Oracle® Fusion Middleware

Developing Applications for Oracle WebLogic Server

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This document describes building WebLogic Server e-commerce applications using the Java Platform, Enterprise Edition 6.

Oracle Fusion Middleware Developing Applications for Oracle WebLogic Server, 12*c* (12.1.2)

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Preface

This preface describes the document accessibility features and conventions used in this guide—*Developing Applications for Oracle WebLogic Server*.

Documentation Accessibility

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Conventions

The following text conventions are used in this document:

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

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Overview of WebLogic Server Application Development

This chapter provides an overview of WebLogic Server applications and basic concepts.

This chapter includes the following sections:

1.1 Document Scope and Audience

This document is written for application developers who want to build WebLogic Server e-commerce applications using the Java Platform, Enterprise Edition 6. It is assumed that readers know Web technologies, object-oriented programming techniques, and the Java programming language.

WebLogic Server applications are created by Java programmers, Web designers, and application assemblers. Programmers and designers create modules that implement the business and presentation logic for the application. Application assemblers assemble the modules into applications that are ready to deploy on WebLogic Server.

1.2 WebLogic Server and the Java EE Platform

WebLogic Server implements Java Platform, Enterprise Edition (Java EE) Version 6.0 technologies (see http://www.oracle.com/technetwork/java/javaee/overview/index.html). Java EE is the standard platform for developing multi-tier enterprise applications based on the Java programming language. The technologies that make up Java EE were developed collaboratively by several software vendors.

An important aspect of the Java EE programming model is the introduction of metadata annotations. Annotations simplify the application development process by allowing a developer to specify within the Java class itself how the application component behaves in the container, requests for dependency injection, and so on. Annotations are an alternative to deployment descriptors that were required by older versions of enterprise applications (Java EE 1.4 and earlier).

Starting in Java EE 5 and continuing in Java EE 6, the focus has been ease of development. There is less code to write – much of the boilerplate code has been removed, defaults are used whenever possible, and annotations are used extensively to reduce the need for deployment descriptors.

- EJB 3.1 provides simplified programming and packaging model changes. The mandatory use of Java interfaces from previous versions has been removed, allowing plain old Java objects to be annotated and used as EJB components. The simplification is further enhanced through the ability to place EJB modules directly inside of Web applications, removing the need to produce archives to store the Web and EJB components and combine them together in an EAR file.
- Java EE 6 includes simplified Web services support and the latest Web services APIs, making it an ideal implementation platform for Service-Oriented Architectures (SOA).
- Constructing Web applications is made easier with JavaServer Faces (JSF) technology and the JSP Standard Tag Library (JSTL). Java EE 6 supports rich thin-client technologies such as AJAX, for building applications for Web 2.0.

WebLogic Server Java EE applications are based on standardized, modular components. WebLogic Server provides a complete set of services for those modules and handles many details of application behavior automatically, without requiring programming. Java EE defines module behaviors and packaging in a generic, portable way, postponing run-time configuration until the module is actually deployed on an application server.

Java EE includes deployment specifications for Web applications, EJB modules, Web services, enterprise applications, client applications, and connectors. Java EE does not specify *how* an application is deployed on the target server—only how a standard module or application is packaged. For each module type, the specifications define the files required and their location in the directory structure.

Java is platform independent, so you can edit and compile code on any platform, and test your applications on development WebLogic Servers running on other platforms. For example, it is common to develop WebLogic Server applications on a PC running Windows or Linux, regardless of the platform where the application is ultimately deployed.

For more information, refer to the Java EE specification at: http://www.oracle.com/technetwork/java/javaee/tech/index-jsp-142185.html.

1.3 Overview of Java EE Applications and Modules

A WebLogic Server Java EE application consists of one of the following modules or applications running on WebLogic Server:

- Web application modules—HTML pages, servlets, JavaServer Pages, and related files. See Section 1.4, "Web Application Modules".
- Enterprise JavaBeans (EJB) modules—entity beans, session beans, and message-driven beans. See Section 1.5, "Enterprise JavaBean Modules".
- Connector modules—resource adapters. See Section 1.6, "Connector Modules".
- Enterprise applications—Web application modules, EJB modules, resource adapters and Web services packaged into an application. See Section 1.7, "Enterprise Applications".
- Web services—See Section 1.8, "WebLogic Web Services".

A WebLogic application can also include the following WebLogic-specific modules:

- JDBC and JMS modules—See Section 1.9, "JMS and JDBC Modules".
- WebLogic Diagnostic FrameWork (WLDF) modules—See Section 1.10, "WebLogic Diagnostic Framework Modules".
- Coherence Grid Archive (GAR) Modules—See Section 1.11, "Coherence Grid Archive (GAR) Modules."

1.4 Web Application Modules

A Web application on WebLogic Server includes the following files:

- At least one servlet or JSP, along with any helper classes.
- Optionally, a `web.xml` deployment descriptor, a Java EE standard XML document that describes the contents of a WAR file.
- Optionally, a `weblogic.xml` deployment descriptor, an XML document containing WebLogic Server-specific elements for Web applications.
- A Web application can also include HTML and XML pages with supporting files such as images and multimedia files.

1.4.1 Servlets

Servlets are Java classes that execute in WebLogic Server, accept a request from a client, process it, and optionally return a response to the client. An `HttpServlet` is most often used to generate dynamic Web pages in response to Web browser requests.

1.4.2 JavaServer Pages

JavaServer Pages (JSPs) are Web pages coded with an extended HTML that makes it possible to embed Java code in a Web page. JSPs can call custom Java classes, known as tag libraries, using HTML-like tags. The `appc` compiler compiles JSPs and translates them into servlets. WebLogic Server automatically compiles JSPs if the servlet class file is not present or is older than the JSP source file. See Section 5.2, "Building Modules and Applications Using wlappc".

You can also precompile JSPs and package the servlet class in a Web application (WAR) file to avoid compiling in the server. Servlets and JSPs may require additional helper classes that must also be deployed with the Web application.

1.4.3 More Information on Web Application Modules

See the following documentation:

- Section 4.3, "Organizing Java EE Components in a Split Development Directory".
- *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*
- *Developing JSP Tag Extensions for Oracle WebLogic Server*

1.5 Enterprise JavaBean Modules

Enterprise JavaBeans (EJB) 3.1 technology is the server-side component architecture for the development and deployment of component-based business applications. EJB technology enables rapid and simplified development of distributed, transactional, secure, and portable applications based on Java EE 6 technology.

The EJB 3.1 specification provides simplified programming and packaging model changes. The mandatory use of Java interfaces from previous versions has been removed, allowing plain old Java objects to be annotated and used as EJB components. The simplification is further enhanced through the ability to place EJB modules directly inside of Web applications, removing the need to produce archives to store the Web and EJB components and combine them together in an EAR file.

1.5.1 EJB Documentation in WebLogic Server

For more information about using EJBs with WebLogic Server, see:

- For information about all the new features in EJB 3.1, see "Enterprise Java Beans (EJBs)" in *What's New in Oracle WebLogic Server*.
- For information about basic EJB concepts and components, see "Enterprise Java Beans (EJBs)" in *Understanding Oracle WebLogic Server*.
- For instructions on how to program, package, and deploy 3.1 EJBs on WebLogic Server, see *Developing Enterprise JavaBeans for Oracle WebLogic Server*.
- For instructions on how to organize and build WebLogic Server EJBs in a split directory environment, see *Developing Applications for Oracle WebLogic Server*.
- For more information on how to program and package 2.x EJBs, see *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

1.5.2 Additional EJB Information

To learn more about EJB concepts, such as the benefits of enterprise beans, the types of enterprise beans, and their life cycles, then visit the following Web sites:

- Enterprise JavaBeans 3.1 Specification (JSR-318) at `http://jcp.org/en/jsr/summary?id=318`
- The "Enterprise Beans" chapter of the Java EE 6 Tutorial at `http://docs.oracle.com/javaee/6/tutorial/doc/bnblr.html`
- Introducing the Java EE 6 Platform: Part 3 (EJB Technology, Even Easier to Use) at `http://www.oracle.com/technetwork/articles/javaee/javaee6overview-part3-139660.html#ejbeasy`

1.6 Connector Modules

Connectors (also known as resource adapters) contain the Java, and if necessary, the native modules required to interact with an Enterprise Information System (EIS). A resource adapter deployed to the WebLogic Server environment enables Java EE applications to access a remote EIS. WebLogic Server application developers can use HTTP servlets, JavaServer Pages (JSPs), Enterprise JavaBeans (EJBs), and other APIs to develop integrated applications that use the EIS data and business logic.

To deploy a resource adapter to WebLogic Server, you must first create and configure WebLogic Server-specific deployment descriptor, `weblogic-ra.xml` file, and add this to the deployment directory. Resource adapters can be deployed to WebLogic Server as standalone modules or as part of an enterprise application. See Section 1.7, "Enterprise Applications".

For more information on connectors, see *Developing Resource Adapters for Oracle WebLogic Server*.

1.7 Enterprise Applications

An enterprise application consists of one or more Web application modules, EJB modules, and resource adapters. It might also include a client application. An enterprise application can be optionally defined by an `application.xml` file, which was the standard Java EE deployment descriptor for enterprise applications.

1.7.1 Java EE Programming Model

An important aspect of the Java EE programming model is the introduction of metadata annotations. Annotations simplify the application development process by allowing a developer to specify within the Java class itself how the application behaves in the container, requests for dependency injection, and so on. Annotations are an alternative to deployment descriptors that were required by older versions of enterprise applications (1.4 and earlier).

With Java EE annotations, the standard `application.xml` and `web.xml` deployment descriptors are optional. The Java EE programming model uses the JDK annotations feature (see `http://docs.oracle.com/javaee/6/api/`) for Web containers, such as EJBs, servlets, Web applications, and JSPs. See Chapter 8, "Using Java EE Annotations and Dependency Injection."

If the application includes WebLogic Server-specific extensions, the application is further defined by a `weblogic-application.xml` file. Enterprise applications that include a client module will also have a `client-application.xml` deployment descriptor and a WebLogic run-time client application deployment descriptor. See Appendix A, "Enterprise Application Deployment Descriptor Elements."

1.7.2 Packaging and Deployment Overview

For both production and development purposes, Oracle recommends that you package and deploy even standalone Web applications, EJBs, and resource adapters as part of an enterprise application. Doing so allows you to take advantage of Oracle's split development directory structure, which greatly facilitates application development. See Chapter 4, "Creating a Split Development Directory Environment."

An enterprise application consists of Web application modules, EJB modules, and resource adapters. It can be packaged as follows:

- For development purposes, Oracle recommends the WebLogic split development directory structure. Rather than having a single archived EAR file or an exploded EAR directory structure, the split development directory has two parallel directories that separate source files and output files. This directory structure is optimized for development on a single WebLogic Server instance. See Chapter 4, "Creating a Split Development Directory Environment." Oracle provides the `wlpackage` Ant task, which allows you to create an EAR without having to use the JAR utility; this is exclusively for the split development directory structure. See Section 6.2, "Packaging Applications Using wlpackage".
- For development purposes, Oracle further recommends that you package standalone Web applications and Enterprise JavaBeans (EJBs) as part of an enterprise application, so that you can take advantage of the split development directory structure. See Section 4.3, "Organizing Java EE Components in a Split Development Directory".
- For production purposes, Oracle recommends the exploded (unarchived) directory format. This format enables you to update files without having to redeploy the application. To update an archived file, you must unarchive the file, update it, then rearchive and redeploy it.
- You can choose to package your application as a JAR archived file using the `jar` utility with an `.ear` extension. Archived files are easier to distribute and take up less space. An EAR file contains all of the JAR, WAR, and RAR module archive files for an application and an XML descriptor that describes the bundled modules. See Section 6.2, "Packaging Applications Using wlpackage".

The optional `META-INF/application.xml` deployment descriptor contains an element for each Web application, EJB, and connector module, as well as additional elements to describe security roles and application resources such as databases. If this descriptor is present the WebLogic deployer picks the list of modules from this descriptor. However if this descriptor is not present, the container guesses the modules from the annotations defined on the POJO (plain-old-Java-object) classes. See Appendix A, "Enterprise Application Deployment Descriptor Elements."

1.8 WebLogic Web Services

Web services can be shared by and used as modules of distributed Web-based applications. They commonly interface with existing back-end applications, such as customer relationship management systems, order-processing systems, and so on. Web services can reside on different computers and can be implemented by vastly different technologies, but they are packaged and transported using standard Web protocols, such as HTTP, thus making them easily accessible by any user on the Web.

A Web service consists of the following modules, at a minimum:

- A Web service implementation hosted by a server on the Web. WebLogic Web services are hosted by WebLogic Server. A Web service module may include either Java classes or EJBs that implement the Web service. Web services are packaged either as Web application archives (WARs) or EJB modules (JARs), depending on the implementation.
- A standard for transmitting data and Web service invocation calls between the Web service and the user of the Web service. WebLogic Web services use Simple Object Access Protocol (SOAP) 1.1 as the message format and HTTP as the connection protocol.

- A standard for describing the Web service to clients so they can invoke it. WebLogic Web services use Web services Description Language (WSDL) 1.1, an XML-based specification, to describe themselves.
- A standard for clients to invoke Web services—JAX-WS or JAX-RPC. See *Developing JAX-WS Web Services for Oracle WebLogic Server* or *Developing JAX-RPC Web Services for Oracle WebLogic Server*, respectively.
- A standard for finding and registering the Web service (UDDI).

For more information about WebLogic Web services and the standards that are supported, see *Understanding WebLogic Web Services for Oracle WebLogic Server*.

1.9 JMS and JDBC Modules

JMS and JDBC configurations are stored as modules, defined by an XML file that conforms to the `weblogic-jms.xsd` and `jdbc-data-source.xsd` schema, respectively. These modules are similar to standard Java EE modules. An administrator can create and manage JMS and JDBC modules as global system resources, as modules packaged with a Java EE application (as a packaged resource), or as standalone modules that can be made globally available.

With modular deployment of JMS and JDBC resources, you can migrate your application and the required JMS or JDBC configuration from environment to environment, such as from a testing environment to a production environment, without opening an enterprise application file (such as an EAR file) or a JMS or JDBC standalone module, and without extensive manual JMS or JDBC reconfiguration.

Application developers create application modules in an enterprise-level IDE or another development tool that supports editing of XML files, then package the JMS or JDBC modules with an application and pass the application to a WebLogic administrator to deploy.

For more information, see:

- "Configuring JMS Application Modules for Deployment"
- "Configuring JDBC Application Modules for Deployment"

1.10 WebLogic Diagnostic Framework Modules

The WebLogic Diagnostic Framework (WLDF) provides features for generating, gathering, analyzing, and persisting diagnostic data from WebLogic Server instances and from applications deployed to server instances. For server-scoped diagnostics, some WLDF features are configured as part of the configuration for the domain. Other features are configured as system resource descriptors that can be targeted to servers (or clusters). For application-scoped diagnostics, diagnostic features are configured as resource descriptors for the application.

Application-scoped instrumentation is configured and deployed as a diagnostic module, which is similar to a diagnostic system module. However, an application module is configured in an XML configuration file named `weblogic-diagnostics.xml` which is packaged with the application archive.

For detailed instructions for configuring instrumentation for applications, see "Configuring Application-Scoped Instrumentation".

1.10.1 Using an External Diagnostics Descriptor

WebLogic Server also supports the use of an external diagnostics descriptor so you can integrate diagnostic functionality into an application that has not imported diagnostic descriptors. This feature supports the deployment view and deployment of an application or a module, detecting the presence of an external diagnostics descriptor if the descriptor is defined in your deployment plan (`plan.xml`).

1.10.1.1 Defining an External Diagnostics Descriptor

First, define the diagnostic descriptor as external and configure its URI in the `plan.xml` file. For example:

```
<module-override>
  <module-name>reviewService.ear</module-name>
  <module-type>ear</module-type>
  </module-descriptor>
  <module-descriptor external="true">
  <root-element>wldf-resource</root-element>
  <uri>META-INF/weblogic-diagnostics.xml</uri>
  ...
  ...
</module-override>
<config-root>D:\plan</config-root>
```

Then place the external diagnostic descriptor file under the URI. Using the example above, you would place the descriptor file under `d:\plan\ META-INF`.

1.11 Coherence Grid Archive (GAR) Modules

A Coherence GAR module provides distributed in-memory caching and data grid computing that allows applications to increase their availability, scalability, and performance. GAR modules are deployed as both standalone modules and packaged with Java EE applications (as a packaged resource). A GAR module may also be made globally available.

A GAR module is defined by the coherence-application.xml deployment descriptor and must conform to the `coherence-application.xsd` XML schema. The GAR contains the artifacts that comprise a Coherence application: Coherence configuration files, application classes (such as entry processors, aggregators, filters), and any dependencies that are required.

1.12 Bean Validation

The Bean Validation specification (JSR 316) defines a metadata model and API for validating data in JavaBeans components. It is supported on both the server and Java EE 6 client; therefore, instead of distributing validation of data over several layers, such as the browser and the server side, you can define the validation constraints in one place and share them across the different layers. Further, bean validation is not only for validating beans. In fact, it can also be used to validate any Java object.

Bean Validation and JNDI

Where required by the Java EE 6 specifications, the default `Validator` and `ValidatorFactory` are located using JNDI under the names `java:comp/Validator` and `java:comp/ValidatorFactory`. These two artifacts reflect the validation descriptor that is in scope.

Bean Validation Configuration

Bean validation can be configured by using XML descriptors or annotation.

- Descriptors:
  - Descriptor elements override corresponding annotations.
  - Weblogic Server allows one descriptor per module. Therefore, an application can have several validation descriptors but only one is allowed per module scope.
  - Validation descriptors are named `validation.xml` and are packaged in the `META-INF` directory, except for Web modules, where the descriptor is packaged in the `WEB-INF` directory.
- Annotations:
  - Injection of the default `Validator` and `ValidatorFactory` is requested using the `@Resource` annotation. However, not all source files are scanned for this annotation.
  - The WebLogic Connector uses bean validation internally to validate the connector descriptors.

Once bean validation is configured, the standard set of container managed classes for a given container will be scanned. For example, for EJBs, bean and interceptor classes are scanned. Web application classes and ManagedBeans also support the injection of `Validator` and `ValidatorFactories`.

For more information about the classes that support bean validation, please see the related component specifications for the list of classes that support dependency injection.

1.13 XML Deployment Descriptors

A *deployment configuration* refers to the process of defining the deployment descriptor values required to deploy an enterprise application to a particular WebLogic Server domain. The deployment configuration for an application or module is stored in three types of XML document: Java EE deployment descriptors, WebLogic Server descriptors, and WebLogic Server deployment plans. This section describes the Java EE and WebLogic-specific deployment descriptors. See Section 1.14, "Deployment Plans" for information on deployment plans.

The Java EE programming model uses the JDK annotations feature for Web containers (see `http://docs.oracle.com/javaee/6/api/`), such as EJBs, servlets, Web applications, and JSPs. Annotations simplify the application development process by allowing a developer to specify within the Java class itself how the component behaves in the container, requests for dependency injection, and so on. Annotations are an alternative to deployment descriptors that were required by older versions of Web applications (2.4 and earlier), enterprise applications (1.4 and earlier), and Enterprise JavaBeans (2.*x* and earlier). See Chapter 8, "Using Java EE Annotations and Dependency Injection."

However, enterprise applications fully support the use of deployment descriptors, even though the standard Java EE ones are not required. For example, you may prefer to use the old EJB 2.*x* programming model, or might want to allow further customizing of the EJB at a later development or deployment stage; in these cases you can create the standard deployment descriptors in addition to, or instead of, the metadata annotations.

Modules and applications have deployment descriptors—XML documents—that describe the contents of the directory or JAR file. Deployment descriptors are text documents formatted with XML tags. The Java EE specifications define standard, portable deployment descriptors for Java EE modules and applications. Oracle defines additional WebLogic-specific deployment descriptors for deploying a module or application in the WebLogic Server environment.

Table 1–1 lists the types of modules and applications and their Java EE-standard and WebLogic-specific deployment descriptors.

Note: The XML schemas for the WebLogic deployment descriptors listed in the following table include elements from the `http://xmlns.oracle.com/weblogic/weblogic-javaee/1.4/weblogic-javaee.xsd` schema, which describes common elements shared among all WebLogic-specific deployment descriptors.

For the most current schema information, see: `http://www.oracle.com/technetwork/middleware/weblogic/overview/index.html`.

Table 1–1 Java EE and WebLogic Deployment Descriptors

Module or Application	Scope	Deployment Descriptors
Web Application	Java EE	`web.xml` See the Servlet 3.0 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/web-app_3_0.xsd` `WEB-INF/beans.xml`—required only if the classes in the WAR file are to participate in Contexts and Dependency Injection (CDI) Schema: `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/beans_1_0.xsd` See Chapter 9, "Using Contexts and Dependency Injection for the Java EE Platform."
	WebLogic	`weblogic.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-web-app/1.5/weblogic-web-app.xsd` See "weblogic.xml Deployment Descriptor Elements" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.
Enterprise Bean 3.0	Java EE	`ejb-jar.xml` See the EJB 3.1 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/ejb-jar_3_1.xsd` `META-INF/beans.xml`—required only if the classes in the EJB JAR file are to participate in CDI Schema: `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/beans_1_0.xsd` See Chapter 9, "Using Contexts and Dependency Injection for the Java EE Platform."

Table 1–1 (Cont.) Java EE and WebLogic Deployment Descriptors

Module or Application	Scope	Deployment Descriptors

	WebLogic	`weblogic-ejb-jar.xml`
		Schema http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.4/weblogic-ejb-jar.xsd
		`weblogic-rdbms-jar.xml`
		Schema: http://xmlns.oracle.com/weblogic/weblogic-rdbms-jar/1.2/weblogic-rdbms-jar.xsd
		`persistence-configuration.xml`
		Schema: http://xmlns.oracle.com/weblogic/persistence-configuration/1.0/persistence-configuration.xsd
		See *Developing Enterprise JavaBeans for Oracle WebLogic Server*.

Enterprise Bean 2.1	Java EE	`ejb-jar.xml` See the EJB 2.1 Schema at http://java.sun.com/xml/ns/j2ee/ejb-jar_2_1.xsd

	WebLogic	`weblogic-ejb-jar.xml`
		Schema: http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.4/weblogic-ejb-jar.xsd
		See "The weblogic-ejb-jar.xml Deployment Descriptor" in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.
		`weblogic-cmp-rdbms-jar.xml`
		Schema: http://xmlns.oracle.com/weblogic/weblogic-rdbms-jar/1.2/weblogic-rdbms-jar.xsd
		See "The weblogic-cmp-rdbms-jar.xml Deployment Descriptor" in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

Web services	Java EE	`webservices.xml` See the Web services 1.2 Schema at http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/javaee_web_services_1_2.xsd

Table 1–1 (Cont.) Java EE and WebLogic Deployment Descriptors

Module or Application	Scope	Deployment Descriptors

	WebLogic	`weblogic-webservices.xml`
		Schema: http://xmlns.oracle.com/weblogic/weblogic-webservices/1.1/weblogic-webservices.xsd
		`weblogic-wsee-clientHandlerChain.xml`
		Schema: http://xmlns.oracle.com/weblogic/weblogic-wsee-clientHandlerChain/1.0/weblogic-wsee-clientHandlerChain.xsd
		weblogic-webservices-policy.xml
		Schema: http://xmlns.oracle.com/weblogic/webservice-policy-ref/1.1/webservice-policy-ref.xsd
		weblogic-wsee-standaloneclient.xml
		Schema: http://xmlns.oracle.com/weblogic/weblogic-wsee-standaloneclient/1.0/weblogic-wsee-standaloneclient.xsd
		See "WebLogic Web Service Deployment Descriptor Element Reference" in *WebLogic Web Services Reference for Oracle WebLogic Server*.

Resource Adapter	Java EE	`ra.xml` See the Connector 1.6 Schema at http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/connector_1_6.xsd `META-INF/beans.xml`—required only if the classes in the RAR file are to participate in CDI Schema: http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/beans_1_0.xsd See Chapter 9, "Using Contexts and Dependency Injection for the Java EE Platform."
	WebLogic	`weblogic-ra.xml` `Schema:` http://xmlns.oracle.com/weblogic/weblogic-connector/1.4/weblogic-connector.xsd See "weblogic-ra.xml Schema" in *Developing Resource Adapters for Oracle WebLogic Server*.
Enterprise Application	Java EE	`application.xml` See the Application 6 Schema at http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/application_6.xsd
	WebLogic	`weblogic-application.xml` Schema: http://xmlns.oracle.com/weblogic/weblogic-application/1.5/weblogic-application.xsd See Section A.1, "weblogic-application.xml Deployment Descriptor Elements".

Table 1–1 (Cont.) Java EE and WebLogic Deployment Descriptors

Module or Application	Scope	Deployment Descriptors
Client Application	Java EE	`application-client.xml` See the Application Client 6 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/application-client_6.xsd` `META-INF/beans.xml`—required only if the classes in the application client JAR file are to participate in CDI Schema: `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/beans_1_0.xsd` See Chapter 9, "Using Contexts and Dependency Injection for the Java EE Platform."
	WebLogic	`application-client.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-application-client/1.4/weblogic-application-client.xsd` See "Developing a Java EE Application Client (Thin Client)" in *Developing Stand-alone Clients for Oracle WebLogic Server*.
HTTP Pub/Sub Application	WebLogic	`weblogic-pubsub.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-pubsub/1.0/weblogic-pubsub.xsd` See "Using the HTTP Publish-Subscribe Server" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.
JMS Module	WebLogic	*`FileName`*`-jms.xml`, where *`FileName`* can be anything you want. Schema: `http://xmlns.oracle.com/weblogic/weblogic-jms/1.2/weblogic-jms.xsd` See "Configuring JMS Application Modules for Deployment" in *Administering JMS Resources for Oracle WebLogic Server*.
JDBC Module	WebLogic	*`FileName`*`-jdbc.xml`, where *`FileName`* can be anything you want. Schema: `http://xmlns.oracle.com/weblogic/jdbc-data-source/1.3/jdbc-data-source.xsd` See "Configuring JDBC Application Modules for Deployment" in *Administering JDBC Data Sources for Oracle WebLogic Server*.

Table 1–1 (Cont.) Java EE and WebLogic Deployment Descriptors

Module or Application	Scope	Deployment Descriptors

Deployment Plan	WebLogic	`plan.xml`
		Schema:
		`http://xmlns.oracle.com/weblogic/deployment-plan/1.0/deployment-plan.xsd`
		See "Understanding WebLogic Server Deployment" in *Deploying Applications to Oracle WebLogic Server*.

WLDF Module	WebLogic	`weblogic-diagnostics.xml`
		Schema:
		`http://xmlns.oracle.com/weblogic/weblogic-diagnostics/1.0/weblogic-diagnostics.xsd`
		See "Deploying WLDF Application Modules" in *Configuring and Using the Diagnostics Framework for Oracle WebLogic Server*.

Coherence Modules	WebLogic	`coherence-application.xml`
		Schema:
		`http://xmlns.oracle.com/coherence/coherence-application/1.0/coherence-application.xsd`
		See *Developing Oracle Coherence Applications for Oracle WebLogic Server*.

When you package a module or application, you create a directory to hold the deployment descriptors—`WEB-INF` or `META-INF`—and then create the XML deployment descriptors in that directory.

1.13.1 Automatically Generating Deployment Descriptors

WebLogic Server provides a variety of tools for automatically generating deployment descriptors. These are discussed in the sections that follow.

1.13.2 EJBGen

EJBGen is an Enterprise JavaBeans 2.*x* code generator or command-line tool that uses Javadoc markup to generate EJB deployment descriptor files. You annotate your Bean class file with Javadoc tags and then use EJBGen to generate the Remote and Home classes and the deployment descriptor files for an EJB application, reducing to a single file you need to edit and maintain your EJB `.java` and descriptor files. See "EJBGen Reference" in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

1.13.3 Java-based Command-line Utilities

WebLogic Server includes a set of Java-based command-line utilities that automatically generate both standard Java EE and WebLogic-specific deployment descriptors for Web applications and enterprise applications.

These command-line utilities examine the classes you have assembled in a staging directory and build the appropriate deployment descriptors based on the servlet classes, and so on. These utilities include:

- `java weblogic.marathon.ddinit.EarInit` — automatically generates the deployment descriptors for enterprise applications.
- `java weblogic.marathon.ddinit.WebInit` — automatically generates the deployment descriptors for Web applications.

For an example of DDInit, assume that you have created a directory called c:\stage that contains the JSP files and other objects that make up a Web application but you have not yet created the web.xml and weblogic.xml deployment descriptors. To automatically generate them, execute the following command:

```
prompt> java weblogic.marathon.ddinit.WebInit c:\stage
```

The utility generates the web.xml and weblogic.xml deployment descriptors and places them in the WEB-INF directory, which DDInit will create if it does not already exist.

1.13.4 Upgrading Deployment Descriptors From Previous Releases of Java EE and WebLogic Server

So that your applications can take advantage of the features in the current Java EE specification and release of WebLogic Server, Oracle recommends that you always upgrade deployment descriptors when you migrate applications to a new release of WebLogic Server.

To upgrade the deployment descriptors in your Java EE applications and modules, first use the weblogic.DDConverter tool to generate the upgraded descriptors into a temporary directory. Once you have inspected the upgraded deployment descriptors to ensure that they are correct, repackage your Java EE module archive or exploded directory with the new deployment descriptor files.

Invoke weblogic.DDConverter with the following command:

```
prompt> java weblogic.DDConverter [options] archive_file_or_directory
```

where *archive_file_or_directory* refers to the archive file (EAR, WAR, JAR, or RAR) or exploded directory of your enterprise application, Web application, EJB, or resource adapter.

The following table describes the weblogic.DDConverter command options.

Option	Description
-d <dir>	Specifies the directory to which descriptors are written.
-help	Prints the standard usage message.
-quiet	Turns off output messages except error messages.
-verbose	Turns on additional output used for debugging.

The following example shows how to use the weblogic.DDConverter command to generate upgraded deployment descriptors for the my.ear enterprise application into the subdirectory tempdir in the current directory:

```
prompt> java weblogic.DDConverter -d tempdir my.ear
```

1.14 Deployment Plans

A *deployment plan* is an XML document that defines an application's WebLogic Server deployment configuration for a specific WebLogic Server environment. A deployment plan resides outside of an application's archive file, and can apply changes to deployment properties stored in the application's existing WebLogic Server deployment descriptors. Administrators use deployment plans to easily change an application's WebLogic Server configuration for a specific environment *without* modifying existing Java EE or WebLogic-specific deployment descriptors. Multiple deployment plans can be used to reconfigure a single application for deployment to multiple, differing WebLogic Server environments.

After programmers have finished programming an application, they export its deployment configuration to create a custom deployment plan that administrators later use for deploying the application into new WebLogic Server environments. Programmers distribute both the application deployment files and the custom deployment plan to deployers (for example, testing, staging, or production administrators) who use the deployment plan as a blueprint for configuring the application for their environment.

WebLogic Server provides the following tools to help programmers export an application's deployment configuration:

- `weblogic.PlanGenerator` creates a template deployment plan with null variables for selected categories of WebLogic Server deployment descriptors. This tool is recommended if you are beginning the export process and you want to create a template deployment plan with null variables for an entire class of deployment descriptors.
- The Administration Console updates or creates new deployment plans as necessary when you change configuration properties for an installed application. You can use the Administration Console to generate a new deployment plan or to add or override variables in an existing plan. The Administration Console provides greater flexibility than `weblogic.PlanGenerator`, because it allows you to interactively add or edit individual deployment descriptor properties in the plan, rather than export entire categories of descriptor properties.

For complete and detailed information about creating and using deployment plans, see:

- "Understanding WebLogic Server Deployment"
- "Exporting an Application for Deployment to New Environments"
- "Understanding WebLogic Server Deployment Plans"

1.15 Development Tools

This section describes required and optional tools for developing WebLogic Server applications.

1.15.1 Java API Reference and the wls-api.jar File

Oracle provides the Oracle Fusion Middleware Java API Reference for Oracle WebLogic Server, which defines all of the supported Java classes available for use when developing Java EE applications for WebLogic Server. See the *Java API Reference for Oracle WebLogic Server*.

In conjunction with the Java API Reference for Oracle WebLogic Server, Oracle recommends using the `wls-api.jar` file to develop and compile Java EE applications for your WebLogic Server environment. The `wls-api.jar` file is located in the `wlserver/server/lib` directory of your WebLogic Server distribution and offers the following benefits:

- developing more performant code based on tested best practices
- avoiding deprecated or unsupported code paths

1.15.1.1 Using the wls-api.jar File

Use the `wls-api.jar` file and the `api.jar` file to develop and compile your Java EE applications in Integrated Development Environments (IDEs), such as Oracle JDeveloper. IDEs provide an array of tools to simplify development of Java-based applications. The `wls-api.jar` file provides a clean and concise API jar to develop and run Java EE applications for WebLogic environments.

> **Note:** The `wls-api.jar` file does not reference any Java EE classes. Oracle provides the `api.jar` file with a manifest classpath that includes access to Java EE JARs.

You may need to include the `weblogic.jar` file in the classpath of your development environment to access tools such as WLST, the `weblogic.Deployer` utilty, and `weblogic.appc`.

1.15.1.2 Using the weblogic.jar File

You must continue to use the `weblogic.jar` file for runtime environments, as a client or to develop and compile legacy applications. However, use the `wls-api.jar` file to develop and compile Java EE applications for your WebLogic Server environment.

1.15.2 Apache Ant

The preferred Oracle method for building applications with WebLogic Server is Apache Ant. Ant is a Java-based build tool. One of the benefits of Ant is that is it is extended with Java classes, rather than shell-based commands. Oracle provides numerous Ant extension classes to help you compile, build, deploy, and package applications using the WebLogic Server split development directory environment.

Another benefit is that Ant is a cross-platform tool. Developers write Ant build scripts in eXtensible Markup Language (XML). XML tags define the targets to build, dependencies among targets, and tasks to execute in order to build the targets. Ant libraries are bundled with WebLogic Server to make it easier for our customers to build Java applications out of the box.

To use Ant, you must first set your environment by executing either the `setExamplesEnv.cmd` (Windows) or `setExamplesEnv.sh` (UNIX) commands located in the *`WL_SERVER`*`\samples\domains\wl_server` directory, where *`WL_SERVER`* is your WebLogic Server installation directory.

For a complete explanation of ant capabilities, see: `http://jakarta.apache.org/ant/manual/index.html`

> **Note:** The Apache Jakarta Web site publishes online documentation for only the most current version of Ant, which might be different from the version of Ant that is bundled with WebLogic Server. Use the following command, after setting your WebLogic environment, to determine the version of Ant bundled with WebLogic Server:
>
> ```
> prompt> ant -version
> ```
>
> To view the documentation for a specific version of Ant, such as the version included with WebLogic Server, download the Ant zip file from `http://archive.apache.org/dist/ant/binaries/` and extract the documentation.

For more information on using Ant to compile your cross-platform scripts or using cross-platform scripts to create XML scripts that can be processed by Ant, refer to any of the WebLogic Server examples, such as *`EXAMPLES_HOME`*`/wl_server/examples/src/examples/ejb20/basic/beanManaged/build.xml`, where *`EXAMPLES_HOME`* represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

Also refer to the following WebLogic Server documentation on building examples using Ant: *`EXAMPLES_HOME`*`/wl_server/examples/src/examples/examples.html`.

1.15.2.1 Using a Third-Party Version of Ant

You can use your own version of Ant if the one bundled with WebLogic Server is not adequate for your purposes. To determine the version of Ant that is bundled with WebLogic Server, run the following command after setting your WebLogic environment:

```
prompt> ant -version
```

If you plan to use a different version of Ant, you can replace the appropriate JAR file in the *`WL_HOME`*`\server\lib\ant` directory with an updated version of the file (where *`WL_HOME`* refers to the main WebLogic installation directory, such as `c:\Oracle\Middleware\Oracle_Home\wlserver`) or add the new file to the front of your CLASSPATH.

1.15.2.2 Changing the Ant Heap Size

By default the environment script allocates a heap size of 128 megabytes to Ant. You can increase or decrease this value for your own projects by setting the `-X` option in your local `ANT_OPTS` environment variable. For example:

```
prompt> setenv ANT_OPTS=-Xmx128m
```

If you want to set the heap size permanently, add or update the `MEM_ARGS` variable in the scripts that set your environment, start WebLogic Server, and so on, as shown in the following snippet from a Windows command script that starts a WebLogic Server instance:

```
set MEM_ARGS=-Xms32m -Xmx200m
```

See the scripts and commands in `WL_HOME/server/bin` for examples of using the `MEM_ARGS` variable.

1.15.3 Source Code Editor or IDE

You need a text editor to edit Java source files, configuration files, HTML or XML pages, and JavaServer Pages. An editor that gracefully handles Windows and UNIX line-ending differences is preferred, but there are no other special requirements for your editor. You can edit HTML or XML pages and JavaServer Pages with a plain text editor, or use a Web page editor such as Dreamweaver. For XML pages, you can also use an enterprise-level IDE with DTD validation or another development tool that supports editing of XML files.

1.15.4 Database System and JDBC Driver

Nearly all WebLogic Server applications require a database system. You can use any DBMS that you can access with a standard JDBC driver, but services such as WebLogic Java Message Service (JMS) require a supported JDBC driver for Oracle, Sybase, Informix, Microsoft SQL Server, or IBM DB2. Refer to "Oracle Fusion Middleware Supported System Configurations" to find out about supported database systems and JDBC drivers.

1.15.5 Web Browser

Most Java EE applications are designed to be executed by Web browser clients. WebLogic Server supports the HTTP 1.1 specification and is tested with current versions of the Firefox and Microsoft Internet Explorer browsers.

When you write requirements for your application, note which Web browser versions you will support. In your test plans, include testing plans for each supported version. Be explicit about version numbers and browser configurations. Will your application support Secure Socket Layers (SSL) protocol? Test alternative security settings in the browser so that you can tell your users what choices you support.

If your application uses applets, it is especially important to test browser configurations you want to support because of differences in the JVMs embedded in various browsers. One solution is to require users to install the Java plug-in so that everyone has the same Java run-time version.

1.15.6 Third-Party Software

You can use third-party software products to enhance your WebLogic Server development environment. See "WebLogic Developer Tools Resources", which provides developer tools information for products that support the application servers.

Note: Check with the software vendor to verify software compatibility with your platform and WebLogic Server version.

1.16 New and Changed Features in this Release

This document contains the following updates to describe the new application development features introduced in this release of WebLogic Server:

- Maven updates—In this release of WebLogic Server, the `weblogic-maven-plugin` provides enhanced functionality to install, start and stop servers, create domains, execute WLST scripts, and compile and deploy applications. With the `weblogic-maven-plugin`, you can install WebLogic Server from within your Maven environment to fulfill the local WebLogic Server requirement. See Chapter 3, "Using the WebLogic Development Maven Plug-In".

- OSGi bundles for WebLogic Server applications—In this release of WebLogic Server, developers who want to use OSGi in their applications can easily share OSGi facilities, such as the OSGi service registry, class loaders, and other OSGi services. See Chapter 16, "Developing OSGi Bundles for WebLogic Server Applications".
- WebSockets—This release of WebLogic Server adds support for the WebSocket Protocol (RFC 6455), which provides two-way, full-duplex communication over a single TCP connection between clients and servers, where each side can send data independently from the other. See Chapter 17, "Using WebSockets in WebLogic Server".
- Coherence Grid Archive (GAR) module support—A Coherence GAR module provides distributed in-memory caching and data grid computing that allows applications to increase their availability, scalability, and performance. See "Coherence Grid Archive (GAR) Modules".

For a comprehensive listing of the new WebLogic Server features introduced in this release, see *What's New in Oracle WebLogic Server*.

2

Using Ant Tasks to Configure and Use a WebLogic Server Domain

This chapter describes how to start and stop WebLogic Server instances and configure WebLogic Server domains using WebLogic Ant tasks in your development build scripts.

This chapter includes the following sections:

- Section 2.1, "Overview of Configuring and Starting Domains Using Ant Tasks"
- Section 2.2, "Starting Servers and Creating Domains Using the wlserver Ant Task"
- Section 2.3, "Configuring a WebLogic Server Domain Using the wlconfig Ant Task"
- Section 2.4, "Using the libclasspath Ant Task"

2.1 Overview of Configuring and Starting Domains Using Ant Tasks

WebLogic Server provides a pair of Ant tasks to help you perform common configuration tasks in a development environment. The configuration tasks enable you to start and stop WebLogic Server instances as well as create and configure WebLogic Server domains.

When combined with other WebLogic Ant tasks, you can create powerful build scripts for demonstrating or testing your application with custom domains. For example, a single Ant build script can:

- Compile your application using the `wlcompile`, `wlappc`, and Web services Ant tasks.
- Create a new single-server domain and start the Administration Server using the `wlserver` Ant task.
- Configure the new domain with required application resources using the `wlconfig` Ant task.
- Deploy the application using the `wldeploy` Ant task.
- Automatically start a compiled client application to demonstrate or test product features.

The sections that follow describe how to use the configuration Ant tasks, `wlserver` and `wlconfig`.

2.2 Starting Servers and Creating Domains Using the wlserver Ant Task

The `wlserver` Ant task enables you to start, reboot, shutdown, or connect to a WebLogic Server instance. The server instance may already exist in a configured WebLogic Server domain, or you can create a new single-server domain for development by using the `generateconfig=true` attribute.

When you use the `wlserver` task in an Ant script, the task does not return control until the specified server is available and listening for connections. If you start up a server instance using wlserver, the server process automatically terminates after the Ant VM terminates. If you only connect to a currently-running server using the `wlserver` task, the server process keeps running after Ant completes.

The `wlserver` WebLogic Server Ant task extends the standard `java` Ant task (`org.apache.tools.ant.taskdefs.Java`). This means that all the attributes of the `java` Ant task also apply to the `wlserver` Ant task. For example, you can use the `output` and `error` attributes to specify the name of the files to which output and standard errors of the `wlserver` Ant task is written, respectively. For full documentation about the attributes of the standard Java Ant task, see Java on the Apache Ant site (`http://ant.apache.org/manual/Tasks/java.html`).

2.2.1 Basic Steps for Using wlserver

To use the `wlserver` Ant task:

1. Set your environment.

   On Windows, execute the `setWLSEnv.cmd` command, located in the directory *`WL_HOME`*`\server\bin`, where *`WL_HOME`* is the top-level directory of your WebLogic Server installation.

   On UNIX, execute the `setWLSEnv.sh` command, located in the directory*`WL_HOME`*`\server\bin`, where *`WL_HOME`* is the top-level directory of your WebLogic Server installation.

   Note: The `wlserver` task is predefined in the version of Ant shipped with WebLogic Server. If you want to use the task with your own Ant installation, add the following task definition in your build file:

   ```
   <taskdef name="wlserver"
   classname="weblogic.ant.taskdefs.management.WLServer"/>
   ```

   Note: On UNIX operating systems, the `setWLSEnv.sh` command does not set the environment variables in all command shells. Oracle recommends that you execute this command using the Korn shell or bash shell.

2. Add a call to the `wlserver` task in the build script to start, shutdown, restart, or connect to a server. See Section 2.2.3, "wlserver Ant Task Reference" for information about `wlserver` attributes and default behavior.

3. Execute the Ant task or tasks specified in the `build.xml` file by typing `ant` in the staging directory, optionally passing the command a target argument:

   ```
   prompt> ant
   ```

   Use `ant -verbose` to obtain more detailed messages from the `wlserver` task.

2.2.2 Sample build.xml Files for wlserver

The following shows a minimal `wlserver` target that starts a server in the current directory using all default values:

```
<target name="wlserver-default">
  <wlserver/>
</target>
```

This target connects to an existing, running server using the indicated connection parameters and user name/password combination:

```
<target name="connect-server">
  <wlserver host="127.0.0.1" port="7001" username="weblogic" password="weblogic"
action="connect"/>
</target>
```

This target starts a WebLogic Server instance configured in the `config` subdirectory:

```
<target name="start-server">
  <wlserver dir="./config" host="127.0.0.1" port="7001" action="start"/>
</target>
```

This target creates a new single-server domain in an empty directory, and starts the domain's server instance:

```
<target name="new-server">
  <delete dir="./tmp"/>
  <mkdir dir="./tmp"/>
  <wlserver dir="./tmp" host="127.0.0.1" port="7001"
  generateConfig="true" username="weblogic" password="weblogic" action="start"/>
</target>
```

2.2.3 wlserver Ant Task Reference

The following table describes the attributes of the `wlserver` Ant task.

Table 2–1 Attributes of the wlserver Ant Task

Attribute	Description	Data Type	Required?
policy	The path to the security policy file for the WebLogic Server domain. This attribute is used only for starting server instances.	File	No
dir	The path that holds the domain configuration (for example, `c:\Oracle\Middleware\user_projects\domains\mydomain`). By default, `wlserver` uses the current directory.	File	No
beahome	The path to the Middleware Home directory (for example, `c:\Oracle\Middleware`).	File	No
weblogichome	The path to the WebLogic Server installation directory (for example, `c:\Oracle\Middleware\wlserver_12.1`).	File	No
servername	The name of the server to start, shutdown, reboot, or connect to. A WebLogic Server instance is uniquely identified by its protocol, host, and port values, so if you use this set of attributes to specify the server you want to start, shutdown or reboot, you do not need to specify its actual name using the `servername` attribute. The only exception is when you want to shutdown the Administration server; in this case you *must* specify this attribute. The default value for this attribute is `myserver`.	String	Required only when shutting down the Administration server.

Table 2–1 (Cont.) Attributes of the wlserver Ant Task

Attribute	Description	Data Type	Required?
domainname	The name of the WebLogic Server domain in which the server is configured.	String	No
adminserverurl	The URL to access the Administration Server in the domain. This attribute is required if you are starting up a Managed Server in the domain.	String	Required for starting Managed Servers.
username	The user name of an administrator account. If you omit both the `username` and `password` attributes, `wlserver` attempts to obtain the encrypted user name and password values from the `boot.properties` file. See "Boot Identity Files" in the *Administering Server Startup and Shutdown for Oracle WebLogic Server* for more information on `boot.properties`.	String	No
password	The password of an administrator account. If you omit both the `username` and `password` attributes, `wlserver` attempts to obtain the encrypted user name and password values from the `boot.properties` file. See "Boot Identity Files" in the *Administering Server Startup and Shutdown for Oracle WebLogic Server* for more information on `boot.properties`.	String	No
pkpassword	The private key password for decrypting the SSL private key file.	String	No
timeout	The maximum time, in milliseconds, that `wlserver` waits for a server to boot. This also specifies the maximum amount of time to wait when connecting to a running server. The default value for this attribute is `0`, which means the Ant task never times out.	long	No
timeoutSeconds	The maximum time, in seconds, that `wlserver` waits for a server to boot. This also specifies the maximum amount of time to wait when connecting to a running server. The default value for this attribute is `0`, which means the Ant task never times out.	long	No
productionmodeenabled	Specifies whether a server instance boots in development mode or in production mode. Development mode enables a WebLogic Server instance to automatically deploy and update applications that are in the *`domain_name`*`/autodeploy` directory (where *`domain_name`* is the name of a WebLogic Server domain). In other words, development mode lets you use auto-deploy. Production mode disables the auto-deployment feature. See "Deploying Applications and Modules" for more information. Valid values for this attribute are `True` and `False`. The default value is `False` (which means that by default a server instance boots in development mode.) **Note:** If you boot the server in production mode by setting this attribute to `True`, you must reboot the server to set the mode back to development mode. Or in other words, you cannot reset the mode on a running server using other administrative tools, such as the WebLogic Server Scripting Tool (WLST).	Boolean	No
host	The DNS name or IP address on which the server instance is listening. The default value for this attribute is `localhost`.	String	No
port	The TCP port number on which the server instance is listening. The default value for this attribute is `7001`.	int	No

Table 2–1 (Cont.) Attributes of the wlserver Ant Task

Attribute	Description	Data Type	Required?
generateconfig	Specifies whether or not wlserver creates a new domain for the specified server. Valid values for this attribute are true and false. The default value is false.	Boolean	No
action	Specifies the action wlserver performs: start, shutdown, reboot, or connect. The shutdown action can be used with the optional forceshutdown attribute perform a forced shutdown. The default value for this attribute is start.	String	No
failonerror	This is a global attribute used by WebLogic Server Ant tasks. It specifies whether the task should fail if it encounters an error during the build. Valid values for this attribute are true and false. The default value is false.	Boolean	No

forceshutdown	This optional attribute is used in conjunction with the action="shutdown" attribute to perform a forced shutdown. For example:
	`<wlserver`
	`  host="${wls.host}"`
	`  port="${port}"`
	`  username="${wls.username}"`
	`  password="${wls.password}"`
	`  action="shutdown"`
	`  forceshutdown="true"/>`
	`Valid values for this attribute are true and false. The default value is false.`
		Boolean	No

noExit	(Optional) Leave the server process running after Ant exits. Valid values are true or false. The default value is false, which means the server process will shut down when Ant exits.	Boolean	No
protocol	Specifies the protocol that the wlserver Ant task uses to communicate with the WebLogic Server instance. Valid values are t3, t3s, http, https, and iiop. The default value is t3.	String	No
forceImplicitUpgrade	Specifies whether the wlserver Ant task, if run against an 8.1 (or previous) domain, should implicitly upgrade it. Valid values are true or false. The default value is false, which means that the Ant task does *not* implicitly upgrade the domain, but rather, will fail with an error indicating that the domain needs to be upgraded. For more information about upgrading domains, see *Upgrading Oracle WebLogic Server*.	Boolean	No.

Table 2–1 (Cont.) Attributes of the wlserver Ant Task

Attribute	Description	Data Type	Required?
configFile	Specifies the configuration file for your domain. The value of this attribute must be a valid XML file that conforms to the XML schema as defined in the WebLogic Server Domain Configuration Schema at `http://xmlns.oracle.com/weblogic/domain/1.0/domain.xsd`. The XML file must exist in the Administration Server's root directory, which is either the current directory or the directory that you specify with the `dir` attribute. If you do not specify this attribute, the default value is `config.xml` in the directory specified by the `dir` attribute. If you do not specify the dir attribute, then the default domain directory is the current directory.	String	No.
useBootProperties	Specifies whether to use the `boot.properties` file when starting a WebLogic Server instance. If this attribute is set to `true`, WebLogic Server uses the user name and encrypted password stored in the `boot.properties` file to start rather than any values set with the `username` and `password` attributes. **Note:** The values of the `username` and `password` attributes are still used when shutting down or rebooting the WebLogic Server instance. The `useBootProperties` attribute applies *only* when starting the server. Valid values for this attribute are `true` and `false`. The default value is `false`.	Boolean	No
verbose	Specifies that the Ant task output additional information as it is performing its action. Valid values for this attribute are `true` and `false`. The default value is `false`.	Boolean	No

2.3 Configuring a WebLogic Server Domain Using the wlconfig Ant Task

The following sections describe how to use the `wlconfig` Ant task to configure a WebLogic Server domain.

Note:: The `wlconfig` Ant task works *only* against MBeans that are compatible with the MBean server, which was deprecated as of version 9.0 of WebLogic Server. In particular, the `wlconfig` Ant task uses the deprecated proprietary API `weblogic.management.MBeanHome` to access WebLogic MBeans; therefore, `wlconfig` does *not* use the standard JMX interface (`javax.management.MBeanServerConnection`) to discover MBeans. This means that the only MBeans that you can access using `wlconfig` are those listed under the Deprecated MBeans category in the *MBean Reference for Oracle WebLogic Server*

For equivalent functionality, you should use the WebLogic Scripting Tool (WLST). See *Understanding the WebLogic Scripting Tool*.

2.3.1 What the wlconfig Ant Task Does

The `wlconfig` Ant task enables you to configure a WebLogic Server domain by creating, querying, or modifying configuration MBeans on a running Administration Server instance. Specifically, `wlconfig` enables you to:

- Create new MBeans, optionally storing the new MBean Object Names in Ant properties.
- Set attribute values on a named MBean available on the Administration Server.
- Create MBeans and set their attributes in one step by nesting set attribute commands within create MBean commands.
- Query MBeans, optionally storing the query results in an Ant property reference.
- Query MBeans and set attribute values on all matching results.
- Establish a parent/child relationship among MBeans by nesting create commands within other create commands.

2.3.2 Basic Steps for Using wlconfig

1. Set your environment in a command shell. See Section 2.2.1, "Basic Steps for Using wlserver" for details.

   > **Note:** The `wlconfig` task is predefined in the version of Ant shipped with WebLogic Server. If you want to use the task with your own Ant installation, add the following task definition in your build file:
   >
   > ```
   > <taskdef name="wlconfig"
   > classname="weblogic.ant.taskdefs.management.WLConfig"/>
   > ```

2. `wlconfig` is commonly used in combination with `wlserver` to configure a new WebLogic Server domain created in the context of an Ant task. If you will be using `wlconfig` to configure such a domain, first use `wlserver` attributes to create a new domain and start the WebLogic Server instance.
3. Add an initial call to the `wlconfig` task to connect to the Administration Server for a domain. For example:

   ```
   <target name="doconfig">
      <wlconfig url="t3://localhost:7001" username="weblogic"
         password=password>
   </target>
   ```

4. Add nested `create`, `delete`, `get`, `set`, and `query` elements to configure the domain.
5. Execute the Ant task or tasks specified in the `build.xml` file by typing `ant` in the staging directory, optionally passing the command a target argument:

   ```
   prompt> ant doconfig
   ```

   Use `ant -verbose` to obtain more detailed messages from the `wlconfig` task.

Note: Since WLST is the recommended tool for domain creation scripts, you should refer to the WLST offline sample scripts that are installed with the software. The offline scripts demonstrate how to create domains using the domain templates and are located in the following directory: *`WL_HOME`*`\common\templates\scripts\wlst`, where *`WL_HOME`* refers to the top-level installation directory for WebLogic Server. For example, the `basicWLSDomain.py` script creates a simple WebLogic domain, while `sampleMedRecDomain.py` creates a domain that defines resources similar to those used in the Avitek MedRec sample. See *Understanding the WebLogic Scripting Tool*.

2.3.3 wlconfig Ant Task Reference

The following sections describe the attributes and elements that can be used with `wlconfig`.

2.3.4 Main Attributes

The following table describes the main attributes of the `wlconfig` Ant task.

Table 2–2 Main Attributes of the wlconfig Ant Task

Attribute	Description	Data Type	Required?
url	The URL of the domain's Administration Server.	String	Yes
username	The user name of an administrator account.	String	No
password	The password of an administrator account. To avoid having the plain text password appear in the build file or in process utilities such as `ps`, first store a valid user name and encrypted password in a configuration file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command. Then omit both the `username` and `password` attributes in your Ant build file. When the attributes are omitted, `wlconfig` attempts to login using values obtained from the default configuration file. If you want to obtain a user name and password from a non-default configuration file and key file, use the `userconfigfile` and `userkeyfile` attributes with `wlconfig`. See the command reference for `storeUserConfig` in the *WLST Command Reference for WebLogic Server* for more information on storing and encrypting passwords.	String	No

Table 2–2 (Cont.) Main Attributes of the wlconfig Ant Task

Attribute	Description	Data Type	Required?
failonerror	This is a global attribute used by WebLogic Server Ant tasks. It specifies whether the task should fail if it encounters an error during the build. This attribute is set to true by default.	Boolean	No
userconfigfile	Specifies the location of a user configuration file to use for obtaining the administrative user name and password. Use this option, instead of the `username` and `password` attributes, in your build file when you do not want to have the plain text password shown in-line or in process-level utilities such as `ps`. Before specifying the `userconfigfile` attribute, you must first generate the file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command as described in the *WLST Command Reference for WebLogic Server*.	File	No
userkeyfile	Specifies the location of a user key file to use for encrypting and decrypting the user name and password information stored in a user configuration file (the `userconfigfile` attribute). Before specifying the `userkeyfile` attribute, you must first generate the key file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command as described in the *WLST Command Reference for WebLogic Server*.	File	No

2.3.5 Nested Elements

`wlconfig` also has several elements that can be nested to specify configuration options:

- create
- delete
- set
- get
- query
- invoke

2.3.5.1 create

The `create` element creates a new MBean in the WebLogic Server domain. The `wlconfig` task can have any number of `create` elements.

A `create` element can have any number of nested `set` elements, which set attributes on the newly-created MBean. A `create` element may also have additional, nested `create` elements that create child MBeans.

The `create` element has the following attributes.

Table 2–3 Attributes of the create Element

Attribute	Description	Data Type	Required?
name	The name of the new MBean object to create.	String	No (`wlconfig` supplies a default name if none is specified.)
type	The MBean type.	String	Yes
property	The name of an optional Ant property that holds the object name of the newly-created MBean. **Note:** If you nest a `create` element inside of another `create` element, you cannot specify the `property` attribute for the *nested* `create` element.	String	No

2.3.5.2 delete

The `delete` element removes an existing MBean from the WebLogic Server domain. `delete` takes a single attribute:

Table 2–4 Attribute of the delete Element

Attribute	Description	Data Type	Required?
mbean	The object name of the MBean to delete.	String	Required when the `delete` element is a direct child of the `wlconfig` task. Not required when nested within a `query` element.

2.3.5.3 set

The `set` element sets MBean attributes on a named MBean, a newly-created MBean, or on MBeans retrieved as part of a query. You can include the `set` element as a direct child of the `wlconfig` task, or nested within a `create` or `query` element.

The `set` element has the following attributes:

Table 2–5 Attributes of the set Element

Attribute	Description	Data Type	Required?
attribute	The name of the MBean attribute to set.	String	Yes
value	The value to set for the specified MBean attribute. You can specify multiple object names (stored in Ant properties) as a value by delimiting the entire value list with quotes and separating the object names with a semicolon.	String	Yes
mbean	The object name of the MBean whose values are being set. This attribute is required only when the `set` element is included as a direct child of the main `wlconfig` task; it is not required when the set element is nested within the context of a `create` or `query` element.	String	Required only when the `set` element is a direct child of the `wlconfig` task.
domain	This attribute specifies the JMX domain name for Security MBeans and third-party SPI MBeans. It is not required for administration MBeans, as the domain corresponds to the WebLogic Server domain. **Note:** You cannot use this attribute if the `set` element is nested inside of a `create` element.	String	No

2.3.5.4 get

The `get` element retrieves attribute values from an MBean in the WebLogic Server domain. The `wlconfig` task can have any number of `get` elements.

The `get` element has the following attributes.

Table 2–6 Attributes of the get Element

Attribute	Description	Data Type	Required?
attribute	The name of the MBean attribute whose value you want to retrieve.	String	Yes
property	The name of an Ant property that will hold the retrieved MBean attribute value.	String	Yes
mbean	The object name of the MBean you want to retrieve attribute values from.	String	Yes

2.3.5.5 query

The `query` elements finds MBean that match a search pattern.

The query element supports the following nested child elements:

- `set`—performs set operations on all MBeans in the result set.
- `get`—performs get operations on all MBeans in the result set.
- `create`—each MBean in the result set is used as a parent of a new MBean.
- `delete`—performs delete operations on all MBeans in the result set.
- `invoke`—invokes all matching MBeans in the result set.

`wlconfig` can have any number of nested `query` elements.

`query` has the following attributes:

Table 2–7 Attributes of the query Element

Attribute	Description	Data Type	Required?
domain	The name of the WebLogic Server domain in which to search for MBeans.	String	No
type	The type of MBean to query.	String	No
name	The name of the MBean to query.	String	No
pattern	A JMX query pattern.	String	No
property	The name of an optional Ant property that will store the query results.	String	No
domain	This attribute specifies the JMX domain name for Security MBeans and third-party SPI MBeans. It is not required for administration MBeans, as the domain corresponds to the WebLogic Server domain.	String	No

2.3.5.6 invoke

The `invoke` element invokes a management operation for one or more MBeans. For WebLogic Server MBeans, you usually use this command to invoke operations other than the `get`*`Attribute`* and `set`*`Attribute`* that most WebLogic Server MBeans provide.

The `invoke` element has the following attributes.

Table 2–8 Attributes of the invoke Element

Attribute	Description	Data Type	Required?
mbean	The object name of the MBean you want to invoke.	String	You must specify either the mbean or type attribute of the invoke element.
type	The type of MBean to invoke.	String	You must specify either the mbean or type attribute of the invoke element.
methodName	The method of the MBean to invoke.	String	Yes
arguments	The list of arguments (separated by spaces) to pass to the method specified by the methodName attribute.	String	No

2.4 Using the libclasspath Ant Task

Use the libclasspath Ant task to build applications that use libraries, such as application libraries and Web libraries.

- Section 2.4.1, "libclasspath Task Definition"
- Section 2.2.3, "wlserver Ant Task Reference"
- Section 2.4.5, "Example libclasspath Ant Task"

2.4.1 libclasspath Task Definition

To use the task with your own Ant installation, add the following task definition in your build file:

```
   <taskdef name="libclasspath"
classname="weblogic.ant.taskdefs.build.LibClasspathTask"/>
```

2.4.2 libclasspath Ant Task Reference

The following sections describe the attributes and elements that can be used with the libclasspath Ant task.

- Section 2.4.3, "Main libclasspath Attributes"
- Section 2.4.4, "Nested libclasspath Elements"

2.4.3 Main libclasspath Attributes

The following table describes the main attributes of the libclasspath Ant task.

Table 2–9 Attributes of the libclasspath Ant Task

Attribute	Description	Required
basedir	The root of .ear or .war file to extract from.	Either basedir or basewar is required.
basewar	The name of the .war file to extract from.	If basewar is specified, basedir is ignored and the library referenced in basewar is used as the .war file to extract classpath or resourcepath information from.
tmpdir	The fully qualified name of the directory to be used for extracting libraries.	Yes.
classpathproperty	Contains the classpath for the referenced libraries. For example, if basedir points to a .war file that references Web application libraries in the weblogic.xml file, the classpathproperty contains the WEB-INF/classes and WEB-INF/lib directories of the Web application libraries. Additionally, if basedir points to a .war file that has .war files under WEB-INF/bea-ext, the classpathproperty contains the WEB-INF/classes and WEB-INF/lib directories for the Oracle extensions.	At least one of the two attributes is required.
resourcepathproperty	Contains library resources that are not classes. For example, if basedir points to a .war file that has .war files under WEB-INF/bea-ext, resourcepathproperty contains the roots of the exploded extensions.	

2.4.4 Nested libclasspath Elements

libclasspath also has two elements that can be nested to specify configuration options. At least one of the elements is required when using the libclasspath Ant task:

2.4.4.1 librarydir

The following attribute is required when using this element:

dir—Specifies that all files in this directory are registered as available libraries.

2.4.4.2 library

The following attribute is required when using this element:

file—Register this file as an available library.

2.4.5 Example libclasspath Ant Task

This section provides example code of a libclasspath Ant task:

Example 2–1 Example libclasspath Ant Task Code

```
.
.
.
   <taskdef name="libclasspath"
```

```
classname="weblogic.ant.taskdefs.build.LibClasspathTask"/>

   <!-- Builds classpath based on libraries defined in weblogic-application.xml.
-->
   <target name="init.app.libs">
      <libclasspath basedir="${src.dir}" tmpdir="${tmp.dir}"
classpathproperty="app.lib.classpath">
         <librarydir dir="${weblogic.home}/common/deployable-libraries/"/>
      </libclasspath>
   <echo message="app.lib.claspath is ${app.lib.classpath}" level="info"/>
   </target>
.
.
.
```

3
Using the WebLogic Development Maven Plug-In

Apache Maven is a software tool for building and managing Java-based projects. WebLogic Server provides support for Maven through the provisioning of plug-ins that enable you to perform various operations on WebLogic Server from within a Maven environment.

The `weblogic-maven-plugin` provides enhanced functionality to install, start and stop servers, create domains, execute WLST scripts, and compile and deploy applications. With the `weblogic-maven-plugin`, you can install WebLogic Server from within your Maven environment to fulfill the local WebLogic Server requirement.

The following sections describe using `weblogic-maven-plugin`:

- Section 3.1, "Installing Maven"
- Section 3.2, "Configuring the WebLogic Development Maven Plug-In"
- Section 3.3, "Maven Plug-In Goals"

See *Developing Applications Using Continuous Integration* for additional Maven documentation. In particular, see the section "Building Java EE Projects for WebLogic Server with Maven."

3.1 Installing Maven

Before you can use the `weblogic-maven-plugin` plug-in, you must first have a functional Maven installation and a Maven repository. WebLogic Server supports Maven 3.0.4 and later.

