Red Hat JBoss Enterprise Application Platform 7.4

Getting Started Guide

Instructions for downloading, installing, starting, stopping, and maintaining Red Hat JBoss Enterprise Application Platform.
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Abstract

The purpose of this guide is to get you up and running with JBoss EAP quickly. The guide covers administrative tasks, such as basic installation, management, and configuration for JBoss EAP. This guide also helps developers get started writing Jakarta EE applications by using the JBoss EAP quickstarts. To learn more, see the entire JBoss EAP documentation suite.
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PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

We appreciate your feedback on our documentation. To provide feedback, you can highlight the text in a document and add comments. Follow the steps in the procedure to learn about submitting feedback on Red Hat documentation.

Prerequisites

- Log in to the Red Hat Customer Portal.
- In the Red Hat Customer Portal, view the document in Multi-page HTML format.

Procedure

1. Click Feedback to see existing reader comments.

   NOTE
   The feedback feature is enabled only in the Multi-page HTML format.

2. Highlight the section of the document where you want to provide feedback.

3. In the prompt menu that displays near the text you selected, click Add Feedback.
   A text box opens in the feedback section on the right side of the page.

4. Enter your feedback in the text box and click Submit.
   You have created a documentation issue.

5. To view the issue, click the issue tracker link in the feedback view.
Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright’s message.
CHAPTER 1. ADMINISTERING JBOSS EAP

1.1. DOWNLOADING AND INSTALLING JBOSS EAP

The compressed file option is a quick, platform-independent way to download and install JBoss EAP.

1.1.1. Downloading JBoss EAP

You must download the JBoss EAP compressed file before you can install JBoss EAP.

Prerequisites

- Confirm that your system meets the JBoss EAP Supported Configurations.
- Install the latest updates and errata patches.
- Set read and write access for the installation directory.
- Install your desired Java Development Kit (JDK).
- Optional: For Windows Server, set the JAVA_HOME and PATH environment variables.

Procedure

2. Click Downloads.
3. In the Product Downloads list, click Red Hat JBoss Enterprise Application Platform
4. In the Version drop-down menu, select 7.4.
5. Find Red Hat JBoss Enterprise Application Platform 7.4.0 in the list and click the Download link.
   The compressed file is downloaded to your system.

Additional resources

- For access to Red Hat product downloads, visit the Red Hat Customer Portal.

1.1.2. Installing JBoss EAP

You can install the JBoss EAP compressed file by extracting the package contents to your desired file location.

Prerequisites

- Download JBoss EAP.
- Confirm that your system meets the JBoss EAP Supported Configurations.
- Install the latest updates and errata patches.
- Set read and write access for the installation directory.
• Install your desired Java Development Kit (JDK).

• For Windows Server, set the JAVA_HOME and PATH environment variables.

Procedure

1. Move the compressed file to the server and location where you want JBoss EAP to be installed.

2. Extract the compressed file.
   a. On Linux, use the following command:

   ```
   $ unzip jboss-eap-7.4.0.zip
   ```
   b. On Windows Server, right-click the compressed file and select Extract All.

   The directory created by extracting the compressed file is the top-level directory for the JBoss EAP installation. This directory is referred to as EAP_HOME.

Additional resources

• For more information about installing JBoss EAP using the graphical installer or RPM package installation methods, see the Installation Guide.

1.2. STARTING AND STOPPING JBOSS EAP

The method for starting JBoss EAP depends on whether you are running JBoss EAP as a standalone server or on servers in a managed domain.

The method for stopping JBoss EAP depends on whether you are running an interactive or background instance of JBoss EAP.

1.2.1. Starting JBoss EAP as a standalone server

You can run JBoss EAP as a standalone server to manage a single instance of JBoss EAP.

JBoss EAP is supported on the following platforms:

• Red Hat Enterprise Linux
• Windows Server
• Oracle Solaris

The server starts in a suspended state and does not accept requests until all required services start. After required services start, the server transitions into a normal running state and can start accepting requests.

This startup script uses the EAP_HOME/bin/standalone.conf file, or standalone.conf.bat for Windows Server, to set default preferences, such as JVM options. You can customize the settings in this file.

**NOTE**

To see a list of startup script arguments in your terminal, use the --help argument.
JBoss EAP uses the `standalone.xml` configuration file by default, but you can start it using a different one.

**Prerequisites**

- Install JBoss EAP.

**Procedure**

1. Open a terminal.
2. Start JBoss EAP as a standalone server by using the following script:

   ```bash
   $EAP_HOME/bin/standalone.sh
   ``
   a. For Windows Server, use the `EAP_HOME\bin\standalone.bat` script.

**Additional resources**

- For more information about available standalone configuration files and how to use them, see the _Standalone Server Configuration Files_ section.
- For a complete listing of all available startup script arguments and their purposes, see the _Server Runtime Arguments_ section.

1.2.2. Starting JBoss EAP for servers in a managed domain

You can run JBoss EAP in a managed domain operating mode to manage several JBoss EAP instances using a single domain controller.

JBoss EAP is supported on the following platforms:

- Red Hat Enterprise Linux
- Windows Server
- Oracle Solaris

Servers start in a suspended state and do not accept requests until all required services start. After required services start, the servers transition into a normal running state and can start accepting requests.

You must start the domain controller before the servers in any of the server groups in the domain.

**Prerequisites**

- Install JBoss EAP.

**Procedure**

1. Open a terminal.
2. Start the domain controller first and then start each associated host controller by using the following script:
For Windows Server, use the \texttt{EAP\_HOME/bin/domain.bat} script. This startup script uses the \texttt{EAP\_HOME/bin/domain.conf} file, or \texttt{domain.conf.bat} for Windows Server, to set default preferences, such as JVM options. You can customize the settings in this file.

JBoss EAP uses the \texttt{host.xml} host configuration file by default, but you can start it using a different configuration file.

When setting up a managed domain, you must pass additional arguments into the startup script.

**Additional resources**

- For more information about managed domain configuration files, see the Managed Domain Configuration Files section.
- For a complete listing of all available startup script arguments and their purposes, use the \texttt{--help} argument or see the Server Runtime Arguments section.

### 1.2.3. Stopping an interactive instance of JBoss EAP

You can stop a interactive instance of a standalone server or a domain controller from the terminal where you started it.

**Prerequisites**

- You started an instance of JBoss EAP.

**Procedure**

- Press \texttt{Ctrl+C} in the terminal where you started JBoss EAP.

### 1.2.4. Stopping a background instance of JBoss EAP

You can connect to the management CLI to shut down a running instance of a standalone server or servers in a managed domain.

**Prerequisites**

- You have an instance of JBoss EAP running in a terminal.

**Procedure**

1. Start the management CLI by using the following script:

\[
$ \texttt{EAP\_HOME/bin/jboss-cli.sh --connect}
\]

2. Issue the \texttt{shutdown} command:

\[
\texttt{shutdown}
\]
When running an instance of JBoss EAP on servers in a managed domain, you must specify the host name to shut down by using the `--host` argument with the `shutdown` command.

1.3. JBOSS EAP MANAGEMENT

JBoss EAP uses a simplified configuration, with one configuration file per standalone server or managed domain. Default configuration for a standalone server is stored in the `EAP_HOME/standalone/configuration/standalone.xml` file and default configuration for a managed domain is stored in the `EAP_HOME/domain/configuration/domain.xml` file. Additionally, the default configuration for a host controller is stored in the `EAP_HOME/domain/configuration/host.xml` file.

JBoss EAP can be configured using the command-line management CLI, web-based management console, Java API, or HTTP API. Changes made using these management interfaces persist automatically, and the XML configuration files are overwritten by the Management API. The management CLI and management console are the preferred methods, and it is not recommended to edit the XML configuration files manually.

1.3.1. Management Users

The default JBoss EAP configuration provides local authentication so that a user can access the management CLI on the local host without requiring authentication.

However, you must add a management user if you want to access the management CLI remotely or use the management console, which is considered remote access even if the traffic originates on the local host. If you attempt to access the management console before adding a management user, you will receive an error message.

If JBoss EAP is installed using the graphical installer, then a management user is created during the installation process.

This guide covers simple user management for JBoss EAP using the `add-user` script, which is a utility for adding new users to the properties files for out-of-the-box authentication.

For more advanced authentication and authorization options, such as LDAP or Role-Based Access Control (RBAC), see the Core Management Authentication section of the JBoss EAP Security Architecture.

1.3.1.1. Adding a Management User

1. Run the `add-user` utility script and follow the prompts.

   $ EAP_HOME/bin/add-user.sh

   

   **NOTE**

   For Windows Server, use the `EAP_HOME\bin\add-user.bat` script.

2. Press **ENTER** to select the default option **a** to add a management user. This user will be added to the `ManagementRealm` and will be authorized to perform management operations using the management console or management CLI. The other choice, **b**, adds a user to the `ApplicationRealm`, which is used for applications and provides no particular permissions.

3. Enter the desired username and password. You will be prompted to confirm the password.
NOTE

User names can only contain the following characters, in any number and in any order:

- Alphanumeric characters (a-z, A-Z, 0-9)
- Dashes (-), periods (.), commas (,), at sign (@)
- Backslash (\)
- Equals (=)

By default, JBoss EAP allows weak passwords but will issue a warning.

See the Setting Add-User Utility Password Restrictions section of the JBoss EAP Configuration Guide for details on changing this default behavior.

4. Enter a comma-separated list of groups to which the user belongs. If you do not want the user to belong to any groups, press ENTER to leave it blank.

5. Review the information and enter yes to confirm.

6. Determine whether this user represents a remote JBoss EAP server instance. For a basic management user, enter no. One type of user that may need to be added to the ManagementRealm is a user representing another instance of JBoss EAP, which must be able to authenticate to join as a member of a cluster. If this is the case, then answer yes to this prompt and you will be given a hashed secret value representing the user’s password, which will need to be added to a different configuration file.

Users can also be created non-interactively by passing parameters to the add-user script. This approach is not recommended on shared systems, because the passwords will be visible in log and history files. For more information, see Running the Add-User Utility Non-Interactively.

1.3.1.2. Running the Add-User Utility Non-Interactively

You can run the add-user script non-interactively by passing in arguments on the command line. At a minimum, the username and password must be provided.

WARNING

This approach is not recommended on shared systems, because the passwords will be visible in log and history files.

Create a User Belonging to Multiple Groups

The following command adds a management user, mgmtuser1, with the guest and mgmtgroup groups.

$ EAP_HOME/bin/add-user.sh -u 'mgmtuser1' -p 'password1!' -g 'guest,mgmtgroup'
Specify an Alternative Properties File
By default, user and group information created using the `add-user` script are stored in properties files located in the server configuration directory.

User information is stored in the following properties files:

- `EAP_HOME/standalone/configuration/mgmt-users.properties`
- `EAP_HOME/domain/configuration/mgmt-users.properties`

Group information is stored in the following properties files:

- `EAP_HOME/standalone/configuration/mgmt-groups.properties`
- `EAP_HOME/domain/configuration/mgmt-groups.properties`

These default directories and properties file names can be overridden. The following command adds a new user, specifying a different name and location for the user properties files.

