

Oracle® GlassFish Server 3.1 Embedded Server Guide

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Preface

This document explains how to run applications in embedded Oracle GlassFish Server. This document is for software developers who are developing applications to run in embedded GlassFish Server. The ability to program in the Java language is assumed.

This preface contains information about and conventions for the entire Oracle GlassFish Server (GlassFish Server) documentation set.

GlassFish Server 3.1 is developed through the GlassFish project open-source community at <http://glassfish.java.net/>. The GlassFish project provides a structured process for developing the GlassFish Server platform that makes the new features of the Java EE platform available faster, while maintaining the most important feature of Java EE: compatibility. It enables Java developers to access the GlassFish Server source code and to contribute to the development of the GlassFish Server. The GlassFish project is designed to encourage communication between Oracle engineers and the community.

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GlassFish Server Documentation Set

The GlassFish Server documentation set describes deployment planning and system installation. For an introduction to GlassFish Server, refer to the books in the order in which they are listed in the following table.

TABLE P-1 Books in the GlassFish Server Documentation Set

Book Title	Description
<i>Release Notes</i>	Provides late-breaking information about the software and the documentation and includes a comprehensive, table-based summary of the supported hardware, operating system, Java Development Kit (JDK), and database drivers.
<i>Quick Start Guide</i>	Explains how to get started with the GlassFish Server product.
<i>Installation Guide</i>	Explains how to install the software and its components.
<i>Upgrade Guide</i>	Explains how to upgrade to the latest version of GlassFish Server. This guide also describes differences between adjacent product releases and configuration options that can result in incompatibility with the product specifications.
<i>Deployment Planning Guide</i>	Explains how to build a production deployment of GlassFish Server that meets the requirements of your system and enterprise.
<i>Administration Guide</i>	Explains how to configure, monitor, and manage GlassFish Server subsystems and components from the command line by using the <code>asadmin(1M)</code> utility. Instructions for performing these tasks from the Administration Console are provided in the Administration Console online help.
<i>Security Guide</i>	Provides instructions for configuring and administering GlassFish Server security.
<i>Application Deployment Guide</i>	Explains how to assemble and deploy applications to the GlassFish Server and provides information about deployment descriptors.
<i>Application Development Guide</i>	Explains how to create and implement Java Platform, Enterprise Edition (Java EE platform) applications that are intended to run on the GlassFish Server. These applications follow the open Java standards model for Java EE components and application programmer interfaces (APIs). This guide provides information about developer tools, security, and debugging.
<i>Add-On Component Development Guide</i>	Explains how to use published interfaces of GlassFish Server to develop add-on components for GlassFish Server. This document explains how to perform <i>only</i> those tasks that ensure that the add-on component is suitable for GlassFish Server.
<i>Embedded Server Guide</i>	Explains how to run applications in embedded GlassFish Server and to develop applications in which GlassFish Server is embedded.
<i>High Availability Administration Guide</i>	Explains how to configure GlassFish Server to provide higher availability and scalability through failover and load balancing.
<i>Performance Tuning Guide</i>	Explains how to optimize the performance of GlassFish Server.

TABLE P-1 Books in the GlassFish Server Documentation Set (Continued)

Book Title	Description
<i>Troubleshooting Guide</i>	Describes common problems that you might encounter when using GlassFish Server and explains how to solve them.
<i>Error Message Reference</i>	Describes error messages that you might encounter when using GlassFish Server.
<i>Reference Manual</i>	Provides reference information in man page format for GlassFish Server administration commands, utility commands, and related concepts.
<i>Message Queue Release Notes</i>	Describes new features, compatibility issues, and existing bugs for GlassFish Server Message Queue.
<i>Message Queue Technical Overview</i>	Provides an introduction to the technology, concepts, architecture, capabilities, and features of the Message Queue messaging service.
<i>Message Queue Administration Guide</i>	Explains how to set up and manage a Message Queue messaging system.
<i>Message Queue Developer's Guide for JMX Clients</i>	Describes the application programming interface in Message Queue for programmatically configuring and monitoring Message Queue resources in conformance with the Java Management Extensions (JMX).
<i>Message Queue Developer's Guide for Java Clients</i>	Provides information about concepts and procedures for developing Java messaging applications (Java clients) that work with GlassFish Server.
<i>Message Queue Developer's Guide for C Clients</i>	Provides programming and reference information for developers working with Message Queue who want to use the C language binding to the Message Queue messaging service to send, receive, and process Message Queue messages.

Related Documentation

The following tutorials explain how to develop Java EE applications:

- *Your First Cup: An Introduction to the Java EE Platform* (<http://download.oracle.com/javaee/6/firstcup/doc/>). For beginning Java EE programmers, this short tutorial explains the entire process for developing a simple enterprise application. The sample application is a web application that consists of a component that is based on the Enterprise JavaBeans specification, a JAX-RS web service, and a JavaServer Faces component for the web front end.
- *The Java EE 6 Tutorial* (<http://download.oracle.com/javaee/6/tutorial/doc/>). This comprehensive tutorial explains how to use Java EE 6 platform technologies and APIs to develop Java EE applications.

Javadoc tool reference documentation for packages that are provided with GlassFish Server is available as follows.

