

# **mod\_cluster Documentation**

---

---

---

<b>1. Overview</b>	1
1.1. Platforms	1
1.2. Advantages	1
1.3. Requirements	2
1.4. Limitations	2
1.5. Downloads	3
1.6. Configuration	3
1.7. Migration	3
1.8. SSL support	4
1.9. Load Balancing Demo Application	4
<b>2. Quick Start Guide</b>	5
2.1. Download mod_cluster components	5
2.2. Install the httpd binary	5
2.2.1. Install the whole httpd	5
2.2.2. Install only the modules	5
2.2.3. Install in home directory	6
2.2.4. Install in Windows	6
2.3. Configure httpd	7
2.4. Install the server-side binaries	8
2.4.1. Installing in JBoss AS 6.x	8
2.4.2. Installing in JBoss AS 5.x	8
2.4.3. Installing in Tomcat	8
2.4.4. Installing in JBoss AS 4.2.x or 4.3.x	9
2.5. Configuring the server-side	9
2.5.1. Configuring mod_cluster with JBoss AS 5.x+	9
2.5.2. Configuring mod_cluster with standalone JBoss Web or Tomcat	9
2.5.3. Integrate mod_cluster with JBoss AS 4.2.x and 4.3.x	9
2.6. Start httpd	9
2.7. Start the back-end server	10
2.7.1. Starting JBoss AS	10
2.7.2. Starting JBossWeb or Tomcat	10
2.8. Set up more back-end servers	10
2.9. Experiment with the Load Balancing Demo Application	10
<b>3. httpd configuration</b>	11
3.1. Apache httpd configuration	11
3.2. mod_proxy configuration	11
3.3. mod_slotmem configuration	11
3.4. mod_proxy_cluster	12
3.4.1. CreateBalancers	12
3.4.2. UseAlias	12
3.4.3. LBstatusRecalTime	12
3.4.4. WaitForRemove	13
3.4.5. ProxyPassMatch/ProxyPass	13
3.4.6. EnableOptions	13

3.5. mod_manager .....	13
3.5.1. EnableMCPMReceive .....	13
3.5.2. MemManagerFile .....	14
3.5.3. Maxcontext .....	14
3.5.4. Maxnode .....	14
3.5.5. Maxhost .....	14
3.5.6. Maxsessionid .....	14
3.5.7. MaxMCMPMaxMessSize .....	14
3.5.8. ManagerBalancerName .....	14
3.5.9. PersistSlots .....	15
3.5.10. CheckNonce .....	15
3.5.11. AllowDisplay .....	15
3.5.12. AllowCmd .....	15
3.5.13. ReduceDisplay .....	15
3.5.14. SetHandler mod_cluster-manager .....	15
3.6. mod_advertise .....	17
3.6.1. ServerAdvertise .....	17
3.6.2. AdvertiseGroup .....	17
3.6.3. AdvertiseFrequency .....	17
3.6.4. AdvertiseSecurityKey .....	17
3.6.5. AdvertiseManagerUrl .....	17
3.6.6. AdvertiseBindAddress .....	18
3.7. Minimal Example .....	18
<b>4. Building httpd modules .....</b>	<b>19</b>
4.1. Build a patched httpd from it sources .....	19
4.2. Build the 4 modules of mod_cluster .....	19
4.3. Build the mod_proxy module .....	20
<b>5. Installing httpd modules .....</b>	<b>21</b>
5.1. Configuration .....	21
5.2. Installing and using the bundles .....	21
<b>6. Server-side Configuration .....</b>	<b>23</b>
6.1. JBoss AS .....	23
6.1.1. Non-clustered mode .....	23
6.1.2. Configuration Properties .....	24
6.1.3. Connectors .....	24
6.1.4. Node Identity .....	25
6.2. JBoss Web & Tomcat .....	25
6.2.1. Lifecycle Listener .....	25
6.2.2. Additional Tomcat dependencies .....	26
6.3. Migrating from 1.1.x .....	26
6.3.1. mod_cluster-jboss-beans.xml .....	26
6.3.2. server.xml .....	26
6.4. Migrating from 1.0.x .....	26
6.4.1. Dependency with JBoss Web .....	26

---

6.4.2. server.xml .....	26
6.4.3. mod_cluster-jboss-beans.xml .....	27
<b>7. AS7 modcluster subsystem Configuration .....</b>	<b>29</b>
7.1. ModCluster Subsystem in JBoss AS7 .....	29
7.2. ModCluster Subsystem minimal configuration .....	29
7.3. ModCluster Subsystem configuration .....	29
7.3.1. mod-cluster-config Attributes .....	29
7.3.2. simple-load-provider Attributes .....	30
7.3.3. dynamic-load-provider Attributes .....	31
7.3.4. load-metric Configuration .....	31
7.3.5. custom-load-metric Configuration .....	32
7.3.6. load-metric Configuration with the jboss admin console .....	32
<b>8. Building Server-Side Components .....</b>	<b>35</b>
8.1. Requirements .....	35
8.2. Building .....	35
8.3. Build Artifacts .....	35
<b>9. Server-side Configuration Properties .....</b>	<b>37</b>
9.1. Proxy Discovery Configuration .....	37
9.2. Proxy Configuration .....	41
9.3. SSL Configuration .....	45
9.4. Load Configuration for JBoss Web and Tomcat .....	47
<b>10. Server-Side Load Metrics .....</b>	<b>49</b>
10.1. Web Container metrics .....	50
10.1.1. ActiveSessionsLoadMetric .....	50
10.1.2. BusyConnectorsLoadMetric .....	51
10.1.3. ReceiveTrafficLoadMetric .....	51
10.1.4. SendTrafficLoadMetric .....	52
10.1.5. RequestCountLoadMetric .....	53
10.2. System/JVM metrics .....	53
10.2.1. AverageSystemLoadMetric .....	53
10.2.2. HeapMemoryUsageLoadMetric .....	54
10.3. Other metrics .....	54
10.3.1. ConnectionPoolUsageLoadMetric .....	54
<b>11. Installing Server-Side Components .....</b>	<b>57</b>
11.1. Installing in JBoss AS 6.0.0.M1 and up .....	57
11.2. Installing in JBoss AS 5.x .....	57
11.3. Installing in Tomcat .....	57
<b>12. Using SSL in mod_cluster .....</b>	<b>59</b>
12.1. Using SSL between JBossWEB and httpd .....	59
12.1.1. Apache httpd configuration part .....	59
12.1.2. ClusterListener configuration part .....	59
12.1.3. mod-cluster-jboss-beans configuration part .....	60
12.1.4. How the diferent files were created .....	60
12.2. Using SSL between httpd and JBossWEB .....	62

12.2.1. How the diferent files were created .....	63
12.3. Forwarding SSL browser informations when using http/https between httpd and JBossWEB .....	64
<b>13. Migration from mod_jk .....</b>	<b>65</b>
<b>14. Migration from mod_proxy .....</b>	<b>67</b>
14.1. Workers .....	67
14.2. Balancers .....	68
<b>15. Load Balancing Demo Application .....</b>	<b>71</b>
15.1. Overview .....	71
15.2. Basic Usage .....	71
15.3. Client Driver Configuration Options .....	74
15.4. Load Generation Scenarios .....	75
<b>16. Change Log .....</b>	<b>79</b>
16.1. 1.3.1.Final (6 May 2015) .....	79
16.2. 1.3.0.Final (06 February 2014) .....	79
16.3. 1.2.6.Final (07 September 2013) .....	79
16.4. 1.2.5.Final (30 August 2013) .....	79
16.5. 1.2.4.Final (24 April 2013) .....	80
16.6. 1.2.3.Final (18 October 2012) .....	80
16.7. 1.2.2.Final (06 September 2012) .....	80
16.8. 1.2.1.Final (03 May 2012) .....	81
16.9. 1.2.0.Final (06 February 2012) .....	81
16.10. 1.2.0.Beta4 (26 January 2012) .....	82
16.11. 1.2.0.Beta3 (03 January 2012) .....	82
16.12. 1.2.0.Beta2 (11 December 2011) .....	82
16.13. 1.2.0.Beta1 (06 December 2011) .....	83
16.14. 1.1.3.Final (12 August 2011) .....	83
16.15. 1.1.2.Final (21 April 2011) .....	83
16.16. 1.1.1.Final (31 January 2011) .....	84
16.17. 1.1.0.Final (13 August 2010) .....	85
16.18. 1.1.0.CR3 (15 June 2010) .....	86
16.19. 1.1.0.CR2 (11 May 2010) .....	86
16.20. 1.1.0.CR1 (22 March 2010) .....	87
16.21. 1.1.0.Beta1 (30 October 2009) .....	88
<b>17. Frequently Asked questions .....</b>	<b>91</b>
17.1. What is Advertise .....	91
17.2. What to do if I don't want to use Advertise (multicast): .....	91
17.3. I am using Tomcat 7 / 6 what should I do: .....	92
17.4. It is not working what should I do: .....	92
17.4.1. No error .....	92
17.4.2. Error in server.log or catalina.out .....	94
17.4.3. Error in error_log .....	96
17.5. I have "HTTP/1.1 501 Method Not Implemented" .....	96
17.6. Redirect is not working: .....	96

---

17.7. I have more than one Connector mod_cluster does use the right one .....	97
17.8. Chrome can't display /mod_cluster_manager page .....	97
17.9. Using mod_cluster and SELinux. ....	97
17.10. System properties to modify behaviour .....	99





# Overview

`mod_cluster` is an `httpd`-based load balancer. Like `mod_jk` and `mod_proxy`, `mod_cluster` uses a communication channel to forward requests from `httpd` to one of a set of application server nodes. Unlike `mod_jk` and `mod_proxy`, `mod_cluster` leverages an additional connection between the application server nodes and `httpd`. The application server nodes use this connection to transmit server-side load balance factors and lifecycle events back to `httpd` via a custom set of HTTP methods, affectionately called the Mod-Cluster Management Protocol (MCMP). This additional feedback channel allows `mod_cluster` to offer a level of intelligence and granularity not found in other load balancing solutions.

Within `httpd`, `mod_cluster` is implemented as a set of modules for `httpd` with `mod_proxy` enabled. Much of the logic comes from `mod_proxy`, e.g. `mod_proxy_ajp` provides all the AJP logic needed by `mod_cluster`.

## 1.1. Platforms

JBoss already prepares *binary packages* [[http://www.jboss.org/mod\\_cluster/downloads.html](http://www.jboss.org/mod_cluster/downloads.html)] with `httpd` and `mod_cluster` so you can quickly try `mod_cluster` on the following platforms:

- Linux x86, x64, ia64
- Solaris x86, SPARC
- Windows x86, x64, ia64
- HP-UX PA-RISC, ia64

## 1.2. Advantages

`mod_cluster` boasts the following advantages over other `httpd`-based load balancers:

### Dynamic configuration of `httpd` workers

Traditional `httpd`-based load balancers require explicit configuration of the workers available to a proxy. In `mod_cluster`, the bulk of the proxy's configuration resides on the application servers. The set of proxies to which an application server will communicate is determined either by a static list or using dynamic discovery via the *advertise* mechanism. The application server relays lifecycle events (e.g. server startup/shutdown) to the proxies allowing them to effectively auto-configure themselves. Notably, the graceful shutdown of a server will not result in a failover response by a proxy, as is the case with traditional `httpd`-based load balancers.

### Server-side load balance factor calculation

In contrast with traditional `httpd`-based load balancers, `mod_cluster` uses load balance factors calculated and provided by the application servers, rather than computing these in the proxy.

Consequently, `mod_cluster` offers a more robust and accurate set of load metrics than is available from the proxy. See the chapter entitled [Server-Side Load Metrics](#) for details.

### Fine grained web-app lifecycle control

Traditional `httpd`-based load balancers do not handle web application undeployments particularly well. From the proxy's perspective requests to an undeployed web application are indistinguishable from a request for a non-existent resource, and will result in 404 errors. In `mod_cluster`, each server forwards any web application context lifecycle events (e.g. web-app deploy/undeploy) to the proxy informing it to start/stop routing requests for a given context to that server.

### AJP is optional

Unlike `mod_jk`, `mod_cluster` does not require AJP. `httpd` connections to application server nodes can use HTTP, HTTPS, or AJP.

The original concepts are described in a [wiki](http://www.jboss.org/community/docs/DOC-11431) [<http://www.jboss.org/community/docs/DOC-11431>].

## 1.3. Requirements

- `httpd-2.2.8+`
- JBoss AS 5.0.0+ or JBossWeb 2.1.1+



### Note

`httpd-2.2.8+` is already in the bundles, so if you use the bundle you don't need to download Apache `httpd`.

## 1.4. Limitations

`mod_cluster` uses shared memory to keep the nodes description, the shared memory is created at the start of `httpd` and the structure of each item is fixed. The following can't be changed by configuration directives.

- Max Alias length 40 characters (Host: hostname header, Alias in `<Host/>`).
- Max context length 40 (for example `myapp.war` deploys in `/myapp /myapp` is the context).
- Max balancer name length 40 (balancer property in `mbean`).
- Max `JVMRoute` string length 80 (`JVMRoute` in `<Engine/>`).
- Max load balancing group name length 20 (domain property in `mbean`).
- Max hostname length for a node 64 (address in the `<Connector/>`).
- Max port length for a node 7 (8009 is 4 characters, port in the `<Connector/>`).

- Max scheme length for a node 6 (possible values are http, https, ajp, liked with the protocol of <Connector/>).
- Max cookie name 30 (the header cookie name for sessionid default value: JSESSIONID from org.apache.catalina.Globals.SESSION\_COOKIE\_NAME).
- Max path name 30 (the parameter name for the sessionid default value: jsessionid from org.apache.catalina.Globals.SESSION\_PARAMETER\_NAME).
- Max length for a sessionid 120 (something like BE81FAA969BF64C8EC2B6600457EAAAA.node01).

## 1.5. Downloads

Download the latest mod\_cluster release [here](http://www.jboss.org/mod_cluster/downloads/latest) [http://www.jboss.org/mod\_cluster/downloads/latest].

The release is comprised of the following artifacts:

- httpd binaries for common platforms
- JBoss AS/JBossWeb/Tomcat binary distribution

Alternatively, you can build from source using the Git repository:

[https://github.com/modcluster/mod\\_cluster/tags/release/](https://github.com/modcluster/mod_cluster/tags/release/) [https://github.com/modcluster/mod\_cluster/tags]

- Building [httpd modules](#)
- Building [server-side components](#)

## 1.6. Configuration

If you want to skip the details and just set up a minimal working installation of mod\_cluster, see the [Quick Start Guide](#).

- Configuring [httpd](#)
- Configuring [JBoss AS](#)
- Configuring [JBoss Web or Tomcat](#)

## 1.7. Migration

Migrating from mod\_jk or mod\_proxy is fairly straight forward. In general, much of the configuration previously found in httpd.conf is now defined in the application server nodes.

- Migrating from [mod\\_jk](#)
- Migrating from [mod\\_proxy](#)

### 1.8. SSL support

Both the request connections between httpd and the application server nodes, and the feedback channel between the nodes and httpd can be secured. The former is achieved via the [mod\\_proxy\\_https module](#) and a corresponding ssl-enabled HTTP connector in JBoss Web. The latter requires the [mod\\_ssl module](#) and [explicit configuration in JBoss AS/Web](#).

### 1.9. Load Balancing Demo Application

The mod\_cluster binary distribution for JBoss AS/JBossWeb/Tomcat includes a [demo application](#) that helps demonstrate how different server-side scenarios affect the routing of client requests by the load balancer. The demo application is located in the mod\_cluster distribution's demo directory.