```bash
$ EAP_HOME/bin/add-user.sh -u 'mgmtuser2' -p 'password1!' -sc '/path/to/standaloneconfig/' -dc '/path/to/domainconfig/' -up 'newname.properties'
```

The new user was added to the user properties files located at `/path/to/standaloneconfig/newname.properties` and `/path/to/domainconfig/newname.properties`. Note that these files must already exist or you will see an error.

For a complete listing of all available `add-user` arguments and their purposes, use the `--help` argument or see the Add-user arguments section.

### 1.3.2. Management Interfaces

#### 1.3.2.1. Management CLI

The management command-line interface (CLI) is a command-line administration tool for JBoss EAP.

Use the management CLI to start and stop servers, deploy and undeploy applications, configure system settings, and perform other administrative tasks. Operations can be performed in batch mode, allowing multiple tasks to be run as a group.

Many common terminal commands are available, such as `ls`, `cd`, and `pwd`. The management CLI also supports tab completion.

For detailed information on using the management CLI, including commands and operations, syntax, and running in batch mode, see the JBoss EAP Management CLI Guide.

**Launch the Management CLI**

```bash
$ EAP_HOME/bin/jboss-cli.sh
```

**NOTE**

For Windows Server, use the `EAP_HOME\bin\jboss-cli.bat` script.

**Connect to a Running Server**

Or you can launch the management CLI and connect in one step by using the `EAP_HOME/bin/jboss-cli.sh --connect` command.

**Display Help**

Use the following command for general help.

```
help
```

Use the `--help` flag on a command to receive instructions on using that specific command. For instance, to receive information on using `deploy`, the following command is executed.

```
deploy --help
```

**Quit the Management CLI**

```
quit
```

**View System Settings**

The following command uses the `read-attribute` operation to display whether the example datasource is enabled.

```
/subsystem=datasources/data-source=ExampleDS:read-attribute(name=enabled)
{
  "outcome" => "success",
  "result" => true
}
```

When running in a managed domain, you must specify which profile to update by preceding the command with `/profile=PROFILE_NAME`.

```
/profile=default/subsystem=datasources/data-source=ExampleDS:read-attribute(name=enabled)
```

**Update System Settings**

The following command uses the `write-attribute` operation to disable the example datasource.

```
/subsystem=datasources/data-source=ExampleDS:write-attribute(name=enabled,value=false)
```

**Start Servers**

The management CLI can also be used to start and stop servers when running in a managed domain.

```
/host=HOST_NAME/server-config=server-one:start
```

### 1.3.2.2. Management Console

The management console is a web-based administration tool for JBoss EAP.

Use the management console to start and stop servers, deploy and undeploy applications, tune system settings, and make persistent modifications to the server configuration. The management console also has the ability to perform administrative tasks, with live notifications when any changes performed by the current user require the server instance to be restarted or reloaded.
In a managed domain, server instances and server groups in the same domain can be centrally managed from the management console of the domain controller.

For a JBoss EAP instance running on the local host using the default management port, the management console can be accessed through a web browser at http://localhost:9990/console/index.html. You will need to authenticate with a user that has permissions to access the management console.

The management console provides the following tabs for navigating and managing your JBoss EAP standalone server or managed domain.

**Home**
Learn how to accomplish several common configuration and management tasks. Take a tour to become familiar with the JBoss EAP management console.

**Deployments**
Add, remove, and enable deployments. In a managed domain, assign deployments to server groups.

**Configuration**
Configure available subsystems, which provide capabilities such as web services, messaging, or high availability. In a managed domain, manage the profiles that contain different subsystem configurations.

**Runtime**
View runtime information, such as server status, JVM usage, and server logs. In a managed domain, manage your hosts, server groups, and servers.

**Patching**
Apply patches to your JBoss EAP instances.

**Access Control**
Assign roles to users and groups when using Role-Based Access Control.

### 1.3.3. Configuration Files

#### 1.3.3.1. Standalone Server Configuration Files

The standalone configuration files are located in the `EAP_HOME/standalone/configuration/` directory. A separate file exists for each of the five predefined profiles (`default, ha, full, full-ha, load-balancer`).

<table>
<thead>
<tr>
<th>Configuration File</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>standalone.xml</td>
<td>This standalone configuration file is the default configuration that is used when you start your standalone server. It contains all information about the server, including subsystems, networking, deployments, socket bindings, and other configurable details. It does not provide the subsystems necessary for messaging or high availability.</td>
</tr>
<tr>
<td>standalone-ha.xml</td>
<td>This standalone configuration file includes all of the default subsystems and adds the <code>modcluster</code> and <code>jgroups</code> subsystems for high availability. It does not provide the subsystems necessary for messaging.</td>
</tr>
</tbody>
</table>
### Configuration File

<table>
<thead>
<tr>
<th>Configuration File</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>standalone-full.xml</strong></td>
<td>This standalone configuration file includes all of the default subsystems and adds the <a href="https://activemq.apache.org/">messaging-activemq</a> and <a href="https://openjdk.java.net/">iiop-openjdk</a> subsystems. It does not provide the subsystems necessary for high availability.</td>
</tr>
<tr>
<td><strong>standalone-full-ha.xml</strong></td>
<td>This standalone configuration file includes support for every possible subsystem, including those for messaging and high availability.</td>
</tr>
<tr>
<td><strong>standalone-load-balancer.xml</strong></td>
<td>This standalone configuration file includes the minimum subsystems necessary to use the built-in mod_cluster front-end load balancer to load balance other JBoss EAP instances.</td>
</tr>
</tbody>
</table>

By default, starting JBoss EAP as a standalone server uses the **standalone.xml** file. To start JBoss EAP with a different configuration, use the `--server-config` argument. For example,

```sh
$ EAP_HOME/bin/standalone.sh --server-config=standalone-full.xml
```

#### 1.3.3.2. Managed Domain Configuration Files

The managed domain configuration files are located in the **EAP_HOME/domain/configuration/** directory.

<table>
<thead>
<tr>
<th>Configuration File</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>domain.xml</strong></td>
<td>This is the main configuration file for a managed domain. Only the domain master reads this file. This file contains the configurations for all of the profiles (default, ha, full, full-ha, load-balancer).</td>
</tr>
<tr>
<td><strong>host.xml</strong></td>
<td>This file includes configuration details specific to a physical host in a managed domain, such as network interfaces, socket bindings, the name of the host, and other host-specific details. The <strong>host.xml</strong> file includes all of the features of both <strong>host-master.xml</strong> and <strong>host-slave.xml</strong>, which are described below.</td>
</tr>
<tr>
<td><strong>host-master.xml</strong></td>
<td>This file includes only the configuration details necessary to run a server as the master domain controller.</td>
</tr>
<tr>
<td><strong>host-slave.xml</strong></td>
<td>This file includes only the configuration details necessary to run a server as a managed domain host controller.</td>
</tr>
</tbody>
</table>

By default, starting JBoss EAP in a managed domain uses the **host.xml** file. To start JBoss EAP with a different configuration, use the `--host-config` argument. For example,

```sh
$ EAP_HOME/bin/domain.sh --host-config=host-master.xml
```

#### 1.3.3.3. Backing Up Configuration Data
In order to later restore the JBoss EAP server configuration, items in the following locations should be backed up:

- **EAP_HOME/standalone/configuration/**
  - Back up the entire directory to save user data, server configuration, and logging settings for standalone servers.

- **EAP_HOME/domain/configuration/**
  - Back up the entire directory to save user and profile data, domain and host configuration, and logging settings for managed domains.

- **EAP_HOME/modules/**
  - Back up any custom modules.

- **EAP_HOME/welcome-content/**
  - Back up any custom welcome content.

- **EAP_HOME/bin/**
  - Back up any custom scripts or startup configuration files.

### 1.3.3.4. Configuration File Snapshots

To assist in the maintenance and management of the server, JBoss EAP creates a timestamped version of the original configuration file at the time of startup. Any additional configuration changes made by management operations will result in the original file being automatically backed up, and a working copy of the instance being preserved for reference and rollback. Additionally, configuration snapshots can be taken, which are point-in-time copies of the current server configuration. These snapshots can be saved and loaded by an administrator.

The following examples use the `standalone.xml` file, but the same process applies to the `domain.xml` and `host.xml` files.

#### Take a Snapshot

Use the management CLI to take a snapshot of the current configurations.

```java
:take-snapshot
{
  "outcome" => "success",
  "result" => "EAP_HOME/standalone/configuration/standalone_xml_history/snapshot/20151022-133109702standalone.xml"
}
```

#### List Snapshots

Use the management CLI to list all snapshots that have been taken.

```java
:list-snapshots
{
  "outcome" => "success",
  "result" => {
    "directory" => "EAP_HOME/standalone/configuration/standalone_xml_history/snapshot",
    "names" => ["20151022-133109702standalone.xml",]}}
```
Delete a Snapshot
Use the management CLI to delete a snapshot.

```
:delete-snapshot(name=20151022-133109702standalone.xml)
```

Start the Server with a Snapshot
The server can be started using a snapshot or an automatically-saved version of the configuration.

1. Navigate to the `EAP_HOME/standalone/configuration/standalone_xml_history` directory and identify the snapshot or saved configuration file to be loaded.

2. Start the server and point to the selected configuration file. Pass in the file path relative to the configuration directory, `EAP_HOME/standalone/configuration/`.

```
$ EAP_HOME/bin/standalone.sh --server-config=standalone_xml_history/snapshot/20151022-133109702standalone.xml
```

**NOTE**

When running in a managed domain, use the `--host-config` argument instead to specify the configuration file.

1.3.3.5. Property Replacement

JBoss EAP allows you to use expressions to define replaceable properties in place of literal values in the configuration. Expressions use the format `${PARAMETER:DEFAULT_VALUE}`. If the specified parameter is set, then the parameter’s value will be used. Otherwise, the default value provided will be used.

The supported sources for resolving expressions are system properties, environment variables, and the vault. For deployments only, the source can be properties listed in a `META-INF/jboss.properties` file in the deployment archive. For deployment types that support subdeployments, the resolution is scoped to all subdeployments if the properties file is in the outer deployment, for example the EAR. If the properties file is in the subdeployment, then the resolution is scoped just to that subdeployment.

The example below from the `standalone.xml` configuration file sets the `inet-address` for the `public` interface to `127.0.0.1` unless the `jboss.bind.address` parameter is set.

