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JavaServer Pages (JSP) technology, as specified by an industry consortium led by Sun Microsystems, is a component of the standard Java 2 Enterprise Edition (J2EE). The J2EE component of the Oracle Application Server is known as the Oracle Application Server Containers for J2EE (OC4J).

This document provides reference information as well as some conceptual material for JSP tag libraries and utilities included with OC4J in Oracle Application Server 10g Release 2 (10.1.2). These libraries generally conform to the JSP specification.

For general information about the OC4J JSP implementation, including the JSP tag library framework, refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide.

This preface contains the following sections:

- Audience
- Documentation Accessibility
- Related Documentation
- Conventions

**Audience**

This document is intended for Web application developers using servlet and JavaServer Pages technology. It assumes that working Web, servlet, and JSP environments already exist, and that readers are already familiar with the following:

- General Web technology
- Java
- HTML
- Java servlets
- JavaServer Pages
- Configuration of their Web server and servlet environments
- Oracle JDBC (for JSP applications accessing Oracle Database)

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for background information about standard JavaServer Pages technology, the Oracle JSP implementation, and tag library support.
Documentation Accessibility

Our goal is to make Oracle products, services, and supporting documentation accessible, with good usability, to the disabled community. To that end, our documentation includes features that make information available to users of assistive technology. This documentation is available in HTML format, and contains markup to facilitate access by the disabled community. Accessibility standards will continue to evolve over time, and Oracle is actively engaged with other market-leading technology vendors to address technical obstacles so that our documentation can be accessible to all of our customers. For more information, visit the Oracle Accessibility Program Web site at

http://www.oracle.com/accessibility/

Accessibility of Code Examples in Documentation

Screen readers may not always correctly read the code examples in this document. The conventions for writing code require that closing braces should appear on an otherwise empty line; however, some screen readers may not always read a line of text that consists solely of a bracket or brace.

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TTY Access to Oracle Support Services

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Related Documentation

For more information, see these Oracle resources:

Additional OC4J documents available from the Oracle Java Platform Group:

- Oracle Application Server Containers for J2EE User’s Guide
  This book provides some overview and general information for OC4J; primer chapters for servlets, JSP pages, and EJBs; and general configuration and deployment instructions.

- Oracle Application Server Containers for J2EE Stand Alone User’s Guide
  This version of the user’s guide is specifically for the standalone version of OC4J, and is available when you download the standalone version from OTN. OC4J standalone is used in development environments, but not typically in production environments.

- Oracle Application Server Containers for J2EE Servlet Developer’s Guide
  This book provides information for servlet developers regarding use of servlets and the servlet container in OC4J, including basic servlet development, use of JDBC and EJBs, building and deploying applications, and servlet and Web site configuration.

- Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide
This book provides information for JSP developers who want to run their pages in OC4J. It includes a general overview of JSP standards and programming considerations, as well as discussion of Oracle value-added features and steps for getting started in the OC4J environment.

- Oracle Application Server Containers for J2EE Services Guide
  This book provides information about standards-based Java services supplied with OC4J, such as JTA, JNDI, JMS, JAAS, and the Oracle Application Server Java Object Cache.

- Oracle Application Server Containers for J2EE Security Guide
  This document (not to be confused with the Oracle Application Server 10g Security Guide), describes security features and implementations particular to OC4J. This includes information about using JAAS, the Java Authentication and Authorization Service, as well as other Java security technologies.

- Oracle Application Server Containers for J2EE Enterprise JavaBeans Developer’s Guide
  This book provides information about the EJB implementation and EJB container in OC4J.

Also available from the Oracle Java Platform group:
- Oracle Database Java Developer’s Guide
- Oracle Database JDBC Developer’s Guide and Reference
- Oracle Database JPublisher User’s Guide

Available from the Oracle Application Server group:
- Oracle Application Server Administrator’s Guide
- Oracle Application Server Security Guide
- Oracle Application Server Performance Guide
- Oracle Enterprise Manager Concepts
- Oracle HTTP Server Administrator’s Guide
- Oracle Application Server Globalization Guide
- Oracle Application Server Web Cache Administrator’s Guide
- Oracle Application Server Web Services Developer’s Guide
- Oracle Application Server Upgrade and Compatibility Guide

Available from the Oracle JDeveloper group:
- Oracle JDeveloper online help
- Oracle JDeveloper documentation on the Oracle Technology Network:
  http://www.oracle.com/technology/products/jdev/content.html

Available from the Oracle Server Technologies group:
- Oracle XML Developer’s Kit Programmer’s Guide
- Oracle XML API Reference
- Oracle Database Application Developer’s Guide - Fundamentals
- PL/SQL Packages and Types Reference
- PL/SQL User’s Guide and Reference
For information about OracleAS Personalization, which is the foundation of the Personalization tag library, you can refer to the following documents from the OracleAS Personalization group:

- Oracle Application Server Personalization Administrator’s Guide
- Oracle Application Server Personalization Programmer’s Guide

The following OTN Web site for Java servlets and JavaServer Pages is also available:

http://www.oracle.com/technology/ttech/java/servlets/

The following resources are available from Sun Microsystems.

- Web site for JavaServer Pages, including the latest specifications:
  http://java.sun.com/products/jsp/index.jsp

- Web site for Java Servlet technology, including the latest specifications:
  http://java.sun.com/products/servlet/index.jsp

- jsp-interest discussion group for JavaServer Pages
  To subscribe, send an e-mail to listserv@java.sun.com with the following line in the body of the message:
  subscribe jsp-interest yourlastname yourfirstname

  It is recommended, however, that you request only the daily digest of the posted e-mails. To do this add the following line to the message body as well:
  set jsp-interest digest

## Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td>monospace</td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
Overview of Tag Libraries and Utilities

This manual documents tag libraries, JavaBeans, and other utilities supplied with Oracle Application Server Containers for J2EE (OC4J) that are implemented according to JSP standards. There is also a discussion of support for the JavaServer Pages Standard Tag Library (JSTL), and a section summarizing tag libraries provided with Oracle components outside of OC4J.

Oracle-specific features, as well as an introduction to the OC4J JSP container, standard JSP technology, and standard JSP 1.2 tag library features, are covered in the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide.

This chapter consists of the following sections:

- Overview of Tag Libraries and Utilities Provided with OC4J
- Summary of Oracle Caching Support for Web Applications
- Support for the JavaServer Pages Standard Tag Library
- Overview of Tag Libraries from Other Oracle Components

Tags and JavaBeans introduced in the first section provide functionality in several different areas, including type extensions, integration with XML/XSL, database access, and programming convenience.

---

**Note:** The Sample Applications chapter available in previous releases has been removed. Applications that were listed there are available in the OC4J demos, available from the following location on the Oracle Technology Network (requiring an OTN membership, which is free of charge):

http://www.oracle.com/technology/tech/java/oc4j/demos/

---

Overview of Tag Libraries and Utilities Provided with OC4J

The Oracle extensions that are introduced in the following sections are implemented through tag libraries or custom JavaBeans that comply with JSP and JavaBeans standards.

- Tag Syntax Symbology and Notes
- Overview of Extended Type JavaBeans
- Overview of JspScopeListener for Event-Handling
- Overview of Integration with XML and XSL
- Summary of Data-Access JavaBeans and Tag Library
Overview of Tag Libraries and Utilities Provided with OC4J

- Summary of JSP Markup Language (JML) Custom Tag Library
- Summary of Oracle Application Server Personalization Tag Library
- Summary of Web Services Tag Library
- Summary of File Access and Mail Tags
- Summary of EJB Tags
- Summary of JSP Utility Tags

Be aware that some custom tag libraries provided with OC4J—XML, data-access, and JML—pre-date the JavaServer Pages Standard Tag Library (JSTL) and have areas of duplicate functionality. For standards compliance, it is now generally advisable to use JSTL instead of these custom libraries. See “Support for the JavaServer Pages Standard Tag Library” on page 1-17.

Oracle is not desupporting the existing libraries, however. For features in the custom library that are not yet available in JSTL, where there seems to be general usefulness, Oracle will try to have the features adopted into the JSTL standard as appropriate.

---

Notes:
- See “Summary of Oracle Caching Support for Web Applications” on page 1-12 for information about tag libraries provided with OC4J to support caching features.
- See the OC4J demos for sample applications using the features introduced in this section. They can be downloaded from the following location on the Oracle Technology Network (requiring an OTN membership, which is free of charge):
  
  http://www.oracle.com/technology/tech/java/oc4j/demos/

---

Tag Syntax Symbology and Notes

For the syntax documentation in tag descriptions throughout this manual, note the following:
- *Italic* indicates that you must specify a value or string.
- Optional attributes are enclosed in square brackets: [...]  
- Default values of optional attributes are indicated in **bold**.
- Choices in attribute values are separated by vertical bars: |  
- Except where noted, you can use JSP runtime expressions to set tag attribute values: "<% jspExpression %>
- Tag descriptions in this manual use certain tag prefixes by convention; however, you can designate any desired prefix in your taglib directives.

---

Overview of Extended Type JavaBeans

JSP pages generally rely on core Java types in representing scalar values. However, neither of the following standard type categories is fully suitable for use in JSP pages:
- **Primitive types** such as int, float, and double
  
  Values of these types cannot have a specified scope. They cannot be stored in a JSP scope object (for page, request, session, or application scope), because only objects can be stored in a scope object.
Wrapper classes in the standard `java.lang` package, such as `Integer`, `Float`, and `Double`. Values of these types are objects, so they can theoretically be stored in a JSP scope object. However, they cannot be declared in a `jsp:useBean` action, because the wrapper classes do not follow the JavaBean model and do not provide zero-argument constructors.

Additionally, instances of the wrapper classes are immutable. To change a value, you must create a new instance and assign it appropriately.

To work around these limitations in a JDK 1.4 or earlier environment, OC4J provides the `JmlBoolean`, `JmlNumber`, `JmlFPNumber`, and `JmlString` JavaBean classes in package `oracle.jsp.jml` to wrap the most common Java types.

For information, see Chapter 2, "JavaBeans for Extended Types".

**Overview of JspScopeListener for Event-Handling**

*Important:* `JspScopeListener` is deprecated in the OC4J 10.1.2 implementation and will be desupported in later implementations.

OC4J provides the `JspScopeListener` interface for lifecycle management of Java objects of various scopes within a JSP application.

Standard servlet and JSP event-handling is provided through the `javax.servlet.http.HttpSessionBindingListener` interface, but this is for session-based events only. The Oracle `JspScopeListener` can be integrated with `HttpSessionBindingListener` to manage session-based events, and can handle page-based, request-based, and application-based events as well.

For information, see "JSP Event-Handling with JspScopeListener" on page 9-1.

**Overview of Integration with XML and XSL**

You can use JSP syntax to generate any text-based MIME type, not just HTML code. In particular, you can dynamically create XML output. When you use JSP pages to generate an XML document, however, you often want a stylesheet applied to the XML data before it is sent to the client. This is difficult in JavaServer Pages technology, because the standard output stream used for a JSP page is written directly back through the server.

OC4J provides special tags to specify that all or part of a JSP page should be transformed through an XSL stylesheet before it is output. Input can be from the tag body or from an XML DOM object, and output can be to an XML DOM object to the browser.

You can use these tags multiple times in a single JSP page if you want to specify different style sheets for different portions of the page.

There is additional XML support as well:

- A utility tag converts data from an input stream to an XML DOM object.
- Several tags, for such features as caching and SQL operations, now can take XML objects as input or send them as output.
XML utility tags are summarized in Table 1–1. Note that there is also XML functionality in the `dbOpen` SQL tag and the `cacheXMLObj` Web Object Cache tag. For more information, see Chapter 5, "XML and XSL Tag Support".

You can find information about standard JSP 1.2 XML support in the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide.

### Table 1–1 Summary of XML Utility Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>transform</td>
<td>Output XML data with an XSL transformation, either to an HTTP client or a specified XML DOM object.</td>
<td><code>href</code>, <code>fromXMLObjName</code>, <code>toXMLObjName</code>, <code>toWriter</code></td>
</tr>
<tr>
<td>styleSheet</td>
<td>Same as transform tag.</td>
<td><code>href</code>, <code>fromXMLObjName</code>, <code>toXMLObjName</code>, <code>toWriter</code></td>
</tr>
<tr>
<td>parsexml</td>
<td>Convert from an input stream to an XML DOM object.</td>
<td><code>resource</code>, <code>toXMLObjName</code>, <code>validateResource</code>, <code>root</code></td>
</tr>
</tbody>
</table>

### Summary of Data-Access JavaBeans and Tag Library

OC4J supplies a set of custom JavaBeans for use in accessing Oracle Database. The following beans are provided in the `oracle.jsp.dbutil` package:

- **ConnBean** opens a database connection. This bean also supports data sources and connection pooling.
- **ConnCacheBean** uses the Oracle connection caching implementation for database connections. (This requires JDBC 2.0.)
- **DBBean** executes a database query.
- **CursorBean** provides general DML support for queries; `UPDATE`, `INSERT`, and `DELETE` statements; and stored procedure calls.

For information, see "JavaBeans for Data Access" on page 4-1.

For JSP programmers, OC4J also provides a custom tag library for SQL functionality, wrapping the functionality of the JavaBeans. These tags are summarized in Table 1–2. For further information, see "SQL Tags for Data Access" on page 4-11.

### Table 1–2 Summary of Data-Access Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>dbOpen</td>
<td>Open a database connection. This tag also supports data sources and connection pooling.</td>
<td><code>connId</code>, <code>scope</code>, <code>dataSource</code>, <code>user</code>, <code>password</code>, <code>URL</code>, <code>commitOnClose</code>, <code>commitOnCloseOnClose</code>, <code>commitOnCloseOnCommit</code></td>
</tr>
<tr>
<td>dbClose</td>
<td>Close a database connection.</td>
<td><code>connId</code>, <code>scope</code></td>
</tr>
</tbody>
</table>

1-4  Oracle Application Server Containers for J2EE JSP Tag Libraries and Utilities Reference
Although the JSP specification supports scripting languages other than Java, Java is the primary language used. Even though JavaServer Pages technology is designed to separate the dynamic/Java development effort from the static/HTML development effort, it is a hindrance if the Web developer does not know any Java, especially in small development groups where no Java experts are available.

OC4J provides custom tags as an alternative: the JSP Markup Language (JML). The Oracle JML tag library provides an additional set of JSP tags so that you can script your JSP pages without using Java statements. JML provides tags for variable declarations, control flow, conditional branches, iterative loops, parameter settings, and calls to objects. The JML tag library also supports XML functionality, as noted previously.

The following example shows use of the JML for tag, repeatedly printing "Hello World" in progressively smaller headings (H1, H2, H3, H4, H5):

```
<jml:for id='i' from='1' to='5'>
  <H%i>
    Hello World!
  </H%i>
</jml:for>
```
The JML tag library is summarized in Table 1–3. For more information, see Chapter 3, "JSP Markup Language Tags".

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>useVariable</td>
<td>This tag offers a convenient alternative to the \texttt{jsp:useBean} tag for declaring simple variables.</td>
<td>id, scope, type, value</td>
</tr>
<tr>
<td>useForm</td>
<td>This tag provides a convenient syntax for declaring variables and setting them to values passed in from the request.</td>
<td>id, scope, type, param</td>
</tr>
<tr>
<td>useCookie</td>
<td>This tag offers a convenient syntax for declaring variables and setting them to values contained in cookies.</td>
<td>id, scope, type, cookie</td>
</tr>
<tr>
<td>remove</td>
<td>This tag removes an object from its scope.</td>
<td>id, scope</td>
</tr>
<tr>
<td>if</td>
<td>This tag evaluates a single conditional statement. If the condition is true, then the body of the \texttt{if} tag is executed.</td>
<td>condition</td>
</tr>
<tr>
<td>choose</td>
<td>The \texttt{choose} tag, with associated \texttt{when} and \texttt{otherwise} tags, provides a multiple conditional statement.</td>
<td>(None)</td>
</tr>
<tr>
<td>when</td>
<td>This is used with the \texttt{choose} tag.</td>
<td>condition</td>
</tr>
<tr>
<td>otherwise</td>
<td>This is optionally used with the \texttt{choose} and \texttt{when} tags.</td>
<td>(None)</td>
</tr>
<tr>
<td>for</td>
<td>This tag provides the ability to iterate through a loop, as with a Java \texttt{for} loop.</td>
<td>id, from, to</td>
</tr>
<tr>
<td>foreach</td>
<td>This tag provides the ability to iterate over a homogeneous set of values in a Java array, \texttt{Enumeration} instance, or \texttt{Vector} instance.</td>
<td>id, in, limit, type</td>
</tr>
<tr>
<td>return</td>
<td>When this tag is reached, execution returns from the page without further processing.</td>
<td>(None)</td>
</tr>
<tr>
<td>flush</td>
<td>This tag writes the current contents of the page buffer back to the client. This applies only if the page is buffered; otherwise, there is no effect.</td>
<td>(None)</td>
</tr>
</tbody>
</table>

\textbf{Note:} Oracle JSP container versions preceding the JSP 1.1 specification use an Oracle-specific compile-time implementation of the JML tag library. Oracle still supports this implementation as an alternative to the standard runtime implementation, as documented in Appendix A, "JML Compile-Time Syntax and Tags".

\textbf{Summary of Oracle Application Server Personalization Tag Library}

Web site personalization is a mechanism to tailor recommendations to users of a site, based on behavioral and demographic data. Recommendations are made in real-time,
during a user’s Web session. User behavior is saved to a database repository for use in building models for predictions of future user behavior.

OracleAS Personalization uses data mining algorithms in Oracle Database to choose the most relevant content available for a user. Recommendations are calculated by an OracleAS Personalization recommendation engine, using typically large amounts of data regarding past and current user behavior. This is superior to other approaches that rely on common-sense heuristics and require manual definition of rules in the system.

The OracleAS Personalization tag library brings this functionality to a wide audience of JSP developers for use in HTML, XML, or JavaScript pages. The tag interface is layered on top of the Java API of the recommendation engine.

Table 1–4 summarizes the OracleAS Personalization tag library. See Chapter 10, "Personalization Tags" for information.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>startRESession</td>
<td>Start an OracleAS Personalization recommendation engine session.</td>
<td>REName, REURL, RESchema, REPassword, RECacheSize, REFlushInterval, applicationSession, createSession, userType, userID, storeUserIDIn, disableRecording</td>
</tr>
<tr>
<td>endRESession</td>
<td>Explicitly end a recommendation engine session.</td>
<td>(None)</td>
</tr>
<tr>
<td>setVisitorToCustomer</td>
<td>Use this tag for situations where an anonymous visitor creates a registered customer account.</td>
<td>customerID</td>
</tr>
<tr>
<td>getRecommendations</td>
<td>Request a set of recommendations for purchasing, navigation, or ratings.</td>
<td>from, fromHotPicksGroups, storeResultsIn, storeInterestDimensionIn, maxQuantity, tuningName, tuningDataSource, tuningInterestDimension, tuningPersonalizationIndex, tuningProfileDataBalance, tuningProfileUsage, filteringName, filteringTaxonomyID, filteringMethod, filteringCategories, sortOrder</td>
</tr>
</tbody>
</table>
### Table 1–4 (Cont.) Summary of OracleAS Personalization Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>getCrossSellRecommendations</td>
<td>Request a set of recommendations for purchasing, navigation, or ratings, based on input of a set of past items (such as past purchases) that are used as a basis for the recommendations.</td>
<td>storeResultsIn, storeInterestDimensionIn, fromHotPicksGroups, inputItemList, maxQuantity, tuningName, tuningDataSource, tuningInterestDimension, tuningPersonalizationIndex, tuningProfileDataBalance, tuningProfileUsage, filteringName, filteringTaxonomyID, filteringMethod, filteringCategories, sortOrder</td>
</tr>
<tr>
<td>selectFromHotPicks</td>
<td>Request recommendations from a set of “hot picks” groups only.</td>
<td>hotPicksGroups, storeResultsIn, storeInterestDimensionIn, maxQuantity, tuningName, tuningDataSource, tuningInterestDimension, tuningPersonalizationIndex, tuningProfileDataBalance, tuningProfileUsage, filteringName, filteringTaxonomyID, filteringMethod, filteringCategories, sortOrder</td>
</tr>
<tr>
<td>evaluateItems</td>
<td>Evaluate only the set of items that are input to the tag.</td>
<td>storeResultsIn, taxonomyID, inputItemList, tuningName, tuningDataSource, tuningInterestDimension, tuningPersonalizationIndex, tuningProfileDataBalance, tuningProfileUsage, sortOrder</td>
</tr>
<tr>
<td>forItem</td>
<td>Select individual items input to a tag that requires an input list.</td>
<td>index, itemList, type, ID</td>
</tr>
<tr>
<td>getNextItem</td>
<td>Optionally use this tag within some recommendation tags to access and process returned items.</td>
<td>storeTypeIn, storeIDIn, storeItemIn</td>
</tr>
<tr>
<td>recordNavigation</td>
<td>Record a navigation item into the recommendation engine session cache.</td>
<td>type, ID, index, itemList</td>
</tr>
<tr>
<td>recordPurchase</td>
<td>Record a purchasing item into the recommendation engine session cache.</td>
<td>type, ID, index, itemList</td>
</tr>
</tbody>
</table>
The Web services tag library provided with OC4J enables developers to conveniently create JSP pages for Web service client applications. The implementation uses a SOAP-based mechanism, supporting RPC-style or document-style services. A client application would access a Web Services Description Language (WSDL) document, then use the WSDL information to access the operations of a Web service.

The tag library also uses the Oracle implementation of the dynamic invocation API, described in the Oracle Application Server Web Services Developer’s Guide. When a client application acquires a WSDL document at runtime, the dynamic invocation API is the vehicle for invoking any SOAP operation described in the WSDL document.

The Web services tag library is summarized in Table 1–5. For more information, see Chapter 11, "Web Services Tags".

### Table 1–5 Summary of Web Services Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>webservice</td>
<td>Create a Web service proxy. The tag requires the URL of a WSDL document and uses either a binding and SOAP location or a service name and port in creating the proxy.</td>
<td>wsdlUrl, id, scope, binding, soapLocation, service, port</td>
</tr>
<tr>
<td>recordRating</td>
<td>Record a rating item into the recommendation engine session cache.</td>
<td>value, type, ID, index, itemList</td>
</tr>
<tr>
<td>recordDemographic</td>
<td>Record a demographic item into the recommendation engine session cache.</td>
<td>type, value</td>
</tr>
<tr>
<td>removeNavigationRecord</td>
<td>Remove a navigation item that had been recorded into the recommendation engine session cache earlier in the session.</td>
<td>type, ID, index, itemList</td>
</tr>
<tr>
<td>removePurchaseRecord</td>
<td>Remove a purchasing item that had been recorded into the recommendation engine session cache earlier in the session.</td>
<td>type, ID, index, itemList</td>
</tr>
<tr>
<td>removeRatingRecord</td>
<td>Remove a rating item that had been recorded into the recommendation engine session cache earlier in the session.</td>
<td>value, type, ID, index, itemList</td>
</tr>
<tr>
<td>removeDemographicRecord</td>
<td>Remove a demographic item that had been recorded into the recommendation engine session cache earlier in the session.</td>
<td>type, value</td>
</tr>
</tbody>
</table>
Oracle Application Server Containers for J2EE JSP Tag Libraries and Utilities Reference

### Summary of File Access and Mail Tags

OC4J provides tag libraries for file access (uploading and downloading) and for sending e-mail messages from an application.

For uploading files, you can use the `httpUpload` tag or the `oracle.jsp.webutil.fileaccess.HttpUploadBean` JavaBean. For downloading, there is the `httpDownload` tag or the `HttpDownloadBean` JavaBean. Table 1–6 summarizes the file access tags. For more information, see "File-Access JavaBeans and Tags" on page 8-1.

#### Table 1–6  Summary of File Access Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>httpUploadForm</td>
<td>For convenience, you can use this tag to create a form in your application, using multipart encoded form data, that allows users to specify the files to upload.</td>
<td>formsAction, maxFiles, fileNameSize, maxFileNameSize, includeNumbers, submitButtonText</td>
</tr>
<tr>
<td>httpUpload</td>
<td>Upload files from the client to a server. You can upload into either a file system or a database.</td>
<td>destination, destinationType, connId, scope, overwrite, fileName, table, prefixColumn, fileNameColumn, dataColumn</td>
</tr>
</tbody>
</table>
For sending e-mail messages, optionally with server-side or client-side attachments, you can use the `oracle.jsp.webutil.email.SendMailBean` JavaBean or the `sendMail` tag. Table 1–7 summarizes the `sendMail` tag. See “Mail JavaBean and Tag” on page 8-18 for more information.

### Table 1–7  Summary of `sendMail` Tag

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sendMail</code></td>
<td>Send an e-mail message from a JSP page. Tag functionality includes globalization support.</td>
<td>host, sender, recipient, cc, bcc, subject, contentType, contentEncoding, serverAttachment, clientAttachment</td>
</tr>
</tbody>
</table>

### Summary of EJB Tags

OC4J provides a custom tag library to simplify the use of Enterprise JavaBeans in JSP pages. The functionality of the OC4J EJB tags follows the J2EE specification. The tags allow you to instantiate EJBs by name, using configuration information in the `web.xml` file.

There are tags to create a home instance, create an EJB instance, and iterate through a collection of EJBs. Table 1–8 summarizes the EJB tag library. See "EJB Tags" on page 9-10 for more information.

### Table 1–8  Summary of EJB Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>useHome</code></td>
<td>Look up the home interface for the EJB and create an instance of it.</td>
<td>id, type, location, local</td>
</tr>
<tr>
<td><code>useBean</code></td>
<td>Instantiate and use the EJB. The functionality is similar to that of the standard <code>jsp:useBean</code> tag for a JavaBean.</td>
<td>id, type, value, scope, local</td>
</tr>
</tbody>
</table>
Summary of JSP Utility Tags

OC4J has utility tags for displaying a date, displaying an amount of money in the appropriate currency, displaying a number, iterating through a collection, evaluating and including the tag body (depending on whether the user belongs to a specified role), and displaying the last modification date of the current file. Table 1–9 summarizes these tags. See “General Utility Tags” on page 9-16 for more information.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayCurrency</td>
<td>Display a specified amount of money, formatted as currency for the locale.</td>
<td>amount,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>locale</td>
</tr>
<tr>
<td>displayDate</td>
<td>Display a specified date, formatted appropriately for the locale.</td>
<td>date,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>locale</td>
</tr>
<tr>
<td>displayNumber</td>
<td>Display the specified number, for the locale and optionally in the specified format.</td>
<td>number,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>locale,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>format</td>
</tr>
<tr>
<td>iterate</td>
<td>Iterate through a collection.</td>
<td>id,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>type,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>collection,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>max</td>
</tr>
<tr>
<td>ifInRole</td>
<td>Evaluate the tag body and include it in the body of the JSP page, depending on whether the user is in the specified application role.</td>
<td>role,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>include</td>
</tr>
<tr>
<td>lastModified</td>
<td>Display the date of the last modification of the current file, in appropriate format for the locale.</td>
<td>locale</td>
</tr>
</tbody>
</table>

Summary of Oracle Caching Support for Web Applications

This section provides the following information:

- An introduction to caching features supported by the Oracle Application Server in general and the OC4J JSP container in particular
- A discussion of the role of the OC4J Web Object Cache in relation to other Oracle Application Server caching components
- A summary of tag libraries relating to caching features

The Oracle tag libraries introduced in this section comply with JSP standards.
Oracle Application Server and JSP Caching Features

The Oracle Application Server and OC4J provide the following caching features:

- **Oracle Application Server Web Cache**

  This is an HTTP-level cache, maintained outside the application, providing very fast cache operations. It is a content-based cache, capable of caching static data (such as HTML, GIF, or JPEG files) or dynamic data (such as servlet or JSP results). Given that it exists as a content-based cache outside the application, it cannot cache objects (such as Java objects or XML DOM objects) in a Java object format. In addition, post-processing operations applicable to cached data cannot be coded in Java and are predefined by the cache itself.

  The OracleAS Web Cache provides an ESI processor to support Edge Side Includes, an XML-style markup language that allows dynamic content assembly away from the Web server. This technology enables you to separate cacheable pages into distinct cached objects, as desired. OC4J supports this technology through its JESI tag library.

  For an overview of Edge Side Includes and the OracleAS Web Cache, as well as detailed documentation of the JESI tag library, see Chapter 6, "JESI Tags for Edge Side Includes".

  For additional information about the OracleAS Web Cache, see the Oracle Application Server Web Cache Administrator’s Guide.

- **OC4J Web Object Cache**

  This is an application-level cache that is embedded and maintained within a Java Web application. It is a hybrid cache, both Web-based and object-based. A custom tag library or API enables you to define page fragment boundaries and to capture, store, reuse, process, and manage the intermediate and partial execution results of JSP pages and servlets as cached objects. Each page fragment can produce a separate cache object. The produced objects can be HTML or XML text fragments, XML DOM objects, or Java serializable objects. These objects can be cached conveniently in association with HTTP request and session semantics. Alternatively, they can be reused outside HTTP, such as when an application outputs cached XML objects through Simple Mail Transfer Protocol (SMTP), Java Messaging Service (JMS), Advanced Queueing (AQ), or Simple Object Access Protocol (SOAP).

  For more information, see Chapter 7, "Web Object Cache Tags and API".

- **Oracle Application Server Java Object Cache**

  The Oracle Application Server Java Object Cache is a general-use Java cache to manage Java objects within a process, across processes, and on local disk. By managing local copies of objects that are difficult or expensive to retrieve or create, the Java Object Cache can significantly improve application performance. By default, the OC4J Web Object Cache uses the Oracle Application Server Java Object Cache as its underlying cache repository.

**Note:** See the OC4J demos for sample applications using the features introduced in this section. The can be downloaded from the following location on the Oracle Technology Network:

http://www.oracle.com/technology/tech/java/oc4j/demos/
For details about the Java Object Cache, see the Oracle Application Server Containers for J2EE Services Guide.

Role of the JSP Web Object Cache

It is important to understand the role of the OC4J Web Object Cache in the overall setup of a Web application. It works at the Java level and is closely integrated with the HTTP environment of servlet and JSP applications. By contrast, the Oracle Application Server Java Object Cache works at the Java object level, but is not integrated with HTTP. As for the OracleAS Web Cache, it is well integrated with HTTP and is orders of magnitude faster than the Web Object Cache, but it does not operate at the Java level and cannot be directly invoked by Web application code. For example, it cannot apply a style sheet to a cached DOM object within the J2EE container, reuse the cached result in other protocols, or allow direct DOM operations. OracleAS Web Cache can, however, apply a style sheet to text-based XML documents, as opposed to DOM objects, that were cached from the original Web server through HTTP.

The Web Object Cache is not intended for use as the main Web cache for an application. It is an auxiliary cache embedded within the same Java virtual machine that is running your servlets and JSP pages. Because the retrieval path for cached results in the Web Object Cache includes the JVM and the JSP and servlet engines, it generally takes much longer to serve a page from the Web Object Cache compared to the OracleAS Web Cache.

The Web Object Cache does not replace or eliminate the need for either the OracleAS Web Cache or the Oracle Application Server Java Object Cache. It is a complementary caching component in the overall framework of a Web application and should be used together with the other caching products, as appropriate. In fact, the Web Object Cache uses the Java Object Cache as its default repository. And through combined use of the OC4J JESI tags and Web Object Cache tags, you can use the Web Object Cache and OracleAS Web Cache together in the same page.

Web Object Cache Versus OracleAS Web Cache

Think of the OracleAS Web Cache as the primary caching component. It serves cached pages directly to HTTP clients and handles large volumes of HTTP traffic quickly, fitting the requirements of most Web sites. You can use the OracleAS Web Cache to store complete Web pages or partial pages (through use of the JESI tags). Cached pages can be customized, to a certain extent, before being sent to a client, including cookie-replacement and page-fragment concatenation, for example.

It is advisable to use the OracleAS Web Cache as much as possible to speed up response and reduce the load on the Web application server and back-end database. The caching needs of a large percentage of Web pages can be addressed by the OracleAS Web Cache alone.

As a complement to the OracleAS Web Cache, you can use the Web Object Cache to capture intermediate results of JSP and servlet execution and subsequently reuse these cached results in other parts of the Java application logic. It is not beneficial to use the Web Object Cache in your Web application unless you can repeatedly reuse objects after they are cached and you require post-processing on cached objects before they are served to a client.

Web Object Cache Versus Oracle Application Server Java Object Cache

In comparison to the Oracle Application Server Java Object Cache, the Web Object Cache makes it much easier to store and maintain partial execution results in dynamic Web pages. The Java Object Cache, being a pure object-based framework for any
general Java application, is not aware of any HTTP environment in which it might be embedded. For example, its cache keys do not automatically depend on HTTP cookies or sessions. When you directly use the Java Object Cache within a Web application, you are responsible for creating any necessary interfacing with resulting Web pages. The Java Object Cache provides only a programmatic way to specify cache maintenance policies, whereas the Web Object Cache allows the alternative of specifying policies through configuration files.

Summary of Tag Libraries for Caching

OC4J supplies two tag libraries for use with Oracle Application Server caching features:

- JESI tag library
- Web Object Cache tag library

This section summarizes those libraries.

Summary of JESI Tag Library

OC4J provides the JESI tag library as a convenient interface to ESI tags and Edge Side Includes functionality for Web caching. Developers have the option of using ESI tags directly in any Web application, but JESI tags provide additional convenience in a JSP environment.

Table 1–10 summarizes the JESI tag library. See "Oracle JESI Tag Descriptions" on page 6-13 for more information.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>Control caching characteristics for JSP pages in the control/include usage model. You can use a JESI control tag in the top-level page or any included page.</td>
<td>expiration, maxRemovalDelay, cache, control</td>
</tr>
<tr>
<td>include</td>
<td>This tag, like a standard jsp:include tag, enables you to dynamically insert output from the included page into output from the including page. However, it results in the included page being processed and assembled by the ESI processor, typically inside OracleAS Web Cache.</td>
<td>page, alt, ignoreError, copyParam, flush</td>
</tr>
<tr>
<td>param</td>
<td>This is a subtag of the JESI include tag. You can use one or more JESI param tags to pass additional query parameters to the included page.</td>
<td>name, value</td>
</tr>
<tr>
<td>template</td>
<td>Use this tag (together with JESI fragment tags) when you are splitting a JSP page into separate cache fragments. The JESI template tag specifies caching behavior for the aggregate page, outside any fragments.</td>
<td>expiration, maxRemovalDelay, cache, control</td>
</tr>
<tr>
<td>fragment</td>
<td>Use one or more JESI fragment tags within a JESI template tag, between the JESI template start-tag and end-tag, to denote separately cacheable fragments.</td>
<td>expiration, maxRemovalDelay, cache, control</td>
</tr>
<tr>
<td>codeblock</td>
<td>This is a subtag of the JESI template tag. You can use JESI codeblock tags to specify conditional execution of code blocks within the template code.</td>
<td>execute</td>
</tr>
</tbody>
</table>
Summary of Oracle Caching Support for Web Applications

Table 1–11 Summary of Web Object Cache Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cache</td>
<td>Use this tag to cache an object, for example a text fragment, in a JSP application. (Note, however, that there are separate tags for caching XML DOM objects or Java serializable objects.)</td>
<td>policy, ignoreCache, invalidateCache, scope, autoType, selectedParam, selectedCookies, reusableTimeStamp, reusableDeltaTime, name, expirationType, TTL, timeInaDay, dayInaWeek, dayInaMonth, writeThrough, printCacheBlockInfo, printCachePolicy, cacheRepositoryName, reportException</td>
</tr>
<tr>
<td>invalidate</td>
<td>Use this tag, with its JESI object subtag, to explicitly invalidate one or more objects cached by OracleAS Web Cache.</td>
<td>url, username, password, config, output</td>
</tr>
<tr>
<td>object</td>
<td>Use this required subtag of the JESI invalidate tag to specify cached objects to invalidate, according to either the complete URI or a URI prefix.</td>
<td>url, prefix, maxRemovalDelay</td>
</tr>
<tr>
<td>cookie</td>
<td>Optionally use this subtag of the JESI object tag to use cookie information as a further criterion for invalidation.</td>
<td>name, value</td>
</tr>
<tr>
<td>header</td>
<td>Optionally use this subtag of the JESI object tag to use HTTP/1.1 header information as a further criterion for invalidation.</td>
<td>name, value</td>
</tr>
<tr>
<td>personalize</td>
<td>Use this tag to allow page customization, by directing the ESI processor to perform cookie value substitution for every request for an object.</td>
<td>name, default</td>
</tr>
</tbody>
</table>

Summary of Web Object Cache Tag Library

The OC4J Web Object Cache is a mechanism that allows Web applications written in Java to capture, store, reuse, post-process, and maintain the partial and intermediate results generated by a dynamic Web page, such as a JSP page or servlet. The programming interfaces it provides are a tag library (for use in JSP pages) and a Java API (for use in servlets).

Table 1–11 summarizes the Web Object Cache tag library. See "Web Object Cache Tag Descriptions" on page 7-14 for more information.
Support for the JavaServer Pages Standard Tag Library

With Oracle Application Server 10g Release 2 (10.1.2), the OC4J JSP product includes an implementation of the JavaServer Pages Standard Tag Library (JSTL), as specified in the Sun Microsystems JavaServer Pages Standard Tag Library, Version 1.0 specification. The following sections provide an overview of JSTL features and OC4J support:

- **Overview and Philosophy of JSTL**
- **Summary of JSTL Expression Language**
- **Overview of JSTL Tags and Additional Features**
- **JSTL Usage Notes and Future Considerations**

For complete information about JSTL, refer to the specification at the following location:

http://www.jcp.org/aboutJava/communityprocess/first/jsr052/index.html

---

**Note:** JSTL 1.0 requires a JSP 1.2 environment.

---

### Overview and Philosophy of JSTL

JSTL is intended as a convenience for JSP page authors who are not familiar or not comfortable with scripting languages such as Java. Historically, scriptlets have been used in JSP pages to process dynamic data. With JSTL, the intent is for JSTL tag usage to replace the need for scriptlets.

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#### Table 1–11 (Cont.) Summary of Web Object Cache Tag Library

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cacheXMLObj</td>
<td>Generally speaking, use this tag instead of the cache tag if you are caching XML DOM objects. The cacheXMLObj tag supports all the cache tag attributes, as well as additional XML-specific parameters.</td>
<td>All attributes of the cache tag, plus: fromXMLObjName, toXMLObjName, toWriter</td>
</tr>
<tr>
<td>useCacheObj</td>
<td>Use this tag to cache any Java serializable object. The useCacheObj tag supports all the cache tag parameters, as well as additional attributes specific to its functionality.</td>
<td>All attributes of the cache tag, plus: type, id, cacheScope</td>
</tr>
<tr>
<td>cacheInclude</td>
<td>This tag combines functionality of the cache tag (but not the cacheXMLObj tag or useCacheObj tag) and the standard jsp:include tag.</td>
<td>policy, page, printCacheBlockInfo, reportException</td>
</tr>
<tr>
<td>invalidateCache</td>
<td>Use this tag to programmatically invalidate a cache object. Most attributes of the invalidateCache tag behave the same way as attributes of the same names in the cache tag.</td>
<td>policy, ignoreCache, scope, autoType, selectedParam, selectedCookies, name, invalidateNameLike, page, autoInvalidateLevel, cacheRepositoryName, reportException</td>
</tr>
</tbody>
</table>
Readers who have used previous versions of the OC4J JSP product will recognize this as similar to the goals of the Oracle JavaServer Pages Markup Language (JML) tag library. While the JML tag library is still supported, use of the standard JSTL is encouraged. Also see "JSTL Usage Notes and Future Considerations" on page 1-23.

Key JSTL features include the following:

- **JSTL expression language (EL)**
  The expression language further simplifies the code required to access and manipulate application data, making it possible to avoid request-time expressions as well as scriptlets. See the next section, "Summary of JSTL Expression Language".

- **Core tags for expression language support, conditional logic and flow control, iterator actions, and access to URL-based resources**

- **Tags for XML processing, flow control, and XSLT transformations**

- **SQL tags for database access**

- **Tags for I18N-capable internationalization and formatting**
  (The term "I18N" refers to an internationalization standard.)

Tag support is broken into four JSTL sublibraries according to the preceding functional areas. Table 1–12 shows the standard TLD URI and prefix for each sublibrary.

**Table 1–12**  **JSTL Sublibraries**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>URI</th>
<th>Prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td><a href="http://java.sun.com/jstl/core">http://java.sun.com/jstl/core</a></td>
<td>c:</td>
</tr>
<tr>
<td>XML processing</td>
<td><a href="http://java.sun.com/jstl/xml">http://java.sun.com/jstl/xml</a></td>
<td>x:</td>
</tr>
<tr>
<td>SQL database access</td>
<td><a href="http://java.sun.com/jstl/sql">http://java.sun.com/jstl/sql</a></td>
<td>sql:</td>
</tr>
<tr>
<td>I18N internationalization and formatting</td>
<td><a href="http://java.sun.com/jstl/fmt">http://java.sun.com/jstl/fmt</a></td>
<td>fmt:</td>
</tr>
</tbody>
</table>

See "Overview of JSTL Tags and Additional Features" on page 1-20 for more information.

---

**Note:** Given the constraints of having to work with JSP 1.2 containers, the JSTL 1.0 implementation was required to support both the expression language model and the request-time expression model. This dual support is accomplished through parallel JSTL sublibraries. For each sublibrary (core, XML, SQL, and I18N) there are separate TLDs, and hence separate TLD URIs, for the two versions.

It is expected that most users will want to use the expression language model, corresponding to the URIs listed previously. To use the request-time expression model, add "_rt" to each URI in order to access the appropriate TLDs. By convention, add "_rt" to each prefix as well ("c_rt:", for example).

---

**Summary of JSTL Expression Language**

The JSTL expression language makes use of the fact that JSP scoped attributes and request parameters are the preferred vehicles for passing information to and from JSP
pages. By using the JSTL expression language, you can avoid having to use JSP scriptlets and request-time expressions.

In JSTL 1.0, the expression language can be used only in JSTL tag attribute values.

As an example, consider the following use of the JSTL \texttt{c:if} tag to pick out steel-making companies from a company list:

\begin{verbatim}
  \texttt{<c:if test="$\{company.industry == 'steel'\}$">}
  ...
  \texttt{</c:if>}
\end{verbatim}

The rest of this section summarizes JSTL expression language syntax and documents how to enable JSTL expression language evaluation in your OC4J JSP applications.

\textbf{JSTL Expression Language Syntax}

This following list offers a brief summary of key syntax features of the JSTL expression language. This is followed by a few simple examples.

- **Invocation**
  
  The JSTL expression language is invoked through \texttt{${expression}$} syntax. The most basic semantic is that invocation of a named variable \texttt{$\{foo\}$} yields the same result as the method call \texttt{PageContext.findAttribute(foo)}.

- **Data structure access**
  
  To access data within JavaBeans and within collections such as lists, maps, and arrays, the expression language supports the \texttt{.} and \texttt{[]} constructs. The \texttt{.} construct allows access to properties whose names are standard Java identifiers. The \texttt{[]} construct is for more generalized access, but for valid Java identifiers is equivalent to the \texttt{.} construct. The expressions \texttt{foo.bar} and \texttt{foo["bar"]} yield the same result, for example.

- **Relational operators**
  
  The expression language supports the relational operators \texttt{== (or eq)}, \texttt{!= (or ne)}, \texttt{< (or lt)}, \texttt{>} \texttt{(or gt)}, \texttt{<= (or le)}, \texttt{>= (or ge)}.

- **Arithmetic operators**
  
  The expression language supports the arithmetic operators \texttt{+, -, *, / (or div)}, \texttt{% (or mod, for remainder or modulo)}.

- **Logical operators**
  
  The expression language supports the logical operators \texttt{&& (or and)}, \texttt{|| (or or)}, \texttt{! (or not)}, \texttt{empty}.

\textbf{Example: Basic} The following example shows fairly basic invocations of the expression language, including the relational \texttt{"\&\&"} (less than or equal to) operator.

\begin{verbatim}
  \texttt{<c:if test="$\{auto.price <= customer.priceLimit\}$">}
  The \texttt{<c:out value="$\{auto.makemodel\}$"/>} is in your price range.
  \texttt{</c:if>}
\end{verbatim}

\textbf{Example: Accessing Collections} The following example, from the Sun Microsystems \textit{JavaServer Pages Standard Tag Library, Version 1.0} specification, shows use of the \texttt{.} and \texttt{[]} constructs:

\begin{verbatim}
\texttt{<%-- “productDir” is a Map object containing the description of products, “preferences” is a Map object containing the preferences of a user --%>}
\end{verbatim}
product:
    <c:out value="${productDir[product.custId]}"/>
shipping preference:
    <c:out value="${user.preferences['shipping']}"/>

**JSTL Expression Language Implicit Objects**

JSTL offers the following implicit objects:

- **pageScope**: Allows access to page-scope variables.
- **requestScope**: Allows access to request-scope variables.
- **sessionScope**: Allows access to session-scope variables.
- **applicationScope**: Allows access to application-scope variables.
- **pageContext**: Allows access to all properties of the page context of a JSP page.
- **param**: This is a Java Map object where `param["foo"]` returns the first string value associated with the request parameter `foo`.
- **paramValues**: Use `paramValues["foo"]`, for example, to return an array of all string values associated with request parameter `foo`.
- **header**: Similarly to using `param`, you can use this to access the first string value associated with a request header.
- **headerValues**: Similarly to using `paramValues`, you can use this to access all string values associated with a request header.
- **initParam**: Allows access to context initialization parameters.
- **cookie**: Allows access to cookies received in the request.

**JSTL Expression Language Additional Features**

The expression language also offers the following features:

- It can provide default values where failure to evaluate an expression is considered to be recoverable.
- Where application data might not exactly match the type expected by a tag attribute or expression language operator, there are rules to convert the type of the resulting value to the expected type.

See the JSTL 1.0 specification for information.

**Overview of JSTL Tags and Additional Features**

The following sections provide a summary of JSTL tags and discuss some additional JSTL features:

- **Scoped Variables**
- **Configuration Data and the Config Class**
- **JSTL Tag Summary**

**Scoped Variables**

JSTL tags make data available through JSP scoped attributes, referred to as *scoped variables*, which are used in place of scripting variables. JSTL tags that can make data available in this way have `var` and `scope` among their attributes, used as follows:

- **var**: the variable that is to be exposed
- **scope**: the scope of the variable, either page (default), request, session, or application

The **scope** attribute would not be relevant for **NESTED** variables (which would always have page scope), but variables in the JSTL are **AT_END** (available from the end-tag to the end of the page).

The following example uses the core library iterator action tag **forEach** and expression language support tag **out** to expose the current item of an employees collection:

```xml
<c:forEach var="employee" items="${customers}"
  The current employee is <c:out value="${customer}"/>
</c:forEach>
```

**Configuration Data and the Config Class**

JSTL includes functionality to dynamically override JSP configuration data for a particular scope, through a scoped variable. You can accomplish this using functionality of the `javax.servlet.jsp.jstl.core.Config` class.

According to the JSP specification, all scopes (page, request, session, and application) that exist within a JSP page context should together form a single namespace; that is, the name of a scoped variable should be unique across execution of a page.

The **Config** class has functionality to transparently manipulate configuration parameter names to produce the effect that each scope has its own namespace. Effectively, this enables you to set a configuration parameter for a particular scope only.

See the JSTL 1.0 specification for information.

**JSTL Tag Summary**

Table 1–13 summarizes the JSTL tags, organized into functional groups. The JSTL standard tag prefix is noted for each group.

<table>
<thead>
<tr>
<th>Tag Group</th>
<th>Description of Group</th>
<th>Individual Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core, EL support</td>
<td>Includes tags to evaluate an expression and output the result to the current JspWriter object, set the value of a scoped variable or of a property of a target object, remove a scoped variable, and catch a Throwable instance thrown by a nested action.</td>
<td><code>c:out</code>, <code>c:set</code>, <code>c:remove</code>, <code>c:catch</code></td>
</tr>
<tr>
<td>Core, conditional</td>
<td>Includes tags to evaluate body content if a test attribute evaluates as <code>true</code>, and specify mutually exclusive conditional execution paths. The <code>when</code> and <code>otherwise</code> tags are used with the <code>choose</code> tag.</td>
<td><code>c:if</code>, <code>c:choose</code>, <code>c:when</code>, <code>c:otherwise</code></td>
</tr>
<tr>
<td>Core, iterators</td>
<td>Includes tags to iterate body execution over a collection of objects, or a specified number of times, and iterate over a set of tokens separated by supplied delimiters.</td>
<td><code>c:forEach</code>, <code>c:forTokens</code></td>
</tr>
</tbody>
</table>
Table 1–13 (Cont.) Summary of JavaServer Pages Standard Tag Library

<table>
<thead>
<tr>
<th>Tag Group</th>
<th>Description of Group</th>
<th>Individual Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core, URL-related</td>
<td>Includes tags to import the content of a URL-based resource, create a URL using appropriate rewriting rules, send an HTTP redirect to the client, and add a request parameter to a URL. The param tag is a subtag of the import, url, and redirect tags.</td>
<td>cimport, curl, credirect, cparam</td>
</tr>
<tr>
<td>XML, core</td>
<td>Includes tags to parse an XML document, evaluate an XPath expression and output the result to the current JspWriter object, and evaluate an XPath expression and store the result in a scoped variable. (See the note after this table regarding XPath.)</td>
<td>x:parse, x:out, x:set</td>
</tr>
<tr>
<td>XML, flow control</td>
<td>Includes tags to evaluate a specified XPath expression and render its content if the expression evaluates as true, specify mutually exclusive conditional execution paths, and evaluate a specified XPath expression and repeat body execution over the result. The when and otherwise tags are used with the choose tag.</td>
<td>x:if, x:choose, x:when, x:otherwise, x:forEach</td>
</tr>
<tr>
<td>XML, transforms</td>
<td>Includes tags to apply an XSLT style sheet transformation to a document, and set transformation parameters. The param tag is a subtag of the transform tag.</td>
<td>x:transform, x:param</td>
</tr>
<tr>
<td>SQL</td>
<td>Includes tags to query a database, update a database (UPDATE/INSERT/DELETE), establish a transaction context for queries and updates, export a data source as a scoped variable or data source configuration variable, set the values for parameter placeholders (“?”) in a SQL statement, and set the values for parameter placeholders where the type is java.util.Date. The param and dateParam tags are subtags of the query and update tags.</td>
<td>sql:query, sql:update, sql:transaction, sql:setDataSource, sql:driver, sql:param, sql:dateParam</td>
</tr>
<tr>
<td>I18N, internationalization</td>
<td>Includes tags to store a specified locale in the locale configuration variable, create an I18N localization context for use within the tag, create a localization context and store it for use outside the tag, look up a localized message in a resource bundle, and set the request character encoding. The param tag can be used with the message tag to replace a parameter in the message tag.</td>
<td>fmt:locale, fmt:bundle, fmt:message, fmt:param, fmt:requestEncoding</td>
</tr>
</tbody>
</table>
Support for the JavaServer Pages Standard Tag Library

Overview of Tag Libraries and Utilities

Table 1–13 (Cont.) Summary of JavaServer Pages Standard Tag Library

<table>
<thead>
<tr>
<th>Tag Group</th>
<th>Description of Group</th>
<th>Individual Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>I18N, formatting</td>
<td>Includes tags to specify a time zone for formatting or parsing, store a specified time zone in a scoped variable or time zone configuration variable, format a numeric value as appropriate for a locale or special customization, parse the string representation of a numeric value that had been formatted for a locale or special customization, format a date or time for a locale or special customization, and parse the string representation of a date or time that had been formatted for a locale or special customization.</td>
<td>fmt:timeZone, fmt:setTimeZone, fmt:formatNumber, fmt:parseNumber, fmt:formatDate, fmt:parseDate</td>
</tr>
</tbody>
</table>

Note: JSTL tags for XML processing are based on XPath (XML Path), a W3C recommendation. XPath provides a concise notation for specifying and selecting parts of an XML document. Refer to the following Web site for information:

http://www.w3.org/TR/xpath

JSTL Usage Notes and Future Considerations

Be aware off the following considerations:

- The Oracle Application Server 10g Release 2 (10.1.2) JSTL implementation is based on the Jakarta 1.0.3 JSTL version and is suitable for use with OC4J. See the following location for more information about Jakarta:


- The custom JML, XML, and data-access (SQL) tag libraries provided with OC4J pre-date JSTL and have areas of duplicate functionality. For standards compliance, it is now generally advisable to use JSTL instead of the custom libraries, and Oracle plans to desupport the JML library in future releases. For features in the custom libraries that are not yet available in JSTL, where there seems to be general usefulness, Oracle will try to have the features adopted into the JSTL standard as appropriate.

- For the filter functionality of JSTL XML tags to work in OC4J, you must set the SAX driver when starting OC4J. Otherwise, the JSTL demo Filter.jsp gives the following exception:

  javax.servlet.jsp.JspException: System property org.xml.sax.driver not specified

  When starting OC4J standalone, use the following option in the command line:

  -Dorg.xml.sax.driver=oracle.xml.parser.v2.SAXParser

  When starting Oracle Application Server, you can specify this setting through the system properties.
Overview of Tag Libraries from Other Oracle Components

A number of other Oracle components, outside OC4J, provide JSP tag libraries. The following sections summarize these libraries:

- Oracle ADF Business Components Tag Library
- Oracle JDeveloper User Interface Extension (UIX) Tag Library
- Oracle ADF Business Components UIX Tag Library
- Oracle Application Server Wireless Location Tag Library
- Oracle Application Server MapViewer Tag Library
- Oracle Ultra Search Tag Library
- Oracle Application Server Portal Tag Library
- Oracle Business Intelligence Beans Tag Library
- Oracle Application Server Multimedia Tag Library

The Oracle tag libraries introduced in this section comply with JSP standards. The following discussion assumes some prior knowledge of the underlying components.

Oracle ADF Business Components Tag Library

Oracle Application Development Framework (Oracle ADF), offered as part of Oracle JDeveloper, includes the component technology Oracle ADF Business Components. This includes a library of custom Business Components data tags.

These data tags provide a simple tag-based approach for interaction with Business Components data sources, allowing complete access to business components with viewing, editing, and full DML control capabilities. The tag-based approach to building JSP applications with Business Components does not require extensive Java programming and is very much like coding an HTML page.

For more information, refer to the Oracle JDeveloper online help or to the following location on the Oracle Technology Network:

http://www.oracle.com/technology/products/jdev/content.html

Oracle JDeveloper User Interface Extension (UIX) Tag Library

Oracle JDeveloper provides a set of custom tags known as User Interface Extension (UIX) tags. The tags invoke UIX controls, generating the HTML to render tabs, buttons, tables, headers, and other layout and navigational components that implement the Oracle browser look and feel.

The tags are included on several palette pages: UIX JSP Border Layout, UIX JSP Form, UIX JSP Layout, UIX JSP Message Components, UIX JSP Page Layout, UIX JSP Simple Components, and UIX JSP Table.

For more information, refer to the Oracle JDeveloper online help or to the following location on the Oracle Technology Network:

http://www.oracle.com/technology/products/jdev/content.html
Oracle ADF Business Components UIX Tag Library

UIX JSP pages can include both Business Components data tags and Business Components UIX convenience tags that simplify the presentation of data.

The Business Components UIX convenience tags rely on an ApplicationModule data tag to get the data source from the Business Components application module. In addition to the Business Components UIX tags, you can use the (non-UIX) Business Components tags in UIX JSP pages.

For more information, refer to the Oracle JDeveloper online help or to the following location on the Oracle Technology Network:

http://www.oracle.com/technology/products/jdev/content.html

Oracle Reports Tag Library

Oracle Reports consists of Oracle Reports Developer (a component of the Oracle Developer Suite) and Oracle Reports Services (a component of the Oracle Application Server). The Oracle Reports Developer includes tags integrated with data model objects that are used to create JSP reports. The Oracle Reports custom tags allow you to quickly add report blocks and graphs to existing JSP files. These tags can be used as templates to enable you to build and insert your own data-driven Java component into an HTML page for a JSP-based Web report.

Key tags delimit and define the report block. Inside these tags, other tags define the content and the look and feel of the report data.

For more information, refer to the Oracle Reports Developer online help, available through the Help menu in Reports Builder. You can also find more information about Oracle Reports on the Oracle Technology Network:


Oracle Application Server Wireless Location Tag Library

Developers of location-based applications need specialized services for the following:

- Geocoding: associating geographical coordinates with addresses
- Mapping: providing a graphical map for a point, set of points, route, or driving maneuver
- Routing: providing driving directions
- Business directories ("yellow pages"): listing businesses by region and by either category or name
- Traffic: providing information about accidents, construction, and other incidents that affect traffic flow

The OracleAS Wireless location application components compose an API for performing geocoding, providing driving directions, and looking up business directories. Service proxies are included that map existing key providers to the API, and additional providers are expected to be accommodated in the future.

For JSP developers, a tag library is provided. For more information, refer to the Oracle Application Server Wireless Developer’s Guide.
Overview of Tag Libraries from Other Oracle Components

Oracle Application Server MapViewer Tag Library

The OracleAS MapViewer is a programmable tool for rendering maps using spatial data managed by Oracle Spatial or Oracle Locator (also referred to as Locator). OracleAS MapViewer provides tools that hide the complexity of spatial data queries and cartographic rendering, while providing customizable options for more advanced users. These tools can be deployed in a platform-independent manner and are designed to integrate with map-rendering applications.

For convenience, OracleAS MapViewer includes a JSP tag library that you can use to submit map requests.

For more information, see the Oracle Application Server MapViewer User’s Guide.

Oracle Ultra Search Tag Library

Oracle Ultra Search provides a custom tag library for use by developers in incorporating content search functionality into JSP applications. The library includes the following functionality:

- The ability to retrieve search attributes, groups, languages, and lists of values (LOVs) for rendering the advance query form
- The ability to iterate through the resulting hit set and retrieve document attributes and properties for rendering the result page
- The ability to perform a search with “relevance boosting” and an estimation of the total hit count

For more information, see the Oracle Ultra Search Administrator’s Guide. Alternatively, refer to the Oracle Ultra Search online documentation, under Oracle Ultra Search JSP Tag Library.

Oracle Application Server Portal Tag Library

With OracleAS Portal, developers can accomplish the following:

- Build and deploy Internet portals to deliver relevant information and applications to customers, employees, and partners.
- Develop portals rapidly, without code, using productive online tools.
- Increase user productivity with single sign-on and self-service publishing.
- Add value quickly with over 250 prebuilt portlets based on open standards.

The OracleAS Portal tag library provides further convenience for developers building customizable Internet portals. A developer can create internal JSP pages, which are stored inside the Portal database and downloaded when the portal is executed, or external JSP pages, which are stored in the file system, or some combination.

For more information, refer to Oracle Application Server Integrating JavaServer Pages with OracleAS Portal, available through the Oracle Technology Network:


Oracle Business Intelligence Beans Tag Library

The Oracle Business Intelligence Beans (OracleBI Beans) product consists of Java components, utilities, and a JSP tag library that enable rapid development of analytical applications. OracleBI Beans applications leverage the capabilities of OLAP in Oracle
Database. Using OracleBI Beans, you can develop both HTML-client and Java-client applications.

Note: The OracleBI Beans product is a component of the Oracle Developer Suite (OracleDS) and is for use with Oracle JDeveloper.

OracleBI Beans includes the following groups of Java components:

- Presentation beans: beans that let you view, manipulate, and print data
- OLAP beans: beans that interact with an Oracle OLAP data source
- Persistence service: a set of Java packages that support the storage and retrieval of object definitions in the OracleBI Beans Catalog

For further developer convenience, OracleBI Beans includes a JSP tag library. You can use JDeveloper to create OracleBI Beans JSP pages. A JDeveloper wizard prompts you for information related to the tag that you want to use and inserts the coded tag in the JSP page.

For more information, refer to the OracleBI Beans online help. Under "Building Web Modules", click "Using JSP Tags", then "List of BI Beans JSP Tags".

Oracle Application Server Multimedia Tag Library

Oracle Application Server provides the Multimedia Tag Library, a custom JSP tag library for use by developers and Web page authors when generating multimedia HTML tags in JSP pages and uploading multimedia data into interMedia objects.

Oracle interMedia enables Oracle Database to store, retrieve, manage, and manipulate images, audio, video, and other media data, while integrating it with other enterprise information. Specifically, Oracle interMedia supports media storage, media retrieval, media management, and manipulation of media data managed by Oracle and stored in binary large objects, file-based large objects, URLs that contain media data, and specialty servers. Oracle interMedia is accessible to applications through relational and object interfaces.

Oracle interMedia uses object types that are similar to Java classes to describe media data. These interMedia objects have a common media data storage model. Oracle interMedia also provides Java classes to enable users to write Java applications using interMedia objects. There are also Oracle interMedia Java classes for servlets and JavaServer Pages to facilitate retrieving and uploading media data from and to Oracle Database instances.

The Multimedia Tag Library includes a set of tags for retrieving media data and a set for uploading media data. The Multimedia JSP tags for media retrieval include a set of common attributes and tag-specific media-render-attributes. The common attributes are: custom-retrieval-attributes, database-connection-attributes, media-access-attributes, media-cache-control-attributes, and table-and-column-attributes. The media-render-attributes are described with each media retrieval tag.

This chapter describes JavaBeans provided with OC4J for use as extended types. For JSP pages, these types offer advantages over Java primitive types or `java.lang` types.

The chapter consists of the following sections:

- **Overview of JML Extended Types**
- **JML Extended Type Descriptions**

### Overview of JML Extended Types

JSP pages generally rely on core Java types in representing scalar values. However, neither of the following type categories is fully suitable for use in JSP pages:

- **Primitive types such as `int`, `float`, and `double`**
  Values of these types cannot have a specified scope. They cannot be stored in a JSP scope object (for `page`, `request`, `session`, or `application` scope), because only objects can be stored in a scope object.

- **Wrapper classes in the standard `java.lang` package, such as `Integer`, `Float`, and `Double`**
  Values of these types are objects, so they can theoretically be stored in a JSP scope object. However, they cannot be declared in a `jsp:useBean` action, because the wrapper classes do not follow the JavaBean model and do not provide zero-argument constructors.

  Additionally, instances of the wrapper classes are immutable. To change a value, you must create a new instance and assign it appropriately.

On JDK 1.4 or earlier, JML extended types provide a convenient option to work around these limitations. OC4J provides the following JavaBean classes in the `oracle.jsp.jml` package to act as wrappers for the most common Java types:

- **JmlBoolean** to represent a `boolean` value
- **JmlNumber** to represent an `int` value
- **JmlFPNumber** to represent a `double` value
- **JmlString** to represent a `String` value

Each of these classes has a single attribute, `value`, and includes methods to get the value, set the value from input in various formats, test whether the value is equal to a value specified in any of several formats, and convert the value to a string.
Alternatively, instead of using the `getValue()` and `setValue()` methods, you can use the `jsp:getProperty` and `jsp:setProperty` tags, as with any other bean. The following example creates a `JmlNumber` instance called `count` that has application scope:

```jsp
<jsp:useBean id="count" class="oracle.jsp.jml.JmlNumber" scope="application" />
```

Later, assuming that the value has been set elsewhere, you can access it as follows:

```jsp
<h3> The current count is <%=count.getValue() %></h3>
```

The following example creates a `JmlNumber` instance called `maxSize` that has request scope, and sets it using `setProperty`:

```jsp
<jsp:useBean id="maxSize" class="oracle.jsp.jml.JmlNumber" scope="request" >
  <jsp:setProperty name="maxSize" property="value" value="<%= 25 %>'" />
</jsp:useBean>
```

## JML Extended Type Descriptions

This section documents the public methods of the four extended types—`JmlBoolean`, `JmlNumber`, `JmlFPNumber`, and `JmlString”—followed by an example.

---

**Note:** To use the JML extended types, verify that the `ojsputil.jar` file is installed and in your classpath. This file is supplied with OC4J.