#### Strong cryptography warning

mod\_cluster contains mod\_ssl, therefore the following warning (copied from *OpenSSL* [<http://www.openssl.org/>]) applies:

PLEASE REMEMBER THAT EXPORT/IMPORT AND/OR USE OF STRONG CRYPTOGRAPHY SOFTWARE, PROVIDING CRYPTOGRAPHY HOOKS OR EVEN JUST COMMUNICATING TECHNICAL DETAILS ABOUT CRYPTOGRAPHY SOFTWARE IS ILLEGAL IN SOME PARTS OF THE WORLD. SO, WHEN YOU IMPORT THIS PACKAGE TO YOUR COUNTRY, RE-DISTRIBUTE IT FROM THERE OR EVEN JUST EMAIL TECHNICAL SUGGESTIONS OR EVEN SOURCE PATCHES TO THE AUTHOR OR OTHER PEOPLE YOU ARE STRONGLY ADVISED TO PAY CLOSE ATTENTION TO ANY EXPORT/IMPORT AND/OR USE LAWS WHICH APPLY TO YOU. THE AUTHORS OF OPENSSL ARE NOT LIABLE FOR ANY VIOLATIONS YOU MAKE HERE. SO BE CAREFUL, IT IS YOUR RESPONSIBILITY.

# Quick Start Guide

The following are the steps to set up a minimal working installation of mod\_cluster on a single httpd server and a single back end server, either JBoss AS, JBossWeb or Tomcat. The steps can be repeated to add as many httpd servers or back end servers to your cluster as is desired.

The steps shown here are not intended to demonstrate how to set up a production install of mod\_cluster; for example [using SSL to secure access](#) to the httpd-side mod\_manager component is not covered. See the [httpd-side](#) and [java-side](#) configuration documentation for the full set of configuration options.

## 2.1. Download mod\_cluster components

Download the latest [httpd and java release bundles](http://www.jboss.org/mod_cluster/downloads/latest.html) [http://www.jboss.org/mod\_cluster/downloads/latest.html]. If there is no pre-built httpd bundle appropriate for your OS or system architecture, you can [build the binary from source](#).

## 2.2. Install the httpd binary

### 2.2.1. Install the whole httpd

The httpd-side bundles are gzipped tars and include a full httpd install. As they contain already an Apache httpd install you don't need to download Apache httpd. Just extract them in root, e.g.

```
cd /  
tar xvf mod-cluster-1.0.0-linux2-x86-ssl.tar.gz
```

That will give you a full httpd install in your `/opt/jboss` directory.

### 2.2.2. Install only the modules

If you already have a working httpd install that you would prefer to use, you'll need to download the bundle named mod\_cluster httpd dynamic libraries corresponding to you plaform, extract the modules and copy them directory to your httpd install's module directory.

```
cd /tmp  
tar xvf mod_cluster-1.x.y.Final-linux2-x86-so.tar.gz
```

And then you have to copy the files below to you module directory:

- mod\_slotmem.so
- mod\_manager.so

- `mod_proxy_cluster.so`
- `mod_advertise.so`

### 2.2.3. Install in home directory

Since 1.1.0.CR2 a script `opt/jboss/httpd/sbin/installhome.sh` allows reconfiguration of the bundle installation so that it can run in user's home directory. To do that just extract the bundle in your home directory and run the script. Once that done, `httpd` will run on port 8000 and will accept MCMP messages on `localhost:6666` and offer `/mod_cluster_manager` on the same host and port.

### 2.2.4. Install in Windows

Unzip the bundle corresponding to your architecture.

Change to the `bin` directory of the subfolder `httpd-2.2` where you unzip the bundle and run the `installconf.bat` shell script.

```
cd httpd-2.2\bin
installconf.bat
```

You may run `httpd` directly by using:

```
httpd.exe
```

or install Apache `httpd` as a service:

```
httpd.exe -k install
```

and start the service via `net start` or using `httpd.exe`:

```
net start Apache2.2
```

```
httpd.exe -k start
```

Note that in the windows bundles have a flat directory structure, so you have `httpd-2.2/modules/` instead of `opt/jboss/httpd/lib/httpd/modules`.

## 2.3. Configure httpd

Since 1.1.0.CR2 httpd.conf is preconfigured with the Quick Start values. You should adapt the default values to your configuration with older mod\_cluster we will have to add the following to httpd.conf. If you extracted the download bundle to root as shown above and are using that extract as your httpd install, httpd.conf is located in `/opt/jboss/httpd/httpd/conf`.

```
LoadModule proxy_module /opt/jboss/httpd/lib/httpd/modules/mod_proxy.so
LoadModule proxy_ajp_module /opt/jboss/httpd/lib/httpd/modules/mod_proxy_ajp.so
LoadModule slotmem_module /opt/jboss/httpd/lib/httpd/modules/mod_slotmem.so
LoadModule manager_module /opt/jboss/httpd/lib/httpd/modules/mod_manager.so
LoadModule proxy_cluster_module /opt/jboss/httpd/lib/httpd/modules/mod_proxy_cluster.so
LoadModule advertise_module /opt/jboss/httpd/lib/httpd/modules/mod_advertise.so

Listen 10.33.144.3:6666
<VirtualHost 10.33.144.3:6666>

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

    KeepAliveTimeout 60
    MaxKeepAliveRequests 0

    ManagerBalancerName mycluster
    AdvertiseFrequency 5

</VirtualHost>
```

If you are using your own install of httpd, httpd.conf is found in your install's conf directory. The content to add to httpd.conf is slightly different from the above (different path to the various .so files):

```
LoadModule proxy_module modules/mod_proxy.so
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so
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 10.33.144.3:6666
<VirtualHost 10.33.144.3:6666>

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

    KeepAliveTimeout 60
    MaxKeepAliveRequests 0

    ManagerBalancerName mycluster
    AdvertiseFrequency 5

</VirtualHost>
```

## 2.4. Install the server-side binaries

First, extract the java-side binary to a temporary directory. The following assumes it was extracted to /tmp/mod-cluster

Your next step depends on whether your target server is JBoss AS or JBoss Web/Tomcat.

### 2.4.1. Installing in JBoss AS 6.x

You don't need to do anything to install the java-side binaries in AS 6.x; it's part of the AS distribution's default, standard and all configurations.

### 2.4.2. Installing in JBoss AS 5.x

Assuming \$JBOSS\_HOME indicates the root of your JBoss AS install and that you want to use mod\_cluster in the AS's all config:

```
cp -r /tmp/mod-cluster/mod-cluster.sar $JBOSS_HOME/server/all/deploy
```

### 2.4.3. Installing in Tomcat

Assuming \$CATALINA\_HOME indicates the root of your Tomcat install:

```
cp -r /tmp/mod-cluster/JBossWeb-Tomcat/lib/* $CATALINA_HOME/lib/
```



Note that you should remove in the `$CATALINA_HOME/lib/` directory the `mod_cluster-container-tomcat6*` file in Tomcat7 and the `mod_cluster-container-tomcat7*` in Tomcat 6.

## 2.4.4. Installing in JBoss AS 4.2.x or 4.3.x

Assuming `$JBOSS_HOME` indicates the root of your JBoss AS install and that you want to use `mod_cluster` in the AS's all config:

```
cp -r /tmp/mod-cluster/JBossWeb-Tomcat/lib/* $JBOSS_HOME/server/all/deploy/jboss-web.deployer/
```

## 2.5. Configuring the server-side

### 2.5.1. Configuring `mod_cluster` with JBoss AS 5.x+

No post-installation configuration necessary!

### 2.5.2. Configuring `mod_cluster` with standalone JBoss Web or Tomcat

Edit the `$CATALINA_HOME/conf/server.xml` file, adding the following next to the other `<Listener>` elements:

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

### 2.5.3. Integrate `mod_cluster` with JBoss AS 4.2.x and 4.3.x

Edit the `$JBOSS_HOME/server/all/deploy/jboss-web.deployer/server.xml` file, adding the following next to the other `<Listener>` elements:

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

## 2.6. Start httpd

To start httpd do the following:

```
/opt/jboss/httpd/sbin/apachectl start
```

## 2.7. Start the back-end server

### 2.7.1. Starting JBoss AS

```
cd $JBOSS_HOME/bin  
./run.sh -c all
```

### 2.7.2. Starting JBossWeb or Tomcat

```
cd $CATALINA_HOME  
./startup.sh
```

## 2.8. Set up more back-end servers

Repeat the back-end server install and configuration steps for each server in your cluster.

## 2.9. Experiment with the Load Balancing Demo Application

The [load balancing demo application](#) is a good way to learn about mod\_cluster's capabilities.

# httpd configuration

## 3.1. Apache httpd configuration

You need to load the modules that are needed for mod\_cluster for example:

```
LoadModule proxy_module modules/mod_proxy.so
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so
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
```

mod\_proxy and mod\_proxy\_ajp are standard httpd modules. mod\_slotmem is a shared slotmem memory provider. mod\_manager is the module that reads information from JBoss AS/JBossWeb/Tomcat and updates the shared memory information. mod\_proxy\_cluster is the module that contains the balancer for mod\_proxy. mod\_advertise is an additional module that allows httpd to advertise via multicast packets the IP and port where the mod\_cluster is listening. This multi-module architecture allows the modules to easily be changed depending on what the customer wants to do. For example when using http instead of AJP, only

```
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so
```

needs to be changed to:

```
LoadModule proxy_http_module modules/mod_proxy_http.so
```

## 3.2. mod\_proxy configuration

mod\_proxy directives like ProxyIOBufferSize could be used to configure mod\_cluster. There is no need to use ProxyPass directives because mod\_cluster automatically configures which URLs have to be forwarded to JBossWEB.

## 3.3. mod\_slotmem configuration

The actual version doesn't require any configuration directives.

## 3.4. mod\_proxy\_cluster

### 3.4.1. CreateBalancers

CreateBalancers: Define how the balancer are created in the httpd VirtualHosts, this is to allow directives like:

```
ProxyPass / balancer://mycluster1/
```

0: Create in all VirtualHosts defined in httpd.

1: Don't create balancers (requires at least one ProxyPass/ProxyPassMatch to define the balancer names).

2: Create only the main server.

Default: 2

*Note:* When using 1 don't forget to configure the balancer in the ProxyPass directive, because the default is empty stickysession and nofailover=Off and the values received via the MCMP CONFIG message are ignored.

### 3.4.2. UseAlias

UseAlias: Check that the Alias corresponds to the ServerName (See [Host Name Aliases](http://labs.jboss.com/file-access/default/members/jbossweb/freezone/docs/latest/config/host.html) [http://labs.jboss.com/file-access/default/members/jbossweb/freezone/docs/latest/config/host.html])

Off: Don't check (ignore Aliases)

On: Check aliases

Default: Off Ignore the Alias information from the nodes.

*Versions older than 1.3.1.Final only accept values 0 and 1 respectively.*

### 3.4.3. LBstatusRecalTime

LBstatusRecalTime: Time interval in seconds for loadbalancing logic to recalculate the status of a node

Default: 5 seconds

The actual formula to recalculate the status of a node is:

```
status = lbstatus + (elected - oldelected) * 1000/lbfactor;
```

lbfactor is received for the node via STATUS messages. lbstatus is recalculated every LBstatusRecalTime seconds using the formula:

$$\text{lbstatus} = (\text{elected} - \text{oldelected}) * 1000 / \text{lbfactor};$$

elected is the number of time the worker was elected. oldelected is elected last time the lbstatus was recalculated. The node with the lowest status is selected. Nodes with lbfactor # 0 are skipped by the both calculation logic.

### 3.4.4. WaitForRemove

WaitForRemove: Time in seconds before a removed node is forgotten by httpd

Default: 10 seconds

### 3.4.5. ProxyPassMatch/ProxyPass

ProxyPassMatch/ProxyPass: ProxyPassMatch and ProxyPass are mod\_proxy directives that when using ! (instead the back-end url) prevent to reverse-proxy in the path. This could be used allow httpd to serve static information like images.

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

The above for example will allow httpd to server directly the .gif files.

### 3.4.6. EnableOptions

Use OPTIONS method to periodically check the active connection. Fulfils the same role as the CPING/CPONG used by AJP but for HTTP/HTTPS connections. The endpoint needs to implement at least HTTP/1.1.

On (or no value): Use OPTIONS (default)

Off: Don't use OPTIONS

## 3.5. mod\_manger

The Context of a mod\_manger directive is VirtualHost except mentioned otherwise. `server config` means that it must be outside a VirtualHost configuration. If not an error message will be displayed and httpd won't start.

### 3.5.1. EnableMCPMReceive

EnableMCPMReceive - Allow the VirtualHost to receive MCPM. Allow the VirtualHost to receive the MCPM from the nodes. You need one EnableMCPMReceive in your httpd configuration to allow mod\_cluster to work, put it in the VirtualHost where you configure advertise.

### 3.5.2. MemManagerFile

MemManagerFile: That is the base name for the names mod\_manager will use to store configuration, generate keys for shared memory or lock files. That must be an absolute path name; the directories will be created if needed. It is highly recommended that those files are placed on a local drive and not an NFS share. (Context: server config)

Default: \$server\_root/logs/

### 3.5.3. Maxcontext

Maxcontext: That is the number max of contexts supported by mod\_cluster. (Context: server config)

Default: 100

### 3.5.4. Maxnode

Maxnode: That is the number max nodes supported by mod\_cluster. (Context: server config)

Default: 20

### 3.5.5. Maxhost

Maxhost: That is the number max host (Aliases) supported by mod\_cluster. That is also the max number of balancers. (Context: server config)

Default: 20

### 3.5.6. Maxsessionid

Maxsessionid: That is the number of active sessionid we store to give number of active sessions in the mod\_cluster-manager handler. A session is unactive when mod\_cluster doesn't receive any information from the session in 5 minutes. (Context: server config)

Default: 0 (the logic is not activated).

### 3.5.7. MaxMCMPMaxMessSize

MaxMCMPMaxMessSize: Maximum size of MCMP messages. from other Max directives.

Default: calculated from other Max directives. Min: 1024

### 3.5.8. ManagerBalancerName

ManagerBalancerName: That is the name of balancer to use when the JBoss AS/JBossWeb/Tomcat doesn't provide a balancer name.

