Red Hat JBoss Enterprise Application Platform 7.2

Getting Started Guide

For Use with Red Hat JBoss Enterprise Application Platform 7.2

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Abstract

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

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CHAPTER 1. ADMINISTERING JBOSS EAP

1.1. DOWNLOADING AND INSTALLING JBOSS EAP

This guide provides basic instructions for downloading and installing JBoss EAP using the ZIP installation, which is platform independent.

See the *Installation Guide* for additional details, including instructions for installing JBoss EAP using the graphical installer or RPM package installation methods.

1.1.1. Installation Prerequisites

Verify that the following prerequisites have been met before installing JBoss EAP.

Common Prerequisites

- Your system is supported according to the JBoss EAP 7 supported configurations.
- Your system is up-to-date with Red Hat issued updates and errata.

ZIP Installation Prerequisites

- The user who will run JBoss EAP has read and write access for the installation directory.
- The desired Java development kit has been installed.
- For Windows Server, the **JAVA_HOME** and **PATH** environment variables have been set.

1.1.2. Download JBoss EAP

The JBoss EAP ZIP file is available from the Red Hat Customer Portal. The ZIP file installation is platform-independent.

1. Log in to the Red Hat Customer Portal.
2. Click **Downloads**.
3. Click **Red Hat JBoss Enterprise Application Platform** in the **Product Downloads** list.
4. In the **Version** drop-down menu, select **7.2**.
5. Find **Red Hat JBoss Enterprise Application Platform 7.2.0** in the list and click the **Download** link.

1.1.3. Install JBoss EAP

Once the JBoss EAP ZIP installation file has been downloaded, it can be installed by extracting the package contents.

1. If necessary, move the ZIP file to the server and location where JBoss EAP should be installed.

NOTE

The user who will be running JBoss EAP must have read and write access to this directory.

2. Extract the ZIP archive.

```
$ unzip jboss-eap-7.2.0.zip
```

NOTE

For Windows Server, right-click the ZIP file and select **Extract All**.

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

1.2. STARTING AND STOPPING JBOSS EAP

1.2.1. Starting JBoss EAP

JBoss EAP is supported on Red Hat Enterprise Linux, Windows Server, and Oracle Solaris, and runs in either a standalone server or managed domain operating mode. The specific command to start JBoss EAP depends on the underlying platform and the desired operating mode.

Servers are initially started in a suspended state and will not accept any requests until all required services have started, at which time the servers are placed into a normal running state and can start accepting requests.

Start JBoss EAP as a Standalone Server

```
$ EAP_HOME/bin/standalone.sh
```

NOTE

For Windows Server, use the ***EAP_HOME*\bin\standalone.bat** script.

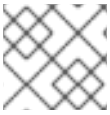
This startup script uses the ***EAP_HOME*/bin/standalone.conf** file, or **standalone.conf.bat** for Windows Server, to set some default preferences, such as JVM options. You can customize the settings in this file.

JBoss EAP uses the **standalone.xml** configuration file by default, but can be started using a different one. For details on the 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, use the **--help** argument or see the Server Runtime Arguments section.

Start JBoss EAP in a Managed Domain
The domain controller must be started before the servers in any of the server groups in the domain. Use this script to first start the domain controller, and then for each associated host controller.

```
$ EAP_HOME/bin/domain.sh
```



NOTE

For Windows Server, use the ***EAP_HOME*\bin\domain.bat** script.

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

JBoss EAP uses the **host.xml** host configuration file by default, but can be started using a different one. For details on the available managed domain configuration files and how to use them, see the Managed Domain Configuration Files section.

When setting up a managed domain, additional arguments will need to be passed into the startup script. For a complete listing of all available startup script arguments and their purposes, use the **--help** argument or see the Server Runtime Arguments section.

1.2.2. Stopping JBoss EAP

The way that you stop JBoss EAP depends on how it was started.

Stop an Interactive Instance of JBoss EAP
Press **Ctrl+C** in the terminal where JBoss EAP was started.

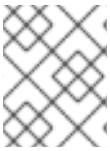
Stop a Background Instance of JBoss EAP
Use the management CLI to connect to the running instance and shut down the server.

1. Launch the management CLI.

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

2. Issue the **shutdown** command.

```
shutdown
```



NOTE

When running 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.

```
$ 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 Utility 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.

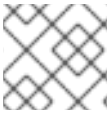
Use the management CLI to start and stop servers, deploy and undeploy applications, configure system settings, and perform other administrative tasks. Operations can be performed in batch mode, allowing multiple tasks to be run as a group.

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

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



NOTE

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

Connect to a Running Server

```
connect
```

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 1.1. Standalone Configuration Files

Configuration File	Purpose
standalone.xml	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.
standalone-ha.xml	This standalone configuration file includes all of the default subsystems and adds the **modcluster** and **jgroups** subsystems for high availability. It does not provide the subsystems necessary for messaging.
standalone-full.xml	This standalone configuration file includes all of the default subsystems and adds the **messaging-activemq** and **iiop-openjdk** subsystems. It does not provide the subsystems necessary for high availability.
standalone-full-ha.xml	This standalone configuration file includes support for every possible subsystem, including those for messaging and high availability.
standalone-load-balancer.xml	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.

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,

```
$ 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 1.2. Managed Domain Configuration Files

Configuration File	Purpose
domain.xml	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*).
host.xml	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 **host.xml** file includes all of the features of both **host-master.xml** and **host-slave.xml**, which are described below.
host-master.xml	This file includes only the configuration details necessary to run a server as the master domain controller.
host-slave.xml	This file includes only the configuration details necessary to run a server as a managed domain host controller.

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,

```
$ 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.

```
: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.

```
:list-snapshots
{
    "outcome" => "success",
    "result" => {
        "directory" => "EAP_HOME/standalone/configuration/standalone_xml_history/snapshot",
        "names" => [
            "20151022-133109702standalone.xml",
            "20151022-132715958standalone.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:

```
${SYSTEM_VALUE_1${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:

```
<password>${VAULT::ds_ExampleDS::password::1}</password>
```

The value of **ds_ExampleDS** could be replaced with a system property (**datasource_name**) using a nested expression. The configuration for the datasource could instead have the following line:

```
<password>${VAULT::${datasource_name}::password::1}</password>
```

JBoss EAP would first evaluate the expression **${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 Java 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 **ee** subsystem that control whether property replacement is applied.