### Type `JmlBoolean`

A `JmlBoolean` object represents a Java boolean value. The `getValue()` and `setValue()` methods get or set the `value` property of the bean as a Java boolean value.

- `boolean getValue()`
- `void setValue(boolean)`

The `setTypedValue()` method has several signatures and can set the `value` property from a string (such as "true" or "false"), a `java.lang.Boolean` value, a Java boolean value, or a `JmlBoolean` value. For the string input, conversion of the string is performed according to the same rules as for the `valueOf()` method of the `java.lang.Boolean` class.

- `void setTypedValue(String)`
- `void setTypedValue(Boolean)`
- `void setTypedValue(boolean)`
- `void setTypedValue(JmlBoolean)`

The `equals()` method tests whether the `value` property is equal to the specified Java boolean value.

- `boolean equals(boolean)`

The `typedEquals()` method has several signatures and tests whether the `value` property has a value equivalent to a specified string (such as "true" or "false"), `java.lang.Boolean` value, or `JmlBoolean` value.

- `boolean typedEquals(String)`
boolean typedEquals(Boolean)

boolean typedEquals(JmlBoolean)

The toString() method returns the value property as a java.lang.String value, either "true" or "false".

String toString()

Type JmlNumber

A JmlNumber object represents a 32-bit number equivalent to a Java int value.
The getValue() and setValue() methods get or set the value property of the bean as a Java int value.

int getValue()

void setValue(int)

The setTypedValue() method has several signatures and can set the value property from a string, a java.lang.Integer value, a Java int value, or a JmlNumber value. For the string input, conversion of the string is performed according to the same rules as for the decode() method of the java.lang.Integer class.

void setTypedValue(String)

void setTypedValue(Integer)

void setTypedValue(int)

void setTypedValue(JmlNumber)

The equals() method tests whether the value property is equal to the specified Java int value.

boolean equals(int)

The typedEquals() method has several signatures and tests whether the value property has a value equivalent to a specified string (such as "1234"), java.lang.Integer value, or JmlNumber value.

boolean typedEquals(String)

boolean typedEquals(Integer)

boolean typedEquals(JmlNumber)

The toString() method returns the value property as an equivalent java.lang.String value (such as "1234"). This method has the same functionality as the toString() method of the java.lang.Integer class.

String toString()

Type JmlFPNumber

A JmlFPNumber object represents a 64-bit floating point number equivalent to a Java double value.
The getValue() and setValue() methods get or set the value property of the bean as a Java double value.

double getValue()

void setValue(double)
The `setTypedValue()` method has several signatures and can set the `value` property from a string (such as "3.57"), a `java.lang.Integer` value, a `Java int` value, a `java.lang.Float` value, a `Java float` value, a `java.lang.Double` value, a `Java double` value, or a `JmlFPNumber` value. For the string input, conversion of the string is according to the same rules as for the `valueOf()` method of the `java.lang.Double` class.

- `void setTypedValue(String)`
- `void setTypedValue(Integer)`
- `void setTypedValue(int)`
- `void setTypedValue(Float)`
- `void setTypedValue(float)`
- `void setTypedValue(Double)`
- `void setTypedValue(double)`
- `void setTypedValue(JmlFPNumber)`

The `equals()` method tests whether the `value` property is equal to the specified Java `double` value.

- `boolean equals(double)`

The `typedEquals()` method has several signatures and tests whether the `value` property has a value equivalent to a specified string (such as "3.57"), `java.lang.Integer` value, `Java int` value, `java.lang.Float` value, `Java float` value, `java.lang.Double` value, `Java double` value, or `JmlFPNumber` value.

- `boolean typedEquals(String)`
- `boolean typedEquals(Integer)`
- `boolean typedEquals(int)`
- `boolean typedEquals(Float)`
- `boolean typedEquals(float)`
- `boolean typedEquals(Double)`
- `boolean typedEquals(double)`
- `boolean typedEquals(JmlFPNumber)`

The `toString()` method returns the `value` property as a `java.lang.String` value (such as "3.57"). This method has the same functionality as the `toString()` method of the `java.lang.Double` class.

- `String toString()`

### Type JmlString

A `JmlString` object represents a `java.lang.String` value.

The `getValue()` and `setValue()` methods get or set the `value` property of the bean as a `java.lang.String` value. If the input in a `setValue()` call is null, then the `value` property is set to an empty (zero-length) string.

- `String getValue()`
- `void setValue(String)`

The `toString()` method is functionally equivalent to the `getValue()` method.

- `String toString()`
The `setTypedValue()` method sets the `value` property according to the specified `JmlString` value. If the `JmlString` value is null, then the `value` property is set to an empty (zero-length) string.

- `void setTypedValue(JmlString)`

The `isEmpty()` method tests whether the `value` property is an empty (zero-length) string:

- `boolean isEmpty()`

The `equals()` method has two signatures and tests whether the `value` property is equal to a specified `java.lang.String` value or `JmlString` value.

- `boolean equals(String)`
- `boolean equals(JmlString)`

### JML Extended Types Example

This example illustrates the use of JML extended type JavaBeans for management of simple types at scope. The page declares four session objects, one for each JML type. The page presents a form that enables you to enter values for each of these types. Once new values are submitted, the form displays both the new values and the previously set values. In the process of generating this output, the page updates the session objects with the new form values.

```jsp
<jsp:useBean id = "submitCount" class = "oracle.jsp.jml.JmlNumber" scope = "session" />
<jsp:useBean id = "bool" class = "oracle.jsp.jml.JmlBoolean" scope = "session" >
  <jsp:setProperty name = "bool" property = "value" param = "fBoolean" />
</jsp:useBean>
<jsp:useBean id = "num" class = "oracle.jsp.jml.JmlNumber" scope = "session" >
  <jsp:setProperty name = "num" property = "value" param = "fNumber" />
</jsp:useBean>
<jsp:useBean id = "fpnum" class = "oracle.jsp.jml.JmlFPNumber" scope = "session" >
  <jsp:setProperty name = "fpnum" property = "value" param = "fFPNumber" />
</jsp:useBean>
<jsp:useBean id = "str" class = "oracle.jsp.jml.JmlString" scope = "session" >
  <jsp:setProperty name = "str" property = "value" param = "fString" />
</jsp:useBean>

<HTML>
<HEAD>
  <META HTTP-EQUIV="Content-Type" CONTENT="text/html;CHARSET=iso-8859-1">
  <META NAME="GENERATOR" Content="Visual Page 1.1 for Windows">
  <TITLE>Extended Datatypes Sample</TITLE>
</HEAD>

<body BACKGROUND="images/bg.gif" BGCOLOR="#FFFFFF">
  <% if (submitCount.getValue() > 1) { %>
    <h3>Last submitted values</h3>
    <ul>
      <li>bool: <%= bool.getValue() %></li>
      <li>num: <%= num.getValue() %></li>
      <li>fpnum: <%= fpnum.getValue() %></li>
    </ul>
  <% } %>
</body>
</HTML>
```
<li> string: <%= str.getValue() %>
</li>
</ul>

if (submitCount.getValue() > 0) {

    <jsp:setProperty name = "bool" property = "value" param = "fBoolean" />
    <jsp:setProperty name = "num" property = "value" param = "fNumber" />
    <jsp:setProperty name = "fpnum" property = "value" param = "fFPNumber" />
    <jsp:setProperty name = "str" property = "value" param = "fString" />

    <h3> New submitted values </h3>
    <ul>
        <li> bool: <jsp:getProperty name="bool" property="value" /> </li>
        <li> num: <jsp:getProperty name="num" property="value" /> </li>
        <li> fpnum: <jsp:getProperty name="fpnum" property="value" /> </li>
        <li> string: <jsp:getProperty name="str" property="value" /> </li>
    </ul>

    <jsp:setProperty name = "submitCount" property = "value"
    value = "<%= submitCount.getValue() + 1 %>">

</FORM ACTION="index.jsp" METHOD="POST" ENCTYPE="application/x-www-form-urlencoded">
<P>
    boolean test: <INPUT TYPE="text" NAME='fBoolean' VALUE="<%= bool.getValue() %>">
    number test: <INPUT TYPE="text" NAME='fNumber' VALUE="<%= num.getValue() %>">
    fpnumber test: <INPUT TYPE="text" NAME='fFPNumber' VALUE="<%= fpnum.getValue() %>">
    string test: <INPUT TYPE="text" NAME='fString' VALUE="<%= str.getValue() %>">
</P>
</FORM>
</BODY>
</HTML>
This chapter documents the Oracle JSP Markup Language (JML) tag library, which provides a set of JSP tags to allow developers to script JSP pages without using Java statements. The JML library provides tags for variable declarations, control flow, conditional branches, iterative loops, parameter settings, and calls to objects.

The chapter consists of the following sections:

- **Overview of the JSP Markup Language (JML) Tag Library**
- **JSP Markup Language (JML) Tag Descriptions**

---

**Important:** The JML tag library is deprecated in the OC4J 10.1.2 implementation, and will be desupported in later implementations. Use the standard JSTL tag library instead.

---

**Note:** The library described here, which uses a standard runtime implementation, is also supported through an Oracle-specific compile-time implementation. The compile-time syntax and tags are documented in Appendix A, "JML Compile-Time Syntax and Tags". General considerations in using compile-time tags instead of runtime tags are discussed in the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide.

---

**Overview of the JSP Markup Language (JML) Tag Library**

OC4J supplies the JSP Markup Language (JML) tag library, developed according to JSP standards. JML tags are intended to simplify coding syntax for JSP developers who are not proficient with Java. There are two main categories of JML tags: logic/flow control and bean binding.

These topics are covered in the following sections:

- **JML Tag Library Philosophy**
- **JML Tag Categories**

Note the following requirements for using JML tags:

- Verify that the file ojsputil.jar is installed and in your classpath. This file is provided with the OC4J installation, in the "well-known" tag library directory.
- The tag library descriptor, jml.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an
Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for jml.tld is the following:

http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jml.tld

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

---

**Note:** The custom JML tag library provided with OC4J pre-dates the JavaServer Pages Standard Tag Library (JSTL) and has areas of duplicate functionality. For standards compliance, it is now generally advisable to use JSTL instead. See “Support for the JavaServer Pages Standard Tag Library” on page 1-17.

---

### JML Tag Library Philosophy

JavaServer Pages technology is intended for two separate developer communities:

- Those whose primary skill is Java programming
- Those whose primary skill is in designing static content, particularly in HTML, and who may have limited scripting experience

The JML tag library is designed to allow most Web developers, with little or no knowledge of Java, to assemble JSP applications with a full complement of program flow-control features.

This model presumes that the business logic is contained in JavaBeans that are developed separately by a Java developer.

### JML Tag Categories

The JML tag library covers a feature set split into two functional categories, as summarized in Table 3-1.

#### Table 3–1  JML Tag Functional Categories

<table>
<thead>
<tr>
<th>Tag Categories</th>
<th>Functionality</th>
<th>Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bean binding tags</td>
<td>The purpose of these tags is to declare or undeclare a JavaBean at a specified JSP scope. See “Bean Binding Tag Descriptions” on page 3-3.</td>
<td>useVariable, useForm, useCookie, remove</td>
</tr>
<tr>
<td>Logic/flow control tags</td>
<td>These tags offer simplified syntax to define code flow, such as for iterative loops or conditional branches. See &quot;Logic and Flow Control Tag Descriptions&quot; on page 3-5.</td>
<td>if, choose..when..[otherwise], foreach, return, flush</td>
</tr>
</tbody>
</table>

### JSP Markup Language (JML) Tag Descriptions

The following sections document the JML tags that are supported in the current JSP runtime implementation:

- Bean Binding Tag Descriptions
- Logic and Flow Control Tag Descriptions
Bean Binding Tag Descriptions

The following sections document JML tags used for bean-binding operations:

- **JML useVariable Tag**
- **JML useForm Tag**
- **JML useCookie Tag**
- **JML remove Tag**

### JML useVariable Tag

This tag offers a convenient alternative to the `jsp:useBean` tag for declaring simple variables.

**Syntax**

```
<jml:useVariable id = "beanInstanceName"
    [ scope = "page" | "request" | "session" | "application" ]
    type = "string" | "boolean" | "number" | "fpnumber"
    [ value = "stringLiteral" ] />
```

**Attributes**

- **id** (required): Specifies the variable being declared.
- **scope**: Defines the duration or scope of the variable (as with a `jsp:useBean` tag). The default scope is `page`.
- **type** (required): Specifies the type of the variable. Type specifications refer to `JmlString`, `JmlBoolean`, `JmlNumber`, or `JmlFPNumber`.
- **value**: Use this to set the variable directly in the declaration, as either a string literal or a JSP expression enclosed in `<%=... %>` syntax. If this attribute is not specified, then the value remains the same as when it was last set (if it already exists) or is initialized with a default value. If it is specified, then the value is always set, regardless of whether this declaration instantiates the object or merely acquires it from the named scope.

**Example**

Consider the following example:

```
<jml:useVariable id = "isValidUser" type = "boolean" value = "<%= dbConn.isValid() %>">
    scope = "session"
</jml:useVariable>
```

This is equivalent to the following:

```
<jsp:useBean id = "isValidUser" class = "oracle.jsp.jml.JmlBoolean" scope = "session" />
<jsp:setProperty name="isValidUser" property="value" value = "<%= dbConn.isValid() %>">
</jsp:setProperty>
```
**JML useForm Tag**

This tag provides a convenient syntax for declaring variables and setting them to values passed in from the request.

**Syntax**

```xml
<jml:useForm id = "beanInstanceName"
    [ scope = "page" | "request" | "session" | "application" ]
    [ type = "string" | "boolean" | "number" | "fpnumber" ]
    param = "requestParameterName" />
```

**Attributes**

- **id** (required): Specifies the variable being declared or referenced.
- **scope**: Defines the duration or scope of the variable (as with a jsp:useBean tag). The default is "page".
- **type**: Specifies the type of the variable. Type specifications refer to JmlString, JmlBoolean, JmlNumber, or JmlFPNumber. The default is "string".
- **param** (required): Specifies the name of the request parameter whose value is used in setting the variable. If the request parameter exists, then the variable value is always updated, regardless of whether this declaration brings the variable into existence. If the request parameter does not exist, then the variable value remains unchanged.

**Example**

The following example sets a session variable named `user` of the type JmlString to the value of the request parameter named `user`.

```xml
<jml:useForm id = "user" type = "string" param = "user" scope = "session" />
```

This is equivalent to the following:

```xml
<jsp:useBean id = "user" class = "oracle.jsp.jml.JmlString" scope = "session" />
<jsp:setProperty name="user" property="value" param = "user" />
```

**JML useCookie Tag**

This tag offers a convenient syntax for declaring variables and setting them to values contained in cookies.

**Syntax**

```xml
<jml:useCookie id = "beanInstanceName"
    [ scope = "page" | "request" | "session" | "application" ]
    [ type = "string" | "boolean" | "number" | "fpnumber" ]
    cookie = "cookieName" />
```

**Attributes**

- **id** (required): Specifies the variable being declared or referenced.
- **scope**: Defines the duration or scope of the variable. This attribute is optional; the default is "page".
- **type**: Identifies the type of the variable. Type specifications refer to JmlString, JmlBoolean, JmlNumber, or JmlFPNumber. The default is "string".
- **cookie** (required): Specifies the name of the cookie whose value is used in setting this variable. If the cookie exists, then the variable value is always updated,
regardless of whether this declaration brings the variable into existence. If the cookie does not exist, then the variable value remains unchanged.

Example
The following example sets a request variable named user of the type JmlString to the value of the cookie named user.

```<jml:useCookie id = "user" type = "string" cookie = "user" scope = "request" />```

This is equivalent to the following:

```<jsp:useBean id = "user" class = "oracle.jsp.jml.JmlString" scope = "request" />
<% 
  Cookies [] cookies = request getCookies();
  for (int i = 0; i < cookies.length; i++) {
    if (cookies[i].getName().equals("user")) {
      user.setValue(cookies[i].getValue());
      break;
    }
  }
%>```

**JML remove Tag**
This tag removes an object, typically a bean, from its scope.

**Syntax**

```<jml:remove id = "beanInstanceName"
    [ scope = "page" | "request" | "session" | "application" ] />
```

**Attributes**

- **id** (required): Specifies the name of the bean being removed.
- **scope**: Specifies the scope of the bean being removed. If not specified, then scopes are searched in the following order: 1) page, 2) request, 3) session, 4) application. The first object whose name matches id is removed.

**Example**
The following example removes the session user object:

```<jml:remove id = "user" scope = "session" />```

This is equivalent to the following:

```<% session.removeValue("user"); %>```

**Logic and Flow Control Tag Descriptions**
The following sections document JML tags that are used for logic and flow control:

- **JML if Tag**
- **JML choose...when...[otherwise] Tags**
- **JML for Tag**
- **JML foreach Tag**
- **JML return Tag**
- **JML flush Tag**
These tags, which are intended for developers without extensive Java experience, can be used in place of Java logic and flow control syntax such as iterative loops and conditional branches.

**JML if Tag**
This tag evaluates a single conditional statement. If the condition is true, then the body of the if tag is executed.

**Syntax**
```jsp
<jml:if condition = "<%= jspExpression %>">
    ...body of jml:if tag (executed if the condition is true)...
</jml:if>
```

**Attributes**
- **condition** (required): Specifies the conditional expression to be evaluated.

**Example**
The following e-commerce example displays information from a user's shopping cart. The code checks to see if the variable holding the current T-shirt order is empty. If not, then the size that the user has ordered is displayed. Assume \texttt{currTS} is of type \texttt{JmlString}.

```jsp
<jml:if condition = "<%= !currTS.isEmpty() %>">
    <S>(size: <%= currTS.getValue().toUpperCase() %>)</S>&nbsp
</jml:if>
```

**JML choose...when...[otherwise] Tags**
The choose tag, with associated when and otherwise tags, provides a multiple conditional statement.

The body of the choose tag contains one or more when tags, where each when tag represents a condition. For the first when condition that is true, the body of that when tag is executed. A maximum of one when body is executed.

If the when conditions are all false, and if the optional otherwise tag is specified, then the body of the otherwise tag is executed.

**Syntax**
```jsp
<jml:choose>
    <jml:when condition = "<%= jspExpression %>">
        ...body of 1st jml:when tag (executed if the condition is true)...
    </jml:when>
    [ ...optional additional when tags... ]
    [ <jml:otherwise>
        ...body of jml:otherwise tag (executed if all when conditions false)...
    </jml:otherwise> ]
</jml:choose>
```

**Attributes**
The when tag uses the following attribute:
- **condition** (required): Specifies the conditional expression to be evaluated.

The choose and otherwise tags have no attributes.

**Example**
The following e-commerce example displays information from a user's shopping cart. This code checks to see if anything has been ordered. If so, the current
order is displayed; otherwise, the user is asked to shop again. (This example omits the code to display the current order.) Presume `orderedItem` is of the type `JmlBoolean`.

```xml
<jml:choose>
    <jml:when condition = "<%= orderedItem.getValue() %>">
        You have changed your order:
        -- output the current order --
    </jml:when>
    <jml:otherwise>
        Are you sure we can't interest you in something, cheapskate?
    </jml:otherwise>
</jml:choose>
```

**JML for Tag**

This tag provides the ability to iterate through a loop, as with a Java `for` loop. The `id` attribute is a local loop variable of the type `java.lang.Integer`. The range starts at the value expressed in the `from` attribute, and the value increments by one after each execution of the body of the loop, until it exceeds the value expressed in the `to` attribute.

Once the range has been traversed, control goes to the first statement following the `for` end-tag.

---

**Note:** Descending ranges are not supported. The `from` value must be less than or equal to the `to` value.

---

**Syntax**

```xml
<jml:for id = "loopVariable"
    from = "<%= jspExpression %>
    to = "<%= jspExpression %>">
    ...body of jml:for tag (executed once at each value of range, inclusive)...
</jml:for>
```

**Attributes**

- `id` (required): This is the name of the loop variable, which holds the current value in the range. This is a `java.lang.Integer` value and can be used only within the body of the tag.
- `from` (required): Specifies the start of the range. This is an expression that must evaluate to a Java `int` value.
- `to` (required): Specifies the end of the range. This is an expression that must evaluate to a Java `int` value.

**Example**

The following example repeatedly prints "Hello World" in progressively smaller headings (H1, H2, H3, H4, H5).

```xml
<jml:for id='i' from=' <%= 1 %>' to=' <%= 5 %>'>
    
    <H<%<i%>> Hello World!
    </H<%<i%>>
</jml:for>
```
**JML foreach Tag**

This tag provides the ability to iterate over a homogeneous set of values. The body of the tag is executed once for each element in the set. If the set is empty, then the body is not executed.

The `id` attribute is a local loop variable containing the value of the current set element. Its type is specified in the `type` attribute. The specified type should match the type of the set elements, as applicable.

This tag currently supports iterations over the following types of data structures:

- Java array
- `java.utilEnumeration`
- `java.util.Vector`

**Syntax**

```xml
<jml:foreach id="loopVariable" in="<%= jspExpression %>" limit="<%= jspExpression %>" type="package.class" >
  ...
</jml:foreach>
```

**Attributes**

- `id` (required): This is the name of the loop variable, which holds the value of the current element at each step of the iteration. It can be used only within the body of the tag. Its type is the same as specified in the `type` attribute.

- `in` (required): Specifies a JSP expression that evaluates to a Java array, `Enumeration` object, or `Vector` object containing the set of values over which to iterate.

- `limit` (required): Specifies a JSP expression that evaluates to a Java `int` value defining the maximum number of iterations, regardless of the number of elements in the set.

- `type` (required): Specifies the type of the loop variable. This should match the type of the set elements, as applicable.

**Example**

The following example iterates over the request parameters.

```xml
<jml:foreach id="name" in="<%= request.getParameterNames() %>" type="java.lang.String" >
  Parameter: <%= name %>
  Value: <%= request.getParameter(name) %> <br>
</jml:foreach>
```

Alternatively, if you want to handle parameters with multiple values:

```xml
<jml:foreach id="name" in="<%= request.getParameterNames() %>" type="java.lang.String" >
  Parameter: <%= name %>
  Value: <jml:foreach id="val" in="<%=request.getParameterValues(name) %>" type="java.lang.String" >
    <%= val %> :
  </jml:foreach>
  <br>
</jml:foreach>
```

**JML return Tag**

When this tag is reached, execution returns from the page without further processing.
Syntax
<jml:return />

Attributes
None.

Example  The following example returns without processing the page if the timer has expired.
<jml:if condition="<%= timer.isExpired() %>">
    You did not complete in time!
    <jml:return />
</jml:if>

JML flush Tag
This tag writes the current contents of the page buffer back to the client. This applies only if the page is buffered; otherwise, there is no effect.

Syntax
<jml:flush />

Attributes
None.

Example  The following example flushes the current page contents before performing an expensive operation.
<jml:flush />
<% myBean.expensiveOperation(out); %>
This chapter describes JavaBeans and tags provided with OC4J for use in accessing a database from servlets and JSP pages.

The chapter consists of the following sections:

- JavaBeans for Data Access
- SQL Tags for Data Access

**JavaBeans for Data Access**

The OC4J product includes a set of JavaBeans that you can use to access a database. The following sections describe the beans:

- Introduction to Data-Access JavaBeans
- Data-Access Support for Data Sources and Pooled Connections
- Data-Access JavaBean Descriptions

**Note:** The JavaBeans described here are used by the tags discussed in "SQL Tags for Data Access" on page 4-11. Generally speaking, these beans and tags can be used with non-Oracle databases, assuming you have appropriate JDBC driver classes; however, numerous features described below, as noted, are Oracle-specific.

**Introduction to Data-Access JavaBeans**

OC4J supplies a set of custom JavaBeans for database access. The following beans are included in the `oracle.jsp.dbutil` package:

- **ConnBean** opens a database connection. This bean also supports data sources and connection pooling. See "Data-Access Support for Data Sources and Pooled Connections" on page 4-2 for related information.

- **ConnCacheBean** uses the Oracle JDBC connection caching implementation for database connections. This requires JDBC 2.0.

- **DBBean** executes a database query. It also has its own connection mechanism, but does not support data sources.

- **CursorBean** provides general DML support for queries; `UPDATE`, `INSERT`, and `DELETE` statements; and stored procedure calls.
This section presumes a working knowledge of Oracle JDBC. Consult the *Oracle Database JDBC Developer’s Guide and Reference* as necessary.

To use the data-access JavaBeans, verify that the file ojsputil.jar is installed and in your classpath. This file is provided with the OC4J installation. For XML-related methods and functionality, you will also need the file xsu12.jar (for JDK 1.2.x or higher), which is provided with Oracle Application Server.

You will also need appropriate JDBC driver classes installed and in your classpath, such as ojdbc14.jar for Oracle Database and JDK 1.4.

**Data-Access Support for Data Sources and Pooled Connections**

The data-access JavaBeans, as well as the data-access tag library, support the use of data sources to specify connection properties. This is also how support for connection pooling is implemented. This mechanism supports both Oracle connection objects and OC4J connection objects.

To use a data source in a JSP page, you must define the data source, its JNDI name, and its connection and pooling properties. In OC4J, do this in a `<data-source>` element in the `data-sources.xml` file. Here is an example:

```xml
<data-source
    class="oracle.jdbc.pool.OracleDataSource"
    name="jdbc.ejbpool/OracleDS"
    location="jdbc/ConnectionDS"
    ejb-location="jdbc/ejbpool/OracleDS"
    url="jdbc:oracle:thin:@myhost:1521/myservice"
    username="scott"
    password="tiger"
    min-connections='3'
    max-connections='50'
    wait-timeout='10'
    inactivity-timeout='30' />
```

It is advisable to use only the `ejb-location` JNDI name in the JNDI lookup for an emulated data source. See the *Oracle Application Server Containers for J2EE Services Guide* for more information about data sources.

**Data-Access JavaBean Descriptions**

The following sections describe attributes and methods of the data-access JavaBeans—ConnBean, ConnCacheBean, DBBean, and CursorBean—and concludes with an example that uses a data source:

- **ConnBean for a Database Connection**
- **ConnCacheBean for Connection Caching**
- **DBBean for Queries Only**
- **CursorBean for DML and Stored Procedures**
- **Example: Using ConnBean and CursorBean with a Data Source**

**ConnBean for a Database Connection**

Use `oracle.jsp.dbutil.ConnBean` to establish a simple database connection, one that uses no connection pooling or caching.
ConnBean has the following properties. The user, password, and URL properties are not required if you use a data source.

- **dataSource**: JNDI name for a data source location
  This is valid only for an environment that supports data sources. See “Data-Access Support for Data Sources and Pooled Connections” on page 4-2 for information about how to set up a data source in OC4J.
- **user**: user ID for database schema
- **password**: user password
- **URL**: database connection string
- **stmtCacheSize**: cache size for Oracle JDBC statement caching
  Setting stmtCacheSize enables Oracle JDBC statement caching.
- **executeBatch**: batch size for Oracle JDBC update batching
  Setting executeBatch enables Oracle JDBC update batching.
- **preFetch**: number of statements to prefetch in Oracle JDBC row prefetching
  Setting preFetch enables Oracle JDBC row prefetching.
- **commitOnClose**: "true" or "false" for whether to execute commit when the connection is closed
  The value of commitOnClose indicates whether an automatic commit should be executed when the connection is closed. A "true" setting results in a commit; a "false" setting results in a rollback. Prior to Oracle9iAS Release 2, an automatic commit was always executed, but in current releases the default is an automatic rollback. The commitOnClose property allows for backward compatibility to ease migration.

Be aware that there can be an application-wide commit-on-close setting in the application web.xml file, but the setting of the ConnBean property is not automatically dependent on that setting. If a JSP pages uses ConnBean instead of a dbOpen tag, the value of the commit-on-close context parameter should be retrieved and then explicitly set as the commitOnClose value in the ConnBean instance. For reference, here is a sample web.xml entry that sets the commit-on-close context parameter:

```xml
<context-param>
  <param-name>commit-on-close</param-name>
  <param-value>true</param-value>
</context-param>
```

**Note:** See the Oracle Database JDBC Developer’s Guide and Reference for information about statement caching, update batching, and row prefetching.

ConnBean provides the following setter and getter methods for these properties:

- **void setDataSource(String)**
Use the following methods to open and close a connection or to verify its status:

- void connect()
  Establish a database connection using ConnBean property settings.
- void close()
  Close the connection and any open cursors.
- boolean isConnectionClosed()
  Determine if the connection is closed.

Use the following method to open a cursor and return a CursorBean object:

- CursorBean getCursorBean(int, String)
  or:

- CursorBean getCursorBean(int)

Input the following:

- One of the following int constants to specify the type of JDBC statement you want: CursorBean.PLAIN_STMT for a Statement object, CursorBean.PREP_STMT for a PreparedStatement object, or CursorBean.CALL_STMT for a CallableStatement object

- A string specifying the SQL operation to execute (optional)
  Alternatively, you can specify the SQL operation in the CursorBean method call that executes the statement.

Note: As with any JavaBean you use in a JSP page, you can set any of the ConnBean properties with a jsp:setProperty action instead of using the setter method directly.
See "CursorBean for DML and Stored Procedures" on page 4-8 for information about CursorBean functionality.

**ConnCacheBean for Connection Caching**

Use oracle.jsp.dbutil.ConnCacheBean to use the Oracle JDBC connection caching mechanism, using JDBC 2.0 connection pooling, for your database connections. Refer to the Oracle Database JDBC Developer’s Guide and Reference for information about connection caching.

---

**Note:** To use data sources or simple connection objects, use ConnBean instead.

---

ConnCacheBean has the following properties:

- **user**: user ID for database schema
- **password**: user password
- **URL**: database connection string
- **maxLimit**: maximum number of connections allowed by this cache
- **minLimit**: minimum number of connections existing for this cache
  
  If you use fewer than this number, there will also be connections in the idle pool of the cache.

- **stmtCacheSize**: cache size for Oracle JDBC statement caching

  Setting stmtCacheSize enables the Oracle JDBC statement caching feature. Refer to the Oracle Database JDBC Developer’s Guide and Reference for information about Oracle JDBC statement caching features and limitations.

- **cacheScheme**: type of cache

  This is indicated by one of the following int constants.

  - **DYNAMIC_SCHEME**: New pooled connections can be created above and beyond the maximum limit, but each one is automatically closed and freed as soon as the logical connection instance that it provided is no longer in use.

  - **FIXED_WAIT_SCHEME**: When the maximum limit is reached, any new connection waits for an existing connection object to be released.

  - **FIXED_RETURN_NULL_SCHEME**: When the maximum limit is reached, any new connection fails, returning null, until connection objects have been released.

The ConnCacheBean class includes the following getter and setter methods for its properties:

- **void setUser(String)**
- **String getUser()**
- **void setPassword(String)**
- **String getPassword()**
- **void setURL(String)**
- **String getURL()**
- **void setMaxLimit(int)**
The ConnCacheBean class also inherits properties and related getter and setter methods from the oracle.jdbc.pool.OracleDataSource class. This provides getter and setter methods for the following properties: databaseName, dataSourceName, description, networkProtocol, portNumber, serverName, and driverType. For information about these properties and their getter and setter methods, see the Oracle Database JDBC Developer’s Guide and Reference.

---

**Note:** As with any JavaBean you use in a JSP page, you can set any of the ConnCacheBean properties with a jsp:setProperty action instead of using the setter method directly.

---

Use the following methods to open and close a connection:

- void setMinLimit(int)

Get a connection from the connection cache using ConnCacheBean property settings.

- void setStmtCacheSize(int)

- int getStmtCacheSize()

- void setCacheScheme(int)

Specify ConnCacheBean.DYNAMIC_SCHEME, ConnCacheBean.FIXED_WAIT_SCHEME, or ConnCacheBean.FIXED_RETURN_NULL_SCHEME.

- int getCacheScheme()

Returns ConnCacheBean.DYNAMIC_SCHEME, ConnCacheBean.FIXED_WAIT_SCHEME, or ConnCacheBean.FIXED_RETURN_NULL_SCHEME.

Although the ConnCacheBean class does not support Oracle JDBC update batching and row prefetching directly, you can enable these features by calling the setDefaultExecuteBatch(int) and setDefaultRowPrefetch(int) methods of the Connection object that you retrieve from the getConnection() method. Alternatively, you can use the setExecuteBatch(int) and setRowPrefetch(int) methods of JDBC statement objects that you create from the Connection object. (Update batching is supported only in prepared statements.) Refer to the Oracle Database JDBC Developer’s Guide and Reference for information about these features.

---

**Note:** When you use ConnCacheBean, use normal Connection object functionality to create and execute statement objects (unlike the case with ConnBean).
**DBBean for Queries Only**

Use `oracle.jsp.dbutil.DBBean` to execute queries only.

---

**Notes:**

- DBBean has its own connection mechanism but does not support data sources. If you require a data source, use ConnBean instead.
- Use CursorBean for any other DML operations (UPDATE, INSERT, DELETE, or stored procedure calls).

---

DBBean has the following properties:

- **user**: user ID for database schema
- **password**: user password
- **URL**: database connection string

DBBean provides the following setter and getter methods for these properties:

- `void setUser(String)`
- `String getUser()`
- `void setPassword(String)`
- `String getPassword()`
- `void setURL(String)`
- `String getURL()`

---

**Note:** As with any JavaBean you use in a JSP page, you can set any of the DBBean properties with a `jsp:setProperty` statement instead of using the setter method directly.

---

Use the following methods to open and close a connection:

- `void connect()`
  
  Establish a database connection using DBBean property settings.

- `void close()`
  
  Close the connection and any open cursors.

Use either of the following methods to execute a query:

- `String getResultAsHTMLTable(String)`
  
  Input a string that contains the `SELECT` statement. This method returns a string with the HTML commands necessary to output the result set as an HTML table. SQL column names (or aliases) are used for the table column headers.

- `String getResultAsXMLString(String)`
  
  Input a string with the `SELECT` statement. This method returns the result set as an XML string, using SQL names (or aliases) for the XML tags.
CursorBean for DML and Stored Procedures

Use oracle.jsp.dbutil.CursorBean for SELECT, UPDATE, INSERT, or DELETE operations, or stored procedure calls, on a simple connection. It uses a previously defined ConnBean object for the connection.

You can specify a SQL operation in a ConnBean object getCursorBean() call or through a call to one of the create(), execute(), or executeQuery() methods of a CursorBean object as described below.

CursorBean supports scrollable and updatable cursors, update batching, row prefetching, and query timeout limits. For information about these Oracle JDBC features, see the Oracle Database JDBC Developer’s Guide and Reference.

---

**Note:** To use connection caching, use ConnCacheBean and normal Connection object functionality. Do not use CursorBean.

---

CursorBean has the following properties:

- **executeBatch**: batch size for Oracle JDBC update batching
  Setting this property enables Oracle JDBC update batching.

- **preFetch**: number of statements to prefetch in Oracle JDBC row prefetching
  Setting this property enables Oracle JDBC row prefetching.

- **queryTimeout**: number of seconds for the driver to wait for a statement to execute before issuing a timeout

- **resultSetType**: scrollability of the result set
  This is indicated by one of the following int constants.
  - **TYPE_FORWARD_ONLY** (default): Use this for a result set that can scroll only forward (using the next() method) and cannot be positioned.
  - **TYPE_SCROLL_INSENSITIVE**: Use this for a result set that can scroll forward or backward and can be positioned, but is not sensitive to underlying data changes.
  - **TYPE_SCROLL_SENSITIVE**: Use this for a result set that can scroll forward or backward, can be positioned, and is sensitive to underlying data changes.

- **resultSetConcurrency**: updatability of the result set
  This is indicated by one of the following int constants.
  - **CONCUR_READ_ONLY** (default): Use this for a result set that is read-only (cannot be updated).
  - **CONCUR_UPDATABLE**: Use this for a result set that is updatable.

You can set these properties with the following methods to enable Oracle JDBC features, as desired:

- **void setExecuteBatch(int)**
- **int getExecuteBatch()**
- **void setPreFetch(int)**
- **int getPreFetch()**
- **void setQueryTimeout(int)**
**JavaBeans for Data Access**

- `int getQueryTimeout()`
- `void setResultSetConcurrency(int)`
  Specify `CursorBean.CONCUR_READ_ONLY` or `CursorBean.CONCUR_UPDATABLE`.
- `int getResultSetConcurrency()`
  Returns `CursorBean.CONCUR_READ_ONLY` or `CursorBean.CONCUR_UPDATABLE`.
- `void setResultType(int)`
  Specify `CursorBean.TYPE_FORWARD_ONLY`, `CursorBean.TYPE_SCROLL_INSENSITIVE`, or `CursorBean.TYPE_SCROLL_SENSITIVE`.
- `int getResultType()`
  Returns `CursorBean.TYPE_FORWARD_ONLY`, `CursorBean.TYPE_SCROLL_INSENSITIVE`, or `CursorBean.TYPE_SCROLL_SENSITIVE`.

---

**Note:** As with any JavaBean you use in a JSP page, you can set any of the `CursorBean` properties with a `jsp:setProperty` action instead of using the setter method directly.

---

To execute a query once a `CursorBean` instance has been defined in a `jsp:useBean` statement, you can use `CursorBean` methods to create a cursor in one of two ways. Use the following methods to create the cursor and supply a connection in separate steps:

- `void create()`
- `void setConnBean(ConnBean)`

Alternatively, use the following method to combine the process into a single step:

- `void create(ConnBean)`

Set up the `ConnBean` object as described in "ConnBean for a Database Connection" on page 4-2.

Use the following method to specify and execute a query (using a JDBC plain `Statement` object behind the scenes):

- `ResultSet executeQuery(String)`
  Input a string that contains the `SELECT` statement.

Alternatively, if you want to format the result set as an HTML table or XML string, use either of the following methods instead of `executeQuery()`:

- `String getResultAsHTMLTable(String)`
  Returns a string with HTML statements to create an HTML table for the result set. Specify a string with the `SELECT` statement.
- `String getResultAsXMLString(String)`
  Returns the result set data in an XML string. Specify a string with the `SELECT` statement.
To execute an UPDATE, INSERT, or DELETE statement once a CursorBean instance has been defined in a jsp:useBean action, you can use CursorBean methods to create a cursor in one of two ways. Use the following methods to create the cursor, specifying a statement type as an integer and specifying a SQL statement as a string, and supply a connection:

- void create(int, String)
- void setConnBean(ConnBean)

Alternatively, use the following method to combine the process into a single step:

- void create(ConnBean, int, String)

Set up the ConnBean object as described in "ConnBean for a Database Connection" on page 4-2.

The int input takes one of the following constants to specify the type of JDBC statement you want: CursorBean.PLAIN_STMT for a Statement object, CursorBean.PREP_STMT for a PreparedStatement object, or CursorBean.CALL_STMT for a CallableStatement object. The String input is to specify the SQL statement.

Use the following method to execute the INSERT, UPDATE, or DELETE statement. You can ignore the boolean return value.

- boolean execute()

Alternatively, for update batching, use the following method, which returns the number of rows affected.

- int executeUpdate()

Note: Specify the SQL operation either during statement creation or during statement execution, but not both. The execute() and executeUpdate() methods can optionally take a string to specify a SQL operation. This is also true of the create() method, as well as the getCursorBean() method in ConnBean.

Additionally, CursorBean supports Oracle JDBC functionality such as registerOutParameter() for callable statements, setXXX() methods for prepared statements and callable statements, and getXXX() methods for result sets and callable statements.

Use the following method to close the database cursor:

- void close()

**Example: Using ConnBean and CursorBean with a Data Source**

This following is a sample JSP page that uses ConnBean with a data source to open a connection, then uses CursorBean to execute a query.

```jsp
<%@ page import="java.sql.*, oracle.jsp.dbutil.*" %>
<jsp:useBean id="cbean" class="oracle.jsp.dbutil.ConnBean" scope="session">
  <jsp:setProperty name="cbean" property="dataSource" value="<%=request.getParameter("datasource")%>">
    value="/" request.getParameter("datasource")%>
  </jsp:setProperty>
</jsp:useBean>
<% try {
    cbean.connect();
    String sql="SELECT ename, sal FROM scott.emp ORDER BY ename";
    CursorBean cb = cbean.getCursorBean (CursorBean.PREP_STMT, sql);
```
OC4J includes a set of tags you can use in JSP pages to execute SQL commands to access a database. The following sections describe the tags:

- Introduction to Data-Access Tags
- Data-Access Tag Descriptions

Note: The custom SQL tag library provided with OC4J pre-dates the JavaServer Pages Standard Tag Library (JSTL) and has areas of duplicate functionality. For standards compliance, it is now generally advisable to use JSTL instead. See "Support for the JavaServer Pages Standard Tag Library" on page 1-17.

Oracle is not desupporting the existing library, however. For features in the custom library that are not yet available in JSTL, where there seems to be general usefulness, Oracle will try to have the features adopted into the JSTL standard as appropriate.

Introduction to Data-Access Tags

OC4J supplies a custom tag library for SQL functionality, consisting of the following tags:

- **dbOpen**: Open a database connection. This tag also supports data sources and connection pooling. See "Data-Access Support for Data Sources and Pooled Connections" on page 4-2 for related information.
- **dbClose**: Close a database connection.
- **dbQuery**: Execute a query.
- **dbCloseQuery**: Close the cursor for a query.
- **dbNextRow**: Process the rows of a result set.
- **dbExecute**: Execute any SQL statement (DML or DDL).
- **dbSetParam**: Set a parameter to bind into a dbQuery or dbExecute tag.
- **dbSetCookie**: Set a cookie.

Note the following requirements for using SQL tags:

- You will need the appropriate JDBC driver file, such as ojdbc14.jar for JDK 1.4, installed and in your classpath.
- Verify that the file ojstputil.jar is installed and in your classpath. This file is provided with the OC4J installation, in the "well-known" tag library directory.
- The tag library descriptor, sqltaglib.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In
an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for sqltaglib.tld is the following:

http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/sqltaglib.tld

For general information about JSP tag library usage, including tag library descriptor files, taglib directives, the well-known tag library directory, and the meaning of uri values, refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide.

Notes:

- The data-access tags use the beans described in "JavaBeans for Data Access" on page 4-1. Generally speaking, these beans and tags can be used with non-Oracle databases, assuming you have appropriate JDBC driver classes; however, numerous features described below, as noted, are Oracle-specific.

- For applications using the data-access tags, consider using the dbSetParam tag to supply only parameter values rather than textual completion of the SQL statement itself. This avoids the possibility of what is referred to as "SQL poisoning", where users might enter additional SQL in addition to the expected value.

Data-Access Tag Descriptions

The following sections provide detailed syntax for the data-access tags and an example using dbOpen and dbQuery tags with a data source:

- SQL dbOpen Tag
- SQL dbClose Tag
- SQL dbQuery Tag
- SQL dbCloseQuery Tag
- SQL dbNextRow Tag
- SQL dbExecute Tag
- SQL dbSetParam Tag
- SQL dbSetCookie Tag
- Example: Using dbOpen and dbQuery with a Data Source

Notes:

- The prefix "sql:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your taglib directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

SQL dbOpen Tag

Use the dbOpen tag to open a database connection for subsequent SQL operations through such tags as dbQuery and dbExecute. Do this by specifying a data source
location, in which case connection caches are supported, or by specifying the user, password, and URL individually. See "Data-Access Support for Data Sources and Pooled Connections" on page 4-2 for information about how to set up a data source in OC4J.

The implementation uses oracle.jsp.dbutil.ConBean instances. For simple connections, but not connection caches, you can optionally set ConBean properties such as stmtCacheSize, preFetch, and batchSize to enable those Oracle JDBC features. See "ConBean for a Database Connection" on page 4-2 for more information.

The ConBean object for the connection is created in an instance of the tag-extra-info class of the dbOpen tag. Refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about the standard JSP tag library framework and tag-extra-info classes.

Syntax
<sql:dbOpen
  [ connId = "connection_id" ]
  [ scope = "page" | "request" | "scope" | "application" ]
  [ dataSource = "JNDI_name" ]
  [ user = "username"
    password = "password"
    URL = "databaseURL" ]
  [ commitOnClose = "true" | "false" ]>
...
</sql:dbOpen>

Nested code that you want to execute through this connection can go into the tag body, between the dbOpen start-tag and end-tag.

---

**Note:** You must set either the dataSource attribute or the user, password, and URL attributes. Optionally, you can use a data source to specify a URL, then use the dbOpen tag user and password attributes separately.

When a data source is used, and is for a cache of connections, the first use of the cache initializes it. If you specify the user and password through the dbOpen tag user and password attributes, that will initialize the cache for that user and password. Subsequent uses of the cache are for the same user and password.

---

Attributes
- **connId:** Optionally use this to specify an ID name for the connection. You can then reference this ID in subsequent tags such as dBQuery or dBExecute. Alternatively, you can nest dBQuery and dBExecute tags inside the dbOpen tag. You can also reference the connection ID in a dbClose tag when you want to close the connection.

  You can still specify a connection ID if you nest dBQuery or dBExecute tags inside the dbOpen tag. In this case, the connection will be found through the connection ID. With the scope attribute, it is possible to have multiple connections using the same connection ID but different scopes.
If you specify a connection ID, then the connection is not closed until you close it explicitly with a dbClose tag. Without a connection ID, the connection is closed automatically when the dbOpen end-tag is encountered.

- **scope** (used only with a connId): Use this to specify the desired scope of the connection instance. The default is page scope.

  If you specify a scope setting in a dbOpen tag, then you must specify the same scope setting in any other tag—dbQuery, dbExecute, or dbClose—that uses the same connection ID.

- **dataSource** (required if you do not set the user, password, and URL attributes): Optionally use this to specify the JNDI name of a data source for database connections. First set up the data source in the OC4J data-sources.xml file. (See "Data-Access Support for Data Sources and Pooled Connections" on page 4-2.) The dataSource setting should correspond to the location name, ejb-location name, or pooled-location name in a <data-source> element in data-sources.xml.

  A data source must specify a URL setting, but does not have to specify a user/password pair. You can use the dbOpen tag user and password attributes instead.

  This attribute is supported only in OC4J environments.

---

**Note:** It is advisable to use only the ejb-location JNDI name in the JNDI lookup for an emulated data source. See the Oracle Application Server Containers for J2EE Services Guide for more information about data sources.

---

- **user** (required if no user/password pair is specified through a data source): This is the user name for a database connection.

  If a user name is specified through both a data source and the user attribute, the user attribute takes precedence. It is advisable to avoid such duplication, because conflicts could arise if the data source is a pooled connection with existing logical connections using a different user name.

- **password** (required if no user/password pair is specified through a data source): This is the user password for a database connection.

  Note that you do not have to hardcode a password into the JSP page, which would be an obvious security concern. Instead, you can get the password and other parameters from the request object, as follows:

  ```
  <sql:dbOpen connId='conn1' user='<%=request.getParameter("user")%>'
  password='<%=request.getParameter("password")%>' URL='url' />
  ```

  As with the user attribute, if a password is specified through both a data source and the password attribute, the password attribute takes precedence.

- **URL** (required if no data source is specified): This is the URL for a database connection. If a URL is supplied through a data source, the dbOpen tag URL attribute is ignored.

- **commitOnClose**: Set this to "true" for an automatic SQL commit when the connection is closed or goes out of scope. The default "false" setting results in an automatic SQL rollback.
As a convenience, if you want to specify application-wide automatic commit or rollback behavior, set the parameter name commit-on-close in the application web.xml file, as in the following example:

```xml
<context-param>
  <param-name>commit-on-close</param-name>
  <param-value>true</param-value>
</context-param>
```

The commitOnClose setting in a dbOpen tag takes precedence over the commit-on-close setting in web.xml.

---

**Note:** In previous releases, the behavior is always to commit automatically when the connection is closed. The commitOnClose attribute offers backward compatibility to simplify migration.

---

### SQL dbClose Tag

Use the dbClose tag to close a connection associated with the optional connId parameter specified in a dbOpen tag. If connId is not used in the dbOpen tag, then the connection is closed automatically when the dbOpen end-tag is reached; a dbClose tag is not required.

**Syntax**

```
<sql:dbClose connId = "connection_id"
             [ scope = "page" | "request" | "scope" | "application" ] />
```

**Attributes**

- **connId** (required): This is the ID for the connection being closed, specified in the dbOpen tag that opened the connection.
- **scope**: This is the scope of the connection instance. The default is "page", but if the dbOpen tag specified a scope other than page, you must specify that same scope in the dbClose tag.

### SQL dbQuery Tag

Use the dbQuery tag to execute a query, outputting the results either as a JDBC result set, HTML table, XML string, or XML DOM object. Place the `SELECT` statement (one only) in the tag body, between the dbQuery start-tag and end-tag.

This tag uses a `oracle.jsp.dbutil.CursorBean` object for the cursor, so you can set properties such as the result set type, result set concurrency, batch size, and prefetch size, if desired. See "CursorBean for DML and Stored Procedures" on page 4-8 for information about CursorBean functionality.

For XML usage, this tag acts as an XML producer. See "XML Producers and XML Consumers" on page 5-1 for more information. Also see "Example Using the transform and dbQuery Tags" on page 5-7.

**Syntax**

```
<sql:dbQuery
     [ queryId = "query_id" ]
     [ connId = "connection_id" ]
     [ scope = "page" | "request" | "scope" | "application" ]
     [ output = "HTML" | "XML" | "JDBC" ]
     [ maxRows = "number" ]
```
SQL Tags for Data Access

[skipRows = 'number']
[bindParams = 'value']
[toXMLObjName = 'objectname']

...SELECT statement (one only)...
</sql:dbQuery>

---

**Important:**

- Do not terminate the SELECT statement with a semicolon. This currently results in a syntax error.
- The dbQuery tag does not currently support LOB columns.

---

**Attributes**

- **queryId:** You can use this to specify an ID name for the cursor. This is required if you want to process the results using a dbNextRow tag.
  
  If the queryId parameter is present, then the cursor is not closed until you close it explicitly with a dbCloseQuery tag. Without a query ID, the cursor is closed automatically when the dbQuery end-tag is encountered. This is not a request-time attribute, meaning it cannot take a JSP expression value.

- **connId:** This is the ID for a database connection, according to the connId setting in the dbOpen tag that opened the connection. If you do not specify connId in a dbQuery tag, then the tag must be nested within the body of a dbOpen tag and will use the connection opened in the dbOpen tag. This is not a request-time attribute.

- **scope:** This is the scope of the connection instance. The default is "page", but if the associated dbOpen tag specified a scope other than page, you must specify that same scope in the dbQuery tag. This is not a request-time attribute.

- **output:** This is the desired output format, one of the following.
  - HTML specifies that the result set is to be output as an HTML table (default).
  - XML specifies that the result set is to be output as an XML string, or an XML DOM object if an object name is specified in the toXMLObjName attribute.
  - JDBC specifies that the result set is to be output as a JDBC ResultSet object that can be processed using the dbNextRow tag to iterate through the rows.

- **maxRows:** This is the maximum number of rows of data to display. The default is all rows.

- **skipRows:** This is the number of data rows to skip in the query results before displaying results. The default is 0.

- **bindParams:** Use this to bind a parameter into the query. The following example is from an application that prompts the user to enter an employee number, using bindParams to bind the specified value into the empno field of the query:

  `<sql:dbQuery connId="con1" bindParams="empno">`  
  `select * from EMP where empno=?`  
  `</sql:dbQuery>`

  Alternatively, you can set a parameter value with the dbSetParam tag to bind it in through the bindParams attribute. See "SQL dbSetParam Tag" on page 4-18.
- `toXMLObjName`: Specify an XML object name if you want to output the results as an XML DOM object. To use this, you must also set `output` to "XML".

**SQL dbCloseQuery Tag**

Use the `dbCloseQuery` tag to close a cursor associated with the optional `queryId` parameter specified in a `dbQuery` tag. If `queryId` is not specified in the `dbQuery` tag, then the cursor is closed automatically when the `dbQuery` end-tag is reached; a `dbCloseQuery` tag is not required.

**Syntax**

```xml
<sql:dbCloseQuery queryId = "query_id" />
```

**Attributes**

- `queryId` (required): The ID for the cursor to be closed, specified in the `dbQuery` tag that opened the cursor.

**SQL dbNextRow Tag**

Use the `dbNextRow` tag to process each row of a result set obtained in a `dbQuery` tag and associated with the specified `queryId`. Place the processing code in the tag body, between the `dbNextRow` start-tag and end-tag. The body is executed for each row of the result set.

To use the `dbNextRow` tag, the `dbQuery` tag must set `output` to "JDBC" and specify a `queryId` for the `dbNextRow` tag to reference.

The result set object is created in an instance of the tag-extra-info class of the `dbQuery` tag. Refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about the standard JSP tag library framework and tag-extra-info classes.

**Syntax**

```xml
<sql:dbNextRow queryId = "query_id" >
...Row processing...
</sql:dbNextRow>
```

**Attributes**

- `queryId` (required): This is the ID of the cursor containing the results to be processed, specified in the `dbQuery` tag that opened the cursor.

**Example**

The following example shows the combined use of a `dbOpen`, `dbQuery`, and `dbNextRow` tag.

```xml
<sql:dbOpen connId="con1" URL="jdbc:oracle:thin:@myhost:1521/myservice" user="scott" password="tiger" />
<sql:dbQuery connId="con1" output="jdbc" queryId="myquery">
  select * from EMP
</sql:dbQuery>
<sql:dbNextRow queryId="myquery">
  <%= myquery.getString(1) %>
</sql:dbNextRow>
<sql:dbCloseQuery queryId="myquery" />
<sql:dbClose connId="con1" />
```
**SQL dbExecute Tag**

Use the `dbExecute` tag to execute a single DML or DDL statement. Place the statement in the tag body, between the `dbExecute` start-tag and end-tag.

This tag uses an `oracle.jsp.dbutil.CursorBean` object for the cursor. See "CursorBean for DML and Stored Procedures" on page 4-8 for information about CursorBean functionality.

**Syntax**

```xml
<sql:dbExecute
[ connId = "connection_id" ]
[ scope = "page" | "request" | "scope" | "application" ]
[ output = "yes" | "no" ]
[ bindParams = "value" ] >

...DML or DDL statement (one only)...
</sql:dbExecute>
```

**Attributes**

- **connId**: This is the ID of a database connection, according to the `connId` setting in the `dbOpen` tag that opened the connection. If you do not specify `connId` in a `dbExecute` tag, then the tag must be nested within the body of a `dbOpen` tag and will use the connection opened in the `dbOpen` tag.

- **scope**: This is the scope of the connection instance. The default is "page", but if the `dbOpen` tag specified a scope other than page, you must specify that same scope in the `dbExecute` tag.

- **output**: If `output="yes"`, then for DML statements the HTML string "number row[s] affected" will be output to the browser to notify the user how many database rows were affected by the operation. For DDL statements, the statement execution status will be printed. The default is "no".

- **bindParams**: Use this to bind a parameter into the SQL statement. The following example is from an application that prompts the user to enter an employee number, using `bindParams` to bind the specified value into the `empno` field of the `DELETE` statement:

```xml
<sql:dbExecute connId="con1" bindParams="empno">
   delete from EMP where empno=?
</sql:dbExecute>
```

Alternatively, you can set a parameter value with the `dbSetParam` tag to bind it in through the `bindParams` attribute. See the next section, "SQL dbSetParam Tag".

**Important:**

- Do **not** terminate the DML or DDL statement with a semicolon. This currently results in a syntax error.

- The `dbExecute` tag does not currently support LOB columns.

**SQL dbSetParam Tag**

You can use this tag to set a parameter value to bind into a query, through the `dbQuery` tag, or to bind into any other SQL operation, through the `dbExecute` tag.
Note: For applications using the data-access tags, consider using the dbSetParam tag to supply only parameter values rather than textual completion of the SQL statement itself. This avoids the possibility of what is referred to as "SQL poisoning", where users might enter more SQL code in addition to the expected value.

Syntax
<sql:dbSetParam name = "param_name"
  value = "param_value"
  [ scope = "page" | "request" | "scope" | "application" ] />

Attributes
- name (required): This is the name of the parameter to set.
- value (required): This is the desired value of the parameter.
- scope: This is the scope of the bind parameter. The default is page scope.

Example: The following example uses a dbSetParam tag to set the value of a parameter named id2. This value is then bound into the SQL statement in the dbExecute tag.

<sql:dbSetParam name="id2" value='<%=request.getParameter("id")%>'
  scope='session' />

Result:
<HR>
<sql:dbOpen dataSource="<%= dataSrcStr %>">
  <sql:dbExecute output="yes" bindParams="id2 name job sal">
    insert into emp(empno, ename, deptno, job, sal)
    values (?, ?, 20, ?, ?)
  </sql:dbExecute>
</sql:dbOpen>
<HR>

SQL dbSetCookie Tag
You can use this tag to set a cookie. The dbSetCookie tag wraps functionality of the standard javax.servlet.http.Cookie class.

Syntax
<sql:dbSetCookie name = "cookie_name"
  [ value = "cookie_value" ]
  [ domain = "domain_name" ]
  [ comment = "comment" ]
  [ maxAge = "age" ]
  [ version = "protocol_version" ]
  [ secure = "true" | "false" ]
  [ path = "path" ] />

Attributes
- name (required): This is the name of the cookie.
- value: This is the desired value of the cookie. Because it is permissible to have a null-value cookie, this attribute is not required.
domain: This is the domain name for the cookie. The form of the domain name is according to the RFC 2019 specification.

comment: This is for a comment describing the purpose of the cookie.

maxAge: This is the maximum allowable age of the cookie, in seconds. Use a setting of "-1" for the cookie to persist until the browser is shut down.

version: This is the version of the HTTP protocol that the cookie complies with.

secure: This informs the browser whether the cookie should be sent using a secure protocol, such as HTTPS.

path: This specifies a file system path for the cookie, the location to which the client should return the cookie.

Example
<sql:dbSetCookie name="cId" value='<%=request.getParameter("id")%>'
    maxAge='800000' />

Example: Using dbOpen and dbQuery with a Data Source
This section provides a sample JSP page that uses a dbOpen tag with a data source to open a connection, then uses a dbQuery tag to execute a query.

<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/sqltaglib.tld" prefix="sql" %>
<HTML>
<BODY>
    <sql:dbOpen dataSource='<%=request.getParameter("datasource") %>'
        connId="con1">
    </sql:dbOpen>
    <sql:dbQuery connId="con1">
        SELECT * FROM emp ORDER BY ename
    </sql:dbQuery>
    <sql:dbClose connId="con1" />
</BODY>
</HTML>
This chapter describes tags provided with OC4J that you can use for XML data and XSL transformation, and summarizes additional XML functionality in other OC4J tags. These tags are implemented according to the JSP specification.

The chapter consists of the following sections:

- Overview of Oracle Tags for XML Support
- XML Utility Tags

**Note:** See the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for additional information about XML-related functionality for JSP pages.

### Overview of Oracle Tags for XML Support

The following sections provide an overview of tags supplied with OC4J that have XML functionality. This includes tags that can take XML DOM objects as input, generate XML DOM objects as output, transform XML documents according to a specified stylesheet, and parse data from an input stream to an XML DOM object.

- XML Producers and XML Consumers
- Summary of OC4J Tags with XML Functionality

**Note:** The custom XML tag library provided with OC4J pre-dates the JavaServer Pages Standard Tag Library (JSTL) and has areas of duplicate functionality. For standards compliance, it is now generally advisable to use JSTL instead. See “Support for the JavaServer Pages Standard Tag Library” on page 1-17.

Oracle is not desupporting the existing library, however. For features in the custom library that are not yet available in JSTL, where there seems to be general usefulness, Oracle will try to have the features adopted into the JSTL standard as appropriate.

### XML Producers and XML Consumers

An XML-related operation can be classified as either of the following, or as both:

- *XML producer*, which outputs an XML object
- *XML consumer*, which takes an XML object as input
Similarly, an XML-related tag can be classified as an XML producer, an XML consumer, or both. XML producers can pass XML objects to XML consumers either explicitly or implicitly; the latter is also known as anonymous passing.

For explicit passing between XML-related tags, there is a toXMLObjName attribute in the producer tag and a fromXMLObjName attribute in the consumer tag. Behind the scenes, the passing is done through the getAttribute() and setAttribute() methods of the standard JSP pageContext object. The following example uses explicit passing:

```xml
<sql:dbQuery output="XML" toXMLObjName="foo" ...>
  ...SQL query...
</sql:dbQuery>
...<ojsp:cacheXMLObj fromXMLObjName="foo" .../>
```

For implicit passing between XML-related tags, do not use the toXMLObjName and fromXMLObjName attributes. The passing is accomplished through direct interaction between the tag handlers, typically in a situation with a nested tag. The following example uses implicit passing:

```xml
<ojsp:cacheXMLObj ...>
  <sql:dbQuery output="XML">
    ...SQL query...
  </sql:dbQuery>
</ojsp:cacheXMLObj>
```

Here, the XML produced in the dbQuery tag is passed to the cacheXMLObj tag directly, without being stored to the pageContext object.

For a tag to be able to function as a consumer with implicit passing, the tag handler implements the OC4J ImplicitXMLObjConsumer interface:

```java
interface ImplicitXMLObjConsumer {
    void setImplicitFromXMLObj();
}
```

### Summary of OC4J Tags with XML Functionality

For the tag libraries supplied with OC4J, Table 5–1 summarizes the tags that can function as XML producers or consumers.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Library</th>
<th>Producer / Consumer</th>
<th>Related Attributes</th>
<th>Tag Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>transform</td>
<td>XML</td>
<td>Both</td>
<td>fromXMLObjName</td>
<td>&quot;XML transform and styleSheet Tags for XML/XSL Data Transformation&quot; on page 5-4</td>
</tr>
<tr>
<td>styleSheet</td>
<td></td>
<td></td>
<td>toXMLObjName</td>
<td></td>
</tr>
<tr>
<td>parsexml</td>
<td>XML</td>
<td>Producer</td>
<td>toXMLObjName</td>
<td>&quot;XML parsexml Tag to Convert from Input Stream&quot; on page 5-5</td>
</tr>
<tr>
<td>cacheXMLObj</td>
<td>Web Object</td>
<td>Both</td>
<td>fromXMLObjName</td>
<td>&quot;Web Object Cache cacheXMLObj Tag&quot; on page 7-18</td>
</tr>
<tr>
<td></td>
<td>Cache</td>
<td></td>
<td>toXMLObjName</td>
<td></td>
</tr>
<tr>
<td>dbQuery</td>
<td>SQL</td>
<td>Producer</td>
<td>toXMLObjName</td>
<td>&quot;SQL dbQuery Tag&quot; on page 4-15</td>
</tr>
</tbody>
</table>
The following sections describe XML utility tags supplied with OC4J:

- **XML Utility Tag Descriptions**
- **XML Utility Tag Examples**

Note the following requirements for the XML utility tag library:

- The XML tag library requires ojsputil.jar, xmlparserv2.jar, and xsu12.jar to be installed and in your classpath. These files are supplied with OC4J. The ojsputil.jar file is located in the "well-known" tag library directory.

- The tag library descriptor, xml.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for xml.tld is the following:
  
  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld

You can refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide* for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

**Notes:**

- The prefix "xml:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your taglib directive.

- See “Tag Syntax Symbology and Notes” on page 1-2 for general information about tag syntax conventions in this manual.

### XML Utility Tag Descriptions

The following sections describe XML utility tags:

- **XML transform and styleSheet Tags for XML/XSL Data Transformation**
- **XML parsexml Tag to Convert from Input Stream**
XML transform and styleSheet Tags for XML/XSL Data Transformation

Many uses of XML and XSL for dynamic JSP pages require an XSL transformation to occur in the server before results are returned to the client. Oracle provides two synonymous tags in the XML library to simplify this process. You can output the result directly to the HTTP client or, alternatively, you can output to a specified XML DOM object. Use either the transform tag or the styleSheet tag, as described and shown in this section. The two tags have identical effects.

Each tag acts as both an XML producer and an XML consumer. They can take as input either of the following:

- An XML DOM object
- The tag body, containing JSP commands and static text that produce the XML code

The tags can output to either or both of the following, with the specified stylesheet being applied in either case:

- An XML DOM object
- The output writer to the browser, in which case the specified stylesheet is applied

When you use the tag body for input, the tag applies to what is between the start-tag and end-tag. You can have multiple XSL transformation blocks within a page, with each block bounded by its own transform or styleSheet tag, specifying its own href pointer to the appropriate style sheet.

