Oracle® Fusion Middleware

Developing Applications for Oracle WebLogic Server

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Preface

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

Audience

This document is written for application developers who want to build WebLogic Server applications using the Java Platform, Enterprise Edition (Java EE). 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.

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Related Resources

New and Changed WebLogic Server Features

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

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

Learn basic concepts about WebLogic Server applications, modules, and deployment descriptors.
This chapter includes the following sections:

- WebLogic Server and the Java EE Platform
  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 runtime configuration until the module is deployed on an application server.
- 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, Enterprise JavaBeans (EJB) modules, connector modules, enterprise applications, or Web services.
- Web Application Modules
  A Web application on WebLogic Server includes some required and typically, some optional files.
- Enterprise JavaBean Modules
  Enterprise JavaBeans (EJB) 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 8 technology.

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- Bean Validation
  The Bean Validation specification (JSR 380) defines a metadata model and API for validating data in JavaBeans components. It is supported on both the server and Java EE 8 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.
- 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.
- 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.

- Development Tools
  To develop WebLogic Server applications, you need various tools such as Java API Reference and the `wls-api.jar` file, source code editor or IDE, database system and JDBC driver, and Web browser. You also need third party tools such as Apache Ant.

WebLogic Server and the Java EE Platform

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 runtime configuration until the module is deployed on an application server.

WebLogic Server implements Java Platform, Enterprise Edition (Java EE) Version 8 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.

Java EE 8 Platform Highlights

Java EE 8 continues to improve API and programming models needed for today's applications and adds features requested by the community. This release modernizes support for many industry standards and continues simplification of enterprise ready APIs. The key goals of the Java EE 8 platform are to modernize the infrastructure for enterprise Java for the cloud and microservices environments, emphasize HTML5 and HTTP/2 support, enhance ease of development through new Contexts and Dependency Injection features, and further enhance security and reliability of the platform.

For information about all the new Java EE 8 features supported in WebLogic Server, see Java EE 8 Support in *What's New in Oracle WebLogic Server*.

WebLogic Server and Java EE Applications

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.

Refer to the Java EE specification at: https://www.oracle.com/java/technologies/java-ee-glance.html#javaee8.

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, Enterprise JavaBeans (EJB) modules, connector modules, enterprise applications, or Web services.

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

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

- JDBC and JMS modules—See JMS and JDBC Modules.
- WebLogic Diagnostic FrameWork (WLDF) modules—See WebLogic Diagnostic Framework Modules.
- Coherence Grid Archive (GAR) Modules—See Coherence Grid Archive (GAR) Modules.

Web Application Modules

A Web application on WebLogic Server includes some required and typically, some optional 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.
- Servlets
- JavaServer Pages
- More Information on Web Application Modules

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.

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 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.

More Information on Web Application Modules

See the following documentation:

- 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*

Enterprise JavaBean Modules

Enterprise JavaBeans (EJB) 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 8 technology.

The EJB 3.2 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.

- EJB Documentation in WebLogic Server
- Additional EJB Information

EJB Documentation in WebLogic Server

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

- For information about all the new features in EJB, see New Features and Changes in EJB in *Developing Enterprise JavaBeans for 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 3.2 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 Creating a Split Development Directory Environment.
- For more information on how to program and package 2.x EJBs, see *Developing Enterprise JavaBeans, Version 2.1, for Oracle WebLogic Server*.

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, visit the following Web sites:

- EJB 3.2 Specification (JSR-345) at http://jcp.org/en/jsr/summary?id=345
- The *Enterprise Beans* chapter of the Java EE 8 Tutorial at https://javaee.github.io/tutorial/partentbeans.html
- Java EE 8 Platform: https://www.oracle.com/java/technologies/java-ee-glance.html#javaee8

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 Enterprise Applications.

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

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.

- Java EE Programming Model
- Packaging and Deployment Overview

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 https://javaee.github.io/javaee-spec/javadocs/) for Web containers, such as EJBs, servlets, Web applications, and JSPs. See 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 Enterprise Application Deployment Descriptor Elements.

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 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 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 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 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 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 Enterprise Application Deployment Descriptor Elements.

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 JAX-WS 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 JAX-WS 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. See *Developing JAX-WS Web Services for Oracle WebLogic Server*.

WebLogic Server also includes support for RESTful web services. For more information about RESTful web services, see *Developing and Securing RESTful Web Services for Oracle WebLogic Server*.

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

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

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.

- Using an External Diagnostics Descriptor

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`).

- Defining an External Diagnostics Descriptor

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`.

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.

Bean Validation

The Bean Validation specification (JSR 380) defines a metadata model and API for validating data in JavaBeans components. It is supported on both the server and Java EE 8 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.

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 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.

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 Deployment Plans for information on deployment plans.

The Java EE programming model uses the JDK annotations feature for Web containers, 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 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/1.7/weblogic-javaee.xsd` schema, which describes common elements shared among all WebLogic-specific deployment descriptors.
>
> For the most current schema information, see `https://www.oracle.com/webfolder/technetwork/weblogic/wls_14.1.1.0.0.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 4.0 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/web-app_4_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_2_0.xsd` See Using Contexts and Dependency Injection for the Java EE Platform.
Web Application	WebLogic	`weblogic.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-web-app/1.9/weblogic-web-app.xsd` See weblogic.xml Deployment Descriptor Elements in *Developing Web Applications, Servlets, and JSPs for Oracle WebLogic Server*.

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

Module or Application	Scope	Deployment Descriptors
Enterprise Bean 3.2	Java EE	`ejb-jar.xml` See the EJB 3.2 Schema at http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/ejb-jar_3_2.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_2_0.xsd See Using Contexts and Dependency Injection for the Java EE Platform.

Enterprise Bean 3.2	WebLogic	`weblogic-ejb-jar.xml`
		Schema http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.7/weblogic-ejb-jar.xsdweblogic-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 3.0	Java EE	`ejb-jar.xml` See the EJB 3.0 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_1.xsd See Using Contexts and Dependency Injection for the Java EE Platform.

Enterprise Bean 3.0	WebLogic	`weblogic-ejb-jar.xml`
		Schema http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.6/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

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

Module or Application	Scope	Deployment Descriptors

Enterprise Bean 2.1	WebLogic	`weblogic-ejb-jar.xml`
		Schema: `http://xmlns.oracle.com/weblogic/weblogic-ejb-jar/1.6/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 1.4 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/javaee_web_services_1_4.xsd`

Web services	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 1.7 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/connector_1_7.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_2_0.xsd` See Using Contexts and Dependency Injection for the Java EE Platform.
Resource Adapter	WebLogic	`weblogic-ra.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-connector/1.5/weblogic-connector.xsd` See weblogic-ra.xml Schema in *Developing Resource Adapters for Oracle WebLogic Server*.

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

Module or Application	Scope	Deployment Descriptors
Enterprise Application	Java EE	`application.xml` See the Application 8 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/application_8.xsd`
Enterprise Application	WebLogic	`weblogic-application.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-application/1.8/weblogic-application.xsd` See weblogic-application.xml Deployment Descriptor Elements.
Client Application	Java EE	`application-client.xml` See the Application Client 8 Schema at `http://www.oracle.com/webfolder/technetwork/jsc/xml/ns/javaee/application-client_8.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_2_0.xsd` See Using Contexts and Dependency Injection for the Java EE Platform.
Client Application	WebLogic	`application-client.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-application-client/1.6/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/1.8/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/1.6/jdbc-data-source.xsd` See Configuring JDBC Application Modules for Deployment in *Administering JDBC Data Sources for Oracle WebLogic Server*.
Deployment Plan	WebLogic	`plan.xml` Schema: `http://www.oracle.com/webfolder/technetwork/weblogic/deployment-plan/index.html` See Understanding WebLogic Server Deployment in *Deploying Applications to Oracle WebLogic Server*.

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

Module or Application	Scope	Deployment Descriptors
Resource Deployment Plan	WebLogic	`resource-deployment-plan.xml` Schema: `http://xmlns.oracle.com/weblogic/resource-deployment-plan/1.0/resource-deployment-plan.xsd` See Using Resource Deployment Plans in *Using Oracle WebLogic Server Multitenant*.
WLDF Module	WebLogic	`weblogic-diagnostics.xml` Schema: `http://xmlns.oracle.com/weblogic/weblogic-diagnostics/2.0/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.

- Automatically Generating Deployment Descriptors
- Java-based Command-line Utilities
- Upgrading Deployment Descriptors From Previous Releases of Java EE and WebLogic Server

Automatically Generating Deployment Descriptors

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

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.

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.

Table 1-2 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
```

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 WebLogic Server Administration Console updates or creates new deployment plans as necessary when you change configuration properties for an installed application. You can use the WebLogic Server Administration Console to generate a new deployment plan or to add or override variables in an existing plan. The WebLogic Server 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

Development Tools

To develop WebLogic Server applications, you need various tools such as Java API Reference and the `wls-api.jar` file, source code editor or IDE, database system and JDBC driver, and Web browser. You also need third party tools such as Apache Ant.

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

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

- Using the wls-api.jar File
- Using the weblogic.jar File

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`.

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.

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 *ORACLE_HOME*`/wlserver/samples/server/examples/src/examples/ejb20/basic/beanManaged/build.xml`, where *ORACLE_HOME* represents the directory in which you installed WebLogic Server. 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: *ORACLE_HOME*`/wlserver/samples/server/examples/src/examples/examples.html`.

- Using a Third-Party Version of Ant
- Changing the Ant Heap Size

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.

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.

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.

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. See the Oracle Fusion Middleware Supported System Configurations page on Oracle Technology Network to find out about supported database systems and JDBC drivers.

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.

Third-Party Software

You can use third-party software products to enhance your WebLogic Server development environment. WebLogic Developer Tools Resources 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.

2

Using Ant Tasks to Configure and Use a WebLogic Server Domain

Learn about 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:

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`.

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`).

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 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.

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>
```

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`. For more information on server naming convention, see Domain and Server Name Restrictions in *Understanding Domain Configuration for Oracle WebLogic Server*.	String	Required only when shutting down the Administration server.
`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

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

Attribute	Description	Data Type	Required?
`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 that the Ant task will wait indefinitely until the server transitions to the`RUNNING` state.	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 that the Ant task will wait indefinitely until the server transitions to the `RUNNING` state.	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
`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

Table 2-1 (Cont.) Attributes of the wlserver 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. 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.
`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.

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

Attribute	Description	Data Type	Required?
`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

Configuring a WebLogic Server Domain Using the wlconfig Ant Task

You can use the `wlconfig` Ant task or the WebLogic Scripting Tool (WLST) to configure a WebLogic Server domain.

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

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

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.

Basic Steps for Using wlconfig

1. Set your environment in a command shell. See 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*.

wlconfig Ant Task Reference

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

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 *Understanding the WebLogic Scripting Tool* for more information on storing and encrypting passwords.	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. 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 *Understanding the WebLogic Scripting Tool*.	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 *Understanding the WebLogic Scripting Tool*.	File	No

Nested Elements

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

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

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.

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

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

Table 2-6 (Cont.) Attributes of the get Element

Attribute	Description	Data Type	Required?
`mbean`	The object name of the MBean you want to retrieve attribute values from.	String	Yes

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

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

Example of Creating a Security Realm with the wlconfig Ant Task

You can use this example to create a security realm with the wlconfig Ant task:

Example 2-1 Creating a Security Realm with wlconfig

```
<wlconfig url="t3://myhost:7001"
      username="weblogic"
      password="password">
   <create type="weblogic.management.security.Realm" name="MyRealm"
property="new.provider">
      <set attribute="DefaultRealm" value="false"/>
      <create name="MyAuthenticator"
type="weblogic.security.providers.authentication.DefaultAuthenticator" realm="MyRealm"/>
      <create name="MyAuthorizer"
type="weblogic.security.providers.authorization.DefaultAuthorizer" realm="MyRealm"/>
      <create name="MyRoleMapper"
type="weblogic.security.providers.authorization.DefaultRoleMapper" realm="MyRealm"/>
      <create name="MyCredentialMapper"
type="weblogic.security.providers.credentials.DefaultCredentialMapper" realm="MyRealm"/>
      <create name="MyCertPathProvider"
type=""weblogic.security.providers.pk.WebLogicCertPathProvider" realm="MyRealm"/>
   </create>
   <set mbean="Security:Name=MyRealm" attribute="CertPathBuilder"
value="Security:Name=MyRealmMyCertPathProvider"/>
</wlconfig>
```

Using the libclasspath Ant Task

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

The following sections describe how to build applications:

- libclasspath Task Definition
- wlserver Ant Task Reference
- Example libclasspath Ant Task
- libclasspath Task Definition
- libclasspath Ant Task Reference

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"/>
```

libclasspath Ant Task Reference

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

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.	

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:

- librarydir
- library

librarydir

The following attribute is required when using this element:

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

library

The following attribute is required when using this element:

`file`—Register this file as an available library.

Example libclasspath Ant Task

This section provides example code of a `libclasspath` Ant task:

Example 2-2 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 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 when needed.

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

- Installing Maven
- Configuring the WebLogic Maven Plug-In
- Maven Plug-In Goals

See Building Java EE Projects for WebLogic Server with Maven in *Developing Applications Using Continuous Integration* for additional Maven documentation.

- Installing Maven
  To use the `weblogic-maven-plugin` plug-in, you must first have a functional Maven installation and a Maven repository.
- Configuring the WebLogic Maven Plug-In
  Use the pre-built JAR file and accompanying POM file to install and configure `weblogic-maven-plugin`.
- Maven Plug-In Goals
  See an alphabetical listing of all the Maven plug-in goals.

Installing Maven

To use the `weblogic-maven-plugin` plug-in, you must first have a functional Maven installation and a Maven repository.

Maven is *not* included in the WLS 14.1.1.0.0 installation. 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`.

> **Note:**
>
> 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.

Configuring the WebLogic Maven Plug-In

Use the pre-built JAR file and accompanying POM file to install and configure `weblogic-maven-plugin`.

Complete the following steps to install and configure `weblogic-maven-plugin`:

1. Install the Oracle Maven sync plug-in and run the push goal:
   a. Change the directory to: *ORACLE_HOME*`\oracle_common\plugins\maven\com\oracle\maven\oracle-maven-sync\14.1.1`
   b. `mvn install:install-file -DpomFile=oracle-maven-sync-14.1.1.pom -Dfile=oracle-maven-sync-14.1.1.jar`
   c. `mvn com.oracle.maven:oracle-maven-sync:push -DoracleHome=c:\oracle\middleware\oracle_home\`
2. To validate successful installation of the plug-in, use the Maven `help:describe` goal. For more information, see the Apache help plug-in describe goal documentation.

```
mvn help:describe -DgroupId=com.oracle.weblogic
-DartifactId=weblogic-maven-plugin -Dversion=14.1.1-0-0
```

- How to use the WebLogic Maven Plug-in
- Basic Configuration POM File

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`, `wsgen`, `wsimport`, `ws-jwsc`, `ws-wsdlc`, and `ws-clientgen` goals require a POM.

Other goals will work either way. For example, `install`, `wlst`, `wlst-client`, `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.

The following 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>14.1.1-0-0</version>
        <configuration>
<middlewareHome>/fmwhome/wls14110</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`, `purge-tasks`, `redeploy`, `update-app`, `start-app`, `stop-app`, `wlst`, `wlst-client`, and `list-apps`
post-integration-test[2]	`remove-domain`, `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.

Basic Configuration POM File

Example 3-2 illustrates a basic Java EE 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>14.1.1-0-0</version>
       <type>pom</type>
       <scope>provided</scope>
      </dependency>
    </dependencies>

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

            <!-- WebLogic Server 14c Maven Plugin -->
            <plugin>
                <groupId>com.oracle.weblogic</groupId>
                <artifactId>weblogic-maven-plugin</artifactId>
                <version>14.1.1-0-0</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>
```

Maven Plug-In Goals

See an alphabetical listing of all the 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. Does not require a local server installation.
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 to a running server. Supports all deployment formats; for example, WAR, JAR, RAR, and such.
distribute-app	Prepares deployment files for deployment by copying deployment files to target servers and validating them.
install	Installs WebLogic Server.
list-apps	Lists the deployment names for applications and standalone modules deployed, distributed, or installed in the domain.
purge-tasks	Flushes out retired deployment tasks.
redeploy	Redeploys a running application or part of a running application.
remove-domain	Removes a domain directory.
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.
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
wlst-client	WLST wrapper that does not require a local server install for WLST online commands.
ws-clientgen	Generates client Web service artifacts from a WSDL.
wsgen	JAX-WS service endpoint implementation class and generates all of the portable artifacts for a JAX-WS Web service.
wsimport	Maven goal that parses a WSDL and binding files and generates the Java code needed to access it
ws-jwsc	Builds a JAX-WS Web service.
ws-wsdlc	Generates a set of artifacts and a partial Java implementation of the Web service from a WSDL.

- appc
- create-domain
- deploy
- distribute-app
- install
- list-apps
- purge-tasks
- redeploy
- remove-domain
- start-app
- start-server
- stop-app
- stop-server
- undeploy
- uninstall
- update-app
- wlst
- wlst-client
- ws-clientgen
- wsgen
- wsimport
- ws-wsdlc
- ws-jwsc

appc

Full Name

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

Description

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. Does not require a local server installation.

Parameters

Table 3-4 appc Parameters

Name	Type	Required	Description
`altappdd`	`java.lang.String`	false	Specifies an alternate descriptor. May be used to specify an alternate `application.xml` for an `.ear` deployment or an alternate `web.xml` or `ejb.xml` for standalone module deployments.
`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`
`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.

Table 3-4 (Cont.) appc Parameters

Name	Type	Required	Description
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 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 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.
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.

Table 3-4 (Cont.) appc Parameters

Name	Type	Required	Description
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". The 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". The 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
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:14.1.1-0-0: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 Aug 19 10:52:46 EST 2015
[INFO] Final Memory: 26M/692M
[INFO]
```

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.

> **Note:**
>
> Beginning in version 12.2.1, there is a single unified version of WLST that automatically includes the WLST environment from all products in the `ORACLE_HOME`.

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	Deprecated. As of version 12.2.1, there is a single, unified version of WLST. This parameter is deprecated and ignored.
workingDir	java.lang.String	false	The current working directory where the create-domain goal executes. The default value is: ${project.build.directory}/weblogic-maven-plugin

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/wls14110</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 14.1.1-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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 Aug 19 13:13:25 EDT 2015
[INFO] Final Memory: 9M/23M
[INFO] ------------------------------------------------------------------------
```

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.
altappdd	java.lang.String	false	Specifies an alternate descriptor. May be used to specify an alternate application.xml for an .ear deployment or an alternate web.xml or ejb.xml for standalone module deployments.
appversion	java.lang.String	false	Version of the application to start.
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.
libimplver	java.lang.String	false	Implementation version of a Java EE library or optional package. This option can be used only if the library or package does not include an implementation version in its manifest file.
library	boolean	false	Deploy as a shared Java EE library or optional package.
libspecver	java.lang.String	false	Specification version of a Java EE library or optional package. This option can be used only if the library or package does not include a specification version in its manifest file.
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 3-6 (Cont.) deploy 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.
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 address of the artifact to deploy. The address can be one of the following: • A colon (:) separated list of Maven coordinates of the form: groupId:artifactId:packaging:classifier:version. • An archive file or exploded archive directory on the local system. For example, /home/myhome/myapps/helloworld.war. • A remote HTTP URL (http://foo/a/b.ear).
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.

Table 3-6 (Cont.) deploy Parameters

Name	Type	Required	Description
usenonexclusivelock	boolean	false	When true, the deployment operation uses an existing lock, already acquired by the same user, on the domain. This parameter is helpful in environments where multiple deployment tools are used simultaneously and one of the tools has already acquired a lock on the domain configuration. 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.

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 14.1.1-0-0
[INFO]
------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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
<Aug 19, 2015> <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 Aug 19 13:41:11 EDT 2015
[INFO] Final Memory: 10M/25M
```

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

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

Name	Type	Required	Description
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.
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. 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.

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

Name	Type	Required	Description
serverClasspath	java.lang.String	false	This parameter is deprecated in this release and ignored.
source	java.lang.String	false	Specifies the address of the artifact to distribute. The address can be one of the following: • A colon (:) separated list of Maven coordinates of the form: groupId:artifactId:packaging:classifier:version. • An archive file or exploded archive directory on the local system. For example, /home/myhome/myapps/helloworld.war. • A remote HTTP URL (http://foo/a/b.ear).
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.
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/wls14110
 -Dname=cluster-test -Duser=weblogic -Dpassword=password -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:14.1.1-0-0: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
<Aug 19, 2015> <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 Aug 19 14:10:00 EST 2015
[INFO] Final Memory: 15M/429M
```

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

install

Full Name

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

Description

Installs WebLogic Server from a JAR file.

Parameters

Table 3-8 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/wls_generic.jar). • A remote HTTP URL (http://myarchive/installers/wls_generic.jar).

Table 3-8 (Cont.) install Parameters

Name	Type	Required	Description
installCommand	java.lang.String	false	Installs the product with a binary or jar installer (including the quickstart installers.) The following macros are supported: • @INSTALLER_FILE@ - the path to the installer file. • @INSTALL_TO_LOCATION@ - the target directory (only relevant for the quickstart installer). • @JAVA_HOME@ - path to the Java home. • @JAVA_TMPDIR@ - path to the Java temporary directory. • @RESPONSE_FILE@ - path to the OUI silent installer response file. • @INV_PTR_LOC_FILE@ - path to the OUI invPtrLoc file. JAR installer example: @JAVA_HOME@/bin/java -Xms512m -Xmx1024m -Djava.io.tmpdir=@JAVA_TMPDIR@ -jar @INSTALLER_FILE@ -silent -responseFile @RESPONSE_FILE@ -invPtrLoc @INV_PTR_LOC_FILE@ Quick Start JAR installer example: @JAVA_HOME@/bin/java -Xms512m -Xmx1024m -Djava.io.tmpdir=@JAVA_TMPDIR@ -jar @INSTALLER_FILE@ ORACLE_HOME=@INSTALL_TO_LOCATION@ This parameter is optional. If specified for a quickstart installer when the supplementalQuickStartLocation parameter is supplied, the same command is used for the supplemental quickstart installer by replacing the @INSTALLER_FILE@ macro with the file location derived from the supplementalQuickStartLocation parameter. If the @INSTALLER_FILE@ macro is not being used, the install goal replaces the argument following the '-jar' argument in the installCommand string with the supplemental quickstart installer JAR file name.
installDir	java.lang.String	true	Deprecated. Use the middlewareHome parameter instead.
invPtrLoc	java.lang.String	false	The silent installer inventory location file. This is required on Unix-based platforms when using the binary or JAR installers.
middlewareHome	java.lang.String	false	The ORACLE_HOME directory to install into when using the quickstart installer.
quickStartInstaller	boolean	false	Indicates that this is a quickstart installer. The quickstart installer requires you to specify the artifactLocation and installDir parameter. All other parameters are ignored when this parameter is set to true. The default value is false.
response	java.lang.String	false	Deprecated. Use the responseFile parameter instead.
responseFile	java.lang.String	false	The silent installer response file. This is required when using the binary or jar installers.
supplementalQuickStartLocation	java.lang.String	false	The Quick Start supplemental installer.

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.

Example 3-7 shows an example of installing WebLogic Server using a JAR file on a Windows-based system.

Example 3-7 Install From JAR File

```
mvn com.oracle.weblogic:weblogic-maven-plugin:install
 -DartifactLocation=c:\wls-temp\wls_jrf_generic.jar
-DinstallDir=C:\test-maven -DresponseFile=c:\wls-temp\response.txt
[INFO] Scanning for projects...
[INFO]
[INFO]
------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO]
------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:install (default-cli) @
standalone-p
om ---
[INFO] [install]ORACLE_HOME = C:\test-maven\Oracle\Middleware\Oracle_Home
[INFO] Executing:  [cmd:[C:\\Windows\\System32\\cmd.exe, /c,
C:\weblogic\dev\AUT
O_D~1\x86_64\JDK180~3\JDK18~1.0_4\jre\bin\java.exe -Xms1024m -Xmx1024m -
Djava.io
.tmpdir=C:\Users\user\AppData\Local\Temp\ -jar c:\wls-temp\wls_jrf_g
eneric.jar -silent -responseFile c:\wls-temp\response.txt ]]
[INFO] Process being executed, waiting for completion.
[INFO] [exec] Launcher log file is C:\Users\user\AppData\Local\Temp\OraInsta
ll2015-04-23_09-45-13AM\launcher2015-04-23_09-45-13AM.log.
[INFO] [exec] Extracting
files.....
.....
..
```

```
.................................
[INFO] [exec] Starting Oracle Universal Installer
[INFO] [exec]
[INFO] [exec] Checking if CPU speed is above 300 MHz.   Actual 2491    Passed
[INFO] [exec] Checking swap space: must be greater than 512 MB    Passed
[INFO] [exec] Checking if this platform requires a 64-bit JVM.   Actual 64 Pa
ssed (64-bit not required)
[INFO] [exec]
[INFO] [exec]
[INFO] [exec] Preparing to launch the Oracle Universal Installer from
C:\Users\
user\AppData\Local\Temp\OraInstall2015-04-23_09-45-13AM
[INFO] [exec] Log: C:\Users\user\AppData\Local\Temp\OraInstall2015-04-23_09-
45-13AM\install2015-04-23_09-45-13AM.log
[INFO] [exec] Copyright (c) 1996, 2015, Oracle and/or its affiliates. All
rights
 reserved.
[INFO] [exec] Reading response file..
[INFO] [exec] -nocheckForUpdates / SKIP_SOFTWARE_UPDATES flag is passed and
henc
e skipping software update
[INFO] [exec] Skipping Software Updates...
[INFO] [exec] Starting check : CertifiedVersions
[INFO] [exec] Expected result: One of 6.1,6.2,6.3
[INFO] [exec] Actual Result: 6.1
[INFO] [exec] Check complete. The overall result of this check is: Passed
[INFO] [exec] CertifiedVersions Check: Success.
[INFO] [exec] Starting check : CheckJDKVersion
[INFO] [exec] Expected result: 1.8.0_40
[INFO] [exec] Actual Result: 1.8.0_40-ea
[INFO] [exec] Check complete. The overall result of this check is: Passed
[INFO] [exec] CheckJDKVersion Check: Success.
[INFO] [exec] Validations are enabled for this session.
[INFO] [exec] Verifying data......
[INFO] [exec] Copying Files...
[INFO] [exec] -----------20%----------40%----------60%----------80%-----Visit
ht
tp://www.oracle.com/support/policies.html for Oracle Technical Support
policies.

[INFO] [exec] ---100%
[INFO] [exec]
[INFO] [exec] The installation of Oracle Fusion Middleware 14c Infrastructure
14
.1.1.0.0 completed successfully.
[INFO] [exec] Logs successfully copied to C:\weblogic\src
\inventory\logs.
[INFO] Installer exited with code: 0
[INFO]
------------------------------------------------------------------------
[INFO] BUILD SUCCESS
```

Example 3-8 shows an example of installing WebLogic Server using a JAR file and the `installCommand` parameter on a Windows-based system.

Example 3-8 Install From JAR File With installCommand

```
mvn com.oracle.weblogic:weblogic-maven-plugin:install
-DinstallCommand="@JAVA_HOME@/bin/java -Xms512m -Xmx1024m
-jar  @INSTALLER_FILE@ -silent -responseFile c:\wls-temp\response.txt"
-DartifactLocation=c:\wls-temp\wls_jrf_generic.jar
-DresponseFile=c:\wls-temp\response.txt
INFO] Scanning for projects...
[INFO]
[INFO]
------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO]
------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:install (default-cli) @
standalone-p
om ---
[INFO] [install]ORACLE_HOME = C:\test-maven\Oracle\Middleware\Oracle_Home
[INFO] Executing:  [cmd:[C:\\Windows\\System32\\cmd.exe, /c,
C:\weblogic\dev\AUT
O_D~1\x86_64\JDK180~3\JDK18~1.0_4\jre/bin/java -Xms512m -Xmx1024m -jar
c:\wls-t
emp\wls_jrf_generic.jar -silent -responseFile c:\wls-temp\response.txt]]
[INFO] Process being executed, waiting for completion.
[INFO] [exec] Launcher log file is C:\Users\user\AppData\Local\Temp\OraInsta
ll2015-04-23_10-58-13AM\launcher2015-04-23_10-58-13AM.log.
[INFO] [exec] Extracting
files.....................................................
.....................................................................................
..
.................
[INFO] [exec] Starting Oracle Universal Installer
[INFO] [exec]
[INFO] [exec] Checking if CPU speed is above 300 MHz.   Actual 2491    Passed
[INFO] [exec] Checking swap space: must be greater than 512 MB    Passed
[INFO] [exec] Checking if this platform requires a 64-bit JVM.   Actual 64
Pa
ssed (64-bit not required)
[INFO] [exec]
[INFO] [exec]
[INFO] [exec] Preparing to launch the Oracle Universal Installer from
C:\Users\
user\AppData\Local\Temp\OraInstall2015-04-23_10-58-13AM
[INFO] [exec] Log: C:\Users\user\AppData\Local\Temp\OraInstall2015-04-23_10-
58-13AM\install2015-04-23_10-58-13AM.log
[INFO] [exec] Copyright (c) 1996, 2015, Oracle and/or its affiliates. All
rights
 reserved.
[INFO] [exec] Reading response file..
[INFO] [exec] -nocheckForUpdates / SKIP_SOFTWARE_UPDATES flag is passed and
henc
e skipping software update
[INFO] [exec] Skipping Software Updates...
[INFO] [exec] Starting check : CertifiedVersions
[INFO] [exec] Expected result: One of 6.1,6.2,6.3
```

```
[INFO] [exec] Actual Result: 6.1
[INFO] [exec] Check complete. The overall result of this check is: Passed
[INFO] [exec] CertifiedVersions Check: Success.
[INFO] [exec] Starting check : CheckJDKVersion
[INFO] [exec] Expected result: 1.8.0_40
[INFO] [exec] Actual Result: 1.8.0_40-ea
[INFO] [exec] Check complete. The overall result of this check is: Passed
[INFO] [exec] CheckJDKVersion Check: Success.
[INFO] [exec] Validations are enabled for this session.
[INFO] [exec] Verifying data......
[INFO] [exec] Copying Files...
[INFO] [exec] -----------20%----------40%----------60%----------80%-----Visit
ht
tp://www.oracle.com/support/policies.html for Oracle Technical Support
policies.

[INFO] [exec] ---100%
[INFO] [exec]
[INFO] [exec] The installation of Oracle Fusion Middleware 14c Infrastructure
14
.1.1.0.0 completed successfully.
[INFO] [exec] Logs are located here: C:\Users\user\AppData\Local\Temp\OraIns
tall2015-04-23_10-58-13AM.
[INFO] Installer exited with code: 0
[INFO]
------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO]
------------------------------------------------------------------------
```

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 3-9 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.

Table 3-9 (Cont.) list-apps Parameters

Name	Type	Required	Description
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.
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 3-9 shows typical list-apps goal output.

Example 3-9 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 14.1.1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 11M/28M
[INFO] ------------------------------------------------------------------------
C:\Oracle\Middleware\Oracle_Home\wlserver\server\lib>
```

purge-tasks

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:purge-tasks`

Description

Flushes out retired deployment tasks.

Parameters

Table 3-10 purge-tasks 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
debug	boolean	false	When true, compiles debugging information into class files. 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
password	java.lang.String	false	Specifies the administrative password.
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

Use the purge-tasks goal to flush out retired deployment tasks.

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

Example 3-11 shows typical purge-tasks goal output.

Example 3-10 purge-tasks

```
mvn  com.oracle.weblogic:weblogic-maven-plugin:purge-task
s -Duser=weblogic -Dpassword=password
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:purge-tasks (default-cli) @ standalo
ne-pom ---
weblogic.Deployer invoked with options:  -noexit -purgetasks -user weblogic -adm
inurl t3://localhost:7001
```

```
Currently there are no retired tasks.
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 13.139s
[INFO] Finished at: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 8M/24M
[INFO] ------------------------------------------------------------------------
```

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`
`appversion`	`java.lang.String`	false	Version of the application to start.
`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.
`libimplver`	`java.lang.String`	false	Implementation version of a Java EE library or optional package. This option can be used only if the library or package does not include an implementation version in its manifest file.
`library`	boolean	false	Deploy as a shared Java EE library or optional package.
`libspecver`	`java.lang.String`	false	Specification version of a Java EE library or optional package. This option can be used only if the library or package does not include a specification version in its manifest file.
`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.

Table 3-11 (Cont.) redeploy Parameters

Name	Type	Required	Description
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.
removePlanOverride	boolean	false	Removes an overridden deployment plan during a redeploy or update deployment action. To remove an application override, specify the removePlanOverride attribute.
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
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	Specifies the address of the artifact to redeploy. The address can be one of the following: • A colon (:) separated list of Maven coordinates of the form: groupId:artifactId:packaging:classifier:version. • An archive file or exploded archive directory on the local system. For example, /home/myhome/myapps/helloworld.war. • A remote HTTP URL (http://foo/a/b.ear).
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.

Table 3-11 (Cont.) redeploy Parameters

Name	Type	Required	Description
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 3-11 shows typical `redeploy` goal output.

Example 3-11 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 14.1.1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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
<Aug 19, 2015> <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: Wed Aug 19 11:33:51 EDT 2015
```

remove-domain

Full Name

`com.oracle.weblogic:weblogic-maven-plugin:remove-domain`

Description

Removes a domain directory. The domain must not be running for this goal to succeed. This is a convenience goal for the simple use case. If the domain is already removed, stdout prints a status message but the goal does not fail.