```
<interface name="public">
  <inet-address value="${jboss.bind.address:127.0.0.1}"/>
</interface>
```

The `jboss.bind.address` parameter can be set when starting EAP as a standalone server with the following command:

```
$ EAP_HOME/bin/standalone.sh -Djboss.bind.address=IP_ADDRESS
```

Nested Expressions
Expressions can be nested, which allows for more advanced use of expressions in place of fixed values. The format of a nested expression is like that of a normal expression, but one expression is embedded in the other, for example:

\[
\text{\$\{SYSTEM\_VALUE\_1\$\{SYSTEM\_VALUE\_2\}}
\]

Nested expressions are evaluated recursively, so the inner expression is first evaluated, then the outer expression is evaluated. Expressions may also be recursive, where an expression resolves to another expression, which is then resolved. Nested expressions are permitted anywhere that expressions are permitted, with the exception of management CLI commands.

An example of where a nested expression might be used is if the password used in a datasource definition is masked. The configuration for the datasource might have the following line:

\[
<\text{password}>\$\{\text{VAULT::ds\_ExampleDS::password::1}\}</\text{password}>
\]

The value of \text{ds\_ExampleDS} could be replaced with a system property (\text{datasource\_name}) using a nested expression. The configuration for the datasource could instead have the following line:

\[
<\text{password}>\$\{\text{VAULT::}\$\{\text{datasource\_name}\}\$\{\text{::password::1}\}</\text{password}>
\]

JBoss EAP would first evaluate the expression \$\{\text{datasource\_name}\}, then input this to the larger expression and evaluate the resulting expression. The advantage of this configuration is that the name of the datasource is abstracted from the fixed configuration.

Descriptor-Based Property Replacement

Application configuration, such as datasource connection parameters, typically varies between development, testing, and production environments. This variance is sometimes accommodated by build system scripts, as the Jakarta EE specification does not contain a method to externalize these configurations. With JBoss EAP, you can use descriptor-based property replacement to manage configuration externally.

Descriptor-based property replacement substitutes properties based on descriptors, allowing you to remove assumptions about the environment from the application and the build chain. Environment-specific configurations can be specified in deployment descriptors rather than annotations or build system scripts. You can provide configuration in files or as parameters at the command line.

There are several flags in the \text{ee} subsystem that control whether property replacement is applied.

JBoss-specific descriptor replacement is controlled by the \text{jboss-descriptor-property-replacement} flag and is \text{enabled by default}. When enabled, properties can be replaced in the following deployment descriptors:

- \text{jboss-ejb3.xml}
- \text{jboss-app.xml}
- \text{jboss-web.xml}
- \text{jboss-permissions.xml}
- \text{*-jms.xml}
- \text{*-ds.xml}
The following management CLI command can be used to enable or disable property replacement in JBoss-specific descriptors:

```
/subsystem=ee:write-attribute(name="jboss-descriptor-property-replacement",value=VALUE)
```

Jakarta EE descriptor replacement controlled by the `spec-descriptor-property-replacement` flag and is disabled by default. When enabled, properties can be replaced in the following deployment descriptors:

- `ejb-jar.xml`
- `permissions.xml`
- `persistence.xml`
- `application.xml`
- `web.xml`

The following management CLI command can be used to enable or disable property replacement in Jakarta EE descriptors:

```
/subsystem=ee:write-attribute(name="spec-descriptor-property-replacement",value=VALUE)
```

## 1.4. NETWORK AND PORT CONFIGURATION JBOSS EAP

JBoss EAP comes with interfaces, socket bindings, and IPv6 addresses to help make the configuration easier. Use the following detailed information about each of these network and port configurations to run JBoss EAP successfully.

### 1.4.1. Interfaces

JBoss EAP references named interfaces throughout the configuration. You can configure JBoss EAP to reference individual interface declarations with logical names rather than requiring the full details of the interface at each use.

You can also experience easier configuration in a managed domain where network interface details can vary across multiple machines. Each server instance can correspond to a logical name group.

The `standalone.xml`, `domain.xml`, and `host.xml` files all include interface declarations. There are several preconfigured interface names, depending on which default configuration is used. The `management` interface can be used for all components and services that require the management layer, including the HTTP management endpoint. The `public` interface can be used for all application-related network communications. The `unsecure` interface is used for IIOP sockets in the standard configuration. The `private` interface is used for JGroups sockets in the standard configuration.

### 1.4.1.1. Default interface configurations

JBoss EAP includes the following four default interfaces:

```
<interfaces>
  <interface name="management">
    <inet-address value="${jboss.bind.address.management:127.0.0.1}"/>
  </interface>
</interfaces>
```
By default, JBoss EAP binds these interfaces to **127.0.0.1**, but these values can be overridden at runtime by setting the appropriate property. For example, the **inet-address** of the **public** interface can be set when starting JBoss EAP as a standalone server with the following command.

```
$ EAP_HOME/bin/standalone.sh -Djboss.bind.address=IP_ADDRESS
```

Alternatively, you can use the **-b** switch on the server start command line.

**IMPORTANT**

If you modify the default network interfaces or ports that JBoss EAP uses, you must also remember to change any scripts that use the modified interfaces or ports. These include JBoss EAP service scripts, as well as remembering to specify the correct interface and port when accessing the management console or management CLI.

**Additional resources**

- For more information about server start options, see **Server Runtime Arguments**.

### 1.4.1.2. Optional interface configurations

Network interfaces are declared by specifying a logical name and selection criteria for the physical interface. The selection criteria can reference a wildcard address or specify a set of one or more characteristics that an interface or address must have in order to be a valid match.

Interfaces can be configured using the management console or the management CLI. Below are several examples of adding and updating interfaces. The management CLI command is shown first, followed by the corresponding configuration XML.

**Additional resources**

- For a listing of all available interface selection criteria, see the **Interface Attributes** section.

#### 1.4.1.2.1. Interface with a NIC value

You can use the following example to add a new interface with a NIC value of **eth0**.

```
<interface name="external">  
  <inet-address value="${jboss.bind.address:127.0.0.1}"/>
</interface>

<interface name="private">  
  <inet-address value="${jboss.bind.address.private:127.0.0.1}"/>
</interface>

<interface name="unsecure">  
  <inet-address value="${jboss.bind.address.unsecure:127.0.0.1}"/>
</interface>
</interfaces>
```
1.4.1.2.2. Interface with several conditional values

You can use the following example to add a new interface that matches any interface or address on the correct subnet if it is running, supports multicast, and is not point-to-point.

```
/interface=default:add(subnet-match=192.168.0.0/16,up=true,multicast=true,not={point-to-point=true})
```

1.4.1.2.3. Updates to an interface attribute

In this example, you can update the public interface’s default inet-address value, keeping the jboss.bind.address property so that you can set this value at runtime.

```
/interface=public:write-attribute(name=inet-address,value="${jboss.bind.address:192.168.0.0}")
```

1.4.1.2.4. Additional interfaces to a server in a managed domain

You can add more interfaces to a server in a managed domain using the following code.

```
/host=HOST_NAME/server-config=SERVER_NAME/interface=INTERFACE_NAME:add(inet-address=127.0.0.1)
```

1.4.2. Socket bindings

Socket bindings and socket binding groups allow you to define network ports and their relationship to the networking interfaces required for your JBoss EAP configuration. A socket binding is a named configuration for a socket. A socket binding group is a collection of socket binding declarations that are grouped under a logical name.
This allows other sections of the configuration to reference socket bindings by their logical name, rather than requiring the full details of the socket configuration at each use.

The declarations for these named configurations can be found in the `standalone.xml` and `domain.xml` configuration files. A standalone server contains only one socket binding group, while a managed domain can contain multiple groups. You can create a socket binding group for each server group in the managed domain, or share a socket binding group between multiple server groups.

The ports JBoss EAP uses by default depend on which socket binding groups are used and the requirements of your individual deployments.

There are three types of socket bindings that can be defined in a socket binding group in the JBoss EAP configuration:

**Inbound Socket Bindings**

The `socket-binding` element is used to configure inbound socket bindings for the JBoss EAP server. The default JBoss EAP configurations provide several preconfigured `socket-binding` elements, for example, for HTTP and HTTPS traffic. Another example can be found in the Broadcast Groups section of Configuring Messaging for JBoss EAP.

**Remote Outbound Socket Bindings**

The `remote-destination-outbound-socket-binding` element is used to configure outbound socket bindings for destinations that are remote to the JBoss EAP server. The default JBoss EAP configurations provide an example remote destination socket binding that can be used for a mail server.

**Local Outbound Socket Bindings**

The `local-destination-outbound-socket-binding` element is used to configure outbound socket bindings for destinations that are local to the JBoss EAP server. This type of socket binding is not expected to be commonly used.

Attributes for this element can be found in the Local Outbound Socket Binding Attributes table.

**Additional resources**

- To view attributes for inbound socket bindings, refer to the Inbound Socket Binding Attributes table.
- To view attributes for remote outbound socket bindings, refer to the Remote Outbound Socket Binding Attributes table.
- For additional examples of remote outbound socket bindings, refer to the Using the Integrated Artemis Resource Adapter for Remote Connections section of Configuring Messaging for JBoss EAP.
- To view attributes for local outbound socket bindings, refer to the Local Outbound Socket Binding Attributes table.

**1.4.2.1. Management ports**

Management ports were consolidated in JBoss EAP 7. By default, JBoss EAP 7 uses port **9990** for both native management, used by the management CLI, and HTTP management, used by the web-based management console. Port **9999**, which was used as the native management port in JBoss EAP 6, is no longer used but can still be enabled if desired.

If HTTPS is enabled for the management console, then port **9993** is used by default.
1.4.2.2. Default socket bindings

JBoss EAP ships with a socket binding group for each of the five predefined profiles (default, ha, full, full-ha, load-balancer).

IMPORTANT

If you modify the default network interfaces or ports that JBoss EAP uses, you must also remember to change any scripts that use the modified interfaces or ports. These include JBoss EAP service scripts, as well as remembering to specify the correct interface and port when accessing the management console or management CLI.

Additional resources

- For detailed information about the default socket bindings, such as default ports and descriptions, see the Default Socket Bindings section.

1.4.2.2.1. Standalone server

When running as a standalone server, only one socket binding group is defined per configuration file. Each standalone configuration file (standalone.xml, standalone-ha.xml, standalone-full.xml, standalone-full-ha.xml, standalone-load-balancer.xml) defines socket bindings for the technologies used by its corresponding profile.

For example, the default standalone configuration file (standalone.xml) specifies the below socket bindings.