Syntax

```xml
<xml:transform href='xslRef'
    [ fromXMLObjName = 'objectname' ]
    [ toXMLObjName = 'objectname' ]
    [ toWriter = 'true' | 'false' ]>
    [...body...]
</xml:transform >
```

or:

```xml
<xml:styleSheet href='xslRef'
    [ fromXMLObjName = 'objectname' ]
    [ toXMLObjName = 'objectname' ]
    [ toWriter = 'true' | 'false' ]>
    [...body...]
</xml:styleSheet >
```

Attributes

- `href` (required): Specify the XSL stylesheet to use for the XML data transformation. This is required whether you are outputting to an XML object (where you can have transformation without formatting) or to the browser.

Note the following regarding the href attribute:
It can refer to either a static XSL stylesheet or a dynamically generated one. For example, it can refer to a JSP page or servlet that generates the stylesheet.

It can be a fully qualified URL (http://host:port/path), an application-relative JSP reference (starting with "/"), or a page-relative JSP reference (not starting with "/"). Refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about application-relative and page-relative paths.

Its value can be a static Java string constant literal, or it can be dynamically specified through a standard JSP request-time expression.

fromXMLObjName: Use this to specify an input XML DOM object if input is from a DOM object instead of from the tag body. If there is both a tag body and a fromXMLObjName specification, fromXMLObjName takes precedence.

toXMLObjName: Use this to specify the name of an output XML DOM object if output is to a DOM object, instead of or in addition to going to the JSP writer object for output to the HTTP client. This is not required if there is an implicit XML consumer, such as a tag within which the transform or styleSheet tag is nested.

toWriter: This is "true" or "false" to indicate whether output goes to the JSP writer object for output to the HTTP client. This can be instead of or in addition to output to a DOM object. The default is "true", for backward compatibility. (Prior to Oracle9iAS Release 2, this was the only output choice; there was no toXMLObjName attribute.)

**XML parsexml Tag to Convert from Input Stream**

The XML tag library supplies an XML producer utility tag, **parsexml**, that converts from an input stream to an XML DOM object. This tag can take input from a specified resource or from the tag body.

**Syntax**

```xml
<xml:parsexml
    [ resource = "xmlresource" ]
    [ toXMLObjName = "objectname" ]
    [ validateResource = "dtd_path" ]
    [ root = "dtd_root_element" ]>
    [...body...]
</xml:parsexml>
```

**Attributes**

- **resource**: Use this to specify an XML resource if input is from a resource instead of from the tag body. For example:

  ```xml
  resource="/dir1/hello.xml"
  ```

  If there is both a tag body and a specified resource, the resource takes precedence.

- **toXMLObjName**: Specify the name of the XML DOM object where the output will go. This is not required if there is an implicit XML consumer, such as a tag within which the parsexml tag is nested.

- **validateResource**: For XML validation, you can specify the path to the appropriate DTD. Alternatively, the DTD can be embedded in the XML resource. This is not a request-time attribute.
■ root: If validating, specify the root element in the DTD for validation. This is not a request-time attribute. If you specify validateResource without specifying root, the default root is the top-level of the DTD.

**XML Utility Tag Examples**

The following sections provide examples that use XML utility tags:

- Example Using the transform Tag
- Example Using the transform and dbQuery Tags
- Examples Using the transform and parsexml Tags

**Example Using the transform Tag**

This section provides a sample XSL stylesheet and a sample JSP page that uses the transform tag to filter its output through the stylesheet. This is a simplistic example, with the XML in the page being static. A more realistic example might use the JSP page to dynamically generate all or part of the XML before performing the transformation.

**Sample Stylesheet: hello.xsl**

```xml
<?xml version="1.0"?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:template match='page'>
    <html>
      <head>
        <title>
          <xsl:value-of select='title'/>
        </title>
      </head>
      <body bgcolor="#ffffff">
        <xsl:apply-templates/>
      </body>
    </html>
  </xsl:template>

  <xsl:template match='title'>
    <h1 align="center">
      <xsl:apply-templates/>
    </h1>
  </xsl:template>

  <xsl:template match='paragraph'>
    <p align="center">
      <i>
        <xsl:apply-templates/>
      </i>
    </p>
  </xsl:template>

</xsl:stylesheet>
```

**Sample JSP Page: hello.jsp**

```jsp
<%@ page session = "false" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld"
```
Example Using the transform and dbQuery Tags
This example returns a result set from a dbQuery tag, using a transform tag to filter the query results through the XSL style sheet rowset.xsl (code below). It uses a dbOpen tag to open a connection, with the connection string being obtained either from the request object or through the useDataSource.jsp page (code below). Data passing from the dbOpen tag to the transform tag is done implicitly. For related information, see “SQL dbQuery Tag” on page 4-15 and “SQL dbOpen Tag” on page 4-12.

JSP Page
<%@ page import="oracle.sql.*, oracle.jdbc.driver.*, oracle.jdbc.*, java.sql.*" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld"
prefix="xml" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/sqltaglib.tld"
prefix="sql" %>

<% String dataSrcStr=request.getParameter("dataSrcStr");
if (dataSrcStr==null) {
    dataSrcStr=(String)session.getValue("dataSrcStr");
} else {
    session.putValue("dataSrcStr",dataSrcStr);
} %>

This example results in the output shown in Figure 5–1.

**Figure 5–1 Sample XSL Output**

![Sample XSL Output](image-url)
if (dataSrcStr==null) { %>
<jsp:forward page="../sql/useDataSource.jsp" />%>

<h3>Transform DBQuery Tag Example</h3>
<xml:transform href="style/rowset.xsl">
<sql:dbOpen connId="conn1" dataSource="<%= dataSrcStr %>" />
<sql:dbQuery connId="conn1" output="xml" queryId="myquery">
    select ENAME, EMPNO from EMP order by ename
</sql:dbQuery>
<sql:dbCloseQuery queryId="myquery" />
<sql:dbClose connId="conn1" />
</xml:transform>

---

**Note:** For the `dbOpen` tag in this example, assume that the data source specifies the user name and password as well as the URL.

---

**rowset.xsl**

```xml
<xsl:stylesheet version='1.0' xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
   <xsl:template match="ROWSET">
      <html><body>
      <h1>A Simple XML/XSL Transformation</h1>
      <table border="2">
      <xsl:for-each select="ROW">
         <tr>
         <td><xsl:value-of select="@num"></td>
         <td><xsl:value-of select="ENAME"></td>
         <td><xsl:value-of select="EMPNO"></td>
         </tr>
      </xsl:for-each>
      </table>
      </body></html>
    </xsl:template>
</xsl:stylesheet>
```

**useDataSource.jsp**

```jsp
<body bgcolor="#FFFFFF">
<font size=+0>
<B>Please enter a suitable JDBC connection string, before you try the above demo</B>
<pre>
To use a data source that you have set up in data-sources.xml, enter the data source string below. Once you have set the data source string it will remain in effect until the session times out.
</pre>
<%
String dataSrcStr;
dataSrcStr=request.getParameter("dataSrcStr");
if (dataSrcStr==null) {
    dataSrcStr=(String)session.getValue("dataSrcStr");
}
if (dataSrcStr==null) {
    dataSrcStr="jdbc/OracleCoreDS"; // default data source string
}
```
Examples Using the transform and parsexml Tags

This section provides two examples that take output from a parsexml tag and filter it through a transform tag, using the XSL stylesheet email.xsl. In each case, data is collected by the parsexml tag handler from a specified resource XML file, then passed explicitly from the parsexml tag to the transform tag through the toxml1 XML object.

The first example uses the XML resource email.xml and the DTD email.dtd. No root attribute is specified, so validation is from the top-level element, <email>.

The second example uses the XML resource emailWithDtd.xml, which has the DTD embedded in the file. The root attribute explicitly specifies that validation is from the element <email>.

The files email.xml, email.dtd, emailWithDtd.xml, and email.xsl are also listed below.

Example 1 for transform and parsexml

```xml
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld" prefix="xml" %>
<h3>XML Parsing Tag Email Example</h3>
<xml:transform fromXMLObjName="toxml1" href="style/email.xsl">
  <xml:parsexml resource="style/email.xml" validateResource="style/email.dtd"
                toXMLObjName="toxml1">
  </xml:parsexml>
</xml:transform>
```

Example 2 for transform and parsexml

```xml
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld" prefix="xml" %>
<h3>XML Parsing Tag Email Example</h3>
<xml:transform fromXMLObjName="toxml1" href="style/email.xsl">
  <xml:parsexml resource="style/emailWithDtd.xml" root="email"
                toXMLObjName="toxml1">
  </xml:parsexml>
</xml:transform>
```

email.xml

```xml
<email>
  <recipient>Manager</recipient>
  <copyto>jsp_dev</copyto>
  <subject>XML Bug fixed</subject>
  <bugno>BUG 1109876!</bugno>
  <body>for reuse tag and checked in the latest version!</body>
  <sender>Developer</sender>
</email>
```

e-mail.dtd
<!ELEMENT email (recipient, copyto, subject, bugno, body, sender)>
<!ELEMENT recipient (#PCDATA)>
<!ELEMENT copyto (#PCDATA)>
<!ELEMENT subject (#PCDATA)>
<!ELEMENT bugno (#PCDATA)>
<!ELEMENT body (#PCDATA)>
<!ELEMENT sender (#PCDATA)>
This chapter describes the Edge Side Includes for Java (JESI) tag library that is supplied with OC4J. These tags operate on top of an Edge Side Includes (ESI) framework that is available in the Oracle Application Server Web Cache to provide ESI caching functionality in a JSP application.

The chapter consists of the following sections:

- Overview of Edge Side Includes Technology and Processing
- Overview of JESI Functionality
- Oracle JESI Tag Descriptions
- JESI Tag Handling and JESI-to-ESI Conversion

For an overview of Web caching, including a discussion of the OracleAS Web Cache, the Oracle Application Server Java Object Cache, and the OC4J Web Object Cache, see "Summary of Oracle Caching Support for Web Applications" on page 1-12.

Note: The JESI specification is not yet finalized. Although every effort has been made to comply with the latest working version, it is not possible to assure that the OC4J 10.1.2 implementation will fully comply with the final version of the JESI specification.

Overview of Edge Side Includes Technology and Processing

JESI tags, which are used to break down dynamic content of JSP pages into cacheable components, are based upon the Edge Side Includes architecture and markup language.

Although the use of JESI tags does not depend on any particular ESI processor or caching system, a typical scenario among Oracle customers is to use the OracleAS Web Cache and its ESI processor.

The following sections provide background information about some of the underlying technology upon which the Oracle JESI tags are based.

- Edge Side Includes Technology
- Oracle Application Server Web Cache and ESI Processor

This discussion provides only a brief overview of the ESI architecture and language. For additional information about ESI technology, refer to the following Web site:

http://www.esi.org
Edge Side Includes Technology

This section introduces the features of ESI technology and the concept of ESI surrogates.

Introduction to ESI

Edge Side Includes is an XML-style markup language that allows dynamic content assembly at the “edge” of the network, away from the origin Web server, and is designed to take advantage of available tools such as Web caches and content delivery networks (CDNs) to improve performance for users.

ESI provides a way to reduce the load on Web and application servers by promoting processing on intermediaries, known as surrogates or reverse proxies, that understand the ESI language and act on behalf of the Web server. ESI content is intended for processing somewhere between the time it leaves the originating Web server and the time it is displayed in the user’s browser. A surrogate is commanded through HTTP headers. Such a surrogate can be referred to as an ESI processor and can be included as part of the functionality of a Web cache.

ESI lends itself to a partial-page caching methodology, where each dynamic portion of a Web page can be cached individually and retrieved separately and appropriately.

Using the ESI markup tags, a developer can define aggregate Web pages and the cacheable components that are to be retrieved and assembled, as appropriate, by the ESI processor for viewing in the HTTP client. Think of an aggregate page, which is the resource associated with the URL that a user specifies, as a container for assembly. This includes retrieval and assembly instructions that are specified through the ESI tags.

---

**Important:** Do not use ESI tags directly in a page where you use JESI tags.

---

More About Surrogates

Because surrogates act on behalf of Web servers, where page content is owned, they allow content owners to have sufficient control over their behavior. In this way, they offer greater potential for performance improvements than would otherwise be available.

The caching process in surrogates operates similarly to the caching process in HTTP, using similar freshness and validation mechanisms as the foundation. However, surrogates also possess additional control mechanisms.

Key ESI Features

Version 1.0 of the ESI language includes the following key areas of functionality:

- **Inclusion**
  
  An ESI processor assembles fragments of dynamic content, retrieved from the network, into aggregate pages to output to the user. Each fragment can have its own meta data to control its caching behavior. See Figure 6–1 below.

- **Support of variables**
  
  ESI supports the use of variables that are based on HTTP request attributes. ESI statements can use variables during processing or can output them directly into the processed markup.

- **Conditional processing**
Overview of Edge Side Includes Technology and Processing

ESI allows the use of boolean comparisons for conditional logic in determining how pages are processed.

- Error handling and alternative processing

Some ESI tags support specification of a default resource or an alternative resource (or both), such as an alternate Web page, if the primary resource cannot be found.

Figure 6–1  ESI Include Model

Oracle Application Server Web Cache and ESI Processor

This section introduces the OracleAS Web Cache and its ESI processor. See the Oracle Application Server Web Cache Administrator’s Guide for more information.

Introduction to Oracle Application Server Web Cache

Oracle offers OracleAS Web Cache to help e-businesses manage Web site performance issues. It is a content-aware server accelerator, or reverse proxy server, that improves the performance, scalability, and availability of Web sites that run on the Oracle Application Server.

By storing pages from frequently accessed URLs in memory, OracleAS Web Cache eliminates the need to repeatedly process requests for those URLs on the application Web server. Unlike legacy proxy servers that handle only static documents, OracleAS Web Cache caches both static content and dynamically generated content from one or more application Web servers. As the result of more frequent cache hits, performance enhancement is greater than with legacy proxies and the load on application servers is less.

Conceptually, OracleAS Web Cache is positioned in front of application Web servers, caching their content and sending that content to Web browsers that request it. When Web browsers access the Web site, they send HTTP protocol or HTTPS protocol requests to OracleAS Web Cache, which, in turn, acts as a virtual server for the application Web servers. If the requested content has expired, has been invalidated, or is no longer accessible, then OracleAS Web Cache retrieves the new content from the application Web servers.

Steps in Oracle Application Server Web Cache Usage

Here are the steps for typical browser interaction with OracleAS Web Cache:
1. A browser sends a request to the Web site of a company.
2. The request, in turn, generates a request to the Domain Name System (DNS) for the IP address of the Web site.
3. DNS returns the IP address of OracleAS Web Cache.
4. The browser sends the request for the Web page to OracleAS Web Cache.
5. If the requested content is in its cache, then OracleAS Web Cache sends the content directly to the browser. This is known as a cache hit.
6. If OracleAS Web Cache does not have the requested content, or if the content is outdated or invalid, then the Web cache hands off the request to the application Web server. This is known as a cache miss.
7. The application Web server sends the content through OracleAS Web Cache.
8. OracleAS Web Cache sends the content to the client and makes a copy of the page in cache.

---

**Note:** A page that is stored in the cache is removed at some point after it becomes invalid or outdated.

---

**Oracle Application Server Web Cache ESI Processor**

OracleAS Web Cache includes an ESI processor to support the use of the Edge Side Includes markup language in caching. (See "Edge Side Includes Technology" on page 6-2.)

Web developers in an OracleAS Web Cache environment can use the ESI language directly in their applications; however, for JSP developers, there are several reasons to use the JESI tag library that is provided as a convenient JSP interface to the ESI language. See "Advantages of JESI Tags", which follows shortly.

---

**Overview of JESI Functionality**

The following sections introduce JESI functionality and the Oracle implementation:

- Advantages of JESI Tags
- Overview of JESI Tags Implemented by Oracle
- JESI Usage Models
- Invalidation of Cached Objects
- Personalization of Cached Pages
- JESI Fallback Execution

You can access the proposed JESI specification at the following Web site:

http://www.esi.org

---

**Advantages of JESI Tags**

OC4J provides the JESI tag library as a convenient interface to ESI tags and Edge Side Includes functionality for Web caching. Developers have the option of using ESI tags directly in any Web application, but JESI tags provide additional convenience for JSP pages. Here are the main advantages in using JESI tags instead of using ESI tags directly:
Overview of JESI Functionality

■ Standard JSP framework and convenient features
  – JESI tags allow use of the familiar and convenient features of JSP programming. For example, you can reference included pages according to page-relative or application-relative locations, instead of the complete URL or file path.
  – You can pass dynamic values to JESI tag attributes.
  – You can use JESI tags in combination with tags from other JSP tag libraries.

■ JESI shortcut syntax
  JESI tags support convenient syntax and tag attributes for specifying meta data information (such as expiration for cached pages), explicitly invalidating pages as appropriate, and personalizing pages using cookie information.

■ Application-level configuration files
  The JESI tag library can use application-level configuration files for convenient specification of deployment-time parameters and application default settings that are appropriate to a particular environment. In this way, you can deploy to different environments that have diverse needs and set appropriate defaults without changing application code. For example, you can use such a configuration file to preset the cache server URL, user name, and password for invalidation requests.

Overview of JESI Tags Implemented by Oracle

The Oracle implementation of JESI is layered on top of the standard ESI framework. It also conforms with the pending (as of the OC4J 10.1.2 implementation) JESI standard, JSR-128, which is sponsored by the Java Community Process (JCP) organization. For more information about the JCP organization and the status of JSR-128, go to the following location:

http://www.jcp.org

Because the JESI tag library is a standard implementation, note the following:

■ An application that uses JESI tags does not depend on the OC4J JSP container. It is portable to any standard JSP container. (Outside of OC4J, you can use either the reference implementation to be provided with JSR-128, or the JESI implementation that is provided with the JSP container you are using, if applicable.)

■ Even though this document discusses the OracleAS Web Cache and its ESI processor in particular, the JESI tag library does not depend on any particular caching environment and can work with any ESI processor that conforms to the ESI 1.0 specification.

The Oracle JESI tag library supports the following tags:

■ JESI control, JESI include, JESI param, JESI template, JESI fragment, and JESI codeblock for dynamic caching of page content

■ JESI invalidate (and subtags) for explicit invalidation of cached objects, when appropriate

■ JESI personalize for page customization through cookies

JSP developers use these tags (such as JESI include) instead of corresponding ESI tags (such as esi:include). The usefulness and convenience of this is discussed in "Advantages of JESI Tags" on page 6-4.
JESI Usage Models

There are two models for how to use JESI tags to define aggregate pages and their cacheable components:

- Control/include model
- Template/fragment model

This section describes these models and concludes with some special notes about the JESI include tag.

Control/Include Model

The control/include approach to using JESI tags is modular, typically bringing most (or all) cacheable content into the aggregate page as included pages. This is particularly convenient when you are developing new pages. Use this model as follows:

- Use the JESI control tag in the top-level page to set caching parameters for content outside the included content, as applicable.
- Use JESI include tags to bring in dynamic content.
- Use a JESI control tag inside each included page to set caching parameters for those pages, as appropriate.

Each included file is a distinct cacheable object (although caching can be disabled according to tag settings), and any content in the top-level page is also a distinct object.

Both tags are optional, depending on the situation. A page can have a JESI control tag without any JESI include tags. In fact, this is a simple way to convert an existing page for JESI use. There is also no requirement for a JESI control tag in a page that uses JESI include tags. The ESI processor will be appropriately notified of the presence of the JESI include tags, regardless. And there is no requirement for an included page to have a JESI control tag.

The cacheability of a page, either top-level or included, is determined as follows.

- If there is a JESI control tag, cacheability depends on attribute settings or on the default attribute values, as applicable.
- If there is no JESI control tag, cacheability depends on configuration settings of the ESI processor.
- The JESI control tag in the top-level page has no effect on included pages.

See the following sections for tag syntax and examples:

- "JESI control Tag" on page 6-14
- "JESI include Tag" on page 6-15
- "JESI param Tag" on page 6-17
- "Examples: Control/Include Model" on page 6-18
Template/Fragment Model

In the template/fragment approach, content is contained in a single page and you split the page into separately cacheable fragments as desired. This model is particularly convenient when you are converting existing pages for JESI use and want certain portions to be separate cacheable components. Use this model as follows:

- Use the JESI template tag to enclose the aggregate of all visible content. This tag sets caching parameters for the content outside the fragments. There must be no visible content outside the template tag.
- Use JESI fragment tags as desired, between the template start-tag and end-tag, to define fragments within the aggregate, to be cached separately.
- Optionally use JESI include tags as well, either at the template level or the fragment level.
- Optionally use codeblock tags within the template tag, outside of any fragments, to mark conditional execution of blocks of code.

The JESI template tag and JESI fragment tag are always used together. If you do not need separate fragments in a page, use the JESI control tag instead of the JESI template tag.

Each fragment is a distinct, cacheable object. Any content at the template level, outside any fragments, is a distinct, cacheable object. Any page that is included through a JESI include tag is also a distinct, cacheable object. Cacheability is determined as follows.

- The cacheability of the template (content outside any fragments) depends on the JESI template tag attribute settings or on the default attribute values, as applicable.
- Similarly, the cacheability of a fragment depends on the attribute settings of the JESI fragment tag or on the default attribute values, as applicable.
- The cacheability of an included page is determined as follows.
  - If there is a JESI control tag, cacheability depends on attribute settings or on the default attribute values, as applicable.
  - If there is no JESI control tag, cacheability depends on configuration settings of the ESI processor.

**Note:** It is permissible for the template/fragment model to be used in a response that has already processed a JESI control tag. This might be required, for example, in a case where conditional generation of the aggregate response can include response from any of a set of alternative pages. In this case, the JSP container uses the attribute settings of the control tag, ignores the attribute settings of the template tag, but notes the fact that there is a template tag properly enclosing any fragment tags, as required. As is always the case in the template/fragment model, there must be no cacheable content outside the template tag.

Because the template and fragments are independent, cacheable objects, they can expire at different times in the ESI processor. When a cache miss occurs or an object that has expired is requested, the ESI processor makes a request to the origin server (OC4J in the case of Oracle Application Server) for a fresh copy.

If a requested object is a JESI template, the JSP container executes code in the page that is outside any fragments. In output that is generated by the JSP translator, the
translator also places ESI markup that designates where all the fragments should be included. The code that is contained in the JESI fragments will not be executed at that time. The following figure illustrates this.

**Figure 6–2  JESI Request for Template**

When a fragment expires, the ESI processor makes a request to the origin server for that particular fragment. To execute a fragment, the OC4J JSP container executes the template code (code outside of any fragments) plus the code of the fragment being requested. The template code is executed to allow a fragment to rely on certain side effects, such as declaration or initialization of variables.

The output of the fragment code is returned in the response; the output of the template code is discarded. Upon receiving the response, the ESI processor will cache the updated copy of the fragment. The following figure illustrates this.
Remember this behavior when choosing code placement and expiration policies for your templates and fragments. In particular, because template code is executed in every update request, be aware of where you place any expensive code. Do not place an expensive computation at the template level unless it must be executed every time or is appropriately placed within a `codeblock` tag. Otherwise, place expensive computation in a fragment that has as long an expiration time as possible.

Figure 6–4 shows one `codeblock` tag scenario, in which the code block is to be executed only when a fragment is requested. In this figure, the request is for the template, so the code block is not executed.

Figure 6–5 shows another `codeblock` tag scenario, in which the code block is still to be executed only when a fragment is requested. This time, however, the request is for the fragment, so the code block is executed.

**Note:** To avoid needlessly repeating the execution of expensive template code, strategically place the code within JESI `codeblock` tags. Configure each `codeblock` tag according to when you want the code within it to be executed (whenever the template is requested, whenever a fragment is requested, or always).
Additionally, remember that no two fragments are ever executed during the same request. For example, you should not declare or set the value of a scriptlet variable in one fragment and depend on that variable or the set value in another fragment. If a variable is needed in more than one fragment, then it should be declared and set in the template code (possibly inside a codeblock tag). Similarly, do not set a request or session attribute in one fragment and then try to read it in another fragment. Such "page-global logic" should also be placed at the template level.

Finally, remember that the different fragments of a page will be refreshed at different times, according to invalidation messages and expiration settings. Typically, in a
well-tuned application, most fragments would be served from the ESI cache, having to be regenerated only infrequently.

---

**Note:** You can intersperse JESI template, JESI fragment, and JESI include tags with jsp:include tags if the JESI tags follow JESI rules and are properly nested with respect to each other. For example, you can have a page with a JESI template tag, have a jsp:include tag within the template tag, and have JESI fragment tags in the included page. You can also use the JESI template tag within an included page if there is no other template tag at a higher level, and if all output to the response buffer is within the template tag.

---

See the following sections for tag syntax and examples:

- "JESI template Tag" on page 6-20
- "JESI fragment Tag" on page 6-21
- "JESI include Tag" on page 6-15
- "JESI codeblock Tag" on page 6-22
- "Examples: Template/Fragment Model" on page 6-23

**Notes About JESI and JSP Includes**

In using either the control/include or template/fragment model, be aware of the following notes regarding the JESI include statement:

- A nested JESI inclusion is supported, either as a JESI include statement that includes a page that, in turn, has its own JESI include statement, or as a JESI include statement inside a fragment that is defined with a JESI fragment statement.

  In the second case, for example, the ESI processor executes the following steps:
  
  1. It requests the content of the aggregate page.
  2. It locates the content of the fragment in the cache (if applicable) or requests it.
  3. It locates the content of the included page in the cache (if applicable) or requests it.

- Despite conceptual similarities between the JESI include tag and the standard jsp:include tag, there are situations in which you should not substitute a JESI include tag for a jsp:include tag when you convert a JSP page for caching. Because the ESI processor uses separate HTTP requests, you are unable to pass an HTTP request or response object between one page and a page it includes through a JESI include tag. If the code in the included page requires access to the request or response object of the originating page, then you should consider using the JESI template/fragment model and putting the code in a JESI fragment tag (within the JESI template tag of the aggregate page) instead of using the JESI include tag.

**Invalidation of Cached Objects**

There might be situations where cached objects must be explicitly invalidated due to external circumstances, such as changes to relevant data in a database. There might
also be situations where execution of one page might invalidate the data of cached objects corresponding to another page.

For this reason, JESI provides the JESI invalidate tag and related subtags. These tags allow you to invalidate pages based on appropriate combinations of the following:

- Full URI or URI prefix
- Cookie name-value pair (optional)
- HTTP/1.1 request header name-value pair (optional)

Invalidation messages are in an XML-based format and specify the URLs to be invalidated. These messages are initiated by the JSP container when it executes the JESI invalidate tag, and transmitted to the cache server over HTTP using a POST method. The cache server then replies with an invalidation response, sent back over HTTP.

See "Descriptions of Tags and Subtags for Invalidation of Cached Objects" on page 6-25 for tag syntax and examples.

**Personalization of Cached Pages**

Dynamic Web pages frequently display customized information tailored to each individual user. For example, a welcome page might display the user's name and a special greeting, or current quotes for stocks the user owns.

For this kind of tailored output, the Web page depends on cookie information, which can be provided through the JESI personalize tag. Without this tag to inform the ESI processor of the need to perform cookie substitution, the Web page cannot be shared by multiple users at the ESI level.

See "Description of Tag for Page Personalization" on page 6-32 for tag syntax and examples.

**JESI Fallback Execution**

If no ESI processor is available for a page that uses JESI tags (such as on a system without OracleAS Web Cache, or in which Web Cache or its ESI processor is down), then the OC4J JSP container steps in to assemble the pages appropriately. Essentially, it takes over and provides the most crucial functionality to execute the pages properly.

Caching does not take place, nor does error-checking of JESI tag attribute values.

In these circumstances, the JSP container processes the particular JESI tags as follows:

- It ignores JESI control tags.
- It executes JESI include tags as though they are jsp:include tags, and the associated JESI param tags as though they are jsp:param tags. Note that any scriptlet code that is nested within a JESI include tag will still be executed.

**Note:** In this circumstance, unlike with JESI include functionality, there is no longer a separate response object for an included page.

- It checks JESI template and fragment tags for proper nesting, but otherwise ignores them and executes all their tag bodies during a single request.
- It unconditionally executes any code in JESI codeblock tags.
It ignores JESI invalidation tags and all subtags.

For JESI personalize tags, it inserts the cookie value into the response body if the cookie previously existed. If the cookie did not previously exist and a default value is specified in the personalize tag, then the JSP container inserts the default value into the response body. If the cookie did not previously exist and no default value is specified, then the personalize tag has no effect.

Oracle JESI Tag Descriptions

The following sections describe the syntax and attributes of the JESI tags provided with OC4J, followed by usage examples:

- Descriptions of Tags for Dynamic Caching
- Descriptions of Tags and Subtags for Invalidation of Cached Objects
- Description of Tag for Page Personalization

Note the following requirements for the JESI tag library:

- The Oracle JESI tag library, a standard JavaServer Pages tag library implementation, is included in the ojsputil.jar file, which is provided with OC4J and is located in the "well-known" tag library directory. Verify that this file is installed and in your classpath.

- The tag library descriptor, jesitaglib.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in the ojsputil.jar file. The uri value for jesitaglib.tld is the following:

  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld

Refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

Notes:

- The prefix "jesi:" is used in the tag syntax here. This is by convention and is not required. You can specify any desired prefix in your taglib directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

Descriptions of Tags for Dynamic Caching

The following sections cover the use of JESI tags for dynamic caching, document their syntax and attributes, and provide examples:

- JESI control Tag
- JESI include Tag
- JESI param Tag
- Examples: Control/Include Model
- JESI template Tag
- JESI fragment Tag
■ JESI codeblock Tag

■ Examples: Template/Fragment Model

See "JESI Usage Models" on page 6-6 for overviews of the control/include and template/fragment models.

### JESI control Tag

The JESI control tag controls caching characteristics for JSP pages in the control/include usage model. You can use a JESI control tag in the top-level page or any included page, but it is not mandatory. For any page without a JESI control tag in the control/include model, cacheability is according to the configuration settings of the ESI processor. (See "JESI Usage Models" on page 6-6.)

Because action resulting from the JESI control tag sets the HTTP response header, this tag should appear as early as possible in the page, before any other JESI tags or any buffer flushes in the page.

Note the following:

■ All attributes of the JESI control tag are optional. If you use a tag without any settings, then, by default, the cacheability of a response has an expiration setting of 24 hours, with immediate removal of expired objects.

■ If you want caching behavior to be determined by the configuration of the ESI processor, then do not use a JESI control tag for the page in question.

■ The JESI control tag of an originating page (a page with a JESI include tag) has no effect on included pages. Use a JESI control tag in each included page as well, as necessary.

■ If the JSP container encounters multiple JESI control tags while generating a single response, then only the first one is processed. The rest are ignored. Note that a page that is included through a JESI include tag (where such a page might have its own JESI control tag) results in a separate response.

■ If the JSP container has already encountered a JESI template tag when it encounters a JESI control tag while still generating the same response, then the control tag is ignored.

■ If a page with a JESI control tag depends on request parameters, consider whether you must cache different versions of the page, depending on the request query string. Another alternative is to not cache the page at all (set cache="no") if you anticipate that too many different request parameter values will result in too many cached versions of the page.

### Syntax

```xml
<jesi:control
    [ expiration = 'value' ]
    [ maxRemovalDelay = 'value' ]
    [ cache = 'yes' | 'no' | 'no-remote' ]
    [ control = 'uninterpreted_string' ] />
```

### Attributes

■ expiration: Specifies the lifetime, in seconds, of the cached object. The default is 86400 (24 hours).

■ maxRemovalDelay: Specifies the maximum time, in seconds, that the ESI processor continues to store the cached object after it has expired. The default is 0, for immediate removal.
- **cache**: Specifies whether the response corresponding to the tag is cacheable. A "yes" setting (the default) enables caching. Alternatively, you can set cache to "no" to disable caching, or to "no-remote" to enable caching only on the closest cache (instead of on a remote ESI processor or content delivery network).

One reason to make a page noncacheable, for example, is if you are using a JESI include tag with copyParam="yes". See "JESI include Tag" below.

- **control**: The value of this attribute is appended without change to the Surrogate-Control response header that was created during processing of the JESI control tag. The OracleAS Web Cache ESI processor does not use this attribute; however, it would be useful if you are using another ESI processor for your application and want to pass it any additional proprietary information in the header.

---

**Notes:**

- Do not confuse the control attribute name with the control tag name.
- "JESI Tag Handling and JESI-to-ESI Conversion" on page 6-33 includes some discussion of the Surrogate-Control header.

---

**JESI include Tag**

The JESI include tag, as with a standard jsp:include tag, allows dynamic insertion of output from the included page into output from the originating page. It does so by directing the ESI processor to process and assemble the included pages. Each included page is a separate cacheable object (but might not be cached, depending on settings).

You can use this tag in either the control/include model or the template/fragment model, in any of the following scenarios:

- By itself, without a JESI control tag or JESI template and fragment tags
- In the control/include model, after a JESI control tag
- In the template/fragment model, within a JESI fragment tag, or within the JESI template tag but outside any fragments

(See "JESI Usage Models" on page 6-6.)

In addition, it is permissible to nest JESI includes, either by using a JESI include tag inside a page that is itself included through a JESI include tag, or by using a JESI include tag inside a page that is included through a standard jsp:include tag.

The cacheability of an included page is determined as follows:

- If there is a JESI control tag, cacheability depends on attribute settings or on the default attribute values, as applicable.
- If there is no JESI control tag, cacheability depends on configuration settings of the ESI processor.

**Syntax**

```xml
<jesi:include page = "uri"
    [ alt = "alternate_uri" ]
    [ ignoreError = "true" | "false" ]
    [ flush = "true" | "false" ]
    [ copyParam = "true" | "false" ]
>```
...optional jesi:param tags, related scriptlets...
</jesi:include>

---

**Notes:**

- As with standard jsp:include tags and their optional jsp:param subtags, you can use JESI param tags nested within a JESI include tag to specify new parameters that will be sent to the originating page (the page with the JESI include tag). See "JESI param Tag" on page 6-17 for tag syntax. In addition, the body of a JESI include tag can contain scriptlet code to be used in evaluating the added parameters. Output from the scriptlet code, however, and from the body of any JESI include tag in general, is discarded.

- In some cases, JESI include tags behave differently from jsp:include tags. This is because the JESI include tag results in separate request and response objects for the included page. A JESI include tag is not suitable, for example, when the originating page sets a request attribute and the included page reads this attribute from the request object.

- For backward compatibility, the deprecated "copyparam" form of the copyParam attribute is accepted. The change from copyparam to copyParam was made to comply with the proposed JESI specification. It is likely that copyparam will be desupported at some point.

---

**Attributes**

- **page** *(required)*: Specifies the URI of the JSP page to be included, either a page-relative or application-relative location. (Refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide regarding syntax for page-relative and application-relative locations.) A full "http://..." or "https://..." URL is supported as well. The URI can optionally specify additional query parameters and values to pass to the included page, but using JESI param subtags is a preferred mechanism for this. See "JESI param Tag" on page 6-17.

- **alt**: Specifies a URI for an alternate page that is to be included if the page that is specified in the page attribute cannot be found. Syntax is the same as for the page attribute.

- **ignoreError**: Set this to "true" for continued processing of the originating page, even if no included page can be accessed (neither the page page nor the alt page). The default is "false".

- **flush**: This attribute is ignored, but is allowed in order to ease migration from jsp:include syntax.

- **copyParam**: If the included page makes use of request parameters, set this to "true" if you want to copy parameters and their values from the HTTP request string of the originating page to the included page. The default value is "false".

  If request parameters are significant to the included page and copyParam="true", then either the originating page should not be cached...
(cache="no" in the JESI control, JESI template, or JESI fragment tag), or multiple versions of the originating page should be cached, according to parameter settings.

As an example, avoid scenarios such as the following:

```xml
<jesi:control cache="yes" />
...
<jesi:include page="arf.jsp" copyParam="true" />
```

The reason is that if a copy of this originating page is served from the cache, and if parameters of this subsequent request are different than those of the original request, then the page will not execute on the server or have a chance to properly copy new parameters into arf.jsp. This would result in clients being served arf.jsp generated from incorrect parameters.

However, this scenario would not be problematic in certain circumstances, such as either of the following:

- The arf.jsp page does not use the request parameters.
- Appropriate versions of the originating page and arf.jsp are cached in the ESI processor, based on URL parameters. See the Oracle Application Server Web Cache Administrator's Guide for more information.

### JESI param Tag

The JESI param tag is an optional subtag of the JESI include tag. These tags work together in the same way that standard jsp:include and jsp:param tags work together.

You can use one or more JESI param subtags to pass additional query parameters to the target page of the JESI include tag. Doing this is more straightforward than the alternative, which is to specify parameters in the page URI of the JESI include tag. If you use both mechanisms, then parameters from param tags are appended after parameters from the include tag page URI. Any parameters that are copied from the original request, through an include tag copyParam="true" setting, are appended after parameters from JESI param tags.

See "Example 5: Control/Include with param Tag" on page 6-19 for a sample.

**Note:** Be aware that the parameter name and value will be evaluated when the originating page (the page with the JESI include and param tags) is generated. If, afterward, the originating page is cached in an ESI processor, then the name and value of the parameter, passed down to the included page, remain unchanged until the originating page is regenerated. (This is similar to the treatment of request parameters that are copied from the request through a copyParam="true" setting.)

### Syntax

```xml
<jesi:include page = "uri" ... >
    <jesi:param name="param_name"
        value="param_value" />
    ...
</jesi:include>
```

### Attributes
■ name (required): Specifies the name of the parameter.
■ value (required): Specifies the value of the parameter.

Examples: Control/Include Model
This section provides examples of JESI tag usage in the control/include model.

Example 1: Control/Include The following example employs default cache settings; no JESI control tag is necessary. The JESI include tags specify no alternate files, and a "file not found" error will halt processing. The flush attribute is permissible, but ignored.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<html>
<body>
<jesi:include page="stocks.jsp" flush="true" />
<p>
<hr>
<jesi:include page="/weather.jsp" flush="true" />
<p>
<hr>
<jesi:include page="../sales.jsp" flush="true" />
</body>
</html>
```

Example 2: Control/Include This example uses the JESI control tag to specify nondefault cache settings for maxRemovalDelay and expiration. In addition, it explicitly enables caching of the page, though this is already enabled by default. The first JESI include tag specifies an alternate page in case order.jsp cannot be retrieved by the ESI processor, and specifies that processing should continue even if neither page can be retrieved. The second JESI include tag specifies no alternate page; processing will halt if the page cannot be retrieved.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<jesi:control maxRemovalDelay="1000" expiration="300" cache="yes"/>
<jesi:include page="order.jsp" alt="alt.jsp" ignoreError="true"/>
<jesi:include page="commit.jsp" />
```

Example 3: Control/Include This example is of an aggregate page with conditional output. A cookie represents the identity of a customer. If no cookie is found, the user will be shown a generic welcome page with general product information. If a cookie is found, the user will be shown a list of products according to the user profile. This list is brought into the page through a JESI include statement.

The JESI control tag also sets nondefault values for maxRemovalDelay and expiration and explicitly enables caching for the page.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<jesi:control maxRemovalDelay="1000" expiration="300" cache="yes"/>
<%  
String customerId=CookieUtil.getCookieValue(request,"customerid");  
if (customerId==null) {
   // some unknown customer
   
   <jesi:include page="genericwelcome.jsp" />
```
Example 4: Control/Include

This example illustrates the use of JESI include statements with request parameters. Assume that the main page is accessed through the following URL:


The main page takes the parameter setting p2=abc. Here is that page:

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<html>
<esi:control cache="no" />
<esi:include page="a.jsp?p1=v1" />
<h3>hello ...</h3>
<esi:include page="b.jsp" />
<h3>world ...</h3>
<esi:include page="c.jsp?p1=v2" copyParam="true" />
</esi:control>
</html>
```

The a.jsp page takes the parameter setting p1=v1. The c.jsp page takes the setting p1=v2 as well as the setting p2=abc, as a result of the copyParam setting and the p2 setting in the URL for the main page.

Additionally, the top-level page is noncacheable, according to the cache="no" setting. In fact, remember that you should use the copyParam setting in a JESI include tag only when the originating page is noncacheable, because the request attributes might change from one request to the next. Remember, too, that the cache="no" setting has no effect on the included pages. They are still cacheable by default. In other words, each is cacheable unless it has its own JESI control tag with cache="no" for some reason.

Example 5: Control/Include with param Tag

This example illustrates use of a JESI param tag to add runtime values as new parameters to the included page request. Assume the main page is accessed through a URL such as the following, taking the parameter setting p1=v1:

http://host:port/application/main.jsp?p1=v1

Here is the page:

```jsp
<esi:control cache="yes" />
<esi:include page="a.jsp" >
<% String v2 = null;
    if(request.getParameter("p1").equals("v1")
       v2 = "v1 set";
    else
       v2 = "v2 unset";
```
Oracle JESI Tag Descriptions

%>
<jesi:param name="p2" value="<%=v2%>" />
</jesi:include>

JESI template Tag
Use the JESI template tag to specify caching behavior for the template content, outside any fragments, in the template/fragment usage model. (See "JESI Usage Models" on page 6-6.) The corresponding HTTP header will be set according to the ESI specification. The content outside the fragments is referred to here as the template content and is a separate cacheable object, and the content of each fragment set aside with a JESI fragment tag is a separate cacheable object.

---

**Important:** All response output must be generated between the template start-tag and end-tag. Place the JESI template start-tag as early in the page as possible. It must appear before any JESI fragment tags or any buffer flushes in the page. It must also appear before any other visible output content such as text, HTML markup, new lines, or white space. Place the JESI template end-tag as late in the page as possible, after any JESI fragment tags and any other visible output content.

---

Always use the JESI template tag together with JESI fragment tags. If you have no need for separate fragments, then use a JESI control tag instead of a JESI template tag.

Note the following:

- All attributes of the JESI template tag are optional. If you use a tag without any settings, then, by default, the cacheability of a response has an expiration setting of 24 hours, with immediate removal of expired objects.

- In the template/fragment model, you cannot delegate decisions about cacheability to the ESI processor. You must have a JESI template tag, and cacheability of the template content is according to the template tag attribute settings or default values, as applicable. Similarly, each fragment must be set aside with a JESI fragment tag, and cacheability of each fragment is according to its fragment tag attribute settings or default values.

- Do not use multiple JESI template tags in a single JSP page. In addition, do not use additional JESI template tags in pages that are included, through jsp:include functionality, into the same response object. In either case, an exception will result.

- It is permissible to place a JESI template tag inside a page that is included through a standard jsp:include tag, as long as there is no template tag in any higher-level pages and you follow any other relevant restrictions that are mentioned in this section.

- If the JSP container has already encountered a JESI control tag when it encounters a JESI template tag while still generating the same response, then any attributes of the template tag are ignored and caching is according to the control tag.
The JESI template tag cacheability settings have no effect on the enclosed fragments; fragments provide their own settings (or default values).

If request parameters are significant to a fragment, then either the enclosing template content should not be cached (cache="no" in the JESI template tag), or separate versions of the template content should be cached, according to parameter values. Different versions of the fragment should also be cached, according to parameter values.

In the background, a fragment involves an additional request, as with a page included through a JESI include tag. Request parameters (if any) are always passed from the template to the fragment, equivalent to JESI include tag functionality with a setting of copyParam="true". (This kind of issue is also discussed in “JESI include Tag” on page 6-15.)

The JESI template tag has the same attributes, with the same usage, as the JESI control tag.

Syntax

```xml
<jesi:template
    [ expiration = "value" ]
    [ maxRemovalDelay = "value" ]
    [ cache = "yes" | "no" | "no-remote" ]
    [ control = "uninterpreted_string" ] >
    ...page content, jesi:fragment tags, optional jesi:include tags, optional jesi:codeblock tags..
</jesi:template>
```

Attributes

For attribute descriptions, see "JESI control Tag" on page 6-14.

**JESI fragment Tag**

Use one or more JESI fragment tags within a JESI template tag, between the JESI template start-tag and end-tag, in the template/fragment model. (See "JESI Usage Models" on page 6-6.) Each JESI fragment tag defines a separate fragment of the JSP page, as desired, for caching behavior. Each fragment is a separate cacheable object.

When a particular fragment is requested for inclusion into the aggregate response through the ESI mechanism, the ESI processor retrieves only that fragment.

The JESI fragment tag has the same attributes, with the same usage, as the JESI control and JESI template tags.

Note the following:

- Each JESI fragment tag specifies its own caching instructions to the ESI processor. Cacheability is according to the specified attribute settings or the
default values, as applicable. The settings of the surrounding JESI template tag have no effect on the fragments.

- You cannot nest a JESI fragment tag within another JESI fragment tag.

- Unlike with the control/include model, it is not possible to delegate caching instructions to the ESI processor in the template/fragment model, given that a template tag, and fragment tags as applicable, are required. Caching is always according to template or fragment tag attribute settings or the default values.

- As long as you follow the restrictions mentioned in this section, it is permissible to place a JESI fragment tag inside a page that is included through a standard jsp:include tag. The JESI template tag that encloses the JESI fragment tag can appear in the same included page or in a higher level page such as the page containing the jsp:include statement.

**Syntax**

```xml
<jesi:fragment
    [ expiration = 'value' ]
    [ maxRemovalDelay = 'value' ]
    [ cache = 'yes' | 'no' | 'no-remote' ]
    [ control = 'uninterpreted_string' ]>
...
</jesi:fragment>
```

**Attributes**

For attribute descriptions, see "JESI control Tag" on page 6-14.

**JESI codeblock Tag**

In the template/fragment model, you can optionally use one or more JESI codeblock tags within template code, outside of any fragments, to mark conditional execution of particular blocks of code. Each codeblock tag surrounds a block of code and specifies when it should be executed:

- Only when the template is requested
  or:
- Only when a fragment (any fragment) is requested
  or:
- Always (whether a template or fragment is requested)

Without use of this tag, all template code is executed with every request—with each request for the template as well as with each request for any fragment, although template output is discarded in the case of a request for a fragment.

Although it is important to execute the template whenever a fragment is requested—to allow fragments to depend on template code side effects such as variable declaration or initialization—there might be blocks of code that are not critical to fragments. You can place any such code block into a codeblock tag with a specification to execute the block only when the template is requested.

Alternatively, there might be blocks of template code that are potentially vital to all fragments, but not to the template itself. You can place any such code block into a codeblock tag with a specification to execute the block only when any fragment is requested.
Note: It is advisable to not generate any visible output within a JESI codeblock tag. This is to avoid unexpected behavior due to differences in execution between requests for the template and requests for fragments. If execute="template" (or "always") and the template is requested, then the code is executed and the content is output, as presumably intended. However, if execute="fragment" (or "always") and the request is for a fragment, then the code is executed but the entire output of the template is suppressed, as is always the case when a fragment is requested. See Figure 6–3 in "Template/Fragment Model" on page 6-7.

Syntax

<jesi:template ... >
...
  <jesi:codeblock execute = "template" | "fragment" | "always" >
    ...request-dependent JSP content...
  </jesi:codeblock>
...
</jesi:template>

Attributes

- execute (required): Specify the value "template" to execute the code block only when the template is requested. Specify the value "fragment" to execute the code block only when any fragment is requested. A setting of "always" results in the code block being executed with every request for the page, and is equivalent to not using a codeblock tag at all.

Examples: Template/Fragment Model

This section contains examples of JESI tag usage in the template/fragment model.

Example 1: Template/Fragment  This is a general example showing use of the JESI template and JESI fragment tags. Because only the expiration attribute is set in any of the tags, all other settings are according to defaults. The setting of the cache attribute defaults to "yes", so the template and all three fragments are cached.

The template content (outside the fragments) uses an expiration of 3600 seconds, according to the JESI template tag. This applies to all the HTML blocks because they are outside the fragments. JSP code block #1 is cached with an expiration setting of 60; JSP code block #2 is cached with the default expiration setting; and JSP code block #3 is cached with an expiration setting of 600.

<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<jesi:template expiration="3600">
  ...HTML block #1...
  <jesi:fragment expiration="60">
    ...JSP code block #1...
  </jesi:fragment>
  ...HTML block #2...
  <jesi:fragment>
    ...JSP code block #2...
  </jesi:fragment>
  ...HTML block #3...
  <jesi:fragment expiration="600">
Example 2: Template/Fragment  This example employs JESI include tags inside the fragments. The following are the cacheable objects for this page:

- Each included page
- Each fragment, outside of the page it includes
- The aggregate of the HTML blocks, which are all at the template level outside any fragments

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<jesi:template expiration="3600">
  ...HTML block #1...
  <jesi:fragment expiration="60">
    ...JSP code block #1...
    <jesi:include page="stocks.jsp" />
  </jesi:fragment>
  ...HTML block #2...
  <jesi:fragment>
    ...JSP code block #2...
    <jesi:include page="/weather.jsp" />
  </jesi:fragment>
  ...HTML block #3...
  <jesi:fragment expiration="600">
    ...JSP code block #3...
    <jesi:include page="../sales.jsp" />
  </jesi:fragment>
  ...HTML block #4...
</jesi:template>
```

Example 3: Template/Fragment with Codeblock  This is a conceptual example of how you can use the codeblock tag in the template/fragment model. In this case, to improve performance, the code that connects to the database would be placed in the code block so that it is not reexecuted needlessly.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>
<jesi:template>
  Welcome to the Frequent Flyer Home page!
  <jesi:codeblock execute="fragment">
    /* Open a database connection and store it in the variable dbConn. */
  </jesi:codeblock>
  BEST DEALS
  <jesi:fragment expiration="600" maxRemovalDelay="180">
    ...in Air Travel
    /* Select the three cheapest USA domestic round-trip fares, using the database connection stored in dbConn. */
  </jesi:fragment>
  <jesi:fragment expiration="600" maxRemovalDelay="180">
    ...in Accommodations
    /* select the three best hotel deals, using the database connection stored in dbConn. */
  </jesi:fragment>
</jesi:template>
```
Descriptions of Tags and Subtags for Invalidation of Cached Objects

Use the JESI invalidate tag and the following subtags, as appropriate, to explicitly invalidate cached objects in the ESI processor:

- **JESI object**
- **JESI cookie** (subtag of JESI object)
- **JESI header** (subtag of JESI object)

The following sections cover the syntax of these tags, the JESI configuration file (which can be used to specify the user name, password, and URL to log in for invalidation), and some examples:

- **JESI invalidate Tag**
- **JESI Configuration File**
- **JESI object Subtag**
- **JESI cookie Subtag**
- **JESI header Subtag**
- **Examples: Page Invalidation**

See "Invalidation of Cached Objects" on page 6-11 for an overview.

**JESI invalidate Tag**

Use the JESI invalidate tag with its JESI object subtag to explicitly invalidate one or more cached objects.

Use the subtags as follows:

- Use the required JESI object subtag to specify what to invalidate, according to the URI or URI prefix.
- Optionally use JESI cookie subtags or JESI header subtags (or both) of the JESI object tag to specify further criteria for what to invalidate, according to cookie or HTTP header information.

**Syntax**

```xml
<jesi:invalidate
   [ url = "url"
     username = "user_name"
     password = "password" ]
   [ config = "configfilename" ]
   [ output = "browser" ] >
```

Required subtag (described in "JESI object Subtag" on page 6-28):

```xml
<jesi:object ... >
```

Optional subtag of JESI object (described in "JESI cookie Subtag" on page 6-29):

```xml
<jesi:cookie ... />
```

Optional subtag of JESI object (described in "JESI header Subtag" on page 6-30):

```xml
<jesi:header ... />
```
Either specify the user, password, and URL all through their individual attributes, or all in the configuration file that is either referred to in the config attribute or is found in the default location. The default location is /WEB-INF/jesi.xml or, for backward compatibility, /WEB-INF/config.xml. See "JESI Configuration File" on page 6-27 for information about the file. If the user name, password, and URL are specified through the configuration file as well as through the attribute settings, then the attribute settings take precedence.

If you specify a <user> element for the OracleAS Web Cache "invalidator" account in the OC4J jazn-data.xml file, then you can use special syntax in the password attribute to refer to the information in jazn-data.xml instead of specifying the password in clear text. The password is specified in jazn-data.xml in an obfuscated form. See the username and password attribute descriptions below. See the Oracle Application Server Containers for J2EE Security Guide for information about the jazn-data.xml file.

---

Note: It is permissible to have multiple object tags within an invalidate tag.

---

Attributes

- **url**: Specifies the URL of the cache server. If this attribute is omitted, then you must specify the URL, as well as the user name and password, in the JESI configuration file.

- **username**: Specifies the user name for logging in to the cache server to perform invalidation. OracleAS Web Cache typically requires an "invalidator" user name. If this attribute is omitted, then you must specify the user name, as well as the password and URL, in the JESI configuration file.

  If the OC4J jazn-data.xml file contains a <user> element for the OracleAS Web Cache "invalidator" account, then you can use that account name for the username value, such as:

  username="invalidator"

- **password**: Specifies the password for logging in to the cache server to perform invalidation. If this attribute is omitted, then you must specify the password, as well as the user name and URL, in the JESI configuration file.

  If the OC4J jazn-data.xml file contains a <user> element for the OracleAS Web Cache "invalidator" account, then you can get the de-obfuscated password from that file by using special right-arrow syntax with a dash ("-"), and right-carrot (">") followed by the invalidator account name, such as:

  password="->invalidator"

- **config**: Specifies a JESI configuration file, using either an application-relative or a page-relative location. You can use this file to provide the cache server URL, user name for invalidation, and password instead of using the corresponding tag attributes. Note the following:

  - You can use a configuration file in the default location instead of specifying one through the config attribute. See "JESI Configuration File" on page 6-27.
No configuration file is consulted if username, password, and url are all specified through tag attributes.

- output: Optionally sets an output device to receive the invalidation response from the cache server. Currently, the only supported setting is "browser", which wraps the Web cache response with HTML formatting to show the message in the user's Web browser. If you do not set this parameter, then the invalidation response will not be displayed.

**JESI Configuration File**

The proposed JESI specification supports the use of a configuration file. Currently, you can use a configuration file only to specify the user name, password, and URL for invalidation. (Alternatively, you can specify the user name, password, and URL through attributes of each JESI invalidate tag. See "JESI invalidate Tag" on page 6-25.)

A JESI configuration file must have a <jesi-config> top-level element, an <invalidation> subelement under that, and <username>, <password>, and <url> subelements under the <invalidation> element.

---

**Note:** For backward compatibility, the deprecated elements <ojsp-config> and <web-cache> are currently acceptable instead of <jesi-config> and <invalidation>, respectively. The new elements are to comply with the proposed JESI specification. It is likely that the <ojsp-config> and <web-cache> will be desupported in a future release.

---

In the current implementation there are two possible default files, or you can place the file anywhere within your application and specify its name and location through the config attribute of the invalidate tag, specifying either an application-relative or a page-relative location.

The preferred default file is /WEB-INF/jesi.xml, which conforms with the proposed JESI specification. For backward compatibility, the previous default file, /WEB-INF/config.xml, is also supported.

The following precedence is used to obtain the user name, password, and URL for invalidation:

1. If the JESI invalidate tag specifies the username, password, and url attribute settings (all three), then those values are used.

---

**Note:** If the invalidate tag specifies one or two of these attributes but not all three, an exception is raised. An exception is also raised if one or more of the attribute values is an empty string or null.

---

2. If you do not specify username, password, and url in the invalidate tag, but the config attribute specifies a configuration file, then values from the specified configuration file are used.

3. If you do not specify username, password, url, and config in the invalidate tag, then the JSP container attempts to use a default configuration file. First, the container searches for /WEB-INF/jesi.xml and uses the settings
from that file if it is found. If that file is not found, then the container searches for /WEB-INF/config.xml and uses the settings from that file if it is found.

---

**Notes:** If the invalidate tag does not specify the user name, password, and URL, an exception is thrown under either of the following circumstances:

- If at any point a configuration file is found that does not specify all three attributes
- If no configuration file is found

---

If the OC4J jazn-data.xml file contains a `<user>` element for the OracleAS Web Cache "invalidator" account, you can that account name in the JESI configuration file and get the password from jazn-data.xml by using special right-arrow syntax with a dash ("-") and right-carrot (">"), followed by the invalidator account name. See "Example 2: Configuration File Obtaining Password from jazn-data.xml" below.

**Example 1: Configuration File with Clear Text for Password**  The following example shows a configuration file that is used instead of the url, username, and password attributes to set the URL and login information:

```xml
<?xml version="1.0" ?>
<jesi-config>
  <invalidation>
    <url>http://yourhost.yourcompany.com:4001</url>
    <username>invalidator</username>
    <password>invpwd</password>
  </invalidation>
</jesi-config>
```

**Example 2: Configuration File Obtaining Password from jazn-data.xml**  The following example, instead of using clear text to specify the password, uses special "-">" syntax to obtain the de-obfuscated password from the jazn-data.xml file. This example assumes jazn-data.xml contains a `<user>` element for the OracleAS Web Cache "invalidator" account:

```xml
<?xml version="1.0" ?>
<jesi-config>
  <invalidation>
    <url>http://yourhost.yourcompany.com:4001</url>
    <username>invalidator</username>
    <password>-invalidator</password>
  </invalidation>
</jesi-config>
```

**JESI object Subtag**  Use the required JESI object subtag of the JESI invalidate tag to specify cached objects to invalidate, according to either the complete URI or a URI prefix. Optionally, use JESI cookie subtags or JESI header subtags (or both) to specify further criteria for invalidation, based on cookie or HTTP header information.

Specify either the complete URI or the URI prefix in the uri attribute setting. Whether this field is interpreted as a full URI or as a prefix depends on the setting of the prefix attribute.

**Syntax**
<jesi:object uri = "uri_or_uri_prefix"  
[ maxRemovalDelay = "value" ]  
[ prefix = "yes" | "no" ] >

Optional subtag (described in "JESI cookie Subtag" below):

    <jesi:cookie ... />

Optional subtag (described in "JESI header Subtag" on page 6-30):

    <jesi:header ... />

</jesi:object>

Here is the syntax if you do not use either subtag:

<jesi:object uri = "uri_or_uri_prefix"  
[ maxRemovalDelay = "value" ]  
[ prefix = "yes" | "no" ] />

---

**Notes:**

- It is permissible to have multiple object tags within an invalidate tag.
- It is permissible to have multiple cookie tags or header tags within an object tag.

---

**Attributes**

- **uri** (required): Specifies either the complete URI of the page whose corresponding cached object is to be invalidated (if prefix="no"), or a URI prefix that specifies objects for multiple pages to be invalidated according to location (if prefix="yes").
  
  If a prefix is specified, then cached objects for all pages under that location are invalidated. For example, for a prefix of "/abc/def", cached objects for all pages in the corresponding directory and any subdirectories are invalidated.

- **prefix**: Set this to "yes" if the uri attribute is to be interpreted as a URI prefix only. Use the default "no" setting if the uri value is to be interpreted as a complete URI.

- **maxRemovalDelay**: Specifies the maximum delay, in seconds, between the time when a cached object is invalidated and the time when it is removed and, therefore, can no longer be served by the ESI processor. This delay is 0 by default, for immediate removal.

**JESI cookie Subtag**

Use one or more JESI cookie subtags of the JESI object tag (which is a subtag of the JESI invalidate tag) if you want to use cookie information as further criteria for invalidation. This cookie information is in addition to the URI or URI prefix setting in the JESI object tag, and possibly in addition to JESI header tags as well. The cookie tag is useful for invalidating objects that have had multiple versions cached, based on cookie information.

The cookie tag has no body.

**Syntax**
<jesi:cookie name = "cookie_name"
[ value = "cookie_value" ] />

---

**Notes:**

- It is permissible to have multiple cookie tags within an object tag.
- Unlike most other JESI tag attributes, it is permissible for the value attribute to have a null or empty-string value.

---

**Attributes**

- **name** (required): This is the name of the cookie.
- **value**: This is the value of the cookie.

For each use of the **cookie** subtag, the request URL of the object to be invalidated must have a cookie that matches the name attribute setting and, if specified, the value attribute setting.

---

**JESI header Subtag**

Use one or more JESI header subtags of the JESI object tag (which is a subtag of the JESI invalidate tag) if you want to use HTTP/1.1 header information as further criteria for invalidation. This header information is in addition to the URI or URI prefix setting in the JESI object tag, and possibly in addition to JESI cookie tags as well. The header tag is useful for invalidating objects that have had multiple versions cached, based on header information.

The **header** tag has no body.

---

**Syntax**

<jesi:header name = "header_name"
value = "header_value" />

---

**Note:** It is permissible to have multiple header tags within an object tag.

---

**Attributes**

- **name** (required): This is the name of the HTTP/1.1 header.
- **value** (required): This is the value of the HTTP/1.1 header.

For each use of the **header** subtag, the request URL of the object to be invalidated must have a header that matches the name and value attribute settings.

---

**Examples: Page Invalidation**

This section provides examples of page invalidation using the JESI invalidate tag, its JESI object subtag, and the JESI cookie subtag of the JESI object tag.

**Example 1: Page Invalidation** This example invalidates a single object in the ESI processor, specified by its complete URI. (By default, the **uri** attribute of the object tag specifies a full URI, not a URI prefix.) The JESI invalidate tag also specifies the URL...
for the cache server, and the user name and password for the invalidation account. In addition, it specifies that the invalidation response from the cache server should be displayed in the user’s browser.

...<jesi:invalidate url="http://yourhost.yourcompany.com:4001"
  usernames="invalidator" password="invpwd"
  output="browser">
  <jesi:object url="/images/logo.gif"/>
</jesi:invalidate>
...

Example 2: Page Invalidation This example is equivalent to "Example 1: Page Invalidation" immediately above, but uses a configuration file to specify the cache server URL and login information.

...<jesi:invalidate config="/myconfig.xml" output="browser">
  <jesi:object url="/images/logo.gif"/>
</jesi:invalidate>
...

The JESI invalidate tag specifies an application-relative location for the configuration file. As an example, suppose myconfig.xml has the following content:

<?xml version="1.0" ?>
<jesi-config>
  <invalidation>
    <url>http://yourhost.yourcompany.com:4001</url>
    <username>invalidator</username>
    <password>invpwd</password>
  </invalidation>
</jesi-config>

Example 3: Page Invalidation This example invalidates all objects in the ESI processor, according to the URI prefix "/". It does not specify that the invalidation response should be displayed in the browser, so it will not be displayed at all.

...<jesi:invalidate url="http://yourhost.yourcompany.com:4001"
  usernames="invalidator" password="invpwd">
  <jesi:object url="/" prefix="yes"/>
</jesi:invalidate>
...

Example 4: Page Invalidation This example invalidates a single object but allows it to be served stale for up to 30 minutes (1800 seconds).

...<jesi:invalidate url="http://yourhost.yourcompany.com:4001"
  usernames="invalidator" password="invpwd">
  <jesi:object url="/images/logo.gif" maxRemovalDelay="1800"/>
</jesi:invalidate>
...

Example 5: Page Invalidation This example specifies the same object for invalidation as "Example 1: Page Invalidation" on page 6-30, but specifies that it should be invalidated only if its request URL has a cookie named user_type with the value customer.

...<jesi:invalidate url="http://yourhost.yourcompany.com:4001"
Description of Tag for Page Personalization

To allow page customization when sharing the same cached page between multiple users, the ESI processor must be informed of dependencies by the page on cookie and session information. Cookie value replacement, for example, occurs in the ESI processor instead of in the Web server.

JESI personalize Tag

Use the JESI `personalize` tag to allow page customization, by directing the ESI processor to substitute cookie values from a current request before serving a cached page.

The effect of this tag is to insert an ESI placeholder with the cookie name and value into the response body. If the cookie that is specified in the name attribute is found in the request and has a non-null value, its value is used. If the cookie is not found in the request or has a null value, but a value is specified through the default attribute, then a new cookie is created and the default value is used. If the cookie did not previously exist and no default value is specified, the tag has no effect.

The `personalize` tag has no body.

Syntax

```
<jesi:personalize name = "cookie_name"
[ default = "default_value" ] />
```

Notes:

- For backward compatibility, the deprecated "value" form of the `default` attribute is accepted. The change from value to default was made to comply with the proposed JESI specification. It is likely that value will be desupported in a future release.

- OC4J automatically places single quotes around the specified default (or value) setting to comply with the ESI specification. Prior to the OC4J 9.0.4 implementation, you had to include the single quotes as part of your setting.

Attributes

- name (required): Specifies the name of the cookie whose value is used as the basis for personalizing the page.

- default: This is an optional default value in case the cookie is not found or has a null value.

Example: Page Personalization

The following example shows usage of the JESI personalize tag:
The corresponding ESI tag that is generated allows the ESI processor to find the necessary information. In this case, it looks for a cookie named user_id and retrieves its value. If it cannot find the cookie, it uses a default value of "guest".

Handling this cookie-value replacement in the ESI processor allows the ESI processor to serve multiple customized pages from a single cached copy, without involving the application server.

### Example: JESI-to-ESI Conversion for Included Pages

As an example of JESI-to-ESI conversion, consider the following JSP code:

```jsp
<p>BEGIN</p>
jesi:control cache="no"/
jesi:include page="stocks.jsp" flush="true" />
p>
hr>
jesi:include page="/weather.jsp" copyParam="true" flush="true" />
p>
hr>
jesi:include page="../sales.jsp?tax=local" copyParam="true" flush="true" />
p>END</p>
```

Assume that this JSP code is part of a page with the following URL:

http://host:port/application1/top.jsp

Further assume the following request:

http://host:port/application1/top.jsp?city=Washington_DC

In this case, the JESI `include` tag handler generates ESI markup such as in the following response.

In the response header:

```
Surrogate-Control: content="ESI/1.0",max-age=86400+0,no-store
```

In the response body:

```esi
BEGIN
esi:include src="/application1/stocks.jsp"
hr>
esi:include src="/weather.jsp?city=Washington_DC"
hr>
esi:include src="/sales.jsp?tax=local&city=Washington_DC"
```
This response is read by the ESI processor before being delivered to the client. A Surrogate-Control header alerts the ESI processor that the response body contains ESI markup; therefore, the caching mechanism looks inside the response body for ESI tags. In addition, the Surrogate-Control header sets the cache directive to no-store, according to the cache="no" attribute setting. Expiration and maximum delay interval have no impact in this case.

In response to each of the three esi:include tags, the ESI processor makes an additional request to the URL that is specified. Each response is included into the top-level page, and only after that is the assembled page delivered to the client. Note that the client receives one response, but the cache initially makes four requests to obtain it. This might seem like a lot of overhead; however, the overall efficiency will be improved if many additional requests also use the same included pages, such as weather.jsp. No requests for these pages are required, because they are cached separately on the ESI processor.

Example: JESI-to-ESI Conversion for a Template and Fragment

Suppose that when employees connect to a corporate intranet site, the content of their pages is dynamic except for a few features that are present in every response. In particular, there is always a footer displaying the stock chart and latest business headlines for the company, and the business headlines are obtained from an external business news site. Because all returned pages will have to include the same information, and it is expensive to obtain, it is more efficient to cache the footer in the ESI processor.

The remainder of the page response is dynamic, incorporating the stock fragment in a slightly different way each time. To avoid having to rewrite the page, you can mark the footer as a JESI fragment and the enclosing page as a JESI template.

Also assume that a charity campaign is in progress and that the organizers want to display a bar chart showing their goal amount and the current donation amount as part of all corporate pages. This information is stored in a special database table and is updated twice a day. The chart is a good candidate to be an additional JESI fragment. Therefore, you would add a JESI template tag at the top of the page and use JESI fragment tags to enclose the fragments that are to be cached as separate entities.

Assume that the URL to the corporate page is as follows:

http://www.bigcorp.com/employee_page.jsp

Further assume that you have modified the page as follows:

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jesitaglib.tld" prefix="jesi" %>

<jesi:template cache="no">
  <p>BEGIN</p>
  ... some dynamic page content...
  <jesi:fragment>
    This_is_the_body_of_Charity_Chart
  </jesi:fragment>
  ... some more dynamic content...
  <jesi:fragment>
    This_is_the_body_of_Business_Footer
  </jesi:fragment>
</jesi:template>
```

END"/>
When the page is requested, an HTTP response is generated as follows.