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

- **jboss-ejb3.xml**
- **jboss-app.xml**
- **jboss-web.xml**
- ***-jms.xml**
- ***-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)
```

Java 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**
- **persistence.xml**
- **application.xml**
- **web.xml**

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

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

1.4. NETWORK AND PORT CONFIGURATION

1.4.1. Interfaces

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

This also allows for 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.

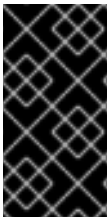
1.4.1.1. Default Interface Configurations

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

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



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.

1.4.1.2. Configuring Interfaces

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. For a listing of all

available interface selection criteria, see the Interface Attributes section.

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.

Add an Interface with a NIC Value
Add a new interface with a NIC value of **eth0**.

```
/interface=external:add(nic=eth0)
```

```
<interface name="external">
  <nic name="eth0"/>
</interface>
```

Add an Interface with Several Conditional Values
Add a new interface that matches any interface/address on the correct subnet if it is up, 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})
```

```
<interface name="default">
  <subnet-match value="192.168.0.0/16"/>
  <up/>
  <multicast/>
  <not>
    <point-to-point/>
  </not>
</interface>
```

Update an Interface Attribute
Update the **public** interface's default **inet-address** value, keeping the **jboss.bind.address** property to allow for this value to be set at runtime.

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

```
<interface name="public">
   <inet-address value="${jboss.bind.address:192.168.0.0}"/>
</interface>
```

Add an Interface to a Server in a Managed Domain

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

```
<servers>
  <server name="SERVER_NAME" group="main-server-group">
    <interfaces>
      <interface name="INTERFACE_NAME">
        <inet-address value="127.0.0.1"/>
      </interface>
```

```
    </interfaces>
  </server>
</servers>
```

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

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. Another example can be found in the Using the Integrated Artemis Resource Adapter for Remote Connections section of *Configuring Messaging* for JBoss EAP.
Attributes for this element can be found in the Remote Outbound Socket Binding Attributes table.

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.

1.4.2.1. Management Ports

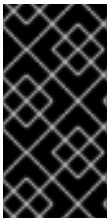
Management ports were consolidated in JBoss EAP 7. By default, JBoss EAP 7 uses port **9990** for both native management, used by the management CLI, and HTTP management, used by the web-based management console. Port **9999**, which was used as the native management port in JBoss EAP 6, is no longer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

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



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.

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.

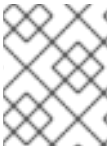
```
<socket-binding-group name="standard-sockets" default-interface="public" port-
offset="${jboss.socket.binding.port-offset:0}">
    <socket-binding name="management-http" interface="management"
port="${jboss.management.http.port:9990}"/>
    <socket-binding name="management-https" interface="management"
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>
```

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**
- **load-balancer-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.

```
<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.

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 that 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 steps below show how to configure JBoss EAP to run using IPv6 addresses.

Configure the JVM Stack for IPv6 Addresses
Update the startup configuration to prefer IPv6 addresses.

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
```

Update Interface Declarations for IPv6 Addresses
The default interface values in the configuration can be changed to IPv6 addresses. For example, the below management CLI command sets the **management** interface to the IPv6 loopback address (**::1**).

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

The following example shows how the XML configuration may look after running the above command.

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

1.5. OPTIMIZING 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 Java 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 Java 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 Java 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 **7.2** in the **Version** drop-down menu.
3. Find the **Red Hat JBoss Enterprise Application Platform 7.2.0 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

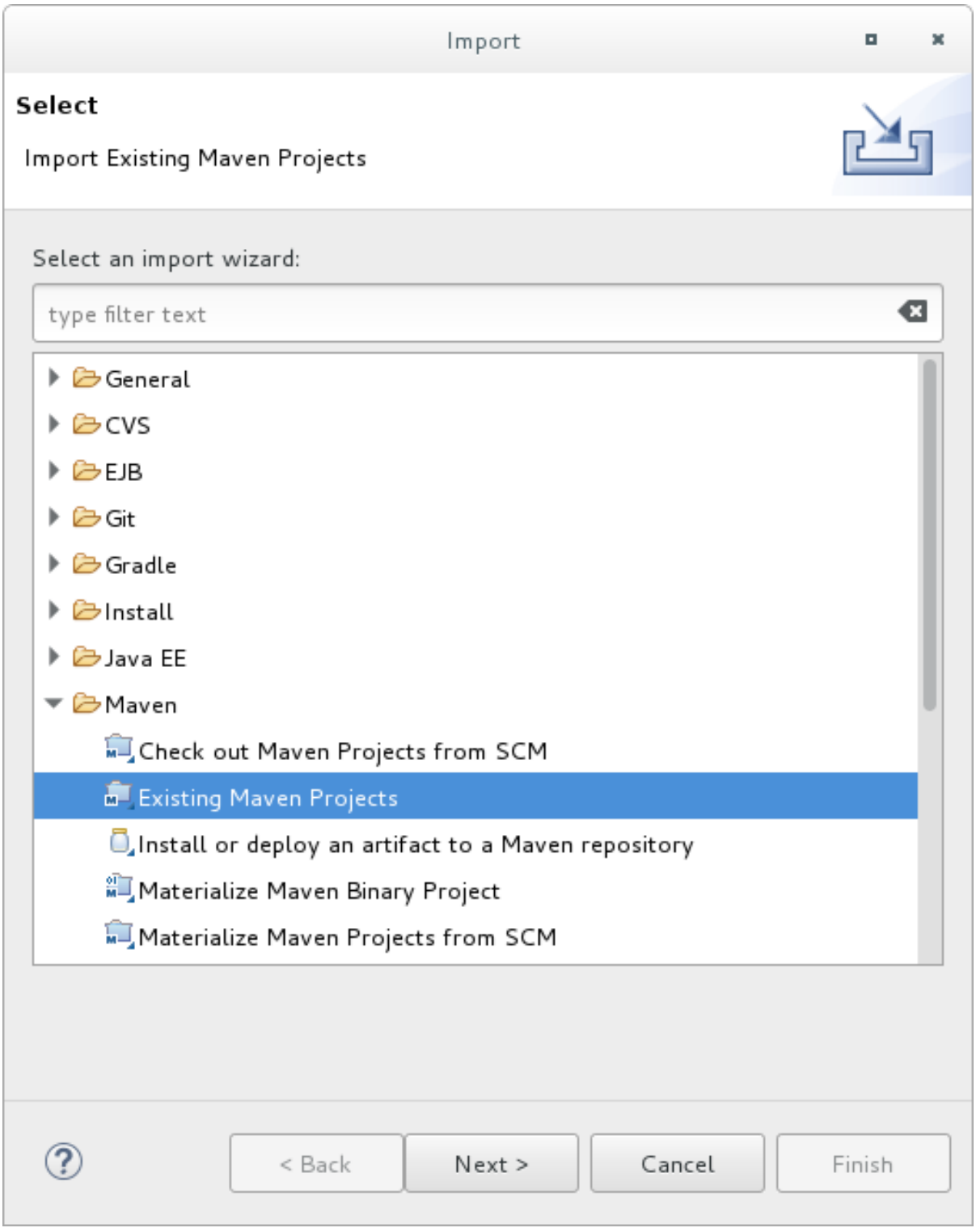
Each quickstart ships with a POM file that contains its project and configuration information. Use this POM file to easily import the quickstart into Red Hat CodeReady Studio.