Default: mycluster

### 3.5.9. PersistSlots

PersistSlots: Tell mod\_slotmem to persist the nodes, Alias and Context in files. (Context: server config)

Default: Off

### 3.5.10. CheckNonce

CheckNonce: Switch check of nonce when using mod\_cluster-manager handler on | off Since 1.1.0.CR1

Default: on Nonce checked

### 3.5.11. AllowDisplay

AllowDisplay: Switch additional display on mod\_cluster-manager main page on | off Since 1.1.0.GA

Default: off Only version displayed

### 3.5.12. AllowCmd

AllowCmd: Allow commands using mod\_cluster-manager URL on | off Since 1.1.0.GA

Default: on Commmands allowed

### 3.5.13. ReduceDisplay

ReduceDisplay - Reduce the information the main mod\_cluster-manager page to allow more nodes in the page. on | off

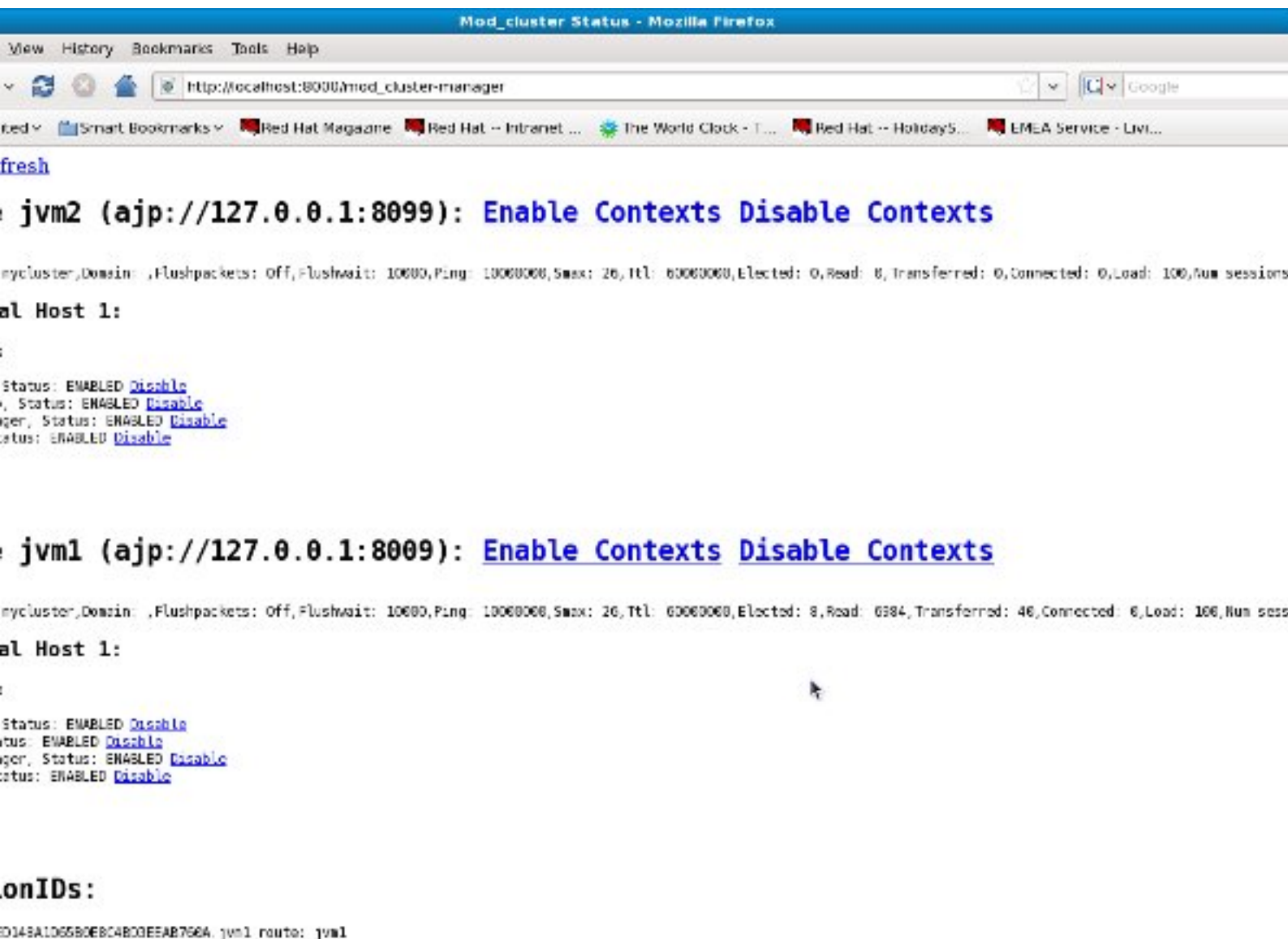
Default: off Full information displayed

### 3.5.14. SetHandler mod\_cluster-manager

SetHandler mod\_cluster-manager: That is the handler to display the node mod\_cluster sees from the cluster. It displays the information about the nodes like INFO and additionally counts the number of active sessions.

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

When accessing the location you define in httpd.conf you get something like:



Note that:

Transferred: Corresponds to the POST data send to the back-end server.

Connected: Corresponds to the number of requests been processed when the mod\_cluster status page was requested.

sessions: Corresponds to the number of sessions mod\_cluster report as active (on which there was a request during the past 5 minutes). That field is not present when Maxsessionid is zero.



## 3.6. mod\_advertise

mod\_advertise uses multicast packets to advertise the VirtualHost where it is configured that must be the same VirtualHost where mod\_manager is defined. Of course at least one mod\_advertise must be in the VirtualHost to allow mod\_cluster to find the right IP and port to give to the ClusterListener.

### 3.6.1. ServerAdvertise

**ServerAdvertise On:** Use the advertise mechanism to tell the JBoss AS/JBossWeb/Tomcat to whom it should send the cluster information.

**ServerAdvertise On http://hostname:port:** Tell the hostname and port to use. Only needed if the VirtualHost is not defined correctly, if the VirtualHost is a [Name-based Virtual Host](http://httpd.apache.org/docs/2.2/vhosts/name-based.html) [http://httpd.apache.org/docs/2.2/vhosts/name-based.html] or when VirtualHost is not used.

**ServerAdvertise Off:** Don't use the advertise mechanism.

**Default:** Off. (Any Advertise directive in a VirtualHost sets it to On in the VirtualHost)

### 3.6.2. AdvertiseGroup

**AdvertiseGroup IP:port:** That is the multicast address to use (something like 232.0.0.2:8888 for example). IP should correspond to AdvertiseGroupAddress and port to AdvertisePort in the JBoss AS/JBossWeb/Tomcat configuration. Note that if JBoss AS is used and the -u startup switch is included in the AS startup command, the default AdvertiseGroupAddress is the value passed via the -u. If port is missing the default port will be used: 23364.

**Default:** 224.0.1.105:23364.

### 3.6.3. AdvertiseFrequency

**AdvertiseFrequency seconds[.milliseconds]:** Time between the multicast messages advertising the IP and port.

**Default:** 10 Ten seconds.

### 3.6.4. AdvertiseSecurityKey

**AdvertiseSecurityKey value:** key string used to verify advertisements checksums. If configured on either side the verification is required. Both sides must use the same security key.

**Default:** No default value.

### 3.6.5. AdvertiseManagerUrl

**AdvertiseManagerUrl value:** Not used in this version (It is sent in the X-Manager-Url: value header). That is the URL that JBoss AS/JBossWeb/Tomcat should use to send information to mod\_cluster

Default: No default value. Information not sent.

### 3.6.6. AdvertiseBindAddress

AdvertiseBindAddress IP:port: That is the address and port httpd is bind to send the multicast messages. This allow to specify an address on multi IP address boxes.

Default: 0.0.0.0:23364

## 3.7. Minimal Example

```
LoadModule proxy_module modules/mod_proxy.so
LoadModule proxy_ajp_module modules/mod_proxy_ajp.so
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 10.33.144.3:6666
<VirtualHost 10.33.144.3:6666>

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

    KeepAliveTimeout 60
    MaxKeepAliveRequests 0

    ManagerBalancerName mycluster
    ServerAdvertise On
    EnableMCPMReceive

</VirtualHost>
```

# Building httpd modules

## 4.1. Build a patched httpd from its sources

To build httpd-2.2.x from its sources see [ASF httpd doc](http://httpd.apache.org/docs/2.2/install.html) [http://httpd.apache.org/docs/2.2/install.html]

If needed, patch the httpd-2.2.x sources with (The patch prevents long waiting time when the node IP can't be resolved that should not happen so you can skip the patch part if you don't want to rebuild httpd). [mod\\_proxy\\_ajp.patch](https://github.com/modcluster/mod_cluster/blob/master/native/mod_proxy_cluster/mod_proxy_ajp.patch) [https://github.com/modcluster/mod\_cluster/blob/master/native/mod\_proxy\_cluster/mod\_proxy\_ajp.patch]

```
(cd modules/proxy
 patch -p0 < $location/mod_proxy_ajp.patch
)
```

Configure httpd with something like:

```
./configure --prefix=apache_installation_directory \
  --with-mpm=worker \
  --enable-mods-shared=most \
  --enable-maintainer-mode \
  --with-expat=builtin \
  --enable-ssl \
  --enable-proxy \
  --enable-proxy-http \
  --enable-proxy-ajp \
  --disable-proxy-balancer
```

Rebuild (make) and reinstall (make install) after that.

## 4.2. Build the 4 modules of mod\_cluster

You need an httpd installation with mod\_proxy (--enable-proxy) and ajp protocol (--enable-proxy-ajp) enabled and with dso enabled (--enable-so)

Download the mod\_cluster sources:

```
git clone git://github.com/modcluster/mod_cluster.git
```

Build the mod\_cluster modules components, for each subdirectory advertise, mod\_manager, mod\_proxy\_cluster and mod\_slotmem do something like:

```
sh buildconf
./configure --with-apxs=apxs_file_location
make
cp *.so apache_installation_directory/modules
```

Where apache\_installation\_directory is the location of an installed version of httpd-2-2.x.

NOTE: You can ignore the libtool message on most platform:

```
libtool: install: warning: remember to run `libtool --finish apache_installation_directory/modules'
```

Once that is done use [Apache httpd configuration](#) to configure mod\_cluster.

### 4.3. Build the mod\_proxy module

It is only needed for httpd-2.2.x where  $x < 11$ . Process like the other mod\_cluster modules.

# Installing httpd modules

Several bundles are available at [http://www.jboss.org/mod\\_cluster/downloads.html](http://www.jboss.org/mod_cluster/downloads.html).

In case you can't find a prepared package of mod\_cluster in the download area, it is possible to build mod\_cluster for the sources. You need a distribution of httpd (at least 2.2.8) or (better) a source tarball of httpd and the sources of mod\_cluster. [Building](#) explains how to build mod\_cluster for its sources.

## 5.1. Configuration

A minimal configuration is needed in httpd (See [httpd.conf](#)). A listener must be added in in JBossWEB conf/server.xml (See [Configuring JBoss AS/Web](#)).

## 5.2. Installing and using the bundles

The bundles are tar.gz on POSIX platforms just extract them in root something like:

```
cd /  
tar xvf mod-cluster-1.x.y-linux2-x86-ssl.tar.gz
```

The httpd.conf is located in /opt/jboss/httpd/httpd/conf to quick test just add something like:

```
Listen 10.33.144.3:6666  
<VirtualHost 10.33.144.3:6666>  
  
    <Directory />  
        Order deny,allow  
        Deny from all  
        Allow from 10.33.144.  
    </Directory>  
  
    KeepAliveTimeout 60  
    MaxKeepAliveRequests 0  
  
    ManagerBalancerName mycluster  
    AdvertiseFrequency 5  
  
</VirtualHost>
```

To start httpd do the following:

```
/opt/jboss/httpd/sbin/apachectl start
```

NOTE: Make sure to use SSL before going in production.

# Server-side Configuration

## 6.1. JBoss AS

mod\_cluster is supported in AS7 via the modcluster subsystem See [AS7](#).

In other AS version mod\_cluster's configuration resides within the following file:

`$JBOSS_HOME/server/$PROFILE/deploy/mod_cluster.sar/META-INF/mod_cluster-jboss-beans.xml` file.

The entry point for mod\_cluster's server-side configuration is the `ModClusterListener` bean, which delegates web container (i.e. JBoss Web) specific events to a container agnostic event handler.

In general, the `ModClusterListener` bean defines:

1. A `ContainerEventHandler` in which to handle events from the web container.
2. A reference to the JBoss mbean server.

e.g.

```
<bean name="ModClusterListener"
class="org.jboss.modcluster.container.jbossweb.JBossWebEventHandlerAdapter">
  <constructor>
    <parameter class="org.jboss.modcluster.container.ContainerEventHandler">
      <inject bean="ModClusterService"/>
    </parameter>
    <parameter class="javax.management.MBeanServer">
      <inject bean="JMXKernel" property="mbeanServer"/>
    </parameter>
  </constructor>
</bean>
```

### 6.1.1. Non-clustered mode

In non-clustered mode, each JBoss AS node communicates with the load balancer directly, and do not communicate with each other. Non-clustered mode is configured via the `ModClusterService` bean.

In general, the `ModClusterService` bean defines:

1. An object containing mod\_cluster's *configuration properties*.

2. An object responsible for calculating the load balance factor for this node. This is described in detail in the chapter entitled [Server-Side Load Metrics](#).

e.g.

```
<bean name="ModClusterService" class="org.jboss.modcluster.ModClusterService" mode="On
Demand">

annotation>
<constructor>
  <parameter class="org.jboss.modcluster.config.ModClusterConfig">
    <inject bean="ModClusterConfig"/>
  </parameter>
  <parameter class="org.jboss.modcluster.load.LoadBalanceFactorProvider">
    <inject bean="DynamicLoadBalanceFactorProvider"/>
  </parameter>
</constructor>
</bean>
```

### 6.1.2. Configuration Properties

The `ModClusterConfig` bean enumerates the configuration properties used by `mod_cluster`. For the complete list of configuration properties and their default values, see the chapter entitled [Server-side Configuration Properties](#).

e.g.

```
<bean name="ModClusterConfig" class="org.jboss.modcluster.config.ModClusterConfig"
mode="On Demand">
  <!-- Specify configuration properties here -->
</bean>
```

### 6.1.3. Connectors

Like `mod_jk` and `mod_proxy_balancer`, `mod_cluster` requires a connector in your `server.xml` to which to forward web requests. Unlike `mod_jk` and `mod_proxy_balancer`, `mod_cluster` is not confined to AJP, but can use HTTP as well. While AJP is generally faster, an HTTP connector can optionally be secured via SSL. If multiple possible connectors are defined in your `server.xml`, `mod_cluster` uses the following algorithm to choose between them:

1. If an native (APR) AJP connector is available, use it.



2. If an AJP connector is available, use it.
3. Otherwise, choose the HTTP connector with the highest max threads.

### 6.1.4. Node Identity

Like `mod_jk` and `mod_proxy_balancer`, `mod_cluster` identifies each node via a unique [jvm route](http://docs.jboss.org/jbossweb/2.1.x/config/engine.html) [http://docs.jboss.org/jbossweb/2.1.x/config/engine.html]. By default, `mod_cluster` uses the following algorithm to assign the jvm route for a given node:

1. Use the value from `server.xml`, `<Engine jvmRoute="..." />`, if defined.
2. Generate a jvm route using the configured `???`. The default implementation does the following:
  - a. Use the value of the `jboss.mod_cluster.jvmRoute` system property, if defined.
  - b. Generate a UUID.

While UUIDs are ideal for production systems, in a development or testing environment, it is useful to know which node served a given request just by looking at the jvm route. In this case, you can utilize the `org.jboss.modcluster.SimpleJvmRouteFactory`. The factory generates jvm routes of the form:

*bind-address:port.engine-name*

## 6.2. JBoss Web & Tomcat

`mod_cluster`'s entire configuration for JBoss Web or Tomcat resides entirely within `$CATALINA_HOME/conf/server.xml`.

This limits the adds the following constraints to `mod_cluster`'s feature set:

- Only non-clustered mode is supported
- *Only one load metric* can be used to calculate a load factor.

### 6.2.1. Lifecycle Listener

The entry point for JBoss Web and Tomcat configuration is the `ModClusterListener`. All `mod_cluster` [configuration properties](#) are defined as attributes of the `<Listener/>` element. For the complete list of configuration properties and their default values, see the chapter entitled [Server-side Configuration Properties](#).

e.g.

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

## 6.2.2. Additional Tomcat dependencies

mod\_cluster uses jboss-logging, which exists in JBoss Web, but not in Tomcat. Consequently, to use mod\_cluster with Tomcat, it is necessary to add [jboss-logging-spi.jar](https://repository.jboss.org/nexus/content/groups/public-jboss/org/jboss/logging/jboss-logging-spi/) [https://repository.jboss.org/nexus/content/groups/public-jboss/org/jboss/logging/jboss-logging-spi/] to \$CATALINA\_HOME/lib.

## 6.3. Migrating from 1.1.x

In mod\_cluster 1.2.x the web containers now are separated cleanly, that requires you to change standalone and mbean configuration a little.

### 6.3.1. mod\_cluster-jboss-beans.xml

The JBoss microcontainer configuration for mod\_cluster 1.1.x is *not* compatible with the configuration for 1.2.x. you need to change the ModClusterListener mbean class to: "org.jboss.modcluster.container.jbossweb.JBossWebEventHandlerAdapter".

### 6.3.2. server.xml

You need to change the <Listener/> element className to: "org.jboss.modcluster.container.catalina.standalone.ModClusterListener".

## 6.4. Migrating from 1.0.x

In mod\_cluster 1.0.x, you were required to make several manual configuration changes to the jbossweb service before mod\_cluster would be usable. mod\_cluster 1.1.x eliminates much of this hassle - and is designed to be fully functional out of the box.

### 6.4.1. Dependency with JBoss Web

In 1.0.x, mod\_cluster needed to be deployed *before* JBoss Web. This ensured that mod\_cluster was available to handle web application deployment lifecycle events during triggered during server startup. To achieve this, you had to add an explicit dependency on mod\_cluster to jbossweb's jboss-beans.xml config file.

mod\_cluster 1.1.x reverses this dependency, such that mod\_cluster now depends on JBoss Web. Consequently, you no longer need to make any changes to JBoss Web's jboss-beans.xml file.

