



# Demystifying Tomcat and cPanel

Stephen Bee



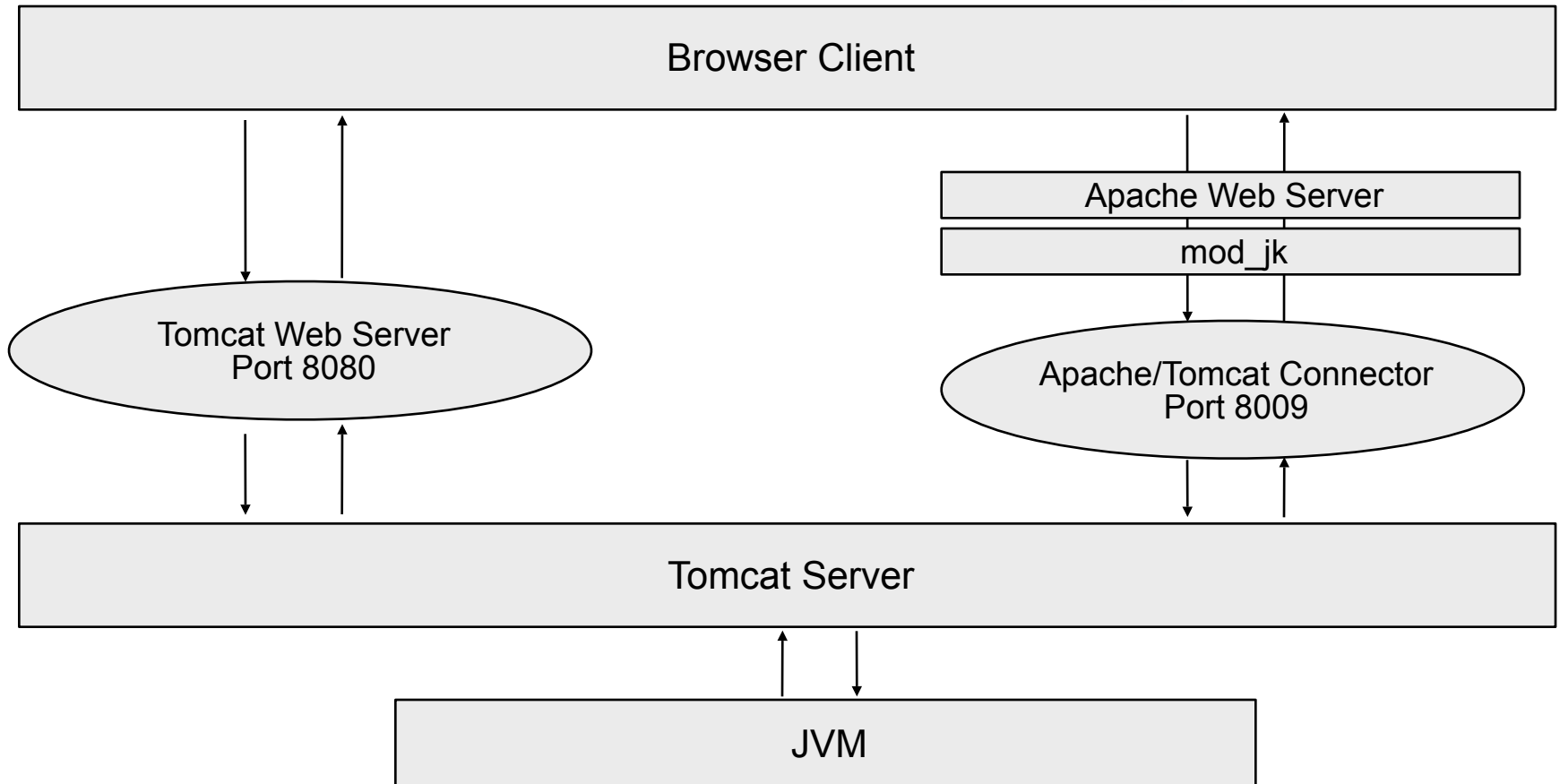
**All trademarks used herein are  
the sole property of their  
respective owners.**

## What is Tomcat?

- »» A Java driven Web Application Server
  - <http://tomcat.apache.org/>
- »» Provides support for Java web applications
  - JSP Documents
  - WAR (**W**eb **A**pplication **aR**chive) files
- »» Has a self-contained HTTP server



# The course of a Tomcat request



## Benefits (and down falls) of Tomcat

- » Easy to install
- » JVM and application libraries are pre-loaded
  - **Pro:** Things only need to be compiled once
  - **Con:** Requires a hefty chunk of memory



# Installation



# **Installation Requirements**

**Any supported Linux distribution.**

»» FreeBSD is not currently supported.