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.

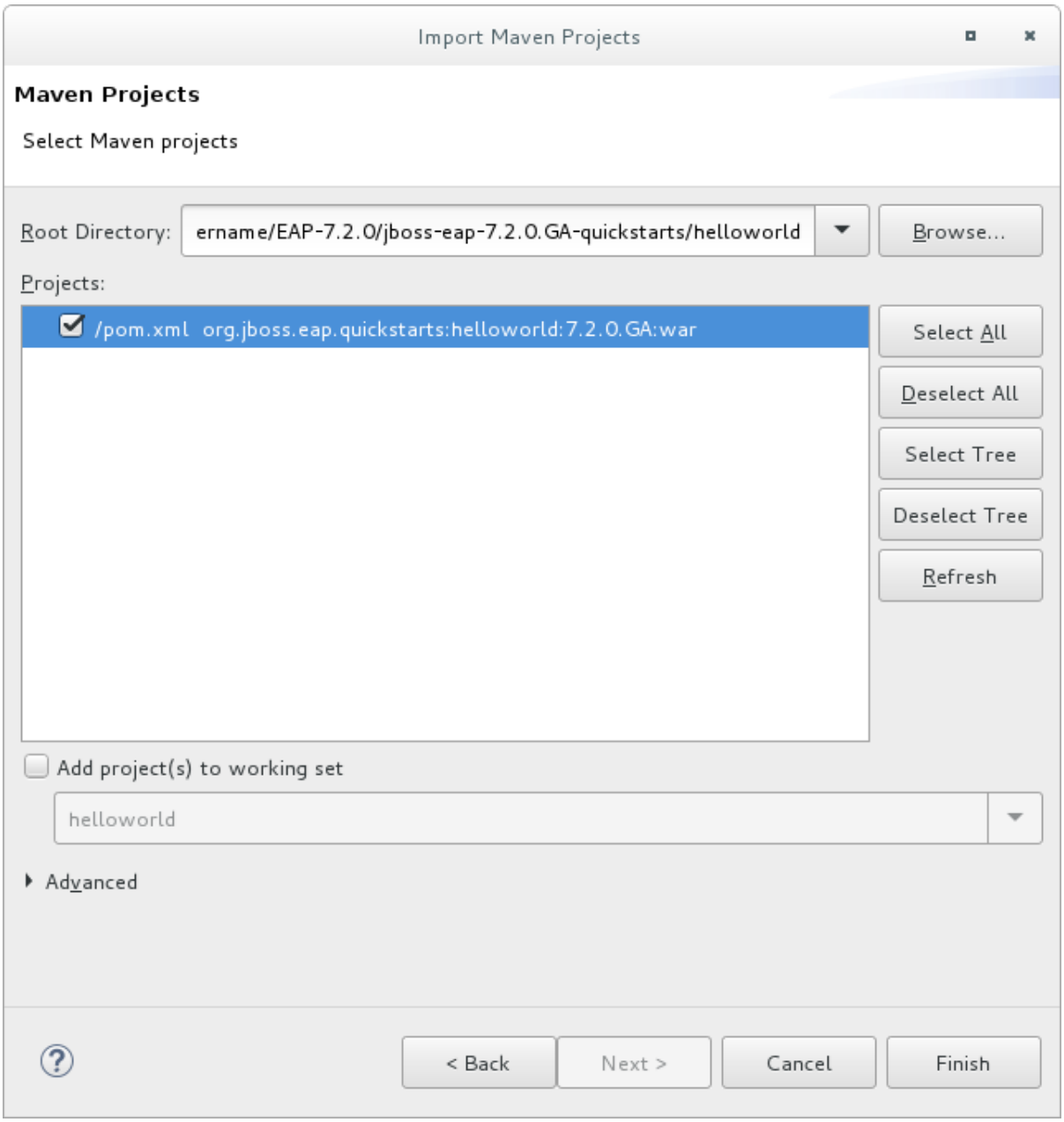
1. Start Red Hat CodeReady Studio.
2. Select **File → Import**.
3. Choose **Maven → Existing Maven Projects**, then click **Next**.

Figure 2.1. Import Existing Maven Projects



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.

Figure 2.2. Select Maven Projects



5. Click **Finish**.

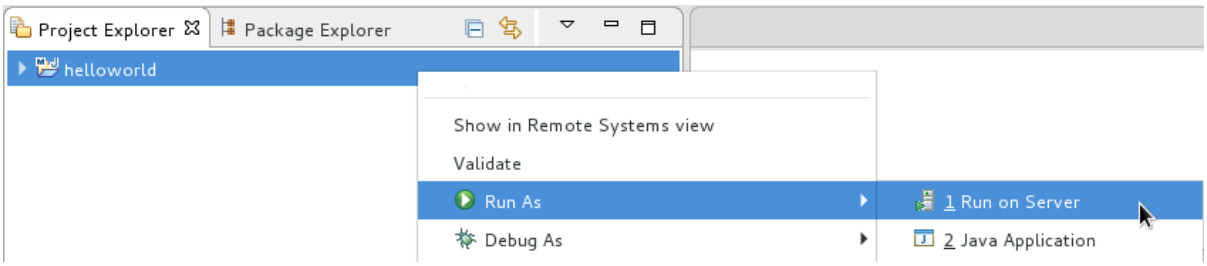
Run the *helloworld* Quickstart

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.