A distribution of Maven 3.0.4 is included with WebLogic Server in the following location: `*ORACLE_HOME*\oracle_common\modules\org.apache.maven_3.0.4`. This is a copy of the standard Maven 3.0.4 release, without any modifications.

Run the `*ORACLE_HOME*\wlserver\server\bin\setWLSEnv` script to configure Maven.

Alternatively, you can download and install your own copy of Maven from the Maven Web site: `http://maven.apache.org`. Make sure you set any required variables as detailed in that documentation, such as `M2_HOME` and `JAVA_HOME`.

The `weblogic-maven-plugin` sets the Java protocol handler to `weblogic.net`. To use the default JDK protocol handlers, specify the system property `-DUseSunHttpHandler=true` in the JVM that executes Maven. To do this, override the environment variable `MAVEN_OPTS` inside the `mvn.bat` or `mvn.sh` files to set the appropriate value. For example: `set MAVEN_OPTS="-DUseSunHttpHandler=true"`.

For detailed information on installing and using Maven to build applications and projects, see the Maven Users Centre at http://maven.apache.org/users/index.html.

3.2 Configuring the WebLogic Development Maven Plug-In

The `weblogic-maven-plugin` plug-in is provided as a pre-built JAR file and accompanying pom file.

Follow these steps for installing and configuring `weblogic-maven-plugin`:

1. Install the Oracle Maven sync plug-in and run the push goal:

   a. Change directory to `*ORACLE_HOME*\oracle_common\plugins\maven\com\oracle\maven\oracle-maven-sync\12.1.2`.

   b. `mvn install:install-file -DpomFile=oracle-maven-sync.12.1.2.pom -Dfile=oracle-maven-sync.12.1.2.jar`.

   c. `mvn com.oracle.maven:oracle-maven-sync:push -Doracle-maven-sync.oracleHome=c:\oracle\middleware\oracle_home\`.

2. You can validate whether you have successfully installed the plug-in using the Maven `help:describe` goal. See the Apache help plug-in describe goal documentation for additional information.

   ```
   mvn help:describe -DgroupId=com.oracle.weblogic
   -DartifactId=weblogic-maven-plugin -Dversion=12.1.2-0-0
   ```

3.2.1 How to use the WebLogic Maven Plug-in

There are two ways to invoke the goals in the WebLogic Maven plug-in:

- From a Maven project POM.
- From the command line.

The appc, ws-jwsc, ws-wsdlc, and ws-clientgen goals require a POM.

Other goals will work either way. For example, install, wlst, start-server, or stop-server work either from a POM or the command line.

The preferred and recommended way is to use a Maven POM file.

To invoke a WebLogic Maven plug-in goal from a POM file, do the following:

1. Add a build section to your POM if you do not already have one.
2. Add a plug-in section to the build section for the WebLogic Maven plug-in.
3. Add an execution section to the WebLogic Maven plug-in's `plugin` section for each goal that you want to execute. This section must provide the necessary parameters for the goal, and map the goal to a phase in the Maven Lifecycle.

Example 3–1 shows an example of the necessary additions, including a few goals. The detailed descriptions of each goal later in this section present the details for parameters and examples for each goal.

If you map multiple goals to the same lifecycle phase, they are typically executed in the order you list them in the POM.

Example 3–1 Modifying the POM File

```
<build>
    <plugins>
      <plugin>
        <!-- This is the configuration for the
             weblogic-maven-plugin
        -->
        <groupId>com.oracle.weblogic</groupId>
<artifactId>weblogic-maven-plugin</artifactId>
        <version>12.1.2-0-0</version>
        <configuration>
<middlewareHome>/fmwhome/wls12120</middlewareHome>
        </configuration>
        <executions>
          <!-- Execute the appc goal during the package phase -->
          <execution>
            <id>wls-appc</id>
            <phase>package</phase>
            <goals>
              <goal>appc</goal>
            </goals>
            <configuration>
<source>${project.build.directory}/${project.name}.${project.packaging}</source>
            </configuration>
          </execution>
          <!-- Deploy the application to the WebLogic Server in the
               pre-integration-test phase
          -->
          <execution>
            <id>wls-deploy</id>
            <phase>pre-integration-test</phase>
            <goals>
              <goal>deploy</goal>
            </goals>
            <configuration>
              <!--The admin URL where the app is deployed.
Here use the plugin's default value t3://localhost:7001-->
<adminurl>t3://127.0.0.1:7001</adminurl>
              <user>weblogic</user>
              <password>password</password>
              <!--The location of the file or directory to be deployed-->
<source>${project.build.directory}/${project.build.finalName}.${project.packaging}
</source>
              <!--The target servers where the application is deployed.
Here use the plugin's default value AdminServer-->
              <targets>AdminServer</targets>
              <verbose>true</verbose>
<name>${project.build.finalName}</name>
            </configuration>
          </execution>
          <!-- Stop the application in the pre-integration-test phase -->
          <execution>
            <id>wls-stop-app</id>
            <phase>pre-integration-test</phase>
            <goals>
              <goal>stop-app</goal>
            </goals>
            <configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
              <user>weblogic</user>
              <password>password</password>
<name>${project.build.finalName}</name>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
```

Table 3–1 lists the phases in the default Maven lifecycle.

Table 3–1 Maven Lifecycle Phases

Phase	Description
validate	Validates the project is correct and all necessary information is available.
compile	Compiles the source code of the project.
test	Tests the compiled source code using a suitable unit testing framework. These tests should not require the code be packaged or deployed.
package	Takes the compiled code and package it in its distributable format, such as a JAR.
integration-test	Processes and deploys the package if necessary into an environment where integration tests can be run.
verify	Runs any checks to verify the package is valid and meets quality criteria.
install	Installs the package into the local repository, for use as a dependency in other projects locally.
deploy	In an integration or release environment, copies the final package to the remote repository for sharing with other developers and projects.

Table 3–2 shows the most common mappings of goals to phases

Table 3–2 Common Mapping of Goals to Phases

Phase	Goal
validate	ws-clientgen, ws-wsdlc
compile	ws-jwsc
test	NA
package	appc
pre-integration-test[1]	install, create-domain, start-server, distribute-app, deploy, redeploy, update-app, start-app, stop-app, wlst, and list-apps
post-integration-test[2]	undeploy, stop-server, uninstall
verify	NA
install	NA
deploy	NA

[1] The integration-test phase has pre sub-phases that are executed before the actual execution of any integration tests, respectively.

[2] The integration-test phase has post sub-phases that are executed after the actual execution of any integration tests, respectively.

3.2.2 Basic Configuration POM File

Example 3–2 illustrates a basic Java EE 6 Web application pom.xml file that demonstrates the use of the weblogic-maven-plugin appc goal.

Example 3–2 Basic Configuration pom.xml File

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>

    <groupId>demo.sab</groupId>
    <artifactId>maven-demo</artifactId>
    <version>1.0-SNAPSHOT</version>
    <packaging>war</packaging>

    <name>maven-demo</name>

    <properties>
        <endorsed.dir>${project.build.directory}/endorsed</endorsed.dir>
        <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    </properties>

    <dependencies>
      <dependency>
       <groupId>com.oracle.weblogic</groupId>
       <artifactId>weblogic-server-pom</artifactId>
       <version>12.1.2-0-0</version>
       <type>pom</type>
       <scope>provided</scope>
      </dependency>
    </dependencies>

    <build>
        <plugins>
            ...
            ...

            <!-- WebLogic Server 12c Maven Plugin -->
            <plugin>
                <groupId>com.oracle.weblogic</groupId>
                <artifactId>weblogic-maven-plugin</artifactId>
                <version>12.1.2-0-0</version>
            </plugin>
            <configuration>
             </configuration>
             <executions>
               <execution>
                <id>wls-appc</id>
                <phase>package</phase>
                <goals>
                 <goal>appc</goal>
                </goals>
               <configuration>
                 source>${project.build.directory}/${project.name}.
                   ${project.packaging}</source>
               </configuration>
              </execution>
             </executions>
         </plugins>
    </build>

</project>
```

3.3 Maven Plug-In Goals

Table 3–3 lists all the `weblogic-maven-plugin` goals. Each goal is described in detail in the sections that follow.

Table 3–3 Maven Plug-In Goals

Goal Name	Description
appc	Generates and compiles the classes needed to deploy EJBs and JSPs to WebLogic Server. Also validates the deployment descriptors for compliance with the current specifications at both the individual module level and the application level.
create-domain	Creates a domain for WebLogic Server using a domain template. This goal supports specifying the domain directory (the last directory determines the domain name) and the administrative username and password. For more complex domain creation, use the `wlst` goal.
deploy	Deploys WebLogic Server applications and modules. Supports all deployment formats; for example, WAR, JAR, and such.
distribute-app	Prepares deployment files for deployment by copying deployment files to target servers and validating them.
help	Deprecated. Use the standard Maven help plug-in instead.
install	Installs WebLogic Server.
list-apps	Lists the deployment names for applications and standalone modules deployed, distributed, or installed in the domain.
redeploy	Redeploys a running application or part of a running application.
start-app	Starts an application deployed on WebLogic Server.
start-server	Starts WebLogic Server. This goal starts WLS by running a local start script. For starting remote servers using the node manager, use the wlst goal instead.
stop-app	Stops an application.
stop-server	Stops WebLogic Server. This goal stops WLS by running a local start script. For stopping remote servers using the node manager, use the wlst goal instead.
undeploy	Undeploys the application from WebLogic Server. Stops the deployment unit and removes staged files from target servers.
uninstall	Uninstalls WebLogic Server. Currently works only for servers installed using the Zip installer.
update-app	Updates an application's deployment plan by redistributing the plan files and reconfiguring the application based on the new plan contents.
wlst	WLST wrapper for Maven.

Table 3–3 (Cont.) Maven Plug-In Goals

Goal Name	Description
ws-clientgen	Generates client Web service artifacts from a WSDL.
ws-wsdlc	Generates a set of artifacts and a partial Java implementation of the Web service from a WSDL.
ws-jwsc	Builds a JAX-WS Web service.

3.3.1 appc

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:appc`

Description

Generates and compiles the classes need to deploy EJBs and JSPs to WebLogic Server. Also validates the deployment descriptors for compliance with the current specifications at both the individual module level and the application level. Does not require a local server installation.

Parameters

Table 3–4 appc Parameters

Name	Type	Required	Description
`altappdd`	`java.lang.String`	false	Specifies the path to an alternative Java EE application deployment descriptor.
`altwlsappdd`	`java.lang.String`	false	Specifies the path to an alternative WebLogic Server application deployment descriptor.
`basicClientJar`	`boolean`	false	When true, does not include deployment descriptors in client JARs generated for EJBs. Default value is: `false`
`classpath`	`java.lang.String`	false	This parameter is deprecated in this release and ignored. Use the standard Maven dependency model instead to manipulate the effective CLASSPATH during a build.
`clientJarOutputDir`	`java.lang.String`	false	Specifies a directory where generated client JARs will be written.
`commentary`	`boolean`	false	This parameter is deprecated in this release.
`compiler`	`java.lang.String`	false	Specifies the Java compiler for compiling class files from the generated Java source code. The Java compiler program should be in your `PATH` unless you specify the absolute path to the compiler explicitly. Default value is: `javac`
`compilerClass`	`java.lang.String`	false	The class that invokes the compiler. Default value is: `com.sun.tools.javac.Main`
`continueCompilation`	`boolean`	false	When true, continues compilation even when there are errors in the JSP files. Default value is: `false`
`debug`	`boolean`	false	When true, compiles debugging information into class files. Default value is: `false`

Table 3–4 (Cont.) appc Parameters

Name	Type	Required	Description
deprecation	boolean	false	When true, warns about the use of deprecated methods in the generated Java source file when compiling the source file into a class file. Default value is: false
destdir	java.io.File	false	Specifies the directory where compiled class files are written. Use this parameter to place compiled classes in a directory that is already in your CLASSPATH.
enableHotCodeGen	boolean	false	This parameter is deprecated in this release.
forceGeneration	boolean	false	When true, forces the generation of EJB and JSP classes. Otherwise, the classes will not be regenerated if it is determined to be unnecessary. Default value is: false
idl	boolean	false	When true, generates IDL for EJB remote interfaces. Default value is: false
idlDirectory	java.lang.String	false	Specifies the directory where IDL files will be written. Default: the target directory or JAR
idlFactories	boolean	false	When true, generates factory methods for valuetypes. Default value is: false
idlMethodSignatures	java.lang.String	false	Specifies the method signatures used to trigger IDL code generation.
idlNoAbstractInterfaces	boolean	false	When true, does not generate abstract interfaces and methods or attributes that contain them. Default value is: false
idlNoValueTypes	boolean	false	Does not generate valuetypes or the methods and attributes that contain them. Default value is: false
idlOrbix	boolean	false	When true, generates IDL somewhat compatible with Orbix 2000 2.0 C++. Default value is: false
idlOverwrite	boolean	false	When true, overwrites existing IDL files. Default value is: false
idlVerbose	boolean	false	When true, displays additional status information for IDL generation. Default value is: false
idlVisibroker	boolean	false	When true, generates IDL somewhat compatible witih Visibroker 4.5 C++. Default value is: false
ignorePlanValidation	boolean	false	When true, ignores the plan file if it does not exist.
iiop	boolean	false	When true, generates CORBA stubs for EJBs. Default value is: false
iiopDirectory	java.lang.String	false	Specifies the directory where IIOP stub files will be written. Default: the target directory or JAR
keepgenerated	boolean	false	When true, preserves the generated .java files. Default value is: false
libraries	java.lang.String	false	A comma-separated list of libraries.
librarydir	java.io.File	false	Registers all the files in the specified directory as libraries.

Table 3–4 (Cont.) appc Parameters

Name	Type	Required	Description
lineNumbers	boolean	false	When true, adds JSP line numbers to generated class files to aid in debugging. Default value is: false
manifest	java.io.File	false	This parameter is deprecated in this release. Use the standard Maven mechanism to specify the Manifest during packaging.
maxfiles	java.lang.Integer	false	Specifies the maximum number of generated Java files to be compiled at one time.
middlewareHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
noexit	boolean	false	When true, does not exit from the execution of the appc goal when encountering JSP compile errors. Default value is: true
normi	boolean	false	This parameter is deprecated in this release.
nowarn	boolean	false	When true, suppresses compiler warnings. Default value is: false
nowrite	boolean	false	This parameter is deprecated in this release.
optimize	boolean	false	When true, compiles with optimization on. Default value is: false
output	java.io.File	false	Specifies an alternate output archive or directory. When not set, the output is placed in the source archive or directory.
plan	java.io.File	false	Specifies the path to an optional deployment plan.
quiet	boolean	false	When true, turns off output except for errors.
runtimeFlags	java.lang.String	false	Passes a list of options to the compiler.
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored. Use the standard Maven dependency model instead to manipulate the effective CLASSPATH.
source	java.io.File	false	Specifies the path to the source files. Default value is: ${project.build.directory}/${project.artifactId}.${project.packaging}
sourceVersion	java.lang.String	false	Limits the compatibility of the Java files to a JDK no higher than specified. For example "1.5". Default value is: The JDK version of the Java compiler used
supressCompiler	boolean	false	This parameter is deprecated in this release and ignored. Use the standard Maven dependency model instead to add the target classes to the effective CLASSPATH during a build.
targetVersion	java.lang.String	false	Specifies the minimum level of the JVM required to run the compiled class files. For example, "1.5". Default value is: The JDK version of the Java compiler used
verbose	boolean	false	When true, displays additional status information during the compilation process. Default value is: false

Table 3–4 (Cont.) appc Parameters

Name	Type	Required	Description
verboseJavac	boolean	false	When true, enables verbose output from the Java compiler. Default value is: false
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
writeInferredDescriptors	boolean	false	When true, writes out the descriptors with inferred information including annotations.

Usage Example

The appc goal executes the WebLogic Server application compiler utility to prepare an application for deployment.

```
<execution>
<id>wls-appc</id>
<phase>package</phase>
<goals>
<goal>appc</goal>
</goals>
<configuration>
<source>${project.build.directory}/${project.name}.${project.packaging}</source>
</configuration>
</execution>
```

Example 3–3 shows typical appc goal output.

Example 3–3 appc

```
$ mvn com.oracle.weblogic:weblogic-maven-plugin:appc
 -Dsource=target/basicWebapp.war -DforceGeneration=true
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building basicWebapp 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:appc (default-cli) @ main-test ---
[INFO] Running weblogic.appc on
/home/oracle/src/tests/main-test/target/basicWebapp.war
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 7.901s
[INFO] Finished at: Wed May 15 10:52:46 EST 2013
[INFO] Final Memory: 26M/692M
[INFO]
```

3.3.2 create-domain

Full Name

com.oracle.weblogic:weblogic-maven-plugin:create-domain

Description

Creates a domain for WebLogic Server using a domain template. This goal supports specifying the domain directory (the last directory determines the domain name) and the administrative username and password. For more complex domain creation, use the `wlst` goal.

Parameters

Table 3–5 create-domain Parameters

Name	Type	Required	Description
`domainHome`	`java.lang.String`	true	Specifies the directory to use for creating the domain. This goal takes the name of the last subdirectory specified as the domain name and sets the new domain's name to that value. For example, domainHome=/weblogic/domains/MyNewDomain causes the domain name to be set to 'MyNewDomain'.
`domainTemplate`	`java.lang.String`	false	Specifies the domain template file to use to create the domain. The default domain template included with WebLogic Server is used when this parameter is not specified.
`failOnDomainExists`	`boolean`	false	When `true` and the domain to be created already exists, the build fails and an exception is thrown. When `false` and the domain to be created already exists, the build is successful and the existing domain is not overwritten. If the domain does not exist, this parameter has no effect. Default value is: `false`
`middlewareHome`	`java.lang.String`	true	The path to the Oracle Middleware install directory.
`password`	`java.lang.String`	**true**	Specifies the administrative password.
`serverClasspath`	`java.lang.String`	false	This parameter is deprecated and ignored in this release.
`user`	`java.lang.String`	**true**	Specifies the administrative user name.
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated and ignored in this release.
`wlstVersion`	`java.lang.String`	false	Specifies whether to run the wlst.sh script from *`${middlewareHome}`*`/wlserver/common/bin` or *`${middlewareHome}`*`/oracle_common/common/bin`. Allowable values are `wls` and `oracle_common`. The default is `wls`.

Usage Example

Use the `create-domain` goal to create a WebLogic Server domain from a specified WebLogic Server installation. You specify the location of the domain using the `domainHome` configuration parameter.

When creating a domain, a user name and password are required. You can specify these using the `user` and `password` configuration parameters in your POM file or by specifying them on the command line.

The domain name is taken from the last subdirectory specified in `domainHome`.

```
<execution>
<id>wls-create-domain</id>
<phase>pre-integration-test</phase>
<goals>
<goal>create-domain</goal>
</goals>
<configuration>
```

```
<middlewareHome>c:/dev/wls12120</middlewareHome>
<domainHome>${project.build.directory}/base_domain</domainHome>
<user>weblogic</user>
<password>password</password>
</configuration>
</execution>
```

Example 3–4 shows typical command output from the execution of the `create-domain` goal.

Example 3–4 create-domain

```
mvn com.oracle.weblogic:weblogic-maven-plugin:create-domain
-DdomainHome=c:\oracle\middleware\oracle_home\user_projects\domains\maven-domain
-DmiddlewareHome=c:\oracle\middleware\oracle_home -Duser=weblogic
-Dpassword=password
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:create-domain (default-cli) @
 weblogic-maven-plugin ---
[INFO] [create-domain]Domain creation script:
readTemplate(r'C:/oracle/middleware/oracle_
home/wlserver/common/templates/wls/wls.jar')
set('Name', 'maven-domain')
cd('/Security/maven-domain/User/weblogic')
set('Name', 'weblogoc')
set('Password', '***')
writeDomain(r'c:/oracle/middleware/oracle_home/user_
projects/domains/maven-domain')
[INFO] [wlst]script temp file =
C:/Users/user/AppData/Local/Temp/test6066166061714573929.py
[INFO] [wlst]Executing: [cmd:[C://windows\\system32\\cmd.exe, /c,
C:\oracle\middleware\oracle_home\wlserver\common\bin\wlst.cmd
C:\Users\user\AppData\Local\Temp\test6066166061714573929.py ]]
[INFO] Process being executed, waiting for completion.
[INFO] [exec]
[INFO] [exec] Initializing WebLogic Scripting Tool (WLST) ...
[INFO] [exec]
[INFO] [exec] Welcome to WebLogic Server Administration Scripting Shell
[INFO] [exec]
[INFO] [exec] Type help() for help on available commands
[INFO] [exec]
[INFO] [wlst][cmd:[C:\\windows\\system32\\cmd.exe, /c,
C:\oracle\middleware\oracle_home\wlserver\common\bin\wlst.cmd
C:\Users\user\AppData\Local\Temp\test6066166061714573929.py ]] exit code=0
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 18.276s
[INFO] Finished at: Wed May 01 13:13:25 EDT 2013
[INFO] Final Memory: 9M/23M
[INFO] ------------------------------------------------------------------------
```

3.3.3 deploy

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:deploy`

Description

Deploys WebLogic Server applications and modules to a running server. Supports all deployment formats; for example, WAR, JAR, RAR, and such. Does not require a local server installation.

Parameters

Table 3–6 deploy Parameters

Name	Type	Required	Description
adminurl	java.lang.String	false	Specifies the listen address and listen port of the Administration Server. Default value is: t3://localhost:7001
advanced	boolean	false	When true, prints advanced usage options.
debug	boolean	false	When true, displays debug-level messages to the standard output. Default value is: false
enableSecurityValidation	boolean	false	When true, enables validation of security data. Default value is: false
examples	boolean	false	When true, displays examples of how to use this plug-in.
external_stage	boolean	false	When true, indicates that the user wants to copy the application in the server staging area externally or using a third-party tool. When specified, WebLogic Server looks for the application under StagingDirectoryName(of target server)/ applicationName. Default value is: false
failOnError	boolean	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: true
id	java.lang.String	false	Specifies an optional, user-supplied, unique deployment task identifier.
middlewareHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
name	java.lang.String	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
nostage	boolean	false	When true, does not copy the deployment files to target servers, but leaves them in a fixed location, specified by the source parameter. By default, nostage is true for the Administration Server and stage is true for the Managed Server targets.
noversion	boolean	false	When true, ignores all version related code paths on the Administration Server. Default value is: false
nowait	boolean	false	When true, initiates multiple tasks and then monitors them later with the -list action. Default value is: false
password	java.lang.String	false	Specifies the administrative password.

Table 3–6 (Cont.) deploy Parameters

Name	Type	Required	Description
plan	java.lang.String	false	Specifies the path to the deployment plan.
purgetasks	boolean	false	When true, eliminates retired deployment tasks. Default value is: false
remote	boolean	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the source parameter specifies a path on the server, unless the upload parameter is also used. Default value is: false
retiretimeout	java.lang.Integer	false	Specifies the number of seconds before WebLogic Server undeploys the currently-running version of this application or module so that clients can start using a new version. When not specified, a graceful retirement policy is assumed. Default value is: -1
securityModel	java.lang.String	false	Specifies the security model to be used for this deployment, overriding the default security model for the security realm. Possible values are: DDOnly, CustomRoles, CustomRolesAndPolicies, and Advanced.
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
source	java.lang.String	false	Archive file or exploded archive directory to deploy. You can omit the option and supply only the file or directory to deploy.
stage	boolean	false	When true, indicates that the application needs to be copied into the target server staging area before deployment. By default, nostage is true for the Administration Server and stage is true for the Managed Server targets.
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: submod@mod-jms.xml@target or submoduleName@target.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. The default is AdminServer.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of -1 means wait forever. Default value is: -1
upload	boolean	false	When true, copies the source files to the Administration Server's upload directory prior to deployment. Use this setting when running the plug-in remotely (using the remote parameter) and when the user lacks normal access to the Administration Server's file system. Default value is: false
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.

Table 3–6 (Cont.) deploy Parameters

Name	Type	Required	Description
`verbose`	`boolean`	false	When true, displays additional status information. Default value is: `false`
`version`	`boolean`	false	When true, prints the version information. Default value is: `false`
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Usage Example

Use this goal to deploy an application.

```
<execution>
<id>wls-deploy</id>
<phase>pre-integration-test</phase>
<goals>
<goal>deploy</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
<user>weblogic</user>
<password>password</password>
<source>${project.build.directory}/${project.build.finalName}
.${project.packaging}</source>
<targets>AdminServer</targets>
<verbose>true</verbose>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–5 shows typical `deploy` goal output.

Example 3–5 deploy

```
mvn com.oracle.weblogic:weblogic-maven-plugin:deploy
-Dsource=C:\webservices\MySimpleEjb.jar
-Dpassword=password -Duser=weblogic
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:deploy (default-cli) @ weblogic-mave
n-plugin ---
weblogic.Deployer invoked with options:  -noexit -adminurl t3://localhost:7001 -
deploy -user weblogic -source C:\webservices\MySimpleEjb.jar -targets AdminServe
r
<May 1, 2013 1:41:09 PM EDT> <Info> <J2EE Deployment SPI> <BEA-260121> <Initiati
ng deploy operation for application, MySimpleEjb [archive: C:\webservices\MySimp
leEjb.jar], to AdminServer .>
Task 0 initiated: [Deployer:149026]deploy application MySimpleEjb on AdminServer
.
Task 0 completed: [Deployer:149026]deploy application MySimpleEjb on AdminServer
.
Target state: deploy completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
```

```
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 9.042s
[INFO] Finished at: Wed May 01 13:41:11 EDT 2013
[INFO] Final Memory: 10M/25M
```

3.3.4 distribute-app

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:distribute-app`

Description

Prepares deployment files for deployment by copying deployment files to target servers and validating them. Does not require a local server installation.

Parameters

Table 3–7 distribute-app Parameters

Name	Type	Required	Description
`adminurl`	`java.lang.String`	false	Specifies the listen address and listen port of the Administration Server. Default value is: `t3://localhost:7001`
`advanced`	`boolean`	false	When true, prints advanced usage options.
`debug`	`boolean`	false	When true, displays debug-level messages to the standard output. Default value is: `false`
`enableSecurityValidation`	`boolean`	false	When true, enables validation of security data. Default value is: `false`
`examples`	`boolean`	false	When true, displays examples of how to use this plug-in.
`external_stage`	`boolean`	false	When true, indicates that the user wants to copy the application in the server staging area externally or using a third-party tool. When specified, WebLogic Server looks for the application under `StagingDirectoryName(of target server)/ applicationName`. Default value is: `false`
`failOnError`	`boolean`	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: `true`
`id`	`java.lang.String`	false	Specifies an optional, user-supplied, unique deployment task identifier.
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`name`	`java.lang.String`	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
`nostage`	`boolean`	false	When true, does not copy the deployment files to target servers, but leaves them in a fixed location, specified by the `source` parameter. By default, `nostage` is true for the Administration Server and `stage` is true for the Managed Server targets.

Table 3–7 (Cont.) distribute-app Parameters

Name	Type	Required	Description
noversion	boolean	false	When true, ignores all version related code paths on the Administration Server. Default value is: false
nowait	boolean	false	When true, initiates multiple tasks and then monitors them later with the -list action. Default value is: false
password	java.lang.String	false	Specifies the administrative password.
plan	java.lang.String	false	Specifies the path to the deployment plan.
purgetasks	boolean	false	When true, eliminates retired deployment tasks. Default value is: false
remote	boolean	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the source parameter specifies a path on the server, unless the upload parameter is also used. Default value is: false
retiretimeout	java.lang.Integer	false	Specifies the number of seconds before WebLogic Server undeploys the currently-running version of this application or module so that clients can start using a new version. When not specified, a graceful retirement policy is assumed. Default value is: -1
securityModel	java.lang.String	false	Specifies the security model to be used for this deployment, overriding the default security model for the security realm. Possible values are: DDOnly, CustomRoles, CustomRolesAndPolicies, and Advanced.
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
source	java.lang.String	false	Specifies the archive file or exploded archive directory to deploy. This can be one of the following: a file, directory, or exploded archive on the local system, or a colon (:) separated list of Maven coordinates of the form (groupId:artifactID:packaging:classifier:version). When not using Maven coordinates, the source path points to a local file system unless the remote parameter is used. Default value is: ${project.build.directory}/${project.artifactId}.${project.packaging}
stage	boolean	false	When true, indicates that the application needs to be copied into the target server staging area before deployment. By default, nostage is true for the Administration Server and stage is true for the Managed Server targets.
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: submod@mod-jms.xml@target or submoduleName@target.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. When not specified, all configured targets are used. For a new application, the default target is the Administration Server.

Table 3–7 (Cont.) distribute-app Parameters

Name	Type	Required	Description
`timeout`	`java.lang.Integer`	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of `-1` means wait forever. Default value is: `-1`
`upload`	`boolean`	false	When true, copies the source files to the Administration Server's upload directory prior to deployment. Use this setting when running the plug-in remotely (using the `remote` parameter) and when the user lacks normal access to the Administration Server's file system. Default value is: `false`
`user`	`java.lang.String`	false	Specifies the administrative user name.
`userConfigFile`	`java.lang.String`	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
`userKeyFile`	`java.lang.String`	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
`verbose`	`boolean`	false	When true, displays additional status information. Default value is: `false`
`version`	`boolean`	false	When true, prints the version information. Default value is: `false`
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Use this goal to prepare deployment files for deployment.

```
<execution>
<id>wls-distribute-app</id>
<phase>pre-integration-test</phase>
<goals>
<goal>distribute-app</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
<user>weblogic</user>
<password>password</password>
<source>${project.build.directory}/${project.build.finalName}
.${project.packaging}</source>
<targets>cluster1</targets>
<verbose>true</verbose>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–6 shows typical `distribute-app` goal output.

Example 3–6 distribute-app

```
$ mvn com.oracle.weblogic:weblogic-maven-plugin:distribute-app
 -Dadminurl=t3://localhost:7001 -Dstage=true -DmiddlewareHome=/maven/wls12120
 -Dname=cluster-test -Duser=weblogic -Dpassword=welcome1 -Dtargets=cluster1
 -Dsource=target/cluster-test-1.0-SNAPSHOT.war
[INFO] Scanning for projects...
[INFO]
```

```
[INFO] ------------------------------------------------------------------------
[INFO] Building cluster-test 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:distribute-app (default-cli) @
 cluster-test ---
weblogic.Deployer invoked with options: -noexit -adminurl t3://localhost:7001
 -distribute -user weblogic -name cluster-test -source
/home/oracle/src/tests/uber-test/cluster-test/
target/cluster-test-1.0-SNAPSHOT.war -targets cluster1 -stage
<May 15, 2013 2:09:58 PM EST> <Info> <J2EE Deployment SPI> <BEA-260121>
 <Initiating distribute operation for application, cluster-test [archive:
/home/oracle/src/tests/uber-test/cluster-test/
target/cluster-test-1.0-SNAPSHOT.war], to cluster1 .>
Task 0 initiated: [Deployer:149026]distribute application cluster-test on
 cluster1.
Task 0 completed: [Deployer:149026]distribute application cluster-test on
 cluster1.
Target state: distribute completed on Cluster cluster1

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 6.953s
[INFO] Finished at: Wed May 15 14:10:00 EST 2013
[INFO] Final Memory: 15M/429M
[INFO] ------------------------------------------------------------------------
```

3.3.5 help

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:help`

Description

Deprecated. Use the standard Maven help plug-in instead.

Lists all the goals supported by the `weblogic-maven-plugin`.

Parameters

Table 3–8 help Parameters

Name	Type	Required	Description
`detail`	`boolean`	false	When true, prints detailed goal information. Default value is: `false`

3.3.6 install

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:install`

Description

Installs WebLogic Server.

Parameters

Table 3–9 install Parameters

Name	Type	Required	Description
`artifactLocation`	`java.lang.String`	**true**	Specifies the address of the installation. The address can be one of the following: a colon (:) separated list of Maven coordinates of the form: `groupId:artifactId:packaging:classifier:version`, a file on the local system `(/home/myhome/myapps/helloworld.war)`, or a remote `HTTP` URL (`http://foo/a/b.zip)`.
`domainHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`installCommand`	`java.lang.String`	false	Installs the product with an executable installer. The following macros are supported: `@INSTALLER_FILE@` - the path to the installer file, `@JAVA_HOME@` - path to the Java home. For example: `@JAVA_HOME@ -Xms512m -Xmx1024m -jar @INSTALLER_FILE@ one two`
`installDir`	`java.lang.String`	true	The location to install the server. For the zip installer, the equivalent of middlewareHome is *`${installDir}`*`/wls12120`.

Usage Example

Use this goal to install WebLogic Server into a local directory so it can be used to execute other goals, as well as to create a WebLogic Server domain for deploying and testing the application represented as the Maven project.

> **Note:** The install goal creates a single managed server called `myserver`, and does not create a domain. Most other goals, including create-domain, use a default server name of `AdminServer`. You therefore need to override the default `AdminServer` server name in your POM.

This goal installs WebLogic Server using a specified installation distribution. You specify the location of the distribution using the `artifactLocation` configuration parameter, which can be the location of the distribution as a file on the file system; an HTTP URL which can be accessed; or a Maven coordinate of the distribution installed in a Maven repository. Specify the `artifactLocation` configuration element in the `weblogic-maven-plugin` section of the `pom.xml` file, or by using the `-DartifactLocation` property when invoking Maven.

For example, if you want to install a WebLogic Server ZIP file distribution, you can specify the location of the ZIP distribution as one of the following:

- A local file reference—For a local file reference, specify the path on the local file system.
- A URL reference.
- A Maven artifact—In this case, the distribution is retrieved from the local Maven repository itself. This means that it needs to have been previously installed into the local repository or pulled over from a remote repository.

  `artifactLocation` can be a URL, a file path, or a Maven coordinate of the form `groupId:artifactId:packaging:version` or `groupId:artifactId:packaging:classifier:version`. For example,

```
   com.oracle.weblogic:weblogic-server-installer:zip:12.1.2-0-0.
```

```
<execution>
<id>wls-install-server</id>
<phase>pre-integration-test</phase>
<goals>
<goal>install</goal>
</goals>
<configuration>
<installDir>c:/dev</installDir>
<artifactLocation>c:/temp/wls1212_dev.zip</artifactLocation>
</configuration>
</execution>
```

Example 3–7 shows typical `install` goal output.

Example 3–7 install

```
mvn com.oracle.weblogic:weblogic-maven-plugin:install
 -DartifactLocation=wls1212.zip -DinstallDir=c:\oracle\middleware
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:install (default-cli) @ standalone-p
om ---
[INFO] Installing wls1212.zip into the location: c:\oracle\middleware
[INFO] Installing the product, this may take some time.
[INFO] [install]installHome = c:\oracle\middleware
[INFO] [install]middlewareHome = c:\oracle\middleware\wls12120
[INFO] Executing: [cmd:[C:\\windows\\system32\\cmd.exe, /c, configure.cmd -silen
t]]
[INFO] Process being executed, waiting for completion.
[INFO] [configure script] exit code: 0
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 2:43.223s
[INFO] Finished at: Thu May 09 15:57:22 EDT 2013
[INFO] Final Memory: 6M/17M
[INFO] ------------------------------------------------------------------------
```

3.3.7 list-apps

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:list-apps`

Description

Lists the deployment names for applications and standalone modules deployed, distributed, or installed in the domain. Does not require a local server installation.

Parameters

Table 3–10 list-apps Parameters

Name	Type	Required	Description
adminurl	java.lang.String	false	Specifies the listen address and listen port of the Administration Server. Default value is: t3://localhost:7001
advanced	boolean	false	When true, prints advanced usage options.
debug	boolean	false	When true, displays debug-level messages to the standard output. Default value is: false
examples	boolean	false	When true, displays examples of how to use this plug-in.
failOnError	boolean	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: true
middlewareHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
noversion	boolean	false	When true, ignore all version-related code paths on the Administration Server. Default value is: false
nowait	boolean	false	When true, initiates multiple tasks and then monitors them later with the -list action.
password	java.lang.String	false	Specifies the administrative password.
purgetasks	boolean	false	When true, eliminates retired deployment tasks.
remote	boolean	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the source parameter specifies a path on the server, unless the upload parameter is also used.
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of -1 means wait forever. Default value is: -1
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
verbose	boolean	false	When true, displays additional status information. Default value is: false
version	boolean	false	When true, prints the version information. Default value is: false
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.

Use the list-apps goal to list the deployment names.

```
<execution>
<id>wls-list-apps</id>
<phase>pre-integration-test</phase>
<goals>
<goal>list-apps</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
<user>weblogic</user>
<password>password</password>
</configuration>
</execution>
```

Example 3–8 shows typical `list-apps` goal output.

Example 3–8 list-apps

```
mvn com.oracle.weblogic:weblogic-maven-plugin:list-apps
-Duser=weblogic -Dpassword=password
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:list-apps (default-cli) @ weblogic-m
aven-plugin ---
weblogic.Deployer invoked with options:  -noexit -adminurl t3://localhost:7001 -
listapps -user weblogic
 SamplesSearchWebApp
 stockBackEnd
 ajaxJSF
 asyncServlet30
 singletonBean
 webFragment
 examplesWebApp
 mainWebApp
 annotation
 MySimpleEjb
 stockFrontEnd
 jsfBeanValidation
 programmaticSecurity
 entityBeanValidation
 faceletsJSF
 bookmarkingJSF
 stockAdapter
 noInterfaceViewInWAR
 jdbcDataSource.war
 asyncMethodOfEJB
 calendarStyledTimer
 cdi
 jaxrs
 criteriaQuery
 portableGlobalJNDIName
 multipartFileHandling
 elementCollection
Number of Applications Found : 27
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
```

```
[INFO] Total time: 8.656s
[INFO] Finished at: Fri May 03 11:33:51 EDT 2013
[INFO] Final Memory: 11M/28M
[INFO] ------------------------------------------------------------------------
C:\Oracle\Middleware\Oracle_Home\wlserver\server\lib>
```

3.3.8 redeploy

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:redeploy`

Description

Redeploys a running application or part of a running application. Does not require a local server installation.

Parameters

Table 3–11 redeploy Parameters

Name	Type	Required	Description
`adminurl`	`java.lang.String`	false	Specifies the listen address and listen port of the Administration Server. Default value is: `t3://localhost:7001`
`deleteFiles`	`java.lang.String`	false	Removes the files specified in this parameter while leaving the application activated. This parameter is valid only for unarchived deployments.
`examples`	`boolean`	false	When true, displays examples of how to use this plug-in.
`failOnError`	`boolean`	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: `true`
`id`	`java.lang.String`	false	Specifies an optional, user-supplied, unique deployment task identifier.
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`name`	`java.lang.String`	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
`password`	`java.lang.String`	false	Specifies the administrative password.
`plan`	`java.lang.String`	false	Specifies the path to the deployment plan.
`remote`	`boolean`	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the `source` parameter specifies a path on the server, unless the `upload` parameter is also used.
`retiretimeout`	`java.lang.Integer`	false	Specifies the number of seconds before WebLogic Server undeploys the currently running version of this application or module so that clients can start using a new version. When not specified, a graceful retirement policy is assumed. Default value is: `-1`

Table 3–11 (Cont.) redeploy Parameters

Name	Type	Required	Description
rmiGracePeriod	java.lang.Integer	false	Specifies the number of seconds in the grace period for RMI requests during graceful shutdown. Can be used only when the graceful parameter is true. The default value of -1 means no grace period. Default value is: -1
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
source	java.lang.String	false	Archive file or exploded archive directory to deploy. You can omit this option and supply only the file or directory to deploy.
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: submod@mod-jms.xml@target or submoduleName@target.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. The default target is AdminServer.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of -1 means wait forever. Default value is: -1
upload	boolean	false	When true, copies the specified source files to the Administration Server's upload directory prior to redeployment. Use this setting when running the plug-in remotely (using the remote parameter) and when the user lacks normal access to the Administration Server's file system. Default value is: false
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
verbose	boolean	false	When true, displays additional status information during the deployment process. Default value is: false
version	boolean	false	When true, prints the version information. Default value is: false
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.

Use the redeploy goal to redeploy an application or part of that application.

```
<execution>
<id>wls-redeploy</id>
<phase>pre-integration-test</phase>
<goals>
<goal>redeploy</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
```

```
<user>weblogic</user>
<password>password</password>
<source>${project.build.directory}/${project.build.finalName}.${project.packaging}
</sour
ce>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–9 shows typical `redeploy` goal output.

Example 3–9 redeploy

```
mvn com.oracle.weblogic:weblogic-maven-plugin:redeploy -Dsou
rce=C:\Oracle\Middleware\Oracle_Home\wlserver\server\lib\MySimpleEjb.jar  -Duser
=weblogic -Dpassword=password -Dname=ExampleEJB
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:redeploy (default-cli) @ weblogic-ma
ven-plugin ---
weblogic.Deployer invoked with options:  -noexit -adminurl t3://localhost:7001 -
redeploy -user weblogic -name ExampleEJB -source C:\Oracle\Middleware\Oracle_Hom
e\wlserver\server\lib\MySimpleEjb.jar -targets AdminServer
<May 3, 2013 12:38:02 PM EDT> <Info> <J2EE Deployment SPI> <BEA-260121> <Initiat
ing redeploy operation for application, ExampleEJB [archive: C:\Oracle\Middlewar
e\Oracle_Home\wlserver\server\lib\MySimpleEjb.jar], to AdminServer .>
Task 3 initiated: [Deployer:149026]deploy application ExampleEJB on AdminServer.

Task 3 completed: [Deployer:149026]deploy application ExampleEJB on AdminServer.

Target state: redeploy completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 6.322s
[INFO] Finished at: Fri May 03 12:38:02 EDT 2013
```

3.3.9 start-app

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:start-app`

Description

Starts an application deployed on WebLogic Server. Does not require a local server installation.

Parameters

Table 3–12 start-app Parameters

Name	Type	Required	Description
`adminmode`	`boolean`	false	When true, switches the application to administration mode so that it accepts only administration requests via a configured administration channel. When false, production mode is assumed. Default value is: `false`
`adminurl`	`java.lang.String`	false	Specifies the listen address and listen port of the Administration Server. Default value is: `t3://localhost:7001`
`advanced`	`boolean`	false	When true, prints advanced usage options.
`appversion`	`java.lang.String`	false	Specifies the version identifier of the application. When not specified, the currently active version of the application is assumed.
`debug`	`boolean`	false	When true, displays debug-level messages to the standard output. Default value is: `false`
`domainHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`examples`	`boolean`	false	When true, displays examples of how to use this plug-in.
`failOnError`	`boolean`	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: `true`
`id`	`java.lang.String`	false	Specifies an optional, user-supplied, unique deployment task identifier.
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`name`	`java.lang.String`	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
`noversion`	`boolean`	false	When true, ignores all version-related code paths on the Administration Server. Default value is: `false`
`nowait`	`boolean`	false	When true, initiates multiple tasks and then monitors them later with the `-list` action.
password	`java.lang.String`	false	Specifies the administrative password.
`planversion`	`java.lang.String`	false	Specifies the version of the deployment plan. When not specified, the currently active version of the application's deployment plan is assumed.
`purgetasks`	`boolean`	false	When true, eliminates retired deployment tasks. Default value is: `false`
`remote`	`boolean`	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the `source` parameter specifies a path on the server, unless the `upload` parameter is also used. Default value is: `false`

Table 3–12 (Cont.) start-app Parameters

Name	Type	Required	Description
`retiretimeout`	`java.lang.Integer`	false	Specifies the number of seconds before WebLogic Server undeploys the currently running version of this application or module so that clients can start using a new version. When not specified, a graceful retirement policy is assumed. Default value is: `-1`
`serverClasspath`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`submoduletargets`	`java.lang.String`	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: `submod@mod-jms.xml@target` or `submoduleName@target`.
`targets`	`java.lang.String`	false	Specifies a comma-separated list of targets for the current operation. When not specified, all configured targets are used. For a new application, the default target is the Administration Server.
`timeout`	`java.lang.Integer`	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of `-1` means wait forever. Default value is: `-1`
`user`	`java.lang.String`	false	Specifies the administrative user name.
`userConfigFile`	`java.lang.String`	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
`userKeyFile`	`java.lang.String`	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
`verbose`	`boolean`	false	When true, displays additional status information during the deployment process. Default value is: `false`
`version`	`boolean`	false	When true, prints the version information. Default value is: `false`
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Use the start-app goal to starts an application.

```
<execution>
<id>wls-start-app</id>
<phase>pre-integration-test</phase>
<goals>
<goal>start-app</goal>
</goals>
<configuration>
<adminurl>t3://localhost:7001</adminurl>
<user>weblogic</user>
<password>password</password>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–10 shows typical `start-app` goal output.

Example 3–10 start-app

```
mvn com.oracle.weblogic:weblogic-maven-plugin:start-app
-Duser=weblogic -Dpassword=password -Dname=ExampleEJB
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:start-app (default-cli) @ weblogic-m
aven-plugin ---
weblogic.Deployer invoked with options:  -noexit -adminurl t3://localhost:7001 -
start -user weblogic -name ExampleEJB -retiretimeout -1
<May 3, 2013 12:44:15 PM EDT> <Info> <J2EE Deployment SPI> <BEA-260121> <Initiat
ing start operation for application, ExampleEJB [archive: null], to configured t
argets.>
Task 5 initiated: [Deployer:149026]start application ExampleEJB on AdminServer.
Task 5 completed: [Deployer:149026]start application ExampleEJB on AdminServer.
Target state: start completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 6.053s
[INFO] Finished at: Fri May 03 12:44:16 EDT 2013
[INFO] Final Memory: 10M/26M
[INFO] ------------------------------------------------------------------------
```

3.3.10 start-server

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:start-server`

Description

Starts WebLogic Server from a script in the current working directory.

Parameters

Table 3–13 start-server Parameters

Name	Type	Required	Description
`command`	`java.lang.String[]`	false	Specifies the script to start WebLogic Server. If this parameter is not specified, it will default to either `startWebLogic.sh` or `startWebLogic.cmd`, based on the platform.
`domainHome`	`java.lang.String`	false	Specifies the path to the WebLogic Server domain. Default value is: `${basedir}/Oracle/Domains/mydomain`
`httpPingUrl`	`java.lang.String`	false	Specifies the URL that, when pinged, will verify that the server is running.
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Table 3–13 (Cont.) start-server Parameters

Name	Type	Required	Description
`serverClasspath`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`timeoutSecs`	`java.lang.Integer`	false	Specifies in seconds, the timeout for the script. Valid when the `waitForExit` parameter is `true`. A zero (`0`) or negative value indicates that the script will not timeout. Default value is: `-1`
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Usage Example

The `start-server` goal executes a `startWebLogic` command on a given domain, starting the WebLogic Server instance.

```
<execution>
<id>wls-wlst-start-server</id>
<phase>pre-integration-test</phase>
<goals>
<goal>start-server</goal>
</goals>
<configuration>
<domainHome>${project.build.directory}/base_domain</domainHome>
</configuration>
</execution>
```

Example 3–11 shows typical `start-server` goal output.

Example 3–11 start-server

```
mvn com.oracle.weblogic:weblogic-maven-plugin:start-server
-DdomainHome=c:\oracle\middleware\oracle_home\user_projects\domains\wl_server
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:start-server (default-cli)
@ weblogi
c-maven-plugin ---
.[INFO] Starting server in domain:
c:\oracle\middleware\oracle_home\user_project
s\domains\wl_server
[INFO] Check stdout file for details:
c:\oracle\middleware\oracle_home\user_proj
ects\domains\wl_server\server-2183114106972126386.out
[INFO] Process being executed, waiting for completion.
.............
[INFO] Server started successful
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 37.725s
[INFO] Finished at: Wed May 01 14:25:45 EDT 2013
[INFO] Final Memory: 8M/23M
```

3.3.11 stop-app

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:stop-app`

Description

Stops an application.   Does not require a local server installation.

Parameters

Table 3–14 stop-app Parameters

Name	Type	Required	Description
`adminmode`	`boolean`	false	When true, switches the application to administration mode so that it accepts only administration requests via a configured administration channel. When false, production mode is assumed. Default value is: `false`
`adminurl`	`java.lang.String`	false	Specifies the listen address and listen port of the Administration Server. Default value is: `t3://localhost:7001`
`advanced`	`boolean`	false	When true, prints advanced usage options.
`appversion`	`java.lang.String`	false	Specifies the version identifier of the application. When not specified, the currently active version of the application is assumed.
`debug`	`boolean`	false	When true, displays debug-level messages to the standard output. Default value is: `false`
`domainHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`examples`	`boolean`	false	When true, displays examples of how to use this plug-in.
`failOnError`	`boolean`	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: `true`
`graceful`	`boolean`	false	When true, stops the application after existing `HTTP` clients have completed their work. When not specified, force shutdown is assumed.
`id`	`java.lang.String`	false	Specifies an optional, user-supplied, unique deployment task identifier.
`ignoresessions`	`boolean`	false	When true, ignores pending `HTTP` sessions during graceful shutdown. Can be used only when the `graceful` parameter is `true`. Default value is: `false`
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`name`	`java.lang.String`	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
`noversion`	`boolean`	false	When true, ignores all version-related code paths on the Administration Server. Default value is: `false`
`nowait`	`boolean`	false	When true, initiates multiple tasks and then monitors them later with the `-list` action.

Table 3–14 (Cont.) stop-app Parameters

Name	Type	Required	Description
password	java.lang.String	false	Specifies the administrative password.
planversion	java.lang.String	false	Specifies the version of the deployment plan. When not specified, the currently active version of the application's deployment plan is assumed.
purgetasks	boolean	false	When true, eliminates retired deployment tasks.
remote	boolean	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the `source` parameter specifies a path on the server, unless the `upload` parameter is also used. Default value is: `false`
rmiGracePeriod	java.lang.Integer	false	Specifies the number of seconds in the grace period for RMI requests during graceful shutdown. Can be used only when the `graceful` parameter is `true`. The default value of `-1` means no grace period. Default value is: `-1`
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: `submod@mod-jms.xml@target` or `submoduleName@target`.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. When not specified, all configured targets are used. For a new application, the default target is the Administration Server.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of `-1` means wait forever. Default value is: `-1`
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
verbose	boolean	false	When true, displays additional status information. Default value is: `false`
version	boolean	false	When true, prints the version information. Default value is: `false`
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.

Use the stop-app goal to stop an application.

```
<execution>
<id>wls-start-app</id>
<phase>pre-integration-test</phase>
<goals>
```

```
<goal>start-app</goal>
</goals>
<configuration>
<adminurl>t3://localhost:7001</adminurl>
<user>weblogic</user>
<password>password</password>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–12 shows typical `stop-app` goal output.

Example 3–12 stop-app

```
mvn com.oracle.weblogic:weblogic-maven-plugin:stop-app  -Dus
er=weblogic -Dpassword=password -Dname=ExampleEJB
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:stop-app (default-cli)
@ weblogic-ma
ven-plugin ---
weblogic.Deployer invoked with options:  -noexit
-adminurl t3://localhost:7001 -
stop -user weblogic -name ExampleEJB
<May 3, 2013 12:46:27 PM EDT> <Info>
<J2EE Deployment SPI> <BEA-260121> <Initiat
ing stop operation for application, ExampleEJB [archive: null],
to configured ta
rgets.>
Task 6 initiated: [Deployer:149026]stop application ExampleEJB on
AdminServer.
Task 6 completed: [Deployer:149026]stop application ExampleEJB on
AdminServer.
Target state: stop completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 6.028s
[INFO] Finished at: Fri May 03 12:46:27 EDT 2013
[INFO] Final Memory: 10M/29M
[INFO] ------------------------------------------------------------------------
C:\Oracle\Middleware\Oracle_Home\wlserver\server\lib>
```

3.3.12 stop-server

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:stop-server`

Description

Stops WebLogic Server from a script in the current working directory.

Parameters

Table 3–15 stop-server Parameters

Name	Type	Required	Description
adminurl	java.lang.String	false	Specifies the listen address and listen port of the Administration Server. Default value is: t3://localhost:7001
command	java.lang.String[]	false	Specifies the script to stop WebLogic Server. This will default to stopWebLogic.sh or stopWebLogic.cmd, based on the platform.
domainHome	java.lang.String	false	Specifies the path to the WebLogic Server domain. Default value is: ${basedir}/Oracle/Domains/mydomain
middlewareHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
outputLog	java.lang.String	false	Specifies the log file to which the script output will be redirected. When not specified, it defaults to stdout.
password	java.lang.String	**true**	Specifies the administrative password.
timeoutSecs	java.lang.Integer	false	Specifies, in seconds, the timeout for the script. This is valid when the waitForExit parameter is true. A zero (0) or negative value indicates that the script will not timeout. Default value is: -1
user	java.lang.String	**true**	Specifies the administrative user name.
waitForExit	boolean	false	When true, the plug-in should wait for the script to complete. Default value is: true
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
workingDir	java.lang.String	false	Specifies the working directory for the script. If you do not specify this attribute, it defaults to the current working directory. Default value is: ${project.base.directory}

Usage Example

The stop-server goal stops a server instance using the stopWebLogic script in the specified domain.

```
<execution>
<id>wls-wlst-stop-server</id>
<phase>post-integration-test</phase>
<goals>
<goal>stop-server</goal>
</goals>
<configuration>
<domainHome>${project.build.directory}/base_domain</domainHome>
<user>weblogic</user>
<password>password</password>
<adminurl>t3://localhost:7001</adminurl>
</configuration>
</execution>
```

Example 3–13 shows typical stop-server goal output.

Example 3–13 stop-server

```
mvn com.oracle.weblogic:weblogic-maven-plugin:stop-server
 -DdomainHome=c:\oracle\middleware\oracle_home\userprojects\domains\wl_server
-DworkingDir=c:\oracle\middleware\oracle_home\user_projects\domains\wl_server
-Duser=weblogic -Dpassword=password
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:stop-server (default-cli)
@ weblogic
-maven-plugin ---
[INFO] Stop server in domain:
c:\oracle\middleware\oracle_home\user_projects\dom
ains\wl_server
[INFO] Process being executed, waiting for completion.
[INFO] [exec] Stopping Weblogic Server...
[INFO] [exec]
[INFO] [exec] Initializing WebLogic Scripting Tool (WLST) ...
[INFO] [exec]
[INFO] [exec] Welcome to WebLogic Server Administration Scripting Shell
[INFO] [exec]
[INFO] [exec] Type help() for help on available commands
[INFO] [exec]
[INFO] [exec] Connecting to t3://localhost:7001 with userid weblogic ...
[INFO] [exec] Successfully connected to Admin Server "AdminServer" that belongs
to domain "wl_server".
[INFO] [exec]
[INFO] [exec] Warning: An insecure protocol was used to connect to the
[INFO] [exec] server. To ensure on-the-wire security, the SSL port or
[INFO] [exec] Admin port should be used instead.
[INFO] [exec]
[INFO] [exec] Shutting down the server AdminServer with force=false while connec
ted to AdminServer ...
[INFO] [exec] WLST lost connection to the WebLogic Server that you were
[INFO] [exec] connected to, this may happen if the server was shutdown or
[INFO] [exec] partitioned. You will have to re-connect to the server once the
[INFO] [exec] server is available.
[INFO] [exec] Disconnected from weblogic server: AdminServer
[INFO] [exec] Disconnected from weblogic server:
[INFO] [exec]
[INFO] [exec]
[INFO] [exec] Exiting WebLogic Scripting Tool.
[INFO] [exec]
[INFO] [exec] Done
[INFO] [exec] Stopping Derby Server...
[INFO] [exec] Derby server stopped.
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 23.270s
[INFO] Finished at: Wed May 01 14:33:47 EDT 2013
[INFO] Final Memory: 9M/23M
[INFO] ------------------------------------------------------------------------
```

3.3.13 undeploy

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:undeploy`

Description

Undeploys the application from WebLogic Server. Stops the deployment unit and removes staged files from target servers. Does not require a local server installation.

Parameters

Table 3–16 undeploy Parameters

Name	Type	Required	Description
adminurl	java.lang.String	false	Specifies the listen address and listen port of the Administration Server. Default value is: t3://localhost:7001
advanced	boolean	false	When true, prints advanced usage options.
appversion	java.lang.String	false	Specifies the version identifier of the application. When not specified, the currently active version of the application is assumed.
debug	boolean	false	When true, displays debug-level messages to the standard output. Default value is: false
examples	boolean	false	When true, displays examples of how to use this plug-in.
failOnError	boolean	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: true
graceful	boolean	false	When true, stops the application after existing HTTP clients have completed their work. When not specified, forced shutdown is assumed.
id	java.lang.String	false	Specifies an optional, user-supplied, unique deployment task identifier.
ignoresessions	boolean	false	When true, ignores pending HTTP sessions during graceful shutdown. Can be used only when the graceful parameter is true. Default value is: false
middlewareHome	java.lang.String	false	This parameter is deprecated in this release and ignored.
name	java.lang.String	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
noversion	boolean	false	When true, ignores all version-related code paths on the Administration Server. Default value is: false
nowait	boolean	false	When true, initiates multiple tasks and then monitors them later with the -list action.
password	java.lang.String	false	Specifies the administrative password.
planversion	java.lang.String	false	Specifies the version of the deployment plan. When not specified, the currently active version of the application's deployment plan is assumed.

Table 3–16 (Cont.) undeploy Parameters

Name	Type	Required	Description
purgetasks	boolean	false	When true, eliminates retired deployment tasks.
remote	boolean	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the source parameter specifies a path on the server, unless the upload parameter is also used. Default value is: false
rmiGracePeriod	java.lang.Integer	false	Specifies the number of seconds in the grace period for RMI requests during graceful shutdown. Can be used only when the graceful parameter is true. The default value of -1 means no grace period. Default value is: -1
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: submod@mod-jms.xml@target or submoduleName@target.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. When not specified, all configured targets are used. For a new application, the default target is the Administration Server.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of -1 means wait forever. Default value is: -1
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
verbose	boolean	false	When true, displays additional status information during the deployment process. Default value is: false
version	boolean	false	When true, prints the version information. Default value is: false
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.

Use the undeploy goal to undeploy an application from WebLogic Server.

```
<execution>
<id>wls-undeploy</id>
<phase>post-integration-test</phase>
<goals>
<goal>undeploy</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
<user>weblogic</user>
```

```
<password>password</password>
<name>${project.build.finalName}</name>
</configuration>
</execution>
```

Example 3–14 shows typical `undeploy` goal output.

Example 3–14   undeploy

```
mvn com.oracle.weblogic:weblogic-maven-plugin:undeploy
-Duser=weblogic -Dpassword=password -Dname=ExampleEJB
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:undeploy (default-cli)
@ weblogic-ma
ven-plugin ---
weblogic.Deployer invoked with options:  -noexit
-adminurl t3://localhost:7001 -
undeploy -user weblogic -name ExampleEJB -targets AdminServer
<May 3, 2013 12:48:15 PM EDT> <Info> <J2EE Deployment SPI>
<BEA-260121> <Initiat
ing undeploy operation for application, ExampleEJB [archive: null],
to AdminServ
er .>
Task 7 initiated: [Deployer:149026]remove application ExampleEJB
on AdminServer.

Task 7 completed: [Deployer:149026]remove application ExampleEJB
on AdminServer.

Target state: undeploy completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 6.114s
[INFO] Finished at: Fri May 03 12:48:15 EDT 2013
[INFO] Final Memory: 9M/26M
[INFO] ------------------------------------------------------------------------
```

3.3.14 uninstall

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:uninstall`

Description

Uninstalls WebLogic Server using the Zip installer. This goal requires a Zip installer-installed WebLogic Server installation

Parameters

Table 3–17 uninstall Parameters

Name	Type	Required	Description
`middlewareHome`	`java.lang.String`	true	The Oracle Middleware installation directory.

Use the uninstall goal to uninstall WebLogic Server.

```
<execution>
<id>wls-uninstall-server</id>
<phase>post-integration-test</phase>
<goals>
<goal>uninstall</goal>
</goals>
<configuration>
<middlewareHome>c:/dev/wls12120</middlewareHome>
</configuration>
</execution>
```

Example 3–15 shows typical `uninstall` goal output.

Example 3–15 uninstall

```
mvn com.oracle.weblogic:weblogic-maven-plugin:uninstall
-DmiddlewareHome=C:\Oracle\Middleware\Oracle_Home
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building WebLogic Server Maven Plugin 12.1.2.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:uninstall
(default-cli) @ weblogic-m
aven-plugin ---
[INFO] Attempting to uninstall from :
C:\Oracle\Middleware\Oracle_Home
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 27.886s
```

3.3.15 update-app

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:update-app`

Description

Updates an application's deployment plan by redistributing the plan files and reconfiguring the application based on the new plan contexts. Does not require a local server installation.

Parameters

Table 3–18 update-app Parameters

Name	Type	Required	Description
`adminurl`	`java.lang.String`	false	Specifies the listen address and listen port of the Administration Server. Default value is: `t3://localhost:7001`
`advanced`	`boolean`	false	When true, prints advanced usage options.
`appversion`	`java.lang.String`	false	Specifies the version identifier of the application. When not specified, the currently active version of the application is assumed.
`debug`	`boolean`	false	When true, displays debug-level messages to the standard output. Default value is: `false`
`domainHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`examples`	`boolean`	false	When true, displays examples of how to use this plug-in.
`failOnError`	`boolean`	false	When true, forces the Mojo to fail the build upon encountering an error if it would otherwise just log the error. Default value is: `true`
`id`	`java.lang.String`	false	Specifies an optional, user-supplied, unique deployment task identifier.
`middlewareHome`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.
`name`	`java.lang.String`	false	Specifies the deployment name to assign to a newly-deployed application or standalone module.
`noversion`	`boolean`	false	When true, ignores all version-related code paths on the Administration Server. Default value is: `false`
`nowait`	`boolean`	false	When true, initiates multiple tasks and then monitors them later with the `-list` action.
`password`	`java.lang.String`	false	Specifies the administrative password.
`plan`	`java.lang.String`	false	Specifies the location of the deployment plan.
`planversion`	`java.lang.String`	false	Specifies the version of the deployment plan. When not specified, the currently active version of the application's deployment plan is assumed.
`purgetasks`	`boolean`	false	When true, eliminates retired deployment tasks. Default value is: `false`
`remote`	`boolean`	false	When true, specifies that the plug-in is not running on the same machine as the Administration Server. In this case, the `source` parameter specifies a path on the server, unless the `upload` parameter is also used. Default value is: `false`
`rmiGracePeriod`	`java.lang.Integer`	false	Specifies the number of seconds in the grace period for RMI requests during graceful shutdown. Can be used only when the `graceful` parameter is `true`. The default value of `-1` means no grace period. Default value is: `-1`
`serverClasspath`	`java.lang.String`	false	This parameter is deprecated in this release and ignored.

Table 3–18 (Cont.) update-app Parameters

Name	Type	Required	Description
submoduletargets	java.lang.String	false	Specifies JMS Server targets for resources defined within a JMS application module. Possible values have the form: submod@mod-jms.xml@target or submoduleName@target.
targets	java.lang.String	false	Specifies a comma-separated list of targets for the current operation. When not specified, all configured targets are used. For a new application, the default target is the Administration Server.
timeout	java.lang.Integer	false	Specifies the maximum number of seconds WebLogic Server will wait for the deployment task to complete. The default value of -1 means wait forever. Default value is: -1
upload	boolean	false	When true, copies the source files to the Administration Server's upload directory prior to deployment. Use this setting when running the plug-in remotely (using the remote parameter) and when the user lacks normal access to the Administration Server's file system. Default value is: false
user	java.lang.String	false	Specifies the administrative user name.
userConfigFile	java.lang.String	false	Specifies the location of a user configuration file to use for the administrative user name and password instead of specifying the user name and password directly in plain text.
userKeyFile	java.lang.String	false	Specifies the location of a user key file to use for encrypting and decrypting the user name and password stored in the user configuration file.
verbose	boolean	false	When true, displays additional status information. Default value is: false
version	boolean	false	When true, prints the version information. Default value is: false
weblogicHome	java.lang.String	false	This parameter is deprecated in this release and ignored.

Use the update-app goal to update an application's deployment plan.

```
<execution>
<id>wls-update-app</id>
<phase>pre-integration-test</phase>
<goals>
<goal>update-app</goal>
</goals>
<configuration>
<adminurl>t3://127.0.0.1:7001</adminurl>
<user>weblogic</user>
<password>password</password>
<name>${project.build.finalName}</name>
<plan>${basedir}/misc/myplan.xml</plan>
</configuration>
</execution>
```

Example 3–16 shows typical wlst goal output.