Parameters

Table 3-12 remove-domain Parameters

Name	Type	Required	Description
`domainHome`	`java.lang.String`	true	The path to the domain directory.
`workingDir`	`java.lang.String`	false	Specifies the current working directory. Default value is: `${project.build.directory}/weblogic-maven-plugin)`

Use the remove-domain goal to remove a domain directory.

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

Example 3-13 shows typical `remove-domain` goal output.

Example 3-12 remove-domain

```
mvn com.oracle.weblogic:weblogic-maven-plugin:remove-domain
-DdomainHome=C:\Oracle\Middleware\Oracle_Home\user_projects\domains\base_domain
:
[INFO] [remove-domain]Executing: [cmd:[C:\\Windows\\System32\\cmd.exe, /c, rmdir
 /Q /S C:\Oracle\Middleware\Oracle_Home\user_projects\domains\base_domain]]
[INFO] Process being executed, waiting for completion.
[INFO] [remove-domain][cmd:[C:\\Windows\\System32\\cmd.exe, /c, rmdir /Q /S C:\O
racle\Middleware\Oracle_Home\user_projects\domains\base_domain]] exit code=0
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 4:01.074s
[INFO] Finished at: Wed Aug 19 11:33:51 EDT 2015
```

```
[INFO] Final Memory: 8M/20M
[INFO] ------------------------------------------------------------------------
```

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 3-13 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.

Table 3-13 (Cont.) start-app Parameters

Name	Type	Required	Description
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
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 all targets to which the application is deployed.
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 start 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 3-13 shows typical `start-app` goal output.

Example 3-13 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 14.1.1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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
<Aug 19, 2015> <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: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 10M/26M
[INFO] ------------------------------------------------------------------------
```

start-server

Full Name

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

Description

Starts WebLogic Server from a script in the current working directory. This is a convenience goal for the simple use case. If the server is already started, stdout prints a status message but the goal does not fail.

Parameters

Table 3-14 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`

Table 3-14 (Cont.) start-server Parameters

Name	Type	Required	Description
`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.
`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 3-14 shows typical `start-server` goal output.

Example 3-14 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 14.1.1-0-0
[INFO] ------------------------------------------------------------------------[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:start-server (default-cli)
@ weblogic-maven-plugin ---
.[INFO] Starting server in domain:
c:\oracle\middleware\oracle_home\user_projects\domains\wl_server
[INFO] Check stdout file for details:
c:\oracle\middleware\oracle_home\user_projects\domains\wl_server\server-218311410697212636
86.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 Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 8M/23M
```

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 3-15 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.
`password`	`java.lang.String`	false	Specifies the administrative password.

Table 3-15 (Cont.) stop-app Parameters

Name	Type	Required	Description
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.
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.
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 3-15 shows typical `stop-app` goal output.

Example 3-15 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 14.1.1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:stop-app (default-cli)
@ weblogic-ma
ven-plugin ---
weblogic.Deployer invoked with options:  -noexit
-adminurl t3://localhost:7001 -
stop -user weblogic -name ExampleEJB
<Aug 19, 2015> <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: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 10M/29M
[INFO] ------------------------------------------------------------------------
C:\Oracle\Middleware\Oracle_Home\wlserver\server\lib>
```

stop-server

Full Name

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

Description

Stops WebLogic Server from a script in the current working directory. This is a convenience goal for the simple use case. If the server is already stopped, stdout prints a status message but the goal does not fail.

Parameters

Table 3-16 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`

Table 3-16 (Cont.) stop-server Parameters

Name	Type	Required	Description
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 3-16 shows typical stop-server goal output.

Example 3-16 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 14.1.1-0-0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0: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 Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 9M/23M
[INFO] ------------------------------------------------------------------------
```

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 3-17 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.
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 3-17 (Cont.) undeploy 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.
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 3-17 shows typical `undeploy` goal output.

Example 3-17 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 14.1.1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:undeploy (default-cli)
@ weblogic-ma
```

```
ven-plugin ---
weblogic.Deployer invoked with options:  -noexit
-adminurl t3://localhost:7001 -
undeploy -user weblogic -name ExampleEJB -targets AdminServer
<Aug 19, 2015> <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: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 9M/26M
[INFO] ------------------------------------------------------------------------
```

uninstall

Full Name

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

Description

Uninstalls WebLogic Server.

Parameters

Table 3-18 uninstall Parameters

Name	Type	Required	Description
`invPtrLoc`	`java.io.File`	true	This parameter is deprecated and ignored.
`middlewareHome`	`java.lang.String`	true	The Oracle Middleware installation directory. This parameter is required when uninstalling a server installed using the Quickstart installer. Otherwise, it is ignored and the location in the responseFile is used.
`response`	`java.io.File`	true	Deprecated. Use the responseFile parameter.
`responseFile`	`java.io.File`	true	The silent installer response file. This is required when using the binary or JAR installers.

Example 3-18 shows an example of uninstalling WebLogic Server in a JAR file installation.

Example 3-18 uninstall in JAR Installation

```
mvn com.oracle.weblogic:weblogic-maven-plugin:uninstall -DresponseFile=c:\wls-
temp\response.txt
[INFO] Scanning for projects...
[INFO]
```

```
[INFO]
------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO]
------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:uninstall (default-cli) @
standalone
-pom ---
[INFO] [uninstall]ORACLE_HOME = C:\test-maven\Oracle\Middleware\Oracle_Home
[INFO] [uninstall]ORACLE_HOME = C:\test-maven\Oracle\Middleware\Oracle_Home
[INFO] Executing:  [cmd:[C:\\Windows\\System32\\cmd.exe, /c, C:\test-
maven\Oracl
e\Middleware\Oracle_Home\oui\bin\deinstall.cmd -noconsole -deinstall -silent -
re
sponseFile c:\wls-temp\response.txt]]
[INFO] Process being executed, waiting for completion.
[INFO] Installer exited with code: 0
[INFO]
------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO]
------------------------------------------------------------------------
```

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 3-19 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`

Table 3-19 (Cont.) update-app Parameters

Name	Type	Required	Description
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.
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
removePlanOverride	boolean	false	Removes an overridden deployment plan during a redeploy or update deployment action. To remove an application override, specify the removePlanOverride attribute.
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	The targets on which to update the application or module. This attribute can be a comma-separated list. If no targets are specified, all targets are updated.
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.

Table 3-19 (Cont.) update-app Parameters

Name	Type	Required	Description
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 3-19 shows typical wlst goal output.

Example 3-19 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:14.1.1-0-0: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
<Aug 19, 2015> <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 Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 18M/435M
[INFO] ------------------------------------------------------------------------
```

wlst

Full Name

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

Description

This goal is a wrapper for the WLST scripting tool. It requires a server install for WLST online commands.

Parameters

Table 3-20 wlst Parameters

Name	Type	Required	Description
`args`	`java.lang.String`	false	Deprecated. Use the scriptArgs parameter to specify the arguments as a list of scriptArg elements. 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.

Table 3-20 (Cont.) wlst Parameters

Name	Type	Required	Description
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!')". Because Python uses indentation to demarcate nested code blocks, scripts that contain multiple lines must be specified in the POM without any indentation within the pom.xml, unless required for code block demarcation.
scriptArgs	java.lang.String	false	Specifies the command-line arguments to pass to the WLST Jython interpreter as a list of string values. If the argument contains any embedded whitespace, the caller must include enclosing single quotes or escaped double quotes within the scriptArg element's value. If scriptArgs is specified, the args parameter (deprecated) is ignored.
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	This parameter is deprecated and ignored in this release.
workingDir	java.lang.String	false	The current working directory where the wlst-script and create-domain goal executes. The default value is: ${project.build.directory}/weblogic-maven-plugin

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/wls14110</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 3-20 shows typical `wlst` goal output.

Example 3-20 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:14.1.1-0-0: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>
```

wlst-client

Full Name

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

Description

This goal is a WLST wrapper that does not require a local server install for WLST online commands. If a local server install is not present, this goal supports only WLST online commands.

Parameters

Table 3-21 wlst-client Parameters

Name	Type	Required	Description
`args`	`java.lang.String`	false	Deprecated. Use the scriptArgs parameter to specify the arguments as a list of scriptArg elements.
`debug`	`boolean`	false	When true, displays additional status information. Default value is: `false`

Table 3-21 (Cont.) wlst-client Parameters

Name	Type	Required	Description
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	false	The path to the Oracle Middleware install directory. This parameter is required for any WLST offline commands. If a WLST script uses offline commands without specifying a valid middlewareHome, this wlst-client goal fails.
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!')". Because Python uses indentation to demarcate nested code blocks, scripts that contain multiple lines must be specified in the POM without any indentation within the pom.xml, unless required for code block demarcation.
scriptArgs	java.lang.String	false	Specifies the command-line arguments to pass to the WLST Jython interpreter as a list of string values. If the argument contains any embedded whitespace, the caller must include enclosing single quotes or escaped double quotes within the scriptArg element's value. If scriptArgs is specified, the args parameter (deprecated) is ignored.

Running Scripts With Fusion Middleware Dependencies

If you use the wlst-client goal to run WLST scripts that contain Fusion Middleware dependencies, you must first include the com.oracle.fmwshare dependency to pull in the necessary libraries needed by those scripts.

The com.oracle.fmwshare dependency must be listed before any Fusion Middleware dependencies.

For example, to run a WLST script for SOA, add a dependency on com.oracle.fmwshare and SOA, similar to the following:

```
<plugin>
 <groupId>com.oracle.weblogic</groupId>
 <artifactId>weblogic-maven-plugin</artifactId>
 <version>14.1.1-0-0</version>
```

```
 <executions>
  <execution>
   <id>soa-wlst-client</id>
   <goals>
    <goal>wlst-client</goal>
   </goals>
   <configuration>
    <fileName>${project.basedir}/misc/doSoaStuff.py</fileName>
    <scriptArgs>
     <scriptArg>${adminUserName}</scriptArg>
     <scriptArg>${adminPassword}</scriptArg>
     <scriptArg>${adminUrl}</scriptArg>
    </scriptArgs>
   </configuration>
  </execution>
 </executions>
 <dependencies>
  <dependency>
   <groupId>com.oracle.fmwshare</groupId>
   <artifactId>fmwshare-wlst-dependencies</artifactId>
   <version>14.1.1-0-0</version>
   <type>pom</type>
  </dependency>
  <dependency>
   <groupId>com.oracle.soa</groupId>
   <artifactId>soa-wlst-dependencies</artifactId>
   <version>14.1.1-0-0</version>
   <type>pom</type>
  </dependency>
 </dependencies>
</plugin>
```

Usage Example

The `wlst-client` 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-client` goal does not require a local server install for WLST online commands.

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

For example:

```
<execution>
<id>wls-wlst-server</id>
<phase>post-integration-test</phase>
<goals>
<goal>wlst-client</goal>
</goals>
<configuration>
<fileName>${project.basedir}/misc/configure_resources.py</fileName>
<args>t3://some-host: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 3-20 shows typical `wlst-client` goal output.

Example 3-21 wlst-client

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

[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building maven-demo 1.0
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:wlst (default-cli) @ maven-demo ---
[INFO] ++========================================================================++
[INFO] ++  weblogic-maven-plugin: wlst                                          ++
[INFO] ++========================================================================++

*** Creating DataSource ***

Connecting to t3://some-host: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
```

As another example, assume that you have the following simple WLST script:

```
try:
  connect('weblogic','password','t3://10.151.69.120:7001')
  listApplications()
```

```
  print('TEST PASS')
except:
  print('TEST FAIL')
```

You can supply this WLST script with the `fileName` configuration parameter, as shown in Example 3-22.

Example 3-22 wlst-client Script Example

```
C:\Oracle\Middleware\Oracle_Home\oracle_common\plugins\maven\com\oracle\maven\or
acle-maven-sync\14.1.1>mvn com.oracle.weblogic:weblogic-maven-plugin:wlst-client
  -DfileName=test.py
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] Building Maven Stub Project (No POM) 1
[INFO] ------------------------------------------------------------------------
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:wlst-client (default-cli) @ standalo
ne-pom ---
[INFO] [wlst-client]No middlewareHome specified.
Connecting to t3://10.151.69.120:7001 with userid weblogic ...
Successfully connected to Admin Server "AdminServer" that belongs to domain "bas
e_domain".

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.

 jaxwsejb30ws
TEST PASS
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 29.197s
[INFO] Finished at: Wed Aug 19 11:33:51 EDT 2020
[INFO] Final Memory: 18M/45M
```

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>
```

exit() is Trapped

`exit()` exits WLST from the user session and closes the scripting shell. By default, WLST calls `System.exit(0)` for the current WLST JVM when exiting WLST. Because wlst-client runs inside the same JVM as the Maven build process, the entire Maven build process would exit. To provide for this, the Maven implementation traps WLST `exit()` calls and throws an exception.

Calling exit() explicitly from a WLST script is discouraged.

For example, assume you were to modify the previous WLST script example to include `exit()`, as follows:

```
try:
  connect('weblogic','password','t3://10.151.69.120:7001')
  listApplications()
  exit()
  print('TEST PASS')
except:
  print('TEST FAIL')
```

When the Maven implementation traps `exit()`, it throws an exception:

```
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.

 jaxwsejb30ws


Exiting WebLogic Scripting Tool.

TEST FAIL
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 29.250s
[INFO] Finished at: Wed Aug 19 11:33:51 EDT 2020
[INFO] Final Memory: 19M/45M
[INFO] ------------------------------------------------------------------------
```

ws-clientgen

Deprecated

This goal is deprecated in this release.

Full Name

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

Description

Parameters

Table 3-22 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 3-22 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 3-23 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.io.File`	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.
`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`	`JMSTransportClient`	false	Invoking a WebLogic Web service using JMS transport. Table 3-25 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.

Table 3-22 (Cont.) ws-clientgen Parameters

Name	Type	Required	Description
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 3-23 describes the parameters of the bindings parameter.

Table 3-23 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 3-24 describes the parameters of the xmlCatalog parameter.

Table 3-24 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 3-25 describes the parameters of the jmstransportclient parameter.

Table 3-25 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.
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.

Table 3-25 (Cont.) jmstransportclient Parameters

Name	Type	Required	Description
jndiConnectionFactoryName	java.lang.String	NA	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	NA	JNDI provider URL. Default value is t3://localhost:7001.
deliveryMode	java.lang.String	NA	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>14.1.1-0-0</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 3-23 shows typical `ws-clientgen` goal output.

Example 3-23 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:14.1.1-0-0: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
```

wsgen

Full Name

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

Description

Maven goal that reads a JAX-WS service endpoint implementation class and generates all of the portable artifacts for a JAX-WS Web service. Use the `wsgen` goal when you are starting from Java classes.

You can then package the service endpoint interface and implementation class, value types, and generated classes, if any, into a WAR file, and deploy the WAR to a Web container.

The `wsgen` goal provides a wrapper for the JAX-WS Maven wsgen plug-in goal.

Parameters

Table 3-26 describes the `wsgen` parameters.

Table 3-26 wsgen Parameters

Name	Type	Required	Description
`args`	`java.lang.String`	false	Specifies optional command-line options. Multiple elements can be specified, and each token must be placed in its own list.

Table 3-26 (Cont.) wsgen Parameters

Name	Type	Required	Description
destDir	java.io.File	false	Specifies the full pathname of where to place output generated classes. Use xnocompile to turn this off. The default is ${project.build.outputDirectory}).
encoding	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 is platform dependent.
extension	boolean	false	extension is always set to true and you do not need to set it. Extensions are not limited to Oracle JAX-WS vendor extensions.
executable	java.lang.String	false	Name of the executable. Can be wsgen.
genWsdl	boolean	false	Specifies that a WSDL file should be generated in ${resourceDestDir}. By default, the WSDL is not generated.
inlineSchemas	boolean	false	Generates inline schemas in a generated WSDL. The default is false. The genWsdl parameter must be set to true.
jmstransportservice	boolean	false	Use JMS transport for Web services. It can be omitted. See Table 3-34 for a description of jmstransportservice parameters.
keep	boolean	false	Specifies whether to keep generated files. The default is true.
metadata	java.io.File	false	Metadata file for the wsgen task, as described in External Web Service Metadata in *JAX-WS Release Documentation*. Unmatched files are ignored.
portName	java.lang.String	false	Specify the port name to use in the generated WSDL. The genWsdl parameter must be set to true.
protocol	java.lang.String	false	Use in conjunction with genWsdl to specify the protocol to use in the wsdl:binding. The genWsdl parameter must be set to true. Valid values are soap1.1 and Xsoap1.2. The default is soap soap1.1. Xsoap1.2 is non-standard and you can use it only in conjunction with the extension option.
resourceDestDir	java.io.File	false	Specifies the directory to contain the generated WSDL files. The default is *${project.build.directory}*/generated-sources/wsdl. The genWsdl parameter must be set to true.
sei	java.lang.String	false	Specifies the service endpoint implementation class name.
servicename	java.lang.String	false	Specify the service name (wsdl:servicename) to use in the generated WSDL. The genWsdl parameter must be set to true.
sourceDestDir	java.io.File	false	Specify where to place generated source files. This parameter also sets keep to true. The default is ${project.build.directory}/generated-sources/wsgen.
verbose	boolean	false	Output messages about what the tool is doing. Default value is: false.
vmArgs	java.util.List	false	Specify optional JVM options. You can specify multiple elements, and each token must be placed in its own list.

Table 3-26 (Cont.) wsgen Parameters

Name	Type	Required	Description
xdonotoverwrite	boolean	false	No description provided
xnocompile	boolean	false	Turns off compilation after code generation, and lets the generated sources be compiled by Maven during the compilation phase. The default is false. This parameter also sets keep to true.

Usage Example

The wsgen goal reads a JAX-WS service endpoint implementation class and generates all of the portable artifacts for a JAX-WS Web service.

Specify the Maven process-classes life cycle phase. Then, run mvn process-classes in the same directory of the POM file.

To do this, modify the pom.xml file to specify the process-classes life cycle phase, the wsgen 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>
  <sourceDirectory>.</sourceDirectory>
    <plugins>
      <plugin>
        <groupId>com.oracle.weblogic</groupId>
        <artifactId>weblogic-maven-plugin</artifactId>
        <version>14.1.1-0-0</version>
        <executions>
          <execution>
            <id>wsgen</id>
            <phase>process-classes</phase>
            <goals>
              <goal>wsgen</goal>
            </goals>
            <configuration>
              <destDir>${project.build.directory}/wsgenOutput/</destDir>
             <sei>myexample.IPInfo</sei>
            <verbose>true</verbose>
            <genWsdl>true</genWsdl>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

Example 3-24 shows typical `wsgen` goal output.

Example 3-24 wsgen

```
mvn -Dfile=pom.xml process-classes
[INFO] Scanning for projects...
[INFO]
[INFO]
------------------------------------------------------------------------
[INFO] Building maven_plugin_simple 1.0
[INFO]
------------------------------------------------------------------------
[INFO]
[INFO] --- maven-resources-plugin:2.5:resources (default-resources) @
maven_plug
in_simple ---
[debug] execute contextualize
[WARNING] Using platform encoding (Cp1252 actually) to copy filtered
resources,
i.e. build is platform dependent!
[INFO] skip non existing resourceDirectory
C:\Oracle\Middleware\Oracle_Home\orac
le_common\plugins\maven\com\oracle\maven\oracle-maven-
sync\14.1.1\src\main\resou
rces
[INFO]
[INFO] --- maven-compiler-plugin:2.3.2:compile (default-compile) @
maven_plugin_
simple ---
[WARNING] File encoding has not been set, using platform encoding Cp1252,
i.e. b
uild is platform dependent!
[INFO] Compiling 1 source file to
C:\Oracle\Middleware\Oracle_Home\oracle_common
\plugins\maven\com\oracle\maven\oracle-maven-sync\14.1.1\target\classes
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:wsgen (wsgen) @
maven_plugin_simple
---
[INFO] Processing: myexample.IPInfo
[WARNING] Using platform encoding (Cp1252), build is platform dependent!
[INFO] jaxws:wsgen args: [-keep, -s,
'C:\Oracle\Middleware\Oracle_Home\oracle_co
mmon\plugins\maven\com\oracle\maven\oracle-maven-sync\14.1.1\target\generated-
so
urces\wsgen', -d,
'C:\Oracle\Middleware\Oracle_Home\oracle_common\plugins\maven\
com\oracle\maven\oracle-maven-sync\14.1.1\target\wsgenOutput', -verbose, -
extens
ion, -wsdl, -r,
'C:\Oracle\Middleware\Oracle_Home\oracle_common\plugins\maven\co
m\oracle\maven\oracle-maven-sync\14.1.1\target\generated-sources\wsdl',
myexampl
e.IPInfo]
myexample\jaxws\GetIpAddress.java
myexample\jaxws\GetIpAddressResponse.java
```

```
[INFO]
------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO]
------------------------------------------------------------------------
[INFO] Total time: 21.309s
[INFO] Finished at: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 8M/32M
[INFO]
------------------------------------------------------------------------
```

In this example, the `wsgen` goal creates the following files:

```
target
  classes
   META-INF
      wsdl
        IPInfoService.wsdl
        IPInfoService_schema1.xsd
      myexample
        IPInfo.class
  generated-sources
      wsdl
        IPInfoService.wsdl
        IPInfoService_schema1.xsd
      wsgen
        myexample
          jaxws
            GetIpAddress.java
            GetIpAddressResponse.java
  wsgenoutput
        myexample
          jaxws
            GetIpAddress.class
            GetIpAddressResponse.class
```

wsimport

Full Name

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

Description

Maven goal that parses a WSDL and binding files and generates the Java code needed to access it. Use the `wsimport` goal when you are starting from a WSDL.

The `wsimport` goal provides a wrapper for the JAX-WS Maven wsimport goal.

Parameters

Table 3-27 describes the `wsimport` parameters.

Table 3-27 wsimport Parameters

Name	Type	Required	Description
`args`	`java.lang.String`	false	Specifies optional command-line options. Multiple elements can be specified, and each token must be placed in its own list.
`bindingDirectory`	`java.io.File`	false	Directory containing binding files.
`bindingFiles`	`java.util.List`	false	List of files to use for bindings. If not specified, all `.xml` files in the `bindingDirectory` are used.
`catalog`	`java.io.File`	false	Catalog file to resolve external entity references support TR9401, XCatalog, and OASIS XML Catalog format.
`destDir`	`java.io.File`	false	Specifies the full pathname of where to place output generated classes. Use `xnocompile` to turn this off. The default is `${project.build.outputDirectory}`.
`encoding`	`java.lang.String`	false	Specifies the character encoding of the output files, such as the deployment descriptors and XML files. Examples of character encodings are SHIFT-JIS and UTF-8. The default is platform dependent.
`executable`	`java.lang.String`	false	Name of the executable. Can be `wsimport`.
`extension`	`boolean`	false	`extension` is always set to `true` and you do not need to set it. Extensions are not limited to Oracle JAX-WS vendor extensions.
`genJWS`	`boolean`	false	Generate stubbed JWS implementation file. The default is `false`.
`httpproxy`	`java.lang.String`	false	Set HTTP/HTTPS proxy. Format is `[user[:password]@]proxyHost[:proxyPort]`.
`implDestDir`	`java.io.File`	false	Specify where to generate JWS implementation file.
`implPortName`	`java.lang.String`	false	Local portion of port name for generated JWS implementation. Implies `genJWS=true`. Note: It is a QName string, formatted as: "{" + Namespace URI + "}" + local part.
`implServiceName`	`java.lang.String`	false	Local portion of service name for generated JWS implementation. Implies `genJWS=true`. Note: It is a QName string, formatted as: "{" + Namespace URI + "}" + local part.
`jmstransportclient`	`JMSTransportClient`	false	Invoking a WebLogic Web service using JMS transport. Table 3-25 describes the parameters of the `jmstransportclient` parameter.
`jmsUri`	`jmsUri`	false	Override jmsUri defined in a WSDL file. Requires `extension=true`.
`keep`	`boolean`	false	Specifies whether to keep generated files. The default is `true`.
`packageName`	`java.lang.String`	false	The package in which the source files will be generated.
`quiet`	`boolean`	false	Suppress wsimport output. The default is `false`.
`sourceDestDir`	`java.io.File`	false	Specify where to place generated source files. This parameter also sets `keep` to true. The default is `${project.build.directory}/generated-sources/wsimport`.
`staleFile`	`java.io.File`	false	The folder containing flag files used to determine if the output is stale. If you do not specify a folder, the default is `${project.build.directory}/jaxws/stale`.

Table 3-27 (Cont.) wsimport Parameters

Name	Type	Required	Description
target	java.lang.String	false	Generate code as per the given JAXWS specification version. Setting "2.0" will cause JAX-WS to generate artifacts that run with JAX-WS 2.0 runtime.
verbose	boolean	false	Output messages about what the tool is doing. Default value is: false.
vmArgs	java.lang.String	false	Specify optional JVM options. You can specify multiple elements, and each token must be placed in its own list.
wsdlDirectory	java.io.File	false	Directory containing WSDL files.
wsdlFiles	java.util.List	false	List of files to use for WSDLs. If not specified, all .wsdl files in the wsdlDirectory will be used.

wsdlLocation	java.lang.String	false	@WebService.wsdlLocation and @WebServiceClient.wsdlLocation value.
			Can end with asterisk, in which case relative path of the WSDL will be appended to the given wsdlLocation.
			Example:
			`...`
			`<configuration>`
			`<wsdlDirectory>src/mywsdls</wsdlDirectory>`
			`<wsdlFiles>`
			`<wsdlFile>a.wsdl</wsdlFile>`
			`<wsdlFile>b/b.wsdl</wsdlFile>`
			`<wsdlFile>${basedir}/src/mywsdls/c.wsdl</wsdlFile>`
			`</wsdlFiles>`
			`<wsdlLocation>http://example.com/mywebservices/*</wsdlLocation>`
			`</configuration>`
			`...`
			wsdlLocation for a.wsdl will be http://example.com/mywebservices/a.wsdl
			wsdlLocation for b/b.wsdl will be http://example.com/mywebservices/b/b.wsdl
			wsdlLocation for ${basedir}/src/mywsdls/c.wsdl will be file://absolute/path/to/c.wsdl
			Note: External binding files cannot be used if asterisk notation is in place.

wsdlUrls	java.util.List	false	List of external WSDL URLs to be compiled.
xadditionalHeaders	boolean	false	Maps headers not bound to the request or response messages to Java method parameters.
xauthFile	java.io.File	false	Specify the location of authorization file.
xdebug	boolean	false	Turn on debug message. The default is false.
xdisableAuthenticator	boolean	false	Disable Authenticator used by JAX-WS RI, xauthfile will be ignored if set.

Table 3-27 (Cont.) wsimport Parameters

Name	Type	Required	Description
xdisableSSLHostnameVerification	boolean	false	Disable the SSL Hostname verification while fetching WSDL(s).
xjcArgs	java.util.List	false	Specify optional XJC-specific parameters that should simply be passed to xjc using -B option of WsImport command. Multiple elements can be specified, and each token must be placed in its own list.
xnoAddressingDataBinding	boolean	false	Binding W3C EndpointReferenceType to Java. By default WsImport follows spec and does not bind EndpointReferenceType to Java and uses the spec provided W3CEndpointReference.
xnocompile	boolean	false	Turns off compilation after code generation, and lets the generated sources be compiled by Maven during the compilation phase. The default is true. This parameter also sets keep to true.
xuseBaseResourceAndURLToLoadWSDL	boolean	false	No description provided by JAX-WS Maven wsimport.

Usage Example

The wsimport goal parses a WSDL and binding files and generates Java code needed to access the Web service.

You can use the wsimport goal in two ways:

- To generate the client-side artifacts. Then, implement the client to invoke the Web service.
- To create your own implementation of the Web service. Use wsimport goal with the genJWS parameter to generate portable artifacts and a stubbed implementation file. You then implement the service endpoint.

Specify the Maven generate-sources life cycle phase. Then, run mvn generate-sources in the same directory of the POM file.

Assume that you want to import the WSDL shown in Example 3-25.

Example 3-25 WSDL to Import

```
<?xml version='1.0' encoding='UTF-8'?><!-- Published by JAX-WS RI at
 http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.2.9-b14041
 svn-revision#14041. --><!-- Generated by JAX-WS RI at
 http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.2.9-b14041
 svn-revision#14041. --><definitions
xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
uti
lity-1.0.xsd" xmlns:wsp="http://www.w3.org/ns/ws-policy" xmlns:wsp1_
2="http://schemas.xmlsoap.org/ws/2004/09/policy"
 xmlns:wsam="http://www.w3.org/2007/05/addressing/metadata"
 xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
 xmlns:tns="http://ws.web.wls.my.org/"
 xmlns:xsd="http://www.w3.org/2001/XMLSchema"
 xmlns="http://schemas.xmlsoap.org/wsdl/"
 targetNamespace="http://ws.web.wls.my.org/" name="SampleWs">
```

```
    <types>
        <xsd:schema>
            <xsd:import namespace="http://ws.web.wls.my.org/"
schemaLocation="x.xsd"/>
        </xsd:schema>
    </types>
    <message name="hello">
        <part name="parameters" element="tns:hello"/>
    </message>
    <message name="helloResponse">
        <part name="parameters" element="tns:helloResponse"/>
    </message>
    <portType name="SampleWs">
        <operation name="hello">
            <input wsam:Action="http://ws.web.wls.my.org/SampleWs/
helloRequest" message="tns:hello"/>
            <output wsam:Action="http://ws.web.wls.my.org/SampleWs/
helloResponse" message="tns:helloResponse"/>
        </operation>
    </portType>
    <binding xmlns:soapjms="http://www.w3.org/2010/soapjms/"
name="SampleWsPortBinding" type="tns:SampleWs">

<soapjms:jndiInitialContextFactory>weblogic.jndi.WLInitialContextFactory</
soapjms:jndiInitialContextFactory>

<soapjms:jndiConnectionFactoryName>com.oracle.webservices.api.jms.ConnectionFa
ctory</soapjms:jndiConnectionFactoryName>
        <soapjms:jndiUrl>t3://localhost:7001</soapjms:jndiUrl>
        <soapjms:bindingVersion>SOAP_JMS_1_0</soapjms:bindingVersion>
        <soapjms:destinationName>com.oracle.webservices.api.jms.RequestQueue</
soapjms:destinationName>
        <soapjms:targetService>SampleWs</soapjms:targetService>
        <soapjms:timeToLive>180000</soapjms:timeToLive>
        <soapjms:deliveryMode>PERSISTENT</soapjms:deliveryMode>
        <soapjms:priority>0</soapjms:priority>
        <soapjms:messageType>BYTES</soapjms:messageType>
        <soapjms:destinationType>QUEUE</soapjms:destinationType>
        <soap:binding transport="http://www.w3.org/2010/soapjms/"
style="document"/>
        <operation name="hello">
            <soap:operation soapAction=""/>
            <input>
                <soap:body use="literal"/>
            </input>
            <output>
                <soap:body use="literal"/>
            </output>
        </operation>
    </binding>
    <service name="SampleWs">
        <port name="SampleWsPort" binding="tns:SampleWsPortBinding">
            <soap:address
location="jms:jndi:com.oracle.webservices.api.jms.RequestQueue?
targetService=Sampl
eWs&amp;amp;jndiURL=t3://
```

```
localhost:7001&amp;messageType=BYTES&amp;deliveryMode=PERSISTENT"/>
        </port>
    </service>
</definitions>
```

To import this WSDL, modify the `pom.xml` file to specify the `generate-sources` life cycle phase, the `wsimport` goal, the WSDL location, and include any parameters you need to set. This example uses a local WSDL file for demonstration purposes.

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>14.1.1-0-0</version>
        <executions>
          <execution>
          <id>wsimport-jmssample</id>
           <goals>
           <goal>wsimport</goal>
           </goals>
            <phase>generate-sources</phase>
            <configuration>
               <wsdlFiles>
                 <wsdlFile>${basedir}/import-example/SampleWs.wsdl</wsdlFile>
               </wsdlFiles>
               <genJWS>true</genJWS>
            </configuration>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

Example 3-26 shows typical `wsimport` goal output.

Example 3-26 wsimport

```
mvn -Dfile=pom.xml generate-sources
[INFO] Scanning for projects...
[INFO]
[INFO]
------------------------------------------------------------------------
[INFO] Building maven_plugin_simple 1.0
[INFO]
------------------------------------------------------------------------
```

```
[INFO]
[INFO] --- weblogic-maven-plugin:14.1.1-0-0:wsimport (wsimport-jmssample) @
mave
n_plugin_simple ---
[INFO] Processing: file:/C:/Oracle/Middleware..../import-example/SampleWs.wsdl
[WARNING] Using platform encoding (Cp1252), build is platform dependent!
[INFO] jaxws:wsimport args: [-keep, -s,
'C:\Oracle\Middleware\...\import-example\target\generated-sources\wsimport', -
d,
 'C:\Oracle\Middleware...\import-example\target\classes', -extension,
 -Xnocompile, -jms, -jmsuri, jms:jndi:null?targetServi
ce=null, -httpproxy:some-proxy-name, -generateJWS, -implDestDir,
'C:\Oracle\Middleware...\import-example',
"file:/C:/Oracle/Middleware...import-example/SampleWs.wsdl"]
parsing WSDL...