»» [Click here for cPanel's system requirements](#)



# **Installation Requirements**

**An EasyApache 3 equipped cPanel system.**

➤➤ Tomcat is no longer managed through WHM -> Plugins



# Installation Requirements

**An experienced Tomcat admin!**

- » Application deployment will require administrative action
- » cPanel only configures and removes virtual hosts



# Installing Tomcat in WHM

WHM -> Software -> Apache Update

1. Profile → 2. Apache Version → 3. PHP Major Version → 4. PHP Minor version → 5. Short Options List -



## Short Options List

Please choose specific options:

☒ **Tomcat** [[More Info ↑](#)]

*v5.5.25 - Experts ONLY: Do not install this unless you have a tomcat admin.*



# Confirming the Installation Worked

**<http://server.example.com:8080/jsp-examples/>**



Execute the example



Look at the source code for the example



Return to this screen

Tip: For session scoped beans to work, the cookies must be enabled. This can be done using browser options.

## JSP 2.0 Examples

### **Expression Language**

Basic Arithmetic



[Execute](#)



[Source](#)

Basic Comparisons



[Execute](#)



[Source](#)

Implicit Objects



[Execute](#)



[Source](#)

Functions



[Execute](#)



[Source](#)



## **What's Installed?**



# What's Installed?

## The Java Development Kit (JDK)

- » Contains the JRE (Java Runtime Environment)
- » Installed to **/usr/local/jdk/**
  - Commonly referred to as **\$JAVA\_HOME**



# What's Installed?

## The binary Tomcat distribution

- » Is pre-compiled Java byte code. Is simply downloaded and extracted
- » Installs to **`/usr/local/jakarta/apache-tomcat-${VERSION}`**
- » **`/usr/local/jakarta/tomcat/`** is a symbolic link to the installation directory
  - Is also known as **`$CATALINA_HOME`** and/or **`$CATALINA_BASE`**



# What's Installed?

## Apache Tomcat Connectors (mod\_jk)

- » Provides the ability for Apache to communicate with Tomcat
- » Installed as **mod\_jk.so** in your Apache modules directory



# What's Installed?

## **cPanel provisioned maintenance scripts**

- » Used in favour of the Tomcat initialization scripts
- » Creates and removes Tomcat virtual hosts



## The start up process



## Start up :: Initialization Scripts

- »» /usr/sbin/stoptomcat
- »» /usr/sbin/starttomcat
- »» /scripts/restartsrv\_tomcat



## Start up :: /usr/sbin/starttomcat

- » Called from **/etc/rc.local** during boot process
- » Defines the following important environment variables:

**CATALINA\_HOME**  
/usr/local/jakarta/tomcat

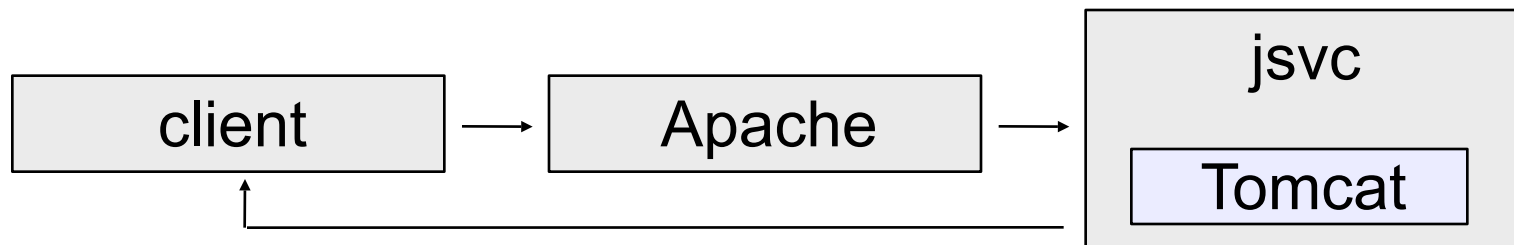
**CATALINA\_BASE**  
/usr/local/jakarta/tomcat