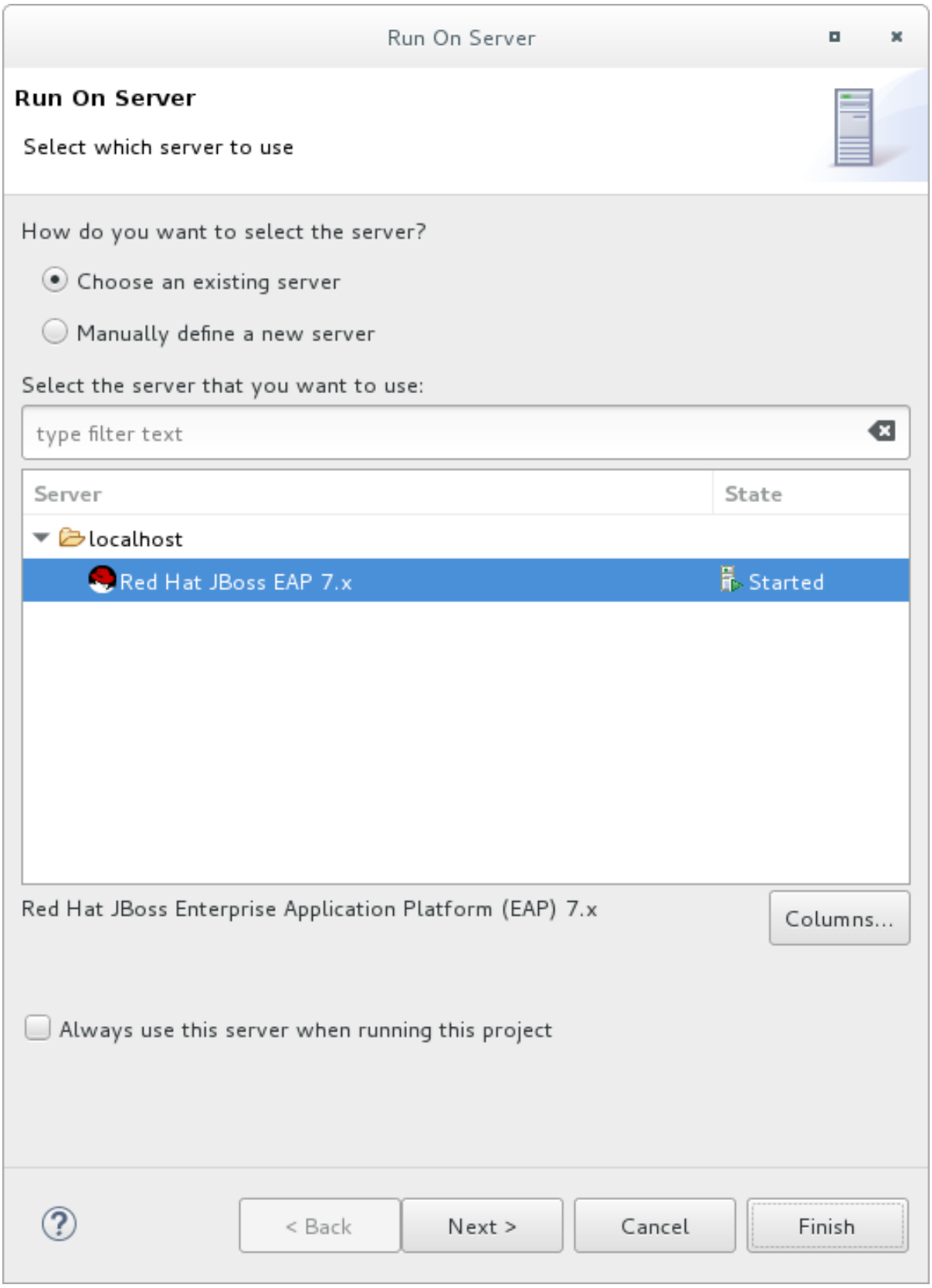
2. Right-click the **helloworld** project in the **Project Explorer** tab and select **Run As → Run on Server**.

Figure 2.3. Run As - Run on Server



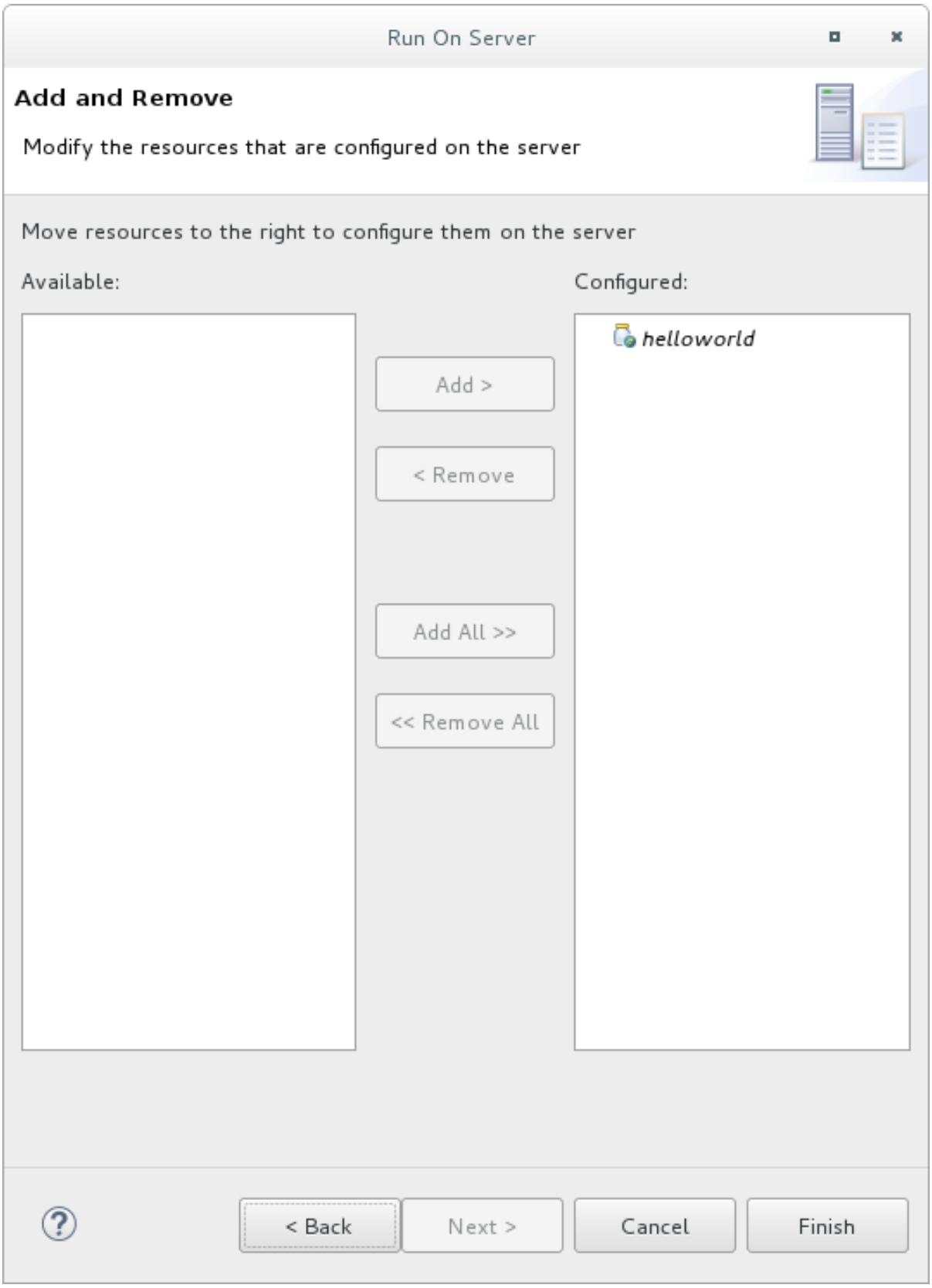
3. Select the JBoss EAP 7.2 server from the server list and click **Next**.