In the response header:

```
Surrogate-Control: content="ESI/1.0",max-age=86400+0,no-store
```

In the response body:

```
BEGIN
... some dynamic page content...
<esi:include src="/employee_page.jsp?__esi_fragment=1"/>
... some more dynamic content...
<esi:include src="/employee_page.jsp?__esi_fragment=2"/>
END
```

As with the JESI `include` example in "Example: JESI-to-ESI Conversion for Included Pages" on page 6-33, the ESI processor is alerted by the `Surrogate-Control` response header. Note the `no-store` directive, generated because of the `cache="no"` setting in the JESI `template` tag.

The ESI processor makes two additional requests, where it fetches and caches the two fragments. After that, the composite page is returned to the employee. When the employee works with the page again, the dynamic content will be newly generated but the chart and the footer will be served from the cache.

---

**Note:** Surrogate-Control headers are consumed by the ESI processor and are not seen in the final response to the client.
This chapter describes the Web Object Cache, an application-level caching mechanism supplied with OC4J. For Web applications written in Java, you can use the Web Object Cache in conjunction with the Oracle Application Server Web Cache for increased speed and scalability.

The chapter consists of the following sections:

- Overview of the Web Object Cache
- Key Functionality of the Web Object Cache
- Attributes for Policy Specification and Use
- Web Object Cache Tag Descriptions
- Web Object Cache API Descriptions
- Cache Policy Descriptor
- Cache Repository Descriptor
- Configuration for Back-End Repository

For an overview of Web caching, including a discussion of the OracleAS Web Cache and Oracle Application Server Java Object Cache, see “Summary of Oracle Caching Support for Web Applications” on page 1-12.

Overview of the Web Object Cache

The OC4J Web Object Cache is a mechanism that allows Web applications written in Java to capture, store, reuse, post-process, and maintain the partial and intermediate results generated by a dynamic Web page, such as a JSP or servlet. For programming interfaces, it provides a tag library and a Java API.

The Web Object Cache works at the Java level and is closely integrated with the HTTP environment of JSP and servlet applications. Cached objects might consist of HTML or XML fragments, XML DOM objects, or Java serializable objects.

With the Web Object Cache programming interfaces, you can split Web pages into page blocks that define separate cache objects for finer control of caching. (The terms block and object are used somewhat interchangeably in this sense.) In this way, the application itself can control life span and other behavior of individual cache entities during runtime. Application developers have the best understanding of the life cycle patterns of their application Web pages, so are best suited to determine how to split pages into cache blocks. You can specify maintenance policies for cached objects either declaratively in an external file, the cache policy descriptor, or programmatically within the application itself.
The following sections provide an overview of the Web Object Cache:

- **Benefits of the Web Object Cache**
- **Web Object Cache Components**
- **Cache Policy and Scope**

## Benefits of the Web Object Cache

**Note:** The Web Object Cache is useful in particular scenarios and does not replace the need for other caching mechanisms, including the OracleAS Web Cache. For an overview of the Web Object Cache and how it relates to the OracleAS Web Cache and the Oracle Application Server Java Object Cache, including a discussion of when it is appropriate to use each one, see "Summary of Oracle Caching Support for Web Applications" on page 1-12.

Using the Web Object Cache can significantly reduce the amount of time spent in constructing page blocks or Java objects in dynamic applications, such as those with expensive intermediate operations like querying a database and formatting or transforming the results. Subsequent queries pull the information out of the cache, so the query and formatting do not have to be repeated.

Furthermore, developers can closely control the cache programmatically, through API calls or custom JSP tags. This can include controlling when cache entries are created, what they are named, when they expire, which users can see which cached data, and what operations can be applied to cached data before the results are served to the user.

Some kinds of Web applications benefit more than others by using the Web Object Cache, depending on the nature and use of their data. For example, applications such as catalog and directory browsing, delayed stock quotes, and personalized portals would particularly benefit. Applications such as real-time stock trading or real-time stock quotes, however, would not benefit, because the data has to be updated so frequently that the overhead of the caching operations would outweigh the benefits. (In these circumstances, however, the OracleAS Web Cache might still be useful because of its lighter overhead.)

In general, the Web Object Cache is most useful in the following situations:

- For special post-processing on cached data objects, such as XSLT or XML DOM operations
- For sharing data in a non-HTTP situation, such as reusing cached XML data or Java objects and sending the data to others through SMTP, JMS, AQ, or SOAP
- For special storage needs, such as storing cached data in a file system or database for persistent storage of data with a long lifetime
- For application-specific authorization, allowing different users to have different access rights to different data items, such as for a Web-based groupware application

The application can have its own authorization scheme. The Web Object Cache is embedded within Java authorization logic.

Using the Web Object Cache in JSP pages is particularly convenient. JSP code generation can save much of the development effort.
Web Object Cache Components

The Web Object Cache consists of two main components:

- Cache repository
- Cache programming interfaces

This section also provides a brief introduction to the Oracle Application Server Java Object Cache, which is the default cache repository of the Web Object Cache.

Cache Repository

The cache repository is the component that is responsible for data storage, data distribution, and cache expiration. There can be multiple repository implementations for a programmable Web cache (such as the Web Object Cache), depending on the tier and platform. For example, the file system might be used for secondary storage in the middle tier, and database tables might be used for primary storage in the database tier.

The Web Object Cache uses the Oracle Application Server Java Object Cache as its default repository. The Java Object Cache is a general-purpose Java caching service and API designed for application use, with objects being accessible by name.

The Java Object Cache is a powerful and flexible programming facility. There are no restrictions on the types of objects that can be cached or the original source of the objects. The management of each object can be easily customized. Each object has a set of attributes such as the following:

- How the object is loaded into the cache
- Where the object is stored (in memory, on disk, or both)
- The lifetime, also known as the time-to-live, of the object
- Whom to notify when the object is invalidated

Objects can be invalidated as a group or individually.

For more information about the Java Object Cache, see the Oracle Application Server Containers for J2EE Services Guide.

---

Note: See "Configuration for Back-End Repository" on page 7-41 for information about configuring the Java Object Cache or a file system as the back-end repository for the Web Object Cache.

Cache Programming Interfaces

The front-end caching interfaces are used through JSP pages and servlets to handle HTTP processing and to direct the semantics relating to the cache policy (rules and specifications determining how the cache works).

The OC4J Web Object Cache programming interfaces can be further divided as follows:

- Web Object Cache API
  
  This is the common layer across servlets and JSP pages, dealing with the HTTP semantics and cache policy. This layer communicates with the cache repository.

- Web Object Cache tag library
  
  This is a convenient wrapper, using JSP custom tag functionality, for the Web Object Cache API. Use custom tags in a JSP page to control the caching, with the API being called through the underlying tag handler classes.
This chapter describes these programming interfaces and their interaction with the cache repository. Cache tags are described in "Web Object Cache Tag Descriptions" on page 7-14. The underlying cache policy API is described in "Web Object Cache API Descriptions" on page 7-27. In servlets, you will use the underlying API; in JSP pages, you will typically use the more convenient tags.

Cache Policy and Scope

The cache policy is a set of specifications determining details of the cache and how it will behave. This includes the following:

- Cache scope
- Cache block naming rules
- Data expiration rules
- Cache repository name

You can set cache policy specifications (as described in "Attributes for Policy Specification and Use" on page 7-7) through any of the following:

- Cache tag attributes (for JSP pages)
  See "Web Object Cache Tag Descriptions" on page 7-14.
- Cache policy methods (for servlets)
  See "Web Object Cache API Descriptions" on page 7-27.
- External cache policy descriptor files (for JSP pages or servlets)
  See "Cache Policy Descriptor" on page 7-38.

A cache policy object—an instance of the oracle.jsp.jwcache.CachePolicy class—is created with policy settings based on these inputs. Because the expiration policy is part of the cache policy, each CachePolicy object includes an attribute that is an instance of the oracle.jsp.jwcache.ExpirationPolicy class.

Cache data can be of either session scope, where it is available to only the current HTTP session, or application scope, where it is available to all users of the application.

For example, consider an online banking application that caches the account balance. Only the current user is interested in this information, so session scope is appropriate.

By contrast, consider an online store with a welcome page that issues the same general product recommendations to all users. In this case, it is appropriate for the page to use a cache that has application scope.

Key Functionality of the Web Object Cache

The following sections discuss key areas of functionality of the Web Object Cache:

- Cache Block Naming: Implicit Versus Explicit
- Cache Block Runtime Functionality
- Data Invalidation and Expiration

Cache Block Naming: Implicit Versus Explicit

A cache block is associated with a cache block name, which can be determined either implicitly by the caching policy (generally advisable) or explicitly by your application
code. For retrieval, to avoid regenerating the page fragment in question, there is a lookup of the cache block name.

For implicit naming, there are two inputs:

- **Cache policy**
  A cache policy API layer performs naming logic.

- **HTTP request object**
  The caching logic borrows corresponding semantics from the standard Java servlet API.

For most situations, implicit naming will result in names that are sufficiently informative, because the HTTP request usually includes all the inputs to the Web application (inputs that determine what the application should generate).

Explicit naming might be desirable in some cases, however, such as when a group of users needs to share the same data. In this case, because relevant identification information might not be available directly from the user’s HTTP request, an implicit cache name would not be useful. Instead, you can write code to explicitly generate a cache name that identifies the group. Preferably, the name-generation logic should still use only request parameters as input, not other states existing inside the application. This makes the semantics easier to follow and the code easier to debug.

Following is an example of explicit naming. In the `cache` tag, note the `name` attribute with a JSP expression that calls `someMethod()` to set the cache block name:

```jsp
<ojsp:cache policy="/WEB-INF/policy1.cpd" name="<%= someObj.someMethod() %>">
  ...
</ojsp:cache>
```

In the following example, because there is no `name` attribute in the `cache` tag, the cache block name will be determined implicitly according to the HTTP request and the cache policy:

```jsp
<ojsp:cache policy="/WEB-INF/policy2.cpd">
  ...
</ojsp:cache>
```

See "More About Cache Block Naming and the autoType Attribute" on page 7-10 for more information.

---

**Note:** Cache blocks can be nested. In this case, the logic of the inner cache block will be executed only when the content of the outer block must be regenerated.

---

**Cloneable Cache Objects**

The OC4J Web Object Cache provides an interface, `oracle.jsp.jwcache.CloneableCacheObj`, that you can implement in serializable cache objects that you want to be cloneable. For mutable objects that are cached without being serialized, cloning is useful in providing a complete and hierarchical copy of the cache object. This section explains the usefulness of cloneability, first covering some necessary background information.
Memory-Oriented Repositories Versus Secondary Storage Repositories
There are two categories of repositories that can be used as the back-end of the Web Object Cache:

- Secondary storage cache repository such as a file system repository
- Memory-oriented cache repository such as the Oracle Application Server Java Object Cache, the default repository of the Web Object Cache

A secondary storage repository requires Java serialization during cache operations. During storage to the cache, objects are serialized into the repository; during retrieval from the cache, they are deserialized into memory. Therefore, as a result of the serialization/deserialization process, a complete and distinct copy of the cache object is automatically created during each cache operation.

This is not the case when you store or retrieve cache objects to or from a memory-oriented repository. With a memory-oriented repository, the identical object in the user application will be stored to the cache, or the identical object in the cache will be retrieved for the user. By default, no copy is made. If there are multiple retrievals, all retrievals share the same object.

Advantages in Cloning Copies of Cache Objects
In many cases in your applications, you will want to ensure that different retrievals use different copies of a cache object. There are two key reasons for this:

- If the identical cache object is shared across multiple retrievals, changes made to the data in one place might unintentionally affect values retrieved and used elsewhere.
- If the identical cache object is shared across multiple retrievals, then multiple Java threads might access the same object simultaneously. This would result in thread safety issues if the original object design was not thread-safe. Perhaps, for example, the object was originally intended for page-scope or request-scope usage only, where there could be only one thread for each object. This thread-behavior assumption would be violated.

To avoid these possible problems, use complete and hierarchical copies when you store and retrieve generic Java serializable data to or from a memory-oriented repository. "Complete and hierarchical" means copying not just the direct members referenced by the object, but also any indirect variables that are referenced. For example, assume an object \texttt{xyz} has a \texttt{java.util.Vector} instance as a member variable. Cloning a complete and hierarchical copy involves copying not just the \texttt{Vector} instance itself, but also all mutable objects or elements referenced by the \texttt{Vector} instance.

Use of the CloneableCacheObject Interface
If you implement the \texttt{CloneableCacheObject} interface and its \texttt{cloneCacheObj()} method in your cache objects, then the Web Object Cache will automatically call \texttt{cloneCacheObj()} to make a complete and hierarchical copy of each cache object whenever it is stored to or retrieved from a memory-oriented cache repository.

Cache Block Runtime Functionality
During runtime, when a Web Object Cache cache tag is encountered, the tag handler checks whether a corresponding cache object exists and was created recently enough to reuse. If so, the code in the body of the tag is not executed; instead, the cache object is reused. But if the cache object does not exist or is too old, the tag body code will be
executed to generate a new object (page fragment, XML DOM object, or Java
serializable object). Then this freshly generated object will be captured, such as
through special buffer writing or object passing, and stored into the cache.

If computations in content generation are costly, such as for a complicated database
query, and the life span of the cache is appropriate, so that the cached data is reusable,
then the Web Object Cache can save significant amounts of time and system resources.
Application speed and throughput will be greatly improved.

Data Invalidation and Expiration

You can set up cache blocks to expire after a specified duration or at a specified time,
or they can be invalidated explicitly by a method call or tag invocation.

Cache Block Expiration

Because cache blocks mainly consist of semi-static fragments of information, the
Oracle implementation does not require a tightly coherent expiration model. A looser
model typically provides acceptable results and requires less synchronization
overhead.

There are two categories of expiration for data in Web Object Cache blocks:

- Duration (time-to-live): Expiration occurs after data has been in the cache for a
  specified amount of time.
- Fixed time/day: Expiration occurs regularly at a set time, such as at a specified
time each day or on a specified day each week.

Expiration details are determined by the settings of attributes in an instance of the
oracle.jsp.jwcache.ExpirationPolicy class. This ExpirationPolicy
object is an attribute of the CachePolicy object associated with the cache block. See
"Expiration Policy Attributes" on page 7-12.

In JSP pages, you can set ExpirationPolicy attributes through attributes of the
Web Object Cache cache tags. In servlets, you can use methods of the
ExpirationPolicy object directly. (See "ExpirationPolicy Methods" on page 7-32.)
Alternatively, you can set ExpirationPolicy attributes through a cache policy
descriptor. (See “Cache Policy Descriptor” on page 7-38.)

Cache Block Invalidation

Instead of depending on expiration to invalidate a cache, you can invalidate it
explicitly in one of the following ways:

- Use the invalidateCache tag. See "Web Object Cache invalidateCache Tag" on
  page 7-23.
- Use the overloaded invalidateCache(), invalidateCacheLike(), or
  invalidateCacheOtherPathLike() method of a CachePolicy instance to
  explicitly invalidate one or more cache blocks. See "CachePolicy Methods" on
  page 7-28.

Attributes for Policy Specification and Use

This section describes cache policy attributes—specifically, attributes of the
CachePolicy and ExpirationPolicy classes. You can set these attributes through
custom tags in JSP pages, directly through the provided Java API in servlets, or
through a cache policy descriptor file.
Cache Policy Attributes

Cache policies, introduced in "Cache Policy and Scope" on page 7-4, consist of the
details that determine how cache blocks behave. You can set cache policy attributes in
several ways, as described in subsequent sections:

- In JSP pages through custom tags
  See "Web Object Cache Tag Descriptions" on page 7-14.
- In servlets through method calls
- Through a cache policy descriptor file
  See "Cache Policy Descriptor" on page 7-38.

Specification of cache policy settings results in the creation of a cache policy object,
which includes an expiration policy object as one of its attributes. Following is
abbreviated code for the CachePolicy class (in package oracle.jsp.jwcache), for
illustration purposes only, showing the names of the cache policy attributes:

class CachePolicy
{
    boolean ignoreCache;
    int scope;
    int autoType;
    String selectedParameters[];
    String selectedCookies[];
    Date reusableTimeStamp;
    long reusableDeltaTime;
    ExpirationPolicy expirationPolicy;
    String cacheRepositoryName;
    boolean reportException;
}

Note: The names documented below for integer constants are for
servlet usage. Different names can be used for the Web Object

Table 7-1 Cache Policy Attribute Descriptions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ignoreCache</td>
<td>boolean</td>
<td>This is for use during development only. When making frequent code changes, set this to true to disable the cache, typically so that results that were generated prior to your changes will not be returned. Default: false</td>
</tr>
<tr>
<td>scope</td>
<td>int</td>
<td>Specifies the scope of the cache. Use the integer constant SCOPE_SESSION for the cache block to be accessible only to the current HTTP session, or SCOPE_APP for the cache block to be accessible to all HTTP sessions of the application. Default: SCOPE_APP</td>
</tr>
</tbody>
</table>
Attributes for Policy Specification and Use

Web Object Cache Tags and API

Table 7–1 (Cont.) Cache Policy Attribute Descriptions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>autoType</td>
<td>int</td>
<td>Specifies whether the cache block is named explicitly or implicitly and how properties of the HTTP request are used in cache block naming (for implicit naming). The name is relevant in determining when the cache is reused for subsequent requests. See &quot;More About Cache Block Naming and the autoType Attribute&quot; on page 7-10. Default: implicitly, according to the URI plus all parameters plus selected cookies (TYPE_URI_ALLPARAM)</td>
</tr>
<tr>
<td>selectedParameters[]</td>
<td>String []</td>
<td>These are selected request parameter names used in cache block naming, used in conjunction with autoType. See &quot;More About Cache Block Naming and the autoType Attribute&quot; on page 7-10. Default: null</td>
</tr>
<tr>
<td>selectedCookies[]</td>
<td>String []</td>
<td>These are selected cookie names used in cache block naming, used in conjunction with autoType. See &quot;More About Cache Block Naming and the autoType Attribute&quot; on page 7-10. Default: null</td>
</tr>
</tbody>
</table>
| reusableTimeStamp | java.util.Date  | This is an absolute time limit for cache usability, where any cache block created prior to that time will not be reused. Instead, data is regenerated but the cache block is unaltered. See "More About reusableTimeStamp and reusableDeltaTime" on page 7-12. Note the following regarding reusableTimeStamp:  
  ■ It can be expressed as milliseconds between midnight, January 1, 1970 and the desired absolute time limit, or as a java.util.Date instance. Additional convenient formats are available through the cache tag. (See "Web Object Cache Tag Descriptions" on page 7-14.)  
  ■ It takes precedence over reusableDeltaTime.  
  ■ If its value is set as the integer constant REUSABLE_ALWAYS or the string constant REUSABLE_IGNORED, then cache entries are always reusable, for as long as they remain in the cache.  
  ■ It is not available through the XML cache policy descriptor file. Default: always reusable |
As discussed in "Cache Block Naming: Implicit Versus Explicit" on page 7-4, cache blocks can be named either implicitly, sometimes called *auto-naming*, or explicitly, sometimes called *user-naming*.

More specifically, there are six ways for cache blocks to be named. Explicit naming is the first way. Specify this with an *autoType* setting of `TYPE_USERSPECIFIED` (an integer constant).

The other five ways are variations of implicit naming:

- Implicit naming with only the request URI being used in the name
  
  Specify this with an *autoType* setting of `TYPE_URI_ONLY`.

- Implicit naming according to the following:
  
  Request URI + query string + selected cookies

### Table 7–1 (Cont.) Cache Policy Attribute Descriptions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| `reusableDeltaTime` | `long`          | This is a relative time limit for cache usability, where a cache block is not reused if the difference between cache block creation time and current time is greater than `reusableDeltaTime`. Instead, data is regenerated but the cache block is unaltered. See "More About `reusableTime` and `reusableDeltaTime`" on page 7-12. Note the following regarding `reusableDeltaTime`:
  
  - It is specified in seconds.
  - The `reusableTime` attribute overrides it.
  - If its value is set as the integer constant `REUSABLE_ALWAYS` or the string constant `REUSABLE_IGNORED`, then cache entries are always reusable, for as long as they remain in the cache. Default: always reusable |
| `expirationPolicy` | `ExpirationPolicy` | This is an expiration policy object (an instance of `oracle.jsp.jwcache.ExpirationPolicy`), which specifies circumstances under which the repository will remove cache blocks from storage. Default: the default expiration policy object For information about expiration policy objects, parameters, and defaults, see "Expiration Policy Attributes" on page 7-12. |
| `cacheRepositoryName` | `String` | This is the name of the cache repository. Each cache policy can use its own repository. The configurations of cache repositories are defined in the `/WEB-INF/wcache.xml` file. Default: "DefaultCacheRepository" |
| `reportException` | `boolean` | A false setting of this attribute results in most cache operation failures being silent, without any exception being reported to the browser. Default: true |
Specify this with an autoType setting of TYPE_URI_QUERYSTR. Specify the cookies in the selectedCookies[] attribute.

- Implicit naming according to the following:
  Request URI + all parameters + selected cookies (default)
  Specify this with an autoType setting of TYPE_URI_ALLPARAM. Specify the cookies in the selectedCookies[] attribute.

- Implicit naming according to the following:
  Request URI + selected parameters + selected cookies
  Specify this with an autoType setting of TYPE_URI.SelectedPARAM. Specify the parameters in the selectedParameters[] attribute and the cookies in the selectedCookies[] attribute.

- Implicit naming according to the following:
  Request URI + all but excluded parameters + selected cookies
  Specify this with an autoType setting of TYPE_URI_EXCLUDEDPARAM. Specify the cookies in the selectedCookies[] attribute and the excluded parameters in the selectedParameters[] attribute.

As an example, assume that you have developed a JSP page, welcome.jsp, with a personalized greeting for each user. The data with the personalized greeting is the only cache block in the page. Further assume that you have specified "request URI + selected parameters + selected cookies" naming, with user as the only selected parameter for cache block naming and no selected cookies for naming.

Now assume the page is requested as follows:

```
http://host:port/a.jsp?user=Amy
```

In this case, a.jsp?user=Amy becomes the cache block name.

Now assume that the page is later requested by another user, as follows:

```
http://host:port/a.jsp?user=Brian
```

This will not reuse the "Amy" cache, because the value of user is different. Instead, a new cache block is created with a.jsp?user=Brian as the name.

Now assume a later request by the first user, as follows:

```
http://host:port/a.jsp?mypar=3&user=Amy
```

Because the user is again Amy, this request will reuse the first cache, displaying Amy's customized information without having to regenerate it. The mypar parameter is irrelevant to the caching mechanism because it was not included in the selectedParameters[] list of the cache policy object, presumably because the value of mypar is not relevant in terms of cacheable page output.

Now assume the following subsequent request:

```
http://host:port/a.jsp?yourpar=4&user=Brian&hello=true&foo=barfly
```

Because the user is again Brian, this request will reuse the second cache, displaying Brian's customized information without having to regenerate it. The yourpar, hello, and foo parameters are irrelevant to the caching mechanism because they were not included in the selectedParameters[] list of the cache policy object.
More About reusableTimeStamp and reusableDeltaTime

Be aware that the concept of reusable is different than the concept of time-to-live (TTL) and is intended for more advanced use. Time-to-live, which controls the general lifetime of a cache, is described in "Expiration Policy Attributes" below. Usually time-to-live is all that is required to appropriately limit the use of cached data.

The attributes for reusability—reusableTimeStamp and reusableDeltaTime—are intended for more specialized use and do not affect the expiration or invalidation of cached data. As an example, consider a situation where different users have different requirements for how up-to-date a Web report is. Assume that most users can accept a report produced anytime within the past day, and that they all want to be looking at the same version so they can compare figures. An appropriate TTL value, then, would be "one day".

Also presume, however, that there is a small group of privileged users for whom the data is much more time-sensitive. They want to have information that is no more than one hour old.

In this case, although TTL is set to "one day" for all users, there can be a reusableDeltaTime setting of "one hour" for the privileged users, which will result in the cache not being used for them if the data is more than one hour old. Remember, though, that reusableTimeStamp and reusableDeltaTime do not expire the cache or otherwise affect it. The cached data can still be used for non-privileged users, according to the time-to-live.

It is up to the application logic to set appropriate values of reusableTimeStamp and reusableDeltaTime for the privileged user group.

Expiration Policy Attributes

Expiration policies are introduced in "Data Invalidation and Expiration" on page 7-7. Expiration policies contain the details that determine when cache blocks expire, at which point their data should no longer be used and the data should be regenerated instead. (Note that for most discussion, you can think of the expiration policies as being part of the cache policies.) ExpirationPolicy attributes, as with CachePolicy attributes, can be set in any of the following ways:

- In JSP pages through custom tags
  See "Web Object Cache Tag Descriptions" on page 7-14.
- In servlets through method calls
  See "ExpirationPolicy Methods" on page 7-32.
- Through a cache policy descriptor file
  See "Cache Policy Descriptor" on page 7-38.

The following abbreviated code for the ExpirationPolicy class (in package oracle.jsp.jwcache), provided for illustration purposes only, shows the names of the expiration policy attributes:

class ExpirationPolicy
{
    int expirationType;
    long TTL;
    long timeInaDay;
    int dayInaWeek;
    int dayInaMonth;
    boolean writeThrough;
}
Table 7–2 describes the expiration policy object attributes.

**Note:** The names documented below for integer constants are for servlet usage. Different names can be used for the Web Object Cache tags. See "Web Object Cache cache Tag" on page 7-15.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| expirationType    | int  | This is the type of expiration policy and is one of the following, where TYPE_XXX values are integer constants:  
  - Time-to-live, to expire after a certain amount of time according to the TTL attribute, specified with an expirationType setting of TYPE_TTL  
  - Daily, to expire within a day at a certain time according to the timeInaDay attribute, specified with an expirationType setting of TYPE_DAILY  
  - Weekly, to expire within a week on a certain day at a certain time according to the dayInaWeek and timeInaDay attributes, specified with an expirationType setting of TYPE_WEEKLY  
  - Monthly, to expire within a month on a certain date at a certain time according to the dayInaMonth and timeInaDay attributes, specified with an expirationType setting of TYPE_MONTHLY  
  Default: time-to-live  
| TTL               | long | This is time-to-live, the amount of time the cache block is good for, expressed in seconds. The value must be a positive number.  
  Default: 300 (5 minutes)  
| timeInaDay        | long | This is the time of day used for daily, weekly, or monthly expiration, expressed in seconds from midnight, where 0 is 00:00:00 (midnight) and 86399 is 23:59:59.  
  Default: 300 (00:05:00); ignored if expirationType=TYPE_TTL  
| dayInaWeek        | int  | This is the day of the week for weekly expiration, at the specified timeInaDay. Possible values are  
  - WEEKLY_SUNDAY  
  - WEEKLY_MONDAY  
  - WEEKLY_TUESDAY  
  - WEEKLY_WEDNESDAY  
  - WEEKLY_THURSDAY  
  - WEEKLY_FRIDAY  
  - WEEKLY_SATURDAY  
  Default: Wednesday; ignored unless expirationType=TYPE_WEEKLY |
Web Object Cache Tag Descriptions

From JSP pages, you can specify cache policy settings, expiration policy settings, and explicit invalidation through custom tags provided with OC4J. The following sections describe the tags:

- **Cache Tag Descriptions**
- **Cache Invalidation Tag Description**

Note the following requirements for the Web Object Cache tag library:

- The Web Object Cache classes are in the file ojsputil.jar, which is supplied with OC4J and is located in the "well-known" tag library directory. Verify that this file is installed and in your classpath.

- To use the Oracle Application Server Java Object Cache as the back-end repository, the file cache.jar must be installed and in your classpath. This file also comes with OC4J. In the OC4J 10.1.2 implementation, cache.jar is listed in the manifest classpath of oc4j.jar. If the Web Object Cache tag library is loaded by OC4J, then no action on your part is necessary.

- The tag library descriptor, jwcache.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for jwcache.tld is the following:

  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jwcache.tld

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.
Cache Tag Descriptions

This section describes the following tags:

- **cache**
  This tag is for general character-based caching (HTML or XML fragments).

- **cacheXMLObj**
  This tag is for caching XML objects; its parameters are a superset of the `cache` tag parameters. Because the Web Object Cache is particularly useful when post-processing XML documents, you will likely use the `cacheXMLObj` tag more often than the `cache` tag.

- **useCacheObj**
  This tag is for general caching of Java serializable objects. Some of the semantics and syntax are patterned after the standard `jsp:useBean` tag.

- **cacheInclude**
  This tag combines the functionality of the `cache` tag with that of the standard `jsp:include` tag.

This section also describes conditional execution of code within the cache tags, possible resulting problems, the workaround of dividing cache blocks into individual JSP pages, and, optionally, using the `cacheInclude` tag to combine the pages together appropriately.

Web Object Cache cache Tag

This section documents the syntax and attributes of the `cache` tag, which you can use to set up general caching in a JSP application, in contrast to the caching of XML objects or Java serializable object.

**Note:** For caching XML objects, use the `cacheXMLObj` tag instead. For caching Java serializable objects, use the `useCacheObj` tag. These tags support all the `cache` tag attributes described here. See "Web Object Cache cacheXMLObj Tag" on page 7-18 and "Web Object Cache useCacheObj Tag" on page 7-20.

**Syntax**

```
<ojsp:cache
  [ policy = "filename" ]
  [ ignoreCache = "true" | "false" ]
  [ invalidateCache = "true" | "false" ]
  [ scope = "application" | "session" ]
  [ autoType = "user" | "URI" | "URI_query" | "URI_allParam" | "URI_selectedParam" | "URI_excludedParam" ]
```
Attributes

Most of the parameters of the cache tag correspond to attributes in the CachePolicy or ExpirationPolicy class, described earlier in this chapter (as referenced below).

- policy: Optionally use this to specify a cache policy descriptor, the settings of which would be used in defining the cache policy. You can use a cache policy descriptor instead of using the various individual cache tag attribute settings, or to establish default values that you can optionally override through tag attribute settings.

Specify the descriptor file name according to JSP application-relative syntax. You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about application-relative syntax.

Here is a simple example of a cache policy descriptor:

```xml
<cachePolicy scope="application">
  <expirationPolicy expirationType="TTL" TTL="25" timeInaDay="00:10:00"
    writeThrough="true" />
</cachePolicy>
```

See “Cache Policy Descriptor” on page 7-38 for more information.

- invalidateCache: Enable this flag for the corresponding cache block (any pre-existing cache block with the same name) to first be invalidated. This is particularly useful where implicit cache block naming is used, but can also be used
for explicit names by specifying the cache block name in the name attribute of the cache tag. The default setting is "false".

**Note:** Do not confuse this attribute with the more general-purpose invalidateCache tag. See "Web Object Cache invalidateCache Tag" on page 7-23. The invalidateCache attribute is for more specialized or advanced use to invalidate individual cache blocks.

- **scope**: See "Cache Policy Attributes" on page 7-8.
- **autoType**: See "Cache Policy Attributes" on page 7-8. The correspondence between tag attribute settings and class attribute values (integer constants) is as follows:
  - The user setting is equivalent to TYPE_USERSPECIFIED.
  - URI is equivalent to TYPE_URI_ONLY.
  - URI_query is equivalent to TYPE_URI_QUERYSTR.
  - URI_allParam is equivalent to TYPE_URI_ALLPARAM.
  - URI_selectedParam is equivalent to TYPE_URI_SELECTEDPARAM.
  - URI_excludedParam is equivalent to TYPE_URI_EXCLUDEDPARAM.
- **selectedParam**: See "Cache Policy Attributes" on page 7-8.
- **selectedCookies**: See "Cache Policy Attributes" on page 7-8.
- **reusableDeltaTime**: See "Cache Policy Attributes" on page 7-8.
- **name**: Where you use explicit cache-block naming, use the name parameter to specify the block name.
- **expirationType**: See "Expiration Policy Attributes" on page 7-12.
- **TTL**: See "Expiration Policy Attributes" on page 7-12.
- **timeInaDay**: See "Expiration Policy Attributes" on page 7-12.
- **dayInaWeek**: See "Expiration Policy Attributes" on page 7-12.
- **dayInaMonth**: See "Expiration Policy Attributes" on page 7-12.
- **writeThrough**: See "Expiration Policy Attributes" on page 7-12.
- **printCacheBlockInfo** (for debugging): Enabling this parameter results in printing of the internal cache name, creation time, and expiration time of the cache block, within HTML or XML comment constructs. The default setting is "false".
- **printCachePolicy** (for debugging): Enabling this parameter results in printing of the values of all cache policy attributes for this cache block, within HTML or XML comment constructs. The default setting is "false".
- **cacheRepositoryName**: See "Cache Policy Attributes" on page 7-8.

**Attribute Usage Notes**

- The name attribute is relevant only when autoType is set to user.
- The `selectedParam` attribute is relevant only when `autoType` is set to `URI_selectedParam` or `URI_excludedParam`.
- The `selectedCookies` attribute is not relevant when `autoType` is set to `user` or `URI`.
- The `timeInaDay` attribute is not relevant when `expirationType` is set to `TTL`.
- The `dayInaWeek` attribute is relevant only when `expirationType` is set to `weekly`.
- The `dayInaMonth` attribute is relevant only when `expirationType` is set to `monthly`.

**Example: cache Tag**

This example lists and caches a set of items, using the `cache` tag.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jwcache.tld" prefix="ojsp" %>
<title>listitem.jsp</title>
<% String itemid=request.getParameter("itemid");
   if (itemid==null) {
      out.println("Please select a category from the above drop down box.");
      return;
   }
%>
<% long l1=(new java.util.Date()).getTime(); %>
<ojsp:cache autoType="URI_selectedParam" selectedParam="itemid"
   printCacheBlockInfo="true" printCachePolicy="true"
   policy="/WEB-INF/test-policy.cpd">
   Item List: <%= itemid %><br>
   Time: <%= new java.util.Date() %><br>
   <jsp:useBean class="java.util.Hashtable" id="table" scope="application" />
   <hr>
   <%
      Vector list=(Vector) table.get(itemid);
      if (list==null) {
         out.println("No such item!");
      } else {
         for (int i=0; i<list.size(); i++) {
            <%= list.elementAt(i) %><br>
         }
      }
   %>
   timestamp:<%= new java.util.Date() %><br>
</ojsp:cache>
<% long l2=(new java.util.Date()).getTime(); %>
Time for general cache operation:<%= l2-l1 %><br>

**Web Object Cache cacheXMLObj Tag**

Generally speaking, use the `cacheXMLObj` tag instead of the `cache` tag if you are caching XML DOM objects.
The `cacheXMLObj` tag supports all the `cache` tag attributes described in "Web Object Cache cache Tag" on page 7-15, as well as the attributes described here.

Syntax (in addition to that of the cache tag)

```jsp
<ojsp:cacheXMLObj
  ...
  [ fromXMLObjName = "objectname" ]
  [ toXMLObjName = "objectname" ]
  [ toWriter = "true" | "false" ] >
[...Code for cache block...]
</ojsp:cacheXMLObj>
```

Notes:

- This tag can optionally be in the form of a single tag with no body, in which case the `fromXMLObjName` attribute can be used for input instead:

```jsp
<ojsp:cacheXMLObj ... fromXMLObjName="..." ... />
```

- For convenience, this tag is duplicated in the XML tag library, being defined in the `xml.tld` tag library descriptor file.

- This tag can act as both an XML producer and an XML consumer. Do not use `fromXMLObjName` and `toXMLObjName` if the XML object is being passed implicitly. (See "XML Producers and XML Consumers" on page 5-1.)

Attributes (in addition to those of the cache tag)

- `fromXMLObjName`: For explicit passing, specify the name of the XML input object being passed to the cache (from the `pageContext` object).

- `toXMLObjName`: For explicit passing, specify the name of the XML output object being passed from the cache (to the `pageContext` object).

- `toWriter`: Set this to "true" to write the XML object to a JSP writer to output directly to the user's browser. The default value is "false".

Note: The `cacheXMLObj` tag is one of several custom tags supplied with OC4J that are XML-related, meaning these tags sometimes (or always) take an XML object as input or create one as output. Other such tags include the SQL library `dbQuery` tag, which can output query results as an XML DOM object, and the XML library `transform` and `stylesheet` tags, which can take an XML object as input and use XSLT transformation to create another XML object or a JSP writer as output. These tags are consistent in having a `fromXMLObjName` attribute and a `toXMLObjName` attribute for explicit passing of XML data. For general information, see "XML Producers and XML Consumers" on page 5-1.

Example: `cacheXMLObj` Tag
This example uses Web Object Cache tags, JESI tags, and tags from the XML and SQL libraries. (For JESI tag descriptions, see "Oracle JESI Tag Descriptions" on page 6-13. For a description of the XML transform tag, see "XML Utility Tags" on page 5-3. For SQL tag descriptions, see "SQL Tags for Data Access" on page 4-11.)

The SQL dbOpen and SQL dbQuery tags connect to the database and execute a query. The cacheXMLObj tag caches the XML DOM object produced by the query. In subsequent executions (for output through different stylesheets, for example), the query does not have to be reexecuted, because the DOM object can be retrieved from the Web Object Cache. The XML transform tag outputs the query results according to an XML stylesheet, specified through a variable. The JESI fragment tag encloses HTML output to be cached, which does not require application-level caching. The JESI template tag disables caching outside the fragment, through the cache="no" setting.

```
<jesi:template cache="no">
<% String userStyleLoc="style/rowset.xsl"; %>
<h3>Transform DBQuery Tag Example</h3>
<h4>Current Time=<%= new java.util.Date() %></h4>
<jesi:fragment expiration="60">
 <!-- You can cache HTML in OracleAS Web Cache with JESI
 or you can cache it in Oracle Web Object Cache -->
<%-- The XML DOM object is produced by dbQuery
 And, the DOM object is cached in Oracle Web Object Cache.
 XSLT is performed on the cached object. --%>
<sql:dbOpen connId="conn1" dataSource="<%= dataSrcStr %>">
<sql:dbQuery connId="conn1" output="xml" queryId="myquery">
  select ENAME, EMPNO from EMP
</sql:dbQuery>
</esi:fragment>
<sql:dbClose connId="conn1"/>
</esi:template>
```

### Web Object Cache useCacheObj Tag

Use the useCacheObj tag to cache any Java serializable object.

The useCacheObj tag supports all the cache tag attributes described in "Web Object Cache Tag" on page 7-15, as well as the attributes described here.

**Syntax (in addition to that of the cache tag)**

```
<ojsp:useCacheObj
  ...
  type="classname"
  id = "instancename"
  [ cacheScope = 'application' | 'session' ]>
...
</ojsp:useCacheObj>
```
Note: The id and type attributes are not request-time attributes, so cannot be set using JSP runtime expressions.

Attributes (in addition to those of the cache tag)

- **type** (required): Specify the class name of the Java object to cache.
- **id** (required): Specify the instance name of the Java object to cache.
- **cacheScope**: This attribute has the same usage as the scope attribute in the cache and cacheXMLObj tags. See "Cache Policy Attributes" on page 7-8.

The type and id attributes here are used similarly to the type (or class) and id attributes in a jsp:useBean tag.

Example: useCacheObj Tag

```jsp
<ojsp:useCacheObj id="a2" policy="/WEB-INF/test-policy.cpd" type="examples.RStrArray" >
<% // create a temp writeable array
    WStrArray tma2=new WStrArray(3);
    tma2.setString(2, request.getParameter("testing4"));
    tma2.setString(1, "def");
    tma2.setString(0, (new java.util.Date()).toString() );
    // create a readonly copy for the cache
    a2=new RStrArray(tma2);
    // storing the a2 into pagecontext
    // so useCacheObj tag can pick it up
    pageContext.setAttribute("a2",a2);
%>
</ojsp:useCacheObj>
```

Conditional Execution of Code Inside the Cache Tags

Be aware that code inside a cache tag (cache, cacheXMLObj, or useCacheObj) is executed conditionally. In particular:

- Any code inside a cache tag is executed only when the associated cache block is not reused.

Consider the following example:

```jsp
<% String str=null; %>
<% ojsp:useCacheObj ... >
    <% str = "abc"; //...more Java code...%>
</ojsp:useCacheObj>
<% out.print(str.length()); // May cause null pointer exception %>
```

If the cache is available and reused, the code to properly initialize the string str is not executed.

- If you put a method-based variable declaration inside a cache tag, the variable is not available outside the tag.

Consider the following example:

```jsp
<ojsp:useCacheObj ... >
    <% String str = "abc"; //...more Java code...%>
</ojsp:useCacheObj>
<% // String str will not be available here %>
```
If you are using the `cache` tag (not `cacheXMLObj` or `useCacheObj`), it might be helpful to break your cache blocks into separate JSP pages so that you would be less likely to fall into this type of situation. In this case, each cache block would be represented by its own URI and you could use dynamic-include functionality to combine the pages together as desired.

To make this more convenient, Oracle also provides the `cacheInclude` tag, described in the following section, "Web Object Cache cacheInclude Tag".

**Web Object Cache cacheInclude Tag**

The `cacheInclude` tag combines functionality of the `cache` tag (but not the `cacheXMLObj` tag or `useCacheObj` tag) and the standard `jsp:include` tag.

There are a number of advantages in putting cache blocks into separate pages and using `cacheInclude`, including general considerations of modularity and clarity as well as the issues discussed in the preceding section, "Conditional Execution of Code Inside the Cache Tags".

Be aware of the following limitations, however:

- You cannot use a runtime JSP expression in the `cacheInclude` tag.
- You must use implicit cache-block naming for the cache block.
- There is no `flush` parameter, unlike for the `jsp:include` tag.

If any of these limitations presents a problem, then use separate `cache` and `jsp:include` tags.

Also be aware of an important difference between the `cacheInclude` tag and the JESI `include` tag. (See "JESI include Tag" on page 6-15 for information about that tag.) Because the OracleAS Web Cache is in a different caching layer than the Web Object Cache, the including page and included page for a JESI `include` tag cannot share the same request object. There is no such limitation with the `cacheInclude` tag, however. The including page and included page share the same request object, so beans and attributes of `request` scope can be passed between the two pages.

**Syntax**

```jsp
<ojsp:cacheInclude
    policy = "filename"
    page = "URI"
    [ printCacheBlockInfo = 'true' | 'false' ]
    [ reportException = 'true' | 'false' ] >

...Code for cache block...
</ojsp:cacheInclude>
```

**Note:** For the `cacheInclude` tag, because `policy` and `page` are not request-time attributes, you do not have the option of determining their values through JSP expressions. (Be aware that `policy` is a request-time attribute for the `cache`, `cacheXMLObj`, and `useCacheObj` tags.)

**Attributes**
■ policy (required): You must use a cache policy descriptor file to specify cache policy settings; individual parameter settings are not supported.

■ page (required): Use the page attribute to specify the URI of the page to dynamically include, as with a standard \texttt{jsp:include} tag.


Attribute Usage Notes

Consider the following cacheInclude tag usage:

\[
\text{<ojsp:cacheInclude page="anotherPage.jsp" policy="foo.cpd" > }
\]

This is equivalent to the following:

\[
\text{<ojsp:cache policy="foo.cpd" >}
\text{<% pageContext.include("anotherPage.jsp"); %>}
\text{</ojsp:cache>}
\]

It is also equivalent to the following:

\[
\text{<jsp:include page="anotherPage.jsp" flush="true" />}
\]

Assume anotherPage.jsp consists of the following:

\[
\text{<ojsp:cache policy="foo.cpd" >}
\text{...anotherPage.jsp contents...}
\text{</ojsp:cache>}
\]

Cache Invalidation Tag Description

This section describes how to use the invalidateCache tag.

Web Object Cache invalidateCache Tag

To explicitly invalidate a cache block through program logic, you can use the invalidateCache tag. This section documents the syntax and attributes of this tag.

\[
\text{<ojsp:invalidateCache}
\begin{array}{l}
\text{[ policy = "filename" ]}
\text{[ ignoreCache = "true" | "false" ]}
\text{[ scope = "application" | "session" ]}
\text{[ autoType = "user" | "URI" | "URI_query" | "URI_allParam" | "URI_selectedParam" | "URI_excludedParam" ]}
\end{array}
\]

Notes:

- The invalidateCache tag does not accept new cookies; it can use only existing cookies of the current HTTP request. For information about inputting new cookies, see "CachePolicy Methods" on page 7-28.

- Do not confuse the invalidateCache tag with the invalidateCache attribute of the cache tags. The attribute is of more limited use, to invalidate the pre-existing cache object.
Attributes

Most parameters of the invalidateCache tag also exist in the cache and cacheXMLObj tags and are used in the same way, as described earlier in this chapter (and as referenced below).

- **policy**: See "Web Object Cache cache Tag" on page 7-15.
- **scope**: See "Cache Policy Attributes" on page 7-8.
- **autoType**: See "Cache Policy Attributes" on page 7-8. The correspondence between tag attribute settings and class attribute values (integer constants) is as follows:
  - The user setting is equivalent to TYPE_USERSPECIFIED.
  - URI is equivalent to TYPE_URI_ONLY.
  - URI_query is equivalent to TYPE_URI_QUERYSTR.
  - URI_allParam is equivalent to TYPE_URI_ALLPARAM.
  - URI_selectedParam is equivalent to TYPE_URI_SELECTEDPARAM.
  - URI_excludedParam is equivalent to TYPE_URI_EXCLUDEDPARAM.
- **selectedParam**: See "Cache Policy Attributes" on page 7-8.
- **selectedCookies**: See "Cache Policy Attributes" on page 7-8.
- **name**: Use this with invalidateNameLike to invalidate one or more cache blocks that were named through explicit cache-block naming, according to the instructions in "Use of name and invalidateNameLike" below.
- **invalidateNameLike**: Use this with name to invalidate one or more cache blocks that were named through explicit cache-block naming, according to the instructions in "Use of name and invalidateNameLike" below. The default setting is "false".
- **page**: Specify a page-relative or application-relative URI. Use this with autoInvalidateLevel to invalidate one or more cache blocks that were named through implicit cache-block naming, according to the instructions in "Use of page and autoInvalidateLevel" below.
- **autoInvalidateLevel**: Use this with page to invalidate one or more cache blocks that were named through implicit cache-block naming, according to the instructions in "Use of page and autoInvalidateLevel" below.
- **cacheRepositoryName**: See "Cache Policy Attributes" on page 7-8.

---

**Note**: The default value of autoInvalidateLevel depends on specifics of the page URI. See "Use of page and autoInvalidateLevel" on page 7-25.

**Use of name and invalidateNameLike** To invalidate one or more cache blocks that were named through explicit cache-block naming, use the name and invalidateNameLike attributes together, as follows:

- If invalidateNameLike="false", then use the name parameter to specify the name of a single cache block to invalidate.
- If invalidateNameLike="true", and the underlying cache repository supports wild card characters, then you can use the wildcard "*" character in the name parameter to invalidate multiple cache blocks whose names fit the criteria. (The Oracle Application Server Java Object Cache currently does not support wild card characters.)

**Use of page and autoInvalidateLevel** To invalidate one or more cache blocks that were named through implicit cache-block naming, use the page and autoInvalidateLevel attributes together.

Use the page attribute to specify the appropriate URI of the Web page. With implicit naming, cache block names are based on Web page URIs.

Use autoInvalidateLevel to specify the scope of invalidation—application scope, page scope, parameter scope, or cookie scope—as follows:

- If autoInvalidateLevel="application", then all cache blocks associated with the application that the page belongs to will be invalidated.
  
  For example, if there is an application under the /mycontext context path, and autoInvalidateLevel="application", then all cache entries of all pages under http://host:port/mycontext will be invalidated.
  
  Here is a corresponding usage example:

  ```xml
  <ojsp:invalidateCache page="/" autoInvalidateLevel="application" />
  ```

- If autoInvalidateLevel="page", then all cache block entries associated with the page will be invalidated. Consider the following example:
  
  http://host:port/mycontext/mypage01.jsp?foo=bar

  For this request, if autoInvalidate="page", then all cache entries of mypage01.jsp will be invalidated, regardless of what request parameters and cookies they are associated with. This includes cache blocks associated with the following, for example:

  http://host:port/mycontext/mypage01.jsp?p1=v1

  Here is a corresponding usage example:

  ```xml
  <ojsp:invalidateCache page="/mypage01.jsp" autoInvalidateLevel="page" />
  ```

- If autoInvalidateLevel="param", then all cache entries of the page that have the identical selected parameter names and values will be invalidated, regardless of what cookies they are associated with.

  For example, consider the following:

  ```xml
  <ojsp:invalidateCache policy="/WEB-INF/c1.cpd"
      page="/mypage01.jsp?foo=bar"
      autoInvalidateLevel="param" />
  ```
In this case, cache blocks associated with the following, for example, will not be invalidated:
http://host:port/mycontext/mypage01.jsp?foo=bar2

However, cache blocks associated with the following will be invalidated, regardless of what cookies they are associated with:
http://host:port/mycontext/mypage01.jsp?foo=bar

Continuing this example, consider the following:
http://host:port/mycontext/mypage01.jsp?foo=bar&p1=v1

Cache blocks associated with this request will be invalidated if cl.cpd selects the foo HTTP request parameter only, and the cache blocks are stored under the same cache policy, cl.cpd. However, the cache objects will not be invalidated if they were not stored under cl.cpd, or if cl.cpd also selects the p1 parameter.

If autoInvalidateLevel="cookie", then the only cache entries invalidated are those associated with the same page, same selected parameters and values, and same cookies.

---

Note: If the page URI includes a question mark, then the default autoInvalidateLevel is param. If there is no question mark, then the default is page.

---

Example: Use of Cache Invalidation Tag

This section provides a brief example of cache invalidation.

Example: invalidateCache Tag

The following page adds an item to a list of items previously cached, then invalidates the cache. The list will presumably be re-cached later with the new item.

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jwcache.tld" prefix="ojsp" %>
<title>added.jsp</title>
<jsp:useBean class="java.util.Hashtable" id="table" scope="application" />
<% String itemid=request.getParameter("itemid");
    String addItem=request.getParameter("addItem");
    Vector list=(Vector) table.get(itemid);
    if (list==null) {
        list=new Vector();
        table.put(itemid,list);
    }
    list.addElement(addItem);
%>
<b><%= addItem %></b> was added into category <b><%= itemid %></b>.<br>
<% String viewPage="listitem.jsp?itemid="+itemid; %>
<% long l1=(new java.util.Date()).getTime(); %>
<ojsp:invalidateCache page="<%= viewPage %>", autoInvalidateLevel="param"
policy="/WEB-INF/test-policy.cpd" />
<% long l2=(new java.util.Date()).getTime(); %>
Existing cache entry has been invalidated. <br>
Invalidation took <%= l2-l1 %> milliseconds.
<br>
```
Web Object Cache API Descriptions

From servlets, you can use CachePolicy methods to modify cache policy settings or to invalidate a cache block, and ExpirationPolicy methods to modify expiration settings. This requires creating a cache policy object and retrieving its expiration policy object attribute, which the JSP cache tag handlers do automatically.

The following sections describe the API:

- Cache Policy Object Creation
- CachePolicy Methods
- Expiration Policy Object Retrieval
- ExpirationPolicy Methods
- CacheBlock Methods
- Tag Code Versus API Code

The Web Object Cache classes discussed here are in the oracle.jsp.jwcache package and are supplied in the file ojsputil.jar, which comes with OC4J. Verify that this file is installed and in your classpath. Also, to use the Oracle Application Server Java Object Cache as the back-end repository, the file cache.jar must be installed and in your classpath. This file also comes with OC4J.

For more information about the classes, interfaces, and methods described in this section, see the Javadoc that is supplied with OC4J.

Cache Policy Object Creation

There are two approaches to creating a CachePolicy object:

- Use the static lookupPolicy() method of the CacheClientUtil class.
- Use one of the public CachePolicy constructors.

**Note:** Cache policy objects are not resource objects, such as database connections or cursors, so you can manipulate them without life-cycle or resource management concerns.

Using the lookupPolicy() Method

In most situations, the most convenient way to create a CachePolicy object is through the static lookupPolicy() method of the CacheClientUtil class, as in the following example:

```java
CachePolicy cachePolicyObject = oracle.jsp.jwcache.CacheClientUtil.lookupPolicy
    (servletConfig, request, "/WEB-INF/foo.cpd");
```

Input a servlet configuration object (a javax.servlet.ServletConfig instance), a request object (a javax.servlet.http.HttpServletRequest instance), and the URI path, relative to the application root, of an XML cache policy descriptor file.
Here is a simple example of a cache policy descriptor file:

```xml
<cachePolicy scope="application">
    <expirationPolicy expirationType="TTL" TTL="25" timeInaDay="00:10:00"
        writeThrough="true" />
</cachePolicy>
```

See "Cache Policy Descriptor" on page 7-38 for more information.

Using a CachePolicy Constructor

The CachePolicy class has three public constructors: a simple constructor requiring only a servlet configuration object, a "copy" constructor that copies another CachePolicy object, and a "copy" constructor with a given servlet configuration object, as follows:

```java
public CachePolicy(javax.servlet.ServletConfig config)
public CachePolicy(CachePolicy cPolicy)
public CachePolicy(javax.servlet.ServletConfig config,
    CachePolicy cPolicy)
```

CachePolicy Methods

Several utility methods are available in CachePolicy objects, as well as getter and setter methods for key attributes.

CachePolicy Method Signatures and Common Parameters

The following abbreviated code, for illustration purposes only, contains signatures for key methods available in CachePolicy objects.