**JAVA\_HOME**  
The path to the JDK



## Start up :: jsvc

- » Called by `/usr/sbin/starttomcat`
- » Located at `/usr/local/jakarta/tomcat/bin/jsvc`
- » Acts as a wrapper for and daemonizes Tomcat
  - Has control of Tomcat's ports
- » <http://commons.apache.org/daemon/jsvc.html>





## Start up :: jsvc :: Logging

- » Logs to `/usr/local/jakarta/tomcat/logs/catalina.out`
- » Three log levels exist: **SEVERE**, **WARNING**, and **INFO**

```
SEVERE: Error starting endpoint  
java.net.BindException: Address already in use:8080  
at org.apache.tomcat.util.net.PoolTcpEndpoint.initEndpoint(PoolTcpEndpoint.java:298)
```

**Tail the logs for SEVERE and WARNING messages only:**

```
tail -f /usr/local/jakarta/tomcat/logs/catalina.out | egrep -A2 '(SEVERE|WARNING):' &
```



## Start up :: Starting the JVM

- » Tomcat loads the JVM at start up
- » JVM start up information is logged to **catalina.out**
- » All libraries are pre-loaded into memory for efficiency

```
[Opened /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
[Loaded java.lang.Object from /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
[Loaded java.io.Serializable from /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
[Loaded java.lang.Comparable from /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
[Loaded java.lang.CharSequence from /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
[Loaded java.lang.String from /usr/local/jdk1.6.0_02/jre/lib/rt.jar]
..... truncated .....
```



# Start up :: Auto Deploying Applications

- » By default, all WAR files are automatically deployed at start up
  - Can be disabled on a per-host basis with the **deployOnStartup** attribute

```
Loaded org.apache.catalina.startup.HostConfig
DeployedApplication from file:/usr/local/jakarta/apache-tomcat-5.5.25/server/lib/catalina.jar
May 22, 2008 5:12:48 PM org.apache.catalina.startup.HostConfig deployWAR
INFO: Deploying web application archive example.war
```



## Start up :: Knowing when it's completed

- »» Pre-loading all libraries can take quite some time
- »» Applications will be inaccessible until pre-loading completes
- »» Start time in **catalina.out** indicates that start up has completed

**INFO: Server startup in 3740 ms**



# Customizing the Environment



# Start up :: Customizing the Environment

- » `/var/cpanel/tomcat.options`
- » Each argument is defined on a separate line
- » Arguments are parsed, and passed to `jsvc`

**Complete list of JVM and `jsvc` options:**

- <http://blogs.sun.com/watt/resource/jvm-options-list.html>
- `/usr/local/jakarta/tomcat/bin/jsvc -help`



# Customization :: Resource Constraints

»» Place the following in `/var/cpanel/tomcat.options`

```
-Xmx200M  
-Xms100M
```

»» The following should now be output from `/scripts/restartsrv_tomcat`

```
Adding in custom Tomcat option(s): -Xmx200M  
Adding in custom Tomcat option(s): -Xms100M
```