As an additional consequence of this dependency reversal, mod\_cluster can now be hot-deployed or undeployed to a running server without consequence to the JBoss Web service.

### 6.4.2. server.xml

#### 6.4.2.1. Lifecycle listener

mod\_cluster 1.0.x required you to add a lifecycle <Listener/> element to server.xml.

#### 6.4.2.1.1. JBoss AS

The [ModClusterListener](#) bean now registers itself with the JBoss Web server upon deploying the mod\_cluster service; and deregisters itself upon undeploy. Consequently, you no longer need to manually add a <Listener/> to server.xml.

#### 6.4.2.1.2. JBoss Web & Tomcat

You still need to use a lifecycle <Listener/> element in server.xml, but it's location has changed. In 1.1.x, the ModClusterListener class was refactored into the catalina container SPI implementation package, and the old location was deprecated.

#### 6.4.2.2. JVM Route

In mod\_cluster 1.0.x, you needed to add a unique jvmRoute to the <Engine/> element within server.xml. In 1.1.x, this is now optional. The auto-assignment of a jvm route is described in the [previous section](#).

#### 6.4.2.3. Connector bind address

In mod\_cluster 1.0.x, you had the option of manually setting the connector bind address, to restrict the network interface on which mod\_cluster would listen for proxied requests from the load balancer. In mod\_cluster 1.1.x, this is no longer necessary. mod\_cluster will set the bind address automatically, based on the interface on which mod\_cluster's internal connection was established.

### 6.4.3. mod\_cluster-jboss-beans.xml

The JBoss microcontainer configuration for mod\_cluster 1.0.x is *not* compatible with the configuration for 1.1.x. If you had customized your mod\_cluster 1.0.x configuration, please start with the default configuration contained in the 1.1.x mod\_cluster.sar and reapply any changes.

#### 6.4.3.1. Configuration changes

The following configuration properties were renamed between 1.0.x and 1.1.x:

Deprecated property name	Replacement property name
domain	loadBalancingGroup
masterPerDomain	masterPerLoadBalancingGroup
sslKeyStorePass	sslKeyStorePassword



# AS7 modcluster subsystem Configuration

## 7.1. ModCluster Subsystem in JBoss AS7

The `mod_cluster` integration is done via the `modcluster` subsystem. In AS7 only 1.1.x and later is supported.

## 7.2. ModCluster Subsystem minimal configuration

The minimal configuration is having the `modcluster` `schemaLocation` in the `schemaLocation` list:

```
urn:jboss:domain:modcluster:1.0 jboss-mod-cluster.xsd
```

and the `extension` module in the `extensions` list:

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

and `subsystem` declaration like:

```
<subsystem xmlns="urn:jboss:domain:modcluster:1.0"/>
```

With that configuration `modcluster` will listen for advertise on `224.0.1.105:23364` use the `simple-load-provider` with a load factor of 1.

## 7.3. ModCluster Subsystem configuration

### 7.3.1. mod-cluster-config Attributes

The attributes correspond to the [properties](#)

Proxy Discovery Configuration

Attribute	Property	Default
proxy-list	proxyList	<i>None</i>
proxy-url	proxyURL	<i>None</i>
advertise	advertise	<i>true</i>
advertise-security-key	advertiseSecurityKey	<i>None</i>

Attribute	Property	Default
excluded-contexts	excludedContexts	<i>None</i>
auto-enable-contexts	autoEnableContexts	<i>true</i>
stop-context-timeout	stopContextTimeout	<i>10 seconds (in seconds)</i>
socket-timeout	nodeTimeout	<i>20 seconds (in milli seconds)</i>

#### Proxy Configuration

Attribute	Property	Default
sticky-session	stickySession	<i>true</i>
sticky-session-remove	stickySessionRemove	<i>false</i>
sticky-session-force	stickySessionForce	<i>true</i>
node-timeout	workerTimeout	<i>-1</i>
max-attempts	maxAttempts	<i>1</i>
flush-packets	flushPackets	<i>false</i>
flush-wait	flushWait	<i>-1</i>
ping	ping	<i>10</i>
smax	smax	<i>-1 it uses default value</i>
ttl	ttl	<i>-1 it uses default value</i>
domain	loadBalancingGroup	<i>None</i>
load-balancing-group	loadBalancingGroup	<i>None</i>

#### SSL Configuration

SSL configuration part needs to be added here too

### 7.3.2. simple-load-provider Attributes

The simple load provider always send the same load factor. That is the default one. Example:

```
<subsystem xmlns="urn:jboss:domain:modcluster:1.0">
  <mod-cluster-config>
    <simple-load-provider factor="1"/>
  </mod-cluster-config>
</subsystem>
```

Attribute	Property	Default
factor	LoadBalancerFactor	<i>1</i>

### 7.3.3. dynamic-load-provider Attributes

The dynamic load provide allows to have `load-metric` as well as `custom-load-metric` defined. For example:

```
<subsystem xmlns="urn:jboss:domain:modcluster:1.0">
  <mod-cluster-config advertise-socket="mod_cluster">
    <dynamic-load-provider history="10" decay="2">
      <load-metric type="cpu" weight="2" capacity="1"/>
      <load-metric type="sessions" weight="1" capacity="512"/>
      <custom-load-metric class="mypackage.myclass" weight="1" capacity="512">
        <property name="myproperty" value="myvalue" />
        <property name="otherproperty" value="othervalue" />
      </custom-load-metric>
    </dynamic-load-provider>
  </mod-cluster-config>
</subsystem>
```

Attribute	Property	Default
history	history	512
decay	decayFactor	512

### 7.3.4. load-metric Configuration

The load-metric are the "classes" collecting information to allow computation of the load factor sent to httpd

Attribute	Property	Default
type	A Server-Side Load Metrics	<i>Mandatory</i>
weight	weight	9
capacity	capacity	512

#### 7.3.4.1. Supported load metric types

type	Corresponding Server-Side Load Metric
cpu	<a href="#">AverageSystemLoadMetric</a>
mem	<a href="#">SystemMemoryUsageLoadMetric</a>
heap	<a href="#">HeapMemoryUsageLoadMetric</a>
sessions	<a href="#">ActiveSessionsLoadMetric</a>

type	Corresponding Server-Side Load Metric
requests	<a href="#">RequestCount</a> LoadMetric
send-traffic	<a href="#">SendTraffic</a> LoadMetric
receive-traffic	<a href="#">ReceiveTraffic</a> LoadMetric
busyness	<a href="#">BusyConnectors</a> LoadMetric
connection-pool	<a href="#">ConnectionPoolUsage</a> LoadMetric

### 7.3.5. custom-load-metric Configuration

The custom-load-metric are for user defined "classes" collecting information. They are like the load-metric except `type` is replaced by `class`:

Attribute	Property	Default
class	Name of your class	<i>Mandatory</i>

### 7.3.6. load-metric Configuration with the jboss admin console

The load-metric have 4 commands to add / remove metrics

#### 7.3.6.1. add-metric

Allows to add a `load-metric` to the `dynamic-load-provider`

For example:

```
./:add-metric(type=cpu, weight=2, capacity=1)
```

#### 7.3.6.2. remove-metric

Allows to remove a `load-metric` from the `dynamic-load-provider`

For example:

```
./:remove-metric(type=cpu)
```

#### 7.3.6.3. add-custom-metric

Allows to add a `load-custom-metric` to the `dynamic-load-provider`



For example:

```
./:add-custom-metric(class=myclass, weight=2, capacity=1, property=[("pool" => "mypool"),  
("var" => "myvariable")])
```

#### 7.3.6.4. remove-custom-metric

Allows to remove a `load-custom-metric` from the `dynamic-load-provider`

For example:

```
./:remove-custom-metric(class=myclass)
```



# Building Server-Side Components

## 8.1. Requirements

Building mod\_cluster's server-side components from source requires the following tools:

- JDK 5.0+
- Maven 2.0+

## 8.2. Building

Steps to build:

1. Download the mod\_cluster sources

```
git clone git://github.com/modcluster/mod_cluster.git
```

2. Use maven "dist" profile to build:

```
cd mod_cluster  
mvn -P dist package
```



### Note

Some unit tests require UDP port 23365. Make sure your local firewall allows the port.

## 8.3. Build Artifacts

The build produces the following output in the target directory:

mod-cluster.sar

Exploded format sar to copy to the deploy dir in your JBoss AS install

JBossWeb-Tomcat/lib directory

Jar files to copy to the lib directory in your JBossWeb or Tomcat install to support use of mod\_cluster

demo directory

The [load balancing demo](#) application

mod-cluster-XXX.tar.gz

The full distribution tarball; includes the above elements

# Server-side Configuration Properties

The tables below enumerate the configuration properties available to an application server node. The location for these properties depends on [how mod\\_cluster is configured](#).

## 9.1. Proxy Discovery Configuration

The list of proxies from which an application expects to receive AJP connections is either defined statically, via the addresses defined in the [proxyList](#) configuration property; or discovered dynamically via the advertise mechanism. Using a special mod\_advertise module, proxies can advertise their existence by periodically broadcasting a multicast message containing its address/port. This functionality is enabled via the [advertise](#) configuration property. If configured to listen, a server can learn of the proxy's existence, then notify that proxy of its own existence, and update its configuration accordingly. This frees both the proxy *and* the server from having to define static, environment-specific configuration values.

Attribute	AS7 Attribute	Default	Scope	Description
proxyList	proxy-list	None	Configuration	<p>Defines a comma delimited list of httpd proxies with which this node will initially communicate. Value should be of the form:</p> <p><i>address1:port1,address2:port2</i></p> <p>Using the default configuration, this property can be manipulated via the <code>jboss.mod_cluster.proxyList</code> system property.</p>
excludedContexts	excluded-contexts	ROOT, admin-console, invoker, bossws, jmx-console, juddi, web-console	Configuration	<p>List of contexts to exclude from httpd registration, of the form:</p> <p><i>host1:context1,host2:context2,host3:context3</i></p> <p>If no host is indicated, it is assumed to be</p>

Attribute	AS7 Attribute	Default	Scope	Description
				the default host of the server (e.g. localhost). "ROOT" indicates the root context. Using the default configuration, this property can be manipulated via the <code>jboss.mod_cluster.excludedContexts</code> system property.
<code>autoEnableContexts</code>	<code>auto-enable-contexts</code>	<code>true</code>	Configuration	If false the contexts are registered disabled in httpd, they need to be enabled via the <code>enable()</code> mbean method or via <code>mod_cluster_manager</code> .
<code>stopContextTimeout</code>	<code>stop-context-timeout</code>	<code>10</code>	Configuration	The amount of time, measure in units specified by <a href="#"><code>stopContextTimeoutUnit</code></a> , for which to wait for clean shutdown of a context (completion of pending requests for a distributable context; or destruction/expiration of active sessions for a non-distributable context).

Attribute	AS7 Attribute	Default	Scope	Description
stopContextTimeout	None	TimeUnit.SECONDS	Configuration	The unit of time for use with <a href="#">stopContextTimeout</a>
sessionDrainingStrategy	None	org.jboss.modcluster.session.draining.StrategyEnum.DEFAULT	Session Draining	<p>session draining strategy used during undeployment of a web application. There are three possible values:</p> <p><b>DEFAULT</b>            Drain sessions before web application undeploy only if the web application is non-distributable.</p> <p><b>ALWAYS</b>            Always drain sessions before web application undeploy, even for distributable web applications.</p> <p><b>NEVER</b>            Do not drain sessions before web application undeploy,</p>

Attribute	AS7 Attribute	Default	Scope	Description
				even for non-distributable web application.
proxyURL	proxy-url	None	Apache HTTPD	If defined, this value will be prepended to the URL of MCMP commands.
socketTimeout	socket-timeout	20000	Configuration	Number of milliseconds to wait for a response from an httpd proxy to MCMP commands before timing out, and flagging the proxy as in error.
advertise	advertise	true, if <a href="#">proxyList</a> is undefined, false otherwise	Configuration	If enabled, httpd proxies will be auto-discovered via multicast announcements. This can be used either in concert or in place of a static <a href="#">proxyList</a> .
advertiseGroupAddress	advertise-socket	224.0.1.105	Apache HTTPD	UDP address on which to listen for httpd proxy multicast advertisements  In AS7 that corresponding to the name of a socket-binding
advertisePort	See advertise-socket	23364	Apache HTTPD	UDP port on which to listen for httpd proxy



Attribute	AS7 Attribute	Default	Scope	Description
				multicast advertisements
advertiseSecurityKey	advertise-security-key	None	Apache HTTPD	If specified, httpd proxy advertisements checksums (using this value as a salt) will be required to be verified on the server side
advertiseThreadFactory	None	Executors.defaultThreadFactory()	Configuration	The thread factory used to create the background advertisement listener.
jvmRouteFactory	None	new SystemPropertyJvmRouteFactory(new UUIDJvmRouteFactory(), "jboss.mod_cluster.jvmRoute")	Configuration	Defines the strategy for determining the jvm route of a node, if none was specified in server.xml. The default factory first consults the <code>jboss.mod_cluster.jvmRoute</code> system property. If this system property is undefined, the jvm route is assigned a UUID.

## 9.2. Proxy Configuration

The following configuration values are sent to proxies during server startup, when a proxy is detected via the advertise mechanism, or during the resetting of a proxy's configuration during error recovery.

Attribute	AS7 Attribute	Default	Scope	Description
stickySession	sticky-session	true	Balancer	

Attribute	AS7 Attribute	Default	Scope	Description
				Indicates whether subsequent requests for a given session should be routed to the same node, if possible.
stickySessionRemove	sticky-session-remove	false	Balancer	Indicates whether the httpd proxy should remove session stickiness in the event that the balancer is unable to route a request to the node to which it is stuck. This property is ignored if <a href="#">stickySession</a> is false.
stickySessionForce	sticky-session-force	false	Balancer	Indicates whether the httpd proxy should return an error in the event that the balancer is unable to route a request to the node to which it is stuck. This property is ignored if <a href="#">stickySession</a> is false.
workerTimeout	worker-timeout	-1	Balancer	Number of seconds to wait for a worker to become available to handle a

Attribute	AS7 Attribute	Default	Scope	Description
				request. When no workers of a balancer are usable, mod_cluster will retry after a while (workerTimeout/100). That is timeout in the balancer mod_proxy documentation. A value of -1 indicates that the httpd will not wait for a worker to be available and will return an error if none is available.
maxAttempts	max-attempts	1	Balancer	Number of times an httpd proxy will attempt to send a given request to a worker before giving up. The minimum value is 1, meaning try only once. (Note that mod_proxy default is also 1: no retry).
flushPackets	flush-packets	false	Node	Enables/disables packet flushing
flushWait	flush-wait	-1	Node	Time to wait before flushing packets in milliseconds. A value of -1 means wait forever.

Attribute	AS7 Attribute	Default	Scope	Description
ping	ping	10	Node	Time (in seconds) in which to wait for a pong answer to a ping
smax	smax	Determined by httpd configuration	Node	Soft maximum idle connection count (that is the smax in worker mod_proxy documentation). The maximum value depends on the httpd thread configuration (ThreadsPerChild or 1).
ttl	ttl	60	Node	Time to live (in seconds) for idle connections above smax
nodeTimeout	node-timeout	-1	Node	Timeout (in seconds) for proxy connections to a node. That is the time mod_cluster will wait for the back-end response before returning error. That corresponds to timeout in the worker mod_proxy documentation. A value of -1 indicates no timeout. Note that mod_cluster always uses

Attribute	AS7 Attribute	Default	Scope	Description
				a cping/cpong before forwarding a request and the connectiontimeout value used by mod_cluster is the ping value.
balancer	balancer	mycluster	Node	The balancer name
loadBalancingGroup	domain load-balancing-group	None	Node	If specified, load will be balanced among jvmRoutes within the same load balancing group. A loadBalancingGroup is conceptually equivalent to a mod_jk domain directive. This is primarily used in conjunction with partitioned session replication (e.g. buddy replication).



### Note

When nodeTimeout is not defined the ProxyTimeout directive Proxy is used. If ProxyTimeout is not defined the server timeout (Timeout) is used (default 300 seconds). nodeTimeout, ProxyTimeout or Timeout is set at the socket level.