```java
class CachePolicy {
    boolean isRecent(CacheBlock block);
    void putCache(Object data, HttpServletRequest req, SectionId sectionId);
    void putCache(Object data, HttpServletRequest req, String specifiedName);
    void putAutoCacheForOtherPath(Object data, HttpServletRequest req,
        String otherPath, StringSectionId sectionId);
    void putAutoCacheForOtherPath(Object data, HttpServletRequest req,
        String otherPath, Cookie[] newCookies, StringSectionId sectionId);
    CacheBlock getCache(HttpServletRequest req, SectionId sectionId);
    CacheBlock getCache(HttpServletRequest req, String specifiedName);
    CacheBlock getAutoCacheForOtherPath(HttpServletRequest req,
        String otherPath, StringSectionId sectionId);
    CacheBlock getAutoCacheForOtherPath(HttpServletRequest req,
        String otherPath, Cookie[] newCookies, StringSectionId sectionId);
    void invalidateCache(HttpServletRequest req, SectionId sectionId);
    void invalidateCache(HttpServletRequest req, String specifiedName);
    void invalidateCacheLike(HttpServletRequest req, String specifiedName);
    void invalidateCacheLike(HttpServletRequest req, int autoInvalidateLevel);
    void invalidateCacheLike(HttpServletRequest req, String specifiedName,
        int autoInvalidateLevel);
    void invalidateCacheOtherPathLike(HttpServletRequest req, String otherPath);
}
```
void invalidateCacheOtherPathLike(HttpServletRequest req, String otherPath, Cookie[] newCookies, int autoInvalidateLevel);
Date getCurrentTime();
}

These methods use several common parameters:

- **req**, a `javax.servlet.http.HttpServletRequest` instance
  
  This is the current HTTP request object.

- **newCookies**, a `javax.servlet.http.Cookie[]` array
  
  This is an array of new cookies. If you pass in new cookies, they are used in cache operations that use the `otherPath` parameter (such as the `putAutoCacheForOtherPath()` method), assuming the cache policy selects some cookies and invalidation is at the cookie level. If you do not pass in new cookies, then cookies of the current HTTP request are used instead.

- **specifiedName**, a Java string
  
  For explicit cache-block naming, this is the name—either the desired cache block name if you are creating a new cache block, or the existing cache block name if you are retrieving an existing cache block.

- **sectionId**, an `oracle.jsp.jwcache.SectionId` instance, specifically a `StringSectionId` or `NumberSectionId` instance
  
  For implicit cache-block naming, this is a counter that is used in tracking cache blocks. In JSP pages, it is used, incremented, and maintained by JSP cache tag handlers. It is stored in the JSP `pageContext` object. `SectionId` is an interface that is implemented by two classes: `StringSectionId` and `NumberSectionId`. Where `StringSectionId` is specified in a method signature, you must use an instance of that class. Where `SectionId` is specified, you can use an instance of either class, but should typically use `StringSectionId`. The `NumberSectionId` class is primarily intended for use by JSP tag handlers.

  In a servlet, you must create a section ID instance manually. "Servlet Page: DemoCacheServlet.java" on page 7-36 demonstrates the use of a `StringSectionId` instance.

  **Note:** When you construct a `StringSectionId` instance, the string must begin with an alphabetic (not numeric) character.

- **otherPath**, a Java string
  
  This is the URI of another JSP page that has an associated cache block that you want to store, retrieve, or invalidate.

- **autoInvalidateLevel**, an integer
  
  For implicit cache-block naming, you can use this to specify a level of invalidation, either application, page, parameter, or cookie. Use the `CachePolicy` integer constant `AUTO_INVALIDATE_APP_LEVEL`, `AUTO_INVALIDATE_PAGE_LEVEL`, `AUTO_INVALIDATE_PARAM_LEVEL`, or `AUTO_INVALIDATE_COOKIE_LEVEL`. 
CachePolicy Method Descriptions

The CachePolicy methods function as follows:

- **isRecent()**
  
  This method checks the timestamp of the specified cache block and determines whether it is recent enough, given the current time and the values of the cache policy reusableTimeStamp and reusableDeltaTime attributes.

- **putCache(data)**
  
  Use this method to place an object into the cache repository. The data parameter is any serializable Java object you want to cache that will not require any further modification or mutation. In JSP pages, the JSP cache tag handler calls putCache() to cache a BodyContent instance. The cacheXMLObj tag handler calls it to cache an XML DOM object. In a servlet or useCacheObj tag, the cache target object can be any Java serializable object.

  You must also provide an HTTP request object, along with a cache block name (for explicit naming) or a section ID (for implicit naming).

  **Note:** The putCache() method does nothing if the cache policy ignoreCache attribute is set to "true".

- **putAutoCacheForOtherPath(...)**
  
  Place the specified object into the cache repository according to a specified string-based section ID and a specified page path, optionally using specified cookies as well. You must also input an HttpServletRequest object. The cache policy must not use explicit naming (in other words, must not have autoType=TYPE_USERSPECIFIED).

- **getCache(...)**
  
  Use this method to retrieve a cached item from the repository, in the form of a CacheBlock instance. You can specify the cache block name (for explicit naming) or the section ID (for implicit naming). You must also provide an HTTP request object.

  **Note:** The getCache() method does nothing if the cache policy ignoreCache attribute is true.

- **getAutoCacheForOtherPath(...)**
  
  Retrieve a cached item from the repository, in the form of a CacheBlock instance. You can specify the cache block name (for explicit naming) or the section ID (for implicit naming). You must also provide an HttpServletRequest object.

- **invalidateCache(...)**
  
  Use this method to invalidate a single cache block. Invalidation is according to the HTTP request object and also according to the specified cache block name (for explicit naming) or section ID (for implicit naming).

- **invalidateCacheLike(...)**
  
  Note: The putCache() method does nothing if the cache policy ignoreCache attribute is set to "true".
Use this method to invalidate multiple cache blocks. If you use explicit cache-block naming and the cache repository supports wild-card naming, you can input the specifiedName parameter with "*" wild card characters. The Oracle Application Server Java Object Cache currently does not support wild card characters.

If you use implicit cache-block naming, you must specify the autoInvalidateLevel parameter to determine, in combination with the HttpServletRequest object and optionally the specifiedName parameter, what cache blocks are invalidated. The autoInvalidateLevel parameter has the same functionality as in a JSP invalidateCache tag, as explained in "Web Object Cache invalidateCache Tag" on page 7-23 (using information from the request object, instead of using information from the page parameter of the invalidateCache tag).

- invalidateCacheOtherPathLike(…)

  Use this method to invalidate cache blocks associated with the URI you provide in the otherPath parameter. In the signature taking only a request object and the URI, the autoInvalidateLevel parameter is set automatically according to the URI. It is set to param level if there is a question mark ("?") in the URI or to page level otherwise.

  The detailed signature of this method enables you to specifically control the autoInvalidateLevel setting and the cookies used in invalidation.

- getCurrentTime()

  Retrieve the current time value, as a java.util.Date instance, of the underlying cache repository specified in this cache policy.

**CachePolicy Getter and Setter Methods**

You can use the following methods to retrieve or alter CachePolicy object attributes. See "Cache Policy Attributes" on page 7-8 for a discussion of these attributes.

- boolean getIgnoreCache()
- void setIgnoreCache(boolean ignoreCache)
- void setIgnoreCache(String ignoreCacheStr)
- int getScope()
- void setScope(int scope)

  For scope values, use the integer constants SCOPE_APP and SCOPE_SESSION.

- int getAutoType()
- void setAutoType(int autoType)

  For autoType values, use the integer constants TYPE_USERSPECIFIED, TYPE_URI_ONLY, TYPE_URI_QUERYSTR, TYPE_URI_ALLPARAM, TYPE_URI_SELECTEDPARAM, and TYPE_URI_EXCLUDEDPARAM.

- String[] getSelectedParam()
- void setSelectedParam(String[] selectedParameters)
- void setSelectedParam(String selectedParamStr)
- String[] getSelectedCookies()
- void setSelectedCookies(String[] selectedCookies)
- void setSelectedCookies(String selectedCookiesStr)
Web Object Cache API Descriptions

- Date getReusableTimeStamp()
- void setReusableTimeStamp(Date reusableTimeStamp)
- void setReusableTimeStamp(long reusableTimeStamp)

For reusableTimeStamp values, the integer constant REUSABLE_ALWAYS indicates that the cache is always reusable.

- long getReusableDeltaTime()
- void setReusableDeltaTime(long reusableDeltaTime)

For reusableDeltaTime values, the integer constant REUSABLE_ALWAYS indicates that the cache is always reusable.

- ExpirationPolicy getExpirationPolicy()
- void setExpirationPolicy(ExpirationPolicy expirationPolicy)
- String getCacheRepositoryName()
- void setCacheRepositoryName(String repoName)
- boolean getReportException()
- void setReportException(boolean reportException)
- void setReportException(String reportExceptionStr)

The following methods are also available, but are primarily intended for use by the Web Object Cache tag handlers:

- void setScope(String scopeStr)
  For scope values, there are the string constants SCOPE_APP_STR and SCOPE_SESSION_STR.

- void setAutoType(String autoTypeStr)
- void setReusableTimeStamp(String reusableTimeStampStr)
  For reusableTimeStamp values, the string constant REUSABLE_IGNORED indicates that the cache is always reusable.

- void setReusableDeltaTime(String reusableDeltaTimeStr)
  For reusableDeltaTime values, the string constant REUSABLE_IGNORED indicates that the cache is always reusable.

Expiration Policy Object Retrieval

Each CachePolicy object has an ExpirationPolicy attribute. If you want to set expiration policies for a cache block, you can use the getExpirationPolicy() method of its CachePolicy object, as in the following example:

```java
CachePolicy cachePolicyObj = CacheClientUtil.lookupPolicy(config, request, "/WEB-INF/mypolicy.cpd");
ExpirationPolicy expPolicyObj = cachePolicyObj.getExpirationPolicy();
```

ExpirationPolicy Methods

The ExpirationPolicy class has getter and setter methods for its attributes, as follows. For descriptions of these attributes, see “Expiration Policy Attributes” on page 7-12.
- `int getExpirationType()`
- `void setExpirationType(int expirationType)`
- `void setExpirationType(String expirationTypeStr)`
- `long getTTL()`
- `void setTTL(long ttl)`
- `long getTimeInaDay()`
- `void setTimeInaDay(long timeInaDay)`
- `void setTimeInaDay(String timeInaDayStr)`
- `int getDayInaWeek()`
- `void setDayInaWeek(int dayInaWeek)`
- `void setDayInaWeek(String dayInaWeekStr)`
- `int getDayInaMonth()`
- `void setDayInaMonth(int dayInaMonth)`
- `boolean getWriteThrough()`
- `void setWriteThrough(boolean writeThrough)`
- `void setWriteThrough(String writeThroughStr)`

Additionally, the `ExpirationPolicy` class has the following utility method:

- `long getExpirationTime(long createTime)`

  Given the creation time of a cache block expressed in milliseconds since midnight January 1, 1970, this method calculates and returns the expiration time, also in milliseconds since midnight January 1, 1970. That is, the timestamp when expiration should occur, according to the expiration policy.

The `ExpirationPolicy` class also defines the following integer constants for the `expirationType` attribute:

- `TYPE_TTL`
- `TYPE_DAILY`
- `TYPE_WEEKLY`
- `TYPE_MONTHLY`

And the following integer constants are defined for the `dayInaWeek` attribute:

- `WEEKLY_SUNDAY`
- `WEEKLY_MONDAY`
- `WEEKLY_TUESDAY`
- `WEEKLY_WEDNESDAY`
- `WEEKLY_THURSDAY`
- `WEEKLY_FRIDAY`
- `WEEKLY_SATURDAY`
CacheBlock Methods

You can use the `getCache()` method of a `CachePolicy` object to retrieve the associated `CacheBlock` object, as documented in "CachePolicy Methods" on page 7-28 and shown in "Servlet Page: DemoCacheServlet.java" on page 7-36.

The following abbreviated code, for illustrative purposes only, shows the key methods of the `oracle.jsp.jwcache.CacheBlock` class:

```java
class CacheBlock
{
    long getCreationTime();
    long getExpirationTime();
    Serializable getData();
}
```

Here are brief descriptions of these methods:

- `getCreationTime()`: Returns the timestamp indicating when the cache block was created.
- `getExpirationTime()`: Returns the timestamp indicating the expiration time of the cache block.
- `getData()`: Returns the cache block data.

Note: Creation time and expiration time are expressed in milliseconds since midnight, January 1, 1970.

Tag Code Versus API Code

This example presents code for three approaches to an application that caches and presents timestamp output from two cache fragments:

- The first approach, `tagcode.jsp`, is a simple JSP page that uses the Oracle Web Object Cache tags.
- The second approach, `servletcode.jsp`, is a more involved JSP page that uses the Web Object Cache API inside a Java scriptlet instead of using the Web Object Cache tags.
- The third approach, `DemoCacheServlet.java`, uses the Web Object Cache API inside a servlet.

Following the three code samples is a listing of the cache policy descriptor, `test-policy.cpd`.

In each approach, the application will cache the two fragments it displays. You can reload repeatedly, but the times displayed in the fragments will not change until the cached fragments expire. The first fragment takes 25 seconds to expire, getting the 25-second time-to-live value from the `TTL` setting in the cache policy descriptor (`test-policy.cpd`). The second fragment takes 15 seconds to expire, overriding the cache policy descriptor time-to-live value with a value set directly in the page code.

Output for the sample applications looks something like the following:

```
fragment#1  (expires in 25 seconds based on TTL value test-policy)
Sun May 27 15:20:46 PDT 2001

fragment#2  (expires in 15 seconds because TTL overrides test-policy value)
Sun May 27 15:20:46 PDT 2001
```
**Simple JSP Page: tagcode.jsp**

```jsp
<%@ taglib uri="http://xmlns.oracle.com/j2ee/tld/ojsp/jwcache.tld" prefix="ojsp" %>
<title>tagcode.jsp</title>
<pre>
tagcode.jsp
<ojsp:cache policy="/WEB-INF/test-policy.cpd" >
  fragment#1  (expires in 25 seconds based on TTL value test-policy)
  <%= new java.util.Date() %>
</ojsp:cache>
<ojsp:cache policy="/WEB-INF/test-policy.cpd" TTL="15" >
  fragment#2 (expires in 15 seconds because TTL overrides test-policy value)
  <%= new java.util.Date() %>
</ojsp:cache>
</pre>
```

**Scriptlet JSP Page: servletcode.jsp**

Code notes are the same as for the servlet version in the next section, "Servlet Page: DemoCacheServlet.java".

```jsp
<%@ page import="oracle.jsp.jwcache.*,java.io.*" %>
<title>servletcode.jsp</title>
<pre>
servletcode.jsp
<%
  CachePolicy cachePolicyObj = CacheClientUtil.lookupPolicy(config,request, 
      "/WEB-INF/test-policy.cpd" );  // Note A
  StringSectionId sectionId=new StringSectionId("s1");   // Note B
  CacheBlock cacheBlockObj=null;
  cacheBlockObj = cachePolicyObj.getCache(request,sectionId); // Note C
  if (!cachePolicyObj.isRecent(cacheBlockObj)) {  // Note D
    CharArrayWriter newOut=new CharArrayWriter();
    PrintWriter pw=new PrintWriter(newOut);
    // actual logic within a cache block
    pw.println
        ('fragment#1 (expires in 25 seconds based on TTL value test-policy)');
    pw.println(new java.util.Date());
    // which generates content into the "out" object
    if (cacheBlockObj == null) {   // Note E
      cachePolicyObj.putCache(newOut.toCharArray(),request,sectionId);
      // Note F
    }
    out.write(newOut.toCharArray());
    // writing out newly created data back to the original writer
  }
  else {
    out.write((char[])cacheBlockObj.getData());
    // writing the existing cached data to the writer
  }

  sectionId=new StringSectionId("s2");
  long timeToLive = 15;   // now set TTL to 15 on this block
  ExpirationPolicy expirationPolicy = cachePolicyObj.getExpirationPolicy();
  expirationPolicy.setTTL(timeToLive);
  cachePolicyObj.setExpirationPolicy(expirationPolicy);
```

```
package demoPkg;

import javax.servlet.*;
import javax.servlet.http.*;
import java.io.IOException;
import java.io.PrintWriter;
import java.io.CharArrayWriter;
import oracle.jsp.jwcache.CachePolicy;
import oracle.jsp.jwcache.ExpirationPolicy;
import oracle.jsp.jwcache.StringSectionId;
import oracle.jsp.jwcache.CacheBlock;
import oracle.jsp.jwcache.CacheClientUtil;

public class DemoCacheServlet extends HttpServlet{

    public void service(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
        // standard writer object from servlet engine
        PrintWriter out=response.getWriter();
        ServletConfig config=getServletConfig();

        try {
            CachePolicy cachePolicyObj = CacheClientUtil.lookupPolicy(config,request, "/WEB-INF/test-policy.cpd");  // Note A
            StringSectionId sectionId=new StringSectionId("s1");   // Note B
            CacheBlock cacheBlockObj=null;

            cacheBlockObj = cachePolicyObj.getCache(request,sectionId); // Note C
            if (!cachePolicyObj.isRecent(cacheBlockObj)) {  
                CharArrayWriter newOut=new CharArrayWriter();
                PrintWriter pw=new PrintWriter(newOut);

                // actual logic within a cache block
                pw.println("fragment#2 (expires in 15 seconds because TTL overrides test-policy value)");
                pw.println(new java.util.Date());
                // which generates content into the "out" object

                if (cacheBlockObj == null) {  
                    cachePolicyObj.putCache(newOut.toCharArray(),request,sectionId);
                }

                out.write(newOut.toCharArray());
                // writing out newly created data back to the original writer
            } else {  
                out.write((char[])cacheBlockObj.getData());
                // writing the existing cached data to the writer
            }

            %>
            </pre>

            Servlet Page: DemoCacheServlet.java
            Code notes are explained at the end of the code.

            public void service(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
                // standard writer object from servlet engine
                PrintWriter out=response.getWriter();
                ServletConfig config=getServletConfig();

                try {
                    CachePolicy cachePolicyObj = CacheClientUtil.lookupPolicy(config,request, "/WEB-INF/test-policy.cpd");  // Note A
                    StringSectionId sectionId=new StringSectionId("s1");   // Note B
                    CacheBlock cacheBlockObj=null;

                    cacheBlockObj = cachePolicyObj.getCache(request,sectionId); // Note C

                    if (!cachePolicyObj.isRecent(cacheBlockObj)) {  
                        CharArrayWriter newOut=new CharArrayWriter();
                        PrintWriter pw=new PrintWriter(newOut);

                        // actual logic within a cache block
                        pw.println("fragment#2 (expires in 15 seconds because TTL overrides test-policy value)");
                        pw.println(new java.util.Date());
                        // which generates content into the "out" object

                        if (cacheBlockObj == null) {  
                            cachePolicyObj.putCache(newOut.toCharArray(),request,sectionId);
                        }

                        out.write(newOut.toCharArray());
                        // writing out newly created data back to the original writer
                    } else {  
                        out.write((char[])cacheBlockObj.getData());
                        // writing the existing cached data to the writer
                    }

                    %>
                    </pre>

                    Servlet Page: DemoCacheServlet.java
                    Code notes are explained at the end of the code.
if (!cachePolicyObj.isRecent(cacheBlockObj)) {  // Note D
    CharArrayWriter newOut=new CharArrayWriter();
    PrintWriter pw=new PrintWriter(newOut);

    // actual logic within a cache block
    pw.println("fragment#1");
    pw.println(new java.util.Date());
    // which generates content into the "out" object

    if (cacheBlockObj == null) {   // Note E
        cachePolicyObj.putCache(newOut.toCharArray(),request,sectionId);
        // Note F
    }
}

out.write(newOut.toCharArray());
// writing out newly created data back to the original writer
else {

    out.write((char[])cacheBlockObj.getData());
    // writing the existing cached data to the writer
}

sectionId=new StringSectionId("s2");
long timeToLive = 15;   // now set TTL to 15 on this block
ExpirationPolicy expirationPolicy = cachePolicyObj.getExpirationPolicy();
expirationPolicy.setTTL(timeToLive);
cachePolicyObj.setExpirationPolicy(expirationPolicy);
cacheBlockObj = cachePolicyObj.getCache(request,sectionId);
if (!cachePolicyObj.isRecent(cacheBlockObj)) {
    CharArrayWriter newOut=new CharArrayWriter();
    PrintWriter pw=new PrintWriter(newOut);

    // actual logic within a cache block
    pw.println("fragment#2");
    pw.println(new java.util.Date());
    // which generates content into the "out" object

    if (cacheBlockObj == null) {
        cachePolicyObj.putCache(newOut.toCharArray(),request,sectionId);
    }
}

out.write(newOut.toCharArray());
// writing out newly created data back to the original writer
} else {

    out.write((char[])cacheBlockObj.getData());
    // writing the existing cached data to the writer

} catch (Throwable th) {
    // your exception handling code here
    th.printStackTrace(out);
}

**Code Notes**  The following notes describe some of the key functionality of the preceding example:
The cache policy object is created in the `lookupPolicy()` call (Note A), with attribute settings according to the cache policy descriptor `test-policy.cpd`.

The section ID is created for each cache block (Note B), as required for implicit cache-block naming. See "CachePolicy Methods" on page 7-28 for information about section IDs.

The cache block is retrieved from the repository through the `getCache()` method of the cache policy object (Note C) and placed into the repository through the `putCache()` method, according to the section ID in each case.

The `isRecent()` call determines if the cache block is recent enough to use (Note D). If so, the cached data is retrieved through the `getData()` method of the cache block. (See "CacheBlock Methods" on page 7-34.) If not, a special PrintWriter object is created to buffer the output and save it back to the cache repository. If the cache block object is not found (is null, Note E), then the `putCache()` method of the cache policy object is called to create a new cache block (Note F).

**Cache Policy Descriptor: test-policy.cpd**

This cache policy descriptor is used by all three approaches to the sample application: `tagcode.jsp`, `servletcode.jsp`, and `DemoCacheServlet.java`:

```xml
<!--
test-policy.cpd
-->

<cachePolicy scope='application'>
  <expirationPolicy expirationType='TTL' TTL='25' timeInaDay='00:10:00'
   writeThrough='true' />
</cachePolicy>
```

**Cache Policy Descriptor**

You can optionally use an XML-style cache policy descriptor to specify attribute settings for the CachePolicy and ExpirationPolicy objects. In any JSP pages or servlets that you use, you would then specify the cache policy descriptor through the `policy` attribute of a cache, `cacheXMLObj`, `useCacheObj`, `cacheInclude`, or `invalidateCache` tag.

The following sections provide the cache policy descriptor DTD, a sample cache policy descriptor, and information about loading and refreshing the cache policy descriptor:

- **Cache Policy Descriptor DTD**
- **Sample Cache Policy Descriptor**
- **Cache Policy Descriptor Loading and Refreshing**

**Cache Policy Descriptor DTD**

This section provides a listing of the Web Object Cache cache policy descriptor DTD, `cachepolicy.dtd`.

```xml
<--
cachepolicy.dtd
-->
<--
This DTD is used to validate any (Oracle programmable web) cache policy descriptors (for example, '/WEB-INF/foo.cpd').
-->
```
The cachePolicy element is the root element of cache policy descriptors.

<!--
The cachePolicy element is the root element of cache policy descriptors. configuration descriptor.
-->

<!ELEMENT cachePolicy (selectedParam*, selectedCookie*,
reusableTimeStamp?, reusableDeltaTime?,
cacheRepositoryName?, expirationPolicy? ) >

<!ATTLIST cachePolicy ignoreCache (true | false) "false" >
<!ATTLIST cachePolicy scope (application | session) "application" >
<!ATTLIST cachePolicy autoType
[user | URI | URI_query |
URI_allParam | URI_selectedParam | URI_excludedParam ]
"URI_allParam" >
<!ATTLIST cachePolicy reportException (true | false) "true" >

<!ELEMENT selectedParam (#PCDATA) >
<!ELEMENT selectedCookie (#PCDATA) >
<!ELEMENT reusableTimeStamp (#PCDATA) >
<!ELEMENT reusableDeltaTime (#PCDATA) >
<!ELEMENT cacheRepositoryName (#PCDATA) >

<!ELEMENT expirationPolicy EMPTY >

<!ATTLIST expirationPolicy expirationType (TTL | daily | weekly | monthly)
"TTL" >
<!ATTLIST expirationPolicy TTL CDATA "300" >
<!ATTLIST expirationPolicy timeInaDay CDATA #IMPLIED >
<!ATTLIST expirationPolicy dayInaWeek
(Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday)
"Wednesday" >
<!ATTLIST expirationPolicy dayInaMonth CDATA "10" >
<!ATTLIST expirationPolicy writeThrough (true | false) "true" >

Sample Cache Policy Descriptor

This section provides an example of a simple cache policy descriptor that sets the TTL and timeInaDay attributes.

<!--
test-policy.cpd
-->

<cachePolicy scope="application">
  <expirationPolicy expirationType="TTL" TTL="25" timeInaDay="00:10:00"
       writeThrough="true" />
</cachePolicy>

Cache Policy Descriptor Loading and Refreshing

To create a CachePolicy object from an XML cache policy descriptor file, there must be a call to the static lookupPolicy() method of the CacheClientUtil class. For JSP pages, this is handled automatically. For servlets, you must include the lookupPolicy() call in your code. See "Servlet Page: DemoCacheServlet.java" on page 7-36.
If the caching policy has not been previously loaded, the `lookupPolicy()` invocation results in the XML descriptor being parsed and used in constructing a new `CachePolicy` object and an `ExpirationPolicy` attribute of this object. See "Cache Policy Object Creation" on page 7-27 for information about the `lookupPolicy()` method.

The `CachePolicy` object is stored indirectly under the `ServletContext` object associated with your application. When the same caching policy is requested again, the stored policy object will be returned without the descriptor being reread or re-parsed. For performance reasons, because the cache policy descriptor files are seldom changed, as well as for security reasons, OC4J does not provide descriptor auto-reloading functionality. The resulting cache policy object is stored in the middle-tier JVM for faster access.

The `CachePolicy` object will be valid until the servlet context is destroyed or someone calls the static `refreshPolicy()` method of the `CacheClientUtil` class. This method has the same calling sequence as the `lookupPolicy()` method. For example:

```java
oracle.jsp.jwcache.CacheClientUtil.refreshPolicy
    (servletConfig, request, "*/WEB-INF/foo.cpd");
```

When you alter and refresh the caching policy, active cache blocks are not affected.

**Cache Repository Descriptor**

Use an XML-style cache repository descriptor to specify what to use as the back-end cache repository for the Web Object Cache and how to configure it. The following sections list the DTD for cache repository descriptors, as well as a sample cache repository descriptor:

- Cache Repository Descriptor DTD
- Sample Cache Repository Descriptor

---

**Note:** By default, the Web Object Cache uses the Oracle Application Server Java Object Cache as its cache repository.

---

**Cache Repository Descriptor DTD**

This section provides a listing of the Web Object Cache cache repository descriptor DTD, `wcacheldt.dtd`.

```xml
<!--
Copyright 2000 Oracle Corporation
wcacheldt.dtd
-->
<!--
This DTD is used to validate "/WEB-INF/wcache.xml", which is used to hold
web cache repositories configuration information for
Oracle programmable web caching components.
-->
<!--
The wcache-config element is the root element of web cache repositories
configuration descriptor.
-->
<!ELEMENT wcache-config (cache-repository*)>
```
Configuration for Back-End Repository

This section describes how to configure the Oracle Application Server Java Object Cache or a file system as the back-end repository for the OC4J Web Object Cache.

Configuration Notes for Oracle Application Server Java Object Cache

The OC4J server.xml file must have a <javacache-config> element to specify the Java Object Cache configuration file. This is a subelement of the <application-server> element. By default, the entry is as follows:

```xml
/application-server ...
...
  <javacache-config path="..//..//javacache/admin/javacache.xml" />
...
</application-server>
```

Sample Cache Repository Descriptor

This section lists the cache repository descriptor provided with OC4J.

```xml
<wcache-config>
  <cache-repository>
    <cache-repository-name>DefaultCacheRepository</cache-repository-name>
    <cache-repository-class>
      oracle.jsp.jwcache.repository.impl.OCSRepoImpl
    </cache-repository-class>
  </cache-repository>
  <cache-repository>
    <cache-repository-name>SimpleFSRepo</cache-repository-name>
    <cache-repository-class>
      oracle.jsp.jwcache.repository.impl.SimpleFSRepositoryImpl
    </cache-repository-class>
    <init-param>
      <param-name>reporoot</param-name>
      <param-value>/tmp/reporoot</param-value>
    </init-param>
  </cache-repository>
<wcache-config>
```

Note: The DTD does not include reporoot, which is a specific-use parameter that only a file system cache implementation requires.
As shown, and assuming the default configuration file directory location (where server.xml is located), the default is for OC4J instances to share the same Java Object Cache configuration file, javacache.xml, in the ORACLE_HOME/javacache/admin directory.

Here is a sample Java Object Cache configuration file:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<cache-configuration
xmlns="http://www.oracle.com/oracle/ias/cache/configuration"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <logging>
    <location>javacache.log</location>
    <level>ERROR</level>
  </logging>
  <communication>
    <isDistributed>true</isDistributed>
    <coordinator discovery-port="7000"/>
  </communication>
  <persistence>
    <location>diskcache</location>
    <disksize>32</disksize>
  </persistence>
  <max-objects>1000</max-objects>
  <max-size>48</max-size>
  <clean-interval>30</clean-interval>
</cache-configuration>
```

For more information about the Java Object Cache, its configuration, and the javacache.xml file, see the Oracle Application Server Containers for J2EE Services Guide. For more information about the server.xml file, refer to the Oracle Application Server Containers for J2EE User’s Guide.

**Configuration Notes for File System Cache**

To use a file system as the back-end repository, edit the cache repository descriptor, wcache.xml, to set reporoot to specify a root directory for the file system cache. This file is located in the /WEB-INF directory where the OC4J samples are installed. See "Cache Repository Descriptor" on page 7-40 for general information and for an example of a cache repository descriptor that sets a reporoot value.

For example, for a UNIX system:

```xml
<init-param>
  <param-name>reporoot</param-name>
  <param-value>/mydir/repositoryroot</param-value>
</init-param>
```

Alternatively, for a Windows system:

```xml
<init-param>
  <param-name>reporoot</param-name>
  <param-value>c:\mydir\repositoryroot</param-value>
</init-param>
```
This chapter covers OC4J tags and JavaBeans for file access (uploading and downloading) and for e-mail. The e-mail tag and JavaBean make use of the file access functionality for attachments. The chapter is organized as follows:

- File-Access JavaBeans and Tags
- Mail JavaBean and Tag

File-Access JavaBeans and Tags

OC4J provides a standards-compliant tag library and JavaBeans that add convenient file upload and file download functionality for JSP pages and servlets. Files can be uploaded to or downloaded from a file system or database.

The following sections document the file-access tags and beans:

- Overview of OC4J File-Access Functionality
- File Upload and Download Tag Descriptions
- File Upload and Download JavaBean and Class Descriptions

Overview of OC4J File-Access Functionality

Developers have the option of using either custom tags or JavaBeans to program applications that allow users to upload or download files. In either case, the application is presumably programmed so that users specify through the browser where files come from on the client system for uploading or where they go to on the client system for downloading. For JSP pages for uploading, OC4J supplies a convenience tag, `httpUploadForm`, to create a form to use in specifying where the files come from.

For processing an upload, including specifying the destination file system or database location, use the `HttpUploadBean` JavaBean or the `httpUpload` tag. For processing a download, including specifying the source file system or database location, use `HttpDownloadBean` or the `httpDownload` tag. The beans extend `HttpFileAccessBean`, which is not intended for public use. All of the beans are in the `oracle.jsp.webutil.fileaccess` package.

Overview of File Uploading

For user specification in a JSP page of where uploaded files will come from, you can use the `httpUploadForm` tag to create a form. This tag lets users select the files for uploading and creates the necessary multipart HTTP request. You also have the option of using a standard HTML form to create the request.
Use the HttpUploadBean JavaBean or the httpUpload tag to receive and process the multipart form-encoded data stream and write the files to the appropriate location, either in the file system or a database. There is functionality to let you decide whether previous data will be overwritten if the target file or database row already exists.

**Note:** The maximum file size for any upload is 2 GB.

**File System Destination** If the destination is in a file system, you must provide a properties file that designates a base directory. The properties file must be named fileaccess.properties, must be located in the /WEB-INF directory of your application, and must have a fileaccess.basedir entry that indicates an absolute directory path. Here is an example:

```
fileaccess.basedir=/tmp
```

**Note:** On a Windows system, you must still use a forward-slash, not a back-slash, for the directory path:

```
fileaccess.basedir=c:/tmp
```

Furthermore, the specified drive (C: in this case) must be the same drive on which OC4J is installed.

There should be subdirectories as appropriate under the base directory, such as a subdirectory for each authorized user. Destination subdirectories under the base directory must be specified through an attribute of the upload bean or tag. All directories and subdirectories must already exist and be writable; they cannot be created or made writable through OC4J functionality.

**Database Destination** If the destination is in a database, you can optionally use a default table, fileaccess, that you create through the supplied fileaccess.sql script, or you can use any other previously existing table containing the required column types. In either case, you must provide a connection to the database, as an instance of either oracle.jsp.dbutil.ConnBean or the standard java.sql.Connection. You can provide a ConnBean instance explicitly, or in a JSP page you also have the option of providing it implicitly as a result of nesting the httpUpload tag inside a dbOpen tag. (For information about the ConnBean JavaBean and dbOpen tag, see Chapter 4, "Data-Access JavaBeans and Tags").

**Note:** The java.sql.Connection type is currently supported for the file-access beans only, not the tags.

You are also required to specify a destination through an attribute of the upload bean or tag. The destination is simply a Java string value that will be placed in the prefix column of the database table. The prefix is equivalent to a file system path.

File data is written to a database as either a BLOB or a CLOB. You can specify which through an upload bean or tag attribute.

If you do not use the default fileaccess table, you must use attributes of the upload bean or tag to specify the database table name and the names of the columns that will contain the file data, the file prefix, and the file name. Any other table you use must adhere to the pattern of fileaccess, as follows:
It must have a concatenated unique key consisting of the column that holds the file name and the column that holds the prefix.

It must have a BLOB or CLOB column for the file data.

Any column other than the file data column must allow null data.

---

**Note:** When you use a ConnBean instance, the connection will be closed automatically at the end of the scope designated in the jsp:useBean tag that invokes it. There is no such functionality for a Connection instance.

---

**Security Considerations for Uploading** For uploading to a database, the database table does not have a column to indicate a particular authorized user for any given file. Therefore, without precaution, each user can see files that were uploaded by other users, without having to know the file prefixes. To prevent this, you can prepend an appropriate user name to each prefix.

**Overview of File Downloading**

Use the HttpDownloadBean JavaBean or the httpDownload tag as follows:

- To allow users to specify the file system source directory or the database prefix to match for file retrieval
  
  Note the following:
  
  - Matching the prefix for downloads from a database is case-sensitive.
  - Matching the source directory for downloads from a file system is case-sensitive in a case-sensitive operating system, such as UNIX.
  - There is currently no support for specifying file names, either partial or complete.

- To obtain and display a list of the files that are available for download

  Once presented with a list of available files, the user can download them one at a time from the list.

There is also functionality to specify whether you want recursive downloading, where files in subdirectories or with additional database prefix information will also be available for download. For database downloading, a prefix is equivalent to a file system path and can be used to group files into a hierarchy. As an example of recursive downloading from a database, assume you have specified /user as the prefix. Recursive downloading would find matches for files with any prefixes starting with "/user", such as "/user/bill" and "/user/mary", and also such as "user1", "/user2", "/user1/tom", and "/user2/susan".

For downloading files from a file system, utilize the mechanism described in "Overview of File Uploading" on page 8-1. Use the fileaccess.properties file to specify a base directory and use attributes in the download bean or tag to specify the rest of the file path.

For downloading files from a database, as with uploading files to a database, you must provide an instance of oracle.jsp.dbutil.ConnBean or java.sql.Connection. In addition, if you are not using the default fileaccess table (that you can create using the supplied fileaccess.sql script), you must provide all the necessary information about the database table and columns. Specify this information through attributes of the download bean or tag.
The actual downloading of the files is accomplished by DownloadServlet, supplied with OC4J. In using the download tag, specify the path of this servlet through a tag attribute. For a file system source, hyperlinks are automatically created to the servlet so that the user can select a link for each file in order to download the file. For a database source, the servlet will fetch the selected CLOB or BLOB data that forms the file contents. (See “The Download Servlet” on page 8-12.)

Security Considerations for Downloading  For downloading, consider limiting the users’ ability to see what is in the source (server-side) file system or database. Without precaution, the following scenarios are possible:

- For file system downloading, a source value of "*" (perhaps specified through user input) would mean that all directories under the base directory would be available for downloading, with the names of all the files presumably being displayed for the user to choose from.
- For recursive downloading from a database, all files having a prefix beginning with the source string (perhaps specified through user input) would be available for downloading, with the names of all these files presumably being displayed. A source of "*" matches all prefixes.

If this is of concern, you can consider protective measures such as the following:

- Not accepting source values of "*" when downloading from file systems
- Not allowing recursive downloading from databases
- Automatically prepending the source value with a partial directory path or prefix string, such as a user name, to restrict the areas to which users have access

File Upload and Download JavaBean and Class Descriptions

This section describes attributes and methods of the file upload and download JavaBeans provided with OC4J: HttpUploadBean and HttpDownloadBean, respectively.

There is also brief discussion of DownloadServlet, provided with OC4J to perform the actual file downloading, and the class FileAccessException that is used by the file-access JavaBeans for exceptions relating to file uploads and downloads.

To comply with the JavaBean specification, the file upload and download JavaBeans provide no-argument constructors.

---

Note: To use the file upload and download JavaBeans, verify that the file ojsputil.jar is installed and in your classpath. This file is provided with OC4J.

---

The HttpUploadBean

The oracle.jsp.webutil.fileaccess.HttpUploadBean JavaBean provides numerous setter methods for specifying information used for the uploading. It also includes most corresponding getter methods. Once you have set all the required and appropriate attributes, use the upload() method to perform the upload. There is also a method to display the names of the files that were uploaded, typically so you can provide an informative message to the browser.

HttpUploadBean, as with HttpDownloadBean, extends HttpFileAccessBean, which itself is not intended for public use.

See "Overview of File Uploading" on page 8-1 for related information.
Summary of Required Attributes

The following list summarizes required attributes for HttpUploadBean:

- Always required: destination
- Also required for uploads to a database: destinationType, connection
- Also required for uploads to a database table other than the default fileaccess table: table, prefixColumn, fileNameColumn, dataColumn
- Also required for uploads to a database table using a CLOB column for file data: fileType

In addition, for an upload to a file system, you must call the setBaseDir() method to provide a servlet context and HTTP request object so that the bean can find the fileaccess.properties file that specifies the base directory.

Methods

Here are descriptions of the public methods of HttpUploadBean.

**Note:** Many of the attributes and setter methods for HttpUploadBean are the same as for HttpDownloadBean.

- **void upload(javax.servlet.http.HttpServletRequest req)**
  throws FileAccessException

  Once all required and appropriate bean attributes have been set, use this method for the upload. The req parameter is the HTTP request instance containing the multipart form-encoded files. For a JSP page, use the implicit request object.

  throws FileAccessException

  For an upload to a file system, use this method to determine what to use as a base directory. It gets this information from the fileaccess.properties file in your application /WEB-INF directory, which it finds through the servlet context input parameter. The baseDir setting, together with the destination setting, specifies the absolute path to the upload directory.

  The req parameter is the servlet request instance to use in requesting the base directory information. For JSP pages, use the implicit request object.

  This method is not relevant for database uploads.

- **void setDestination(String destination)**

  This method is always required.

  For an upload to a file system, destination and the base directory together specify the absolute path to the upload directory.

  For an upload to a database, destination is used as the file prefix. (There is no "base directory"). The prefix is equivalent to a file system path and can be used to group files into a hierarchy. It is permissible to include separator characters such as "." and "/" in the destination string.

  **Note:** Typically, the destination value will be based at least partially on user input.
■ void setDestinationType(String destinationType)  
  throws FileAccessException  

■ void setDestinationType(int destinationType)  
  throws FileAccessException  

Use the overloaded setDestinationType() method to specify whether the upload is to a file system or a database.

To upload to a database, set destinationType to one of the following: the string "database", the defined String constant FileAccessUtil.DATABASE, the int value 1, or the defined int constant FileAccessUtil.LOCATION_TYPE_DATABASE.

Uploading to a file system is the default, but if you want to specify this explicitly, set destinationType to one of the following: the string "filesystem", the defined String constant FileAccessUtil.FILESYSTEM, the int value 0, or the defined int constant FileAccessUtil.LOCATION_TYPE_FILESYSTEM.

FileAccessUtil is in the oracle.jsp.webutil.fileaccess package.

■ String getDestinationType()  

Retrieve the destination information. Note there is a getter method for the string version only.

■ void setOverwrite(String overwrite)  
  throws FileAccessException  

■ void setOverwrite(boolean overwrite)  

Use the overloaded setOverwrite() method to overwrite existing files or update rows with the same file name and prefix. This is relevant for both file system and database uploads.

Overwriting is enabled by default, but you can enable it explicitly with an overwrite setting of the string "true" or the boolean value true. Disable overwriting with a setting of the string "false" or the boolean value false. String settings are case-insensitive. No settings are accepted other than those listed here.

■ void setFileType(String fileType)  
  throws FileAccessException  

■ void setFileType(int fileType) throws FileAccessException  

For an upload to a database, use the overloaded setFileType() method to specify whether the data is to be stored in a BLOB for binary data (the default) or a CLOB for character data. For a CLOB, set fileType to one of the following: the string "character", the defined String constant FileAccessUtil.CHARACTER_FILE, or the int value 1. To explicitly specify a BLOB, set fileType to one of the following: the string "binary", the defined String constant FileAccessUtil.BINARY_FILE, or the int value 0. String settings are case-insensitive. No settings are accepted other than those listed here.

FileAccessUtil is in the oracle.jsp.webutil.fileaccess package.

■ String getFileType()  

Retrieve the file type information. Note there is a getter method for the string version only.

■ void setTable(String tableName)
For an upload to a database table other than the default fileaccess table, use this method to specify the table name.

- **String getTable()**
  
  Retrieve the table name.

- **void setPrefixColumn(String prefixColumnName)**
  
  For an upload to a database table other than the default fileaccess table, use this method to specify the name of the column containing the file prefix. (In fileaccess, this column name is fileprefix.) The destination value will be written into this column.

- **String getPrefixColumn()**
  
  Retrieve the name of the column containing the file prefix.

- **void setFileNameColumn(String fileNameColumnName)**
  
  For an upload to a database table other than the default fileaccess table, use this method to specify the name of the column containing the file name. (In fileaccess, this column name is filename.) File names will include any file name extensions.

- **String getFileNameColumn()**
  
  Retrieve the name of the column containing the file name.

- **void setDataColumn(String dataColumnName)**
  
  For an upload to a database table other than the default fileaccess table, use this method to specify the name of the BLOB or CLOB column containing the file contents. (In fileaccess, this column name is data.)

- **String getDataColumn()**
  
  Retrieve the name of the column containing the file contents.

- **void setConnection(ConnBean conn)**

- **void setConnection(java.sql.Connection conn)**
  
  For an upload to a database table (default table or otherwise), use this overloaded method to provide a database connection. You can provide an instance of either oracle.jsp.dbutil.ConnBean or the standard java.sql.Connection type. For information about the ConnBean JavaBean, see "ConnBean for a Database Connection" on page 4-2.

  If you use a Connection instance, you must explicitly open and close it. For a ConnBean instance, this is handled automatically.

- **java.util.Enumeration getFileNames()**

  This method returns an Enumeration instance containing the names of the files that were uploaded. (This functionality is not available through the httpUpload tag.)

**Example:** This example uses a plain HTML form to specify a file to upload to a file system, then uses a JSP page that employs HttpUploadBean for the upload.

Here is the HTML form, which specifies beanUploadExample.jsp for its action and will generate the multipart upload stream.
<html><body><form action="beanUploadExample.jsp" ENCTYPE="multipart/form-data" method=POST>
<br> File to upload: <INPUT TYPE="FILE" NAME="File" SIZE="50" MAXLENGTH="120" >
<br><INPUT TYPE="SUBMIT" NAME="Submit" VALUE="Send"> </form></body></html>

And here is the beanUploadExample.jsp page.

```html
<%@ page language="java"
    import="java.util.*, oracle.jsp.webutil.fileaccess.*" %>
<html><body>

%% String userdir = 'fileaccess'; %> // user's part of the upload directory
<jsp:useBean id="upbean"
    class="oracle.jsp.webutil.fileaccess.HttpUploadBean" >
<jsp:setProperty name="upbean" property="destination"
    value="<%= userdir %>' />
</jsp:useBean>

%% upbean.setBaseDir(application, request);
upbean.upload(request);
Enumeration fileNames = upbean.getFileNames();
while (fileNames.hasMoreElements()) { %>
<br><%= (String)fileNames.nextElement() %>
%}
<br>Done!
</body></html>

The HttpDownloadBean

The oracle.jsp.webutil.fileaccess.HttpDownloadBean JavaBean provides numerous setter methods for specifying information used for downloading. It also includes most corresponding getter methods. Once you have set all the required and appropriate attributes, use the listFiles() method to list the files available for download. The actual downloading is accomplished through DownloadServlet, supplied with OC4J, one file at a time. See "The Download Servlet" on page 8-12.

Note: You must construct the URL for DownloadServlet in your application code.

HttpDownloadBean, as with HttpUploadBean, extends HttpFileAccessBean, which itself is not intended for public use.

See "Overview of File Uploading" on page 8-1 for related information.

Summary of Required Attributes

The following list summarizes required attributes for HttpDownloadBean:

- Always required: source
- Also required for uploads to a database: sourceType, connection
- Also required for downloads from a database table other than the default fileaccess table: table, prefixColumn, fileNameColumn, dataColumn
Also required for downloads from a database table using a CLOB column for file data: fileType

In addition, for a download from a file system, you must call the setBaseDir() method to provide a servlet context and HTTP request object so that the bean can find the fileaccess.properties file that specifies the base directory.

**Methods**

Here are descriptions of the public methods of HttpDownloadBean.

**Note:** Many of the attributes and setter methods for HttpDownloadBean are the same as for HttpUploadBean.

- **void listFiles(javax.servlet.http.HttpServletRequest req)**
  throws FileAccessException

Once all required and appropriate bean attributes have been set, use this method to list the files available for download. These are files in the source directory or matching the source database prefix. The req parameter is the HTTP response instance. For a JSP page, use the implicit request object.

For use from the file list, you can create HREF links to DownloadServlet, passing it each file and file prefix, allowing users to select the link for each file they want to download.

**Note:** The listFiles() method writes the file names to memory and to the JSP page or servlet. If you later want to access the file names again, use the getFileNames() method to read them from memory.

- **java.util.Enumeration getFileNames()**

This method returns an Enumeration instance containing the names of the files that are available for download. It requires that the listFiles() method was already called. The listFiles() method writes the file names to memory and to the JSP page or servlet. The getFileNames() method reads them from memory.

  throws FileAccessException

For a download from a file system, use this method to determine what to use as the base directory. It gets this information from the fileaccess.properties file in your application /WEB-INF directory, which it finds through the servlet context input parameter. The baseDir setting, together with the source setting, specifies the absolute path to the directory from which files will be downloaded.

The sc parameter is the servlet context instance for the application. For JSP pages, use the implicit application object.

The req parameter is for the HTTP request instance to use in requesting the base directory information. For JSP pages, use the implicit request object.

A base directory is not relevant for downloads from a database.

- **void setSource(String source)**

This is always required.
For a download from a file system, source and the base directory together specify the absolute path to the directory from which files will be downloaded. If source is set to "*", then all directories under the base directory will be available for downloading.

For a download from a database, source is used as the file prefix. (The base directory is not relevant.) The prefix is equivalent to a file system path and can be used to group files into a hierarchy. If recursive downloading is enabled (through the setRecurse() method), "%" will be appended onto the source value, and the WHERE clause for the query will contain an appropriate LIKE clause. Therefore, all files with prefixes that are partially matched by the source value will be available for download. If you want to match all rows in the database table, set source to "*".

---

**Note:** Typically, the source value will be based at least partially on user input.

- void setSourceType(String sourceType)
  throws FileAccessException

- void setSourceType(int sourceType)
  throws FileAccessException

Use the overloaded setSourceType() method to specify whether the download is from a file system or a database.

To download from a database, set sourceType to one of the following: the string "database", the defined String constant FileAccessUtil.DATABASE, the int value 1, or the defined int constant FileAccessUtil.LOCATION_TYPE_DATABASE.

Downloading from a file system is the default, but if you want to specify this explicitly, set sourceType to one of the following: the string "filesystem", the defined String constant FileAccessUtil.FILESYSTEM, the int value 0, or the defined int constant FileAccessUtil.LOCATION_TYPE_FILESYSTEM.

FileAccessUtil is in the oracle.jsp.webutil.fileaccess package.

- String getSourceType()

Retrieve the source type information. Note there is a getter method for the string version only.

- void setRecurse(String recurse) throws FileAccessException

- void setRecurse(boolean recurse)

Use the overloaded setRecurse() method to enable or disable recursive downloading functionality, where files in file system subdirectories or with additional database prefix information will also be listed as available for downloading. As an example of this functionality from a database, assume source is set to "/user". Recursiveness would also find matches for files with prefixes such as "/user/bill" and "/user/mary", and also such as "/user1", "/user2", "/user1/tom", and "/user2/susan".

Recursiveness is enabled by default, but you can enable it explicitly with a recurse setting of the string "true" or the boolean true. Disable the recursive functionality with a setting of the string "false" or the boolean false. String settings are case-insensitive. No settings are accepted other than those listed here.
void setFileType(String fileType) throws FileAccessException

void setFileType(int fileType) throws FileAccessException

For a download from a database, use the overloaded setFileType() method to specify whether the data is stored in a BLOB for binary data (the default) or a CLOB for character data. For a CLOB, set fileType to one of the following: the string "character", the defined String constant FileAccessUtil.CHARACTER_FILE, or the int value 1. To explicitly specify a BLOB, set fileType to one of the following: the string "binary", the defined String constant FileAccessUtil.BINARY_FILE, or the int value 0. String settings are case-insensitive. No settings are accepted other than those listed here. FileAccessUtil is in the oracle.jsp.webutil.fileaccess package.

String getFileType()

Retrieve the file type information. Note there is a getter method for the string version only.

void setTable(String tableName)

For a download from a database table other than the default fileaccess table, use this method to specify the table name.

String getTable()

Retrieve the table name.

void setPrefixColumn(String prefixColumnName)

For a download from a database table other than the default fileaccess table, use this method to specify the name of the column containing the file prefix. (In fileaccess, this column name is fileprefix.)

String getPrefixColumn()

Retrieve the name of the column containing the file prefix.

void setFileNameColumn(String fileNameColumnName)

For a download from a database table other than the default fileaccess table, use this method to specify the name of the column containing the file name. (In fileaccess, this column name is filename.) The file name includes any file name extension.

String getFileNameColumn()

Retrieve the name of the column containing the file name.

void setDataColumn(String dataColumnName)

For a download from a database table other than the default fileaccess table, use this method to specify the name of the BLOB or CLOB column that holds the file contents. (In fileaccess, this column name is data.)

String getDataColumn()

Retrieve the name of the column containing the file contents.

void setConnection(ConnBean conn)

void setConnection(java.sql.Connection conn)

For a download from a database table (default table or otherwise), use this method to provide a database connection. You can provide an instance of either
 oracle.jsp.dbutil.ConnBean or the standard java.sql.Connection type. For information about the ConnBean JavaBean, see "ConnBean for a Database Connection" on page 4-2.

If you use a Connection instance, you must explicitly open and close it. For a ConnBean instance, this is handled automatically.

Example This example is a JSP page that uses HttpDownloadBean for a download from a file system. Note that the page must construct the URL for the download servlet.

```html
<%@ page language="java" import="java.util.*, oracle.jsp.webutil.fileaccess.*" %>
<html><body>
<% String servletPath = "/servlet/download/"; // path to the download servlet  
    String userDir = "fileaccess/"; // user part of download directory  
%>
<jsp:useBean id="dbean"  
    class="oracle.jsp.webutil.access.HttpDownloadBean" >
    <jsp:setProperty name="dbean" property="source" value='<%=userDir %>' />  
</jsp:useBean>
<%    dbean.setBaseDir(application, request);  
    dbean.listFiles(request); %>
The following files were found:
<%    Enumeration fileNames = dbean.getFileNames();  
    while (fileNames.hasMoreElements()) {  
        String name = (String)fileNames.nextElement();  
        <a href="<%= servletPath + name %>"> <%= name %></a>  
    } %>
<br>Done!
</body></html>

The Download Servlet
To use download functionality, through either HttpDownloadBean or the httpDownload tag, you must have the class oracle.jsp.webutil.fileaccess.DownloadServlet available in your Web server. Its mapping in your Web server must be reflected in your servlet path settings, either through the servletPath attribute if you use the httpDownload tag, or in your application code if you use HttpDownloadBean.

FileAccessException Class
The oracle.jsp.webutil.fileaccess.FileAccessException class is a convenience class supplied with OC4J for file-access exception-handling. It wraps the functionality of the standard java.sql.SQLException and java.io.IOException classes. It handles exceptions from either of the file-access beans in addition to handling SQL and I/O exceptions.

File Upload and Download Tag Descriptions
For file uploading, OC4J supplies the httpUpload tag. This tag, in turn, uses HttpUploadBean. For convenience, you can also use the httpUploadForm tag in programming the form through which users specify the files to upload, or you can code the form manually.

For file downloading, OC4J provides the custom httpDownload tag. This tag uses HttpDownloadBean. This section describes these tags and their attributes.

Note the following requirements for the file upload and download tags:
- Verify that the file ojsputil.jar is installed and in your classpath. This file is provided with OC4J, in the "well-known" tag library directory.

- The tag library descriptor, fileaccess.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for fileaccess.tld is the following:
  
  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/fileaccess.tld

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

---

**Notes:**

- The prefix "fileaccess:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your taglib directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

---

**The httpUploadForm Tag**

For convenience, you can use the httpUploadForm tag to create a form in your application, using multipart encoded form data, that allows users to specify the files to upload.

**Syntax**

```xml
<fileaccess:httpUploadForm formsAction = "action"
  [ maxFiles = "max_number" ]
  [ fileNameSize = "file_input_box_num_chars" ]
  [ maxFileNameSize = "max_file_name_num_chars" ]
  [ includeNumbers = "true" | "false" ]
  [ submitButtonText = "button_label_text" ] />
```

**Note:** The httpUploadForm tag can optionally use a body. For example, the body might consist of a user prompt.

---

**Attributes**

- formsAction (required): This is to indicate the action that will be performed after the form is submitted. For example, formsAction could be the name of a JSP page that uses HttpUploadBean or the httpUpload tag.

- maxFiles: Use this if you want to specify the number of input lines you want to appear in the form. The default is 1.

- fileNameSize: Use this if you want to specify the character-width of the file name input box (or boxes). The default is 20 characters.

- maxFileNameSize: Use this if you want to specify the maximum number of characters allowed in a file name. The default is 80 characters.

- includeNumbers: Set this to "true" if you want the file name input boxes to be numbered. The default setting is "false".
submitButtonText: Use this if you want to specify the text that appears on the "submit" button of the form. The default is "Send".

The httpUpload Tag
This tag wraps the functionality of the HttpUploadBean JavaBean, paralleling its attributes. See "Overview of File Uploading" on page 8-1 and "The HttpUploadBean" on page 8-4 for related information.

Syntax
<fileaccess:httpUpload destination = "dir_path_or_prefix"
[ destinationType = "filesystem" | "database" ]
[ connId = "id" ]
[ scope = "request" | "page" | "session" | "application" ]
[ overwrite = "true" | "false" ]
[ fileType = "character" | "binary" ]
[ table = "table_name" ]
[ prefixColumn = "column_name" ]
[ fileNameColumn = "column_name" ]
[ dataColumn = "column_name" ] />

Attributes
- **destination** (required): For uploading to a file system, this indicates the path, beneath the base directory supplied in the /WEB-INF/fileaccess.properties file, of the directory into which files will be uploaded. For uploading to a database, destination indicates the file prefix, conceptually equivalent to a file system path.

  **Note:** For uploads to a file system, the base directory is automatically retrievable by the tag handler from the JSP page context.

- **destinationType**: Set this to "database" for uploading to a database. The default is to upload to a file system, but you can also explicitly set it to "filesystem". These values are case-insensitive.

- **connId**: For uploading to a database, use this attribute to provide a ConnBean connection ID for the database connection to be used. Or, alternatively, use the httpUpload tag inside a dbOpen tag to implicitly use the dbOpen connection. For information about the ConnBean JavaBean and dbOpen tag provided with OC4J, see Chapter 4, "Data-Access JavaBeans and Tags".

- **scope**: For uploading to a database, use this attribute to specify the scope of the ConnBean instance for the connection. The scope setting here must match the scope setting when the ConnBean instance was created, such as in a dbOpen tag. If the httpUpload tag is nested inside a dbOpen tag, then there is no need to specify connId or scope. In this case, information will be taken from the dbOpen tag. Otherwise, the default scope setting is "page".

- **overwrite**: Set this to "false" if you do not want to overwrite existing files that have the same paths and names as the files you are uploading, or if you do not
want to update rows with the same file name and prefix for database uploading. In this case, an error will be generated if a file already exists. By default, overwrite is set to "true" and httpUpload overwrites files.

- **fileType**: For uploading to a database, set this attribute to "character" for character data, which will be written into a CLOB. The default setting is "binary" for binary data, which will be written into a BLOB.

- **table**: For uploading to a database table other than the default fileaccess table, use this attribute to specify the table name.

- **prefixColumn**: For uploading to a database table other than the default fileaccess table, use this attribute to specify the name of the column containing file prefixes. This column is where the destination values will be written.

- **fileNameColumn**: For uploading to a database table other than the default fileaccess table, use this attribute to specify the name of the column containing file names.

- **dataColumn**: For uploading to a database table other than the default fileaccess table, use this attribute to specify the name of the column containing file contents.

**Example**

This example has a page that uses the httpUploadForm tag to create the HTML form for specifying files to upload. The httpUploadForm tag specifies httpUploadExample.jsp as its forms action. The httpUploadExample.jsp page uses the httpUpload tag to upload to the default fileaccess table in a database.

Here is the page for the HTML form:

```html
<%@ page language="java" import="java.io.*" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/fileaccess.tld" prefix="upload" %>
<html> <body>
<fileaccess:httpUploadForm
    formsAction="httpUploadExample.jsp"
    maxFiles='<%= request.getParameter("MaxFiles") %>'
    includeNumbers="true" fileNameSize="50" maxFileNameSize="120"
    >
    <br> File: </fileaccess:httpUploadForm>
</body> </html>
```

And following is the httpUploadExample.jsp page. Note that the httpUpload tag gets its database connection as a result of being inside a dbOpen tag. Also note that useDataSource.jsp is used to obtain the connection, if necessary. See "useDataSource.jsp" on page 5-8.

```html
<%@ page language="java" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/fileaccess.tld" prefix="upload" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/sqltaglib.tld" prefix="sql" %>
<%! String dataSrcStr=request.getParameter("dataSrcStr"); // get conn string
    if (dataSrcStr==null) { dataSrcStr=(String)session.getValue("dataSrcStr"); } else { session.putValue("dataSrcStr",dataSrcStr); }%
    <sql:dbOpen dataSource="<%= dataSrcStr %>">
    <fileaccess:httpUpload destinationType = "database" />
</sql:dbOpen>
```
The httpDownload Tag

This tag wraps the functionality of the HttpDownloadBean JavaBean, paralleling its attributes. See "Overview of File Downloading" on page 8-3 and "The HttpDownloadBean" on page 8-8 for related information.

Syntax

```xml
<fileaccess:httpDownload servletPath = "path"
    source = "dir_path_or_prefix"
    [ sourceType = "filesystem" | "database" ]
    [ connId = 'id' ]
    [ scope = 'request' | 'page' | 'session' | 'application' ]
    [ recurse = "true" | "false" ]
    [ fileType = "character" | "binary" ]
    [ table = 'table_name' ]
    [ prefixColumn = 'column_name' ]
    [ fileNameColumn = 'column_name' ]
    [ dataColumn = 'column_name' ] />
```

Notes:

- The httpDownload tag can optionally use a body. For example, the body might consist of a user prompt.
- For downloads from a file system, the base directory is automatically retrievable by the tag handler from the JSP page context.

Attributes

- `servletPath` (required): This is the path to the Oracle DownloadServlet, which executes the actual download of each file. For example, if DownloadServlet has been installed in the application app and mapped to the name download, then use "/app/download/", with leading and trailing slashes, as the servletPath setting. The httpDownload tag handler uses this path in constructing the URL to DownloadServlet.

  See "The Download Servlet" on page 8-12 for more information about this servlet.

- `source` (required): For downloading from a file system, this attribute indicates the path, beneath the base directory supplied in the file /WEB-INF/fileaccess.properties, of the directory from which files are retrieved. A value of "*" results in all directories under the base directory being available.

  For downloading from a database, this attribute indicates the file prefix, conceptually equivalent to a file system path. If recursive downloading is enabled (through the `recurse` attribute), "%" will be appended onto the `source` value,
and the WHERE clause for the query will contain an appropriate LIKE clause. Therefore, all files with prefixes that are partially matched by the source value will be available for download. If you want to match all rows in the database table, set source to "*".

---

**Note:** Typically, the source value is based at least partially on user input.

---

- **sourceType:** Set this to "database" for downloading from a database. The default is to download from a file system, or you can explicitly set this to "filesystem".

- **connId:** For downloading from a database, use this attribute to provide a ConnBean connection ID for the database connection to be used. Or, alternatively, you can use the httpDownload tag inside a dbOpen tag to implicitly use the dbOpen connection. For information about the ConnBean JavaBean and dbOpen tag provided with OC4J, see Chapter 4, "Data-Access JavaBeans and Tags".

- **scope:** For downloading from a database, use this attribute to specify the scope of the ConnBean instance for the connection. The scope setting here must match the scope setting when the ConnBean instance was created, such as in a dbOpen tag. If the httpDownload tag is nested inside a dbOpen tag, then there is no need to specify connId or scope. In this case, information will be taken from the dbOpen tag. Otherwise, the default scope setting is "page".

- **recurse:** Set this to "false" if you do not want recursive downloading functionality, where files in file system subdirectories or with additional database prefix information will also be listed as available for download. As an example of this functionality from a database, assume you have set source to "/user". Recursiveness would also find matches for files with prefixes such as "/user/bill" and "/user/mary", and also such as "/user1","/user2", "/user1/tom", and "/user2/susan". The default mode is recursiveness, or you can enable it explicitly with a setting of "true".

- **fileType:** For downloading from a database, set this attribute to "character" for character data, which will be retrieved from a CLOB. The default setting is "binary" for binary data, which will be retrieved from a BLOB.

- **table:** For downloading from a database table other than the default fileaccess table, use this attribute to specify the table name.

- **prefixColumn:** For downloading from a database table other than the default fileaccess table, use this attribute to specify the name of the column containing file prefixes, which is where source values are stored.

- **fileNameColumn:** For downloading from a database table other than the default fileaccess table, use this attribute to specify the name of the column containing file names. File names include any file name extensions.

- **dataColumn:** For downloading from a database table other than the default fileaccess table, use this attribute to specify the name of the column that stores the file contents.

**Example** This example is a JSP page that uses the httpDownload tag to download from the default fileaccess table of a database. The tag body content ("<br>:\") will be output before each file name in the list of files available for download. Note that you must specify the DownloadServlet servlet path in the httpDownload tag. The
Mail JavaBean and Tag

It is often useful to send e-mail messages from a Web application, based on Web site status or user actions, for example. Sun Microsystems has specified a platform-independent and protocol-independent framework for this through its javax.mail package and subpackages, known as the JavaMail API.

For further convenience, Oracle supplies a JavaBean and JSP custom tag based on the JavaMail API to use in providing e-mail functionality through your servlets or JSP pages. The bean and tag, as with other JavaBeans and custom tags supplied with OC4J, are implemented according to JSP and servlet standards.

The following sections describe the mail JavaBean and tag:

- General Considerations for the Mail JavaBean and Tag
- Mail Attachments
- SendMailBean Description
- The sendMail Tag Description

For more information about the JavaMail API, refer to the following Sun Microsystems Web site:

http://java.sun.com/products/javamail/1.2/docs/javadocs/index.html

General Considerations for the Mail JavaBean and Tag

Be aware of the following points, which apply to use of either the mail JavaBean (SendMailBean) or the mail tag (sendMail):

tag handler will use it in constructing the URL to DownloadServlet, which performs the actual downloading.