# Tomcat Configuration



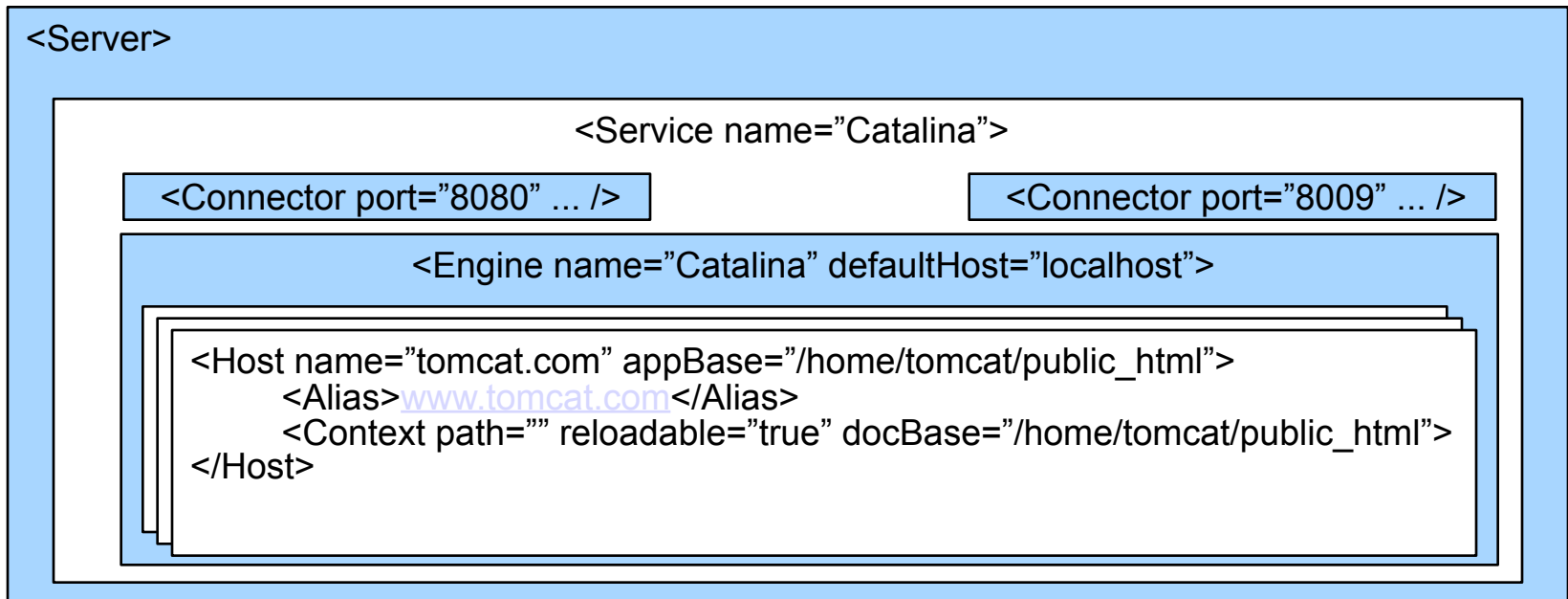
## Configuration :: General

- » Configuration files reside in **/usr/local/jakarta/tomcat/conf/**
- » Most configurations are stored in XML formatted documents
- » Tomcat must be restarted for changes to take effect
  - **/scripts/restartsrv\_tomcat**



## Configuration :: server.xml

- » Configures Virtual Hosts, Connectors, and more.
- » Each instance of Tomcat has it's own **server.xml**



<http://tomcat.apache.org/tomcat-5.5-doc/config/index.html>



## **Configuration :: Connectors**

- » Facilitates communication between applications and the clients
- » Each Connector creates a worker process with a unique port

### **Standalone Web Server - Operates over HTTP**

```
<Connector port="8080" maxHttpHeaderSize="8192" maxThreads="150" minSpareThreads="25"
maxSpareThreads="75" enableLookups="false" redirectPort="8443" acceptCount="100"
connectionTimeout="20000" disableUploadTimeout="true" />
```

### **AJP – A more efficient binary format**

```
<Connector port="8009" enableLookups="false" redirectPort="8443" protocol="AJP/1.3" />
```



## Configuration :: Context

- » Creates a mapping to a web application
- » The default (blank) context is always required

```
<Context path="/register" docBase="/home/joe/public_html/register.war"/>
```

http:// www.example.com / register / Checkout  
Virtual Host Context Application  
Parameter



# **The Front End**

## **Apache Connectors (mod\_jk)**



# **The Front End :: Apache Connectors**

- » Installed in Apache module directory (**mod\_jk.so**)
- » Forwards applications requests to the Tomcat workers
- » Configured on a per-site basis

## **Module Documentation:**

<http://tomcat.apache.org/connectors-doc/reference/apache.html>



# Front End :: Module Configuration

**/usr/local/apache/conf/httpd.conf**

```
LoadModule jk_module modules/mod_jk.so
```

**/usr/local/apache/conf/jk.conf**

```
JkWorkersFile /usr/local/jakarta/tomcat/conf/workers.properties
JkLogFile /usr/local/apache/logs/mod_jk.log
JkLogLevel info
JkLogStampFormat "[%a %b %d %H:%M:%S %Y] "
JkOptions +ForwardKeySize +ForwardURISCompat -ForwardDirectories
JkRequestLogFormat "%w %V %T"
```



## **Front End :: workers.properties**

- Defines parameters for communicating with Tomcat workers
- Multiple workers can be defined, if required.