Generating code...

[INFO]
------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO]
------------------------------------------------------------------------
[INFO] Total time: 20.888s
[INFO] Finished at: Finished at: Wed Aug 19 11:33:51 EDT 2015
[INFO] Final Memory: 7M/23M
[INFO]
------------------------------------------------------------------------
```

In this example, the `wsimport` goal creates the following files:

```
org
  my
   wls
    web
     ws
      SampleWs_SampleWsPortImpl.java
target
  classes
  generated-sources
   wsimport
    org
     my
      wls
       web
        ws
         Hello.java
         HelloResponse.java
         ObjectFactory.java
         package-info.java
         SampleWs.java
         SampleWs_Service.java
  jaxws
```

```
stale
 .2b48c6ef28bc8a45aa2da4246c0c4ac90cf82c57
```

ws-wsdlc

Deprecated

This goal is deprecated in this release.

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 3-28 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 3-28 ws-wsdlc Parameters

Name	Type	Required	Description
`bindings`	`java.lang.String`	false	Customization files that specify JAX-WS and JAXB custom binding declarations or SOAP handler files.
`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.
`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.

Table 3-28 (Cont.) ws-wsdlc Parameters

Name	Type	Required	Description
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>14.1.1-0-0</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 3-27 shows typical `ws-wsdlc` goal output.

Example 3-27 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:14.1.1-0-0: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
```

ws-jwsc

Deprecated

This goal is deprecated in this release.

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 3-28. See Introduction to the POM for information on Maven projects with multiple modules.

Example 3-28 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>14.1.1-0-0</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 3-29 shows an example without a module `element` in which the `jws` parameter is a child of `ws-jwsc`.

Example 3-29 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>14.1.1-0-0</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 3-29 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 3-29 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.

Table 3-29 (Cont.) ws-jwsc Parameters

Name	Type	Required	Description
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 3-30 for a description of jws parameters.
jwses	Jws	false	It contains more than one< jws> element.
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 3-31 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 3-30 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 3-30 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 3-34 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 3-33 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 3-33 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 3-31 describes the parameters of the module parameter.

Table 3-31 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 jwsfileset, 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 3-32 describes the parameters of the FileSet parameter.

Table 3-32 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.

Table 3-32 (Cont.) FileSet Parameters

Name	Type	Required	Description
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 3-32 describes the parameters of the `transportType` parameter.

Table 3-33 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 3-34 describes the parameters of the `jmstransportservice` parameter.

Table 3-34 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.

Table 3-34 (Cont.) jmstransportservice Parameters

Name	Type	Required	Description
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-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 pa 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>14.1.1-0-0</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 3-30 shows typical `ws-jwsc` goal output.

Example 3-30 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:14.1.1-0-0: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

To create a WebLogic Server split development directory that you can use to develop a Java EE application or module, you have to organize the Java EE components and shared classes, generate a basic build.xml file, and develop multiple EAR projects.
This chapter includes the following sections:

- 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.
- Using the Split Development Directory Structure: Main Steps
  In a split development directory structure, you can develop and deploy applications faster, simplify build scripts, and integrate with source control systems.
- 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.
- 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.
- 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.
- Developing Multiple-EAR Projects Using the Split Development Directory
  Projects that require building multiple enterprise applications simultaneously require slightly different conventions and procedures in organizing libraries and classes shared by multiple EARs and linking multiple build.xml files.

- Best Practices for Developing WebLogic Server Applications
  The WebLogic Server documentation library includes a number of recommended best practices for application development, including topics such as packaging, distribution, deployment, and more.

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.
- Source and Build Directories
- Deploying from a Split Development Directory
- Split Development Directory Ant Tasks

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 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)

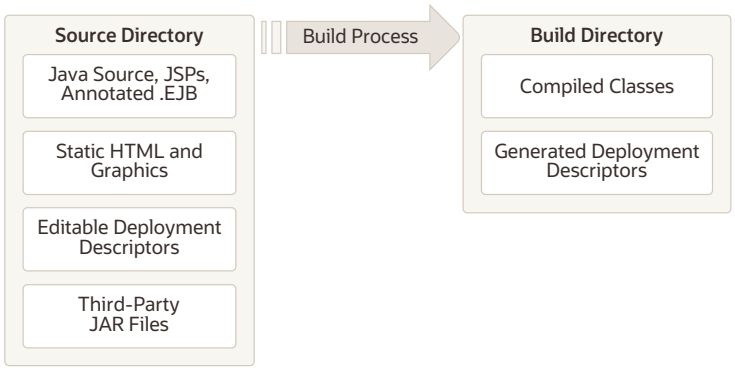
> **Note:**
>
> The split development directory structure does not provide support for developing new Resource Adapter components.

- 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`).

Deploying from a Split Development Directory

All WebLogic Server deployment tools (`weblogic.Deployer`, `wldeploy`, and the WebLogic Server 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.

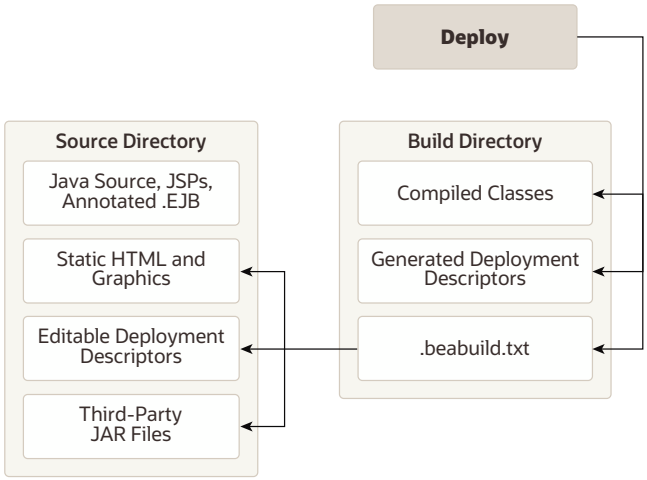
WebLogic Server discovers the location of the source directory by examining the `.beabuild.txt` file that resides in the top level of the application's build directory. If you ever move or modify the source directory location, edit the `.beabuild.txt` file to identify the new source directory name.

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



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 Compiling Applications Using wlcompile.
- `wlappc`—This Ant task invokes the appc compiler, which generates JSPs and container-specific EJB classes for deployment. See 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 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.

Using the Split Development Directory Structure: Main Steps

In a split development directory structure, you can develop and deploy applications faster, simplify build scripts, and integrate with source control systems.

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 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 Organizing Java EE Components in a Split Development Directory and 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 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 Generating a Basic build.xml File Using weblogic.BuildXMLGen for a list of default targets.

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 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:

- Enterprise Application Configuration
- Web Applications
- EJBs

- Shared Utility Classes
- Third-Party Libraries

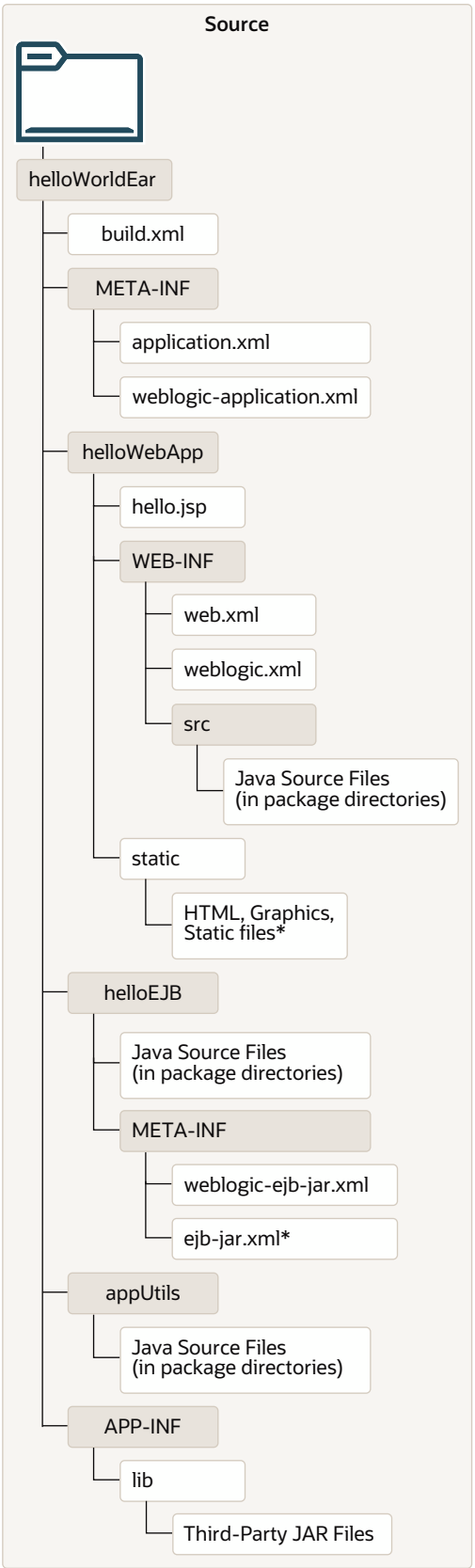
The directory examples are taken from the `splitdir` sample application installed in *ORACLE_HOME*`\wlserver\samples\src\examples\splitdir`, where *ORACLE_HOME* represents the directory in which the WebLogic Server code examples are configured. For more information about the WebLogic Server code examples, see Sample Applications and Code Examples in *Understanding Oracle WebLogic Server.*

- Source Directory Overview
- Enterprise Application Configuration
- Web Applications
- EJBs
- Important Notes Regarding EJB Descriptors

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.

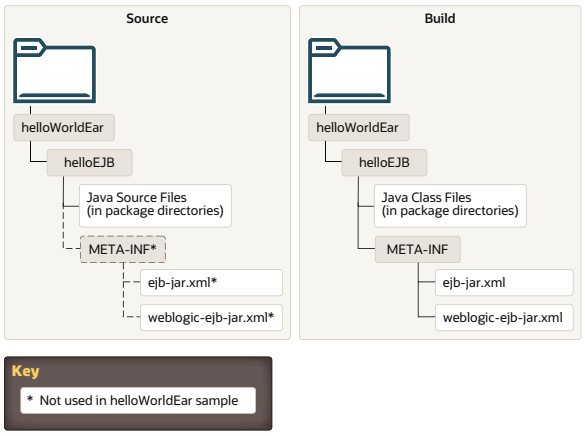
Figure 4-3 Overview of Enterprise Application Source Directory



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

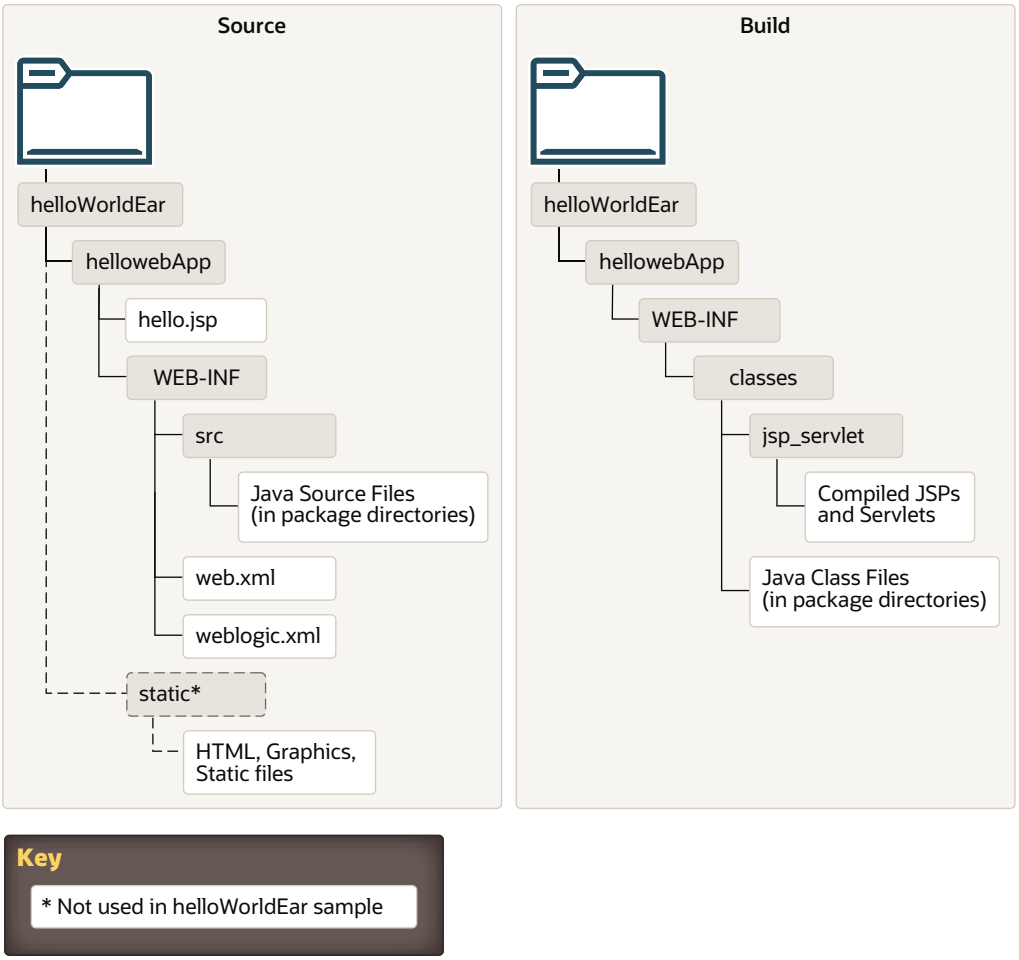


The enterprise application directory will also have one or more subdirectories to hold a Web application, EJB, utility class, and/or third-party Jar file, as described in the following sections.

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:

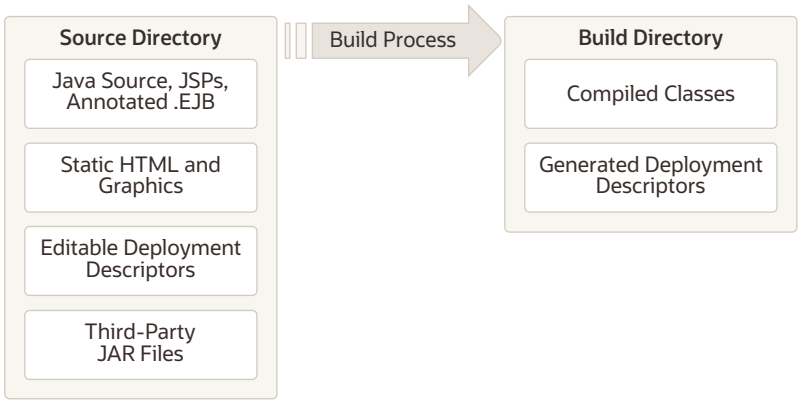
- `helloWebApp\` —The top level of the Web application module can contain JSP files and static content such as HTML files and graphics used in the application. You can also store static files in any named subdirectory of the Web application (for example, `helloWebApp\graphics` or `helloWebApp\static`.)
- `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.

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 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.

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.

Organizing Shared Classes in a Split Development Directory

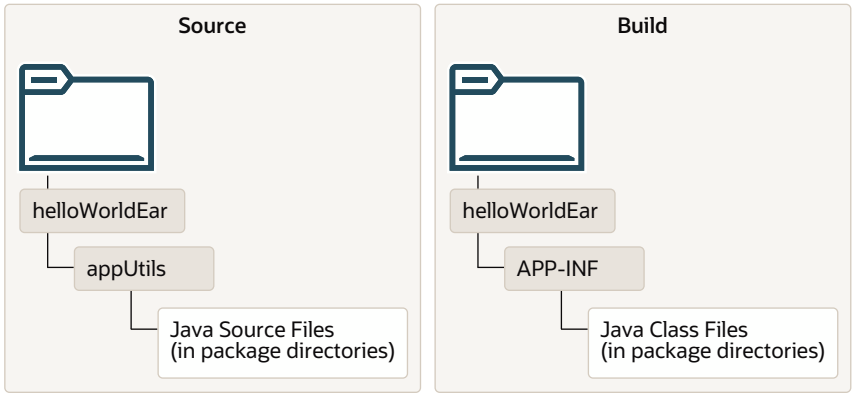
The WebLogic split development directory also helps you store shared utility classes and libraries that are required by modules in your enterprise application.

The following sections describe the directory layout and classloading behavior for shared utility classes and third-party JAR files.

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



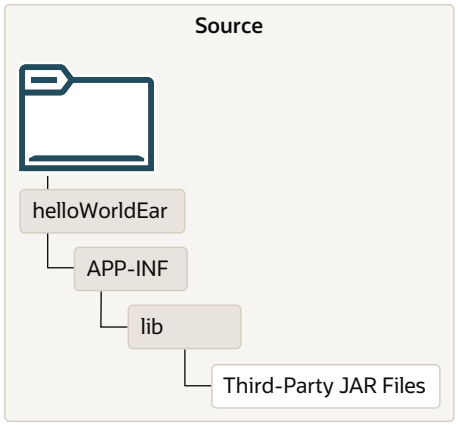
Place the source for Java utility classes in a named subdirectory of the top-level enterprise application directory. Beneath the named subdirectory, use standard package subdirectory conventions.

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.

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.

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`.

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 l`ib\echolib\echolib.jar` library.

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 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
```

Developing Multiple-EAR Projects Using the Split Development Directory

Projects that require building multiple enterprise applications simultaneously require slightly different conventions and procedures in organizing libraries and classes shared by multiple EARs and linking multiple build.xml files.

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 about the WebLogic Server samples, see Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

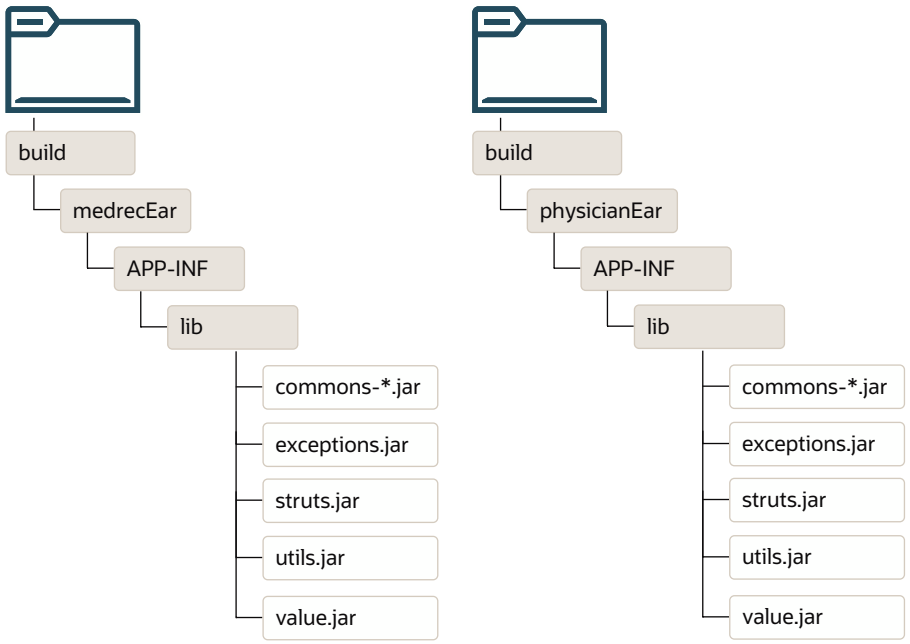
Organizing Libraries and Classes Shared by Multiple EARs

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.

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 main `build.xml` file that calls the other `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 main `build.xml` file. The following line from the MedRec main 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 main build file to 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.

Best Practices for Developing WebLogic Server Applications

The WebLogic Server documentation library includes a number of recommended best practices for application development, including topics such as packaging, distribution, deployment, and more.

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

- Package applications as part of an enterprise application. See Packaging Applications Using wlpackage.
- Use the split development directory structure. See Organizing Java EE Components in a Split Development Directory.
- For distribution purposes, package and deploy in archived format. See Packaging Applications Using wlpackage.
- In most other cases, it is more convenient to deploy in exploded format. See 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

To build WebLogic Server Java EE applications in WebLogic split development directory environment you have to compile applications using `wlcompile` and build modules and applications using `wlappc`.
This chapter includes the following sections:

- Compiling Applications Using wlcompile
- Building Modules and Applications Using wlappc
- Compiling Applications Using wlcompile
  You can use the `wlcompile` Ant task to invoke the javac compiler to compile your application's Java components in a split development directory structure.
- 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.

Compiling Applications Using wlcompile

You can 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:

   ORACLE_HOME`wlserver\samples\server\examples\build\helloWorldEar\APP-INF\classes\`

where *ORACLE_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.

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"/>
```

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 Creating Shared Java EE Libraries and Optional Packages.

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>
```

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.

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 Creating Shared Java EE Libraries and Optional Packages. The `library` element can be used with both `wlcompile` and `wlappc`, described in 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 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" />
```

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.

- wlappc Ant Task Attributes
- wlappc Ant Task Syntax
- Syntax Differences between appc and wlappc
- weblogic.appc Reference
- weblogic.appc Syntax
- weblogic.appc Options

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.

> **Note:**
>
> See weblogic.appc Reference for a list of `weblogic.appc` options.
>
> See also 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.

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

Option	Description
`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 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.
`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.

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

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.

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" />
```

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"/>
```

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.

weblogic.appc Syntax

Use the following syntax to run `appc`:

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

weblogic.appc Options

The following are the available `appc` options:

Option	Description
`-print`	Prints the standard usage message.

Option	Description
`-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).
`-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 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

To deploy and package WebLogic Server Java EE applications in WebLogic split development directory environment use `wldeploy` and `wlpackage` tasks.
This chapter includes the following sections:

- Deploying Applications Using wldeploy
- Packaging Applications Using wlpackage
- 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.
- Packaging Applications Using wlpackage
  Use `wlpackage` when you want to deliver your application to another group or individual for evaluation, testing, performance profiling, or production deployment.

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 wldeploy Ant Task Reference, for a complete command reference.

Packaging Applications Using wlpackage

Use `wlpackage` when you want to deliver your application to another group or individual for evaluation, testing, performance profiling, or production deployment.

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).

- Archive versus Exploded Archive Directory
- wlpackage Ant Task Example
- wlpackage Ant Task Attribute Reference

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.

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" />
```

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.

Table 6-1 (Cont.) Attributes of the wlpackage Ant Task

Attribute	Description	Data Type	Required?
`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

You can program and maintain applications with WebLogic Server using the production redeployment strategy.
This chapter includes the following sections:

- 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.
- 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.
- 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.
- 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 redeploys the application.
- Upgrading Applications to Use Production Redeployment
  You can upgrade applications for deployment to WebLogic Server to use production redeployment.
- Accessing Version Information
  Your application code can use new MBean attributes to retrieve version information for display, logging, or other uses.

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.

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*.

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.

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:

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`.

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.

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.

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 Assigning an Application Version.

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 Accessing Version Information for more information about the MBean attributes that provide the name and identifier.

Client Applications Use Same Version when Possible

As described in 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.

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 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*.

- Application Version Conventions

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
```

Upgrading Applications to Use Production Redeployment

You can upgrade applications for deployment to WebLogic Server 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 Accessing Version Information.

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

Learn about Java EE MetaData annotations and dependency injection (DI) in WebLogic Server.
This chapter includes the following sections:

- Annotation Processing
- Dependency Injection of Resources
- Standard JDK Annotations
- Standard Security-Related JDK Annotations
- Annotation Processing
  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).
- 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.
- Standard JDK Annotations
  Examine a listing of reference information related to standard JDK annotations.
- Standard Security-Related JDK Annotations
  Examine a listing of reference information related to standard security-related JDK annotations.

Annotation Processing

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).

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 `https://javaee.github.io/javaee-spec/javadocs/`).

- Annotation Parsing
- Deployment View of Annotation Configuration
- Compiling Annotated Classes
- Dynamic Annotation Updates

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 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.

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.

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

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.

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.

- Application Life Cycle Annotation Methods

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.

Standard JDK Annotations

Examine a listing of reference information related to standard JDK annotations.

- javax.annotation.PostConstruct
- javax.annotation.PreDestroy
- javax.annotation.Resource
- javax.annotation.Resources

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

For 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*.

- javax.annotation.PostConstruct
- javax.annotation.PreDestroy
- javax.annotation.Resource
- javax.annotation.Resources

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.

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.

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
`authenticationType`	Specifies the authentication type to use for the resource. Valid values for this attribute are: • `AuthenticationType.CONTAINER` • `AuthenticationType.APPLICATION` Default value is `AuthenticationType.CONTAINER`	`AuthenticationType`	No
`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

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

Standard Security-Related JDK Annotations

Examine a listing of reference information related to standard security-related JDK annotations.

- javax.annotation.security.DeclareRoles
- javax.annotation.security.DenyAll
- javax.annotation.security.PermitAll
- javax.annotation.security.RolesAllowed
- javax.annotation.security.RunAs
- javax.annotation.security.DeclareRoles
- javax.annotation.security.DenyAll
- javax.annotation.security.PermitAll
- javax.annotation.security.RolesAllowed
- javax.annotation.security.RunAs

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 WebLogic Server Administration Console. For information about security, 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

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.

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.

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 WebLogic Server Administration Console. For information about security, 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

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 information about security, 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.
This chapter includes the following sections:

- Defining a Managed Bean
  A managed bean is the basic component in a CDI application and defines the beans that CDI can create and manage.
- Injecting a Bean
  To use the beans that you define, inject them into another bean that an application such as a JavaServer Faces can use.
- 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.
- 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.
- Using Qualifiers
  Qualifiers enable you to provide more than one implementation of a particular bean type.
- 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. By providing alternative implementations of a bean type, you can modify an application at deployment time to meet such differing requirements.
- Applying a Scope and Qualifiers to a Session Bean
  CDI enables you to apply a scope and qualifiers to a session bean.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.

- Using Events for Communications Between Beans
  Events enable beans to communicate information without any compilation-time dependency.
- Injecting a Predefined Bean
  Predefined beans are injected with dependent scope and the predefined default qualifier `@Default`.
- 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.
- 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.
- 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.
- Enabling and Disabling CDI
  CDI for a domain is enabled by default. However, even when an application does not use CDI, there is some CDI initialization that occurs when you deploy an application in WebLogic Server. To maximize deployment performance for applications that do not use CDI, you can disable CDI.
- Implicit Bean Discovery
  CDI 1.1 and Java EE 7 introduced the concept of implicit bean archives. An implicit bean archive is an archive of a JAR or a WAR file that does not contain a `beans.xml` file; it contains beans that can be managed by CDI.
- Supporting Third-Party Portable Extensions
  CDI is intended to be a foundation for frameworks, extensions, and integration with other technologies.
- Using the Built-in Annotation Literals
  CDI 2.0 introduces new built-in annotation literals that can be used for creating instances of annotations.
- Using the Configurator Interfaces
  CDI 2.0 introduced some new configurator interfaces which can be used for dynamically defining or modifying CDI objects.
- Bootstrapping a CDI Container
  CDI 2.0 provides the standard API for bootstrapping a CDI container in Java SE. You must explicitly bootstrap the CDI container using the `SeContainerInitializer` abstract class and its static method `newInstance()`.

About CDI for the Java EE Platform

CDI for the Java EE Platform specification was formerly called Web Beans. CDI injection simplifies the use of managed beans with JSF technology in Web applications.

CDI is specified by Java Specification Request (JSR) 365: Contexts and Dependency Injection for the Java 2.0. CDI uses the following related specifications:

- JSR 330: Dependency Injection for Java
- Java EE 8 Managed Beans Specification, which is a part of JSR 366: Java Platform, Enterprise Edition 8 (Java EE 8) Specification
- Interceptors specification, which is a part of JSR 345: Enterprise JavaBeans 3.2

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.

See Introduction to Contexts and Dependency Injection for the Java EE Platform in the *Java EE 8 Tutorial*.

CDI 2.0 Examples

Oracle provides Java EE 8 examples that demonstrate new features in CDI 2.0, such as:

- Asynchronous Events – Demonstrates how to produce async events and how singleton EJBs can consume these events.
- Observer Ordering – Demonstrates how singleton EJBs can consume events according to the priority.
- Interception Factory – Demonstrates how to produce a class instance with adding the specified annotation dynamically by InterceptionFactory.

For more information, see the CDI 2.0 examples in the WebLogic Server distribution kit: `Oracle_HOME\wlserver\samples\server\examples\src\examples\javaee8\cdi` where `ORACLE_HOME` represents the directory in which you installed WebLogic Server. See Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

CDI 1.1 Example

A Java EE 7 example that show how to use CDI is provided in the cdi sample application, which is installed in `Oracle_HOME\wlserver\samples\server\examples\src\examples\javaee7\cdi` where `ORACLE_HOME` represents the directory in which you installed WebLogic Server. See Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

Defining a Managed Bean

A managed bean is the basic component in a CDI application and defines the beans that CDI can create and manage.

A bean is a source of the objects that CDI can create and manage. See About Beans in *The Java EE 8 Tutorial*.

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 346 as listed in About CDI Managed Beans in *The Java EE 8 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 Configuring a CDI Application.

Injecting a Bean

To use the beans that you define, inject them into another bean that an application such as a JavaServer Faces can use.

See Injecting Beans in *The Java EE 8 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 the resource injection that was introduced in the Java EE 5 specification, which 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;
    ...
}
```

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 8 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 Using Qualifiers.

```
package com.example.managers;

import javax.enterprise.context.RequestScoped;

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

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 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 Injecting a Bean.

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. See Using Qualifiers in *The Java EE 8 Tutorial*.

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

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

- Defining Qualifiers for Implementations of a Bean Type
- Applying Qualifiers to a Bean
- Injecting a Qualified Bean

- Defining Qualifiers for Implementations of a Bean Type
- Applying Qualifiers to a Bean
- Injecting a Qualified Bean

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 {}
```

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 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
{...}
```

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 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 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;
   ...
}
```

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. By providing alternative implementations of a bean type, you can modify an application at deployment time to meet such differing requirements.

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.

CDI enables you to select from any number of alternative bean type implementations for injection instead of a corresponding primary implementation. See Using Alternatives in CDI Applications in *The Java EE 8 Tutorial*.

> **Note:**
>
> To select between alternative implementations at development time, use qualifiers as explained in Using Qualifiers.

Providing alternative implementations of a bean type involves the tasks that are explained in the following sections:

- Defining an Alternative Implementation of a Bean Type
- Selecting an Alternative Implementation of a Bean Type for an Application
- Defining an Alternative Implementation of a Bean Type
- Selecting an Alternative Implementation of a Bean Type for an Application

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 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 {
 ...
}
```

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 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>
...
```

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*
- Applying a Scope to a Session Bean
- Applying Qualifiers to a Session Bean

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 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.

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 Using Qualifiers.

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.

See Using Producer Methods, Producer Fields, and Disposer Methods in CDI Applications in *The Java EE 8 Tutorial*.

- Defining a Producer Method
- Defining a Disposer Method
- Defining a Producer Field

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.

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();
    }
}
```

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.

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 Using Java EE Annotations and Dependency Injection.

- Initializing a Managed Bean
- Preparing for the Destruction of a Managed Bean

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.

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.

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 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.

See Using Interceptors in CDI Applications in *The Java EE 8 Tutorial*.

Intercepting method invocations and life cycle events of bean classes involves the tasks that are explained in the following sections:

- Defining an Interceptor Binding Type
- Defining an Interceptor Class
- Identifying Methods for Interception
- Enabling an Interceptor
- Defining an Interceptor Binding Type
- Defining an Interceptor Class
- Identifying Methods for Interception
- Enabling an Interceptor
- Applying an Interceptor on a Producer
  In CDI 1.x, the interceptor is not bound to a producer bean. CDI 2.0 introduces the interface `javax.enterprise.inject.spi.InterceptionFactory<T>`, which allows to apply interceptors programmatically to the return value of a producer method.

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 {}
```

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`
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 {
        ...
```

```
    }
}
```

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() {
    ...
    }
}
```

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 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>
...
```

Applying an Interceptor on a Producer

In CDI 1.x, the interceptor is not bound to a producer bean. CDI 2.0 introduces the interface `javax.enterprise.inject.spi.InterceptionFactory<T>`, which allows to apply interceptors programmatically to the return value of a producer method.