Example 3–16 update-app

```
$ mvn com.oracle.weblogic:weblogic-maven-plugin:update-app -Duser=weblogic
 -Dpassword=password -Dadminurl=t3://localhost:7001 -Dplan=misc/myplan.xml
 -Dname=basicWebapp
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building basicWebapp 1.0-SNAPSHOT
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:update-app (default-cli)
@ main-test ---
weblogic.Deployer invoked with options: -noexit -adminurl
t3://localhost:7001 -update -user weblogic -plan
 /home/oracle/src/tests/main-test/misc/myplan.xml -name basicWebapp -targets
AdminServer
<May 15, 2013 2:30:34 PM EST> <Info> <J2EE Deployment SPI> <BEA-260121>
 <Initiating update operation for application, basicWebapp [archive: null],
 to AdminServer .>
Task 10 initiated: [Deployer:149026]update application basicWebapp on
 AdminServer.
Task 10 completed: [Deployer:149026]update application basicWebapp on
 AdminServer.
Target state: update completed on Server AdminServer

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 10.651s
[INFO] Finished at: Wed May 15 14:30:34 EST 2013
[INFO] Final Memory: 18M/435M
[INFO] ------------------------------------------------------------------------
```

3.3.16 wlst

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:wlst`

Description

WLST wrapper for Maven.

Parameters

Table 3–19 wlst Parameters

Name	Type	Required	Description
`args`	`java.lang.String`	false	Specifies a string value containing command-line arguments to pass to the WLST Python interpreter. The arguments are delimited by spaces. An argument that contains embedded spaces should be quoted either with single quotes or with escaped double quotes. For example, here is a string for args that contains two parameters: `"'Thomas Paine' \"Now is the time that tries men's souls.\""`
`debug`	`boolean`	false	When true, displays additional status information. Default value is: `false`
`executeScriptBeforeFile`	`boolean`	false	When true, specifies whether a script, if supplied, executes before or after the file, if supplied. Either a file or a script is required, and both are allowed. See `filename` and `script` parameters. Default value is: `true`
`failOnError`	`boolean`	false	When true, the Maven build fails if the `wlst` goal fails. The default value is `true`, and consequently any error condition will cause the build to fail. In some cases, setting `failOnError` to `false` will allow the `wlst` goal to ignore the error. Default value is: `true`
`fileName`	`java.lang.String`	false	Specifies the file path of the WLST Python script to execute. Either a `fileName` or a `script` parameter must be specified, and both are allowed.
`middlewareHome`	`java.lang.String`	true	The path to the Oracle Middleware install directory.
`propertiesFile`	`java.lang.String`	false	Specifies the path to a Java properties file. The property names become defined variables in the WLST Python interpreter and are initialized to the values supplied. For example, if the properties file contains the line `"foobar: Very important stuff"`, the variable `foobar` can be used in a Python statement in the following manner: `"print('foobar has the value: ' + foobar)"`.
`script`	`java.lang.String`	false	Specifies an inline WLST Python script, for example, `"print('Hello, world!')"`.
`serverClasspath`	`java.lang.String`	false	This parameter is deprecated and ignored in this release.
`weblogicHome`	`java.lang.String`	false	This parameter is deprecated and ignored in this release.
`wlstVersion`	`java.lang.String`	false	Specifies whether to run the wlst.sh script from `${middlewareHome}/wlserver/common/bin` or `${middlewareHome}/oracle_common/common/bin`. Allowable values are `wls` and `oracle_common`. The default is `wls`.

Usage Example

The `wlst` goal enables the WebLogic Scripting Tool (WLST) to be used to execute scripts that configure resources or perform other operations on a WebLogic Server domain. The `wlst` Maven goal uses the WebLogic Server WLST standard environment so you can use it with all your existing WLST scripts.

You can use the `wlst` goal to execute an external WLST script specified with the `fileName` configuration parameter or you can specify a sequence of WLST commands within the `pom.xml` file using the `script` configuration element.

```
<execution>
<id>wls-wlst-server</id>
<phase>post-integration-test</phase>
<goals>
<goal>wlst</goal>
</goals>
<configuration>
<middlewareHome>c:/dev/wls12120</middlewareHome>
<fileName>${project.basedir}/misc/configure_resources.py</fileName>
<args>t3://localhost:7001 weblogic password AdminServer</args>
<script>
print('This is a WLST inline script\n')
print('Next, we run a WLST script to create JMS resources on the server\n')
</script>
<executeScriptBeforeFile>true</executeScriptBeforeFile>
</configuration>
</execution>
```

Example 3–17 shows typical `wlst` goal output.

Example 3–17 wlst

```
mvn com.oracle.weblogic:weblogic-maven-plugin:wlst
 -DfileName=create-datasource.py

[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building maven-demo 1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:wlst (default-cli) @ maven-demo ---
[INFO] ++====================================================================++
[INFO] ++  weblogic-maven-plugin: wlst
++
[INFO] ++====================================================================++

*** Creating DataSource ***

Connecting to t3://localhost:7001 with userid weblogic ...
Successfully connected to Admin Server 'AdminServer' that belongs to domain
'mydomain'.

Warning: An insecure protocol was used to connect to the
server. To ensure on-the-wire security, the SSL port or
Admin port should be used instead.

Location changed to edit tree. This is a writable tree with
DomainMBean as the root. To make changes you will need to start
an edit session via startEdit().

For more help, use help(edit)

Starting an edit session ...
```

```
Started edit session, please be sure to save and activate your
changes once you are done.
Activating all your changes, this may take a while ...
The edit lock associated with this edit session is released
once the activation is completed.
Activation completed
Location changed to serverRuntime tree. This is a read-only tree with
ServerRuntimeMBean as the root.
For more help, use help(serverRuntime)

**** DataSource Details ****

Name: cp
Driver Name: Oracle JDBC driver
DataSource: oracle.jdbc.xa.client.OracleXADataSource
Properties: {user=demo}
State: Running

[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
```

By default, the `wlst` goal is bound to the pre-integration-test phase. To override the default phase binding for a goal, you can explicitly bind plug-in goals to a particular life cycle phase, for example, to the post-integration-test phase, as shown below. The `pom.xml` file binds the `wlst` goal to both the pre- and post-integration-test phases (a dual phase target). As shown, you can run different scripts in different phases, overriding the default settings, and make modifications according to your needs.

Example `pom.xml` file

```
<project>
  ....
 <executions>
   <execution>
     <id>WLS_SETUP_RESOURCES</id>
     <phase>pre-integration-test</phase>
     <goals>
       <goal>wlst</goal>
     </goals>
     <configuration>
       <fileName>src/main/wlst/create-datasource.py</fileName>
     </configuration>
   </execution>

   <execution>
     <id>WLS_TEARDOWN_RESOURCES</id>
     <phase>post-integration-test</phase>
     <goals>
       <goal>wlst</goal>
     </goals>
     <configuration>
       <fileName>src/main/wlst/remove-datasource.py</fileName>
     </configuration>
   </execution>
 </executions>
 ....
 </project>
```

3.3.17 ws-clientgen

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:ws-clientgen`

Description

Maven goal to generate JAX-WS client Web service artifacts from a WSDL.

The `ws-clientgen` goal provides a Maven wrapper for the "clientgen" Ant task, which is described in *WebLogic Web Services Reference for Oracle WebLogic Server*.

> **Note:** The `ws-clientgen` goal does not work with the JAX-RPC-only JWS annotations described in "WebLogic-Specific Annotations."

Parameters

Table 3–20 briefly describes the `ws-clientgen` parameters. These parameters are more fully described in Table 2-3 "WebLogic-specific Attributes of the clientgen Ant Task" in *WebLogic Web Services Reference for Oracle WebLogic Server*.

Table 3–20 ws-clientgen Parameters

Name	Type	Required	Description
binding bindings	`java.lang.String`	false	Specifies one or more customization files that specify JAX-WS and JAXB custom binding declarations or SOAP handler files. If there is only one binding element, both `<binding>./filename</binding>` and `<bindings><binding>./filename</binding></bindings>` are allowed. See Table 3–21 for a description of `bindings` parameters.
`catalog`	`java.lang.String`	false	Specifies an external XML catalog file to resolve external entity references. For more information about creating XML catalog files, see "Using XML Catalogs" in *Developing JAX-WS Web Services for Oracle WebLogic Server*
`copyWsdl`	boolean	false	Controls where the WSDL should be copied in the ws-clientgen goal 's destination dir.
`debug`	boolean	false	Turns on additional debug output.
`debugLevel`	boolean	false	Uses Ant debug levels.
`destDir`	`java.lang.String`	true	Specifies the directory into which the ws-clientgen goal generates the client source code, WSDL, and client deployment descriptor files. You must specify either the `destFile` or `destDir` attribute, but not both.
`failOnError`	boolean	false	Specifies whether the ws-clientgen goal continues executing in the event of an error. The default value is True.
`fork`	boolean	false	Specifies whether to execute javac using the JDK compiler externally. The default value is false.
`genRuntimeCatalog`	boolean	false	Specifies whether the ws-clientgen goal should generate the XML catalog artifacts in the client runtime environment. This value defaults to true.

Table 3–20 (Cont.) ws-clientgen Parameters

Name	Type	Required	Description
includeAntRuntime	boolean	false	Specifies whether to include the Ant run-time libraries in the classpath.
includeJavaRuntime	boolean	false	Specifies whether to include the default run-time libraries from the executing VM in the classpath.
jmstransportclient	JMSTransport Client	false	Invoking a WebLogic Web service using JMS transport. Table 3–23 describes the parameters of the jmstransportclient parameter.
packageName	java.lang. String	false	Specifies the package name into which the generated client interfaces and stub files are packaged.
produce produces	FileSet List<FileSet>	false	There is only one FileSet. There is more than one FileSet.
verbose	boolean	false	Turns on verbose output
wsdl	java.lang. String	true	Specifies a full path name or URL of the WSDL that describes a Web service (either WebLogic or non-WebLogic) for which the client component files should be generated.
wsdlLocation	java.lang. String	false	Controls the value of the wsdlLocation attribute generated on the WebService or WebServiceProvider annotation.
xauthfile	java.lang. String	false	Specifies the authorization file.
xmlCatalog	java.lang. String	false	Not used.

Table 3–21 describes the parameters of the bindings parameter.

Table 3–21 Binding Parameters

Name	Type	Required	Description
file	java.lang. String	false	Specifies a customization file that contains JAX-WS and JAXB custom binding declarations or SOAP handler files.

Table 3–22 describes the parameters of the xmlCatalog parameter.

Table 3–22 xmlCatalog Parameters

Name	Type	Required	Description
refid	java.lang. String	false	Specifies the directories (separated by semi-colons) that the ws-jwsc goal should search for JWS files to compile.

Table 3–23 describes the parameters of the jmstransportclient parameter.

Table 3–23 jmstransportclient Parameters

Name	Type	Required	Description
destinationName	java.lang. String	false	JNDI name of the destination queue or topic. Default value is com.oracle.webservices.jms.RequestQueue.
destinationType	java.lang. String	false	Valid values include: QUEUE or TOPIC. Default value is QUEUE.
replyToName	java.lang. String	false	JNDI name of the JMS destination to which the response message is sent.

Table 3–23 (Cont.) jmstransportclient Parameters

Name	Type	Required	Description
`targetService`	`java.lang.String`	false	Port component name of the Web service.
`jndiInitialContextFactory`	`java.lang.String`	false	Name of the initial context factory class used for JNDI lookup. Default value is `weblogic.jndi.WLInitialContextFactory`.
`jndiConnectionFactoryName`	`java.lang.String`		JNDI name of the connection factory that is used to establish a JMS connection. Default value is `com.oracle.webservices.jms.ConnectionFactory`.
`jndiUrl`	`java.lang.String`		JNDI provider URL. Default value is `t3://localhost:7001`.
`deliveryMode`	`java.lang.String`		Delivery mode indicating whether the request message is persistent. Valid values are PERSISTENT and NON_PERSISTENT. Default value is PERSISTENT.
`timeToLive`	long	false	Lifetime, in milliseconds, of the request message. Default value is 180000L.
`priority`	int	false	JMS priority associated with the request and response message. Default value is 0.
`jndiContextParameter`	`java.lang.String`	false	JNDI properties, in a format like: someParameterName1=someValue1 , someParameterName2=someValue2.
`bindingVersion`	`java.lang.String`	false	Version of the SOAP JMS binding. Default value is 1.0.
`runAsPrincipal`	`java.lang.String`	false	Principal used to run the listening MDB.
`runAsRole`	`java.lang.String`	false	Role used to run the listening MDB.
`messageType`	`java.lang.String`	false	Message type to use with the request message. Valid values are `com.oracle.webservices.api.jms.JMSMessageType.BYTES` and `com.oracle.webservices.api.jms.JMSMessageType.TEXT`. Default value is BYTES.
`enableHttpWsdlAccess`	boolean	false	Boolean flag that specifies whether to publish the WSDL through HTTP. Default value is true.
`mdbPerDestination`	boolean	false	Boolean flag that specifies whether to create one listening message-driven bean (MDB) for each requested destination. Default value is true.
`activationConfig`	`java.lang.String`	false	Activation configuration properties passed to the JMS provider.
`contextPath`	`java.lang.String`	false	The deployed context of the web service.
`serviceUri`	`java.lang.String`	false	Web service URI portion of the URL.
`portName`	`java.lang.String`	false	The name of the port in the generated WSDL.

Usage Example

The `ws-clientgen` goal generates client Web service artifacts from a WSDL.

This goal benefits from the convention-over-configuration approach, allowing you to execute it using the defaults of the project.

There are two ways to run the ws-clientgen goal:

- From the command line. For example, after you define an alias:

  ```
  mvn -DvariableName1=value1  -DvariableName2=value2
  com.oracle.weblogic:weblogic-maven-plugin:ws-clientgen
  ```

- By specifying the Maven `generate-resources` life cycle phase. Then run `mvn generate-resources` in the same directory of pom.xml.

  To do this, modify the `pom.xml` file to specify the `generate-resources` life cycle phase, the `ws-clientgen` goal, and include any parameters you need to set. Consider the following example:

  ```
  <?xml version="1.0" encoding="UTF-8" standalone="no"?>
  <project>
    <modelVersion>4.0.0</modelVersion>
    <groupId>maven_plugin.simple</groupId>
    <artifactId>maven_plugin_simple</artifactId>
    <version>1.0</version>
    <build>
      <plugins>
        <plugin>
          <groupId>com.oracle.weblogic</groupId>
          <artifactId>weblogic-maven-plugin</artifactId>
          <version>12.1.2-0-0</version>
          <executions>
            <execution>
              <id>clientgen</id>
              <phase>generate-resources</phase>
              <goals>
                <goal>ws-clientgen</goal>
              </goals>
              <configuration>
               <wsdl>${basedir}/AddNumbers.wsdl</wsdl>
                <dest${project.build.outputDirectory}</destDir>
                <packageName>maven_plugin.simple.client</packageName>
              </configuration>
            </execution>
          </executions>
        </plugin>
      </plugins>
    </build>
  </project>
  ```

Example 3–18 shows typical `ws-clientgen` goal output.

Example 3–18   ws-clientgen

```
mvn -f C:\maven-doc\jwsc-test-2\clientgen_pom.xml generate-resources
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building maven_plugin_simple 1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:ws-clientgen (clientgen) @ maven_
plugin_sim
ple ---
[INFO] Executing standalone...
```

```
[INFO] Executing Maven goal 'clientgen'...
calling method public static void weblogic.wsee.tools.clientgen.MavenClientGen.e
xecute(org.apache.maven.plugin.logging.Log,java.util.Map) throws java.lang.Throw
able
[INFO] Consider using <depends>/<produces> so that wsimport won't do unnecessary
 compilation
[WARNING] parsing WSDL...
[WARNING]
[WARNING]
[WARNING]
[WARNING] Generating code...
[WARNING]
[WARNING]
[WARNING] Compiling code...
[WARNING]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
```

3.3.18 ws-wsdlc

Full Name

com.oracle.weblogic:weblogic-maven-plugin:ws-wsdlc

Description

Maven goal to generate a set of artifacts and a partial Java implementation of the Web service from a WSDL.

The ws-wsdlc goal provides a Maven wrapper for the "wsdlc" Ant task, which is described in *WebLogic Web Services Reference for Oracle WebLogic Server*.

Parameters

Table 3–24 briefly describes the ws-wsdlc parameters. These parameters are more fully described in Table 2-3 "WebLogic-specific Attributes of the clientgen Ant Task" in *WebLogic Web Services Reference for Oracle WebLogic Server*.

Table 3–24 ws-wsdlc Parameters

Name	Type	Required	Description
catalog	java.lang.String	false	Specifies an external XML catalog file. For more information about creating XML catalog files, see "Using XML Catalogs" in *Developing JAX-WS Web Services for Oracle WebLogic Server*
debug	boolean	false	Specifies the flag to set when debugging the process. Default value is false.
debugLevel	java.lang.String	false	Uses Ant debug levels.
destImplDir	java.lang.String	false	Specifies the directory into which the stubbed-out JWS implementation file is generated.
destJavadocDir	java.lang.String	false	Specifies the directory into which the Javadoc that describes the JWS interface is generated.
destJwsDir	java.lang.String	true	Specifies the directory into which the JAR file that contains the JWS interface and data binding artifacts should be generated.

Table 3–24 (Cont.) ws-wsdlc Parameters

Name	Type	Required	Description
explode	boolean	false	Specifies the flag to set if you want exploded output. Defaults to true.
failOnError	boolean	false	Specifies whether the ws-clientgen goal continues executing in the event of an error. The default value is true
fork	boolean	false	Specifies whether to execute javac using the JDK compiler externally. The default value is false.
includeAntRuntime	boolean	false	Specifies whether to include the Ant run-time libraries in the classpath. The default value is true.
includeJavaRuntime	boolean	false	Specifies whether to include the default run-time libraries from the executing VM in the classpath. The default value is false.
optimize	boolean	false	Specifies the flag to set if you want optimization. Defaults to true.
packageName	java.lang.String	false	Specifies the package into which the generated JWS interface and implementation files should be generated.
srcPortName	java.lang.String	false	Specifies the name of the WSDL port from which the JWS interface file should be generated. Set the value of this parameter to the value of the name parameter of the port parameter that corresponds to the Web service port for which you want to generate a JWS interface file. The port parameter is a child of the service parameter in the WSDL file. If you do not specify this attribute, ws-wsdlc generates a JWS interface file from the service specified by srcServiceName.
srcServiceName	java.lang.String	false	Specifies the name of the Web service from which the JWS interface file should be generated.
srcWsdl	java.lang.String	true	Specifies the name of the WSDL from which to generate the JAR file that contains the JWS interface and data binding artifacts.
verbose	boolean	false	Specifies the flag to set if you want verbose output. Default value is false.

Usage Example

The ws-wsdlc goal generates a set of artifacts and a partial Java implementation of the Web service from a WSDL.

This goal benefits from the convention-over-configuration approach, allowing you to execute it using the defaults of the project.

There are two ways to run the ws-wsdlc goal:

- From the command line. For example, after you define an alias:

```
mvn -DvariableName1=value1  -DvariableName2=value2
com.oracle.weblogic:weblogic-maven-plugin:ws-wsdlc
```

- By specifying the Maven generate-resources life cycle phase.

  To do this, modify the pom.xml file to specify the generate-resources life cycle phase, the ws-wsdlc goal, and include any parameters you need to set. Then run mvn generate-resources in the same directory of pom.xml.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<project>
```

```
  <modelVersion>4.0.0</modelVersion>
  <groupId>maven_plugin.simple</groupId>
  <artifactId>maven_plugin_simple</artifactId>
  <version>1.0</version>
  <build>
    <plugins>
      <plugin>
        <groupId>com.oracle.weblogic</groupId>
        <artifactId>weblogic-maven-plugin</artifactId>
        <version>12.1.2-0-0</version>
        <executions>
          <execution>
            <id>wsdlc</id>
            <phase>generate-resources</phase>
            <goals>
              <goal>ws-wsdlc</goal>
            </goals>
            <configuration>
              <srcWsdl>${basedir}/AddNumbers.wsdl</srcWsdl>
              <destJwsDir>${project.build.directory}/jwsImpl</destJwsDir>
              <destImplDir>${project.build.directory}/output</destImplDir>
              <packageName>maven_plugin.simple</packageName>
              <verbose>true</verbose>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

Example 3–19 shows typical `ws-wsdlc` goal output.

Example 3–19 ws-wsdlc

```
mvn -f wsdlc_pom.xml generate-resources
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building maven_plugin_simple 1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:ws-wsdlc (wsdlc) @ maven_plugin_simple
---
[INFO] Executing standalone...

[INFO] Executing Maven goal 'wsdlc'...
calling method public static void weblogic.wsee.tools.wsdlc.MavenWsdlc.execute(o
rg.apache.maven.plugin.logging.Log,java.util.Map) throws java.lang.Throwable
Catalog dir = C:\Users\maven\AppData\Local\Temp\_ckr59b
Download file [AddNumbers.wsdl] to C:\Users\maven\AppData\Local\Temp\_ckr59b
srcWsdl is redefined as [ C:\Users\maven\AppData\Local\Temp\_ckr59b\AddNumber
s.wsdl ]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
```

3.3.19 ws-jwsc

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:ws-jwsc`

Description

Maven goal to build a JAX-WS web service.

The `ws-jwsc` goal provides a Maven wrapper for the "jwsc" Ant task, which is described in *WebLogic Web Services Reference for Oracle WebLogic Server*.

> **Note:** The `ws-jwsc` goal does not work with the JAX-RPC-only JWS annotations described in "WebLogic-Specific Annotations."

Nested Configuration in module Elements

The `ws-jwsc` goal supports nested configuration elements, as shown in bold in Example 3–20. See Introduction to the POM for information on Maven projects with multiple modules.

Example 3–20 Nested Configuration Elements

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.test.ws</groupId>
  <artifactId>test-ws-jwsc1</artifactId>
  <version>1.0</version>
  <build>
    <plugins>
      <plugin>
        <groupId>com.oracle.weblogic</groupId>
        <artifactId>weblogic-maven-plugin</artifactId>
        <version>12.1.2-0-0</version>
        <executions>
          <execution>
            <id>first-jwsc</id>
            <phase>generate-resources</phase>
            <goals>
              <goal>ws-jwsc</goal>
            </goals>
            <configuration>
              <srcDir>${basedir}/src/main/java</srcDir>
            <destDir>${project.build.directory}/jwscOutput
                  /${project.build.finalName}</destDir>
              <listfiles>true</listfiles>
              <debug>true</debug>

                <module>
                  <name>pocreate</name>
                  <contextPath>mypub</contextPath>
                  <compiledWsdl>D:\maven-test\order_wsdl.jar</compiledWsdl >

                    <jws>
                      <file>examples/wsee/jwsc/POCreateImpl.java</file>
                       <transportType>
                         <type>WLHttpTransport</type>
                         <serviceUri>POCreate</serviceUri>
                         <portName>POCreatePort</portName>
                       </transportType>
                    </jws>
                    <jws>
                      …
                    </jws>
                   <descriptors>
                     <descriptor>"resources/web.xml"<descriptor/>
                     <descriptor>"resources/weblogic.xml"<descriptor />
                   </descriptors>
                </module>
                <module>
                …
                </module>
              </modules>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

These nested configuration elements for `ws-jwsc` have the following conditions:

- You must use at least one of the following elements: `jws`, `jwses`, `module`, or `modules`.
- Collection elements such as `jwses` and `modules` elements can be omitted.
- If there is only one child element within the collection element, the collection element can also be removed.

  For example, if there is only one `jws` element, use `jws`. If there are multiple `jws` elements, add all of the `jws` elements under a `jwses` element.
- As with the JWSC ant task, if `module` has only one `jws` child element, then other sub elements of `module` can be nested into `jwsc` and `jwsc/transportType`.

Example 3–21 shows an example without a module `element` in which the `jws` parameter is a child of `ws-jwsc`.

Example 3–21 jws Element as Child of ws-jwsc Goal

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.test.ws</groupId>
  <artifactId>test-ws-jwsc</artifactId>
  <version>1.0</version>
  <build>
    <plugins>
      <plugin>
        <groupId>com.oracle.weblogic</groupId>
        <artifactId>weblogic-maven-plugin</artifactId>
        <version>12.1.2-0-0</version>
        <executions>
          <execution>
            <id>first-jwsc</id>
            <phase>compile</phase>
            <goals>
              <goal>ws-jwsc</goal>
```

```
                </goals>
                <configuration>
                  <srcDir>${basedir}/src/main/java</srcDir>
                  <destDir>${project.build.directory}/jwscOutput/
                      ${project.build.finalName}</destDir>
                  <jws>            <!-- no parent <module> -->
                    <file>examples/wsee/jwsc/POCreateImpl.java</file>
                      <compiledWsdl>${project.build.directory}/purchaseorder_wsdl.jar>
                     <transportType>
                       <type>WLHttpTransport</type>
                     </transportType>
                  </jws>
                </configuration>
              </execution>
            </executions>
          </plugin>
        </plugins>
      </build>
    </project>
```

ws-jwsc Parameters

Table 3–25 briefly describes the `ws-jwsc` parameters. These parameters are more fully described in Table 2-3 "WebLogic-specific Attributes of the clientgen Ant Task" in *WebLogic Web Services Reference for Oracle WebLogic Server*.

Table 3–25 ws-jwsc Parameters

Name	Type	Required	Description
`applicationXml`	`java.lang.String`	false	Specifies the full name and path of the application.xml deployment descriptor of the Enterprise Application. If you specify an existing file, the ws-jwsc goal updates it to include the Web services information. However, jwsc does not automatically copy the updated application.xml file to the destDir; you must manually copy this file to the destDIR. If the file does not exist, jwsc creates it. The ws-jwsc goal also creates or updates the corresponding weblogic-application.xml file in the same directory. If you do not specify this attribute, jwsc creates or updates the file destDir/META-INF/application.xml, where destDir is the jwsc attribute.
`debug`	boolean	false	Turns on additional debug output.
`destDir`	`java.lang.String`	true	Specifies the full pathname of the directory that will contain the compiled JWS files, XML Schemas, WSDL, and generated deployment descriptor files, all packaged into a JAR or WAR file.
`destEncoding`	`java.lang.String`	false	Specifies the character encoding of the output files, such as the deployment descriptors and XML files. Examples of character encodings are SHIFT-JIS and UTF-8. The default value of this attribute is UTF-8.
`jws`	Jws	false	There is only one <jws> element. See Table 3–26 for a description of `jws` parameters.
`jwses`	Jws	false	It contains more than one< jws> element.

Table 3–25 (Cont.) ws-jwsc Parameters

Name	Type	Required	Description
`keepGenerated`	boolean	false	Specifies whether the Java source files and artifacts generated by this goal should be regenerated if they already exist. If you specify false, new Java source files and artifacts are always generated and any existing artifacts are overwritten. If you specify true, the goal regenerates only those artifacts that have changed, based on the timestamp of any existing artifacts
`listfiles`	boolean	false	Specifies whether to list all of the files.
`module`	Module	false	It contains one <module> element. See Table 3–27 for a description of `module` parameters.
`modules`	Module	false	It contains more than one <module> element.
`optimize`	boolean	false	Specifies the flag to set when optimization is required. Defaults to true.
`sourcepath`	`java.lang.String`	true	The full pathname of top-level directory that contains the Java files referenced by the JWS file, such as JavaBeans used as parameters or user-defined exceptions.
`srcDir`	`java.lang.String`	true	Specifies the full pathname of the top-level directory that contains the JWS file you want to compile.
`srcEncoding`	`java.lang.String`	false	Specifies the character encoding of the input files, such as the JWS file or configuration XML files. Examples of character encodings are SHIFT-JIS and UTF-8. The default value of this attribute is the character encoding set for the JVM.
`verbose`	boolean	false	Specifies verbose output

jws Parameter

As described in "jws", the `jws` parameter specifies the name of a JWS file that implements your Web service and for which the `ws-jwsc` goal should generate Java code and supporting artifacts, and then package them into a deployable WAR file inside of an Enterprise Application.

You can specify the `jws` parameter in two ways:

- An immediate child element of the `ws-jwsc` goal. In this case, `ws-jwsc` generates a separate WAR file for each JWS file. You typically use this method if you are specifying just one JWS file to the `ws-jwsc` goal.
- A child element of the `module` parameter, which in turn is a child of the `ws-jwsc` goal. In this case, `ws-jwsc` generates a single WAR file that includes all the generated code and artifacts for all the JWS files grouped within the module parameter.

  This method is useful if you want all JWS files to share supporting files, such as common Java data types.

Table 3–26 describes the child parameters of the `jws` parameter. The description specifies whether the parameter applies in the case that `jws` is a child of the `ws-jwsc` goal, is a child of `module`, or both.

Table 3–26 jws Parameters

Name	Type	Required	Description	Child of ws-jwsc, module, or both
compiledWsdl	java.lang.String	false	Specifies the full pathname of the JAR file generated by the ws-wsdlc goal based on an existing WSDL file. Only required for the "starting from WSDL" use case.	both
contextPath	java.lang.String	false	Specifies the deployed context of the web service.	ws-jwsc
explode	boolean	false	Specifies the flag to set when you want exploded output. Defaults to true.	ws-jwsc
file	java.lang.String	true	The name of the JWS file that you want to compile. The ws-jwsc goal looks for the file in the srcdir directory.	both
generateWsdl	boolean	true	Specifies whether the generated WAR file includes the WSDL file in the WEB-INF directory. Default value is false.	both
jmstransportservice	boolean	false	Use JMS transport for Web services. It can be omitted. See Table 3–30 for a description of jmstransportservice parameters.	ws-jwsc
name	java.lang.String	false	Specifies the name of the generated WAR file (or exploded directory, if the explode attribute is set to true) that contains the deployable Web service.	ws-jwsc
transportType	transportType	false	Used when it contains only one transport type element. It can be omitted. See Table 3–29 for a description of transportType parameters.	both
transportTypes	transportType	false	Used when it contains more than one transport type element. It can be omitted. See Table 3–29 for a description of transportType parameters.	both
wsdlOnly	boolean	false	Specifies that only a WSDL file should be generated for this JWS file. The default value is false.	ws-jwsc

module Parameters

As described in "module", the module parameter groups one or more jws parameters together so that their generated code and artifacts are packaged in a single Web application (WAR) file. The module parameter is a child of the ws-jwsc goal.

Table 3–27 describes the parameters of the module parameter.

Table 3–27 module Parameters

Name	Type	Required	Description
`clientgen`	`java.lang.String`	false	There is only one <clientgen> element. It can be omitted.
`clientgens`	`java.lang.String`	false	There is more than one <clientgen> element. It can be omitted.
`contextPath`	`java.lang.String`	false	Specifies the deployed context of the Web service.
`descriptor`	`java.lang.String`	false	Specifies the web.xml descriptor to use if a new one should not be generated. The path should be fully qualified. The files should be separated by ", ".
`ejbWsInWar`	boolean	false	Specifies whether to package EJB-based Web services in a WAR file instead of a JAR file.
`explode`	boolean	false	Specifies the flag to set when you want exploded output. Defaults to true.
`FileSet`	FileSet	false	Used when it contains one FileSet element. It can be omitted.
`FileSets`	FileSet	false	Used when it contains more than one FileSet element. It can be omitted.
`generateWsdl`	boolean	true	Specifies whether the generated WAR file includes the WSDL file in the WEB-INF directory. Default value is false.
`jws`	Jws	false	Used when it contains one jws element. It can be omitted.
`jwses`	Jws	false	Used when it contains more than one jws element. It can be omitted.
`name`	`java.lang.String`	false	Specifies the name of the WAR to use when evaluating the ear file.
`wsdlOnly`	boolean	false	Specifies that only a WSDL file should be generated for this JWS file. The default value is false.
zipfileset	`java.lang.String`	false	There is only one <zipfileset> element.

FileSet Parameters

As described in "fileset", the `FileSet` parameter specifies one or more directories in which the `ws-jwsc` goal searches for JWS files to compile. The list of JWS files that `ws-jwsc` finds is then treated as if each file had been individually specified with the `jws` parameter of `module`.

The `FileSet` parameter is a child of the `ws-jwsc` goal.

Table 3–28 describes the parameters of the FileSet parameter.

Table 3–28 FileSet Parameters

Name	Type	Required	Description
`srcDir`	`java.lang.String`	true	Specifies the directories (separated by semi-colons) that the ws-jwsc goal should search for JWS files to compile.
`prefix`	`java.lang.String`	false	Prefix to use.
`sourceIncludes`	`java.lang.String`	false	Specifies the explicit includes-list for the file set.
`sourceExcludes`	`java.lang.String`	false	Specifies the explicit excludes-list for the file set.

TransportType Parameters

As described in "WLHttpTransport", "WLHttpsTransport", and "WLJMSTransport", you use transport parameters to specify the transport type, context path, and service URI sections of the URL used to invoke the Web service, as well as the name of the port in the generated WSDL.

The `ws-jwsc` goal combines these transport parameters into one, `TransportType`.

Table 3–28 describes the parameters of the `transportType` parameter.

Table 3–29 transportType Parameters

Name	Type	Required	Description
`transportTypeName`	`java.lang.String`	true	Specifies the value is WLHttpTransport, WLHttpsTransport, or WLJMSTransport. Default value is WLHttpTransport.
`serviceUri`	`java.lang.String`	false	Specifies the Web service URI portion of the URL.
`contextPath`	`java.lang.String`	false	Specifies the deployed context of the Web service.
`portName`	`java.lang.String`	false	Specifies the name of the port in the generated WSDL.

Table 3–30 describes the parameters of the `jmstransportservice` parameter.

Table 3–30 jmstransportservice Parameters

Name	Type	Required	Description
`destinationName`	`java.lang.String`	false	JNDI name of the destination queue or topic. Default value is `com.oracle.webservices.jms.RequestQueue`.
`destinationType`	`java.lang.String`	false	Valid values include: QUEUE or TOPIC. Default value is QUEUE.
`replyToName`	`java.lang.String`	false	JNDI name of the JMS destination to which the response message is sent.
`targetService`	`java.lang.String`	false	Port component name of the Web service.
`jndiInitialContextFactory`	`java.lang.String`	false	Name of the initial context factory class used for JNDI lookup. Default value is `weblogic.jndi.WLInitialContextFactory`.
`jndiConnectionFactoryName`	`java.lang.String`		JNDI name of the connection factory that is used to establish a JMS connection. Default value is `com.oracle.webservices.jms.ConnectionFactory`.
`jndiUrl`	`java.lang.String`		JNDI provider URL. Default value is `t3://localhost:7001`.
`deliveryMode`	`java.lang.String`		Delivery mode indicating whether the request message is persistent. Valid values are PERSISTENT and NON_PERSISTENT. Default value is PERSISTENT.
`timeToLive`	long	false	Lifetime, in milliseconds, of the request message. Default value is 180000L.
`priority`	int	false	JMS priority associated with the request and response message. Default value is 0.

Table 3–30 (Cont.) jmstransportservice Parameters

Name	Type	Required	Description
jndiContextParameter	java.lang.String	false	JNDI properties, in a format like: someParameterName1=someValue1 , someParameterName2=someValue2.
bindingVersion	java.lang.String	false	Version of the SOAP JMS binding. Default value is 1.0.
runAsPrincipal	java.lang.String	false	Principal used to run the listening MDB.
runAsRole	java.lang.String	false	Role used to run the listening MDB.
messageType	java.lang.String	false	Message type to use with the request message. Valid values are com.oracle.webservices.api.jms.JMSMessageType.BYTES and com.oracle.webservices.api.jms.JMSMessageType.TEXT. Default value is BYTES.
enableHttpWsdlAccess	boolean	false	Boolean flag that specifies whether to publish the WSDL through HTTP. Default value is true.
mdbPerDestination	boolean	false	Boolean flag that specifies whether to create one listening message-driven bean (MDB) for each requested destination. Default value is true.
activationConfig	java.lang.String	false	Activation configuration properties passed to the JMS provider.
contextPath	java.lang.String	false	The deployed context of the web service.
serviceUri	java.lang.String	false	Web service URI portion of the URL.
portName	java.lang.String	false	The name of the port in the generated WSDL.

Usage Example

The ws-jwsc goal builds a JAX-WS web service.

This goal benefits from the convention-over-configuration approach, allowing you to execute it using the defaults of the project.

To run the ws-jwsc goal, specify the Maven generate-resources phase.

To do this, modify the pom.xml file to specify the generate-resources phase, the ws-jwsc goal, and include any paparameters you need to set. Then run mvn generate-resources in the same directory of pom.xml.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>maven_plugin.simple</groupId>
  <artifactId>maven_plugin_simple</artifactId>
  <version>1.0</version>
  <build>
    <plugins>
      <plugin>
        <groupId>com.oracle.weblogic</groupId>
        <artifactId>weblogic-maven-plugin</artifactId>
        <version>12.1.2-0-0</version>
        <executions>
          <execution>
            <id>jwsc</id>
            <phase>generate-resources</phase>
            <goals>
              <goal>ws-jwsc</goal>
            </goals>
            <configuration>
              <destDir>${project.build.directory}/jwscOutput/
              <listfiles>true</listfiles>
              <debug>true</debug>
              <jws>            <!-- no parent <module> -->
                <file>examples/wsee/jwsc/POCreateImpl.java</file>
                  <compiledWsdl>${project.build.directory}/purchaseorder_wsdl.jar>
                 <transportType>
                   <type>WLHttpTransport</type>
                 </transportType>
</jws>
              <verbose>true</verbose>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

Example 3–22 shows typical `ws-jwsc` goal output.

Example 3–22 ws-jwsc

```
mvn -f jwsc_pom.xml generate-resources
INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building maven_plugin_simple 1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:12.1.2-0-0:ws-jwsc (jwsc) @ maven_plugin_simple
---
[INFO] Executing standalone...

INFO] Executing Maven goal 'jwsc'...
calling method public static void
weblogic.wsee.tools.jws.MavenJwsc.execute(org.apache.maven.plugin.logging.Log,
java.util.Map) throws java.lang.Throwable
[EarFile] Application File :
C:\maven-doc\jwsc-test-2\output\META-INF\application.xml
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
```

4 Creating a Split Development Directory Environment

This chapter describes how to create a WebLogic Server split development directory that you can use to develop a Java EE application or module.

This chapter includes the following sections:

4.1 Overview of the Split Development Directory Environment

The WebLogic split development directory environment consists of a directory layout and associated Ant tasks that help you repeatedly build, change, and deploy Java EE applications. Compared to other development frameworks, the WebLogic split development directory provides these benefits:

- **Fast development and deployment.** By minimizing unnecessary file copying, the split development directory Ant tasks help you recompile and redeploy applications quickly *without* first generating a deployable archive file or exploded archive directory.
- **Simplified build scripts.** The Oracle-provided Ant tasks automatically determine which Java EE modules and classes you are creating, and build components in the correct order to support common classpath dependencies. In many cases, your project build script can simply identify the source and build directories and allow Ant tasks to perform their default behaviors.
- **Easy integration with source control systems.** The split development directory provides a clean separation between source files and generated files. This helps you maintain only editable files in your source control system. You can also clean the build by deleting the entire build directory; build files are easily replaced by rebuilding the project.

4.1.1 Source and Build Directories

The source and build directories form the basis of the split development directory environment. The source directory contains all editable files for your project—Java source files, editable descriptor files, JSPs, static content, and so forth. You create the source directory for an application by following the directory structure guidelines described in Section 4.3, "Organizing Java EE Components in a Split Development Directory".

The top level of the source directory always represents an enterprise application (`.ear` file), even if you are developing only a single Java EE module. Subdirectories beneath the top level source directory contain:

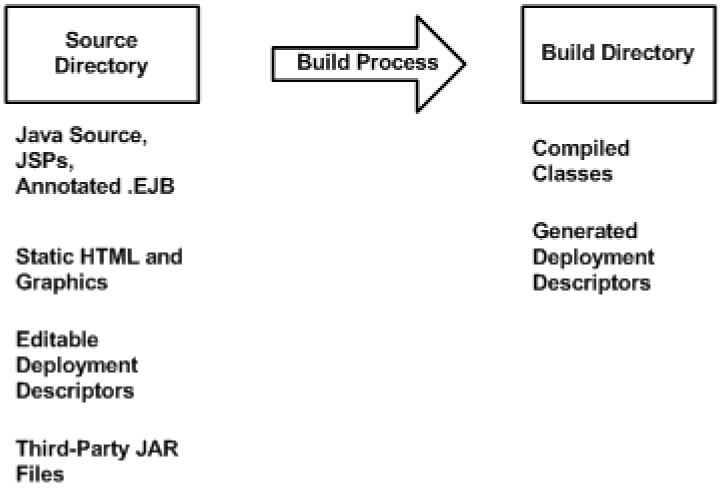
- Enterprise Application Modules (EJBs and Web applications)

> **Note:** The split development directory structure does not provide support for developing new Resource Adapter components.

- Descriptor files for the enterprise application (`application.xml` and `weblogic-application.xml`)
- Utility classes shared by modules of the application (for example, exceptions, constants)
- Libraries (compiled `.jar` files, including third-party libraries) used by modules of the application

The build directory contents are generated automatically when you run the `wlcompile` ant task against a valid source directory. The `wlcompile` task recognizes EJB, Web application, and shared library and class directories in the source directory, and builds those components in an order that supports common class path requirements. Additional Ant tasks can be used to build Web services or generate deployment descriptor files from annotated EJB code.

Figure 4–1 Source and Build Directories



The build directory contains only those files generated during the build process. The combination of files in the source and build directories form a deployable Java EE application.

The build and source directory contents can be place in any directory of your choice. However, for ease of use, the directories are commonly placed in directories named `source` and `build`, within a single project directory (for example, `\myproject\build` and `\myproject\source`).

4.1.2 Deploying from a Split Development Directory

All WebLogic Server deployment tools (`weblogic.Deployer`, `wldeploy`, and the Administration Console) support direct deployment from a split development directory. You specify only the build directory when deploying the application to WebLogic Server.

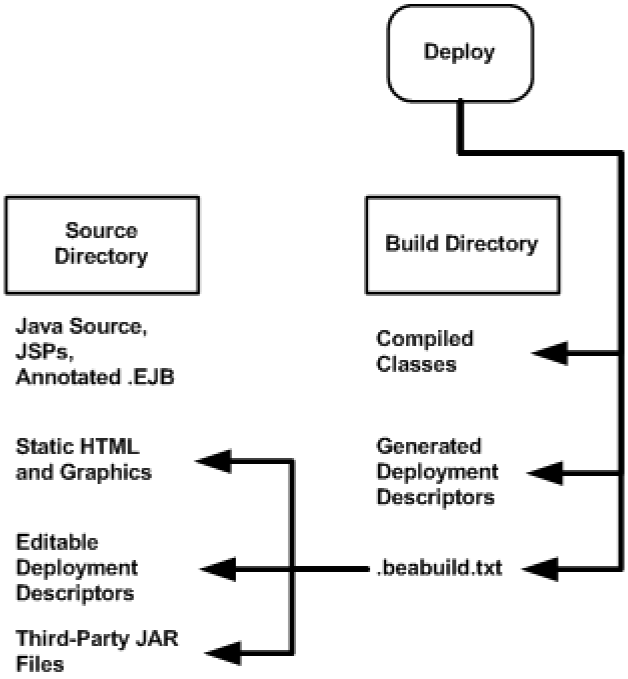
WebLogic Server attempts to use all classes and resources available in the *source* directory for deploying the application. If a required resource is not available in the source directory, WebLogic Server then looks in the application's build directory for that resource. For example, if a deployment descriptor is generated during the build process, rather than stored with source code as an editable file, WebLogic Server obtains the generated file from the build directory.

WebLogic Server discovers the location of the source directory by examining the `.beabuild.txt` file that resides in the top level of the application's build directory. If you ever move or modify the source directory location, edit the `.beabuild.txt` file to identify the new source directory name.

Section 6.1, "Deploying Applications Using wldeploy" describes the `wldeploy` Ant task that you can use to automate deployment from the split directory environment.

Figure 4–2 shows a typical deployment process. The process is initiated by specifying the build directory with a WebLogic Server tool. In the figure, all compiled classes and generated deployment descriptors are discovered in the build directory, but other application resources (such as static files and editable deployment descriptors) are missing. WebLogic Server uses the hidden `.beabuild.txt` file to locate the application's source directory, where it finds the required resources.

Figure 4–2 Split Directory Deployment



4.1.3 Split Development Directory Ant Tasks

Oracle provides a collection of Ant tasks designed to help you develop applications using the split development directory environment. Each Ant task uses the source, build, or both directories to perform common development tasks:

- `wlcompile`—This Ant task compiles the contents of the source directory into subdirectories of the build directory. `wlcompile` compiles Java classes and also processes annotated `.ejb` files into deployment descriptors, as described in Section 5.1, "Compiling Applications Using wlcompile".
- `wlappc`—This Ant task invokes the appc compiler, which generates JSPs and container-specific EJB classes for deployment. See Section 5.2, "Building Modules and Applications Using wlappc".
- `wldeploy`—This Ant task deploys any format of Java EE applications (exploded or archived) to WebLogic Server. To deploy directly from the split development directory environment, you specify the build directory of your application. See Section B, "wldeploy Ant Task Reference".
- `wlpackage`—This Ant task uses the contents of both the source and build directories to generate an EAR file or exploded EAR directory that you can give to others for deployment.

4.2 Using the Split Development Directory Structure: Main Steps

The following steps illustrate how you use the split development directory structure to build and deploy a WebLogic Server application.

1. Create the main EAR source directory for your project. When using the split development directory environment, you must develop Web applications and EJBs as part of an enterprise application, even if you do not intend to develop multiple Java EE modules. See Section 4.3, "Organizing Java EE Components in a Split

Development Directory".

2. Add one or more subdirectories to the EAR directory for storing the source for Web applications, EJB components, or shared utility classes. See Section 4.3, "Organizing Java EE Components in a Split Development Directory" and Section 4.4, "Organizing Shared Classes in a Split Development Directory".
3. Store all of your editable files (source code, static content, editable deployment descriptors) for modules in subdirectories of the EAR directory. Add the entire contents of the source directory to your source control system, if applicable.
4. Set your WebLogic Server environment by executing either the `setWLSEnv.cmd` (Windows) or `setWLSEnv.sh` (UNIX) script. The scripts are located in the *WL_HOME*`\server\bin\` directory, where *WL_HOME* is the top-level directory in which WebLogic Server is installed.

   > **Note:** On UNIX operating systems, the `setWLSEnv.sh` command does not set the environment variables in all command shells. Oracle recommends that you execute this command using the Korn shell or bash shell.

5. Use the `weblogic.BuildXMLGen` utility to generate a default `build.xml` file for use with your project. Edit the default property values as needed for your environment. See Section 4.5, "Generating a Basic build.xml File Using weblogic.BuildXMLGen".
6. Use the default targets in the `build.xml` file to build, deploy, and package your application. See Section 4.5, "Generating a Basic build.xml File Using weblogic.BuildXMLGen" for a list of default targets.

4.3 Organizing Java EE Components in a Split Development Directory

The split development directory structure requires each project to be staged as a Java EE enterprise application. Oracle therefore recommends that you stage even standalone Web applications and EJBs as modules of an enterprise application, to benefit from the split directory Ant tasks. This practice also allows you to easily add or remove modules at a later date, because the application is already organized as an EAR.

> **Note:** If your project requires multiple EARs, see also Section 4.6, "Developing Multiple-EAR Projects Using the Split Development Directory".

The following sections describe the basic conventions for staging the following module types in the split development directory structure:

- Section 4.3.2, "Enterprise Application Configuration"
- Section 4.3.3, "Web Applications"
- Section 4.3.4, "EJBs"
- Section 4.4.1, "Shared Utility Classes"
- Section 4.4.2, "Third-Party Libraries"

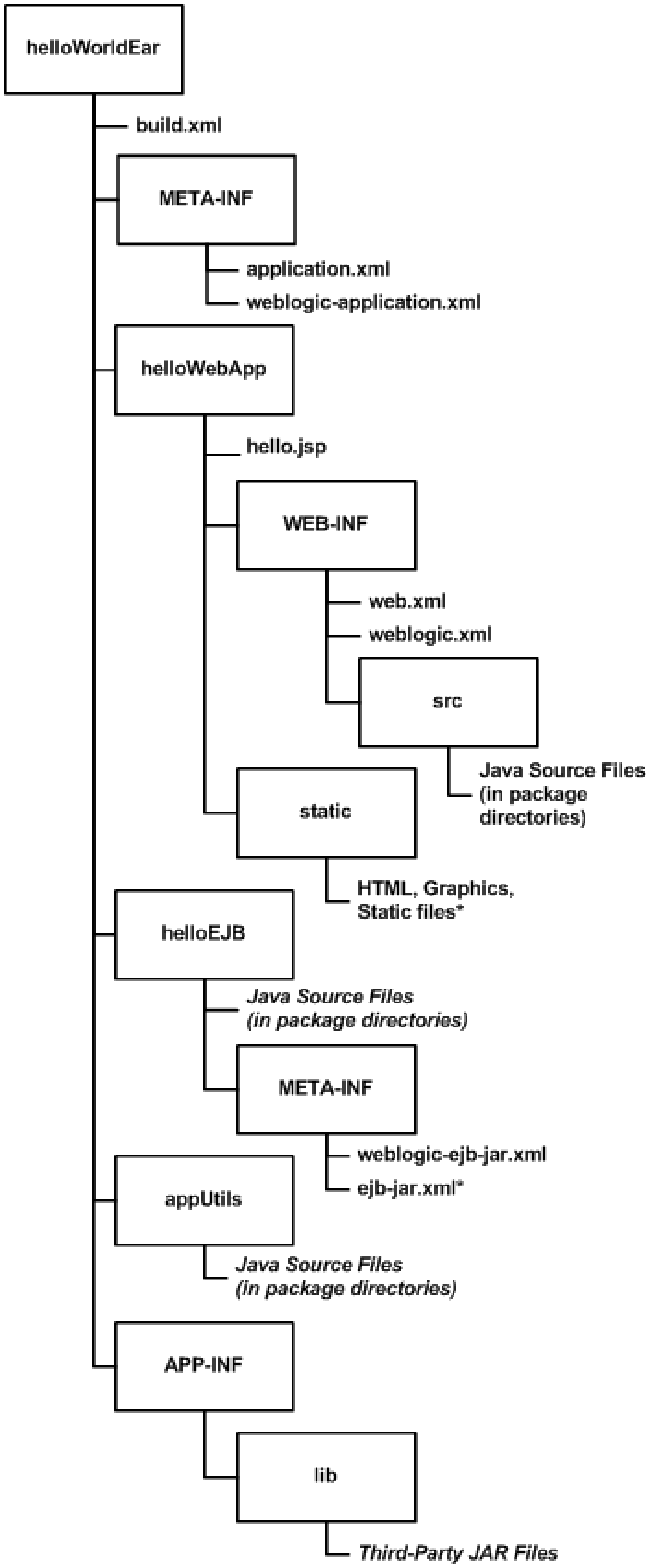
The directory examples are taken from the `splitdir` sample application installed in *EXAMPLES_HOME*`\wl_server\examples\src\examples\splitdir`, where

EXAMPLES_HOME represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server.*

4.3.1 Source Directory Overview

The following figure summarizes the source directory contents of an enterprise application having a Web application, EJB, shared utility classes, and third-party libraries. The sections that follow provide more details about how individual parts of the enterprise source directory are organized.

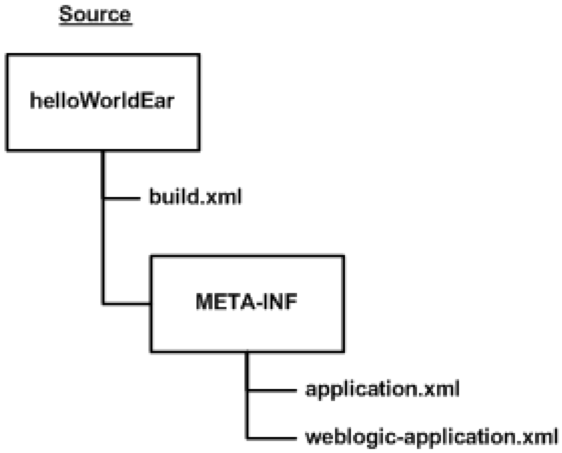
Figure 4–3 Overview of Enterprise Application Source Directory



4.3.2 Enterprise Application Configuration

The top level source directory for a split development directory project represents an enterprise application. The following figure shows the minimal files and directories required in this directory.

Figure 4–4 Enterprise Application Source Directory

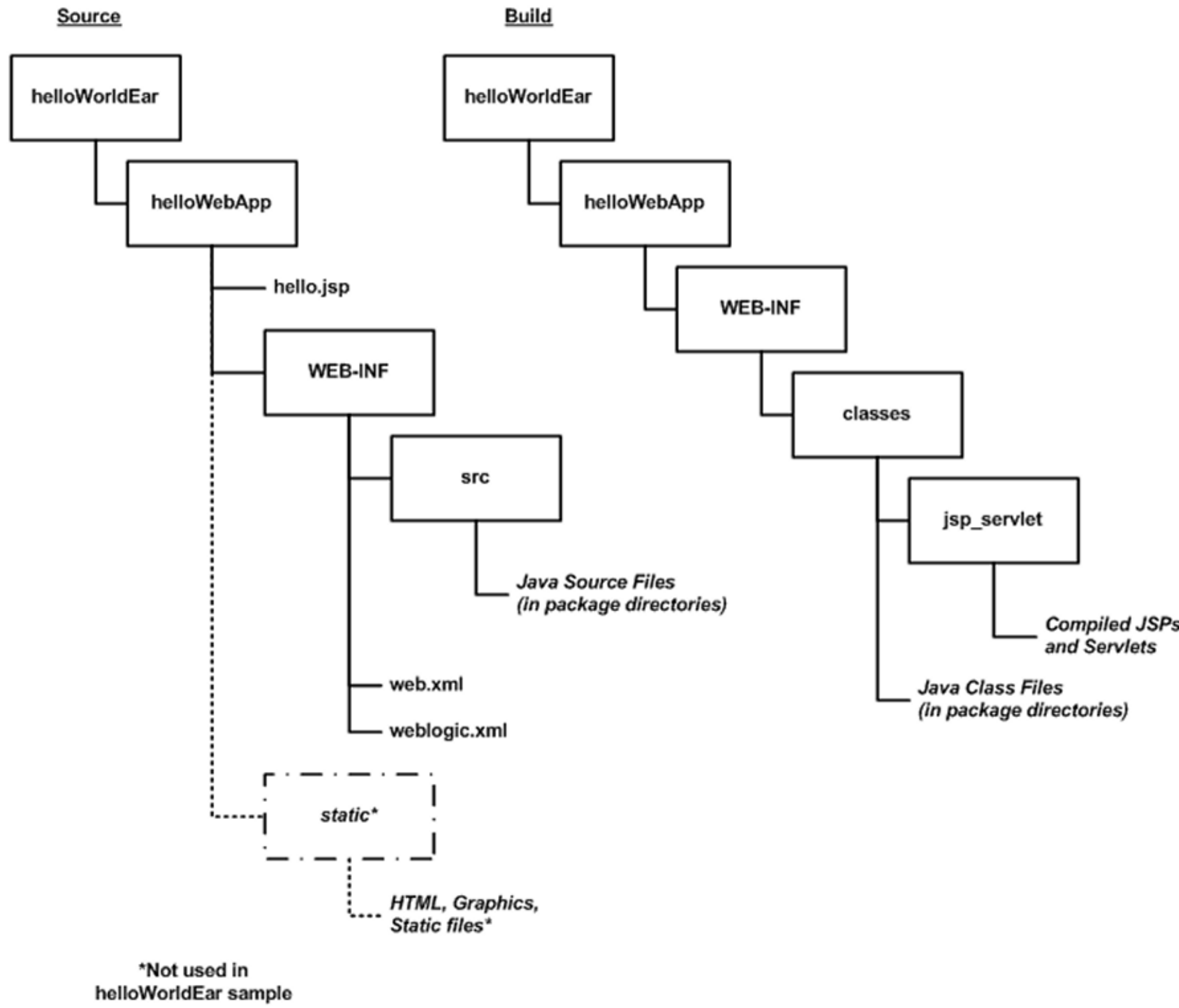


The enterprise application directory will also have one or more subdirectories to hold a Web application, EJB, utility class, and/or third-party Jar file, as described in the following sections.

4.3.3 Web Applications

Web applications use the basic source directory layout shown in the figure below.

Figure 4–5 Web Application Source and Build Directories



The key directories and files for the Web application are:

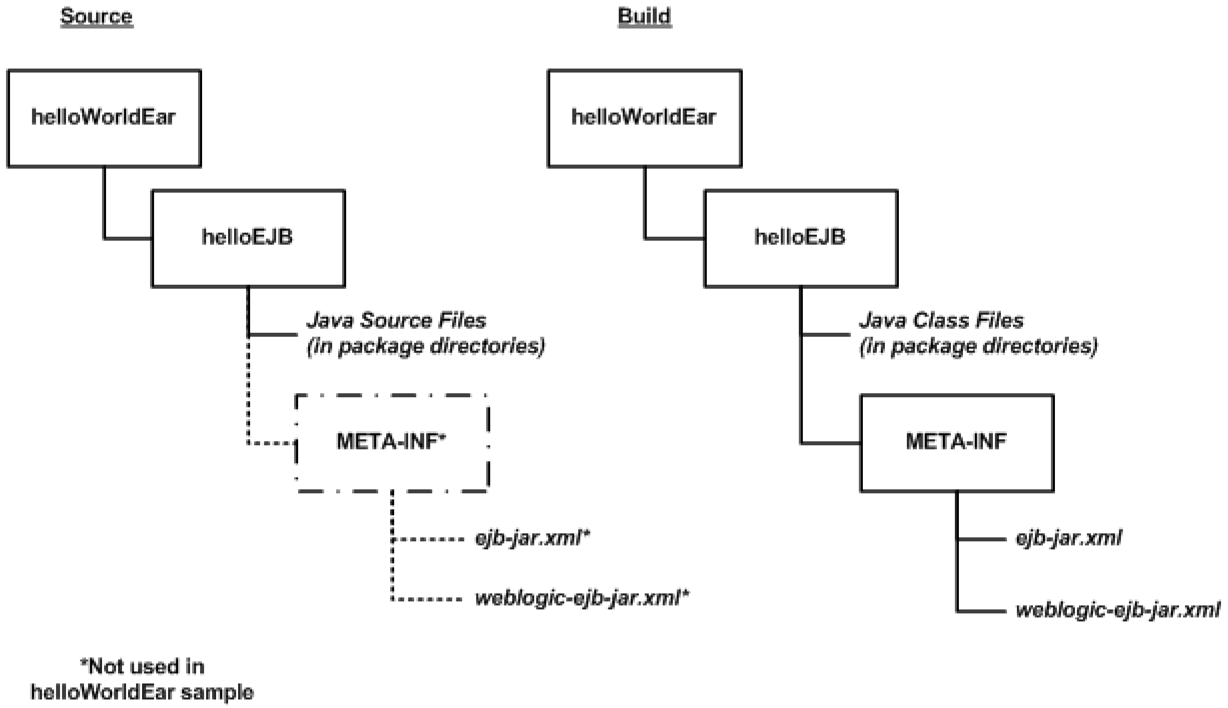
- `helloWebApp\` —The top level of the Web application module can contain JSP files and static content such as HTML files and graphics used in the application. You can also store static files in any named subdirectory of the Web application (for example, `helloWebApp\graphics` or `helloWebApp\static`.)
- `helloWebApp\WEB-INF\` —Store the Web application's editable deployment descriptor files (`web.xml` and `weblogic.xml`) in the `WEB-INF` subdirectory.
- `helloWebApp\WEB-INF\src` —Store Java source files for Servlets in package subdirectories under `WEB-INF\src`.

When you build a Web application, the `appc` Ant task and `jspc` compiler compile JSPs into package subdirectories under `helloWebApp\WEB-INF\classes\jsp_servlet` in the build directory. Editable deployment descriptors are not copied during the build process.

4.3.4 EJBs

EJBs use the source directory layout shown in the figure below.

Figure 4–6 EJB Source and Build Directories



The key directories and files for an EJB are:

- `helloEJB\` —Store all EJB source files under package directories of the EJB module directory. The source files can be either `.java` source files, or annotated `.ejb` files.
- `helloEJB\META-INF\` —Store editable EJB deployment descriptors (ejb-jar.xml and weblogic-ejb-jar.xml) in the `META-INF` subdirectory of the EJB module directory. The `helloWorldEar` sample does not include a `helloEJB\META-INF` subdirectory, because its deployment descriptors files are generated from annotations in the `.ejb` source files. See Section 4.3.5, "Important Notes Regarding EJB Descriptors".

During the build process, EJB classes are compiled into package subdirectories of the `helloEJB` module in the build directory. If you use annotated `.ejb` source files, the build process also generates the EJB deployment descriptors and stores them in the `helloEJB\META-INF` subdirectory of the build directory.

4.3.5 Important Notes Regarding EJB Descriptors

EJB deployment descriptors should be included in the source `META-INF` directory and treated as source code *only* if those descriptor files are created from scratch or are edited manually. Descriptor files that are generated from annotated `.ejb` files should appear only in the build directory, and they can be deleted and regenerated by building the application.

For a given EJB component, the EJB source directory should contain either:

- EJB source code in `.java` source files and editable deployment descriptors in `META-INF`

or:

- EJB source code with descriptor annotations in `.ejb` source files, and *no editable descriptors* in `META-INF`.

In other words, do not provide both annotated `.ejb` source files and editable descriptor files for the same EJB component.

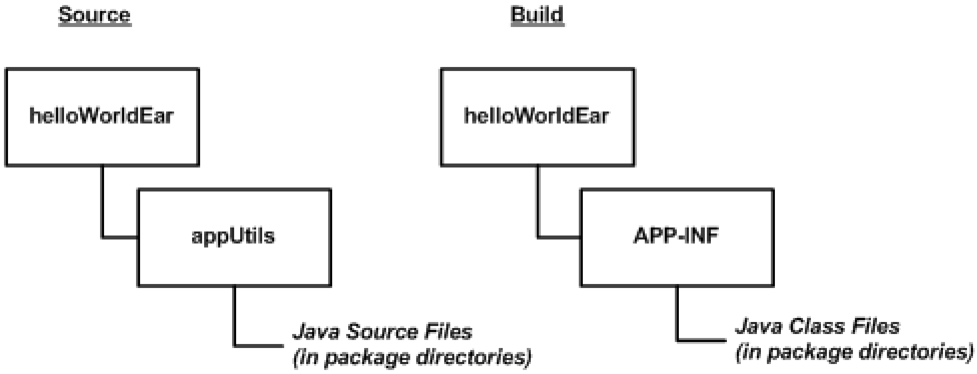
4.4 Organizing Shared Classes in a Split Development Directory

The WebLogic split development directory also helps you store shared utility classes and libraries that are required by modules in your enterprise application. The following sections describe the directory layout and classloading behavior for shared utility classes and third-party JAR files.

4.4.1 Shared Utility Classes

Enterprise applications frequently use Java utility classes that are shared among application modules. Java utility classes differ from third-party JARs in that the source files are part of the application and must be compiled. Java utility classes are typically libraries used by application modules such as EJBs or Web applications.

Figure 4–7 Java Utility Class Directory



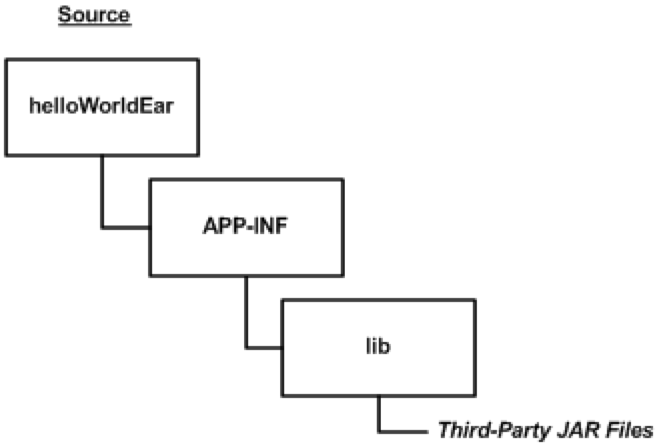
Place the source for Java utility classes in a named subdirectory of the top-level enterprise application directory. Beneath the named subdirectory, use standard package subdirectory conventions.

During the build process, the `wlcompile` Ant task invokes the javac compiler and compiles Java classes into the `APP-INF/classes/` directory under the build directory. This ensures that the classes are available to other modules in the deployed application.

4.4.2 Third-Party Libraries

You can extend an enterprise application to use third-party `.jar` files by placing the files in the `APP-INF\lib\` directory, as shown below:

Figure 4–8 Third-party Library Directory



Third-party JARs are generally not compiled, but may be versioned using the source control system for your application code. For example, XML parsers, logging implementations, and Web application framework JAR files are commonly used in applications and maintained along with editable source code.

During the build process, third-party JAR files are not copied to the build directory, but remain in the source directory for deployment.

4.4.3 Class Loading for Shared Classes

The classes and libraries stored under `APP-INF/classes` and `APP-INF/lib` are available to all modules in the enterprise application. The application classloader always attempts to resolve class requests by first looking in `APP-INF/classes`, then `APP-INF/lib`.

4.5 Generating a Basic build.xml File Using weblogic.BuildXMLGen

After you set up your source directory structure, use the `weblogic.BuildXMLGen` utility to create a basic `build.xml` file. `weblogic.BuildXMLGen` is a convenient utility that generates an Ant build.xml file for enterprise applications that are organized in the split development directory structure. The utility analyzes the source directory and creates build and deploy targets for the enterprise application as well as individual modules. It also creates targets to clean the build and generate new deployment descriptors.

Additionally, optional packages are supported as Java EE shared libraries in `weblogic.BuildXMLGen`, whereby all manifests of an application and its modules are scanned to look for optional package references. If optional package references are found they are added to the compile and `appc` tasks in the generated `build.xml` file.

For example, if a library located at `lib\echolib.jar` is referenced as an optional package, the tasks generated by `weblogic.BuildXMLGen` will contains an `appc` task that would appear as follows:

```
<target name="appc" description="Runs weblogic.appc on your application">
  <wlappc source="${dest.dir}" verbose="${verbose}">
    <library file="lib\echolib\echolib.jar" />
  </wlappc>
</target>
```

The compile and appc tasks for modules also use the lib\echolib\echolib.jar library.

4.5.1 weblogic.BuildXMLGen Syntax

The syntax for weblogic.BuildXMLGen is as follows:

```
java weblogic.BuildXMLGen [options] <source directory>
```

where options include:

- -help—Print standard usage message
- -version—Print version information
- -projectName <project name>—Name of the Ant project
- -d <directory>—Directory where build.xml is created. The default is the current directory.
- -file <build.xml>—Name of the generated build file
- -librarydir <directories>—Create build targets for shared Java EE libraries in the comma-separated list of directories. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages.".
- -username <username>—User name for deploy commands
- -password <password>—User password

After running weblogic.BuildXMLGen, edit the generated build.xml file to specify properties for your development environment. The list of properties you need to edit are shown in the listing below.

Example 4–1 build.xml Editable Properties

```
<!-- BUILD PROPERTIES ADJUST THESE FOR YOUR ENVIRONMENT -->
  <property name="tmp.dir" value="/tmp" />
  <property name="dist.dir" value="${tmp.dir}/dist"/>
  <property name="app.name" value="helloWorldEar" />
  <property name="ear" value="${dist.dir}/${app.name}.ear"/>
  <property name="ear.exploded" value="${dist.dir}/${app.name}_exploded"/>
  <property name="verbose" value="true" />
  <property name="user" value="USERNAME" />
  <property name="password" value="PASSWORD" />
  <property name="servername" value="myserver" />
  <property name="adminurl" value="iiop://localhost:7001" />
```

In particular, make sure you edit the tmp.dir property to point to the build directory you want to use. By default, the build.xml file builds projects into a subdirectory tmp.dir named after the application (/tmp/helloWorldEar in the above listing).

The following listing shows the default main targets created in the build.xml file. You can view these targets at the command prompt by entering the ant -projecthelp command in the EAR source directory.

Example 4–2 Default build.xml Targets

```
appc                 Runs weblogic.appc on your application
build                Compiles helloWorldEar application and runs appc
clean                Deletes the build and distribution directories
compile              Only compiles helloWorldEar application, no appc
compile.appStartup   Compiles just the appStartup module of the application
compile.appUtils     Compiles just the appUtils module of the application
compile.build.orig   Compiles just the build.orig module of the application
compile.helloEJB     Compiles just the helloEJB module of the application
compile.helloWebApp  Compiles just the helloWebApp module of the application
compile.javadoc      Compiles just the javadoc module of the application
deploy                 Deploys (and redeploys) the entire helloWorldEar
application
descriptors          Generates application and module descriptors
ear                  Package a standard J2EE EAR for distribution
ear.exploded         Package a standard exploded J2EE EAR
redeploy.appStartup  Redeploys just the appStartup module of the application
redeploy.appUtils    Redeploys just the appUtils module of the application
redeploy.build.orig  Redeploys just the build.orig module of the application
redeploy.helloEJB    Redeploys just the helloEJB module of the application
redeploy.helloWebApp Redeploys just the helloWebApp module of application
redeploy.javadoc     Redeploys just the javadoc module of the application
undeploy               Undeploys the entire helloWorldEar application
```

4.6 Developing Multiple-EAR Projects Using the Split Development Directory

The split development directory examples and procedures described previously have dealt with projects consisting of a single enterprise application. Projects that require building multiple enterprise applications simultaneously require slightly different conventions and procedures, as described in the following sections.

Note: The following sections refer to the MedRec sample application, which consists of three separate enterprise applications as well as shared utility classes, third-party JAR files, and dedicated client applications. The MedRec source and build directories are installed under *ORACLE_HOME*/user_projects/domain/medrec, where *ORACLE_HOME* is the directory you specified as Oracle Home when you installed Oracle WebLogic Server. For more information, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

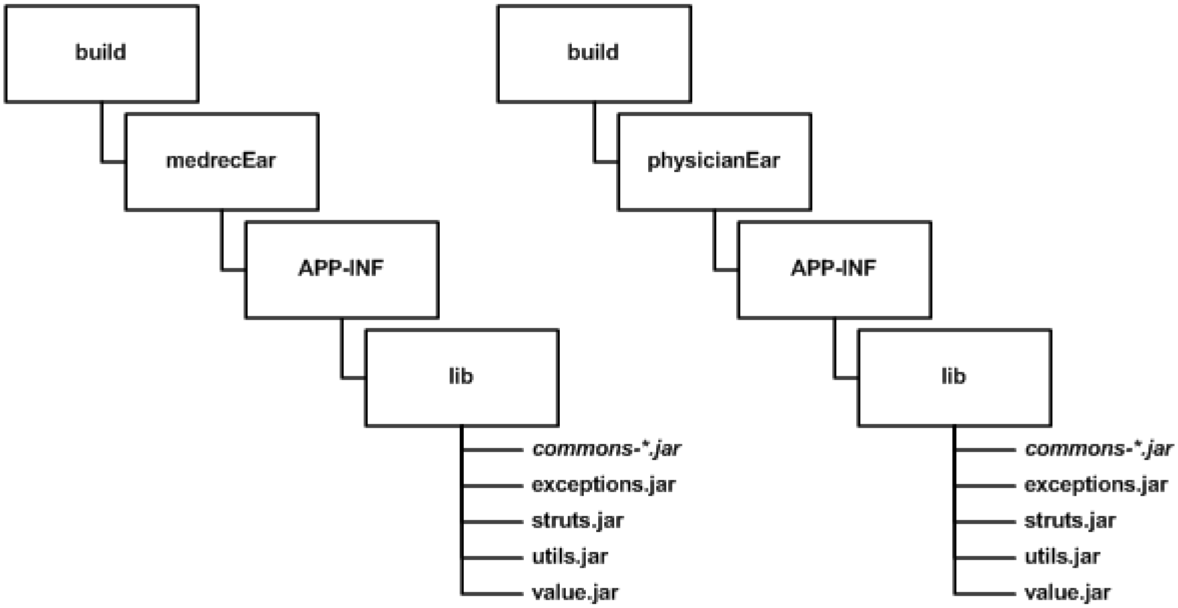
4.6.1 Organizing Libraries and Classes Shared by Multiple EARs

For single EAR projects, the split development directory conventions suggest keeping third-party JAR files in the APP-INF/lib directory of the EAR source directory. However, a multiple-EAR project would require you to maintain a copy of the same third-party JAR files in the APP-INF/lib directory of *each* EAR source directory. This introduces multiple copies of the source JAR files, increases the possibility of some JAR files being at different versions, and requires additional space in your source control system.

To address these problems, consider editing your build script to copy third-party JAR files into the APP-INF/lib directory of the *build* directory for each EAR that requires the libraries. This allows you to maintain a single copy and version of the JAR files in your source control system, yet it enables each EAR in your project to use the JAR files.

The MedRec sample application installed with WebLogic Server uses this strategy, as shown in the following figure.

Figure 4–9 Shared JAR Files in MedRec



MedRec takes a similar approach to utility classes that are shared by multiple EARs in the project. Instead of including the source for utility classes within the scope of each ear that needs them, MedRec keeps the utility class source independent of all EARs. After compiling the utility classes, the build script archives them and copies the JARs into the build directory under the `APP-INF/LIB` subdirectory of each EAR that uses the classes, as shown in figure Figure 4–9.

4.6.2 Linking Multiple build.xml Files

When developing multiple EARs using the split development directory, each EAR project generally uses its own `build.xml` file (perhaps generated by multiple runs of `weblogic.BuildXMLGen`.). Applications like MedRec also use a master `build.xml` file that calls the subordinate `build.xml` files for each EAR in the application suite.

Ant provides a core task (named `ant`) that allows you to execute other project build files within a master `build.xml` file. The following line from the MedRec master build file shows its usage:

```
<ant inheritAll="false" dir="${root}/startupEar" antfile="build.xml"/>
```

The above task instructs Ant to execute the file named `build.xml` in the `/startupEar` subdirectory. The `inheritAll` parameter instructs Ant to pass only user properties from the master build file tot the `build.xml` file in `/startupEar`.

MedRec uses multiple tasks similar to the above to build the `startupEar`, `medrecEar`, and `physicianEar` applications, as well as building common utility classes and client applications.

4.7 Best Practices for Developing WebLogic Server Applications

Oracle recommends the following "best practices" for application development.

- Package applications as part of an enterprise application. See Section 6.2, "Packaging Applications Using wlpackage".

- Use the split development directory structure. See Section 4.3, "Organizing Java EE Components in a Split Development Directory".
- For distribution purposes, package and deploy in archived format. See Section 6.2, "Packaging Applications Using wlpackage".
- In most other cases, it is more convenient to deploy in exploded format. See Section 6.2.1, "Archive versus Exploded Archive Directory".
- Never deploy untested code on a WebLogic Server instance that is serving production applications. Instead, set up a development WebLogic Server instance on the same computer on which you edit and compile, or designate a WebLogic Server development location elsewhere on the network.
- Even if you do not run a development WebLogic Server instance on your development computer, you must have access to a WebLogic Server distribution to compile your programs. To compile any code using WebLogic or Java EE APIs, the Java compiler needs access to the `weblogic.jar` file and other JAR files in the distribution directory. Install WebLogic Server on your development computer to make WebLogic distribution files available locally.

5 Building Applications in a Split Development Directory

This chapter describes how to build WebLogic Server Java EE applications using the WebLogic split development directory environment.

This chapter includes the following sections:

- Section 5.1, "Compiling Applications Using wlcompile"
- Section 5.2, "Building Modules and Applications Using wlappc"

5.1 Compiling Applications Using wlcompile

You use the `wlcompile` Ant task to invoke the javac compiler to compile your application's Java components in a split development directory structure. The basic syntax of `wlcompile` identifies the source and build directories, as in this command from the `helloWorldEar` sample:

```
<wlcompile srcdir="${src.dir}" destdir="${dest.dir}"/>
```

> **Note:** Deployment descriptors are no longer mandatory as of Java EE 5; therefore, exploded module directories must indicate the module type by using the `.war` or `.jar` suffix when there is no deployment descriptor in these directories. The suffix is required so that `wlcompile` can recognize the modules. The `.war` suffix indicates the module is a Web application module and the `.jar` suffix indicates the module is an EJB module.

The following is the order in which events occur using this task:

1. wlcompile compiles the Java components into an output directory:

   ```
   EXAMPLES_HOME\wl_server\examples\build\helloWorldEar\APP-INF\classes\
   ```

   where *`EXAMPLES_HOME`* represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

2. `wlcompile` builds the EJBs and automatically includes the previously built Java modules in the compiler's classpath. This allows the EJBs to call the Java modules without requiring you to manually edit their classpath.

3. Finally, `wlcompile` compiles the Java components in the Web application with the EJB and Java modules in the compiler's classpath. This allows the Web

applications to refer to the EJB and application Java classes without requiring you to manually edit the classpath.

5.1.1 Using includes and excludes Properties

More complex enterprise applications may have compilation dependencies that are not automatically handled by the wlcompile task. However, you can use the include and exclude options to wlcompile to enforce your own dependencies. The includes and excludes properties accept the names of enterprise application modules—the names of subdirectories in the enterprise application source directory—to include or exclude them from the compile stage.

The following line from the helloWorldEar sample shows the appStartup module being excluded from compilation:

```
<wlcompile srcdir="${src.dir}" destdir="${dest.dir}"
   excludes="appStartup"/>
```

5.1.2 wlcompile Ant Task Attributes

Table 5–1 contains Ant task attributes specific to wlcompile.

Table 5–1 wlcompile Ant Task Attributes

Attribute	Description
srcdir	The source directory.
destdir	The build/output directory.
classpath	Allows you to change the classpath used by wlcompile.
includes	Allows you to include specific directories from the build.
excludes	Allows you to exclude specific directories from the build.
librarydir	Specifies a directory of shared Java EE libraries to add to the classpath. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."

5.1.3 Nested javac Options

The wlcompile Ant task can accept nested javac options to change the compile-time behavior. For example, the following wlcompile command ignores deprecation warnings and enables debugging:

```
<wlcompile srcdir="${mysrcdir}" destdir="${mybuilddir}">
   <javac deprecation="false" debug="true"
   debuglevel="lines,vars,source"/>
</wlcompile>
```

5.1.4 Setting the Classpath for Compiling Code

Most WebLogic services are based on Java EE standards and are accessed through standard Java EE packages. The WebLogic and other Java classes required to compile programs that use WebLogic services are packaged in the wls-api.jar file in the lib directory of your WebLogic Server installation. In addition to wls-api.jar, include the following in your compiler's CLASSPATH:

- The lib\tools.jar file in the JDK directory, or other standard Java classes required by the Java Development Kit you use.

- The examples.property file for Apache Ant (for examples environment). This file is discussed in the WebLogic Server documentation on building examples using Ant located at: samples\server\examples\src\examples\examples.html
- Classes for third-party Java tools or services your programs import.
- Other application classes referenced by the programs you are compiling.

5.1.5 Library Element for wlcompile and wlappc

The library element is an optional element used to define the name and optional version information for a module that represents a shared Java EE library required for building an application, as described in Chapter 11, "Creating Shared Java EE Libraries and Optional Packages." The library element can be used with both wlcompile and wlappc, described in Section 5.2, "Building Modules and Applications Using wlappc".

The name and version information are specified as attributes to the library element, described in Table 5–2.

Table 5–2 Library attributes

Attribute	Description
file	Required filename of a Java EE library
name	The optional name of a required Java EE library.
specificationversion	An optional specification version required for the library.
implementationversion	An optional implementation version required for the library.

The format choices for both specificationversion and implementationversion are described in Section 11.3, "Referencing Shared Java EE Libraries in an Enterprise Application". The following output shows a sample library reference:

```
<library file="c:\mylibs\lib.jar" name="ReqLib" specificationversion="920"
implementationversion="1.1" />
```

5.2 Building Modules and Applications Using wlappc

To reduce deployment time, use the weblogic.appc Java class (or its equivalent Ant task wlappc) to pre-compile a deployable archive file, (WAR, JAR, or EAR). Precompiling with weblogic.appc generates certain helper classes and performs validation checks to ensure your application is compliant with the current Java EE specifications. The application-level checks include checks between the application-level deployment descriptors and the individual modules, as well as validation checks across the modules.

Additionally, optional packages are supported as Java EE shared libraries in appc, whereby all manifests of an application and its modules are scanned to look for optional package references.

wlappc is the Ant task interface to the weblogic.appc compiler. The following section describe the wlappc options and usage. Both weblogic.appc and the wlappc Ant task compile modules in the order in which they appear in the application.xml deployment descriptor file that describes your enterprise application.

5.2.1 wlappc Ant Task Attributes

Table 5–3 describes Ant task options specific to wlappc. These options are similar to the weblogic.appc command-line options, but with a few differences.

Notes: See Section 5.2.4, "weblogic.appc Reference" for a list of weblogic.appc options.

See also Section 5.1.5, "Library Element for wlcompile and wlappc".

Table 5–3 wlappc Ant Task Attributes

Option	Description
`print`	Prints the standard usage message.
`version`	Prints `appc` version information.
`output <file>`	Specifies an alternate output archive or directory. If not set, the output is placed in the source archive or directory.
`forceGeneration`	Forces generation of EJB and JSP classes. Without this flag, the classes may not be regenerated (if determined to be unnecessary).
`lineNumbers`	Adds line numbers to generated class files to aid in debugging.
`writeInferredDescriptors`	Specifies that the application or module contains deployment descriptors with annotation information.
`basicClientJar`	Does not include deployment descriptors in client JARs generated for EJBs.
`idl`	Generates IDL for EJB remote interfaces.
`idlOverwrite`	Always overwrites existing IDL files.
`idlVerbose`	Displays verbose information for IDL generation.
`idlNoValueTypes`	Does not generate valuetypes and the methods/attributes that contain them.
`idlNoAbstractInterfaces`	Does not generate abstract interfaces and methods/attributes that contain them.
`idlFactories`	Generates factory methods for valuetypes.
`idlVisibroker`	Generates IDL somewhat compatible with Visibroker 4.5 C++.
`idlOrbix`	Generates IDL somewhat compatible with Orbix 2000 2.0 C++.
`idlDirectory <dir>`	Specifies the directory where IDL files will be created (default: target directory or JAR)
`idlMethodSignatures <>`	Specifies the method signatures used to trigger IDL code generation.
`iiop`	Generates CORBA stubs for EJBs.
`iiopDirectory <dir>`	Specifies the directory where IIOP stub files will be written (default: target directory or JAR)
`keepgenerated`	Keeps the generated `.java` files.
`librarydir`	Specifies a directory of shared Java EE libraries to add to the classpath. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."
`compiler <java.jdt>`	Selects the Java compiler to use. Defaults to JDT.
`debug`	Compiles debugging information into a class file.
`optimize`	Compiles with optimization on.
`nowarn`	Compiles without warnings.
`verbose`	Compiles with verbose output.

Table 5–3 (Cont.) wlappc Ant Task Attributes

Option	Description
`deprecation`	Warns about deprecated calls.
`normi`	Passes flags through to Symantec's sj.
`runtimeflags`	Passes flags through to Java runtime
`classpath <path>`	Selects the classpath to use during compilation.
`clientJarOutputDir <dir>`	Specifies a directory to place generated client jar files. If not set, generated jar files are placed into the same directory location where the JVM is running.
`advanced`	Prints advanced usage options.

5.2.2 wlappc Ant Task Syntax

The basic syntax for using the `wlappc` Ant task determines the destination source directory location. This directory contains the files to be compiled by `wlappc`.

```
<wlappc source="${dest.dir}" />
```

The following is an example of a `wlappc` Ant task command that invokes two options (`idl` and `idlOrverWrite`) from Table 5–3.

```
<wlappc source="${dest.dir}"idl="true" idlOrverWrite="true" />
```

5.2.3 Syntax Differences between appc and wlappc

There are some syntax differences between `appc` and `wlappc`. For appc, the presence of a flag in the command is a Boolean. For `wlappc`, the presence of a flag in the command means that the argument is required.

To illustrate, the following are examples of the same command, the first being an `appc` command and the second being a `wlappc` command:

```
java weblogic.appc -idl foo.ear
<wlappc source="${dest.dir} idl="true"/>
```

5.2.4 weblogic.appc Reference

The following sections describe how to use the command-line version of the `appc` compiler. The `weblogic.appc` command-line compiler reports any warnings or errors encountered in the descriptors and compiles all of the relevant modules into an EAR file, which can be deployed to WebLogic Server.

5.2.5 weblogic.appc Syntax

Use the following syntax to run `appc`:

```
prompt>java weblogic.appc [options] <ear, jar, or war file or directory>
```

5.2.6 weblogic.appc Options

The following are the available `appc` options:

Option	Description
`-print`	Prints the standard usage message.
`-version`	Prints `appc` version information.

Option	Description
`-output <file>`	Specifies an alternate output archive or directory. If not set, the output is placed in the source archive or directory.
`-forceGeneration`	Forces generation of EJB and JSP classes. Without this flag, the classes may not be regenerated (if determined to be unnecessary).
`-library <file[[@name=<string>][@libspecver=<version>][@libimplver=<version|string>]]>`	A comma-separated list of shared Java EE libraries. Optional name and version string information must be specified in the format described in Section 11.3, "Referencing Shared Java EE Libraries in an Enterprise Application".
`-writeInferredDescriptors`	Specifies that the application or module contains deployment descriptors with annotation information.
`-lineNumbers`	Adds line numbers to generated class files to aid in debugging.
`-basicClientJar`	Does not include deployment descriptors in client JARs generated for EJBs.
`-idl`	Generates IDL for EJB remote interfaces.
`-idlOverwrite`	Always overwrites existing IDL files.
`-idlVerbose`	Displays verbose information for IDL generation.
`-idlNoValueTypes`	Does not generate valuetypes and the methods/attributes that contain them.
`-idlNoAbstractInterfaces`	Does not generate abstract interfaces and methods/attributes that contain them.
`-idlFactories`	Generates factory methods for valuetypes.
`-idlVisibroker`	Generates IDL somewhat compatible with Visibroker 4.5 C++.
`-idlOrbix`	Generates IDL somewhat compatible with Orbix 2000 2.0 C++.
`-idlDirectory <dir>`	Specifies the directory where IDL files will be created (default: target directory or JAR)
`-idlMethodSignatures <>`	Specifies the method signatures used to trigger IDL code generation.
`-iiop`	Generates CORBA stubs for EJBs.
`-iiopDirectory <dir>`	Specifies the directory where IIOP stub files will be written (default: target directory or JAR)
`-keepgenerated`	Keeps the generated `.java` files.
`-compiler <javac>`	Selects the Java compiler to use.
`-g`	Compiles debugging information into a class file.
`-O`	Compiles with optimization on.
`-nowarn`	Compiles without warnings.
`-verbose`	Compiles with verbose output.
`-deprecation`	Warns about deprecated calls.
`-normi`	Passes flags through to Symantec's sj.
`-J<option>`	Passes flags through to Java runtime.
`-classpath <path>`	Selects the classpath to use during compilation.

Option	Description
`-clientJarOutputDir <dir>`	Specifies a directory to place generated client jar files. If not set, generated jar files are placed into the same directory location where the JVM is running.
`-advanced`	Prints advanced usage options.

6

Deploying and Packaging from a Split Development Directory

This chapter describes how to deploy WebLogic Server Java EE applications using the WebLogic split development directory environment.

This chapter includes the following sections:

- Section 6.1, "Deploying Applications Using wldeploy"
- Section 6.2, "Packaging Applications Using wlpackage"

6.1 Deploying Applications Using wldeploy

The `wldeploy` task provides an easy way to deploy directly from the split development directory. `wlcompile` provides most of the same arguments as the `weblogic.Deployer` directory. To deploy from a split development directory, you simply identify the build directory location as the deployable files, as in:

```
<wldeploy user="${user}" password="${password}"
   action="deploy" source="${dest.dir}"
   name="helloWorldEar" />
```

The above task is automatically created when you use `weblogic.BuildXMLGen` to create the `build.xml` file.

See Appendix B, "wldeploy Ant Task Reference," for a complete command reference.

6.2 Packaging Applications Using wlpackage

The `wlpackage` Ant task uses the contents of both the source and build directories to create either a deployable archive file (`.EAR` file), or an exploded archive directory representing the enterprise application (exploded `.EAR` directory). Use `wlpackage` when you want to deliver your application to another group or individual for evaluation, testing, performance profiling, or production deployment.

6.2.1 Archive versus Exploded Archive Directory

For production purposes, it is convenient to deploy enterprise applications in exploded (unarchived) directory format. This applies also to standalone Web applications, EJBs, and connectors packaged as part of an enterprise application. Using this format allows you to update files directly in the exploded directory rather than having to unarchive, edit, and rearchive the whole application. Using exploded archive directories also has other benefits, as described in Deployment Archive Files

Versus Exploded Archive Directories in *Deploying Applications to Oracle WebLogic Server*.

You can also package applications in a single archived file, which is convenient for packaging modules and applications for distribution. Archive files are easier to copy, they use up fewer file handles than an exploded directory, and they can save disk space with file compression.

The Java classloader can search for Java class files (and other file types) in a JAR file the same way that it searches a directory in its classpath. Because the classloader can search a directory or a JAR file, you can deploy Java EE modules on WebLogic Server in either a JAR (archived) file or an exploded (unarchived) directory.

6.2.2 wlpackage Ant Task Example

In a production environment, use the `wlpackage` Ant task to package your split development directory application as a traditional EAR file that can be deployed to WebLogic Server. Continuing with the MedRec example, you would package your application as follows:

```
<wlpackage tofile="\physicianEAR\physicianEAR.ear"
           srcdir="\physicianEAR"
            destdir="\build\physicianEAR"/>
<wlpackage todir="\physicianEAR\explodedphysicianEar"
           srcdir="\src\physicianEAR"
            destdir="\build\physicianEAR" />
```

6.2.3 wlpackage Ant Task Attribute Reference

The following table describes the attributes of the `wlpackage` Ant task.

Table 6–1 Attributes of the wlpackage Ant Task

Attribute	Description	Data Type	Required?
`tofile`	Name of the EAR archive file into which the `wlpackage` Ant task packages the split development directory application.	String	You must specify one of the following two attributes: `tofile` or `todir`.
`todir`	Name of an exploded directory into which the `wlpackage` Ant task packages the split development directory application.	String	You must specify one of the following two attributes: `tofile` or `todir`.
`srcdir`	Specifies the source directory of your split development directory application. The source directory contains all editable files for your project—Java source files, editable descriptor files, JSPs, static content, and so forth.	String	Yes.
`destdir`	Specifies the build directory of your split development directory application. It is assumed that you have already executed the `wlcompile` Ant task against the source directory to generate the needed components into the build directory; these components include compiled Java classes and generated deployment descriptors.	String	Yes.

7

Developing Applications for Production Redeployment

This chapter describes how to program and maintain applications with WebLogic Server using the production redeployment strategy.

This chapter includes the following sections:

7.1 What is Production Redeployment?

Production redeployment enables an administrator to redeploy a new version of an application in a production environment without stopping the deployed application or otherwise interrupting the application's availability to clients. Production redeployment works by deploying a new version of an updated application alongside an older version of the same application. WebLogic Server automatically manages client connections so that only new client requests are directed to the new version. Clients already connected to the application during the redeployment continue to use the older, retiring version of the application until they complete their work.

See "Using Production Redeployment to Upgrade Applications" for more information.

7.2 Supported and Unsupported Application Types

Production redeployment only supports HTTP clients and RMI clients. Your development and design team must ensure that applications using production redeployment are not accessed by an unsupported client. WebLogic Server does not detect when unsupported clients access the application, and does not preserve unsupported client connections during production redeployment.

Enterprise applications can contain any of the supported Java EE module types. Enterprise applications can also include application-scoped JMS and JDBC modules.

If an enterprise application includes a JCA resource adapter module, the module:

- Must be JCA 1.5 compliant

- Must implement the `weblogic.connector.extensions.Suspendable` interface
- Must be used in an application-scoped manner, having `enable-access-outside-app` set to `false` (the default value).

Before resource adapters in a newer version of the EAR are deployed, resource adapters in the older application version receive a callback. WebLogic Server then deploys the newer application version and retires the entire older version of the EAR.

For a complete list of production redeployment requirements for resource adapters, see "Production Redeployment" in *Developing Resource Adapters for Oracle WebLogic Server*.

7.2.1 Additional Application Support

Additional production redeployment support is provided for enterprise applications that are accessed by inbound JMS messages from a global JMS destination, and that use one or more message-driven beans as consumers. For this type of application, WebLogic Server suspends message-driven beans in the older, retiring application version before deploying message-driven beans in the newer version. Production redeployment is not supported with JMS consumers that use the JMS API for global JMS destinations. If the message-driven beans need to receive all messages published from topics, including messages published while bean are suspended, use durable subscribers.

7.3 Programming Requirements and Conventions

WebLogic Server performs production redeployment by deploying two instances of an application simultaneously. You must observe certain programming conventions to ensure that multiple instances of the application can co-exist in a WebLogic Server domain. The following sections describe each programming convention required for using production redeployment.

7.3.1 Applications Should Be Self-Contained

As a best practice, applications that use the in-place redeployment strategy should be self-contained in their use of resources. This means you should generally use application-scoped JMS and JDBC resources, rather than global resources, whenever possible for versioned applications.

If an application must use a global resource, you must ensure that the application supports safe, concurrent access by multiple instances of the application. This same restriction also applies if the application uses external (separately-deployed) applications, or uses an external property file. WebLogic Server does not prevent the use of global resources with versioned applications, but you must ensure that resources are accessed in a safe manner.

Looking up a global JNDI resource from within a versioned application results in a warning message. To disable this check, set the JNDI environment property `weblogic.jndi.WLContext.ALLOW_GLOBAL_RESOURCE_LOOKUP` to `true` when performing the JNDI lookup.

Similarly, looking up an external application results in a warning unless you set the JNDI environment property, `weblogic.jndi.WLContext.ALLOW_EXTERNAL_APP_LOOKUP`, to `true`.

7.3.2 Versioned Applications Access the Current Version JNDI Tree by Default

WebLogic Server binds application-scoped resources, such as JMS and JDBC application modules, into a local JNDI tree available to the application. As with non-versioned applications, versioned applications can look up application-scoped resources directly from this local tree. Application-scoped JMS modules can be accessed via any supported JMS interfaces, such as the JMS API or a message-driven bean.

Application modules that are bound to the global JNDI tree should be accessed only from within the same application version. WebLogic Server performs version-aware JNDI lookups and bindings for global resources deployed in a versioned application. By default, an internal JNDI lookup of a global resource returns bindings for the same version of the application.

If the current version of the application cannot be found, you can use the JNDI environment property `weblogic.jndi.WLContext.RELAX_VERSION_LOOKUP` to return bindings from the currently active version of the application, rather than the same version.

Note:: Set `weblogic.jndi.WLContext.RELAX_VERSION_LOOKUP` to `true` only if you are certain that the newer and older version of the resource that you are looking up are compatible with one another.

7.3.3 Security Providers Must Be Compatible

Any security provider used in the application must support the WebLogic Server application versioning SSPI. The default WebLogic Server security providers for authorization, role mapping, and credential mapping support the application versioning SSPI.

7.3.4 Applications Must Specify a Version Identifier

In order to use production redeployment, both the current, deployed version of the application and the updated version of the application must specify unique version identifiers. See Section 7.4, "Assigning an Application Version".

7.3.5 Applications Can Access Name and Identifier

Versioned applications can programmatically obtain both an application name, which remains constant across different versions, and an application identifier, which changes to provide a unique label for different versions of the application. Use the application name for basic display or error messages that refer to the application's name irrespective of the deployed version. Use the application ID when the application must provide unique identifier for the deployed version of the application. See Section 7.6, "Accessing Version Information" for more information about the MBean attributes that provide the name and identifier.

7.3.6 Client Applications Use Same Version when Possible

As described in Section 7.1, "What is Production Redeployment?", WebLogic Server attempts to route a client application's requests to the same version of the application until all of the client's in-progress work has completed. However, if an application version is retired using a timeout period, or is undeployed, the client's request will be routed to the active version of the application. In other words, a client's association with a given version of an application is maintained only on a "best-effort basis."

This behavior can be problematic for client applications that recursively access other applications when processing requests. WebLogic Server attempts to dispatch requests to the same versions of the recursively-accessed applications, but cannot guarantee that an intermediate application version is not undeployed manually or after a timeout period. If you have a group of related applications with strict version requirements, Oracle recommends packaging all of the applications together to ensure version consistency during production redeployment.

7.4 Assigning an Application Version

Oracle recommends that you specify the version identifier in the MANIFEST.MF of the application, and automatically increment the version each time a new application is released for deployment. This ensures that production redeployment is always performed when the administrator or deployer redeploys the application.

For testing purposes, a deployer can also assign a version identifier to an application during deployment and redeployment. See "Assigning a Version Identifier During Deployment and Redeployment" in *Deploying Applications to Oracle WebLogic Server*.

7.4.1 Application Version Conventions

WebLogic Server obtains the application version from the value of the Weblogic-Application-Version property in the MANIFEST.MF file. The version string can be a maximum of 215 characters long, and must consist of valid characters as identified in Table 7–1.

Table 7–1 Valid and Invalid Characters

Valid ASCII Characters	Invalid Version Constructs
a-z	..
A-Z	.
0-9	
period ("."), underscore ("_"), or hyphen ("-") in combination with other characters	

For example, the following manifest file content describes an application with version "v920.beta":

```
Manifest-Version: 1.0
     Created-By: 1.4.1_05-b01 (Sun Microsystems Inc.)
     Weblogic-Application-Version: v920.beta
```

7.5 Upgrading Applications to Use Production Redeployment

If you are upgrading applications for deployment to WebLogic Server 9.2 or later, note that the Name attribute retrieved from AppDeploymentMBean now returns a unique application identifier consisting of both the deployed application name and the application version string. Applications that require only the deployed application name must use the new ApplicationName attribute instead of the Name attribute. Applications that require a unique identifier can use either the Name or ApplicationIdentifier attribute, as described in Section 7.6, "Accessing Version Information".

7.6 Accessing Version Information

Your application code can use new MBean attributes to retrieve version information for display, logging, or other uses. The following table describes the read-only attributes provided by `ApplicationMBean`.

Table 7–2 Read-Only Version Attributes in ApplicationMBean

Attribute Name	Description
`ApplicationName`	A String that represents the deployment name of the application
`VersionIdentifier`	A String that uniquely identifies the current application version across all versions of the same application
`ApplicationIdentifier`	A String that uniquely identifies the current application version across all deployed applications and versions

`ApplicationRuntimeMBean` also provides version information in the new read-only attributes described in the following table.

Table 7–3 Read-Only Version Attributes in ApplicationRuntimeMBean

Attribute Name	Description
`ApplicationName`	A String that represents the deployment name of the application
`ApplicationVersion`	A string that represents the version of the application.
`ActiveVersionState`	An integer that indicates the current state of the active application version. Valid states for an active version are: ■ ACTIVATED—indicates that one or more modules of the application are active and available for processing new client requests. ■ PREPARED—indicates that WebLogic Server has prepared one or more modules of the application, but that it is not yet active. ■ UNPREPARED—indicates that no modules of the application are prepared or active. See the *Java API Reference for Oracle WebLogic Server* for more information. Note that the currently active version does not always correspond to the last-deployed version, because the administrator can reverse the production redeployment process. See "Rolling Back the Production Redeployment Process" in *Deploying Applications to Oracle WebLogic Server*.

8

Using Java EE Annotations and Dependency Injection

This chapter describes Java EE MetaData annotations and dependency injection (DI).

This chapter includes the following sections:

8.1 Annotation Processing

With Java EE annotations, the standard `application.xml` and `web.xml` deployment descriptors are optional. The Java EE programming model uses the JDK annotations feature for Web containers, such as EJBs, servlets, Web applications, and JSPs (see `http://docs.oracle.com/javaee/6/api/`).

Annotations simplify the application development process by allowing developers to specify within the Java class itself how the application component behaves in the container, requests for dependency injection, and so on. Annotations are an alternative to deployment descriptors that were required by older versions of enterprise applications (Java EE 1.4 and earlier).

8.1.1 Annotation Parsing

The application components can use annotations to define their needs. Annotations reduce or eliminate the need to deal with deployment descriptors. Annotations simplify the development of application components. The deployment descriptor can still override values defined in the annotation. One usage of annotations is to define fields or methods that need Dependency Injection (DI). Annotations are defined on the POJO (plain old Java object) component classes like the EJB or the servlet.

An annotation on a field or a method can declare that fields/methods need injection, as described in Section 8.2, "Dependency Injection of Resources". Annotations may also be applied to the class itself. The class-level annotations declare an entry in the application component's environment but do not cause the resource to be injected. Instead, the application component is expected to use JNDI or component context lookup method to lookup the entry. When the annotation is applied to the class, the JNDI name and the environment entry type must be specified explicitly.

8.1.2 Deployment View of Annotation Configuration

The Java EE Deployment API [JSR88] provides a way for developers to examine deployment descriptors. For example, consider an EJB Module that has no deployment descriptors. Assuming that it has some classes that have been declared as EJBs using annotations, a user of Session Helper will still be able to deal with the module as if it had the deployment descriptor. So the developer can modify the configuration information and it will be written out in a deployment plan. During deployment, such a plan will be honored and will override information from annotations.

8.1.3 Compiling Annotated Classes

The WebLogic Server utility `appc` (and its Ant equivalent `wlappc`) and `Appmerge` support metadata annotations. The `appmerge` and `appc` utilities take an application or module as inputs and process them to produce an output application or module respectively. When used with `-writeInferredDescriptors` flag, the output application/module will contain deployment descriptors with annotation information. The descriptors will also have the `metadata-complete` attribute set to `true`, as no annotation processing needs to be done if the output application or module is deployed directly. However, setting of `metadata-complete` attribute to `true` will also restrict `appmerge` and `appc` from processing annotations in case these tools are invoked on a previously processed application or module.

The original descriptors must be preserved in such cases to with an `.orig` suffix. If a developer wants to reapply annotation processing on the output application, they must restore the descriptors and use the `-writeInferredDescriptors` flag again. If `appmerge` or `appc` is used with `-writeInferredDescriptors` on an enterprise application for which no standard deployment descriptor exists, the descriptor will be generated and written out based on the inference rules in the Java EE specification.

For more information on using `appc`, see Section 5.2.4, "weblogic.appc Reference". For more information on using `appmerge`, see Section 11.5, "Using weblogic.appmerge to Merge Libraries".

8.1.4 Dynamic Annotation Updates

Deployed modules can be updated using `update` deployment operation. If such an update has changes to deployment descriptor or updated classes, the container must consider annotation information again while processing the new deployment descriptor.

Containers use the descriptor framework's two-phase update mechanism to check the differences between the current and proposed descriptors. This mechanism also informs the containers about any changes in the non-dynamic properties. The containers then deal with such non-dynamic changes in their own specific ways. The container must perform annotation processing on the proposed descriptor to make sure that it is finding the differences against the right reference.

Similarly, some of the classes from a module could be updated during an update operation. If the container knows that these classes could affect configuration information through annotations, it makes sure that nothing has changed.

8.2 Dependency Injection of Resources

Dependency injection (DI) allows application components to declare dependencies on external resources and configuration parameters via annotations. The container reads these annotations and injects resources or environment entries into the application components. Dependency injection is simply an easier-to-program alternative to using the javax interfaces or JNDI APIs to look up resources.

A field or a method of an application component can be annotated with the @Resource annotation. Note that the container will unbox the environment entry as required to match it to a primitive type used for the injection field or method. Example 8–1 illustrates how an application component uses the @Resource annotation to declare environment entries.

Example 8–1 Dependency Injection of Environment Entries

```
// fields

// The maximum number of tax exemptions, configured by the Deployer.
@Resource int maxExemptions;
// The minimum number of tax exemptions, configured by the Deployer.
@Resource int minExemptions;

…..
}
```

In the above code the @Resource annotation has not specified a name; therefore, the container would look for an env-entry name called <*class-name*>/maxExemptions and inject the value of that entry into the maxExemptions variable. The field or method may have any access qualifier (public, private, etc.). For all classes except application client main classes, the fields or methods must not be static. Because application clients use the same life cycle as Java EE applications, no instance of the application client main class is created by the application client container. Instead, the static main method is invoked. To support injection for the application client main class, the fields or methods annotated for injection must be static.

8.2.1 Application Life Cycle Annotation Methods

An application component may need to perform initialization of its own after all resources have been injected. To support this case, one method of the class can be annotated with the @PostConstruct annotation. This method will be called after all injections have occurred and before the class is put into service. This method will be called even if the class doesn't request any resources to be injected. Similarly, for classes whose life cycle is managed by the container, the @PreDestroy annotation can be applied to one method that will be called when the class is taken out of service and will no longer be used by the container. Each class in a class hierarchy may have @PostConstruct and @PreDestroy methods.

The order in which the methods are called matches the order of the class hierarchy, with methods on a superclass being called before methods on a subclass. From the Java EE side only the application client container is involved in invoking these life cycle methods for Java EE clients. The life cycle methods for Java EE clients must be static. The Java EE client just supports the @PostConstruct callback.

8.3 Standard JDK Annotations

This section provides reference information about the following annotations:

- Section 8.3.1, "javax.annotation.PostConstruct"
- Section 8.3.2, "javax.annotation.PreDestroy"
- Section 8.3.3, "javax.annotation.Resource"

- Section 8.3.4, "javax.annotation.Resources"

For detailed information about EJB-specific annotations for WebLogic Server Enterprise JavaBeans, see *Developing Enterprise JavaBeans for Oracle WebLogic Server*.

For detailed information about Web component-specific annotations WebLogic Server applications, see "WebLogic Annotation for Web Components" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

8.3.1 javax.annotation.PostConstruct

Target: Method

Specifies the life cycle callback method that the application component should execute before the first business method invocation and after dependency injection is done to perform any initialization. This method will be called after all injections have occurred and before the class is put into service. This method will be called even if the class doesn't request any resources to be injected.

You must specify a `@PostConstruct` method in any component that includes dependency injection.

Only one method in the component can be annotated with this annotation.

The method annotated with `@PostConstruct` must follow these requirements:

- `The method must not have any parameters, except in the case of EJB interceptors, in which case it takes an javax.interceptor.InvocationContext` object as defined by the EJB specification.
- The return type of the method must be `void`.
- The method must not throw a checked exception.
- The method may be `public`, `protected`, `package private` or `private`.
- The method must not be `static` except for the application client.
- The method may be `final or non-final, except in the case of EJBs where it must be non-final.`
- `If the method throws an unchecked exception the class must not be put into service. In the case of EJBs, the method annotated with PostConstruct` can handle exceptions and cleanup before the bean instance is discarded.

This annotation does not have any attributes.

8.3.2 javax.annotation.PreDestroy

Target: Method

Specifies the life cycle callback method that signals that the application component is about to be destroyed by the container. You typically apply this annotation to methods that release resources that the class has been holding.

Only one method in the bean class can be annotated with this annotation.

The method annotated with `@PreDestroy` must follow these requirements:

- `The method must not have any parameters, except in the case of EJB interceptors, in which case it takes an` javax.interceptor.InvocationContext object as defined by the EJB specification.

- The return type of the method must be void.
- The method must not throw a checked exception.
- The method may be public, protected, package private or private.
- The method must not be static except for the application client.
- The method may be final or non-final, except in the case of EJBs where it must be non-final.
- If the method throws an unchecked exception the class must not be put into service. In the case of EJBs, the method annotated with PreDestroy can handle exceptions and cleanup before the bean instance is discarded.

This annotation does not have any attributes.

8.3.3 javax.annotation.Resource

Target: Class, Method, Field

Specifies a dependence on an external resource, such as a JDBC data source or a JMS destination or connection factory.

If you specify the annotation on a field or method, the application component injects an instance of the requested resource into the bean when the bean is initialized. If you apply the annotation to a class, the annotation declares a resource that the component will look up at runtime.

Attributes

Table 8–1 Attributes of the javax.annotation.Resource Annotation

Name	Description	Data Type	Required?
name	Specifies the JNDI name of the resource. If you apply the @Resource annotation to a field, the default value of the name attribute is the field name, qualified by the class name. If you apply it to a method, the default value is the component property name corresponding to the method, qualified by the class name. If you apply the annotation to class, there is no default value and thus you are required to specify the attribute.	String	No
type	Specifies the Java data type of the resource. If you apply the @Resource annotation to a field, the default value of the type attribute is the type of the field. If you apply it to a method, the default is the type of the component property. If you apply it to a class, there is no default value and thus you are required to specify this attribute.	Class	No
authentication Type	Specifies the authentication type to use for the resource. Valid values for this attribute are: ■ AuthenticationType.CONTAINER ■ AuthenticationType.APPLICATION Default value is AuthenticationType.CONTAINER	Authentication Type	No

Table 8–1 (Cont.) Attributes of the javax.annotation.Resource Annotation

Name	Description	Data Type	Required?
shareable	Indicates whether a resource can be shared between this component and other components. Valid values for this attribute are `true` and `false`. Default value is `true`.	Boolean	No

mappedName	Specifies a WebLogic Server-specific name to which the component reference should be mapped.
	However, if you do not specify a JNDI name in the WebLogic deployment descriptor file, then the value of `mappedName` will always be used as the JNDI name to look up. For example:
	`@Resource(mappedName = "http://www.bea.com";)`
	`URL url;`
	`@Resource(mappedName="customerDB")`
	`DataSource db;`
	`@Resource(mappedName = "jms/ConnectionFactory")`
	`ConnectionFactory connectionFactory;`
	`@Resource(mappedName = "jms/Queue")`
	`Queue queue;`
	In other words, `MappedName` is honored as JNDI name only when there is no JNDI name specified elsewhere, typically in the WebLogic deployment descriptor file.
		String	No

description	Specifies a description of the resource.	String	No

8.3.4 javax.annotation.Resources

Target: Class

Specifies an array of `@Resource` annotations. Since repeated annotations are not allowed, the Resources annotation acts as a container for multiple resource declarations.

Attributes

Table 8–2 Attributes of the javax.annotation.Resources Annotation

Name	Description	Data Type	Required?
value	Specifies the array of `@Resource` annotations.	`Resource[]`	Yes

8.4 Standard Security-Related JDK Annotations

This section provides reference information about the following annotations:

- Section 8.4.1, "javax.annotation.security.DeclareRoles"
- Section 8.4.2, "javax.annotation.security.DenyAll"
- Section 8.4.3, "javax.annotation.security.PermitAll"
- Section 8.4.4, "javax.annotation.security.RolesAllowed"
- Section 8.4.5, "javax.annotation.security.RunAs"

8.4.1 javax.annotation.security.DeclareRoles

Target: Class

Defines the security roles that will be used in the Java EE container.

You typically use this annotation to define roles that can be tested from within the methods of the annotated class, such as using the `isUserInRole` method. You can also use the annotation to explicitly declare roles that are implicitly declared if you use the `@RolesAllowed` annotation on the class or a method of the class.

You create security roles in WebLogic Server using the Administration Console. For details, see "Manage Security Roles".

Attributes

Table 8–3 Attributes of the javax.annotation.security.DeclareRoles Annotation

Name	Description	Data Type	Required?
value	Specifies an array of security roles that will be used in the Java EE container.	String[]	Yes

8.4.2 javax.annotation.security.DenyAll

Target: Method

Specifies that no security role is allowed to access the annotated method, or in other words, the method is excluded from execution in the Java EE container.

This annotation does not have any attributes.

8.4.3 javax.annotation.security.PermitAll

Target: Method

Specifies that all security roles currently defined for WebLogic Server are allowed to access the annotated method.

This annotation does not have any attributes.

8.4.4 javax.annotation.security.RolesAllowed

Target: Class, Method

Specifies the list of security roles that are allowed to access methods in the Java EE container.

If you specify it at the class-level, then it applies to all methods in the application component. If you specify it at the method-level, then it only applies to that method. If you specify the annotation at both the class- and method-level, the method value overrides the class value.

You create security roles in WebLogic Server using the Administration Console. For details, see "Manage Security Roles".

Attributes

Table 8–4 Attributes of the javax.annotation.security.RolesAllowed Annotation

Name	Description	Data Type	Required?
value	List of security roles that are allowed to access methods of the Java EE container.	String[]	Yes

8.4.5 javax.annotation.security.RunAs

Target: Class

Specifies the security role which actually executes the Java EE container.

The security role must exist in the WebLogic Server security realm and map to a user or group. For details, see "Manage Security Roles".

Attributes

Table 8–5 Attributes of the javax.annotation.security.RunAs Annotation

Name	Description	Data Type	Required?
value	Specifies the security role that the Java EE container should run as.	String	Yes

9

Using Contexts and Dependency Injection for the Java EE Platform

WebLogic Server provides an implementation of the Contexts and Dependency Injection (CDI) specification. The CDI specification defines a set of services for using injection to specify dependencies in an application. CDI provides contextual life cycle management of beans, type-safe injection points, a loosely coupled event framework, loosely coupled interceptors and decorators, alternative implementations of beans, bean navigation through the Unified Expression Language (EL), and a service provider interface (SPI) that enables CDI extensions to support third-party frameworks or future Java EE components.

The following sections explain how to use CDI for the Java EE platform in your applications:

- Section 9.20, "Supporting Third-Party Portable Extensions"

9.1 About CDI for the Java EE Platform

CDI is specified by Java Specification Request (JSR) 299: Contexts and Dependency Injection for the Java EE platform. This specification was formerly called Web Beans. CDI uses the following related specifications:

- JSR 330: Dependency Injection for Java
- Java EE 6 Managed Beans Specification, which is a part of JSR 316: Java Platform, Enterprise Edition 6 (Java EE 6) Specification
- Interceptors specification, which is a part of JSR 318: Enterprise JavaBeans specification

CDI provides the following features:

- **Contexts.** This feature enables you to bind the life cycle and interactions of stateful components to well-defined but extensible life cycle contexts.
- **Dependency injection.** This feature enables you to inject components into an application in a type-safe way and to choose at deployment time which implementation of a particular interface to inject.

CDI is integrated with the major component technologies in Java EE, namely:

- Servlets
- JavaServer Pages (JSP)
- JavaServer Faces (JSF)
- Enterprise JavaBeans (EJB)
- Java EE Connector architecture (JCA)
- Web services

Such integration enables standard Java EE objects, such as Servlets and EJB components, to use CDI injection for dependencies. CDI injection simplifies, for example, the use of managed beans with JSF technology in Web applications.

For more information, see Introduction to Contexts and Dependency Injection for the Java EE Platform in the *Java EE 6 Tutorial*.

A complete example that shows how to use CDI is provided in the `cdi` sample application, which is installed in *`EXAMPLES_HOME`*`\wl_server\examples\src\examples\javaee6\cdi`, where *`EXAMPLES_HOME`* represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

9.2 Defining a Managed Bean

A bean is a source of the objects that CDI can create and manage. For more information, see About Beans in *The Java EE 6 Tutorial*.

A managed bean is the basic component in a CDI application and defines the beans that CDI can create and manage. To define a managed bean, define a top-level plain old Java object (POJO) class that meets either of the following conditions:

- The class is defined to be a managed bean by any other Java EE specification.

- The class meets all of the conditions that are required by JSR 299 as listed in About Managed Beans in *The Java EE 6 Tutorial*.

> **Note:** No special declaration, such as an annotation, is required to define a managed bean. To make the managed beans of an application available for injection, you must configure the application as explained in Section 9.19, "Configuring a CDI Application."

9.3 Injecting a Bean

To use the beans that you define, inject them into another bean that an application such as a JavaServer Faces application can use. For more information, see Injecting Beans in *The Java EE 6 Tutorial*.

CDI ensures type-safe injection of beans by selecting the bean class on the basis of the Java type that is specified in the injection point, not the bean name. CDI also determines where to inject a bean from the Java type in the injection point.

In this respect, CDI bean injection is different than Java EE 5 resource injection. Java EE 5 resource injection selects the resource to inject from the string name of the resource. For example, a data source that is injected with the `javax.annotation.Resource` annotation is identified by its string name.

To inject a bean, obtain an instance of the bean by creating an injection point in the class that is to use the injected bean. Create the injection point by annotating one of the following program elements with the `javax.inject.Inject` annotation:

- An instance class field
- An initializer method parameter
- A bean constructor parameter

Example 9–1 shows how to use the `@Inject` annotation to inject a bean into another bean.

Example 9–1 Injecting a Bean into Another Bean

This example annotates an instance class field to inject an instance of the bean class `Greeting` into the class `Printer`.

```
import javax.inject.Inject;
...
public class Printer {
    @Inject Greeting greeting;
    ...
}
```

9.4 Defining the Scope of a Bean

The scope of a bean defines the duration of a user's interaction with an application that uses the bean. To enable a Web application to use a bean that injects another bean class, the bean must be able to hold state over the duration of the user's interaction with the application.

To define the scope of a bean, annotate the class declaration of the bean with the scope. The `javax.enterprise.context` package defines the following scopes:

- `@RequestScoped`

- `@SessionScoped`
- `@ApplicationScoped`
- `@ConversationScoped`
- `@Dependent`

For information about these scopes, see Using Scopes in *The Java EE 6 Tutorial*.

If you do not define the scope of a bean, the scope of the bean is `@Dependent` by default. The `@Dependent` scope specifies that the bean's life cycle is the life cycle of the object into which the bean is injected.

The predefined scopes **except** `@Dependent` are contextual scopes. CDI places beans of contextual scope in the context whose life cycle is defined by the Java EE specifications. For example, a session context and its beans exist during the lifetime of an HTTP session. Injected references to the beans are contextually aware. The references always apply to the bean that is associated with the context for the thread that is making the reference. The CDI container ensures that the objects are created and injected at the correct time as determined by the scope that is specified for these objects.

Example 9–2 shows how to define the scope of a bean.

Example 9–2 Defining the Scope of a Bean

This example defines the scope of the `Accountant` bean class to be `@RequestScoped`.

The `Accountant` class in this example is qualified by the `@BeanCounter` qualifier. For more information, see Section 9.6, "Using Qualifiers."

```
package com.example.managers;

import javax.enterprise.context.RequestScoped;

@RequestScoped
@BeanCounter
public class Accountant implements Manager
{
 ...
}
```

9.5 Overriding the Scope of a Bean at the Point of Injection

Overriding the scope of a bean at the point of injection enables an application to request a new instance of the bean with the default scope `@Dependent`. The `@Dependent` scope specifies that the bean's life cycle is the life cycle of the object into which the bean is injected. The CDI container provides no other life cycle management for the instance. For more information about scopes, see Section 9.4, "Defining the Scope of a Bean."

> **Note:** The effects of overriding the scope of a bean may be unpredictable and undesirable, particularly if the overridden scope is `@Request` or `@Session`.

To override the scope of a bean at the point of injection, inject the bean by using the `javax.enterprise.inject.New` annotation instead of the `@Inject` annotation.

For more information about the `@Inject` annotation, see Section 9.3, "Injecting a Bean."

9.6 Using Qualifiers

Qualifiers enable you to provide more than one implementation of a particular bean type. When you use qualifiers, you select between implementations at development time. For more information, see Using Qualifiers in *The Java EE 6 Tutorial*.

> **Note:** To select between alternative implementations at deployment time, use alternatives as explained in Section 9.7, "Providing Alternative Implementations of a Bean Type."

Using qualifiers involves the tasks that are explained in the following sections:

- Section 9.6.1, "Defining Qualifiers for Implementations of a Bean Type"
- Section 9.6.2, "Applying Qualifiers to a Bean"
- Section 9.6.3, "Injecting a Qualified Bean"

9.6.1 Defining Qualifiers for Implementations of a Bean Type

A qualifier is an application-defined annotation that enables you to identify an implementation of a bean type. Define a qualifier for each implementation of a bean type that you are providing.

Define qualifiers only if you are providing multiple implementations of a bean type and if you are not using alternatives. If no qualifiers are defend for a bean type, CDI applies the predefined qualifier `@Default` when a bean of the type is injected.

> **Note:** CDI does not require a qualifier to be unique to a particular bean. You can define a qualifier to use for more than one bean type.

To define a qualifier:

1. Define a Java annotation type to represent the qualifier.
2. Annotate the declaration of the annotation type with the `javax.inject.Qualifier` annotation.
3. Specify that the qualifier is to be retained by the virtual machine at run time.

   Use the `java.lang.annotation.Retention(RUNTIME)` meta-annotation for this purpose.
4. Specify that the qualifier may be applied to the program elements `METHOD`, `FIELD`, `PARAMETER`, and `TYPE`.

   Use the `java.lang.annotation.Target({METHOD, FIELD, PARAMETER, TYPE})` meta-annotation for this purpose.

The following examples show how to define qualifiers `@BeanCounter` and `@PeopleManager` for different implementations of the same bean type.

Example 9–3 Defining the @BeanCounter Qualifier

This example defines the `@BeanCounter` qualifier.

```
package com.example.managers;

import static java.lang.annotation.ElementType.FIELD;
import static java.lang.annotation.ElementType.METHOD;
import static java.lang.annotation.ElementType.PARAMETER;
import static java.lang.annotation.ElementType.TYPE;
import static java.lang.annotation.RetentionPolicy.RUNTIME;

import java.lang.annotation.Retention;
import java.lang.annotation.Target;

import javax.inject.Qualifier;

@Qualifier
@Retention(RUNTIME)
@Target({METHOD, FIELD, PARAMETER, TYPE})
public @interface BeanCounter {}
```

Example 9–4 Defining the @PeopleManager Qualifier

This example defines the `@PeopleManager` qualifier.

```
package com.example.managers;

import static java.lang.annotation.ElementType.FIELD;
import static java.lang.annotation.ElementType.METHOD;
import static java.lang.annotation.ElementType.PARAMETER;
import static java.lang.annotation.ElementType.TYPE;
import static java.lang.annotation.RetentionPolicy.RUNTIME;

import java.lang.annotation.Retention;
import java.lang.annotation.Target;

import javax.inject.Qualifier;

@Qualifier
@Retention(RUNTIME)
@Target({METHOD, FIELD, PARAMETER, TYPE})
public @interface PeopleManager {}
```

9.6.2 Applying Qualifiers to a Bean

Applying qualifiers to a bean identifies the implementation of the bean type. You can apply any number of qualifiers or no qualifiers to a bean. If you do not apply any qualifiers to a bean, CDI implicitly applies the predefined qualifier `@Default` to the bean.

> **Note:** CDI does not require a qualifier to be unique to a particular bean. You can apply the same qualifier to different types of beans in the set of beans that are available in the application.

To apply qualifiers to a bean, annotate the class declaration of the bean with each qualifier to apply. Any qualifier that you apply to a bean must be defined as explained in Section 9.6.1, "Defining Qualifiers for Implementations of a Bean Type."

The following examples show how to apply the qualifiers `@BeanCounter` and `@PeopleManager` to different implementations of the `Manager` bean type.

Example 9–5 Applying the @BeanCounter Qualifier to a Bean

This example applies the `@BeanCounter` qualifier to the `Accountant` class. The `Accountant` class is an implementation of the `Manager` bean type. The `@BeanCounter` qualifier is defined in Example 9–3.

```
package com.example.managers;
...
@BeanCounter
public class Accountant implements Manager
{...}
```

Example 9–6 Applying the@ PeopleManager Qualifier to a Bean

This example applies the `@PeopleManager` qualifier to the `Boss` class. The `Boss` class is an implementation of the `Manager` bean type. The `@PeopleManager` qualifier is defined in Example 9–4.

```
package com.example.managers;
...
@PeopleManager
public class Boss implements Manager
{...}
```

9.6.3 Injecting a Qualified Bean

To inject a qualified bean, create an injection point and annotate the injection point with the bean's qualifiers. The qualifiers at the injection point define the overall requirements of the injection target. The CDI application must contain a CDI managed bean that matches the type of the injection point and the qualifiers with which the injection point is annotated. Otherwise, a deployment error occurs. For more information about how to create an injection point, see Section 9.3, "Injecting a Bean."

If you do not annotate the injection point, the predefined qualifier `@Default` is applied to the injection point by default.

CDI resolves the injection point by first matching the bean type and then matching implementations of that type with the qualifiers in the injection point.

Only one active bean class may match the bean type and qualifiers in the injection point. Otherwise, an error occurs.

A bean class is active in one of the following situations:

- The bean class is an alternative that is enabled.
- The bean class is not an alternative and no alternatives for its bean type are enabled.

For information about alternatives, see Section 9.7, "Providing Alternative Implementations of a Bean Type."

Example 9–7 shows how to inject a qualified bean.

Example 9–7 Injecting a Qualified Bean

This example injects the `@BeanCounter` implementation of the `Manager` bean type. The `Manager` bean type is implemented by the following classes:

- `Accountant`, which is shown in Example 9–5
- `Boss`, which is shown in Example 9–6

In this example, the `Accountant` class is injected because the bean type and qualifier of this class match the bean type and qualifier in the injection point.

```
package com.example.managers;
...
import javax.inject.Inject;
...
public class PennyPincher {
   @Inject @BeanCounter Manager accountant;
   ...
}
```

9.7 Providing Alternative Implementations of a Bean Type

The environments for the development, testing, and production deployment of an enterprise application may be very different. Differences in configuration, resource availability, and performance requirements may cause bean classes that are appropriate to one environment to be unsuitable in another environment.

Different deployment scenarios may also require different business logic in the same application. For example, country-specific sales tax laws may require country-specific sales tax business logic in an order-processing application.

By providing alternative implementations of a bean type, you can modify an application at deployment time to meet such differing requirements. CDI enables you to select from any number of alternative bean type implementations for injection instead of a corresponding primary implementation. For more information, see Using Alternatives in *The Java EE 6 Tutorial*.

Note: To select between alternative implementations at development time, use qualifiers as explained in Section 9.6, "Using Qualifiers."

Providing alternative implementations of a bean type involves the tasks that are explained in the following sections:

- Section 9.7.1, "Defining an Alternative Implementation of a Bean Type"
- Section 9.7.2, "Selecting an Alternative Implementation of a Bean Type for an Application"

9.7.1 Defining an Alternative Implementation of a Bean Type

To define an alternative implementation of a bean type:

1. Write a bean class of the same bean type as primary implementation of the bean type.

   To ensure that any alternative can be injected into an application, you must ensure that all alternatives and the primary implementation are all of the same bean type. For information about how to inject a bean, see Section 9.3, "Injecting a Bean."

2. Annotate the class declaration of the implementation with the `javax.enterprise.inject.Alternative` annotation.

Note: To ensure that the primary implementation is selected by default, do not annotate the class declaration of the primary implementation with `@Alternative`.

The following examples show the declaration of the primary implementation and an alternative implementation of a bean type. The alternative implementation is a mock implementation that is intended for use in testing.

Example 9–8 Declaring a Primary Implementation of a Bean Type

This example declares the primary implementation `OrderImpl` of the bean type `Order`.

```
package com.example.orderprocessor;
...
public class OrderImpl implements Order {
 ...
}
```

Example 9–9 Declaring an Alternative Implementation of a Bean Type

This example declares the alternative implementation `MockOrderImpl` of the bean type `Order`. The declaration of the primary implementation of this bean type is shown in Example 9–8.

```
package com.example.orderprocessor;
...
import javax.enterprise.inject.Alternative;

@Alternative
public class MockOrderImpl implements Order {
 ...
}
```

9.7.2 Selecting an Alternative Implementation of a Bean Type for an Application

By default, CDI selects the primary implementation of a bean type for injection into an application. If you require an alternative implementation to be injected, you must select the alternative explicitly.

To select an alternative implementation for an application:

1. Add a `class` element for the alternative to the `alternatives` element in the `beans.xml` file.
2. In the `class` element, provide the fully qualified class name of the alternative.

For more information about the `beans.xml` file, see Section 9.19, "Configuring a CDI Application."

Example 9–16 shows a `class` element in the `beans.xml` file for selecting an alternative implementation of a bean type.

Example 9–10 Selecting an Alternative Implementation of a Bean Type

This example selects the alternative implementation `com.example.orderprocessor.MockOrderImpl`.