### **/usr/local/jakarta/tomcat/conf/workers.properties**

```
workers.tomcat_home=/usr/local/jakarta/tomcat
workers.java_home=/usr/local/jdk/jre
worker.list=ajp12, ajp13

worker.ajp13.port=8009
worker.ajp13.host=localhost
worker.ajp13.type=ajp13
worker.ajp13.lbfactor=1
```



# Front End :: Site Configuration

Site configurations are included from the Apache userdata directories

```
# find /usr/local/apache/conf/ -iname cp_jkmount.conf | head -2
/usr/local/apache/conf/userdata/std/1/tom/tomcat.com/cp_jkmount.conf
/usr/local/apache/conf/userdata/std/2/tom/tomcat.com/cp_jkmount.conf
#
```

Which are then included into the relevant VirtualHost in httpd.conf

```
<VirtualHost 10.0.0.1:80>
  ServerName tomcat.com

  ....
  Include "/usr/local/apache/conf/userdata/std/2/tom/tomcat.com/*.conf"
</VirtualHost>
```



## Front End :: cp\_jkmount.conf

JkMount is used to map a context path to a Tomcat worker

### Example Configuration

```
<IfModule mod_jk.c>  
  JkMount /*.jsp ajp13  
  JkMount /servlet/* ajp13  
  JkMount /servlets/* ajp13  
  JkMount /*.do ajp13  
</IfModule>
```



## Front End :: mod\_jk.log

- Useful for troubleshooting communication failures with mod\_jk
- Log levels can be adjusted in /usr/local/apache/conf/jk.conf
  - <http://tomcat.apache.org/connectors-doc/reference/apache.html>

### Example Log Output

```
ajp_service::jk_ajp_common.c (2046): (ajp13) receiving from tomcat failed, recoverable operation attempt=0
ajp_connect_to_endpoint::jk_ajp_common.c (891): Failed opening socket to (127.0.0.1:8009) (errno=111)
ajp_send_request::jk_ajp_common.c (1311): (ajp13) error connecting to the backend server (errno=111)
```



# **Tying It All Together**

## **Enabling Tomcat on your sites**



## Enabling Tomcat Support :: CLI

**/scripts/addservlets --domain=example.com**

- » Creates **<Host>** container in **server.xml**
- » Creates default **cp\_jkmount.conf** for provided site
- » Copies **jspetest.jsp** into the provides site's document root



# Enabling Tomcat Support :: WHM

Main >> Account Functions >> Install Servlets

## Install Servlets

### Account Selection

Domains	Users
tomcat.com	tom

Ac

Install



## Confirming that it works

<http://www.example.com/jsptest.jsp>

### **Sample Application JSP Page**

This is the output of a JSP page that is part of the Hello, World application. It displays several useful values from the request we are currently processing.

**Request Method:** GET

**Servlet Path:** /jsptest.jsp



# Removing Tomcat Support

```
/scripts/remservlets --  
domain=example.com
```

- Remotes **<Host>** container from **server.xml**
- Removes **cp\_jkmount.conf** for provided site



# **The User End Deploying Applications**



# WAR Deployment :: The easy way

**unzip filename.war**

```
# unzip example.war
Archive:  example.war
  creating: META-INF/
  inflating: META-INF/MANIFEST.MF
  inflating: helloworld.jsp
  creating: WEB-INF/
  inflating: WEB-INF/web.xml
  inflating: index.html
#
```



## How Deployment Works

- » The appBase is scanned for WAR files every 10 seconds
- » WAR files are 'exploded' into the site's work directory

```
/usr/local/jakarta/tomcat/work/Catalina/example.com/war_file_name/
```

- Check catalina.out to confirm application deployment

```
INFO: Deploying web application archive example.war
```

- [Documentation for Automatic Application Deployment](#)



# **WAR Deployment :: The other way**

**Drop the WAR file in a directory in the user's public\_html directory**

## **What Happens:**

- » Application is now accessible via:
  - <http://example.com:8080/appname>
- » mod\_jk must be configured to recognize the application now



# WAR Deployment :: Configuring mod\_jk

**Add a JkMount for the application to site include and restart httpd**

## **Example Configuration**

```
<IfModule mod_jk.c>  
  JkMount /*.jsp ajp13  
  JkMount /servlet/* ajp13  
  JkMount /servlets/* ajp13  
  JkMount /*.do ajp13  
  JkMount /appname/* ajp13  
</IfModule>
```



**Q & A**



## **Resources**

- »» [Tomcat Project Page](#)
- »» [JDK Download Site](#)
- »» [Useful Tomcat configuration tips](#)