The `InterceptionFactory` interface allows to create a wrapper instance whose method invocations are intercepted by method interceptors and forwarded to a provided instance.

```
publicinterfaceInterceptionFactory<T> {
    InterceptionFactory<T> ignoreFinalMethods();
    AnnotatedTypeConfigurator<T> configure();
    T createInterceptedInstance(T instance);
}
```

You can obtain an implementation of `InterceptionFactory` by calling the `BeanManager.createInterceptionFactory()`. The following example shows a producer method using the `InterceptionFactory`:

```
@Produces
@RequestScoped
public Product createInterceptedProduct(InterceptionFactory<Product>
interceptionFactory) {
  interceptionFactory.configure().add(ActionBinding.Literal.INSTANCE);
  return interceptionFactory.createInterceptedInstance(new Product());
}
```

See Using Interceptors in CDI Applications in *Java EE 8 Tutorial* for more information about using interceptors.

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 Intercepting Method Invocations and Life Cycle Events of Bean Classes.

See Using Decorators in *The Java EE 8 Tutorial*.

Decorating a managed bean class involves the tasks that are explained in the following sections:

- Defining a Decorator Class
- Enabling a Decorator Class
- Defining a Decorator Class
- Enabling a Decorator Class

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) {
        ...
    }
}
```

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 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>
...
```

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. 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. See Giving Beans EL Names in *The Java EE 8 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.

The following example shows how to use the `@Named` annotation to assign an EL name to a CDI 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.

The following example 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 9-19 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.

```
...
<h:outputText value="#{cart.total}"/>
...
```

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. See Using Stereotypes in *The Java EE 8 Tutorial*.

Defining and applying stereotypes involves the tasks that are explained in the following sections:

- Defining a Stereotype
- Applying Stereotypes to a Bean

- Defining a Stereotype
- Applying Stereotypes to a Bean

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 Defining the Scope of a Bean
     - `@Alternative`—see Providing Alternative Implementations of a Bean Type
     - One or more interceptor bindings—see Intercepting Method Invocations and Life Cycle Events of Bean Classes
     - `@Named`—see 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 9-20 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 {}
```

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 Defining a Stereotype.

Example 9-21 shows how to apply stereotypes to a bean.

Example 9-21 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 9-20. The definition of the `@Mock` stereotype is beyond the scope of this example.

```
@Action
@Mock
public class MockLoginAction extends LoginAction {
 ...
}
```

Using Events for Communications Between Beans

Events enable beans to communicate information without any compilation-time dependency.

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. See Using Events in *The Java EE 8 Tutorial*.

Using events for communications between beans involves the tasks that are explained in the following sections:

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 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.

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. This method fires the event synchronously and notifies any observer methods.
- The event can be fired asynchronously using the `fireAsync()` method. Invocation of this method returns immediately and the obserer methods are notified asynchronously. See Firing Events in *The Java EE 8 Tutorial*.

Example 9-22 shows how to send an event.

Example 9-22 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);
        }
    }
    ...
}
```

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. See Using Observer Methods to Handle Events in *The Java EE 8 Tutorial*.
- set the observer method order using `@Priority` annotation to specify the order in which the observer methods for an event are invoked. See Observer Method Ordering in *The Java EE 8 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 9-23 shows how to declare an observer method for receiving qualified events of a particular type. Example 9-24 shows how to declare an observer method for receiving all events of a particular type.

Example 9-23 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 9-24 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) {
        ...
    }
```

Injecting a Predefined Bean

Predefined beans are injected with dependent scope and the predefined default qualifier `@Default`.

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 8 Tutorial*.

Example 9-25 shows how to use the `@Resource` annotation to inject a predefined bean.

Example 9-25 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;
        ...
}
```

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 Defining a Producer Field.

The following example shows how to use 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;

    ...
}
```

The following example shows how to inject the same set of resources by combining Java EE 5 resource injection with CDI 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.

The following example shows how to inject 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.
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.

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 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`.

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_2_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:

- Selecting an Alternative Implementation of a Bean Type for an Application
- Enabling an Interceptor
- 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 9-26 shows a `beans.xml` file for configuring a CDI application.

Example 9-26 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://xmlns.jcp.org/xml/ns/javaee"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="
      http://xmlns.jcp.org/xml/ns/javaee
      http://xmlns.jcp.org/xml/ns/javaee/beans_1_1.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>
```

Enabling and Disabling CDI

CDI for a domain is enabled by default. However, even when an application does not use CDI, there is some CDI initialization that occurs when you deploy an application in WebLogic Server. To maximize deployment performance for applications that do not use CDI, you can disable CDI.

You can control whether CDI is enabled in the domain by setting the `Policy` parameter on the CDI container. When this parameter is set to `Enabled`, CDI is enabled for all applications in the domain. When the `Policy` parameter is set to `Disabled`, CDI is disabled for all applications in the domain.

You can disable CDI only for a domain.

- Enabling and Disabling CDI for a Domain

Enabling and Disabling CDI for a Domain

To disable CDI for every application that is deployed to a domain, add the following lines to the `config.xml` file:

```
<domain>
<cdi-container>
<policy>Disabled</policy>
</cdi-container>
<domain>
```

You can use the WLST scripting tool to enable or disable CDI for a domain. The following examples demonstrate how to use WLST to enable and disable CDI for a domain whether you are online or offline.

Example 9-27 Enabling CDI While Online

In the following example, WebLogic Server is running. The arguments *username* and *password* represent the credentials for the user who is connecting WLST to the server, and *url* represents the listen address and listen port of the server instance (for example, localhost:7001). Also note that *domain* represents the domain name.

```
connect('user','password','url')
 domainConfig()
 edit()
 cd('CdiContainer/mydomain')
 startEdit()
 set('Policy','Enabled') // 'Enabled' or 'Disabled'
 validate()
 save()
 activate(block="true")
```

Example 9-28 Enabling CDI While Offline

In the following example, *domain* represents the path of your domain (for example, `/oracle/wls/`*mydomain*). Also note that `mydomain` must match the domain name.

```
readDomain('domain')
create('mydomain','CdiContainer')
cd('CdiContainer/mydomain')
set('Policy','Enabled') // 'Enabled' or 'Disabled'
updateDomain()
 closeDomain()
```

Implicit Bean Discovery

CDI 1.1 and Java EE 7 introduced the concept of implicit bean archives. An implicit bean archive is an archive of a JAR or a WAR file that does not contain a `beans.xml` file; it contains beans that can be managed by CDI.

This can significantly increase the time that it takes to deploy an application. This increase in time is especially noticeable when applications built for releases prior to Java EE 7 are deployed on a Java EE 7 application server. To be compatible with CDI 1.0, WebLogic Server contains an option that sets the container to ignore the archive even when the `beans.xml` file is not present.

You control whether implicit bean discovery is enabled in the domain by setting the `implicit-bean-discovery-enabled` parameter on the CDI container. When this parameter is set to `1`, implicit bean discovery is enabled for all applications in the domain. When the `implicit-bean-discovery-enabled` parameter is set to `0`, implicit bean discovery is disabled for all applications in the domain.

You can disable implicit bean discovery only for a domain.

- Enabling and Disabling Implicit Bean Discovery for a Domain

Enabling and Disabling Implicit Bean Discovery for a Domain

To disable implicit bean discovery for every application that is deployed to a domain, add the following lines `config.xml` file:

```
<domain>
<cdi-container>
<implicit-bean-discovery-enabled>false</implicit-bean-discobery-enabled>
</cdi-container>
<domain>
```

You can use WLST scripting too to enable or disable this feature. The following examples demonstrate how to use WLST to enable and disable implicit bean discovery for a domain whether you are online or offline.

Example 9-29 Enabling Implicit Bean Discovery Using WLST Online

In the following example, WebLogic Server is running. The arguments *username* and *password* represent the credentials for the user who is connecting WLST to the server, and *url* represents

the listen address and listen port of the server instance (for example, localhost:7001). Also note that *domain* represents the domain name.

```
connect('user','password','url')
domainConfig()
edit()
cd('CdiContainer/mydomain')
startEdit()
set('ImplicitBeanDiscoveryEnabled',1)  // 1 to enable 0 to disable
validate()
save()
activate(block="true")
```

Example 9-30 Enabling Implicit Bean Discovery Using WLST Offline

In the following example, *domain* represents the path of your domain (for example, `/oracle/wls/`*mydomain*). Also note that `mydomain` must match the domain name.

```
readDomain(domain)
create('mydomain','CdiContainer')
cd('CdiContainer/mydomain')
set('ImplicitBeanDiscoveryEnabled',1)
// 1 to enable 0 to disable
updateDomain()
closeDomain()
```

Supporting Third-Party Portable Extensions

CDI is intended to be a foundation for frameworks, extensions, and integration with other technologies.

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 365: Contexts and Dependency Injection for the Java EE platform.

Using the Built-in Annotation Literals

CDI 2.0 introduces new built-in annotation literals that can be used for creating instances of annotations.

The following are the new built-in annotations that define a `Literal` static nested class:

Table 9-2 Built-in Annotation Literals

Classes	Package
`Any`	`javax.enterprise.inject`
`Default`	`javax.enterprise.inject`

Table 9-2 (Cont.) Built-in Annotation Literals

Classes	Package
New	javax.enterprise.inject
Specialized	javax.enterprise.inject
Veteod	javax.enterprise.inject
Alternative	javax.enterprise.inject
Typed	javax.enterprise.inject
Nonbinding	javax.enterprise.util
Initialized	javax.enterprise.context
Destroyed	javax.enterprise.context
RequestScoped	javax.enterprise.context
SessionScoped	javax.enterprise.context
ApplicationScoped	javax.enterprise.context
Dependent	javax.enterprise.context
ConversationScoped	javax.enterprise.context

Syntax

Example 9-31 Built-in Annotation Literals

```
Default defaultLiteral = new Default.Literal();
```

Using the Configurator Interfaces

CDI 2.0 introduced some new configurator interfaces which can be used for dynamically defining or modifying CDI objects.

The newly introduced configurator interfaces are:

- `AnnotatedTyeConfigurator`
- `InjectionPointConfigurator`
- `BeanAttributesConfigurator`
- `BeanConfigurator`
- `ObserverMethodConfigurator`
- `ProducerConfigurator`

See Using the Configurators Interfaces in *Java EE 8 Tutorial* for more information.

Bootstrapping a CDI Container

CDI 2.0 provides the standard API for bootstrapping a CDI container in Java SE. You must explicitly bootstrap the CDI container using the `SeContainerInitializer` abstract class and its static method `newInstance()`.

You can configure the CDI container using the API `javax.enterprise.inject.se.SeContainerInitializer` before it is bootstrapped and the

`SeContainerInitializer.initialize()` method bootstraps the container and returns a `SeContainer` instance.

See Configuring the CDI Container in *Java EE 8 Tutorial* for more information.

10

Java API for JSON Processing

WebLogic Server supports the Java API for JSON Processing 1.1 (JSR 374) by including the JSR-374 reference implementation for use with applications deployed on a WebLogic Server instance.
This chapter includes the following sections:

To learn more about JSON concepts, see Java API for JSON Processing in the Java EE 8 Tutorial.

- About JavaScript Object Notation (JSON)
  JSON is a lightweight data-interchange format that is widely used as a common format to serialize and deserialize data in applications that communicate with each other over the Internet. These applications are often created using different programming languages and run in very different environments.
- Object Model API
  The object model API is a high-level API that provides immutable object models for JSON object and array structures.
- Streaming API
  The streaming API is a low-level API designed to process large amounts of JSON data efficiently.
- New Features for JSON Processing

About JavaScript Object Notation (JSON)

JSON is a lightweight data-interchange format that is widely used as a common format to serialize and deserialize data in applications that communicate with each other over the Internet. These applications are often created using different programming languages and run in very different environments.

JSON is suited to this scenario because it is an open standard, it is easy to read and write, and it is more compact than other representations. RESTful web services typically make extensive use of JSON as the format for the data inside requests and responses, with the JSON representations usually being more compact than the counterpart XML representations since JSON does not have closing tags.

The Java API for JSON Processing provides a convenient way to process (parse, generate, transform, and query) JSON text. For generating and parsing JSON data, there are two programming models, which are similar to those used for XML documents:

- The **object model** creates a tree that represents the JSON data in memory. The tree can then be navigated and analyzed. Although the JSON data created in memory is immutable and cannot be modified, the object model is the most flexible and allows for processing that requires access to the complete contents of the tree. However, it is often slower than

the streaming model and requires more memory. The object model generates JSON output by navigating the entire tree at once.

For information about using the object model, see Object Model API.

- The **streaming model** uses an event-based parser that reads JSON data one element at a time. The parser generates events and stops for processing when an object or an array begins or ends, when it finds a key, or when it finds a value. Each element can be processed or discarded by the application code, and then the parser proceeds to the next event. This approach is adequate for local processing, in which the processing of an element does not require information from the rest of the data. The streaming model generates JSON output to a given stream by making a function call with one element at a time.

  For information about using the streaming model, see Streaming API.

Object Model API

The object model API is a high-level API that provides immutable object models for JSON object and array structures.

These JSON structures are represented as object models using the Java types `JsonObject` and `JsonArray`. The interface `javax.json.JsonObject` provides a map view to access the unordered collection of zero or more name-value pairs from the model. Similarly, the `javax.json.JsonArray` interface provides a list view to access the ordered sequence of zero or more values from the model.

The object model API uses builder patterns to create these object models. The `javax.json.JsonObjectBuilder` and `javax.json.JsonArrayBuilder` interfaces provide methods to create models of type `JsonObject` and `JsonArray`, respectively.

These object models can also be created from an input source using the `javax.json.JsonReader` interface. Similarly, these object models can be written to an output source using the `javax.json.JsonWriter` interface.

The following sections show examples of using the object model API:

- Creating an Object Model from JSON Data
- Creating an Object Model from Application Code
- Navigating an Object Model
- Writing an Object Model to a Stream

Creating an Object Model from JSON Data

The following example shows how to create an object model from JSON data in a text file:

```
import java.io.FileReader;
import javax.json.Json;
import javax.json.JsonReader;
import javax.json.JsonStructure;
...
```

```
JsonReader reader = Json.createReader(new FileReader("jsondata.txt"));
JsonStructure jsonst = reader.read();
```

The object reference `jsonst` can be either of type `JsonObject` or of type `JsonArray`, depending on the contents of the file. `JsonObject` and `JsonArray` are subtypes of `JsonStructure`. This reference represents the top of the tree and can be used to navigate the tree or to write it to a stream as JSON data.

Creating an Object Model from Application Code

The following example shows how to create an object model from application code:

```
import javax.json.Json;
import javax.json.JsonObject;
...
JsonObject model = Json.createObjectBuilder()
   .add("firstName", "Duke")
   .add("lastName", "Java")
   .add("age", 18)
   .add("streetAddress", "100 Internet Dr")
   .add("city", "JavaTown")
   .add("state", "JA")
   .add("postalCode", "12345")
   .add("phoneNumbers", Json.createArrayBuilder()
      .add(Json.createObjectBuilder()
         .add("type", "mobile")
         .add("number", "111-111-1111"))
      .add(Json.createObjectBuilder()
         .add("type", "home")
         .add("number", "222-222-2222")))
   .build();
```

The object reference model represents the top of the tree, which is created by nesting invocations to the `add` methods and is built by invoking the `build` method. The `javax.json.JsonObjectBuilder` interface contains the following `add` methods:

```
JsonObjectBuilder add(String name, BigDecimal value)
JsonObjectBuilder add(String name, BigInteger value)
JsonObjectBuilder add(String name, boolean value)
JsonObjectBuilder add(String name, double value)
JsonObjectBuilder add(String name, int value)
JsonObjectBuilder add(String name, JsonArrayBuilder builder)
JsonObjectBuilder add(String name, JsonObjectBuilder builder)
JsonObjectBuilder add(String name, JsonValue value)
JsonObjectBuilder add(String name, long value)
JsonObjectBuilder add(String name, String value)
JsonObjectBuilder addNull(String name)
```

The `javax.json.JsonArrayBuilder` interface contains similar `add` methods that do not have a name (key) parameter. You can nest arrays and objects by passing a new `JsonArrayBuilder` object or a new `JsonObjectBuilder` object to the corresponding `add` method, as shown in this example.

The resulting tree represents the JSON data from JSON Syntax.

Navigating an Object Model

The following example shows a simple approach to navigating an object model:

```
import javax.json.JsonValue;
import javax.json.JsonObject;
import javax.json.JsonArray;
import javax.json.JsonNumber;
import javax.json.JsonString;
...
public static void navigateTree(JsonValue tree, String key) {
   if (key != null)
      System.out.print("Key " + key + ": ");
   switch(tree.getValueType()) {
      case OBJECT:
         System.out.println("OBJECT");
         JsonObject object = (JsonObject) tree;
         for (String name : object.keySet())
            navigateTree(object.get(name), name);
         break;
      case ARRAY:
         System.out.println("ARRAY");
         JsonArray array = (JsonArray) tree;
         for (JsonValue val : array)
            navigateTree(val, null);
         break;
      case STRING:
         JsonString st = (JsonString) tree;
         System.out.println("STRING " + st.getString());
         break;
      case NUMBER:
         JsonNumber num = (JsonNumber) tree;
         System.out.println("NUMBER " + num.toString());
         break;
      case TRUE:
      case FALSE:
      case NULL:
         System.out.println(tree.getValueType().toString());
         break;
   }
}
```

The `navigateTree` method can be used with the models shown in Creating an Object Model from JSON Data and Creating an Object Model from Application Code as follows:

```
navigateTree(model, null);
```

The `navigateTree` method takes two arguments: a JSON element and a key. The key is used only to help print the key-value pairs inside objects. Elements in a tree are represented by the `JsonValue` type. If the element is an object or an array, a new invocation to this method is made for every element contained in the object or array. If the element is a value, it is printed to standard output.

The `JsonValue.getValueType` method identifies the element as an object, an array, or a value. For objects, the `JsonObject.keySet` method returns a set of strings that contains the keys in the object, and the `JsonObject.get(String name)` method returns the value of the element whose key is `name`. For arrays, `JsonArray` implements the `List<JsonValue>` interface. You can use enhanced `for` loops with the `Set<String>` instance returned by `JsonObject.keySet` and with instances of `JsonArray`, as shown in this example.

The `navigateTree` method for the model shown in Creating an Object Model from Application Code produces the following output:

```
OBJECT
Key firstName: STRING Duke
```

```
Key lastName: STRING Java
Key age: NUMBER 18
Key streetAddress: STRING 100 Internet Dr
Key city: STRING JavaTown
Key state: STRING JA
Key postalCode: STRING 12345
Key phoneNumbers: ARRAY
OBJECT
Key type: STRING mobile
Key number: STRING 111-111-1111
OBJECT
Key type: STRING home
Key number: STRING 222-222-2222
```

Writing an Object Model to a Stream

The object models created in Creating an Object Model from JSON Data and Creating an Object Model from Application Code can be written to a stream using the `javax.json.JsonWriter` interface as follows:

```
import java.io.StringWriter;
import javax.json.JsonWriter;
...
StringWriter stWriter = new StringWriter();
JsonWriter jsonWriter = Json.createWriter(stWriter);
jsonWriter.writeObject(model);
jsonWriter.close();

String jsonData = stWriter.toString();
System.out.println(jsonData);

The Json.createWriter method takes an output stream as a parameter. The
JsonWriter.writeObject method writes the object to the stream. The JsonWriter.close
method closes the underlying output stream.

The following example uses try-with-resources to close the JSON writer automatically:

StringWriter stWriter = new StringWriter();
try (JsonWriter jsonWriter = Json.createWriter(stWriter)) {
   jsonWriter.writeObject(model);
}

String jsonData = stWriter.toString();
System.out.println(jsonData);
```

Streaming API

The streaming API is a low-level API designed to process large amounts of JSON data efficiently.

This API consists of the following interfaces:

Interface	Description
javax.json.stream.JsonParser	Contains methods to parse JSON in a streaming way. This interface provides forward, read-only access to JSON data using the pull parsing programming model. In this model the application code controls the thread and calls methods in the parser interface to move the parser forward or to obtain JSON data from the current state of the parser.
javax.json.stream.JsonGenerator	Contains methods to write JSON to an output source in a streaming way. This interface provides methods to write JSON to an output source. The generator writes name-value pairs in JSON objects and values in JSON arrays.

The following sections show examples of using the streaming API:

- Reading JSON Data Using a Parser
- Writing JSON Data Using a Generator
- Reading JSON Data Using a Parser
- Writing JSON Data Using a Generator

Reading JSON Data Using a Parser

The streaming API is the most efficient approach for parsing JSON text. The following example shows how to create a `JsonParser` object and how to parse JSON data using events:

```
import javax.json.Json;
import javax.json.stream.JsonParser;
...
JsonParser parser = Json.createParser(new StringReader(jsonData));
while (parser.hasNext()) {
   JsonParser.Event event = parser.next();
   switch(event) {
      case START_ARRAY:
      case END_ARRAY:
      case START_OBJECT:
      case END_OBJECT:
      case VALUE_FALSE:
      case VALUE_NULL:
      case VALUE_TRUE:
         System.out.println(event.toString());
         break;
      case KEY_NAME:
         System.out.print(event.toString() + " " +
                          parser.getString() + " - ");
         break;
      case VALUE_STRING:
      case VALUE_NUMBER:
         System.out.println(event.toString() + " " +
                            parser.getString());
         break;
   }
}
```

This example consists of three steps:

1. Obtain a parser instance by invoking the `Json.createParser` static method.

2. Iterate over the parser events using the `JsonParser.hasNext` and the `JsonParser.next` methods.
3. Perform local processing for each element.

The example shows the ten possible event types from the parser. The parser's `next` method advances it to the next event.

For the event types `KEY_NAME`, `VALUE_STRING`, and `VALUE_NUMBER`, you can obtain the content of the element by invoking the `JsonParser.getString` method.

For `VALUE_NUMBER` events, you can also use the following methods:

```
START_OBJECT
KEY_NAME firstName - VALUE_STRING Duke
KEY_NAME lastName - VALUE_STRING Java
KEY_NAME age - VALUE_NUMBER 18
KEY_NAME streetAddress - VALUE_STRING 100 Internet Dr
KEY_NAME city - VALUE_STRING JavaTown
KEY_NAME state - VALUE_STRING JA
KEY_NAME postalCode - VALUE_STRING 12345
KEY_NAME phoneNumbers - START_ARRAY
START_OBJECT
KEY_NAME type - VALUE_STRING mobile
KEY_NAME number - VALUE_STRING 111-111-1111
END_OBJECT
START_OBJECT
KEY_NAME type - VALUE_STRING home
KEY_NAME number - VALUE_STRING 222-222-2222
END_OBJECT
END_ARRAY
END_OBJECT
```

Writing JSON Data Using a Generator

The following example shows how to write JSON data to a file using the streaming API:

```
FileWriter writer = new FileWriter("test.txt");
JsonGenerator gen = Json.createGenerator(writer);
gen.writeStartObject()
   .write("firstName", "Duke")
   .write("lastName", "Java")
   .write("age", 18)
   .write("streetAddress", "100 Internet Dr")
   .write("city", "JavaTown")
   .write("state", "JA")
   .write("postalCode", "12345")
   .writeStartArray("phoneNumbers")
      .writeStartObject()
         .write("type", "mobile")
         .write("number", "111-111-1111")
      .writeEnd()
      .writeStartObject()
         .write("type", "home")
         .write("number", "222-222-2222")
      .writeEnd()
   .writeEnd()
.writeEnd();
gen.close();
```

This example obtains a JSON generator by invoking the `Json.createGenerator` static method, which takes a writer or an output stream as a parameter. The example writes JSON data to the

`test.txt` file by nesting invocations to the `write`, `writeStartArray`, `writeStartObject`, and `writeEnd` methods. The `JsonGenerator.close` method closes the underlying writer or output stream.

New Features for JSON Processing

The `javax.json` API supports new features of JSON Processing such as JSON Pointer, JSON Patch, and JSON Merge Patch. These features can be used to retrieve, transform or manipulate values in an object model.
This section includes the following topics:

- JSON Pointer
- JSON Patch
- JSON Merge Patch

In this section, the following sample JSON document is used to demonstrate the new features of JSON Processing. This sample contains name-value pairs and the value for the name `"phoneNumbers"` used in this sample, is an array whose elements are two objects.

```
{
   "firstName": "Duke",
   "lastName": "Java",
   "age": 18,
   "streetAddress": "100 Internet Dr",
   "city": "JavaTown",
   "state": "JA",
   "postalCode": "12345",
   "phoneNumbers": [
      { "Mobile": "111-111-1111" },
      { "Home": "222-222-2222" }
   ]
}
```

- JSON Pointer
  JSON Pointer defines a string syntax for referencing a location in the target.
- JSON Patch
- JSON Merge Patch

JSON Pointer

JSON Pointer defines a string syntax for referencing a location in the target.

A JSON Pointer, when applied to a target `JsonValue`, defines a reference location in the target. An empty JSON Pointer string defines a reference to the target itself.

`JsonPointer` provides the following methods:

where `contacts` is `JsonObject contacts = Json.createReader(new StringReader(jsonstring)).readObject();`

- `add()` - Adds new value or member.

```
/*add*/
JsonPointer pointer = Json.createPointer("/email");
contacts = pointer.add(contacts,Json.createValue("duke@example.com"));
```

- `containsValue()` - Checks if the value is present.

```
/*containsValue*/
JsonPointer pName = Json.createPointer("/firstName");
boolean exist = pName.containsValue("John");
```

- `getValue()` - Fetches a single value.

```
/*getValue*/
JsonPointer pPhone = Json.createPointer("/phoneNumber/0");
Jsonvalue mobileNumber = (pPhone.getValue(contacts);
```

- `remove()` - Removes the value at the target location.

```
/*remove*/
JsonPointer pRemove = Json.createPointer("/phoneNumber/0");
contacts = pRemove.remove(contacts);
```

- `replace()` - Replaces the value at the target location.

```
/*replace*/
JsonPointer pAge = Json.createPointer("/age");
pAge.replace(contacts,30);
```

The following is the resultant JSON document after running the JSON Pointer examples:

```
{
   "firstName": "Duke",
   "lastName": "Java",
   "age": 30,
   "email": "duke@example.com",
   "streetAddress": "100 Internet Dr",
   "city": "JavaTown",
   "state": "JA",
   "postalCode": "12345",
   "phoneNumbers": [
      { "Home": "222-222-2222" }
   ]
}
```

See JSON Pointer RFC.

JSON Patch

JSON Patch defines a format for expressing a sequence of operations to be applied to a JSON document.

`JsonPatch` mainly consists of two interfaces:

- `JsonPatch` - Provides `apply()`, `toJsonArray()` methods.
- `JsonPatchBuilder` - Provides `add()`, `copy()`, `move()`, `replace()`, `remove()`, and `test()` methods.

A `JsonPatch` can be constructed using the following approaches:

- Constructing a JSON Patch with `JsonPatchBuilder`

```
JsonObject contacts = buildPerson();
JsonPatchBuilder builder = Json.createPatchBuilder();
JsonObject result = builder.add("/email","john@example.com")
                           .replace("/age", 30)
                           .remove("/phoneNumber")
                           .test("/firstName", "John")
                           .copy("/address/lastName", "/
lastName")
                           .build()
                           .apply(contacts);
```

- Constructing a JSON Patch with `JsonPatch`

```
JsonArray patch=Json.createArrayBuilder().add(Json.createObjectBuilder()
                                              .add("op","replace")
                                              .add("path","/age")
                                              .add("value", 30))
                                              .build();
JsonPatch jsonPatch = Json.createPatch(patch);
JsonObject result1 = jsonPatch.apply(buildPerson());
command: [{"op":"replace","path":"/age","value":30}
```

See JSON Patch RFC.

JSON Merge Patch

JSON Merge Patch defines a format and processing rules for applying operations to a JSON document that are based upon specific content of the target document.

`JsonMergePatch` describes changes to be made to a target JSON document using a syntax that closely mimics the document being modified.

Table 10-1 JsonMergePatch syntax

Original	Patch	Result
{"a":"b"}	{"a":"c"}	{"a":"c"}
{"a":"b"}	{"b":"c"}	{"a":"b","b":"c"}
{"a":"b"}	{"a":null}	{}
{"a":"b","b":"c"}	{"a":null}	{"b":"c"}

You can create a JSON Merge Patch from:

- An existing `JSONMergePatch`

```
JsonValue contacts = ... ; // The target to be patched
JsonValue patch = ...  ; // JSON Merge Patch
JsonMergePatch mergePatch = Json.createMergePatch(patch);
JsonValue result = mergePatch.apply(contacts);
```

- A difference between two `JsonValues`

```
//The source object
JsonValue source = ... ;
// The modified object
JsonValue target = ... ;
// The diff between source and target in a Json Merge Patch format
JsonMergePatch mergePatch = Json.createMergeDiff(source,target);
```

See JSON Merge Patch RFC.

If you selected to install the Server Examples, the JSON P 1.1 examples are located in the `ORACLE_HOME\wlserver\samples\server\examples\src\examples\javaee8\jsonp` directory, where `ORACLE_HOME` represents the directory in which you installed WebLogic Server.

11

Java API for JSON Binding

JSON Binding (JSON-B) is a standard binding layer for converting Java objects to or from JSON messages. Oracle WebLogic Server 14.1.1.0.0 supports the Java API for JSON Binding 1.0 (JSR 367) specification by including the JSR-367 reference implementation for use with applications deployed on a WebLogic Server instance.

JSON-B defines a default mapping algorithm for converting existing Java classes to JSON, while enabling developers to customize the mapping process through the use of Java annotations. For more information, see:

- JSON Binding in *The Java EE 8 Tutorial*.
- *JSON Binding 1.0 Users Guide*
- JSON Binding package summary

This chapter includes the following sections:

- About Default Mapping
- About Customized Mapping
- Standard Support to Handle Application or JSON Media Type for JAX-RS

- About Default Mapping
  Default mapping is a set of rules used by the JSON-B engine by default without any customization annotations and custom configuration provided.
- About Customized Mapping
  You can customize your mapping in many ways. Use JSON-B annotations for compile time customizations and `JsonbConfig` class for runtime customizations.
- Standard Support to Handle Application or JSON Media Type for JAX-RS
  In a product that supports the Java API for JSON-B, implementations must support entity providers for all Java types supported by JSON-B in combination with the media types - `application/json`, `text/json`, and any other media types matching `*/json` or `*/*+json`.

About Default Mapping

Default mapping is a set of rules used by the JSON-B engine by default without any customization annotations and custom configuration provided.

This mapping is used for serializing and deserializing basic Java types (such as `java.lang.String`, `java.lang.Long`, and `java.lang.Boolean`), Java SE types (such as `java.math.BigInteger` and `java.util.Optional`), and Java date and time classes.

The main entry point in JSON-B is the `Jsonb` class. It provides a set of overloaded `toJson` and `fromJson` methods to serialize Java objects to JSON documents and deserialize them back. `Jsonb` instances are thread safe and can be reused. It is recommended to have a single instance per configuration type.

You can map an object, a collection, or a generic collection:

- Mapping an object

To map an object, you must first create a `Jsonb` instance, and use the `toJson` method to serialize to JSON and the `fromJson` method to deserialize back to an object.

- Mapping a collection or a generic collection

  JSON-B supports collections and generic collections handling. For proper deserialization, the runtime type of the resulting object needs to be passed to JSON-B during deserialization.

For more information about default mapping, see:

- Default Mapping in *JSON Binding 1.0 Users Guide*
- Using the Default Mapping in *The Java EE 8 Tutorial*

About Customized Mapping

You can customize your mapping in many ways. Use JSON-B annotations for compile time customizations and `JsonbConfig` class for runtime customizations.

JSON-B supports the following customizations:

- Creating custom configurations with formatted output
- Changing property names
- Customizing the order of serialized properties
- Ignoring properties
- Changing the default null handling
- Using custom instantiation
- Changing the date and number formats
- Using binary encoding
- Using adapters
- Using serializer and deserializer classes
- Using strict I-JSON support

For more information about customized mapping, see:

- Customized Mapping in *JSON Binding 1.0 Users Guide*
- Using Customizations in *The Java EE 8 Tutorial*

Standard Support to Handle Application or JSON Media Type for JAX-RS

In a product that supports the Java API for JSON-B, implementations must support entity providers for all Java types supported by JSON-B in combination with the media types - `application/json`, `text/json`, and any other media types matching `*/json` or `*/*+json`.

> **Note:**
>
> If both JSON-B and JSON-P are supported in the same environment, entity providers for JSON-B take precedence over those for JSON-P, for all types except `JsonValue` and its sub-types. Note the precedence with JSON-P.

If you selected to install the WebLogic Server Examples, you'll find an example that demonstrates how to use the Java API for JSON Binding with JAX-RS in the *ORACLE_HOME*`\wlserver\samples\server\examples\src\examples\javaee8\jsonb\jaxrs` directory of your WebLogic Server distribution, where *ORACLE_HOME* represents the directory in which you installed WebLogic Server. For more information about the WebLogic Server code examples, see Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

12

Understanding WebLogic Server Application Classloading

Java classloader is a part of the Java virtual machine (JVM) that loads classes into memory. WebLogic Server Java EE application classloading enables WebLogic Server to host multiple isolated applications within the same JVM.
This chapter includes the following sections:

- 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.
- 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. WebLogic Server application classloading allows WebLogic Server to host multiple isolated applications within the same JVM.
- Resolving Class References Between Modules and Applications
  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.
- Using the Classloader Analysis Tool (CAT)
  CAT is a Web-based class analysis tool that 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.
- 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.
- 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.