## 9.3. SSL Configuration

The communication channel between application servers and httpd proxies uses HTTP by default. This channel can be secured using HTTPS by setting the [ssl/](#) property to true.

**Note**

This HTTP/HTTPS channel should not be confused with the processing of HTTP/HTTPS client requests.

Attribute	AS7 Attribute	Default	Description
ssl	<i>None</i>	false	Should connection to proxy use a secure socket layer
sslCiphers	cipher-suite	<i>The default JSSE cipher suites</i>	Overrides the cipher suites used to initialize an SSL socket ignoring any unsupported ciphers
sslProtocol	protocol	TLS (ALL in AS7)	Overrides the default SSL socket protocol.
sslCertificateEncodingAlgorithm	<i>None</i>	<i>The default JSSE key manager algorithm</i>	The algorithm of the key manager factory
sslKeyStore	certificate-key-file	<code>System.getProperty("user.home") + "/.keystore"</code>	The location of the key store containing client certificates
sslKeyStorePassword	password	changeit	The password granting access to the key store (and trust store in AS7)
sslKeyStoreType	<i>None</i>	JKS	The type of key store
sslKeyStoreProvider	<i>None</i>	<i>The default JSSE security provider</i>	The key store provider
sslTrustAlgorithm	<i>None</i>	<i>The default JSSE trust manager algorithm</i>	The algorithm of the trust manager factory
sslKeyAlias	key-alias		The alias of the key holding the client certificates in the key store
sslCrIFile	ca-revocation-url		Certificate revocation list
sslTrustMaxCertLength	<i>None</i>	5	The maximum length of a certificate held in the trust store

Attribute	AS7 Attribute	Default	Description
sslTrustStore	<i>None</i>	System.getProperty("javax.net.ssl.trustStore")	The location of the file containing the trust store
sslTrustStorePassword	<i>None</i>	System.getProperty("javax.net.ssl.trustStorePassword")	The password granting access to the trust store.
sslTrustStoreType	<i>None</i>	System.getProperty("javax.net.ssl.trustStoreType")	The trust store type
sslTrustStoreProvider	<i>None</i>	System.getProperty("javax.net.ssl.trustStoreProvider")	The trust store provider

## 9.4. Load Configuration for JBoss Web and Tomcat

Additional configuration properties used when mod\_cluster is configured in JBoss Web standalone or Tomcat.

Attribute	Default	Description
loadMetricClass	org.jboss.modcluster.load.metric.impl.BusyConnectorsLoadMetric	Class object implementing org.jboss.load.metric.LoadMetric
loadMetricCapacity	1	The capacity of the load metric defined via the loadMetricClass property
loadHistory	9	The number of historic load values to consider in the load balance factor computation.
loadDecayFactor	2	The factor by which a historic load values should degrade in significance.





## Server-Side Load Metrics

A major feature of `mod_cluster` is the ability to use server-side load metrics to determine how best to balance requests.

The `DynamicLoadBalanceFactorProvider` bean computes the load balance factor of a node from a defined set of load metrics.

```
<bean name="DynamicLoadBalanceFactorProvider" class="org.jboss.modcluster.load.impl.DynamicLoadBalanceFactorProvider"
    <annotation>
    <constructor>
    <parameter>
    <set elementClass="org.jboss.modcluster.load.metric.LoadMetric">
    <inject bean="BusyConnectorsLoadMetric"/>
    <inject bean="HeapMemoryUsageLoadMetric"/>
    </set>
    </parameter>
    </constructor>
    <property name="history">9</property>
    <property name="decayFactor">2</property>
    </bean>
```

Load metrics can be configured with an associated weight and capacity.

The weight (default is 1) indicates the significance of a metric with respect to the other metrics. For example, a metric of weight 2 will have twice the impact on the overall load factor than a metric of weight 1.

The capacity of a metric serves 2 functions:

- To normalize the load values from each metric. In some load metrics, capacity is already reflected in the load values. The capacity of a metric should be configured such that  $0 \leq (\text{load} / \text{capacity}) \leq 1$ .
- To favor some nodes over others. By setting the metric capacities to different values on each node, proxies will effectively favor nodes with higher capacities, since they will return smaller load values. This adds an interesting level of granularity to node weighting. Consider a cluster of two nodes, one with more memory, and a second with a faster CPU; and two metrics, one memory-based and the other CPU-based. In the memory-based metric, the first node would be given a higher load capacity than the second node. In a CPU-based metric, the second node would be given a higher load capacity than the first node.

Each load metric contributes a value to the overall load factor of a node. The load factors from each metric are aggregated according to their weights.

In general, the load factor contribution of given metric is: (load / capacity) \* weight / total weight.

The `DynamicLoadBalanceFactorProvider` applies a time decay function to the loads returned by each metric. The aggregate load, with respect to previous load values, can be expressed by the following formula:

$$L = (L_0 + L_1/D + L_2/D^2 + L_3/D^3 + \dots + L_H/D^H) * (1 + D + D^2 + D^3 + \dots + D^H)$$

... or more concisely as:

$$L = (\sum_{i=0}^H L_i/D^i) * (\sum_{i=0}^H D^i)$$

... where  $D$  = `decayFactor`, and  $H$  = history.

Setting history = 0 effectively disables the time decay function and only the current load for each metric will be considered in the load balance factor computation.

The `mod_cluster` load balancer expects the load factor to be an integer between 0 and 100, where 0 indicates max load and 100 indicates zero load. Therefore, the final load factor sent to the load balancer

$$L_{\text{Final}} = 100 - (L * 100)$$

While you are free to write your own load metrics, the following `LoadMetrics` are available out of the box:

## 10.1. Web Container metrics

### 10.1.1. `ActiveSessionsLoadMetric`

- Requires an explicit capacity
- Uses `SessionLoadMetricSource` to query session managers
- Analogous to `method=S` in `mod_jk`

e.g.

```
<bean name="ActiveSessionsLoadMetric" class="org.jboss.modcluster.load.metric.impl.ActiveSessionsLoadMetric"
annotation>
<constructor>
<parameter><inject bean="SessionLoadMetricSource"/></parameter>
```

```

</constructor>
<property name="capacity">1000</property>
</bean>
<bean name="SessionLoadMetricSource" class="org.jboss.modcluster.load.metric.impl.SessionLoadMetricSource"
  <constructor>
    <parameter class="javax.management.MBeanServer">
      <inject bean="JMXKernel" property="mbeanServer"/>
    </parameter>
  </constructor>
</bean>

```

### 10.1.2. `BusyConnectorsLoadMetric`

- Returns the percentage of connector threads from the thread pool that are busy servicing requests
- Uses `ThreadPoolLoadMetricSource` to query connector thread
- Analogous to `method=B` in `mod_jk`

e.g.

```

<bean name="BusyConnectorsLoadMetric" class="org.jboss.modcluster.load.metric.impl.BusyConnectorsLoadMetric"
  <annotation>
    <constructor>
      <parameter><inject bean="ThreadPoolLoadMetricSource"/></parameter>
    </constructor>
  </bean>
<bean name="ThreadPoolLoadMetricSource" class="org.jboss.modcluster.load.metric.impl.ThreadPoolLoadMetricSource"
  <constructor>
    <parameter class="javax.management.MBeanServer">
      <inject bean="JMXKernel" property="mbeanServer"/>
    </parameter>
  </constructor>
</bean>

```

### 10.1.3. `ReceiveTrafficLoadMetric`

- Returns the incoming request POST traffic in KB/sec (the application needs to read POST data)
- Requires an explicit capacity

- Uses `RequestProcessorLoadMetricSource` to query request processors
- Analogous to `method=T` in `mod_jk`

e.g.

```
<bean name="ReceiveTrafficLoadMetric" class="org.jboss.modcluster.load.metric.impl.ReceiveTrafficLoadMetric" m
annotation>
  <constructor>

  <parameter class="org.jboss.modcluster.load.metric.impl.RequestProcessorLoadMetricSource">
    <inject bean="RequestProcessorLoadMetricSource"/>
  </parameter>
</constructor>
  <property name="capacity">1024</property>
</bean>
<bean name="RequestProcessorLoadMetricSource" class="org.jboss.modcluster.load.metric.impl.RequestProcess
  <constructor>
    <parameter class="javax.management.MBeanServer">
      <inject bean="JMXKernel" property="mbeanServer"/>
    </parameter>
  </constructor>
</bean>
```

### 10.1.4. `SendTrafficLoadMetric`

- Returns the outgoing request traffic in KB/sec
- Requires an explicit capacity
- Uses `RequestProcessorLoadMetricSource` to query request processors
- Analogous to `method=T` in `mod_jk`

```
<bean name="SendTrafficLoadMetric" class="org.jboss.modcluster.load.metric.impl.SendTrafficLoadMetric" mode=
annotation>
  <constructor>

  <parameter class="org.jboss.modcluster.load.metric.impl.RequestProcessorLoadMetricSource">
    <inject bean="RequestProcessorLoadMetricSource"/>
  </parameter>
</constructor>
```

```

    </parameter>
</constructor>
    <property name="capacity">512</property>
</bean>

```

### 10.1.5. RequestCountLoadMetric

- Returns the number of requests/sec
- Requires an explicit capacity
- Uses `RequestProcessorLoadMetricSource` to query request processors
- Analogous to `method=R` in `mod_jk`

e.g.

```

<bean name="RequestCountLoadMetric" class="org.jboss.modcluster.load.metric.impl.RequestCountLoadMetric" m

annotation>
    <constructor>

    <parameter class="org.jboss.modcluster.load.metric.impl.RequestProcessorLoadMetricSource">
        <inject bean="RequestProcessorLoadMetricSource"/>
    </parameter>
    </constructor>
    <property name="capacity">1000</property>
</bean>

```

## 10.2. System/JVM metrics

### 10.2.1. AverageSystemLoadMetric

- Returns CPU load
- Requires Java 1.6+
- Uses `OperatingSystemLoadMetricSource` to generically read attributes

e.g.

```

<bean name="AverageSystemLoadMetric" class="org.jboss.modcluster.load.metric.impl.AverageSystemLoadMetric

```

```
class)</  
annotation>  
  <constructor>  
    <parameter><inject bean="OperatingSystemLoadMetricSource"/></parameter>  
  </constructor>  
</bean>  
<bean name="OperatingSystemLoadMetricSource" class="org.jboss.modcluster.load.metric.impl.OperatingSystemL  
</bean>
```

### 10.2.2. `HeapMemoryUsageLoadMetric`

- Returns the heap memory usage as a percentage of max heap size

e.g.

```
<bean name="HeapMemoryUsageLoadMetric" class="org.jboss.modcluster.load.metric.impl.HeapMemoryUsageLo  
annotation>  
</bean>
```

## 10.3. Other metrics

### 10.3.1. `ConnectionPoolUsageLoadMetric`

- Returns the percentage of connections from a connection pool that are in use
- Uses `ConnectionPoolLoadMetricSource` to query JCA connection pools

e.g.

```
<bean name="ConnectionPoolUsageMetric" class="org.jboss.modcluster.load.metric.impl.ConnectionPoolUsageLo  
annotation>  
  <constructor>  
    <parameter><inject bean="ConnectionPoolLoadMetricSource"/></parameter>  
  </constructor>  
</bean>  
<bean name="ConnectionPoolLoadMetricSource" class="org.jboss.modcluster.load.metric.impl.ConnectionPoolLoa
```

```
<constructor>
  <parameter class="javax.management.MBeanServer">
    <inject bean="JMXKernel" property="mbeanServer"/>
  </parameter>
</constructor>
</bean>
```





# Installing Server-Side Components

First, extract the server-side binary to a temporary directory. The following assumes it was extracted to `/tmp/mod_cluster`

Your next step depends on whether your target server is JBoss AS or JBossWeb/Tomcat.

## 11.1. Installing in JBoss AS 6.0.0.M1 and up

You don't need to do anything to install the java-side binaries in AS 6.x; it's part of the AS distribution's default, standard and all configurations.

## 11.2. Installing in JBoss AS 5.x

Assuming `$JBOSS_HOME` indicates the root of your JBoss AS install and that you want to use `mod_cluster` in the AS's all config:

```
cp -r /tmp/mod_cluster/mod_cluster.sar $JBOSS_HOME/server/all/deploy
```

## 11.3. Installing in Tomcat

Assuming `$CATALINA_HOME` indicates the root of your Tomcat install:

```
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/jboss-logging.jar $CATALINA_HOME/lib/  
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/mod_cluster-container-catalina*  
$CATALINA_HOME/lib/  
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/mod_cluster-container-spi* $CATALINA_HOME/  
lib/  
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/mod_cluster-core* $CATALINA_HOME/lib/
```

and additionally for Tomcat6:

```
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/mod_cluster-container-tomcat6*  
$CATALINA_HOME/lib
```

and additionally for Tomcat7:

```
cp /tmp/mod_cluster/JBossWeb-Tomcat/lib/mod_cluster-container-tomcat7*  
$CATALINA_HOME/lib
```

# Using SSL in mod\_cluster

There are 2 connections between the cluster and the front-end. Both could be encrypted. That chapter describes how to encrypt both connections.

## 12.1. Using SSL between JBossWEB and httpd

As the ClusterListener allows to configure httpd it is advised to use SSL for that connection. The most easy is to use a virtual host that will only be used to receive information from JBossWEB. Both side need configuration.

### 12.1.1. Apache httpd configuration part

[mod\\_ssl](http://httpd.apache.org/docs/2.2/mod/mod_ssl.html) [http://httpd.apache.org/docs/2.2/mod/mod\_ssl.html] of httpd is using to do that. See in one example how easy the configuration is:

```
Listen 6666
<VirtualHost 10.33.144.3:6666>
    SSLEngine on
    SSLCipherSuite AES128-SHA:ALL:!ADH:!LOW:!MD5:!SSLV2:!NULL
    SSLCertificateFile conf/server.crt
    SSLCertificateKeyFile conf/server.key
    SSLCACertificateFile conf/server-ca.crt
    SSLVerifyClient require
    SSLVerifyDepth 10
</VirtualHost>
```

The conf/server.crt file is the PEM-encoded Certificate file for the VirtualHost it must be signed by a Certificate Authority (CA) whose certificate is stored in the sslTrustStore of the ClusterListener parameter.

The conf/server.key file is the file containing the private key.

The conf/server-ca.crt file is the file containing the certificate of the CA that have signed the client certificate JBossWEB is using. That is the CA that have signed the certificate corresponding to the sslKeyAlias stored in the sslKeyStore of the ClusterListener parameters.

### 12.1.2. ClusterListener configuration part

There is a [wiki](http://www.jboss.org/community/docs/DOC-9300) [http://www.jboss.org/community/docs/DOC-9300] describing the SSL parameters of the ClusterListener. See in one example how easy the configuration is:

```
<Listener className="org.jboss.web.cluster.ClusterListener"
```

```
ssl="true"
sslKeyStorePass="changeit"
sslKeyStore="/home/jfclere/CERTS/CA/test.p12"
sslKeyStoreType="PKCS12"
sslTrustStore="/home/jfclere/CERTS/CA/ca.p12"
sslTrustStoreType="PKCS12" sslTrustStorePassword="changeit"
/>
```

The `sslKeyStore` file contains the private key and the signed certificate of the client certificate JBossWEB uses to connect to `httpd`. The certificate must be signed by a Certificate Authority (CA) who certificate is in the `conf/server-ca.crt` file of the `httpd`

The `sslTrustStore` file contains the CA certificate of the CA that signed the certificate contained in `conf/server.crt` file.

### 12.1.3. mod-cluster-jboss-beans configuration part

The `mod-cluster-jboss-beans.xml` in `$JBOSS_HOME/server/profile/deploy/mod-cluster.sar/META-INF` in the ClusterConfig you are using you should have something like:

```
<property name="ssl">true</property>
<property name="sslKeyStorePass">changeit</property>
<property name="sslKeyStore">/home/jfclere/CERTS/test.p12</property>
<property name="sslKeyStoreType">pkcs12</property>
<property name="sslTrustStore">/home/jfclere/CERTS/ca.p12</property>
<property name="sslTrustStoreType">pkcs12</property>
<property name="sslTrustStorePassword">changeit</property>
```

### 12.1.4. How the diferent files were created

The files were created using OpenSSL utilities see [OpenSSL](http://www.openssl.org/) [<http://www.openssl.org/>] `CA.pl` (`/etc/pki/tls/misc/CA` for example) has been used to create the test Certificate authority, the certificate requests and private keys as well as signing the certicate requests.