```jsp
<%@ page language="java" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/fileaccess.tld"
    prefix="download" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/sqltaglib.tld"
    prefix="sql" %>
<% String dataSrcStr=request.getParameter("dataSrcStr");
    if (dataSrcStr==null) { dataSrcStr=(String)session.getValue("dataSrcStr");}
    else { session.putValue("dataSrcStr",dataSrcStr);}
    if (dataSrcStr==null) {
        <jsp:forward page="useDataSource.jsp" />
    } %>
<% } %>
<br>Done!
</html>
```

---

**Note**: For the dbOpen tag in this example, assume that the data source specifies the user name and password as well as the URI.
The files \texttt{mail.jar}, containing the JavaMail packages, and \texttt{jaf.jar}, for the JavaBeans Activation Framework, must be in your classpath for mail functionality. These files are provided with OC4J.

To enable support for attachments, the file \texttt{sendmail.properties} must exist, with an appropriate setting, in the application /WEB-INF directory. See \"Enabling Attachments\", which follows shortly.

There is no particular limit to the size of an e-mail message, other than limits of the JVM, system memory, or mail server.

Setting up default mail sessions is specific to the particular Web server. The current implementations of the mail bean and tag do not support automatic use of the default mail session. As an alternative, you can write your own code to obtain the default mail session if one exists for your platform, and to make the session available to the mail bean or tag.

### Mail Attachments

The mail bean and tag support the sending of attachments with e-mail messages. (This support was introduced in the OC4J 9.0.3 implementation.) There are three modes of operation:

- No support for attachments
- Support for attaching one or more files that are on the OC4J server machine, known as \textit{server-side attachments}
- Support for attaching one file that is on the client machine, known as a \textit{client-side attachment}

For a client-side attachment, the file is automatically uploaded to the server machine as part of the process. Multiple client-side attachments are not supported.

### Enabling Attachments

Whether attachments are enabled, and which kind of attachments, is determined by a \texttt{sendmail.properties} file in the application /WEB-INF directory. A file with the following content disables attachments:

\begin{verbatim}
## email attachment permissions
sendmail.attachment=none
\end{verbatim}

You must create this file in /WEB-INF and update it appropriately for any OC4J instance that will use mail attachments.

Any single application can support server-side attachments or client-side attachments, but not both.

To enable server-side attachments, change the setting to \texttt{server}, as follows:

\begin{verbatim}
sendmail.attachment=server
\end{verbatim}

To enable client-side attachments, change the setting to \texttt{client}:

\begin{verbatim}
sendmail.attachment=client
\end{verbatim}

Having multiple settings is an error condition.
**Sending Attachments**

For the mail tag, if server-side attachments are enabled, use the `serverAttachment` tag attribute if you want to specify one or more server-side files to attach to a message. If client-side attachments are enabled, use the `clientAttachment` tag attribute if you want to specify a client-side file to attach to a message (maximum of one file). See "The sendMail Tag Description" on page 8-24. Note that either one of the two attachment modes, but not both, can be supported for any single application.

For both the server attachment mode and the client attachment mode, the mail bean includes methods to specify or retrieve the name (or names) of the file (or files) to attach. See information about `setServerAttachment()`, `getServerAttachment()`, `setClientAttachment()`, and `getClientAttachment()` in "SendMailBean Method Descriptions" on page 8-21.

With either the mail tag or mail bean, a list of server-side files to attach can be either comma-delimited or semicolon-delimited, but not space-delimited (given that spaces are allowed in file names in some operating systems).

**Attachment Usage Notes**

Be aware of the following usage notes for mail attachments, applying to both the mail tag and mail bean.

- For a client-side file attachment, the file-access `httpUpload` tag is used behind the scenes. The file is uploaded to a temporary location on the OC4J server machine, then deleted once the message has been sent. Any limitations or requirements of the `httpUpload` tag apply to a client-side mail attachment as well. See "File Upload and Download Tag Descriptions" on page 8-12.

- Many e-mail servers have somewhat restrictive size limitations, often approximately 4 MB for any one attachment. The only restrictions for the mail tag or bean are according to disk or memory limitations of the server machine.

- If a problem is encountered with any attachment, the e-mail message is terminated.

- Path names are not exposed to the mail recipient in either the server attachment or client attachment mode. Only the file name itself is indicated.

- For server-side attachments, attaching multiple files of the same name (but obviously with different paths) is supported. How this is handled at the recipient end, regarding any possible file renaming to avoid conflict, is according to the mail client being used. Similarly, in either attachment mode, the mail client might rename a file if an attachment has the same name as an attachment to a previous message. This is all beyond the scope and control of the OC4J mail attachment feature.

- You cannot use wild-card characters for file names.

**SendMailBean Description**

The `oracle.jsp.webutil.email.SendMailBean` JavaBean is supplied with OC4J to support e-mail functionality from servlet or JSP applications. To use it in a JSP page, you can instantiate it through the standard `jsp:useBean` tag. (For JSP applications,
however, you would typically use the `sendMail` tag instead of SendMailBean. See "The `sendMail` Tag Description" on page 8-24.)

**SendMailBean Requirements**

To use SendMailBean, verify that the files ojsputil.jar, mail.jar, and activation.jar are installed and in your classpath. These files are supplied with OC4J.

When you use SendMailBean in your code, you must provide the following:

- **Message sender**
  
  Use the `setSender()` method to specify the sender.

- **Primary recipient (or recipients) of the message**
  
  Use the `setRecipient()` method to specify the primary recipient (or recipients).

- **Valid JavaMail session object (javax.mail.Session)**, either directly or indirectly
  
  There are three ways to supply a JavaMail session:
  
  - Use the `setHost()` method to specify a host system. In this case, a JavaMail session object will be created automatically.
  
  - Use the `setMailSession()` method to provide a JavaMail session object directly.
  
  - For JSP applications, use the `setSession()` method to specify the name of a JavaMail session object that already exists and is accessible through a "session string, javax.mail.Session object" pair in the JSP page context. In this case, you must supply the page context instance as an input parameter when you call the `sendMessage()` method to send the e-mail message.

All other SendMailBean attributes are optional.

**SendMailBean Method Descriptions**

This section lists and describes SendMailBean methods to send mail messages, close mail sessions, and set or get bean attributes.

---

**Note:** To comply with the JavaBean specification, SendMailBean has a no-argument constructor.

---

Here are the public SendMailBean methods:

- `void sendMessage()`

- `void sendMessage(javax.servlet.jsp.PageContext)`

  Use the `sendMessage()` method to send the e-mail message.

  If you use the `setSession()` method to supply a JavaMail session, then you must use the `sendMessage(PageContext)` signature and provide the page context instance that holds the specified mail session instance.

  If you use the `setMailSession()` or `setHost()` method to supply a JavaMail session, then you do not have to provide a page context in using the `sendMessage()` method.
Also be aware, however, that specifying a page context instance might be relevant in determining the character set of an e-mail message with a "text" content type. If you provide no page context when invoking the `sendMessage()` method, then the default character set is ISO-8859-1. If you do provide a page context, then the default character set is that of the `response` object of the page context. Also note that you can specify the content type and character set directly through the `setContentType()` method.

- **void close()**
  
  Use this method if you want to release the resources of the JavaMail session instance from the `SendMailBean` instance. This method does not actually close the session.

- **void setBcc(String s)**
  
  Specify a space-delimited or comma-delimited list of any IDs (e-mail addresses or aliases) to receive blind copies of the message. These IDs will be suppressed from the message Cc field.

- **String getBcc()**
  
  Retrieve the list of IDs to receive blind copies of the message.

- **void setCc(String s)**
  
  Specify a space-delimited or comma-delimited list of any IDs (e-mail addresses or aliases) to receive copies of the message. These IDs will appear in the message Cc field.

- **String getCc()**
  
  Retrieve the list of IDs to receive copies of the message.

- **void setContent(String s)**
  
  Specify the contents of the e-mail message.

- **String getContent()**
  
  Retrieve the contents of the e-mail message.

- **void setContentEncoding(String s)**
  
  Specify the content encoding of the e-mail message. Specify "base64" or "B" for base64 encoding, "quoted-printable" or "Q" for quoted-printable encoding, "7bit" for seven-bit encoding, or "8bit" for eight-bit encoding. These content encodings are part of the JavaMail and RFC 2047 standards. Entries are case-insensitive.

  The default content encoding setting is "null", in which case the encoding of the message and headers will be determined by the content. If most characters to be encoded are in ASCII, then quoted-printable encoding will be used; otherwise, base64 encoding will be used.

- **String getContentEncoding()**
  
  Retrieve the content encoding of the message.

- **void setContentType(String s)**
  
  Specify the MIME type and optionally the character set of the message, such as in the following examples:

  ```java
  setContentType("text/html");
  ```
setContentType("text/html; charset=US-ASCII");

The default MIME type setting is "text/plain", but you cannot specify a
color set without explicitly specifying that or some other "text/xxxx" MIME
type setting.

The default character set depends on whether you provide a JSP page context
instance when you call the sendMessage() method to send the e-mail message.
If you provide no page context, then the default character set is ISO-8859-1. If
you do provide a page context, then the default character set is that of the
response object of the page context.

- String getContentType()
  Retrieve the MIME type (and character encoding, if applicable) of the message.

- void setHost(String s)
  One of the ways to supply a JavaMail session is to specify a mail server host name,
in which case SendMailBean will obtain a session automatically. Use the
setText() method for this purpose, providing a mail host name such as
"gmail.oraclecorp.com".
  See "SendMailBean Requirements" on page 8-21 for an overview of supplying the
JavaMail session.

- String getHost()
  Retrieve the specified mail server host name.

- void setMailSession(javax.mail.Session sessobj)
  One of the ways to supply a JavaMail session is to provide the session object
directly. Use the setMailSession() method for this purpose, providing a
javax.mail.Session instance.
  See "SendMailBean Requirements" on page 8-21 for an overview of supplying the
JavaMail session.

- javax.mail.Session getMailSession()
  This returns a JavaMail session that you had previously set.

- void setRecipient(String s)
  Specify a space-delimited or comma-delimited list of IDs (e-mail addresses or
aliases) of the primary recipients of the message. These IDs will appear in the To
field of the message. You must specify at least one recipient.

- String getRecipient()
  Retrieve the list of IDs of the primary recipients of the message.

- void setSender(String s)
  Specify the ID (e-mail address or alias) of the message sender. This ID will appear
in the From field of the message. You must specify the sender.

- String getSender()
  Retrieve the ID of the message sender.

- void setSession(String s)
  One of the ways to supply a JavaMail session is to provide the name of a
javax.mail.Session instance that already exists in the JSP page context object.
Use the `setSession()` method for this purpose, specifying the name of the session instance.

In this case, when you use the `sendMessage()` method to send the e-mail message, you must provide the `javax.servlet.jsp.PageContext` instance as input.

See “SendMailBean Requirements” on page 8-21 for an overview of supplying the JavaMail session.

- **String getSession()**
  Retrieve the name of the session instance.

- **void setSubject(String s)**
  Specify the subject line of the message.

- **String getSubject()**
  Retrieve the subject line of the message.

- **void setServerAttachment(String s)**
  Specify a comma-delimited or semicolon-delimited list of file names (including paths), for server-side files to attach to an e-mail message. These must be files on the OC4J server machine. Server-side attachments must be enabled in the `sendmail.properties` file.

- **String getServerAttachment()**
  Retrieve the file name list for server-side files to attach to the message. This might be useful in presenting a user confirmation page, for example.

- **void setClientAttachment(String s)**
  Specify the path and file name of the client-side file to attach to the e-mail message (maximum of one). This must be a file on the user's client machine. Client-side attachments must be enabled in the `sendmail.properties` file.

- **String getClientAttachment()**
  Retrieve the name of the client-side file to attach to the message. This might be useful in presenting a user confirmation page, for example.

---

**Note:** Regarding mail attachments, see “Mail Attachments” on page 8-19 for related information. Be aware that for any one application, you can use server-side attachments or client-side attachments but not both.

---

**The sendMail Tag Description**

As a convenience for JSP developers, OC4J supplies the `sendMail` tag to provide e-mail functionality for a JSP page. The following sections describe the tag:

- **The sendMail Tag Syntax**
- **The sendMail Tag Attribute Descriptions**
- **Sample Application for sendMail Tag**

Be aware of the following requirements for the `sendMail` tag:
Mail JavaBean and Tag

- Verify that the files ojsputil.jar, mail.jar, and activation.jar are installed and in your classpath. These files are supplied with OC4J; ojsputil.jar is in the "well-known" tag library directory.

- In the current implementation, the sendMail tag has its own tag library descriptor, email.tld. This must be available to the application, and any JSP page using the tag must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for email.tld is the following:

  http://xmlns.oracle.com/j2ee/jsp/ojsp/email.tld

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer's Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

The sendMail Tag Syntax

The sendMail tag has the following syntax:

```<mail:sendMail host = "SMTP_host_name" | session = "JavaMail_session_name"
  sender = "sender_address"
  recipient = "primary_recipient_IDS"
  [ cc = "cc_recipient_IDS" ]
  [ bcc = "bcc_recipient_IDS" ]
  [ subject = "subject_line" ]
  [ contentType = "MIME_type; [charset=charset]" ]
  [ contentEncoding = "B" | "base64" | "Q" | "quoted-printable" | "7bit" | "8bit" ]
  [ serverAttachment = "server_file_list" | clientAttachment = "client_file" ]
>...
E-mail body
...
</mail:sendMail>
```

sendMail Tag Usage Notes Be aware of the following when using the sendMail tag:

- The sender and recipient attributes are required, and either the host or session attribute is required.

- Multiple recipients, cc targets, or bcc targets are space-delimited or comma-delimited.

- Use of serverAttachment assumes server-side attachments are enabled in the sendmail.properties file. Similarly, use of clientAttachment assumes client-side attachments are enabled in sendmail.properties. Only one mode can be enabled for a single application. See "Enabling Attachments" on page 8-19.

- File names in the serverAttachment setting can be comma-delimited or semicolon-delimited, but not space-delimited.

- The e-mail body can contain JSP syntax, which will be processed by the JSP translator.

- Attributes used by the tag are typically input by the user in form fields. All attributes accept request-time expressions.

- The prefix "mail:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your taglib directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.
Mail JavaBean and Tag

The sendMail Tag Attribute Descriptions

The sendMail tag supports the following attributes:

- **host** (required if session is not specified): This is the appropriate mail host name, such as "gmail.oraclecorp.com". This is used in creating a JavaMail session object for the mail message. Alternatively, you can determine a JavaMail session through the session attribute.

- **session** (required if host is not specified): This is the name of an existing JavaMail session object that can be retrieved from the JSP page context. Alternatively, you can determine a JavaMail session through the host attribute.

- **sender** (required): This is the ID (e-mail address or alias) of the sender of the message. This ID will appear in the From field of the message.

- **recipient** (required): This is a space-delimited or comma-delimited list of IDs of the primary recipients of the message. These IDs will appear in the To field of the message.

- **cc**: This is a space-delimited or comma-delimited list of IDs to receive a copy of the message. These IDs will appear in the Cc field of the message.

- **bcc**: This is a space-delimited or comma-delimited list of IDs to receive a blind copy of the message. These IDs will be suppressed from the Cc field.

- **subject**: This is the subject line of the message.

- **contentType**: This is for the MIME type of the message, and optionally a character set as well, as in the following examples:

  - contentType="text/html"
  - contentType="text/html; charset=US-ASCII"

  The default MIME type setting is "text/plain", but you cannot specify a character set without explicitly specifying that or some other text/xxxx MIME type.

  The default character set is that of the response object of the JSP page context.

- **contentEncoding**: Specify "B" or "base64" for base64 encoding, "Q" or "quoted-printable" for quoted-printable encoding, "7bit" for seven-bit encoding, or "8bit" for eight-bit encoding. These are standard JavaMail and RFC 2047 encodings. Entries are case-insensitive.

  The default content encoding setting is "null", in which case the encoding of the message and headers will be determined by the content. If most characters to be encoded are in ASCII, then quoted-printable encoding will be used. Otherwise, base64 encoding will be used.

- **serverAttachment**: This is a comma-delimited or semicolon-delimited list of server-side files to attach to the e-mail message. Server-side attachments must be enabled in the sendmail.properties file.

  Here is an example:

  - serverAttachment="/tmp/confirm.pdf,/home/schedule.doc"

- **clientAttachment**: This is the name of a client-side file (maximum of one) to attach to the e-mail message. Client-side attachments must be enabled in the sendmail.properties file.

  Here is an example:
Sample Application for sendMail Tag

This sample application illustrates use of the sendMail tag with no attachments. During the first execution cycle through the page, before the user has specified the sender (or anything else), the HTML form is displayed for user input. During the next execution cycle through the page, after the user has sent the input, the sendMail tag is executed. This page also uses an error page, error.jsp (shown below), to display any exceptions that are thrown.

```jsp
<%@ page language="java" errorPage="error.jsp" %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/email.tld" prefix="mail" %>
<% if (request.getParameter("sender")==null) {
    <HTML>
    <HEAD><TITLE>SendMail Sample</TITLE></HEAD>
    <FORM METHOD=POST>
    <TABLE BORDER=0 CELLPACING=0 CELLPADDING=0 WIDTH="20%">
    <TR><TD>Host:</TD><TD><INPUT TYPE="text" name="host"></TD></TR>
    <TR><TD>From:</TD><TD><INPUT TYPE="text" name="sender"></TD></TR>
    <TR><TD>To:</TD><TD><INPUT TYPE="text" name="recipient"></TD></TR>
    <TR><TD>Cc:</TD><TD><INPUT TYPE="text" name="cc"></TD></TR>
    <TR><TD>Bcc:</TD><TD><INPUT TYPE="text" name="bcc"></TD></TR>
    <TR><TD>Subject:</TD><TD><INPUT TYPE="text" name="subject" VALUE="Hi"></TD></TR>
    </TABLE><br>
    <TEXTAREA name="body" ROWS=4 COLS=30>"How are you!"</TEXTAREA><br><br>
    <INPUT TYPE="submit" value="Send">
    </FORM>
    } else {
    <BODY BGCOLOR="#FFFFFF">
    <P>Result: <HR>
    <mail:sendMail host='<%=request.getParameter("host")%>'
        sender='<%=request.getParameter("sender")%>'
        recipient='<%=request.getParameter("recipient")%>'
        cc='<%=request.getParameter("cc")%>'
        bcc='<%=request.getParameter("bcc")%>'
        subject='<%=request.getParameter("subject")%>'
        ><%=request.getParameter("body")%>
    Sent out Successfully!</mail:sendMail>
    <HR>
    </BODY>
    }%>
    </HTML>
```

Note: Regarding e-mail attachments, see "Mail Attachments" on page 8-19 for related information. Be aware that for any one application, you can use server-side attachments or client-side attachments but not both.
Here is the error page, error.jsp:

```jsp
<%@ page language="java" isErrorPage="true"%>
<HTML>
Error: <%= exception.getMessage() %>
</HTML>
```

When you run this application, you will initially see the default screen shown in Figure 8–1.

**Figure 8–1  Message with Default Input**

[Image of a message input form]

And Figure 8–2 shows user input for a message from brian.wright@oracle.com to blodney.treehut@oracle.com through the host gmail.oraclecorp.com.
Figure 8–2  Message with User Input
This chapter, consisting of the following sections, documents various OC4J utility features for JSP pages:

- JSP Event-Handling with JspScopeListener
- EJB Tags
- General Utility Tags

JSP Event-Handling with JspScopeListener

**Important:** JspScopeListener is deprecated in the OC4J 10.1.2 implementation and will be desupported in later implementations. Most of its functionality is available in standard features of J2EE 1.4 or higher.

In standard servlet and JSP technology, only session-based events are supported. Oracle extends this support to page-based, request-based, and application-based events through the JspScopeListener interface and JspScopeEvent class in the oracle.jsp.event package.

JspScopeEventListener functionality is documented in the following sections, concluding with examples:

- General Use of JspScopeListener
- Use of JspScopeListener in OC4J and Other Servlet 2.3 Environments
- Examples Using JspScopeListener

**General Use of JspScopeListener**

For Java objects in your application, implement the JspScopeListener interface in the appropriate class, then attach objects of that class to a JSP scope using tags such as jsp:useBean.

When the end of a scope is reached, objects that implement JspScopeListener and have been attached to the scope will be notified. The JSP container accomplishes this by sending a JspScopeEvent instance to such objects through the outOfScope() method specified in the JspScopeListener interface.

This event listener mechanism significantly benefits developers who want to always free object resources that are of page or request scope, regardless of error conditions.
It frees these developers from having to surround their page implementations with Java try/catch/finally blocks.

Properties of the JspScopeEvent object include the following:

- **Scope that is ending**, represented by one of the int constants PAGE_SCOPE, REQUEST_SCOPE, SESSION_SCOPE, or APPLICATION_SCOPE
  
  You can retrieve this scope with the following JspScopeEvent method:
  
  ```java
  public int getScope()
  ```

- **Container object** that is the repository for objects at this scope, one of the implicit objects page, request, session, or application
  
  This is the object that manages the relevant scope. You can retrieve this object with the following JspScopeEvent method:
  
  ```java
  public java.lang.Object getContainer()
  ```

- **Name of the object to which the notification pertains**
  
  This is the name of the instance of the class that implements JspScopeListener. The instance of this class is an attribute of either the page, request, session, or application object (as applicable), so this instance name is the attribute name.
  
  You can retrieve this name with the following JspScopeEvent method:
  
  ```java
  public String getName()
  ```

- **JSP implicit application object**
  
  You can retrieve this with the following JspScopeEvent method:
  
  ```java
  public ServletContext getApplication()
  ```

The JspScopeEvent class has a constructor as follows:

```java
public JspScopeEvent (ServletContext sc, Object container, String name, int scope)
```

**Use of JspScopeListener in OC4J and Other Servlet 2.3 Environments**

JspScopeListener uses different mechanisms to support the different scopes, though all are implemented according to servlet and JSP standards.

For pages running in an OC4J environment, there is also an OC4J-specific runtime implementation for page scope, for convenience.

These features are covered in the following sections:

- Requirements for JspScopeListener
- Runtime and Tag Implementations to Support Page Scope
- Servlet Filter Implementation to Support Request Scope
- Listener Class Implementation to Support Application Scope
- Integration with HttpSessionBindingListener to Support Session Scope

**Requirements for JspScopeListener**

The JspScopeListener implementation requires the following:
JSP Event-Handling with JspScopeListener

- The oracle.jsp.event.JspScopeListener interface and JspScopeEvent class, and the classes of the oracle.jsp.event.impl package, all of which are supplied in the ojsp.jar file
- A servlet 2.3 or higher environment (such as OC4J)

Runtime and Tag Implementations to Support Page Scope
For OC4J environments, there is support for page scope functionality through an Oracle-specific runtime implementation. Enable this by setting the JSP check_page_scope configuration parameter to true. The default is false, for performance reasons.

For portability to other environments, there is also an implementation to support page scope through a custom tag, checkPageScope. Put the appropriate code between the checkPageScope start-tag and end-tag. This tag, with no attributes, is defined as follows:

```html
<!-- The checkPageScope tag -->
<tag>
  <name>checkPageScope</name>
  <tagclass>oracle.jsp.jml.tagext.CheckPageScopeListenerTag</tagclass>
  <bodycontent>JSP</bodycontent>
  <info>
    To provide the notification logic for any JspScopeListener stored in page scope.
    This tag is not needed on OC4J.
  </info>
</tag>
```

Here is an example of its use:

```html
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/jml.tld" prefix="jml" %>
<jml:checkPageScope>
pagescope.jsp
<jsp:useBean id="tb" class="testpkg.TestData" />
<%
  checkPageScope tag will provide the notification logic for any
  JspScopeListener stored in page scope.
  This tag is not needed on OC4J.
  */
  // some more JSP / code here ...
%
<%= new java.util.Date() %>
</jml:checkPageScope>
```

**Note:** The checkPageScope tag is currently part of the Oracle JML tag library, which is included in the ojsputil.jar file and requires the jml.tld tag library descriptor file. An appropriate taglib directive is shown in the preceding example. See "Overview of the JSP Markup Language (JML) Tag Library" on page 3-1 for related information.

Servlet Filter Implementation to Support Request Scope
Objects of request scope are supported through a servlet filter. The filtering applies to any servlets matching a specified URL pattern.
For support of event-handling for request-scope objects, add an entry such as the following to the `web.xml` file for your application, or to `orion-web.xml` or `global-web-application.xml` as appropriate. To ensure proper operation of the `JspScopeListener` functionality, this setting must be after any other filter settings.

```xml
<filter>
  <filter-name>Request Filter</filter-name>
  <filter-class>oracle.jsp.event.impl.RequestScopeFilter</filter-class>
</filter>
<!-- Define filter mappings for the defined filters -->
<filter-mapping>
  <filter-name>Request Filter</filter-name>
  <url-pattern>/jsp/*</url-pattern>
</filter-mapping>
</filter>
```

---

**Note:** In this particular example, "/*jsp/*" is the URL pattern covered by the filter. Users can choose other patterns instead, such as "/*.jsp" or "/*".

---

### Listener Class Implementation to Support Application Scope

Objects with application scope are supported through a servlet context listener implementation class, in accordance with the servlet specification.

For support of event-handling for application-scope objects, add an entry such as the following to the `web.xml` file for your application. To ensure proper operation of the `JspScopeListener` functionality, this setting must be after any other listener settings.

```xml
<listener>
  <listener-class>oracle.jsp.event.impl.AppScopeListener</listener-class>
</listener>
```

For an application-scope object, in addition to notification upon the conclusion of the application and servlet context, there is notification when an attribute is replaced in the servlet context or removed from the servlet context. For example, the listener `outOfScope()` method of an application-scope object is called in either of the following circumstances, assuming a servlet context object `ctx`:

```java
ctx.setAttribute("name", "Smith");
...
ctx.setAttribute("name", "Jones");
```

or:

```java
ctx.setAttribute("name", "Smith");
...
ctx.removeAttribute("name");
```

---

**Note:** This functionality was not available prior to Oracle9iAS Release 2.

---
Integration with HttpSessionBindingListener to Support Session Scope

For session-scope objects, you can write a class that implements both the JspScopeListener interface and the standard javax.servlet.http.HttpSessionBindingListener interface. This would give you the flexibility of supporting instances of this class for other scopes as well. If instances would never be used outside of session scope, however, there is no need to implement JspScopeListener.

In the integration scenario, the valueUnbound() method, specified in the HttpSessionBindingListener interface, should call the outOfScope() method that is specified in the JspScopeListener interface.

Following is a basic example:

```java
import oracle.jsp.event.impl.*;
import javax.servlet.*;
import javax.servlet.http.*;

class SampleObj implements HttpSessionBindingListener,JspScopeListener
{
    public void valueBound(HttpSessionBindingEvent e)
    {
        System.out.println("The object implements the JspScopeListener also");
    }

    public void valueUnBound(HttpSessionBindingEvent e)
    {
        try
        {
            outOfScope(new JspScopeEvent(null,(Object)e.getSession(),
                e.getName(),javax.servlet.jsp.PageContext.SESSION_SCOPE));
        } catch (Throwable e) {}
        ..........
    }
    public void outOfScope(JspScopeEvent e)
    {(...)
    }
}
```

Examples Using JspScopeListener

This section provides two examples of JspScopeListener usage: a JSP page and accompanying JavaBean, then a servlet.

Example: JSP Page Using JspScopeListener

This example consists of a JavaBean, ScopeDispatcher, that implements the JspScopeListener interface, and a JSP page that uses ScopeDispatcher instances for request-scope and application-scope functionality.

bookcatalog.jsp The bookcatalog.jsp page allows users to search for a book in the catalog or insert a new book entry. The catalog is kept in a hashtable that is initially read from the local file stream.

At the end of a request, if a new book has been submitted: 1) the book is entered into the application-level catalog hashtable; 2) the book count increments.

At the end of execution of the application, the catalog hashtable is sent back to the local file stream, the number of newly inserted books is shown, and query results are displayed if there was a book search.
<%@ page import="java.util.*" %>
<%@ page import="java.io.*" %>
<%! static int newbookCount = 0; %>
<%! static Hashtable catalog; %>
<%! boolean bookAdded = false; %>
<html>
<head>
<title>BookStore Price catalog</title>
</head>
<body bgcolor="white">
<font size=5 color="red">
<table color="#FFFFCC" width="100%" border="1" cellspacing="0" cellpadding="0">
<tr>
<td>
<form action="bookcatalog.jsp">
<b>BookName</b>  
<input type="text" name="bookname">
<input type="submit" value="Get the Price">
</form>
</td>
<td>
<form action="bookcatalog.jsp">
<b>BookName</b>
<input type="text" name="new_book">
<br>
<b>Price</b>
<input type="text" name="price">
<input type="submit" value="Add to Catalog">
</form>
</td>
</tr>
</table>
</font>

<% String bookname = request.getParameter("bookname");
catalog = (Hashtable) application.getAttribute("pricelist");
if (catalog == null) {
    try{
        ObjectInputStream oin = new ObjectInputStream(new FileInputStream("bookcatalog.out"));
        Object obj =  oin.readObject();
        catalog = (Hashtable) obj;
        oin.close();
    } catch(Exception e) {
        catalog = new Hashtable();
    }
    application.setAttribute("pricelist",catalog);
}
if (bookname != null) {
    String price = (String) catalog.get(bookname.trim());
    if (price != null) {
        out.println("<h2>Book : " +bookname+ "</h2>Tea:<h2>P" +price +"</h2>);
    } else 
        out.println("<h2>Sory, the Book : " + bookname + " is not available in the catalog</h2>");
}
<%-- declare the event dispatchers --%>
<jsp:useBean id = "requestDispatcher"
class = "oracle.jsp.sample.event.ScopeDispatcher"
scope = "request" >
<jsp:setProperty name = "requestDispatcher" property = "page"
value = "<%= this %>*" />
<jsp:setProperty name = "requestDispatcher" property = "methodName"
value = "request_OnEnd" />
</jsp:useBean>

<jsp:useBean id = "appDispatcher"
class = "oracle.jsp.sample.event.ScopeDispatcher"
scope = "application" >
<jsp:setProperty name = "appDispatcher" property = "page"
value = "<%= this %>*" />
<jsp:setProperty name = "appDispatcher" property = "methodName"
value = "application_OnEnd" />
</jsp:useBean>

<%!
// request_OnEnd Event Handler
public void request_OnEnd(HttpServletRequest request) {
// acquire beans
    String newbook  = request.getParameter("new_book");
    bookAdded = false;
    if ((newbook != null) && (!newbook.equals("")))
    {
        catalog.put(newbook,request.getParameter("price");
        newbookCount++;
        bookAdded = true;
    }
}
%
%
 public void application_OnEnd(ServletContext application)
{
    try
    {
        ObjectOutputstream os = new ObjectOutputStream(
        new FileOutputStream("bookcatalog.out"));
        os.writeObject(catalog);
        os.flush();
        os.close();
    }
    catch (Exception e)
    {
    }
    %>

<%!
if (bookAdded)
out.println("<h2> The New book is been added in the catalog </h2>");
%>
<%-- Page implementation goes here --%>
<h2> Total number of books added is <%= newbookCount %></h2>
</font>
</body>
ScopeDispatcher.java

package oracle.jsp.sample.event;
import java.lang.reflect.*;
import oracle.jsp.event.*;

public class ScopeDispatcher extends Object implements JspScopeListener {
    private Object page;
    private String methodName;
    private Method method;

    public ScopeDispatcher() {
    }

    public Object getPage() {
        return page;
    }

    public void setPage(Object page) {
        this.page = page;
    }

    public String getMethodName() {
        return methodName;
    }

    public void setMethodName(String m) throws NoSuchMethodException,
        ClassNotFoundException {
        method = verifyMethod(m);
        methodName = m;
    }

    public void outOfScope(JspScopeEvent ae) {
        int scope = ae.getScope();
        if ((scope == javax.servlet.jsp.PageContext.REQUEST_SCOPE ||
            scope == javax.servlet.jsp.PageContext.APPLICATION_SCOPE)
            && method != null) {
            try {
                Object args[] = {ae.getContainer()};
                method.invoke(page, args);
            } catch (Exception e) {
                // catch all and continue
            }
        }
    }

    private Method verifyMethod(String m) throws NoSuchMethodException,
        ClassNotFoundException {
        if (page == null) throw new NoSuchMethodException("A page hasn't been set yet.");

        // Don't know whether this is a request or page handler so try one then
        // the other
        Class c = page.getClass();
        Class pTypes[] = {Class.forName("javax.servlet.ServletContext")};
        try {
            return c.getDeclaredMethod(m, pTypes);
        } catch (Exception e) {
            // catch all and continue
        }
    }
}
Example: Servlet Using JspScopeListener

This section contains a sample servlet that uses JspScopeListener functionality for a request-scope object. The nested class DBScopeObj implements the JspScopeListener interface.

```java
import java.io.IOException;
import java.io.PrintWriter;
import java.util.Enumeration;
import javax.servlet.
import javax.servlet.http.
import oracle.jsp.event.
import oracle.jsp.event.impl.

public class RequestScopeServlet extends HttpServlet {

    PrintWriter out;

    public void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
        out = response.getWriter();
        out.println("<html>);
        out.println("<body>;
        out.println("<head>;
        out.println("<title> RequestScopeServlet! </title>);
        out.println("</head>;
        response.setContentType("text/html");
        DBScopeObj aobj = new DBScopeObj();
        request.setAttribute("dbcon",aobj);
        request.setAttribute("name","scott");
        request.setAttribute("company","oracle");
        request.setAttribute("city","sanmateo");
        Enumeration en = request.getAttributeNames();
        out.println("<BR> Request Attributes : <BR> <BR> ");
        while (en.hasMoreElements()) {
            String key = (String)en.nextElement();
            Object value = request.getAttribute(key);
            out.println(key + " : " + value +"<BR>");
        }
        out.println("</body>;
        out.println("</html>;
    }
}

class DBScopeObj implements JspScopeListener
{
    public void initDBCConnection()
    {
        // can create a minimum number of predefined
        // DBCOnnections
    }
```
public void outOfScope(JspScopeEvent e)
{
    ServletContext ctx = e.getApplication();
    out.println
    ("<BR>*****************************************************
    out.println("<BR> JspScopeEvent <BR>");
    out.println("<BLINK>");
    out.println
    ("<BR> In outOfScope method for the Request Attribute <BR>");
    out.println("Name = " + e.getName() + "<BR>");
    out.println("</BLINK>" Resource >
    out.println(******************************************************************************<BR>");
    // logging in the context also
    ctx.log("*****************************************************
    ctx.log(" JspScopeEvent ");
    ctx.log(" In outOfScope method for the Request Attribute ");
    ctx.log("Name = " + e.getName());
    ctx.log("******************************************************************************" Resource >
    returnDBConnection();
}

public void returnDBConnection()
{
    //Can return the handle to the connection pool
}

EJB Tags

OC4J provides a custom tag library to simplify the use of Enterprise JavaBeans in JSP pages. The library includes tags to create a home instance, create an EJB instance, and iterate through a collection of EJBs.

The functionality of the OC4J EJB tags follows the J2EE specification. The tags allow you to instantiate EJ Bs by name, using configuration information in the web.xml file. One of the tags is a useBean tag, with functionality similar to that of the jsp:useBean tag for invoking a regular JavaBean.

The following sections document the tags, concluding with examples:

- EJB Tag Configuration
- EJB Tag Descriptions
- EJB Tag Examples

EJB Tag Configuration

Use an <ejb-ref> element in your application web.xml file for each EJB you will use, as in the following example:
The `<ejb-ref>` element and its subelements, or `<ejb-local-ref>` to use local interfaces, are used according to the servlet specification. Briefly, this is as follows:

- The `<ejb-ref-name>` subelement specifies a reference name that can be used by other components of a J2EE application to access this component. For example, this name could be used in a location value.
- The `<ejb-ref-type>` subelement specifies the category of EJB.
- The `<home>` subelement specifies the package and type of the EJB home interface. Alternatively, use the `<local-home>` subelement for EJB local interfaces.
- The `<remote>` subelement specifies the package and type of the EJB remote interface. Alternatively, use the `<local>` subelement for EJB local interfaces.

These values are reflected in attribute values of the EJB tags.

See the *Oracle Application Server Containers for J2EE Enterprise JavaBeans Developer’s Guide* for additional information about EJB development and configuration.

### EJB Tag Descriptions

This section provides syntax and attribute descriptions for the OC4J EJB tags. Be aware of the following requirements:

- Verify that the file `ojsputil.jar` is installed and in your classpath. This file is provided with OC4J, in the "well-known" tag library directory.
- The tag library descriptor, `ejbtaglib.tld`, must be available to the application, and any JSP page using the library must have an appropriate `taglib` directive. In an Oracle Application Server installation, the TLD is in `ojsputil.jar`. The `uri` value for `ejbtaglib.tld` is the following:

  `http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/ejbtaglib.tld`

You can refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide* for information about `taglib` directives, the well-known tag library directory, TLD files, and the meaning of `uri` values.

### Notes:

- The prefix "ejb:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your `taglib` directive.
- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

The following sections provide information about the EJB tags:

- EJB useHome Tag
- EJB useBean Tag
- EJB createBean Tag
**EJB iterate Tag**

When first creating an EJB instance, you will have to use a `useHome` tag to create a home interface instance. Then use the following as appropriate:

- To create a single EJB instance: a `useBean` tag, and either the `useBean` tag `value` attribute or a nested `createBean` tag
- To create a collection of EJB instances and iterate through them (more typical for entity beans): an `iterate` tag

After an EJB instance is created, it is placed in the appropriate scope object. You will need only a `useBean` tag to access it subsequently.

**EJB useHome Tag**

The `useHome` tag looks up the home interface for the EJB and creates an instance of it.

**Syntax**

```
<ejb:useHome id="home_instance_name"
  type="home_interface_type"
  location="home_lookup_name"
  [ local="true" | "false" ] />
```

This tag uses no body.

**Attributes**

- `id` (required): Specify a name for the home interface instance. This can be for either a local or remote home interface, depending on the setting of the `local` attribute. The instance is accessible from the start-tag to the end of the page.
- `type` (required): This is for the name (Java type) of the home interface.
- `location` (required): This is a JNDI name used to look up the home interface of the desired EJB within the application.
- `local`: Set this to "true" to use the local home interface. The default value is "false", to use the remote home interface. If `local="true"` for the `useHome` tag, this must also be the case for the `useBean` tag.

**Example**

```
<ejb:useHome id="aomHome" type="com.acme.atm.ejb.AccountOwnerManagerHome"
  location="java:comp/env/ejb/accountOwnerManager" />
```

**EJB useBean Tag**

Use the EJB `useBean` tag for instantiating and using the EJB. The `id`, `type`, and `scope` attributes are used as in a standard `jsp:useBean` tag that instantiates a regular JavaBean.

You can use one of two mechanisms when you first instantiate the EJB:

- The `value` attribute

or:

- A nested EJB `createBean` tag

When using a nested `createBean` tag, the EJB instance is implicitly returned into the `value` attribute of the parent `useBean` tag. Once the EJB is instantiated, `value`
attributes and nested createBean tags are unnecessary for subsequent useBean tags using the same EJB instance.

---

**Note:** See "EJB iterate Tag" on page 9-14 for how to use a collection of EJB instances.

---

**Syntax**

```xml
<ejb:useBean id = "EJB_instance_name" type = "EJB_class_name"
[ value = "<%=Object%>" ]
[ scope = "page" | "request" | "session" | "application" ]
[ local = "true" | "false" ] >
```

... nested createBean tag for first instantiation, if no value attribute ...

</ejb:useBean>

**Attributes**

- **id** (required): Specify an instance name for the EJB.
- **type** (required): Specify the class name for the EJB.
- **value**: When first instantiating the EJB, if you do not use a nested createBean tag, you can use the value attribute to return an EJBOBJECT instance to narrow. This is a mechanism for instantiating the EJB.
- **scope**: Specify the scope of the EJB instance. The default scope setting is "page".
- **local**: Set this to "true" to use the local home interface. The default value is "false", to use the remote home interface. If local="true" for the useBean tag, this must also be the case for the useHome tag.

---

**Note:** You cannot use local="true" if scope="session" in a distributable application.

---

**Example** This example shows the use of an EJB that has already been instantiated.

```xml
<ejb:useBean id="bean" type="com.acme.MyBean" scope="session" />
```

---

**EJB createBean Tag**

For first instantiating an EJB, if you do not use the value attribute of the EJB useBean tag, you must nest an EJB createBean tag within the useBean tag to do the work of creating the EJB instance. This will be an EJBOBJECT instance. The instance is implicitly returned into the value attribute of the parent useBean tag.

**Syntax**

```xml
<ejb:createBean instance = "<%=Object%>" />
```

This tag uses no body.

**Attributes**

- **instance** (required): This is to return the EJB, a created EJBOBJECT instance.
Example In this createBean tag, the create() method of the EJB home interface instance creates an instance of the EJB.

```xml
<ejb:useBean id="bean" type="com.acme.MyBean" scope="session">
    <ejb:createBean instance="<%=home.create()%>" />
</ejb:useBean>
```

EJB iterate Tag
Use this tag to iterate through a collection of EJB instances. This is more typical for entity beans, because standard finder methods for entity beans return collections.

In the start-tag, obtain the collection through finder results from the home interface. In the tag body, iterate through the collection as appropriate.

### Note:
See “EJB useBean Tag” on page 9-12 for how to use a single EJB instance.

Syntax

```xml
<ejb:iterate id="EJB_instance_name" 
    type = "EJB_class_name"
    collection = "<%=Collection%>">
[ max = "<%=Integer%>" ] >
... body ...
</ejb:iterate>
```

The body is evaluated once for each EJB in the collection.

**Attributes**
- **id** (required): This is an iterator variable, the EJB instance name for each iteration.
- **type** (required): This is the EJB class name.
- **collection** (required): This is to return the EJB collection.
- **max**: Optionally specify a maximum number of beans to iterate through.

Example

```xml
<ejb:iterate id="account" type="com.acme.atm.ejb.Account"
    collection="<%=accountManager.getOwnerAccounts()%>"
    max="100">
    <jsp:getProperty name="account" property="id" />
</ejb:iterate>
```

EJB Tag Examples

This section provides examples of EJB tag usage, one using a session bean and one using an entity bean.

**EJB Tag Session Bean Example**

This example relies on the following configuration in the application `web.xml` file:

```xml
<ejb-ref>
    <ejb-ref-name>ejb/DemoSession</ejb-ref-name>
    <ejb-ref-type>Session</ejb-ref-type>
</ejb-ref>
```
Here is the sample code:

```jsp
<%@ page import="ejbdemo." %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/ejbtaglib.tld" prefix="ejb" %>
<html>
<head> <title>Use EJB from JSP</title> </head>
<body>
<ejb:useHome id="home" type="ejbdemo.DemoSessionHome"
    location="java:comp/env/ejb/DemoSession" />
<ejb:useBean id="demo" type="ejbdemo.DemoSession" scope="session">
    <ejb:createBean instance="<%=home.create()%>" />
</ejb:useBean>
<heading2>      Enterprise Java Bean:  </heading2>
<p><b> My name is ":<%=demo.getName()%>". </b></p>
</body>
</html>
```

This sample code accomplishes the following:

- It creates the `home` instance of the EJB home interface. Note that the `type` value of the `useHome` tag matches the value of the `<home>` subelement of the `<ejb-ref>` element in the `web.xml` file. Also, the `location` value of `useHome` reflects the value of the `<ejb-ref-name>` subelement of the `<ejb-ref>` element.
- It uses the `home.create()` method to create the `demo` instance of the EJB. Note that the `type` value of the `useBean` tag matches the value of the `<remote>` subelement of the `<ejb-ref>` element in the `web.xml` file.
- It uses the `demo.getName()` method to print a user name.

**EJB Tag Entity Bean Example**

This example relies on the following configuration in the application `web.xml` file:

```xml
<ejb-ref>
    <ejb-ref-name>ejb/DemoEntity</ejb-ref-name>
    <ejb-ref-type>Entity</ejb-ref-type>
    <home>ejbdemo.DemoEntityHome</home>
    <remote>ejbdemo.DemoEntity</remote>
</ejb-ref>
```

Here is the sample code:

```jsp
<%@ page import="ejbdemo." %>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/ejbtaglib.tld" prefix="ejb" %>
<html>
<head> <title>Iterate over EJBs from JSP</title> </head>
<body>
<ejb:useHome id="home" type="ejbdemo.DemoEntityHome"
    location="java:comp/env/ejb/DemoEntity" />
<% int i=0; %>
<ejb:iterate id="demo" type="ejbdemo.DemoEntity"
    collection="<%=home.findAll()%>" max="3">
    <li> <heading2> Bean #<%=++i%>:  </heading2>
```

```
<b>My name is "<%=demo.getName()+"_"+demo.getId()%>". </b></li>
</ejb:iterate>
</body>
</html>

This sample code accomplishes the following:

- It creates the home instance of the EJB home interface. Note that the type value of the useHome tag matches the value of the <home> subelement of the <ejb-ref> element in the web.xml file. Also, the location value of useHome reflects the value of the <ejb-ref-name> subelement of the <ejb-ref> element.

- It uses the home.findAll() method to return a collection of EJBs. Note that the type value in the iterate tag matches the value of the <remote> subelement of the <ejb-ref> element in the web.xml file.

- It iterates through the collection, always using demo for the current instance, and using the demo.getName() and demo.getId() methods to output information from each EJB.

General Utility Tags

OC4J provides miscellaneous utility tags to perform a number of operations. The following sections contain details about the tags:

- Display Tags
- Miscellaneous Utility Tags

Note the following requirements for the utility tags:

- Verify that the file ojsputil.jar is installed and in your classpath. This file is provided with OC4J, in the "well-known" tag library directory.

- The tag library descriptor, utiltaglib.tld, must be available to the application, and any JSP page using the library must have an appropriate taglib directive. In an Oracle Application Server installation, the TLD is in ojsputil.jar. The uri value for utiltaglib.tld is the following:

  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/utiltaglib.tld

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

Notes:

- The prefix "util:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your taglib directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

Display Tags

The following sections document syntax and attributes of the display tags:

- Utility displayCurrency Tag
- Utility displayDate Tag
- **Utility displayNumber Tag**

**Utility displayCurrency Tag**
This tag displays a specified amount of money, formatted as currency appropriate for the locale. If no locale is specified, then the `request` object will be searched for a locale. If none is found there, the system default locale is used.

**Syntax**

```jsp
<util:displayCurrency amount = "<%=Double%>">
    [ locale = "<%=Locale%>" ]
</util:displayCurrency>
```

This tag uses no body.

**Attributes**
- **amount** (required): Specify the amount to format.
- **locale**: Optionally specify a locale, as a `java.util.Locale` instance.

**Example**

```jsp
<util:displayCurrency amount="<%=account.getBalance()%>"
    locale="<%=account.getLocale()%>" />
```

**Utility displayDate Tag**
This tag displays a specified date, formatted appropriately for the locale. If no locale is specified, the system default locale is used.

**Syntax**

```jsp
<util:displayDate date = "<%=Date%>">
    [ locale = "<%=Locale%>" ]
</util:displayDate>
```

This tag uses no body.

**Attributes**
- **date** (required): Specify the date to format, as a `java.util.Date` instance.
- **locale**: Optionally specify a locale, as a `java.util.Locale` instance.

**Example**

```jsp
<util:displayDate date="<%=account.getDate()%>"
    locale="<%=account.getLocale()%>" />
```

**Utility displayNumber Tag**
This displays the specified number appropriately for the locale and optionally in the specified format. If no locale is specified, the system default locale is used.

**Syntax**

```jsp
<util:displayNumber number = "<%=Double%>">
    [ locale = "<%=Locale%>" ]
    [ format = "<%=Format%>" ]
</util:displayNumber>
```

This tag uses no body.
Attributes

- number (required): Specify the number to format.
- locale: Optionally specify the locale, as a java.util.Locale instance.
- format: Optionally specify a format, as a java.text.Format instance.

Example

<util:displayNumber number="<%=shoe.getSize()%>" />

Miscellaneous Utility Tags

The following sections document syntax and attributes of the general utility tags:

- Utility ifInRole Tag
- Utility lastModified Tag

Utility iterate Tag

Use this tag to iterate through a collection. Obtain the collection in the start-tag and iterate through the collection in the body.

Syntax

```xml
<util:iterate id='instance_name' 
  type='class_name'
  collection='<%=Collection%>'
  [ max='<%=Integer%>' ] >

  ... body ...
</util:iterate>
```

The body is evaluated once for each element in the collection.

Attributes

- id (required): This is an iterator variable, the instance name for each iteration.
- type (required): This is the class name; the collection is a set of instances of this type.
- collection (required): This is the collection itself.
- max: Optionally specify a maximum number of elements to iterate through.

Example

```xml
<util:iterate id='contact' type='com.acme.connections.Contact'
  collection='<%=company.getContacts()%>' >

  <jsp:getProperty name='contact' property='name'/>
</util:iterate>
```

Utility ifInRole Tag

Use this tag to evaluate the tag body and include it in the body of the JSP page, depending on whether the user is in the specified application role. The tag handler executes the isUserInRole() method of the request object.

The concept of "role" is according to the servlet specification. Roles are defined in <role> elements in the application web.xml file.
### General Utility Tags

#### JSP Utilities and Utility Tags

### Syntax

```jsp
<util:ifInRole role='"<%=String%>"'
   [ include='true' | "false" ]
   ...
   body to include ...
</util:ifInRole>
```

#### Attributes

- **role** (required): Specify the role to check, to see if the user included in this role.
- **include**: Use a "true" setting (the default) to include the body only if the user is in the role. Use a "false" setting to include the body only if the user is *not* in the role.

#### Example

```jsp
<util:ifInRole role="users" include="true">
   Logged in as <%=request.getRemoteUser()%><br>
   <form action="logout.jsp">
      <input type="submit" value="Log out"><br>
   </form>
</util:ifInRole>

<util:ifInRole role="users" include="false">
   <form method="POST">
      Username: <input name="j_username" type="text"><br>
      Password: <input name="j_password" type="password"><br>
      <input type="submit" value="Log in">
   </form>
</util:ifInRole>
```

#### Utility lastModified Tag

This tag displays the date of the last modification of the current file, appropriately formatted for the locale. If no locale is specified, then the request object will be searched for a locale. If none is found there, the system default locale is used.

#### Syntax

```jsp
<util:lastModified
   [ locale='"<%=Locale%>"' ] />
```

This tag uses no body.

#### Attributes

- **locale**: Optionally specify the locale, as a java.util.Locale instance.

#### Example

```jsp
<util:lastModified />
```
This chapter documents the tag library supplied with OC4J for use with Oracle Application Server Personalization. Use of this library assumes that the OracleAS Personalization product has been properly installed.

The chapter consists of the following section:

- Overview of Personalization
- Overview of Personalization Tag Functionality
- Personalization Tag and Class Descriptions
- Personalization Tag Library Configuration Files

For information about OracleAS Personalization itself, see the Oracle Application Server Personalization Administrator’s Guide and the Oracle Application Server Personalization Programmer’s Guide.

Overview of Personalization

This section introduces personalization, first covering general concepts and then providing an overview of the Oracle implementation in particular.

General Overview of Personalization

This overview covers general personalization concepts and describes the differences between personalization and customization, concepts that are sometimes confused.

Personalization Concepts

Personalization is a mechanism to tailor recommendations to application users, based on behavioral, purchasing, rating, and demographic data. Recommendations are made in real-time, during a user’s application session. User behavior is saved to a profile in a database repository for use in building models to predict future user behavior.

In future user sessions, the models are used to predict behavior and desires of similar users (or, within a single session, the same user), such as products or services to purchase or Web sites to visit. The user will receive recommendations based on these predictions.

The OracleAS Personalization tag library exposes two key functions of personalization:

- Choosing the most relevant content to deliver, based on past user behavior as collected in the user profile
Overview of Personalization

- Embedding this personalized content into application output or Web pages in a flexible manner

A typical personalization scheme might take any or all of the following into account:

- User Web-surfing patterns
- Past user purchase activities
- Past user ratings of items
- Anticipated nature and degree of user interest (such as "buy" versus "like")
- User demographics, such as age, sex, and income

---

**Note:** The concept of personalization is not limited to Web sites and Web applications. You can use personalization in any application where there is appropriate data and a need for personalized recommendations, such as CRM applications. Web applications are the focus of this particular document, however.

---

**Personalization Versus Customization**

Personalization, as implemented by Oracle and described in this chapter, is a complex and dynamic set of features that result in content being chosen automatically and implicitly. It should not be confused with simpler and more static Web site mechanisms that are often referred to as "personalization" but are really simply "customization".

Many sites offer customization such as giving a user a set of possible topics of interest—local weather, stocks of interest, or favorite sports, for example—then displaying output based on the chosen topic. Although it is true that this personalizes the content that is delivered, the process is static and requires explicit user involvement. The focus of the content does not change until the user has an opportunity to change it explicitly through another topic selection.

Personalization chooses content for the user automatically, without direct user request. The process of choosing content is hidden. Moreover, as the system becomes more familiar with user habits by observing behavior, it achieves increased accuracy in predicting future behavior and interests.

**Introduction to Oracle Application Server Personalization**

OracleAS Personalization uses data mining algorithms in Oracle Database to choose the most relevant content available for a user. Recommendations are calculated by an OracleAS Personalization recommendation engine (defined in "Introduction to Recommendation Engines" on page 10-4), typically using large amounts of data regarding past and current user behavior. This approach is superior to others that rely on common-sense heuristics and require manual definition of rules in the system.

The application that uses OracleAS Personalization controls data collection, with OracleAS Personalization itself providing targeted data. This process allows the application to avoid collecting large volumes of data of only minimal usefulness.

The OracleAS Personalization tag library brings this functionality to a wide audience of JSP developers for use in HTML, XML, or JavaScript pages. The tag interface is layered on top of the lower-level Java API of the recommendation engine.
Basis for Recommendations
Depending on the configuration and tuning of an OracleAS Personalization environment, recommendations are based on one or more factors such as the following:

- Past behavior of similar users, according to demographics
- Behavior of past users who have shown the same interests, such as a general trend being established that users who look at items 1, 2, and 3 are likely to be interested in items 5 and 6 as well, without considering the demographics or profiles of the users
- Behavior of the same user earlier in the current session, allowing user-specific personalization even for first-time users or anonymous visitors, as well as providing a high degree of tuning regarding the purpose of the current visit
- Hot picks recommendations, based on current promotions, features of the week, and so on, which might or might not account for user identity

Key Components
OracleAS Personalization includes the following key components:

- Mining table repository (MTR)
- Mining object repository (MOR)
- Recommendation engine farm, consisting of one or more recommendation engines
- Recommendation engine Java API
These are all introduced in upcoming sections.

Introduction to Mining Table Repository
The OracleAS Personalization Mining Table Repository (MTR) contains the schema and data to be used for data mining. It is a set of database tables and views containing the following:

- Records of previous user behavior
- Data collected elsewhere and imported into the repository
- User demographics
These factors are taken together for use in building models to predict future user preferences.

Introduction to Models
A model is essentially a collection of rules deduced from user data. A simplified example of a rule is "female over 55, income between $150,000 and $200,000, recently purchased scuba tank and mask, likely to buy fins and thermal suit".

In OracleAS Personalization, a model is developed according to recorded facts gathered from the mining table repository. Rules in the model are deduced strictly from available data, not from general or common-sense assumptions of what might be typical for a certain classification of person. How close a particular user’s characteristics are to the rules of the best available model determines the likelihood of the resulting recommendation being correct or appropriate.
Introduction to Mining Object Repository
The OracleAS Personalization Mining Object Repository (MOR) is a database schema that maintains mining meta data and mining model results as defined in the OracleAS Personalization data mining schema. The mining object repository serves as the focus for logging in to the data mining system, logging off, and scheduling OracleAS Personalization events. The building of models out of the mining table repository is accomplished according to OracleAS Personalization data mining algorithms.

It is possible to build different models out of the same data by tuning the relevant algorithm to weigh different characteristics of the data more or less heavily. Therefore, there might be multiple models in the mining object repository for a given situation, but only one model is deployed into a recommendation engine at any particular time.

Introduction to Recommendation Engines
An OracleAS Personalization Recommendation Engine (RE) is an Oracle Database schema that downloads an OracleAS Personalization model during deployment, then fetches appropriate user profile data from the mining table repository when processing a request for recommendations. Each engine is responsible for activities such as the following:

- Loading and holding model data
- Processing recommendation requests
- Collecting user profile data

A recommendation engine processes recommendation requests at runtime and produces personalized recommendations. It also tracks current user behavior at the Web site, collecting user profile data during a session. This latter feature allows session-specific personalization for anonymous users and registered users alike.

Populating a recommendation engine involves building a model and then deploying it to a recommendation engine schema, steps that happen behind the scenes. The calculation of particular recommendations is accomplished by PL/SQL stored procedures in the schema.

Introduction to Recommendation Engine Farms
A recommendation engine must be part of a recommendation engine farm. All engines in a farm are loaded with the same model and can be used interchangeably. It is permissible for a farm to consist of only one engine; however, for load-balancing and failover purposes, it is advisable to have multiple engines in the farm. To accomplish the desired effect, these engines would reside in different databases on different physical systems.

Overview of Recommendation Engine API Concepts and Features
OracleAS Personalization provides a Java API for use with recommendation engines. The primary use of the API is for requesting recommendations for appropriate items for a given user. The API essentially acts as a client interface to the stored procedures of a recommendation engine database schema. Calculation of recommendations is accomplished through JDBC calls to the stored procedures, using JDBC connection pooling.

The API also provides short-term storage, referred to as the data collection cache, for collecting user profile data. These data are periodically flushed to recommendation engine tables and from there to the mining table repository. Caching the data in this way, instead of immediately writing user data to the recommendation engine as it is
gathered, minimizes the number of JDBC calls required. Be aware, however, that each
time a recommendation is requested, this does result in a synchronous JDBC call.
Results of recommendation requests are not cached, because of their unique and
personalized nature.

For JSP programmers, the functionality of the recommendation engine API is wrapped
in the functionality of the OracleAS Personalization tag library, so this document does
not discuss details of the API. The tag library provides programming convenience,
automating features that you must manage explicitly if you use the API directly.

The following sections provide an overview of concepts and features for the OracleAS
Personalization recommendation engine:

- Visitors Versus Customers
- Items, Recommendations, Taxonomies, and Categories
- Ratings and Rankings
- Stateful Versus Stateless Recommendation Engine Sessions
- Requests for Recommendations

Visitors Versus Customers

The recommendation engine has two classifications of users:

- Visitor: This is an anonymous user who is not recognized and does not have a
demographic profile or a stored history of past behavior, preferences, and actions.

- Customer: This is a registered user who is therefore recognized and has a
demographic profile and stored history of behavior to be used in generating
accurate recommendations.

Note: An anonymous visitor can be converted into a registered
user in the middle of a session. See "Personalization
setVisitorToCustomer Tag" on page 10-23.

Items, Recommendations, Taxonomies, and Categories

In OracleAS Personalization, item is a generic concept referring to a single article or the
smallest unit of information. Following are some examples:

- Product
- Service to purchase
- URL selected by a user
- Piece of demographic data such as a user’s gender or age

Items are used in several ways:

- They can be passed to item-recording tags for the recording of user data. In this
  situation they are sometimes referred to as data items.

- They can be returned as suggestions. In this situation, they are referred to as
  recommendations. For each item returned as a recommendation, there is also a
  prediction value, which is either a rating or a ranking. These terms are discussed
  in "Ratings and Rankings" on page 10-6.

- They can be passed as input when the application requests recommendations. This
  is done for cross-selling, where recommended items are based on past items, or to
  evaluate and rate or rank a particular set of items.
All individual items in an inventory system must belong to a **taxonomy**. In OracleAS Personalization, a taxonomy refers to a structural organization of items. Typically, the organization of items has a hierarchical structure like a tree or collection of trees, branching from broader groups at the trunk to individual items at the leaves. Item membership in a taxonomy is not exclusive. It is possible to include the same item in multiple taxonomies. A taxonomy is represented by a taxonomy ID, which is a long integer.

Catalog or Web site hosting applications can distinguish among their client data sets by using different taxonomy IDs for different client catalogs or Web sites. Appropriate processing is used to distinguish between classifications of users so that an appropriate taxonomy can be used in each case. For example, a customer at [www.oracle.com](http://www.oracle.com) might indicate that she is a DBA or Web developer. This will determine the taxonomy used in personalizing her future visits. The offering of promotional campaigns, banners, and available books and training, for example, would be drawn either from a Web productivity tools taxonomy or a database administration tools taxonomy.

Individual items within a taxonomy can be grouped into **categories**. In the structure of a taxonomy, categories are intermediate nodes consisting of groups of related items. Note, however, that any given item can belong to multiple categories. As an example, the movie *The English Patient* might belong to categories such as "Screen Adaptations of Novels", "Oscar Winners", "Foreign", and "Drama".

Generally, an item is uniquely identified by a **type** parameter and an **ID** parameter, although a rating item also requires a parameter for the rating value itself. It is assumed that an application will be able to rely on some sort of inventory system that determines a type and ID for each item. A type might be something like "shoes" or "sporting events". An ID is an identifying number. Within any single taxonomy, no two items can have the same ID.

Be aware that for some personalization filtering settings, a recommendation will represent a category, such as "Drama", rather than an item, such as a specific movie title. In this case, the item type of the recommendation is "Category". Also see "Recommendation Filtering" on page 10-17.

The OracleAS Personalization tag library provides a convenient public class to simplify the use of items and recommendations in JSP pages: the `oracle.jsp.webutil.personalization.Item` class. Use this class to access type, ID, and prediction values. See "Item Class Description" on page 10-40 for more information.

**Ratings and Rankings**

Items returned as recommendations include a **prediction** value, as follows:

- For a rating item, the prediction value of each item is its rating. This is a predicted measure of user interest.
- For a purchasing or navigation item, the prediction value indicates a relative ranking among the returned items, based on the estimated probability of user interest.

A navigation item can represent anything a Web application might consider a "hit", such as viewing a page, selecting a link, or clicking a button.

**About Ratings** Rating is a quantitative measure of customer preference on a predefined scale. For movies, for example, you might adopt a five-star system where a user gives his or her favorite movie five stars, which can be thought of as a rating of 5.0. In future sessions, OracleAS Personalization would anticipate a high level of interest in this
Overview of Personalization

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movie for this user and other users with similar interests and backgrounds. A movie that a user likes somewhat, but not as much, might get a rating of three-and-a-half stars, or 3.5.

A definitive rating value is recorded when a user interactively rates an item on the Web site. Rating is a floating point number, to allow as much granularity as desired.

A rating that is returned by the recommendation engine API (or, for JSP pages, by a recommendation tag) is a predicted value, according to OracleAS Personalization algorithms.

In an OracleAS Personalization rating system, the boundaries are configurable, such as 0.0 to 5.0 in the preceding example. This is specified in the MTR.MTR_BIN_BOUNDARY table of the mining table repository.

About Rankings

Ranking is a whole number indicating the relative rank of an item among a group of items. The items are sorted according to the estimated probabilities of being purchased (for commodities to purchase) or being picked (for URL links to visit). The probability is calculated using the data mining model and a customer’s profile data.

As an example, presume three items—item A, item B, and item C—are returned as recommendations. If A has a 0.9 probability of user interest, B has a 0.55 probability, and C has a 0.83 probability, then A would have a ranking of 1, C would be ranked 2, and B would be ranked 3.

The ranking of an item is relative and dynamic. It is relative because ranking is meaningful only for a number of items compared to each other and sorted in a certain order. It is dynamic because ranking of the same item might change for different customers or when ranked against different items.

Stateful Versus Stateless Recommendation Engine Sessions

Web applications can be either stateful or stateless. That is, an application might choose to maintain a user session and user-specific information on the server between requests, or it might not. The recommendation engine API and tag library are designed to handle both situations. Although there are obvious benefits to maintaining user information on the server between requests, there are also high-volume sites that rely on stateless applications for better throughput.

Note, however, that the recommendation engine will always track open user sessions in the recommendation engine database schema, regardless of the session behavior of the Web application.

The recommendation engine tracks a user session by its user ID. Therefore, care must be taken in assigning temporary user IDs to anonymous visitors. If the same ID is used for all anonymous visitors, and their behavior is being tracked, then data collected from all such visitors will be attributed to a single recommendation engine session and therefore behavior of any one anonymous visitor would influence recommendations to the others. You can avoid this problem by assigning each anonymous visitor a temporary ID that is unique within the recommendation engine.
After a recommendation engine session is established and populated with data, an application can request recommendations from it. OracleAS Personalization returns the appropriate recommendations to the calling application, then the application decides what to pass to the user and how to pass it.

In JSP pages, an application can request recommendations through one of several "recommendation tags". The recommendation engine returns a set of suggested items according to user data, with respect to tuning and filtering settings. In using the OracleAS Personalization tag library, you can specify tuning and filtering settings through tag attributes or in a configuration file.

A set of recommendations is generated in the recommendation engine database schema through a JDBC call. The time spent in the call may vary. This depends on the criteria, how many data records must be processed, and such factors as the size of the rules table, the size of the user profile data, and specifics of the recommendation request. Recommendations will be chosen according to the personalization model, which is deployed into the recommendation engine that the application is connected to. When you use OracleAS Personalization tags, use attributes of the startRESession tag to specify the recommendation engine to use.

For cross-sell recommendations, the application must pass in as input one or more purchasing or navigation items of past user interest. The cross-sell recommendations will be based on the item or items passed in, and perhaps on past or current user data as well.

Recommendation items are returned in an array, with a prediction value for each recommendation—either a rating or a ranking, as described in "Ratings and Rankings" on page 10-6—and an interest dimension value for the array as a whole. For items returned as recommendations, the interest dimension indicates how the items will be of interest to the user—as purchasing items, navigation items, or rating items.

The recommendation engine API allows filtering of recommendations before they are returned, based on the taxonomy.

### Overview of Personalization Tag Functionality

The following sections provide an overview of features and functionality of the OracleAS Personalization tag library. For descriptions and syntax of the individual tags, see "Personalization Tag and Class Descriptions" on page 10-19.

- Recommendation Engine Session Management
- Use of Items in Personalization Tags
- Mode of Use for Item Recording Tags

---

**Note:** One of the advantages of the tag library, compared to using the recommendation engine API directly, is that tracking of recommendation engine sessions in a stateless application is managed automatically. You must arrange this mapping yourself if you use the API directly.

Be aware, however, that recommendation engine session tracking through the tag library requires the client, presumably a browser, to support and accept cookies. If this is not always guaranteed, then you must declare your application as stateful.
Use of Tuning, Filtering, and Sorting for Recommendation and Evaluation Tags

Note: The OracleAS Personalization tag library does not assume that HTML will be the only output format. Other formats, such as XML and JavaScript, are supported as well.

Recommendation Engine Session Management

The actions of creating and closing a recommendation engine session are handled through the `startRESession` and `endRESession` tags. For a JSP page using OracleAS Personalization, you must ensure that at least one `startRESession` tag is executed and that it is the first OracleAS Personalization tag encountered for the particular recommendation engine session.

The OracleAS Personalization tag library can support either stateful applications, which maintain state information through HTTP session objects, or stateless applications, which do not. You can use the `session` attribute of `startRESession` to specify which mode to use. Use a "true" setting to allow the tag library to use HTTP session objects, or a "false" setting if you do not want the tags to participate in HTTP sessions.

Setting the `session` attribute of a `startRESession` tag to "true" produces effects similar to those of setting `session` to "true" in a JSP page directive. The difference is that by setting the attribute to "true" in a `startRESession` tag, you are affecting not only the page containing the tag, but also any other pages that contain personalization tags that execute within the same recommendation engine session.

After the `startRESession` tag is executed, the personalization tags maintain the relationship of the Web client to the recommendation engine database session so that subsequent personalization tags apply to the same user, as appropriate.

Starting a Recommendation Engine Session

The `startRESession` tag takes the recommendation engine name and other information from some combination of tag attribute settings and `personalization.xml` configuration file settings.

A `startRESession` tag will result in no operation if the recommendation engine session was previously started for the same Web client, with no `endRESession` tag executed in between. This is for convenience; it allows flexibility regarding the order in which JSP pages are executed. You can place `startRESession` tags in multiple pages of an application without negative consequences.

See "Personalization `startRESession` Tag" on page 10-20 for more information about this tag. Also see "Personalization Tag Library Configuration Files" on page 10-41.

Using a Stateful Application

For a stateful application, which uses HTTP sessions, session information is maintained in the JSP implicit `session` object, a standard `HttpSession` instance.

When the `startRESession` tag is encountered, if its `session` attribute is set to "true" (the default), then the session object is created automatically if it does not already exist.

Using a Stateless Application

For a stateless application, the tag library will maintain internal session tracking through the use of cookies. Therefore, be aware that if you want to use a stateless
application, personalization tags will work only if the client browser accepts cookies. If that is not the case, either because the browser chooses to decline cookies or due to lack of capability, then stateful functionality is required (session="true" for the startRESession tag).

Ending a Recommendation Engine Session

When a stateful application no longer needs a given recommendation engine session, you can use the endRESession tag. As with startRESession tags, repeated executions of endRESession tags result in no further operations, so you can place them in multiple pages of your application without negative consequences.

The endRESession tag has no effect in stateless applications.

