Red Hat JBoss Web Server 2

HTTP Connectors Load Balancing Guide

HTTP load balancing for JBoss Enterprise Application Platform and Red Hat JBoss Web Server 2.0.1

Edition 2

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Edition 2

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Abstract

Read this guide to install and configure JBoss Enterprise Application Platform and Red Hat JBoss Web Server HTTP connectors: mod_jk, mod_cluster, ISAPI, and NSAPI. This guide also discusses clustering and load-balancing using these connectors.

Table of Contents

PREFACE

1. FILE NAME CONVENTIONS

The following naming conventions are used in file paths for readability. Each convention is styled differently to help you identify them in context:

JBOSS_EAP_DIST

The installation root of the JBoss Enterprise Application Platform instance. This folder contains the main folders that comprise the server such as **`/jboss-as`**, **`/seam`**, and **`/resteasy`**.

JBOSS_EwP_DIST

The installation root of the JBoss Enterprise Web Platform instance. This folder contains the main folders that comprise the server such as **`/jboss-as-web`**, **`/seam`**, and **`/resteasy`**.

JBOSS_EWS_DIST

The installation root of the JBoss Enterprise Web Server instance. This folder contains the main folders that comprise the server such as **`/extras`**, **`/httpd`**, and the **`/tomcat6`** folders.

NATIVE

The installation root of the JBoss Native zip, extracted to the same directory level as *JBOSS_EAP_DIST*.

SJWS

The installation root of the Sun Java Web Server instance. The default file locations for this naming convention are:

- for Solaris 10 x86 or SPARC 64: **`/opt/SUNWwbsrv70/`**

HTTPD_DIST

The installation root of the Apache httpd Server. This folder contains the main folders that comprise the server such as **`/conf`**, **`/webapps`**, and **`/bin`**. The JBoss Enterprise Web Server *JBOSS_EWS_DIST* directory contains the root installation of *HTTPD_DIST*.

PART I. APACHE TOMCAT CONNECTOR

CHAPTER 1. OVERVIEW

Apache is a well-known web server which can be extended using plug-ins. The Apache Tomcat Connector **mod_jk** is a plug-in designed to allow request forwarding from Apache httpd Server to a Servlet container. The module also supports load-balancing HTTP calls to a set of Servlet containers while maintaining sticky sessions.

CHAPTER 2. DOWNLOAD AND INSTALL

Apache httpd is included in the JBoss Enterprise Web Server binary you download from https://access.redhat.com.

mod_jk is included in the native installation binaries for JBoss Enterprise Application Platform and JBoss Enterprise Web Server.

Follow the procedures in the JBoss Enterprise Application Platform or JBoss Enterprise Web Server *Installation Guide* to download and install the correct platform and native binaries.

For supported configurations, refer to the JBoss Enterprise Web Server Supported Configurations page.

CHAPTER 3. CONFIGURE LOAD BALANCING USING APACHE AND MOD_JK

Follow the tasks in this chapter to correctly configure load balancing using Apache and the mod_jk connector.

Procedure 3.1. Configure Apache to Load mod_jk

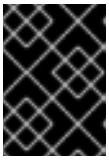
Ensure that Apache and mod_jk are installed (Refer to Chapter 2, *Download and Install*).

1. Open ***HTTPD_DIST*/conf/httpd.conf** and add a single line at the end of the file.

```
# Include mod_jk's specific configuration file
Include conf/mod-jk.conf
```

2. Create a new file named ***HTTPD_DIST*/conf/mod-jk.conf**

3. Add the following configuration to the **mod-jk.conf** file.



IMPORTANT

The **LoadModule** directive must reference the **mod_jk** library directory location applicable to the native binary you installed.

NOTE

The **JkMount** directive specifies which URLs Apache should forward to the **mod_jk** module. Based on the directive's configuration, **mod_jk** forwards the received URL onto the correct Servlet containers.

To enable Apache to serve static content (or PHP content) directly, and only use the load balancer for Java applications, the suggested configuration specifies all requests with URL path **/application/*** are sent to the **mod_jk** load-balancer.

If you only use **mod_jk** as a load balancer, forward all URLs to **mod_jk** by specifying **/*** in the directive.

```
# Load mod_jk module
# Specify the filename of the mod_jk lib
LoadModule jk_module modules/mod_jk.so

# Where to find workers.properties
JkWorkersFile conf/workers.properties

# Where to put jk logs
JkLogFile logs/mod_jk.log

# Set the jk log level [debug/error/info]
JkLogLevel info

# Select the log format
```

```
JkLogStampFormat  "[%a %b %d %H:%M:%S %Y]"

# JkOptions indicates to send SSK KEY SIZE
JkOptions +ForwardKeySize +ForwardURICompat -ForwardDirectories

# JkRequestLogFormat
JkRequestLogFormat "%w %V %T"

# Mount your applications
JkMount /application/* loadbalancer

# Add shared memory.
# This directive is present with 1.2.10 and
# later versions of mod_jk, and is needed for
# for load balancing to work properly
JkShmFile logs/jk.shm

# Add jkstatus for managing runtime data
<Location /jkstatus/>
    JkMount status
    Order deny,allow
    Deny from all
    Allow from 127.0.0.1
</Location>
```

4. **Optional: JKMountFile Directive**
   In addition to the **JkMount** directive, you can use the **JkMountFile** directive to specify a mount points configuration file. The configuration file contains multiple Tomcat forwarding URL mappings.

   a. Navigate to ***HTTPD_DIST*/conf**.

   b. Create a file named **uriworkermap.properties**.

   c. Specify the URL to forward and the worker name using the following syntax example as a guide.

      The example block will configure **mod_jk** to forward requests to **/jmx-console** and **/web-console** to Apache.

      The syntax required takes the form **/url=worker_name**.

      ```
      # Simple worker configuration file

      # Mount the Servlet context to the ajp13 worker
      /jmx-console=loadbalancer
      /jmx-console/*=loadbalancer
      /web-console=loadbalancer
      /web-console/*=loadbalancer
      ```

   d. In ***HTTPD_DIST*/conf/mod-jk.conf**, append the following directive.

      ```
      # You can use external file for mount points.
      # It will be checked for updates each 60 seconds.
      # The format of the file is: /url=worker
      ```

```
# /examples/*=loadbalancer
JkMountFile conf/uriworkermap.properties
```

3.1. CONFIGURING WORKER NODES IN MOD_JK

Complete the following task to configure two mod_jk Worker node definitions in a weighted round robin configuration with sticky sessions active between two servlet containers.

Procedure 3.2. Configure mod_jk Worker Nodes

As a prerequisite, understand the format of the **workers.properties** directives, as specified in Appendix A, *workers.properties Reference* and configure mod_jk (refer to Procedure 3.1, "Configure Apache to Load mod_jk ").

1. Navigate to ***HTTPD_DIST*/conf/**.
2. Create a file named **workers.properties**.
3. Append the following information into the **workers.properties** file.

```
# Define list of workers that will be used
# for mapping requests
worker.list=loadbalancer,status

# Define Node1
# modify the host as your host IP or DNS name.
worker.node1.port=8009
worker.node1.host=node1.mydomain.com
worker.node1.type=ajp13
worker.node1.ping_mode=A
worker.node1.lbfactor=1

# Define Node2
# modify the host as your host IP or DNS name.
worker.node2.port=8009
worker.node2.host=node2.mydomain.com
worker.node2.type=ajp13
worker.node2.ping_mode=A
worker.node2.lbfactor=1

# Load-balancing behavior
worker.loadbalancer.type=lb
worker.loadbalancer.balance_workers=node1,node2
worker.loadbalancer.sticky_session=1

# Status worker for managing load balancer
worker.status.type=status
```

3.2. CONFIGURING JBOSS ENTERPRISE APPLICATION PLATFORM TO WORK WITH MOD_JK

3.2.1. Configuring the Web Subsystem

A web subsystem configuration requires individual configuration of the following:

- The Basic Configuration
- Connector Configuration
- Virtual Server Configuration

3.2.1.1. Basic Configuration

The basic configuration steps listed are prerequisites to a web system configuration.

Procedure 3.3. Basic Configuration for a Web Subsystem

1. **Configure the Required Extension**
   Add an entry to the configuration file to add the required extension, as follows:

```
<extension module="org.jboss.as.web" />
```

2. **Configure the Subsystem**
   Configure the basic information for your subsystem. The following is a sample subsystem configuration:

```
<subsystem xmlns="urn:jboss:domain:web:1.0"
    default-virtual-server="default-host">
 <connector name="http"
            scheme="http"
                   protocol="HTTP/1.1"
            socket-binding="http"/>
 <virtual-server name="default-host"
          enable-welcome-root="true">
  <alias name="localhost" />
  <alias name="example.com" />
 </virtual-server>
</subsystem>
```

For further information about the configuration elements and attributes used in the supplied example configuration, refer to the web subsystem page.