```
<socket-binding-group name="standard-sockets" default-interface="public" port-offset="${jboss.socket.binding.port-offset:0}"
    <socket-binding name="management-http" interface="management" port="${jboss.management.http.port:9990}"/>
    <socket-binding name="management-https" interface="management" port="${jboss.management.https.port:9993}"/>
    <socket-binding name="ajp" port="${jboss.ajp.port:8009}"/>
    <socket-binding name="http" port="${jboss.http.port:8080}"/>
    <socket-binding name="https" port="${jboss.https.port:8443}"/>
    <socket-binding name="txn-recovery-environment" port="4712"/>
    <socket-binding name="txn-status-manager" port="4713"/>
    <outbound-socket-binding name="mail-smtp">
        <remote-destination host="localhost" port="25"/>
    </outbound-socket-binding>
</socket-binding-group>
```

1.4.2.2.2. Managed domain

When running in a managed domain, all socket binding groups are defined in the domain.xml file. There are five predefined socket binding groups:

- standard-sockets
- ha-sockets
- full-sockets
- full-ha-sockets
Each socket binding group specifies socket bindings for the technologies used by its corresponding profile. For example, the full-ha-sockets socket binding group defines several jgroups socket bindings, which are used by the full-ha profile for high availability.

```xml
<socket-binding-groups>
  <socket-binding-group name="standard-sockets" default-interface="public">
    <!-- Needed for server groups using the 'default' profile -->
    <socket-binding name="ajp" port="${jboss.ajp.port:8009}"/>
    <socket-binding name="http" port="${jboss.http.port:8080}"/>
    <socket-binding name="https" port="${jboss.https.port:8443}"/>
    <socket-binding name="txn-recovery-environment" port="4712"/>
    <socket-binding name="txn-status-manager" port="4713"/>
    <outbound-socket-binding name="mail-smtp">
      <remote-destination host="localhost" port="25"/>
    </outbound-socket-binding>
  </socket-binding-group>
  <socket-binding-group name="ha-sockets" default-interface="public">
    <!-- Needed for server groups using the 'ha' profile -->
    ...
  </socket-binding-group>
  <socket-binding-group name="full-sockets" default-interface="public">
    <!-- Needed for server groups using the 'full' profile -->
    ...
  </socket-binding-group>
  <socket-binding-group name="full-ha-sockets" default-interface="public">
    <!-- Needed for server groups using the 'full-ha' profile -->
    <socket-binding name="ajp" port="${jboss.ajp.port:8009}"/>
    <socket-binding name="http" port="${jboss.http.port:8080}"/>
    <socket-binding name="https" port="${jboss.https.port:8443}"/>
    <socket-binding name="iiop" interface="unsecure" port="3528"/>
    <socket-binding name="iiop-ssl" interface="unsecure" port="3529"/>
    <socket-binding name="jgroups-mping" interface="private" port="0" multicast-address="${jboss.default.multicast.address:230.0.0.4}" multicast-port="45700"/>
    <socket-binding name="jgroups-tcp" interface="private" port="7600"/>
    <socket-binding name="jgroups-udp" interface="private" port="55200" multicast-address="${jboss.default.multicast.address:230.0.0.4}" multicast-port="45688"/>
    <socket-binding name="modcluster" port="0" multicast-address="224.0.1.105" multicast-port="23364"/>
    <socket-binding name="txn-recovery-environment" port="4712"/>
    <socket-binding name="txn-status-manager" port="4713"/>
    <outbound-socket-binding name="mail-smtp">
      <remote-destination host="localhost" port="25"/>
    </outbound-socket-binding>
  </socket-binding-group>
  <socket-binding-group name="load-balancer-sockets" default-interface="public">
    <!-- Needed for server groups using the 'load-balancer' profile -->
    ...
  </socket-binding-group>
</socket-binding-groups>
```
NOTE
The socket configuration for the management interfaces is defined in the domain controller’s host.xml file.

1.4.2.3. Configuring socket bindings

When defining a socket binding, you can configure the port and interface attributes, as well as multicast settings such as multicast-address and multicast-port. For details on all available socket bindings attributes, see the Socket Binding Attributes section.

Procedure

Socket bindings can be configured using the management console or the management CLI. The following steps go through adding a socket binding group, adding a socket binding, and configuring socket binding settings using the management CLI.

1. Add a new socket binding group.

```
NOTE
This step cannot be performed when running as a standalone server.

/socket-binding-group=new-sockets:add(default-interface=public)
```

2. Add a socket binding.

```
/socket-binding-group=new-sockets/socket-binding=new-socket-binding:add(port=1234)
```

3. Change the socket binding to use an interface other than the default, which is set by the socket binding group.

```
/socket-binding-group=new-sockets/socket-binding=new-socket-binding:write-attribute(name=interface,value=unsecure)
```

The following example shows how the XML configuration may look after the above steps have been completed.

```
<socket-binding-groups>
  ...
  <socket-binding-group name="new-sockets" default-interface="public">
    <socket-binding name="new-socket-binding" interface="unsecure" port="1234"/>
  </socket-binding-group>
</socket-binding-groups>
```

1.4.2.4. Port offsets

A port offset is a numeric offset value added to all port values specified in the socket binding group for that server. This allows the server to inherit the port values defined in its socket binding group, with an offset to ensure that it does not conflict with any other servers on the same host. For instance, if the HTTP port of the socket binding group is 8080, and a server uses a port offset of 100, then its HTTP port is 8180.
Below is an example of setting a port offset of 250 for a server in a managed domain using the management CLI.

/host=master/server-config=server-two/:write-attribute(name=socket-binding-port-offset,value=250)

Port offsets can be used for servers in a managed domain and for running multiple standalone servers on the same host.

You can pass in a port offset when starting a standalone server using the `jboss.socket.binding.port-offset` property.

```
$ EAP_HOME/bin/standalone.sh -Djboss.socket.binding.port-offset=100
```

### 1.4.3. IPv6 addresses

By default, JBoss EAP is configured to run using IPv4 addresses. The following procedures describe how to configure JBoss EAP to run using IPv6 addresses.

#### 1.4.3.1. Configuring the JVM Stack for IPv6 Addresses

You can configure your JBoss EAP to run using IPv6.

**Procedure**

To update your start-up configuration to run on IPv6 addresses, complete the following steps.

1. Open the startup configuration file.
   - When running as a standalone server, edit the `EAP_HOME/bin/standalone.conf` file (or `standalone.conf.bat` for Windows Server).
   - When running in a managed domain, edit the `EAP_HOME/bin/domain.conf` file (or `domain.conf.bat` for Windows Server).

2. Set the `java.net.preferIPv4Stack` property to `false`.

   ```
   -Djava.net.preferIPv4Stack=false
   ```

3. Append the `java.net.preferIPv6Addresses` property and set it to `true`.

   ```
   -Djava.net.preferIPv6Addresses=true
   ```

The following example shows how the JVM options in the startup configuration file may look after making the above changes.

```
# Specify options to pass to the Java VM.
#
if [ "x$JAVA_OPTS" = "x" ]; then
    JAVA_OPTS="-Xms1303m -Xmx1303m -Djava.net.preferIPv4Stack=false"
    JAVA_OPTS="$JAVA_OPTS -Djboss.modules.system.pkgs=$JBOSS_MODULES_SYSTEM_PKGS -Djava.awt.headless=true"
    JAVA_OPTS="$JAVA_OPTS -Djava.net.preferIPv6Addresses=true"
else
```
1.4.3.2. Default interface values updated to IPv6 addresses

The default interface values in the configuration can be changed to IPv6 addresses. For example, the following management CLI command sets the management interface to the IPv6 loopback address (::1).

```
/java=management:write-attribute(name=inet-address,value="${jboss.bind.address.management:[::1]}")
```

After running the previous command, the following example shows how the XML configuration might look.