- The API specification for version 6 of Java EE is located at <http://download.oracle.com/javaee/6/api/>.
- The API specification for GlassFish Server 3.1, including Java EE 6 platform packages and nonplatform packages that are specific to the GlassFish Server product, is located at <http://glassfish.java.net/nonav/docs/v3/api/>.

Additionally, the [Java EE Specifications \(http://www.oracle.com/technetwork/java/javaee/tech/index.html\)](http://www.oracle.com/technetwork/java/javaee/tech/index.html) might be useful.

For information about creating enterprise applications in the NetBeans Integrated Development Environment (IDE), see the [NetBeans Documentation, Training & Support page \(http://www.netbeans.org/kb/\)](http://www.netbeans.org/kb/).

For information about the Java DB database for use with the GlassFish Server, see the [Java DB product page \(http://www.oracle.com/technetwork/java/javadb/overview/index.html\)](http://www.oracle.com/technetwork/java/javadb/overview/index.html).

The Java EE Samples project is a collection of sample applications that demonstrate a broad range of Java EE technologies. The Java EE Samples are bundled with the Java EE Software Development Kit (SDK) and are also available from the [Java EE Samples project page \(http://java.net/projects/glassfish-samples\)](http://java.net/projects/glassfish-samples).

Typographic Conventions

The following table describes the typographic changes that are used in this book.

TABLE P-2 Typographic Conventions

Typeface	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name%</code> you have mail.
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name%</code> su Password:
<i>AaBbCc123</i>	A placeholder to be replaced with a real name or value	The command to remove a file is <code>rm filename</code> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized (note that some emphasized items appear bold online)	Read Chapter 6 in the <i>User's Guide</i> . A <i>cache</i> is a copy that is stored locally. Do <i>not</i> save the file.

Symbol Conventions

The following table explains symbols that might be used in this book.

TABLE P-3 Symbol Conventions

Symbol	Description	Example	Meaning
[]	Contains optional arguments and command options.	ls [-l]	The -l option is not required.
{ }	Contains a set of choices for a required command option.	-d {y n}	The -d option requires that you use either the y argument or the n argument.
\${ }	Indicates a variable reference.	\${com.sun.javaRoot}	References the value of the com.sun.javaRoot variable.
-	Joins simultaneous multiple keystrokes.	Control-A	Press the Control key while you press the A key.
+	Joins consecutive multiple keystrokes.	Ctrl+A+N	Press the Control key, release it, and then press the subsequent keys.
→	Indicates menu item selection in a graphical user interface.	File → New → Templates	From the File menu, choose New. From the New submenu, choose Templates.

Default Paths and File Names

The following table describes the default paths and file names that are used in this book.

TABLE P-4 Default Paths and File Names

Placeholder	Description	Default Value
<i>as-install</i>	Represents the base installation directory for GlassFish Server. In configuration files, <i>as-install</i> is represented as follows: \${com.sun.aas.installRoot}	Installations on the Oracle Solaris operating system, Linux operating system, and Mac OS operating system: <i>user's-home-directory/glassfish3/glassfish</i> Windows, all installations: <i>SystemDrive:\glassfish3\glassfish</i>

TABLE P-4 Default Paths and File Names (Continued)

Placeholder	Description	Default Value
<i>as-install-parent</i>	Represents the parent of the base installation directory for GlassFish Server.	Installations on the Oracle Solaris operating system, Linux operating system, and Mac operating system: <i>user's-home-directory/glassfish3</i> Windows, all installations: <i>SystemDrive:\glassfish3</i>
<i>domain-root-dir</i>	Represents the directory in which a domain is created by default.	<i>as-install/domains/</i>
<i>domain-dir</i>	Represents the directory in which a domain's configuration is stored. In configuration files, <i>domain-dir</i> is represented as follows: <code>\${com.sun.aas.instanceRoot}</code>	<i>domain-root-dir/domain-name</i>

Documentation, Support, and Training

The Oracle web site provides information about the following additional resources:

- [Documentation \(http://www.oracle.com/technetwork/indexes/documentation/index.html\)](http://www.oracle.com/technetwork/indexes/documentation/index.html)
- [Support \(http://www.oracle.com/us/support/index.html\)](http://www.oracle.com/us/support/index.html)
- [Training \(http://education.oracle.com/\)](http://education.oracle.com/)

Searching Oracle Product Documentation

Besides searching Oracle product documentation from the [Oracle Documentation \(http://www.oracle.com/technetwork/indexes/documentation/index.html\)](http://www.oracle.com/technetwork/indexes/documentation/index.html) web site, you can use a search engine by typing the following syntax in the search field:

search-term **site:oracle.com**

For example, to search for “broker,” type the following:

broker site:oracle.com

Third-Party Web Site References

Third-party URLs are referenced in this document and provide additional, related information.

Note – Oracle is not responsible for the availability of third-party web sites mentioned in this document. Oracle does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Oracle will not be responsible or liable for any actual or alleged damage or loss caused or alleged to be caused by or in connection with use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

Oracle GlassFish Server 3.1 Embedded Server Guide

This document explains how to run applications in embedded Oracle GlassFish Server. This document is for software developers who are developing applications to run in embedded GlassFish Server. The ability to program in the Java language is assumed.