3.2.1.2. Configuring Connectors

Connectors are a child resource for the subsystem. The following is a list of valid connectors that can be configured using the new socket binding:

- HTTP Connectors.
- HTTPS Connectors.
- AJP Connectors.
- Native Connectors.

Each connector must reference an available socket binding. As a result, the steps to create a new socket binding for each connector type is listed before the configuration information for each of the valid connector types.

For details about ***connector*** attributes, refer to the connectors page.

3.2.1.2.1. Configuring HTTP Connectors

HTTP connectors are the default connector and the simplest to configure. They operating using port **8080**.

Procedure 3.4. Configure HTTP Connectors

1. **Create a New Socket Binding**
   Use the following configuration to create a new socket binding to use when creating a HTTP connector:

```
[standalone@localhost:9999 /] /socket-binding-group=standard-
sockets/socket-binding=custom:add(port=8181)
```

2. **Configure the HTTP Connector**
   The following is an example of a HTTP connector configuration:

```
[standalone@localhost:9999 /] /subsystem=web/connector=test-
connector:add(socket-
binding=custom,scheme=http,protocol="HTTP/1.1",enabled=true)
```

3.2.1.2.2. Configuring HTTPS Connectors

HTTPS connectors, unlike HTTP connectors, use Java Secure Socket Extension (JSSE) as a default.

Procedure 3.5. Configure HTTPS Connectors

1. **Create a New Socket Binding**
   Use the following configuration to create a new socket binding to use when creating a HTTPS connector:

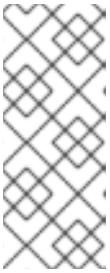
```
[standalone@localhost:9999 /] /socket-binding-group=standard-
sockets/socket-binding=https:add(port=8443)
```

2. **Use the Socket Binding to Create a New HTTPS Connector**
   Use the following configuration to create a new HTTPS connector with an unused socket binding:

```
[standalone@localhost:9999 /] /subsystem=web/connector=test-
connector:add(socket-binding=https, scheme=https,
protocol="HTTP/1.1", enabled=false, secure = true)
```

3. **Add the SSL Configuration**
   Use the following configuration to add the SSL configuration for a HTTP connector:

```
/subsystem=web/connector=test-connector/configuration=ssl:add
```



NOTE

The specified configuration uses the default SSL configuration. For JSSE, use the key stored in the location ***${user.home}/*.keystore** and the default password **changeit**. No default configuration is available for OpenSSL. As a result, the ***configuration=ssl*** element must be configured correctly for use with OpenSSL. For further information, refer to the SSL documentation.

4. **Enable the Connector**
   Use the following configuration to enable the connector:

```
/subsystem=web/connector=test-connector:write-
attribute(name=enabled, value=true)
```

5. **Activate the New Configuration**
   Use the following command to reload the server and activate the new configuration:

```
:reload
```

3.2.1.2.3. Further Information About mod_jk

For further information about mod_jk, refer to the *JBoss Enterprise Application Platform Administration and Configuration Guide*'s *Apache mod_jk* chapter.

3.2.1.2.4. Configuring AJP Connectors

The following procedure outlines the steps to creating and configuring a new AJP connector:

Procedure 3.6. Configure AJP Connectors

1. **Create a New Socket Binding**
   Use the following configuration to create a new socket binding to use when creating an AJP connector:

```
[standalone@localhost:9999 /] /socket-binding-group=standard-
sockets/socket-binding=ajp:add(port=8009)
```

2. **Use a Socket Binding to Create a New AJP Connector**
   Use the following configuration to create a new AJP connector with an unused socket binding:

```
[standalone@localhost:9999 /]
/subsystem=web/connector=ajp:add(socket-binding=ajp,
protocol="AJP/1.3", enabled=true, scheme="http")
```

3. **Configure the AJP Connector**
   The following is an example of an AJP connector configuration:

```
[standalone@localhost:9999 /] /subsystem=web:read-children-
names(child-type=connector)
{
    "outcome" => "success",
    "result" => [
```

```
            "ajp",
            "http"
        ]
}
[standalone@localhost:9999 /] /subsystem=web/connector=ajp:read-
resource(recursive=true)
{
    "outcome" => "success",
    "result" => {
        "enable-lookups" => false,
        "enabled" => true,
        "max-post-size" => 2097152,
        "max-save-post-size" => 4096,
        "protocol" => "AJP/1.3",
        "redirect-port" => 8443,
        "scheme" => "http",
        "secure" => false,
        "socket-binding" => "ajp",
        "ssl" => undefined,
        "virtual-server" => undefined
    }
}
```

3.2.1.2.5. Configuring Native Connectors

Native connectors are high performance connectors based on Apache Tomcat Native.

The following procedure outlines the steps to creating and configuring a new native connector:

Procedure 3.7. Configure Native Connectors

1. **Configure the Native Connector**
   The following is an example of a native connector configuration:

```
[standalone@localhost:9999 /] /subsystem=web/connector=https:read-
resource(recursive=true)
{
    "outcome" => "success",
    "result" => {
        "protocol" => "HTTP/1.1",
        "scheme" => "https",
        "secure" => true,
        "socket-binding" => "https",
        "ssl" => {
            "certificate-file" =>
"/home/jfclere/CERTS/SERVER/newcert.pem",
            "certificate-key-file" =>
"/home/jfclere/CERTS/SERVER/newkey.pem",
            "password" => "xxxxxxx"
        },
        "virtual-server" => undefined
    }
}
```

2. **Configure the SSL Information**

In the provided example, configure the SSL information required.

3.2.1.3. Configuring Virtual Servers

Virtual servers declarations are child resources for the web subsystem. Virtual servers can be referred to using a defined alias and can also refer to a default web application.

Adding a Virtual Server Declaration

A **`virtual-server`** can be declared using the default ***`:add()`*** operation, as follows:

```
[standalone@localhost:9999 /] /subsystem=web/virtual-
server=example.com:add
```

Removing a Virtual Server Declaration

A **`virtual-server`** can be declared using the default ***`:remove()`*** operation, as follows:

```
[standalone@localhost:9999 /] /subsystem=web/virtual-
server=example.com:remove
```

Virtual-Server Sample Configuration

The following is a sample configuration for the virtual-server element:

```
[standalone@localhost:9999 /] /subsystem=web:read-children-names(child-
type=virtual-server)
{
    "outcome" => "success",
    "result" => ["localhost"]
}

[standalone@localhost:9999 /] /subsystem=web/virtual-server=default-
host:read-resource
{
    "outcome" => "success",
    "result" => {
        "access-log" => undefined,
        "alias" => ["example.com"],
        "default-web-module" => undefined,
        "enable-welcome-root" => true,
        "rewrite" => undefined
    }
}
```

For details about the ***`virtual-server`*** configuration attributes, refer to the virtual-server page.

3.2.1.4. Querying Connectors

Connectors can be queried to reveal specific statistical information.

Querying Example

The following is an example of a query that seeks the ***`bytesSent`*** and ***`requestCount`*** attributes:

```
[standalone@localhost:9999 /] /subsystem=web/connector=http:read-
```

```
attribute(name=bytesSent, name=requestCount)
{
    "outcome" => "success",
    "result" => "3"
}
```

Change the values of ***name*** in the above configuration to one of the listed connector attributes to query connectors for specific information.

Connector Attributes

The following table is a list of the connector attributes that can be queried.

Table 3.1. Connector Attributes

Value	Description
bytesSent	The number of bytes sent by the connector.
bytesreceived	The number of bytes received by the connector (POST data).
processingTime	The processing time used by the connector in milliseconds.
errorCount	The number of errors that occur when requests sent by the connector are being processed.
maxTime	The maximum amount of time to process a request.
requestCount	The number of requests processed by the connector.

3.3. CONFIGURING APACHE TOMCAT TO WORK WITH MOD_JK

Tomcat is configured to use mod_jk by default. Specifically, refer to the **`conf/server.xml`** file, which contains the following code for this purpose:

```
<connector port="8009" protocol="AJP/1.3" redirectPort="8443" />
```

Set the ***`jvmRoute`*** attribute at your engine as follows:

```
<Engine name="Catalina" jvmRoute="node1" >
```

The ***`jvmRoute`*** attribute value must match the worker name set in **`workers.properties`**.

This default Tomcat configuration is ready for immediate use with mod_jk.

PART II. JBOSS HTTP CONNECTOR

CHAPTER 4. OVERVIEW

The JBoss HTTP Connector **mod_cluster** is a reduced configuration, intelligent load-balancing solution for JBoss Enterprise Application Platform, based on technology originally developed by the JBoss mod_cluster community project.

The JBoss HTTP connector load-balances HTTP requests to JBoss Enterprise Application Platform and JBoss Enterprise Web Server worker nodes, utilizing Apache as the proxy server. It serves as a load balancing solution for Tomcat in JBoss Enterprise Web Server as well as for JBoss Enterprise Application Platform.