```
<interfaces>
    <interface name="management">
        <inet-address value="${jboss.bind.address.management:[::1]}"/>
    </interface>
    ....
</interfaces>
```

1.5. OPTIMIZATION OF THE JBOSS EAP SERVER CONFIGURATION

Once you have installed the JBoss EAP server, and you have created a management user, Red Hat recommends that you optimize your server configuration.

Make sure you review information in the Performance Tuning Guide for information about how to optimize the server configuration to avoid common problems when deploying applications in a production environment. Common optimizations include setting ulimits, enabling garbage collection, creating Java heap dumps, and adjusting the thread pool size.

It is also a good idea to apply any existing patches for your release of the product. Each patch for EAP contains numerous bug fixes. For more information, see Patching JBoss EAP in the Patching and Upgrading Guide for JBoss EAP.
CHAPTER 2. DEVELOPING APPLICATIONS USING JBOSS EAP

2.1. OVERVIEW

This guide provides information on getting started developing applications by using Red Hat CodeReady Studio and the JBoss EAP 7 quickstart examples.

Red Hat CodeReady Studio is an Eclipse-based integrated development environment (IDE) that integrates JBoss application development plug-ins. Red Hat CodeReady Studio can assist with your application development with the availability of JBoss-specific wizards and the ability to deploy applications to JBoss EAP servers. Many quickstart code examples are provided with JBoss EAP 7 to help users get started writing applications using different Jakarta EE technologies.

2.2. SETTING UP THE DEVELOPMENT ENVIRONMENT

1. Download and install Red Hat CodeReady Studio.
   For instructions, see Installing CodeReady Studio stand-alone using the Installer in the Red Hat CodeReady Studio Installation Guide.

2. Set up the JBoss EAP server in Red Hat CodeReady Studio.
   For instructions, see Downloading, Installing, and Setting Up JBoss EAP from within the IDE in the Getting Started with CodeReady Studio Tools guide.

2.3. USING THE QUICKSTART EXAMPLES

The quickstart examples provided with JBoss EAP are Maven projects.

2.3.1. About Maven

Apache Maven is a distributed build automation tool used in Java application development to create, manage, and build software projects. Maven uses standard configuration files called Project Object Model (POM) files to define projects and manage the build process. POMs describe the module and component dependencies, build order, and targets for the resulting project packaging and output using an XML file. This ensures that the project is built in a correct and uniform manner.

Maven achieves this by using a repository. A Maven repository stores Java libraries, plug-ins, and other build artifacts. The default public repository is the Maven 2 Central Repository, but repositories can be private and internal within a company with a goal to share common artifacts among development teams. Repositories are also available from third-parties. For more information, see the Apache Maven project and the Introduction to Repositories guide.

JBoss EAP includes a Maven repository that contains many of the requirements that Jakarta EE developers typically use to build applications on JBoss EAP.

For more information about how to use Maven with JBoss EAP, see Using Maven with JBoss EAP in the JBoss EAP Development Guide.

2.3.2. Using Maven with the Quickstarts

The artifacts and dependencies needed to build and deploy applications to JBoss EAP 7 are hosted on a public repository. Starting with the JBoss EAP 7 quickstarts, it is no longer necessary to configure your Maven settings.xml file to use these repositories when building the quickstarts. The Maven repositories
are now configured in the quickstart project POM files. This method of configuration is provided to make it easier to get started with the quickstarts, however, is generally not recommended for production projects because it can slow down your build.

Red Hat CodeReady Studio includes Maven, so there is no need to download and install it separately.

If you plan to use the Maven command line to build and deploy your applications, then you must first download Maven from the Apache Maven project and install it using the instructions provided in the Maven documentation.

2.3.3. Download and Run the Quickstarts

2.3.3.1. Download the Quickstarts

JBoss EAP comes with a comprehensive set of quickstart code examples designed to help users begin writing applications using various Jakarta EE technologies. The quickstarts can be downloaded from the Red Hat Customer Portal.

1. Log in to the JBoss EAP download page on the Red Hat Customer Portal.
2. Select 7.4 in the Version drop-down menu.
3. Find the Red Hat JBoss Enterprise Application Platform 7.4.0 Quickstarts entry in the list and click Download to download a ZIP file containing the quickstarts.
4. Save the ZIP file to the desired directory.
5. Extract the ZIP file.

2.3.3.2. Run the Quickstarts in Red Hat CodeReady Studio

Once the quickstarts have been downloaded, they can be imported into Red Hat CodeReady Studio and deployed to JBoss EAP.

Import a Quickstart into Red Hat CodeReady Studio

Each quickstart ships with a POM file that contains its project and configuration information. Use this POM file to easily import the quickstart into Red Hat CodeReady Studio.

IMPORTANT

If your quickstart project folder is located within the IDE workspace when you import it into Red Hat CodeReady Studio, the IDE generates an invalid project name and WAR archive name. Be sure your quickstart project folder is located outside the IDE workspace before you begin.

2. Select File → Import.
3. Choose Maven → Existing Maven Projects, then click Next.
4. Browse to the desired quickstart’s directory (for example the `helloworld` quickstart), and click OK. The Projects list box is populated with the `pom.xml` file of the selected quickstart project.
5. Click Finish.

Run the **helloworld** Quickstart

Running the **helloworld** quickstart is a simple way to verify that the JBoss EAP server is configured and running correctly.

1. If you have not yet defined a server, add the JBoss EAP server to Red Hat CodeReady Studio. See [Downloading, Installing, and Setting Up JBoss EAP from within the IDE](#) in the Getting Started with CodeReady Studio Tools guide.

2. Right-click the **helloworld** project in the **Project Explorer** tab and select Run As → Run on Server.
Select the JBoss EAP 7.4 server from the server list and click **Next**.
4. The **helloworld** quickstart is already listed to be configured on the server. Click **Finish** to deploy the quickstart.
5. Verify the results.

- In the **Server** tab, the JBoss EAP 7.4 server status changes to **Started**.

- The **Console** tab shows messages detailing the JBoss EAP server start and the **helloworld** quickstart deployment.
The `helloworld` application is available at [http://localhost:8080/helloworld](http://localhost:8080/helloworld) and displays the text **Hello World!**.

For further details on the `helloworld` quickstart, see [Explore the helloworld Quickstart](#).

### Run the `bean-validation` Quickstart

Some quickstarts, such as the `bean-validation` quickstart, do not provide a user interface layer and instead provide Arquillian tests to demonstrate functionality.

1. Import the `bean-validation` quickstart into Red Hat CodeReady Studio.

2. In the **Servers** tab, right-click on the server and choose **Start** to start the JBoss EAP server. If you do not see a **Servers** tab or have not yet defined a server, add the JBoss EAP server to Red Hat CodeReady Studio. See [Downloading, Installing, and Setting Up JBoss EAP from within the IDE](#) in the **Getting Started with CodeReady Studio Tools** guide.

3. Right-click on the `bean-validation` project in the **Project Explorer** tab and select **Run As** → **Maven Build**.

4. Enter the following in the **Goals** input field and then click **Run**.

```
clean verify -Parq-remote
```
5. Verify the results.
The **Console** tab shows the results of the **bean-validation** Arquillian tests:

---

**T E S T S**
---

Running org.jboss.as.quickstarts.bean_validation.test.MemberValidationTest
Tests run: 5, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 2.189 sec

Results:

Tests run: 5, Failures: 0, Errors: 0, Skipped: 0

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

2.3.3.3. Run the Quickstarts from the Command Line

You can easily build and deploy the quickstarts from the command line using Maven. If you do not yet have Maven installed, see the **Apache Maven** project to download and install it.
A README.md file is provided at the root directory of the quickstarts that contains general information about system requirements, configuring Maven, adding users, and running the quickstarts.

Each quickstart also contains its own README.md file that provides the specific instructions and Maven commands to run that quickstart.

Run the helloworld Quickstart from the Command Line

1. Review the README.md file in the root directory of the helloworld quickstart.

2. Start the JBoss EAP server.

   $ EAP_HOME/bin/standalone.sh

3. Navigate to the helloworld quickstart directory.

4. Build and deploy the quickstart using the Maven command provided in the quickstart’s README.md file.

   $ mvn clean install wildfly:deploy

5. The helloworld application is now available at http://localhost:8080/helloworld and displays the text Hello World!

2.4. REVIEW THE QUICKSTART EXAMPLES

2.4.1. Explore the helloworld Quickstart

The helloworld quickstart shows you how to deploy a simple servlet to JBoss EAP. The business logic is encapsulated in a service, which is provided as Jakarta Contexts and Dependency Injection bean and injected into the Servlet. This quickstart is a starting point to be sure you have configured and started your server properly.

Detailed instructions to build and deploy this quickstart using the command line can be found in the README.html file at the root of the helloworld quickstart directory. This topic shows you how to use Red Hat CodeReady Studio to run the quickstart and assumes you have installed Red Hat CodeReady Studio, configured Maven, and imported and successfully run the helloworld quickstart.

Prerequisites


- Run the helloworld quickstart. For instructions, see Run the Quickstarts in Red Hat CodeReady Studio.

- Verify that the helloworld quickstart was successfully deployed to JBoss EAP by opening a web browser and accessing the application at http://localhost:8080/helloworld.

Examine the Directory Structure

The code for the helloworld quickstart can be found in the QUICKSTART_HOME/helloworld directory. The helloworld quickstart is comprised of a Servlet and the Jakarta Contexts and Dependency Injection bean. It also contains a beans.xml file in the application’s WEB-INF directory.
that has a version number of 1.1 and a bean-discovery-mode of all. This marker file identifies the WAR as a bean archive and tells JBoss EAP to look for beans in this application and to activate the Jakarta Contexts and Dependency Injection.

The src/main/webapp/ directory contains the files for the quickstart. All the configuration files for this example are located in the WEB-INF/ directory within src/main/webapp/, including the beans.xml file. The src/main/webapp/ directory also includes an index.html file, which uses a simple meta refresh to redirect the user’s browser to the Servlet, which is located at http://localhost:8080/helloworld/HelloWorld. The quickstart does not require a web.xml file.

Examine the Code
The package declaration and imports have been excluded from these listings. The complete listing is available in the quickstart source code.

1. Review the HelloWorldServlet code.

The HelloWorldServlet.java file is located in the src/main/java/org/jboss/as/quickstarts/helloworld/ directory. This servlet sends the information to the browser.

Example: HelloWorldServlet Class Code

```java
@SuppressWarnings("serial")
@WebServlet(
    "HelloWorld"
)
public class HelloWorldServlet extends HttpServlet {

    static String PAGE_HEADER = "<html><head><title>helloworld</title></head><body>";
    static String PAGE_FOOTER = "</body></html>";

    @Inject
    HelloService helloService;

    @Override
    protected void doGet(HttpServletRequest req, HttpServletResponse resp) throws ServletException, IOException {
        resp.setContentType("text/html");
        PrintWriter writer = resp.getWriter();
        writer.println(PAGE_HEADER);
        writer.println("<h1>" + helloService.createHelloMessage("World") + "</h1>");
        writer.println(PAGE_FOOTER);
        writer.close();
    }
}
```

Table 2.1. HelloWorldServlet Details

<table>
<thead>
<tr>
<th>Line</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>All you need to do is add the @WebServlet annotation and provide a mapping to a URL used to access the servlet.</td>
</tr>
<tr>
<td>46-48</td>
<td>Every web page needs correctly formed HTML. This quickstart uses static Strings to write the minimum header and footer output.</td>
</tr>
</tbody>
</table>
These lines inject the HelloService Jakarta Contexts and Dependency Injection bean which generates the actual message. As long as we don’t alter the API of HelloService, this approach allows us to alter the implementation of HelloService at a later date without changing the view layer.

This line calls into the service to generate the message "Hello World", and write it out to the HTTP request.

2. Review the HelloService code.
The HelloService.java file is located in the src/main/java/org/jboss/as/quickstarts/helloworld/ directory. This service simply returns a message. No XML or annotation registration is required.

Example: HelloService Class Code

```java
public class HelloService {
    String createHelloMessage(String name) {
        return "Hello " + name + "!";
    }
}
```

2.4.2. Explore the numberguess Quickstart

The numberguess quickstart shows you how to create and deploy a simple non-persistant application to JBoss EAP. Information is displayed using the Jakarta Server Faces view and business logic is encapsulated in two Jakarta Contexts and Dependency Injection beans. In the numberguess quickstart, you have ten attempts to guess a number between 1 and 100. After each attempt, you’re told whether your guess was too high or too low.

The code for the numberguess quickstart can be found in the QUICKSTART_HOME/numberguess/ directory where QUICKSTART_HOME is the directory where you downloaded and unzipped the JBoss EAP quickstarts. The numberguess quickstart is comprised of a number of beans, configuration files, and Facelets Jakarta Server Faces views, and is packaged as a WAR module.

Detailed instructions to build and deploy this quickstart using the command line can be found in the README.html file at the root of the numberguess quickstart directory. The following examples use Red Hat CodeReady Studio to run the quickstart.

Prerequisites

- Run the numberguess quickstart. For instructions, see Run the Quickstarts in Red Hat CodeReady Studio and replace helloworld with numberguess in the instructions.
- Verify the numberguess quickstart was deployed successfully to JBoss EAP by opening a web browser and accessing the application at this URL: http://localhost:8080/numberguess.
Examine the Configuration Files
All the configuration files for this example are located in the 
QUICKSTART_HOME/numberguess/src/main/webapp/WEB-INF/ directory of the quickstart.

1. Examine the faces-config.xml file.
   This quickstart uses Jakarta Server Faces 2.2 version of faces-config.xml filename. A
   standardized version of Facelets is the default view handler in Jakarta Server Faces 2.2 so it
   requires no configuration. This file consists of only the root element and is simply a marker file
   to indicate JSF should be enabled in the application.

   ```xml
   <faces-config version="2.2"
      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/web-facesconfig_2_2.xsd">
   </faces-config>
   ```

2. Examine the beans.xml file.
   The beans.xml file contains a version number of 1.1 and a bean-discovery-mode of all. This file
   is a marker file that identifies the WAR as a bean archive and tells JBoss EAP to look for beans
   in this application and to activate the Jakarta Contexts and Dependency Injection.

   ```xml
   <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"
      bean-discovery-mode="all">
   </beans>
   ```

   NOTE
   This quickstart does not need a web.xml file.

2.4.2.1. Examine the Jakarta Server Faces Code

Jakarta Server Faces uses the .xhtml file extension for source files, but delivers the rendered views with
the .jsf extension. The home.xhtml file is located in the src/main/webapp/ directory.

Example: Jakarta Server Faces Source Code