The following topics are addressed here:

- [“Introduction to Embedded GlassFish Server” on page 13](#)
- [“Embedded GlassFish Server File System” on page 13](#)
- [“Including the GlassFish Server Embedded Server API in Applications” on page 14](#)
- [“Using the EJB 3.1 Embeddable API with Embedded GlassFish Server” on page 27](#)
- [“Default Java Persistence Data Source for Embedded GlassFish Server” on page 30](#)

Introduction to Embedded GlassFish Server

Embedded Oracle GlassFish Server enables you to use GlassFish Server as a library. Embedded GlassFish Server also enables you to run GlassFish Server inside any Virtual Machine for the Java platform (Java Virtual Machine or JVMmachine).

Note – Embedded GlassFish Server does *not* run on the Java Platform, Micro Edition (Java ME platform).

Embedded GlassFish Server File System

The following Embedded GlassFish Server directories and files are important:

- [“Installation Root Directory” on page 14](#)
- [“Instance Root Directory” on page 14](#)
- [“The domain.xml File” on page 14](#)

Installation Root Directory

The installation root directory, represented as *as-install*, is the parent of the directory that embedded GlassFish Server uses for configuration files. This directory corresponds to the base directory for an installation of GlassFish Server. Configuration files are contained in the following directories in the base directory for an installation of GlassFish Server:

- domains
- lib

Instance Root Directory

The instance root directory, represented as *domain-dir*, is the parent directory of a server instance directory. Embedded Oracle GlassFish Server uses the server instance directory for domain configuration files.

If *domain-dir* is not specified, GlassFish Server creates a directory named `gfembedrandom-numbertmp` in a temporary directory, where *random-number* is a randomly generated 19-digit number. GlassFish Server then copies configuration files into this directory. The temporary directory is the value of the system property `java.io.tmpdir`. You can override this value by specifying the `glassfish.embedded.tmpdir` property as a system property.

The domain.xml File

Using an existing `domain.xml` file avoids the need to configure embedded GlassFish Server programmatically in your application. Your application obtains domain configuration data from an existing `domain.xml` file. You can create this file by using the administrative interfaces of an installation of nonembedded GlassFish Server.

Note – The built-in `domain.xml` file used by default by Embedded GlassFish Server can be downloaded from <http://embedded-glassfish.java.net/domain.xml>.

Including the GlassFish Server Embedded Server API in Applications

Oracle GlassFish Server provides an application programming interface (API) for developing applications in which GlassFish Server is embedded. For details, see the `org.glassfish.embeddable` packages at <http://embedded-glassfish.java.net/nonav/apidocs/>.

The following topics are addressed here:

- “Setting the Class Path” on page 15
- “Creating, Starting, and Stopping Embedded GlassFish Server” on page 15
- “Deploying and Undeploying an Application in an Embedded GlassFish Server” on page 19
- “Running `asadmin` Commands Using the GlassFish Server Embedded Server API” on page 25
- “Sample Applications” on page 26

Setting the Class Path

To enable your applications to locate the class libraries for embedded GlassFish Server, add the following JAR file to your class path:

`glassfish-embedded-static-shell.jar`

Contains references to classes needed for deploying all Java EE application types. Must be used with a nonembedded installation of GlassFish Server. Reference this file from the `as-install/glassfish/lib/embedded` directory of a nonembedded GlassFish Server installation. Do not move this file or it will not work. For an explanation of *as-install*, see [Installation Root Directory](#).

Note – Oracle GlassFish Server only supports use of the `glassfish-embedded-static-shell.jar` file.

In addition, add to the class path any other JAR files or classes upon which your applications depend. For example, if an application uses a database other than Java DB, include the Java DataBase Connectivity (JDBC) driver JAR files in the class path.

Creating, Starting, and Stopping Embedded GlassFish Server

Before you can run applications, you must set up and run the embedded GlassFish Server.

The following topics are addressed here:

- “Creating and Configuring an Embedded GlassFish Server” on page 15
- “Running an Embedded GlassFish Server” on page 18

Creating and Configuring an Embedded GlassFish Server

To create and configure an embedded GlassFish Server, perform these tasks:

1. Instantiate the `org.glassfish.embeddable.BootstrapProperties` class.
2. Invoke any methods for configuration settings that you require. This is optional.

3. Invoke the `GlassFishRuntime.bootstrap()` or `GlassFishRuntime.bootstrap(BootstrapProperties)` method to create a `GlassFishRuntime` object.
4. Instantiate the `org.glassfish.embeddable.GlassFishProperties` class.
5. Invoke any methods for configuration settings that you require. This is optional.
6. Invoke the `glassfishRuntime.newGlassFish(GlassFishProperties)` method to create a `GlassFish` object.

The methods of the `BootstrapProperties` class for setting the server configuration are listed in the following table. The default value of each configuration setting is also listed.

TABLE 1 Methods of the `BootstrapProperties` Class

Purpose	Method	Default Value
References an existing Installation Root Directory , also called <i>as-install</i>	<code>setInstallRoot(String as-install)</code>	None. If <code>glassfish-embedded-static-shell.jar</code> is used, the Installation Root Directory is automatically determined and need not be specified.