4.1. KEY FEATURES

Apache HTTP Server-based

The JBoss HTTP Connector **mod_cluster** uses Apache as the proxy server.

Real-time load-balancing calculation

The JBoss HTTP Connector **mod_cluster** creates a feedback network between the worker nodes and the proxy server. The **mod_cluster** service is deployed on each of the worker nodes. This service feeds real-time load information to the proxy server. The proxy server then makes intelligent decisions on where to allocate work, based on the current load on each worker node. This real-time adaptive load distribution results in increased optimization of resources.

The information that is reported by the worker nodes and the load-balancing policy used by the proxy are both customizable.

Routing based on real-time application life cycle

The JBoss HTTP Connector **mod_cluster** service deployed on the worker nodes relays application lifecycle events to the proxy server. This allows the server to dynamically update its routing table. When an application is undeployed on a node, the proxy server no longer routes traffic for that application to that node.

Automatic Proxy Discovery

The proxy server can be configured to announce its presence via UDP multicast. New worker nodes discover the proxy server and add themselves to the load-balancing cluster automatically. This greatly reduces the configuration and maintenance needed. When UDP multicast is not available or is undesirable, worker nodes are configured with a static list of proxies.

Multiple Protocol Support

The JBoss HTTP Connector **mod_cluster** can use HTTP, HTTPS, or Apache JServ Protocol (AJP) for communication between the proxy and the worker nodes.

4.2. COMPONENTS

Proxy Server

On the proxy server, the JBoss HTTP Connector **mod_cluster** consists of four Apache modules.

Shared Memory Manager: `mod_slotmem.so`

The Shared Memory Manager module, **mod_slotmem**, makes the real-time worker node information available to multiple Apache server processes.

Cluster Manager Module: `mod_manager.so`

The Cluster Manager module, **mod_manager**, receives and acknowledges messages from nodes, including worker node registrations, worker node load data, and worker node application life cycle events.

Proxy Balancer Module: `mod_proxy_cluster.so`

The Proxy Balancer Module, **mod_proxy_cluster**, handles the routing of requests to cluster nodes. The Proxy Balancer selects the appropriate node to forward the request to, based on application location in the cluster, current state of each of the cluster nodes, and the Session ID (if a request is part of an established session).

Proxy Advertisement Module: `mod_advertise.so`

The Proxy Advertisement Module, **mod_advertise.so**, broadcasts the existence of the proxy server via UDP multicast messages. The server advertisement messages contain the IP address and port number where the proxy is listening for responses from nodes that wish to join the load-balancing cluster.

NOTE

Refer to Section 5.1, “Apache Modules” for detailed information about the available modules including user-configurable parameters.

Worker Node Components

Worker Node Service

The **`mod_cluster`** module is a part of the JBoss Enterprise Web Server 2.0 libraries and is already installed in Tomcats and httpd.

For further information about the **`mod_cluster`** subsystem, refer to the JBoss Enterprise Application Platform 6 Administration and Configuration Guide

4.3. LIMITATIONS

The JBoss HTTP Connector **`mod_cluster`** uses shared memory to keep the nodes description, the shared memory is created at the startup of **`httpd`** and the structure of each item is fixed. Therefore, when defining proxy server and worker node properties, make sure to follow these character limits:

- Maximum Alias length: 100 characters (Alias corresponds to the network name of the respective virtual host; the name is defined in the Host element)
- Maximum context length: 80 characters (for example, if **`myapp.war`** is deployed in **`/myapp`**, then **`/myapp`** is the context)
- Maximum balancer name length: 40 characters (the balancer property in mbean)
- Maximum JVMRoute string length: 80 character (JVMRoute in the <Engine> element)
- Maximum domain name length: 20 characters (the domain property in mbean)

- Maximum hostname length for a node: 64 characters (hostname address in the <Connector> element)
- Maximum port length for a node: 7 characters (8009 is 4 characters, the port property in the <Connector> element)
- Maximum scheme length for a node: 6 characters (possible values are **`http`**, **`https`**, **`ajp`**, the protocol of the connector)
- Maximum cookie name length: 30 characters (the header cookie name for session ID default value: ***`JSESSIONID`*** from ***`org.apache.catalina.Globals.SESSION_COOKIE_NAME`***)
- Maximum path name length: 30 characters (the parameter name for the session ID default value: ***`JSESSIONID`*** from ***`org.apache.catalina.Globals.SESSION_PARAMETER_NAME`***)
- Maximum length of a session ID: 128 characters (session ID resembles the following: **`BE81FAA969BF64C8EC2B6600457EAAAA.node01`**)

CHAPTER 5. PROXY SERVER COMPONENTS

Read this chapter to install the JBoss HTTP Connector **mod_cluster** on a JBoss Enterprise Web Server proxy server.

5.1. APACHE MODULES

Read this section for expanded definitions of the Apache proxy server modules discussed in Section 4.2, “Components”. .

5.1.1. mod_manager.so

The Cluster Manager module, **mod_manager**, receives and acknowledges messages from nodes, including worker node registrations, worker node load data, and worker node application life cycle events.

```
LoadModule manager_module modules/mod_manager.so
```

You can also define the following related directives in the **<VirtualHost>** element:

EnableMCPMReceive

Allows the ***VirtualHost*** to receive the mod_cluster Protocol Message (MCPM) from nodes. Add one ***EnableMCPMRecieve*** attribute to the httpd configuration to allow ***mod_cluster*** to operate correctly. ***EnableMCPMRecieve*** must be added in the ***VirtualHost*** configuration, at the location where ***advertise*** is configured.

MaxMCMPMaxMessSize

Defines the maximum size of mod_cluster Management Protocol (MCMP) messages. The default value for this is calculate from other **Max** directives. The minumum value for this is **1024**.

AllowDisplay

Toggles the additional display on the ***mod_cluster-manager*** main page. The default value is **off** which causes only the versions to display on the ***mod_cluster-manager*** main page.

AllowCmd

Toggles permissions for commands using ***mod_cluster-manager*** URL. The default value is **on**, which allows commands.

ReduceDisplay

Toggles the reduction of information displayed on the ***mod_cluster-manager*** page. Reducing the information allows more nodes to display on the page. The default value is **off** which allows all the available information to display.

MemManagerFile

Defines the location for the files in which mod_manager stores configuration details. mod_manager also uses this location for generated keys for shared memory and lock files. *This must be an absolute path name.* It is recommended that this path be on a local drive, and not a NFS share. The default value is ***$server_root*/logs/**.

Maxcontext

The maximum number of contexts JBoss mod_cluster will use. The default value is **100**.

Maxnode

The maximum number of worker nodes JBoss mod_cluster will use. The default value is **20**.

Maxhost

The maximum number of hosts (aliases) JBoss mod_cluster will use. This is also the maximum number of load balancers. The default value is **10**.

Maxsessionid

The maximum number of active session identifiers stored. A session is considered inactive when no information is received from that session within five minutes. The default value is **0**, which disables this logic.

ManagerBalancerName

The name of the load balancer to use when the worker node does not provide a load balancer name. The default value is **mycluster**.

PersistSlots

When set to **on**, nodes, aliases and contexts are persisted in files. The default value is **off**.

CheckNonce

When set to **on**, session identifiers are checked to ensure that they are unique, and have not occurred before. The default is **on**.

WARNING

Setting this directive to **off** can leave your server vulnerable to replay attacks.

SetHandler mod_cluster-manager

Defines a handler to display information about worker nodes in the cluster. This is defined in the **Location** element:

```
<Location $LOCATION>
  SetHandler mod_cluster-manager
  Order deny,allow
  Deny from all
  Allow from 127.0.0.1
</Location>
```

When accessing the *$LOCATION* defined in the **Location** element in your browser, you will see something like the following. (In this case, *$LOCATION* was also defined as **mod_cluster-handler**.)

Transferred corresponds to the POST data sent to the worker node. *Connected* corresponds to the number of requests that had been processed when this status page was requested. *Sessions* corresponds to the number of active sessions. This field is not present when **`Maxsessionid`** is **`0`**.

5.1.2. mod_proxy_cluster.so

The Proxy Balancer Module, **mod_proxy_cluster**, handles the routing of requests to cluster nodes. The Proxy Balancer selects the appropriate node to forward the request to, based on application location in the cluster, current state of each of the cluster nodes, and the Session ID (if a request is part of an established session).

```
LoadModule proxy_cluster_module modules/mod_proxy_cluster.so
```

You can also define the following related directives in the **`<VirtualHost>`** element to change load balancing behavior.

mod_proxy_cluster directives

CreateBalancers

Defines how load balancers are created in the Apache HTTP Server virtual hosts. The following values are valid in **`CreateBalancers`**:

0

Create load balancers in all virtual hosts defined in Apache HTTP Server. Remember to configure the load balancers in the **`ProxyPass`** directive.

1

Do not create balancers. When using this value, you must also define the load balancer name in the **`ProxyPass`** or **`ProxyPassMatch`**.