```
...
<alternatives>
    <class>com.example.orderprocessor.MockOrderImpl</class>
</alternatives>
...
```

9.8 Applying a Scope and Qualifiers to a Session Bean

CDI enables you to apply a scope and qualifiers to a session bean. A session bean is an EJB component that meets either of the following requirements:

- The class that implements the bean is annotated with one of the following annotations:
  - `javax.ejb.Singleton`, which denotes a singleton session bean
  - `javax.ejb.Stateful`, which denotes a stateful session bean
  - `javax.ejb.Stateless`, which denotes a stateless session bean
- The bean is listed in the `ejb-jar.xml` deployment-descriptor file.

For more information about session beans, see the following documents:

- *Developing Enterprise JavaBeans for Oracle WebLogic Server*
- *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*

9.8.1 Applying a Scope to a Session Bean

The scopes that CDI allows you to apply to a session bean depend on the type of the session bean as shown in Table 9–1.

Table 9–1 Allowed CDI Scopes for Session Beans

Session Bean Type	Allowed Scopes
Singleton	Either of the following scopes: ■ Dependent ■ Application
Stateful	Any
Stateless	Dependent

For more information about scopes in CDI, see Section 9.4, "Defining the Scope of a Bean."

When CDI injects a reference to a stateful session bean, CDI creates the bean, injects the bean's fields, and manages the stateful session bean according to its scope. When the context is destroyed, CDI calls the stateful session bean's remove method to remove the bean.

9.8.2 Applying Qualifiers to a Session Bean

CDI allows you to apply any qualifier to a session bean. CDI does not restrict the type of qualifier that you can apply to a session bean. For more information about qualifiers in CDI, see Section 9.6, "Using Qualifiers."

9.9 Using Producer Methods, Disposer Methods, and Producer Fields

A producer method is a method that generates an object that can then be injected.

A disposer method enables an application to perform customized cleanup of an object that a producer method returns.

A producer field is a field of a bean that generates an object. A producer field is a simpler alternative to a producer method.

For more information, see Using Producer Methods and Fields in *The Java EE 6 Tutorial*.

9.9.1 Defining a Producer Method

A producer method enables an application to customize how CDI managed beans are created. This customization involves overriding the process that CDI normally uses to resolve beans. A producer method enables you to inject an object that is not an instance of a CDI bean class.

A producer method must be a method of a CDI bean class or session bean class. However, a producer method may return objects that are not instances of CDI bean classes. In this situation, the producer method must return an object that matches a bean type.

A producer method can have any number of parameters. If necessary, you can apply qualifiers to these parameters. All parameters of a producer method are injection points. Therefore, the parameters of a producer method do not require the `@Inject` annotation.

To define a producer method, annotate the declaration of the method with the `javax.enterprise.inject.Produces` annotation.

If the producer method sometimes returns null, set the scope of the method to dependent.

> **Note:** Calling a producer method directly in application code does not invoke CDI.

For an example of the definition of a producer method, see Example 9–11.

9.9.2 Defining a Disposer Method

If you require customized cleanup of an object that a producer method returns, define a disposer method in the class that declares the producer method.

To define a disposer method, annotate the disposed parameter in the declaration of the method with the `javax.enterprise.inject.Disposes` annotation. The type of the disposed parameter must be the same as the return type of the producer method.

A disposer method matches a producer method when the disposed object's injection point matches both the type and qualifiers of the producer method. You can define one disposer method to match to several producer methods in the class.

Example 9–11 shows how to use the `@Produces` annotation to define a producer method and the `@Disposes` annotation to define a disposer method.

Example 9–11 Defining a Producer Method and Disposer Method

This example defines the producer method `connect` and the disposer method `close`.

The producer method `connect` returns an object of type `Connection`. In the disposer method `close`, the parameter `connection` is the disposed parameter. This parameter is of type `Connection` to match the return type of the producer method.

At run time, the CDI framework creates an instance of `SomeClass` and then calls the producer method. Therefore, the CDI framework is responsible for injecting the parameters that are passed to the producer method.

The scope of the producer method is @RequestScoped. When the request context is destroyed, if the Connection object is in the request context, CDI calls the disposer method for this object. In the call to the disposer method, CDI passes the Connection object as a parameter.

```
import javax.enterprise.inject.Produces;
import javax.enterprise.inject.Disposes;

import javax.enterprise.context.RequestScoped;

public class SomeClass {
    @Produces @RequestScoped
    public Connection connect(User user) {
        return createConnection(user.getId(),
                user.getPassword());
    }

    private Connection createConnection(
            String id, String password) {...}

    public void close(@Disposes Connection connection) {
        connection.close();
    }
}
```

9.9.3 Defining a Producer Field

A producer field is a simpler alternative to a producer method. A producer field must be a field of a managed bean class or session bean class. A producer field may be either static or nonstatic, subject to the following constraints:

- In a session bean class, the producer field must be a static field.
- In a managed bean class, the producer field can be either static or nonstatic.

To define a producer field, annotate the declaration of the field with the javax.enterprise.inject.Produces annotation.

If the producer field may contain a null when accessed, set the scope of the field to dependent.

Note: Using a producer field directly in application code does not invoke CDI.

Producer fields do not have disposers.

9.10 Initializing and Preparing for the Destruction of a Managed Bean

CDI managed bean classes and their superclasses support the annotations for initializing and preparing for the destruction of a managed bean. These annotations are defined in JSR 250: Common Annotations for the Java Platform. For more information, see Chapter 8, "Using Java EE Annotations and Dependency Injection".

9.10.1 Initializing a Managed Bean

Initializing a managed bean specifies the life cycle callback method that the CDI framework should call after dependency injection but before the class is put into service.

To initialize a managed bean:

1. In the managed bean class or any of its superclasses, define a method that performs the initialization that you require.
2. Annotate the declaration of the method with the `javax.annotation.PostConstruct` annotation.

   When the managed bean is injected into a component, CDI calls the method after all injection has occurred and after all initializers have been called.

> **Note:** As mandated by JSR 250, if the annotated method is declared in a superclass, the method is called unless a subclass of the declaring class overrides the method.

9.10.2 Preparing for the Destruction of a Managed Bean

Preparing for the destruction of a managed bean specifies the life cycle callback method that signals that an application component is about to be destroyed by the container.

To prepare for the destruction of a managed bean:

1. In the managed bean class or any of its superclasses, define a method that prepares for the destruction of the managed bean.

   In this method, perform any cleanup that is required before the bean is destroyed, such a releasing resources that the bean has been holding.
2. Annotate the declaration of the method with the `javax.annotation.PreDestroy` annotation.

   CDI calls the method before starting the logic for destroying the bean.

> **Note:** As mandated by JSR 250, if the annotated method is declared in a superclass, the method is called unless a subclass of the declaring class overrides the method.

9.11 Intercepting Method Invocations and Life Cycle Events of Bean Classes

Intercepting a method invocation or a life cycle event of a bean class interposes an interceptor class in the invocation or event. When an interceptor class is interposed, additional actions that are defined in the interceptor class are performed. An interceptor class simplifies the maintenance of code for tasks that are frequently performed and are separate from the business logic of the application. Examples of such tasks are logging and auditing.

> **Note:** The programming model for interceptor classes is optimized for operations that are separate from the business logic of the application. To intercept methods that perform operations with business semantics, use a decorator class as explained in Section 9.12, "Decorating a Managed Bean Class."

The interceptors that were introduced in the Java EE 5 specification are specific to EJB components. For more information about Java EE 5 interceptors, see "Specifying

Interceptors for Business Methods or Life Cycle Callback Events" in *Developing Enterprise JavaBeans for Oracle WebLogic Server*.

CDI enables you to use interceptors with the following types of Java EE managed objects:

- CDI managed beans
- EJB session beans
- EJB message-driven beans

Note: You **cannot** use interceptors with EJB entity beans because CDI does not support EJB entity beans.

For more information, see Using Interceptors in *The Java EE 6 Tutorial*.

Intercepting method invocations and life cycle events of bean classes involves the tasks that are explained in the following sections:

- Section 9.11.1, "Defining an Interceptor Binding Type"
- Section 9.11.2, "Defining an Interceptor Class"
- Section 9.11.3, "Identifying Methods for Interception"
- Section 9.11.4, "Enabling an Interceptor"

9.11.1 Defining an Interceptor Binding Type

An interceptor binding type is an application-defined annotation that associates an interceptor class with an intercepted bean. Define an interceptor binding type for each type of interceptor that you require.

Note: CDI does not require an interceptor binding type to be unique to a particular interceptor class. You can define an interceptor binding type to use for more than one interceptor class.

To define an interceptor binding type:

1. Define a Java annotation type to represent the interceptor binding type.
2. Annotate the declaration of the annotation type with the `javax.interceptor.InterceptorBinding` annotation.
3. Specify that the interceptor binding type is to be retained by the virtual machine at run time.

   Use the `java.lang.annotation.Retention(RUNTIME)` meta-annotation for this purpose.
4. Specify that the interceptor binding type may be applied to the program elements `METHOD` and `TYPE`.

   Use the `java.lang.annotation.Target({METHOD, TYPE})` meta-annotation for this purpose.

Example 9–12 Defining An Interceptor Binding Type

This example defines the `@Transactional` interceptor binding type.

```
package com.example.billpayment.interceptor;

import static java.lang.annotation.ElementType.METHOD;
import static java.lang.annotation.ElementType.TYPE;
import static java.lang.annotation.RetentionPolicy.RUNTIME;

import java.lang.annotation.Retention;
import java.lang.annotation.Target;

import javax.interceptor.InterceptorBinding;

@InterceptorBinding
@Target({METHOD, TYPE})
@Retention(RUNTIME)
public @interface Transactional {}
```

9.11.2 Defining an Interceptor Class

An interceptor class is used to interpose in method invocations or life cycle events that occur in an associated target bean class. In an interceptor class, provide the code for tasks that are frequently performed and are separate from the business logic of the application, such as logging and auditing.

To define an interceptor class:

1. Define a Java class to represent the interceptor.
2. Annotate the declaration of the class with the following annotations:
   - `javax.interceptor.Interceptor`
   - The interceptor binding types that are defined for the class

     You can apply any number of interceptor binding types to an interceptor class.

     Note: CDI does not require an interceptor binding type to be unique to a particular interceptor class. You can apply the same interceptor binding type to multiple interceptor classes.

3. Implement the interceptor methods in the class.

   CDI does not require the signature of an interceptor method to match the signature of the intercepted method.

4. Identify the interceptor methods in the class.

   An interceptor method is the method that is invoked when a method invocation or a life cycle event of a bean class is intercepted.

   To identify an interceptor method, annotate the declaration of the method with the appropriate annotation for the type of the interceptor method.

Interceptor Method Type	Annotation
Method invocation	`javax.interceptor.AroundInvoke`
EJB timeout	`javax.interceptor.AroundTimeout`
Initialization of a managed bean or EJB component	`javax.annotation.PostConstruct`

Interceptor Method Type	Annotation
Destruction of a managed bean or EJB component	`javax.annotation.PreDestroy`
Activation of a stateful session bean	`javax.ejb.PostActivate`
Passivation of a stateful session bean	`javax.ejb.PrePassivate`

> **Note:** An interceptor class can have multiple interceptor methods. However, an interceptor class can have no more than one interceptor method of a given type.

Example 9–13 shows how to define an interceptor class.

Example 9–13 Defining an Interceptor Class

This example defines the interceptor class for which the `@Transactional` interceptor binding type is defined. The `manageTransaction` method of this class is an interceptor method. The `@Transactional` interceptor binding is defined in Example 9–12.

```
package com.example.billpayment.interceptor;

import javax.annotation.Resource;
import javax.interceptor.*;
...
@Transactional @Interceptor
public class TransactionInterceptor {
    @Resource UserTransaction transaction;
    @AroundInvoke
    public Object manageTransaction(InvocationContext ctx)
            throws Exception {
        ...
    }
}
```

9.11.3 Identifying Methods for Interception

Identifying methods for interception associates the methods with the interceptor that is invoked when the methods are invoked. CDI enables you to identify all methods of a bean class or only individual methods of a bean class for interception.

- To identify all methods of a bean class for interception, annotate the declaration of the bean class with the appropriate interceptor binding type.
- To identify an individual method of a bean class for interception, annotate the declaration of the method with the appropriate interceptor binding type.

CDI does not require the signature of an intercepted method to match the signature of the interceptor method. To determine the arguments and return type of an intercepted method, an interceptor must query an interceptor context. Therefore, you can intercept any method or life cycle event in a bean class without any knowledge at compilation time of the interfaces of bean class.

> **Note:** An implementation of a Java EE 5 interceptor must be declared in the annotation on the method that is to be intercepted. A CDI interceptor uses an interceptor binding to identify an interceptor method and to relate an intercepted method to its interceptor method. Both the intercepted method and the interceptor method must be annotated with the binding. In this way, the intercepted method and the interceptor are related to each other only through the interceptor binding.

Example 9–14 Identifying All Methods of a Bean Class for Interception

This example identifies all methods of the `ShoppingCart` class for interception by the `@Transactional` interceptor.

```
package com.example.billpayment.interceptor;

@Transactional
public class ShoppingCart {
    ...
}
```

Example 9–15 Identifying an Individual Method of a Class for Interception

This example identifies only the `checkout` method of the `ShoppingCart` class for interception by the `@Transactional` interceptor.

```
package com.example.billpayment.interceptor;

public class ShoppingCart {
    ...
    @Transactional public void checkout() {
    ...
    }
}
```

9.11.4 Enabling an Interceptor

By default, an interceptor is disabled. If you require an interceptor to be interposed in method invocations and events, you must enable the interceptor explicitly.

To enable an interceptor:

1. Add a `class` element for the interceptor to the `interceptors` element in the `beans.xml` file.
2. In the `class` element, provide the fully qualified class name of the interceptor.

   Ensure that the order of t he `class` elements in the `beans.xml` file matches the order in which the interceptors are to be invoked.

   CDI interceptors are invoked in the order in which they are declared in the `beans.xml` file. Interceptors that are defined in the `ejb-jar.xml` file or by the `javax.interceptor.Interceptors` annotation are called before the CDI interceptors. Interceptors are called before CDI decorators.

> **Note:** Java EE 5 interceptors are invoked in the order in which they are annotated on an intercepted method.

For more information about the `beans.xml` file, see Section 9.19, "Configuring a CDI Application."

Example 9–16 shows a `class` element in the `beans.xml` file for enabling an interceptor class.

Example 9–16 Enabling an Interceptor Class

This example enables the interceptor class `com.example.billpayment.interceptor.TransactionInterceptor`. The interceptor class is defined in Example 9–13.

```
...
<interceptors>
    <class>com.example.billpayment.interceptor.TransactionInterceptor</class>
</interceptors>
...
```

9.12 Decorating a Managed Bean Class

Decorating a managed bean class enables you to intercept invocations of methods in the decorated class that perform operations with business semantics. You can decorate any managed bean class.

> **Note:** The programming model for decorator classes is optimized for operations that perform the business logic of the application. To intercept methods that are separate from the business logic of an application, use an interceptor class as explained in Section 9.11, "Intercepting Method Invocations and Life Cycle Events of Bean Classes."

For more information, see Using Decorators in *The Java EE 6 Tutorial*.

Decorating a managed bean class involves the tasks that are explained in the following sections:

- Section 9.12.1, "Defining a Decorator Class"
- Section 9.12.2, "Enabling a Decorator Class"

9.12.1 Defining a Decorator Class

A decorator class intercepts invocations of methods in the decorated class that perform operations with business semantics. A decorator class and an interceptor class are similar because both classes provide an around-method interception. However, a method in a decorator class has the same signature as the intercepted method in the decorated bean class.

To define a decorator class:

1. Write a Java class that implements the same interface as the bean class that you are decorating.

   If you want to intercept only some methods of the decorated class, declare the decorator class as an abstract class. If you declare the class as abstract, you are not required to implement all the methods of the bean class that you are decorating.

2. Annotate the class declaration of the decorator class with the `javax.decorator.Decorator` annotation.

3. Implement the methods of the decorated bean class that you want to intercept.

   If the decorator class is a concrete class, you must implement all the methods of the bean class that you are decorating.

   You must ensure that the intercepting method in a decorator class has the same signature as the intercepted method in the decorated bean class.

4. Add a delegate injection point to the decorator class.

   A decorator class must contain exactly one delegate injection point. A delegate injection point injects a delegate object, which is an instance of the decorated class, into the decorator object.

   You can customize how any method in the decorator object handles the implementation of the decorated method. CDI allows but does not require the decorator object to invoke the corresponding delegate object. Therefore, you are free to choose whether the decorator object invokes the corresponding delegate object.

   a. In the decorator class, inject an instance of the bean class that you are decorating.

   b. Annotate the injection point with the `javax.decorator.Delegate` annotation.

   c. Apply qualifiers that you require to the injection point, if any.

      If you apply qualifiers to the injection point, the decorator applies only to beans whose bean class matches the qualifiers of the injection point.

   Note: No special declaration, such as an annotation, is required to define a decorated bean class. An enabled decorator class applies to any bean class or session bean that matches the bean type and qualifiers of the delegate injection point.

Example 9–17 shows the definition of a decorator class.

Example 9–17 Defining a Decorator Class

This example defines the decorator class `DataAccessAuthDecorator`. This class decorates any bean of type `DataAccess`.

Because only some methods of the decorated class are to be intercepted, the class is declared as an abstract class. This class injects a delegate instance `delegate` of the decorated implementation of the `DataAcess` bean type.

```
import javax.decorator.*;
import javax.inject.Inject;
import java.lang.Override;
...
@Decorator
public abstract class DataAccessAuthDecorator
        implements DataAccess {

    @Inject @Delegate DataAccess delegate;

    @Override
    public void delete(Object object) {
        authorize(SecureAction.DELETE, object);
        delegate.delete(object);
    }

    private void authorize(SecureAction action, Object object) {
        ...
    }
}
```

9.12.2 Enabling a Decorator Class

By default, a decorator class is disabled. If you require a decorator class to be invoked in a CDI application, you must enable the decorator class explicitly.

To enable an decorator class:

1. Add a `class` element for the decorator class to the `decorators` element in the `beans.xml` file.
2. In the `class` element, provide the fully qualified class name of the decorator class.

   Ensure that the order of the `class` elements in the `beans.xml` file matches the order in which the decorator classes are to be invoked.

> **Note:** Any interceptor classes that are defined for an application are invoked before the application's decorator classes.

For more information about the `beans.xml` file, see Section 9.19, "Configuring a CDI Application."

Example 9–18 shows a `class` element in the `beans.xml` file for enabling a decorator class.

Example 9–18 Enabling a Decorator Class

This example enables the decorator class `com.example.billpayment.decorator.DataAccessAuthDecorator`.

```
...
<decorators>
     <class>com.example.billpayment.decorator.DataAccessAuthDecorator</class>
</decorators>
...
```

9.13 Assigning an EL Name to a CDI Bean Class

EL enables components in the presentation layer to communicate with managed beans that implement application logic. Components in the presentation layer are typically JavaServer Faces (JSF) pages and JavaServer Pages (JSP) pages. For more information, see "JSP Expression Language" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

In the scripting languages in JSP pages and JSF pages, the syntax of an injected variable is identical to the syntax of a built-in variable of these languages. Any CDI bean that is injected into a JSP page or JSF page must be accessible through an EL name. For more information, see Giving Beans EL Names in *The Java EE 6 Tutorial*.

To assign an EL name to a CDI bean class, annotate the class declaration of the bean class with the `javax.inject.Named` annotation.

If you do not specify a name, the EL name is the unqualified class name with the first character in lower case. For example, if the unqualified class name is `ShoppingCart`, the EL name is `shoppingCart`.

To specify a name, set the `value` element of the `@Named` annotation to the name that you require.

Note: To assign an EL name to a CDI bean class, you must annotate the bean class declaration with the `@Named` annotation. If the class is not annotated with `@Named`, the CDI bean class does not have an EL name.

Example 9–19 shows how to use the `@Named` annotation to assign an EL name to a CDI bean class.

Example 9–19 Assigning an EL Name to a Bean Class

This example assigns the EL name `cart` to the `ShoppingCart` class.

```
import javax.enterprise.context.SessionScoped;


@SessionScoped
@Named("cart")
public class ShoppingCart {
    public String getTotal() {
       ...
    }

    ...
}
```

Any bean that a JSP page or JSF page accesses must conform to the JavaBeans standard. To access a CDI managed bean from a JSP page or JSF page through the bean's EL name, use a syntax that is similar to the syntax for JavaBeans components.

Example 9–20 shows how an instance of the `ShoppingCart` class is accessed in a JSF page through the EL name that is assigned to the class.

Example 9–20 Accessing a Bean Through its EL Name

This example accesses an instance of the `ShoppingCart` class to display the value of its `total` property in a JSF page.

This property is returned by the `getTotal` getter method of the `ShoppingCart` class as shown in Example 9–19.

```
...
<h:outputText value="#{cart.total}"/>
...
```

9.14 Defining and Applying Stereotypes

In a large application in which several beans perform similar functions, you may require the same set of annotations to be applied to several bean classes. Defining a stereotype requires you to define the set of annotations only once. You can then use the stereotype to guarantee that the same set of annotations is applied to all bean classes that require the annotations. For more information, see Using Stereotypes in *The Java EE 6 Tutorial*.

Defining and applying stereotypes involves the tasks that are explained in the following sections:

- Section 9.14.1, "Defining a Stereotype"
- Section 9.14.2, "Applying Stereotypes to a Bean"

9.14.1 Defining a Stereotype

A stereotype is an application-defined annotation type that incorporates other annotation types.

To define a stereotype:

1. Define a Java annotation type to represent the stereotype.
2. Annotate the declaration of the annotation type with the following annotations:
   - `javax.enterprise.inject.Stereotype`
   - The other annotation types that you want the stereotype to incorporate

     You can specify the following annotation types in a stereotype:

     - A default scope—see Section 9.4, "Defining the Scope of a Bean"
     - `@Alternative`—see Section 9.7, "Providing Alternative Implementations of a Bean Type"
     - One or more interceptor bindings—see Section 9.11, "Intercepting Method Invocations and Life Cycle Events of Bean Classes"
     - `@Named`—see Section 9.13, "Assigning an EL Name to a CDI Bean Class"
3. Specify that the stereotype is to be retained by the virtual machine at run time.

   Use the `java.lang.annotation.Retention(RUNTIME)` meta-annotation for this purpose.
4. Specify that the stereotype may be applied to the program element `TYPE`.

   Use the `java.lang.annotation.Target(TYPE)` meta-annotation for this purpose.

The following example shows the definition of a stereotype.

Example 9–21 Defining a Stereotype

This example defines the stereotype `@Action`, which specifies the following for each bean that the stereotype annotates:

- The default scope is request scope unless the scope is overridden with a scope annotation.
- The default EL name is assigned to the bean unless the name is overridden with the `@Named` annotation.
- The interceptor bindings `@Secure` and `@Transactional` are applied to the bean. The definition of these interceptor bindings is beyond the scope of this example.

```
import javax.enterprise.inject.Stereotype;
import javax.inject.Named;
import javax.enterprise.context.RequestScoped;
import static java.lang.annotation.ElementType.TYPE;
import static java.lang.annotation.RetentionPolicy.RUNTIME;
import java.lang.annotation.Retention;
import java.lang.annotation.Target;

@RequestScoped
@Secure
@Transactional
@Named
@Stereotype
@Target(TYPE)
@Retention(RUNTIME)
public @interface Action {}
```

9.14.2 Applying Stereotypes to a Bean

To apply stereotypes to a bean, annotate the class declaration of the bean with each stereotype to apply. You can apply any number of stereotypes to a bean. Any stereotype that you apply to a bean must be defined as explained in Section 9.14.1, "Defining a Stereotype."

Example 9–22 shows how to apply stereotypes to a bean.

Example 9–22 Applying Stereotypes to a Bean

This example applies the stereotypes `@Action` and `@Mock` to the bean class `MockLoginAction`. The definition of the `@Action` stereotype is shown in Example 9–21. The definition of the `@Mock` stereotype is beyond the scope of this example.

```
@Action
@Mock
public class MockLoginAction extends LoginAction {
 ...
}
```

9.15 Using Events for Communications Between Beans

At run time, your application may perform operations that generate information or cause state changes that must be communicated between beans. For example, an application may require stateful beans in one architectural tier of the application to synchronize their internal state with state changes that occur in a different tier.

Events enable beans to communicate this information without any compilation-time dependency. One bean can define an event, another bean can send the event, and yet another bean can handle the event. The beans can be in separate packages and even in separate tiers of the application. For more information, see Using Events in *The Java EE 6 Tutorial*.

Using events for communications between beans involves the tasks that are explained in the following sections:

- Section 9.15.1, "Defining an Event Type"
- Section 9.15.2, "Sending an Event"
- Section 9.15.3, "Handling an Event"

9.15.1 Defining an Event Type

An event type is a Java class that represents the information that you want to communicate between beans. For example, an event type may represent the state information that a stateful bean must synchronize with state changes in a different tier of an application.

Define an event type for each set of changes that you want to communicate between beans.

To define an event type:

1. Define a Java class to represent the event type.

   Ensure that the class meets these requirements:

   - The class is declared as a concrete Java class.
   - The class has no type variables.

     The event types of the event include all superclasses and interfaces of the run time class of the event object. An event type must not contain a type variable. Any Java type can be an observed event type.

2. If necessary, define any qualifiers to further distinguish events of this type. For more information, see Section 9.6.1, "Defining Qualifiers for Implementations of a Bean Type."

3. Provide code in the class to populate the event payload of event objects that are instantiated from the class.

   The event payload is the information that you want the event to contain. You can use a JavaBeans property with getter and setter methods to represent an item of information in the event payload.

9.15.2 Sending an Event

To communicate a change that occurs in response to an operation, your application must send an event of the correct type when performing the operation. CDI provides a predefined event dispatcher object that enables application code to send an event and select the associated qualifiers at run time.

To send an event:

1. Obtain an instance of the event type to send.

2. Call methods of the event instance to populate the event payload of the event object that you are sending.

3. Inject an instance of the parameterized `javax.enterprise.event.Event` interface.

   If you are sending a qualified event, annotate the injection point with the event qualifier.

4. Call the `fire` method of the injected `Event` instance.

   In the call to the `fire` method, pass as a parameter the event instance that you are sending.

Example 9–23 shows how to send an event.

Example 9–23 Sending an Event

This example injects an instance of the event of type `User` with the qualifier `@LoggedIn`. The `fire` method sends only `User` events to which the `@LoggedIn` qualifier is applied.

```
import javax.enterprise.event.Event;
import javax.enterprise.context.SessionScoped;
import javax.inject.Inject;
import java.io.Serializable;

@SessionScoped
public class Login implements Serializable {

    @Inject @LoggedIn Event<User> userLoggedInEvent;
    private User user;

    public void login(Credentials credentials) {

        //... use credentials to find user

        if (user != null) {
            userLoggedInEvent.fire(user);
        }
    }
    ...
}
```

9.15.3 Handling an Event

Any CDI managed bean class can handle events.

To handle an event:

1. In your bean class, define a method to handle the event.

   > **Note:** If qualifiers are applied to an event type, define one method for each qualified type.

2. In the signature of the method, define a parameter for passing the event to the method.

   Ensure that the type of the parameter is the same as the Java type of the event.

3. Annotate the parameter in the method signature with the `javax.enterprise.event.Observes` annotation.

   If necessary, set elements of the `@Observes` annotation to specify whether the method is conditional or transactional. For more information, see Using Observer Methods to Handle Events in *The Java EE 6 Tutorial*.

4. If the event type is qualified, apply the qualifier to the annotated parameter.

5. In the method body, provide code for handling the event payload of the event object.

Example 9–24 shows how to declare an observer method for receiving qualified events of a particular type. Example 9–25 shows how to declare an observer method for receiving all events of a particular type.

Example 9–24 Handling a Qualified Event of a Particular Type

This example declares the `afterLogin` method in which the parameter `user` is annotated with the `@Observes` annotation and the `@LoggedIn` qualifier. This method is called when an event of type `User` with the qualifier `@LoggedIn` is sent.

```
import javax.enterprise.event.Observes;

    public void afterLogin(@Observes @LoggedIn User user) {
        ...
    }
```

Example 9–25 Handling Any Event of a Particular Type

This example declares the `afterLogin` method in which the parameter `user` is annotated with the `@Observes` annotation. This method is called when any event of type `User` is sent.

```
import javax.enterprise.event.Observes;

    public void afterLogin(@Observes User user) {
        ...
    }
```

9.16 Injecting a Predefined Bean

CDI provides predefined beans that implement the following interfaces:

`javax.transaction.UserTransaction`
Java Transaction API (JTA) user transaction.

`java.security.Principal`
The abstract notion of a principal, which represents any entity, such as an individual, a corporation, and a login ID.

The principal represents the identity of the current caller. Whenever the injected principal is accessed, it always represents the identity of the current caller.

For example, a principal is injected into a field at initialization. Later, a method that uses the injected principal is called on the object into which the principal was injected. In this situation, the injected principal represents the identity of the current caller when the method is run.

`javax.validation.Validator`
Validator for bean instances.

The bean that implements this interface enables a `Validator` object for the default bean validation `ValidatorFactory` object to be injected.

`javax.validation.ValidatorFactory`
Factory class for returning initialized `Validator` instances.

The bean that implements this interface enables the default bean validation `ValidatorFactory` object to be injected.

To inject a predefined bean, create an injection point by using the `javax.annotation.Resource` annotation to obtain an instance of the bean. For the bean type, specify the class name of the interface that the bean implements.

Predefined beans are injected with dependent scope and the predefined default qualifier `@Default`.

For more information about injecting resources, see Resource Injection in *The Java EE 6 Tutorial*.

Example 9–26 shows how to use the `@Resource` annotation to inject a predefined bean.

Example 9–26 Injecting a Predefined Bean

This example injects a user transaction into the servlet class `TransactionServlet`. The user transaction is an instance of the predefined bean that implements the `javax.transaction.UserTransaction` interface.

```
import javax.annotation.Resource;
import javax.servlet.http.*;
...
public class TransactionServlet extends HttpServlet {
    @Resource UserTransaction transaction;
        ...
}
```

9.17 Injecting and Qualifying Resources

Java EE 5 resource injection relies on strings for configuration. Typically, these strings are JNDI names that are resolved when an object is created. CDI ensures type-safe injection of beans by selecting the bean class on the basis of the Java type that is specified in the injection point.

Even in a CDI bean class, Java EE 5 resource injection is required to access real resources such as data sources, Java Message Service (JMS) resources, and Web service references. Because CDI bean classes can use Java EE 5 resource injection, you can use producer fields to minimize the reliance on Java EE 5 resource injection. In this way, CDI simplifies how to encapsulate the configuration that is required to access the correct resource.

To minimize the reliance on Java EE 5 resource injection:

1. Use Java EE 5 resource injection in only one place in the application.
2. Use producer fields to translate the injected resource type into a CDI bean.

   You can the inject this CDI bean into the application in the same way as any other CDI bean.

   For more information about producer fields, see Section 9.9.3, "Defining a Producer Field."

Example 9–27 shows how to use Java EE 5 annotations to inject resources. Example 9–28 shows how to inject the same set of resources by combining Java EE 5 resource injection with CDI producer fields.

Example 9–27 Using Java EE 5 Annotations to Inject Resources

```
import javax.annotation.Resource;
import javax.persistence.PersistenceContext;
import javax.persistence.PersistenceUnit;
import javax.ejb.EJB;
import javax.xml.ws.WebServiceRef;
...
public class SomeClass {

    @WebServiceRef(lookup="java:app/service/PaymentService")
    PaymentService paymentService;
    @EJB(ejbLink="../payment.jar#PaymentService")
    PaymentService paymentService;

    @Resource(lookup="java:global/env/jdbc/CustomerDatasource")
    Datasource customerDatabase;

    @PersistenceContext(unitName="CustomerDatabase")
    EntityManager customerDatabasePersistenceContext;

    @PersistenceUnit(unitName="CustomerDatabase")
    EntityManagerFactory customerDatabasePersistenceUnit;

    ...
}
```

Example 9–28 Combining Java EE 5 Resource Injection With Producer Fields

The declaration of the `SomeClass` class is annotated with `@ApplicationScoped` to set the scope of this bean to application. The `@Dependent` scope is implicitly applied to the producer fields.

```
import javax.enterprise.context.ApplicationScoped;
import javax.enterprise.inject.Produces;
import javax.annotation.Resource;
import javax.persistence.PersistenceContext;
import javax.persistence.PersistenceUnit;
import javax.ejb.EJB;
javax.xml.ws.WebServiceRef;
...
@ApplicationScoped
public class SomeClass {

    @Produces
    @WebServiceRef(lookup="java:app/service/PaymentService")
    PaymentService paymentService;

    @Produces
    @EJB(ejbLink="../their.jar#PaymentService")
    PaymentService paymentService;

    @Produces @CustomerDatabase
    @Resource(lookup="java:global/env/jdbc/CustomerDatasource")
    Datasource customerDatabase;

    @Produces @CustomerDatabase
    @PersistenceContext(unitName="CustomerDatabase")
    EntityManager customerDatabasePersistenceContext;

    @Produces @CustomerDatabase
    @PersistenceUnit(unitName="CustomerDatabase")
    EntityManagerFactory customerDatabasePersistenceUnit;
    ...
}
```

CDI enables you to use Java EE resources in CDI applications in a way that is consistent with CDI. To use Java EE resources in this way, inject the resources as CDI beans into other beans.

Example 9–29 shows how to inject a Java EE resource as a CDI bean into another bean.

Example 9–29 injecting a Java EE Resource as a CDI Bean Into Another Bean

This example injects a persistence unit resource into a request-scoped bean.

```
import javax.enterprise.context.RequestScoped;
import javax.enterprise.inject.Inject;

@RequestScoped
public class SomeOtherClass {
    ...
    @Inject @CustomerDatabase
    private EntityManagerFactory emf;
    ...
}
```

Another class, for example `YetAnotherClass`, could inject a field of type `SomeOtherClass`. If an instance of `SomeOtherClass` does not already exist in the current request context, CDI performs the following sequence of operations:

1. Constructing the instance of `SomeOtherClass`
2. Injecting the reference to the entity manager factory by using the producer field from Example 9–28
3. Saving the new instance of `SomeOtherClass` in the current request context

In every case, CDI injects the reference to this instance of `SomeOtherClass` into the field in `YetAnotherClass`. When the request context is destroyed, the instance of `SomeOtherClass` and its reference to the entity manager factory are destroyed.

9.18 Using CDI With JCA Technology

WebLogic Server supports CDI in embedded resource adapters and global resource adapters. To enable a resource adapter for CDI, provide a `beans.xml` file in the `META-INF` directory of the packaged archive of the resource adapter. For more information about the `beans.xml` file, see Section 9.19, "Configuring a CDI Application."

All classes in the resource adapter are available for injection. All classes in the resource adapter can be CDI managed beans except for the following classes:

- **Resource adapter beans.** These beans are classes that are annotated with the `javax.resource.spi.Connector` annotation or are declared as corresponding elements in the resource adapter deployment descriptor `ra.xml`.
- **Managed connection factory beans.** These beans are classes that are annotated with the `javax.resource.spi.ConnectionDefinition` annotation or the `javax.resource.spi.ConnectionDefinitions` annotation, or are declared as corresponding elements in `ra.xml`.
- **Activation specification beans.** These beans are classes that are annotated with the `javax.resource.spi.Activation` annotation or are declared as corresponding elements in `ra.xml`.
- **Administered object beans.** These beans are classes that are annotated with the `javax.resource.spi.AdministeredObject` annotation or are declared as corresponding elements in `ra.xml`.

9.19 Configuring a CDI Application

Configuring a CDI application enables CDI services for the application.You must configure a CDI application to identify the application as a CDI application. No special declaration, such as an annotation, is required to define a CDI managed bean. And no module type is defined specifically for packaging CDI applications.

To configure a CDI application, provide a file that is named `beans.xml` in the packaged archive of the application. The `beans.xml` file must be an instance of the extensible markup language (XML) schema `beans_1_0.xsd`.

If your application does **not** use any alternatives, interceptors, or decorators, the `beans.xml` file can be empty. However, you must provide the `beans.xml` file even if the file is empty.

If your CDI application uses alternatives, interceptors, or decorators, you must enable these items by declaring them in the `beans.xml` file. For more information, see:

- Section 9.7.2, "Selecting an Alternative Implementation of a Bean Type for an Application"
- Section 9.11.4, "Enabling an Interceptor"
- Section 9.12.2, "Enabling a Decorator Class"

The required location of the `beans.xml` file depends on the type of the application:

- For a Web application, the `beans.xml` file must be in the `WEB-INF` directory.
- For an EJB module, resource archive (RAR) file, application client JAR file, or library JAR file, the `beans.xml` file must be in the `META-INF` directory.

You can provide CDI bean archives in the `lib` directory of an EJB module. You must provide a `beans.xml` file in the `META-INF` directory of each CDI bean archive the `lib` directory of an EJB module.

Example 9–30 shows a `beans.xml` file for configuring a CDI application.

Example 9–30 beans.xml File for Configuring a CDI Application

This example configures a CDI application by enabling the following classes:

- The alternative implementation `com.example.orderprocessor.MockOrderImpl`
- The interceptor class `com.example.billpayment.interceptor.TransactionInterceptor`
- The decorator class `com.example.billpayment.decorator.DataAccessAuthDecorator`

```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://java.sun.com/xml/ns/javaee"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="
      http://java.sun.com/xml/ns/javaee
      http://java.sun.com/xml/ns/javaee/beans_1_0.xsd">
<alternatives>
    <class>com.example.orderprocessor.MockOrderImpl</class>
</alternatives>
<interceptors>
    <class>com.example.billpayment.interceptor.TransactionInterceptor</class>
</interceptors>
<decorators>
    <class>com.example.billpayment.decorator.DataAccessAuthDecorator</class>
```

```
</decorators>
</beans>
```

9.20 Supporting Third-Party Portable Extensions

CDI is intended to be a foundation for frameworks, extensions, and integration with other technologies. Therefore, CDI exposes SPIs that enable the development of portable extensions to CDI, such as:

- Integration with business process management engines
- Integration with third-party frameworks such as Spring, Seam, GWT or Wicket
- New technology that is based upon the CDI programming model

The SPIs that enable the development of portable extensions to CDI are provided in the `javax.enterprise.inject.spi` package.

Code in CDI extensions can handle events that are sent by the CDI framework.

For more information, see "Portable extensions" in JSR 299: Contexts and Dependency Injection for the Java EE platform.

10 Understanding WebLogic Server Application Classloading

This chapter describes Java classloaders and WebLogic Server Java EE application classloading.

This chapter includes the following sections:

10.1 Java Classloading

Classloaders are a fundamental module of the Java language. A classloader is a part of the Java virtual machine (JVM) that loads classes into memory; a classloader is responsible for finding and loading class files at run time. Every successful Java programmer needs to understand classloaders and their behavior. This section provides an overview of Java classloaders.

10.1.1 Java Classloader Hierarchy

Classloaders contain a hierarchy with parent classloaders and child classloaders. The relationship between parent and child classloaders is analogous to the object relationship of super classes and subclasses. The bootstrap classloader is the root of the Java classloader hierarchy. The Java virtual machine (JVM) creates the bootstrap classloader, which loads the Java development kit (JDK) internal classes and `java.*` packages included in the JVM. (For example, the bootstrap classloader loads `java.lang.String`.)

The extensions classloader is a child of the bootstrap classloader. The extensions classloader loads any JAR files placed in the extensions directory of the JDK. This is a convenient means to extending the JDK without adding entries to the classpath. However, anything in the extensions directory must be self-contained and can only refer to classes in the extensions directory or JDK classes.

The system classpath classloader extends the JDK extensions classloader. The system classpath classloader loads the classes from the classpath of the JVM.

Application-specific classloaders (including WebLogic Server classloaders) are children of the system classpath classloader.

Note: What Oracle refers to as a "system classpath classloader" is often referred to as the "application classloader" in contexts outside of WebLogic Server. When discussing classloaders in WebLogic Server, Oracle uses the term "system" to differentiate from classloaders related to Java EE applications or libraries (which Oracle refers to as "application classloaders").

10.1.2 Loading a Class

Classloaders use a delegation model when loading a class. The classloader implementation first checks its cache to see if the requested class has already been loaded. This class verification improves performance in that its cached memory copy is used instead of repeated loading of a class from disk. If the class is not found in its cache, the current classloader asks its parent for the class. Only if the parent cannot load the class does the classloader attempt to load the class. If a class exists in both the parent and child classloaders, the parent version is loaded. This delegation model is followed to avoid multiple copies of the same form being loaded. Multiple copies of the same class can lead to a `ClassCastException`.

Classloaders ask their parent classloader to load a class before attempting to load the class themselves. Classloaders in WebLogic Server that are associated with Web applications can be configured to check locally first before asking their parent for the class. This allows Web applications to use their own versions of third-party classes, which might also be used as part of the WebLogic Server product. The Section 10.1.3, "prefer-web-inf-classes Element" section discusses this in more detail.

10.1.3 prefer-web-inf-classes Element

The `weblogic.xml` Web application deployment descriptor contains a `<prefer-web-inf-classes>` element (a sub-element of the `<container-descriptor>` element). By default, this element is set to `False`. Setting this element to `True` subverts the classloader delegation model so that class definitions from the Web application are loaded in preference to class definitions in higher-level classloaders. This allows a Web application to use its own version of a third-party class, which might also be part of WebLogic Server. See "weblogic.xml Deployment Descriptor Elements".

When using this feature, you must be careful not to mix instances created from the Web application's class definition with issuances created from the server's definition. If such instances are mixed, a `ClassCastException` results.

Example 10–1 illustrates the `prefer-web-inf-classes` element, its description and default value.

Example 10–1 prefer-web-inf-classes Element

```
/**
* If true, classes located in the WEB-INF directory of a web-app will be
* loaded in preference to classes loaded in the application or system
* classloader.
* @default false
*/
boolean isPreferWebInfClasses();
void setPreferWebInfClasses(boolean b);
```

10.1.4 Changing Classes in a Running Program

WebLogic Server allows you to deploy newer versions of application modules such as EJBs while the server is running. This process is known as hot-deploy or hot-redeploy and is closely related to classloading.

Java classloaders do not have any standard mechanism to undeploy or unload a set of classes, nor can they load new versions of classes. In order to make updates to classes in a running virtual machine, the classloader that loaded the changed classes must be replaced with a new classloader. When a classloader is replaced, all classes that were loaded from that classloader (or any classloaders that are offspring of that classloader) must be reloaded. Any instances of these classes must be re-instantiated.

In WebLogic Server, each application has a hierarchy of classloaders that are offspring of the system classloader. These hierarchies allow applications or parts of applications to be individually reloaded without affecting the rest of the system. Section 10.2, "WebLogic Server Application Classloading" discusses this topic.

10.1.5 Configuring Class Caching

WebLogic Server now allows you to enable class caching for faster start ups. Once you enable caching, the server records all the classes loaded until a specific criterion is reached and persists the class definitions in an invisible file. When the server restarts, the cache is checked for validity with the existing code sources and the server uses the cache file to bulk load the same sequence of classes recorded in the previous run. If any change is made to the system classpath or its contents, the cache will be invalidated and re-built on server restart.

The advantages of using class caching are:

- Reduces server startup time.
- The package level index reduces search time for all classes and resources.

The cache uses optimization techniques to minimize the initial cache recording time. Cache recording continues until a specific class has been recorded.

> **Note:** Class caching is supported in development mode when starting the server using a `startWebLogic` script. Class caching is disabled by default and is not supported in production mode. The decrease in startup time varies among different JRE vendors.

1. To enable class caching, set an environment variable (`CLASS_CACHE=true` for UNIX, `set CLASS_CACHE=true` for Windows) in the `startWebLogic` script.
2. Configure class caching using the following properties:
   - Logging: To debug class caching issues, turn on logging by placing the following system properties in the `JAVA_OPTIONS` for the section of the startup script that enables caching.

     ```
     -Dclass.load.log.level=finest
     -Dclass.load.log.file=/tmp/class-load-log.txt
     ```

     There are three levels of logging: fine, finer, finest. Do not enable logging during regular cache operation. Logging will slow the start up of the server. Use logging for debugging only.
   - Recording limit: Though the recording limit for class caching is set to a specific class, you can configure this class in your environment to a different class.

-Dlaunch.complete=<fully qualified class name> for example com.oracle.component.Foo

The class used in this property must be in the system classpath for WebLogic Server.

Example 10–2 illustrates modified UNIX and Windows `startWebLogic` scripts with class caching enabled and logging turned on.

Example 10–2 startWebLogic scripts

```
On UNIX

# CLASS CACHING
CLASS_CACHE=true
if [ "${CLASS_CACHE}" = "true" ] ; then
        echo "Class caching enabled..."
        JAVA_OPTIONS="${JAVA_OPTIONS} -Dlaunch.main.class=${SERVER_CLASS}
        -Dlaunch.class.path="${CLASSPATH}"
        -Dlaunch.complete=weblogic.store.internal.LockManagerImpl
        -Dclass.load.log.level=finest
        -Dclass.load.log.file=/tmp/class-load-log.txt
        -cp ${WL_HOME}/server/lib/pcl2.jar"
        export JAVA_OPTIONS
        SERVER_CLASS="com.oracle.classloader.launch.Launcher"
fi


On Windows

@REM CLASS CACHING
set CLASS_CACHE=true
if "%CLASS_CACHE%"=="true" (
    echo Class caching enabled...
    set JAVA_OPTIONS=%JAVA_OPTIONS% -Dlaunch.main.class=%SERVER_CLASS%
    -Dlaunch.class.path="%CLASSPATH%" -Dclass.load.log.level=finest
    -Dclass.load.log.file=C:\class-load-log.txt
    -Dlaunch.complete=weblogic.store.internal.LockManagerImpl
    -cp %WL_HOME%\server\lib\pcl2.jar
    set SERVER_CLASS=com.oracle.classloader.launch.Launcher
)
```

10.2 WebLogic Server Application Classloading

The following sections provide an overview of the WebLogic Server application classloaders:

- Section 10.2.1, "Overview of WebLogic Server Application Classloading"
- Section 10.2.2, "Application Classloader Hierarchy"
- Section 10.2.3, "Custom Module Classloader Hierarchies"
- Section 10.2.6, "Individual EJB Classloader for Implementation Classes"
- Section 10.2.7, "Application Classloading and Pass-by-Value or Reference"
- Section 10.2.8, "Using a Filtering ClassLoader"

10.2.1 Overview of WebLogic Server Application Classloading

WebLogic Server classloading is centered on the concept of an application. An application is normally packaged in an Enterprise Archive (EAR) file containing application classes. Everything within an EAR file is considered part of the same application. The following may be part of an EAR or can be loaded as standalone applications:

- An Enterprise JavaBean (EJB) JAR file
- A Web application WAR file
- A resource adapter RAR file

> **Note:** See the following sections for more information:
>
> - For information on resource adapters and classloading, see Section 10.3.1, "About Resource Adapter Classes".
> - For information on overriding generic application files while classloading, see "Generic File Loading Overrides" in *Deploying Applications to Oracle WebLogic Server*.

If you deploy an EJB and a Web application separately, they are considered two applications. If they are deployed together within an EAR file, they are one application. You deploy modules together in an EAR file for them to be considered part of the same application.

Every application receives its own classloader hierarchy; the parent of this hierarchy is the system classpath classloader. This isolates applications so that application A cannot see the classloaders or classes of application B. In hierarchy classloaders, no sibling or friend concepts exist. Application code only has visibility to classes loaded by the classloader associated with the application (or module) and classes that are loaded by classloaders that are ancestors of the application (or module) classloader. This allows WebLogic Server to host multiple isolated applications within the same JVM.

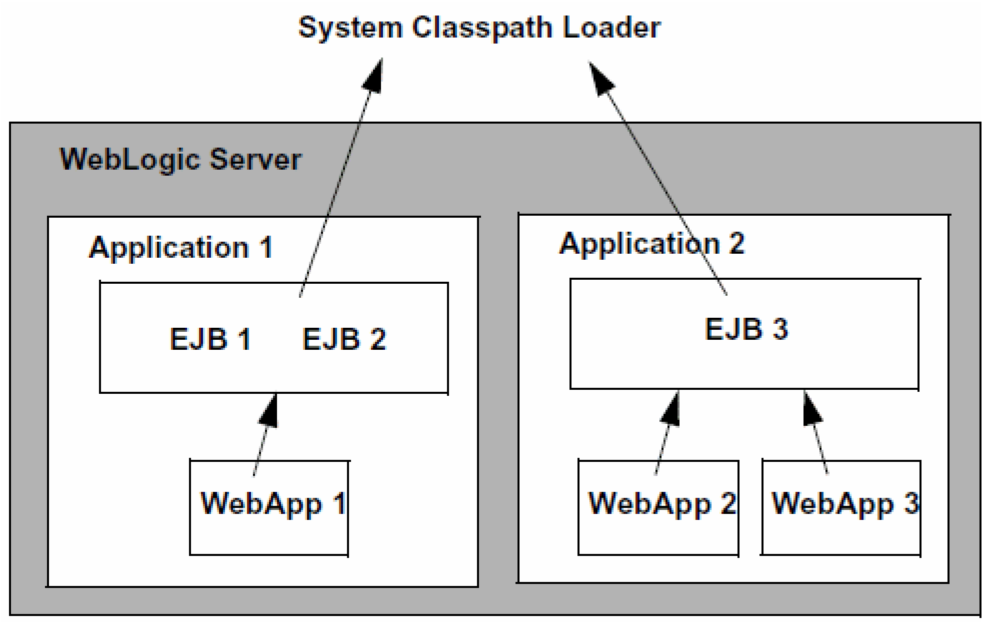
10.2.2 Application Classloader Hierarchy

WebLogic Server automatically creates a hierarchy of classloaders when an application is deployed. The root classloader in this hierarchy loads any EJB JAR files in the application. A child classloader is created for each Web application WAR file.

Because it is common for Web applications to call EJBs, the WebLogic Server application classloader architecture allows JavaServer Page (JSP) files and servlets to see the EJB interfaces in their parent classloader. This architecture also allows Web applications to be redeployed without redeploying the EJB tier. In practice, it is more common to change JSP files and servlets than to change the EJB tier.

The following graphic illustrates this WebLogic Server application classloading concept.

Figure 10–1 WebLogic Server Classloading



If your application includes servlets and JSPs that use EJBs:

- Package the servlets and JSPs in a WAR file
- Package the Enterprise JavaBeans in an EJB JAR file
- Package the WAR and JAR files in an EAR file
- Deploy the EAR file

Although you could deploy the WAR and JAR files separately, deploying them together in an EAR file produces a classloader arrangement that allows the servlets and JSPs to find the EJB classes. If you deploy the WAR and JAR files separately, WebLogic Server creates sibling classloaders for them. This means that you must include the EJB home and remote interfaces in the WAR file, and WebLogic Server must use the RMI stub and skeleton classes for EJB calls, just as it does when EJB clients and implementation classes are in different JVMs. This concept is discussed in more detail in the next section Section 10.2.7, "Application Classloading and Pass-by-Value or Reference".

Note: The Web application classloader contains all classes for the Web application except for the JSP class. The JSP class obtains its own classloader, which is a child of the Web application classloader. This allows JSPs to be individually reloaded.

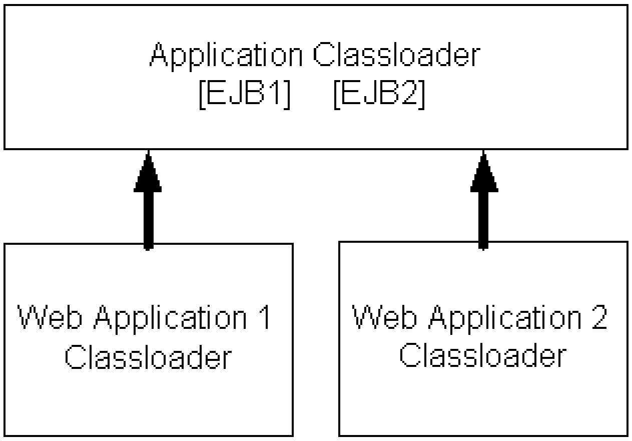
10.2.3 Custom Module Classloader Hierarchies

You can create custom classloader hierarchies for an application allowing for better control over class visibility and reloadability. You achieve this by defining a `classloader-structure` element in the `weblogic-application.xml` deployment descriptor file.

The following diagram illustrates how classloaders are organized by default for WebLogic applications. An application level classloader exists where all EJB classes are loaded. For each Web module, there is a separate child classloader for the classes of that module.

For simplicity, JSP classloaders are not described in the following diagram.

Figure 10–2 Standard Classloader Hierarchy



This hierarchy is optimal for most applications, because it allows call-by-reference semantics when you invoke EJBs. It also allows Web modules to be independently reloaded without affecting other modules. Further, it allows code running in one of the Web modules to load classes from any of the EJB modules. This is convenient, as it can prevent a Web module from including the interfaces for EJBs that it uses. Note that some of those benefits are not strictly Java EE-compliant.

The ability to create custom module classloaders provides a mechanism to declare alternate classloader organizations that allow the following:

- Reloading individual EJB modules independently
- Reloading groups of modules to be reloaded together
- Reversing the parent child relationship between specific Web modules and EJB modules
- Namespace separation between EJB modules

10.2.4 Declaring the Classloader Hierarchy

You can declare the classloader hierarchy in the WebLogic-specific application deployment descriptor `weblogic-application.xml`.

The DTD for this declaration is as follows:

Example 10–3 Declaring the Classloader Hierarchy

```
<!ELEMENT classloader-structure (module-ref*, classloader-structure*)>
<!ELEMENT module-ref (module-uri)>
<!ELEMENT module-uri (#PCDATA)>
```

The top-level element in `weblogic-application.xml` includes an optional `classloader-structure` element. If you do not specify this element, then the standard classloader is used. Also, if you do not include a particular module in the definition, it is assigned a classloader, as in the standard hierarchy. That is, EJB modules are associated with the application root classloader, and Web application modules have their own classloaders.

The classloader-structure element allows for the nesting of classloader-structure stanzas, so that you can describe an arbitrary hierarchy of classloaders. There is currently a limitation of three levels. The outermost entry indicates the application classloader. For any modules not listed, the standard hierarchy is assumed.

Note: JSP classloaders are not included in this definition scheme. JSPs are always loaded into a classloader that is a child of the classloader associated with the Web module to which it belongs.

For more information on the DTD elements, refer to Appendix A, "Enterprise Application Deployment Descriptor Elements."

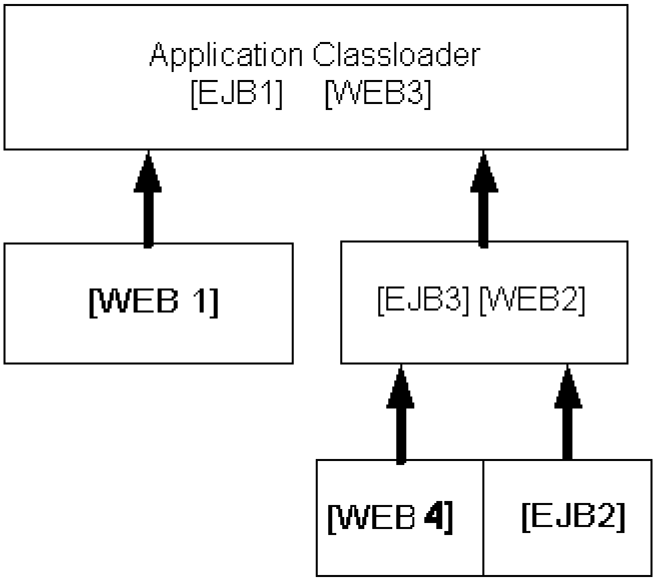
The following is an example of a classloader declaration (defined in the classloader-structure element in weblogic-application.xml):

Example 10–4 Example Classloader Declaration

```
<classloader-structure>
   <module-ref>
      <module-uri>ejb1.jar</module-uri>
   </module-ref>
   <module-ref>
      <module-uri>web3.war</module-uri>
   </module-ref>

   <classloader-structure>
      <module-ref>
         <module-uri>web1.war</module-uri>
      </module-ref>
   </classloader-structure>

   <classloader-structure>
      <module-ref>
         <module-uri>ejb3.jar</module-uri>
      </module-ref>
      <module-ref>
         <module-uri>web2.war</module-uri>
      </module-ref>

      <classloader-structure>
         <module-ref>
            <module-uri>web4.war</module-uri>
         </module-ref>
      </classloader-structure>
      <classloader-structure>
         <module-ref>
            <module-uri>ejb2.jar</module-uri>
         </module-ref>
      </classloader-structure>
   </classloader-structure>
</classloader-structure>
```

The organization of the nesting indicates the classloader hierarchy. The above stanza leads to a hierarchy shown in the following diagram.

Figure 10–3 Example Classloader Hierarchy



10.2.5 User-Defined Classloader Restrictions

User-defined classloader restrictions give you better control over what is reloadable and provide inter-module class visibility. This feature is primarily for developers. It is useful for iterative development, but the reloading aspect of this feature is not recommended for production use, because it is possible to corrupt a running application if an update includes invalid elements. Custom classloader arrangements for namespace separation and class visibility are acceptable for production use. However, programmers should be aware that the Java EE specifications say that applications should not depend on any given classloader organization.

Some classloader hierarchies can cause modules within an application to behave more like modules in two separate applications. For example, if you place an EJB in its own classloader so that it can be reloaded individually, you receive call-by-value semantics rather than the call-by-reference optimization Oracle provides in our standard classloader hierarchy. Also note that if you use a custom hierarchy, you might end up with stale references. Therefore, if you reload an EJB module, you should also reload the calling modules.

There are some restrictions to creating user-defined module classloader hierarchies; these are discussed in the following sections.

10.2.5.1 Servlet Reloading Disabled

If you use a custom classloader hierarchy, servlet reloading is disabled for Web applications in that particular application.

10.2.5.2 Nesting Depth

Nesting is limited to three levels (including the application classloader). Deeper nestings lead to a deployment exception.

10.2.5.3 Module Types

Custom classloader hierarchies are currently restricted to Web and EJB modules.

10.2.5.4 Duplicate Entries

Duplicate entries lead to a deployment exception.

10.2.5.5 Interfaces

The standard WebLogic Server classloader hierarchy makes EJB interfaces available to all modules in the application. Thus other modules can invoke an EJB, even though they do not include the interface classes in their own module. This is possible because EJBs are always loaded into the root classloader and all other modules either share that classloader or have a classloader that is a child of that classloader.

With the custom classloader feature, you can configure a classloader hierarchy so that a callee's classes are not visible to the caller. In this case, the calling module must include the interface classes. This is the same requirement that exists when invoking on modules in a separate application.

10.2.5.6 Call-by-Value Semantics

The standard classloader hierarchy provided with WebLogic Server allows for calls between modules within an application to use call-by-reference semantics. This is because the caller is always using the same classloader or a child classloader of the callee. With this feature, it is possible to configure the classloader hierarchy so that two modules are in separate branches of the classloader tree. In this case, call-by-value semantics are used.

10.2.5.7 In-Flight Work

Be aware that the classloader switch required for reloading is not atomic across modules. In fact, updates to applications in general are not atomic. For this reason, it is possible that different in-flight operations (operations that are occurring while a change is being made) might end up accessing different versions of classes depending on timing.

10.2.5.8 Development Use Only

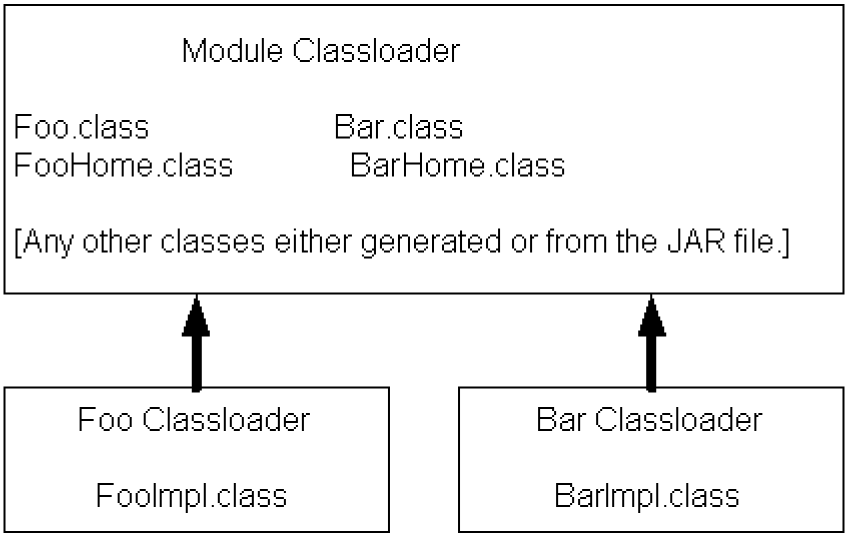
The development-use-only feature is intended for development use. Because updates are not atomic, this feature is not suitable for production use.

10.2.6 Individual EJB Classloader for Implementation Classes

WebLogic Server allows you to reload individual EJB modules without requiring you to reload other modules at the same time and having to redeploy the entire EJB module. This feature is similar to how JSPs are currently reloaded in the WebLogic Server servlet container.

Because EJB classes are invoked through an interface, it is possible to load individual EJB implementation classes in their own classloader. This way, these classes can be reloaded individually without having to redeploy the entire EJB module. Below is a diagram of what the classloader hierarchy for a single EJB module would look like. The module contains two EJBs (`Foo` and `Bar`). This would be a sub-tree of the general application hierarchy described in the previous section.

Figure 10–4 Example Classloader Hierarchy for a Single EJB Module



To perform a partial update of files relative to the root of the exploded application, use the following command line:

Example 10–5 Performing a Partial File Update

```
java weblogic.Deployer -adminurl url -user user -password password
-name myapp -redeploy myejb/foo.class
```

After the `-redeploy` command, you provide a list of files relative to the root of the exploded application that you want to update. This might be the path to a specific element (as above) or a module (or any set of elements and modules). For example:

Example 10–6 Providing a List of Relative Files for Update

```
java weblogic.Deployer -adminurl url -user user -password password
-name myapp -redeploy mywar myejb/foo.class anotherejb
```

Given a set of files to be updated, the system tries to figure out the minimum set of things it needs to redeploy. Redeploying only an EJB `impl` class causes only that class to be redeployed. If you specify the whole EJB (in the above example, `anotherejb`) or if you change and update the EJB home interface, the entire EJB module must be redeployed.

Depending on the classloader hierarchy, this redeployment may lead to other modules being redeployed. Specifically, if other modules share the EJB classloader or are loaded into a classloader that is a child to the EJB's classloader (as in the WebLogic Server standard classloader module) then those modules are also reloaded.

10.2.7 Application Classloading and Pass-by-Value or Reference

Modern programming languages use two common parameter passing models: pass-by-value and pass-by-reference. With pass-by-value, parameters and return values are copied for each method call. With pass-by-reference, a pointer (or reference) to the actual object is passed to the method. Pass by reference improves performance because it avoids copying objects, but it also allows a method to modify the state of a passed parameter.

WebLogic Server includes an optimization to improve the performance of Remote Method Interface (RMI) calls within the server. Rather than using pass by value and the RMI subsystem's marshalling and unmarshalling facilities, the server makes a direct Java method call using pass by reference. This mechanism greatly improves performance and is also used for EJB 2.0 local interfaces.

RMI call optimization and call by reference can only be used when the caller and callee are within the same application. As usual, this is related to classloaders. Because applications have their own classloader hierarchy, any application class has a definition in both classloaders and receives a ClassCastException error if you try to assign between applications. To work around this, WebLogic Server uses call-by-value between applications, even if they are within the same JVM.

Note: Calls between applications are slower than calls within the same application. Deploy modules together as an EAR file to enable fast RMI calls and use of the EJB 2.0 local interfaces.

10.2.8 Using a Filtering ClassLoader

In WebLogic Server, any JAR file present in the system classpath is loaded by the WebLogic Server system classloader. All applications running within a server instance are loaded in application classloaders which are children of the system classloader. In this implementation of the system classloader, applications cannot use different versions of third-party JARs which are already present in the system classloader. Every child classloader asks the parent (the system classloader) for a particular class and cannot load classes which are seen by the parent.

For example, if a class called `com.foo.Baz` exists in both `$CLASSPATH` as well as the application EAR, then the class from the `$CLASSPATH` is loaded and not the one from the EAR. Since `weblogic.jar` is in the `$CLASSPATH`, applications can not override any WebLogic Server classes.

The following sections define and describe how to use a filtering classloader:

- Section 10.2.9, "What is a Filtering ClassLoader"
- Section 10.2.10, "Configuring a Filtering ClassLoader"
- Section 10.2.11, "Resource Loading Order"

10.2.9 What is a Filtering ClassLoader

The `FilteringClassLoader` provides a mechanism for you to configure deployment descriptors to explicitly specify that certain packages should always be loaded from the application, rather than being loaded by the system classloader. This allows you to use alternate versions of applications such as Xerces and Ant. Though the `FilteringClassLoader` lets you bundle and use 3rd party JARs in your application, it is not recommended that you filter out API classes, like classes in `javax` packages or `weblogic` packages.

The `FilteringClassLoader` sits between the application classloader and the system classloader. It is a child of the system classloader and the parent of the application classloader. The `FilteringClassLoader` intercepts the `loadClass(String` *`className`*`)` method and compares the *`className`* with a list of packages specified in `weblogic-application.xml` file. If the package matches the *`className`*, the `FilteringClassLoader` throws a `ClassNotFoundException`. This exception notifies the application classloader to load this class from the application.

10.2.10 Configuring a Filtering ClassLoader

To configure the FilteringClassLoader to specify that a certain package is loaded from an application, add a prefer-application-packages descriptor element to weblogic-application.xml which details the list of packages to be loaded from the application. The following example specifies that org.apache.log4j.* and antlr.* packages are loaded from the application, not the system classloader:

```
<prefer-application-packages>
  <package-name>org.apache.log4j.*</package-name>
  <package-name>antlr.*</package-name>
</prefer-application-packages>
```

The prefer-application-packages descriptor element can also be defined in weblogic.xml. For more information, see "prefer-application-packages".

You can specify that a certain package be loaded for a WAR file included within an EAR file by configuring the FilteringClassLoader in the weblogic.xml file of the WAR file.

For example, A.ear contains B.war. A.ear defines the FilteringClassLoader in weblogic-application.xml, and B.war defines a different FilteringClassLoader in weblogic.xml. When you deploy A.ear, B.war loads the package defined in the FilteringClassLoader in weblogic.xml. The WAR-level FilteringClassLoader has priority over the EAR-level FilteringClassLoader for this WAR file.

For aid in configuring filtering classloaders, see Section 10.4, "Using the Classloader Analysis Tool (CAT)."

10.2.11 Resource Loading Order

The resource loading order is the order in which java.lang.ClassLoader methods getResource() and getResources() return resources. When filtering is enabled, this order is slightly different from the case when filtering is disabled. Filtering is enabled implies that there are one or more package patterns in the FilteringClassLoader. Without any filtering (default), the resources are collected in the top-down order of the classloader tree. For instance, if Web (1) requests resources, the resources are grouped in the following order: Sys (3), App (2) and Web(1). See Example 10–7.

Example 10–7 Using the System Classloader

```
System (3)
   |
  App (2)
   |
  Web (1)
```

To be more explicit, given a resource /META-INF/foo.xml which exists in all the classloaders, would return the following list of URLs:

```
META-INF/foo.xml - from the System ClassLoader (3)
META-INF/foo.xml - from the App ClassLoader (2)
META-INF/foo.xml - from the Web ClassLoader (1)
```

When filtering is enabled, the resources from the child of the FilteringClassLoader (an application classloader) down to the calling classloader are returned before the ones from the system classloader. In Example 10–8, if the same resource existed in all the classloaders (D), (B) and (A) one would get them in the following order if requested by the Web classloader:

```
META-INF/foo.xml - from the App ClassLoader (B)
META-INF/foo.xml - from the Web ClassLoader (A)
META-INF/foo.xml - from the System ClassLoader (D)
```

Note: The resources are returned in the default Java EE delegation model beneath the `FilteringClassLoader`. Only the resources from the parent of the `FilteringClassLoader` are appended to the end of the enumeration being returned.

Example 10–8 Using a Filtering Classloading Implementation

```
System (D)
  |
  FilteringClassLoader (filterList := x.y.*) (C)
   |
  App (B)
   |
  Web (A)
```

If the application classloader requested the same resource, the following order would be obtained.