The methods of the `GlassFishProperties` class for setting the server configuration are listed in the following table. The default value of each configuration setting is also listed.

TABLE 2 Methods of the `GlassFishProperties` Class

Purpose	Method	Default Value
References an existing Instance Root Directory , also called <i>domain-dir</i>	<code>setInstanceRoot(String domain-dir)</code>	In order of precedence: <ul style="list-style-type: none"> ▪ <code>glassfish.embedded.tmpdir</code> property value specified in <code>GlassFishProperties</code> object ▪ <code>glassfish.embedded.tmpdir</code> system property value ▪ <code>java.io.tmp</code> system property value ▪ <i>as-install/domains/domain1</i> if a nonembedded installation is referenced

TABLE 2 Methods of the GlassFishProperties Class (Continued)

Purpose	Method	Default Value
Creates a new or references an existing configuration file	<code>setConfigFileURI(String configFileURI)</code>	In order of precedence: <ul style="list-style-type: none"> ■ <code>domain-dir/config/domain.xml</code> if <code>domain-dir</code> was set using <code>setInstanceRoot</code> ■ built-in embedded <code>domain.xml</code>
Specifies whether the configuration file is read-only	<code>setConfigFileReadOnly(boolean readOnly)</code>	<code>true</code>
Sets the port on which Embedded GlassFish Server listens.	<code>setPort(String networkListener, int port)</code>	<code>none</code>

Note – Do not use `setPort` if you are using `setInstanceRoot` or `setConfigFileURI`.

EXAMPLE 1 Creating an Embedded GlassFish Server

This example shows code for creating an Embedded GlassFish Server.

```
...
import org.glassfish.embeddable.*;
...
    GlassFish glassfish = GlassFishRuntime.bootstrap().newGlassFish();
    glassfish.start();
...

```

EXAMPLE 2 Creating an Embedded GlassFish Server with configuration customizations

This example shows code for creating an Embedded GlassFish Server using the existing `domain-dir C:\samples\test\applicationserver\domains\domain1`.

```
...
import org.glassfish.embeddable.*;
...
    BootstrapProperties bootstrapProperties = new BootstrapProperties();
    bootstrapProperties.setInstallRoot("C:\\samples\\test\\applicationserver");
    GlassFishRuntime glassfishRuntime = GlassFishRuntime.bootstrap(bootstrapProperties);

    GlassFishProperties glassfishProperties = new GlassFishProperties();
    glassfishProperties.setInstanceRoot("C:\\samples\\test\\applicationserver\\domains\\domain1");
    GlassFish glassfish = glassfishRuntime.newGlassFish(glassfishProperties);

    glassfish.start();
...

```

Running an Embedded GlassFish Server

After you create an embedded GlassFish Server as described in [“Creating and Configuring an Embedded GlassFish Server”](#) on page 15, you can perform operations such as:

- [Setting the Port](#)
- [Starting the Server](#)
- [Stopping the Server](#)

Setting the Port of an Embedded GlassFish Server From an Application

You must set the server's HTTP or HTTPS port. If you do not set the port, your application fails to start and throws an exception. You can set the port directly or indirectly.

Note – Do not use `setPort` if you are using `setInstanceRoot` or `setConfigFileURI`. These methods set the port indirectly.

- To set the port directly, invoke the `setPort` method of the `GlassFishProperties` object.
- To set the port indirectly, use a `domain.xml` file that sets the port. For more information, see [“The domain.xml File”](#) on page 14.

EXAMPLE 3 Setting the port of an Embedded GlassFish Server

This example shows code for setting the port of an embedded GlassFish Server.

```
...
import org.glassfish.embeddable.*;
...
    GlassFishProperties glassfishProperties = new GlassFishProperties();
    glassfishProperties.setPort("http-listener", 8080);
    glassfishProperties.setPort("https-listener", 8181);
...
```

Starting an Embedded GlassFish Server From an Application

To start an embedded GlassFish Server, invoke the `start` method of the `GlassFish` object.

EXAMPLE 4 Starting an Embedded GlassFish Server

This example shows code for setting the port and starting an embedded GlassFish Server. This example also includes the code from [Example 1](#) for creating a `GlassFish` object.

```
...
import org.glassfish.embeddable.*;
...
    GlassFishProperties glassfishProperties = new GlassFishProperties();
    glassfishProperties.setPort("http-listener", 8080);
    glassfishProperties.setPort("https-listener", 8181);
...
```

EXAMPLE 4 Starting an Embedded GlassFish Server (Continued)

```

GlassFish glassfish = GlassFishRuntime.bootstrap().newGlassFish(glassfishProperties);
glassfish.start();
...

```

Stopping an Embedded GlassFish Server From an Application

The API for embedded GlassFish Server provides a method for stopping an embedded server. Using this method enables your application to stop the server in an orderly fashion by performing any necessary cleanup steps before stopping the server, for example:

- Undeploying deployed applications
- Releasing any resources that your application uses

To stop an embedded GlassFish Server, invoke the `stop` method of an existing `GlassFish` object.