2

Create only the main server. This is the default value for **`CreateBalancers`**.

UseAlias

Defines whether to check that the defined **Alias** corresponds to the **ServerName**. The following values are valid for **UseAlias**:

0

Ignore Alias information from worker nodes. This is the default value for **UseAlias**.

1

Verify that the defined alias corresponds to a worker node's server name.

LBstatusRecalTime

Defines the interval in seconds between the proxy calculating the status of a worker node. The default interval is 5 seconds.

ProxyPassMatch; ProxyPass

ProxyPass maps remote servers into the local server namespace. If the local server has an address **http://local.com/**, then the following **ProxyPass** directive would convert a local request for **http://local.com/requested/file1** into a proxy request for **http://worker.local.com/file1**.

```
ProxyPass /requested/ http://worker.local.com/
```

ProxyPassMatch uses Regular Expressions to match local paths to which the proxied URL should apply.

For either directive, **!** indicates that a specified path is local, and a request for that path should not be routed to a remote server. For example, the following directive specifies that **.gif** files should be served locally.

```
ProxyPassMatch ^(/.*\.gif)$ !
```

5.1.3. mod_advertise.so

The Proxy Advertisement Module, **mod_advertise.so**, broadcasts the existence of the proxy server via UDP multicast messages. The server advertisement messages contain the IP address and port number where the proxy is listening for responses from nodes that wish to join the load-balancing cluster.

This module must be defined alongside **mod_manager** in the **VirtualHost** element. Its identifier in the following code snippet is **advertise_module**.

```
LoadModule advertise_module modules/mod_advertise.so
```

mod_advertise also takes the following directives:

ServerAdvertise

Defines how the advertising mechanism is used.

When set to **On**, the advertising mechanism is used to tell worker nodes to send status information to this proxy. You can also specify a hostname and port with the following syntax:

ServerAdvertise On http://hostname:port/. This is only required when using a name-based virtual host, or when a virtual host is not defined.

The default value is **Off**. When set to **off**, the proxy does not advertise its location. If an Advertise directive in a **VirtualHost** is used then the ServerAdvertise value is set to **On** for that **VirtualHost**.

AdvertiseGroup

Defines the multicast address to advertise on. The syntax is **AdvertiseGroup *address:port***, where *address* should correspond to **AdvertiseGroupAddress**, and *port* should correspond to **AdvertisePort** in your worker nodes.

If your worker node is JBoss Enterprise Application Platform-based, and the **-u** switch is used at startup, the default **AdvertiseGroupAddress** is the value passed via the **-u** switch.

The default value is **224.0.1.105:23364**.

AdvertiseFrequency

The interval (in seconds and milliseconds, where the latter is represented by a decimal point before the value) between multicast messages advertising the IP address and port. The default value is **10**.

AdvertiseSecurityKey

Defines a string used to identify the JBoss HTTP Connector mod_cluster in JBoss Web. By default this directive is not set and no information is sent.

AdvertiseManagerUrl

Defines the URL that the worker node should use to send information to the proxy server. By default this directive is not set and no information is sent.

AdvertiseBindAddress

Defines the address and port over which to send multicast messages. The syntax is **AdvertiseBindAddress address:port**. This allows an address to be specified on machines with multiple IP addresses. The default value is **0.0.0.0:23364**.

5.1.4. mod_proxy.so

A standard Apache HTTP Server module. This module lets the server act as proxy for data transferred over AJP (Apache JServe Protocol), FTP (File Transfer Protocol), CONNECT (for SSL, the Secure Sockets Layer), and HTTP (Hyper Text Transfer Protocol). This module does not require additional configuration. Its identifier is **proxy_module**.

Mod_proxy directives such as ***ProxyIOBufferSize*** are used to configure ***mod_cluster***.

5.1.5. mod_proxy_ajp.so

A standard Apache HTTP Server module that provides support for AJP (Apache JServe Protocol) proxying. **Mod_proxy.so** is required to use this module.

5.1.6. mod_slotmem.so

Mod_slotmem does not require any configuration directives.

5.2. PROXY SERVER COMPONENTS INSTALLATION AND DEFAULT CONFIGURATION

In JBoss Enterprise Web Server 2.0, mod_cluster is configured correctly for httpd by default. Refer to the Chapter 6, *Configure Basic Proxy Server* chapter to set a custom configuration.

CHAPTER 6. CONFIGURE BASIC PROXY SERVER

Follow the instructions in this chapter to configure a JBoss Enterprise Web Server to use the JBoss HTTP connector mod_cluster.

6.1. BASIC PROXY CONFIGURATION OVERVIEW

Configuration of the proxy server consists of one mandatory and one optional portion:

1. Configure a Proxy Server listener to receive worker node connection requests and worker node feedback.

2. Optional: Disable server advertisement.

Server Advertisement

The proxy server can advertise itself using UDP multicast. When UDP multicast is available on the network between the proxy server and the worker nodes Server Advertisement allows you to add worker nodes with no further configuration required on the proxy server, and minimal configuration on the worker nodes.

If UDP multicast is not available or undesirable, configure the worker nodes with a static list of proxy servers, as detailed in Section 8.1, “Static Proxy Configuration”. There is no need in either case to configure the proxy server with a list of worker nodes.

6.2. CONFIGURE A LOAD-BALANCING PROXY USING THE HTTP CONNECTOR

Read this section to configure a load balancing proxy that uses the JBoss HTTP Connector.

Prerequisites

The only prerequisite required for this procedure is a JBoss Enterprise Web Server 2 installation. Refer to the JBoss Enterprise Web Server *Installation Guide* for installation instructions.

Procedure 6.1. Configure a Load-balancing Proxy Using the HTTP Connector

Follow this task to configure a JBoss Enterprise Web Server Apache service to act as a load-balancing proxy using the JBoss HTTP Connector.

1. **Create a Listen Directive for the Proxy Server**
   Edit the configuration file ***JBOSS_EWS_DIST*/httpd/conf.d/mod_cluster.conf** and add the following:

   ```
   Listen IP_ADDRESS:PORT_NUMBER
   ```

   Where *IP_ADDRESS* is the IP address of a server network interface to communicate with the worker nodes, and *PORT_NUMBER* is the port on that interface to listen on.

   NOTE

   The port *PORT_NUMBER* must be open on the server firewall for incoming TCP connections.

Example 6.1. Example Listen Directive

```
Listen 10.33.144.3:6666
```

2. **Create Virtual Host**
   Add the following to the file ***JBOSS_EWS_DIST*/httpd/conf.d/mod_cluster.conf**:

```
<VirtualHost IP_ADDRESS:PORT_NUMBER>

   <Directory />
      Order deny,allow
      Deny from all
      Allow from 10.33.144.
   </Directory>

   KeepAliveTimeout 60
   MaxKeepAliveRequests 0

   ManagerBalancerName mycluster
   AdvertiseFrequency 5
   EnableMCPMReceive On

   <Location /mod_cluster-manager>
       SetHandler mod_cluster-manager
       Order deny,allow
       Deny from all
       Allow from 10.33.144.
   </Location>

</VirtualHost>
```

   Where *IP_ADDRESS* and *PORT_NUMBER* are the values from the Listen directive.

3. **Optional: Disable Server Advertisement**
   The presence of the **AdvertiseFrequency** directive, which is set to five seconds here, causes the server to periodically send server advertisement messages via UDP multicast.

   These server advertisement messages contain the *IP_ADDRESS* and *PORT_NUMBER* specified in the VirtualHost definition. Worker nodes that are configured to respond to server advertisements use this information to register themselves with the proxy server.

   To disable server advertisement, add the following directive to the **VirtualHost** definition:

```
ServerAdvertise Off
```

   If server advertisements are disabled, or UDP multicast is not available on the network between the proxy server and the worker nodes, you must configure worker nodes with a static list of proxy servers. Refer to Section 8.1, “Static Proxy Configuration” for directions.

4. **Restart the JBoss Enterprise Web Server Apache service**
   Refer to the JBoss Enterprise Web Server documentation for detailed directions.

CHAPTER 7. INSTALL NODE WITH BASIC CONFIGURATION

Read this chapter to install the JBoss HTTP Connector on a worker node, and implement basic configuration for the node to begin immediate operation.

7.1. WORKER NODE REQUIREMENTS

Supported Worker Node types

- JBoss Enterprise Platform 6 JBoss Web component
- JBoss Enterprise Platform 5 JBoss Web component
- JBoss Enterprise Web Server Tomcat service

NOTE

JBoss Enterprise Platform worker nodes support all JBoss HTTP Connector functionality. JBoss Enterprise Web Server Tomcat worker nodes support a subset of JBoss HTTP Connector functionality.

JBoss HTTP Connector Enterprise Web Server Node Limitations

- Non-clustered mode only.
- Only one load metric can be used at a time when calculating the load balance factor.