#### 12.1.4.1. Create the CA

1. Create a work directory and work for there:

```
mkdir -p CERTS/Server
cd CERTS/Server
```

2. Create a new CA:

```
/etc/pki/tls/misc/CA -newca
```

That creates a directory for example `../..CA` that contains a `cacert.pem` file which content have to be added to the `conf/server-ca.crt` described above.

3. Export the CA certificate to a .p12 file:

```
openssl pkcs12 -export -nokeys -in ../..CA/cacert.pem -out ca.p12
```

That reads the file `cacert.pem` that was created in the previous step and convert it into a pkcs12 file the JVM is able to read.

That is the `ca.p12` file used in the `ss/TrustStore` parameter above.

#### 12.1.4.2. Create the server certificate

1. Create a new request:

```
/etc/pki/tls/misc/CA -newreq
```

That creates 2 files named `newreq.pem` and `newkey.pem`. `newkey.pem` is the file `conf/server.key` described above.

2. Sign the request:

```
/etc/pki/tls/misc/CA -signreq
```

That creates a file named `newcert.pem`. `newcert.pem` is the file `conf/server.crt` described above. At that point you have created the SSL stuff needed for the `VirtualHost` in `httpd`. You should use a browser to test it after importing in the browser the content of the `cacert.pem` file.

#### 12.1.4.3. Create the client certificate

1. Create a work directory and work for there:

```
mkdir -p CERTS/Client  
cd CERTS/Client
```

2. Create request and key for the JBossWEB part.

```
/etc/pki/tls/misc/CA -newreq
```

That creates 2 files: Request is in newreq.pem, private key is in newkey.pem

3. Sign the request.

```
/etc/pki/tls/misc/CA -signreq
```

That creates a file: newcert.pem

4. Don't use a passphrase when creating the client certificate or remove it before exporting:

```
openssl rsa -in newkey.pem -out key.txt.pem  
mv key.txt.pem newkey.pem
```

5. Export the client certificate and key into a p12 file.

```
openssl pkcs12 -export -inkey newkey.pem -in newcert.pem -out test.p12
```

That is the sslKeyStore file described above (/home/jfclere/CERTS/CA/test.p12)

## 12.2. Using SSL between httpd and JBossWEB

Using https allows to encrypt communications between httpd and JBossWEB. But due to the resources it needs that no advised to use it in high load configuration.

(See [Encrypting connection between httpd and TC](http://www.jboss.org/community/docs/DOC-9701) [http://www.jboss.org/community/docs/DOC-9701] for detailed instructions).

httpd is configured to be a client for AS/TC so it should provide a certificate AS/TC will accept and have a private key to encrypt the data, it also needs a CA certificate to valid the certificate AS/TC will use for the connection.

```
SSLProxyEngine On  
SSLProxyVerify require  
SSLProxyCACertificateFile conf/cacert.pem  
SSLProxyMachineCertificateFile conf/proxy.pem
```

conf/proxy.pem should contain both key and certificate. The certificate must be trusted by Tomcat via the CA in truststoreFile of <connector/>.

conf/cacert.pem must contain the certificate of the CA that signed the AS/TC certificate. The corresponding key and certificate are the pair specified by keyAlias and truststoreFile of the <connector/>. Of course the <connector/> must be the https one (normally on port 8443).

### 12.2.1. How the different files were created

The files were created using OpenSSL utilities see [OpenSSL](http://www.openssl.org/) [http://www.openssl.org/] CA.pl (/etc/pki/tls/misc/CA for example) has been used to create the test Certificate authority, the certificate requests and private keys as well as signing the certificate requests.

#### 12.2.1.1. Create the CA

(See [above](#))

#### 12.2.1.2. Create the server certificate

(See [above](#))

The certificate and key need to be imported into the java keystore using keytool

make sure you don't use a passphrase for the key (don't forget to clean the file when done)

1. Convert the key and certificate to p12 file:

```
openssl pkcs12 -export -inkey key.pem -in newcert.pem -out test.p12
```

make sure you use the keystore password as Export passphrase.

2. Import the contents of the p12 file in the keystore:

```
keytool -importkeystore -srckeystore test.p12 -srcstoretype PKCS12
```

3. Import the CA certificate in the java trustore: (Fedora13 example).

```
keytool -import -trustcacerts -alias "caname" \
-file ../../CA/cacert.pem -keystore /etc/pki/java/cacerts
```

4. Edit server.xml to have a <connector/> similar to:

```
<Connector port="8443" protocol="HTTP/1.1" SSLEnabled="true"
```

```
keyAlias="1"  
truststoreFile="/etc/pki/java/cacerts"  
maxThreads="150" scheme="https" secure="true"  
clientAuth="true" sslProtocol="TLS" />
```

5. Start TC/AS and use openssl s\_client to test the connection:

```
openssl s_client -CAfile /home/jfclere/CA/cacert.pem -cert newcert.pem -key newkey.pem \  
-host localhost -port 8443
```

There shouldn't be any error and you should be able to see your CA in the "Acceptable client certificate CA names".

### 12.3. Forwarding SSL browser informations when using http/https between httpd and JBossWEB

When using http or https between httpd and JBossWEB you need to use the SSLValve and export the SSL variable as header in the request in httpd. If you are using AJP, mod\_proxy\_ajp will read the SSL variables and forward them to JBossWEB automatically.

(See [Forwarding SSL environment when using http/https proxy](http://www.jboss.org/community/docs/DOC-11988) [http://www.jboss.org/community/docs/DOC-11988] for detailed instructions).

The SSL variable used by mod\_proxy\_ajp are the following:

1. "HTTPS" SSL indicateur.
2. "SSL\_CLIENT\_CERT" Chain of client certificates.
3. "SSL\_CIPHER" Cipher used.
4. "SSL\_SESSION\_ID" Id of the session.
5. "SSL\_CIPHER\_USEKEYSIZE" Size of the key used.



# Migration from mod\_jk

Mod\_cluster only support Apache httpd, there are no plan to support IIS or Iplanet.

The migration from mod\_jk to mod\_cluster is not very complex. Only very few worker properties can't be mapped to mod\_cluster parameters.

Here is the table of worker properties and how to transfer them in the ClusterListener parameters.

mod_jk worker property	ClusterListener parameter	Remarks
host	-	It is read from the <Connector/> Address information
port	-	It is read from the <Connector/> Port information
type	-	It is read from the <Connector/> Protocol information
route	-	It is read from the <Engine/> JVMRoute information
domain	domain	That is not supported in this version
redirect	-	The nodes with loadfactor = 0 are standby nodes they will be used no other nodes are available
socket_timeout	nodeTimeout	Default 10 seconds
socket_keepalive	-	KEEP_ALIVE os is always on in mod_cluster
connection_pool_size	-	The max size is calculated to be AP_MPMQ_MAX_THREADS+1 (max)
connection_pool_minsize	smax	The default is max
connection_pool_timeout	ttd	Time to live when over smax connections. The default is 60 seconds
-	workerTimeout	Max time to wait for a free worker default 1 second
retries	maxAttempts	Max retries before returning an error Default: 3
recovery_options	-	mod_cluster behave like mod_jk with value 7

mod_jk worker property	ClusterListener parameter	Remarks
fail_on_status	-	Not supported
max_packet_size	iobuffersize/receivebuffersize	Not supported in this version. Use ProxyIOBufferSize
max_reply_timeouts	-	Not supported
recover_time	-	The ClusterListener will tell (via a STATUS message) mod_cluster that the node is up again
activation	-	mod_cluster receives this information via ENABLE/DISABLE/STOP messages
distance	-	mod_cluster handles this via the loadfactor logic
mount	-	The context "mounted" automatically via the ENABLE-APP messages. ProxyPass could be used too
secret	-	Not supported
connect_timeout	-	Not supported. Use ProxyTimeout or server TimeOut (Default 300 seconds)
prepost_timeout	ping	Default 10 seconds
reply_timeout	-	Not supported. Use ProxyTimeout or server TimeOut? directive (Default 300 seconds)

# Migration from mod\_proxy

As mod\_cluster is a sophisticated balancer migration from mod\_proxy to mod\_cluster is strait forward. mod\_cluster replaces a reverse proxy with loadbalancing. A reversed proxy is configured like:

```
ProxyRequests Off
<Proxy *>
Order deny,allow
Allow from all
</Proxy>
ProxyPass /foo http://foo.example.com/bar
ProxyPassReverse /foo http://foo.example.com/bar
```

All the general proxy parameters could be used in mod\_cluster they work like in mod\_proxy, only the balancers and the workers definitions are slightly different.

## 14.1. Workers

Mod_proxy Parameter	ClusterListener parameter	Remarks
min	-	Not supported in this version
max	-	mod_cluster uses mod_proxy default value
smax	smax	Same as mod_proxy
ttl	ttl	Same as mod_proxy
acquire	workerTimeout	Same as mod_proxy acquire but in seconds
disablereuse	-	mod_cluster will disable the node in case of error and the ClusterListener will for the reuse via the STATUS message
flushPackets	flushPackets	Same as mod_proxy
flushwait	flushwait	Same as mod_proxy
keepalive	-	Always on: OS KEEP_ALIVE is always used. Use connectionTimeout in the <Connector> if needed
lbset	-	Not supported

Mod_proxy Parameter	ClusterListener parameter	Remarks
ping	ping	Same as mod_proxy Default value 10 seconds
lbfactor	-	The load factor is received by mod_cluster from a calculated value in the ClusterListener
redirect	-	Not supported lbfactor sent to 0 makes a standby node
retry	-	ClusterListener will test when the node is back online
route	JVMRoute	In fact JBossWEB via the JVMRoute in the Engine will add it
status	-	mod_cluster has a finer status handling: by context via the ENABLE/STOP/DISABLE/REMOVE application messages. hot-standby is done by lbfactor = 0 and Error by lbfactor = 1 both values are sent in STATUS message by the ClusterListener
timeout	nodeTimeout	Default wait for ever ( <a href="http://httpd.apache.org/docs/2.2/mod/mod_proxy.html">http://httpd.apache.org/docs/2.2/mod/mod_proxy.html</a> is wrong there)
ttl	ttl	Default 60 seconds

## 14.2. Balancers

Mod_proxy Parameter	ClusterListener parameter	Remarks
lbmethod	-	There is only one load balancing method in mod_cluster "cluster_byrequests"
maxattempts	maxAttempts	Default 1
nofailover	stickySessionForce	Same as in mod_proxy
stickysession	StickySessionCookie/ StickySessionPath	The 2 parameters in the ClusterListener are combined in one that behaves like in mod_proxy

Mod_proxy Parameter	ClusterListener parameter	Remarks
timeout	workerTimeout	Default 1 seconds

---

# Load Balancing Demo Application

## 15.1. Overview

The mod\_cluster distribution includes a demo application that helps demonstrate how different server-side scenarios affect the routing of client requests by the load balancer. The demo application is located in the mod\_cluster distribution's demo directory.

The demo application consists of two components:

1. The first component is a war file that needs to be deployed in JBossWeb/Tomcat/JBoss AS. The war includes a number of servlets.
2. The second component is a GUI application that allows a user to launch a pool of threads that repeatedly make requests to the load balancer. The requests are ultimately routed to the demo war's primary servlet. The application tracks which servers are handling the requests and displays this information in a chart.

The application can also send separate requests to the demo war's load generation servlets, allowing the user to see how different load conditions affect the balancing of requests.

Note that the demo application does not actually depend on mod\_cluster in any way. Its only dependency is on JBossWeb/Tomcat.<sup>1</sup> Consequently, the demo can be used to demonstrate the effect of different server-side scenarios on the routing decisions made by any load balancer, including mod\_jk, mod\_proxy or the various hardware load balancers.

Note also that this demo application is not intended to be used as a load testing tool; i.e. something that can demonstrate the maximum load a cluster configuration can handle. Using it as such has a good chance of showing you the maximum load the client can generate rather than the maximum load your cluster can handle.

## 15.2. Basic Usage

To run the demo application:

1. Unpack the mod\_cluster distribution on your filesystem. Here we assume it has been unzipped to ~/mod\_cluster or C:\mod\_cluster.
2. Install mod\_cluster into your httpd server as described at [Installation of the httpd part](#)
3. Install mod\_cluster into your JBossAS/JBossWeb/Tomcat servers as described at [Installation on the Java side](#)

---

<sup>1</sup>The demo's "Datasource Use" load generation scenario requires the use of JBoss Application Server.

4. In AS7 you have to set `org.apache.tomcat.util.ENABLE_MODELER` to true, Something like:

```
<system-properties>  
  <property name="org.apache.tomcat.util.ENABLE_MODELER" value="true"/>  
</system-properties>
```

5. Start `httpd` and your `JBossAS`/`JBossWeb`/`Tomcat` servers

6. Deploy the `load-demo.war` found in the distribution's `demo/server` folder to your `JBossAS`/`JBossWeb`/`Tomcat` servers.

7. Start the demo application:

a. On `*nix`:

```
cd ~/mod_cluster/demo/client  
./run-demo.sh
```

b. On Windows:

```
C:\>cd mod_cluster\demo\client  
C:\mod_cluster\demo\client>run-demo
```



The screenshot shows a web application titled "Load Balancing Demonstration". It has four tabs: "Client Control", "Server Load Control", "Request Balancing", and "Session Balancing". The "Server Load Control" tab is currently selected. Below the tabs, there are several input fields and a button:

- Target Hostname:** A text input field containing "localhost".
- Target Port:** A text input field containing "8000".
- Load Creation Action:** A dropdown menu with "Connection Pool Use" selected.
- Number of Connections:** A text input field containing "50".
- Duration:** A text input field containing "15".
- Create Load:** A blue button with white text.

8. Configure the hostname and address of the httpd server, the number of client threads, etc and click the "Start" button. See [Client Driver Configuration Options](#) for details on the configuration options.
9. Switch to the "Request Balancing" tab to see how many requests are going to each of your JBossAS/JBossWeb/Tomcat servers.
10. Switch to the "Session Balancing" tab to see how many active sessions <sup>2</sup> are being hosted by each of your JBossAS/JBossWeb/Tomcat servers.
11. Stop some of your JBossAS/JBossWeb/Tomcat servers and/or undeploy the load-demo.war from some of the servers and see the effect this has on load balancing.
12. Restart some of your JBossAS/JBossWeb/Tomcat servers and/or re-deploy the load-demo.war to some of the servers and see the effect this has on load balancing.

13Experiment with adding artificial load to one or more servers to see what effect that has on load balancing. See [Load Generation Scenarios](#) for details.

Most of the various panels in application interface also present information on the current status on any client threads. "Total Clients" is the number of client threads created since the last time the "Start" button was pushed. "Live Clients" is the number of threads currently running. "Failed Clients" is the number of clients that terminated abnormally; i.e. made a request that resulted in something other than an HTTP 200 response.

### 15.3. Client Driver Configuration Options

The configuration of the client is driver is done via the application's "Client Control" tab.

The screenshot shows the 'Load Balancing Demonstration' application window. The title bar is blue with the text 'Load Balancing Demonstration'. Below the title bar is a tabbed interface with four tabs: 'Client Control', 'Server Load Control', 'Request Balancing', and 'Session Balancing'. The 'Client Control' tab is selected. The main area of the 'Client Control' tab contains the following controls:

- Target Hostname:** A text input field containing 'localhost'.
- Target Port:** A text input field containing '8000'.
- Load Creation Action:** A dropdown menu with 'Connection Pool Use' selected.
- Number of Connections:** A text input field containing '50'.
- Duration:** A text input field containing '15'.
- Create Load:** A button located below the input fields.

