

Tomcat Administration

Hands on Lab

Note:

1. All the installable(s) need to be downloaded into `/home/training/Downloads` folder from the given ftp site.
2. Replace "tomcat" with the actual release name of tomcat distribution name.

Lab 1: Install and run Tomcat

Step1: Install JDK

```
$ sudo mkdir /usr/java
$mv /home/training/Download/jdk-8u31-linux-i586.tar.gz
/usr/java
$tar -zxvf /usr/java/ jdk-8u31-linux-i586.tar.gz
$rm /usr/java/ jdk-8u31-linux-i586.tar.gz
```

Step2: set JAVA_HOME and PATH

```
$sudo /etc/profile.d/myenv.sh
```

Add the following lines to the file and save

```
JAVA_HOME=/usr/java/jdk1.8.0_31
PATH=$JAVA_HOME/bin:$PATH
export JAVA_HOME PATH
```

Step 3: Reboot your System

```
$sudo reboot
```

Step4: Install Tomcat Server

```
$sudo mv /home/training/Downloads/tomcat.zip /opt
$sudo unzip /opt/tomcat.zip -d /opt
$sudo chmod 750 -R /opt/tomcat
$sudo chown -R training:training /opt/tomcat
```

Step 5: Start the Server

```
$cd /opt/tomcat/bin
$./startup.sh
```

Open one more terminal and check the log as

```
$tail -f -n /opt/tomcat/logs/catalina.out
```

(output from the above command should show that the server has started)

Step 6: Open a browser window and type

<http://localhost:8080>

This url should bring up the tomcat home page.

Step 7: Shutdown the server

```
$cd /opt/tomcat/bin
$./shutdown.sh
```

Observe the log for shutdown confirmation.

Lab 2: Configure 2 CATALINA_BASE and start 2 instances of Tomcat Server

Step 1: CATALINA_BASE (1st)

```
mkdir /opt/tomcat/tomcat1
cd /opt/tomcat
cp -R webapps temp work logs conf tomcat1/
```

Step2: CATALINA_BASE (2nd)

```
mkdir /opt/tomcat/tomcat2
cd /opt/tomcat
cp -R webapps temp work logs conf tomcat2/
```

Step3: Make 2 copies of startup.sh and update CATALINA_BASE

```
cp bin/startup.sh bin/startup1.sh
cp bin/startup.sh bin/startup2.sh
```

Step4: edit the above script files to include/modify the CATALINA_BASE

```
vi bin/startup1.sh
```

add the following to the beginning of the file

```
export CATALINA_BASE=/opt/tomcat/tomcat1
```

```
vi bin/startup2.sh
```

add the following to the beginning of the file

```
export CATALINA_BASE=/opt/tomcat/tomcat2
```

Step5: Make 2 copies of shutdown.sh and update CATALINA_BASE

```
cp bin/shutdown.sh bin/shutdown1.sh
cp bin/shutdown.sh bin/shutdown2.sh
```

Step6: edit the above script files to include/modify the CATALINA_BASE

```
vi bin/shutdown1.sh
```

add the following to the beginning of the file

```
export CATALINA_BASE=/opt/tomcat/tomcat1
```

```
vi bin/shutdown2.sh
```

add the following to the beginning of the file

```
export CATALINA_BASE=/opt/tomcat/tomcat2
```

Step7: modify the server ports

Edit /opt/tomcat/**tomcatX**/conf/server.xml and

Modify the ports as follows:

CATALINA_BASE	Port Name	Value
tomcat1	shutdown	8015
	ajp	8019
	http	8090
tomcat2	shutdown	8025
	Ajp	8029
	http	8100

Step8: Start,Test and shutdown the servers

```
$cd /opt/tomcat/bin
$./startup1.sh
$./startup2.sh
Test the servers as we did in LAB1->step6
```

Lab3: Install a Web Application and Test

1. Start Tomcat Server

```
$cd /opt/tomcat/bin
$./startup.sh
```

2. Copy the Web Application to deploy location

```
cp /home/training/Downloads/apps/TestWebApp.war
/opt/tomcat/webapps/
```

3. Open the browser and type the following url
<http://localhost:8080/TestWebApp/>

Lab4: Create a WAR file from the given resources and deploy, test

1. \$cd /home/training/Downloads/apps/MyApp

2. \$jar -cvf MyApp.war .