Figure 2.4. Run on Server



4. The **helloworld** quickstart is already listed to be configured on the server. Click **Finish** to deploy the quickstart.

Figure 2.5. Modify Resources Configured on the Server



5. Verify the results.

- In the **Server** tab, the JBoss EAP 7.2 server status changes to **Started** .
- The **Console** tab shows messages detailing the JBoss EAP server start and the **helloworld** quickstart deployment.

```
WFLYUT0021: Registered web context: /helloworld
WFLYSRV0010: Deployed "helloworld.war" (runtime-name : "helloworld.war")
```

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

For further details on the **helloworld** quickstart, see Explore the helloworld Quickstart.

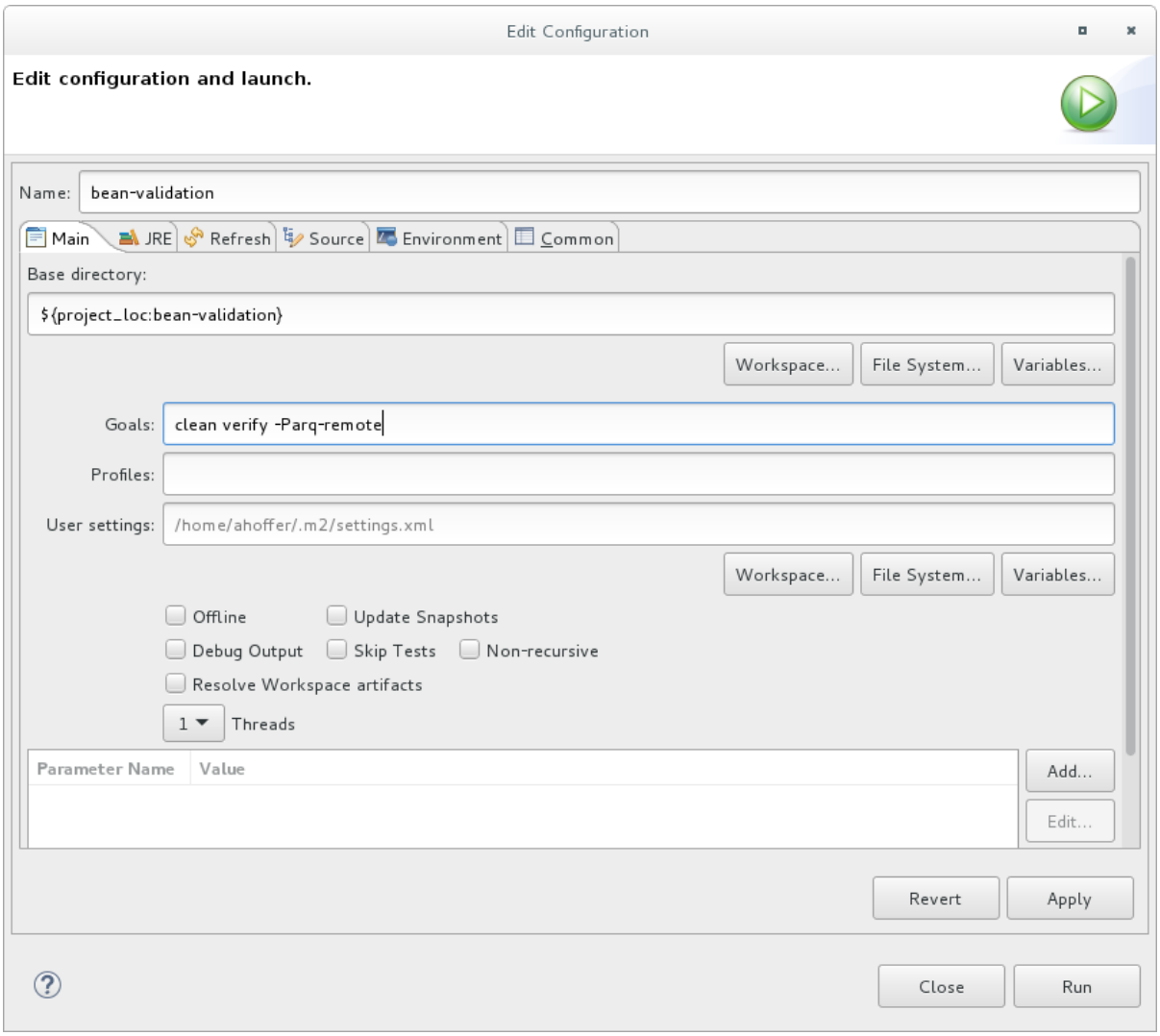
Run the *bean-validation* Quickstart

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
```

Figure 2.6. Edit Configuration



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 a Contexts and Dependency Injection (CDI) 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

- Install Red Hat CodeReady Studio. For instructions, see Installing CodeReady Studio stand-alone using the Installer in the Red Hat CodeReady Studio *Installation Guide*.
- 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 a CDI 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 CDI.

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