```
META-INF/foo.xml - from the App ClassLoader (B)
META-INF/foo.xml - from the System ClassLoader (D)
```

For `getResource()`, only the first descriptor is returned and `getResourceAsStream()` returns the `inputStream` of the first resource.

10.3 Resolving Class References Between Modules and Applications

Your applications may use many different Java classes, including Enterprise Beans, servlets and JavaServer Pages, utility classes, and third-party packages. WebLogic Server deploys applications in separate classloaders to maintain independence and to facilitate dynamic redeployment and undeployment. Because of this, you need to package your application classes in such a way that each module has access to the classes it depends on. In some cases, you may have to include a set of classes in more than one application or module. This section describes how WebLogic Server uses multiple classloaders so that you can stage your applications successfully.

For more information about analyzing and resolving classloading issues, see Section 10.4, "Using the Classloader Analysis Tool (CAT)."

10.3.1 About Resource Adapter Classes

Each resource adapter now uses its own classloader to load classes (similar to Web applications). As a result, modules like Web applications and EJBs that are packaged along with a resource adapter in an application archive (EAR file) do not have visibility into the resource adapter's classes. If such visibility is required, you must place the resource adapter classes in APP-INF/classes. You can also archive these classes (using the JAR utility) and place them in the APP-INF/lib of the application archive.

Make sure that no resource-adapter specific classes exist in your WebLogic Server system classpath. If you need to use resource adapter-specific classes with Web modules (for example, an EJB or Web application), you must bundle these classes in the corresponding module's archive file (for example, the JAR file for EJBs or the WAR file for Web applications).

10.3.2 Packaging Shared Utility Classes

WebLogic Server provides a location within an EAR file where you can store shared utility classes. Place utility JAR files in the `APP-INF/lib` directory and individual classes in the `APP-INF/classes` directory. (Do not place JAR files in the `/classes` directory or classes in the `/lib` directory.) These classes are loaded into the root classloader for the application.

This feature obviates the need to place utility classes in the system classpath or place classes in an EJB JAR file (which depends on the standard WebLogic Server classloader hierarchy). Be aware that using this feature is subtly different from using the manifest `Class-Path` described in the following section. With this feature, class definitions are shared across the application. With manifest `Class-Path`, the classpath of the referencing module is simply extended, which means that separate copies of the classes exist for each module.

10.3.3 Manifest Class-Path

The Java EE specification provides the manifest `Class-Path` entry as a means for a module to specify that it requires an auxiliary JAR of classes. You only need to use this manifest `Class-Path` entry if you have additional supporting JAR files as part of your EJB JAR or WAR file. In such cases, when you create the JAR or WAR file, you must include a manifest file with a `Class-Path` element that references the required JAR files.

The following is a simple manifest file that references a `utility.jar` file:

```
Manifest-Version: 1.0 [CRLF]
Class-Path: utility.jar [CRLF]
```

In the first line of the manifest file, you must always include the `Manifest-Version` attribute, followed by a new line (CR | LF |CRLF) and then the `Class-Path` attribute.

The manifest `Class-Path` entries refer to other archives relative to the current archive in which these entries are defined. This structure allows multiple WAR files and EJB JAR files to share a common library JAR. For example, if a WAR file contains a manifest entry of `y.jars`, this entry should be next to the WAR file (not within it) as follows:

```
/<directory>/x.war
/<directory>/y.jars
```

The manifest file itself should be located in the archive at `META-INF/MANIFEST.MF`.

For more information, see `http://docs.oracle.com/javase/tutorial/deployment/jar/manifestindex.html`.

10.4 Using the Classloader Analysis Tool (CAT)

CAT is a Web-based class analysis tool which simplifies filtering classloader configuration and aids you in analyzing classloading issues, such as detecting conflicts, debugging application classpaths and class conflicts, and proposes solutions to help you resolve them.

CAT is a stand-alone Web application, distributed as a single WAR file, `wls-cat.war`, exposing its features through a Web-based front end. CAT is deployed as an internal on-demand application only in development mode. Deployment happens upon first access. If the server is running in production mode, it is not deployed automatically. You can deploy it in production mode; there are no limitations on its use, but you must deploy it manually, just like any other Web application. The CAT Web application is located at `WL_HOME/server/lib/wls-cat.war`. You can deploy it to any WebLogic Server version 10.3.x and later.

> **Note:** CAT is not supported on IBM SDK for Java because some functions of the CAT application depend on HotSpot implementation.

To begin using CAT:

- In the WebLogic Server Administration Console, select **Deployments** > ***app_name*** > **Testing** and then select the **Classloader Analysis Tool** link. Enter your Console login credentials.
- Or, open your browser to `http://wls-host:port/wls-cat/` and then enter your Console login credentials.

CAT has a simple Web GUI which displays all your currently running applications and modules. In the left-side navigation pane, you select the application or module that you want to analyze; a brief description of it is shown in the right-side pane. You use the right-side pane to perform actions and analyses on the selected application or module. CAT lets you:

- Analyze classloading conflicts
- View the system and application classloaders
- Generate reports

CAT analyzes classes loaded by the system classpath classloader and the WebLogic Server main application classloaders, defined here as the filtering, application, and module classloaders. You can perform analysis at the class, package, or JAR level. The results for each action you select can be shown in either a basic view or a detailed view.

Here are some of the tasks which you can perform using CAT:

- Display basic information about applications and modules
- Analyze classloading conflicts
- Review proposed solutions
- Get suggestions for configuring filtering classloaders
- Display the classloader hierarchy and the entire classpath for each classloader
- Search for a class (or a resource) on a classloader

10.5 Sharing Applications and Modules By Using Java EE Libraries

Java EE libraries provide an easy way to share one or more different types of Java EE modules among multiple enterprise applications. A Java EE library is a single module or collection of modules that is registered with the Java EE application container upon deployment. For more information, see Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."

10.6 Adding JARs to the Domain /lib Directory

WebLogic Server includes a lib subdirectory, located in the domain directory, that you can use to add one or more JAR files, so that the JAR file classes are available (within a separate system level classloader) to all Java EE applications running on WebLogic Server instances in the domain. The JARS in the domain /lib directory will not be appended to the system classpath. The classloader that gets created is a child of the system classloader. Any classes that are in JARs in the domain /lib directory will only be visible to Java EE applications, such as EAR files. Classes in the system classpath cannot access classes in the domain /lib directory.

The lib subdirectory is intended for JAR files that change infrequently and are required by all or most applications deployed in the server. For example, you might use the lib directory to store third-party utility classes that are required by all Java EE deployments in a domain. Third-party utility classes will be made available because the domain /lib classloader will be the parent of any Java EE application.

The lib directory is not recommended as a general-purpose method for sharing a JARs between one or two applications deployed in a domain, or for sharing JARs that need to be updated periodically. If you update a JAR in the lib directory, you must reboot all servers in the domain in order for applications to realize the change. If you need to share a JAR file or Java EE modules among several applications, use the Java EE libraries feature described in Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."

To share JARs using the lib directory:

1. Shutdown all servers in the domain.
2. Copy the JAR file(s) to share into a lib subdirectory of the domain directory. For example:

   ```
   mkdir c:\bea\wlserver_12.1\samples\domains\wl_server\lib
   cp c:\3rdpartyjars\utility.jar
     c:\bea\wlserver_12.1\samples\domains\wl_server\lib
   ```

   > **Note:** WebLogic Server must have read access to the lib directory during startup.
   >
   > The Administration Server does not automatically copy files in the lib directory to Managed Servers on remote machines. If you have Managed Servers that do not share the same physical domain directory as the Administration Server, you must manually copy JAR file(s) to the *domain_name*/lib directory on the Managed Server machines.

3. Start the Administration Server and all Managed Servers in the domain.

11

Creating Shared Java EE Libraries and Optional Packages

This chapter describes how to share components and classes among applications using shared Java EE libraries and optional packages supported in WebLogic Server.

This chapter includes the following sections:

11.1 Overview of Shared Java EE Libraries and Optional Packages

The shared Java EE library feature in WebLogic Server provides an easy way to share one or more different types of Java EE modules among multiple enterprise applications. A shared Java EE library is a single module or collection of modules that is registered with the Java EE application container upon deployment. A shared Java EE library can be any of the following:

- standalone EJB module
- standalone Web application module
- multiple EJB modules packaged in an enterprise application
- multiple Web application modules package in an enterprise application

- single plain JAR file

Oracle recommends that you package a shared Java EE library into its appropriate archive file (EAR, JAR, or WAR). However, for development purposes, you may choose to deploy shared Java EE libraries as exploded archive directories to facilitate repeated updates and redeployments.

After the shared Java EE library has been registered, you can deploy enterprise applications that reference the library. Each referencing application receives a reference to the required library on deployment, and can use the modules that make up the library as if they were packaged as part of the referencing application itself. The library classes are added to the classpath of the referencing application, and the referencing application's deployment descriptors are merged (in memory) with those of the modules that make up the shared Java EE library.

In general, this topic discusses shared Java EE libraries that can be referenced only by enterprise applications. You can also create libraries that can be referenced only by another Web application. The functionality is very similar to application libraries, although the method of referencing them is slightly different. See Section 11.8, "Web Application Shared Java EE Library Information" for details.

Note: WebLogic Server also provides a simple way to add one or more JAR files to the WebLogic Server System classpath, using the `lib` subdirectory of the domain directory. See Section 10.6, "Adding JARs to the Domain `/lib` Directory".

11.1.1 Optional Packages

WebLogic Server supports optional packages as described at `http://docs.oracle.com/javase/7/docs/technotes/guides/extensions/extensions.html` with versioning described in Optional Package Versioning (see `http://docs.oracle.com/javase/7/docs/technotes/guides/extensions/versioning.html`). Optional packages provide similar functionality to Java EE libraries, allowing you to easily share a single JAR file among multiple applications. As with Java EE libraries, optional packages must first be registered with WebLogic Server by deploying the associated JAR file as an optional package. After registering the package, you can deploy Java EE modules that reference the package in their manifest files.

Optional packages are also supported as Java EE shared libraries in `weblogic.BuildXMLGen`, whereby all manifests of an application and its modules are scanned to look for optional package references. If optional package references are found they are added to the `wlcompile` and `appc` tasks in the generated `build.xml` file.

Optional packages differ from Java EE libraries because optional packages can be referenced from any Java EE module (EAR, JAR, WAR, or RAR archive) or exploded archive directory. Java EE libraries can be referenced only from a valid enterprise application.

For example, third-party Web application Framework classes needed by multiple Web applications can be packaged and deployed in a single JAR file, and referenced by multiple Web application modules in the domain. Optional packages, rather than Java EE libraries, are used in this case, because the individual Web application modules must reference the shared JAR file. (With Java EE libraries, only a complete enterprise application can reference the library).

Note: Oracle documentation and WebLogic Server utilities use the term *library* to refer to both Java EE libraries and optional packages. Optional packages are called out only when necessary.

11.1.2 Library Directories

The Java EE platform provides several mechanisms for applications to use optional packages and shared libraries. Libraries can be bundled with an application or may be installed separately for use by any application. An EAR file may contain a directory that contains libraries packaged in JAR files. The `library-directory` element of the EAR file's deployment descriptor contains the name of this directory. If a `library-directory` element isn't specified, or if the EAR file does not contain a deployment descriptor, the directory named `lib` is used. An empty `library-directory` element may be used to specify that there is no library directory. All files in this directory (but not in subdirectories) with a `.jar` extension must be made available to all components packaged in the EAR file, including application clients. These libraries may reference other libraries, either bundled with the application or installed separately.

This feature is similar to the `APP-INF/lib` feature supported in WebLogic Server. If both `APP-INF/lib` and `library-directory` exist, then the jars in the `library-directory` would take precedence; that is, they would be placed before the `APP-INF/lib` jar files in the classpath. For more information on `APP-INF/lib`, see Section 10.3, "Resolving Class References Between Modules and Applications" and Section 4.4, "Organizing Shared Classes in a Split Development Directory".

11.1.3 Versioning Support for Libraries

WebLogic Server supports versioning of shared Java EE libraries, so that referencing applications can specify a required minimum version of the library to use, or an exact, required version. WebLogic Server supports two levels of versioning for shared Java EE libraries, as described in the Optional Package Versioning document at `http://docs.oracle.com/javase/7/docs/technotes/guides/extensions/versioning.html`:

- Specification Version—Identifies the version number of the specification (for example, the Java EE specification version) to which a shared Java EE library or optional package conforms.
- Implementation Version—Identifies the version number of the actual code implementation for the library or package. For example, this would correspond to the actual revision number or release number of your code. Note that you must also provide a specification version in order to specify an implementation version.

As a best practice, Oracle recommends that you always include version information (a specification version, or both an implementation and specification version) when creating shared Java EE libraries. Creating and updating version information as you develop shared components allows you to deploy multiple versions of those components simultaneously for testing. If you include no version information, or fail to increment the version string, then you must undeploy existing libraries before you can deploy the newer one. See Section 11.7, "Deploying Shared Java EE Libraries and Dependent Applications".

Versioning information in the referencing application determines the library and package version requirements for that application. Different applications can require different versions of a given library or package. For example, a production application may require a specific version of a library, because only that library has been fully approved for production use. An internal application may be configured to always use a minimum version of the same library. Applications that require no specific version can be configured to use the latest version of the library. Section 11.3, "Referencing Shared Java EE Libraries in an Enterprise Application".

11.1.4 Shared Java EE Libraries and Optional Packages Compared

Optional packages and shared Java EE libraries have the following features in common:

- Both are registered with WebLogic Server instances at deployment time.
- Both support an optional implementation version and specification version string.
- Applications that reference shared Java EE libraries and optional packages can specify required versions for the shared files.
- Optional packages can reference other optional packages, and shared Java EE libraries can reference other shared Java EE libraries.

Optional packages differ from shared Java EE Libraries in the following basic ways:

- Optional packages are plain JAR files, whereas shared Java EE libraries can be plain JAR files, Java EE enterprise applications, or standalone Java EE modules (EJB and Web applications). This means that libraries can have valid Java EE and WebLogic Server deployment descriptors. Any deployment descriptors in an optional package JAR file are ignored.
- Any Java EE application or module can reference an optional package (using `META-INF/MANIFEST.MF`), whereas only enterprise applications and Web applications can reference a shared Java EE library (using `weblogic-application.xml` or `weblogic.xml`).

In general, use shared Java EE libraries when you need to share one or more EJB, Web application or enterprise application modules among different enterprise applications. Use optional packages when you need to share one or more classes (packaged in a JAR file) among different Java EE modules.

Plain JAR files can be shared either as libraries or optional packages. Use optional packages if you want to:

- Share a plain JAR file among multiple Java EE modules
- Reference shared JAR files from other shared JARs
- Share plain JARs as described by the Java EE 5.0 specification

Use shared Java EE libraries to share a plain JAR file if you only need to reference the JAR file from one or more enterprise applications, and you do not need to maintain strict compliance with the Java EE specification.

> **Note:** Oracle documentation and WebLogic Server utilities use the term *shared Java EE library* to refer to both libraries and optional packages. Optional packages are called out only when necessary.

11.1.5 Additional Information

For information about deploying and managing shared Java EE libraries, optional packages, and referencing applications from the administrator's perspective, see "Deploying Shared Java EE Libraries and Dependent Applications" in *Deploying Applications to Oracle WebLogic Server*.

11.2 Creating Shared Java EE Libraries

To create a new shared Java EE library that you can share with multiple applications:

1. Assemble the shared Java EE library into a valid, deployable Java EE module or enterprise application. The library must have the required Java EE deployment descriptors for the Java EE module or for an enterprise application.

   See Section 11.2.1, "Assembling Shared Java EE Library Files".

2. Assemble optional package classes into a working directory.

   See Section 11.2.2, "Assembling Optional Package Class Files".

3. Create and edit the `MANIFEST.MF` file for the shared Java EE library to specify the name and version string information.

   See Section 11.2.3, "Editing Manifest Attributes for Shared Java EE Libraries".

4. Package the shared Java EE library for distribution and deployment.

   See Section 11.2.4, "Packaging Shared Java EE Libraries for Distribution and Deployment".

11.2.1 Assembling Shared Java EE Library Files

The following types of Java EE modules can be deployed as a shared Java EE library:

- An EJB module, either an exploded directory or packaged in a JAR file.
- A Web application module, either an exploded directory or packaged in a WAR file.
- An enterprise application, either an exploded directory or packaged in an EAR file.
- A plain Java class or classes packaged in a JAR file.
- A shared Java EE library referenced from another library. (See Section 11.8, "Web Application Shared Java EE Library Information".)

Shared Java EE libraries have the following restrictions:

- You must ensure that context roots in Web application modules of the shared Java EE library do not conflict with context roots in the referencing enterprise application. If necessary, you can configure referencing applications to override a library's context root. See Section 11.3, "Referencing Shared Java EE Libraries in an Enterprise Application".
- Shared Java EE libraries cannot be nested. For example, if you are deploying an EAR as a shared Java EE library, the entire EAR must be designated as the library. You cannot designate individual Java EE modules within the EAR as separate, named libraries.
- As with any other Java EE module or enterprise application, a shared Java EE library must be configured for deployment to the target servers or clusters in your domain. This means that a library requires valid Java EE deployment descriptors as well as WebLogic Server-specific deployment descriptors and an optional deployment plan. See *Deploying Applications to Oracle WebLogic Server*.

Oracle recommends packaging shared Java EE libraries as enterprise applications, rather than as standalone Java EE modules. This is because the URI of a standalone module is derived from the deployment name, which can change depending on how the module is deployed. By default, WebLogic Server uses the deployment archive filename or exploded archive directory name as the deployment name. If you redeploy a standalone shared Java EE library from a different file or location, the deployment name and URI also change, and referencing applications that use the wrong URI cannot access the deployed library.

If you choose to deploy a shared Java EE library as a standalone Java EE module, always specify a known deployment name during deployment and use that name as the URI in referencing applications.

11.2.2 Assembling Optional Package Class Files

Any set of classes can be organized into an optional package file. The collection of shared classes will eventually be packaged into a standard JAR archive. However, because you will need to edit the manifest file for the JAR, begin by assembling all class files into a working directory:

1. Create a working directory for the new optional package. For example:

   ```
   mkdir /apps/myOptPkg
   ```

2. Copy the compiled class files into the working directory, creating the appropriate package sudirectories as necessary. For example:

   ```
   mkdir -p /apps/myOptPkg/org/myorg/myProduct
   cp /build/classes/myOptPkg/org/myOrg/myProduct/*.class
   /apps/myOptPkg/org/myOrg/myProduct
   ```

3. If you already have a JAR file that you want to use as an optional package, extract its contents into the working directory so that you can edit the manifest file:

   ```
   cd /apps/myOptPkg
   jar xvf /build/libraries/myLib.jar
   ```

11.2.3 Editing Manifest Attributes for Shared Java EE Libraries

The name and version information for a shared Java EE library are specified in the `META-INF/MANIFEST.MF` file. Table 11–1 describes the valid shared Java EE library manifest attributes.

Table 11–1 Manifest Attributes for Java EE Libraries

Attribute	Description
`Extension-Name`	An optional string value that identifies the name of the shared Java EE library. Referencing applications must use the exact `Extension-Name` value to use the library. As a best practice, always specify an `Extension-Name` value for each library. If you do not specify an extension name, one is derived from the deployment name of the library. Default deployment names are different for archive and exploded archive deployments, and they can be set to arbitrary values in the deployment command.
`Specification-Version`	An optional String value that defines the specification version of the shared Java EE library. Referencing applications can optionally specify a required `Specification-Version` for a library; if the exact specification version is not available, deployment of the referencing application fails. The `Specification-Version` uses the following format: Major/minor version format, with version and revision numbers separated by periods (such as "9.0.1.1") Referencing applications can be configured to require either an exact version of the shared Java EE library, a minimum version, or the latest available version. The specification version for a shared Java EE library can also be set at the command-line when deploying the library, with some restrictions. See Section 11.7, "Deploying Shared Java EE Libraries and Dependent Applications".
`Implementation-Version`	An optional String value that defines the code implementation version of the shared Java EE library. You can provide an `Implementation-Version` only if you have also defined a `Specification-Version`. `Implementation-Version` uses the following formats: ■ Major/minor version format, with version and revision numbers separated by periods (such as "9.0.1.1") ■ Text format, with named versions (such as "9011Beta" or "9.0.1.1.B") If you use the major/minor version format, referencing applications can be configured to require either an exact version of the shared Java EE library, a minimum version, or the latest available version. If you use the text format, referencing applications must specify the exact version of the library. The implementation version for a shared Java EE library can also be set at the command-line when deploying the library, with some restrictions. See Section 11.7, "Deploying Shared Java EE Libraries and Dependent Applications".

To specify attributes in a manifest file:

1. Open (or create) the manifest file using a text editor. For the example shared Java EE library, you would use the commands:

```
cd /apps/myLibrary
mkdir META-INF
emacs META-INF/MANIFEST.MF
```

   For the optional package example, use:

```
cd /apps/myOptPkg
mkdir META-INF
emacs META-INF/MANIFEST.MF
```

2. In the text editor, add a string value to specify the name of the shared Java EE library. For example:

```
Extension-Name: myExtension
```

Applications that reference the library must specify the exact `Extension-Name` in order to use the shared files.

3. As a best practice, enter the optional version information for the shared Java EE library. For example:

```
Extension-Name: myExtension
Specification-Version: 2.0
Implementation-Version: 9.0.0
```

Using the major/minor format for the version identifiers provides the most flexibility when referencing the library from another application (see Table 11–2)

> **Note:** Although you can optionally specify the Specification-Version and Implementation-Version at the command line during deployment, Oracle recommends that you include these strings in the `MANIFEST.MF` file. Including version strings in the manifest ensures that you can deploy new versions of the library alongside older versions. See Section 11.7, "Deploying Shared Java EE Libraries and Dependent Applications".

11.2.4 Packaging Shared Java EE Libraries for Distribution and Deployment

If you are delivering the shared Java EE Library or optional package for deployment by an administrator, package the deployment files into an archive file (an `.EAR` file or standalone module archive file for shared Java EE libraries, or a simple `.JAR` file for optional packages) for distribution. See Section 6.1, "Deploying Applications Using wldeploy".

Because a shared Java EE library is packaged as a standard Java EE application or standalone module, you may also choose to export a library's deployment configuration to a deployment plan, as described in *Deploying Applications to Oracle WebLogic Server*. Optional package `.JAR` files contain no deployment descriptors and cannot be exported.

For development purposes, you may choose to deploy libraries as exploded archive directories to facilitate repeated updates and redeployments.

11.3 Referencing Shared Java EE Libraries in an Enterprise Application

A Java EE application can reference a registered shared Java EE library using entries in the application's `weblogic-application.xml` deployment descriptor. Table 11–2 describes the XML elements that define a library reference.

Table 11–2 weblogic-application.xml Elements for Referencing a Shared Java EE Library

Element	Description
library-ref	library-ref is the parent element in which you define a reference to a shared Java EE library. Enclose all other elements within library-ref.
library-name	A required string value that specifies the name of the shared Java EE library to use. library-name must exactly match the value of the Extension-Name attribute in the library's manifest file. (See Table 11–2.)
specification-version	An optional String value that defines the required specification version of the shared Java EE library. If this element is not set, the application uses a matching library with the highest specification version. If you specify a string value using major/minor version format, the application uses a matching library with the highest specification version that is not below the configured value. If all available libraries are below the configured specification-version, the application cannot be deployed. The required version can be further constrained by using the exact-match element, described below. If you specify a String value that does not use major/minor versioning conventions (for example, 9.2BETA) the application requires a shared Java EE library having the exact same string value in the Specification-Version attribute in the library's manifest file. (See Table 11–2.)
implementation-version	An optional String value that specifies the required implementation version of the shared Java EE library. If this element is not set, the application uses a matching library with the highest implementation version. If you specify a string value using major/minor version format, the application uses a matching library with the highest implementation version that is not below the configured value. If all available libraries are below the configured implementation-version, the application cannot be deployed. The required implementation version can be further constrained by using the exact-match element, described below. If you specify a String value that does not use major/minor versioning conventions (for example, 9.2BETA) the application requires a shared Java EE library having the exact same string value in the Implementation-Version attribute in the library's manifest file. (See Table 11–2.)
exact-match	An optional Boolean value that determines whether the application should use a shared Java EE library with a higher specification or implementation version than the configured value, if one is available. By default this element is false, which means that WebLogic Server uses higher-versioned libraries if they are available. Set this element to true to require the exact matching version as specified in the specification-version and implementation-version elements.
context-root	An optional String value that provides an alternate context root to use for a Web application shared Java EE library. Use this element if the context root of a library conflicts with the context root of a Web application in the referencing Java EE application. *Web application shared Java EE library* refers to special kind of library: a Web application that is referenced by another Web application. See Section 11.8, "Web Application Shared Java EE Library Information".

For example, this simple entry in the weblogic-application.xml descriptor references a shared Java EE library, myLibrary:

```
<library-ref>
   <library-name>myLibrary</library-name>
</library-ref>
```

In the above example, WebLogic Server attempts to find a library name myLibrary when deploying the dependent application. If more than one copy of myLibrary is registered, WebLogic Server selects the library with the highest specification version. If multiple copies of the library use the selected specification version, WebLogic Server selects the copy having the highest implementation version.

This example references a shared Java EE library with a requirement for the specification version:

```
<library-ref>
   <library-name>myLibrary</library-name>
   <specification-version>2.0</specification-version>
</library-ref>
```

In the above example, WebLogic Server looks for matching libraries having a specification version of 2.0 or higher. If multiple libraries are at or above version 2.0, WebLogic Server examines the selected libraries that use Float values for their implementation version and selects the one with the highest version. Note that WebLogic Server ignores any selected libraries that have a non-Float value for the implementation version.

This example references a shared Java EE library with both a specification version and a non-Float value implementation version:

```
<library-ref>
   <library-name>myLibrary</library-name>
   <specification-version>2.0</specification-version>
   <implementation-version>81Beta</implementation-version>
</library-ref>
```

In the above example, WebLogic Server searches for a library having a specification version of 2.0 or higher, and having an exact match of `81Beta` for the implementation version.

The following example requires an exact match for both the specification and implementation versions:

```
<library-ref>
   <library-name>myLibrary</library-name>
   <specification-version>2.0</specification-version>
   <implementation-version>8.1</implementation-version>
   <exact-match>true</exact-match>
</library-ref>
```

The following example specifies a `context-root` with the library reference. When a WAR library reference is made from `weblogic-application.xml`, the `context-root` may be specified with the reference:

```
<library-ref>
   <library-name>myLibrary</library-name>
   <context-root>mywebapp</context-root>
</library-ref>
```

11.3.1 Overriding context-roots Within a Referenced Enterprise Library

A Java EE application can override `context-roots` within a referenced EAR library using entries in the application's `weblogic-application.xml` deployment descriptor. Table 11–3 describes the XML elements that override `context-root` in a library reference.

Table 11–3 weblogic-application.xml Elements for Overriding a Shared Java EE Library

Element	Description
`context-root`	An optional String value that overrides the `context-root` elements declared in libraries. In the absence of this element, the library's `context-root` is used. Only a referencing application (for example, a user application) can override the `context-root` elements declared in its libraries.
`override-value`	An optional String value that specifies the value of the `library-context-root-override` element when overriding the context-root elements declared in libraries. In the absence of these elements, the library's `context-root` is used.

The following example specifies a `context-root-override`, which in turn, refers to the old `context-root` specified in one of its libraries and the new `context-root` that should be used instead. (override):

```
<library-ref>
   <library-name>myLibrary</library-name>
   <specification-version>2.0</specification-version>
   <implementation-version>8.1</implementation-version>
   <exact-match>true</exact-match>
</library-ref>
<library-context-root-override>
   <context-root>webapp</context-root>
   <override-value>mywebapp</override-value>
</library-context-root-override>
```

In the above example, the current application refers to `myLibrary`, which contains a Web application with a `context-root` of `webapp`. The only way to override this reference is to declare a `library-context-root-override` that maps `webapp` to `mywebapp`.

11.3.2 URIs for Shared Java EE Libraries Deployed As a Standalone Module

When referencing the URI of a shared Java EE library that was deployed as a standalone module (EJB or Web application), note that the module URI corresponds to the deployment name of the shared Java EE library. This can be a name that was manually assigned during deployment, the name of the archive file that was deployed, or the name of the exploded archive directory that was deployed. If you redeploy the same module using a different file name or from a different location, the default deployment name also changes and referencing applications must be updated to use the correct URI.

To avoid this problem, deploy all shared Java EE libraries as enterprise applications, rather than as standalone modules. If you choose to deploy a library as a standalone Java EE module, always specify a known deployment name and use that name as the URI in referencing applications.

11.4 Referencing Optional Packages from a Java EE Application or Module

Any Java EE archive (JAR, WAR, RAR, EAR) can reference one or more registered optional packages using attributes in the archive's manifest file.

Table 11–4 Manifest Attributes for Referencing Optional Packages

Attribute	Description
Extension-List *logical_name* [...]	A required String value that defines a logical name for an optional package dependency. You can use multiple values in the `Extension-List` attribute to designate multiple optional package dependencies. For example: `Extension-List: dependency1 dependency2`
`[`*logical_name*`-]Extension-Name`	A required string value that identifies the name of an optional package dependency. This value must match the `Extension-Name` attribute defined in the optional package's manifest file. If you are referencing multiple optional packages from a single archive, prepend the appropriate logical name to the `Extension-Name` attribute. For example: `dependency1-Extension-Name: myOptPkg`
`[`*logical_ name*`-]Specification-Version`	An optional String value that defines the required specification version of an optional package. If this element is not set, the archive uses a matching package with the highest specification version. If you include a `specification-version` value using the major/minor version format, the archive uses a matching package with the highest specification version that is not below the configured value. If all available package are below the configured `specification-version`, the archive cannot be deployed. If you specify a String value that does not use major/minor versioning conventions (for example, 9.2BETA) the archive requires a matching optional package having the exact same string value in the `Specification-Version` attribute in the package's manifest file. (See Table 11–2.) If you are referencing multiple optional packages from a single archive, prepend the appropriate logical name to the `Specification-Version` attribute.
`[`*logical_ name*`-]Implementation-Version`	An optional String value that specifies the required implementation version of an optional package. If this element is not set, the archive uses a matching package with the highest implementation version. If you specify a string value using the major/minor version format, the archive uses a matching package with the highest implementation version that is not below the configured value. If all available libraries are below the configured `implementation-version`, the application cannot be deployed. If you specify a String value that does not use major/minor versioning conventions (for example, 9.2BETA) the archive requires a matching optional package having the exact same string value in the `Implementation-Version` attribute in the package's manifest file. (See Table 11–2.) If you are referencing multiple optional packages from a single archive, prepend the appropriate logical name to the `Implementation-Version` attribute.

For example, this simple entry in the manifest file for a dependent archive references two optional packages, `myAppPkg` and `my3rdPartyPkg`:

```
Extension-List: internal 3rdparty
internal-Extension-Name: myAppPkg
3rdparty-Extension-Name: my3rdPartyPkg
```

This example requires a specification version of 2.0 or higher for `myAppPkg`:

```
Extension-List: internal 3rdparty
internal-Extension-Name: myAppPkg
3rdparty-Extension-Name: my3rdPartyPkg
internal-Specification-Version: 2.0
```

This example requires a specification version of 2.0 or higher for `myAppPkg`, and an exact match for the implementation version of `my3rdPartyPkg`:

```
Extension-List: internal 3rdparty
internal-Extension-Name: myAppPkg
3rdparty-Extension-Name: my3rdPartyPkg
internal-Specification-Version: 2.0
3rdparty-Implementation-Version: 8.1GA
```

By default, when WebLogic Server deploys an application or module and it cannot resolve a reference in the application's manifest file to an optional package, WebLogic Server prints a warning, but continues with the deployment anyway. You can change this behavior by setting the system property `weblogic.application.RequireOptionalPackages` to `true` when you start WebLogic Server, either at the command line or in the command script file from which you start the server. Setting this system property to `true` means that WebLogic Server does *not* attempt to deploy an application or module if it cannot resolve an optional package reference in its manifest file.

11.5 Using weblogic.appmerge to Merge Libraries

`weblogic.appmerge` is a tool that is used to merge libraries into an application, with merged contents and merged descriptors. It also has the ability to write a merged application to disk. You can then use `weblogic.appmerge` to understand a library merge by examining the merged application you have written to disk.

- Section 11.5.1, "Using weblogic.appmerge from the CLI"
- Section 11.5.2, "Using weblogic.appmerge as an Ant Task"

11.5.1 Using weblogic.appmerge from the CLI

Invoke `weblogic.appmerge` using the following syntax:

```
java weblogic.appmerge [options] <ear, jar, war file, or directory>
```

where valid options are shown in Table 11–5:

Table 11–5 weblogic.appmerge Options

Option	Comment
`-help`	Print the standard usage message.
`-version`	Print version information.
`-output <file>`	Specifies an alternate output archive or directory. If not set, output is placed in the source archive or directory.
`-plan <file>`	Specifies an optional deployment plan.
`-verbose`	Provide more verbose output.
`-library <file>`	Comma-separated list of libraries. Each library may optionally set its name and versions, if not already set in its manifest, using the following syntax: `<file> [@name=<string>@libspecver=<version> @libimplver=<version|string>].`
`-librarydir <dir>`	Registers all files in specified directory as libraries.
`-writeInferredDescriptors`	Specifies that the application or module contains deployment descriptors with annotation information.

Example:

```
$ java weblogic.appmerge -output CompleteSportsApp.ear -library
Weather.war,Calendar.ear SportsApp.ear
```

11.5.2 Using weblogic.appmerge as an Ant Task

The ant task provides similar functionality as the command line utility. It supports source, output, libraryDir, plan and verbose attributes as well as multiple <library> sub-elements. Here is an example:

```
<taskdef name="appmerge" classname="weblogic.ant.taskdefs.j2ee.AppMergeTask"/>
<appmerge source="SportsApp.ear" output="CompleteSportsApp.ear">
   <library file="Weather.war"/>
   <library file="Calendar.ear"/>
</appmerge>
```

11.6 Integrating Shared Java EE Libraries with the Split Development Directory Environment

The BuildXMLGen includes a -librarydir option to generate build targets that include one or more shared Java EE library directories. See Section 4.5, "Generating a Basic build.xml File Using weblogic.BuildXMLGen".

The wlcompile and wlappc Ant tasks include a librarydir attribute and library element to specify one or more shared Java EE library directories to include in the classpath for application builds. See Section 5, "Building Applications in a Split Development Directory".

11.7 Deploying Shared Java EE Libraries and Dependent Applications

Shared Java EE libraries are registered with one or more WebLogic Server instances by deploying them to the target servers and indicating that the deployments are to be shared. Shared Java EE libraries must be targeted to the same WebLogic Server instances you want to deploy applications that reference the libraries. If you try to deploy a referencing application to a server instance that has not registered a required library, deployment of the referencing application fails. See "Registering Libraries with WebLogic Server" in *Deploying Applications to Oracle WebLogic Server* for more information.

See "Install a Java EE Library" for detailed instructions on installing (deploying) a shared Java EE library using the Administration Console. See "Target a Shared Java EE Library to a Server or Cluster" for instructions on using the Administration Console to target the library to the server or cluster to which the application that is referencing the library is also targeted.

If you use the wldeploy Ant task as part of your iterative development process, use the library, libImplVer, and libSpecVer attributes to deploy a shared Java EE library. See Appendix B, "wldeploy Ant Task Reference," for details and examples.

After registering a shared Java EE library, you can deploy applications and archives that depend on the library. Dependent applications can be deployed only if the target servers have registered all required libraries, and the registered deployments meet the version requirements of the application or archive. See "Deploying Applications that Reference Libraries" in *Deploying Applications to Oracle WebLogic Server* for more information.

11.8 Web Application Shared Java EE Library Information

In general, this topic discusses shared Java EE libraries that can be referenced only by enterprise applications. You can also create libraries that can be referenced only by another Web application. The functionality is very similar to application libraries, although the method of referencing them is slightly different.

> **Note:** For simplicity, this section uses the term *Web application library* when referring to a shared Java EE library that is referenced only by another Web application.

In particular:

- Web application libraries can only be referenced by other Web applications.
- Rather than update the `weblogic-application.xml` file, Web applications reference Web application libraries by updating the `weblogic.xml` deployment descriptor file. The elements are almost the same as those described in Section 11.3, "Referencing Shared Java EE Libraries in an Enterprise Application"; the only difference is that the `<context-root>` child element of `<library-ref>` is ignored in this case.
- You cannot reference any other type of shared Java EE library (EJB, enterprise application, or plain JAR file) from the `weblogic.xml` deployment descriptor file of a Web application.

Other than these differences in how they are referenced, the way to create, package, and deploy a Web application library is the same as that of a standard shared Java EE library.

11.9 Using WebApp Libraries With Web Applications

Just as standard shared Java EE applications can be deployed to WebLogic Server as `application-libraries`, a standard Web application can be deployed to WebLogic Server as a `webapp-library` so that other Web applications can refer to these libraries.

Web application libraries facilitate the reuse of code and resources. Such libraries also help you separate out third-party Web applications or frameworks that your Web application might be using. Furthermore, common resources can be packaged separately as libraries and referenced in different Web applications, so that you don't have to bundle them with each Web application. When you include a `webapp-library` in your Web application, at deployment time the container merges all the static resources, classes, and `JAR` files into your Web application.

The first step in using a WebApp library is to register a Web application as a `webapp-library`. This can be accomplished by deploying a Web application using either the Administration Console or the `weblogic.Deployer` tool as a library. To make other Web applications refer to this library, their `weblogic.xml` file must have a `library-ref` element pointing to the `webapp-library`, as follows:

```
<library-ref>
<library-name>BaseWebApp</library-name>
<specification-version>2.0</specification-version>
<implementation-version>8.1beta</implementation-version>
<exact-match>false</exact-match>
</library-ref>
```

When multiple libraries are present, the CLASSPATH/resource path precedence order follows the order in which the library-refs elements appear in the weblogic.xml file.

11.10 Accessing Registered Shared Java EE Library Information with LibraryRuntimeMBean

Each deployed shared Java EE library is represented by a LibraryRuntimeMBean. You can use this MBean to obtain information about the library itself, such as its name or version. You can also obtain the ApplicationRuntimeMBeans associated with deployed applications. ApplicationRuntimeMBean provides two methods to access the libraries that the application is using:

- getLibraryRuntimes() returns the shared Java EE libraries referenced in the weblogic-application.xml file.
- getOptionalPackageRuntimes() returns the optional packages referenced in the manifest file.

For more information, see the *Java API Reference for Oracle WebLogic Server*.

11.11 Order of Precedence of Modules When Referencing Shared Java EE Libraries

When an enterprise application references one or more shared Java EE libraries, and the application is deployed to WebLogic Server, the server internally merges the information in the weblogic-application.xml file of the referencing enterprise application with the information in the deployment descriptors of the referenced libraries. The order in which this happens is as follows:

1. When the enterprise application is deployed, WebLogic Server reads its weblogic-application.xml deployment descriptor.
2. WebLogic Server reads the deployment descriptors of any referenced shared Java EE libraries. Depending on the type of library (enterprise application, EJB, or Web application), the read file might be weblogic-application.xml, weblogic.xml, weblogic-ejb-jar.xml, and so on.
3. WebLogic Server first merges the referenced shared Java EE library deployment descriptors (in the order in which they are referenced, one at a time) and then merges the weblogic-application.xml file of the referencing enterprise application on top of the library descriptor files.

As a result of the way the descriptor files are merged, the elements in the descriptors of the shared Java EE libraries referenced first in the weblogic-application.xml file have precedence over the ones listed last. The elements of the enterprise application's descriptor itself have precedence over all elements in the library descriptors.

For example, assume that an enterprise application called myApp references two shared Java EE libraries (themselves packaged as enterprise applications): myLibA and myLibB, in that order. Both the myApp and myLibA applications include an EJB module called myEJB, and both the myLibA and myLibB applications include an EJB module called myOtherEJB.

Further assume that once the myApp application is deployed, a client invokes, via the myApp application, the myEJB module. In this case, WebLogic Server actually invokes the EJB in the myApp application (rather than the one in myLibA) because modules in the *referencing* application have higher precedence over modules in the *referenced* applications. If a client invokes the `myOtherEJB` EJB, then WebLogic Server invokes the one in `myLibA`, because the library is referenced first in the `weblogic-application.xml` file of `myApp`, and thus has precedence over the EJB with the same name in the `myLibB` application.

11.12 Best Practices for Using Shared Java EE Libraries

Keep in mind these best practices when developing shared Java EE libraries and optional packages:

- Use shared Java EE Libraries when you want to share one or more Java EE modules (EJBs, Web applications, enterprise applications, or plain Java classes) with multiple enterprise applications.
- If you need to deploy a standalone Java EE module, such as an EJB JAR file, as a shared Java EE library, package the module within an enterprise application. Doing so avoids potential URI conflicts, because the library URI of a standalone module is derived from the deployment name.
- If you choose to deploy a shared Java EE library as a standalone Java EE module, always specify a known deployment name during deployment and use that name as the URI in referencing applications.
- Use optional packages when multiple Java EE archive files need to share a set of Java classes.
- If you have a set of classes that must be available to applications in an entire domain, and you do not frequently update those classes (for example, if you need to share 3rd party classes in a domain), use the domain `/lib` subdirectory rather than using shared Java EE libraries or optional packages. Classes in the `/lib` subdirectory are made available (within a separate system level classloader) to all Java EE applications running on WebLogic Server instances in the domain.
- Always specify a specification version and implementation version, even if you do not intend to enforce version requirements with dependent applications. Specifying versions for shared Java EE libraries enables you to deploy multiple versions of the shared files for testing.
- Always specify an `Extension-Name` value for each shared Java EE library. If you do not specify an extension name, one is derived from the deployment name of the library. Default deployment names are different for archive and exploded archive deployments, and they can be set to arbitrary values in the deployment command
- When developing a Web application for deployment as a shared Java EE library, use a unique context root. If the context root conflicts with the context root in a dependent Java EE application, use the `context-root` element in the EAR's `weblogic-application.xml` deployment descriptor to override the library's context root.
- Package shared Java EE libraries as archive files for delivery to administrators or deployers in your organization. Deploy libraries from exploded archive directories during development to allow for easy updates and repeated redeployments.
- Deploy shared Java EE libraries to all WebLogic Server instances on which you want to deploy dependent applications and archives. If a library is not registered with a server instance on which you want to deploy a referencing application, deployment of the referencing application fails.

12

Programming Application Life Cycle Events

This chapter describes how to create applications that respond to WebLogic Server application life cycle events.

This chapter includes the following sections:

- Section 12.1, "Understanding Application Life Cycle Events"
- Section 12.2, "Registering Events in weblogic-application.xml"
- Section 12.3, "Programming Basic Life Cycle Listener Functionality"
- Section 12.4, "Examples of Configuring Life Cycle Events with and without the URI Parameter"
- Section 12.5, "Understanding Application Life Cycle Event Behavior During Re-deployment"
- Section 12.6, "Programming Application Version Life Cycle Events"

> **Note:** Application-scoped startup and shutdown classes have been deprecated as of release 9.0 of WebLogic Server. The information in this chapter about startup and shutdown classes is provided only for backwards compatibility. Instead, you should use life cycle listener events in your applications.

12.1 Understanding Application Life Cycle Events

Application life cycle listener events provide handles on which developers can control behavior during deployment, undeployment, and redeployment. This section discusses how you can use the application life cycle listener events.

Four application life cycle events are provided with WebLogic Server, which can be used to extend listener, shutdown, and startup classes. These include:

- Listeners—attachable to any event. Possible methods for Listeners are:
  - `public void preStart(ApplicationLifecycleEvent evt) {}`

    The preStart event is the beginning of the prepare phase, or the start of the application deployment process.
  - `public void postStart(ApplicationLifecycleEvent evt) {}`

    The postStart event is the end of the activate phase, or the end of the application deployment process. The application is deployed.
  - `public void preStop(ApplicationLifecycleEvent evt) {}`

The preStop event is the beginning of the deactivate phase, or the start of the application removal or undeployment process.

– `public void postStop(ApplicationLifecycleEvent evt) {}`

The postStop event is the end of the remove phase, or the end of the application removal or undeployment process.

- Shutdown classes only get postStop events.

Note: Application-scoped shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Use life cycle listeners instead.

- Startup classes only get preStart events.

Notes: Application-scoped shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Use life cycle listeners instead.

For Startup and Shutdown classes, you only implement a `main{}` method. If you implement any of the methods provided for Listeners, they are ignored.

No `remove{}` method is provided in the `ApplicationLifecycleListener`, because the events are only fired at startup time during deployment (prestart and poststart) and shutdown during undeployment (prestop and poststop).

12.2 Registering Events in weblogic-application.xml

In order to use these events, you must register them in the `weblogic-application.xml` deployment descriptor. See Appendix A, "Enterprise Application Deployment Descriptor Elements". Define the following elements:

- `listener`—Used to register user defined application life cycle listeners. These are classes that extend the abstract base class `weblogic.application.ApplicationLifecycleListener`.
- `shutdown`—Used to register user-defined shutdown classes.
- `startup`—Used to register user-defined startup classes.

12.3 Programming Basic Life Cycle Listener Functionality

You create a listener by extending the abstract class (provided with WebLogic Server) `weblogic.application.ApplicationLifecycleListener`. The container then searches for your listener.

You override the following methods provided in the WebLogic Server `ApplicationLifecycleListener` abstract class to extend your application and add any required functionality:

- preStart{}
- postStart{}
- preStop{}
- postStop{}

Example 12–1 illustrates how you override the ApplicationLifecycleListener. In this example, the public class MyListener extends ApplicationLifecycleListener.

Example 12–1 MyListener

```
import weblogic.application.ApplicationLifecycleListener;
import weblogic.application.ApplicationLifecycleEvent;
public class MyListener extends ApplicationLifecycleListener {
  public void preStart(ApplicationLifecycleEvent evt) {
     System.out.println
     ("MyListener(preStart) -- we should always see you..");
   } // preStart
  public void postStart(ApplicationLifecycleEvent evt) {
     System.out.println
     ("MyListener(postStart) -- we should always see you..");
   } // postStart
  public void preStop(ApplicationLifecycleEvent evt) {
     System.out.println
     ("MyListener(preStop) -- we should always see you..");
   } // preStop
  public void postStop(ApplicationLifecycleEvent evt) {
     System.out.println
     ("MyListener(postStop) -- we should always see you..");
   } // postStop
   public static void main(String[] args) {
     System.out.println
     ("MyListener(main): in main .. we should never see you..");
   } // main
}
```

Example 12–2 illustrates how you implement the shutdown class. The shutdown class is attachable to preStop and postStop events. In this example, the public class `MyShutdown` does not extend `ApplicationLifecycleListener` because a shutdown class declared in the `weblogic-application.xml` deployment descriptor does not need to depend on any WebLogic Server-specific interfaces.

Example 12–2 MyShutdown

```
import weblogic.application.ApplicationLifecycleListener;
import weblogic.application.ApplicationLifecycleEvent;
public class MyShutdown {
   public static void main(String[] args) {
     System.out.println
     ("MyShutdown(main): in main .. should be for post-stop");
   } // main
}
```

Example 12–3 illustrates how you implement the startup class. The startup class is attachable to preStart and postStart events. In this example, the public class `MyStartup` does not extend `ApplicationLifecycleListener` because a startup class declared in the `weblogic-application.xml` deployment descriptor does not need to depend on any WebLogic Server-specific interfaces.

Example 12–3 MyStartup

```
import weblogic.application.ApplicationLifecycleListener;
import weblogic.application.ApplicationLifecycleEvent;
public class MyStartup {
   public static void main(String[] args) {
     System.out.println
     ("MyStartup(main): in main .. should be for pre-start");
   } // main
}
```

12.3.1 Configuring a Role-Based Application Life Cycle Listener

You can configure an application life cycle event with role-based capability where a user identity can be specified to startup and shutdown events using the `run-as-principal-name` element. However, if the `run-as-principal-name` identity defined for the application life cycle listener is an administrator, the application deployer must have administrator privileges; otherwise, deployment will fail.

1. Follow the basic programming steps outlined in Section 12.3, "Programming Basic Life Cycle Listener Functionality".
2. Within the `listener` element add the `run-as-principal-name` element to specify the user who has privileges to startup and/or shutdown the event. For example:

```
<listener>
  <listener-class>myApp.MySessionAttributeListenerClass</listener-class>
  <run-as-principal-name>javajoe</run-as-principal-name>
</listener>
```

The identity specified here should be a valid user name in the system. If `run-as-principal-name` is not specified, the deployment initiator user identity will be used as the `run-as` identity for the execution of the application life cycle listener.

12.4 Examples of Configuring Life Cycle Events with and without the URI Parameter

The following examples illustrate how you configure application life cycle events in the `weblogic-application.xml` deployment descriptor file. The URI parameter is not required. You can place classes anywhere in the application `$CLASSPATH`. However, you must ensure that the class locations are defined in the `$CLASSPATH`. You can place listeners in `APP-INF/classes` or `APP-INF/lib`, if these directories are present in the EAR. In this case, they are automatically included in the `$CLASSPATH`.

The following example illustrates how you configure application life cycle events using the URI parameter. In this case, the archive `foo.jar` contains the classes and exists at the top level of the EAR file. For example: `myEar/foo.jar`.

Example 12–4 Configuring Application Life Cycle Events Using the URI Parameter

```
<listener>
     <listener-class>MyListener</listener-class>
     <listener-uri>foo.jar</listener-uri>
</listener>
<startup>
     <startup-class>MyStartup</startup-class>
     <startup-uri>foo.jar</startup-uri>
</startup>
<shutdown>
     <shutdown-class>MyShutdown</shutdown-class>
     <shutdown-uri>foo.jar</shutdown-uri>
</shutdown>
```

The following example illustrates how you configure application life cycle events without using the URI parameter.

Example 12–5 Configuring Application Life Cycle Events without Using the URI Parameter

```
<listener>
      <listener-class>MyListener</listener-class>
 </listener>
 <startup>
      <startup-class>MyStartup</startup-class>
 </startup>
 <shutdown>
      <shutdown-class>MyShutdown</shutdown-class>
 </shutdown>
```

12.5 Understanding Application Life Cycle Event Behavior During Re-deployment

Application life cycle events are only triggered if a full re-deployment of the application occurs. During a full re-deployment of the application—provided the application life cycle events have been registered—the application life cycle first commences the shutdown sequence, next re-initializes its classes, and then performs the startup sequence.

For example, if your listener is registered for the full application life cycle set of events (preStart, postStart, preStop, postStop), during a full re-deployment, you see the following sequence of events:

1. `preStop{}`
2. `postStop{}`
3. Initialization takes place. (Unless you have set debug flags, you do not see the initialization.)
4. `preStart{}`
5. `postStart{}`

12.6 Programming Application Version Life Cycle Events

The following sections describe how to create applications that respond to WebLogic Server application version life cycle events:

- Section 12.6.1, "Understanding Application Version Life Cycle Event Behavior"
- Section 12.6.2, "Types of Application Version Life Cycle Events"
- Section 12.6.3, "Example of Production Deployment Sequence When Using Application Version Life Cycle Events"

12.6.1 Understanding Application Version Life Cycle Event Behavior

WebLogic Server provides application version life cycle event notifications by allowing you to extend the `ApplicationVersionLifecycleListener` class and specify a life cycle listener in `weblogic-application.xml`. See Appendix A, "Enterprise Application Deployment Descriptor Elements" and Section 12.4, "Examples of Configuring Life Cycle Events with and without the URI Parameter".

Application version life cycle events are invoked:

- For both static and dynamic deployments.
- Using either anonymous ID or using user identity.
- Only if the current application is versioned; otherwise, version life cycle events are ignored.
- For all application versions, including the version that registers the listener. Use the `ApplicationVersionLifecycleEvent.isOwnVersion` method to determine if an event belongs to a particular version. See the `ApplicationVersionLifecycleEvent` class for more information on types of version life cycle events.

12.6.2 Types of Application Version Life Cycle Events

Four application version life cycle events are provided with WebLogic Server:

- `public void preDeploy(ApplicationVersionLifecycleEvent evt)`
  - The `preDeloy` event is invoked when an application version deploy or redeploy operation is initiated.
- `public void postDeploy(ApplicationVersionLifecycleEvent evt)`
  - The `postDeloy` event is invoked when an application version is deployed or redeployed successfully.
- `public void preUndeploy(ApplicationVersionLifecycleEvent evt)`
  - The `preUndeloy` event is invoked when an application version undeploy operation is initiated.
- `public void postDelete(ApplicationVersionLifecycleEvent evt)`
  - The `postDelete` event is invoked when an application version is deleted.

> **Note:** A `postDelete` event is only fired after the entire application version is completely removed. It does not include a partial undeploy, such as undeploying a module or from a subset of targets.

12.6.3 Example of Production Deployment Sequence When Using Application Version Life Cycle Events

The following table provides an example of a deployment (V1), production redeployment (V2), and an undeploy (V2).

Table 12–1 Sequence of Deployment Actions and Application Version Life Cycle Events

Deployment action	Time	Version V1	Version V2
Deployment of Version V1	T0	`preDeploy(V1)` invoked.	
	T1	Deployment starts.	
	T2	Application life cycle listeners for V1 are registered.	
	T3	V1 is active version, Deployment is complete.	
	T4	`postDeploy(V1)` invoked.	

Table 12–1 (Cont.) Sequence of Deployment Actions and Application Version Life Cycle Events

Deployment action	Time	Version V1	Version V2
	T5	Application Listeners gets `postDeploy(V1).`	
Production Redeployment of Version V2	T6		`preDeploy(V2)` invoked.
	T7	Application version listener receives `preDeploy(V1).`	
	T8		Deployment starts.
	T9		Application life cycle listeners for V2 are registered.
	T10	If deploy(V2) succeeds, V1 ceases to be active version.	If deploy(V2) succeeds, V2 replaces V1 as active version. Deployment is complete.
	T11		`postDeploy(V2)` invoked. **Note:** This event occurs even if the deployment fails.
	T12	Application version listener gets `postDeploy(V2).` If deploy(V2) fails, V1 remains active.	
	T13		Application listeners gets `postDeploy(V2).`
	T14	If deploy(V2) succeeds, V1 begins retirement.	
	T15	Application listeners for V1 are unregistered.	
	T16	V1 is retired.	
Undeployment of V2	T17		`preUndeploy(v2)` invoked.
	T18		Application listeners gets `preUndeploy(v2)` invoked.
	T19		Undeployment begins.
	T20		V2 is no longer active version.
	T21		Application version listeners for V2 are unregistered.
	T22		Undeployment is complete.
	T23		If the entire application is undeployed, `postDelete(V2)` is invoked. **Note:** This event occurs even if the undeployment fails.

13 Programming Context Propagation

This chapter describes how to use the context propagation APIs in your applications.

This chapter includes the following sections:

- Section 13.1, "Understanding Context Propagation"
- Section 13.2, "Programming Context Propagation: Main Steps"
- Section 13.3, "Programming Context Propagation in a Client"
- Section 13.4, "Programming Context Propagation in an Application"

13.1 Understanding Context Propagation

Context propagation allows programmers to associate information with an application which is then carried along with every request. Furthermore, downstream components can add or modify this information so that it can be carried back to the originator. Context propagation is also known as *work areas*, *work contexts*, or *application transactions*.

Common use-cases for context propagation are any type of application in which information needs to be carried outside the application, rather than the information being an integral part of the application. Examples of these use cases include diagnostics monitoring, application transactions, and application load-balancing. Keeping this sort of information outside of the application keeps the application itself clean with no extraneous API usage and also allows the addition of information to read-only components, such as 3rd party components.

Programming context propagation has two parts: first you code the client application to create a `WorkContextMap` and `WorkContext`, and then add user data to the context, and then you code the invoked application itself to get and possibly use this data. The invoked application can be of any type: EJB, Web service, servlet, JMS topic or queue, and so on. See Section 13.2, "Programming Context Propagation: Main Steps" for details.

The WebLogic context propagation APIs are in the `weblogic.workarea` package. The following table describes the main interfaces and classes.

Table 13–1 Interfaces and classes of the WebLogic Context Propagation API

Interface or Class	Description
`WorkContextMap` Interface	Main context propagation interface used to tag applications with data and propagate that information via application requests. `WorkContextMaps` is part of the client or application's JNDI environment and can be accessed through JNDI by looking up the name `java:comp/WorkContextMap`.
`WorkContext` Interface	Interface used for marshaling and unmarshaling the user data that is passed along with an application. This interface has four implementing classes for marshaling and unmarshaling the following types of data: simple 8-bit ASCII contexts (`AsciiWorkContext`), long contexts (`LongWorkContext`), Serializable context (`SerializableWorkContext`), and String contexts (`StringWorkContext`). `WorkContext` has one subinterface, `PrimitiveWorkContext`, used to specifically marshal and unmarshal a single primitive data item.
`WorkContextOutput/Input` Interfaces	Interfaces representing primitive streams used for marshaling and unmarshaling, respectively, `WorkContext` implementations.
`PropagationMode` Interface	Defines the propagation properties of `WorkContexts`. Specifies whether the WorkContext is propagated locally, across threads, across RMI invocations, across JMS queues and topics, or across SOAP messages. If not specified, default is to propagate data across remote and local calls in the same thread.
`PrimitiveContextFactory` Class	Convenience class for creating `WorkContexts` that contain only primitive data.

For the complete API documentation about context propagation, see the `weblogic.workarea Javadocs`.

13.2 Programming Context Propagation: Main Steps

The following procedure describes the high-level steps to use context propagation in your application. It is assumed in the procedure that you have already set up your iterative development environment and have an existing client and application that you want to update to use context propagation by using the `weblogic.workarea` API.

1. Update your client application to create the `WorkContextMap` and `WorkContext` objects and then add user data to the context.

   See Section 13.3, "Programming Context Propagation in a Client".

2. If your client application is standalone (rather than running in a Java EE component deployed to WebLogic Server), ensure that its CLASSPATH includes the Java EE application client, also called the *thin client*.

   See *Developing Stand-alone Clients for Oracle WebLogic Server*.

3. Update your application (EJB, Web service, servlet, and so on) to also create a `WorkContextMap` and then get the context and user data that you added from the client application.

   See Section 13.4, "Programming Context Propagation in an Application".

13.3 Programming Context Propagation in a Client

The following sample Java code shows a standalone Java client that invokes a Web service; the example also shows how to use the `weblogic.workarea.*` context propagation APIs to associate user information with the invoke. The code relevant to context propagation is shown in bold and explained after the example.

For the complete API documentation about context propagation, see the `weblogic.workarea Javadocs`.

> **Note:** See *Developing JAX-WS Web Services for Oracle WebLogic Server* for information on creating Web services and client applications that invoke them.

```
package examples.workarea.client;
import java.rmi.RemoteException;
import javax.xml.rpc.ServiceException;
import javax.xml.rpc.Stub;
import javax.naming.InitialContext;
import javax.naming.NamingException;
import weblogic.workarea.WorkContextMap;
import weblogic.workarea.WorkContext;
import weblogic.workarea.PrimitiveContextFactory;
import weblogic.workarea.PropagationMode;
import weblogic.workarea.PropertyReadOnlyException;
/**
 * This is a simple standalone client application that invokes the
 * the <code>sayHello</code> operation of the WorkArea Web service.
 *
 */
public class Main {
  public final static String SESSION_ID= "session_id_key";
  public static void main(String[] args)
      throws ServiceException, RemoteException, NamingException,
PropertyReadOnlyException{
    WorkAreaService service = new WorkAreaService_Impl(args[0] + "?WSDL");
    WorkAreaPortType port = service.getWorkAreaPort();
    WorkContextMap map = (WorkContextMap)new
InitialContext().lookup("java:comp/WorkContextMap");
    WorkContext stringContext = PrimitiveContextFactory.create("A String
Context");
    // Put a string context
    map.put(SESSION_ID, stringContext, PropagationMode.SOAP);
    try {
      String result = null;
      result = port.sayHello("Hi there!");
      System.out.println( "Got result: " + result );
    } catch (RemoteException e) {
      throw e;
    }
  }
}
```

In the preceding example:

- The following code shows how to import the needed `weblogic.workarea.*` classes, interfaces, and exceptions:

```
import weblogic.workarea.WorkContextMap;
import weblogic.workarea.WorkContext;
import weblogic.workarea.PrimitiveContextFactory;
import weblogic.workarea.PropagationMode;
import weblogic.workarea.PropertyReadOnlyException;
```

- The following code shows how to create a `WorkContextMap` by doing a JNDI lookup of the context propagation-specific JNDI name `java:comp/WorkContextMap`:

  ```
  WorkContextMap map = (WorkContextMap)
        new InitialContext().lookup("java:comp/WorkContextMap");
  ```

- The following code shows how to create a `WorkContext` by using the `PrimitiveContextFactory`. In this example, the `WorkContext` consists of the simple String value `A String Context`. This String value is the user data that is passed to the invoked Web service.