Using endRESession tags in stateful applications is sometimes optional, but is necessary in the following circumstances:

- If the application intends to subsequently start a new recommendation engine session with a different recommendation engine user ID from the same browser or within the same HTTP session
- To connect to a different recommendation engine from the same browser or within the same HTTP session

In these cases, the endRESession tag must be executed before the next startRESession tag.

Use of endRESession tags is also advisable if an application stops using its OracleAS Personalization tags significantly before the HTTP session is over, so that recommendation engine resources can be released.

See "Personalization endRESession Tag" on page 10-22 for detailed information about this tag.

---

**Note:** If endRESession is not used in a stateful application, the underlying recommendation engine session will be closed automatically when the HTTP session goes out of scope. In a stateless application, the underlying recommendation engine session is allowed to time out.

---

Use of Items in Personalization Tags

The OracleAS Personalization tag library provides a number of tags for item manipulation. There are tags to record user behavior information, tags to remove user behavior information that was previously recorded, tags for outputting items as recommendations, and a tag for inputting a specific set of items to be evaluated and rated or ranked.

The following section provide an overview of how to use the tag library:

- Overview of Item Recording and Removal Tags
- Overview of Recommendation and Evaluation Tags
- Use of Tag-Extra-Info Scripting Variables for Returned Items
- Specification of Input Items
- Inputting Item Arrays
- Demographic Items
Overview of Item Recording and Removal Tags

The following tags are for recording data items into the recommendation engine session cache or for removing items that were recorded earlier in the session:

- `recordNavigation` and `removeNavigationRecord`
- `recordPurchase` and `removePurchaseRecord`
- `recordRating` and `removeRatingRecord`
- `recordDemographic` and `removeDemographicRecord`

**Note:** During the session, recorded items are periodically flushed to the recommendation engine. Removing an item after that point still works, but requires a database round-trip. See related information about REFlushInterval in "Personalization startRESession Tag" on page 10-20.

To record or remove a purchasing, navigation, or rating item, you must specify the item to record or remove by providing either a type and ID (and a value, for a rating item), or an item array and an index into that array. See "Specification of Input Items" on page 10-13 for more information. To record or remove a demographic item, which implicitly applies to the current user, you must specify the demographic type, such as `AGE`, and a value, such as 44. See "Demographic Items" on page 10-14.

There is typically little need to use the `removeXXXRecord` tags. If you place your `recordXXX` tags in "receiving pages", there should be no need to use `removePurchaseRecord` or `removeNavigationRecord` tags. Using `removeRatingRecord` and `removeDemographicRecord` tags would be necessary only in situations where users changed their minds after their initial input had been recorded. See "Mode of Use for Item Recording Tags" on page 10-15 for related information.

For detailed tag information, see “Item Recording and Removal Tag Descriptions” on page 10-33.

Overview of Recommendation and Evaluation Tags

The following tags return an array of items as recommendations:

- `selectFromHotPicks`
- `getRecommendations`
- `getCrossSellRecommendations`
- `evaluateItems`

For the `selectFromHotPicks`, `getRecommendations`, and `getCrossSellRecommendations` tags, which are referred to in this document as recommendation tags, the array of items is a set of recommendations returned from an entire taxonomy or from hot picks groups within a taxonomy. The `getCrossSellRecommendations` tag must also take a set of purchasing items or navigation items as input, on which to base the recommendations (known as cross-selling).

Hot picks might be promotional items or other specially selected groups of items. The picks to choose from can be specified through a tag attribute. See the Oracle Application Server Personalization Administrator’s Guide for more information about hot picks.
For `evaluateItems`, you must input a particular set of items for which you want evaluations. Some or all (or in some cases, none) of the same items are then returned, either rated or ranked depending on the interest dimension. See “Ratings and Rankings” on page 10-6 for background information.

For the `getRecommendations` and `evaluateItems` tags, the results are based on the particular user. The user identity is specified through the `startRESESession` tag and is implicitly applied to all subsequent personalization tags. The `getCrossSellRecommendations` tag depends on the set of input items.

**More About the Recommendation Tags** Following is additional information about each of the recommendation tags. For detailed tag descriptions, see "Recommendation and Evaluation Tag Descriptions" on page 10-23.

- **selectFromHotPicks**: The items returned are from a set of hot picks groups. Use the `hotPicksGroups` attribute to specify the hot picks groups to choose from. In a sense, this is a "non-personal" tag in the OracleAS Personalization tag library, because the results do not depend on the user. It might still be useful in personalized applications, however, for displaying promotions for a first-time visitor or for a particular geographical area or interest group, for example.

- **getRecommendations**: The items returned are based on the user, but you can also specify that they must be from a set of hot picks groups specified through the `fromHotPicksGroups` attribute.

- **getCrossSellRecommendations**: The items returned are based on input items. You can also specify that the items returned must be from a set of hot picks groups specified through the `fromHotPicksGroups` attribute. The input items are assumed to be of previous interest to one user. Functionality of this tag attempts to answer the following question: Assuming that a user bought or navigated to the input items in the past, what are the most likely additional items of interest to that user in the future? These could be additional items to purchase or navigate to, according to the interest dimension.

**Input Items** For the tags that take items as input—the `getCrossSellRecommendations` and `evaluateItems` tags—you can use one or more nested `forItem` tags to specify desired items, or you can input an entire array of items through a tag attribute. For more information about inputting items, see "Specification of Input Items" on page 10-13.

**Output Items** For the `evaluateItems` and `getCrossSellRecommendations` tags, there is a required tag attribute to specify the name of a tag-extra-info (TEI) variable for the output array of items. For the `getRecommendations` and `selectFromHotPicks` tags, this attribute is optional. Alternatively or additionally, the items are available sequentially to any `getNextItem` tags nested within the `getRecommendations` or `selectFromHotPicks` tag.

For the recommendation tags, you can use the `maxQuantity` attribute to specify the maximum number of output items. To determine the actual number of items returned, use the `length` attribute of the TEI array variable for the returned items. No separate TEI variable is provided for the array size. See the following section, "Use of Tag-Extra-Info Scripting Variables for Returned Items", for information about TEI variables.
Use of Tag-Extra-Info Scripting Variables for Returned Items

For each tag that returns an array of items, there is a tag-extra-info (TEI) class that provides functionality allowing you to use a scripting variable of the following array type:

```java
oracle.jsp.webutil.personalization.Item[]
```

The array of items is returned in this variable. Each of these tags has a `storeResultsIn` attribute that you use to specify a variable name. You can loop through the array in your application to display all the items, such as in an HTML table. Use the `length` attribute of the array to determine how many items were returned.

The `selectFromHotPicks`, `getRecommendations`, and `getCrossSellRecommendations` tags can also return a TEI String variable indicating the interest dimension for the items in the array, eitherNAVIGATION, PURCHASING, or RATING. Use the `storeInterestDimensionIn` tag attribute to specify a variable name for the interest dimension.

---

**Note:** For general information about tag-extra-info classes and scripting variables, refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide*.

---

Specification of Input Items

There are two general situations where you must input items:

- To provide input items to a `getCrossSellRecommendations` or `evaluateItems` tag
  
  In addition to the `getCrossSellRecommendations` or `evaluateItems` tag, this can involve one or more nested `forItem` tags. The `forItem` tags are used to select desired input items.

- To record an item into the recommendation engine session or, using similar syntax, to remove an item that was previously recorded
  
  This involves a `recordXXX` or `removeXXXRecord` tag.

You can specify items in the following general ways:

1. Specify the type and ID of each desired item, and also the rating value for a rating item. Or, for a demographic item, specify the type and value.
2. Supply an item array, and the index into the array for each desired item.
3. Supply an entire array of items (not relevant for `recordXXX` and `removeXXXRecord` tags).

For scenarios #2 and #3, see the following section, "Inputting Item Arrays", for more information.

You can input one or more items into a `getCrossSellRecommendations` or `evaluateItems` tag as follows:

- Nest one or more `forItem` tags inside the tag, using the `type` and `ID` attributes of each `forItem` tag to specify a desired item (scenario #1 above).
Nest one or more forItem tags inside the tag, using the itemList attribute of each forItem tag to specify an item array and using the index attribute to specify a desired element of the array (scenario #2).

or:

Specify an Item[] array through the inputItemList attribute of the tag (scenario #3). The entire array is taken as input.

Note that you can use more than one of these procedures simultaneously. The getCrossSellRecommendations and evaluateItems tags can take input from multiple sources.

You can specify an item for a recordXXX or removeXXXRecord tag as follows:

- Use the type and ID attributes of the tag, and the value attribute for recordRating or removeRatingRecord, to specify the item (scenario #1 above). Or, for recordDemographic or removeDemographicRecord, use the type and value attributes.

or:

- Use the itemList attribute of the tag to specify an item array, and the index attribute of the tag to specify the desired element of the array (scenario #2).

Inputting Item Arrays

For situations where you input an array of Item[] objects to a tag, you must specify the array through a JSP expression. This can apply to any of the following tags:

- getCrossSellRecommendations or evaluateItems, when you use the inputItemList attribute to input an entire array
- forItem (inside getCrossSellRecommendations or evaluateItems), recordPurchase, recordNavigation, recordRating, removePurchaseRecord, removeNavigationRecord, or removeRatingRecord, when you use the itemList and index attributes to input an array and specify one element of it for use

You can supply the array in the following ways:

- Create it in a scriptlet and specify it through a JSP expression:

  ```jsp
  <% Item[] myList = newItem[] {newItem("shoes", 1)}; %>
  <op:evaluateItems inputItemList="<%=myList %> .../>
  ```

- Supply it by using a TEI variable that contains the output from a recommendation tag:

  ```jsp
  <op:getRecommendations storeResultsIn="myRecs" .../>
  <!-- First tag is closed, but TEI variable is still in scope. Later use it in second tag. -->
  <op:getCrossSellRecommendations inputItemList="<%=myRecs %>
  ```

**Note:** See "Recommendation and Evaluation Tag Descriptions" on page 10-23 for detailed syntax information for the tags shown here.

Demographic Items

Demographic data items, consisting of background information about the user such as gender and age, are used in only the recordDemographic and removeDemographicRecord tags. Because they do not contain purchasing,
navigations, or rating information, they cannot be returned by a recommendation tag or input to a `getCrossSellRecommendations` or `evaluateItems` tag.

Demographic items, instead of being identified by `type` and `ID` as for purchasing and navigation items, are identified by `type` and `value`. These are the only two attributes for the `recordDemographic` and `removeDemographicRecord` tags. There are several pre-defined types, which exist as columns in the mining table repository in the `MTR.MTR_CUSTOMERS` table:

- GENDER
- AGE
- MARITAL_STATUS
- PERSONAL_INCOME
- HOUSEHOLD_INCOME
- IS_HEAD_OF_HOUSEHOLD
- HOUSEHOLD_SIZE
- RENT_OWN_INDICATOR

There are also 50 columns you can customize: `ATTRIBUTE1` through `ATTRIBUTE50`. To use a custom type, you must do the following:

1. Map the `ATTRIBUTEx` column to an existing enterprise database, thus defining what the attribute is.
2. Define the corresponding value boundaries in the `MTR.MTR_BIN_BOUNDARIES` table.

### Mode of Use for Item Recording Tags

You can currently use one mode of operation for item recording tags: **receiving mode**. In this mode, if users select something such as an item to purchase or a URL to navigate to, then the page they are sent to, referred to as the **receiving page**, contains the `recordXXX` tag to record the item.

As a general example, assume that a page uses a `getRecommendations` tag to generate a list of recommendations that are displayed in a sequence. Each recommended item has a `Details` link that a user can select to get more information and a `Purchase` link that a user can select to purchase the item. You can place a `recordNavigation` tag in the page the user goes to by selecting `Details`; and you can place a `recordPurchase` tag in the page the user goes to by selecting `Purchase` (a purchase confirmation page, for example). In either case, the `type` and `ID` of the item are likely already known on the receiving pages, which are devoted specifically to that item.

Similarly, you might place a `recordDemographic` tag in a JSP page where users enter demographic information. For example, there might be a page that allows users to enter marital status, age, and personal income. Once a user enters the information—suppose he is single, age 44, with an annual salary of $50,000—the target of the action behind the HTML form is an advertising page tailored to that profile. This page would have `recordDemographic` tags for types `MARITAL_STATUS`, `AGE`, and `PERSONAL_INCOME`. You can use multiple `recordDemographic` tags in a single page.

It is typical to identify items by specifying the appropriate attributes, such as `type` and `ID` for purchasing and navigation items. Alternatively, you can use a previously created item list, and an index value into that list, to specify an item. The application
can copy an item list array object into a session or request object and also pass the index as a parameter to the receiving page. On the receiving page, the item list can be retrieved from the session or request object and passed to the recordXXX tag along with the index. This approach has at least one advantage, in that the sending page or pages can collect more than one index before invoking the receiving page, then simultaneously record numerous items from the same item list.

Use of Tuning, Filtering, and Sorting for Recommendation and Evaluation Tags

As summarized earlier, the selectFromHotPicks, getRecommendations, getCrossSellRecommendations, and evaluateItems tags all return an array of items. The following sections document tuning and filtering settings you can use to more carefully tailor the recommendations that are returned. There is also information about a setting to sort the recommendations. Filtering settings do not apply to the evaluateItems tag, however, because the items output are always from the set of items input.

- Tuning Settings
- Recommendation Filtering
- Sorting Order

Tuning Settings

Several tuning settings determine some of the qualifications and logic used by the recommendation engine in returning recommendations. There must be a value for each setting, determinable in one of the ways described here.

You can specify these settings through the tuningXXX attributes of the selectFromHotPicks, getRecommendations, getCrossSellRecommendations, and evaluateItems tags, as summarized in Table 10–1. Alternatively, you can use the tuningName attribute to get the settings from the specified <Tuning> element in either the application-level personalization.xml file (preferred) or the server-wide personalization.xml file. Also see “Personalization Tag Library Configuration Files” on page 10-41.

If there are no attribute settings and no <Tuning> element, default values will be chosen according to the following steps, in order:

1. According to a <DefaultTuning> element in the application-level personalization.xml file.
2. According to a <DefaultTuning> element in the server-wide personalization.xml file.
3. According to the following hardcoded settings:
   
   - tuningDataSource="ALL"
   - tuningInterestDimension="NAVIGATION"
   - tuningPersonalizationIndex="MEDIUM"
   - tuningProfileDataBalance="BALANCED"
   - tuningProfileUsages="INCLUDE"

   **Note:** To use the hardcoded defaults, do not use any of the tuningXXX attribute settings. If some tuning settings are defined in a tag, then none of the hardcoded values will be used. In this case, if any setting cannot be found in a tag attribute or personalization.xml file, an exception will be thrown.
Overview of Personalization Tag Functionality

Personalization Tags

For more information about tuning settings, refer to the Oracle Application Server Personalization Administrator’s Guide.

Recommendation Filtering

In addition to tuning settings, there are filtering settings that you can specify for a recommendations request. There must be a value for each setting, determinable in one of the ways described here.

You can specify these settings through the filteringXXX attributes of the getRecommendations, getCrossSellRecommendations, and selectFromHotPicks tags. (Filtering is not relevant to the evaluateItems tag.) Alternatively, you can use the filteringName attribute to get the settings from the specified <Filtering> element in either the application-level personalization.xml file (preferred) or the server-wide personalization.xml file. Also see “Personalization Tag Library Configuration Files” on page 10-41.

If there are no attribute settings and no <Filtering> element, default values will be chosen from the <DefaultFiltering> element in either the application-level personalization.xml file (preferred) or the server-wide personalization.xml file.

These are the filtering parameters:

- **filteringTaxonomyID**: This is a Java string representing an integer, where the integer is the ID of an item taxonomy in the OracleAS Personalization environment.

- **filteringMethod**: This is one of ALL_ITEMS, INCLUDE_ITEMS, EXCLUDE_ITEMS, SUBTREE_ITEMS, ALL_CATEGORIES, INCLUDE_CATEGORIES, EXCLUDE_CATEGORIES, SUBTREE_CATEGORIES, and CATEGORY_LEVEL. Table 10–2 summarizes the meanings. These methods always apply to the taxonomy specified through the filteringTaxonomyID value.

For the getCrossSellRecommendations tag, only the ALL_ITEMS, INCLUDE_ITEMS, EXCLUDE_ITEMS, and SUBTREE_ITEMS settings are supported.

### Table 10–1 Tuning Settings for Requesting Recommendations

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>tuningDataSource</td>
<td>Specify the kind of past user data to be considered in making recommendations. (Do not confuse this kind of data source with the data source concept in the J2EE platform model.)</td>
<td>ALL, NAVIGATION, PURCHASE, RATING, DEMOGRAPHIC</td>
</tr>
<tr>
<td>tuningInterestDimension</td>
<td>Specify the kind of recommendation to be returned.</td>
<td>RATING, PURCHASING, NAVIGATION</td>
</tr>
<tr>
<td>tuningPersonalizationIndex</td>
<td>Choose how generalized or how personalized the recommendation algorithm should be.</td>
<td>LOW, MEDIUM, HIGH</td>
</tr>
<tr>
<td>tuningProfileDataBalance</td>
<td>Choose whether to stress historical data, current session data, or both in making recommendations.</td>
<td>HISTORY, CURRENT, BALANCED</td>
</tr>
<tr>
<td>tuningProfileUsage</td>
<td>Choose whether to use data in the user’s demographic profile.</td>
<td>INCLUDE, EXCLUDE</td>
</tr>
</tbody>
</table>

For more information about tuning settings, refer to the Oracle Application Server Personalization Administrator’s Guide.
filteringCategories: This is a Java string of integer IDs, delimited by a single plus sign (+) after each ID, identifying existing item categories in the given taxonomy. Categories are defined in the MTR.MTR_CATEGORY table of the mining table repository.

**Note:** Do not provide a filteringCategories setting when filteringMethod is ALL_ITEMS or ALL_CATEGORIES.

### Table 10–2 Filtering Methods for Requesting Recommendations

<table>
<thead>
<tr>
<th>Filtering Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL_ITEMS</td>
<td>Recommend items from all leaves in the taxonomy.</td>
</tr>
<tr>
<td>INCLUDE_ITEMS</td>
<td>Recommend items that belong to the categories specified in filteringCategories.</td>
</tr>
<tr>
<td>EXCLUDE_ITEMS</td>
<td>Recommend items in the taxonomy that do not belong to the categories specified in filteringCategories.</td>
</tr>
<tr>
<td>SUBTREE_ITEMS</td>
<td>Recommend items that belong to the subtrees of the categories specified in filteringCategories.</td>
</tr>
<tr>
<td>ALL_CATEGORIES</td>
<td>Recommend all categories in the taxonomy.</td>
</tr>
<tr>
<td>INCLUDE_CATEGORIES</td>
<td>Recommend categories specified in filteringCategories.</td>
</tr>
<tr>
<td>EXCLUDE_CATEGORIES</td>
<td>Recommend categories in the taxonomy that are not specified in filteringCategories.</td>
</tr>
<tr>
<td>SUBTREE_CATEGORIES</td>
<td>Recommend categories from the subtrees of the categories specified in filteringCategories.</td>
</tr>
<tr>
<td>CATEGORY_LEVEL</td>
<td>Recommend categories of the same level as the categories specified in filteringCategories.</td>
</tr>
</tbody>
</table>

For any of the XXX_CATEGORIES settings, recommendations are returned in the form of categories, such as "drama", rather than specific items, such as a particular movie title. The item type is Category in this case, and categories must first be defined in the mining table repository.

For more information about filtering settings, refer to the Oracle Application Server Personalization Programmer’s Guide.

**Sorting Order**

You can sort returned items according to the prediction field of each item, which is either a rating or a ranking. See "Ratings and Rankings" on page 10-6 for information about how to use this field.

Use the sortOrder attribute of the selectFromHotPicks, getRecommendations, getCrossSellRecommendations, or evaluateItems tag to specify a sorting order of ASCEND, DESCEND, or NONE (default). Ascending order lists the best match first; descending order does the opposite. An ascending order of five ranked items would be 1, 2, 3, 4, then 5, because 1 is the highest rank. An ascending order of five rated items would be something like 4.5, 3.9, 2.5, 2.2, then 1.8, because a higher number means a higher rating.
Personalization Tag and Class Descriptions

The following sections provide detailed descriptions of syntax and usage for the OracleAS Personalization tags and the `Item` public class, concluding with a discussion of tag limitations:

- Session Management Tag Descriptions
- Recommendation and Evaluation Tag Descriptions
- Item Recording and Removal Tag Descriptions
- Item Class Description
- Personalization Tag Constraints

Note the following requirements for the OracleAS Personalization tag library:

- Verify that the file `ojsputil.jar` is installed and in your classpath. This file is provided with OC4J, in the "well-known" tag library directory.

- You will need the classes for the recommendation engine API, which are in the `oreapirt.jar` file. If you install Oracle Application Server with the "Business Intelligence" option, this file will be installed in the `[SRCHOME]/dmt/jlib` directory. Copy it to a location that is accessible to your application.

- The tag library descriptor, `personalization.tld`, must be available to the application, and any JSP page using the library must have an appropriate `taglib` directive. In an Oracle Application Server installation, the TLD is in `ojsputil.jar`. The `uri` value for `personalization.tld` is the following:
  
  ```
  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/personalization.tld
  ```

  You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about `taglib` directives, the well-known tag library directory, TLD files, and the meaning of `uri` values.

Notes:

- The prefix "op:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your `taglib` directive.

- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

Using some of the tag attributes described here requires some general knowledge of the OracleAS Personalization and recommendation engine implementations. Where information here is incomplete, see the Oracle Application Server Personalization Administrator’s Guide or the Oracle Application Server Personalization Programmer’s Guide.

Session Management Tag Descriptions

The following sections document tags for starting, ending, and managing recommendation engine sessions:

- Personalization startRESession Tag
- Personalization endRESession Tag
- Personalization setVisitorToCustomer Tag
**Personalization startRESession Tag**

This section provides syntax and attribute descriptions for the `startRESession` tag, which you use to start a recommendation engine session. Also see "Recommendation Engine Session Management" on page 10-9 for related information.

The `startRESession` tag must be executed before any other OracleAS Personalization tag that executes within the same recommendation engine session.

---

**Note:** Also see "Personalization Tag Constraints" on page 10-41.

---

### Syntax

```
<op:startRESession REName = "recommendation_engine_connection_name"
                   [ REURL = "rec_engine_database_connection_URL" ]
                   [ RESchema = "rec_engine_schema_name" ]
                   [ REPassword = "rec_engine_schema_password" ]
                   [ RECacheSize = "kilobytes_of_cache" ]
                   [ REFlushInterval = "milliseconds_to_flush" ]
                   [ session = "true" | "false" ]
                   [ userType = "visitor" | "customer" ]
                   [ UserID = "user_ID_for_site_login" ]
                   [ storeUserIDIn = "variable_name" ]
                   [ disableRecording = "true" | "false" ] />
```

The `startRESession` tag has no body.

### Attributes

Also see "Attribute Usage Notes" following the attribute descriptions.

- **REName** (required): Use this to specify the name of a recommendation engine connection in a recommendation engine farm. Under some circumstances, it must also match the name of an `<RE>` element in `personalization.xml` so that settings can be retrieved from there, as mentioned in the attribute usage notes. See "Personalization Tag Library Configuration Files" on page 10-41 for related information.

- **REURL**: This is the JDBC connection string for the recommendation engine database.

- **RESchema**: This is the name of the recommendation engine database schema.

- **REPassword**: This is the password corresponding to the `RESchema` name.

  If the OC4J jazn-data.xml file contains a `<user>` element for an account, `scott` for example, in the recommendation engine database, you can get the de-obfuscated password from there by using special right-arrow syntax with a dash ("-"") and right-carrot (">") followed by the account name, such as:

  ```
  password="->scott"
  ```

- **RECacheSize**: Use this to specify the size of the recommendation engine session cache, in kilobytes. The default is 3234 KB. This should be adjusted in coordination with `REFlushInterval`, as described in the attribute usage notes.

- **REFlushInterval**: Use this to specify how often the data in the recommendation engine session cache is flushed into the recommendation engine schema. The unit is milliseconds, with a default of 60000 (1 minute). This should be adjusted in coordination with `RECacheSize`, as described in the attribute usage notes.

---

10-20   Oracle Application Server Containers for J2EE JSP Tag Libraries and Utilities Reference
Personization Tag and Class Descriptions

- **session**: Use a "true" setting (default) to specify that you want your OracleAS Personalization JSP pages to act in a stateful manner, through the use of HTTP session objects. Use a "false" setting for pages to act in a stateless manner, using cookies instead.

- **userType**: This indicates whether the Web site user is an anonymous "visitor" (default) or a registered "customer".

- **userID**: This is the user name for the Web site user. If not provided, such as for an anonymous visitor, the ID is generated automatically by the tag handler.

- **storeUserIDIn**: If you want to store the userID value for later use, storeUserIDIn can specify the name of a TEI String variable in which to store it. This attribute is useful for automatically generated user IDs.

- **disableRecording**: Use a "true" setting to disable the actions of any recordXXX tags. This is to allow for the possibility, for example, of a Web site that permits users to specify that their activities should not be recorded. It is also a way to improve site performance during peak hours. This attribute can be set at request-time, based on the current user ID, for example. This permits recording to be disabled for appropriate users only, or at appropriate times, without changing your JSP code. The default setting is "false".

**Attribute Usage Notes**

- For the startRESession tag to work, REName is a required attribute, and you must define REURL, RESchema, and REPassword through tag attributes or through one of the personalization.xml files. (Also see "Personalization Tag Library Configuration Files" on page 10-41.)

- REName specifies the name of a recommendation engine connection in a recommendation engine farm. Multiple user sessions should share the same connection whenever possible, for greater efficiency. To accomplish this, use the same REName value whenever you want to use the same connection. After the recommendation engine connection is created, it is cached, using the REName value as a key.

  If REURL, RESchema, or REPassword is not set through attributes of the startRESession tag that first establishes a connection, then the settings of all three must come from a personalization.xml file with an <RE> element whose Name attribute matches the REName value of the startRESession tag. In this case, you must also set RECacheSize and REFlushInterval in the <RE> element if you want nondefault values. In this scenario, the application-wide personalization.xml is searched first; the server-wide personalization.xml is searched only if the application-wide file did not have an <RE> element with the REName value as its name.

  **Note:** When REName matches the name of an existing connection, any settings for REURL, RESchema, REPassword, RECacheSize, and REFlushInterval are superfluous and therefore ignored.

- You can use the REName attribute together with <RE> element settings to facilitate load-balancing among recommendation engines in a farm. Each <RE> element points to a different recommendation engine in the farm. The JSP page can rotate among different recommendation engines in the farm by assigning different values to the REName attribute of different startRESession tags, according to some load-balancing mechanism.
Although default values are provided for RECacheSize and REFlushInterval, these are intended only to get you started. Once you have experience in running the application, you can tune these values according to Web site conditions. The settings of RECacheSize and REFlushInterval should be in coordination with each other, and according to your estimate of how quickly items might be added to the recommendation engine session cache as the result of user actions. The default cache size is 3234 KB, the maximum possible, which is enough space to store approximately 4800 items. The default flush interval of 60 seconds (60000 milliseconds) results in a cache incoming rate of 80 items each second. If you increase the flush interval to 120 seconds, you can support only 40 new items being added each second. On the other hand, if you reduce the flush interval to 30 seconds, you can support a cache incoming rate of 160 items each second. A disadvantage in shortening the flush interval, however, is that removing an item (through a removeXXXRecord tag) after it has been flushed requires a database round-trip.

Be aware that all sessions sharing the same recommendation engine connection within the same JVM are also sharing the same session cache. The cache incoming rate is cumulative across all such sessions.

Example  The following example shows a startRESession tag that establishes the URL and user name, scott, for the recommendation engine database and gets the de-obfuscated password for the scott account from the OC4J jazn-data.xml file. This assumes an entry for scott in jazn-data.xml.

```xml
<op:startRESession REName = "RE1"
    REURL = "@jdbc:oracle:thin:@sid"
    RESchema = "scott"
    REPassword = "->scott" />
```

Personalization endRESession Tag

Use this tag to explicitly end a recommendation engine session in a stateful application. This is usually optional, but is required under some circumstances. (See "Ending a Recommendation Engine Session" on page 10-10.) It is also advisable to use this tag in a stateful application if application logic determines that the recommendation engine session is no longer required. This will free unneeded resources.

For situations where you do not use endRESession, note the following behavior:

- If you started the recommendation engine session with the session attribute of the startRESession tag set to "true", then the recommendation engine session will be closed implicitly at the end of the HTTP session.

- If you started the recommendation engine session with session set to "false", then the recommendation engine session will be allowed to time out once it has been inactive for a sufficient period of time. The timeout interval is specified as a configuration parameter of the recommendation engine schema. The endRESession tag has no effect.

Syntax

```xml
<op:endRESession />
```

The endRESession tag has no attributes and no body.
Personalization setVisitorToCustomer Tag
Use this tag for situations where an anonymous visitor creates a registered customer account. Upon execution of this tag, the existing recommendation engine session is converted from a visitor session to a customer session. Previous data gathered in the session will be retained. This tag does not actually create the new customer, nor does it execute a new login. It only converts the ongoing recommendation engine session.

The customerID is a request-time attribute and must be provided by the application.

Syntax
<op:setVisitorToCustomer customerID = "<%=registered_customer_name%>" />

The setVisitorToCustomer tag has no body.

Attributes
- customerID (required): The application provides the ID for the newly registered customer.

Recommendation and Evaluation Tag Descriptions
The following sections provide detailed descriptions of the recommendation tags, the evaluation tag, and related subtags:

The following tags are covered:
- Personalization getRecommendations Tag
- Personalization getCrossSellRecommendations Tag
- Personalization selectFromHotPicks Tag
- Personalization evaluateItems Tag
- Personalization forItem Tag
- Personalization getNextItem Tag

Also see "Overview of Recommendation and Evaluation Tags" on page 10-11.

Personalization getRecommendations Tag
Use this tag to request a set of recommendations for purchasing, navigation, or ratings. Items from a particular taxonomy are considered, with tuning and filtering as specified. Recommendations are returned in an array of the following type:
oracle.jsp.webutil.personalization.Item[]

Although other tags, such as getCrossSellRecommendations and evaluateItems, require items to be input for use as a basis for recommendations, the getRecommendations tag does not. Recommendations are based on user identity and profile (user session and historical data), not on specific items.

The resulting recommendations can optionally be stored in a TEI variable of type Item[], with the variable name specified in the storeResultsIn attribute of the tag. The recommendations are also available implicitly within the getRecommendations tag. You can optionally use a tag body with nested getNextItem tags for any desired processing of the items. See "Personalization getNextItem Tag" on page 10-32.
Syntax

```xml
<op:getRecommendations
    [ from = "top" | "bottom" ]
    [ fromHotPicksGroups = "string_of_Hot_Picks_group_numbers" ]
    [ storeResultsIn = 'TEI_variable_name' ]
    [ storeInterestDimensionIn = 'TEI_variable_name' ]
    [ maxQuantity = "integer_value" ]
    [ tuningName = "name_from_config_file_Tuning_element" ]
    [ tuningDataSource = "ALL"|"NAVIGATION"|"PURCHASE"|"RATING"|"DEMOGRAPHIC" ]
    [ tuningInterestDimension = "NAVIGATION"|"PURCHASING"|"RATING" ]
    [ tuningPersonalizationIndex = "LOW"|"MEDIUM"|"HIGH" ]
    [ tuningProfileDataBalance = "HISTORY"|"CURRENT"|"BALANCED" ]
    [ tuningProfileUsage = 'INCLUDE'|'EXCLUDE' ]
    [ filteringName = "name_from_config_file_Filtering_element" ]
    [ filteringTaxonomyID = "integer_value" ]
    [ filteringMethod = "ALL_ITEMS"|"EXCLUDE_ITEMS"|"INCLUDE_ITEMS"|
        "SUBTREE_ITEMS"|"ALL_CATEGORIES"|"INCLUDE_CATEGORIES"|
        "EXCLUDE_CATEGORIES"|"SUBTREE_CATEGORIES"|"CATEGORY_LEVEL" ]
    [ filteringCategories = "string_of_integers" ]
    [ sortOrder = "ASCEND"|"DESCEND"|"NONE" ]
>
...
</op:getRecommendations>
```

Attributes  Also see "Attribute Usage Notes" following the attribute descriptions.

- **from**: Use this if you want items to be selected from the entire taxonomy of items. A "top" setting, which is the default and is typical, displays the N (or less) most desirable items, where N is the maximum number of recommendations to display (maxQuantity). A "bottom" setting displays the N (or less) least desirable items. This is useful, for example, if Product Management wants to know which items are least favored by customers.

- **fromHotPicksGroups**: Use this if you want items to be selected from one or more hot picks groups. The application must determine a series of hot picks group ID numbers, from the same recommendation engine that was specified in the startRESession tag. In the fromHotPicksGroups attribute, you must list the group ID numbers in a string, delimited by plus signs (+), such as "10+20+30".

- **storeResultsIn**: Optionally specify the name of a TEI variable of type Item[] in which to store the resulting recommendations. (This is a required attribute for getCrossSellRecommendations, but not for getRecommendations.) If a variable name is provided, then the scope of the variable is AT_BEGIN, meaning it is available from the start-tag to the end of the page. Note that the value is a variable name, not a JSP expression. You must provide the variable name for translation; this is not a request-time attribute.

- **storeInterestDimensionIn**: Optionally specify the name of a TEI string variable in which to store the interest dimension, which is either NAVIGATION, PURCHASING, or RATING. Use the Item class defined constant INT_DIM_NAVIGATION, INT_DIM_PURCHASING, or INT_DIM_RATING for comparisons. If a variable name is provided, then the scope of the variable is AT_BEGIN, meaning it is available from the start-tag to the end of the page. You must provide the variable name for translation; this is not a request-time attribute.
The value returned will be the same as the `tuningInterestDimension` setting used in the tag.

- **maxQuantity**: Use this if you want to specify a maximum number of recommendations that can be returned. This is optional if there is a general default specified in the `<RecommendationSettings>` element of the application `personalization.xml` file or the server-wide `personalization.xml` file. Also see “Personalization Tag Library Configuration Files” on page 10-41.

- **tuningName**: Use this to specify the name of a `<Tuning>` element in `personalization.xml` so that tuning settings can be retrieved from there. Alternatively, use the individual `tuningXXX` attributes.

- **tuningDataSource**: See “Tuning Settings” on page 10-16.

- **tuningInterestDimension**: See “Tuning Settings” on page 10-16.

- **tuningPersonalizationIndex**: See “Tuning Settings” on page 10-16.

- **tuningProfileDataBalance**: See “Tuning Settings” on page 10-16.

- **tuningProfileUsage**: See “Tuning Settings” on page 10-16.

- **filteringName**: Use this to specify the name of a `<Filtering>` element in `personalization.xml` so that filtering settings can be retrieved from there. Alternatively, use the individual `filteringXXX` attributes.

- **filteringTaxonomyID**: See “Recommendation Filtering” on page 10-17.

- **filteringMethod**: See “Recommendation Filtering” on page 10-17.

- **filteringCategories**: See “Recommendation Filtering” on page 10-17. Integers in the string are delimited by plus signs (+), such as "101+200+35".

- **sortOrder**: Use this to specify whether items are sorted in ascending order ("ASCEND", best match first) or descending order ("DESCEND"). The default is neither ("NONE"), for no sorting requirement. See “Sorting Order” on page 10-18 for more information.

**Attribute Usage Notes**

- You must specify either `from` or `fromHotPicksGroups`.

- Access the output items either through the `storeResultsIn` attribute, or through a tag body with nested `getNextItem` tags, or optionally both.

- Specify `tuningName`, corresponding to the name of a `<Tuning>` element in `personalization.xml`, or specify individual tuning settings through the `tuningXXX` attributes. If you do neither, see “Tuning Settings” on page 10-16 for information about how default values are chosen. Also see “Personalization Tag Library Configuration Files” on page 10-41.

- Specify `filteringName`, corresponding to the name of a `<Filtering>` element in `personalization.xml`, or specify individual filtering settings through the `filteringXXX` attributes. If you do neither, see “Recommendation Filtering” on page 10-17 for information about how default values are chosen.

- A `filteringCategories` setting is required, unless `filteringMethods` is set to `ALL_ITEMS` or `ALL_CATEGORIES`. These settings can be through either the tag attributes or `personalization.xml`.

- The `XXX_CATEGORIES` filtering methods return categories, as defined in the mining table repository, rather than specific items.
**Example**
Following is an example of basic usage of the `getRecommendations` tag. The `storeResultsIn` attribute defines an `Item[]` array for receiving and displaying results.

```java
<op:getRecommendations storeResultsIn="myRecs">
  <% for(int i = 0; i< myRecs.length; i++) {
    Render(myRecs[i].getType(),myRecs[i].getID());
  } %>
</op:getRecommendations>
```

Also see "**Personalization getNextItem Tag**" on page 10-32 for an example of a `getRecommendations` tag that uses a nested `getNextItem` tag.

**Personalization getCrossSellRecommendations Tag**

Like the `getRecommendations` tag, the `getCrossSellRecommendations` tag returns a set of recommendations in an array of type `Item[]` for purchasing, navigation, or ratings. Items from a particular taxonomy are considered, with tuning and filtering as specified.

To use `getCrossSellRecommendations`, however, you must input a set of purchasing or navigation items of past user interest that are used as a basis for the resulting recommendations. The items must all be from the same taxonomy.

You can input items through a specified item array or through a tag body with nested `forItem` tags. See "**Specification of Input Items**" on page 10-13 for more information. Also see "**Personalization forItem Tag**" on page 10-31.

The recommendations from the `getCrossSellRecommendations` tag are stored in a TEI variable of type `Item[]`, with the variable name specified in the `storeResultsIn` attribute of the tag.

---

**Note:** Also see "**Personalization Tag Constraints**" on page 10-41.

**Syntax**

```xml
<op:getCrossSellRecommendations
  storeResultsIn = 'TEI_variable_name'
  [ storeInterestDimensionIn = 'TEI_variable_name' ]
  [ fromHotPicksGroups = 'string_of_Hot_Picks_group_numbers' ]
  [ inputItemList = 'item_array_expression' ]
  [ maxQuantity = 'integer_value' ]
  [ tuningName = 'name_from_config_file_Tuning_element' ]
  [ tuningDataSource = 'ALL'|'NAVIGATION'|'PURCHASE'|'RATING'|'DEMOGRAPHIC' ]
  [ tuningInterestDimension = 'NAVIGATION'|'PURCHASING'|'RATING' ]
  [ tuningPersonalizationIndex = 'LOW'|'MEDIUM'|'HIGH' ]
  [ tuningProfileDataBalance = 'HISTORY'|'CURRENT'|'BALANCED' ]
  [ tuningProfileUsage = 'INCLUDE'|'EXCLUDE' ]
  [ filteringName = 'name_from_config_file_Filtering_element' ]
  [ filteringTaxonomyID = 'integer_value' ]
  [ filteringMethod = 'ALL_ITEMS'|'EXCLUDE_ITEMS'|'INCLUDE_ITEMS'|'SUBTREE_ITEMS' ]
  [ filteringCategories = 'string_of_integers' ]
  [ sortOrder = 'ASCEND'|'DESCEND'|'NONE' ]
>
...
</op:getCrossSellRecommendations>
```
Attributes  Also see "Attribute Usage Notes" following the attribute descriptions.

- **inputItemList**: If you want to supply the input items through an Item[] array, use this attribute with a JSP expression that returns the array. The item array in the expression can come from a prior recommendation tag. See "Inputting Item Arrays" on page 10-14 for more information.

All other attributes of the getCrossSellRecommendations tag are used as for the getRecommendations tag, as described in "Personalization getRecommendations Tag" on page 10-23, except for any limitations mentioned in the attribute usage notes, and the fact that storeResultsIn is a required attribute for the getCrossSellRecommendations tag.

For additional information about tuning, filtering, and sorting, see "Tuning Settings" on page 10-16, "Recommendation Filtering" on page 10-17, and "Sorting Order" on page 10-18.

Attribute Usage Notes

- Inputting items requires the inputItemList attribute or a body with nested forItem tags, or optionally both. If you use both mechanisms, then the forItem tags will be executed first and the indicated items will be placed in an item list. Then the inputItemList entries are considered and appended to the list.

- Unlike for the getRecommendations tag, storeResultsIn is a required attribute for the getCrossSellRecommendations tag. You must specify the name of a TEI variable of type Item[] for storage of the resulting recommendations.

- Specify tuningName, corresponding to the name of a <Tuning> element in personalization.xml, or specify individual tuning settings through the tuningXXX attributes. If you do neither, see "Tuning Settings" on page 10-16 for information about how default values are chosen. Also see "Personalization Tag Library Configuration Files" on page 10-41.

- If the tuningInterestDimension setting is not the same as the tuningDataSource setting, you might not get any recommendations, depending on how OracleAS Personalization rules are set.

- Specify filteringName, corresponding to the name of a <Filtering> element in personalization.xml, or specify individual filtering settings through the filteringXXX attributes. If you do neither, see "Recommendation Filtering" on page 10-17 for information about how default values are chosen.

- A filteringCategories setting is required, unless filteringMethods is set to "ALL_ITEMS". These settings can be through either the tag attributes or personalization.xml.

- The getCrossSellRecommendations tag cannot use category-based filtering; therefore, it supports only a limited set of filtering methods: ALL_ITEMS, INCLUDE_ITEMS, EXCLUDE_ITEMS, and SUBTREE_ITEMS.

Example  The following example uses a getCrossSellRecommendations tag to suggest follow-up DVD titles to a user who rented or purchased certain titles in the past.

```jsp
<% long[] ids = ApplicationPackage.getUserHistory("Smith01");
Item[] DVDs = new Item[ids.length];
for(int i=0; i<ids.length; i++) {
    DVDs[i] = new Item("DVD", ids[i] );
}
```
pageContext.setAttribute("pastInterest", DVDs);

<op: getCrossSellRecommendations inputItemList="pastInterest"
storeResultsIn="moreDVDs"
maxQuantity = "4"
sortOrder = "ASCEND" />

<!-- display 4 best cross-sell items -->
<h1> You will also enjoy these titles! </h1>
ApplicationSupport.displayItem(moreDVDs[1].getType(), moreDVDs[1].getID());
ApplicationSupport.displayItem(moreDVDs[2].getType(), moreDVDs[2].getID());
ApplicationSupport.displayItem(moreDVDs[3].getType(), moreDVDs[3].getID());
ApplicationSupport.displayItem(moreDVDs[4].getType(), moreDVDs[4].getID());

Also see "Personalization forItem Tag" on page 10-31 for an example of a
getcrossSellRecommendations tag that uses a nested forItem tag.

Personalization selectFromHotPicks Tag

Use this tag to request recommendations from a set of hot picks groups only, instead of
from the taxonomy as a whole, and without considering the user profile. Tuning and
filtering are still applied to items in the specified groups.

Other than the fact that selectFromHotPicks does not consider user identity and
profile, it works in essentially the same way as the getRecommendations tag with a
specified fromHotPicksGroups setting. See "Personalization getRecommendations
Tag" on page 10-23 for detailed information about that tag.

You can optionally store the resulting recommendations in a TEI variable of type
Item[], with the variable name specified in the storeResultsIn attribute of the
tag. The recommendations are also available implicitly within the
selectFromHotPicks tag. You can optionally use a tag body with nested
getNextItem tags for any desired processing of the items. See "Personalization
getNextItem Tag" on page 10-32.

**Note:** Also see "Personalization Tag Constraints" on page 10-41.

**Syntax**

<op:selectFromHotPicks
hotPicksGroups = "string_of_Hot_Picks_group_numbers"
[storeResultsIn = "TEI_variable_name"]
[storeInterestDimensionIn = "TEI_variable_name"]
[maxQuantity = "integer_value"]
[tuningName = "name_from_config_file_Tuning_element"]
[tuningDataSource = "ALL|NAVIGATION|PURCHASE|RATING|DEMOGRAPHIC"]
[tuningInterestDimension = "NAVIGATION|PURCHASING|RATING"]
[tuningPersonalizationIndex = "LOW|MEDIUM|HIGH"]
[tuningProfileDataBaseBalance = "HISTORY|CURRENT|BALANCED"]
[tuningProfileUsage = "INCLUDE|EXCLUDE"]
[filteringName = "name_from_config_file_Filtering_element"]
[filteringTaxonomyID = "integer_value"]
[filteringMethod = "ALL_ITEMS|EXCLUDE_ITEMS|INCLUDE_ITEMS|
  SUBTREE_ITEMS|ALL_CATEGORIES|INCLUDE_CATEGORIES|
  EXCLUDE_CATEGORIES|SUBTREE_CATEGORIES|CATEGORY_LEVEL"]
[filteringCategories = "string_of_integers"]
[sortOrder = "ASCEND|DESCEND|NONE"]">

...
Attributes

Also see “Attribute Usage Notes” following the attribute descriptions.

- **hotPicksGroups** (required): You must use this to specify one or more hot picks groups from which the recommendations will be selected. The application must determine one or more hot picks group ID numbers, for the same recommendation engine that was specified in the `startRESession` tag. In the `hotPicksGroups` attribute, you must list the group ID numbers in a string, delimited by plus signs (+), such as "1+20+35".

Use all other attributes as for the `getRecommendations` tag, as described in "Personalization getRecommendations Tag" on page 10-23, except for any limitations mentioned in the attribute usage notes.

For additional information about tuning, filtering, and sorting, see "Tuning Settings" on page 10-16, "Recommendation Filtering" on page 10-17, and "Sorting Order" on page 10-18.

See “Personalization getNextItem Tag” on page 10-32 for an example of a `selectFromHotPicks` tag that uses a nested `getNextItem` tag.

Attribute Usage Notes

- The `hotPicksGroups` attribute is equivalent to the `fromHotPicksGroups` attribute of the `getRecommendations` tag, but `hotPicksGroups` is required.

- Access the output items through the `storeResultsIn` attribute or through a tag body with nested `getNextItem` tags, or optionally both.

- Specify `tuningName`, corresponding to the name of a `<Tuning>` element in `personalization.xml`, or specify individual tuning settings through the `tuningXXX` attributes. If you do neither, see "Tuning Settings" on page 10-16 for information about how default values are chosen. Also see "Personalization Tag Library Configuration Files" on page 10-41.

- Specify `filteringName`, corresponding to the name of a `<Filtering>` element in `personalization.xml`, or specify individual filtering settings through the `filteringXXX` attributes. If you do neither, see "Recommendation Filtering" on page 10-17 for information about how default values are chosen.

- A `filteringCategories` setting is required unless `filteringMethods` is set to "ALL_ITEMS" or "ALL_CATEGORIES". These settings can be through either the `tag` attributes or `personalization.xml`.

- The `XXX_CATEGORIES` filtering methods return categories, as defined in the mining table repository, rather than specific items.

**Personalization evaluateItems Tag**

Use the `evaluateItems` tag to evaluate the set of items that are input to the tag. The items must all be from the same taxonomy. For an interest dimension of PURCHASING or NAVIGATION, the items are ranked. For an interest dimension of RATING, the items are rated. A subset of the evaluated items— anywhere from none to all of the items, depending on effects of the `tuningDataSource` setting—are returned in a TEI array variable of type `Item[]`. You must specify the name of the variable through the `storeResultsIn` attribute. For each item in the array, the `prediction` attribute contains the ranking or rating value.
See "Ratings and Rankings" on page 10-6 for background information about item ratings and rankings.

You can input items through a specified item array or through a tag body with nested forItem tags. See "Specification of Input Items" on page 10-13 for more information. Also see "Personalization forItem Tag" on page 10-31.

---

Note: Also see "Personalization Tag Constraints" on page 10-41.

---

Syntax

```op:evaluateItems
   storeResultsIn = 'TEI_variable_name'
taxonomyID = 'integer_value'
   [ inputItemList = 'item_array_expression' ]
   [ tuningName = 'name_from_config_file_Tuning_element' ]
   [ tuningDataSource = 'ALL'|'NAVIGATION'|'PURCHASE'|'RATING'|'DEMOGRAPHIC' ]
   [ tuningInterestDimension = 'NAVIGATION'|'PURCHASING'|'RATING' ]
   [ tuningPersonalizationIndex = 'LOW'|'MEDIUM'|'HIGH' ]
   [ tuningProfileDataBalance = 'HISTORY'|'CURRENT'|'BALANCED' ]
   [ tuningProfileUsage = 'INCLUDE'|'EXCLUDE' ]
   [ sortOrder = 'ASCEND'|'DESCEND'|'NONE' ] >
...
</op:evaluateItems>
```

Attributes Also see "Attribute Usage Notes" following the attribute descriptions.

- **taxonomyID** (required): This is an integer specifying the ID of the taxonomy the items are from.
- **inputItemList**: If you want to supply the input items through an Item[] array, use this attribute with a JSP expression that returns the array. The item array in the expression can come from a prior recommendation tag. See "Inputting Item Arrays" on page 10-14 for more information.

Use all other evaluateItems attributes as for the getRecommendations tag, as described in "Personalization getRecommendations Tag" on page 10-23, except for any limitations mentioned in the attribute usage notes, and the fact that storeResultsIn is a required attribute for the evaluateItems tag.

For additional information about tuning and sorting, see "Tuning Settings" on page 10-16 and "Sorting Order" on page 10-18.

Attribute Usage Notes

- Inputting items requires the inputItemList attribute or a body with nested forItem tags, or optionally both. If you use both mechanisms, then the forItem tags will be executed first and the indicated items will be placed in an item list. Then the inputItemList entries will be considered and appended to the list.
- Unlike for the getRecommendations tag, storeResultsIn is a required attribute for the evaluateItems tag. You must specify a TEI variable of type Item[] for storage of the rated items.
- Specify tuningName, corresponding to the name of a <Tuning> element in personalization.xml, or specify individual tuning settings through the tuningXXX attributes. If you do neither, see "Tuning Settings" on page 10-16 for
information about how default values are chosen. Also see "Personalization Tag Library Configuration Files" on page 10-41.

- There are no filtering attributes for the `evaluateItems` tag, because the items to be rated are simply the items that are input. Therefore, you must specify the taxonomy through a separate attribute: `taxonomyID`.

**Example**  This example takes sale items as input, uses the `evaluateItems` tag to put them in order of highest interest to the user, then displays the most interesting one.

```jsp
<% Item[] saleItems = ApplicationSupport.getSaleItems(); %>

<!-- Choose the sale items of greatest interest to this user -->
<op:evaluateItems storeResultsIn="bestItems" taxonomyID="1"
    inputItemList="<%=saleItems%>" />

<% ApplicationSupport.displayItem(bestItems(1)); %>
```

**Personalization forItem Tag**

Use this tag to specify individual items for input to a `getCrossSellRecommendations` tag or an `evaluateItems` tag.

See "Specification of Input Items" on page 10-13 for conceptual information about how to use the `forItem` tag.

---

**Note:**  Also see "Personalization Tag Constraints" on page 10-41.

---

**Syntax**

```jsp
<op:forItem
    [ itemList = "item_array_expression" ]
    [ index = "index_into_item_array" ]
    [ type = "type_of_item" ]
    [ ID = "item_ID_number" ] />
```

The `forItem` tag has no body.

There are two modes of use for this tag:

- Use both `index` and `itemList`.

or:

- Use both `type` and `ID`.

**Attributes**

- `itemList`: Use a JSP expression that returns an `Item[]` array. The item array in the expression can come from a prior recommendation tag. Use this attribute together with `index`, which specifies a desired element of the array. Do not use this attribute if you use `type` and `ID`. See "Inputting Item Arrays" on page 10-14 for more information.

- `index`: Use this to specify the index number of the desired element of an item array. Specify the item array in the `itemList` attribute. Do not use this attribute if you use `type` and `ID`.

- `type`: This is for the type of items, such as "shoes". Use this attribute together with `ID`. Do not use it if you use `index` and `itemList.`
ID: This is an identification number, unique for each item of a given type. Use this attribute together with type. Do not use it if you use index and itemList.

Example The following example uses several specified shoe purchasing items as input for a cross-sell recommendation, then displays the resulting recommendations.

```
<op:getCrossSellRecommendations storeResultsIn="shoeItems">
  <op:forItem type="shoes" ID="20" />
  <op:forItem type="shoes" ID="26" />
  <op:forItem type="shoes" ID="45" />
  <op:forItem type="shoes" ID="93" />
  <op:forItem type="shoes" ID="101" />
</op:getCrossSellRecommendations>
<p> Based on past shoe purchases, here are the shoes we recommend! </p>
<%= ApplicationSupport.displayItemArray(shoeItems) %>
```

Personalization getNextItem Tag

You can optionally use nested getNextItem tags within a getRecommendations or selectFromHotPicks tag body to access the recommendations that the outer tag returns. (The alternative is to access the items through the storeResultsIn attribute of the getRecommendations or selectFromHotPicks tag.)

The first time a getNextItem tag is executed it accesses the first item, then subsequent getNextItem executions proceed through the item array one by one, with each getNextItem execution taking the next item. When the end of the item array is reached, the tag puts null values into each of its tag attributes.

Use tag attributes to store either the type and ID of the next item, or the Item instance itself.

Be aware of the following:

- Using the explicit item array from a getRecommendations or selectFromHotPicks tag, through the storeResultsIn attribute, does not preclude the use of getNextItem tags. The item array accessible through storeResultsIn is unaffected by processing through getNextItem tags.

- If you use one or more getRecommendations tags nested inside another getRecommendations tag, or one or more selectFromHotPicks tags inside another selectFromHotPicks tag, then only one of the tags can use nested getNextItem tags to access implicit tag results. Other tags in the nesting chain must use the storeResultsIn attribute. No such restriction exists for a getRecommendations tag inside a selectFromHotPicks tag, or for a selectFromHotPicks tag inside a getRecommendations tag.

Syntax

```
<op:getNextItem
    [ storeTypeIn = "TEI_variable_for_item_type" ]
    [ storeIDIn = "TEI_variable_for_item_ID" ]
    [ storeItemIn = "TEI_variable_for_Item_instance" ] />
```

The getNextItem tag has no body.

There are two modes of use for this tag:

- Use both storeTypeIn and storeIDIn.
  or:
- Use storeItemIn.
Attributes  Also see "Attribute Usage Notes" following the attribute descriptions.

- **storeTypeIn**: Specify the name of a TEI String variable to store the type of the next item. Use this in conjunction with **storeIDIn**; do not use it if you use **storeItemIn**.

- **storeIDIn**: Specify the name of a TEI String variable to store the ID of the next item. Use this in conjunction with **storeTypeIn**; do not use it if you use **storeItemIn**.

- **storeItemIn**: Specify the name of a TEI variable of type **Item** to store the next item. Do not use this if you use **storeTypeIn** and **storeIDIn**.

**Attribute Usage Notes**

All TEI variables are of scope **AT_END**, meaning they are available from the end-tag to the end of the JSP page. All TEI variables must be declared in scriptlet code earlier in the page and must be visible in the scope of the **getNextItem** tag. Unlike TEI variables in other personalization tags, these variables will **not** be declared by the JSP container.

**Examples**  The following example shows a **getNextItem** tag being used in a loop inside a **getRecommendations** tag. The loop terminates when **getNextItem** returns null.

```jsp
<op:getRecommendations from="top" tuningName="BalancedTuning" filteringName="GeneralFiltering" />
<p> Top Picks selected especially for you: </p>
<% String type=null; String ID=null; while(true) { %>
<op:getNextItem storeTypeIn="type" storeIDIn="ID" />
<% if(type==null) break;%>
<li> type: <%=type%> ID: <%=ID%> </li>
<% } %>
</op:getRecommendations>
```

And this next example shows a **getNextItem** tag in a loop inside a **selectFromHotPicks** tag:

```jsp
<op:selectFromHotPicks hotPicksGroups="1+5" tuningName="HotPicksTuning" filteringName="GeneralFiltering" />
<p> We know you enjoy Horror and Musical movies. Look what we have on sale this week! </p>
<% Item item=null; while(true) { %>
<op:getNextItem storeItemIn="item" />
<% if(item==null) break;%>
<li> <%=ApplicationSupport.displayItem(item) %> </li>
<% } %>
</op:selectFromHotPicks>
```

**Item Recording and Removal Tag Descriptions**

The following sections provide detailed descriptions of the **record*** and **remove*** Record tags. Use the appropriate **record*** tag to record an item into the recommendation engine session cache. Use the corresponding **remove***Record
tag if you want to remove an item that was recorded earlier in the session. Items in the cache are periodically flushed to the recommendation engine session; removing an item after that point requires a database round-trip.

- **Personalization recordNavigation Tag**
- **Personalization recordPurchase Tag**
- **Personalization recordRating Tag**
- **Personalization recordDemographic Tag**
- **Personalization removeNavigationRecord Tag**
- **Personalization removePurchaseRecord Tag**
- **Personalization removeRatingRecord Tag**
- **Personalization removeDemographicRecord Tag**

Also see "Overview of Item Recording and Removal Tags" on page 10-11.

**Personalization recordNavigation Tag**

Use this tag to record a navigation item into the recommendation engine session. This is to record that a user demonstrated an interest in the item by navigating to it. For example, he or she may see an icon that represents something of interest, then click a Tell Me More button next to the icon. See "Personalization removeNavigationRecord Tag" on page 10-37 for information about the tag to remove a navigation item.

You can disable actions of the recordNavigation tag by setting the disableRecording attribute of the startRESession tag to "true". See "Personalization startRESession Tag" on page 10-20 for more information.

**Syntax**

```op:recordNavigation
[ type = "type_of_item" ]
[ ID = "item_ID_number" ]
[ itemList = "item_array_expression" ]
[ index = "index_into_item_array" ] />
```

The recordNavigation tag has no body.

There are two modes of use for this tag:

- Use both type and ID.

or:

- Use both index and itemList.


**Attributes**

- **type**: This is for the type of item, such as "shoes". Use this attribute together with ID. Do not use it if you use index and itemList.

- **ID**: This is an identification number, unique for each item of a given type. Use this attribute together with type. Do not use it if you use index and itemList.
Personalization Tag and Class Descriptions

**Personalization Tags**

- **itemList**: Use a JSP expression that returns an Item[] array. The item array in the expression can come from a prior recommendation tag. Use this attribute together with `index`, which specifies a desired element of the array. Do not use this attribute if you use `type` and `ID`. See "Inputting Item Arrays" on page 10-14 for more information.

- **index**: Use this to specify the index number of the desired element of an item array. Specify the item array in the `itemList` attribute. Do not use this attribute if you use `type` and `ID`.

**Personalization recordPurchase Tag**

Use this tag to record a purchasing item into the recommendation engine session. This is to record a purchase the user has made. See 'Personalization removePurchaseRecordTag' on page 10-38 for information about the tag to remove a purchasing item.

You can disable actions of the `recordPurchase` tag by setting the `disableRecording` attribute of the `startRESession` tag to "true". See "Personalization startRESession Tag" on page 10-20 for more information.

**Syntax**

```html
<op:recordPurchase
    [ type = "type_of_item" ]
    [ ID = "item_ID_number" ]
    [ itemList = "item_array_expression" ]
    [ index = "index_into_item_array" ] />
```

The `recordPurchase` tag has no body.

There are two modes of use for this tag:

- Use both `type` and `ID`.
- Use both `index` and `itemList`.


**Attributes**

Attributes are the same as for the `recordNavigation` tag. See "Personalization recordNavigation Tag" on page 10-34.

**Example** Consider the following excerpts from two JSP pages.

**Page 1:**

```jsp
<%@ page session='true' %>
<op:getRecommendations storeResultsIn "myRecs" />
...display recommendations...
<% session.setAttribute("recommendationList", myRecs); %>
```

**Page 2:**

```jsp
<%@ page session='true' %>
<op:recordPurchase itemList="<%=session.getAttribute("recommendationList") %>"
    index="<%=request.getParameter("index") %>" />
```
Page 1 obtains a list of recommendations and displays them, along with a **Buy** link for each item. The item array is stored in the *session* object for subsequent pages to use.

Page 2 is executed when the user selects a link to buy a particular recommendation. The item list is retrieved from a session attribute; the index of the item selected is retrieved from a request parameter. Page 2 might be a Shopping Cart page, for example.

**Personalization recordRating Tag**

Use this tag to record a rating item into the recommendation engine session. This would be based on a user rating of the item. See "Personalization removeRatingRecord Tag" on page 10-38 for information about the tag to remove a rating item.

This tag differs from *recordNavigation* and *recordPurchase* in that a rating value must also be specified.

---

**Note:** Also see "Personalization Tag Constraints" on page 10-41.

---

**Syntax**

```xml
<op:recordRating value = "rating_value"
    [ type = "type_of_item" ]
    [ ID = "item_ID_number" ]
    [ itemList = "item_array_expression" ]
    [ index = "index_into_item_array" ] />
```

The *recordRating* tag has no body.

There are two modes of use for this tag:

- Use both *type* and *ID*.

or:

- Use both *index* and *itemList*.

The *value* attribute is required in either case.


**Attributes**

- *value* (required): This is a string representing the user rating value. An integer or floating point number can be entered. The number should be in the appropriate rating range, according to boundaries in the `MTR.MTR_BIN_BOUNDERIES` table in the mining table repository.

The other attributes are the same as for the *recordNavigation* tag. See "Personalization recordNavigation Tag" on page 10-34.

**Personalization recordDemographic Tag**

Use this tag to record a demographic item into the recommendation engine session. A demographic item consists of a piece of personal information about a particular user. See "Personalization removeDemographicRecord Tag" on page 10-39 for information about the tag to remove a demographic item.

This tag differs from the other *recordXXX* tags in that it has only two attributes: *type* and *value*. The *type* attribute indicates what kind of information the item contains, such as "AGE". The *value* attribute contains the corresponding value, such as "44".
Personalization Tag and Class Descriptions

Note: Also see "Personalization Tag Constraints" on page 10-41.

Syntax

```xml
<op:recordDemographic
type = "GENDER"|"AGE"|"MARITAL_STATUS"|"PERSONAL_INCOME"|
   "HOUSEHOLD_INCOME"|"IS_HEAD_OF_HOUSEHOLD"|"HOUSEHOLD_SIZE"|
   "RENT_OWN_INDICATOR"|"ATTRIBUTE1"|...|"ATTRIBUTE50"
value = "item_value" />
```

The recordDemographic tag has no body.

Attributes

- **type** (required): Specify one of the supported demographic types. In addition to the several named types, there are 50 types you can customize: ATTRIBUTE1, ATTRIBUTE2, ..., ATTRIBUTE50. See "Demographic Items" on page 10-14 for additional information.
- **value** (required): Specify an appropriate value, given the demographic type, such as "MALE" or "FEMALE" for a GENDER item.

Personalization removeNavigationRecord Tag

Use this tag to remove a navigation item that had been recorded into the recommendation engine session earlier in the session. See "Personalization recordNavigation Tag" on page 10-34 for information about the tag to record a navigation item.

To remove an item, you must use the removeNavigationRecord tag during the same recommendation engine session in which the item was recorded. The session cache is periodically flushed to the recommendation engine database schema during the course of a session. If you remove an item after it has been flushed, execution of the removal tag will require a database round-trip.

Note: Also see "Personalization Tag Constraints" on page 10-41.

Syntax

```xml
<op:removeNavigationRecord
   
   [ type = "type_of_item" ]
   
   [ ID = "item_ID_number" ]
   
   [ itemList = "item_array_expression" ]
   
   [ index = "index_into_item_array" ] />
```

The removeNavigationRecord tag has no body.

There are two modes of use for this tag:

- Use both type and ID.

or:

- Use both index and itemList.


Attributes
Attributes are the same as for the recordNavigation tag. See "Personalization recordNavigation Tag" on page 10-34.

**Personalization removePurchaseRecord Tag**

Use this tag to remove a purchasing item that had been recorded into the recommendation engine session earlier in the session. See "Personalization recordPurchase Tag" on page 10-35 for information about the tag to record a purchasing item.

To remove an item, you must use the removePurchaseRecord tag during the same recommendation engine session in which the item was recorded. The session cache is periodically flushed to the recommendation engine database schema during the course of a session. If you remove an item after it has been flushed, execution of the removal tag will require a database round-trip.