EXAMPLE 5 Stopping an Embedded GlassFish Server

This example shows code for prompting the user to press the Enter key to stop an embedded GlassFish Server. Code for creating a `GlassFish` object is not shown in this example. For an example of code for creating a `GlassFish` object, see [Example 1](#).

```

...
import java.io.BufferedReader;
...
import org.glassfish.embeddable.*;
...
    System.out.println("Press Enter to stop server");
        // wait for Enter
    glassfish.stop(); // Stop Embedded GlassFish Server
...

```

As an alternative, you can use the `dispose` method to stop an embedded GlassFish Server and dispose of the temporary file system.

Deploying and Undeploying an Application in an Embedded GlassFish Server

Deploying an application installs the files that comprise the application into Embedded GlassFish Server and makes the application ready to run. By default, an application is enabled when it is deployed.

The following topics are addressed here:

- “To Deploy an Application From an Archive File or a Directory” on page 20
- “Undeploying an Application” on page 21
- “Creating a Scattered Archive” on page 22
- “Creating a Scattered Enterprise Archive” on page 23

For general information about deploying applications in GlassFish Server, see *Oracle GlassFish Server 3.1 Application Deployment Guide*.

▼ To Deploy an Application From an Archive File or a Directory

An archive file contains the resources, deployment descriptor, and classes of an application. The content of the file must be organized in the directory structure that the Java EE specifications define for the type of archive that the file contains. For more information, see [Chapter 2, “Deploying Applications,”](#) in *Oracle GlassFish Server 3.1 Application Deployment Guide*.

Deploying an application from a directory enables you to deploy an application without the need to package the application in an archive file. The contents of the directory must match the contents of the expanded Java EE archive file as laid out by the GlassFish Server. The directory must be accessible to the machine on which the *deploying* application runs. For more information about the requirements for deploying an application from a directory, see “[To Deploy an Application or Module in a Directory Format](#)” in *Oracle GlassFish Server 3.1 Application Deployment Guide*.

If some of the resources needed by an application are not under the application's directory, see “[Creating a Scattered Archive](#)” on page 22.

- 1 Instantiate the `java.io.File` class to represent the archive file or directory.**
- 2 Invoke the `getDeployer` method of the `GlassFish` object to get an instance of the `org.glassfish.embeddable.Deployer` class.**
- 3 Invoke the `deploy(File archive, params)` method of the instance of the `Deployer` object.**
Specify the `java.io.File` class instance you created previously as the first method parameter.

For information about optional parameters you can set, see the descriptions of the `deploy(1)` command parameters. Simply quote each parameter in the method, for example “`--force=true`”.

Example 6 Deploying an Application From an Archive File

This example shows code for deploying an application from the archive file `c:\samples\simple.war` and setting the `name`, `contextroot`, and `force` parameters. This example also includes the code from [Example 1](#) for creating `GlassFishProperties` and `GlassFish` objects.

```

...
import java.io.File;
...
import org.glassfish.embeddable.*;
...
    GlassFishProperties glassfishProperties = new GlassFishProperties();
    glassfishProperties.setPort("http-listener", 8080);
    glassfishProperties.setPort("https-listener", 8181);
    ...
    GlassFish glassfish = GlassFishRuntime.bootstrap().newGlassFish(glassfishProperties);
    glassfish.start();
    File war = new File("c:\\samples\\simple.war");
    Deployer deployer = glassfish.getDeployer();
    deployer.deploy(war, "--name=simple", "--contextroot=simple", "--force=true");
    // deployer.deploy(war) can be invoked instead. Other parameters are optional.
...

```

Undeploying an Application

Undeploy an application when the application is no longer required to run in GlassFish Server. For example, before stopping GlassFish Server, undeploy all applications that are running in GlassFish Server.

Note – If you reference a nonembedded GlassFish Server installation using the `glassfish-embedded-static-shell.jar` file and do not undeploy your applications in the same server life cycle in which you deployed them, expanded archives for these applications remain under the `domain-dir/applications` directory.

To undeploy an application, invoke the `undeploy` method of an existing `Deployer` object. In the method invocation, pass the name of the application as a parameter. This name is specified when the application is deployed.

For information about optional parameters you can set, see the descriptions of the [deploy\(1\)](#) command parameters. Simply quote each parameter in the method, for example `"--cascade=true"`.

To undeploy all deployed applications, invoke the `undeployAll` method of an existing `EmbeddedDeployer` object. This method takes no parameters.

EXAMPLE 7 Undeploying an Application

This example shows code for undeploying the application that was deployed in [Example 6](#).

```

...
import org.glassfish.embeddable.*;
...
    deployer.undeploy(war, "--droptables=true", "--cascade=true");
...

```

Creating a Scattered Archive

Deploying a module from a scattered archive (WAR or JAR) enables you to deploy an unpackaged module whose resources, deployment descriptor, and classes are in any location. Deploying a module from a scattered archive simplifies the testing of a module during development, especially if all the items that the module requires are not available to be packaged.

In a scattered archive, these items are not required to be organized in a specific directory structure. Therefore, you must specify the location of the module's resources, deployment descriptor, and classes when deploying the module.