```xml
19<html xmlns="http://www.w3.org/1999/xhtml"
20 xmlns:ui="http://java.sun.com/jsf/facelets"
21 xmlns:h="http://java.sun.com/jsf/html"
22 xmlns:f="http://java.sun.com/jsf/core">
23
24<head>
25<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1" />
26<title>Numberguess</title>
27</head>
28
29<body>
```
30 <div id="content">
31 <h1>Guess a number...<h1>
32 <h:form id="numberGuess">
33
34 <!-- Feedback for the user on their guess -->
35 <div style="color: red">
36 <h:messages id="messages" globalOnly="false" />
37 <h:outputText id="Higher" value="Higher!" rendered="#{game.number gt game.guess and game.guess ne 0}" />
38 <h:outputText id="Lower" value="Lower!" rendered="#{game.number lt game.guess and game.guess ne 0}" />
39 </div>
40 <!-- Instructions for the user -->
41 <div>
42 I'm thinking of a number between <span id="numberGuess:smallest">#{game.smallest}</span> and <span id="numberGuess:biggest">#{game.biggest}</span>. You have #{game.remainingGuesses} guesses remaining.
43 </div>
44
45 <!-- Input box for the users guess, plus a button to submit, and reset -->
46 <div>
47 Your guess:
48 <h:inputText id="inputGuess" value="#{game.guess}" required="true" size="3"
49 disabled="#{game.number eq game.guess}"
50 validator="#{game.validateNumberRange}" />
51 <h:commandButton id="guessButton" value="Guess"
52 action="#{game.check}" disabled="#{game.number eq game.guess}" />
53 </div>
54 <div>
55 <h:commandButton id="restartButton" value="Reset"
56 action="#{game.reset}" immediate="true" />
57 </div>
58 <h:form>
59 60</h:form>
61</div>
62
63
64 <br style="clear: both" />
65
66
67
68
69</div>
70
71
72
73</body>
74</html>

The following line numbers correspond to those seen when viewing the file in Red Hat CodeReady Studio.

Table 2.2. Jakarta Server Faces Details

<table>
<thead>
<tr>
<th>Line</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-40</td>
<td>These are the messages which can be sent to the user: &quot;Higher!&quot; and &quot;Lower!&quot;</td>
</tr>
</tbody>
</table>
As the user guesses, the range of numbers they can guess gets smaller. This sentence changes to make sure they know the number range of a valid guess.

This input field is bound to a bean property using a value expression.

A validator binding is used to make sure the user does not accidentally input a number outside of the range in which they can guess. If the validator was not here, the user might use up a guess on an out of bounds number.

There must be a way for the user to send their guess to the server. Here we bind to an action method on the bean.

### 2.4.2.2. Examine the Class Files

All of the `numberguess` quickstart source files can be found in the `QUICKSTART_HOME/numberguess/src/main/java/org/jboss/as/quickstarts/numberguess/` directory. The package declaration and imports have been excluded from these listings. The complete listing is available in the quickstart source code.

1. **Review the Random.java Qualifier Code**
   A qualifier is used to remove ambiguity between two beans, both of which are eligible for injection based on their type. For more information on qualifiers, see Use a Qualifier to Resolve an Ambiguous Injection in the JBoss EAP Development Guide. The `@Random` qualifier is used for injecting a random number.

   ```java
   @Target({ TYPE, METHOD, PARAMETER, FIELD })
   @Retention(RUNTIME)
   @Documented
   @Qualifier
   public @interface Random {
   }
   ```

2. **Review the MaxNumber.java Qualifier Code**
   The `@MaxNumber` qualifier is used for injecting the maximum number allowed.

   ```java
   @Target({ TYPE, METHOD, PARAMETER, FIELD })
   @Retention(RUNTIME)
   @Documented
   @Qualifier
   public @interface MaxNumber {
   }
   ```

3. **Review the Generator.java Code**
   The `Generator` class creates the random number via a producer method, exposing the maximum possible number via the same. This class is application-scoped, so you don’t get a different random each time.

   ```java
   @SuppressWarnings("serial")
Review the `Game.java` Code

The session-scoped `Game` class is the primary entry point of the application. It is responsible for setting up or resetting the game, capturing and validating the user’s guess, and providing feedback to the user with a `FacesMessage`. It uses the post-construct lifecycle method to initialize the game by retrieving a random number from the `@Random Instance<Integer>` bean.

Notice the `@Named` annotation in the class. This annotation is only required when you want to make the bean accessible to the Jakarta Server Faces view by using Jakarta Expression Language, in this case `#{game}`.
private int biggest;

/**
 * The number of guesses remaining
 */
private int remainingGuesses;

/**
 * The maximum number we should ask them to guess
 */
@Inject
@MaxNumber
private int maxNumber;

/**
 * The random number to guess
 */
@Inject
@Random
Instance<Integer> randomNumber;

public Game() {
}

public int getNumber() {
  return number;
}

public int getGuess() {
  return guess;
}

public void setGuess(int guess) {
  this.guess = guess;
}

public int getSmallest() {
  return smallest;
}

public int getBiggest() {
  return biggest;
}

public int getRemainingGuesses() {
  return remainingGuesses;
}

/**
 * Check whether the current guess is correct, and update the biggest/smallest guesses as needed. Give feedback to the user
 * if they are correct.
 */
public void check() {
if (guess > number) {
    biggest = guess - 1;
} else if (guess < number) {
    smallest = guess + 1;
} else if (guess == number) {
    FacesContext.getCurrentInstance().addMessage(null, new
    FacesMessage("Correct"));
}

remainingGuesses--;
}

/**
 * Reset the game, by putting all values back to their defaults, and getting a new random
 * number. We also call this method
 * when the user starts playing for the first time using {@link PostConstruct
 * @PostConstruct} to set the initial
 * values.
 */
@PostConstruct
public void reset() {
    this.smallest = 0;
    this.guess = 0;
    this.remainingGuesses = 10;
    this.biggest = maxNumber;
    this.number = randomNumber.get();
}

/**
 * A Jakarta Server Faces validation method which checks whether the guess is valid. It
 * might not be valid because there are no guesses left,
 * or because the guess is not in range.
 */
public void validateNumberRange(FacesContext context, UIComponent toValidate, Object value) {
    if (remainingGuesses <= 0) {
        FacesMessage message = new FacesMessage("No guesses left!");
        context.addMessage(toValidate.getClientId(context), message);
        ((UIInput) toValidate).setValid(false);
        return;
    }
    int input = (Integer) value;

    if (input < smallest || input > biggest) {
        ((UIInput) toValidate).setValid(false);

        FacesMessage message = new FacesMessage("Invalid guess");
        context.addMessage(toValidate.getClientId(context), message);
    }
}
APPENDIX A. REFERENCE INFORMATION FOR GETTING STARTED WITH JBOSS EAP

You can use the arguments, attributes, and default socket binding to help you get started with using JBoss EAP. For example, you can use arguments to set an alternative configuration to a default JBoss EAP standalone server. This helps configure the server to meet your needs.

A.1. SERVER RUNTIME ARGUMENTS AND SWITCHES

On standalone servers and servers in a managed domain, you can use specific server runtime arguments with an application’s startup script. The script can start a server with alternative configurations to those defined in the standalone.xml, domain.xml, and host.xml configuration files. Alternative configurations might include starting the server with an alternative socket bindings set or a secondary configuration.

Before you start the server, you can access the available parameters list by issuing the help switch, -h or --help, in your terminal.

Table A.1. Descriptions of runtime arguments and switches:

<table>
<thead>
<tr>
<th>Argument or switch</th>
<th>Server type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--admin-only</td>
<td>Standalone</td>
<td>Sets the server’s running type to <strong>ADMIN_ONLY</strong>. The argument opens administrative interfaces and accepts management requests, but the argument does not start other runtime services or accept user requests. For best performance, use the <strong>start-mode=admin-only</strong> argument.</td>
</tr>
<tr>
<td>--admin-only</td>
<td>Domain</td>
<td>Sets the host controller’s running type to <strong>ADMIN_ONLY</strong> causing the host controller to open administrative interfaces and accept management requests, but the host controller does not start servers. For the master host controller for the domain, it accepts incoming connections from slave host controllers.</td>
</tr>
<tr>
<td>-b=&lt;value&gt;, -b &lt;value&gt;</td>
<td>Standalone, Domain</td>
<td>Set system property <code>jboss.bind.address</code>, which you can use to configure the bind address for the public interface. The bind address defaults to <strong>127.0.0.1</strong>. See the <code>-b&lt;interface&gt;=&lt;value&gt;</code> entry for setting the bind address for other interfaces.</td>
</tr>
<tr>
<td>-b&lt;interface&gt;=&lt;value&gt;</td>
<td>Standalone, Domain</td>
<td>Set system property <code>jboss.bind.address.&lt;interface&gt;</code> to the given value. For example, <code>bmanagement=IP_ADDRESS</code>.</td>
</tr>
<tr>
<td>--backup</td>
<td>Domain</td>
<td>Keep a copy of the persistent domain configuration even if this host is not the domain controller.</td>
</tr>
<tr>
<td>Argument or switch</td>
<td>Server type</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-c=&lt;config&gt;, -c &lt;config&gt;</td>
<td>Standalone</td>
<td>Name of the server configuration file to use. The default is standalone.xml.</td>
</tr>
<tr>
<td>-c=&lt;config&gt;, -c &lt;config&gt;</td>
<td>Domain</td>
<td>Name of the server configuration file to use. The default is domain.xml.</td>
</tr>
<tr>
<td>--cached-dc</td>
<td>Domain</td>
<td>If the host is not the domain controller and cannot contact the domain controller at boot then you must boot by using a locally cached copy of the domain configuration.</td>
</tr>
<tr>
<td>--debug [&lt;port&gt;]</td>
<td>Standalone</td>
<td>Activate debug mode with an optional argument to specify the port. Argument only works if the launch script supports the Argument.</td>
</tr>
<tr>
<td>-D&lt;name&gt;[=&lt;value&gt;]</td>
<td>Standalone, Domain</td>
<td>Set a system property.</td>
</tr>
<tr>
<td>--domain-config=&lt;config&gt;</td>
<td>Domain</td>
<td>Name of the server configuration file to use. Defaults as domain.xml.</td>
</tr>
<tr>
<td>--git-repo</td>
<td>Standalone</td>
<td>The location of the Git repository that is used to manage and persist server configuration data. This can be local if you want to store it locally, or the URL to a remote repository.</td>
</tr>
<tr>
<td>--git-branch</td>
<td>Standalone</td>
<td>The branch or tag name in the Git repository to use. This argument should name an existing branch or tag name as it will not be created if it does not exist. If you use a tag name, you put the repository in a detached HEAD state, meaning future commits are not attached to any branches. Tag names are read-only and are normally used when you need to replicate a configuration across several nodes.</td>
</tr>
<tr>
<td>--git-auth</td>
<td>Standalone</td>
<td>The URL to an Elytron configuration file that contains the credentials the server uses when it connects to a remote Git repository. You can use the argument when your remote Git repository requires authentication. Elytron does not support SSH. Elytron supports only default SSH authentication by using private keys without a password. You cannot use the argument with a local repository.</td>
</tr>
<tr>
<td>-h, --help</td>
<td>Standalone, Domain</td>
<td>Display the help message and exit the help index.</td>
</tr>
<tr>
<td>Argument or switch</td>
<td>Server type</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>--host-config=&lt;config&gt;</td>
<td>Domain</td>
<td>Name of the host configuration file to use.</td>
</tr>
<tr>
<td>--interprocess-hc-address=&lt;address&gt;</td>
<td>Domain</td>
<td>Address on which the host controller can listen for communication.</td>
</tr>
<tr>
<td>--interprocess-hc-port=&lt;port&gt;</td>
<td>Domain</td>
<td>Port on which the host controller can listen for communication.</td>
</tr>
<tr>
<td>--master-address=&lt;address&gt;</td>
<td>Domain</td>
<td>Set system property <code>jboss.domain.master.address</code> to the given value.</td>
</tr>
<tr>
<td>--master-port=&lt;port&gt;</td>
<td>Domain</td>
<td>Set system property <code>jboss.domain.master.port</code> to the given value.</td>
</tr>
<tr>
<td>--read-only-server-config=&lt;config&gt;</td>
<td>Standalone</td>
<td>Name of the server configuration file to use.</td>
</tr>
<tr>
<td>--read-only-domain-config=&lt;config&gt;</td>
<td>Domain</td>
<td>Name of the domain configuration file to use.</td>
</tr>
<tr>
<td>--read-only-host-config=&lt;config&gt;</td>
<td>Domain</td>
<td>Name of the host configuration file to use.</td>
</tr>
<tr>
<td>-P=&lt;url&gt;, -P &lt;url&gt;, --properties=&lt;url&gt;</td>
<td>Standalone,</td>
<td>Load system properties from the given URL.</td>
</tr>
<tr>
<td>--pc-address=&lt;address&gt;</td>
<td>Domain</td>
<td>Address on which the process controller listens for communication.</td>
</tr>
<tr>
<td>--pc-port=&lt;port&gt;</td>
<td>Domain</td>
<td>Port on which the process controller listens for communication.</td>
</tr>
<tr>
<td>-S[name]=[&lt;value&gt;]</td>
<td>Standalone</td>
<td>Set a security property.</td>
</tr>
</tbody>
</table>
### Argument or switch  |  Server type  |  Description
--- | --- | ---
-secmgr  |  Standalone, Domain  |  Runs the server with a security manager installed.

--server-config=<config>  |  Standalone  |  Name of the server configuration file to use. Defaults as standalone.xml.

--start-mode=<mode>  |  Standalone  |  Set the start mode of the server. You cannot use the argument cannot with the --admin-only argument. You can use the following entries with the argument:

- normal: The server starts normally.
- admin-only: The server only opens in administrative interfaces and accept management requests, but the server does not start other runtime services or accept end user requests.
- suspend: The server starts in suspended mode, but the server does not receive service requests until the server resumes.

-u=<value>, -u <value>  |  Standalone, Domain  |  Set system property jboss.default.multicast.address, which the server uses in configuring the multicast address in the socket-binding elements in the configuration files. Defaults as 230.0.0.4.

-v, -V, --version  |  Standalone, Domain  |  Display the application server version and exit.

### WARNING
JBoss EAP sets its included configuration files to handle the behavior of the switches. For example, -b and -u. If you change your configuration files to no longer use the system property controlled by the switch then adding the system property to the start command does not work.

### A.2. ADD-USER ARGUMENTS
You can use arguments with the add-user.sh script or the add-user.bat script to configure how these scripts add new users to a properties file for authentication purposes.

Table A.2. Descriptions of add-user arguments
<table>
<thead>
<tr>
<th>Command line argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-a</td>
<td>Creates a user in the application realm. If you do not create a user in the application realm then the script creates a user in the management realm by default.</td>
</tr>
<tr>
<td>-dc &lt;value&gt;</td>
<td>The domain configuration directory that contains the properties files. If you omit the argument then the script sets <code>EAP_HOME/domain/configuration/</code> as the default directory.</td>
</tr>
<tr>
<td>-sc &lt;value&gt;</td>
<td>An alternative standalone server configuration directory that contains properties files. If you omit the argument then the script sets <code>EAP_HOME/standalone/configuration/</code> as the default directory.</td>
</tr>
<tr>
<td>-up, --user-properties &lt;value&gt;</td>
<td>The name of the alternative user properties file. You can set an absolute path for the file or specify a file name by using the argument with an <code>--sc</code> or a <code>--dc</code> argument to set an alternative configuration directory.</td>
</tr>
<tr>
<td>-g, --group &lt;value&gt;</td>
<td>A comma-separated list of groups to assign to a user.</td>
</tr>
<tr>
<td>-gp, --group-properties &lt;value&gt;</td>
<td>The name of the alternative group properties file. You can set an absolute path for the file or specify a file name by using the argument with an <code>--sc</code> or a <code>--dc</code> argument to set an alternative configuration directory.</td>
</tr>
<tr>
<td>-p, --password &lt;value&gt;</td>
<td>The password of the user.</td>
</tr>
</tbody>
</table>
| -u, --user <value> | The name of the user. User names can only contain the following characters, in any number and in any order: 
- Alphanumeric characters (a-z, A-Z, 0-9) 
- Dashes (-), periods (.), commas (,), at sign (@) 
- Backslash (\) 
- Equals (=) |
| -r, --realm <value> | The name of the realm used to secure the management interfaces. If omitted, the default is `ManagementRealm`. |
| -s, --silent | Run the `add-user` script with no output to the console. |
| -e, --enable | Enable the user. |
| -d, --disable | Disable the user. |
| -cw, --confirm-warning | Automatically confirm warning in interactive mode. |
| -h, --help | Display usage information for the `add-user` script. |
A.3. INTERFACE ATTRIBUTES

You can use interface attributes to configure a JBoss EAP interface.

NOTE

Attribute names in the table display in the order JBoss EAP lists them in its management model. See the schema definition file located at `EAP_HOME/docs/schema/wildfly-config_5_0.xsd` to view the elements as they appear in the XML. XML element listings must differ from those displayed in the management model.

Table A.3. Descriptions of interface attributes:

<table>
<thead>
<tr>
<th>Interface attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>any</td>
<td>Specifies that an interface must meet at least one, but not necessarily all, of the selected nested set of criteria.</td>
</tr>
<tr>
<td>any-address</td>
<td>Empty attribute that binds a wildcard address to sockets that use an interface. The attribute has the following configuration options:</td>
</tr>
<tr>
<td></td>
<td>- Attribute uses the IPv6 wildcard address (::) as default. If you set the <code>java.net.preferIPv4Stack</code> system property to <code>true</code> then the socket uses the IPv4 wildcard address (0.0.0.0).</td>
</tr>
<tr>
<td></td>
<td>- If a socket binds to an IPv6 anylocal address on a dual-stack machine, the socket accepts both IPv6 and IPv4 traffic.</td>
</tr>
<tr>
<td></td>
<td>- If a socket binds to an IPv4 (IPv4-mapped) anylocal address, the socket accepts only IPv4 traffic.</td>
</tr>
<tr>
<td>inet-address</td>
<td>Specifies either an IP address in IPv6 or IPv4 dotted decimal notation or a host name resolved to an IP address.</td>
</tr>
<tr>
<td>link-local-address</td>
<td>Empty attribute that specifies criteria for whether or not an interface includes a link-local address.</td>
</tr>
<tr>
<td>loopback</td>
<td>Empty attribute that specifies criteria for whether or not an interface identifies as a loopback interface.</td>
</tr>
<tr>
<td>loopback-address</td>
<td>A loopback address that might not have been configured on the machine's loopback interface. Attribute differs from <code>inet-address</code> type, as the interface uses the attribute value even if the value contains an NIC without an IP address.</td>
</tr>
</tbody>
</table>
### Interface attribute Description

<table>
<thead>
<tr>
<th>Interface attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>multicast</td>
<td>Empty attribute that specifies criteria for whether or not an interface supports multicast.</td>
</tr>
<tr>
<td>name</td>
<td>The name of the interface.</td>
</tr>
<tr>
<td>nic</td>
<td>The name of a network interface, such as <em>eth0</em>, <em>eth1</em>, or <em>lo</em>.</td>
</tr>
<tr>
<td>nic-match</td>
<td>A regular expression that matches the names of the network interfaces available on a machine to an acceptable interface.</td>
</tr>
<tr>
<td>not</td>
<td>Attribute that indicates the selection criteria that an interface must not meet.</td>
</tr>
<tr>
<td>point-to-point</td>
<td>Empty attribute that specifies criteria for whether or not an interface identifies as a point-to-point interface.</td>
</tr>
<tr>
<td>public-address</td>
<td>Empty attribute that specifies criteria for whether or not an interface contains a publicly routable address.</td>
</tr>
<tr>
<td>site-local-address</td>
<td>Empty attribute that specifies criteria for whether or not an interface contains a site-local address.</td>
</tr>
<tr>
<td>subnet-match</td>
<td>Specifies a network IP address and the number of bits in the address’ network prefix, which is written in <em>slash notation</em>, such as <em>192.168.0.0/16</em>.</td>
</tr>
<tr>
<td>up</td>
<td>Empty attribute that specifies criteria for whether or not an interface locates as up.</td>
</tr>
<tr>
<td>virtual</td>
<td>Empty attribute that specifies criteria for whether or not an interface contains identifies as a virtual interface.</td>
</tr>
</tbody>
</table>

### A.4. SOCKET BINDING ATTRIBUTES

You can use socket binding attributes to configure the socket binding for your JBoss EAP server.