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.

- Java Classloader Hierarchy
- Loading a Class
- prefer-web-inf-classes Element
- Changing Classes in a Running Program

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").

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 prefer-web-inf-classes Element section discusses this in more detail.

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 instances created from the server's definition. If such instances are mixed, a `ClassCastException` results.

Example 12-1 illustrates the `prefer-web-inf-classes` element, its description and default value.

Example 12-1 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);
```

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. WebLogic Server Application Classloading discusses this topic.

Class Caching With the Policy Class Loader

The Policy Class Loader (PCL) is the default system class loader when starting WebLogic Server using a startWebLogic script. The Policy Class Loader improves class loader performance and server startup time through class caching and indexing and is supported in any WebLogic mode (development or production).

The Policy Class Loader caches loaded classes in a cache file. Upon subsequent starts, the cached classes are preloaded in bulk, improving performance in use cases that load a large number of classes from the system class loader, such as server startup. The Policy Class Loader also contains an eager index, which maps package names and JAR files containing the source code. This index improves lookup time for classes and reduces the time spent looking for missing classes or resources. Cached files are generated in the `DOMAIN_HOME/servers/weblogic_name/cache/classloader` directory.

> **Note:**
>
> Class Caching with the Policy Class Loader is only supported for JDK 8.

Policy Class Loader by default has the class caching not enabled. In WebLogic Server 12.1.3, you could enable class caching in development mode by setting the `CLASS_CACHE` environment variable in the `startWebLogic` script. For pre-existing 12.1.3 start scripts, continue to use the `CLASS_CACHE` variable to enable class caching. See Configuring Class Caching in Developing Applications for Oracle WebLogic Server 12c (12.1.3).

As of WebLogic Server 12.2.1, new domains use the Policy Class Loader by default for class caching. Any 12.1.3 domains that upgrade to 12.2.1 also automatically use the Policy Class Loader.

> **Note:**
>
> If you want to disable the Policy Class Loader and use the standard system class loader in JVM, set `USE_JVM_SYSTEM_LOADER=true` when you run the `startWebLogic` script.

Class Caching With Application Class Data Sharing

The Application Class Data Sharing (AppCDS) is a class loader optimization that supports archive files of predefined, validated, and linked classes.

This implementation improves the startup time of Oracle WebLogic Server and allows multiple JVMs on the same machine to share memory pages, thereby reducing overall memory usage.

To use this feature, do the following:

1. Generate Class List During WebLogic Server Trial
2. Generate AppCDS Archive
3. Run WebLogic Server With AppCDS Archive

Generate Class List During WebLogic Server Trial

Generate a class list by starting the WebLogic Server with the following option:

```
./startWebLogic.sh generateClassList
```

By default, the class list will be generated at `$DOMAIN_HOME/WebLogic.classlist`. You can change this by setting the value of `APPCDS_CLASS_LIST` when starting the WebLogic Server. For example:

```
APPCDS_CLASS_LIST=my.classlist ./startWebLogic.sh generateClassList
```

When you use class caching with AppCDS, the Policy Class Loader (PCL) will be disabled.

Generate AppCDS Archive

Generate an AppCDS archive using the command:

```
./generateArchive.sh
```

By default, the class list file will be available at `$DOMAIN_HOME/WebLogic.classlist`, and the archive file will be generated at `$DOMAIN_HOME/WebLogic.jsa`. You can change these filenames by setting the value of `APPCDS_CLASS_LIST` and `APPCDS_ARCHIVE` respectively, when running the `generateArchive.sh` command. For example:

```
APPCDS_CLASS_LIST=my.classlist APPCDS_ARCHIVE=myArchive.jsa ./
generateArchive.sh
```

Run WebLogic Server With AppCDS Archive

After you generate an AppCDS archive, run the WebLogic Server using this archive:

```
./startWebLogic.sh useArchive
```

You can change the default location of the AppCDS archive by setting the value of `APPCDS_ARCHIVE` when starting the WebLogic Server. For example:

```
APPCDS_ARCHIVE=myArchive.jsa ./startWebLogic.sh useArchive
```

AppCDS is not compatible with Policy Class Loader. Therefore, Policy Class Loader will be disabled.

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. WebLogic Server application classloading allows WebLogic Server to host multiple isolated applications within the same JVM.

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 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.

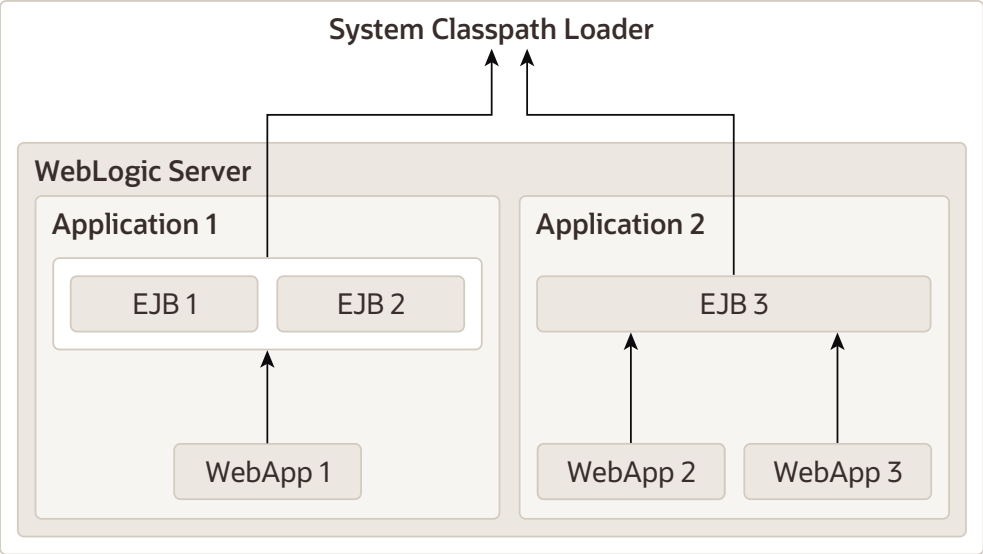
Application Classloader Hierarchy

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 12-1 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 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.

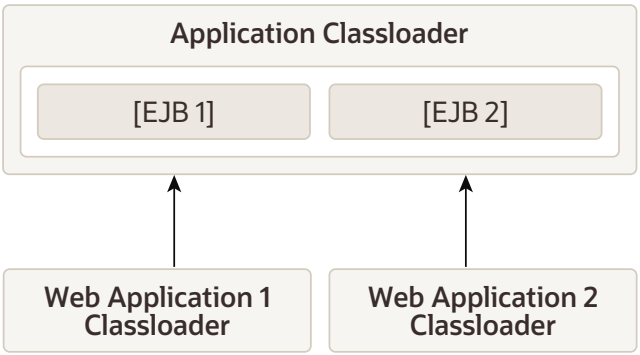
Custom Module Classloader Hierarchies

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 12-2 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

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:

```
<!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.

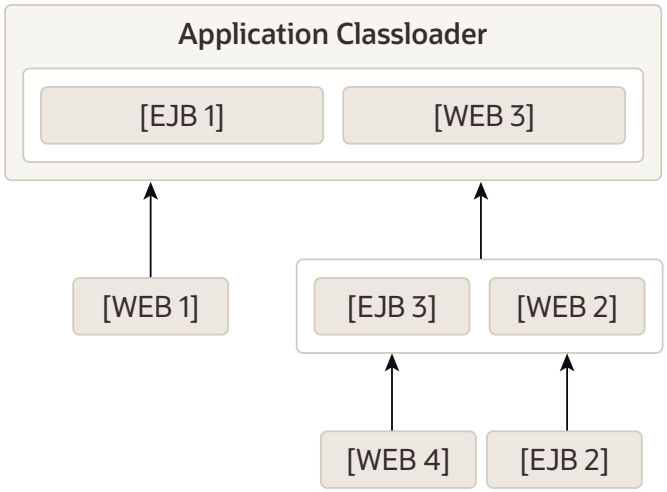
For more information on the DTD elements, refer to Enterprise Application Deployment Descriptor Elements.

The following is an example of a classloader declaration (defined in the `classloader-structure` element in `weblogic-application.xml`):

```
<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 12-3 Example Classloader Hierarchy



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.

- Servlet Reloading Disabled
- Nesting Depth
- Module Types
- Duplicate Entries
- Interfaces
- Call-by-Value Semantics
- In-Flight Work
- Development Use Only

Servlet Reloading Disabled

If you use a custom classloader hierarchy, servlet reloading is disabled for Web applications in that particular application.

Nesting Depth

Nesting is limited to three levels (including the application classloader). Deeper nestings lead to a deployment exception.

Module Types

Custom classloader hierarchies are currently restricted to Web and EJB modules.

Duplicate Entries

Duplicate entries lead to a deployment exception.

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.

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.

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.

Development Use Only

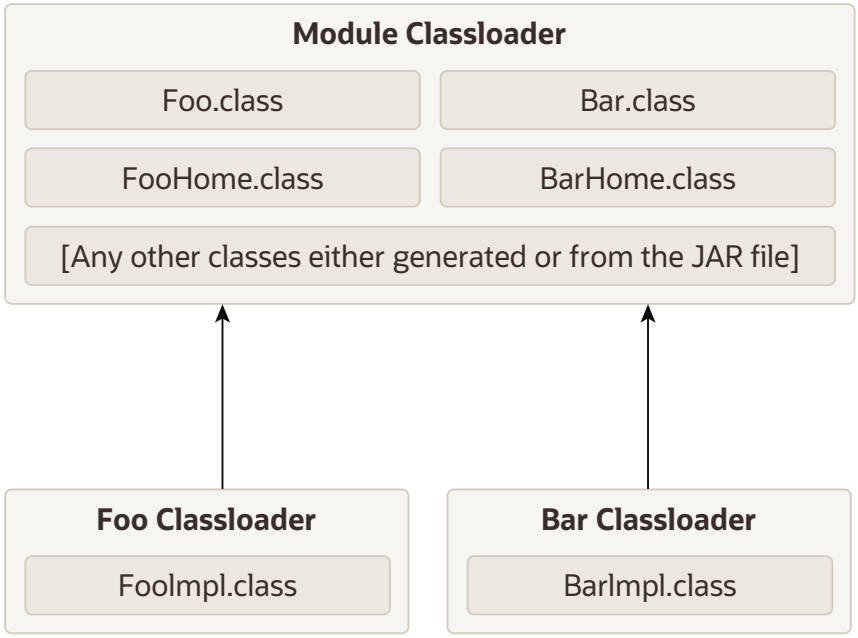
The development-use-only feature is intended for development use. Because updates are not atomic, this feature is not suitable for production use.

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 12-4 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 12-2 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 12-3 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.

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.

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 cannot override any WebLogic Server classes.

The following sections define and describe how to use a filtering classloader:

- What is a Filtering Classloader
- Configuring a Filtering Classloader

- Resource Loading Order

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.

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`. 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 Using the Classloader Analysis Tool (CAT).

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 12-4.

> **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 12-4 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 12-5, 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)
```

Example 12-5 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.

Resolving Class References Between Modules and Applications

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.

Your applications may use many different Java classes, including Enterprise Beans, servlets and JavaServer Pages, utility classes, and third-party packages. 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 Using the Classloader Analysis Tool (CAT).

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).

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.

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. More information about the manifest format can be found at: https://docs.oracle.com/en/java/javase/11/docs/specs/jar/jar.html

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`.

See http://docs.oracle.com/javase/tutorial/deployment/jar/manifestindex.html.

Using the Classloader Analysis Tool (CAT)

CAT is a Web-based class analysis tool that 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.

Opening the CAT Interface

CAT has a simple Web GUI that displays all your currently running applications and modules.

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.

In the navigation pane, select the application or module that you want to analyze; a brief description of it is shown in the right-side pane. Use the right-side pane to perform actions and analyses on the selected application or module, such as:

- Analyze classloading conflicts
- View the system and application classloaders
- Generate reports

How CAT Analyzes Classes

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

Identifying Class References through Manifest Hierarchies

Applications can have multiple manifest references to classes that are not directly present in the applications's classpath, but which are *chained* into the Classpath by manifest references. In some cases, application developers may not be aware that additional classes have been unknowingly pulled into the application's classpath from other JARs, which in turn have manifest references to other JARs.

CAT has the ability to search through an application's or module's classpath to detect and display the underlying chained manifest references, as shown in the following Sample EAR with Manifest Hierarchies example:

```
cat4mf.ear
  +- ejb.jar
  +- web-mf-in-root.war
  +- lib
      +- applib.jar
  +- apputil_1.jar
  +- apputil_1_1.jar
  +- apputil_1_1_1.jar
  +- apputil_1_2.jar
  +- apputil_1_2_1.jar
  +- ejbutil_1.jar
  +- ejbutil_1_1.jar
  +- ejbutil_1_2.jar
  +- ejbutil_1_2_1.jar
  +- webutil_1.jar
  +- webutil_1_1.jar
  +- webutil_1_1_1.jar
  +- webutil_2.jar
  +- webutil_2_1.jar
```

The `ejb.jar` has a manifest reference to `ejbutil_1.jar`, which has references to both `ejbutil_1_1.jar` and `ejbutil_1_2.jar`, which has a further reference to `ejbutil_1_2_1.jar`, as follows:

```
ejb.jar
   -> ejbutil_1.jar
          -> ejbutil_1_1.jar
          -> ejbutil_1_2.jar
                 -> ejbutil_1_2_1.jar
```

Using CAT to Display the Manifest References

1. Open the CAT tool, as described in Opening the CAT Interface.
2. Use the navigation pane to select the running application or module to analyze.

   Note: The manifest references can best be analyzed from the module level rather than the application level.
3. In the **Summary for Application** pane, click the **Classloader Tree** view to list all the classloaders for the selected application/module.
   - Selecting the **detailed** view from the menu displays the classpath of each classloader.
   - The hash code of each classloader is an active URL.
4. Click the classloader hash code URL you want to analyze.
5. The **Classloader** page defaults to the basic view, so select the **detailed** view to see the classpath and the classes loaded by the classloader.
6. Enter one of the loaded classnames in the **Resource to analyze** field (using the format `pckgname.classname`, and click **Analyze Resource**.
7. The **Manifest References** section of the detailed output provides the list of chained manifest references for the selected classname.

   Continuing with Sample EAR with Manifest Hierarchies example, the output should look like this:

```
path/to/user_projects/applications/cat4mf/y79s0z/ejb.jar
   path/to/user_projects/applications/cat4mf/y79s0z/ejbutil_1.jar
      path/to/user_projects/applications/cat4mf/y79s0z/ejbutil_1_2.jar
        path/to/user_projects/applications/cat4mf/y79s0z/ejbutil_1_2_1.jar
```

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 Creating Shared Java EE Libraries and Optional Packages.

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 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 DOMAIN_HOME\wl_server\lib
cp c:\3rdpartyjars\utility.jar
  DOMAIN_HOME\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.

13

Creating Shared Java EE Libraries and Optional Packages

You can share components and classes among applications using shared Java EE libraries and optional packages supported in WebLogic Server.
This chapter includes the following sections:

- 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.
- Web Application Shared Java EE Library Information
  Some of the shared Java EE libraries 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.
- 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.
- Accessing Registered Shared Java EE Library Information with LibraryRuntimeMBean
  You can use different types of MBeans to obtain information about the shared Java EE library and access the libraries that the applications use.
- 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.
- Best Practices for Using Shared Java EE Libraries

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 libraries can be referenced by enterprise applications and you can also create libraries that can be referenced only by another Web application.

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 class path of the referencing application, and the primary deployment descriptors of the

referencing application or module 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 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 Adding JARs to the Domain /lib Directory.

Optional Packages

WebLogic Server supports optional packages as described at `https://docs.oracle.com/javase/8/docs/technotes/guides/extensions/extensions.html` with versioning described in Optional Package Versioning (see `https://docs.oracle.com/javase/8/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.

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 Resolving Class References Between Modules and Applications and Organizing Shared Classes in a Split Development Directory.

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 `https://docs.oracle.com/javase/8/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 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. Referencing Shared Java EE Libraries in an Enterprise Application.

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.

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*.

Creating Shared Java EE Libraries

You can deploy the Java EE modules such as an EJB, a Web application, an enterprise application, a plain Java class, and others as a shared Java EE library. These modules can be shared among multiple enterprise applications in WebLogic Server.

To create a new shared Java EE library:

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 Assembling Shared Java EE Library Files.
2. Assemble optional package classes into a working directory.

   See 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 Editing Manifest Attributes for Shared Java EE Libraries.
4. Package the shared Java EE library for distribution and deployment.

   See Packaging Shared Java EE Libraries for Distribution and Deployment.

- Assembling Shared Java EE Library Files
- Assembling Optional Package Class Files
- Editing Manifest Attributes for Shared Java EE Libraries
- Packaging Shared Java EE Libraries for Distribution and Deployment

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 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 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.

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
   ```

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 13-1 describes the valid shared Java EE library manifest attributes.

Table 13-1 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 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 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 13-2)

> **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 Deploying Shared Java EE Libraries and Dependent Applications.

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 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.

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 13-2 describes the XML elements that define a library reference.

Table 13-2 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`.

Table 13-2 (Cont.) weblogic-application.xml Elements for Referencing a Shared Java EE Library

Element	Description
`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 13-2.)
`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 13-2.)
`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 13-2.)
`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 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>
```

- Overriding context-roots Within a Referenced Enterprise Library
- URIs for Shared Java EE Libraries Deployed As a Standalone Module

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 13-3 describes the XML elements that override `context-root` in a library reference.

Table 13-3 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.

Table 13-3 (Cont.) weblogic-application.xml Elements for Overriding a Shared Java EE Library

Element	Description
`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`.

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.

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 13-4 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 13-2.) 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 13-2.) 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.

Using weblogic.appmerge to Merge Libraries

You can use `weblogic.appmerge` to understand a library merge by examining the merged application you have written to disk.

`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.

- Using weblogic.appmerge from the CLI
- Using weblogic.appmerge as an Ant Task

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 13-5:

Table 13-5 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
```

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>
```

Integrating Shared Java EE Libraries with the Split Development Directory Environment

You can generate a basic *build.xml* file in the shared Java EE library directories and then build the applications in a split development directory.

The `BuildXMLGen` includes a `-librarydir` option to generate build targets that include one or more shared Java EE library directories. See 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 Building Applications in a Split Development Directory.

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 WebLogic Server Administration Console. See Target a Shared Java EE Library to a Server or Cluster for instructions on using the WebLogic Server 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 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.

Web Application Shared Java EE Library Information

Some of the shared Java EE libraries 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 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.

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 WebLogic Server 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.

Accessing Registered Shared Java EE Library Information with LibraryRuntimeMBean

You can use different types of MBeans to obtain information about the shared Java EE library and access the libraries that the applications use.

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 `ApplicationRuntimeMBean`s 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.

See the *Java API Reference for Oracle WebLogic Server*.

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 WebLogic Server internally merges the information 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.

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.

14

Programming Application Life Cycle Events

Learn how to create applications that respond to WebLogic Server application life cycle events. This chapter includes the following sections:

- Understanding Application Life Cycle Events
- Registering Events in weblogic-application.xml
- Programming Basic Life Cycle Listener Functionality
- Examples of Configuring Life Cycle Events with and without the URI Parameter
- Understanding Application Life Cycle Event Behavior During Re-deployment
- 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.

- Understanding Application Life Cycle Events
  Application life cycle listener events provide handles on which developers can control behavior during deployment, undeployment, and redeployment. Learn how you can use the application life cycle listener events.
- Registering Events in weblogic-application.xml
  You must register the application life cycle listener events in the `weblogic-application.xml` deployment descriptor in order to use them.
- Programming Basic Life Cycle Listener Functionality
  You can create a listener by extending the abstract class (provided with WebLogic Server) `weblogic.application.ApplicationLifecycleListener`. The container then searches for your listener.
- Examples of Configuring Life Cycle Events with and without the URI Parameter
  You can configure application life cycle events with or without using the URI parameter in the `weblogic-application.xml` deployment descriptor file.
- Understanding Application Life Cycle Event Behavior During Redeployment
  Application life cycle events are only triggered if a full redeployment of the application occurs. During a full redeployment 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.
- Programming Application Version Life Cycle Events
  Learn how to create applications that respond to WebLogic Server application version life cycle events.

Understanding Application Life Cycle Events

Application life cycle listener events provide handles on which developers can control behavior during deployment, undeployment, and redeployment. Learn 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.

> **Note:**
>
> 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).

Registering Events in weblogic-application.xml

You must register the application life cycle listener events in the `weblogic-application.xml` deployment descriptor in order to use them.

See 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.

Programming Basic Life Cycle Listener Functionality

You can 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 14-1 illustrates how you override the ApplicationLifecycleListener. In this example, the public class MyListener extends ApplicationLifecycleListener.

Example 14-1 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 14-2 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 14-2 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 14-3 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 14-3 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
}
```

- Configuring a Role-Based Application Life Cycle Listener

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 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.

Examples of Configuring Life Cycle Events with and without the URI Parameter

You can configure application life cycle events with or without using the URI parameter in the `weblogic-application.xml` deployment descriptor file.

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 14-4 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 14-5 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>
```

Understanding Application Life Cycle Event Behavior During Redeployment

Application life cycle events are only triggered if a full redeployment of the application occurs. During a full redeployment 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{}`

Programming Application Version Life Cycle Events

Learn how to create applications that respond to WebLogic Server application version life cycle events.

- Understanding Application Version Life Cycle Event Behavior
- Types of Application Version Life Cycle Events
- Example of Production Deployment Sequence When Using Application Version Life Cycle Events

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 Enterprise Application Deployment Descriptor Elements and 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.

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.

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 14-1 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.	
Deployment of Version V1	T1	Deployment starts.	
Deployment of Version V1	T2	Application life cycle listeners for V1 are registered.	
Deployment of Version V1	T3	V1 is active version, Deployment is complete.	
Deployment of Version V1	T4	`postDeploy(V1)` invoked.	
Deployment of Version V1	T5	Application Listeners gets `postDeploy(V1)`.	

Table 14-1 (Cont.) Sequence of Deployment Actions and Application Version Life Cycle Events

Deployment action	Time	Version V1	Version V2
Production Redeployment of Version V2	T6		`preDeploy(V2)` invoked.
Production Redeployment of Version V2	T7	Application version listener receives `preDeploy(V1)`.	
Production Redeployment of Version V2	T8		Deployment starts.
Production Redeployment of Version V2	T9		Application life cycle listeners for V2 are registered.
Production Redeployment of Version V2	T10	If deploy(V2) succeeds, V1 ceases to be active version.	If deploy(V2) succeeds, V2 replaces V1 as active version. Deployment is complete.
Production Redeployment of Version V2	T11		`postDeploy(V2)` invoked. **Note:** This event occurs even if the deployment fails.
Production Redeployment of Version V2	T12	Application version listener gets `postDeploy(V2)`. If deploy(V2) fails, V1 remains active.	
Production Redeployment of Version V2	T13		Application listeners gets `postDeploy(V2)`.
Production Redeployment of Version V2	T14	If deploy(V2) succeeds, V1 begins retirement.	
Production Redeployment of Version V2	T15	Application listeners for V1 are unregistered.	
Production Redeployment of Version V2	T16	V1 is retired.	
Undeployment of V2	T17		`preUndeploy(v2)` invoked.
Undeployment of V2	T18		Application listeners gets `preUndeploy(v2)` invoked.
Undeployment of V2	T19		Undeployment begins.
Undeployment of V2	T20		V2 is no longer active version.
Undeployment of V2	T21		Application version listeners for V2 are unregistered.
Undeployment of V2	T22		Undeployment is complete.
Undeployment of V2	T23		If the entire application is undeployed, `postDelete(V2)` is invoked. **Note:** This event occurs even if the undeployment fails.

15

Programming Context Propagation

Learn how to use the context propagation APIs in WebLogic Server applications.
This chapter includes the following sections:

- Understanding Context Propagation
- Programming Context Propagation: Main Steps
- Programming Context Propagation in a Client
- Programming Context Propagation in an Application
- 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.
- Programming Context Propagation: Main Steps
  You can associate information to a request on a client, retrieve that information on the server, and then retrieve the value updated by the server instance using context propagation.
- Programming Context Propagation in a Client
  You can program context propagation to get “associated” user information when a client invokes an application.
- Programming Context Propagation in an Application
  You can program context propagation to get the user data and other associated information when the applications are invoked.

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 attaches information to a request through a `WorkContext`. This information follows the request to any process that supports context propagation through a `PropagationMode`. 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, usually related to the request, needs to be carried outside the application or to another 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. The ability of context propagation to tie information to a request greatly simplifies managing such data, in contrast to maintaining a map of request data in each application and then implementing custom code to transmit such information between applications or threads.

However, context propagation can occur within an application. For example, if an application submits work through a Work Manager, part of the processing occurs in different threads. Context propagation uses a `PropagationMode` to carry information to other threads.

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 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 15-1 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.

Programming Context Propagation: Main Steps

You can associate information to a request on a client, retrieve that information on the server, and then retrieve the value updated by the server instance using context propagation.

The following procedure describes the high-level steps to use context propagation with WebLogic Server. This example demonstrates how to associate information to a request on a client, how to retrieve that information on the server, and then how to retrieve the value updated by the server instance. 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 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 Programming Context Propagation in an Application.

Programming Context Propagation in a Client

You can program context propagation to get “associated” user information when a client invokes an application.

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 your 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{
    YourWorkAreaService service = new YourWorkAreaService(args[0] + "?WSDL");
    YourWorkAreaPortType 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;
```

- Substitute your implementation of the `WorkArea` service and port for your Web service for *`YourWorkAreaService`* and *`YourWorkAreaPortType`*.
- 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");
```

- The following code saves the `stringContext` under the `SESSION_ID` key in the `WorkContextMap`. Specifying the propagation mode of `SOAP` causes the propagation of the `stringContext` along any `SOAP` message sent to servers supporting context propagation.

```
map.put(SESSION_ID, stringContext, PropagationMode.SOAP);
```

Programming Context Propagation in an Application

You can program context propagation to get the user data and other associated information when the applications are invoked.

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;
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 WorkContextAwareWebService {
  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);
WorkContext modifiedLocalWC = PrimitiveContextFactory.create(localwc.get() + "
could be replaced by a new value...");
    map.put(SESSION_ID, newLocalWC, PropagationMode.SOAP);
    System.out.println("local context: " + localwc);
    System.out.println("sayHello: " + message);
    return "The server received message: " + message + ", with SESSION_ID: " + localwc;
   } 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 propagation mode is `SOAP` only, meaning that propagation occurs both to the server with the request and to the client with the response. The following code shows how the server instance could modify the `stringContext`:

  ```
  WorkContext modifiedLocalWC = PrimitiveContextFactory.create(localwc.get() + " could
  be replaced by a new value...");
  ```

- The following code replaces the work context with an updated value. When retrieving `SESSION_ID` on the client after the server returns the response, the value updated by the server is now present on the client.

  ```
  map.put(SESSION_ID, newLocalWC, PropagationMode.SOAP);
  ```

16

Programming JavaMail with WebLogic Server

Learn how to program JavaMail with WebLogic Server to add email capabilities to your WebLogic Server applications.
This chapter includes the following sections:

- Overview of Using JavaMail with WebLogic Server Applications
  WebLogic Server includes the JavaMail API version 1.5 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.
- 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.
- 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.
- Sending Messages with JavaMail
  You can send a message using JavaMail within a WebLogic Server module.
- Reading Messages with JavaMail
  The JavaMail 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.

Overview of Using JavaMail with WebLogic Server Applications

WebLogic Server includes the JavaMail API version 1.5 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.

Documentation for using the JavaMail API is available at https://javaee.github.io/javamail/. 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 https://maven.java.net/content/repositories/releases/com/sun/mail/pop3 and add it to the WebLogic Server classpath if you want to use it.

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 https://javaee.github.io/javamail/ThirdPartyProducts. Then add your extended JavaMail package in the WebLogic Server classpath *in front of* `weblogic.jar`.

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 WebLogic Server 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 WebLogic Server 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 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.

Sending Messages with JavaMail

You can send a message using JavaMail within a WebLogic Server module.

Here are the steps to send a message with JavaMail:

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 WebLogic Server 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.

Reading Messages with JavaMail

The JavaMail 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.

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. 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 WebLogic Server 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.

17

Threading and Clustering Topics

Learn 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:

- Using Threads in WebLogic Server
- Using the Work Manager API for Lower-Level Threading
- Programming Applications for WebLogic Server Clusters
- 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.
- 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.
- Programming Applications for WebLogic Server Clusters
  There are certain requirements and restrictions when you deploy JSPs and servlets, and EJBs to a WebLogic Server cluster. Also you need to understand the implications of binding clustered objects in the JNDI tree when you develop EJBs or custom RMI objects in a cluster.

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.

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.

See Using Work Managers to Optimize Scheduled Work in *Administering Server Environments for Oracle WebLogic Server*

Programming Applications for WebLogic Server Clusters

There are certain requirements and restrictions when you deploy JSPs and servlets, and EJBs to a WebLogic Server cluster. Also you need to understand the implications of binding clustered objects in the JNDI tree when you develop EJBs or custom RMI objects in a cluster.

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.

18

Developing OSGi Bundles for WebLogic Server Applications

Learn about 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:

- Understanding OSGi
  OSGi is a Java modularity system developed and maintained by the OSGi Alliance, of which Oracle is a member.
- Features Provided in WebLogic Server OSGi Implementation
  WebLogic Server allows you to configure and manage one or more instances of an OSGi framework. You can also create and deploy your own OSGi bundles.
- Configuring the OSGi Framework
  OSGi framework provides a secure and managed Java framework. You can configure and manage one or more instances of the framework and ensure persistence.
- Creating OSGi Bundles
  You use the OSGi API bundle that is located in `wlserver/server/lib/org.apache.felix.org.apache.felix.main.jar` to create your own OSGi bundle.
- Deploying OSGi Bundles
  After you create an OSGi bundle you can deploy the OSGi bundle on a target system and in the `osgi-lib` directory. In WebLogic Server you can deploy OSGi bundles from inside a JAR, EAR, or WAR file.
- 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.

- Using OSGi Logging Via WebLogic Server
  The Apache Felix implementation of the OSGi Log service is installed by default when you install WebLogic Server. The OSGi bundle registers with the OSGi logging service and sends logs from the OSGi logger to the WebLogic Server logger.
- 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.
- OSGI Example
  WebLogic Server includes two simple example OSGi 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.

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 `https://docs.osgi.org/specification/`.
- The OSGi Javadoc is available from `https://docs.osgi.org/specification/`.

As described on the OSGi Alliance Web page, "The OSGi Alliance is a worldwide consortium of technology innovators that advances a proven and mature process to create open specifications that enable the modular assembly of software built with Java technology. Modularity reduces software complexity; OSGi is the best model to modularize Java.."

The OSGi Architecture Web page 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:

- 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.

Features Provided in WebLogic Server OSGi Implementation

WebLogic Server allows you to configure and manage one or more instances of an OSGi framework. You can also create and deploy your own OSGi bundles.

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 Weblogic Server 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.

Configuring the OSGi Framework

OSGi framework provides a secure and managed Java framework. You can configure and manage one or more instances of the framework and ensure persistence.

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.

- Configuring OSGi Framework Instances
- Configuring OSGi Framework Persistence
- Configuring OSGi Framework Instances

- Configuring OSGi Framework Persistence
- Using OSGi Services
- Connecting to an OSGi Console

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 18-1.

Table 18-1 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.
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 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 WebLogic Server 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 18-3 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/documentation/subprojects/apache-felix-framework/apache-felix-framework-configuration-properties.html`.

Table 18-1 (Cont.) OSGi Framework Attributes

Attribute	Usage
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.

- Configuring OSGi Framework Instance From Administration Console
- Configuring OSGi Framework Instance From config.xml
- Configuring OSGi Framework Instance From WLST
- Configuring OSGi Framework Instance from a Java Program
- Parameter Required for Installing Bundles in the Framework

Configuring OSGi Framework Instance From Administration Console

You can configure an OSGi framework from the WebLogic Server 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 18-1 for a description of the attributes.

See Configure OSGi Frameworks in the *Oracle WebLogic Server Administration Console Online Help*.

Configuring OSGi Framework Instance From config.xml

Example 18-1 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 18-1 Configuring OSGi Framework Instance From config.xml

```
<osgi-framework>
       <name>test-osgi-frame</name>
       <target>AdminServer</target>
   </osgi-framework>
```

Configuring OSGi Framework Instance From WLST

Example 18-2 shows an example of using WLST to add the OSGi framework to be used by the WebLogic Server instance.

Example 18-2 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
```

Configuring OSGi Framework Instance from a Java Program

Example 18-3 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 18-3 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);
```

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 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.

Configuring OSGi Framework Persistence

OSGi has a persistence mechanism, described in http://www.osgi.org/javadoc/r4v43/core/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 18-1 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.