To create a scattered archive, perform these tasks:

1. Instantiate the `org.glassfish.embeddable.archive.ScatteredArchive` class.
2. Invoke the `addClassPath` and `addMetadata` methods if you require them.
3. Invoke the `toURI` method to deploy the scattered archive.

The methods of this class for setting the scattered archive configuration are listed in the following table. The default value of each configuration setting is also listed.

TABLE 3 Constructors and Methods of the `ScatteredArchive` Class

Purpose	Method	Default Value
Creates and names a scattered archive	<code>ScatteredArchive(String name, ScatteredArchive.Type type)</code>	None
Creates and names a scattered archive based on a top-level directory. If the entire module is organized under the <i>topDir</i> , this is the only method necessary. The <i>topDir</i> can be null if other methods specify the remaining parts of the module.	<code>ScatteredArchive(String name, ScatteredArchive.Type type, File topDir)</code>	None
Adds a directory to the classes classpath	<code>addClassPath(File path)</code>	None
Adds a metadata locator	<code>addMetaData(File path)</code>	None
Adds and names a metadata locator	<code>addMetaData(File path, String name)</code>	None
Gets the deployable URI for this scattered archive	<code>toURI()</code>	None

EXAMPLE 8 Deploying an Application From a Scattered Archive

This example shows code for creating a WAR file and using the `addClassPath` and `addMetadata` methods. This example also includes the code from [Example 6](#) for deploying an application from an archive file.

```
...
import java.io.File;
...
import org.glassfish.embeddable.*;
...
    GlassFishProperties glassfishProperties = new GlassFishProperties();
    glassfishProperties.setPort("http-listener", 9090);
    GlassFish glassfish = GlassFishRuntime.bootstrap().newGlassFish(glassfishProperties);
    glassfish.start();
    Deployer deployer = glassfish.getDeployer();
    ScatteredArchive archive = new ScatteredArchive("testapp", ScatteredArchive.Type.WAR);
    // target/classes directory contains compiled servlets
    archive.addClassPath(new File("target", "classes"));
    // resources/sun-web.xml is the WEB-INF/sun-web.xml
    archive.addMetadata(new File("resources", "sun-web.xml"));
    // resources/web.xml is the WEB-INF/web.xml
    archive.addMetadata(new File("resources", "web.xml"));
    // Deploy the scattered web archive.
    String appName = deployer.deploy(archive.toURI(), "--contextroot=hello");

    deployer.undeploy(appName);
    glassfish.stop();
    glassfish.dispose();
...

```

Creating a Scattered Enterprise Archive

Deploying an application from a scattered enterprise archive (EAR) enables you to deploy an unpackaged application whose resources, deployment descriptor, and classes are in any location. Deploying an application from a scattered archive simplifies the testing of an application during development, especially if all the items that the application requires are not available to be packaged.

In a scattered archive, these items are not required to be organized in a specific directory structure. Therefore, you must specify the location of the application's resources, deployment descriptor, and classes when deploying the application.

To create a scattered enterprise archive, perform these tasks:

1. Instantiate the `org.glassfish.embeddable.archive.ScatteredEnterpriseArchive` class.
2. Invoke the `addArchive` and `addMetadata` methods if you require them.
3. Invoke the `toURI` method to deploy the scattered enterprise archive.

The methods of this class for setting the scattered enterprise archive configuration are listed in the following table. The default value of each configuration setting is also listed.

TABLE 4 Constructors and Methods of the ScatteredEnterpriseArchive Class

Purpose	Method	Default Value
Creates and names a scattered enterprise archive	ScatteredEnterpriseArchive(String <i>name</i>)	None
Adds a module or library	addArchive(File <i>archive</i>)	None
Adds a module or library	addArchive(File <i>archive</i> , String <i>name</i>)	None
Adds a module or library	addArchive(URI <i>URI</i>)	None
Adds a module or library	addArchive(URI <i>URI</i> , String <i>name</i>)	None
Adds a metadata locator	addMetaData(File <i>path</i>)	None
Adds and names a metadata locator	addMetaData(File <i>path</i> , String <i>name</i>)	None
Gets the deployable URI for this scattered archive	toURI()	None

EXAMPLE 9 Deploying an Application From a Scattered Enterprise Archive

This example shows code for creating an EAR file and using the `addArchive` and `addMetadata` methods. This example also includes code similar to [Example 8](#) for creating a scattered archive.

```

...
import java.io.File;
...
import org.glassfish.embeddable.*;
...
GlassFishProperties glassfishProperties = new GlassFishProperties();
glassfishProperties.setPort("http-listener", 9090);
GlassFish glassfish = GlassFishRuntime.bootstrap().newGlassFish(glassfishProperties);
glassfish.start();
Deployer deployer = glassfish.getDeployer();

// Create a scattered web application.
ScatteredArchive webmodule = new ScatteredArchive("testweb", ScatteredArchive.Type.WAR);
// target/classes directory contains my compiled servlets
webmodule.addClassPath(new File("target", "classes"));
// resources/sun-web.xml is my WEB-INF/sun-web.xml
webmodule.addMetadata(new File("resources", "sun-web.xml"));

// Create a scattered enterprise archive.
ScatteredEnterpriseArchive archive = new ScatteredEnterpriseArchive("testapp");
// src/application.xml is my META-INF/application.xml
archive.addMetadata(new File("src", "application.xml"));
// Add scattered web module to the scattered enterprise archive.
// src/application.xml references Web module as "scattered.war".
//Hence specify the name while adding the archive.
archive.addArchive(webmodule.toURI(), "scattered.war");