7.2. INSTALL AND CONFIGURE A WORKER NODE

This section contains a number of tasks. Follow the appropriate task to install and configure a worker node on JBoss Enterprise Application Platform, or JBoss Enterprise Web Server.

7.2.1. Configure a JBoss Enterprise Application Server 6 Worker Node

A mod_cluster worker node consists of an Enterprise Application Platform server. This server can be part of a server group in a Managed Domain, or a standalone server. A separate process runs within JBoss Enterprise Application Platform, which manages all of the nodes of the cluster. This is called the master.

The master is only configured once, via the `mod_cluster` subsystem. Each worker node is configured separately, so repeat this procedure for each node you wish to add to the cluster.

If you use a managed domain, each server in a server group is a worker node which shares an identical configuration. Therefore, configuration is done to an entire server group. In a standalone server, configuration is done to a single JBoss Enterprise Application Platform instance. The configuration steps are otherwise identical.

Worker Node Configuration

- If you use a standalone server, it must be started with the `standalone-ha` profile.
- If you use a managed domain, your server group must use the **ha** or `full-ha` profile, and the `ha-sockets` or `full-ha-sockets` socket binding group. JBoss Enterprise Application

Platform ships with a cluster-enabled server group called **other-server-group** which meets these requirements.

NOTE

Where Management CLI commands are given, they assume you use a managed domain. If you use a standalone server, remove the **/profile=full-ha** portion of the commands.

Procedure 7.1. Configure a Worker Node

1. **Configure the network interfaces.**
   By default, the network interfaces all default to **127.0.0.1**. Every physical host which hosts either a standalone server or one or more servers in a server group needs its interfaces to be configured to use its public IP address, which the other servers can see.

   To change the IP address of a JBoss Enterprise Application Platform host, you need to shut it down and edit its configuration file directly. This is because the Management API which drives the Management Console and Management CLI relies on a stable management address.

   Follow these steps to change the IP address on each server in your cluster to the master's public IP address.

   a. Shut down the server completely.

   b. Edit either the **host.xml**, which is in ***EAP_HOME*/domain/configuration/** for a managed domain, or the **standalone-ha.xml** file, which is in ***EAP_HOME*/standalone/configuration/** for a standalone server.

   c. Locate the **<interfaces>** element. Three interfaces are configured, **management**, **public**, and **unsecured**. For each of these, change the value **127.0.0.1** to the external IP address of the host.

   d. For hosts that participate in a managed domain but are not the master, locate the **<host** element. Note that it does not have the closing **>** symbol, because it contains attributes. Change the value of its name attribute from **master** to a unique name, a different one per slave. This name will also be used for the slave to identify to the cluster, so make a note of it.

   e. **Optional Step**
      For newly-configured hosts which need to join a managed domain, find the **<domain-controller>** element. Comment out or remove the **<local />** element, and add the following line, changing the IP address (**X.X.X.X**) to the address of the domain controller. This step does not apply for a standalone server.

      ```
      <remote host="X.X.X.X" port="${jboss.domain.master.port:9999}"
      security-realm="ManagementRealm"/>
      ```

   f. Save the file and exit.

2. **Configure authentication for each slave server.**
   Each slave server needs a username and password created in the domain controller's or standalone master's **ManagementRealm**. On the domain controller or standalone master, run the ***EAP_HOME*/add-user.sh** command. Add a user with the same username as the slave, to

the **ManagementRealm**. When asked if this user will need to authenticate to an external JBoss AS instance, answer **yes**. An example of the input and output of the command is below, for a slave called **slave1**, with password **changeme**.

```
user:bin user$ ./add-user.sh

What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): a

Enter the details of the new user to add.
Realm (ManagementRealm) :
Username : slave1
Password : changeme
Re-enter Password : changeme
About to add user 'slave1' for realm 'ManagementRealm'
Is this correct yes/no? yes
Added user 'slave1' to file '/home/user/jboss-eap-
6.0/standalone/configuration/mgmt-users.properties'
Added user 'slave1' to file '/home/user/jboss-eap-
6.0/domain/configuration/mgmt-users.properties'
Is this new user going to be used for one AS process to connect to
another AS process e.g. slave domain controller?
yes/no? yes
To represent the user add the following to the server-identities
definition <secret value="Y2hhbmdlbWU=" />
```

3. **Copy the <secret> element from the add-user.sh output.**
   Copy the value from the last line of the **add-user.sh** output. You need to add this value to your slave's configuration file in the next step.

4. **Modify the slave host's security realm to use the new authentication.**
   Re-open the slave host's **host.xml** or **standalone-ha.xml** file and locate the **<security-realms>** element. Add the following block of XML code directly below the **<security-realm name="ManagementRealm">** line, replacing the **<secret value="Y2hhbmdlbWU="/>** line with the one from the previous step.

   ```
   <server-identities>
       <secret value="Y2hhbmdlbWU="/>
   </server-identities>
   ```

   Save and exit the file.

5. **Restart the server.**
   The slave will now authenticate to the master using the its host name as the username and the encrypted string as its password.

Result

Your standalone server, or servers within a server group of a managed domain, are now configured as mod_cluster worker nodes. If you deploy a clustered application, its sessions are replicated to all cluster nodes for failover, and it can accept requests from an external HTTPD server or load balancer. Each node of the cluster discovers the other nodes using automatic discovery, by default.

7.2.2. Configure a Tomcat Worker Node

Follow this procedure to install the JBoss HTTP Connector on a JBoss Enterprise Web Server node and configure it for non-clustered operation.

NOTE

The supplied instructions are valid for Tomcat version 6 and 7 and do not require any changes for either of these versions.

Prerequisites

The following is a list of prerequisites for this task:

- Install a supported JBoss Enterprise Web Server.
- Understand the Proxy Configuration parameters discussed in *Appendix B: Java Properties Reference*.

Procedure 7.2. Configure a Worker Node for Tomcat

1. **Add a Listener to Tomcat**
   Add the following **`Listener`** element beneath the other Listener elements in ***`JBOSS_EWS_DIST`*`/tomcat6/conf/server.xml`**.

   ```
   <Listener
   className="org.jboss.modcluster.container.catalina.standalone.ModClu
   sterListener" advertise="true" stickySession="true"
   stickySessionForce="false" stickySessionRemove="true" />
   ```

2. **Give the Worker a Unique Identity**
   Edit ***`JBOSS_EWS_DIST`*`/tomcat6/conf/server.xml`** and add a **`jvmRoute`** attribute and value to the **`Engine`** element, as shown:

   ```
   <Engine name="Catalina" defaultHost="localhost"
   jvmRoute="worker01">
   ```

3. **Optional Step: Configure Firewall for Proxy Server Advertisements**
   A proxy server using the JBoss HTTP Connector can advertise itself via UDP multicast. To receive these multicast messages, open port 23364 for UDP connections on the worker node's firewall.

   For Linux Users

   ```
   /sbin/iptables -A INPUT -m state --state NEW -m udp -p udp --dport
    23364 -j ACCEPT
   -m comment -comment "receive mod_cluster proxy server
   advertisements"
   ```

   If you are not using Automatic Proxy Discovery, configure worker nodes with a static list of proxies. In this case you can safely ignore the following warning message:

   ```
   [warning] mod_advertise: ServerAdvertise Address or Port not
   defined, Advertise disabled!!!
   ```

CHAPTER 8. ADVANCED CONFIGURATION

Read this chapter to configure advanced features of the JBoss HTTP Connector.

8.1. STATIC PROXY CONFIGURATION

Server advertisement allows worker nodes to dynamically discover and register themselves with proxy servers. If UDP broadcast is not available or server advertisement is disabled then worker nodes must be configured with a static list of proxy server addresses and ports.

Procedure 8.1. Configure Application Platform Worker Node with Static Proxy List

Follow this task to configure a JBoss Enterprise Application Platform worker node to operate with static list of proxy servers.

The only prerequisite for this procedure is that the JBoss Enterprise Application Platform worker node is configured. Refer to Chapter 7, *Install Node with Basic Configuration* for directions.

1. **Disable Dynamic Proxy Discovery**
   Edit the **`standalone/configuration/standalone-ha.xml`** file and set the **`advertise`** property to false as follows:

   ```
   <mod-cluster-config advertise='false" connector="ajp" proxy-
   list="${jboss.modcluster.proxyList:}">
   ```

2. Choose and implement one of the following static proxy options:

   - **Option 1: Create a Static Proxy Server List**
     Edit the file **`standalone/configuration/standalone-ha.xml`** and add a comma separated list of proxies in the form of *IP_ADDRESS:PORT* in the **`proxyList`** property.

     Example 8.1. Example Static Proxy List

     ```
     <mod-cluster-config advertise="false" connector="ajp" proxy-
     list="10.33.144.3:6666,10.33.144.1:6666">
     ```

   - **Option 2: Start the Worker Node with a Static Proxy List as a Parameter**

     a. Edit **`standalone/configuration/standalone-ha.xml`**.

     b. Add the following line:

     ```
     <mod-cluster-config advertise="false" connector="ajp" proxy-
     list="${jboss.modcluster.proxyList:}">
     ```

     c. Add a comma separated list of proxies in the form of *IP_ADDRESS:PORT* as the **`jboss.modcluster.proxyList`** parameter when starting the node.