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 (https://www.osgi.org/resources/) 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.

Connecting to an OSGi Console

To view details such as the versions, lifecycle state, and others in the OSGi framework that you configured, you have to connect to an OSGi console. There are many Felix consoles. However, WebLogic Server includes the Apache Felix implementation of the OSGi framework. WebLogic Server release includes a version of Apache Felix that corresponds to the OSGi R6 framework. For information about the specific version of Apache Felix that is included in WebLogic Server, see Third-Party Products in Oracle Fusion Middleware in *Oracle® Fusion Middleware Licensing Information User Manual*. The content of this document applies to all versions of WebLogic Server 12c. This framework is packaged as *org.apache.felix.org.apache.felix.main.jar* in the WebLogic Server distribution. There are other shells and consoles such as the GoGo console, all of them involve the same basic steps.

1. Getting the required bundles
2. Starting the required bundles
3. Connecting to the console

To connect to Apache Felix Remote Shell in the development environment, do the following:

1. Download the Felix Shell and Felix Remote Shell bundles from the downloads page in http://felix.apache.org.
2. Install and start these bundles in one of following ways:
   - Place the bundles under `$ORACLE_HOME/wlserver/server/osgi-lib`
   - Create an application that contains these two bundles and then deploy that application after creating the OSGi framework.
3. Create and start an OSGi framework from the WebLogic Server console.

Use telnet to connect to the console which listens on localhost port 6666 by default.

- `help` lists all the available commands
- `ps` lists all bundles and what state they are in

Creating OSGi Bundles

You use the OSGi API bundle that is located in `wlserver/server/lib/org.apache.felix.org.apache.felix.main.jar` 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.

Deploying OSGi Bundles

After you create an OSGi bundle you can deploy the OSGi bundle on a target system and in the `osgi-lib` directory. In WebLogic Server you can deploy OSGi bundles from inside a JAR, EAR, or WAR file.

- Preparing to Deploy an OSGi Bundle on a Target System
- Deploying OSGi Bundles in the osgi-lib Directory

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*.

- Preparing to Deploy Bundles as Enterprise Applications
- Preparing to Deploy Bundles as Web Applications
- Global Work Managers
- Global Data Sources

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 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 18-1 shows an example of updating config.xml to add the OSGi framework used by the WebLogic Server.

Example 18-4 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 18-4 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 18-4 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.

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 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 18-1 shows an example of updating config.xml to add the OSGi framework used by the WebLogic Server.

Example 18-5 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 18-5 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 18-4 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.

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 18-1.

You can determine which global work manager is in use from a Java application, as shown in Example 18-7.

Example 18-6 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);
      }
    }
```

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 18-1.

You can determine which global data source is in use from a Java application, as shown in Example 18-7.

Example 18-7 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) {
```

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 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.

- Setting the Start Level and Run Level for a Bundle

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.

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 18-8 shows how to access a bundle that you create from JNDI.

Example 18-8 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;

  }

}
```

Using OSGi Logging Via WebLogic Server

The Apache Felix implementation of the OSGi Log service is installed by default when you install WebLogic Server. The OSGi bundle registers with the OSGi logging service and sends logs from the OSGi logger to the WebLogic Server logger.

The Apache Felix implementation of the OSGi Log service is installed by default in the installation directory *WL_HOME*/server/osgi-lib.

An OSGi bundle com.oracle.weblogic.osgi.logger_*relnum*.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 18-2.

Table 18-2 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

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 18-1) 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.

OSGI Example

WebLogic Server includes two simple example OSGi 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.

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 *ORACLE_HOME*`wl_server/examples/src/examples/osgi/osgiApp`, where *ORACLE_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*.

19

Using the WebSocket Protocol in WebLogic Server

WebLogic Server supports the WebSocket protocol (RFC 6455), which provides full-duplex communications between two peers over the TCP protocol. The WebLogic Server implementation of the WebSocket protocol and its accompanying API enable you to develop and deploy applications that communicate bidirectionally with clients. Although you can use the WebSocket protocol for any type of client-server communication, the implementation is most commonly used to communicate with browsers running Web pages that use the World Wide Web Consortium (W3C) JavaScript WebSocket API. The WebLogic Server implementation of the WebSocket protocol also supports Java clients.
This chapter includes the following sections:

- Overview of Creating a WebSocket Application
  The Java API for WebSocket (JSR-356) enables you to create, configure, and deploy WebSocket endpoints in web applications. The WebSocket client API specified in JSR-356 also enables you to access remote WebSocket endpoints from any Java application.
- Creating an Endpoint
  The container creates one instance of an endpoint for each connection to its deployment URI. Each instance retains user state for each connection and simplifies development.
- Handling Life Cycle Events for a WebSocket Connection
  Different life cycle events for a WebSocket connection such as connection opened, message received, error, and connection closed are handled differently in an annotated endpoint and a programmatic endpoint.
- Defining, Injecting, and Accessing a Resource for a WebSocket Endpoint
  The Java API for WebSocket allows you to use Contexts and Dependency Injection (CDI) to inject and access a resource that a WebSocket endpoint requires. You can use the injected resource from within a method for handling a lifecycle event for a WebSocket connection.
- Sending a Message
  The Java API for WebSocket enables you to send text messages, binary messages, and ping frames from an endpoint to its connected peers.
- Encoding and Decoding a WebSocket Message
  The Java API for WebSocket provides support for converting between WebSocket messages and custom Java types by using encoders and decoders. This mechanism simplifies WebSocket applications because it decouples the business logic from the serialization and deserialization of objects.
- Specifying a Part of an Endpoint Deployment URI as an Application Parameter
  The `ServerEndpoint` annotation enables you to use a level 1 URI template to specify parts of an endpoint deployment URI as application parameters. A URI template describes a range of URIs through variable expansion.
- Maintaining Client State
  Because the container creates an instance of the endpoint class for every connection, you can define and use instance variables to store client state information.
- Configuring a Server Endpoint Programmatically
  The Java API for WebSocket enables you to configure how the container creates server endpoint instances.
- Building Applications that Use the Java API for WebSocket
  The Java API for WebSocket is located within the `wlserver/server/lib/api.jar` file. To build applications that use the Java API for WebSocket, define this library in the classpath when compiling the application.
- Deploying a WebSocket Application
  In WebLogic Server, you deploy a WebSocket application as part of a standard Java EE Web application archive (WAR), either as a standalone Web application or a WAR module within an enterprise application.
- Monitoring WebSocket Applications
  You can monitor message statistics and runtime properties for WebSocket applications and endpoints. Endpoint-level monitoring collects information per individual endpoint, while application-level monitoring aggregates information from all endpoints deploying in the given application.
- 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 WebSocket protocol.

- Writing a WebSocket Client
  A WebSocket client application is typically a browser-based client. The Java API for WebSocket can also be used to write a Java WebSocket client.
- Securing a WebSocket Application
  In WebLogic Server, you deploy a WebSocket application as a Web application archive (WAR), either as a standalone Web application or a WAR module within an enterprise application. Therefore, many security practices that you apply to securing Web applications can apply to WebSocket applications.
- Enabling Protocol Fallback for WebSocket Messaging
  Protocol fallback provides a mechanism for using an alternative transport for WebSocket messaging when the WebSocket protocol is not supported. Typically the WebSocket protocol is not supported either because the WebSocket object is not available or because WebSocket frames are blocked by a firewall. In this release, the only supported alternative transport is HTTP Long Polling.
- Migrating an Application to the JSR 356 Java API for WebSocket from the Deprecated API
  To ensure compatibility of your WebSocket applications with future releases of WebLogic Server, use the JSR 356 Java API for WebSocket instead of the deprecated packages.
- Example of Using the Java API for WebSocket with WebLogic Server
  Examine an example in which a server endpoint echoes text that a user has sent from a client. When the user sends a text message, the server appends the text (from your server) to the message and sends the message back to the user.

Understanding the WebSocket Protocol

WebSocket is an application protocol that provides simultaneous two-way communication over a single TCP connection between a client and a server. The WebSocket protocol enables the client and the server to send data independently.

As part of the HTML5 specification (`http://www.w3.org/TR/html5/`), the WebSocket Protocol is supported by most browsers. A browser that supports the WebSocket protocol provides a JavaScript API to connect to endpoints, send messages, and assign callback methods for WebSocket events (such as opened connections, received messages, and closed connections).

For general information about the WebSocket Protocol, see `http://tools.ietf.org/html/rfc6455`.

- Limitations of the HTTP Request-Response Model
- WebSocket Endpoints
- Handshake Requests in the WebSocket Protocol
- Messaging and Data Transfer in the WebSocket Protocol

Limitations of the HTTP Request-Response Model

In the traditional request-response model used in HTTP, the client requests resources and the server provides responses. The exchange is always initiated by the client; the server cannot send any data without the client requesting it first. This model worked well for the World Wide Web when clients made occasional requests for documents that changed infrequently, but the limitations of this approach are increasingly apparent as content changes quickly and users expect a more interactive experience on the web. The WebSocket protocol addresses these limitations by providing a full-duplex communication channel between the client and the server.

Combined with other client technologies, such as JavaScript and HTML5, WebSocket enables web applications to deliver a richer user experience.

WebSocket Endpoints

In a WebSocket application, the server publishes a WebSocket **endpoint** and the client uses the endpoint's URI to connect to the server.

A WebSocket endpoint is represented by a URI in one of the following formats:

```
ws://host:port/path?query
wss://host:port/path?query
```

The `ws` scheme represents an unencrypted WebSocket connection.

The `wss` scheme represents an encrypted WebSocket connection.

The remaining components in these formats are as follows:

host
The host as defined in [RFC3986], Section 3.2.2.

port
Optional. The port as defined in [RFC3986], Section 3.2.3. The default port number is 80 for unencrypted connections and 443 for encrypted connections.

path
The path as defined in [RFC3986], Section 3.3. In a WebSocket endpoint, the path indicates the location of the endpoint within a server.

query
Optional. A query as defined in [RFC3986], Section 3.4.

Handshake Requests in the WebSocket Protocol

To initiate a WebSocket connection, the client sends a handshake request to a WebSocket endpoint that the server has published. The client locates the endpoint by using the end point's URI. The connection is established if the handshake request passes validation, and the server accepts the request. The handshake is compatible with existing HTTP-based infrastructure: web servers interpret the handshake as an HTTP connection upgrade request.

Example 19-1 Handshake Request from a WebSocket Client

The following example shows a handshake request from a client.

```
GET /path/to/websocket/endpoint HTTP/1.1
Host: localhost
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Key: xqBt3ImNzJbYqRINxEFlkg==
Origin: http://localhost
Sec-WebSocket-Version: 13
```

Example 19-2 Server Response to a Handshake Request from a WebSocket Client

The following example shows a handshake from a server in response to a handshake request from a client.

```
HTTP/1.1 101 Switching Protocols
Upgrade: websocket
```

```
Connection: Upgrade
Sec-WebSocket-Accept: K7DJLdLooIwIG/MOpvWFB3y3FE8=
```

The server applies a known operation to the value of the `Sec-WebSocket-Key` header to generate the value of the `Sec-WebSocket-Accept` header. The client applies the same operation to the value of the `Sec-WebSocket-Key` header. If the result matches the value received from the server, the connection is established successfully. The client and the server can send messages to each other after a successful handshake.

Messaging and Data Transfer in the WebSocket Protocol

The WebSocket protocol is symmetrical after the connection has been established: the client and the WebLogic Server instance can send messages to each other at any time while the connection is open, and they can close the connection at any time. Typically, clients connect to only one server, but servers accept connections from multiple clients.

WebSocket supports text messages (encoded as UTF-8) and binary messages. The control frames in WebSocket are *close*, *ping*, and *pong* (a response to a *ping* frame). Ping and pong frames may also contain application data.

Understanding the WebLogic Server WebSocket Implementation

The WebLogic Server WebSocket implementation supports JSR 356 Java API for Websocket.

For more information about the Java API for WebSocket, see the JSR 356 specification `http://www.jcp.org/en/jsr/detail?id=356`:

> **Note:**
>
> The proprietary WebLogic Server WebSocket API that was introduced in release 12.1.2 is deprecated but remains supported for backward compatibility.
>
> Although the JSR 356 Java API for WebSocket coexists with the proprietary WebLogic Server WebSocket API, an application cannot contain calls to both APIs. Only one of the APIs can be used in an application.
>
> Information about how to use the deprecated API is available in the documentation for Oracle WebLogic Server 12c (12.1.2) in Chapter 17, Using WebSockets in WebLogic Server in *Developing Applications for Oracle WebLogic Server 12c (12.1.2)*.

The WebLogic Server WebSocket implementation includes the following components:

- WebSocket Protocol Implementation
- WebLogic WebSocket Java API
- Protocol Fallback for WebSocket Messaging
- Sample WebSocket Applications
- WebSocket Protocol Implementation
- WebLogic WebSocket Java API
- Protocol Fallback for WebSocket Messaging

- Sample WebSocket Applications

WebSocket Protocol Implementation

The WebSocket protocol implementation in WebLogic Server is provided by the reference implementation of JSR 356 Java API for WebSocket. This implementation of the WebSocket protocol handles connection upgrades, establishes and manages connections, and handles exchanges with the client.

WebLogic WebSocket Java API

The WebLogic WebSocket API is provided by the reference implementation of JSR 356 Java API for WebSocket. This API consists of the following packages:

`javax.websocket.server`
This package contains annotations, classes, and interfaces to create and configure server endpoints.

`javax.websocket`
This package contains annotations, classes, interfaces, and exceptions that are common to client and server endpoints.

The API reference documentation for these packages is available in the following sections of the *Java EE 8 Specification APIs*:

- Package javax.websocket
- Package javax.websocket.server

Protocol Fallback for WebSocket Messaging

Protocol fallback provides a mechanism for using an alternative transport for WebSocket messaging when the WebSocket protocol is not supported. Typically the WebSocket protocol is not supported either because the WebSocket object is not available or because WebSocket frames are blocked by a firewall. In this release, the only supported alternative transport is HTTP Long Polling.

Protocol fallback enables you to rely on standard programming APIs to perform WebSocket messaging regardless of whether or not the runtime environment supports the WebSocket protocol. For more information, see Enabling Protocol Fallback for WebSocket Messaging.

Sample WebSocket Applications

If the WebLogic Server Examples component is installed and configured on your machine, you can use the WebSocket examples to demonstrate using WebSockets in WebLogic Server. For more information about running these examples, see Sample Applications and Code Examples in *Understanding Oracle WebLogic Server*.

Overview of Creating a WebSocket Application

The Java API for WebSocket (JSR-356) enables you to create, configure, and deploy WebSocket endpoints in web applications. The WebSocket client API specified in JSR-356 also enables you to access remote WebSocket endpoints from any Java application.

The process for creating and deploying a WebSocket endpoint is as follows:

1. Create an endpoint class.
2. Implement the lifecycle methods of the endpoint.
3. Add your business logic to the endpoint.
4. Deploy the endpoint inside a web application.

Creating an Endpoint

The container creates one instance of an endpoint for each connection to its deployment URI. Each instance retains user state for each connection and simplifies development.

The Java API for WebSocket enables you to create the following kinds of endpoints:

- Annotated endpoints
- Programmatic endpoints

The process is different for programmatic endpoints and annotated endpoints. In most cases, it is easier to create and deploy an annotated endpoint than a programmatic endpoint.

> **Note:**
>
> As opposed to servlets, WebSocket endpoints are instantiated multiple times. The container creates one instance of an endpoint for each connection to its deployment URI. Each instance is associated with one and only one connection. This behavior facilitates keeping user state for each connection and simplifies development because only one thread is executing the code of an endpoint instance at any given time.

Creating an Annotated Endpoint

Creating an annotated endpoint enables you to handle life cycle events for a WebSocket connection by annotating methods of the endpoint class. For more information, see Handling Life Cycle Events in an Annotated WebSocket Endpoint. An annotated endpoint is deployed automatically with the application.
The Java API for WebSocket enables you to create annotated server endpoints and annotated client endpoints.

To created an annotated server endpoint:

1. Write a Plain Old Java Object (POJO) class to represent the server endpoint.

   The class must have a public no-argument constructor.

2. Annotate the class declaration of the POJO class with the `javax.websocket.server.ServerEndpoint` annotation.

   This annotation denotes that the class represents a WebSocket server endpoint.

3. .Set the value element of the `ServerEndpoint` annotation to the relative path to which the endpoint is to be deployed.

   The path must begin with a forward slash (/).

Example 19-3 Declaring an Annotated Server Endpoint Class

The following example shows how to declare an annotated server endpoint class. For an example of how to declare a programmatic endpoint class to represent the same endpoint, see Example 19-5.

This example declares the annotated server endpoint class `EchoEndpoint`. The endpoint is to be deployed to the /echo path relative to the application.

```
import javax.websocket.server.ServerEndpoint;
...
@ServerEndpoint("/echo")
public class EchoEndpoint {
...
}
```

Example 19-4 Declaring an Annotated Client Endpoint Class

To create an annotated client endpoint:

1. Write a Plain Old Java Object (POJO) class to represent the client endpoint.

   The class can have a constructor that takes arguments. However, to connect such an endpoint to a server endpoint, you must use the variant of the connectToServer method that takes an instance. You cannot use the variant that takes a class. For more information, see Connecting a Java WebSocket CLient to a Server Endpoint

2. Annotate the class declaration of the POJO class with the `javax.websocket.ClientEndpoint` annotation.

   This annotation denotes that the class represents a WebSocket client endpoint.

The following example shows how to declare an annotated client endpoint class.

This example declares the annotated client endpoint class `ExampleEndpoint`.

```
import javax.websocket.ClientEndpoint;
...
@ClientEndpoint
public class ExampleEndpoint {
 ...
}
```

Creating a Programmatic Endpoint

Creating a programmatic endpoint requires you to handle life cycle events for a WebSocket connection by overriding methods of the endpoint's superclass. For more information, see Handling Life Cycle Events in a Programmatic WebSocket Endpoint. A programmatic endpoint is **not** deployed automatically with the application. You must deploy the endpoint explicitly. For more information, see Specifying the Path Within an Application to a Programmatic Endpoint.

To create a programmatic endpoint, extend the `javax.websocket.Endpoint` class.

Example 19-5 shows how to declare a programmatic endpoint class. For an example of how to declare an annotated endpoint class to represent the same endpoint, see Example 19-3.

Example 19-5 Declaring a Programmatic Endpoint Class

This example declares the programmatic endpoint class `EchoEndpoint`. For an example that shows how to specify the path within an application to this endpoint, see Example 19-6.

```
import javax.websocket.Endpoint;
...
public class EchoEndpoint extends Endpoint {
...
}
```

Specifying the Path Within an Application to a Programmatic Endpoint

To enable remote clients to connect to a programmatic endpoint, you must specify the path within an application to the endpoint.

To specify the path within an application to a programmatic endpoint:

1. Invoke the `javax.websocket.server.ServerEndpointConfig.Builder.create` static method to obtain an instance of the `javax.websocket.server.ServerEndpointConfig.Builder` class.

   In the invocation of the `create` method, pass the following information as parameters to the method:

   - The class of the endpoint
   - The path relative to the application at which the endpoint is to be available

2. Invoke the `build` method on the `ServerEndpointConfig.Builder` object that you obtained in the previous step.

When you deploy your application, the endpoint is available at the following URI:

`ws://`*`host`*`:`*`port`*`/`*`application`*`/`*`path`*

The replaceable items in this URI are as follows:

host
The host on which the application is running.

port
The port on which WebLogic Server listens for client requests.

application
The name with which the application is deployed.

path
The path that you specified in the invocation of the `create` method.

For example, the URI to the endpoint at the `/echo` path relative to the `/echoapp` application running on the local host is `ws://localhost:8890/echoapp/echo`.

Example 19-6 shows how to perform this task in a single line of Java code.

Example 19-6 Specifying the Path Within an Application to a Programmatic Endpoint

This example specifies `/echo` as the path within an application to the programmatic endpoint `EchoEndpoint` from Example 19-5.

```
import javax.websocket.server.ServerEndpointConfig.Builder;
...
```

```
ServerEndpointConfig.Builder.create(EchoEndpoint.class, "/echo").build();
...
```

Handling Life Cycle Events for a WebSocket Connection

Different life cycle events for a WebSocket connection such as connection opened, message received, error, and connection closed are handled differently in an annotated endpoint and a programmatic endpoint.

How to handle life cycle events for a WebSocket connection depends on whether the endpoint of the connection is an annotated endpoint or a programmatic endpoint. For more information, see:

- Handling Life Cycle Events in an Annotated WebSocket Endpoint
- Handling Life Cycle Events in a Programmatic WebSocket Endpoint
- Handling Life Cycle Events in an Annotated WebSocket Endpoint
- Handling Life Cycle Events in a Programmatic WebSocket Endpoint

Handling Life Cycle Events in an Annotated WebSocket Endpoint

Handling a life cycle event in an annotated WebSocket involves the following tasks:

1. Adding a method to your endpoint class to handle the event

   The allowed method parameters are defined by the annotation that you will use to designate the event.

2. Annotating the method declaration with the annotation that designates the event that the method is to handle.

Table 19-1 lists the life cycle events in a WebSocket endpoint and the annotations available in the `javax.websocket` package to designate the methods that handle them. The examples in the table show the most common parameters for these methods. Each example in the table includes an optional `javax.websocket.Session` parameter. A `Session` object represents a conversation between a pair of WebSocket endpoints.

For details about the combinations of parameters that are allowed by an annotation, see the API reference documentation for the annotation.

Table 19-1 Annotations in javax.websocket for WebSocket Endpoint Lifecycle Events

Event	Annotation	Example

Connection opened	`OnOpen`	`@OnOpen`
		`public void open(Session session,`
		`EndpointConfig conf)`
		`{ }`

Message received	`OnMessage`	`@OnMessage` `public String message (String msg) { }`

Table 19-1 (Cont.) Annotations in javax.websocket for WebSocket Endpoint Lifecycle Events

Event	Annotation	Example

Error	`OnError`	`@OnError`
		`public void error(Session session,`
		`Throwable error) { }`

Connection closed	`OnClose`	`@OnClose`
		`public void close(Session session,`
		`CloseReason reason)`
		`{ }`

- Handling a Connection Opened Event
- Handling a Message Received Event
- Handling an Error Event
- Handling a Connection Closed Event

Handling a Connection Opened Event

Handle a connection opened event to notify users that a new WebSocket conversation has begun.

To handle a connection opened event, annotate the method for handling the event with the `OnOpen` annotation.

Example 19-7 shows how to handle a connection opened event.

Example 19-7 Handling a Connection Opened Event

This example prints the identifier of the session when a WebSocket connection is opened.

```
import javax.websocket.OnOpen;
import javax.websocket.Session;
...
   @OnOpen
   public void openedConnection (Session session) {
      System.out.println("WebSocket opened: " + session.getId());
   }
...
```

Handling a Message Received Event

The Java API for WebSocket enables you to handle the following types of incoming messages:

- Text messages
- Binary messages
- Pong messages

1. Add a method to your endpoint class to handle the type of the incoming message.

Ensure that the data type of the parameter for receiving the message is compatible with the type of the message as shown in the following table.

Message Type	Data Type of the Parameter for Receiving the Message
Text	Any one of the following data types depending on how the message is to be received: • To receive the whole message: `java.lang.String` • To receive the whole message converted to a Java primitive or class equivalent to that type: the primitive or class equivalent • To receive the message in parts: `String` and boolean pair • To receive the whole message as a blocking stream: `java.io.Reader` • To receive the message encoded as a Java object: any type for which the endpoint has a text decoder (`javax.websocket.Decoder.Text` or `javax.websocket.Decoder.TextStream`)
Binary	Any one of the following data types depending on how the message is to be received: • To receive the whole message: byte array or `java.nio.ByteBuffer` • To receive the message in parts: byte array and boolean pair, or `ByteBuffer` and boolean pair • To receive the whole message as a blocking stream: `java.io.InputStream` • To receive the message encoded as a Java object: any object type for which the endpoint has a binary decoder (`javax.websocket.Decoder.Binary` or `javax.websocket.Decoder.BinaryStream`)
Pong	`javax.websocket.PongMessage`

2. Annotate the method declaration with the `OnMessage` annotation.

   You can have at most three methods annotated with `@OnMessage` in an endpoint, one method for each message type: text, binary, and pong.

> **Note:**
>
> For an annotated endpoint, you add methods for handling incoming messages to your endpoint class. You are not required to create a separate message handler class. However, for a programmatic endpoint, you must create a separate message handler class.
>
> To compare how to handle incoming messages for an annotated endpoint and a programmatic endpoint, see Example 19-8 and Example 19-12.

Example 19-8 Handling Incoming Text Messages for an Annotated Endpoint

The following example shows how to handle incoming text messages for an annotated endpoint.

This example replies to every incoming text message by sending the message back to the peer of this endpoint. The method that is annotated with the `OnMessage` annotation is a method of the endpoint class, not a separate message handler class.

For an example of how to perform the same operation for a programmatic endpoint, see Example 19-12.

```
import java.io.IOException;

import javax.websocket.OnMessage;
import javax.websocket.Session;
...
   @OnMessage
   public String onMessage(String msg) throws IOException {
      return msg;
   }
...
```

Example 19-9 Handling all Types of Incoming Messages

This example handles incoming text messages, binary messages, and pong messages. Text messages are received whole as `String` objects. Binary messages are received whole as `ByteBuffer` objects.

```
import java.nio.ByteBuffer;

import javax.websocket.OnMessage;
import javax.websocket.PongMessage;
import javax.websocket.Session;
...
   @OnMessage
   public void textMessage(Session session, String msg) {
      System.out.println("Text message: " + msg);
   }
   @OnMessage
   public void binaryMessage(Session session, ByteBuffer msg) {
      System.out.println("Binary message: " + msg.toString());
   }
   @OnMessage
   public void pongMessage(Session session, PongMessage msg) {
      System.out.println("Pong message: " +
                         msg.getApplicationData().toString());
   }
...
```

Handling an Error Event

You need handle only error events that are not modeled in the WebSocket protocol, for example:

- Connection problems
- Runtime errors from message handlers
- Conversion errors in the decoding of messages

To handle an error event, annotate the method for handling the event with the `OnError` annotation.

Example 19-10 shows how to handle an error event.

Example 19-10 Handling an Error Event

This example prints a stack trace in response to an error event.

```
import javax.websocket.OnError;
import javax.websocket.Session;

   ...
   @OnError
```

```
public void error(Session session, Throwable t) {
   t.printStackTrace();
   ...
}
```

Handling a Connection Closed Event

You need handle a connection closed event only if you require some special processing before the connection is closed, for example, retrieving session attributes such as the ID, or any application data that the session holds before the data becomes unavailable after the connection is closed.

To handle a connection closed event, annotate the method for handling the event with the `OnClose` annotation.

Example 19-11 shows how to handle a connection closed event.

Example 19-11 Handling a Connection Closed Event

This example prints the message `Someone is disconnecting...` in response to a connection closed event.

```
import javax.websocket.OnClose;
import javax.websocket.Session;
...
  @OnClose
  public void bye(Session remote) {
    System.out.println("Someone is disconnecting...");
  }
...
```

Handling Life Cycle Events in a Programmatic WebSocket Endpoint

Table 19-2 summarizes how to handle lifecycle events in a programmatic WebSocket endpoint.

Table 19-2 Handling Life Cycle Events in a Programmatic WebSocket Endpoint

Event	How to Handle
Connection opened	Override the abstract `onOpen` method of the `Endpoint` class.
Message received	1. Declare that your endpoint class implements the message handler interface `javax.websocket.MessageHandler.Partial` or `javax.websocket.MessageHandler.Whole`. 2. Register your message handler by invoking the `addMessageHandler` method of your endpoint's `Session` object. 3. Implement the `onMessage` method of the message handler interface that your endpoint class implements.
Error	Optional: Override the `onError` method of the `Endpoint` class. If you do not override this method, the `onError` method that your endpoint inherits from the `Endpoint` class is called when an error occurs.
Connection closed	Optional: Override the `onClose` method of the `Endpoint` class. If you do not override this method, the `onClose` method that your endpoint inherits from the `Endpoint` class is called immediately before the connection is closed.

Example 19-12 shows how handle incoming text messages for a programmatic endpoint by handling connection opened events and message received events.

Example 19-12 Handling Incoming Text Messages for a Programmatic Endpoint

This example echoes every incoming text message. The example overrides the `onOpen` method of the `Endpoint` class, which is the only abstract method of this class.

The `Session` parameter represents a conversation between this endpoint and the remote endpoint. The `addMessageHandler` method registers message handlers, and the `getBasicRemote` method returns an object that represents the remote endpoint.

The message handler is implemented as an anonymous inner class. The `onMessage` method of the message handler is invoked when the endpoint receives a text message.

For more information about sending a message, see Sending a Message.

For an example of how to perform the same operation for an annotated endpoint, see Example 19-8.

```
import java.io.IOException;
import javax.websocket.EndpointConfig;
import javax.websocket.MessageHandler;
import javax.websocket.Session;
...
   @Override
   public void onOpen(final Session session, EndpointConfig config) {
      session.addMessageHandler(new MessageHandler.Whole<String>() {
         @Override
         public void onMessage(String msg) {
            try {
               session.getBasicRemote().sendText(msg);
            } catch (IOException e) { ... }
         }
      });
   }
...
```

Defining, Injecting, and Accessing a Resource for a WebSocket Endpoint

The Java API for WebSocket allows you to use Contexts and Dependency Injection (CDI) to inject and access a resource that a WebSocket endpoint requires. You can use the injected resource from within a method for handling a lifecycle event for a WebSocket connection.

For more information about CDI, see Using Contexts and Dependency Injection for the Java EE Platform.

To define, inject, and access a resource for a WebSocket endpoint:

1. Define a managed bean to represent the resource to inject.

   For more information, see Defining a Managed Bean.

2. In the endpoint class, inject the managed bean.

   For more information, see Injecting a Bean.

3. From within the relevant method, invoke methods of the injected bean as required.

The following examples show how to define, inject, and access a resource for a WebSocket endpoint:

- Example 19-13
- Example 19-14

Example 19-13 Defining a Managed Bean for a WebSocket Endpoint

This example defines the managed bean class `InjectedSimpleBean`.

```
import javax.annotation.PostConstruct;

public class InjectedSimpleBean {

  private static final String TEXT = " (from your server)";
  private boolean postConstructCalled = false;

  public String getText() {
    return postConstructCalled ? TEXT : null;
  }

  @PostConstruct
  public void postConstruct() {
    postConstructCalled = true;
  }

}
```

Example 19-14 Injecting and Accessing a Resource for a WebSocket Endpoint

This example injects an instance of the `InjectedSimpleBean` managed bean class into the server endpoint `SimpleEndpoint`. When the endpoint receives a message, it invokes the `getText` method on the injected bean. The method returns the text `(sent from your server)`. The endpoint then sends back a message which is a concatenation of the original message and gathered data.

The `InjectedSimpleBean` managed bean class is defined in Example 19-13.

```
import javax.websocket.OnMessage;
import javax.websocket.server.ServerEndpoint;

import javax.annotation.PostConstruct;
import javax.inject.Inject;

@ServerEndpoint(value = "/simple")
public class SimpleEndpoint {

  private boolean postConstructCalled = false;

  @Inject
  InjectedSimpleBean bean;

  @OnMessage
  public String echo(String message) {
    return postConstructCalled ?
           String.format("%s%s", message, bean.getText()) :
           "PostConstruct was not called";
  }

  @PostConstruct
  public void postConstruct() {
    postConstructCalled = true;
```

```
    }
}
```

Sending a Message

The Java API for WebSocket enables you to send text messages, binary messages, and ping frames from an endpoint to its connected peers.

- Text messages
- Binary messages
- Ping frames

Sending a Message to a Single Peer of an Endpoint

To send a message to a single peer of an endpoint:

1. Obtain the `Session` object from the connection.

   The `Session` object is available as a parameter in the lifecycle methods of the endpoint. How to obtain this object depends on whether the message that you are sending is a response to a message from a peer.

   - If the message is a response, obtain the `Session` object from inside the method that received the message.
   - If the message is **not** a response, store the `Session` object as an instance variable of the endpoint class in the method for handling a connection opened event. Storing the `Session` object in this way enables you to access it from other methods.

2. Use the `Session` object to obtain an object that implements one of the subinterfaces of `javax.websocket.RemoteEndpoint`.

   - If you are sending the message synchronously, obtain a `RemoteEndpoint.Basic` object. This object provides blocking methods for sending a message.

     To obtain a `RemoteEndpoint.Basic` object, invoke the `Session.getBasicRemote()` method.

   - If you are sending the message asynchronously, obtain a `RemoteEndpoint.Async` object. This object provides non-blocking methods for sending a message.

     To obtain a `RemoteEndpoint.Async` object, invoke the `Session.getAsyncRemote()` method.

3. Use the `RemoteEndpoint` object that you obtained in the previous step to send the message to the peer.

   The following list shows some of the methods you can use to send a message to the peer:

   - `void RemoteEndpoint.Basic.sendText(String text)`

     Send a text message to the peer. This method blocks until the whole message has been transmitted.

   - `void RemoteEndpoint.Basic.sendBinary(ByteBuffer data)`

Send a binary message to the peer. This method blocks until the whole message has been transmitted.

- `void RemoteEndpoint.sendPing(ByteBuffer appData)`

  Send a ping frame to the peer.

- `void RemoteEndpoint.sendPong(ByteBuffer appData)`

  Send a pong frame to the peer.

Example 19-15 demonstrates how to use this procedure to reply to every incoming text message. For an example of how to send a message as the return value of a method, see Example 19-8.

Example 19-15 Sending a Message to a Single Peer of an Endpoint

This example replies to every incoming text message by sending the message back to the peer of this endpoint.