Specific attributes exist for the following types of socket bindings:

- Inbound socket bindings
- Remote outbound socket bindings
- Local outbound socket bindings
NOTE

Attribute names in the table display in the order JBoss EAP lists them in its management model. See the schema definition file located at `EAP_HOME/docs/schema/wildfly-config_5_0.xsd` to view the elements as they appear in the XML. XML element listings must differ from those displayed in the management model.

Table A.4. Descriptions of inbound socket binding, `socket-binding`, attributes:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>client-mappings</td>
<td>Specifies the client mappings for an inbound socket binding. A client that connects to an inbound socket must use the destination address specified in the mapping. This address matches the outbound interface. By using the client-mapping attribute with an inbound socket binding, you can apply advanced network topologies that use either network address translation or include bindings on multiple network interfaces. You must evaluate each mapping in declared order; that is, the first successful match determines the destination for the mapping.</td>
</tr>
<tr>
<td>fixed-port</td>
<td>Use the attribute to determine if the port value must remain fixed. You can use the attribute even if you applied numeric offsets to the other sockets in the socket group.</td>
</tr>
<tr>
<td>interface</td>
<td>Attribute that sets name of the interface to which the socket binds. You can also use the attribute to set the interface that multicast sockets must listen. If you do not define a declared interface then the attribute uses the <code>default-interface</code> value from the enclosing socket binding group.</td>
</tr>
<tr>
<td>multicast-address</td>
<td>Multicast address on which the socket receives multicast traffic. If you do not specify a value for the attribute then you do not configure the socket to receive multicast functionality.</td>
</tr>
<tr>
<td>multicast-port</td>
<td>Port on which the socket receives multicast traffic. You must configure the attribute if you configured the <code>multicast-address</code> attribute.</td>
</tr>
<tr>
<td>name</td>
<td>You must set a name of the socket. A service requiring access to the socket configuration information cannot use the name to find the socket.</td>
</tr>
<tr>
<td>port</td>
<td>Number of the port to which the socket binds. You must override the attribute value if you configured servers to apply a port-offset to increment or decrement all port values.</td>
</tr>
</tbody>
</table>

Table A.5. Descriptions of remote outbound socket binding, `remote-destination-outbound-socket-binding`, attributes:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixed-source-port</td>
<td>Determines whether the port value must remain fixed, even if you applied numeric offsets to the other outbound sockets in a socket group.</td>
</tr>
</tbody>
</table>
### Attribute Descriptions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>host</td>
<td>The host name or IP address of the remote destination to which an outbound socket connects.</td>
</tr>
<tr>
<td>port</td>
<td>The port number of the remote destination to which an outbound socket connects.</td>
</tr>
<tr>
<td>source-interface</td>
<td>The name of the interface that JBoss EAP uses for the source address of the outbound socket.</td>
</tr>
<tr>
<td>source-port</td>
<td>The port number that JBoss EAP uses as the source port of the outbound socket.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixed-source-port</td>
<td>Determines whether the port value must remain fixed, even if you applied numeric offsets to the other outbound sockets in the socket group.</td>
</tr>
<tr>
<td>socket-binding-ref</td>
<td>The name of the local socket binding that JBoss EAP uses to determine the port for the connecting outbound socket.</td>
</tr>
<tr>
<td>source-interface</td>
<td>The name of the interface that JBoss EAP uses for the source address of the outbound socket.</td>
</tr>
<tr>
<td>source-port</td>
<td>The port number that JBoss EAP uses as the source port of the outbound socket.</td>
</tr>
</tbody>
</table>

### A.5. DEFAULT SOCKET BINDINGS

You can set default socket bindings for each socket binding group.

The following five types of default socket bindings exist for JBoss EAP:

- **standard-sockets**
- **ha-sockets**
- **full-sockets**
- **full-ha-sockets**
- **load-balancer-sockets**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixed-source-port</td>
<td>Determines whether the port value must remain fixed, even if you applied numeric offsets to the other outbound sockets in the socket group.</td>
</tr>
<tr>
<td>socket-binding-ref</td>
<td>The name of the local socket binding that JBoss EAP uses to determine the port for the connecting outbound socket.</td>
</tr>
<tr>
<td>source-interface</td>
<td>The name of the interface that JBoss EAP uses for the source address of the outbound socket.</td>
</tr>
<tr>
<td>source-port</td>
<td>The port number that JBoss EAP uses as the source port of the outbound socket.</td>
</tr>
<tr>
<td>Socket Binding</td>
<td>Port</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
</tr>
<tr>
<td>ajp</td>
<td>8009</td>
</tr>
<tr>
<td>http</td>
<td>8080</td>
</tr>
<tr>
<td>https</td>
<td>8443</td>
</tr>
<tr>
<td>management-http</td>
<td>9990</td>
</tr>
<tr>
<td>management-https</td>
<td>9993</td>
</tr>
<tr>
<td>txn-recovery-environment</td>
<td>4712</td>
</tr>
<tr>
<td>txn-status-manager</td>
<td>4713</td>
</tr>
</tbody>
</table>

Table A.8. Descriptions of default ha-sockets socket bindings:

<table>
<thead>
<tr>
<th>Socket Binding</th>
<th>Port</th>
<th>Multicast Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ajp</td>
<td>8009</td>
<td></td>
<td>Apache JServ Protocol. Used for HTTP clustering and load balancing.</td>
</tr>
<tr>
<td>http</td>
<td>8080</td>
<td></td>
<td>The default port for deployed web applications.</td>
</tr>
<tr>
<td>https</td>
<td>8443</td>
<td></td>
<td>SSL-encrypted connection between deployed web applications and clients.</td>
</tr>
<tr>
<td>jgroups-mping</td>
<td></td>
<td>45700</td>
<td>Multicast. Used to discover initial membership in a HA cluster.</td>
</tr>
<tr>
<td>jgroups-tcp</td>
<td>7600</td>
<td></td>
<td>Unicast peer discovery in HA clusters using TCP.</td>
</tr>
<tr>
<td>jgroups-udp</td>
<td>55200</td>
<td>45688</td>
<td>Multicast peer discovery in HA clusters using UDP.</td>
</tr>
<tr>
<td>management-http</td>
<td>9990</td>
<td></td>
<td>Used for HTTP communication with the management layer.</td>
</tr>
</tbody>
</table>
### Table A.9. Descriptions of default full-sockets socket bindings:

<table>
<thead>
<tr>
<th>Socket Binding</th>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>management-https</td>
<td>9993</td>
<td>Used for HTTPS communication with the management layer.</td>
</tr>
<tr>
<td>modcluster</td>
<td>23364</td>
<td>Multicast port for communication between JBoss EAP and the HTTP load balancer.</td>
</tr>
<tr>
<td>txn-recovery-environment</td>
<td>4712</td>
<td>The JTA transaction recovery manager.</td>
</tr>
<tr>
<td>txn-status-manager</td>
<td>4713</td>
<td>The JTA / JTS transaction manager.</td>
</tr>
</tbody>
</table>

### Table A.10. Descriptions of default full-ha-sockets socket bindings:

<table>
<thead>
<tr>
<th>Name</th>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ajp</td>
<td>8009</td>
<td>Apache JServ Protocol. Used for HTTP clustering and load balancing.</td>
</tr>
<tr>
<td>http</td>
<td>8080</td>
<td>The default port for deployed web applications.</td>
</tr>
<tr>
<td>https</td>
<td>8443</td>
<td>SSL-encrypted connection between deployed web applications and clients.</td>
</tr>
<tr>
<td>iiop</td>
<td>3528</td>
<td>CORBA services for JTS transactions and other ORB-dependent services.</td>
</tr>
<tr>
<td>iiop-ssl</td>
<td>3529</td>
<td>SSL-encrypted CORBA services.</td>
</tr>
<tr>
<td>management-http</td>
<td>9990</td>
<td>Used for HTTP communication with the management layer.</td>
</tr>
<tr>
<td>management-https</td>
<td>9993</td>
<td>Used for HTTPS communication with the management layer.</td>
</tr>
<tr>
<td>txn-recovery-environment</td>
<td>4712</td>
<td>The JTA transaction recovery manager.</td>
</tr>
<tr>
<td>txn-status-manager</td>
<td>4713</td>
<td>The JTA / JTS transaction manager.</td>
</tr>
<tr>
<td>Name</td>
<td>Port</td>
<td>Multicast Port</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>http</td>
<td>8080</td>
<td></td>
</tr>
<tr>
<td>https</td>
<td>8443</td>
<td></td>
</tr>
<tr>
<td>iiop</td>
<td>3528</td>
<td></td>
</tr>
<tr>
<td>iiop-ssl</td>
<td>3529</td>
<td></td>
</tr>
<tr>
<td>jgroups-mping</td>
<td></td>
<td>45700</td>
</tr>
<tr>
<td>jgroups-tcp</td>
<td>7600</td>
<td></td>
</tr>
<tr>
<td>jgroups-udp</td>
<td>55200</td>
<td>45688</td>
</tr>
<tr>
<td>management-http</td>
<td>9990</td>
<td></td>
</tr>
<tr>
<td>management-https</td>
<td>9993</td>
<td></td>
</tr>
<tr>
<td>modcluster</td>
<td></td>
<td>23364</td>
</tr>
<tr>
<td>txn-recovery-environment</td>
<td>4712</td>
<td></td>
</tr>
<tr>
<td>txn-status-manager</td>
<td>4713</td>
<td></td>
</tr>
</tbody>
</table>

Table A.11. Descriptions of default load-balancer-sockets socket bindings:

<table>
<thead>
<tr>
<th>Name</th>
<th>Port</th>
<th>Multicast Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>http</td>
<td>8080</td>
<td></td>
<td>The default port for deployed web applications.</td>
</tr>
<tr>
<td>https</td>
<td>8443</td>
<td></td>
<td>SSL-encrypted connection between deployed web applications and clients.</td>
</tr>
<tr>
<td>Name</td>
<td>Port</td>
<td>Multicast Port</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>management-http</td>
<td>9990</td>
<td></td>
<td>Used for HTTP communication with the management layer.</td>
</tr>
<tr>
<td>management-https</td>
<td>9993</td>
<td></td>
<td>Used for HTTPS communication with the management layer.</td>
</tr>
<tr>
<td>mcmp-management</td>
<td>8090</td>
<td></td>
<td>The port for the Mod-Cluster Management Protocol (MCMP) connection to transmit lifecycle events.</td>
</tr>
<tr>
<td>modcluster</td>
<td></td>
<td>23364</td>
<td>Multicast port for communication between JBoss EAP and the HTTP load balancer.</td>
</tr>
</tbody>
</table>