     Example 8.2. Example Static Proxy List Parameter

     ```
     -
     Djboss.modcluster.proxyList=10.33.144.3:6666,10.33.144.1:666
     6
     ```

Procedure 8.2. Configure Web Server Worker Node with Static Proxy List

Follow this procedure to configure a JBoss Enterprise Web Server worker node to operate with a static list of proxy servers.

Prerequisites for this procedure are that a JBoss Enterprise Web Server worker node is configured (refer to Chapter 7, *Install Node with Basic Configuration* for directions) and an understanding of the proxy configuration parameters discussed in Appendix B, *Java Properties Reference*.

1. **Disable dynamic proxy discovery**
   Edit the file ***JBOSS_EWS_DIST*/*tomcat6*/conf/server.xml**. and set the **advertise** property of the ModClusterListener to false:

2. **Define a mod_cluster listener**
   Add a <Listener> element to the **server.xml** file .

   ```
   <Listener
   className="org.jboss.modcluster.container.catalina.standalone.ModClu
   sterListener" advertise="false" stickySession="true"
   stickySessionForce="false" stickySessionRemove="true"/>
   ```

3. **Create a static proxy server list**
   Add a comma separated list of proxies in the form of *IP_ADDRESS:PORT* as the **proxyList** property of the ModClusterListener <Listener> element.

   Example 8.3. Example Static Proxy List

   ```
   <Listener
   className="org.jboss.modcluster.container.catalina.standalone.ModC
   lusterListener" advertise="false" stickySession="true"
   stickySessionForce="false" stickySessionRemove="true"
   proxyList="10.33.144.3:6666,10.33.144.1:6666"/>
   ```

PART III. USING JSVC WITH JBOSS ENTERPRISE WEB SERVER

CHAPTER 9. JSVC

9.1. ABOUT JSVC

Jsvc is a set of libraries and applications that facilitates running Java applications on UNIX. In the context of JBoss Enterprise Web Server 2.0, Jsvc allows Tomcat to switch identities. Using Jsvc, Tomcat can perform root user level operations and then revert to a non-privileged user.

9.2. USE JSVC WITH TOMCAT 7

9.2.1. Run Jsvc with Tomcat 7

Run the following command to run Jsvc with Tomcat 7:

```
/opt/jboss-ews-2.0/share/tomcat7/bin/daemon.sh start
```

9.2.2. Configure Jsvc with Tomcat 7

The following parameters can be set when running the **daemon.sh** script to run Jsvc:

Table 9.1. Jsvc Configuration Parameters for Tomcat 7

Parameter Name	Environment Variable	Default Value	Description
--java-home	*JAVA_HOME*	Based on the value of the ***PATH*** variable.	The Java home directory location.
--catalina-home	*CATALINA_HOME*	Determined by the location of the script.	The Tomcat installation directory location.
--catalina-base	*CATALINA_BASE*	Based on the value of the ***PATH*** variable.	The directory that contains the specific configuration and set up information if multiple servers are using the same installation.
--catalina-pid	-	$CATALINA_BASE/logs/catalina-daemon.pid	The file where the process ID (PID) for the running instance of Tomcat is stored.
--tomcat-user	-	**tomcat**	The user Tomcat uses.

9.3. USE JSVC WITH TOMCAT 6

Unlike Tomcat 7, there is no wrapper script available to use when running Jsvc with Tomcat 6. Users can write their own scripts for this purpose using the configuration parameters described in the following table:

Table 9.2. Jsvc Configuration Variables for Tomcat 6

Options	Default Value	Description
-home	**/home2/java/j2sdk*{version}***	The Java home directory location. Tomcat 6 requires JDK version **1.6** or later.
-Dcatalina.home	**/opt/jboss-ews-2.0/tomcat6**	The Tomcat installation directory.
-user	**tomcat**	The user Tomcat uses.
-Djava.io.tmpdir	**/var/tmp**	The temporary directory used by Tomcat 6.
-pidfile	**/var/run/jsvc.pid**	The file where the process ID (PID) for the running instance of Tomcat is stored.
-Dcatalina.base	**/opt/jboss-ews-2.0/tomcat6**	The directory that contains the specific configuration and set up information if multiple servers are using the same installation.
-outfile	**stdout**	The file where the **stdout** output of the embedded Java Virtual Machine is redirected.
-errfile	**stderr**	The file where the **stderr** output of the Java Virtual Machine is redirected.
-stop	-	Stops Jsvc cleanly. The PID file location set with the ***-pidfile*** parameter contains information created when Jsvc starts. This file and its information is used to stop the Jsvc instance.

Parameters that are used after specifying an option (for example, the parameters in the table that begin with **-D**) are used by the embedded Java Virtual Machine that is started by Jsvc. The following is an example of how such parameters are used:

```
-Djava.library.path=/opt/jboss-ews-2.0/tomcat6
```

Similarly, the classpath can be added using ***-cp***. The following example illustrates a sample classpath option that starts **org.apache.catalina.startup.Bootstrap**:

```
-cp $JAVA_HOME/lib/tools.jar:$CATALINA_HOME/bin/commons-
daemon.jar:$CATALINA_HOME/bin/bootstrap.jar
```

CHAPTER 10. WORKING EXAMPLES

10.1. COMPLETE WORKING EXAMPLE

The following are a set of example configuration files for a complete working example.

Load Balancer

A proxy server listening on localhost:

```
LoadModule slotmem_module modules/mod_slotmem.so
LoadModule manager_module modules/mod_manager.so
LoadModule proxy_cluster_module modules/mod_proxy_cluster.so
LoadModule advertise_module modules/mod_advertise.so

Listen 127.0.0.1:6666
<VirtualHost 127.0.0.1:6666>

    <Directory />
        Order deny,allow
        Deny from all
        Allow from 127.0.0.1
    </Directory>

    KeepAliveTimeout 60
    MaxKeepAliveRequests 0

    ManagerBalancerName mycluster
    ServerAdvertise On
    AdvertiseFrequency 5
    EnableMCPMReceive On

<Location /mod_cluster-manager>
    SetHandler mod_cluster-manager
    Order deny,allow
    Deny from all
    Allow from 127.0.0.1
</Location>

</VirtualHost>
```

Worker Configuration for Tocat

Edit the **`$CATALINA_HOME/conf/server.xml`** file and add the following listener element to configure the worker for Tomcat:

```
<Listener
className="org.jboss.modcluster.container.catalina.standalone.ModClusterListener" advertise="true"/>
```

Example iptables Firewall Rules

Following are a set of example firewall rules using **`iptables`**, for a cluster node on the 192.168.1.0/24 subnet.

```
/sbin/iptables -I INPUT 5 -p udp -d 224.0.1.0/24 -j ACCEPT -m comment --
comment "mod_cluster traffic"
/sbin/iptables -I INPUT 6 -p udp -d 224.0.0.0/4 -j ACCEPT -m comment --
comment "JBoss Cluster traffic"
/etc/init.d/iptables save
```

10.2. MOD_AUTH_KERB EXAMPLE

Use the prerequisites and subsequent procedure for a basic example about configuring and running Kerberos authentication with JBoss Enterprise Web Server's httpd and mod_auth_kerb on Red Hat Enterprise Linux.

10.2.1. mod_auth_kerb Example Prerequisites

The following is a list of prerequisites for the working example. Ensure that all prerequisites are met before attempting to use the example instructions.

- Install mod_auth_kerb on Red Hat Enterprise Linux.
- Install curl with GSS-negotiate support.
- Configure and run a LDAP/Kerberos server (for example ApacheDS) on the same host as your JBoss Enterprise Web Server.

WARNING

Using an ApacheDS as a LDAP/Kerberos server is not supported by Red Hat. This should not be implemented in a production environment and is mentioned here as a test.