```
42 @SuppressWarnings("serial")
43 @WebServlet("/HelloWorld")
44 public class HelloWorldServlet extends HttpServlet {
45
46     static String PAGE_HEADER = "<html><head><title>helloworld</title></head><body>";
47
48     static String PAGE_FOOTER = "</body></html>";
49
50     @Inject
51    HelloService helloService;
52
53     @Override
54     protected void doGet(HttpServletRequest req, HttpServletResponse resp) throws
ServletException, IOException {
55         resp.setContentType("text/html");
56         PrintWriter writer = resp.getWriter();
57         writer.println(PAGE_HEADER);
58         writer.println("<h1>" + helloService.createHelloMessage("World") + "</h1>");
59         writer.println(PAGE_FOOTER);
60         writer.close();
61     }
62
63 }
```

Table 2.1. HelloWorldServlet Details

Line	Note
43	All you need to do is add the **@WebServlet** annotation and provide a mapping to a URL used to access the servlet.
46-48	Every web page needs correctly formed HTML. This quickstart uses static Strings to write the minimum header and footer output.

Line	Note
50-51	These lines inject the HelloService CDI 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.
58	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

```
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 a JSF view and business logic is encapsulated in two CDI 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 (JSF) 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

- Install Red Hat CodeReady Studio. For instructions, see Installing CodeReady Studio stand-alone using the Installer in the Red Hat CodeReady Studio *Installation Guide*.
- 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 the JSF 2.2 version of **faces-config.xml** filename. A standardized version of Facelets is the default view handler in JSF 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.

```
<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 CDI.

```
<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 JSF Code

JSF 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: JSF Source Code

```
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">
```

```
<h1>Guess a number...</h1>
<h:form id="numberGuess">

<!-- Feedback for the user on their guess -->
<div style="color: red">
<h:messages id="messages" globalOnly="false" />
<h:outputText id="Higher" value="Higher!"
   rendered="#{game.number gt game.guess and game.guess ne 0}" />
<h:outputText id="Lower" value="Lower!"
   rendered="#{game.number lt game.guess and game.guess ne 0}" />
</div>

<!-- Instructions for the user -->
<div>
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.
</div>

<!-- Input box for the users guess, plus a button to submit, and reset -->
<!-- These are bound using EL to our CDI beans -->
<div>
Your guess:
<h:inputText id="inputGuess" value="#{game.guess}"
 required="true" size="3"
 disabled="#{game.number eq game.guess}"
 validator="#{game.validateNumberRange}" />
 <h:commandButton id="guessButton" value="Guess"
  action="#{game.check}"
  disabled="#{game.number eq game.guess}" />
</div>
<div>
<h:commandButton id="restartButton" value="Reset"
action="#{game.reset}" immediate="true" />
</div>
</h:form>

</div>

<br style="clear: both" />

</body>
</html>
```

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

Table 2.2. JSF Details

Line	Note
36-40	These are the messages which can be sent to the user: "Higher!" and "Lower!"

Line	Note
45-48	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.
55-58	This input field is bound to a bean property using a value expression.
58	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.
59-61	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.

```
@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.

```
@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.

```
@SuppressWarnings("serial")
@ApplicationScoped
public class Generator implements Serializable {

   private java.util.Random random = new java.util.Random(System.currentTimeMillis());

   private int maxNumber = 100;

   java.util.Random getRandom() {
      return random;
   }

   @Produces
   @Random
   int next() {
      // a number between 1 and 100
      return getRandom().nextInt(maxNumber - 1) + 1;
   }

   @Produces
   @MaxNumber
   int getMaxNumber() {
      return maxNumber;
   }
}
```