The panel includes the following options:

1. Proxy Hostname: Hostname of the load balancer or the IP address on which it is listening for requests<sup>3</sup>

2. Proxy Port: Port on which the load balancer is listening for requests <sup>4</sup>
3. Context Path: Portion of the request URL that specifies the request is for the load-demo.war
4. Session Life: Number of seconds a client thread should use a session before invalidating or abandoning it. Generally it is good to keep this to a small value; otherwise the use of session stickiness will prevent changes in server load from affecting the load balancer's routing decisions. With sticky sessions enabled (strongly recommended), it is the creation of a new session that allows the load balancer to try to balance load.
5. Invalidate: Controls what the client thread should do when it stops using a session because Session Life has passed. If checked, the driver will send a request that results in the session being invalidated. If unchecked, the session will just be abandoned, and will continue to exist on the server until Session Timeout seconds have passed. In the future this will likely be changed to a percentage input, so X% can be invalidated, the rest abandoned.
6. Session Timeout: Number of seconds a session can remain unused before the server is free to expire it. Unchecking Invalidate and setting a high value relative to Session Life allows a significant number of unused sessions to accumulate on the server.
7. Num Threads: Number of client threads to launch. Each thread repeatedly makes requests until the "Stop" button is pushed or a request receives a response other than HTTP 200.
8. Sleep Time: Number of ms the client threads should sleep between requests.
9. Startup Time: Number of seconds over which the application should stagger the start of the client threads. Staggering the start advised as it avoids the unnatural situation where for the life of the demonstration all sessions start at about the same time and then are invalidated or abandoned at the same time. Staggering the start allows the load balancer to continually see new sessions and decide how to route them.

## 15.4. Load Generation Scenarios

You can use the application's GUI to instruct individual servers to artificially generate various types of load, and then track how that load affects request and session balancing. Load generation is controlled via the application's "Server Load Control" tab.

The screenshot shows a web application titled "Load Balancing Demonstration". It has four tabs: "Request Control", "Server Load Control" (which is selected), "Request Balancing", and "Session Balancing". Below the tabs, there are several input fields and a button. The "Target Hostname" field contains "localhost". The "Target Port" field contains "8000". The "Load Creation Action" is a dropdown menu currently showing "Connection Pool Use". The "Number of Connections" field contains "50". The "Duration" field contains "15". A "Create Load" button is positioned below these fields.

Load Balancing Demonstration			
Request Control	Server Load Control	Request Balancing	Session Balancing
Target Hostname:	<input type="text" value="localhost"/>	Target Port:	<input type="text" value="8000"/>
Load Creation Action:	<div>Connection Pool Use ▼</div>		
Number of Connections	<input type="text" value="50"/>		
Duration	<input type="text" value="15"/>		
<div>Create Load</div>			

The panel includes the following options:

- Target Hostname and Target Port: The hostname or IP address of the server on which you want load generated. There are two strategies for setting these:
  1. You can use the hostname and port of the load balancer, in which case the load balancer will pick a backend server and route the request to it. Note the client application does not maintain a session cookie for these requests, so if you invoke another server load generation request, you shouldn't expect the same server to handle it.
  2. If the JBoss AS/JBossWeb/Tomcat servers are running the HttpConnector as well as the AJP connector, you can specify the address and port on which a particular server's HttpConnector is listening. The standard port is 8080.
- Load Creation Action: Specifies the type of load the target server should generate. See below for details on the available load types.

- Params: Zero or more parameters to pass to the specified load creation servlet. For example, in the screenshot above, Number of Connections and Duration. How many parameters are displayed, their name and their meaning depend on the selected Load Creation Action. The label for each parameter includes a tooltip that explains its use.

The available Load Creation Actions are as follows:

#### Active Sessions

Generates server load by causing session creation on the target server.

#### Datasource Use

Generates server load by taking connections from the java:DefaultDS datasource for a period

#### Connection Pool Use

Generates server load by tying up threads in the webserver connections pool for a period

#### Heap Memory Pool Use

Generates server load by filling 50% of free heap memory for a period

#### CPU Use

Generates server CPU load by initiating a tight loop in a thread

#### Server Receive Traffic

Generates server traffic receipt load by POSTing a large byte array to the server once per second for a period

#### Server Send Traffic

Generates server traffic send load by making a request once per second to which the server responds with a large byte array


#### Request Count

Generates server load by making numerous requests, increasing the request count on the target server




# Change Log


## 16.1. 1.3.1.Final (6 May 2015)

	MODCLUSTER-344 Pings for HTTP/HTTPS connections are now sent by default, can be disabled by "EnableOptions Off"
---	---









## 16.2. 1.3.0.Final (06 February 2014)

	MODCLUSTER-288 Drop SystemMemoryUsageLoadMetric altogether
---	--

## 16.3. 1.2.6.Final (07 September 2013)





	MODCLUSTER-360 mod_proxy_cluster.h doesn't contain the right information
--	--

## 16.4. 1.2.5.Final (30 August 2013)




	MODCLUSTER-334 mod_cluster core when use ProxyPass / balancer://bal and CreateBalancers 1
	MODCLUSTER-335 Regression in ProxyPass integration
	MODCLUSTER-339 "proxy: DNS lookup failure" with IPv6 on Solaris
	MODCLUSTER-345 http_handle_cping_cpong with EnableOptions and HTTPS connector
	MODCLUSTER-347 mod_cluster-manager may break up aliases from a single VirtualHost, causing a messy page
	MODCLUSTER-332 Add Engine.getExecutor() to container SPI
	HTTP httpd-2.4.x doesn't like the extra CRLF.
	MODCLUSTER-349 mod_manager truncates ENABLE-APP messages.

	Fix ap_proxy_make_fake_req in 2.4.x
---	-------------------------------------






### 16.5. 1.2.4.Final (24 April 2013)

	MODCLUSTER-315 Convert project to use i18n logging and exceptions
	MODCLUSTER-328 mod_cluster doesn't recognize ? as a proper context delimiter causing 503s on requests with query strings
	JBPAPP-9493 mod_cluster returns "Bad Gateway" HTTP ErrorCode 502 with https
	MODCLUSTER-326 rename NMAKEmakefile to NMAKEmakefile.example




### 16.6. 1.2.3.Final (18 October 2012)

	JBPAPP-9788 Tomcat with mod_cluster refuses to shut down
	JBPAPP-10168 Option sessionDrainingStrategy in mod_cluster listener in tomcat causes an exception
	JBPAPP-10147 The shutdown port of tomcat is released before performing actual shut down










### 16.7. 1.2.2.Final (06 September 2012)

	JBPAPP-9493 mod_cluster returns "Bad Gateway" HTTP ErrorCode 502 with https
	JBPAPP-9791 mod_rewrite + mod_cluster: one kind of "proxying" RewriteRules don't work on Windows
	MODCLUSTER-224 when using tomcat manager webapp to stop/start an application the start is ignored by mod_cluster
	MODCLUSTER-322 Using AverageSystemLoadMetric can improperly cause a Load Factor of 0
	MODCLUSTER-312 port JBPAPP-8956 to 1.2.x








	MODCLUSTER-311 mod_manager doesn't handle multiple virtualhosts per node
	MODCLUSTER-309 mod_proxy_cluster not checking all available balancers (but only the first one) for an available route
	JBPAPP-8957 Segmentation Fault when you run two or more JBoss Server Cluster behind *ONE* Apache Server on RHEL 6

## 16.8. 1.2.1.Final (03 May 2012)












	MODCLUSTER-304 Port to httpd 2.4
	MODCLUSTER-305 ProxyPass can break StickySession
	MODCLUSTER-297 Warnings when compiling mod_cluster
	MODCLUSTER-192 Add SSL stuff in the FAQ
	MODCLUSTER-298 mod_cluster doesn't work with IPv6.
	MODCLUSTER-289 MemManagerFile creates directory but put files in ..
	MODCLUSTER-290 mod_cluster's mod_advertise can not start on IPv6-only box
	MODCLUSTER-279 mod_cluster returns 503s after STATUS
	MODCLUSTER-281 Make stickySessionForce default to false in native part from 1.2.0 release

## 16.9. 1.2.0.Final (06 February 2012)

	Fix CVE-2011-4608: Add EnableMCPMReceive in configuration. (JBPAPP-7708)
	mod_proxy code for old httpd versions needs to be updated. (MODCLUSTER-227)
	Missing Documentation For mod_cluster with JBoss AS5. (MODCLUSTER-248)
	sticky-session-force change requires httpd restart. (MODCLUSTER-273)

	mod_cluster management console/Status does not show exact mod_cluster version. (MODCLUSTER-256)
---	---

### 16.10. 1.2.0.Beta4 (26 January 2012)

	read-attribute and :write-attribute Error in AS7. (MODCLUSTER-246)
	routing table lookup creates performance issues.. (MODCLUSTER-252)
	Error 503 using mod_cluster: CVE-2011-3348. (MODCLUSTER-258)
	warning while compiling on some lab boxes. (MODCLUSTER-266)
	String index out of range: -1 with a lot of nodes/ deploymentswarning while compiling on some lab boxes. (MODCLUSTER-266)
	404 while/just after removing a node. (MODCLUSTER-272)
	ProxyPass doesn't work with mod_cluster whne mixing mod_cluster and other scheme handlers404 while/just after removing a node. (MODCLUSTER-274)
	mod_cluster forgets removed node too fast. (MODCLUSTER-231)
	Allow context lengths greater than 40 (MODCLUSTER-236)
	Increase the MAXMESSIZE and allow it to be configurable via a parameter. (MODCLUSTER-244)
	Calculate the MAXMESSIZE dynamically. (MODCLUSTER-245)

### 16.11. 1.2.0.Beta3 (03 January 2012)






Code reorganisation

### 16.12. 1.2.0.Beta2 (11 December 2011)





	
---	--

	Load-demo application does not work with AS7. (MODCLUSTER-259)
--	--





### 16.13. 1.2.0.Beta1 (06 December 2011)







	Modify jbossweb metrics to use service provider spi, instead of jmx. (MODCLUSTER-151)
	mod_cluster throws warnings at shutdown in AS7. (MODCLUSTER-143)
	Refactor mod_cluster to allow implementations for other application servers. (MODCLUSTER-105)
	AS7 integration. (MODCLUSTER-219)
	Refactor project into modules for HA, catalina, core, etc. (MODCLUSTER-112)

### 16.14. 1.1.3.Final (12 August 2011)








	request hang with a node is stopped in EC2 (MODCLUSTER-217) (jfclere)
	Extra ENABLE-APP/REMOVE-APP event after failover (MODCLUSTER-220) (jfclere)
	mod_cluster does not work with Tomcat 7 due to API Change in Connector (MODCLUSTER-240) (jfclere)
	kill -HUP httpd process increase the number of open locks (MODCLUSTER-241) (jfclere)






### 16.15. 1.1.2.Final (21 April 2011)

	mod_cluster failover does not work for a / webappcontext when the / root context exists (MODCLUSTER-188) (jfclere)
	UseAlias broken (MODCLUSTER-212) (jfclere)
	mod_rewrite PT doesn't work (MODCLUSTER-213) (jfclere)
	memory usage growing in httpd (MODCLUSTER-214) (jfclere)











	Second attempt to connect from Jboss to apache module sends incomplete Host Header (MODCLUSTER-216) (jfclere)
	when using tomcat manager webapp to stop/start an application the start is ignored by mod_cluster (MODCLUSTER-224) (jfclere)
	Unable to override load properties when running in Tomcat 6 (MODCLUSTER-232) (jfclere)
	Documentation contains wrong default loadMetric class name (MODCLUSTER-233) (jfclere)
	mod_cluster should issue a warning when Maxcontext is reached and no more context will be taken (MODCLUSTER-223) (jfclere)
	add a note explaining where Maxcontext must be put in httpd.conf and issue error if in wrong location (MODCLUSTER-225) (jfclere)



### 16.16. 1.1.1.Final (31 January 2011)

	NPE when overriding default load metric in ModClusterListener (MODCLUSTER-183) (pferraro)
	mod_cluster failover does not work for a / webappcontext when the / root context exists (MODCLUSTER-188) (jfclere)
	mod_cluster issues an ENABLE-APP too early in the webapp lifecycle (MODCLUSTER-190) (jfclere)
	mod_cluster 1.1.0 docs step 11.1.4.3 is wrong (MODCLUSTER-193) (jfclere)
	Incorrect routing of requests when one context root is the prefix of another (MODCLUSTER-196) (jfclere)
	Can only rewrite from the root context in httpd if there is a root context deployed in JBoss (MODCLUSTER-198) (jfclere)
	the STATUS MCMP message is send before the connector is started (MODCLUSTER-202) (jfclere)










	The windoze bundle don't have the default configuration (MODCLUSTER-205) (jfclere)
	httpd cores after graceful restart after the mod_cluster configuration is added (MODCLUSTER-206) (jfclere)
	Make logging on Tomcat use JDK14LoggerPlugin by default (MODCLUSTER-185) (pferraro)
	update mod_cluster to use HTTP/1.1 (MODCLUSTER-201) (jfclere)
	Add support for system properties used in 1.0.x (MODCLUSTER-207) (pferraro)

## 16.17. 1.1.0.Final (13 August 2010)






	Demo servlets throw InstanceNotFoundException against EAP5 (MODCLUSTER-170) (pferraro)
	mod_advertise: Invalid ServerAdvertise Address too often (MODCLUSTER-172) (jfclere)
	Fix class name of MBeanAttributeRatioLoadMetric in MC config (MODCLUSTER-174) (pferraro)
	Wrong configuration could cause an httpd core (MODCLUSTER-175) (jfclere)
	Advertise not configured error message in log is actually a warning (MODCLUSTER-176) (jfclere)
	Better no servers connected message (MODCLUSTER-165) (jfclere)
	How does the UI deal with 20 or more servers (MODCLUSTER-165) (jfclere)
	mod_cluster should use hostname provided in address instead a IP address (MODCLUSTER-168) (pferraro)
	Read only view of mod_cluster-manager (MODCLUSTER-181) (jfclere)
	Demo client throws Bus Error when run with JDK 1.6 on OSX (MODCLUSTER-169) (jfclere)





	Use versioned docs (MODCLUSTER-141) (jfclere, pferraro)
	Deprecate use of term "domain" (MODCLUSTER-177) (jfclere, pferraro)

## 16.18. 1.1.0.CR3 (15 June 2010)










	Rpc failure can lead to failure to deploy a webapp (MODCLUSTER-140) (pferraro)
	Quotes in jsessionId causing sticky sessions to fail (MODCLUSTER-146) (jfclere)
	ManagerBalancerName doesn't work (MODCLUSTER-153) (jfclere)
	Parsing of IPv6 loopback address fails (MODCLUSTER-156) (pferraro)
	SystemMemoryUsageLoadMetric returns wrong load metric (MODCLUSTER-157) (pferraro)
	Clean shutdown logic can still inadvertently kill requests for non-distributed contexts. (MODCLUSTER-159) (pferraro)
	NoClassDefFoundError running demo app against AS6 (MODCLUSTER-161) (pferraro)
	Allow override of default clean shutdown behavior (MODCLUSTER-139) (pferraro)
	Avoid unnecessary open sockets for non-master nodes (MODCLUSTER-158) (pferraro)












## 16.19. 1.1.0.CR2 (11 May 2010)

	Add the lifecycle listener dynamically (MODCLUSTER-20) (pferraro)
	Use UUID for auto-generated jvmRoute (MODCLUSTER-142) (pferraro)
	improve packaging so that the bundle can run in ~ too (MODCLUSTER-150) (jfclere)
	jboss.mod_cluster.proxyList: invalid hosts cause mod-cluster startup to be delayed (MODCLUSTER-155) (pferraro)
	



	mod_cluster 1.1.0.CR1 doesn't work with Tomcat (MODCLUSTER-143) (jfclere/pferraro)
	Allow configuration of stopContextTimeout units (MODCLUSTER-138) (pferraro)
	Add a solaris10 64 bits sparc in the bundles (MODCLUSTER-137) (jfclere)
	INFO and mod_cluster_manager/ displays milliseconds and DUMP second (MODCLUSTER-128) (jfclere)
	Make mod_cluster manager tolerant to F5 page refresh when disabled context (MODCLUSTER-124) (jfclere)