```


EXAMPLE 9 Deploying an Application From a Scattered Enterprise Archive (Continued)

```
// lib/mylibrary.jar is a library JAR file.
archive.addArchive(new File("lib", "mylibrary.jar"));
// target/ejbclasses contain my compiled EJB module.
// src/application.xml references EJB module as "ejb.jar".
//Hence specify the name while adding the archive.
archive.addArchive(new File("target", "ejbclasses"), "ejb.jar");

// Deploy the scattered enterprise archive.
String appName = deployer.deploy(archive.toURI());

deployer.undeploy(appName);
glassfish.stop();
glassfish.dispose();
...

```

Running asadmin Commands Using the GlassFish Server Embedded Server API

Running `asadmin(1M)` commands from an application enables the application to configure the embedded GlassFish Server to suit the application's requirements. For example, an application can run the required `asadmin` commands to create a JDBC technology connection to a database.

For more information about configuring embedded GlassFish Server, see the [Oracle GlassFish Server 3.1 Administration Guide](#). For detailed information about `asadmin` commands, see Section 1 of the [Oracle GlassFish Server 3.1-3.1.1 Reference Manual](#).

Note – Ensure that your application has started an embedded GlassFish Server before the application attempts to run `asadmin` commands. For more information, see [“Running an Embedded GlassFish Server” on page 18](#).

The `org.glassfish.embeddable` package contains classes that you can use to run `asadmin` commands. Use the following code examples as templates and change the command name, parameter names, and parameter values as needed.

EXAMPLE 10 Running an `asadmin create-jdbc-resource` Command

This example shows code for running an `asadmin create-jdbc-resource` command. Code for creating and starting the server is not shown in this example. For an example of code for creating and starting the server, see [Example 4](#).

```
...
import org.glassfish.embeddable.*;
...
String command = "create-jdbc-resource";

```

EXAMPLE 10 Running an `asadmin create-jdbc-resource` Command *(Continued)*

```

String poolid = "--connectionpoolid=DerbyPool";
String dbname = "jdbc/DerbyPool";
CommandRunner commandRunner = glassfish.getCommandRunner();
CommandResult commandResult = commandRunner.run(command, poolid, dbname);
...

```

EXAMPLE 11 Running an `asadmin set-log-level` Command

This example shows code for running an `asadmin set-log-level` command. Code for creating and starting the server is not shown in this example. For an example of code for creating and starting the server, see [Example 4](#).

```

...
import org.glassfish.embeddable.*;
...
String command = "set-log-level";
String weblevel = "javax.enterprise.system.container.web=FINE";
CommandRunner commandRunner = glassfish.getCommandRunner();
CommandResult commandResult = commandRunner.run(command, weblevel);
...

```

Sample Applications

EXAMPLE 12 Using an Existing `domain.xml` File and Deploying an Application From an Archive File

This example shows code for the following:

- Using the existing file `c:\myapp\embeddedserver\domains\domain1\config\domain.xml` and preserving this file when the application is stopped.
- Deploying an application from the archive file `c:\samples\simple.war`.

```

import java.io.File;
import java.io.BufferedReader;
import org.glassfish.embeddable.*;

public class Main {

    /**
     * @param args the command line arguments
     */

    public static void main(String[] args) {
        File configFile = new File("c:\\myapp\\embeddedserver\\domains\\domain1\\config\\domain.xml");
        File war = new File("c:\\samples\\simple.war");
        try {
            GlassFishRuntime glassfishRuntime = GlassFishRuntime.bootstrap();
            ...
            GlassFishProperties glassfishProperties = new GlassFishProperties();
            glassfishProperties.setConfigFileURI(configFile.toURI());
            glassfishProperties.setConfigFileReadOnly(false);

```

EXAMPLE 12 Using an Existing domain.xml File and Deploying an Application From an Archive File
(Continued)

```

...
GlassFish glassfish = glassfishRuntime.newGlassFish(glassfishProperties);
glassfish.start();

    Deployer deployer = glassfish.getDeployer();
    deployer.deploy(war, "--force=true");
}
catch (Exception e) {
    e.printStackTrace();
}

System.out.println("Press Enter to stop server");
// wait for Enter
new BufferedReader(new java.io.InputStreamReader(System.in)).readLine();
try {
    glassfish.dispose();
    glassfishRuntime.shutdown();
}
catch (Exception e) {
    e.printStackTrace();
}
}
}
}

```

Using the EJB 3.1 Embeddable API with Embedded GlassFish Server

The EJB 3.1 Embeddable API is designed for unit testing of EJB modules. You must use this API with a pre-installed GlassFish Server instance. However, you can take advantage of Embedded GlassFish Server's ease of use by referencing the GlassFish Server instance with the `glassfish-embedded-static-shell.jar` file.