```
import java.io.IOException;

import javax.websocket.OnMessage;
import javax.websocket.Session;
...
   @OnMessage
   public void onMessage(Session session, String msg) {
      try {
         session.getBasicRemote().sendText(msg);
      } catch (IOException e) { ... }
   }
...
```

Sending a Message to All Peers of an Endpoint

Some WebSocket applications must send messages to all connected peers of the application's WebSocket endpoint, for example:

- A stock application must send stock prices to all connected clients.
- A chat application must send messages from one user to all other clients in the same chat room.
- An online auction application must send the latest bid to all bidders on an item.

However, each instance of an endpoint class is associated with one and only one connection and peer. Therefore, to send a message to all peers of an endpoint, you must iterate over the set of all open WebSocket sessions that represent connections to the same endpoint.

To send a message to all peers of an endpoint:

1. Obtain the set of all open WebSocket sessions that represent connections to the endpoint.

   Invoke the `getOpenSessions` method on the endpoint's `Session` object for this purpose.

2. Send the message to each open session that you obtained in the previous step.

   a. Use the session to obtain a `RemoteEndpoint` object.

   b. Use the `RemoteEndpoint` object to send the message.

      See Sending a Message to a Single Peer of an Endpoint

Example 19-16 Sending a Message to All Peers of an Endpoint

This example forwards incoming text messages to all connected peers.

```
import java.io.IOException;

import javax.websocket.OnMessage;
import javax.websocket.Session;
import javax.websocket.server.ServerEndpoint;
 ...
@ServerEndpoint("/echoall")
public static class EchoAllEndpoint {
    @OnMessage
    public void messageReceived(Session session, String msg) {
        for (Session sess : session.getOpenSessions()) {
            try {
                sess.getBasicRemote().sendText(msg);
            } catch (IOException e) {
                // handle exception
            }
        }
    }
}
```

Ensuring Efficiency when Sending a Message to All Peers of an Endpoint

In a real-world application, in which many messages are being sent, you can use multiple threads to ensure that the application sends messages efficiently.

If too many WebSocket connections are open, 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.

Ensuring Thread Safety for WebSocket Endpoints

The Java API for WebSocket specification requires that Java EE implementations instantiate endpoint classes once per connection. This requirement facilitates the development of WebSocket endpoints because you are guaranteed that only one thread is executing the code in a WebSocket endpoint class at any given time. When you introduce a new thread in an endpoint, you must ensure that variables and methods accessed by more than one thread are thread safe.

Encoding and Decoding a WebSocket Message

The Java API for WebSocket provides support for converting between WebSocket messages and custom Java types by using encoders and decoders. This mechanism simplifies WebSocket applications because it decouples the business logic from the serialization and deserialization of objects.

An encoder takes a Java object and produces a representation that can be transmitted as a WebSocket text message or binary message. For example, encoders typically produce JavaScript Object Notation (JSON), Extensible Markup Language (XML), or binary representations. A decoder performs the reverse function: it reads a WebSocket message and creates a Java object.

> **Note:**
>
> If you want to send and receive multiple Java types as the same type of WebSocket message, define the types to extend a common class. For example, if you want to send and receive the Java types `MessageA` and `MessageB` as text messages, define the types to extend the common class `Message`.
>
> Defining the types in this way enables you to implement a single decoder class for multiple types.

- Encoding a Java Object as a WebSocket Message
- Decoding a WebSocket Message as a Java Object

Encoding a Java Object as a WebSocket Message

You can have more than one encoder for text messages and more than one encoder for binary messages. Like endpoints, encoder instances are associated with one and only one WebSocket connection and peer. Therefore, only one thread is executing the code of an encoder instance at any given time.

To encode a Java object as a WebSocket message:

1. For each custom Java type that you want to send as a WebSocket message, implement the appropriate interface for the type of the WebSocket message:
   - For a text message, implement `javax.websocket.Encoder.Text<T>`.
   - For a binary message, implement `javax.websocket.Encoder.Binary<T>`.

   These interfaces specify the `encode` method.
2. Specify that your endpoint will use your encoder implementations.
   - For an annotated endpoint, add the names of your encoder implementations to the `encoders` optional element of the `ServerEndpoint` annotation.
   - For a programmatic endpoint, pass a list of the names of your encoder implementations as a parameter of the `encoders` method of a `javax.websocket.server.ServerEndpointConfig.Builder` object.
3. Use the `sendObject(Object data)` method of the `RemoteEndpoint.Basic` or `RemoteEndpoint.Async` interfaces to send your objects as messages.

   The container looks for an encoder that matches your type and uses it to covert the object to a WebSocket message.

The following examples show how to send the Java types `com.example.game.message.MessageA` and `com.example.game.message.MessageB` as text messages:

- Example 19-17
- Example 19-18
- Example 19-19

Example 19-17 Implementing an Encoder Interface

This example implements the `Encoder.Text<MessageA>` interface.

```
package com.example.game.encoder;

import javax.websocket.EncodeException;
import javax.websocket.Encoder;
import javax.websocket.EndpointConfig;

import com.example.game.message.MessageA;
...
public class MessageATextEncoder implements Encoder.Text<MessageA> {
   @Override
   public void init(EndpointConfig ec) { }
   @Override
   public void destroy() { }
   @Override
   public String encode(MessageA msgA) throws EncodeException {
      // Access msgA's properties and convert to JSON text...
      return msgAJsonString;
   }
...
}
```

The implementation of `Encoder.Text<MessageB>` is similar.

Example 19-18 Defining Encoders for an Annotated WebSocket Endpoint

This example defines the encoder classes `MessageATextEncoder.class` and `MessageBTextEncoder.class` for the WebSocket server endpoint `EncEndpoint`.

```
package com.example.game;

import javax.websocket.server.ServerEndpoint;

import com.example.game.encoder.MessageATextEncoder;
import com.example.game.encoder.MessageBTextEncoder;
...

@ServerEndpoint(
   value = "/myendpoint",
   encoders = { MessageATextEncoder.class, MessageBTextEncoder.class }
...
)
public class EncEndpoint { ... }
```

Example 19-19 Sending Java Objects Encoded as WebSocket Messages

This example uses the `sendObject` method to send `MessageA` and `MessageB` objects as WebSocket messages.

```
import javax.websocket.Session;
...
import com.example.game.message.MessageA;
import com.example.game.message.MessageB;
...
MessageA msgA = new MessageA(...);
MessageB msgB = new MessageB(...);
session.getBasicRemote.sendObject(msgA);
session.getBasicRemote.sendObject(msgB);
...
```

Decoding a WebSocket Message as a Java Object

Unlike encoders, you can have at most **one** decoder for binary messages and **one** decoder for text messages. Like endpoints, decoder instances are associated with one and only one WebSocket connection and peer, so only one thread is executing the code of a decoder instance at any given time.

To decode a WebSocket message as a Java object:

1. Implement the appropriate interface for the type of the WebSocket message:
   - For a text message, implement `javax.websocket.Decoder.Text<T>`.
   - For a binary message, implement `javax.websocket.Decoder.Binary<T>`.

   These interfaces specify the `willDecode` and `decode` methods.
2. Specify that your endpoint will use your decoder implementations.
   - For an annotated endpoint, add the names of your decoder implementations to the `decoders` optional element of the `ServerEndpoint` annotation.
   - For a programmatic endpoint, pass a list of the names of your decoder implementations as a parameter of the `decoders` method of a `javax.websocket.server.ServerEndpointConfig.Builder` object.
3. Ensure that the method in your endpoint for handling a message received event takes your custom Java type as a parameter.

   See Handling Life Cycle Events for a WebSocket Connection.

   When the endpoint receives a message that can be decoded by one of the decoders you specified, the container calls the method that takes your custom Java type as a parameter if this method exists.

The following examples show how to decode WebSocket text messages as the Java types `com.example.game.message.MessageA` and `com.example.game.message.MessageB`:

- Example 19-20
- Example 19-21
- Example 19-22

These examples assume that the Java types `com.example.game.message.MessageA` and `com.example.game.message.MessageB` extend the `com.example.game.message.Message` class.

Example 19-20 Implementing a Decoder Interface

This example implements the `Decoder.Text<Message>` interface.

Because only one decoder for text messages is allowed for an endpoint, the implementation is a decoder for the `Message` superclass. This decoder is used for decoding the subclasses of `Message`.

```
package com.example.game.decoder;

import javax.websocket.DecodeException;
import javax.websocket.Decoder;
import javax.websocket.EndpointConfig;

import com.example.game.message.Message;
import com.example.game.message.MessageA;
import com.example.game.message.MessageB;
```

```
...

public class MessageTextDecoder implements Decoder.Text<Message> {
   @Override
   public void init(EndpointConfig ec) { }
   @Override
   public void destroy() { }
   @Override
   public Message decode(String string) throws DecodeException {
      // Read message...
      if ( /* message is an A message */ )
         return new MessageA(...);
      else if ( /* message is a B message */ )
         return new MessageB(...);
   }
   @Override
   public boolean willDecode(String string) {
      // Determine if the message can be converted into either a
      // MessageA object or a MessageB object...
      return canDecode;
   }
}
```

Example 19-21 Defining a Decoder for an Annotated WebSocket Endpoint

This example defines the decoder class `MessageTextDecoder.class` for the WebSocket server endpoint `EncEndpoint`.

For completeness, this example also includes the definitions of the encoder classes `MessageATextEncoder.class` and `MessageBTextEncoder.class` from Example 19-18.

```
package com.example.game;

import javax.websocket.server.ServerEndpoint;

import com.example.game.encoder.MessageATextEncoder;
import com.example.game.encoder.MessageBTextEncoder;
import com.example.game.decoder.MessageTextDecoder;
...
@ServerEndpoint(
   value = "/myendpoint",
   encoders = { MessageATextEncoder.class, MessageBTextEncoder.class },
   decoders = { MessageTextDecoder.class }
)
public class EncEndpoint { ... }
```

Example 19-22 Receiving WebSocket Messages Encoded as Java Objects

This example defines the method `message` that receives `MessageA` objects and `MessageB` objects.

```
import javax.websocket.OnMessage;
import javax.websocket.Session;
...
import com.example.game.message.Message;
import com.example.game.message.MessageA;
import com.example.game.message.MessageB;
...
@OnMessage
public void message(Session session, Message msg) {
   if (msg instanceof MessageA) {
      // We received a MessageA object...
```

```
   else if (msg instanceof MessageB) {
      // We received a MessageB object...
   }
}
```

Specifying a Part of an Endpoint Deployment URI as an Application Parameter

The `ServerEndpoint` annotation enables you to use a level 1 URI template to specify parts of an endpoint deployment URI as application parameters. A URI template describes a range of URIs through variable expansion.

For more information about URI templates, see http://tools.ietf.org/html/rfc6570.

To specify a part of an endpoint deployment URI as an application parameter:

1. Set the `value` element of the `ServerEndpoint` annotation to the URI template that you want to use.

   In the URI template, enclose each variable for expansion in a pair of braces.
2. Declare each variable for expansion as a parameter in a method for handling one of the following types of event:
   - Connection opened
   - Connection closed
   - Message received

   The type of the parameter can be `String`, a primitive type, or a boxed version of them.
3. Annotate the declaration of the parameter with the `javax.websocket.server.PathParam` annotation.
4. Set the value element of the `PathParam` annotation to the name of the variable.
5. In the body of the method that takes the parameter, provide logic for expanding the variable.

Example 19-23 shows how to specify a part of an endpoint deployment URI as an application parameter.

Example 19-23 Specifying a Part of an Endpoint Deployment URI as an Application Parameter

This example specifies an endpoint deployment URI as a URI template that contains the variable `{room-name}`. The variable is expanded through the `roomName` parameter of the `open` method to determine which chat room the user wants to join.

```
import javax.websocket.EndpointConfig;
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.PathParam;
import javax.websocket.server.ServerEndpoint;

@ServerEndpoint("/chatrooms/{room-name}")
public class ChatEndpoint {
   @OnOpen
   public void open(Session session,
                    EndpointConfig c,
                    @PathParam("room-name") String roomName) {
```

```
      // Add the client to the chat room of their choice ...
   }
...
}
```

Code in the body of the `open` method to expand the `{room-name}` variable is not shown in this example.

If the endpoint is deployed inside a web application called `chatapp` at a local Java EE server in port 8080, clients can connect to the endpoint using any of the following URIs:

```
http://localhost:8080/chatapp/chatrooms/currentnews
http://localhost:8080/chatapp/chatrooms/music
http://localhost:8080/chatapp/chatrooms/cars
http://localhost:8080/chatapp/chatrooms/technology
```

Maintaining Client State

Because the container creates an instance of the endpoint class for every connection, you can define and use instance variables to store client state information.

In addition, the `Session.getUserProperties` method provides a modifiable map to store user properties.

To store information common to all connected clients, you can use class (static) variables; however, you are responsible for ensuring thread-safe access to them.

Example 19-24 shows how to maintain client state.

Example 19-24 Maintaining Client State

This example replies to incoming text messages with the contents of the previous message from each client.

```
import java.io.IOException;
import javax.websocket.OnMessage;
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.ServerEndpoint;

@ServerEndpoint("/delayedecho")
public class DelayedEchoEndpoint {
   @OnOpen
   public void open(Session session) {
      session.getUserProperties().put("previousMsg", " ");
   }
   @OnMessage
   public void message(Session session, String msg) {
      String prev = (String) session.getUserProperties()
                                    .get("previousMsg");
      session.getUserProperties().put("previousMsg", msg);
      try {
         session.getBasicRemote().sendText(prev);
      } catch (IOException e) { ... }
   }
}
```

Configuring a Server Endpoint Programmatically

The Java API for WebSocket enables you to configure how the container creates server endpoint instances.

You can provide custom endpoint configuration logic for:

- Accessing the details of the handshake request for a WebSocket connection
- Performing custom checks on the `Origin` HTTP header
- Modifying the WebSocket handshake response
- Choosing a WebSocket subprotocol from those requested by the client
- Controlling the instantiation and initialization of endpoint instances
- Specifying the extensions that a server endpoint will support

To configure a server endpoint programmatically:

1. Extend the `javax.websocket.server.ServerEndpointConfig.Configurator` class.
2. Override the methods that perform the configuration operations for which you require custom logic, as shown in the following table.

Configuration Operation	Method to Override
Accessing the details of the handshake request for a WebSocket connection	`modifyHandshake`
Performing custom checks on the `Origin` HTTP header	`checkOrigin`
Modifying the WebSocket handshake response	`modifyHandshake`
Choosing a WebSocket subprotocol from those requested by the client	`getNegotiatedSubprotocol`
Controlling the instantiation and initialization of endpoint instances	`getEndpointInstance`
Specifying the extensions that a server endpoint will support	`getNegotiatedExtensions`

3. In the server endpoint class, set the `configurator` element of the `ServerEndpoint` annotation to the configurator class.

The following examples show how to configure a server endpoint programmatically:

- Example 19-25
- Example 19-26

Example 19-25 Extending the ServerEndpointConfig.Configurator Class

This example extends the `ServerEndpointConfig.Configurator` class to make the handshake request object available to endpoint instances.

```
import javax.websocket.HandshakeResponse;
import javax.websocket.server.ServerEndpointConfig.Configurator;
import javax.websocket.server.HandshakeRequest;
...
public class CustomConfigurator extends ServerEndpointConfig.Configurator {

    @Override
```

```
    public void modifyHandshake(ServerEndpointConfig conf,
                                HandshakeRequest req,
                                HandshakeResponse resp) {

        conf.getUserProperties().put("handshakereq", req);
    }
...
}
```

Example 19-26 Specifying a Custom Configurator for a Server Endpoint Class

This example specifies the custom configurator class `CustomConfigurator.class` for the server endpoint class `MyEndpoint`.

The custom configurator enables instances of the server endpoint class to access the handshake request object. The server endpoint class uses the handshake request object to access the details of the handshake request, such as its headers or the `HttpSession` object.

```
import javax.websocket.EndpointConfig;
import javax.websocket.HandshakeResponse;
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.HandshakeRequest;
import javax.websocket.server.ServerEndpoint;
import java.util.List;
import java.util.Map;
...
@ServerEndpoint(
    value = "/myendpoint",
    configurator = CustomConfigurator.class
)
public class MyEndpoint {

    @OnOpen
    public void open(Session s, EndpointConfig conf) {
        HandshakeRequest req = (HandshakeRequest) conf.getUserProperties()
                                                      .get("handshakereq");
        Map<String,List<String>> headers = req.getHeaders();
        ...
    }
}
```

Building Applications that Use the Java API for WebSocket

The Java API for WebSocket is located within the `wlserver/server/lib/api.jar` file. To build applications that use the Java API for WebSocket, define this library in the classpath when compiling the application.

You can also use Maven to build applications that use the Java API for WebSocket. If you are using Maven, obtain the Maven artifact that contains the Java API for WebSocket from maven central as `javax.websocket.javax.websocket-api:1.0`. For more information, see Using the WebLogic Maven Plug-In.

Deploying a WebSocket Application

In WebLogic Server, you deploy a WebSocket application as part of a standard Java EE Web application archive (WAR), either as a standalone Web application or a WAR module within an enterprise application.

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.

However, you can optionally set the context initialization properties the are listed in Table 19-3. To indicate that these properties are specific to WebLogic Server and not part of the JSR 356 specification, their fully qualified names contain the prefix `weblogic.websocket`.

Table 19-3 Context Initialization Properties for a WebSocket Application

Property	Type	Description
`weblogic.websocket.tyrus.incoming-buffer-size`	`Integer`	The maximum underlying buffer size in bytes for receiving messages. The application cannot process messages that are larger than this size. This parameter affects the following server sessions and client sessions: • **All** server sessions in the same application • **Only** client sessions that are connected with the server-instantiated `javax.websocket.server.ServerContainer` object in the application You can override this setting for clients sessions by setting a property of the same name for a client endpoint. For more information, see Configuring a WebSocket Client Endpoint Programmatically. The default buffer size is 4194315, of which 4 Mbytes are for the payload and 11 bytes are for the frame overhead.
`weblogic.websocket.tyrus.session-max-idle-timeout`	`Integer`	The maximum period in milliseconds after which an idle connection times out. The default value is 30000, which corresponds to 30 seconds.
`weblogic.websocket.tyrus.cluster`	`String`	WebSocket cluster uses Coherence as part of its implementation to establish communication among all the members in the cluster. WebSocket clustering enables horizontal scaling, allows you to send messages to all members of the cluster, increases the maximum number of connected clients, and decreases broadcast execution time. Clustering is disabled by default. To enable clustering set the value to *true*.

Example 19-27 shows how to set context initialization properties for a WebSocket application.

Example 19-27 Setting Context Initialization Properties for a WebSocket Application

This example sets context initialization parameters for a WebSocket application as follows:

- The maximum underlying buffer size for receiving messages is set to 16777227 bytes.
- The maximum period after which an idle connection times out is set to 60,000 milliseconds, which corresponds to 1 minute.
- Enable WebSocket cluster using managed Coherence server to establish communication among all members.

> **Note:**
>
> Clustering requires a managed Coherence server with local storage enabled. See, Configure Coherence Cluster Member Storage Settings in *Administering Clusters for Oracle WebLogic Server*.

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="3.0" ...>
   ...
  <context-param>
    <param-name>weblogic.websocket.tyrus.incoming-buffer-size</param-name>
    <param-value>16777227</param-value>
  </context-param>
  <context-param>
    <param-name>weblogic.websocket.tyrus.session-max-idle-timeout</param-name>
    <param-value>60000</param-value>
  </context-param>
  <context-param>
    <param-name>weblogic.websocket.tyrus.cluster </param-name>
    <param-value>true</param-value>
  </context-param>
</web-app>
```

Monitoring WebSocket Applications

You can monitor message statistics and runtime properties for WebSocket applications and endpoints. Endpoint-level monitoring collects information per individual endpoint, while application-level monitoring aggregates information from all endpoints deploying in the given application.

WebSocket Monitoring Properties

The following table details the types of properties monitored at runtime and whether monitoring occurs at the application or endpoint level. For message-related properties, WebLogic Server uses bytes for message size and distinguishes three types of messages: text, binary, and control.

Property	Description	Monitoring Level
Open session count	The number of current open sessions for the WebSocket application or endpoint.	application, endpoint
Maximum open sessions count	The highest number of open sessions for the WebSocket application or endpoint since server startup.	application, endpoint
Error counts	The list of errors with the number of times each error has occurred. Errors are represented by throwable class names.	application, endpoint

Property	Description	Monitoring Level
Sent messages count	The number of sent messages for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Received messages count	The number of received messages for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Sent messages count per second	The number of sent messages per second for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Received messages count per second	The number of received messages per second for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Minimum sent message size	The smallest sent message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Minimum received message size	The smallest received message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Maximum sent message size	The largest sent message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint

Property	Description	Monitoring Level
Maximum received message size	The largest received message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Average sent message size	The average sent message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Average received message size	The average received message size for the WebSocket application or endpoint since monitoring began. Statistics are provided per individual message type (text, binary, and control) and as a total count.	application, endpoint
Endpoint path	The path on which the endpoint is registered, relative to the application context root.	endpoint only
Endpoint class name	The name of the endpoint class.	endpoint only

To access monitored metrics for WebSocket applications and endpoints at runtime, use the following MBeans:

- `WebAppComponentRuntimeMBean`
- `WebsocketApplicationRuntimeMBean`
- `WebsocketBaseRuntimeMBean`
- `WebsocketEndpointRuntimeMBean`
- `WebsocketMessageStatisticsRuntimeMBean`

To use the Administration Console or Fusion Middleware Control to monitor WebSocket applications and endpoints, see the following online help topics:

- Monitoring WebSocket applications in *Oracle WebLogic Server Administration Console Online Help*

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 WebSocket protocol.

The following proxy servers support the WebSocket protocol:

- Oracle HTTP Server
- Apache HTTP Server when used with the Oracle WebLogic Server Proxy Plug-In

For information about the specific versions of Apache HTTP Server supported for use with the Oracle WebLogic Server Proxy Plug-In, see the Oracle Fusion Middleware Supported System Configurations page on the Oracle Technology Network.

Writing a WebSocket Client

A WebSocket client application is typically a browser-based client. The Java API for WebSocket can also be used to write a Java WebSocket client.

- Writing a Browser-Based WebSocket Client
- Writing a Java WebSocket Client

Writing a Browser-Based WebSocket Client

A browser-based WebSocket client application is typically a composite of HTML5 technologies, including HTML markup, CSS3, and JavaScript that makes use of the WebSocket JavaScript API. For more information about HTML5, see `http://www.w3.org/TR/html5/`.

Most browsers support the W3C WebSocket API that can be used to create and work with the WebSocket protocol. For information about the W3C WebSocket API, see: `http://www.w3.org/TR/websockets/`.

If the WebSocket protocol is not guaranteed to be supported in the runtime environment, use the JavaScript API for WebSocket fallback in your browser-based client. This API provides an implementation of the standard W3C WebSocket API. The API also provides a mechanism for using an alternative transport for WebSocket messaging when the WebSocket protocol is not supported. For more information, see Enabling Protocol Fallback for WebSocket Messaging.

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.

```
var url = ((window.location.protocol == "https:") ? "wss:" : "ws:")
+ "//" + window.location.host
+ "/websocket-helloworld-wls/helloworld_delay.ws";

var 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()"/>
```

Writing a Java WebSocket Client

The `javax.websocket` package contains annotations, classes, interfaces, and exceptions that are common to client and server endpoints. Use the APIs in this package for writing a Java WebSocket client in the same way as for writing a server. Additional programming tasks that are specific to writing a client are described in the subsections that follow.

- Configuring a WebSocket Client Endpoint Programmatically
- Connecting a Java WebSocket Client to a Server Endpoint
- Setting the Maximum Number of Threads for Dispatching Messages from a WebSocket Client

Configuring a WebSocket Client Endpoint Programmatically

WebLogic Server provides properties for configuring how the container creates client endpoint instances. To indicate that these properties are specific to WebLogic Server and not part of the JSR 356 specification, their fully qualified names contain the prefix `weblogic.websocket`.

WebLogic Server provides properties for the following:

- **HTTP proxy configuration.** WebLogic Server supports client connections to a remote server WebSocket endpoint through an HTTP proxy as defined in the WebSocket Protocol (RFC 6455).

  Properties for HTTP proxy configuration are listed in Table 19-4.
- **Secure Sockets Layer (SSL) configuration.** WebLogic Server supports client connections to a remote server WebSocket endpoint over SSL with wss scheme.

  Properties for SSL configuration are listed in Table 19-5.
- **Buffer size for incoming messages.** WebLogic Server supports limiting the size of incoming messages for WebSocket client endpoints.

  Properties for buffer size configuration are described in Table 19-6.

Table 19-4 HTTP Proxy Configuration Properties for a Java WebSocket Client

Property	Type	Description
`weblogic.websocket.client.PROXY_HOST`	`String`	The name of the HTTP proxy host. If you are configuring proxy settings for a JavaScript client, you must specify this property.
`weblogic.websocket.client.PROXY_PORT`	`Integer`	Optional. The port number for connections to the HTTP proxy host. If you specify an HTTP proxy host without the port number, the port number defaults to 80.

Table 19-4 (Cont.) HTTP Proxy Configuration Properties for a Java WebSocket Client

Property	Type	Description
`weblogic.websocket.client.PROXY_USERNAME`	`String`	Optional. The user name for logging in to the proxy host.
`weblogic.websocket.client.PROXY_PASSWORD`	`String`	Optional. The user name for logging in to the proxy host.

Table 19-5 SSL Configuration Properties for a Java WebSocket Client

Property	Type	Description
`weblogic.websocket.client.SSL_PROTOCOLS`	`String`	Optional. A comma-separated list of supported versions of the SSL protocol.
`weblogic.websocket.client.SSL_TRUSTSTORE`	`String`	Optional. The path to the keystore file, which contains the security certificates for use in SSL encryption.
`weblogic.websocket.client.SSL_TRUSTSTORE_PWD`	`String`	Optional. The password for the keystore.

Table 19-6 Buffer-Size Configuration Properties for a Java WebSocket Client

Property	Type	Description
`weblogic.websocket.tyrus.incoming-buffer-size`	`Integer`	The maximum underlying buffer size in bytes for receiving messages. The client cannot process messages that are larger than this size. If set, this property overrides the value of the context initialization property of the same name that is described in Table 19-3. The default buffer size is 4194315, of which 4 Mbytes are for the payload and 11 bytes are for the frame overhead.

> **Note:**
>
> Configure a client endpoint before connecting the client to its server endpoint.

To configure a WebSocket client endpoint programmatically:

1. Obtain a `javax.websocket.ClientEndpointConfig` object.
   a. Invoke the `javax.websocket.ClientEndpointConfig.Builder.create` static method to obtain an instance of the `ClientEndpointConfig.Builder` class.
   b. Invoke the `build` method on the `ClientEndpointConfig.Builder` object that you obtained in the previous step.
2. Set each configuration property that you want to change to its new value.
   a. Invoke the `getUserProperties` method on the `ClientEndpointConfig` object that you obtained in the previous step to obtain a modifiable `java.util.Map` object that contains the user properties.

b. Invoke the `put` method on the `Map` object that you obtained in the previous step.

   In the invocation of the `put` method, provide the property name and its new value as parameters to the method.

Example 19-28 shows how to configure a WebSocket client endpoint programmatically.

Example 19-28 Configuring a WebSocket Client Endpoint Programmatically

This example programmatically configures a WebSocket client endpoint as follows:

- The name of the HTTP proxy host is set to `proxy.example.com`.
- The port number for connections to the HTTP proxy host is set to 80.
- The path to the keystore file is set to `/export/keystore`.
- The password for the keystore is set to the *`keystore_password`*.
- The maximum underlying buffer size for receiving messages is set to 16777227 bytes, that is 16 Mbytes for the payload and 11 bytes for the frame overhead.

```
...
import javax.websocket.ClientEndpointConfig;
...
    ClientEndpointConfig cec = ClientEndpointConfig.Builder.create().build();
    // configure the proxy host
    cec.getUserProperties().put("weblogic.websocket.client.PROXY_HOST",
                                "proxy.example.com");
    // configure the proxy port
    cec.getUserProperties().put("weblogic.websocket.client.PROXY_PORT", 80);
    // configure the trust keystore path
    cec.getUserProperties().put("weblogic.websocket.client.SSL_TRUSTSTORE",
                                "/export/keystore");
    // configure the trust keystore's password
    cec.getUserProperties().put("weblogic.websocket.client.SSL_TRUSTSTORE_PWD",
                                "keystore_password");
    // for receiving 16 Mbyte payload
    cec.getUserProperties().put("weblogic.websocket.tyrus.incoming-buffer-size",
                                16 * 1024 * 1024 + 11);
...
```

Connecting a Java WebSocket Client to a Server Endpoint

To connect a Java WebSocket client to a server endpoint:

1. Invoke the `javax.websocket.ContainerProvider.getWebSocketContainer()` static method to obtain the client's `javax.websocket.WebSocketContainer` instance.
2. Invoke the overloaded `connectToServer` method on the `WebSocketContainer` object that you obtained in the previous step.

   The variant of the method to invoke depends on whether the endpoint is an annotated endpoint or a programmatic endpoint and whether support for Java EE services such as dependency injection are required.

Endpoint Type	Support for Java EE Services	Variant of the connectToServer Method
Annotated	Not required	connectToServer(Object annotatedEndpointInstance, URI path)
Annotated	Required	connectToServer(Class<?> annotatedEndpointClass, URI path)

Endpoint Type	Support for Java EE Services	Variant of the connectToServer Method
Programmatic	Not required	connectToServer(Endpoint endpointInstance, ClientEndpointConfig cec, URI path)
Programmatic	Required	connectToServer(Class<? extends Endpoint> endpointClass, ClientEndpointConfig cec, URI path)

In the invocation of the `connectToServer` method, provide the following information as parameters to the method:

- The **client** WebSocket endpoint
- The complete path to the **server** WebSocket endpoint

If the **client** endpoint is a programmatic endpoint, you must also provide configuration information for the endpoint.

Example 19-4 shows how to connect a Java WebSocket client to a server endpoint.

Example 19-29 Connecting a Java WebSocket Client to a Server Endpoint

This example connects the Java WebSocket client `ClientExample` to the WebSocket server endpoint at `ws://example.com:80/echoserver/echo`. The WebSocket client endpoint is represented by the class `ExampleEndpoint`. The declaration of the `ExampleEndpoint` class is shown in Example 19-4.

```
import java.io.IOException;
import java.net.URI;

import javax.websocket.CloseReason;
import javax.websocket.ContainerProvider;
import javax.websocket.Session;
import javax.websocket.WebSocketContainer;
...

public class ClientExample {

  public static void main(String[] args) throws Exception {
    WebSocketContainer container = ContainerProvider.getWebSocketContainer();
    Session session = container.connectToServer(ExampleEndpoint.class,
      new URI("ws://example.com:80/echoserver/echo"));
    ...
    session.close();
  }
```

Setting the Maximum Number of Threads for Dispatching Messages from a WebSocket Client

By default, the maximum number of threads for dispatching messages from a WebSocket client depends on how many processors are available:

- If 20 or fewer processors are available, the maximum number of threads is 20.
- If more than 20 processors are available, the maximum number of threads is equal to the number of available processors.

To set the maximum number of threads for dispatching messages from a WebSocket client:

- In the `java` command to launch your client application, set the system property `weblogic.websocket.client.max-aio-threads` to the number that you require.

Example 19-30 shows how to set the maximum number of threads for dispatching messages from a WebSocket client.

Example 19-30 Setting the Maximum Number of Threads for Dispatching Messages from a WebSocket Client

This example sets the maximum number of threads for dispatching messages from the WebSocket client `ClientExample` to 50.

```
java -Dweblogic.websocket.client.max-aio-threads=50 ClientExample
```

Securing a WebSocket Application

In WebLogic Server, you deploy a WebSocket application as a Web application archive (WAR), either as a standalone Web application or a WAR module within an enterprise application. 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
- Authenticating and Authorizing WebSocket Clients
- Establishing Secure WebSocket Connections
- Avoiding Mixed Content
- Applying Verified-Origin Policies
- Authenticating and Authorizing WebSocket Clients
- Establishing Secure WebSocket Connections
- Avoiding Mixed Content
- Specifying Limits for a WebSocket Connection

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` by extending the `javax.websocket.server.ServerEndpointConfig.Configurator` class.