4. 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 a JSF view by using Expression Language (EL), in this case **#{game}**.

```
@SuppressWarnings("serial")
@Named
@SessionScoped
public class Game implements Serializable {

   /**
    * The number that the user needs to guess
    */
   private int number;

   /**
    * The users latest guess
    */
   private int guess;

   /**
    * The smallest number guessed so far (so we can track the valid guess range).
    */
   private int smallest;
```

```
    /**
     * The largest number guessed so far
     */
    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 {@linkplain 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 JSF 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 MATERIAL

A.1. SERVER RUNTIME ARGUMENTS

The application server startup script accepts arguments and switches at runtime. This allows the server to start under 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.

The available parameters list can be accessed by passing the help switch **-h** or **--help** at startup.

Table A.1. Runtime Switches and Arguments

Argument or Switch	Operating Mode	Description
--admin-only	Standalone	Set the server's running type to **ADMIN_ONLY**. This will cause it to open administrative interfaces and accept management requests, but not start other runtime services or accept end user requests. Note that it is recommended to use **--start-mode=admin-only** instead.
--admin-only	Domain	Set the host controller's running type to **ADMIN_ONLY** causing it to open administrative interfaces and accept management requests but not start servers or, if this host controller is the master for the domain, accept incoming connections from slave host controllers.
-b=<value>, -b <value>	Standalone, Domain	Set system property **jboss.bind.address**, which is used in configuring the bind address for the public interface. This defaults to **127.0.0.1** if no value is specified. See the **-b<interface>=<value>** entry for setting the bind address for other interfaces.
-b<interface>=<value>	Standalone, Domain	Set system property **jboss.bind.address.<interface>** to the given value. For example,**-bmanagement=*IP_ADDRESS***
--backup	Domain	Keep a copy of the persistent domain configuration even if this host is not the domain controller.
-c=<config>, -c <config>	Standalone	Name of the server configuration file to use. The default is **standalone.xml**.
-c=<config>, -c <config>	Domain	Name of the server configuration file to use. The default is **domain.xml**.

Argument or Switch	Operating Mode	Description
--cached-dc	Domain	If the host is not the domain controller and cannot contact the domain controller at boot, boot using a locally cached copy of the domain configuration.
--debug [<port>]	Standalone	Activate debug mode with an optional argument to specify the port. Only works if the launch script supports it.
-D<name>[=<value>]	Standalone, Domain	Set a system property.
--domain-config=<config>	Domain	Name of the server configuration file to use. The default is **domain.xml**.
--git-repo	Standalone	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.
--git-branch	Standalone	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.
--git-auth	Standalone	The URL to an Elytron configuration file that contains the credentials to be used when connecting to a remote Git repository. This argument is required if your remote Git repository requires authentication. Although Git supports SSH authentication, Elytron does not; therefore, only default SSH authentication is supported using private keys without a password. This argument is not used with a **local** repository.
-h, --help	Standalone, Domain	Display the help message and exit.
--host-config=<config>	Domain	Name of the host configuration file to use. The default is **host.xml**.
--interprocess-hc-address=<address>	Domain	Address on which the host controller should listen for communication from the process controller.

Argument or Switch	Operating Mode	Description
--interprocess-hc-port=<port>	Domain	Port on which the host controller should listen for communication from the process controller.
--master-address=<address>	Domain	Set system property **jboss.domain.master.address** to the given value. In a default slave host controller configuration, this is used to configure the address of the master host controller.
--master-port=<port>	Domain	Set system property **jboss.domain.master.port** to the given value. In a default slave host controller configuration, this is used to configure the port used for native management communication by the master host controller.
--read-only-server-config=<config>	Standalone	Name of the server configuration file to use. This differs from **--server-config** and **-c** in that the original file is never overwritten.
--read-only-domain-config=<config>	Domain	Name of the domain configuration file to use. This differs from **--domain-config** and **-c** in that the initial file is never overwritten.
--read-only-host-config=<config>	Domain	Name of the host configuration file to use. This differs from **--host-config** in that the initial file is never overwritten.
-P=<url>, -P <url>, --properties=<url>	Standalone, Domain	Load system properties from the given URL.
--pc-address=<address>	Domain	Address on which the process controller listens for communication from processes it controls.
--pc-port=<port>	Domain	Port on which the process controller listens for communication from processes it controls.
-S<name>[=<value>]	Standalone	Set a security property.
-secmgr	Standalone, Domain	Runs the server with a security manager installed.
--server-config=<config>	Standalone	Name of the server configuration file to use. The default is **standalone.xml**.

Argument or Switch	Operating Mode	Description
--start-mode=<mode>	Standalone	Set the start mode of the server. This option cannot be used in conjunction with **--admin-only**. Valid values are: • **normal**: The server will start normally. • **admin-only**: The server will only open administrative interfaces and accept management requests but not start other runtime services or accept end user requests. • **suspend**: The server will start in suspended mode and will not service requests until it has been resumed.
-u=<value>, -u <value>	Standalone, Domain	Set system property **jboss.default.multicast.address**, which is used in configuring the multicast address in the socket-binding elements in the configuration files. This defaults to **230.0.0.4** if no value is specified.
-v, -V, --version	Standalone, Domain	Display the application server version and exit.

WARNING

The configuration files that ship with JBoss EAP are set up 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 it to the launch command will have no effect.

A.2. ADD-USER UTILITY ARGUMENTS

The following table describes the arguments available for the **add-user.sh** or **add-user.bat** script, which is a utility for adding new users to the properties file for out-of-the-box authentication.

Table A.2. Add-User Command Arguments

Command Line Argument	Description
-a	Create a user in the application realm. If omitted, the default is to create a user in the management realm.

Command Line Argument	Description
-dc <value>	The domain configuration directory that will contain the properties files. If it is omitted, the default directory is ***EAP_HOME*/domain/configuration/**.
-sc <value>	An alternative standalone server configuration directory that will contain the properties files. If omitted, the default directory is ***EAP_HOME*/standalone/configuration/**.
-up, --user-properties <value>	The name of the alternative user properties file. It can be an absolute path or it can be a file name used in conjunction with the **-sc** or **-dc** argument that specifies the alternative configuration directory.
-g, --group <value>	A comma-separated list of groups to assign to this user.
-gp, --group-properties <value>	The name of the alternative group properties file. It can be an absolute path or it can be a file name used in conjunction with the **-sc** or **-dc** argument that specifies the alternative configuration directory.
-p, --password <value>	The password of the user.
-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.
-ds, --display-secret	Print the secret value in non-interactive mode.

A.3. INTERFACE ATTRIBUTES

NOTE

Attribute names in this table are listed as they appear in the management model, for example, when using the management CLI. 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, as there may be differences from the management model.

Table A.3. Interface Attributes and Values

Interface Element	Description
any	Element indicating that part of the selection criteria for an interface should be that it meets at least one, but not necessarily all, of the nested set of criteria.
any-address	Empty element indicating that sockets using this interface should be bound to a wildcard address. The IPv6 wildcard address (**::**) will be used unless the **java.net.preferIPv4Stack** system property is set to true, in which case the IPv4 wildcard address (**0.0.0.0**) will be used. If a socket is bound to an IPv6 anylocal address on a dual-stack machine, it can accept both IPv6 and IPv4 traffic; if it is bound to an IPv4 (IPv4-mapped) anylocal address, it can only accept IPv4 traffic.