**Note:** Also see "Personalization Tag Constraints" on page 10-41.

**Syntax**

```xml
<op:removePurchaseRecord
[ type = "type_of_item" ]
[ ID = "item_ID_number" ]
[ itemList = "item_array_expression" ]
[ index = "index_into_item_array" ] />
```

The removePurchaseRecord tag has no body.

There are two modes of use for this tag:

- Use both type and ID.

or:

- Use both index and itemList.


**Attributes**

Attributes are the same as for the recordNavigation tag. See "Personalization recordNavigation Tag" on page 10-34.

**Personalization removeRatingRecord Tag**

Use this tag to remove a rating item that had been recorded into the recommendation engine session earlier in the session. See "Personalization recordRating Tag" on page 10-36 for information about the tag to record a rating item.

This tag differs from removeNavigationRecord and removePurchaseRecord in that a rating value must also be specified.

To remove an item, you must use the removeRatingRecord tag during the same recommendation engine session in which the item was recorded. The session cache is periodically flushed to the recommendation engine database schema during the course of a session. If you remove an item after it has been flushed, execution of the removal tag will require a database round-trip.

**Note:** Also see "Personalization Tag Constraints" on page 10-41.
Syntax

```xml
<op:removeRatingRecord value = "rating_value"
    [ type = "type_of_item" ]
    [ ID = "item_ID_number" ]
    [ itemList = "item_array_expression" ]
    [ index = "index_into_item_array" ] />
```

The `removeRatingRecord` tag has no body.

There are two modes of use for this tag:

- Use both `type` and `ID`.

or:

- Use both `index` and `itemList`.

The `value` attribute is required in either case.


Attributes

- `value` (required): This is a string representing the user rating value that was previously recorded.

The other attributes are the same as for the `recordNavigation` tag. See "Personalization recordNavigation Tag" on page 10-34.

**Personalization removeDemographicRecord Tag**

Use this tag to remove a demographic item that had been recorded into the recommendation engine session earlier in the session. See "Personalization recordDemographic Tag" on page 10-36 for information about the tag to record a demographic item.

This tag differs from the other `removeXXXRecord` tags in that it has only two attributes: `type` and `value`. The `type` attribute indicates what kind of information the item contains, such as "AGE". The `value` attribute contains the corresponding value, such as "44".

To remove an item, you must use the `removeDemographicRecord` tag during the same recommendation engine session in which the item was recorded. The session cache is periodically flushed to the recommendation engine database schema during the course of a session. If you remove an item after it has been flushed, execution of the removal tag will require a database round-trip.

---

**Note:** Also see "Personalization Tag Constraints" on page 10-41.

Syntax

```xml
<op:removeDemographicRecord
type = "GENDER"|"AGE"|"MARITAL_STATUS"|"PERSONAL_INCOME"|
  "HOUSEHOLD_INCOME"|"IS_HEAD_OF_HOUSEHOLD"|"HOUSEHOLD_SIZE"|
  "RENT_OWN_INDICATOR"|"ATTRIBUTE1"|...|"ATTRIBUTE50"
value = "item_value" />
```

The `removeDemographicRecord` tag has no body.

Attributes
Attributes are the same as for the recordDemographic tag. See "Personalization recordDemographic Tag" on page 10-36.

Item Class Description

The OracleAS Personalization tag library offers the following convenient wrapper class to facilitate the use of items, categories, and recommendations in JSP pages:

`oracle.jsp.webutil.personalization.Item`

Tag handlers create Item instances as necessary. There are two particular scenarios where you must use, and sometimes create, Item instances directly:

- When you want to retrieve type, ID, and prediction values from a recommendation item
  For a purchasing or navigation item, the prediction value is a ranking. For a rating item, the prediction value is a rating.
- When you want to create instances manually for input item lists for the `getCrossSellRecommendations` and `evaluateItems` tags

The Item class provides the following getter methods for the first scenario:

- `String getType()`
  Return the item type, such as "shoes", for example, or one of the supported demographic types for demographic items. A value of "$CATEGORY" indicates that an entire category is being recommended.

- `longgetID()`
  Return the item ID number.

- `float getPrediction()`
  Return either the rating, for a rating item, or the ranking, for a purchasing or navigation item. Rankings are always integers, but this attribute must be floating point because ratings can be floating point.

The class provides the following setter methods for the second scenario:

- `void setType(java.lang.String)`
  Set the item type.

- `void setID(long)`
  Set the item ID number.

There are also methods to define the item as a category and to determine if it has already been defined as a category:

- `void setCategory()`
  Set the item type to "$CATEGORY".

- `boolean isCategory()`
  Returns true if the item type is "$CATEGORY".

The Item class provides the following public constructors:

- `Item()`
- `Item(String type, long ID)`
- `Item(String type, String ID)`
The type attribute must be a string; the ID attribute can be a string or a long value.

The Item class also defines the following String constant values for interest dimensions. Use the following values for comparisons to values returned in the storeInterestDimensionIn attribute of the recommendation tags.

- **INT_DIM_NAVIGATION**: This indicates an item recommended for its high navigation interest.
- **INT_DIM_PURCHASING**: This indicates an item recommended for its high purchasing interest.
- **INT_DIM_RATING**: This indicates an item recommended for its high rating interest.

**Personalization Tag Constraints**

Be aware of the following constraints regarding attribute settings for the OracleAS Personalization tags.

- The **startRESession** tag has the following limitations:
  - The **REName** attribute has a maximum of 12 characters.
  - The **REURL** attribute has a maximum of 256 characters.
  - The **RESchema** attribute has a maximum of 30 characters.
  - The **REPassword** attribute has a maximum of 30 characters.
  - The **userID** attribute has a maximum of 32 characters.

  The same restrictions apply to the corresponding attributes of the `<RE>` element of a personalization.xml file, except for **userID**, which is not used in personalization.xml.

- There can be no more than 1024 **Item** elements passed into any tag or returned by any tag. This is not only the maximum size of any single **Item[]** array passed to or from a tag, but is also a combined maximum if any tag receives input from both an item list and one or more **forItem** tags.

- For the recommendation tags—**getRecommendations**, **getCrossSellRecommendations**, and **selectFromHotPicks**—a maximum of 1024 hot picks groups can be specified. This applies to the **fromHotPicksGroups** attribute of the **getRecommendations** and **getCrossSellRecommendations** tags, and to the **hotPicksGroups** attribute of the **fromHotPicksGroups** tag.

- Also for the recommendation tags, the **filteringCategories** attribute can specify a maximum of 256 categories.

  Equivalently, there can be a maximum of 256 `<Category>` subelements in the `<Filtering>` element of a personalization.xml file.

- Maximum length of the value attribute for the **recordDemographic**, **removeDemographicRecord**, **recordRating**, and **removeRatingRecord** tags is 60 characters.

**Personalization Tag Library Configuration Files**

The OracleAS Personalization tag library supports the use of configuration files, named personalization.xml, to specify global and default tag attribute settings.
The following sections document personalization.xml files and their supported elements:

- The personalization.xml Files
- Element Descriptions for personalization.xml
- Sample personalization.xml File

The personalization.xml Files

The OracleAS Personalization tag library supports configuration files named personalization.xml. These files are useful in specifying default settings for optional tag attributes and for specifying default and named tuning and filtering settings. Using personalization.xml for tuning and filtering settings is particularly useful, because the settings can be quite involved and it would be inconvenient to have to set them in multiple tags or multiple pages.

There can be two personalization.xml files relevant to a given application:

- /WEB-INF/personalization.xml
  
  Use this file for the particular application only, for any defaults or settings that are application-wide.

- ORACLE_HOME/j2ee/home/config/personalization.xml
  
  This is a server-wide configuration file. It is accessed for any required settings that cannot be found in tag attributes or in the personalization.xml file for the particular application.

Element Descriptions for personalization.xml

This section documents the XML DTD for personalization.xml elements supported by the OracleAS Personalization tag library. These elements are inside a top-level <personalization-config> element.

The personalization tags will validate any personalization.xml file against this DTD.

Note: Also see "Personalization Tag Constraints" on page 10-41. Some of these limitations apply to personalization.xml elements as well as to tag attribute settings.

RecommendationSettings Element

Use this element to set a default value for maxQuantity, the maximum number of recommendations that can be returned, for the getRecommendations, getCrossSellRecommendations, and selectFromHotPicks tags.

The maxQuantity setting must be a string representing a positive integer.

Definition

```
<!ELEMENT RecommendationSettings EMPTY>
<!ATTLIST RecommendationSetting  maxQuantity  CDATA #REQUIRED>
```
RE Element
Use this element to specify the name of a recommendation engine connection and to make the connection. See "Personalization startRESession Tag" on page 10-20 for information about the attributes.

Definition

```xml
<!ELEMENT RE EMPTY>
<!ATTLIST RE Name CDATA #REQUIRED>
<!ATTLIST RE URL CDATA #REQUIRED>
<!ATTLIST RE Schema CDATA #REQUIRED>
<!ATTLIST RE Password CDATA #REQUIRED>
<!ATTLIST RE CacheSize CDATA #REQUIRED>
<!ATTLIST RE FlushInterval CDATA #REQUIRED>
```

You can refer to the Name attribute in startRESession tag REName attributes.

If the OC4J jazn-data.xml file contains a <user> element for an account in the recommendation engine database (scott for example), you can get the de-obfuscated password from there by using special right-arrow syntax with a dash ("-") and right-carrot ("->") followed by the account name, such as:

Password="->scott"

Tuning Element
Use this element to define named tuning settings. See "Tuning Settings" on page 10-16 for information about the attributes.

Definition

```xml
<!ELEMENT Tuning EMPTY>
<!ATTLIST Tuning Name CDATA #REQUIRED>
<!ATTLIST Tuning DataSource (NAVIGATION|PURCHASING|RATING|DEMOGRAPHIC|ALL) "ALL" >
<!ATTLIST Tuning InterestDimension (NAVIGATION|PURCHASING|RATING) #REQUIRED >
<!ATTLIST Tuning PersonalizationIndex (LOW|MEDIUM|HIGH) #REQUIRED >
<!ATTLIST Tuning ProfileDataBalance (HISTORY|CURRENT|BALANCED) #REQUIRED >
<!ATTLIST Tuning ProfileUsage (INCLUDE|EXCLUDE) "INCLUDE" >
```

The Name attribute is required and must give a unique name to this set of tuning settings so that the name can be referred to in recommendation tag tuningName attributes.

Other attributes are also required to fully define tuning settings for a recommendation request, except for ProfileUsage, which has a default value of INCLUDE. See the Oracle Application Server Personalization Programmer’s Guide for more information.

DefaultTuning Element
Use this element for tuning settings if there are no individual tuning tag attributes and no tuningName tag attribute (with corresponding <Tuning> element in personalization.xml).

Attribute meanings are the same as for the <Tuning> element discussed immediately above.

Definition
<!ELEMENT DefaultTuning EMPTY>
<!ATTLIST DefaultTuning DataSource
(NAVIGATION|PURCHASING|RATING|DEMOGRAPHIC|ALL) "ALL" >
<!ATTLIST DefaultTuning InterestDimension (NAVIGATION|PURCHASING|RATING)
#REQUIRED >
<!ATTLIST DefaultTuning PersonalizationIndex (LOW|MEDIUM|HIGH)
#REQUIRED >
<!ATTLIST DefaultTuning ProfileDataBalance (HISTORY|CURRENT|BALANCED)
#REQUIRED >
<!ATTLIST DefaultTuning ProfileUsage (INCLUDE|EXCLUDE) "INCLUDE" >

Filtering Element and Category Elements

Use these elements to define named filtering settings. See "Recommendation Filtering" on page 10-17 for information about the attributes.

Use the filtering Name attribute to provide a unique name to be referenced from personalization tags.

One or more <Category> elements must be nested within a filtering subelement, except for the AllItems and AllCategories subelements. Contents of a <Category> element must be a string representing a long integer.

Definition

<!ELEMENT Filtering (ExcludeItems|IncludeItems|ExcludeCategories|
IncludeCategories|CategoryLevel|SubTreeItems|
SubTreeCategories|AllItems|AllCategories) >
<!ATTLIST Filtering Name CDATA #REQUIRED>
<!ATTLIST Filtering TaxonomyID CDATA #REQUIRED>
<!ELEMENT Category (#PCDATA) >
<!ELEMENT ExcludeItems ( Category+ ) >
<!ELEMENT IncludeItems ( Category+ ) >
<!ELEMENT ExcludeCategories ( Category+ ) >
<!ELEMENT IncludeCategories ( Category+ ) >
<!ELEMENT CategoryLevel ( Category+ ) >
<!ELEMENT SubTreeItems ( Category+ ) >
<!ELEMENT SubTreeCategories ( Category+ ) >
<!ELEMENT AllItems EMPTY >
<!ELEMENT AllCategories EMPTY >

DefaultFiltering Element

Use this element for filtering settings if there are no individual filtering tag attributes and no filteringName tag attribute (with corresponding <Filtering> element in personalization.xml).

Definition

<!ELEMENT DefaultFiltering (ExcludeItems|IncludeItems|ExcludeCategories|
IncludeCategories|CategoryLevel|SubTreeItems|
SubTreeCategories|AllItems|AllCategories) >
<!ATTLIST DefaultFiltering TaxonomyID CDATA #REQUIRED>
<!ELEMENT Category (#PCDATA) >
<!ELEMENT ExcludeItems ( Category+ ) >
<!ELEMENT IncludeItems ( Category+ ) >
<!ELEMENT ExcludeCategories ( Category+ ) >
<!ELEMENT IncludeCategories ( Category+ ) >
<!ELEMENT CategoryLevel ( Category+ ) >
<!ELEMENT SubTreeItems ( Category+ )>
<!ELEMENT SubTreeCategories ( Category+ )>
<!ELEMENT AllItems EMPTY>
<!ELEMENT AllCategories EMPTY>

Sample personalization.xml File

```xml
<?xml version="1.0" ?>
<personalization-config>
  <description> Sample personalization config file </description>
  <RecommendationSettings maxQuantity="5" />
  <RE Name="RE1" URL="jdbc:oracle:thin:@sid" Schema="RESCHEMA"
       Password="secret" CacheSize="2999" FlushInterval="30000" />
  <RE Name="RE2" URL="jdbc:oracle:oci:@acme" Schema="RE2-schema"
       Password="RE2-pwd" CacheSize="5555" FlushInterval="100000" />
  <Tuning Name = "tuning1" DataSource="ALL"
          InterestDimension="NAVIGATION"
          PersonalizationIndex="HIGH" ProfileDataBalance="BALANCED"
          ProfileUsage="INCLUDE" />
  <DefaultTuning DataSource="PURCHASING" InterestDimension="RATING"
                   PersonalizationIndex="MEDIUM" ProfileDataBalance="CURRENT"
                   ProfileUsage="EXCLUDE" />
  <Filtering Name = "filter1" TaxonomyID="25" >
    <CategoryLevel>
      <Category>10</Category>
      <Category>11</Category>
      <Category>15</Category>
    </CategoryLevel>
  </Filtering>
  <DefaultFiltering TaxonomyID="1" >
    <AllItems/>
  </DefaultFiltering>
</personalization-config>
```

Alternatively, if there are jazn-data.xml entries for the RESCHEMA and RE2-schema accounts, you can get the de-obfuscated passwords from there instead of specifying them in clear text in personalization.xml, as follows:

```xml
<RE Name="RE1" URL="jdbc:oracle:thin:@sid" Schema="RESCHEMA"
     Password="->RESCHEMA" CacheSize="2999" FlushInterval="30000" />
<RE Name="RE2" URL="jdbc:oracle:oci:@acme" Schema="RE2-schema"
     Password="->RE2-schema" CacheSize="5555" FlushInterval="100000" />
```
Oracle furnishes a tag library with OC4J that enables developers to create JSP pages for use as client programs for Web services. This chapter describes the tag library and consists of the following sections:

- Overview of Web Services
- OC4J Web Services Tags

This chapter is written with the assumption that you are already familiar with Web services, Simple Object Access Protocol (SOAP), and the Web Services Description Language (WSDL); however, some overview is provided here. There are also references to additional documents, including related specifications from the World Wide Web Consortium (W3C).

The OC4J Web services tag library is based on Oracle Application Server Web Services. See the Oracle Application Server Web Services Developer’s Guide for information.

Overview of Web Services

The following sections provide a quick overview of Web services concepts:

- General Web Services Overview
- Overview of SOAP and Related Features
- Overview of Web Services Description Language Key Elements
- Overview of Web Service Messages and XML Schema Definitions
- Web Service Example

General Web Services Overview

Web services are sets of procedures, or actions, that can be invoked by a client over the Internet, regardless of the computing platform. Web services consist of loosely coupled components over a distributed computing environment following a widely adopted set of standards such as SOAP, WSDL, and UDDI (all discussed later in this chapter). As an example, there might be a "World Cup Soccer" service that consists of actions to get scores, schedules, and standings.

A Web service must have the following features:

- It must be able to describe itself, such as its functionality and its input and output attributes. A Web service describes itself through an XML-style WSDL document. See “Overview of Web Services Description Language Key Elements” on page 11-3.
It must make itself generally available so that client applications can access it. The standard way to do this is to be listed in a Universal Description, Discovery, and Integration (UDDI) directory. Public UDDI directories are available to aggregate groups of businesses or users (or perhaps to anyone on the Internet), while private UDDI directories are available only within a particular business or group.

A client application must be able to invoke it through a standard protocol once the application has found and examined it. A leading protocol for Web services is Simple Object Access Protocol (SOAP). With SOAP, the Web service is behind a SOAP server at the server end and the client application goes through a SOAP server at the client end. Data exchanges are “SOAP-enveloped” and can gain access through firewalls. This SOAP exchange is conceptually similar to a Remote Method Invocation (RMI) exchange, except that RMI exchanges cannot go through firewalls. See “Overview of SOAP and Related Features” below for a brief overview of SOAP.

Once invoked, it must return a response to provide requested results to the client application. This is performed through the same standard protocol, such as SOAP.

For more information about Web services, particularly OracleAS Web Services, you can refer to the Oracle Application Server Web Services Developer’s Guide.

For related specifications, refer to the following Web sites for the W3C SOAP specification, W3C WSDL specification, and UDDI specification, respectively:

http://www.w3.org/TR/SOAP

http://www.w3.org/TR/wsd1

http://www.uddi.org/specification.html

Overview of SOAP and Related Features

This section offers a brief overview of SOAP. See the W3C Simple Object Access Protocol (SOAP) 1.1 specification for details.

SOAP is a lightweight, XML-based protocol for exchanging typed and structured data over the Internet or other distributed environments. Among other features, SOAP supports remote procedure call (RPC) and message-oriented data exchanges.

In a message-oriented implementation, data is exchanged through a modular packaging and encoding model. A message is a WSDL component that specifies input data parts and output data parts associated with an operation. See “Overview of Web Service Messages and XML Schema Definitions” on page 11-4 for more information.

RPC is an alternative to sockets, with the communication interface being at the level of procedure calls. It is as though you are calling a local procedure, but arguments of the call are actually packaged and sent to a remote target. The RPC mechanism uses a request/response methodology, where an end-point receives a procedure-oriented message and sends back a corresponding response.

Using SOAP with RPC is independent of the protocol binding. Where HTTP is the protocol binding, HTTP requests correspond to RPC calls, and HTTP responses correspond to RPC responses.

Key aspects of SOAP include the following.

- SOAP envelope construct: The envelope encloses a SOAP header and SOAP body and indicates what is in a message, whether it is required, and who should process it.
- SOAP encoding rules: Encoding rules define serialization mechanisms for the exchange of instances of the datatypes used in an application.
- SOAP RPC representation: The RPC representation specifies a convention for representing RPC calls and responses.

**Overview of Web Services Description Language Key Elements**

A Web service is described using the XML-based Web Services Description Language in a WSDL (.wsdl) document.

Following are some key WSDL terms.

- **Operation**: An operation is a particular action performed by a service, such as any of the "get scores", "get schedules", and "get standings" examples for a World Cup service.
- **Message**: A message is an abstract definition that specifies the data that is being input and output for an operation.
- **Port type**: A port type is an abstract definition of the operations supported by a service.
- **Binding**: A binding is a protocol and data format specification for one or more operations supported by a service. A binding mechanism maps the generic or abstract definition of a Web service to a concrete implementation, including data encoding, message protocol, and communication protocol.
- **Port**: A port is a single end-point, a combination of a binding and a network address. Essentially, a port is the concrete manifestation of the capabilities described by a port type. In a SOAP-based implementation, a port is a SOAP location.

To be more precise than previously, a Web service is really a collection of related ports, or end-points, not just a collection of abstract actions or operations.

The WSDL specification outlines the general structure of a WSDL document, which includes the following key elements. Refer to the W3C Web Services Description Language (WSDL) 1.1 specification for complete information.

- A `<types>` element, through one or more `<schema>` subelements, contains descriptions of the data that is exchanged in messages used by the operations of the service.
- A `<message>` element provides an abstract definition of data being sent as input or output for an operation.
- A `<portType>` element, through one or more `<operation>` subelements, contains abstract definitions of the operations of the Web service. An `<operation>` element specifies the message that is used for input and the message that is used for output for the operation.
- A `<binding>` element, also through `<operation>` subelements, binds each operation to the particular protocol and data formats to be used.
- A `<service>` element defines the ports, or end-points, of the Web service. Within the `<service>` element is one or more `<port>` subelements, where each `<port>` element ties a binding to an address to define the end-point.
Overview of Web Service Messages and XML Schema Definitions

Messages define parameters used by the operations, or methods, of a Web service. A message is a typed definition of the data being communicated, consisting of one or more parts. Each part corresponds to a logical entity, such as a "Purchase Order" part and an "Invoice" part. For each part, there are type specifications for the associated data items.

In a SOAP-based implementation, such as for OracleAS Web Services, the datatypes used by a message are defined through the XML Schema Definition (XSD) language, which supports predefined simple types as well as user-defined complex types.

With an implementation that uses XSD, the syntax for defining a message is as follows:

```xml
<message name="nmtoken">
  <part name="nmtoken" [type="qname"] [element="qname"] />
</message>
```

In this syntax, the `element` attribute refers to where an XSD complex type is defined using XSD syntax, the `type` attribute indicates an XSD simple type, "nmtoken" indicates a standard XML name token, and "qname" indicates a standard XML qualified name. There can be zero or more messages, and zero or more parts for each message.

For a SOAP encoding style of `encoded`, only simple types are allowed, so the `element` attribute is not used. For an encoding style of `literal`, you can have simple types or complex types, so a `<part>` element can use either the `type` attribute or the `element` attribute, but not both.

Here is an example of a message definition, from "Example: WSDL Definition", which follows shortly:

```xml
<message name="GetLastTradePriceInput">
  <part name="body" element="xsd1:TradePriceRequest"/>
</message>
```

GetLastTradePriceInput is the name of the message, which is an input message (as the name implies). In this case, the `element` attribute refers to a namespace where a complex type, `TradePriceRequest`, is defined. Here is an example of such a definition (also part of "Example: WSDL Definition" below):

```xml
<element name="TradePriceRequest">
  <complexType>
    <all>
      <element name="tickerSymbol" type="string"/>
      <element name="companyName" type="string"/>
    </all>
  </complexType>
</element>
```

An XML schema primer is available from W3C at the following location:

http://www.w3.org/TR/xmlschema-0/

Web Service Example

This example shows the WSDL definition of a Web service, illustrating the input and output messages embedded in an HTTP request and HTTP response, respectively.
Example: WSDL Definition

The W3C Web Services Description Language (WSDL) 1.1 specification provides the following example of a WSDL document that defines a stock quote service taking a ticker symbol as input and returns the current stock price as output. Note this uses a SOAP encoding style of literal, so complex types are allowed (and used).

```xml
<?xml version="1.0"?>
<definitions name="StockQuote"

targetNamespace="http://example.com/stockquote.wsdl"
    xmlns:tns="http://example.com/stockquote.wsdl"
    xmlns:xsd1="http://example.com/stockquote.xsd"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns="http://schemas.xmlsoap.org/wsdl/">
    <types>
        <schema targetNamespace="http://example.com/stockquote.xsd"
            xmlns="http://www.w3.org/2000/10/XMLSchema">
            <element name="TradePriceRequest">
                <complexType>
                    <all>
                        <element name="tickerSymbol" type="string"/>
                    </all>
                </complexType>
            </element>
            <element name="TradePrice">
                <complexType>
                    <all>
                        <element name="price" type="float"/>
                    </all>
                </complexType>
            </element>
        </schema>
    </types>
    <message name="GetLastTradePriceInput">
        <part name="body" element="xsd1:TradePriceRequest"/>
    </message>
    <message name="GetLastTradePriceOutput">
        <part name="body" element="xsd1:TradePrice"/>
    </message>
    <portType name="StockQuotePortType">
        <operation name="GetLastTradePrice">
            <input message="tns:GetLastTradePriceInput"/>
            <output message="tns:GetLastTradePriceOutput"/>
        </operation>
    </portType>
    <binding name="StockQuoteSoapBinding" type="tns:StockQuotePortType">
        <soap:binding style="document"
            transport="http://schemas.xmlsoap.org/soap/http"/>
        <operation name="GetLastTradePrice">
            <soap:operation soapAction="http://example.com/GetLastTradePrice"/>
            <input>
                <soap:body use="literal"/>
            </input>
            <output>
                <soap:body use="literal"/>
            </output>
        </operation>
    </binding>
</definitions>
```
This WSDL definition first specifies the `GetLastTradePriceInput` and `GetLastTradePriceOutput` input and output messages, then ties them to the operation `GetLastTradePrice`, then defines a binding and a port for that operation.

**Notes:**
- This example has all aspects of the Web service definition, including the XML schema definitions for data exchanges, in the same document. Alternatively, `stockquote.xsd`, for example, could be a separate XSD document instead of a namespace within this document. The W3C WSDL specification illustrates this. Be aware, however, that the OC4J Web services tag library does not support WSDL documents that use `<import>` elements to import other WSDL documents.
- The example uses a document-style binding. The OC4J 10.1.2 implementation of the Web services tag library supports RPC-style and document-style bindings. In the document-style case, the output response object is an XML document of type `XMLElement`. In the RPC-style case, the output object might be of any type.

**Example: SOAP Messages Embedded in HTTP Request and Response**
Corresponding to the Web service defined in the preceding example, this section shows what the messages would look like, with the soap-enveloped input message embedded in an HTTP request, and the soap-enveloped output message embedded in an HTTP response. These examples are also from the W3C Web Services Description Language (WSDL) 1.1 specification.

Here is a request:

```plaintext
POST /StockQuote HTTP/1.1
Host: www.stockquoteserver.com
Content-Type: text/xml; charset='utf-8'
Content-Length: nnnn
SOAPAction: "SOAP_URI"

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
  <soapenv:Body>
    <m:GetLastTradePrice xmlns:m="xmlns_URI">
      <m:tickerSymbol>DIS</m:tickerSymbol>
    </m:GetLastTradePrice>
  </soapenv:Body>
</soapenv:Envelope>
```
In this example, `xmlns_URI` is a URI value used to identify the namespace where the GetLastTradePrice operation and its messages are defined, such as the WSDL document in the preceding "Example: WSDL Definition". This is also where `tickerSymbol` is defined. The request is for a stock quote for Walt Disney Company. `SOAP_URI` is the URI for the SOAP action HTTP header for the HTTP binding of SOAP.

And here is the response:

```
HTTP/1.1 200 OK
Content-Type: text/xml; charset="utf-8"
Content-Length: nnnn

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/">
    <soapenv:Body>
        <m:GetLastTradePriceResponse xmlns:m="Some_URI">
            <m:price>34.5</m:price>
        </m:GetLastTradePriceResponse>
    </soapenv:Body>
</soapenv:Envelope>
```

By convention, the response for an operation `Xxxx` is called `XxxxResponse`. `Some_URI` is a URI value used to identify the namespace where the GetLastTradePriceResponse operation is defined.

### OC4J Web Services Tags

The following sections provide an overview and details of the Web services tag library, as well as an overview of OracleAS Web Services, upon which the tag library implementation is based.

- Overview of OracleAS Web Services and the Tag Library Implementation
- Overview of Functionality of Web Services Tags
- Web Services Tag Descriptions
- Web Services Tag Examples

### Overview of OracleAS Web Services and the Tag Library Implementation

The Web services tag library provided with OC4J enables developers to conveniently create JSP pages for Web service client applications. The implementation uses a SOAP-based mechanism. A client application would access the WSDL document, then use the WSDL information to access the operations of a Web service.

The tag library also uses the Oracle implementation of the dynamic invocation API, described in the Oracle Application Server Web Services Developer’s Guide. When a client application acquires a WSDL document at runtime, the dynamic invocation API is the vehicle for invoking any SOAP operation described in the WSDL document. The tag handler uses the API when sending a SOAP request that invokes a Web service and when handling the SOAP response.

The Oracle dynamic invocation API consists of classes and interfaces in the `oracle.j2ee.ws.client` and `oracle.j2ee.ws.client.wsdl` packages.

The `oracle.j2ee.ws.client` package includes the following.

- `WebServiceProxyFactory`: Given a WSDL document (through a Java input stream that contains the document or through the URL of the document), a
WebServiceProxyFactory instance can use the name of a service and the name of one of its ports, as specified in the WSDL document, to create a WebServiceProxy instance (an instance of a class that implements the WebServiceProxy interface).

- **WebServiceProxy**: Use this interface in representing a service defined in a WSDL document. Each WebServiceProxy instance is based on the location of the WSDL document and, optionally, on additional qualifiers that identify which service and port should be used. A WebServiceProxy class exposes methods to determine the WSDL port type, including the syntax and signatures of all operations exposed by the WSDL document, and to invoke the defined operations.

- **WebServiceMethod**: Use this interface in invoking a Web service method, or operation.

The `oracle.j2ee.ws.client.wsdl` package includes the following.

- **Operation**: This interface represents a WSDL operation.
- **Message**: This interface represents a message used in the input or output of an operation.
- **Part**: This interface represents a message part.
- **Input**: This interface represents an input message.
- **Output**: This interface represents an output message.

---

**Note**: The dynamic invocation API is packaged in `dsv2.jar` in the `ORACLE_HOME/lib` directory. Also note that the SOAP implementation requires `soap.jar` in the `ORACLE_HOME/soap` directory.

---

**Overview of Functionality of Web Services Tags**

This section provides an overview of the OC4J Web services tag library and its functionality. The tag library includes support for the following:

- Binding to a Web service
- Using a Web service operation through SOAP requests and SOAP responses
- Defining input and output message parts
- Mapping SOAP/XML datatypes to Java types
- Setting custom properties for use by the client application

The tag library supports invoking operations defined in WSDL documents that use the W3C XML schema version whose namespace is the following:

`http://www.w3.org/2001/XMLSchema`

The Web services tag library includes the `webservice` tag, optionally with nested `map` and `property` tags, and the `invoke` tag, optionally with nested `part` tags. They are used as follows.

- **webservice**: Use this tag to create a Web service proxy. The tag requires the URL of a WSDL document and then uses one of the following combinations:
  - A binding and SOAP location, useful for a WSDL document identified in a UDDI registry
OC4J Web Services Tags

- A service name and port, provided through tag attributes or through the first service and its first port from the WSDL document

- **map**: The Web service proxy uses this tag, if specified, to add an entry to the SOAP mapping registry, which is a registry that maps local SOAP/XML types to Java types. Any number of `map` tags can be nested within a `webservice` tag, one tag for each desired type mapping.

- **property**: Optionally, use this tag to define any of several supported custom properties for use by the Web service client application. Each `property` tag must be nested within the `webservice` tag; the property will have the same scope as the parent Web service.

- **invoke**: Use this tag to invoke an operation of the Web service. An `invoke` tag accesses a Web service proxy either by being nested within a `webservice` tag, or through a scripting variable.

- **part**: If an operation has input message parts, use `part` tags, nested within an `invoke` tag, to define the message parts. Use one `part` tag for each part.

---

**Notes:**

- The tag library does not support the use of `<import>` elements within WSDL documents to import other WSDL documents.

- Custom bindings, including custom HTTP bindings or custom MIME bindings, are not supported.

Because the OC4J Web services tag library implementation is based on the OracleAS Web Services implementation, any additional limitations of OracleAS Web Services also apply to the tag library.

---

**Web Services Tag Descriptions**

The following sections supply detailed descriptions of the OC4J Web services tags, a standards-compliant JavaServer Pages tag library implementation, including syntax documentation:

- Web Services `webservice` Tag
- Web Services `map` Tag
- Web Services `property` Tag
- Web Services `invoke` Tag
- Web Services `part` Tag

Note the following requirements for the Web services tag library:

- The Web services tag library is included in the `ojsputil.jar` file. This file is provided with OC4J, in the "well-known" tag library directory. Verify that this file is installed and in your classpath.

- The tag library descriptor, `wstaglib.tld`, must be available to the application, and any JSP page using the library must have an appropriate `taglib` directive. In an Oracle Application Server installation, the TLD is in `ojsputil.jar`. The `uri` value for `wstaglib.tld` is the following:

  http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/wstaglib.tld
You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for information about taglib directives, the well-known tag library directory, TLD files, and the meaning of uri values.

For an example that uses the tags described in this section, see "Web Services Tag Examples" on page 11-15.

Notes:
- The prefix "ws:" is used in the tag syntax here. This is by convention, but is not required. You can specify any desired prefix in the taglib directive.
- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

Web Services webservice Tag
Use this tag to create a Web service proxy, an instance of a class that implements the oracle.j2ee.ws.client.WebServiceProxy interface. The tag requires the URL of a WSDL document and uses a binding and SOAP location or a service name and port, as follows:

1. First, if tag attributes provide a binding and SOAP location, the tag handler uses them in creating the proxy. Tag attributes for service name and port are ignored in this case.

2. If no binding and SOAP location are provided, the tag handler uses a service name and port, as follows:
   a. If a service name and port are provided through tag attributes, then the tag handler uses them in creating the proxy.
   b. If no service name and port are provided, the tag handler uses the first service in the WSDL document and the first port listed for that service.

Using a binding and SOAP location is particularly useful for a Web service whose WSDL document is accessed through a UDDI registry. In that case, the binding and location can be determined through UDDI queries and supplied to the tag through request-time expressions.

After the Web service proxy is created, it will use any nested map tags to add entries to the SOAP mapping registry. See the next section, "Web Services map Tag".

Syntax

```xml
<ws:webservice wsdlUrl = "WSDL_URL_of_Web_service"
    [ id = "variable_name_for_Web_service_proxy" ]
    [ scope = "page" | "request" | "session" | "application" ]
    [ binding = "SOAP_binding_information" ]
    [ soapLocation = "SOAP_endpoint_URL" ]
    [ service = "service_name_in_WSDL" ]
    [ port = "port_name_for_service" ] >

...body / nested tags...

</ws:webservice>
```

Note: The scope attribute cannot take request-time expressions.
Attributes

- **wsdlUrl (required):** Use this attribute to specify a URL where the WSDL for the desired Web service can be accessed.

- **id:** If the Web service is to be accessed by an *invoke* tag that is *not* nested within the *webservice* tag, use the *id* attribute to specify the name for a WebServiceProxy scripting variable so that the variable can be referenced by the *invoke* tag. The specified name must be a valid Java identifier. When you use the *id* attribute, the specified variable will be declared automatically with scope AT_END (available from the *webservice* end-tag to the end of the JSP page).

- **scope:** Optionally, specify the scope of the *webservice* tag. The default setting is "page".

- **binding:** In scenario #1 above, use the *binding* attribute to specify the SOAP binding information for a SOAP location (end-point URL) that you specify through the *soapLocation* attribute. You must use these attributes together. The binding information is as defined in the WSDL document, specifying concrete protocol and data format specifications for the operations and messages defined by a particular port type.

- **soapLocation:** In scenario #1 above, use *soapLocation* to specify a SOAP location (end-point URL) as defined in the WSDL document, for which the binding information specified through the *binding* attribute applies. You must use these attributes together.

- **service:** In scenario #2a above, use the *service* attribute to specify the name of a service defined in the WSDL document. You must use this attribute with the *port* attribute, but both are ignored if you use *binding* and *soapLocation*.

- **port:** In scenario #2a above, use the *port* attribute to specify a port for the service that is specified through the *service* attribute. You must use these attributes together. The Web service proxy will use the specified port. The port address will be as specified in the corresponding *<service>* element in the WSDL document. The *service* and *port* attributes are ignored if you use *binding* and *soapLocation*.

Web Services map Tag

For interoperability, a mapping mechanism is necessary to map WSDL-defined SOAP/XML datatypes to the Java types used in JSP pages of a Java client application. This is possible through the OracleAS Web Services SOAP mapping registry.

You can have any number of *map* tags nested within a *webservice* tag, to have the Web service proxy add entries to the registry. Use one *map* tag for each desired type mapping.

The registry is an instance of the *XMLJavaMappingRegistry* class of the *org.apache.soap.util.xml* package. A WebServiceProxy instance has a *getXMLMappingRegistry()* method to access the registry.

The *map* tag includes attributes to specify the encoding style, serialization utility (class name), deserialization utility (class name), and namespace URI to facilitate the type mapping. The Web services tag library supports custom classes for serialization and deserialization, if you want to create your own.

---

**Important:** When using a *map* tag, you must nest it within a *webservice* tag.
Syntax

```xml
<ws:map localName = "local_name_of_SOAPXML_type"
namespaceUri = "URI_of_namespace_for_SOAPXML_type"
javaType = "Java_type_to_map"
encodingStyle = "URL_of_SOAP_encoding_style"
java2xmlClassName = "Java_to_XML_serializer"
xm2javaClassName = "XML_to_Java_deserializer" />
```

Attributes

- **localName** (required): Specify the local name of the SOAP/XML datatype, such as SOAPStruct, for example.
- **namespaceUri** (required): Specify a valid URI for the namespace of the SOAP/XML datatype. The following is an example:
  
  `http://soapinterop.org/xsd`
- **javaType** (required): Specify the Java type which you want to map to the SOAP/XML type. The types must be legally mappable.
- **encodingStyle** (required): Specify a valid URI for a SOAP encoding style. The following is an example:
  
  `http://schemas.xmlsoap.org/soap/encoding`
- **java2xmlClassName** (required): Specify the class name with the functionality for serializing the data for Java-to-XML conversion. This can be a custom class. The following is an example:
  
  `org.apache.soap.encoding.soapenc.BeanSerializer`
- **xml2javaClassName** (required): Specify the class name with the functionality for deserializing the data for XML-to-Java conversion. This can be a custom class. The following is an example:
  
  `org.apache.soap.encoding.soapenc.BeanSerializer`

Web Services property Tag

You can optionally use this tag to specify a name/value pair that defines any of several supported custom properties for use by the Web service client application. For example, you could use `property` tags to specify an HTTP proxy host and proxy port if a proxy is required for access through a network firewall. The following properties are supported:

- **http.proxyHost**: Use this property to specify the host name of an HTTP proxy server.
- **http.proxyPort**: Use this property to specify a port number of an HTTP proxy server.
- **javax.net.ssl.KeyStore**: Use this property to specify the full path of an Oracle security wallet file.

**Important:** When using a `property` tag, you must nest it within a `webservice` tag. The property will have the same scope as the parent Web service.

**Syntax**
**Attributes**

- **property** (required): Specify the property you want to set; it must be one of the supported properties listed in the tag syntax.
- **value** (required): Specify the desired value of the property—a host name, port number, or full path to an Oracle wallet file.

**Web Services invoke Tag**

Use this tag to invoke an operation of the Web service. The tag handler will call the remote Web service operation by passing an input message in a SOAP request, then will wait for the SOAP response. You must specify the operation, as well as an object ID for the object that will contain the returned response. The tag handler uses the operation name to find the operation in the WSDL document.

The *invoke* tag gains access to a Web service proxy in one of two ways:

- The *invoke* tag is nested within the *webservice* tag that establishes the proxy.
- The *invoke* tag uses its *webservice* attribute to access a WebProxyService scripting variable created through a *webservice* tag *id* attribute.

In a situation where there are overloaded operations (two operations of the same name using different I/O messages), the *invoke* tag has attributes to specify the input and output message names for the desired operation. In this case, for RPC-style bindings, the specified input and output message names are used to form the RPC signature of the operation. Otherwise, the RPC signature is the default according to the WSDL document.

If the output message has multiple parts, then the returned result is an array of message parts (all within a single SOAP response).

The *invoke* tag can act as an XML producer, supporting explicit passing of an XML output object through the *toXMLObjName* attribute. This is useful if the *invoke* tag is nested inside other kinds of tags such as Web Object Cache tags or the XML *transform* tag. Also note that an XML output object can be written to the *JspWriter* object of the JSP page for output directly to the user's browser. This is enabled through the *xmlToWriter* attribute.

---

**Notes:**

- Waiting for the SOAP response is a blocking function.
- The scope of the output result object, identified by the *id* attribute, is the same as the scope of the proxy object defined in the *webservice* tag for the Web service. For an *invoke* tag nested within a *webservice* tag, this scope is from the *webservice* start-tag to the *webservice* end-tag. However, the *id* object can still be accessed outside the *webservice* tag through use of the *findAttribute()* method of the JSP page context object.

**Syntax**

```xml
<ws:invoke id='variable_name_for_output_result'
          operation='operation_to_invoke'/>
```
[ [ webservice = 'variable_name_of_Web_service_proxy' ]
[ inputMsgName = 'name_of_input_message' ]
[ outputMsgName = 'name_of_output_message' ]
[ xmlToWriter = 'true' | 'false' ]
[ toXMLObjName = 'objectname' ] ]

...body / nested tags...
</ws:invoke>

Attributes

- **id** (required): Specify a scripting variable name for the output result object. The specified name must be a valid Java identifier. See the note preceding the tag syntax above for information about the scope of the id object.

- **operation** (required): Specify an operation to be executed (an operation from the WSDL document).

- **webservice**: Use this attribute if you want to specify the name of a WebServiceProxy scripting variable corresponding to the service to invoke. This is not necessary if the invoke tag is nested inside the webservice tag that accesses the desired service.

- **inputMsgName**: Optionally specify the input message name—the name of a wsdl:input tag in the WSDL document—for the operation. This is only necessary if there are overloaded operations (operations with the same name that use different message names).

- **outputMsgName**: Optionally specify the output message name—the name of a wsdl:output tag in the WSDL document—for the operation. This is necessary only if there are overloaded operations (operations with the same name that use different message names).

- **xmlToWriter**: For a document-style Web service, and if the output is an XML object, set this attribute to "true" if you want to output the XML to the JspWriter output object of the JSP page. The default setting is "false".

- **toXMLObjName**: For a document-style Web service, and if you want to explicitly pass the output in an XML object, use this attribute to specify the name of the object.

Web Services part Tag

Use this tag, nested within an invoke tag, if the operation being performed requires input message part values, using one part tag for each input part.

How to specify the part value might depend on whether you are using an RPC-style or document-style Web service. For RPC-style, you must use the value attribute. For document-style, you have the option of passing the value through an XML request element in the tag body.

**Note:** If you use both a tag body and the value attribute, the tag body is ignored.

Syntax

```xml
<ws:part name = 'part_name'
    [ value = 'part_value' ] >
```
...optional body, with request element, for document-style...

</ws:part>

Attributes

- name (required): Specify the name of the input part (a valid Java identifier).
- value: Specify the value of the input part. This is required for an RPC-style Web service. For a document-style Web service, you can use the tag body instead.

Web Services Tag Examples

This section provides a template for use of the Web services tag library, a sample JSP page to invoke an RPC-style Web service, and a sample page to invoke a document-style Web service.

Web Services Example: Usage Template

```html
<HTML>
<HEAD>
<TITLE>Title</TITLE>
</HEAD>
<BODY>
<H2>This is sample HTML text.</H2>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/wstaglibrary.tld" prefix="ws" %>
<ws:webservice id="myws" wsdlUrl="wsdlurl"
    { binding="" soapLocation="" | service="" port=""
    }
    { scope="page | request | session | application"
    }
    >
    <ws:property name="property" value="string"/>
    
    <ws:map encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
        localname="SOAPStruct"
        namespaceUri="http://soapinterop.org/xsd"
        javaType="MySoapStructBean"
        java2xmlClassName="org.apache.soap.encoding.soapenc.BeanSerializer"
        xml2javaClassName="org.apache.soap.encoding.soapenc.BeanSerializer"
        />
    </ws:webservice>

    <ws:invoke id="result" webservice="myws" operation="add" inputMsgName="" outputMsgName="">
        <ws:part name="part_name" value="{string | <%= expression %}>"/>
    </ws:invoke>

    <% =result %>
</BODY>
</HTML>
```

Web Services Example: Sample JSP Page for RPC-Style Web Service

```jsp
<%@ page contentType="text/html"%>
<%@ taglib uri="http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/wstaglibrary.tld"
```
Web Services Example: Sample JSP Page for Document-Style Web Service

```jsp
<%@ page contentType="text/xml;" %>
<%@ page import= oracle.xml.parser.v2.XMLElement; %>
<%@ taglib uri= "http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/wstaglib.tld" prefix= "ws" %>
<%@ taglib uri= "http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld" prefix= "xml" %>
<ws:webservice id= "bookService"
    wsdlUrl= "http://hosting.msugs.ch/cheeso9/books/books.asmx?WSDL"
    binding= "LookyBookServiceSoap"
    soapLocation = "http://hosting.msugs.ch/cheeso9/books/books.asmx"
    scope= "session">
    <ws:invoke id= "bookResult"
        operation= "GetInfo"
        webservice= "bookService">
        <ws:part name= "parameters">
            <GetInfo xmlns= "http://dinoch.dyndns.org/webservices/">
            </GetInfo>
        </ws:part>
    </ws:invoke>
</ws:webservice>
<%@ taglib uri= "http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/wstaglib.tld" prefix= "ws" %>
<%@ taglib uri= "http://xmlns.oracle.com/j2ee/jsp/tld/ojsp/xml.tld" prefix= "xml" %>
<ws:webservice id= "bookService"
    wsdlUrl= "http://hosting.msugs.ch/cheeso9/books/books.asmx?WSDL"
    binding= "LookyBookServiceSoap"
    soapLocation = "http://hosting.msugs.ch/cheeso9/books/books.asmx"
    scope= "session">
    <ws:invoke id= "bookResult"
        operation= "GetInfo"
        webservice= "bookService">
        <ws:part name= "parameters">
            <GetInfo xmlns= "http://dinoch.dyndns.org/webservices/">
            </GetInfo>
        </ws:part>
    </ws:invoke>
</ws:webservice>
<%@ page contentType="text/html;" %>
`
The JSP tag library framework was introduced in the JSP 1.1 specification. Oracle JSP releases prior to the implementation of the JSP 1.1 specification could support JML tags only as Oracle-specific translator extensions. This is referred to as compile-time tag support in this manual.

JSP releases with OC4J continue to support the compile-time JML implementation; however, it is generally advisable to use the standards-compliant runtime implementation whenever possible. The runtime implementation is documented in Chapter 3, "JSP Markup Language Tags".

This appendix discusses features of the compile-time implementation that are not in common with the runtime implementation, and consists of the following sections:

- JML Compile-Time Syntax Support
- JML Compile-Time Tag Support

For a general discussion of when it might be advantageous to use a compile-time implementation, refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer's Guide.

### JML Compile-Time Syntax Support

The following sections describe Oracle-specific bean reference syntax and expression syntax supported by the compile-time JML implementation for specifying tag attribute values:

- JML Bean References and Expressions, Compile-Time Implementation
- Attribute Settings with JML Expressions

This functionality requires the OC4J JSP translator; it is not portable to other JSP environments.

### JML Bean References and Expressions, Compile-Time Implementation

A bean reference is any reference to a JavaBean instance that results in accessing either a property or a method of the bean. This includes a reference to a property or method of a bean where the bean itself is a property of another bean.
This becomes cumbersome, because standard JavaBeans syntax requires that properties be accessed by calling their accessor methods rather than by direct reference. For example, consider the following direct reference:

```
a.b.c.d.doIt()
```

This must be expressed as follows in standard JavaBeans syntax:

```
a.getB().getC().getD().doIt()
```

The Oracle compile-time JML implementation, however, offers abbreviated syntax, as described in the following subsections.

### JML Bean References

Oracle-specific syntax supported by the compile-time JML implementation allows bean references to be expressed using direct dot (".") notation. Note that standard bean property accessor method syntax is also still valid.

Consider the following standard JavaBean reference:

```
customer.getName()
```

In JML bean reference syntax, you can express this in either of the following ways:

```
customer.getName()
```

or:

```
customer.name
```

JavaBeans can optionally have a default property whose reference is assumed if no reference is explicitly stated. You can omit default property names in JML bean references. In the example above, if *name* is the default property, then the following are all valid JML bean references:

```
customer.getName()
```

or:

```
customer.name
```

or:

```
customer
```

Most JavaBeans do not define a default property. Of those that do, the most significant are the JML datatype JavaBeans described in Chapter 2, "JavaBeans for Extended Types".

### JML Expressions

JML expression syntax supported by the compile-time JML implementation is a superset of standard JSP expression syntax, adding support for the JML bean reference syntax documented in the preceding section.

A JML bean reference appearing in a JML expression must be enclosed in the following syntax:

```
$[JML_bean_reference]
```
Attribute Settings with JML Expressions

Tag attribute documentation under "JSP Markup Language (JML) Tag Descriptions" on page 3-2 notes standards-compliant syntax. You can set attributes, as documented there, for either the runtime or the compile-time JML implementation and even for non-Oracle JSP environments.

If you intend to use only the Oracle-specific compile-time implementation, however, you can set attributes using JML bean references and JML expression syntax, as documented in the preceding section, "JML Bean References and Expressions, Compile-Time Implementation". Note the requirements that follow.

- Wherever Chapter 3 documents an attribute that accepts either a string literal or an expression, you can use a JML expression in its $[...]$ syntax inside standard JSP <%=...%> syntax.

  Consider an example using the JML useVariable tag. You would use syntax such as the following for the runtime implementation:

  ```html
  <jml:useVariable id = "isValidUser" type = "boolean"
    value = "<%= dbConn.isValid() %>
    scope = "session" />
  ```

  You can alternatively use syntax such as the following for the compile-time implementation (the value attribute can be either a string literal or an expression):

  ```html
  <jml:useVariable id = "isValidUser" type = "boolean"
    value = "<%= $[dbConn.valid] %>
    scope = "session" />
  ```

- Wherever Chapter 3 documents an attribute that accepts an expression only, you can use a JML expression in its $[...]$ syntax without being nested in <%=...%> syntax.

  Consider an example using JML choose...when tags. You would use something such as the following syntax for the runtime implementation (presuming orderedItem is a JmlBoolean instance):

  ```html
  <jml:choose>
    <jml:when condition = "<%= orderedItem.getValue() %>">
      You have changed your order:
      -- outputs the current order --
    </jml:when>
    <jml:otherwise>
      Are you sure we can't interest you in something?
    </jml:otherwise>
  </jml:choose>
  ```

  You can alternatively use syntax such as the following for the compile-time implementation, where the condition attribute can be an expression only:

  ```html
  <jml:choose>
    <jml:when condition = "${orderedItem}" >
      You have changed your order:
      -- outputs the current order --
    </jml:when>
    <jml:otherwise>
      Are you sure we can't interest you in something?
    </jml:otherwise>
  </jml:choose>
  ```
JML Compile-Time Tag Support

This section presents the following:

- Documentation of the `taglib` directive that you must use for compile-time JML support
- Summary of all compile-time tags, noting which are desupported in the runtime implementation
- Description of tags supported by the compile-time implementation that are desupported in the runtime implementation

Tags still supported in the runtime implementation are documented in "JSP Markup Language (JML) Tag Descriptions" on page 3-2.

---

**Note:** In most cases, JML tags that are desupported in the runtime implementation have standard JSP equivalents. Some of the compile-time tags, however, were desupported because they have functionality that is difficult to implement when adhering to the current JSP specification.

---

The `taglib` Directive for Compile-Time JML Support

The Oracle compile-time JML support implementation uses a custom class, `OpenJspRegisterLib`, to implement JML tag support.

In a JSP page using JML tags with the compile-time implementation, the `taglib` directive must specify the fully qualified name of this class, instead of specifying a TLD file as in standard JSP tag library usage:

```jsp
<%@ taglib uri="oracle.jsp.parse.OpenJspRegisterLib" prefix="jml" %>
```

For information about usage of the `taglib` directive for the JML runtime implementation, see "Overview of the JSP Markup Language (JML) Tag Library" on page 3-1.

---

JML Tag Summary, Compile-Time Versus Runtime

Most JML tags are available in both the runtime model and the compile-time model; however, there are exceptions, as summarized in the following tables.

---

### Table A–1  Bean-Binding Tags: Compile-Time Model Versus Runtime Model

| Tag     | Supported in Oracle Compile-Time Implementation? | Supported in Oracle Runtime Implementation?
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>useBean</td>
<td>Yes</td>
<td>No; use <code>jsp:useBean</code>.</td>
</tr>
<tr>
<td>useVariable</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>useForm</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>useCookie</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>remove</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The following sections provide detailed descriptions of JML tags that are still supported by the JML compile-time implementation but are not supported by the JML runtime implementation.

### Table A–2 Bean Manipulation Tags: Compile-Time Model Versus Runtime Model

<table>
<thead>
<tr>
<th>Tag</th>
<th>Supported in Oracle Compile-Time Implementation?</th>
<th>Supported in Oracle Runtime Implementation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>getProperty</td>
<td>Yes</td>
<td>No; use jsp:getProperty.</td>
</tr>
<tr>
<td>setProperty</td>
<td>Yes</td>
<td>No; use jsp:setProperty.</td>
</tr>
<tr>
<td>set</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>call</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>lock</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### Table A–3 Control Flow Tags: Compile-Time Model Versus Runtime Model

<table>
<thead>
<tr>
<th>Tag</th>
<th>Supported in Oracle Compile-Time Implementation?</th>
<th>Supported in Oracle Runtime Implementation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>if</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>choose</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>for</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>foreach</td>
<td>Yes; type attribute is optional.</td>
<td>Yes; type attribute is required.</td>
</tr>
<tr>
<td>return</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>flush</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>include</td>
<td>Yes</td>
<td>No; use jsp:include.</td>
</tr>
<tr>
<td>forward</td>
<td>Yes</td>
<td>No; use jsp:forward.</td>
</tr>
</tbody>
</table>

### Table A–4 XML Tags: Compile-Time Model Versus Runtime Model

<table>
<thead>
<tr>
<th>Tag</th>
<th>Supported in Oracle Compile-Time Implementation?</th>
<th>Supported in Oracle Runtime Implementation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>transform</td>
<td>Deprecated</td>
<td>Yes</td>
</tr>
<tr>
<td>styleSheet</td>
<td>Deprecated</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Table A–5 Utility Tags: Compile-Time Model Versus Runtime Model

<table>
<thead>
<tr>
<th>Tag</th>
<th>Supported in Oracle Compile-Time Implementation?</th>
<th>Supported in Oracle Runtime Implementation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>print</td>
<td>Yes; use double-quotes to specify a string literal.</td>
<td>No; use JSP expressions.</td>
</tr>
<tr>
<td>plugin</td>
<td>Yes</td>
<td>No; use jsp:plugin.</td>
</tr>
</tbody>
</table>

**Note:** Since Oracle9iAS Release 2 (9.0.3), the `transform` and `styleSheet` tags are deprecated in the compile-time implementation.

## Descriptions of Additional JML Tags, Compile-Time Implementation

The following sections provide detailed descriptions of JML tags that are still supported by the JML compile-time implementation but are not supported by the JML runtime implementation.
runtime implementation. The tags supported in the runtime implementation are documented under "JSP Markup Language (JML) Tag Descriptions" on page 3-2.

- JML useBean Tag
- JML getProperty Tag
- JML setProperty Tag
- JML set Tag
- JML call Tag
- JML lock Tag
- JML include Tag
- JML forward Tag
- JML print Tag
- JML plugin Tag

**Notes:**

- The prefix "jml:" is used in the tag syntax here. This is by convention but is not required. You can specify any desired prefix in your `taglib` directive.
- See "Tag Syntax Symbology and Notes" on page 1-2 for general information about tag syntax conventions in this manual.

**JML useBean Tag**

This tag declares an object to be used in the page, locating the previously instantiated object at the specified scope by name if it exists. If it does not exist, the tag creates a new instance of the appropriate class and attaches it to the specified scope by name.

The syntax and semantics are the same as for the standard `jsp:useBean` tag, except that wherever a JSP expression is valid in `jsp:useBean` usage, either a JML expression or a JSP expression is valid in JML `useBean` usage.

You can refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide for an overview of the `jsp:useBean` tag.

**Syntax**

```xml
<jml:useBean id = "beanInstanceName"
    [ scope = "page" | "request" | "session" | "application" ]
    class = "package.class" |
    type = "package.class" |
    class = "package.class" type = "package.class" |
    beanName = "package.class" | 
    "%= jmlExpression %" type = "package.class" />
```

Alternatively, you can have additional nested tags, such as `setProperty` tags, and use a `</jml:useBean>` end-tag.

**Attributes**

In addition to specifying `id`, you must specify `class`, `type` (or `class` and `type`), or `beanName`.

Refer to the Sun Microsystems JavaServer Pages Specification for detailed information about `jsp:useBean` attributes and their syntax.
Example

<jml:useBean id="isValidUser" class="oracle.jsp.jml.JmlBoolean" scope="session" />

**JML getProperty Tag**

This tag is functionally identical to the standard *jsp:getProperty* tag. It prints the value of the bean property into the response.

For general information about *getProperty* usage, refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide* or the Sun Microsystems *JavaServer Pages Specification*.

**Syntax**

```
<jml:getProperty name="beanInstanceName"
    property="propertyName" />
```

**Attributes**

- **name** (required): This is the name of the bean whose property is being retrieved.
- **property** (required): This is the name of the property being retrieved.

**Example** The following example outputs the current value of the *salary* property. Assume *salary* is of type *JmlNumber*.

```xml
<jml:getProperty name='salary' property='value' />
```

This is equivalent to the following:

```xml
<%= salary.getValue() %>
```

**JML setProperty Tag**

This tag covers the functionality supported by the standard *jsp:setProperty* tag and adds functionality to support JML expressions. In particular, you can use JML bean references.

For general information about *setProperty* usage, refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide* or the Sun Microsystems *JavaServer Pages Specification*.

**Syntax**

```
<jml:setProperty name="beanInstanceName"
    property=" ** " | 
    property="propertyName" [ param="parameterName" ] | 
    property="propertyName" 
    [ value="stringLiteral" | "<%= jmlExpression %>"] />
```

**Attributes**

- **name** (required): This is the name of the bean whose property is being set.
- **property** (required): This is the name of the property being set.
- **value**: This is an optional parameter that lets you set the value directly instead of from a request parameter. The JML *setProperty* tag supports JML expressions in addition to standard JSP expressions to specify the value.

**Example** The following example updates *salary* with a six percent raise. Assume *salary* is of type *JmlNumber*.
<jml:setProperty name="salary" property="value" value="<%= $(salary) * 1.06 %>
" />

This is equivalent to the following:

<% salary.setValue(salary.getValue() * 1.06); %>

### JML set Tag

This tag provides an alternative for setting a bean property, using syntax that is more convenient than that of the `setProperty` tag.

#### Syntax

<jml:set name = "beanInstanceName.propertyName" value = "stringLiteral" | "<%= jmlExpression %>">

#### Attributes

- **name (required):** This is a direct reference (JML bean reference) to the bean property to be set.
- **value (required):** This is the new property value. It is expressed either as a string literal, a JML expression, or a standard JSP expression.

#### Example

Each of the following examples updates `salary` with a six percent raise. Assume `salary` is of type `JmlNumber`.

<jml:set name="salary.value" value="<%= salary.getValue() * 1.06 %>" />

or:

<jml:set name="salary.value" value="<%= salary.value * 1.06 %>" />

or:

<jml:set name="salary" value="<%= salary * 1.06 %>" />

These are equivalent to the following:

<% salary.setValue(salary.getValue() * 1.06); %>

### JML call Tag

This tag provides a mechanism to invoke bean methods that return nothing.

#### Syntax

<jml:call method = "beanInstanceName.methodName(parameters)" />

#### Attributes

- **method (required):** This is the method call as you would write it in a scriptlet, except that the `beanInstanceName.methodName` portion of the statement can be written as a JML bean reference if enclosed in JML expression `[$[...]]` syntax.

#### Example

The following example redirects the client to a different page:

<jml:call name='response.sendRedirect("http://www.oracle.com/")' />

This is equivalent to the following:

<% response.sendRedirect("http://www.oracle.com/"); %>
**JML lock Tag**

This tag allows controlled, synchronous access to the named object for any code that uses it within the tag body.

Generally, JSP developers need not be concerned with concurrency issues. However, because application-scope objects are shared across all users running the application, access to critical data must be controlled and coordinated.

You can use the JML `lock` tag to prevent concurrent updates by different users.

**Syntax**

```xml
<jml:lock name = "beanInstanceName" >
    ...body...
</jml:lock>
```

**Attributes**

- **name** (required): This is the name of the object that should be locked during execution of code in the `lock` tag body.

**Example** In the following example, `pageCount` is an application-scope `JmlNumber` value. The variable is locked to prevent the value from being updated by another user between the time this code gets the current value and the time it sets the new value.

```xml
<jml:lock name='pageCount' >
    <jml:set name='pageCount.value' value='<s%= pageCount.getValue() + 1 %>' /> 
</jml:lock>
```

This is equivalent to the following:

```jsp
<% synchronized(pageCount) {
    pageCount.setValue(pageCount.getValue() + 1); 
}%>
```

---

**JML include Tag**

This tag includes the output of another JSP page, a servlet, or an HTML page in the response of the including page (the page invoking `include`). It provides the same functionality as the standard `jsp:include` tag except that the `page` attribute can also be expressed as a JML expression.

For general information about `include` usage, refer to the Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer's Guide or the Sun Microsystems JavaServer Pages Specification.

**Syntax**

```xml
<jml:include page = "relativeURL" | "<%= jmlExpression %>
    flush = "true" | "false" />
```

**Attributes**

For general information about `include` attributes and usage, refer to the Sun Microsystems JavaServer Pages Specification.

**Example** The following example includes the output of table.jsp, a presentation component that renders an HTML table based on data in the query string and request attributes.
**JML forward Tag**

This tag forwards the request to another JSP page, a servlet, or an HTML page. It provides the same functionality as the standard `jsp:forward` tag except that the `page` attribute can also be expressed as a JML expression.

For general information about `forward` usage, refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide*.

**Syntax**

```xml
<jml:forward page = "relativeURL" | "<%= jmlExpression %>">
```

**Attributes**

For general information about `forward` attributes, refer to the Sun Microsystems *JavaServer Pages Specification*.

**Example**

```xml
<jml:forward page="altpage.jsp" />
```

**JML print Tag**

This tag provides essentially the same functionality as a standard JSP expression of the form: `<%= expr %>`. A specified JML expression or string literal is evaluated and the result is output into the response. With this tag, the JML expression does not have to be enclosed in `<%= . . . %>` syntax; however, a string literal must be enclosed in double-quotes.

**Syntax**

```xml
<jml:print eval = "stringLiteral" | jmlExpression />
```

**Attributes**

- **eval** (required): Specifies the string or expression to be evaluated and output.

**Examples**

Either of the following examples outputs the current value of `salary`, which is of type `JmlNumber`:

```xml
<jml:print eval="$[salary]" />
```

or:

```xml
<jml:print eval="salary.getValue()" />
```

The following example prints a string literal:

```xml
<jml:print eval="'Your string here'" />
```

**JML plugin Tag**

This tag has functionality identical to that of the standard `jsp:plugin` tag.

For general information about `plugin` usage, refer to the *Oracle Application Server Containers for J2EE Support for JavaServer Pages Developer’s Guide* or the Sun Microsystems *JavaServer Pages Specification*.
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- Apache HTTP Server
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