- Create the following LDAP users:
  - Create the user **krbtgt**:

```
dn: uid=krbtgt,ou=Users,dc=example,dc=com
objectClass: top
objectClass: person
objectClass: inetOrgPerson
objectClass: krb5principal
objectClass: krb5kdcentry
cn: KDC Service
sn: Service
uid: krbtgt
userPassword: secret
krb5PrincipalName: krbtgt/EXAMPLE.COM@EXAMPLE.COM
krb5KeyVersionNumber: 0
```

  - Create the user **ldap**:

```
dn: uid=ldap,ou=Users,dc=example,dc=com
objectClass: top
objectClass: person
objectClass: inetOrgPerson
objectClass: krb5principal
objectClass: krb5kdcentry
cn: LDAP
sn: Service
uid: ldap
userPassword: randall
krb5PrincipalName: ldap/localhost@EXAMPLE.COM
krb5KeyVersionNumber: 0
```

- Create the user **HTTP**:

```
dn: uid=HTTP,ou=Users,dc=example,dc=com
objectClass: top
objectClass: person
objectClass: inetOrgPerson
objectClass: krb5principal
objectClass: krb5kdcentry
cn: HTTP
sn: Service
uid: HTTP
userPassword: secretpwd
krb5PrincipalName: HTTP/localhost@EXAMPLE.COM
krb5KeyVersionNumber: 0
```

- Create user **hnelson** (test user):

```
dn: uid=hnelson,ou=Users,dc=example,dc=com
objectClass: top
objectClass: person
objectClass: inetOrgPerson
objectClass: krb5principal
objectClass: krb5kdcentry
cn: Horatio Nelson
sn: Nelson
uid: hnelson
userPassword: secret
krb5PrincipalName: hnelson@EXAMPLE.COM
krb5KeyVersionNumber: 0
```

10.2.2. Configure the Kerberos Client

Use the following procedure to configure a Kerberos client for testing purposes:

Procedure 10.1. Configure the Kerberos Client

1. **Create the Kerberos Configuration File**
   Create the **krb5.conf** configuration file in the **/etc** directory and add the following to the file:

```
[logging]
```

```
  default = FILE:/var/log/krb5libs.log
  kdc = FILE:/var/log/krb5kdc.log
  admin_server = FILE:/var/log/kadmind.log

[libdefaults]
  default_realm = EXAMPLE.COM
  default_tgs_enctypes = des-cbc-md5,des3-cbc-sha1-kd
  default_tkt_enctypes = des-cbc-md5,des3-cbc-sha1-kd
  dns_lookup_realm = false
  dns_lookup_kdc = false
  allow_weak_crypto = yes
  ticket_lifetime = 24h
  renew_lifetime = 7d
  forwardable = yes

[realms]
  EXAMPLE.COM = {
    kdc = localhost:60088
    admin_server = localhost:60088
  }

[domain_realm]
  .example.com = EXAMPLE.COM
  example.com = EXAMPLE.COM
```

2. **Create a Key Tab**
   Create a key tab in the **/etc/httpd** folder with the following contents:

```
ktutil
ktutil:  addent -password -p HTTP/localhost@EXAMPLE.COM -k 0 -e des-
cbc-md5
Password for HTTP/localhost@EXAMPLE.COM: secretpwd
ktutil:  list
slot KVNO Principal
---- ---- ---------------------------------------------------------
--------------
   1    0               HTTP/localhost@EXAMPLE.COM
ktutil:  wkt krb5.keytab
ktutil:  quit

Under root user:
chgrp apache /etc/httpd/krb5.keytab
chmod 640 /etc/httpd/krb5.keytab
```

3. **Check the Hosts File**
   Ensure that the following host configuration is included in the **/etc/hosts** file:

```
127.0.0.1 localhost
```

10.2.3. Configure mod_auth_kerb

Use the following procedure to configure mod_auth_kerb. As a prerequisite, ensure that the Kerberos Client is configured.

Procedure 10.2. Configure mod_auth_kerb

- Create the **auth_kerb.conf** configuration file in the **/etc/httpd/conf.d/** folder and add the following information to the file:

```
#
# The mod_auth_kerb module implements Kerberos authentication over
# HTTP, following the "Negotiate" protocol.
#

LoadModule auth_kerb_module modules/mod_auth_kerb.so

<Location /kerberostest>
#  SSLRequireSSL
  AuthType Kerberos
  AuthName "Kerberos Login"
  KrbMethodNegotiate On
  KrbMethodK5Passwd Off
  KrbAuthRealms EXAMPLE.COM
  KrbServiceName HTTP
  Krb5KeyTab /etc/httpd/krb5.keytab
  require valid-user
</Location>
```

10.2.4. Test the Kerberos Authentication

Use the following instructions to test the Kerberos authentication. As a prerequisite for this procedure, ensure that the Kerberos Client is configured.

Procedure 10.3. Test the Kerberos Authentication

1. **Create a Test Page**
   Create a test page named **auth_kerb_page.html** in the **$JBOSS_EWS_DIST/httpd/www/html/kerberostest/**.

2. **Add the Contents of the Test Page**
   Add the following contents to the test page (**auth_kerb_page.html**):

```
<html>
  <body>
    <h1>mod_auth_kerb successfully authenticated!</h1>
</body>
</html>
```

3. **Optional: Set LogLevel**
   Optionally, set the LogLevel debug for httpd debugging in the **$JBOSS_EWS_DIST/httpd/conf/httpd.conf** file.

4. **Start httpd**
   As the root user, start the JBoss Enterprise Web Server httpd as follows:

```
# $JBOSS_EWS_DIST/httpd/sbin/apachectl start
```

5. **Test Authentication**

Test the authentication as follows:

a. Initiate Kerberos authentication for the test user **hnelson**:

```
$ kinit hnelson
```

b. View the details for the test user **hnelson**:

```
$ klist
```

A result similar to the following appears:

```
Ticket cache: FILE:/tmp/krb5cc_18602
Default principal: hnelson@EXAMPLE.COM

Valid starting     Expires            Service principal
06/03/13 14:21:13  06/04/13 14:21:13
krbtgt/EXAMPLE.COM@EXAMPLE.COM
        renew until 06/10/13 14:21:13
```

c. **Testing httpd Kerberos Authentication**
Test httpd Kerberos authentication as follows:

```
$ curl --negotiate -u :
http://localhost/kerberostest/auth_kerb_page.html
```

If working correctly, the following result appears:

```
<html>
  <body>
    <h1>mod_auth_kerb successfully authenticated!</h1>
</body>
</html>
```

Refer to http://modauthkerb.sourceforge.net/ for more information about mod_auth_kerb.

APPENDIX A. WORKERS.PROPERTIES REFERENCE

Apache httpd Server worker nodes are Servlet containers that are mapped to the **mod_jk** load balancer. The worker nodes are defined in ***HTTPD_DIST*/conf/workers.properties**. This file specifies where the different Servlet containers are located, and how calls should be load-balanced across them.

The **workers.properties** file contains two sections:

Global Properties

This section contains directives that apply to all workers.

Worker Properties

This section contains directives that apply to each individual worker.

Each node is defined using the Worker Properties naming convention. The worker name can only contain alphanumeric characters, limited to [a-z][A-Z][0-9][_-/].

The structure of a Worker Property is **worker.*worker_name*.*directive***

worker

The constant prefix for all worker properties.

worker_name

The arbitrary name given to the worker. For example: node1, node_01, Node_1.

directive

The specific directive required.

The main directives required to configure worker nodes are described below.

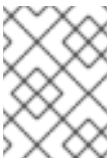
NOTE

For the full list of **worker.properties** configuration directives, refer directly to the Apache Tomcat Connector - Reference Guide

worker.properties Global Directives

worker.list

Specifies the list of worker names used by mod_jk. The workers in this list are available to map requests to.



NOTE

A single node configuration, which is not managed by a load balancer, must be set to **worker.list=*[worker name]***.

workers.properties Mandatory Directives

type

Specifies the type of worker, which determines the directives applicable to the worker. The default value is ***ajp13***, which is the preferred worker type to select for communication between the web server and Apache httpd Server.

Other values include ***ajp14***, ***lb***, ***status***.

For detailed information about ajp13, refer to The Apache Tomcat Connector - AJP Protocol Reference

workers.properties Connection Directives

host

The hostname or IP address of the worker. The worker node must support the ajp13 protocol stack. The default value is **localhost**.

You can specify the ***port*** directive as part of the host directive by appending the port number after the hostname or IP address. For example: **worker.node1.host=192.168.2.1:8009** or **worker.node1.host=node1.example.com:8009**

port

The port number of the remote server instance listening for defined protocol requests. The default value is **8009**, which is the default listen port for AJP13 workers. If you are using AJP14 workers, this value must be set to **8011**.

ping_mode

Specifies the conditions under which connections are probed for their current network health.

The probe uses an empty AJP13 packet for the CPing, and expects a CPong in return, within a specified timeout.

You specify the conditions by using a combination of the directive flags. The flags are not comma-separated. For example, a correct directive flag set is **worker.node1.ping_mode=CI**

C (connect)

Specifies the connection is probed once after connecting to the server. You specify the timeout using the ***connect_timeout*** directive, otherwise the value for ***ping_timeout*** is used.

P (prepost)

Specifies the connection is probed before sending each request to the server. You specify the timeout using the ***prepost_timeout*** directive, otherwise the value for ***ping_timeout*** is used.

I (interval)

Specifies the connection is probed during regular internal maintenance cycles. You specify the idle time between each interval using the ***connection_ping_interval*** directive, otherwise the value for ***ping_timeout*** is used.