inet-address	Either an IP address in IPv6 or IPv4 dotted decimal notation, or a host name that can be resolved to an IP address.
link-local-address	Empty element indicating that part of the selection criteria for an interface should be whether or not an address associated with it is link-local.
loopback	Empty element indicating that part of the selection criteria for an interface should be whether or not it is a loopback interface.
loopback-address	A loopback address that may not actually be configured on the machine's loopback interface. Differs from inet-address type in that the given value will be used even if no NIC can be found that has the IP address associated with it.
multicast	Empty element indicating that part of the selection criteria for an interface should be whether or not it supports multicast.
name	The name of the interface.
nic	The name of a network interface (e.g. eth0, eth1, lo).
nic-match	A regular expression against which the names of the network interfaces available on the machine can be matched to find an acceptable interface.
not	Element indicating that part of the selection criteria for an interface should be that it does not meet any of the nested set of criteria.

Interface Element	Description
point-to-point	Empty element indicating that part of the selection criteria for an interface should be whether or not it is a point-to-point interface.
public-address	Empty element indicating that part of the selection criteria for an interface should be whether or not it has a publicly routable address.
site-local-address	Empty element indicating that part of the selection criteria for an interface should be whether or not an address associated with it is site-local.
subnet-match	A network IP address and the number of bits in the address' network prefix, written in *slash notation*, for example, **192.168.0.0/16**.
up	Empty element indicating that part of the selection criteria for an interface should be whether or not it is currently up.
virtual	Empty element indicating that part of the selection criteria for an interface should be whether or not it is a virtual interface.

A.4. SOCKET BINDING ATTRIBUTES

NOTE

Attribute names in these tables are listed as they appear in the management model, for example, when using the management CLI. 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, as there may be differences from the management model.

The following tables show the attributes that can be configured for each of the three types of socket bindings.

- socket-binding
- remote-destination-outbound-socket-binding
- local-destination-outbound-socket-binding

Table A.4. Inbound Socket Binding (socket-binding) Attributes

Attribute	Description
client-mappings	Specifies the client mappings for this socket binding. A client connecting to this socket should use the destination address specified in the mapping that matches its desired outbound interface. This allows for advanced network topologies that use either network address translation, or have bindings on multiple network interfaces to function. Each mapping should be evaluated in declared order, with the first successful match used to determine the destination.

Attribute	Description
fixed-port	Whether the port value should remain fixed even if numeric offsets are applied to the other sockets in the socket group.
interface	Name of the interface to which the socket should be bound, or, for multicast sockets, the interface on which it should listen. This should be one of the declared interfaces. If not defined, the value of the **default-interface** attribute from the enclosing socket binding group will be used.
multicast-address	Multicast address on which the socket should receive multicast traffic. If unspecified, the socket will not be configured to receive multicast.
multicast-port	Port on which the socket should receive multicast traffic. Must be configured if **multicast-address** is configured.
name	The name of the socket. Services needing to access the socket configuration information will find it using this name. This attribute is required.
port	Number of the port to which the socket should be bound. Note that this value can be overridden if servers apply a port-offset to increment or decrement all port values.

Table A.5. Remote Outbound Socket Binding (remote-destination-outbound-socket-binding) Attributes

Attribute	Description
fixed-source-port	Whether the port value should remain fixed even if numeric offsets are applied to the other outbound sockets in the socket group.
host	The host name or IP address of the remote destination to which this outbound socket will connect.
port	The port number of the remote destination to which the outbound socket should connect.
source-interface	The name of the interface that will be used for the source address of the outbound socket.
source-port	The port number that will be used as the source port of the outbound socket.

Table A.6. Local Outbound Socket Binding (local-destination-outbound-socket-binding) Attributes

Attribute	Description

Attribute	Description
fixed-source-port	Whether the port value should remain fixed even if numeric offsets are applied to the other outbound sockets in the socket group.
socket-binding-ref	The name of the local socket binding that will be used to determine the port to which this outbound socket connects.
source-interface	The name of the interface that will be used for the source address of the outbound socket.
source-port	The port number that will be used as the source port of the outbound socket.

A.5. DEFAULT SOCKET BINDINGS

The following tables show the default socket bindings for each socket binding group.

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

Table A.7. standard-sockets

Socket Binding	Port	Description
ajp	8009	Apache JServ Protocol. Used for HTTP clustering and load balancing.
http	8080	The default port for deployed web applications.
https	8443	SSL-encrypted connection between deployed web applications and clients.
management-http	9990	Used for HTTP communication with the management layer.
management-https	9993	Used for HTTPS communication with the management layer.
txn-recovery-environment	4712	The JTA transaction recovery manager.
txn-status-manager	4713	The JTA / JTS transaction manager.

Table A.8. ha-sockets

Socket Binding	Port	Multicast Port	Description
ajp	8009		Apache JServ Protocol. Used for HTTP clustering and load balancing.
http	8080		The default port for deployed web applications.
https	8443		SSL-encrypted connection between deployed web applications and clients.
jgroups-mping		45700	Multicast. Used to discover initial membership in a HA cluster.
jgroups-tcp	7600		Unicast peer discovery in HA clusters using TCP.
jgroups-udp	55200	45688	Multicast peer discovery in HA clusters using UDP.
management-http	9990		Used for HTTP communication with the management layer.
management-https	9993		Used for HTTPS communication with the management layer.
modcluster		23364	Multicast port for communication between JBoss EAP and the HTTP load balancer.
txn-recovery-environment	4712		The JTA transaction recovery manager.
txn-status-manager	4713		The JTA / JTS transaction manager.

Table A.9. full-sockets

Socket Binding	Port	Description
ajp	8009	Apache JServ Protocol. Used for HTTP clustering and load balancing.
http	8080	The default port for deployed web applications.
https	8443	SSL-encrypted connection between deployed web applications and clients.

Socket Binding	Port	Description
iiop	3528	CORBA services for JTS transactions and other ORB-dependent services.
iiop-ssl	3529	SSL-encrypted CORBA services.
management-http	9990	Used for HTTP communication with the management layer.
management-https	9993	Used for HTTPS communication with the management layer.
txn-recovery-environment	4712	The JTA transaction recovery manager.
txn-status-manager	4713	The JTA / JTS transaction manager.

Table A.10. full-ha-sockets

Name	Port	Multicast Port	Description
ajp	8009		Apache JServ Protocol. Used for HTTP clustering and load balancing.
http	8080		The default port for deployed web applications.
https	8443		SSL-encrypted connection between deployed web applications and clients.
iiop	3528		CORBA services for JTS transactions and other ORB-dependent services.
iiop-ssl	3529		SSL-encrypted CORBA services.
jgroups-mping		45700	Multicast. Used to discover initial membership in a HA cluster.
jgroups-tcp	7600		Unicast peer discovery in HA clusters using TCP.
jgroups-udp	55200	45688	Multicast peer discovery in HA clusters using UDP.
management-http	9990		Used for HTTP communication with the management layer.

Name	Port	Multicast Port	Description
management-https	9993		Used for HTTPS communication with the management layer.
modcluster		23364	Multicast port for communication between JBoss EAP and the HTTP load balancer.
txn-recovery-environment	4712		The JTA transaction recovery manager.
txn-status-manager	4713		The JTA / JTS transaction manager.

Table A.11. load-balancer-sockets

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

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