## 16.20. 1.1.0.CR1 (22 March 2010)


















	Update httpd to 2.2.25. (MODCLUSTER-134) (jfclere)
	Apache with mod_cluster refuses to start at first, but after 7 retries it starts up (MODCLUSTER-120) (jfclere)
	Add getLoad() to load metric mbean interface (MODCLUSTER-130) (pferraro)
	Disable "cnone" request parameter to ease remote invocation on mod_cluster-manager (MODCLUSTER-127) (jfclere)
	Microcontainer does not always choose the right constructor when creating ModClusterService (MODCLUSTER-116) (pferraro)
	Microcontainer does not choose the right constructor when creating RequestCountLoadMetric (MODCLUSTER-126) (pferraro)
	Mod_cluster does support more that 3 Alias in <Host/> (MODCLUSTER-121) (jfclere)
	Allow toggling of context auto-enable during mod_cluster startup. (MODCLUSTER-125) (pferraro)
	

	STATUS should retry the worker even if there was an error before. (MODCLUSTER-133) (jfclere)
	Split ModClusterServiceMBean.ping(String) into 3 methods (MODCLUSTER-110) (pferraro/jfclere)
	Use clean shutdown by default, leveraging STOP-APP-RSP for <distributed/> contexts and session draining for non-distributed contexts. mod_cluster shutdown now triggered earlier via Connector JMX notification. (MODCLUSTER-131) (pferraro/jfclere)
	move the web site to magnolia (MODCLUSTER-114) (.org team)
	ping and nodeTimeout interact. (MODCLUSTER-132) (jfclere)
	update mod_jk to 1.2.30 (MODCLUSTER-138) (jfclere)
	query string is truncated to (MODCLUSTER-118) (jfclere)
	AdvertiseBindAddress does not default to the 23364 port (MODCLUSTER-119) (jfclere)
	Skip load balance factor calculation if there are no proxies to receive status message (MODCLUSTER-103) (pferraro)
	Disabling contexts does not work (MODCLUSTER-123) (jfclere)
	advertise doesn't use new AdvertiseSecurityKey on graceful restarts. (MODCLUSTER-129) (jfclere)
	Load-demo.war specifies obsolete servlet in web.xml (MODCLUSTER-113) (pferraro)

## 16.21. 1.1.0.Beta1 (30 October 2009)

	Interaction with mod_rewrite looks weird for end-users. (MODCLUSTER-86) (jfclere)
	admin-console should be in the excludedContexts. (MODCLUSTER-87) (pferraro)



	ClassCastException upon redeploy after mod-cluster-jboss-beans.xml modification. (MODCLUSTER-88) (pferraro)
	Alias from webapps/jboss-web.xml are not handled correctly in mod_cluster. (MODCLUSTER-89) (jfclere)
	Display version. (MODCLUSTER-90) (jfclere)
	Connector bind address of 0.0.0.0 propagated to proxy. (MODCLUSTER-91) (pferraro)
	Display status of the worker. (MODCLUSTER-92) (jfclere)
	Update httpd to latest version. (MODCLUSTER-93) (jfclere)
	getProxyInfo failed when there are too many nodes. (MODCLUSTER-94) (jfclere)
	mod_cluster-manager display corrupted with jboss starting. (MODCLUSTER-95) (jfclere)
	DISABLE application active as STOPPED. (MODCLUSTER-96) (jfclere)
	Httpd should remove workers it can't ping. (MODCLUSTER-97) (jfclere)
	Linux mod_cluster_manager display zero instead values. (MODCLUSTER-98) (jfclere)
	mod_cluster_manager doesn't seem to ENABLE/DISABLE the right context. (MODCLUSTER-99) (jfclere)
	load balancing logic doesn't allow manual demo of load-balancing. (MODCLUSTER-100) (jfclere)
	404 errors when load is increasing. (MODCLUSTER-102) (jfclere)
	Advertise security key verification does not work. (MODCLUSTER-104) (jfclere)
	Allow advertise listener to listen on a specific network interface. (MODCLUSTER-106) (pferraro)
	Allow thread factory injection for advertise listener. (MODCLUSTER-108) (pferraro)



Create SPI and isolate tomcat/jbossweb usage into service provider implementation. (MODCLUSTER-111) (pferraro)

# Frequently Asked questions

## 17.1. What is Advertise

Advertise allows autodiscovery of httpd proxies by the cluster nodes. It is done by sending multicast messages from httpd to the cluster. The httpd specialized module: mod\_advertise sends UDP message on a multicast group, both mod\_advertise and the cluster listener joined the multicast group and the cluster receives the messages.

Example for mod\_advertise message:

```
HTTP/1.0 200 OK
Date: Wed, 08 Apr 2009 12:26:32 GMT
Sequence: 16
Digest: f2d5f806a53effa6c67973d2ddcdd233
Server: 1b60092e-76f3-49fd-9f99-a51c69c89e2d
X-Manager-Address: 127.0.0.1:6666
X-Manager-Url: /bla
X-Manager-Protocol: http
X-Manager-Host: 10.33.144.3
```

The X-Manager-Address header value is used by the cluster logic to send information about the cluster to the proxy. It is the IP and port of the VirtualHost where mod\_advertise is configured or URL parameter of the ServerAdvertise directive.

See [Proxy Discovery](#) in Configuration Properties and [mod\\_advertise](#) in Apache httpd configuration.

## 17.2. What to do if I don't want to use Advertise (multicast):

In the VirtualHost receiving the MCPM of httpd.conf don't use any Advertise directive or use:

```
ServerAdvertise Off
```

In mod\_cluster-jboss-beans.xml add the addresses and ports of the VirtualHost to the proxyList property and set advertise to false, for example:

```
<property name="proxyList">10.33.144.3:6666,10.33.144.1:6666</property>
<property name="advertise">false</property>
```

In server.xml (with JBossweb/Tomcat)

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

### 17.3. I am using Tomcat 7 / 6 what should I do:

See at the end of [java configuration](#). You can't use the mod\_cluster clustered mode with Tomcat so you get a loadbalancing logic similar to mod\_jk but with a dynamic configuration.

### 17.4. It is not working what should I do:

Most likely you have a configuration problem. Check the log of the cluster nodes and error\_log of httpd.

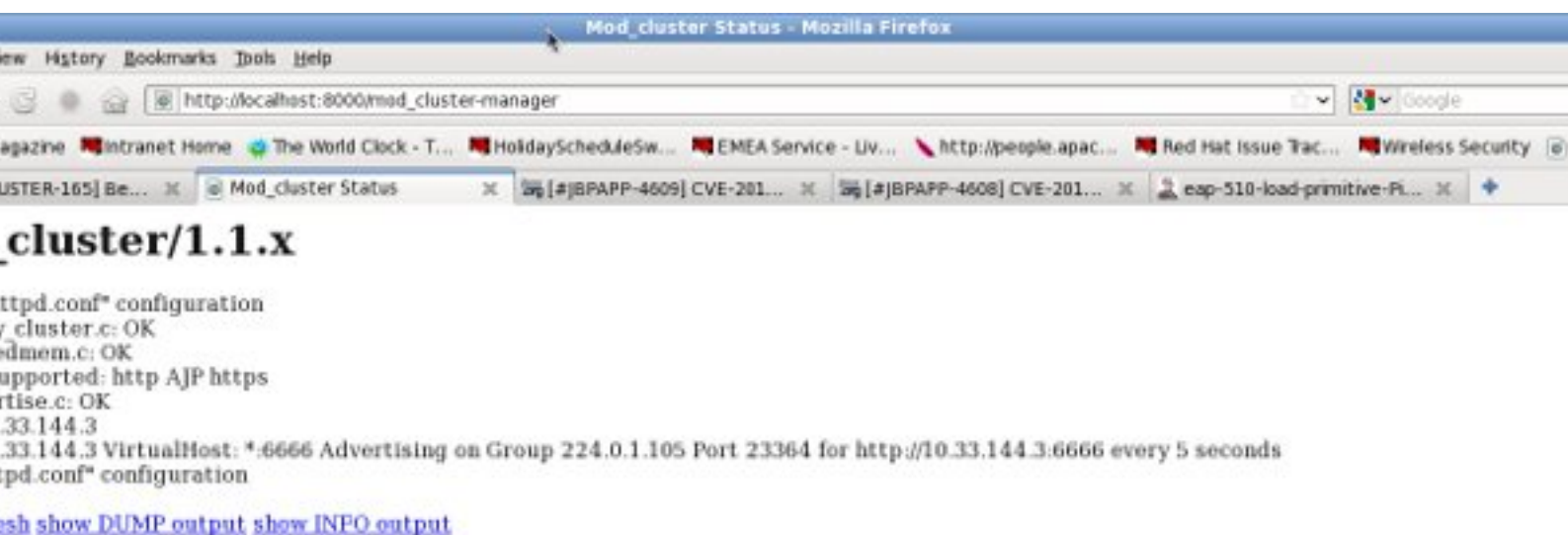
#### 17.4.1. No error

That happens when Advertise is not working: The nodes don't get the [advertise messages](#) from httpd.

1. Check the modules are loaded and Advertise is started. In httpd.conf activate extended information display, add:

```
AllowDisplay On
```

When accessing to the [mod\\_cluster\\_manager](#) you should get something like:



If not, go to the [Minimal Example](#) and add the missing directive(s).

2. Check that Advertise message are received on the cluster node. A [small Java](https://github.com/modcluster/mod_cluster/blob/master/test/java/Advertize.java) [https://github.com/modcluster/mod\_cluster/blob/master/test/java/Advertize.java] utility could be used to check Advertise. It is in the mod\_cluster repository and can be compiled using javac. A compiled version can be found under in /opt/jboss/httpd/tools in the bundles. Run it using java Advertise multicastaddress port. The output should be something like:

```
[jfclore@jfcpc java]$ java Advertize 224.0.1.105 23364
ready waiting...
received: HTTP/1.0 200 OK
Date: Mon, 28 Jun 2010 07:30:31 GMT
Sequence: 1
Digest: df8a4321fa99e5098174634f2fe2f87c
```

```
Server: 1403c3be-837a-4e76-85b1-9dfe5ddb4378
X-Manager-Address: test.example.com:6666
X-Manager-Url: /1403c3be-837a-4e76-85b1-9dfe5ddb4378
X-Manager-Protocol: http
X-Manager-Host: test.example.com
```

### 3. No Advertise messages

Check firewall (don't forget the boxes firewall). Advertise uses UDP port 23364 and multicast address 224.0.1.105

### 4. Can't get Advertise messages

Use ProxyList property. In case Advertise can't work you put the address and port of the VirtualHost used in httpd to receive the MCMP. In server/profile/deploy/mod\_cluster.sar/META-INF/mod\_cluster-jboss-beans.xml

```
<property name="proxyList">test.example.com:6666</property>
```

or in server.xml:

```
<Listener

    proxyList="test.example.com:6666"/>
```

## 17.4.2. Error in server.log or catalina.out

### 1. "IO error sending command ":

Check firewall and error\_log if there is nothing error\_log then it is a firewall problem. If you have something like:

```
18:36:14,533 INFO [DefaultMCMPhandler] IO error sending command INFO to proxy jfcp/
10.33.144.3:8888
```

You can use telnet hostname/address port to check by hands that it is OK for example:

```
[jfclore@jfcpc docs]$ telnet 10.33.144.3 8888
Trying 10.33.144.3...
Connected to jfcpc.
Escape character is '^['.
```

```
GET /
```

```
<html><body><h1>It works!</h1></body></html>Connection closed by foreign host.
```

Check that the address and port are the expected ones you may use ServerAdvertise On `http://hostname:port`, like:

ServerAdvertise On `http://localhost:6666`

Or use the servlet `testhttpd` in the `testhttpd.war` of the bundle (in `/opt/jboss/httpd/tools`). Install/ deploy it in the node and start the AS/Tomcat on the node, then access to the node directly and call `/testhttpd/testhttpd`



If you don't get a similar page the output should help to find that is wrong.

### 17.4.3. Error in error\_log

1. "client denied by server configuration":

The directory in the VirtualHost is not allowed for the client. If you have something like:

```
Mon Jun 28 18:08:47 2010] [error] [client 10.33.144.3] client denied by server configuration: /
```

You need to have something like:

```
<Directory />  
  Order deny,allow  
  Deny from all  
  Allow from 10.33.144.3  
</Directory>
```

### 17.5. I have "HTTP/1.1 501 Method Not Implemented"

You need to configure [EnableMCPMReceive](#) in the VirtualHost where you received the MCMP elements in the Apache httpd configuration. Something like:

```
<VirtualHost localhost:6666>  
  <Directory />  
    Order deny,allow  
    Deny from all  
    Allow from 127.0.0.1  
  </Directory>  
  ServerAdvertise on http://localhost:6666  
  EnableMCPMReceive  
</VirtualHost>
```

### 17.6. Redirect is not working:

When using http/https instead AJP proxyname, proxyhost and redirect must be configured in the Connector. Something like:

```
<Connector port="8080" protocol="HTTP/1.1"  
  connectionTimeout="20000"  
  proxyName="httpd_host_name"
```



I have more than one Connector mod\_cluster  
does use the right one

```
proxyPort="8000"  
redirectPort="443" />
```

## 17.7. I have more than one Connector mod\_cluster does use the right one

Mod\_cluster tries to use the first AJP connector configured. If there isn't any AJP connector it uses the http or https that has the biggest maxthreads value. That is "maxThreads" in Tomcat and JBossAS4/5/6:

```
<Connector port="8080" protocol="HTTP/1.1" maxThreads="201" />
```

Or "max-connections" in AS7: (32 \* processor + 1 for native and 512 \* processor + 1 for JIO).

```
<connector name="http" protocol="HTTP/1.1" scheme="http" socket-binding="http" max-connections="513" />
```

## 17.8. Chrome can't display /mod\_cluster\_manager page

When using chrome with mod\_cluster\_manager the page is not displayed and the following error is displayed:

Error 312 (net::ERR\_UNSAFE\_PORT): Unknown error.

you can change the port of the VirtualHost to 7777 or any value chrome accepts or add:

```
--explicitly-allowed-ports=6666
```

to the start parameters of chrome.

## 17.9. Using mod\_cluster and SELinux.

Mod\_cluster needs to open port and create shared memory and files, therefore some permissions have to be added, you need to configure something like:

```
policy_module(mod_cluster, 1.0)
```

```
require {
    type unconfined_java_t;
    type httpd_log_t;
    type httpd_t;
    type http_port_t;
    class udp_socket node_bind;
    class file write;
}

#===== httpd_t =====

allow httpd_t httpd_log_t:file write;
corenet_tcp_bind_generic_port(httpd_t)
corenet_tcp_bind_soundd_port(httpd_t)
corenet_udp_bind_generic_port(httpd_t)
corenet_udp_bind_http_port(httpd_t)

#===== unconfined_java_t =====
allow unconfined_java_t http_port_t:udp_socket node_bind;
```

Put the above in a file for example `mod_cluster.te` and generate the `mod_cluster.pp` file (for example in Fedora 16):

```
[jfclerc@jfcpc docs]$ make -f /usr/share/selinux/devel/Makefile
Compiling targeted mod_cluster module
/usr/bin/checkmodule: loading policy configuration from tmp/mod_cluster.tmp
/usr/bin/checkmodule: policy configuration loaded
/usr/bin/checkmodule: writing binary representation (version 14) to tmp/mod_cluster.mod
Creating targeted mod_cluster.pp policy package
rm tmp/mod_cluster.mod.fc tmp/mod_cluster.mod
```

The `mod_cluster.pp` file should be proceeded by `semodule` as root:

```
root@jfcpc docs]# semodule -i mod_cluster.pp
[root@jfcpc docs]#
```

## 17.10. System properties to modify behaviour

`org.jboss.modcluster.container.catalina.status-frequency` (default: 1) send STATUS messages only 1/n periodic event (tomcat, jbossweb). The events occur every `backgroundProcessorDelay` (default 10 seconds).