The EJB 3.1 Embeddable API is described in [Java Specification Request \(JSR\) 318](http://jcp.org/en/jsr/detail?id=318) (<http://jcp.org/en/jsr/detail?id=318>). An `ejb-embedded` sample is included in the samples available at [Java EE 6 Downloads](http://www.oracle.com/technetwork/java/javaee/downloads/index.html) (<http://www.oracle.com/technetwork/java/javaee/downloads/index.html>) or [Code Samples](http://www.oracle.com/technetwork/java/javaee/documentation/index.html) (<http://www.oracle.com/technetwork/java/javaee/documentation/index.html>).

The EJB 3.1 Embeddable API supports all EJB 3.1 Lite features with addition of the EJB timer service and testing of EJB modules packaged in a WAR file.

For EJB modules in a WAR file (or an exploded directory), if a web application has one EJB module, and there are no other EJB modules in the classpath, those entries (libraries) are ignored. If there are other EJB modules, a temporary EAR file is created. For EJB modules in a WAR file to be tested, the client code must use EJB modules with interfaces or without annotations. Those EJB modules are not part of the classpath and can't be loaded by the client class loader.

The following topics are addressed here:

- “To Use the EJB 3.1 Embeddable API with Embedded GlassFish Server” on page 28
- “EJB 3.1 Embeddable API Properties” on page 29

▼ To Use the EJB 3.1 Embeddable API with Embedded GlassFish Server

- 1 To specify GlassFish Server as the Container Provider, include `glassfish-embedded-static-shell.jar` in the class path of your embeddable EJB application.

Reference the `glassfish-embedded-static-shell.jar` file from the `as-install/glassfish/lib/embedded` directory of a GlassFish Server installation. Do not move this file or it will not work.

See Section 22.3.3 of the EJB 3.1 Specification, *Embeddable Container Bootstrapping*.

- 2 Configure any required resources.

For more information about configuring resources, see the Administration Console Online Help or Part II, “Resources and Services Administration,” in *Oracle GlassFish Server 3.1 Administration Guide*. The `jdbc/__default` Java DB database is preconfigured with all distributions of GlassFish Server. However, you must start the database manually.

If your embeddable EJB application uses Java Persistence, you do not need to specify a JDBC resource. See “Default Java Persistence Data Source for Embedded GlassFish Server” on page 30.

- 3 Invoke one of the `createEJBContainer` methods.

Note – Do not deploy your embeddable EJB application or any of its dependent Java EE modules before invoking one of the `createEJBContainer` methods. These methods perform deployment in the background and do not load previously deployed applications or modules.

- 4 To change the **Instance Root Directory**, set the `org.glassfish.ejb.embedded.glassfish.instance.root` system property value by using the `createEJBContainer(Map<?, ?> properties)` method.

The default **Instance Root Directory** location is `as-install/domains/domain1`. This system property applies only to embeddable EJB applications used with Embedded GlassFish Server.

- 5 Close the EJB container properly to release all acquired resources and threads.

EJB 3.1 Embeddable API Properties

Properties that can be passed to the `EJBContainer#createEJBContainer(Properties)` method are summarized in the following table. All properties are in the `org.glassfish.ejb.embedded.glassfish` package. For example, the full name of the `installation.root` property is `org.glassfish.ejb.embedded.glassfish.installation.root`.

TABLE 5 EJB 3.1 Embeddable API Properties

Property	Default	Description
<code>installation.root</code>	GlassFish Server installation location	The Installation Root Directory .
<code>instance.root</code>	In order of precedence: <ul style="list-style-type: none"> ▪ <code>glassfish.embedded.tmpdir</code> system property value ▪ <code>java.io.tmp</code> system property value ▪ <code>as-install/domains/domain1</code> 	The Instance Root Directory .
<code>configuration.file</code>	<code>domain-dir/config/domain.xml</code>	The configuration file.
<code>keep-temporary-files</code>	<code>false</code>	If <code>true</code> , keeps temporary files (exploded EAR file and configuration file) created by the embedded EJB container when Embedded GlassFish Server is stopped.
<code>web.http.port</code>	None	Enables the web container if set. Needed for testing web services in a WAR file. The value is ignored and can be an empty string.
<code>instance.reuse</code>	<code>false</code>	If <code>true</code> , no changes are made to the existing configuration file, and a temporary server instance is not created for the embedded run. Instead, execution happens against the existing server instance. Do not use this option if the reused server instance could be in use by the running GlassFish Server.
<code>skip-client-modules</code>	<code>false</code>	If <code>true</code> , omits modules from the classpath if they are not specified using <code>EJBContainer.MODULES</code> and have a manifest file with a <code>Main-Class</code> attribute.

Default Java Persistence Data Source for Embedded GlassFish Server

The `jdbc/__default` Java DB database is preconfigured with Embedded GlassFish Server. It is used when an application is deployed in Embedded GlassFish Server that uses Java Persistence but doesn't specify a data source. Embedded GlassFish Server uses the embedded Java DB database created in a temporary domain that is destroyed when Embedded GlassFish Server is stopped.

By default, weaving is enabled when the GlassFish Server Embedded Server API is used. To disable weaving, set the `org.glassfish.persistence.embedded.weaving.enabled` property to `false`.

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