A (all)

The most common setting, which specifies all directive flags are applied. For information about the ***_timeout** advanced directives, refer directly to Apache Tomcat Connector - Reference Guide.

ping_timeout

Specifies the time to wait for CPong answers to a CPing connection probe (refer to ***ping_mode***). The default value is 10000 (milliseconds).

worker.properties Load Balancing Directives

lbfactor

Specifies the load-balancing factor for an individual worker, and is only specified for a member worker of a load balancer.

This directive defines the relative amount of HTTP request load distributed to the worker compared to other workers in the cluster.

A common example where this directive applies is where you want to differentiate servers with greater processing power than others in the cluster. For example, if you require a worker to take three times the load than other workers, specify **`worker.`*`worker name`*`.lbfactor=3`**

balance_workers

Specifies the worker nodes that the load balancer must manage. The directive can be used multiple times for the same load balancer, and consists of a comma-separated list of worker names as specified in the workers.properties file.

sticky_session

Specifies whether requests for workers with SESSION IDs are routed back to the same worker. The default is ***0*** (false). When set to ***1*** (true), load balancer persistence is enabled.

For example, if you specify **`worker.loadbalancer.sticky_session=0`**, each request is load balanced between each node in the cluster. In other words, different requests for the same session will go to different servers based on server load.

If **`worker.loadbalancer.sticky_session=1`**, each session is persisted (locked) to one server until the session is terminated, providing that server is available.

APPENDIX B. JAVA PROPERTIES REFERENCE

Read this appendix to learn about the JBoss HTTP Connector mod_cluster configuration properties that apply to a Tomcat server node.

B.1. PROXY CONFIGURATION

The configuration values are sent to proxies under the following conditions:

- During server startup
- When a proxy is detected through the advertise mechanism
- During error recovery, when a proxy's configuration is reset.

IMPORTANT

Clustering is not supported in Tomcat for JBoss Enterprise Web Server 2.0.

Table B.1. Proxy Configuration Values for Tomcat

Value	Default	Description
stickySession	true	Specifies whether subsequent requests for a given session should be routed to the same node, if possible.
stickySessionRemove	false	Specifies whether the httpd proxy should remove session stickiness if the balancer is unable to route a request to the node to which it is stuck. This property is ignored if ***`stickySession`*** is **`false`**.
stickySessionFalse	true	Specifies whether the httpd proxy should return an error if the balancer is unable to route a request to the node to which it is stuck. This property is ignored if ***`stickySession`*** is **`false`**.

Value	Default	Description
workerTimeout	-1	Specifies the number of seconds to wait for a worker to become available to handle a request. When none of the workers of a balancer are unusable, **mod_cluster** retries after an interval (the interval value is the result of dividing the value of ***workerTimeout*** by 100) to find an usable worker. A value of **-1** indicates that the httpd will not wait for a worker to be available and will return an error if no workers are available.
maxAttempts	1	Specifies the number of times the httpd proxy will attempt to send a given request to a worker before aborting. The minimum value is **1**: try once before aborting.
flushPackets	false	Specifies whether packet flushing is enabled or disabled.
flushWait	-1	Specifies the time to wait before flushing packets. A value of **-1** means wait forever.
ping	10	Time to wait (in seconds) for a pong answer to a ping.
smax	-	Specifies the soft maximum idle connection count. The maximum value is determined by the httpd thread configuration (***ThreadsPerChild*** or **1**).
ttl	60	Specifies the time (in seconds) idle connections persist, above the ***smax*** threshold.

Value	Default	Description
nodeTimeout	-1	Specifies the time (in seconds) `mod_cluster` waits for the back-end server response before returning an error. `mod_cluster` always uses a cping/cpong before forwarding a request. The ***`connectiontimeout`*** value used by `mod_cluster` is the ping value.
balancer	mycluster	Specifies the name of the load-balancer.
loadBalancingGroup	-	Optional parameter, which specifies how load is balanced across jvmRoutes within the same load balancing group. `loadBalancingGroup` is used in conjunction with partitioned session replication (for example, buddy replication).

Table B.2. Proxy Configuration Values for JBoss Enterprise Application Platform 6

Attribute	Property	Default	Description
sticky-session	stickySession	true	Specifies whether subsequent requests for a given session should be routed to the same node, if possible.
sticky-session-remove	stickySessionRemove	false	Specifies whether the httpd proxy should remove session stickiness if the balancer is unable to route a request to the node to which it is stuck. This property is ignored if ***`stickySession`*** is `false`.

Attribute	Property	Default	Description
sticky-session-force	stickySessionForce	true	Specifies whether the httpd proxy should return an error if the balancer is unable to route a request to the node to which it is stuck. This property is ignored if ***`stickySession`*** is **`false`**.
node-timeout	workerTimeout	-1	Specifies the number of seconds to wait for a worker to become available to handle a request. When all the workers of a balancer are usable, **`mod_cluster`** will retry after a while (workerTimeout/100) to find an usable worker. A value of **`-1`** indicates that the httpd will not wait for a worker to be available and will return an error if no workers are available.
max-attempts	maxAttempts	1	Specifies the number of times the httpd proxy will attempt to send a given request to a worker before aborting. The minimum value is **`1`**: try once before aborting.
flush-packets	flushPackets	false	Specifies whether packet flushing is enabled or disabled.
flush-wait	flushWait	-1	Specifies the time to wait before flushing packets. A value of **`-1`** means wait forever.
ping	ping	10	Time to wait (in seconds) for a pong answer to a ping.

Attribute	Property	Default	Description
smax	smax	-1	Specifies the soft maximum idle connection count. The maximum value is determined by the httpd thread configuration (***`ThreadsPerChild`*** or **`1`**).
ttl	ttl	-1	Specifies the time (in seconds) idle connections persist, above the ***`smax`*** threshold.
load-balancing-group	loadBalancingGroup	-	Optional parameter, which specifies how load is balanced across jvmRoutes within the same load balancing group. ***`loadBalancingGroup`*** is used in conjunction with partitioned session replication (for example, buddy replication).

B.2. MOD_CLUSTER PROXY AND PROXY DISCOVERY CONFIGURATION ATTRIBUTES

The following tables contain attributes and information about mod_cluster proxy and proxy discovery configuration attributes.

Table B.3. mod_cluster Proxy Discovery Configuration Attributes

Attribute	Property	Default Value
proxy-list	proxyList	-
proxy-url	proxyURL	-
advertise	advertise	true
advertise-security-key	advertiseSecurityKey	-
excluded-contexts	excludedContexts	-

Attribute	Property	Default Value
auto-enable-contexts	autoEnableContexts	true
stop-context-timeout	stopContextTimeout	10 seconds (in seconds)
socket-timeout	nodeTimeout	20 seconds (in milliseconds)

Table B.4. mod_cluster Proxy Configuration Attributes

Attribute	Property	Default Value
sticky-session	stickySession	true
sticky-session-remove	stickySessionRemove	false
sticky-session-force	stickySessionForce	true
node-timeout	workerTimeout	-1
max-attempts	maxAttempts	1
flush-packets	flushPackets	false
flush-wait	flushWait	-1
ping	ping	10
smax	smax	-1 (uses the default value)
ttl	ttl	-1 (uses the default value)
domain	loadBalancingGroup	-
load-balancing-group	loadBalancingGroup	-

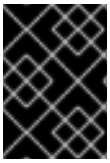
B.3. LOAD CONFIGURATION

The following table contains additional configuration properties that are used when `mod_cluster` is configured with Tomcat:

Table B.5. Load Configuration for Tomcat

Attribute	Default Value	Description

Attribute	Default Value	Description
loadMetricClass	Please see note.	This is the class name of an object that is implementing org.jboss.load.metric.LoadMetric.
loadMetricCapacity	1	This is the capacity of the load metric defined via the ***`loadMetricClass`*** property.
loadHistory	9	This is the number of historic load values that must be considered in the load balance factor computation.
loadDecayFactor	2	This is the factor by which the historic load values decrease in significance.



IMPORTANT

The default value for **`loadMetricClass`** is **`org.jboss.modcluster.load.metric.impl.BusyConnectorsLoadMetric`**.

APPENDIX C. REVISION HISTORY

Revision 3.0.1-10.1 **Wed Feb 11 2015** **Lucas Costi**
Updated the Product Name to reflect the new name grouping for the product. No update was made to details in the guide.

Revision 3.0.1-10 **Mon Jun 17 2013** **Misha Husnain Ali**
Updated Report a Bug link.

Revision 3.0.1-9 **Wed Jun 05 2013** **Misha Husnain Ali**
Fix for BZ-859267

Revision 3.0.1-8 **Wed Jun 05 2013** **Misha Husnain Ali**
Fix for BZ-888447

Revision 3.0.1-7 **Wed Jun 05 2013** **Misha Husnain Ali**
Fix for BZ-859267

Revision 3.0.1-6 **Wed Jun 05 2013** **Misha Husnain Ali**
Updates for 2.0.1.

Revision 2.0.1-13 **Friday Oct 26 2012** **Misha Husnain Ali**
Final version of this guide for 2.0.