  ```
  WorkContext stringContext =
       PrimitiveContextFactory.create("A String Context");
  ```

- Finally, the following code shows how to add the context data, along with the key `SESSION_ID`, to the `WorkContextMap` and associate it with the current thread. The `PropagationMode.SOAP` constant specifies that the propagation happens over SOAP messages; this is because the client is invoking a Web service.

  ```
  map.put(SESSION_ID, stringContext, PropagationMode.SOAP);
  ```

13.4 Programming Context Propagation in an Application

The following sample Java code shows a simple Java Web service (JWS) file that implements a Web service. The JWS file also includes context propagation code to get the user data that is associated with the invoke of the Web service. The code relevant to context propagation is shown in bold and explained after the example.

For the complete API documentation about context propagation, see the `weblogic.workarea Javadocs`.

> **Note:** See *Developing JAX-WS Web Services for Oracle WebLogic Server* for information on creating Web services and client applications that invoke them.

```
package examples.workarea;
import javax.naming.InitialContext;
// Import the Context Propagation classes
import weblogic.workarea.WorkContextMap;
import weblogic.workarea.WorkContext;
import javax.jws.WebMethod;
import javax.jws.WebService;
import weblogic.jws.WLHttpTransport;
@WebService(name="WorkAreaPortType",
            serviceName="WorkAreaService",
             targetNamespace="http://example.org")
@WLHttpTransport(contextPath="workarea",
                 serviceUri="WorkAreaService",
                  portName="WorkAreaPort")
/**
 * This JWS file forms the basis of simple WebLogic
 * Web service with a single operation: sayHello
 *
 */
public class WorkAreaImpl {
  public final static String SESSION_ID = "session_id_key";
  @WebMethod()
  public String sayHello(String message) {
```

```
   try {
    WorkContextMap map = (WorkContextMap) new
InitialContext().lookup("java:comp/WorkContextMap");
    WorkContext localwc = map.get(SESSION_ID);
    System.out.println("local context: " + localwc);
    System.out.println("sayHello: " + message);
    return "Here is the message: '" + message + "'";
   } catch (Throwable t) {
    return "error";
   }
  }
}
```

In the preceding example:

- The following code shows how to import the needed context propagation APIs; in this case, only the WorkContextMap and WorkContext interfaces are needed:

  ```
  import weblogic.workarea.WorkContextMap;
  import weblogic.workarea.WorkContext;
  ```

- The following code shows how to create a `WorkContextMap` by doing a JNDI lookup of the context propagation-specific JNDI name `java:comp/WorkContextMap`:

  ```
  WorkContextMap map = (WorkContextMap)
      new InitialContext().lookup("java:comp/WorkContextMap");
  ```

- The following code shows how to get context's user data from the current `WorkContextMap` using a key; in this case, the key is the same one that the client application set when it invoked the Web service: `SESSION_ID`:

  ```
  WorkContext localwc = map.get(SESSION_ID);
  ```

14 Programming JavaMail with WebLogic Server

This chapter describes how to program JavaMail with WebLogic Server to add email capabilities to your WebLogic Server applications.

This chapter includes the following sections:

14.1 Overview of Using JavaMail with WebLogic Server Applications

WebLogic Server includes the JavaMail API version 1.4 reference implementation. Using the JavaMail API, you can add email capabilities to your WebLogic Server applications. JavaMail provides access from Java applications to Internet Message Access Protocol (IMAP)- and Simple Mail Transfer Protocol (SMTP)-capable mail servers on your network or the Internet. It does not provide mail server functionality; you must have access to a mail server to use JavaMail.

Complete documentation for using the JavaMail API is available at `http://www.oracle.com/technetwork/java/javamail-138606.html`. This section describes how you can use JavaMail in the WebLogic Server environment.

The `weblogic.jar` file contains the following JavaMail API packages:

- `javax.mail`
- `javax.mail.event`
- `javax.mail.internet`
- `javax.mail.search`

The `weblogic.jar` also contains the Java Activation Framework (JAF) package, which JavaMail requires.

The `javax.mail` package includes providers for Internet Message Access protocol (IMAP) and Simple Mail Transfer Protocol (SMTP) mail servers. There is a separate POP3 provider for JavaMail, which is not included in `weblogic.jar`. You can download the POP3 provider at http://www.oracle.com/technetwork/java/javamail/index-138643.html and add it to the WebLogic Server classpath if you want to use it.

14.2 Understanding JavaMail Configuration Files

JavaMail depends on configuration files that define the mail transport capabilities of the system. The `weblogic.jar` file contains the standard configuration files which enable IMAP and SMTP mail servers for JavaMail and define the default message types JavaMail can process.

Unless you want to extend JavaMail to support additional transports, protocols, and message types, you do not have to modify any JavaMail configuration files. If you do want to extend JavaMail, see http://www.oracle.com/technetwork/java/javamail-138606.html. Then add your extended JavaMail package in the WebLogic Server classpath *in front of* `weblogic.jar.`

14.3 Configuring JavaMail for WebLogic Server

To configure JavaMail for use in WebLogic Server, you create a mail session in the WebLogic Server Administration Console. This allows server-side modules and applications to access JavaMail services with JNDI, using Session properties you preconfigure for them. For example, by creating a mail session, you can designate the mail hosts, transport and store protocols, and the default mail user in the Administration Console so that modules that use JavaMail do not have to set these properties. Applications that are heavy email users benefit because the mail session creates a single `javax.mail.Session` object and makes it available via JNDI to any module that needs it.

For information on using the Administration Console to create a mail session, see "Configure access to JavaMail" in the *Oracle WebLogic Server Administration Console Online Help*.

You can override any properties set in the mail session in your code by creating a `java.util.Properties` object containing the properties you want to override. See Section 14.4, "Sending Messages with JavaMail". Then, after you look up the mail session object in JNDI, call the `Session.getInstance()` method with your `Properties` object to get a customized Session.

14.4 Sending Messages with JavaMail

Here are the steps to send a message with JavaMail from within a WebLogic Server module:

1. Import the JNDI (naming), JavaBean Activation, and JavaMail packages. You will also need to import `java.util.Properties:`

   ```
   import java.util.*;
   import javax.activation.*;
   import javax.mail.*;
   import javax.mail.internet.*;
   import javax.naming.*;
   ```

2. Look up the Mail Session in JNDI:

   ```
   InitialContext ic = new InitialContext();
   Session session = (Session) ic.lookup("myMailSession");
   ```

3. If you need to override the properties you set for the Session in the Administration Console, create a `java.util.Properties` object and add the properties you want to override. Then call `getInstance()` to get a new Session object with the new properties.

```
Properties props = new Properties();
props.put("mail.transport.protocol", "smtp");
props.put("mail.smtp.host", "mailhost");
// use mail address from HTML form for from address
props.put("mail.from", emailAddress);
Session session2 = session.getInstance(props);
```

4. Construct a `MimeMessage`. In the following example, *to*, *subject*, and *messageTxt* are String variables containing input from the user.

```
Message msg = new MimeMessage(session2);
msg.setFrom();
msg.setRecipients(Message.RecipientType.TO,
                  InternetAddress.parse(to, false));
msg.setSubject(subject);
msg.setSentDate(new Date());
// Content is stored in a MIME multi-part message
// with one body part
MimeBodyPart mbp = new MimeBodyPart();
mbp.setText(messageTxt);
Multipart mp = new MimeMultipart();
mp.addBodyPart(mbp);
msg.setContent(mp);
```

5. Send the message.

```
Transport.send(msg);
```

The JNDI lookup can throw a `NamingException` on failure. JavaMail can throw a `MessagingException` if there are problems locating transport classes or if communications with the mail host fails. Be sure to put your code in a try block and catch these exceptions.

14.5 Reading Messages with JavaMail

The JavaMail API allows you to connect to a message store, which could be an IMAP server or POP3 server. Messages are stored in folders. With IMAP, message folders are stored on the mail server, including folders that contain incoming messages and folders that contain archived messages. With POP3, the server provides a folder that stores messages as they arrive. When a client connects to a POP3 server, it retrieves the messages and transfers them to a message store on the client.

Folders are hierarchical structures, similar to disk directories. A folder can contain messages or other folders. The default folder is at the top of the structure. The special folder name INBOX refers to the primary folder for the user, and is within the default folder. To read incoming mail, you get the default folder from the store, and then get the INBOX folder from the default folder.

The API provides several options for reading messages, such as reading a specified message number or range of message numbers, or pre-fetching specific parts of messages into the folder's cache. See the JavaMail API for more information.

Here are steps to read incoming messages on a POP3 server from within a WebLogic Server module:

1. Import the JNDI (naming), JavaBean Activation, and JavaMail packages. You will also need to import `java.util.Properties`:

   ```
   import java.util.*;
   import javax.activation.*;
   import javax.mail.*;
   import javax.mail.internet.*;
   import javax.naming.*;
   ```

2. Look up the Mail Session in JNDI:

   ```
   InitialContext ic = new InitialContext();
   Session session = (Session) ic.lookup("myMailSession");
   ```

3. If you need to override the properties you set for the Session in the Administration Console, create a `Properties` object and add the properties you want to override. Then call `getInstance()` to get a new Session object with the new properties:

   ```
   Properties props = new Properties();
   props.put("mail.store.protocol", "pop3");
   props.put("mail.pop3.host", "mailhost");
   Session session2 = session.getInstance(props);
   ```

4. Get a `Store` object from the Session and call its `connect()` method to connect to the mail server. To authenticate the connection, you need to supply the mailhost, user name, and password in the connect method:

   ```
   Store store = session.getStore();
   store.connect(mailhost, username, password);
   ```

5. Get the default folder, then use it to get the INBOX folder:

   ```
   Folder folder = store.getDefaultFolder();
   folder = folder.getFolder("INBOX");
   ```

6. Read the messages in the folder into an array of Messages:

   ```
   Message[] messages = folder.getMessages();
   ```

7. Operate on messages in the Message array. The Message class has methods that allow you to access the different parts of a message, including headers, flags, and message contents.

Reading messages from an IMAP server is similar to reading messages from a POP3 server. With IMAP, however, the JavaMail API provides methods to create and manipulate folders and transfer messages between them. If you use an IMAP server, you can implement a full-featured, Web-based mail client with much less code than if you use a POP3 server. With POP3, you must provide code to manage a message store via WebLogic Server, possibly using a database or file system to represent folders.

15
Threading and Clustering Topics

This chapter describes how to use threads in WebLogic Server as well as how to program applications for use in WebLogic Server clusters.

This chapter includes the following sections:

- Section 15.1, "Using Threads in WebLogic Server"
- Section 15.2, "Using the Work Manager API for Lower-Level Threading"
- Section 15.3, "Programming Applications for WebLogic Server Clusters"

15.1 Using Threads in WebLogic Server

WebLogic Server is a sophisticated, multi-threaded application server and it carefully manages resource allocation, concurrency, and thread synchronization for the modules it hosts. To obtain the greatest advantage from WebLogic Server's architecture, construct your application modules created according to the standard Java EE APIs.

In most cases, avoid application designs that require creating new threads in server-side modules:

- Applications that create their own threads do not scale well. Threads in the JVM are a limited resource that must be allocated thoughtfully. Your applications may break or cause WebLogic Server to thrash when the server load increases. Problems such as deadlocks and thread starvation may not appear until the application is under a heavy load.
- Multithreaded modules are complex and difficult to debug. Interactions between application-generated threads and WebLogic Server threads are especially difficult to anticipate and analyze.

In some situations, creating threads may be appropriate, in spite of these warnings. For example, an application that searches several repositories and returns a combined result set can return results sooner if the searches are done asynchronously using a new thread for each repository instead of synchronously using the main client thread.

If you must use threads in your application code, create a pool of threads so that you can control the number of threads your application creates. Like a JDBC connection pool, you allocate a given number of threads to a pool, and then obtain an available thread from the pool for your runnable class. If all threads in the pool are in use, wait until one is returned. A thread pool helps avoid performance issues and allows you to optimize the allocation of threads between WebLogic Server execution threads and your application.

Be sure you understand where your threads can deadlock and handle the deadlocks when they occur. Review your design carefully to ensure that your threads do not compromise the security system.

To avoid undesirable interactions with WebLogic Server threads, do not let your threads call into WebLogic Server modules. For example, do not use enterprise beans or servlets from threads that you create. Application threads are best used for independent, isolated tasks, such as conversing with an external service with a TCP/IP connection or, with proper locking, reading or writing to files. A short-lived thread that accomplishes a single purpose and ends (or returns to the thread pool) is less likely to interfere with other threads.

Avoid creating daemon threads in modules that are packaged in applications deployed on WebLogic Server. When you create a daemon thread in an application module such as a servlet, you will not be able to redeploy the application because the daemon thread created in the original deployment will remain running.

Be sure to test multithreaded code under increasingly heavy loads, adding clients even to the point of failure. Observe the application performance and WebLogic Server behavior and then add checks to prevent failures from occurring in production.

15.2 Using the Work Manager API for Lower-Level Threading

The Work Manager provides a simple API for concurrent execution of work items. This enables Java EE-based applications (including servlets and EJBs) to schedule work items for concurrent execution, which will provide greater throughput and increased response time. After an application submits work items to a Work Manager for concurrent execution, the application can gather the results. The Work Manager provides common "join" operations, such as waiting for any or all work items to complete. The Work Manager for Application Servers specification provides an application-server-supported alternative to using lower-level threading APIs, which are inappropriate for use in managed environments such as servlets and EJBs, as well as being too difficult to use for most applications.

For more information, see "Using Work Managers to Optimize Scheduled Work".

15.3 Programming Applications for WebLogic Server Clusters

JSPs and servlets that will be deployed to a WebLogic Server cluster must observe certain requirements for preserving session data. See "Requirements for HTTP Session State Replication" in *Administering Clusters for Oracle WebLogic Server* for more information.

EJBs deployed in a WebLogic Server cluster have certain restrictions based on EJB type. See "Understanding WebLogic Enterprise JavaBeans" in *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*for information about the capabilities of different EJB types in a cluster. EJBs can be deployed to a cluster by setting clustering properties in the EJB deployment descriptor.

If you are developing either EJBs or custom RMI objects for deployment in a cluster, also refer to "Using WebLogic JNDI in a Clustered Environment" in *Developing JNDI Applications for Oracle WebLogic Server* to understand the implications of binding clustered objects in the JNDI tree.

16

Developing OSGi Bundles for WebLogic Server Applications

This chapter describes the OSGi environment in WebLogic Server and how to deploy OSGi bundles to WebLogic Server. Developers who want to use OSGi in their applications can easily share OSGi facilities, such as the OSGi service registry, class loaders, and other OSGi services.

For general information about OSGi, see `http://www.osgi.org`.

This chapter includes the following sections:

16.1 Understanding OSGi

OSGi is a Java modularity system developed and maintained by the OSGi Alliance, of which Oracle is a member.

The OSGi specifications and related Javadoc together describe a comprehensive operating environment for Java applications:

- You can download the OSGi Service Platform Core Specification from `http://www.osgi.org/Release4/Download`.
- The OSGi Javadoc is available from `http://www.osgi.org/Release4/Javadoc`.

As described on the OSGi Alliance Technology Web page (`http://www.osgi.org/About/Technology`), "OSGi technology is the dynamic module system for Java. The OSGi Service Platform provides functionality to Java that makes Java the premier environment for software integration and thus for development. Java provides the portability that is required to support products on many different platforms. The OSGi technology provides the standardized primitives that allow applications to be constructed from small, reusable and collaborative components. These components can be composed into an application and deployed."

The OSGi Architecture Web page `http://www.osgi.org/About/WhatIsOSGi` further describes the OSGi technology as "...a set of specifications that define a dynamic component system for Java. These specifications enable a development model where applications are (dynamically) composed of many different (reusable) components. The OSGi specifications enable components to hide their implementations from other components while communicating through services, which are objects that are specifically shared between components. This surprisingly simple model has far reaching effects for almost any aspect of the software development process."

OSGi offers you the following benefits, as described in Benefits of Using OSGi `http://www.osgi.org/About/WhyOSGi`:

- Versioning of package wiring, for both implementors and users of interfaces.
- The "uses" directive allows for intelligent wiring of class loaders and helps ensure a consistent class space.
- Flexible and dynamic security.
- Dynamic service wiring through an active registry.
- Various standard OSGi specifications provided by multiple vendors.

16.2 Features Provided in WebLogic Server OSGi Implementation

WebLogic Server allows you to add a list of OSGi frameworks (maintained via OsgiFrameWorkMBean MBeans) to the server configuration.   After the OSGi framework has been booted, a bundle object for the framework is placed into the local server JNDI tree. Applications can then get this bundle from JNDI and thereafter use that as their entry point into the OSGi system.

Applications can also deploy their own OSGi bundles. One specific OSGi bundle from the chosen framework instance can be used in the application classloader hierarchy.

WebLogic Server allows you to:

- Configure and manage one or more instances of an OSGi framework from the Administration Console and WLST.

  WebLogic Server includes the Apache Felix implementation of the OSGi framework.   See `http://felix.apache.org` for information on Felix.
- Create and deploy your own OSGi bundles.

  WebLogic Server includes an OSGi bundle containing the OSGi API.   You can use this API to create your own OSGi bundles.
- One specific OSGi bundle from the chosen framework instance can be used in the application classloader hierarchy.
- Access OSGi bundles directly from JNDI.
- Deploy and undeploy OSGi bundles.
- Log OSGi status via the WebLogic Server logging mechanism.
- Incorporate the OSGi services of your choice.
- Enable OSGi persistence.
- Manage OSGi bundle start levels for deployed bundles.

These topics are described in the sections that follow.

16.3 Configuring the OSGi Framework

As described in the OSGi Service Platform Core Specification, "The Framework forms the core of the OSGi Service Platform Specifications. It provides a general-purpose, secure, and managed Java framework that supports the deployment of extensible and downloadable applications known as bundles. "

WebLogic Server includes the Felix implementation of OSGi framework. You can configure and manage one or more instances of the Felix OSGi framework.

> **Note:** WebLogic Server supports only the Felix framework. Other OSGi Frameworks are not supported and have not been tested.

This section includes the following subsections:

- Section 16.3.1, "Configuring OSGi Framework Instances"
- Section 16.3.2, "Configuring OSGi Framework Persistence"

16.3.1 Configuring OSGi Framework Instances

WebLogic Server includes an OSGi framework by default, but it does not automatically start it.

You must configure WebLogic Server to boot an OSGi framework when WebLogic Server boots. You can do this in four ways, according to your preference:

- Use the WebLogic Server Administration Console to configure an OSGi framework instance.
- Edit the `*DOMAIN_HOME*\config\config.xml` deployment descriptor file to add an entry for the OSGi server and set the attribute values. You specify the OSGi framework you want the WebLogic Server instance to use.
- Use WLST to create the OSGi framework and set the attribute values. WLST then stores the values in the `*DOMAIN_HOME*\config\config.xml` deployment descriptor file.
- Write a Java program to create the OSGi framework and set the attribute values.

In all four cases, configuration of an OSGi framework instance is controlled by the OsgiFrameWorkMBean. For each framework associated with an OsgiFrameWorkMBean, WebLogic Server boots an OSGi framework with a unique name.

You configure the OSGi framework attributes shown in Table 16–1.

Table 16–1 OSGi Framework Attributes

Attribute	Usage
Target	This attribute is required. You must select a target (servers or clusters) on which an MBean will be deployed from the list of servers or clusters in the current domain on which this item can be deployed.
Name	The name of the framework instance. The name of a given framework instance must be unique within a WebLogic Server server instance.

Table 16–1 (Cont.) OSGi Framework Attributes

Attribute	Usage
Implementation Class	The name of the framework implementation class for the `org.osgi.framework.launch.FrameworkFactory` class. The default value is `org.apache.felix.framework.FrameworkFactory`.
Deploy Installation Bundles	Determines whether OSGi bundles are installed in the framework. This attribute is "populate" by default. See Section 16.3.1.5, "Parameter Required for Installing Bundles in the Framework" for more information.
Dynamically Created	Determines whether the MBean is created dynamically or is persisted to `config.xml`. The configuration is always persisted if you use the Administration Console and this attribute is not displayed.
Init Properties	The standard Felix properties to be used when initializing the framework. All standard properties and all properties specific to the framework can be set. See Example 16–3 for an example of setting the Init Properties from a Java program. The Apache Felix Framework Configuration Properties are described in `http://felix.apache.org/site/apache-felix-framework-configuration-properties.html`.
Framework Boot delegation	The name of the `org.osgi.framework.bootdelegation` property. Note that this value, if set, will take precedence over anything specified in the init-properties.
Framework System Packages Extra	The name of the `org.osgi.framework.system.packages.extra` property. Note that this value, if set, will take precedence over anything specified in the init-properties.
Register Global Data Sources	Boolean. Returns true if global data sources should be added to the OSGi service registry.
Register Global Work Managers	Boolean. Returns true if global work managers should be added to the OSGi service registry.

16.3.1.1 Configuring OSGi Framework Instance From Administration Console

You can configure an OSGi framework from the Administration Console. Perform the following steps:

1. In the WebLogic Server Administration Console, expand **Services** in the left panel.
2. Click **OSGi Frameworks** in the left panel.
3. On the Summary of OSGi Frameworks page, click **New**.

   If you have already created an OSGi framework, you can instead click **Clone** to use an existing framework as the basis for a new one.
4. On the Creating a New OSGi Framework page, name this framework instance. The name must be unique.
5. Click **Next**.
6. On the OSGI Framework Targets page, select the servers or clusters to which you would like to deploy this OSGi framework.
7. Click **Finish**.

8. On the Summary of OSGi Frameworks page, select the framework you just created.
9. On the Settings for Framework page, examine the defaults to make sure that they are correct for your environment. See Table 16–1 for a description of the attributes.

See Configure OSGi Frameworks in the *Oracle WebLogic Server Administration Console Online Help*.

16.3.1.2 Configuring OSGi Framework Instance From config.xml

Example 16–1 shows an example of updating `config.xml` to add the OSGi framework to be used by WebLogic Server. Add the `<osgi-framework>` element just before the `</domain>` element.

If you need to add multiple OSGi framework instances, add multiple `<osgi-framework>` elements. Remember that each <name> element must be unique within the server.

After you add this element, you must reboot the WebLogic Server instance.

Example 16–1   Configuring OSGi Framework Instance From config.xml

```
<osgi-framework>
       <name>test-osgi-frame</name>
       <target>AdminServer</target>
   </osgi-framework>
```

16.3.1.3 Configuring OSGi Framework Instance From WLST

Example 16–2 shows an example of using WLST to add the OSGi framework to be used by the WebLogic Server instance.

Example 16–2   Configuring OSGi Framework Instance From WLST

```
java weblogic.WLST

connect('weblogic', 'password')
edit()
startEdit()
wls:/mydomain/edit !> cmo.createOsgiFramework('test-osgi-frame')
[MBeanServerInvocationHandler]com.bea:Name=test-osgi-frame,Type=OsgiFramework
targetServer=cmo.lookupServer('AdminServer')
cd('OsgiFrameworks')
cd('test-osgi-frame')
cmo.addTarget(targetServer)
wls:/mydomain/edit !> save()
wls:/mydomain/edit !> activate()
wls:/mydomain/edit/OsgiFrameworks> ls('a')
drw-   test-osgi-frame
wls:/mydomain/edit/OsgiFrameworks> cd('test-osgi-frame')
wls:/mydomain/edit/OsgiFrameworks/test-osgi-frame> ls('a')
-rw-   DeployInstallationBundles                    populate
-rw-   DeploymentOrder                              1000
-r--   DynamicallyCreated                           false
-rw-   FactoryImplementationClass                   org.apache.felix.framework.F
rameworkFactory
-r--   Id                                           0
-rw-   InitProperties                               null
-rw-   Name                                         test-osgi-frame
```

```
-rw-   Notes                                     null
-rw-   OrgOsgiFrameworkBootdelegation            null
-rw-   OrgOsgiFrameworkSystemPackagesExtra       null
-rw-   RegisterGlobalDataSources                 true
-rw-   RegisterGlobalWorkManagers                true
-r--   Type                                      OsgiFramework
```

16.3.1.4 Configuring OSGi Framework Instance from a Java Program

Example 16–3 shows an example of using a Java program to add the OSGi framework to be used by the WebLogic Server instance.   Comments in the code describe each operation.

Example 16–3 Configuring OSGi Framework from Java Program

```
/**...imports omitted
*/
  /**
   * Create an OSGi framework instance with the designated name
   *
   * @param frameworkName
   */
  protected void createOSGiFrameworkInstance(String frameworkName) {
    createOSGiFrameworkInstance(frameworkName, null, null, null, null, null);
  }

  protected void createOSGiFrameworkInstance(String frameworkName,
                                             String isRegisterGlobalWorkManagers,
                                             String isRegisterGlobalDataSources,
                                             String deployInstallationBundles,
                                             String orgOsgiFrameworkBootdelegation,
                                             String orgOsgiFrameworkSystemPackagesExtra) {
    createOSGiFrameworkInstance(frameworkName,
                                null,
                                isRegisterGlobalWorkManagers,
                                isRegisterGlobalDataSources,
                                deployInstallationBundles,
                                orgOsgiFrameworkBootdelegation,
                                orgOsgiFrameworkSystemPackagesExtra);
  }

  /**
   * Create a fresh framework
   *
   * @param isRegisterGlobalWorkManagers
   * @param isRegisterGlobalDataSources
   * @param deployInstallationBundles
   * @param orgOsgiFrameworkBootdelegation
   * @param orgOsgiFrameworkSystemPackagesExtra
   */
  protected void createOSGiFrameworkInstance(String frameworkName,
                                             Properties initProp,
                                             String isRegisterGlobalWorkManagers,
                                             String isRegisterGlobalDataSources,
                                             String deployInstallationBundles,
                                             String orgOsgiFrameworkBootdelegation,
                                             String orgOsgiFrameworkSystemPackagesExtra) {
```

```
    frameworkInstances.add(frameworkName);

    if (initProp == null) {
      initProp = new Properties();
    }
    initProp.setProperty("wlstest.framework.instance.name", frameworkName);
    //initProp.setProperty("felix.cache.locking", "false");
    //initProp.setProperty("org.osgi.framework.storage.clean", "onFirstInit");

    MBeanServerConnection connection = null;

    try {

      // Initiate the necessary MBean facilities.
      connection = initConnection();
      // Switch the edit session on.
      ObjectName domainMBean = startEditSession(connection);

      // Get the current WebLogic server MBean:
      ObjectName serverMBean = null;
      ObjectName[] serverMBeans = (ObjectName[]) connection.getAttribute(domainMBean, "Servers");
      for (ObjectName objectName : serverMBeans) {
        log("found server: " + objectName);
        serverMBean = objectName;
      }

      // Get or create an OsgiFrameworkMBean:
      ObjectName osgiFrameworkMBean = null;
      ObjectName[] osgiFrameworkMBeans = (ObjectName[]) connection.getAttribute(domainMBean,
"OsgiFrameworks");
      log("osgiFrameworkMBeans.length=" + osgiFrameworkMBeans.length);
      for (ObjectName objectName : osgiFrameworkMBeans) {
        String osgiFrameworkName = (String) connection.getAttribute(objectName, "Name");
        log("--------------> " + osgiFrameworkName);
        if (osgiFrameworkName.equals(frameworkName)) {
          osgiFrameworkMBean = objectName;
          log("Found OSGi framework instance: " + frameworkName);
          break;
        }
      }

      if (osgiFrameworkMBean != null) {
        log("Will destroy the framework instance: " + osgiFrameworkMBean);
        connection.invoke(osgiFrameworkMBean,
                          "removeTarget",
                          new Object[] { serverMBean },
                          new String[] { "javax.management.ObjectName" });
        connection.invoke(domainMBean,
                          "destroyOsgiFramework",
                          new Object[] { osgiFrameworkMBean },
                          new String[] { "javax.management.ObjectName" });
      }

      log("Will create a new framework instance from scratch");
      osgiFrameworkMBean = (ObjectName) connection.invoke(domainMBean,
                                                          "createOsgiFramework",
                                                          new Object[] { frameworkName },
                                                          new String[] { "java.lang.String" });

      // Set common properties:
```

```
      if (initProp != null) {
        Attribute initPropAttr = new Attribute("InitProperties", initProp);
        connection.setAttribute(osgiFrameworkMBean, initPropAttr);
      }
      Attribute systemPackagesExtraAttr = new Attribute("OrgOsgiFrameworkSystemPackagesExtra",
                                                   "javax.naming,weblogic.work,javax.sql");
      connection.setAttribute(osgiFrameworkMBean, systemPackagesExtraAttr);
      connection.invoke(osgiFrameworkMBean,
                        "addTarget",
                        new Object[] { serverMBean },
                        new String[] { "javax.management.ObjectName" });

      // Set individual property to the OSGi framework instance:
      if (isRegisterGlobalWorkManagers != null) {
        Attribute attr = new Attribute("RegisterGlobalWorkManagers",
Boolean.parseBoolean(isRegisterGlobalWorkManagers));
        connection.setAttribute(osgiFrameworkMBean, attr);
      }

      if (isRegisterGlobalDataSources != null) {
        Attribute attr = new Attribute("RegisterGlobalDataSources",
Boolean.parseBoolean(isRegisterGlobalDataSources));
        connection.setAttribute(osgiFrameworkMBean, attr);
      }

      if (deployInstallationBundles != null) {
        Attribute attr = new Attribute("DeployInstallationBundles", deployInstallationBundles);
        connection.setAttribute(osgiFrameworkMBean, attr);
      }

      if (orgOsgiFrameworkBootdelegation != null) {
        Attribute attr = new Attribute("OrgOsgiFrameworkBootdelegation",
orgOsgiFrameworkBootdelegation);
        connection.setAttribute(osgiFrameworkMBean, attr);
      }

      if (orgOsgiFrameworkSystemPackagesExtra != null) {
        Attribute attr = new Attribute("OrgOsgiFrameworkSystemPackagesExtra",
orgOsgiFrameworkSystemPackagesExtra);
        connection.setAttribute(osgiFrameworkMBean, attr);
      }

      MBeanInfo mi = connection.getMBeanInfo(osgiFrameworkMBean);
      log("Attributes are as below:");
      for (MBeanAttributeInfo mai : mi.getAttributes()) {
        Object value = connection.getAttribute(osgiFrameworkMBean, mai.getName());
        System.out.printf("    %-40s = %s\n", mai.getName(), value);
      }

      // Save your changes
      ObjectName cfgMgr = (ObjectName) connection.getAttribute(service, "ConfigurationManager");
      connection.invoke(cfgMgr, "save", null, null);
```

16.3.1.5 Parameter Required for Installing Bundles in the Framework

The OsgiFrameWorkMBean MBean `Deploy Installation Bundles` attribute controls whether or not bundles present in the `osgi-lib` directory (described later in this chapter in Section 16.5.2, "Deploying OSGi Bundles in the osgi-lib Directory") are actually installed into the framework.

The `Deploy Installation Bundles` parameter accepts the following values:

- `ignore` — None of the bundles in this directory are installed and started.
- `populate` — The bundles are installed and started if possible. This is the default. Furthermore, a few extra packages are added to the boot delegation classpath parameters in order to enable the bundles in the `osgi-lib` directory if they are not already there.

  It is not be considered a failure that causes the system to not boot if these bundles do not properly resolve and therefore cannot be started.

16.3.2 Configuring OSGi Framework Persistence

OSGi has a persistence mechanism, described in `http://www.osgi.org/javadoc/r4v43/org/osgi/framework/launch/Framework.html`, in which all installed bundles must be started in accordance with each bundle's persistent autostart setting.

This persistence mechanism is disabled by default. However, you can use the standard Felix Init property shown in Table 16–1 to enable the OSGi persistence mechanism.

Note: WebLogic Server is not directly involved in the OSGi persistence mechanism. In particular, WebLogic Server does not fail the data over to other servers.

16.3.3 Using OSGi Services

You can make standard OSGi services available to your OSGi bundle. To do this, import the correct packages for the Felix framework and make sure that the application bundle has the required authorization.

These services are described in the OSGi Service Platform Core Specification (`http://www.osgi.org/Download/File?url=/download/r4v43/r4.core.pdf`) and include but are not limited to standard Framework supplied services such as the Package Admin Service, Conditional Permission Admin Service, or the StartLevel Service.

See the "Apache Felix Tutorial Example 1, Service Event Listener Bundle" for an example of creating a simple bundle that listens for OSGi service events.

16.4 Creating OSGi Bundles

You use the OSGi API bundle (provided with WebLogic Server) to create your own OSGI bundle.

See the "Apache Felix Tutorial Example 1, Service Event Listener Bundle" for an example of creating a simple bundle. As described in this example, the `Import-Package` attribute of the manifest file informs the framework of the bundle's dependencies on external packages. All bundles with an activator must import `org.osgi.framework` because it contains the core OSGi class definitions.

16.5 Deploying OSGi Bundles

This section includes the following subsections:

- Section 16.5.1, "Preparing to Deploy an OSGi Bundle on a Target System"
- Section 16.5.2, "Deploying OSGi Bundles in the osgi-lib Directory"

16.5.1 Preparing to Deploy an OSGi Bundle on a Target System

You can deploy OSGi bundles from inside a JAR, EAR, or WAR file, as appropriate for your application.

Before you do this, you must first specify which OSGi framework you want your bundle to use, and identity the bundle to WebLogic Server.

> **Note:** If the OSGi framework instance you specify does not exist on the target server, the OSGi bundle fails to deploy.

How you do this depends on whether your bundle is inside a WAR file or an EAR file:

- WAR — The framework instance and bundle name must be in an element in the Web application's `weblogic.xml` deployment descriptor file.
- EAR — The framework instance and bundle name must be in an element in the application's `weblogic-application.xml` deployment descriptor file.

  If the EAR file contains WAR files, then the bundles inside the WAR files are deployed using the `weblogic.xml` deployment descriptor file from the embedded WAR files.

The sections that follow describe the required steps in detail.

For more information about WebLogic Server deployment descriptors, see *Deploying Applications to Oracle WebLogic Server*.

16.5.1.1 Preparing to Deploy Bundles as Enterprise Applications

Before you deploy your OSGi bundle, you must first:

1. Use either the *`DOMAIN_HOME`*`\config\config.xml` deployment descriptor file or WLST to add an entry for the OSGi framework, as described in Section 16.3.1, "Configuring OSGi Framework Instances".
2. In the EAR file that contains the OSGi bundle, add both the name of the OSGi framework and the name of the bundle itself to the `weblogic-application.xml` deployment descriptor file.

Example 16–1 shows an example of updating `config.xml` to add the OSGi framework used by the WebLogic Server.

Example 16–4 shows an example of updating `weblogic-application.xml` to add both the name of the OSGi framework and the name and location of the bundle.

Example 16–4 Adding the Framework and Bundle to weblogic-application.xml

```
<osgi-framework-reference>
    <name>test-osgi-frame</name>
    <application-bundle-symbolic-name>com.oracle.weblogic.test.client
</application-bundle-symbolic-name>
  <bundles-directory>rashi/osgi-lib</bundles-directory>
</osgi-framework-reference>
```

The stanza in Example 16–4 tells the WebLogic Server to attach to the OSGi framework named "test-osgi-frame" and to find the bundle in that server with the symbolic name `com.oracle.weblogic.test.client` in order to find classes from that OSGi framework.

16.5.1.2 Preparing to Deploy Bundles as Web Applications

Before you install your bundle as a WAR file, you must first:

1. Use either the *DOMAIN_HOME*\config\config.xml deployment descriptor file or WLST to add an entry for the OSGi framework, as described in Section 16.3.1, "Configuring OSGi Framework Instances".
2. Add both the name of the OSGi framework and the name of the bundle itself to the web application's weblogic.xml deployment descriptor file.

Example 16–1 shows an example of updating config.xml to add the OSGi framework used by the WebLogic Server.

Example 16–5 shows an example of updating weblogic.xml to add both the name of the OSGi framework and the name and location of the bundle.

Example 16–5 Adding the Framework and Bundle to weblogic.xml

```
<osgi-framework-reference>
    <name>test-osgi-frame</name>
    <application-bundle-symbolic-name>com.oracle.weblogic.test.client
</application-bundle-symbolic-name>
  <bundles-directory>rashi/osgi-lib</bundles-directory>
</osgi-framework-reference>
```

The stanza in Example 16–4 tells the WebLogic Server to attach to the OSGi framework named "test-osgi-frame" and to find the bundle in that server with the symbolic name com.oracle.weblogic.test.client in order to find classes from that OSGi framework.

16.5.1.3 Global Work Managers

Work Managers prioritize work based on rules you define and by monitoring actual run time performance statistics. This information is then used to optimize the performance of your application. See "Using Work Managers to Optimize Scheduled Work" in *Administering Server Environments for Oracle WebLogic Server*.

The OSGi implementation can take advantage of global work managers if the Register Global Work Managers MBean attribute is set to true, as described in Table 16–1.

You can determine which global work manager is in use from a Java application, as shown in Example 16–7.

Example 16–6 Determining Global Work Managers

```
    // Get the global scoped work manager service:
    ServiceReference[] refWmSvcs = bc.getServiceReferences(WorkManager.class.getCanonicalName(),
                                                           "(name=GlobalScopedWorkManager)");
    if (refWmSvcs != null) {
      logger.setAttribute(frameworkInstanceName, bundleIdentifier + "_WorkManager_Count",
refWmSvcs.length);
      for (int i = 0; i < refWmSvcs.length; i++) {
        ServiceReference refWmSvc = refWmSvcs[i];
        WorkManager wm = (WorkManager) bc.getService(refWmSvc);
        logger.setAttribute(frameworkInstanceName, bundleIdentifier + "_WorkManager" + (i + 1),
wm.getName());
        bc.ungetService(refWmSvc);
      }
    }
```

16.5.1.4 Global Data Sources

In WebLogic Server, you can configure database connectivity by configuring JDBC data sources and multi data sources and then targeting or deploying the JDBC resources to servers or clusters in your WebLogic domain, as described in WebLogic Server Data Sources in *Understanding Oracle WebLogic Server*.

The OSGi implementation can take advantage of global data sources if the Register Global Data Sources MBean attribute is set to true, as described in Table 16–1.

You can determine which global data source is in use from a Java application, as shown in Example 16–7.

Example 16–7 Determining Global Data Sources

```
    // Get the global data source services:
    ServiceReference[] refDsSvcs =
bc.getServiceReferences(DataSource.class.getCanonicalName(), "(name=OsgiDS)");
    if (refDsSvcs != null) {
      logger.setAttribute(frameworkInstanceName, bundleIdentifier + "_DataSource_
Count", refDsSvcs.length);
      for (int i = 0; i < refDsSvcs.length; i++) {
        String data = null;
        ServiceReference refDsSvc = refDsSvcs[i];
        DataSource ds = (DataSource) bc.getService(refDsSvc);
        Connection conn = null;
        Statement stmt = null;
        ResultSet rs = null;
        try {
          conn = ds.getConnection();
          stmt = conn.createStatement();
          rs = stmt.executeQuery("select * from dual");
          rs.next();
          data = rs.getString(0);
        } catch (SQLException e) {
```

16.5.2 Deploying OSGi Bundles in the osgi-lib Directory

Note: The OsgiFrameWorkMBean MBean `Deploy Installation Bundles` attribute controls whether or not bundles present in the `osgi-lib` directory are actually installed, as described in Section 16.3.1.5, "Parameter Required for Installing Bundles in the Framework". This attribute is true by default, and the bundles are installed.

To deploy a bundle with the start-level of 1, create the *`WL_HOME`*/*`server`*/`osgi-lib` directory if it does not already exist, and then copy the archive file (EAR, WAR) file to it.

Any files in this directory that end with `.jar`, `.ear`, or `.war` are considered an OSGi bundle to be installed into a framework when it starts.

`WL_HOME`/*`server`*/`osgi-lib` is consulted only when the server first boots, and is not monitored for changes thereafter. If you add a new OSGi bundle to the *`WL_HOME`*/*`server`*/`osgi-lib` directory and want to deploy it, you must reboot WebLogic Server.

16.5.2.1 Setting the Start Level and Run Level for a Bundle

To deploy a bundle with the start-level of 1, copy the archive file (EAR, WAR) file to the *WL_HOME*/*server*/osgi-lib directory.

In addition, the *WL_HOME*/*server*/osgi-lib directory supports a start- and run-level scheme based on subdirectories.

If you create subdirectories with names that begin with a number between 1 and 32K (for example 2, 3, 4), then the archive files under those directories are installed and started with the given run-level.

16.6 Accessing Deployed Bundle Objects From JNDI

After the OSGi server has been booted, a bundle object is placed into the local server JNDI tree. Applications can therefore get this bundle from JNDI and thereafter use that as the entry point into the OSGi system.

The org.osgi.framework.*Bundle* is placed into the java:app/osgi/Bundle JNDI environment of the application.

One specific OSGi bundle from the chosen framework instance can be used in the application classloader hierarchy.

Example 16–8 shows how to access a bundle that you create from JNDI.

Example 16–8 Accessing Your OSGi Bundle From JNDI

```
    public static final String BUNDLE_JNDI_NAME = "java:app/osgi/Bundle";
...
    String bundleSymbolicName = null;

    Bundle bundle = null;
    OsgiInfo info = new OsgiInfo();
    List<String> errorMessages = new ArrayList<String>();

    try {
      Context initCtx = new InitialContext();
      bundle = (Bundle) initCtx.lookup(Constants.BUNDLE_JNDI_NAME);
    } catch (NamingException e) {
      errorMessages.add(e.toString());
      System.out.println("Failed to lookup bundle from JNDI due to " + e);
    }

    if (bundle != null) {

      bundleSymbolicName = bundle.getSymbolicName() + "_" + bundle.getVersion();
      info.setCurrentBundle(bundleSymbolicName);

      BundleContext bc = bundle.getBundleContext();

      if (bc != null) {

        // Get the start level service:
        StartLevel startLevelSvc = null;
        ServiceReference startLevelSr =
bc.getServiceReference("org.osgi.service.startlevel.StartLevel");
        if (startLevelSr != null) {
          startLevelSvc = (StartLevel) bc.getService(startLevelSr);
        }
        List<String> allInstalledBundles = new ArrayList<String>();
        List<String> allActivatedBundles = new ArrayList<String>();
        Map<String, List<String>> services = new HashMap<String, List<String>>();
        Map<String, String> startLevels = new HashMap<String, String>();

        for (Bundle b : bc.getBundles()) {

          // Collect all the installed and activated bundles:
          String bundleId = b.getSymbolicName() + "_" + b.getVersion();
          allInstalledBundles.add(bundleId);
          if (b.getState() == Bundle.ACTIVE) {
            allActivatedBundles.add(bundleId);
          }

          // Collect the registered services:
          ServiceReference[] srs = b.getRegisteredServices();
          if (srs != null) {
            List<String> list = new ArrayList<String>();
            for (ServiceReference sr : srs) {
              list.add(sr + "-->" + bc.getService(sr));
            }
            services.put(bundleId, list);
          }

          // Collect the start levels:
          if (startLevelSvc != null) {
            startLevels.put(bundleId, startLevelSvc.getBundleStartLevel(b) + "");
          }
        }

        info.setAllInstalledBundles(allInstalledBundles);
        info.setAllActivatedBundles(allActivatedBundles);
        info.setRegisteredServices(services);
        info.setStartLevels(startLevels);

        // Query the work manager services:
        List<String> workManagers = new ArrayList<String>();
        try {
          ServiceReference[] wmSrs = bc.getServiceReferences(WorkManager.class.getCanonicalName(),
null);
          if (wmSrs != null) {
            for (ServiceReference sr : wmSrs) {
              WorkManager wm = (WorkManager) bc.getService(sr);
              workManagers.add(wm.getName());
            }
          }
        } catch (InvalidSyntaxException e) {
          e.printStackTrace(System.out);
        }
        info.setWorkManagers(workManagers);

        // Query the data source services:
        List<String> dataSources = new ArrayList<String>();
        try {
          ServiceReference[] dsSrs = bc.getServiceReferences(DataSource.class.getCanonicalName(),
null);
          if (dsSrs != null) {
            for (ServiceReference sr : dsSrs) {
              dataSources.add(sr.getProperty("name").toString());
            }
          }
        } catch (InvalidSyntaxException e) {
          e.printStackTrace(System.out);
        }
        info.setDataSources(dataSources);

      }
    }

    String bundleFileName = null;
    try {
      BundleIntrospect introspection = new BundleIntrospect();
      bundleFileName = introspection.whichBundleFile();
      info.setCurrentBundleFileName(bundleFileName);
    } catch (Throwable e) {
      errorMessages.add(e.toString());
      //e.printStackTrace(System.out);
    }
    info.setErrorMessages(errorMessages);

    return info;

  }

}
```

16.7 Using OSGi Logging Via WebLogic Server

The Apache Felix implementation of the OSGi Log service, version 1.0.0, is installed by default in the installation directory *WL_HOME*/server/osgi-lib.

An OSGi bundle com.oracle.weblogic.osgi.logger_1.0.0.jar is also installed in *WL_HOME*/server/osgi-lib. This bundle registers itself with the OSGi logging service and sends logs from the OSGi logger to the WebLogic Server logger.

The logger system name is OSGiForApps. The messages severity levels are mapped between OSGi and WebLogic Server as shown in Table 16–2.

Table 16–2 OSGi and WebLogic Server Logging Severity Mapping

OSGi Severity Levels	WebLogic Server Severity Level
LogLevel.LOG_ERROR	Severities.ERROR
LogLevel.LOG_WARNING	Severities.WARNING
LogLevel.LOG_INFO	Severities.INFO
LogLevel.LOG_DEBUG	Severities.DEBUG

16.8 Configuring a Filtering ClassLoader for OSGi Bundles

You can use a filtering classloader to specify the use of alternate library versions that are deployed as OSGi bundles.

To configure the FilteringClassLoader to specify that a certain package is loaded from an application, add a prefer-application-packages descriptor element to weblogic-application.xml, which details the list of packages to be loaded from the application. The following example specifies that org.apache.log4j.* and antlr.* packages are loaded from the application, not the system classloader:

```
<prefer-application-packages>
```

```
  <package-name>org.apache.log4j.*</package-name>
  <package-name>antlr.*</package-name>
</prefer-application-packages>
```

Place packages in `WEB-INF/lib` or in `WEB-INF/osgi-lib` if the package is an OSGi bundle. You can either add OSGi bundle dependencies directly to `WEB-INF/osgi-lib` or configure the `org.osgi.framework.system.packages.extra` property (see Table 16–1) in your OSGi framework instance to export the necessary `javax` packages that the application needs.

For more information on filtering classloaders, see "Using a Filtering ClassLoader".

16.9 OSGI Example

WebLogic Server includes an example that demonstrates how to deploy OSGi bundles to WebLogic Server. If you installed the WebLogic Server examples, the OSGi example source code is available in *`EXAMPLES_HOME`*`/wl_server/examples/src/examples/osgi/osgiApp`, where *`EXAMPLES_HOME`* represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

There are two simple bundles: client and server. The server bundle (ServerBundle) exports a packet that the client bundle (ClientBundle) imports.

The example produces an HTML page that displays the deployed OSGi bundles.

17

Using WebSockets in WebLogic Server

This chapter describes the implementation of the WebSocket Protocol in WebLogic Server.

This chapter includes the following sections:

- Understanding WebSockets
- Using WebSockets in WebLogic Server

17.1 Understanding WebSockets

WebLogic Server supports the WebSocket Protocol (RFC 6455), which provides simultaneous two-way communication over a single TCP connection between clients and servers, where each side can send data independently from the other. To initiate the WebSocket connection, the client sends a handshake request to the server. The connection is established if the handshake request passes validation, and the server accepts the request. When a WebSocket connection is created, a browser client can send data to a WebLogic Server instance while simultaneously receiving data from that server instance. As part of the HTML5 specification (`http://www.w3.org/TR/html5/`), the WebSocket Protocol is supported by most browsers. For general information about the WebSocket Protocol, see `http://tools.ietf.org/html/rfc6455`.

If the WebLogic Server Examples component is installed and configured on your machine, you can use the HTML5 WebSocket example for a demonstration of using WebSockets in WebLogic Server. For more information about running this example, see "Sample Applications and Code Examples" in *Understanding Oracle WebLogic Server*.

The following sections describe the life cycle of a WebSocket in WebLogic Server:

- Handshake Request
- Reading and Sending Messages
- Timeout Period
- Connection Closure
- Concurrency and Message Ordering

17.1.1 Handshake Request

All WebSocket connections are initiated by the client. To establish a WebSocket connection, the client must send a handshake request (an HTTP GET request) to the server. If the HTTP request matches the `pathPatterns` attribute of the `@WebSocket` annotation, then the internal WebSocket servlet validates the handshake request. The validation process follows application validation (implemented in the `accept` method of the WebSocket listener) and the rules defined in the WebSocket Protocol. If the handshake request is valid, then the servlet upgrades the HTTP request to a WebSocket connection, and the server sends a WebSocket handshake response to the client. If the request is invalid, then the servlet rejects the request.

17.1.2 Reading and Sending Messages

After the WebSocket connection is established, the server frees the request thread and listens for read events on the connection. When the server detects a read event, the server decodes the message, as defined in the WebSocket Protocol, and invokes the corresponding methods of the listener. For example, the server invokes `onMessage` methods if the message is a text or binary message, `onFragment` methods if the message is a fragment, and so on. The Work Manager specified in the `dispatchPolicy` attribute of the `@WebSocket` annotation controls the thread that invokes these methods.

At the same time, messages can be sent to the WebSocket by invoking the corresponding methods of the `WebSocketConnection` interface until the WebSocket is closed. For example:

- `send` methods send messages to a WebSocket.
- `sendPing` and `sendPong` methods send Ping and Pong control frame.
- `stream` methods send message fragments.

The context associated with a WebSocket is tied to that specific WebSocket. Sending messages is a synchronous task and occurs on the thread that issues the call.

17.1.3 Timeout Period

A WebSocket times out if no read or write activity occurs and no Ping messages are received within the configured timeout period. The container enforces a 30-second timeout period as the default. If the timeout period is set to `-1`, no timeout period is set for the connection.

Upon timeout, the container invokes the listener's `onTimeout()` method, at which time the listener sends an appropriate message to the client. After the `onTimeout()` method returns, the container closes the WebSocket.

17.1.4 Connection Closure

At any time during WebSocket communication, the client or server can terminate the WebSocket connection. If the client issues a close request, the container invokes the listener's `onClose()` method and terminates the underlying connection. From the server side, you can use the `WebSocketConnection.close` methods to close the WebSocket connection. Upon invoking these methods, the server issues a close request to the client before it closes the connection.

17.1.5 Concurrency and Message Ordering

After upgrading to a WebSocket connection, messages can flow asynchronously in either direction. However, to prevent message corruption, message sending must be synchronous. When multiple threads attempt to send messages on the same WebSocket, ordering is not guaranteed; the thread that first acquires the lock sends the first message.

The WebSocketConnection methods that send messages to the client are not thread safe. If multiple threads use the same instance of the WebSocketConnection methods to send messages, the application is responsible for using the appropriate lock mechanism to send messages synchronously. Otherwise, messages may be corrupted.

17.2 Using WebSockets in WebLogic Server

In WebLogic Server, you can use the WebSocket Protocol implementation and accompanying programming API to develop and deploy applications that communicate bidirectionally with clients. Although you can use WebSockets for any type of client-server communication, the implementation is most commonly used to communicate with browsers running Web pages that use the WebSocket API.

The following sections describe using WebSockets in WebLogic Server:

- Understanding the WebLogic Server WebSockets Implementation
- Building Applications Using the WebLogic WebSocket API
- Deploying WebSocket Applications
- Using WebSockets with Proxy Servers
- Client Programming
- Broadcasting Messages to WebSocket Clients
- Securing WebSocket Applications
- Example of Using WebSockets with WebLogic Server

17.2.1 Understanding the WebLogic Server WebSockets Implementation

The WebLogic Server WebSockets implementation includes the following components:

- WebSocket Protocol Implementation
- WebLogic WebSocket Java API
- weblogic.websocket.annotation.WebSocket

17.2.1.1 WebSocket Protocol Implementation

The WebSocket Protocol handles connection upgrades, establishes and manages connections, and handles exchanges with the client. Using the existing WebLogic Server threading and network infrastructure, WebLogic Server fully integrates the WebSockets Protocol in its implementation.

17.2.1.2 WebLogic WebSocket Java API

You can use the WebLogic WebSocket API weblogic.websocket package to develop WebSocket applications. Table 17–1 lists and summarizes the classes and interfaces included in this API. For complete information, see weblogic.websocket in the *Java API Reference for Oracle WebLogic Server*.

Table 17–1 WebLogic WebSocket Java API Interfaces and Classes

Name	Description
weblogic.websocket.WebSocketListener	Interface that receives and handles WebSocket messages. The container is responsible for wiring the listener to the corresponding servlet, which handles the HTTP upgrade request to a WebSocket.

Table 17–1 (Cont.) WebLogic WebSocket Java API Interfaces and Classes

Name	Description
`weblogic.websocket.WebSocketConnection`	Interface that represents the WebSocket connection between the client and the server. An application uses `WebSocketConnection` methods to manipulate the connection and send messages to the client.
`weblogic.websocket.WebSocketContext`	Interface that provides context information for a set of WebSocket connections handled by a WebSocket listener. This interface also provides context information and associated settings for a WebSocket endpoint declared by the `@WebSocket` annotation or set by the application. From the `WebSocketContext` object, you can access the `ServletContext` object of the Web application. The `WebSocketContext` object provides configuration information, such as timeout seconds of the WebSocket connection, the maximum size of open WebSocket connections, and the maximum number of messages that can be received or sent across a WebSocket connection. An application can also obtain all of the open WebSocket connections from the `WebSocketContext` interface and broadcast messages by iterating each WebSocket connection.
`weblogic.websocket.WebSocketAdapter`	Class that provides a convenient, empty implementation of the `WebSocketListener` interface. In this class, almost all of the callback methods are implemented as empty methods. Applications can extend this class and then override specific callback methods as needed, instead of implementing the entire `WebSocketListener` interface.
`weblogic.websocket.WSHandshakeRequest`	Class that defines an object to provide WebSocket opening handshake request information to a WebSocket listener.
`weblogic.websocket.WSHandshakeResponse`	Class that defines an object that assists in sending the opening handshake response to the client.

17.2.1.3 weblogic.websocket.annotation.WebSocket

The `@WebSocket` annotation declares a WebSocket endpoint that communicates using the WebSocket Protocol. Use the `@WebSocket` annotation to mark a class as a WebSocket listener that is ready to be exposed as a WebSocket endpoint on which read events are processed. The class annotated by the `@WebSocket` annotation must implement the `WebSocketListener` interface or extend from the `WebSocketAdapter` class. For more information, see `weblogic.websocket.annotation.WebSocket` in the *Java API Reference for Oracle WebLogic Server*.

Example 17–1 demonstrates using the `@WebSocket` annotation:

Example 17–1 Using the @WebSocket Annotation

```
@WebSocket (
    pathPatterns = {"/chat/*"},
    timeout = 30,
    maxConnections = 1000)

public class MyListener implements WebSocketListener {
    ...
}
```

17.2.2 Building Applications Using the WebLogic WebSocket API

You can use the WebLogic WebSocket API to create browser-based applications that require two-way communication with servers without relying on having multiple HTTP connections open.

WebLogic Server provides the WebLogic WebSocket API within the `wlserver/server/lib/wls-api.jar` file. To build applications using the WebLogic WebSocket API, define this library in the classpath when compiling the application.

You can also use Maven to build applications using the WebLogic WebSocket API. For more information, see "Using the WebLogic Development Maven Plug-In".

17.2.3 Deploying WebSocket Applications

In WebLogic Server, you deploy WebSocket applications as part of standard Java EE Web application archives (WARs), either as standalone Web applications or WAR modules within enterprise applications. When you deploy the Web application, WebLogic Server detects the `@WebSocket` annotation on a class and automatically establishes it as a WebSocket endpoint.

You do not need to configure the WebSocket endpoint in the `web.xml` file, or any other deployment descriptor, or perform any type of dynamic operation to register or enable the WebSocket endpoint.

17.2.4 Using WebSockets with Proxy Servers

Clients accessing WebSocket applications must either connect directly to the WebLogic Server instance or through a Web proxy server that supports the WebSockets Protocol.

Currently, the only Oracle proxy server that supports WebSockets is Oracle Traffic Director. If you use a different proxy server to access WebSocket applications, then ensure that the proxy server supports WebSockets.

17.2.5 Client Programming

A WebSocket client application is typically a composite of HTML5 technologies, including the HTML markup, CSS3, and JavaScript that makes use of the WebSocket JavaScript API. Oracle does not provide a WebSocket JavaScript API for WebSocket clients. However, most browsers support a standard WebSocket API that can be used to create and work with WebSockets. For more information about HTML5, see `http://www.w3.org/TR/html5/`.

The following steps show an example of the execution flow on a client that is sending messages to a WebLogic Server instance using the WebSockets Protocol.

1. The client opens a WebSocket connection to the server hosting the WebSocket endpoint, using the `ws://` or `wss://` protocol prefix. For more information, see "Establishing Secure WebSocket Connections".

   ```
   url = ((window.location.protocol == "https:") ? "wss:" : "ws:")
   + "//" + window.location.host
   + "/websocket-helloworld-wls/helloworld_delay.ws";

   ws = new WebSocket(url);
   ```

2. The client registers listeners with the WebSocket object to respond to events, such as opening, closing, and receiving messages. Based on the event and the information received, the client performs the appropriate action.

```
ws.onopen = function(event) {
    document.getElementById("status").innerHTML = "OPEN"
}

ws.onmessage = function(event) {
    msg = event.data
      document.getElementById("short_msg").innerHTML =
      event.data;
}
```

3. The client sends messages to the server over the WebSocket object as needed by the application.

```
function sendMsg() {
    // Check if connection is open before sending
    if(ws == null || ws.readyState != 1) {
        document.getElementById("reason").innerHTML
        = "Not connected can't send msg"
    } else {
        ws.send(document.getElementById("name").value);
    }
}

<input id="send_button" class="button" type="button" value="send"
onclick="sendMsg()"/>
```

17.2.6 Broadcasting Messages to WebSocket Clients

In some scenarios, applications must send messages to all of the open WebSocket connections. For example, a stock application must send stock prices to connected WebSocket clients, or a chat application must send messages from one user to all of the other clients in the same chat room.

In order to broadcast messages to all of the WebSocket clients, the application must first determine all of the open WebSocket connections using the `getWebSocketConnections()` method in the `WebSocketContext` interface. You can then iterate each `WebSocketConnection` to send the message to each client.

The following brief code example demonstrates broadcasting messages to clients:

```
import weblogic.websocket.WebSocketListener;
import weblogic.websocket.WebSocketConnection;
import weblogic.websocket.WebSocketContext;

@WebSocket(pathPatterns={"/demo"})
public class MyListener implements WebSocketListener {
  …

  public void broadcast(String message) {
    for(WebSocketConnection conn :
        getWebSocketContext().getWebSocketConnections()) {
      try {
        conn.send(message);
      } catch (IOException ioe) {
        // handle the error condition.
      }
    }
  }
}
```

For real-world applications, two important aspects must be considered that are not addressed in the previous code example:

- Efficiency
- Concurrency

Efficiency

If too many WebSocket connections are open, then using one thread to broadcast messages is inefficient, because the time it takes for a client to receive a message depends on its location in the iteration process. If thousands of WebSocket connections are open, then iteration is slow, causing some clients to receive messages early and other clients to receive messages much later. This delay is unacceptable in certain situations; for example, a stock application should ensure that each client receives stock price data as early as possible.

To increase efficiency, the application can partition open WebSocket connections into groups and then use multiple threads to broadcast messages to each group of WebSocket connections.

Concurrency

The implementation of the `WebSocketConnection` interface is not thread safe. If multiple threads send messages on the same `WebSocketConnection` instance without a proper lock mechanism, then the messages could have issues. Problematic messages could cause connections to close unexpectedly because the client cannot correctly interpret a message.

Applications should choose the appropriate lock mechanism to ensure that when one thread sends messages on a particular `WebSocketConnection` instance, no other threads can send messages on the same `WebSocketConnection` instance.

17.2.7 Securing WebSocket Applications

In WebLogic Server, you deploy WebSocket applications as Web application archives (WARs), either as standalone Web applications or WAR modules within enterprise applications. Therefore, many security practices that you apply to securing Web applications can apply to WebSocket applications. For information about Web application security, see "Developing Secure Web Applications" in *Developing Applications with the WebLogic Security Service*.

The following sections describe security considerations for WebSocket applications in WebLogic Server:

- Applying Verified-Origin Policies
- Using WebSocket Client Authentication and Authorization
- Establishing Secure WebSocket Connections
- Avoiding Mixed Content
- Specifying Limits for WebSocket Connections

17.2.7.1 Applying Verified-Origin Policies

Modern browsers use same-origin policies to prevent scripts that are running on Web pages loaded from one origin from interacting with resources from a different origin. The WebSocket Protocol (RFC 6455) uses a verified-origin policy that enables the server to decide whether or not to consent to a cross-origin connection.

When a script sends an opening handshake request to a WebSocket application, an Origin HTTP header is sent with the WebSocket handshake request. If the application does not verify the Origin, then it accepts connections from any origin. If the application is configured not to accept connections from origins other than the expected origin, then the WebSocket application can reject the connection. You can ensure that the WebSocket application verifies the Origin through the accept method of the WebSocketListener implementation class.

The following code example demonstrates applying a verified-origin policy:

```
import weblogic.websocket.WebSocketListener;
import weblogic.websocket.WSHandshakeRequest;
import weblogic.websocket.WSHandshakeResponse;

@WebSocket(pathPatterns={"/demo"})
public class MyListener implements WebSocketListener {
    private static final String ORIGIN = "http://www.example.com:7001";
    public boolean accept(WSHandshakeRequest request, WSHandshakeResponse
response) {
      return ORIGIN.equals(request.getOrigin());
    }
    …
}
```

Note: Nonbrowser clients (for example, Java Client) are not required to send an Origin HTTP header with the WebSocket handshake request. If a WebSocket handshake request does not include an Origin header, then the request is from a nonbrowser client; if a handshake request includes an Origin header, then the request may be from either a browser or a nonbrowser client.

Because nonbrowser clients can send arbitrary Origin headers, the browser origin security model is not recommended for nonbrowser clients.

17.2.7.2 Using WebSocket Client Authentication and Authorization

The WebSocket Protocol (RFC 6455) does not specify an authentication method for WebSocket clients during the handshake process. You can use standard Web container authentication and authorization functionality to prevent unauthorized clients from opening WebSocket connections on the server.

Authentication

All configurations of the <auth-method> element that are supported for Web applications can also be used for WebSocket applications. These authentication types include BASIC, FORM, CLIENT-CERT, and so on. For more information, see "Developing Secure Web Applications" in *Developing Applications with the WebLogic Security Service*.

You can secure the pathPatterns attribute by configuring the relevant <security-constraint> element in the web.xml deployment descriptor file of the WebSocket application. By configuring <security-constraint>, clients must authenticate themselves before sending WebSocket handshake requests. Otherwise, the server rejects the WebSocket handshake request. For more information about the <security-constraint> element, see "web.xml Deployment Descriptor Elements" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

The following code example demonstrates securing `pathPatterns` on the `WebSocketListener` implementation class, where `pathPatterns={"/demo"}`:

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>Secured WebSocket Endpoint</web-resource-name>
    <url-pattern>/demo/*</url-pattern>
    <http-method>GET</http-method>
  </web-resource-collection>
  <auth-constraint>
    <role-name>user</role-name>
  </auth-constraint>
</security-constraint>
<login-config>
  <auth-method>FORM</auth-method>
  <form-login-config>
    <form-login-page>/login.jsp</form-login-page>
    <form-error-page>/error.jsp</form-error-page>
  </form-login-config>
</login-config>
<security-role>
  <role-name>user</role-name>
</security-role>
```

Authorization

You can configure a WebSocket application to authorize certain clients in the `accept` method of the `WebSocketListener` implementation class. If the application does not authorize a client to create a WebSocket connection, the server rejects the WebSocket handshake request from that client.