The following code example demonstrates applying a verified-origin policy:

```
...
import javax.websocket.server.ServerEndpointConfig;

public class MyConfigurator extends ServerEndpointConfig.Configurator {
 ...
    private static final String ORIGIN = "http://www.example.com:7001";

    @Override
    public boolean checkOrigin(String originHeaderValue) {
        return ORIGIN.equals(originHeaderValue)
    }
}
...
```

For more information, see Configuring a Server Endpoint Programmatically.

> **Note:**
>
> Nonbrowser clients (for example, Java clients) 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.

Authenticating and Authorizing WebSocket Clients

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.

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. See Developing Secure Web Applications in *Developing Applications with the WebLogic Security Service*.

You can secure the path to the endpoint within your application 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 the path to the endpoint within your application, where the path is `/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>
```

- Authorizing WebSocket Clients

Authorizing WebSocket Clients

You can configure a WebSocket application to implement BASIC and DIGEST authentication methods and authorize certain clients by manipulating handshake message headers through the `javax.websocket.ClientEndpointConfig.Configurator` class. If the application does not authorize a client to create a WebSocket connection, the server rejects the WebSocket handshake request from that client.

To check the value of the origin header that the client passed during the opening handshake, use the `checkOrigin` method of the `javax.websocket.server.ServerEndpointConfig.Configurator` class. To provide custom checks, you can override this method. For more information, see Configuring a Server Endpoint Programmatically.

A JSR356 code example for Authorization is required.

Establishing Secure WebSocket Connections

To establish a WebSocket connection, the client sends a handshake request to the server. When using the `ws` scheme 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` scheme. The `wss` scheme 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 unencrypted 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>
```

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`.

Specifying Limits for a WebSocket Connection

By specifying limits for a WebSocket connection, you can prevent clients from exhausting server resources, such as memory, sockets, and so forth.

You can specify the following limits for a WebSocket connection:

- **Maximum message size.** To set the maximum message size for a WebSocket connection, set the `maxMessageSize` element of the `onMessage` annotation to the size in bytes.
- **Idle timeout value.** To set the idle timeout value for a WebSocket connection, invoke one of the following methods:
  - For an individual connection, invoke the `setMaxIdleTimeout` method of the `Session` object.
  - For the entire container, invoke the `setDefaultMaxSessionIdleTimeout` method of a `WebSocketContainer` object.

Enabling Protocol Fallback for WebSocket Messaging

Protocol fallback provides a mechanism for using an alternative transport for WebSocket messaging when the WebSocket protocol is not supported. Typically the WebSocket protocol is not supported either because the WebSocket object is not available or because WebSocket frames are blocked by a firewall. In this release, the only supported alternative transport is HTTP Long Polling.

Protocol fallback enables you to rely on standard programming APIs to perform WebSocket messaging regardless of whether or not the runtime environment supports the WebSocket protocol.

> **Note:**
>
> To support WebSocket fallback, the server must use the JSR 356 Java API for WebSocket, not the proprietary WebLogic Server WebSocket API.

Using the JavaScript API for WebSocket Fallback in Client Applications

The JavaScript API for WebSocket fallback provides an implementation of the standard W3C WebSocket API and additional APIs to facilitate WebSocket fallback. For information about the JavaScript API for WebSocket fallback, see *JavaScript API Reference for WebSocket Fallback*. For information about the W3C WebSocket API, see: `http://www.w3.org/TR/websockets/`.

When you use the standard W3C WebSocket JavaScript API, code your application without regard to whether the WebSocket protocol is supported.

Configuring WebSocket Fallback

WebLogic Server provides properties for configuring WebSocket fallback as listed in Table 19-7.

Table 19-7 WebSocket Fallback Configuration Properties

Property	Type	Default	Description
`baseUrl`	string	.	The location of the `scripts` directory, relative to the HTML context of the page. The structure of the `scripts` directory **must** be preserved. The `scripts` directory can be moved to wherever it can be reached, but its content must not change after it was created.
`debug`	integer	0	The debug level.
`ENCODE_FOR_IE_BELOW`	integer	10	The version of the Internet Explorer browser below which Base16 encoding is to be used for framed data.
`ENFORCE_ENCODING`	Boolean	false	Whether Base16 encoding is to be used.
`NB_TRY_FOR_EACH_TRANSPORT`	integer	2	The maximum number of consecutive retries to establish a connection on a given transport.
`PING_INTERVAL`	integer	25000	Interval in milliseconds between consecutive pings to the server.

Table 19-7 (Cont.) WebSocket Fallback Configuration Properties

Property	Type	Default	Description
SERVER_PING_ENABLED	Boolean	true	Whether pings from the client to the server are enabled.
transport	string	none	The enforced transport, which can be one of the following transports: • WebSocket • XMLHttpRequest
TRY_AGAIN_INTERVAL	integer	1000	The number of seconds after which an unsuccessful connection attempt is repeated with the same transport. The retry count for the transport is **not** incremented. If the attempt fails within this number of milliseconds, the retry count is incremented by 1.
WEBSOCKET_CREATION_TIMEOUT	integer	1000	The number of milliseconds after which creation of a WebSocket connection is considered to have failed.

If the WebSocket protocol is available, WebLogic Server uses that protocol even if protocol fallback is enabled. WebLogtic Server uses the value of the TRY_AGAIN_INTERVAL property and the NB_TRY_FOR_EACH_TRANSPORT property as follows to determine whether the WebSocket protocol is available if a connection attempt fails:

- If the connection is not established within TRY_AGAIN_INTERVAL milliseconds, the attempt is repeated with same transport. The retry count for this transport is **not** incremented.
- If the attempt fails within TRY_AGAIN_INTERVAL milliseconds, the retry count is incremented by 1.
- If the retry count reaches the value of NB_TRY_FOR_EACH_TRANSPORT, the next transport is tried.
- If the retry count for the last transport reaches the value of NB_TRY_FOR_EACH_TRANSPORT, the connection is closed, that is, the onclose function is called on the client.

To configure WebSocket fallback:

1. Construct a JSON object in which you set the configuration properties that you require.

   For details about these properties, see Table 19-7.
2. Pass the object as a parameter to one of the following functions:
   - If the fallback mechanism cannot be guaranteed to be present, pass the object as the parameter to the OraSocket.configure function **before** constructing the WebSocket object.

     To ensure that your application does not fail if the JavaScript library for WebSocket fallback is unavailable, call the OraSocket.configure function in a try/catch block.
   - Otherwise, pass the object as the second, optional parameter of the WebSocket object's constructor.

Example 19-31 shows how to configure WebSocket fallback.

Example 19-31 Configuring WebSocket Fallback

This example enforces the XMLHttpRequest transport, sets the debug level to 10, and disables pings from the client to the server.

```
...
    try {
      var config = {};
      config = { transport: XMLHttpRequest, debug: 10, SERVER_PING_ENABLED: false };
      OraSocket.config(config);
    } catch (err) {
      console.log("Error creating WebSocket:" + JSON.stringify(err));
    }
...
```

Creating a WebSocket Object

A WebSocket object represents a WebSocket connection from the client to a remote host.

To create a WebSocket object, invoke the `WebSocket` constructor, passing the following information as parameters:

- The URL to which the client should connect
- Optionally, a JSON object that contains configuration settings for WebSocket fallback

  For more information about the JSON object, see Configuring WebSocket Fallback.

Example 19-32 shows how to create a WebSocket object.

Example 19-32 Creating a WebSocket Object

This example creates the WebSocket Object `ws`. The example uses standard JavaScript functions to determine the URL to which the client should connect from the URL of the document that contains this code.

```
...
var URI_SUFFIX = "/websocket-101/ws-101-app";
var ws;
var connectionStatus = "Connecting...";
var calledBy = document.location.toString();
var machine, port, secured;
var regExp = new RegExp("(http|ws)(.?):[/]{2}([^/|^:]*):?(\\d*)/(.*)");
var matches = regExp.exec(calledBy);
secured = matches[2];
machine = matches[3];
port    = matches[4];
...
  statusFld  = document.getElementById('status');
...
  try
  {
    var wsURI = "ws" + secured + "://" + machine + ":" + port + URI_SUFFIX;
    ws = new WebSocket(wsURI);
  }
  catch (err)
  {
    var mess = 'WebSocket creation error:' + JSON.stringify(err);
    connectionStatus = "<font color='red'>Unable to connect.</font>";
    if (statusFld !== undefined)
      statusFld.innerHTML = mess;
    else
      alert(mess);
  }
...
```

Handling Life Cycle Events for a JavaScript WebSocket Client

Handling lifecycle events for a JavaScript WebSocket client involves writing the `WebSocket` object's callback functions as listed in Table 19-8. The table also provides a cross-reference to an example that shows how to handle each type of event.

Table 19-8 Callback Functions for Handling Life Cycle Events

Event	Callback Function	Example
Connection opened	`onopen`	Example 19-33
Message received	`onmessage`	Example 19-34
Error	`onerror`	Example 19-35
Connection closed	`onclose`	Example 19-36

> **Note:**
>
> The creation of the `ws WebSocket` object in the examples is shown in Example 19-32.

Example 19-33 Handling a Connection Opened Event for a JavaScript WebSocket Client

This example uses standard JavaScript functions to display the current date and time followed by the message `Connection opened` when a connection is opened.

```
...
  ws.onopen = function()
  {
    try
    {
      var text;
      try
     {
        text = 'Message:';
      }
      catch (err)
      {
        text = '<small>Connected</small>';
      }
      promptFld.innerHTML = text;
      if (nbMessReceived === 0)
        statusFld.innerHTML = "";
      statusFld.innerHTML += ((nbMessReceived === 0?"":"<br>") + "<small>" +
                              (new Date()).format("d-M-Y H:i:s._ Z") +
                              "</small>:<font color='blue'>" +
                              ' Connection opened.' + "</font>");
      statusFld.scrollTop = statusFld.scrollHeight;
      nbMessReceived++;
    }
    catch (err) {}
  };
...
```

Example 19-34 Handling a Message Received Event for a JavaScript WebSocket Client

This example uses standard JavaScript functions to display the current time followed by the content of the message when a message is received.

```
...
  ws.onmessage = function(message) // message/event
  {
    var json = {};
    if (typeof(message.data) === 'string')
    {
      try
      {
        json = JSON.parse(message.data);
      }
      catch (e)
      {
        console.log(e);
        console.log('This doesn\'t look like valid JSON: ' + message.data);
      }
    }
    if (json.type !== undefined && json.type === 'message' &&
       typeof(json.appdata.text) === 'string') // it's a single message, text
    {
      var dt = new Date();
     /**
       * Add message to the chat window
       */
      var existing = contentFld.innerHTML; // Content already there
      var toDisplay = "";
      try { toDisplay = json.appdata.text; }
      catch (err) {}
      contentFld.innerHTML = existing +
           ('At ' +
           + (dt.getHours() < 10 ? '0' + dt.getHours() : dt.getHours()) + ':'
           + (dt.getMinutes() < 10 ? '0' + dt.getMinutes() : dt.getMinutes())
           + ': ' + toDisplay + '<br>');
      contentFld.scrollTop = contentFld.scrollHeight;
    }
    else // Unexpected
    {
      var payload = {};
    }
  };
...
```

Example 19-35 Handling an Error Event for a JavaScript WebSocket Client

This example uses standard JavaScript functions to display the current date and time followed by an error message when an error occurs.

```
...
  ws.onerror = function(error)
  {
    if (nbMessReceived === 0)
      statusFld.innerHTML = "";
    statusFld.innerHTML += ((nbMessReceived === 0?"":"<br>") + "<small>" +
                            (new Date()).format("d-M-Y H:i:s._ Z") +
                            "</small>:<font color='red'>" + error.err + "</font>");
    statusFld.scrollTop = statusFld.scrollHeight;
    nbMessReceived++;
  };
...
```

Example 19-36 Handling a Connection Closed Event for a JavaScript WebSocket Client

This example uses standard JavaScript functions to display the current date and time followed by the message `Connection closed` when a connection is closed.

```
...
  ws.onclose = function()
  {
    if (nbMessReceived === 0)
      statusFld.innerHTML = "";
    statusFld.innerHTML += ((nbMessReceived === 0?"":"<br>") + "<small>" +
                            (new Date()).format("d-M-Y H:i:s._ Z") +
                            "</small>:<font color='blue'>" + ' Connection closed' +
                            "</font>");
    promptFld.innerHTML = 'Connection closed';
  };
...
```

Sending a Message from a JavaScript WebSocket Client

To send a message from a JavaScript WebSocket client:

1. Define a function for sending the message.
2. In the body of the function for sending the message, call the `send` function of the `WebSocket` object.
3. Call the function that you defined for sending the message.

The following examples shows how to send a message from a JavaScript WebSocket client:

- Example 19-37
- Example 19-38

Example 19-37 Defining a Function for Sending a Message

This example defines the function `send` for sending a message.

The creation of the `ws WebSocket` object in this example is shown in Example 19-32.

```
...
var send = function(mess)
{
  ws.send(mess);
};
...
```

Example 19-38 Calling a Function for Sending a Message

This example calls the `send` function for sending the contents of the text field when the user clicks Send.

The definition of the `send` function is shown in Example 19-37.

```
...
<input type="text" id="input" style="border-radius:2px; border:1px solid #ccc;
margin-top:10px; padding:5px; width:400px;"
placeholder="Type your message here"/>
<button onclick="javascript:send(document.getElementById('input').value);">Send</button>
...
```

Packaging and Specifying the Location of the WebSocket Fallback Client Library

Package the `orasocket.min.js` file in the `scripts` directory of your web application.

In the client application, add the following `script` element to specify the location of `orasocket.min.js`.

```
<script type="text/javascript" src="scripts/orasocket.min.js"></script>
```

Enabling WebSocket Fallback

By default, WebSocket fallback is disabled.

To enable WebSocket fallback, set the `com.oracle.tyrus.fallback.enabled` context parameter to `true` in the application's deployment descriptor file `web.xml`.

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="3.0" ...>
   ...
  <context-param>
    <description>Enable fallback mechanism</description>
    <param-name>com.oracle.tyrus.fallback.enabled</param-name>
    <param-value>true</param-value>
  </context-param>
</web-app>
```

Migrating an Application to the JSR 356 Java API for WebSocket from the Deprecated API

To ensure compatibility of your WebSocket applications with future releases of WebLogic Server, use the JSR 356 Java API for WebSocket instead of the deprecated packages.

As of WebLogic Server 12.1.3, the packages `weblogic.websocket` and `weblogic.websocket.annotation` are deprecated and will be removed in a future release. After these packages have been removed, you will no longer be able to use these packages for connections over the WebSocket protocol.

Comparison of the JSR 356 API and Proprietary WebLogic Server WebSocket API

Table 19-9 shows the proprietary WebLogic Server WebSocket API and the corresponding JSR 356 API to use to perform tasks for developing a WebSocket application. The table shows only the JSR 356 API to use for an annotated endpoint. For each task, the table also provides a cross-reference to instructions for performing the task by using the JSR 356 API.

Table 19-9 Comparison of the JSR 356 API and Proprietary WebLogic Server WebSocket API

Task	Proprietary WebLogic Server WebSocket API	JSR 356 API	Instructions
Create a server endpoint class	1. `WebSocketListener` interface or `WebSocketAdapter` superclass 2. `WebSocket` annotation	`ServerEndpoint` annotation	Creating an Annotated Endpoint
Handle a connection opened event	`onOpen` method of a `WebSocketListener` object	`OnOpen` annotation on the method that handles the event	Handling a Connection Opened Event
Handle a message received event	One of the following variants of the overloaded `onMessage` method of a `WebSocketListener` object: • For a message that consists of a text data frame: `onMessage(WebSocketConnection connection, String payload)` • For a message that consists of a binary data frame: `onMessage(WebSocketConnection connection, byte[] payload)`	`OnMessage` annotation on the method that handles the event	Handling a Message Received Event
Handle an error event	`onError` method of a `WebSocketListener` object	`OnError` annotation on the method that handles the event	Handling an Error Event
Handle a connection closed event	`onClose` method of a `WebSocketListener` object	`OnClose` annotation on the method that handles the event	Handling a Connection Closed Event

Send a message	One of the following methods of a `WebSocketConnection` object:
	• `send(String message)`
	• `send(byte[] message)`
	• `sendPing`
	• `sendPong`
	• `stream(boolean last, String fragment)`
	• `stream(boolean last, byte[] fragment, int off, int length)`
		1. `Session` interface
		2. One of the following methods of the `Session` object
		`getBasicRemote()`
		`getAsyncRemote()`
		3. One of the following methods of the `RemoteEndpoint.Basic` object or `RemoteEndpoint.Async` object:
		`sendText`
		`sendBinary`
		`sendPing`
		`sendPong`
			Sending a Message to a Single Peer of an Endpoint

Table 19-9 (Cont.) Comparison of the JSR 356 API and Proprietary WebLogic Server WebSocket API

Task	Proprietary WebLogic Server WebSocket API	JSR 356 API	Instructions
Send a message to all peers connected to an endpoint	1. `getWebSocketContext` method of a `WebSocketConnection` object 2. `getWebSocketConnections` method of the `WebSocketContext` object obtained by the previous call	`getOpenSessions` method of the `Session` object	Sending a Message to All Peers of an Endpoint
Set the maximum message size for a WebSocket connection	`maxMessageSize` element of the `WebSocket` annotation	`maxMessageSize` element of the `onMessage` annotation	
Set the idle timeout value for a WebSocket connection	`timeout` element of the `WebSocket` annotation	One of the following APIs: • For an individual connection: `setMaxIdleTimeout` method of the `Session` object • For the entire container: `setDefaultMaxSessionIdleTimeout` method of a `WebSocketContainer` object	
Set the maximum number of open connections on a WebSocket connection	`maxConnections` element of the `WebSocket` annotation	Not supported by JSR 356 Java API for Websocket	

Converting a Proprietary WebSocket Server Endpoint to Use the JSR 356 API

To convert a proprietary WebSocket server endpoint to use the JSTR 356 API:

1. Convert your `WebSocket` class to an annotated server endpoint class.

   Converting a `WebSocket` class to an annotated endpoint class requires fewer changes than converting the `WebSocket` class to a programmatic endpoint class.

   a. Convert the `WebSocket` class to a POJO class by removing the `extends WebSocketAdapter` clause or `implements WebSocketListener` clause from the class declaration.

   b. Replace the `weblogic.websocket.annotation.WebSocket` annotation on the class declaration with the `javax.websocket.server.ServerEndpoint` annotation.

      For more information, see Creating an Annotated Endpoint.

> **Note:**
>
> If the `pathPatterns` element of your existing endpoint contains the `/*` suffix, you must rewrite your code to achieve the same result as the `/*` suffix. For more information, see Replacing the /* Suffix in a Path Pattern String.

2. Annotate the declaration of each method for handling a life cycle event with the annotation that designates the event that the method handles.

   For more information, see Handling Life Cycle Events in an Annotated WebSocket Endpoint.

3. Replace each reference to the `weblogic.websocket.WebSocketConnection` interface with a reference to the `javax.websocket.Session` interface.

4. Replace each method invocation on the `WebSocketConnection` object with an invocation of the corresponding method on the `Session` object.

   For example, the `close` method of a `WebSocketConnection` object takes a `weblogic.websocket.ClosingMessage` object as a parameter. In the `close` method of a `Session` object the corresponding parameter is a `javax.websocket.CloseReason` object.

5. Change each method invocation on a `Session` object to send a message as follows:

   a. Add an invocation of the `getBasicRemote` method or `getAsyncRemote` method to obtain a reference to the object that represents the peer of this endpoint.

   b. Replace the method in the deprecated API for sending the message with the corresponding method in the JSR 356 API.

      The method of the JSR 356 API is a method of the `javax.websocket.RemoteEndpoint.Basic` object or `javax.websocket.RemoteEndpoint.Async` object to which you obtained a reference in the previous step.

      For more information, see Sending a Message.

Deprecated API Method	RemoteEndpoint.Basic Method	RemoteEndpoint.Async Method
send(String message)	sendText(String text)	One of the following methods: sendText(String text) sendText(String text, SendHandler handler)
send(byte[] message)	sendBinary(ByteBuffer data)	One of the following methods: sendBinary (ByteBuffer data) sendBinary(ByteBuffer data, SendHandler handler)
sendPing(byte[] message)	sendPing(ByteBuffer applicationData)	sendPing(ByteBuffer applicationData)
sendPong(byte[] message)	sendPong(ByteBuffer applicationData)	sendPong(ByteBuffer applicationData)
stream(boolean last, String fragment)	sendText(String partialMessage, boolean isLast)	No corresponding method.

Deprecated API Method	RemoteEndpoint.Basic Method	RemoteEndpoint.Async Method
stream(boolean last, byte[] fragment, int off, int length)	sendBinary(ByteBuffer partialByte, boolean isLast)	No corresponding method.

6. Replace references in `import` clauses to classes in the deprecated API with references to the classes in the JSR 356 API that your endpoint uses.
7. Recompile and re-deploy the application that uses the server endpoint.

Replacing the /* Suffix in a Path Pattern String

The `pathPatterns` element of the `WebSocket` annotation in the deprecated API accepts the `/*` suffix in a path pattern string. The `/*` suffix matches the path pattern with any resource path that starts with the path pattern before the `/*` suffix. For example, the resource path `/ws/chat` is matched by path pattern `/ws/*`.

No equivalent to the `/*` suffix exists in the JSR 356 API. If your existing endpoint relies on the `/*` suffix, you must rewrite your code to achieve the same result as the `/*` suffix. How to rewrite your code depends on whether the `/*` suffix represents variable path parameters in an endpoint URI or additional data for an endpoint.

- Replacing a /* Suffix that Represents Variable Path Parameters in an Endpoint URI
- Replacing a /* Suffix that Represents Additional Data for an Endpoint

Replacing a /* Suffix that Represents Variable Path Parameters in an Endpoint URI

The `/*` suffix in a path pattern string might represent one or more variable path parameters in an endpoint URI. In this situation, use a URI template instead of the `/*` suffix.

The JSR 356 API supports only level 1 URI templates in which path parameters are clearly separated by slashes (`/`). Therefore, in the URI template, you must define one variable for expansion for each variable path parameter that replaces the `/*` suffix in your existing endpoint.

For example, if one variable path parameter replaces the `/*` suffix in your existing endpoint, define a URI template similar to the following example:

```
/ws/{param1}
```

The URI `/ws/test` matches the template in the preceding example. The `param1` variable is expanded to `test`.

Similarly, if two variable path parameters replace the `/*` suffix in your existing endpoint, define a URI template similar to the following example:

```
/ws/{param1}/{param2}
```

The URI `/ws/test/chat` matches the template in the preceding example. The `param1` variable is expanded to `test` and the `param2` variable is expanded to `chat`.

For more information, see Specifying a Part of an Endpoint Deployment URI as an Application Parameter.

Replacing a /* Suffix that Represents Additional Data for an Endpoint

The `/*` suffix in a path pattern string might represent additional data for an endpoint that is transferred as part of the URI. In this situation, use query parameters instead of the `/*` suffix.

The JSR 356 specification does not forbid or restrict the use of query parameters in any way. Therefore, you can use a query parameter to transfer any data provided that the following conditions are met:

- URLs are shorter than their maximum allowed length.
- All data is properly encoded.

To obtain an endpoint's query parameters, invoke the method of the endpoint's `Session` object that obtains the parameters in the required format:

- To obtain the parameters as a single string that contains the entire query, invoke the `getQueryString` method. See Example 19-39.
- To obtain the parameters as a map that contains a list of query parameters, invoke the `getRequestParameterMap` method. See Example 19-40.

Example 19-39 Obtaining Query Parameters as a Single String

This example obtains the query parameters in the request URI `/echo?foo=bar,baz,mane,padme,hum` as the application output `"# foo=bar,baz,mane,padme,hum"`.

```
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.ServerEndpoint;
...
@ServerEndpoint("/echo")
public class EchoEndpoint {

    @OnOpen
    public void onOpen(Session session) throws IOException {
        System.out.println("# " + session.getQueryString());
    }

    // ...
}
```

Example 19-40 Obtaining Query Parameters as a Map

This example obtains the query parameters in the request URI `/echo?foo=bar&foo=baz&foo=mane&foo=padme&foo=hum` as the `List<String>` `# [bar, baz, mane, padme, hum]`.

```
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.HandshakeRequest;
import javax.websocket.server.ServerEndpoint;
import java.util.List;
import java.util.Map;
...
@ServerEndpoint("/echo")
public class EchoEndpoint {

    @OnOpen
    public void onOpen(Session session) throws IOException {
        System.out.println("# " + session.getRequestParameterMap().get("foo"));
```

```
    }

    // ...
}
```

Example of Converting a Proprietary WebSocket Server Endpoint to Use the JSR 356 API

Example 19-41 shows how to convert a proprietary WebSocket server endpoint to use he JSR 356 API from the deprecated API.

Example 19-41 Converting a WebSocket Server Endpoint to Use the JSR 356 API

This example shows the changes that are required to convert a WebSocket server endpoint to the use JSR 356 API instead of the deprecated API.

In this example, lines of deprecated code are commented out with the `//` comment characters. Lines of code from the JSR 356 API are indicated by the comment `//JSR 356`.

```
package examples.webapp.html5.websocket;

//import weblogic.websocket.ClosingMessage;       Deprecated
//import weblogic.websocket.WebSocketAdapter;     Deprecated
//import weblogic.websocket.WebSocketConnection;  Deprecated
//import weblogic.websocket.annotation.WebSocket; Deprecated

  import javax.websocket.CloseReason;              //JSR 356
  import javax.websocket.OnMessage;                //JSR 356
  import javax.websocket.Session;                  //JSR 356
  import javax.websocket.server.ServerEndpoint;    //JSR 356

  import java.io.IOException;

//@WebSocket(  Deprecated
//  timeout = -1,  Deprecated
//  pathPatterns = {"/ws"}   Deprecated
//)
  @ServerEndpoint("/ws") //JSR 356
//public class MessageListener extends WebSocketAdapter {  Deprecated
  public class MessageListener {
//@Override  Not required. Replaced by @OnMessage in a POJO class
  @OnMessage //JSR 356
//public void onMessage(WebSocketConnection connection, String payload) { Deprecated
  public void onMessage(Session connection, String payload) //JSR 356
   throws IOException {                                    //JSR 356
    // Sends message from the browser back to the client.
    String msgContent = "Message \"" + payload + "\" has been received by server.";
    try {
//    connection.send(msgContent); Deprecated
      connection.getBasicRemote().sendText(msgContent); //JSR 356
    } catch (IOException e) {
//    connection.close(ClosingMessage.SC_GOING_AWAY); Deprecated
      connection.close(new                                                  //JSR 356
       CloseReason(CloseReason.CloseCodes.GOING_AWAY, "Going away.")); //JSR 356
    }
  }
}
```

Example of Using the Java API for WebSocket with WebLogic Server

Examine an example in which a server endpoint echoes text that a user has sent from a client. When the user sends a text message, the server appends the text (from your server) to the message and sends the message back to the user.

Example 19-42 Using the Java API for WebSocket with WebLogic Server

```
package com.example.websocket.sample.echo;

import java.io.IOException;

import javax.websocket.OnError;
import javax.websocket.OnMessage;
import javax.websocket.OnOpen;
import javax.websocket.Session;
import javax.websocket.server.ServerEndpoint;

@ServerEndpoint("/echo")
public class EchoEndpoint {

  @OnOpen
  public void onOpen(Session session) throws IOException {
    session.getBasicRemote().sendText("onOpen is invoked.");
  }

  @OnMessage
  public String echo(String message) {
    return message + " (from server)";
  }

  @OnError
  public void onError(Throwable t) {
    t.printStackTrace();
  }

}
```

A

Enterprise Application Deployment Descriptor Elements

Learn about enterprise application deployment descriptors such as `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 Using Java EE Annotations and Dependency Injection.

The `weblogic-application.xml` file is also optional if you are not using any WebLogic Server extensions.

This chapter includes the following sections:

weblogic-application.xml Deployment Descriptor Elements

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 following sections describe the many of the individual elements that are defined in the weblogic-application.xml Schema.

The file is located in the `META-INF` subdirectory of the application archive. The following sections describe elements that can appear in the file.

- jdbc-connection-pool
- security
- application-param
- classloader-structure
- listener
- singleton-service
- startup
- shutdown
- work-manager
- session-descriptor
- library-ref
- library-context-root-override
- fast-swap

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 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 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 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 security.

Table A-1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description

`<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 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 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 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 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 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 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 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 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 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 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 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 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.
<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.

Table A-1 (Cont.) weblogic-application Elements

Element	Required?	Maximum Number In File	Description
`<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. 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 fast-swap.
`<ready-registration>`	Optional	1	To use the ReadyApp framework, register an EAR-based application with the framework by adding the following code to the application's WebLogic deployment descriptor `META-INF\weblogic-application.xml`: `<wls:ready-registration>true</wls:ready-registration>` When the application starts, the state of the application is set to *NOT READY*. **Note**: The prefix `wls:` may not be required, depending on the contents of the `weblogic-application.xml` file. If the rest of the tags do not have the prefix, you can ignore the prefix. For more information, see *Deploying Applications to Oracle WebLogic Server*.

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 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.

- entity-cache

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>`

Table A-3 (Cont.) entity-cache Elements

Element	Required?	Maximum Number in File	Description
`<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 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>`

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.

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 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 entity-mapping.

- parser-factory
- entity-mapping

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

Table A-6 (Cont.) parser-factory Elements

Element	Required?	Maximum Number in File	Description
`<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.

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.

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. 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 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 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 driver-params.
`<acl-name>`	Optional	1	DEPRECATED.

- connection-factory
- pool-params
- driver-params

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.

Table A-9 (Cont.) connection-factory Elements

Element	Required?	Maximum Number in File	Description

`<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>`

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.
<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.

Table A-10 (Cont.) pool-params Elements

Element	Required?	Maximum Number in File	Description
`<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 driver-params for more information. • `keep-logical-conn-open-on-release`—Optional. Boolean. 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).

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.
<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

Table A-11 (Cont.) driver-params Elements

Element	Required?	Maximum Number in File	Description
`<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.

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>`

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.

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.

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.

Table A-15 (Cont.) listener Elements

Element	Required?	Maximum Number in File	Description
`<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.

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.

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 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.

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 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.

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.

Table A-19 (Cont.) work-manager Elements

Element	Required ?	Maximum Number in File	Description
<response-time-request-class>	Optional	1	See the description of the <response-time-request> element in 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 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 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 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 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>.
<capacity>	Optional	1	See the description of the <capacity> element in 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>.

Table A-19 (Cont.) work-manager Elements

Element	Required?	Maximum Number in File	Description
`<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>`.

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.
`<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`.

Table A-20 (Cont.) session-descriptor Elements

Element	Required?	Maximum Number in File	Description
<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.
<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.

Table A-20 (Cont.) session-descriptor Elements

Element	Required?	Maximum Number in File	Description
<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.

library-ref

The following table describes the elements you can define within a library-ref element.

See 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.

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 library-ref.

See 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.

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.

weblogic-application.xml Schema

See `http://xmlns.oracle.com/weblogic/weblogic-application/1.6/weblogic-application.xsd` for the XML Schema of the `weblogic-application.xml` deployment descriptor file.

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_7.xsd`.

B

wldeploy Ant Task Reference

Learn about the different tools to deploy applications and standalone modules to WebLogic Server.
This chapter includes the following sections:

- 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.
- Basic Steps for Using wldeploy
  To use the wldeploy Ant task you must perform several required and some optional steps.
- Sample build.xml Files for wldeploy
  Examine these sample `build.xml` files which show how to deploy an application on a single WebLogic Server instance, undeploy the application, perform a partial redeploy of the application, undeploy a particular file in the application, and deploy a Java EE library.
- wldeploy Ant Task Attribute Reference

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 Using Ant Tasks to Configure and Use a WebLogic Server Domain, for more information about `wlserver` and `wlconfig`. See Building Applications in a Split Development Directory, for information about `wlcompile`.

Basic Steps for Using wldeploy

To use the wldeploy Ant task you must perform several required and some optional steps.

1. Set your environment.

On Windows platforms, 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 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 Sample build.xml Files for wldeploy and 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
   ```

Sample build.xml Files for wldeploy

Examine these sample `build.xml` files which show how to deploy an application on a single WebLogic Server instance, undeploy the application, perform a partial redeploy of the application, undeploy a particular file in the application, and deploy a Java EE library.

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>
```

wldeploy Ant Task Attribute Reference

The following sections describe the attributes and child element `<files>` of the `wldeploy` Ant task.

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 WebLogic Server 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 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 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 Creating Shared Java EE Libraries and Optional Packages.	String
`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

Table B-1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
`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
`removePlanOverride`	Removes an overridden deployment plan during a redeploy or update deployment action. To remove an application override, specify the removePlanOverride attribute. You can specify the removePlanOverride attribute for the redeploy deployment actions. For more information about overriding application configuration, see Overriding Application Configuration in Using WebLogic Server MT.	String
`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 Redeploying 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, WebLogic Server 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
`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

Table B-1 (Cont.) Attributes of the wldeploy Ant Task

Attribute	Description	Data Type
`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

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.