The following code example demonstrates configuring the `accept` method of the `WebSocketListener` implementation class:

```
import weblogic.websocket.WebSocketListener;
import weblogic.websocket.WSHandshakeRequest;
import weblogic.websocket.WSHandshakeResponse;

@WebSocket(pathPatterns={"/demo"})
public class MyListener implements WebSocketListener {
    private static final String ORIGIN = "http://www.example.com:7001";
    public boolean accept(WSHandshakeRequest request, WSHandshakeResponse
response) {
      return ORIGIN.equals(request.getOrigin()) ||
hasPermission(request.getUserPrincipal());
    }

    private boolean hasPermission(Principal user) {
    // Verifies whether the user is authorized to create this WebSocket
connection.
    }
    …
}
```

17.2.7.3 Establishing Secure WebSocket Connections

To establish a WebSocket connection, the client sends a handshake request to the server. When using the `ws://` URI to open the WebSocket connection, the handshake request is a plain HTTP request; the data being transferred over the established WebSocket connection is not encrypted.

To establish a secure WebSocket connection and prevent data from being intercepted, WebSocket applications should use the `wss://` URI. The `wss://` URI ensures that clients send handshake requests as HTTPS requests, encrypting transferred data by TLS/SSL.

You can configure a WebSocket application to accept only HTTPS handshake requests, where all WebSocket connections must be encrypted and nonencrypted WebSocket handshake requests are rejected. Specify the `<user-data-constraint>` element in the `web.xml` deployment descriptor file of the WebSocket application. For more information about the `<user-data-constraint>` element, see "web.xml Deployment Descriptor Elements" in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

The following code example demonstrates configuring the `<user-data-constraint>` element:

```
<security-constraint>
    <web-resource-collection>
      <web-resource-name>Secured WebSocket Endpoint</web-resource-name>
      <url-pattern>/demo/*</url-pattern>
      <http-method>GET</http-method>
    </web-resource-collection>
    <auth-constraint>
      <role-name>user</role-name>
    </auth-constraint>
    <user-data-constraint>
      <transport-guarantee>CONFIDENTIAL</transport-guarantee>
    </user-data-constraint>
  </security-constraint>
```

17.2.7.4 Avoiding Mixed Content

If a script attempts to open a WebSockets connection through the `ws://` URI (using a plain HTTP request), but the top-level Web page is retrieved through an HTTPS request, the Web page is referred to as mixed content. Although most browsers no longer allow mixed content, some still do. WebSocket applications should avoid mixed content, because it allows certain information that should be protected, such as `JSESSIONID` and cookies, to be exposed.

For more information about mixed content, see "Web Security Context: User Interface Guidelines" at `http://www.w3.org/TR/wsc-ui/#securepage`.

17.2.7.5 Specifying Limits for WebSocket Connections

The WebLogic Server WebSocket API enables you to specify limits for WebSocket connections by configuring attributes of the `@WebSocket` annotation. By configuring an application to specify limits, you can prevent clients from requesting a large number of connections and potentially exhausting server resources, such as memory, sockets, and so on.

You can specify the following limits:

- timeout
- maxMessageSize
- maxConnections

timeout

The value of the `timeout` attribute provides the idle timeout value of the WebSocket connection in seconds.

The WebSocket Protocol (RFC 6455) defines Ping and Pong control frames to keep WebSocket connections open. Instead of specifying large values in the `timeout` attribute, applications should send Ping or Pong messages to keep WebSocket connections open.

maxMessageSize

The value of the `maxMessageSize` attribute specifies the maximum size of a WebSocket message that the server can receive. The server rejects any message that exceeds this size. If a message is too large, then the client receives a closing frame message with the status code 1009, and the WebSocket connection closes. Applications should specify a reasonable value for this attribute.

For more information about status code 1009, see the WebSocket Protocol (RFC 6455) at `http://tools.ietf.org/html/rfc6455`.

maxConnections

The value of the `maxConnections` attribute specifies the maximum number of open connections on this WebSocket. If the number of open connections exceeds this value, then the server rejects any new WebSocket handshake requests. Applications should specify a reasonable value for this attribute.

The following code example demonstrates setting the previous limits:

```
import weblogic.websocket.WebSocketListener;
import weblogic.websocket.WSHandshakeRequest;
import weblogic.websocket.WSHandshakeResponse;

@WebSocket(pathPatterns={"/demo"},
           timeout=15,
           maxMessageSize=1024,
           maxConnections=1000)
public class MyListener implements WebSocketListener {
    …
}
```

17.2.8 Example of Using WebSockets with WebLogic Server

Example 17–2 uses the WebLogic WebSocket API. In this example, the WebSocket listener receives messages from the browser, encapsulates the received messages, and sends them back to the browser.

Example 17–2 Using WebSockets with WebLogic Server

```
package examples.webapp.html5.websocket;

import weblogic.websocket.ClosingMessage;
import weblogic.websocket.WebSocketAdapter;
import weblogic.websocket.WebSocketConnection;
import weblogic.websocket.annotation.WebSocket;

import java.io.IOException;

@WebSocket(
  timeout = -1,
  pathPatterns = {"/ws/*"}
)
public class MessageListener extends WebSocketAdapter {

  @Override
  public void onMessage(WebSocketConnection connection, String payload) {
    // Sends message from the browser back to the client.
    String msgContent = "Message \"" + payload + "\" has been received by
server.";
    try {
      connection.send(msgContent);
    } catch (IOException e) {
      connection.close(ClosingMessage.SC_GOING_AWAY);
    }
  }
}
```

A

Enterprise Application Deployment Descriptor Elements

The following sections describe enterprise application deployment descriptors: `application.xml` (a Java EE standard deployment descriptor) and `weblogic-application.xml` (a WebLogic-specific application deployment descriptor).

With Java EE annotations, the standard `application.xml` deployment descriptor is optional. Annotations simplify the application development process by allowing developers to specify within the Java class itself how the application component behaves in the container, requests for dependency injection, and so on. Annotations are an alternative to deployment descriptors that were required by older versions of enterprise applications (Java EE 1.4 and earlier). See Chapter 8, "Using Java EE Annotations and Dependency Injection"

The `weblogic-application.xml` file is also optional if you are not using any WebLogic Server extensions.

- Section A.1, "weblogic-application.xml Deployment Descriptor Elements"
- Section A.2, "weblogic-application.xml Schema"
- Section A.3, "application.xml Schema"

A.1 weblogic-application.xml Deployment Descriptor Elements

The following sections describe the many of the individual elements that are defined in the weblogic-application.xml Schema. The `weblogic-application.xml` file is the WebLogic Server-specific deployment descriptor extension for the `application.xml` Java EE deployment descriptor. This is where you configure features such as shared Java EE libraries referenced in the application and EJB caching.

The file is located in the `META-INF` subdirectory of the application archive. The following sections describe elements that can appear in the file.

A.1.1 weblogic-application

The `weblogic-application` element is the root element of the application deployment descriptor.

The following table describes the elements you can define within a `weblogic-application` element.

Table A–1 weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<ejb>`	Optional	1	Contains information that is specific to the EJB modules that are part of a WebLogic application. Currently, one can use the `ejb` element to specify one or more application level caches that can be used by the application's entity beans. For more information on the elements you can define within the `ejb` element, see Section A.1.2, "ejb".
`<xml>`	Optional	1	Contains information about parsers and entity mappings for XML processing that is specific to this application. For more information on the elements you can define within the `xml` element, see Section A.1.4, "xml".
`<jdbc-connection-pool>`	Optional	Unbounded	Zero or more. Specifies an application-scoped JDBC connection pool. For more information on the elements you can define within the `jdbc-connection-pool` element, see Section A.1.5, "jdbc-connection-pool".
`<security>`	Optional	1	Specifies security information for the application. For more information on the elements you can define within the `security` element, see Section A.1.6, "security".

`<application-param>`	Optional	Unbounded	Zero or more. Used to specify un-typed parameters that affect the behavior of container instances related to the application. The parameters listed here are currently supported. Also, these parameters in `weblogic-application.xml` can determine the default encoding to be used for requests and for responses.
			■ `webapp.encoding.default`—Can be set to a string representing an encoding supported by the JDK. If set, this defines the default encoding used to process servlet requests and servlet responses. This setting is ignored if `webapp.encoding.usevmdefault` is set to `true`. This value is also overridden for request streams by the `input-charset` element of `weblogic.xml`.
			■ `webapp.encoding.usevmdefault`—Can be set to `true` or `false`. If `true`, the system property `file.encoding` is used to define the default encoding.
			The following parameter is used to affect the behavior of Web applications that are contained in this application.
			■ `webapp.getrealpath.accept_context_path`—This is a compatibility switch that may be set to `true` or `false`. If set to `true`, the context path of Web applications is allowed in calls to the servlet API `getRealPath`.
			Example:
			`<application-param>`
			`<param-name>webapp.encoding.default`
			`</param-name>`
			`<param-value>UTF8</param-value>`
			`</application-param>`
			For more information on the elements you can define within the `application-param` element, see Section A.1.7, "application-param".

Table A–1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<classloader-structure>`	Optional	Unbounded	A classloader-structure element allows you to define the organization of classloaders for this application. The declaration represents a tree structure that represents the classloader hierarchy and associates specific modules with particular nodes. A module's classes are loaded by the classloader that its associated with this element. Example: <classloader-structure> <module-ref> <module-uri>ejb1.jar</module-uri> </module-ref> </classloader-structure> <classloader-structure> <module-ref> <module-uri>ejb2.jar</module-uri> </module-ref> </classloader-structure> For more information on the elements you can define within the `classloader-structure` element, see Section A.1.8, "classloader-structure".
`<listener>`	Optional	Unbounded	Zero or more. Used to register user-defined application lifecycle listeners. These are classes that extend the abstract base class `weblogic.application.ApplicationLifecycleListener`. For more information on the elements you can define within the `listener` element, see Section A.1.9, "listener".
`<singleton-service>`	Optional	Unbounded	Zero or more. Used to register user-defined singleton services. These are classes that implement the interface `weblogic.cluster.singleton.SingletonService`. For more information on the elements you can define within the `singleton-service` element, see Section A.1.10, "singleton-service".
`<startup>`	Optional	Unbounded	Zero or more. Used to register user-defined startup classes. For more information on the elements you can define within the `startup` element, see Section A.1.11, "startup". **Note:** Application-scoped startup and shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Instead, you should use lifecycle listener events in your applications. For details, see Chapter 12, "Programming Application Life Cycle Events"
`<shutdown>`	Optional	Unbounded	Zero or more. Used to register user defined shutdown classes. For more information on the elements you can define within the `shutdown` element, see Section A.1.12, "shutdown". **Note:** Application-scoped startup and shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Instead, you should use lifecycle listener events in your applications. For details, see Chapter 12, "Programming Application Life Cycle Events."

Table A–1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
<module>	Optional	Unbounded	Represents a single WebLogic application module, such as a JMS or JDBC module. This element has the following child elements: ■ name—The name of the module. ■ type—The type of module. Valid values are JMS, JDBC, Interception, or GAR. ■ path—The path of the XML file that fully describes the module, relative to the root of the enterprise application. The following example shows how to specify a JMS module called Workflows, fully described by the XML file jms/Workflows-jms.xml: <module> <name>Workflows</name> <type>JMS</type> <path>jms/Workflows-jms.xml</path> </module>
<library-ref>	Optional	Unbounded	A reference to a shared Java EE library. For more information on the elements you can define within the library element, see Section A.1.15, "library-ref".
<fair-share-request>	Optional	Unbounded	Specifies a fair share request class, which is a type of Work Manager request class. In particular, a fair share request class specifies the average percentage of thread-use time required to process requests. The <fair-share-request> element can take the following child elements: ■ name—The name of the fair share request class. ■ fair-share—An integer representing the average percentage of thread-use time. See "Using Work Managers to Optimize Scheduled Work".
<response-time-request>	Optional	Unbounded	Specifies a response time request class, which is a type of Work manager class. In particular, a response time request class specifies a response time goal in milliseconds. The <response-time-request> element can take the following child elements: ■ name—The name of the response time request class. ■ goal-ms—The integer response time goal. See "Using Work Managers to Optimize Scheduled Work".

Table A–1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<context-request>`	Optional	Unbounded	Specifies a context request class, which is a type of Work manager class. In particular, a context request class assigns request classes to requests based on context information, such as the current user or the current user's group. The `<context-request>` element can take the following child elements: ■ `name`—The name of the context request class. ■ `context-case`—An element that describes the context. The `<context-case>` element can itself take the following child elements: ■ `user-name` or `group-name`—The user or group to which the context applies. ■ `request-class-name`—The name of the request class. See "Using Work Managers to Optimize Scheduled Work".
`<max-threads-constraint>`	Optional	Unbounded	Specifies a `max-threads-constraint` Work Manager constraint. A Work Manager constraint defines minimum and maximum numbers of threads allocated to execute requests and the total number of requests that can be queued or executing before WebLogic Server begins rejecting requests. The max-threads constraint limits the number of concurrent threads executing requests from the constrained work set. The `<max-threads-constraint>` element can take the following child elements: ■ `name`—The name of the max-thread-constraint. ■ Either `count` or `pool-name`—The integer maximum number of concurrent threads, or the name of a connection pool which determines the maximum. See "Using Work Managers to Optimize Scheduled Work".
`<min-threads-constraint>`	Optional	Unbounded	Specifies a `min-threads-constraint` Work Manager constraint. A Work Manager constraint defines minimum and maximum numbers of threads allocated to execute requests and the total number of requests that can be queued or executing before WebLogic Server begins rejecting requests. The min-threads constraint guarantees a number of threads the server will allocate to affected requests to avoid deadlocks. The `<min-threads-constraint>` element can take the following child elements: ■ `name`—The name of the min-thread-constraint. ■ `count`—The integer minimum number of threads. See "Using Work Managers to Optimize Scheduled Work".

Table A–1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<capacity>`	Optional	Unbounded	Specifies a `capacity` Work Manager constraint. A Work Manager constraint defines minimum and maximum numbers of threads allocated to execute requests and the total number of requests that can be queued or executing before WebLogic Server begins rejecting requests. The capacity constraint causes the server to reject requests only when it has reached its capacity. The `<capacity>` element can take the following child elements: ■ `name`—The name of the capacity constraint. ■ `count`—The integer thread capacity. See "Using Work Managers to Optimize Scheduled Work".
`<work-manager>`	Optional	Unbounded	Specifies the Work Manager that is associated with the application. For more information on the elements you can define within the `work-manager` element, see Section A.1.13, "work-manager". See "Using Work Managers to Optimize Scheduled Work" for detailed information on Work Managers.
`<application-admin-mode-trigger>`	Optional	Unbounded	Specifies the number of stuck threads needed to bring the application into administration mode. You can specify the following child elements: ■ `max-stuck-thread-time`—The maximum amount of time, in seconds, that a thread should remain stuck. ■ `stuck-thread-count`—Number of stuck threads that triggers the stuck thread work manager.
`<session-descriptor>`	Optional	Unbounded	Specifies a list of configuration parameters for servlet sessions. For more information on the elements you can define within the `<session-descriptor>` element, see Section A.1.14, "session-descriptor".
`<library-context-root-override>`	Optional	Unbounded	Zero or more. Used to override the context-root of a Web module specified in the deployment descriptor of a library referenced by this application. For more information on the elements you can define within the `<library-context-root-override>` element, see Section A.1.16, "library-context-root-override".
`<component-factory-class-name>`	Optional	1	Used to enable the Spring extension by setting this element to `org.springframework.jee.interfaces.SpringComponentFactory`. This element exists in EJB, Web, and application descriptors. A module-level descriptor overwrites an application-level descriptor. If set to null (default), the Spring extension is disabled.

Table A–1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<prefer-application-packages>`	Optional	1	Used for filtering ClassLoader configuration. Specifies a list of packages for classes that must always be loaded from the application.
`<prefer-application-resources>`	Optional	1	Used for filtering ClassLoader configuration. Specifies a list of resources that must always be loaded from the application, even if the resources are found in the system classloader. Note that the resource loading behavior is different from the resource loading behavior when `<prefer-application-packages>` is used. In that case, application resources get a preference over system resources. The resources captured in this element are never looked up in the system classloader.
`<fast-swap>`	Optional	1	Specifies whether FastSwap deployment is used to minimize redeployment since Java classes are redefined in-place without reloading the ClassLoader. For more information, see "Using FastSwap Deployment to Minimize Redeployment" in *Deploying Applications to Oracle WebLogic Server*. For information on the elements you can define within the `<fast-swap>` element, see Section A.1.17, "fast-swap".

A.1.2 ejb

The following table describes the elements you can define within an `ejb` element.

Table A–2 ejb Elements

Element	Required?	Maximum Number in File	Description
`<entity-cache>`	Optional	Unbounded	Zero or more. The `entity-cache` element is used to define a named application level cache that is used to cache entity EJB instances at runtime. Individual entity beans refer to the application-level cache that they must use, referring to the cache name. There is no restriction on the number of different entity beans that may reference an individual cache. To use application-level caching, you must specify the cache using the `<entity-cache-ref>` element of the `weblogic-ejb-jar.xml` descriptor. Two default caches named `ExclusiveCache` and `MultiVersionCache` are used for this purpose. An application may explicitly define these default caches to specify non-default values for their settings. Note that the caching-strategy cannot be changed for the default caches. By default, a cache uses `max-beans-in-cache` with a value of 1000 to specify its maximum size. Example: <entity-cache> <entity-cache-name>ExclusiveCache</entity-cache-name> <max-cache-size> <megabytes>50</megabytes> </max-cache-size> </entity-cache> For more information on the elements you can define within the `entity-cache` element, see Section A.1.2.1, "entity-cache".
`<start-mbds-with-application`	Optional	1	Allows you to configure the EJB container to start Message Driven BeanS (MDBS) with the application. If set to true, the container starts MDBS as part of the application. If set to false, the container keeps MDBS in a queue and the server starts them as soon as it has started listening on the ports.

A.1.2.1 entity-cache

The following table describes the elements you can define within a `entity-cache` element.

Table A–3 entity-cache Elements

Element	Required?	Maximum Number in File	Description
`<entity-cache-name>`	Required	1	Specifies a unique name for an entity bean cache. The name must be unique within an ear file and may not be the empty string. Example: `<entity-cache-name>ExclusiveCache</entity-cache-name>`
`<max-beans-in-cache>`	Optional If you specify this element, you cannot also specify `<max-cache-size>`.	1	Specifies the maximum number of entity beans that are allowed in the cache. If the limit is reached, beans may be passivated. This mechanism does not take into account the actual amount of memory that different entity beans require. This element can be set to a value of 1 or greater. Default Value: `1000`
`<max-cache-size>`	Optional If you specify this element, you cannot also specify `<max-beans-in-cache>`.	1	Used to specify a limit on the size of an entity cache in terms of memory size—expressed either in terms of bytes or megabytes. A bean provider should provide an estimate of the average size of a bean in the `weblogic-ejb-jar.xml` descriptor if the bean uses a cache that specifies its maximum size using the `max-cache-size` element. By default, a bean is assumed to have an average size of 100 bytes. For more information on the elements you can define within the `ejb` element, see Section A.1.3, "max-cache-size".
`<max-queries-in-cache>`	Optional	1	Specifies the maximum SQL queries that can be present in the entity cache at a given moment.
`<caching-strategy>`	Optional	1	Specifies the general strategy that the EJB container uses to manage entity bean instances in a particular application level cache. A cache buffers entity bean instances in memory and associates them with their primary key value. The `caching-strategy` element can only have one of the following values: ■ `Exclusive`—Caches a single bean instance in memory for each primary key value. This unique instance is typically locked using the EJB container's exclusive locking when it is in use, so that only one transaction can use the instance at a time. ■ `MultiVersion`—Caches multiple bean instances in memory for a given primary key value. Each instance can be used by a different transaction concurrently. Default Value: `MultiVersion` Example: <caching-strategy>Exclusive</caching-strategy>

A.1.3 max-cache-size

The following table describes the elements you can define within a `max-cache-size` element.

Table A–4 max-cache-size Elements

Element	Required?	Maximum Number in File	Description
`<bytes>`	You *must* specify either `<bytes>` or `<megabytes>`	1	The size of an entity cache in terms of memory size, expressed in bytes.
`<megabytes>`	You *must* specify either `<bytes>` or `<megabytes>`	1	The size of an entity cache in terms of memory size, expressed in megabytes.

A.1.4 xml

The following table describes the elements you can define within an `xml` element.

Table A–5 xml Elements

Element	Required?	Maximum Number in File	Description
`<parser-factory>`	Optional	1	The parent element used to specify a particular XML parser or transformer for an enterprise application. For more information on the elements you can define within the `parser-factory` element, see Section A.1.4.1, "parser-factory".
`<entity-mapping>`	Optional	Unbounded	Zero or More. Specifies the entity mapping. This mapping determines the alternative entity URI for a given public or system ID. The default place to look for this entity URI is the `lib/xml/registry` directory. For more information on the elements you can define within the `entity-mapping` element, see Section A.1.4.2, "entity-mapping".

A.1.4.1 parser-factory

The following table describes the elements you can define within a `parser-factory` element.

Table A–6 parser-factory Elements

Element	Required?	Maximum Number in File	Description
<saxparser-factory>	Optional	1	Allows you to set the SAXParser Factory for the XML parsing required in this application only. This element determines the factory to be used for SAX style parsing. If you do not specify the `saxparser-factory` element setting, the configured SAXParser Factory style in the Server XML Registry is used. Default Value: Server XML Registry setting
<document-builder-factory>	Optional	1	Allows you to set the Document Builder Factory for the XML parsing required in this application only. This element determines the factory to be used for DOM style parsing. If you do not specify the `document-builder-factory` element setting, the configured DOM style in the Server XML Registry is used. Default Value: Server XML Registry setting
<transformer-factory>	Optional	1	Allows you to set the Transformer Engine for the style sheet processing required in this application only. If you do not specify a value for this element, the value configured in the Server XML Registry is used. Default value: Server XML Registry setting.

A.1.4.2 entity-mapping

The following table describes the elements you can define within an `entity-mapping` element.

Table A–7 entity-mapping Elements

Element	Required?	Maximum Number in File	Description
<entity-mapping-name>	Required	1	Specifies the name for this entity mapping.
<public-id>	Optional	1	Specifies the public ID of the mapped entity.
<system-id>	Optional	1	Specifies the system ID of the mapped entity.
<entity-uri>	Optional	1	Specifies the entity URI for the mapped entity.
<when-to-cache>	Optional	1	Legal values are: ■ cache-on-reference ■ cache-at-initialization ■ cache-never The default value is `cache-on-reference`.
<cache-timeout-interval>	Optional	1	Specifies the integer value in seconds.

A.1.5 jdbc-connection-pool

Note: The `jdbc-connection-pool` element is deprecated. To define a data source in your enterprise application, you can package a JDBC module with the application. For more information, see "Configuring JDBC Application Modules for Deployment" in *Administering JDBC Data Sources for Oracle WebLogic Server*.

The following table describes the elements you can define within a `jdbc-connection-pool` element.

Table A–8 jdbc-connection-pool Elements

Element	Required?	Maximum Number in File	Description
`<data-source-jndi-name>`	Required	1	Specifies the JNDI name in the application-specific JNDI tree.
`<connection-factory>`	Required	1	Specifies the connection parameters that define overrides for default connection factory settings. ■ `user-name`—Optional. The `user-name` element is used to override `UserName` in the `JDBCDataSourceFactoryMBean`. ■ `url`—Optional. The `url` element is used to override `URL` in the `JDBCDataSourceFactoryMBean`. ■ `driver-class-name`—Optional. The `driver-class-name` element is used to override `DriverName` in the `JDBCDataSourceFactoryMBean`. ■ `connection-params`—Zero or more. ■ `parameter+` (`param-value`, `param-name`)—One or more For more information on the elements you can define within the `connection-factory` element, see Section A.1.5.1, "connection-factory".
`<pool-params>`	Optional	1	Defines parameters that affect the behavior of the pool. For more information on the elements you can define within the `pool-params` element, see Section A.1.5.2, "pool-params".
`<driver-params>`	Optional	1	Sets behavior on WebLogic Server drivers. For more information on the elements you can define within the `driver-params` element, see Section A.1.5.3, "driver-params".
`<acl-name>`	Optional	1	DEPRECATED.

A.1.5.1 connection-factory

The following table describes the elements you can define within a `connection-factory` element.

Table A–9 connection-factory Elements

Element	Required?	Maximum Number in File	Description
`<factory-name>`	Optional	1	Specifies the name of a `JDBCDataSourceFactoryMBean` in the `config.xml` file.

`<connection-properties>`	Optional	1	Specifies the connection properties for the connection factory. Elements that can be defined for the `connection-properties` element are:
			■ `user-name`—Optional. Used to override UserName in the JDBCDataSourceFactoryMBean.
			■ `password`—Optional. Used to override Password in the JDBCDataSourceFactoryMBean.
			■ `url`—Optional. Used to override URL in the JDBCDataSourceFactoryMBean.
			■ `driver-class-name`—Optional. Used to override DriverName in the JDBCDataSourceFactoryMBean
			■ `connection-params`—Zero or more. Used to set parameters which will be passed to the driver when making a connection. Example:
			`<connection-params>`
			`  <parameter>`
			`   <description>Desc of param`
			`   </description>`
			`   <param-name>foo</param-name>`
			`   <param-value>xyz</param-value>`
			`  </parameter>`
			`</connection-params>`

A.1.5.2 pool-params

The following table describes the elements you can define within a `pool-params` element.

Table A–10 pool-params Elements

Element	Required?	Maximum Number in File	Description
`<size-params>`	Optional	1	Defines parameters that affect the number of connections in the pool. ■ `initial-capacity`—Optional. The `initial-capacity` element defines the number of physical database connections to create when the pool is initialized. The default value is `1`. ■ `max-capacity`—Optional. The `max-capacity` element defines the maximum number of physical database connections that this pool can contain. Note that the JDBC Driver may impose further limits on this value. The default value is `1`. ■ `capacity-increment`—Optional. The `capacity-increment` element defines the increment by which the pool capacity is expanded. When there are no more available physical connections to service requests, the pool creates this number of additional physical database connections and adds them to the pool. The pool ensures that it does not exceed the maximum number of physical connections as set by `max-capacity`. The default value is `1`. ■ `shrinking-enabled`—Optional. The `shrinking-enabled` element indicates whether or not the pool can shrink back to its `initial-capacity` when connections are detected to not be in use. ■ `shrink-period-minutes`—Optional. The `shrink-period-minutes` element defines the number of minutes to wait before shrinking a connection pool that has incrementally increased to meet demand. The `shrinking-enabled` element must be set to `true` for shrinking to take place. ■ `shrink-frequency-seconds`—Optional. ■ `highest-num-waiters`—Optional. ■ `highest-num-unavailable`—Optional.

Table A–10 (Cont.) pool-params Elements

Element	Required?	Maximum Number in File	Description
`<xa-params>`	Optional	1	Defines the parameters for the XA DataSources. ■ `debug-level`—Optional. Integer. The `debug-level` element defines the debugging level for XA operations. The default value is `0`. ■ `keep-conn-until-tx-complete-enabled`—Optional. Boolean. If you set the `keep-conn-until-tx-complete-enabled` element to `true`, the XA connection pool associates the same XA connection with the distributed transaction until the transaction completes. ■ `end-only-once-enabled`—Optional. Boolean. If you set the `end-only-once-enabled` element to `true`, the `XAResource.end()` method is only called once for each pending `XAResource.start()` method. ■ `recover-only-once-enabled`—Optional. Boolean. If you set the recover-only-once-enabled element to true, recover is only called one time on a resource. ■ `tx-context-on-close-needed`—Optional. Set the `tx-context-on-close-needed` element to `true` if the XA driver requires a distributed transaction context when closing various JDBC objects (for example, result sets, statements, connections, and so on). If set to `true`, the SQL exceptions that are thrown while closing the JDBC objects in no transaction context are swallowed. ■ `new-conn-for-commit-enabled`—Optional. Boolean. If you set the `new-conn-for-commit-enabled` element to `true`, a dedicated XA connection is used for commit/rollback processing of a particular distributed transaction.

`<xa-params>`
`Continued...`
	Optional	1	■ `prepared-statement-cache-size`—**Deprecated**. Optional. Use the prepared-statement-cache-size element to set the size of the prepared statement cache. The size of the cache is a number of prepared statements created from a particular connection and stored in the cache for further use. Setting the size of the prepared statement cache to 0 turns it off.
			Note: `Prepared-statement-cache-size` is deprecated. Use `cache-size` in `driver-params/prepared-statement`. See Section A.1.5.3, "driver-params" for more information.
			■ `keep-logical-conn-open-on-release`—OptionaB. oolean. Set the `keep-logical-conn-open-on-release` element to `true`, to keep the logical JDBC connection open when the physical XA connection is returned to the XA connection pool. The default value is `false`.
			■ `local-transaction-supported`—Optional. Boolean. Set the `local-transaction-supported` to `true` if the XA driver supports SQL with no global transaction; otherwise, set it to `false`. The default value is `false`.
			■ `resource-health-monitoring-enabled`—Optional. Set the `resource-health-monitoring-enabled` element to `true` to enable JTA resource health monitoring for this connection pool.

Table A–10 (Cont.) pool-params Elements

Element	Required?	Maximum Number in File	Description

`<xa-params>`
`Continued...`
	Optional	1	■ `xa-set-transaction-timeout`—Optional.
			Used in: xa-params
			Example:
			<xa-set-transaction-timeout>
			true
			</xa-set-transaction-timeout>
			■ `xa-transaction-timeout`—Optional.
			When the `xa-set-transaction-timeout` value is set to true, the transaction manager invokes setTransactionTimeout on the resource before calling XAResource.start. The Transaction Manager passes the global transaction timeout value. If this attribute is set to a value greater than 0, then this value is used in place of the global transaction timeout.
			Default value: 0
			Used in: xa-params
			Example:
			`<xa-transaction-timeout>`
			`30`
			`</xa-transaction-timeout>`
			■ `rollback-localtx-upon-connclose`—Optional.
			When the `rollback-localtx-upon-connclose` element is true, the connection pool calls `rollback()` on the connection before putting it back in the pool.
			Default value: false
			Used in: xa-params
			Example:
			<rollback-localtx-upon-connclose>
			true </rollback-localtx-upon-connclose>

`<login-delay-seconds>`	Optional	1	Sets the number of seconds to delay before creating each physical database connection. Some database servers cannot handle multiple requests for connections in rapid succession. This property allows you to build in a small delay to let the database server catch up. This delay occurs both during initial pool creation and during the lifetime of the pool whenever a physical database connection is created.
`<leak-profiling-enabled>`	Optional	1	Enables JDBC connection leak profiling. A connection leak occurs when a connection from the pool is not closed explicitly by calling the `close()` method on that connection. When connection leak profiling is active, the pool stores the stack trace at the time the connection object is allocated from the pool and given to the client. When a connection leak is detected (when the connection object is garbage collected), this stack trace is reported. This element uses extra resources and will likely slowdown connection pool operations, so it is not recommended for production use.

Table A–10 (Cont.) pool-params Elements

Element	Required?	Maximum Number in File	Description
<connection-check-params>	Optional	1	■ Defines whether, when, and how connections in a pool is checked to make sure they are still alive. ■ table-name—Optional. The table-name element defines a table in the schema that can be queried. ■ check-on-reserve-enabled—Optional. If the check-on-reserve-enabled element is set to true, then the connection will be tested each time before it is handed out to a user. ■ check-on-release-enabled—Optional. If the check-on-release-enabled element is set to true, then the connection will be tested each time a user returns a connection to the pool. ■ refresh-minutes—Optional. If the refresh-minutes element is defined, a trigger is fired periodically (based on the number of minutes specified). This trigger checks each connection in the pool to make sure it is still valid. ■ check-on-create-enabled—Optional. If set to true, then the connection will be tested when it is created. ■ connection-reserve-timeout-seconds—Optional. Number of seconds after which the call to reserve a connection from the pool will timeout. ■ connection-creation-retry-frequency-seconds—Optional. The frequency of retry attempts by the pool to establish connections to the database. ■ inactive-connection-timeout-seconds—Optional. The number of seconds of inactivity after which reserved connections will forcibly be released back into the pool.
<connection-check-params> Continued...	Optional	1	■ test-frequency-seconds—Optional. The number of seconds between database connection tests. After every test-frequency-seconds interval, unused database connections are tested using table-name. Connections that do not pass the test will be closed and reopened to re-establish a valid physical database connection. If table-name is not set, the test will not be performed. ■ init-sql—Optional. Specifies a SQL query that automatically runs when a connection is created.
<jdbcxa-debug-level>	Optional	1	This is an internal setting.
<remove-infected-connections-enabled>	Optional	1	Controls whether a connection is removed from the pool when the application asks for the underlying vendor connection object. Enabling this attribute has an impact on performance; it essentially disables the pooling of connections (as connections are removed from the pool and replaced with new connections).

A.1.5.3 driver-params

The following table describes the elements you can define within a driver-params element.

Table A–11 driver-params Elements

Element	Required?	Maximum Number in File	Description

`<statement>`	Optional	1	Defines the `driver-params` statement. Contains the following optional element: `profiling-enabled`.
			Example:
			`<statement>`
			`<profiling-enabled>true`
			`</profiling-enabled>`
			`</statement>`

`<prepared-statement`	Optional	1	Enables the running of JDBC prepared statement cache profiling. When enabled, prepared statement cache profiles are stored in external storage for further analysis. This is a resource-consuming feature, so it is recommended that you turn it off on a production server. The default value is false. ■ `profiling-enabled`—Optional. ■ `cache-profiling-threshold`—Optional. The `cache-profiling-threshold` element defines a number of statement requests after which the state of the prepared statement cache is logged. This element minimizes the output volume. This is a resource-consuming feature, so it is recommended that you turn it off on a production server. ■ `cache-size`—Optional. The `cache-size` element returns the size of the prepared statement cache. The size of the cache is a number of prepared statements created from a particular connection and stored in the cache for further use. ■ `parameter-logging-enabled`—Optional. During SQL roundtrip profiling it is possible to store values of prepared statement parameters. The `parameter-logging-enabled` element enables the storing of statement parameters. This is a resource-consuming feature, so it is recommended that you turn it off on a production server. ■ `max-parameter-length`—Optional. During SQL roundtrip profiling it is possible to store values of prepared statement parameters. The `max-parameter-length` element defines maximum length of the string passed as a parameter for JDBC SQL roundtrip profiling. This is a resource-consuming feature, so you should limit the length of data for a parameter to reduce the output volume. ■ `cache-type`—Optional.

Table A–11 (Cont.) driver-params Elements

Element	Required?	Maximum Number in File	Description
`<row-prefetch-enabled>`	Optional	1	Specifies whether to enable row prefetching between a client and WebLogic Server for each ResultSet. When an external client accesses a database using JDBC through Weblogic Server, row prefetching improves performance by fetching multiple rows from the server to the client in one server access. WebLogic Server ignores this setting and does not use row prefetching when the client and WebLogic Server are in the same JVM
`<row-prefetch-size>`	Optional	1	Specifies the number of result set rows to prefetch for a client. The optimal value depends on the particulars of the query. In general, increasing this number increases performance, until a particular value is reached. At that point further increases do not result in any significant increase in performance. **Note:** Typically you will not see any increase in performance after 100 rows. The default value should be adequate for most situations. Valid values for this element are between 2 and 65536. The default value is 48.
`<stream-chunk-size>`	Optional	1	Specifies the data chunk size for streaming data types, which are pulled from WebLogic Server to the client as needed.

A.1.6 security

The following table describes the elements you can define within a `security` element.

Table A–12 security Elements

Element	Required?	Maximum Number in File	Description
`<realm-name>`	Optional	1	Names a security realm to be used by the application. If none is specified, the system default realm is used

`<security-role-assignment>`	Optional	Unbounded	Declares a mapping between an application-wide security role and one or more WebLogic Server principals.
			Example:
			`<security-role-assignment>`
			`  <role-name>`
			`    PayrollAdmin`
			`  </role-name>`
			`  <principal-name>`
			`    Tanya`
			`  </principal-name>`
			`  <principal-name>`
			`    Fred`
			`  </principal-name>`
			`  <principal-name>`
			`    system`
			`  </principal-name>`
			`</security-role-assignment>`

A.1.7 application-param

The following table describes the elements you can define within a `application-param` element.

Table A–13 application-param Elements

Element	Required?	Maximum Number in File	Description
`<description>`	Optional	1	Provides a description of the application parameter.
`<param-name>`	Required	1	Defines the name of the application parameter.
`<param-value>`	Required	1	Defines the value of the application parameter.

A.1.8 classloader-structure

The following table describes the elements you can define within a `classloader-structure` element.

Table A–14 classloader-structure Elements

Element	Required?	Maximum Number in File	Description
`<module-ref>`	Optional	Unbounded	The following list describes the elements you can define within a `module-ref` element: ■ `module-uri`—Zero or more. Defined within the `module-ref` element.
`<classloader-structure>`	Optional	Unbounded	Allows for arbitrary nesting of classloader structures for an application. However, for this version of WebLogic Server, the depth is restricted to three levels.

A.1.9 listener

The following table describes the elements you can define within a `listener` element.

Table A–15 listener Elements

Element	Required?	Maximum Number in File	Description
`<listener-class>`	Required	1	Name of the user's implementation of `ApplicationLifecycleListener`.
`<listener-uri>`	Optional	1	A JAR file within the EAR that contains the implementation. If you do not specify the `listener-uri`, it is assumed that the class is visible to the application.
`<run-as-principal-name>`	Optional	1	Specific a user identity to startup and shutdown application lifecycle events. The identity specified here should be a valid user name in the system. If `run-as-principal-name` is not specified, the deployment initiator user identity will be used as the `run-as` identity for the execution of the application lifecycle listener. **Note:** If the `run-as-principal-name` identity defined for the application lifecycle listener is an administrator, the application deployer must have administrator privileges; otherwise, deployment will fail.

A.1.10 singleton-service

The following table describes the elements you can define within a `singleton-service` element.

Table A–16 singleton-service Elements

Element	Required?	Maximum Number in File	Description
`<class-name>`	Required	1	Defines the name of the class to be run when the application is being deployed.
`<singleton-uri>`	Optional	1	Defines a JAR file within the EAR that contains the `singleton-service`. If `singleton-uri` is not defined, then its assumed that the class is visible to the application.

A.1.11 startup

The following table describes the elements you can define within a `startup` element.

> **Note::** Application-scoped startup and shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Instead, you should use lifecycle listener events in your applications. For details, see Chapter 12, "Programming Application Life Cycle Events."

Table A–17 startup Elements

Element	Required?	Maximum Number in File	Description
`<startup-class>`	Required	1	Defines the name of the class to be run when the application is being deployed.
`<startup-uri>`	Optional	1	Defines a JAR file within the EAR that contains the `startup-class`. If `startup-uri` is not defined, then its assumed that the class is visible to the application.

A.1.12 shutdown

The following table describes the elements you can define within a `shutdown` element.

Note: : Application-scoped startup and shutdown classes have been deprecated as of release 9.0 of WebLogic Server. Instead, you should use lifecycle listener events in your applications. For details, see Chapter 12, "Programming Application Life Cycle Events."

Table A–18 shutdown Elements

Element	Required Optional	Maximum Number in File	Description
`<shutdown-class>`	Required	1	Defines the name of the class to be run when the application is undeployed.
`<shutdown-uri>`	Optional	1	Defines a JAR file within the EAR that contains the `shutdown-class`. If you do not define the `shutdown-uri` element, it is assumed that the class is visible to the application.

A.1.13 work-manager

The following table describes the elements you can define within a work-manager element.

See "Using Work Managers to Optimize Scheduled Work" for examples and information on Work Managers.

Table A–19 work-manager Elements

Element	Required?	Maximum Number in File	Description
`<name>`	Required	1	The name of the Work Manager.
`<response-time-request-class>`	Optional	1	See the description of the `<response-time-request>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<fair-share-request-class>`, `<context-request-class>`, or `<request-class-name>`.
`<fair-share-request-class>`	Optional	1	See the description of the `<fair-share-request>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<response-time-request-class>`, `<context-request-class>`, or `<request-class-name>`.
`<context-request-class>`	Optional	1	See the description of the `<context-request>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<fair-share-request-class>`, `<response-time-request-class>`, or `<request-class-name>`.
`<request-class-name>`	Optional	1	The name of the request class. If you specify this element, you cannot also specify `<fair-share-request-class>`, `<context-request-class>`, or `<response-time-request-class>`.
`<min-threads-constraint>`	Optional	1	See the description of the `<min-threads-constraint>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<min-threads-constraint-name>`.
`<min-threads-constraint-name>`	Optional	1	The name of the min-threads constraint. If you specify this element, you cannot also specify `<min-threads-constraint>`.
`<max-threads-constraint>`	Optional	1	See the description of the `<max-threads-constraint>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<max-threads-constraint-name>`.
`<max-threads-constraint-name>`	Optional	1	The name of the max-threads constraint. If you specify this element, you cannot also specify `<max-threads-constraint>`.

Table A–19 (Cont.) work-manager Elements

Element	Required?	Maximum Number in File	Description
`<capacity>`	Optional	1	See the description of the `<capacity>` element in Section A.1.1, "weblogic-application" for information on this child element of `<work-manager>`. If you specify this element, you cannot also specify `<capacity-name>`.
`<capacity-name>`	Optional	1	The name of the thread capacity constraint. If you specify this element, you cannot also specify `<capacity>`.
`<work-manager-shutdown-trigger>`	Optional	1	Used to specify a Stuck Thread Work Manager component that can shut down the Work Manager in response to stuck threads. You can specify the following child elements: ▪ `max-stuck-thread-time`—The maximum amount of time, in seconds, that a thread should remain stuck. ▪ `stuck-thread-count`—Number of stuck threads that triggers the stuck thread work manager. If you specify this element, you cannot also specify `<ignore-stuck-threads>`.
`<ignore-stuck-threads>`	Optional	1	Specifies whether the Work Manager should ignore stuck threads and never shut down even if threads become stuck. If you specify this element, you cannot also specify `<work-manager-shutdown-trigger>`.

A.1.14 session-descriptor

The following table describes the elements you can define within a session-descriptor element.

Table A–20 session-descriptor Elements

Element	Required?	Maximum Number in File	Description
`<timeout-secs>`	Optional	1	Specifies the number of seconds after which the session times out. Default value is 3600 seconds.
`<invalidation-interval-secs>`	Optional	1	Specifies the number of seconds of the invalidation trigger interval. Default value is 60 seconds.
`<debug-enabled>`	Optional	1	Specifies whether debugging is enabled for HTTP sessions. Default value is `false`.
`<id-length>`	Optional	1	Specifies the length of the session ID. Default value is 52.

Table A–20 (Cont.) session-descriptor Elements

Element	Required?	Maximum Number in File	Description
`<tracking-enabled>`	Optional	1	Specifies whether session tracking is enabled between HTTP requests. Default value is `true`.
`<cache-size>`	Optional	1	Specifies the cache size for JDBC and file persistent sessions. Default value is 1028.
`<max-in-memory-sessions>`	Optional	1	Specifies the maximum sessions limit for memory/replicated sessions. Default value is -1, or unlimited.
`<cookies-enabled>`	Optional	1	Specifies the Web application container should set cookies in the response. Default value is `true`.
`<cookie-name>`	Optional	1	Specifies the name of the cookie that tracks sessions. Default name is `JSESSIONID`.
`<cookie-path>`	Optional	1	Specifies the session tracking cookie path. Default value is `/`.
`<cookie-domain>`	Optional	1	Specifies the session tracking cookie domain. Default value is `null`.
`<cookie-comment>`	Optional	1	Specifies the session tracking cookie comment. Default value is `null`.
`<cookie-secure>`	Optional	1	Specifies whether the session tracking cookie is marked secure. Default value is `false`.
`<cookie-max-age-secs>`	Optional	1	Specifies that maximum age of the session tracking cookie. Default value is `-1`, or unlimited.
`<persistent-store-type>`	Optional	1	Specifies the type of storage for session persistence. You can specify the following values: ■ `memory`—Default value. ■ `replicated`—Requires clustering. ■ `replicated_if_clustered`—Defaults to `memory` in non-clustered case. ■ `file` ■ `jdbc` ■ `cookie`
`<persistent-store-cookie-name>`	Optional	1	Specifies the name of the cookie that holds the attribute name and values when using `cookie`-based session persistence. Default value is `WLCOOKIE`.

Table A–20 (Cont.) session-descriptor Elements

Element	Required?	Maximum Number in File	Description
`<persistent-store-dir>`	Optional	1	Specifies the name of the directory when using `file`-based session persistence. The directory is relative to the temporary directory defined for the Web application. Default value is `session_db`.
`<persistent-store-pool>`	Optional	1	Specifies the name of the JDBC connection pool when using `jdbc`-based session persistence.
`<persistent-store-table>`	Optional	1	Specifies the name of the database table when using `jdbc`-based session persistence. Default value is `wl_servlet_sessions`.
`<jdbc-column-name-max-inactive-interval>`	Optional	1	Alternative name for the `wl_max_inactive_interval` column name when using `jdbc`-based session persistence. Required for certain databases that do not support long column names
`<jdbc-connection-timeout-secs>`	Optional	1	DEPRECATED
`<url-rewriting-enabled>`	Optional	1	Specifies whether URL rewriting is enabled. Default value is `true`.
`<http-proxy-caching-of-cookies>`	Optional	1	Specifies whether WebLogic Server adds the following HTTP header to the response: `Cache-control: no-cache=set-cookie` This header specifies that proxy caches should not cache the cookies. Default value is `true`, which means that the header is NOT added. Set this element to `false` if you want the header added to the response.
`<encode-session-id-in-query-params>`	Optional	1	Specifies whether WebLogic Server should encode the session ID in the path parameters. Default value is `false`.
`<monitoring-attribute-name>`	Optional	1	Used to tag runtime information for different sessions. For example, set this element to `username` if you have a `username` attribute that is guaranteed to be unique.
`<sharing-enabled>`	Optional	1	Specifies whether HTTP sessions are shared across multiple Web applications. Default value is `false`.

A.1.15 library-ref

The following table describes the elements you can define within a `library-ref` element.

See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages," for additional information and examples.

Table A–21 library Elements

Element	Required?	Maximum Number in File	Description
`<library-name>`	Required	1	Specifies the name of the referenced shared Java EE library.
`<specification-version>`	Optional	1	Specifies the minimum specification-version required.
`<implementation-version>`	Optional	1	Specifies the minimum implementation-version required.
`<exact-match>`	Optional	1	Specifies whether there must be an exact match between the specification and implementation version that is specified and that of the referenced library. Default value is `false`.
`<context-root>`	Optional	1	Specifies the context-root of the referenced Web application's shared Java EE library.

A.1.16 library-context-root-override

The following table describes the elements you can define within a `library-context-root-override` element to override `context-root` elements within a referenced EAR library. See Section A.1.15, "library-ref".

See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages," for additional information and examples.

Table A–22 library-context-root-override Elements

Element	Required?	Maximum Number in File	Description
`<context-root>`	Optional	1	Overrides the `context-root` elements declared in libraries. In the absence of this element, the library's `context-root` is used. Only a referencing application (for example, a user application) can override the `context-root` elements declared in its libraries.
`<override-value>`	Optional	1	Specifies the value of the `library-context-root-override` element when overriding the `context-root` elements declared in libraries. In the absence of these elements, the library's `context-root` is used.

A.1.17 fast-swap

The following table describes the elements you can define within a `fast-swap` element.

For more information about FastSwap Deployment, see "Using FastSwap Deployment to Minimize Redeployment" in *Deploying Applications to Oracle WebLogic Server*.

Table A–23 fast-swap Elements

Element	Required?	Maximum Number in File	Description
`<enabled>`	Optional	1	Set to `true` to enable FastSwap deployment in your application.
`<refresh-interval>`	Optional	1	FastSwap checks for changes in application classes when an incoming HTTP request is received. Subsequent HTTP requests arriving within the `refresh-interval` seconds will not trigger a check for changes. The first HTTP request arriving after the `refresh-interval` seconds have passed, will cause FastSwap to perform a class-change check again.
`<redefinition-task-limit>`	Optional	1	FastSwap class redefinitions are performed asynchronously by redefinition tasks. They can be controlled and inspected using JMX interfaces. Specifies the number of redefinition tasks that will be retained by the FastSwap system. If the number of tasks exceeds this limit, older tasks are automatically removed.

A.2 weblogic-application.xml Schema

See http://xmlns.oracle.com/weblogic/weblogic-application/1.5/weblogic-application.xsd for the XML Schema of the `weblogic-application.xml` deployment descriptor file.

A.3 application.xml Schema

For more information about `application.xml` deployment descriptor elements, see the Java EE 6 schema available at http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/application_6.xsd.

B
wldeploy Ant Task Reference

The following sections describe tools for deploying applications and standalone modules to WebLogic Server:

- Section B.1, "Overview of the wldeploy Ant Task"
- Section B.2, "Basic Steps for Using wldeploy"
- Section B.3, "Sample build.xml Files for wldeploy"
- Section B.4, "wldeploy Ant Task Attribute Reference"

B.1 Overview of the wldeploy Ant Task

The `wldeploy` Ant task enables you to perform `weblogic.Deployer` functions using attributes specified in an Ant XML file. You can use `wldeploy` along with other WebLogic Server Ant tasks to create a single Ant build script that:

- Builds your application from source, using `wlcompile`, `appc`, and the Web services Ant tasks.
- Creates, starts, and configures a new WebLogic Server domain, using the `wlserver` and `wlconfig` Ant tasks.
- Deploys a compiled application to the newly-created domain, using the `wldeploy` Ant task.

See Chapter 2, "Using Ant Tasks to Configure and Use a WebLogic Server Domain," for more information about `wlserver` and `wlconfig`. See Chapter 5, "Building Applications in a Split Development Directory," for information about `wlcompile`.

B.2 Basic Steps for Using wldeploy

To use the `wldeploy` Ant task:

1. Set your environment.

   On Windows NT, execute the `setWLSEnv.cmd` command, located in the directory *`WL_HOME`*`\server\bin`, where *`WL_HOME`* is the top-level directory of your WebLogic Server installation.

   On UNIX, execute the `setWLSEnv.sh` command, located in the directory *`WL_HOME`*`/server/bin`, where *`WL_HOME`* is the top-level directory of your WebLogic Server installation.

Note: On UNIX operating systems, the `setWLSEnv.sh` command does not set the environment variables in all command shells. Oracle recommends that you execute this command using the Korn shell or bash shell.

---

2. In the staging directory, create the Ant build file (`build.xml` by default). If you want to use an Ant installation that is different from the one installed with WebLogic Server, start by defining the `wldeploy` Ant task definition:

   ```
   <taskdef name="wldeploy"
   classname="weblogic.ant.taskdefs.management.WLDeploy"/>
   ```

3. If necessary, add task definitions and calls to the `wlserver` and `wlconfig` tasks in the build script to create and start a new WebLogic Server domain. See Chapter 2, "Using Ant Tasks to Configure and Use a WebLogic Server Domain," for information about `wlserver` and `wlconfig`.
4. Add a call to `wldeploy` to deploy your application to one or more WebLogic Server instances or clusters. See Section B.3, "Sample build.xml Files for wldeploy" and Section B.4, "wldeploy Ant Task Attribute Reference".
5. Execute the Ant task or tasks specified in the `build.xml` file by typing `ant` in the staging directory, optionally passing the command a target argument:

   ```
   prompt> ant
   ```

B.3 Sample build.xml Files for wldeploy

The following example shows a `wldeploy` target that deploys an application to a single WebLogic Server instance:

```
<target name="deploy">
  <wldeploy
    action="deploy" verbose="true" debug="true"
    name="DeployExample" source="output/redeployEAR"
    user="weblogic" password="weblogic"
    adminurl="t3://localhost:7001" targets="myserver" />
</target>
```

The following example shows a corresponding task to undeploy the application; the example shows that when you undeploy or redeploy an application, you do not specify the source archive file or exploded directory, but rather, just its deployed name.:

```
<target name="undeploy">
  <wldeploy
    action="undeploy" verbose="true" debug="true"
    name="DeployExample"
    user="weblogic" password="weblogic"
    adminurl="t3://localhost:7001" targets="myserver"
    failonerror="false" />
</target>
```

The following example shows how to perform a partial redeploy of the application; in this case, just a single WAR file in the application is redeployed:

```
<target name="redeploy_partial">
  <wldeploy
    action="redeploy" verbose="true"
```

```
      name="DeployExample"
      user="weblogic" password="weblogic"
      adminurl="t3://localhost:7001" targets="myserver"
      deltaFiles="examples/general/redeploy/SimpleImpl.war" />
  </target>
```

The following example uses the nested `<files>` child element of `wldeploy` to specify a particular file in the application that should be undeployed:

```
  <target name="undeploy_partial">
    <wldeploy
      action="undeploy" verbose="true" debug="true"
      name="DeployExample"
      user="weblogic" password="weblogic"
      adminurl="t3://localhost:7001" targets="myserver"
      failonerror="false">
      <files
         dir="${current-dir}/output/redeployEAR/examples/general/redeploy"
         includes="SimpleImpl.jsp" />
    </wldeploy>
  </target>
```

The following example shows how to deploy a Java EE library called `myLibrary` whose source files are located in the `output/myLibrary` directory:

```
  <target name="deploy">
    <wldeploy action="deploy" name="myLibrary"
      source="output/myLibrary" library="true"
      user="weblogic" password="weblogic"
      verbose="true" adminurl="t3://localhost:7001"
      targets="myserver" />
  </target>
```

B.4 wldeploy Ant Task Attribute Reference

The following sections describe the attributes and child element `<files>` of the `wldeploy` Ant task.

B.4.1 Main Attributes

The following table describes the main attributes of the `wldeploy` Ant task.

These attributes mirror some of the arguments of the `weblogic.Deployer` command. Oracle provides an Ant task version of the `weblogic.Deployer` command so that developers can easily deploy and test their applications as part of the iterative development process. Typically, however, administrators use the `weblogic.Deployer` command, and not the `wldeploy` Ant task, to deploy applications in a production environment. For that reason, see the "weblogic.Deployer Command-Line Reference" in *Deploying Applications to Oracle WebLogic Server* for the full and complete definition of the attributes of the `wldeploy` Ant task. The table below is provided just as a quick summary.

Table B–1 Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
action	The deployment action to perform. Valid values are `deploy`, `cancel`, `undeploy`, `redeploy`, `distribute`, `start`, and `stop`.	String
adminmode	Specifies that the deployment action puts the application into Administration mode. Administration mode restricts access to an application to a configured Administration channel. Valid values for this attribute are `true` and `false`. Default value is `false`, which means that by default the application is deployed in production mode so that all clients can access it immediately.	Boolean
adminurl	The URL of the Administration Server. The format of the value of this attribute is *`protocol`*`://`*`host`*`:`*`port`*, where *`protocol`* is either `http` or `t3`, *`host`* is the host on which the Administration Server is running, and *`port`* is the port which the Administration Server is listening. **Note:** In order to use the HTTP protocol, you must enable the http tunnelling option in the Administration Console.	String
allversions	Specifies that the action (redeploy, stop, and so on) applies to all versions of the application. Valid values for this attribute are `true` and `false`. The default value is `false`.	Boolean
altappdd	Specifies the name of an alternate Java EE deployment descriptor (`application.xml`) to use for deployment. If you do not specify this attribute, and you are deploying an enterprise application, the default deployment descriptor is called `application.xml` and is located in the META-INF subdirectory of the main application directory or archive (specified by the `source` attribute.)	String
altwlsappdd	Specifies the name of an alternate WebLogic Server deployment descriptor (`weblogic-application.xml`) to use for deployment. If you do not specify this attribute, and you are deploying an enterprise application, the default deployment descriptor is called `weblogic-application.xml` and is located in the META-INF subdirectory of the main application directory or archive (specified by the `source` attribute.)	String
appversion	The version identifier of the deployed application.	String
debug	Enable `wldeploy` debugging messages.	Boolean
deleteFiles	Specifies whether to remove static files from a server's staging directory. This attribute is valid only for unarchived deployments, and only for applications deployed using `stage` mode. You must specify target servers when using this attribute. Specifying the `deleteFiles` attributes indicates that WebLogic Server should remove only those files that it copied to the staging area during deployment. This attribute can be used only in combination with `action="redeploy"`. Because the `deleteFiles` attribute deletes all specified files, Oracle recommends that you use caution when using the `deleteFiles` attribute and that you do not use it in production environments. Valid values for this attribute are true and false. Default value is false.	Boolean
deltaFiles	Specifies a comma- or space-separated list of files, relative to the root directory of the application, which are to be redeployed. Use this attribute only in conjunction with `action="redeploy"` to perform a partial redeploy of an application.	String

Table B–1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
enableSecurityValidation	Specifies whether or not to enable validation of security data. Valid values for this attribute are true and false. Default value is false.	Boolean
externalStage	Specifies whether the deployment uses `external_stage` deployment mode. In this mode, the Ant task does not copy the deployment files to target servers; instead, you must ensure that deployment files have been copied to the correct subdirectory in the target servers' staging directories. You can specify only one of the following attributes: `stage`, `nostage`, or `external_stage`. If none is specified, the default deployment mode to Managed Servers is `stage`; the default mode to the Administration Server and in single-server cases is `nostage`. See "Controlling Deployment File Copying with Staging Modes".	Boolean
failonerror	This is a global attribute used by WebLogic Server Ant tasks. It specifies whether the task should fail if it encounters an error during the build. Valid values for this attribute are true and false. Default value is true.	Boolean
graceful	Stops the application after existing HTTP clients have completed their work. You can use this attribute *only* when stopping or undeploying an application, or in other words, you must also specify either the `action="stop"` or `action="undeploy"` attributes. Valid values for this attribute are `true` and `false`. Default value is `false`.	Boolean
id	Identification used for obtaining status or cancelling the deployment. You assign a unique ID to an application when you deploy it, and then subsequently use the ID when redeploying, undeploying, stopping, and so on. If you do not specify this attribute, the Ant task assigns a unique ID to the application.	String
ignoresessions	This option immediately places the application into Administration mode without waiting for current HTTP sessions to complete. You can use this attribute *only* when stopping or undeploying an application, or in other words, you must also specify either the `action="stop"` or `action="undeploy"` attributes. Valid values for this attribute are `true` and `false`. Default value is `false`.	Boolean
libImplVer	Specifies the implementation version of a Java EE library or optional package. This attribute can be used only if the library or package does not include a implementation version in its manifest file. You can specify this attribute only in combination with the `library` attribute. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."	String
library	Identifies the deployment as a shared Java EE library or optional package. You must specify the `library` attribute when deploying or distributing any Java EE library or optional package. Valid values for this attribute are `true` and `false`. Default value is `false`. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."	Boolean
libSpecVer	Provides the specification version of a Java EE library or optional package. This attribute can be used only if the library or package does not include a specification version in its manifest file. You can specify this attribute only in combination with the `library` attribute. See Chapter 11, "Creating Shared Java EE Libraries and Optional Packages."	String

Table B–1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
name	The deployment name for the deployed application. If you do not specify this attribute, WebLogic Server assigns a deployment name to the application, based on its archive file or exploded directory.	String
nostage	Specifies whether the deployment uses nostage deployment mode. In this mode, the Ant task does not copy the deployment files to target servers, but leaves them in a fixed location, specified by the `source` attribute. Target servers access the same copy of the deployment files. You can specify only one of the following attributes: `stage`, `nostage`, or `external_stage`. If none is specified, the default deployment mode to Managed Servers is `stage`; the default mode to the Administration Server and in single-server cases is `nostage`. See "Controlling Deployment File Copying with Staging Modes".	Boolean
noversion	Indicates that the `wldeploy` Ant task should ignore all version related code paths on the Administration Server. This behavior is useful when deployment source files are located on Managed Servers (not the Administration Server) and you want to use the external_stage staging mode. If you use this option, you cannot use versioned applications. Valid values for this attribute are true and false. Default value is false.	Boolean
nowait	Specifies whether `wldeploy` returns immediately after making a deployment call (by deploying as a background task).	Boolean
password	The administrative password. To avoid having the plain text password appear in the build file or in process utilities such as `ps`, first store a valid user name and encrypted password in a configuration file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command. Then omit both the `username` and `password` attributes in your Ant build file. When the attributes are omitted, `wldeploy` attempts to login using values obtained from the default configuration file. If you want to obtain a user name and password from a non-default configuration file and key file, use the `userconfigfile` and `userkeyfile` attributes with `wldeploy`. See the command reference for `storeUserConfig` in the *WLST Command Reference for WebLogic Server* for more information on storing and encrypting passwords.	String
plan	Specifies a deployment plan to use when deploying the application or module. By default, `wldeploy` does not use an available deployment plan, even if you are deploying from an application root directory that contains a plan.	String
planversion	The version identifier of the deployment plan.	String
remote	Specifies whether the server is located on a different machine. This affects how filenames are transmitted. Valid values for this attribute are `true` and `false`. Default value is `false`, which means that the Ant task assumes that all source paths are valid paths on the local machine.	Boolean
retiretimeout	Specifies the number of seconds before WebLogic Server undeploys the currently-running version of this application or module so that clients can start using the new version. It is assumed, when you specify this attribute, that you are starting, deploying, or redeploying a new version of an already-running application. See "Updating Applications in a Production Environment".	int

Table B–1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
securityModel	Specifies the security model to use for this deployment. Possible security models are: ■ Deployment descriptors only ■ Customize roles ■ Customize roles and policies ■ Security realm configuration (advanced model) Valid actual values for this attribute are `DDOnly`, `CustomRoles`, `CustomRolesAndPolicy`, or `Advanced`. See "Options for Securing Web application and EJB Resources" for more information on these security models.	String
source	The archive file or exploded directory to deploy.	File
stage	Specifies whether the deployment uses stage deployment mode. In this mode, the Ant task copies deployment files to target servers' staging directories. You can specify only one of the following attributes: `stage`, `nostage`, or `external_stage`. If none is specified, the default deployment mode to Managed Servers is `stage`; the default mode to the Administration Server and in single-server cases is `nostage`. See "Controlling Deployment File Copying with Staging Modes".	Boolean
submoduletargets	Specifies JMS server targets for resources defined within a JMS application module. The value of this attribute is a comma-separated list of JMS server names. See "Using Sub-Module Targeting with JMS Application Modules".	String
targets	The list of target servers to which the application is deployed. The value of this attribute is a comma-separated list of the target servers, clusters, or virtual hosts. If you do not specify a target list when deploying an application, the target defaults to the Administration Server instance.	String
timeout	The maximum number of seconds to wait for a deployment to succeed.	int
upload	Specifies whether the source file(s) are copied to the Administration Server's upload directory prior to deployment. Use this attribute when you are on a remote machine and you cannot copy the deployment files to the Administration Server by other means. Valid values for this attribute are `true` and `false`. Default value is `false`.	Boolean
usenonexclusivelock	Specifies that the deployment action (deploy, redeploy, stop, and so on) uses the existing lock on the domain that has already been acquired by the same user performing the action. This attribute is particularly useful when the user is using multiple deployment tools (Ant task, command line, Administration Console, and so on) simultaneously and one of the tools has already acquired a lock on the domain. Valid values for this attribute are `true` and `false`. Default value is `false`.	Boolean
user	The administrative user name.	String

Table B–1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
userconfigfile	Specifies the location of a user configuration file to use for obtaining the administrative user name and password. Use this option, instead of the `user` and `password` attributes, in your build file when you do not want to have the plain text password shown in-line or in process-level utilities such as `ps`. Before specifying the `userconfigfile` attribute, you must first generate the file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command as described in the *WLST Command Reference for WebLogic Server*.	String
userkeyfile	Specifies the location of a user key file to use for encrypting and decrypting the user name and password information stored in a user configuration file (the `userconfigfile` attribute). Before specifying the `userkeyfile` attribute, you must first generate the key file using the WebLogic Scripting Tool (WLST) `storeUserConfig` command as described in the *WLST Command Reference for WebLogic Server*.	String
verbose	Specifies whether `wldeploy` displays verbose output messages.	Boolean

B.4.2 Nested <files> Child Element

The `wldeploy` Ant task also includes the `<files>` child element that can be nested to specify a list of files on which to perform a deployment action (for example, a list of JSPs to undeploy.)

Note: : Use of `<files>` to redeploy a list of files in an application has been deprecated as of release 9.0 of WebLogic Server. Instead, use the `deltaFiles` attribute of wldeploy.

The `<files>` element works the same as the standard `<fileset>` Ant task (except for the difference in actual task name). Therefore, see the Apache Ant Web site at `http://ant.apache.org/manual/Types/fileset.html` for detailed reference information about the attributes you can specify for the `<files>` element.