3. A file named **MyApp.war** will be generated under MyApp folder

4. \$cp /home/training/Downloads/apps/MyApp/MyApp.war
/opt/tomcat/webapps/

5. Open the browser and type the following url
<http://localhost:8080/MyApp/>

Lab4: Change the deploy Location of Applications

1. \$cd

```
$mkdir apps-deploy
```

2. edit in /opt/tomcat/conf/server.xml in vi editor
vi /opt/tomcat/conf/server.xml

3. go to element "**Host**" (around line No.128)and modify the
"**appBase**" attribute as given

```
<Host name="localhost" appBase="/home/training/apps-deploy"
      unpackWARs="true" autoDeploy="true"
      xmlValidation="false" xmlNamespaceAware="false">
```

4. Restart Tomcat

```
$/opt/tomcat/bin/shutdown.sh
$/opt/tomcat/bin/startup.sh
```

5. Now deploy TestWebApp.war and test

```
$ cp /home/training/Downloads/apps/MyApp/MyApp.war
/opt/tomcat/webapps/
```

6. Open the browser and type the following url

<http://localhost:8080/TestWebApp/>

Lab 5: Change the Context Root of a Web Application

1. vi /opt/tomcat/conf/server.xml
2. locate the element named "Host"
3. Add the element <Context/> within <Host../> as below:

```
<Host name="localhost"  appBase="/home/training/apps-deploy"
unpackWARs="true" autoDeploy="true"
xmlValidation="false" xmlNamespaceAware="false">

<Context path="/TestApp"
docBase="/home/training/Downloads/apps/TestWebApp.war"/>
</Host>
```
7. Open the browser and type the following url
<http://localhost:8080/TestApp/>

Lab6: Configure to make your application as default one

1. Take TestWebApp as example (/home/training/Downloads/apps/TestWebApp.war)
2. Remove or Rename /opt/tomcat/webapps/ROOT application
3. Add /opt/tomcat/conf/Catalina/localhost/ROOT.xml as follows:

```
<Context
docBase="/home/training/Downloads/apps/TestWebApp.war"
path=""
relodable="true"
/>
```
4. Restart Tomcat and Test

Lab7: Create a DataSource for MySQL Database and test

1. Copy the jdbc driver for MySQL Database (Already Installed) to tomcat's classpath

```
$cp /home/training/Downloads/apps/mysql-connector-java-
5.1.22-bin.jar /opt/tomcat/lib
```

2. Option1:
 - a. Modify /opt/tomcat/conf/context.xml to include the configuration for DataSource.

```
<Context>
<WatchedResource>WEB-INF/web.xml</WatchedResource>
  <Resource name="jdbc/ds" auth="Container"
    type="javax.sql.DataSource" username="root"
    password="root" driverClassName="com.mysql.jdbc.Driver"
    url="jdbc:mysql://localhost:3306/testdb" maxActive="8"  />
</Context>
```

- b. Extract the .war file /home/training/Downloads/apps/TestDataSource.war

```
unzip /home/training/Downloads/apps/TestDataSource.war -d
TestDatasource
```

- c. Edit TestDatasource/WEB-INF/web.xml as follows:

```
<resource-ref id="ResourceRef_1243388427265">
  <description>
  </description>
  <res-ref-name>jdbc/ds</res-ref-name>
```

```
<res-type>javax.sql.DataSource</res-type>
<res-auth>Container</res-auth>
<res-sharing-scope>Shareable</res-sharing-scope>
</resource-ref>
```

d. Create a .war from the resources inside TestDataSource folder and deploy it.

```
$cd /home/training/Downloads/apps/TestDataSource
$jar -cvf TestDS.war .
$cp TestDS.war /opt/tomcat/webapps/
```

e. Restart Tomcat

```
$/opt/tomcat/bin/shutdown.sh
$/opt/tomcat/bin/startup.sh
```

f. Open the browser and type the following url

<http://localhost:8080/TestDS/EmpInfo.html>

Enter 1 to 10 to verify the DataSource

3. Option2 :

a. Create a file named "context.xml" using vi and add the elements as given

```
<Context>
  <WatchedResource>WEB-INF/web.xml</WatchedResource>
  <Resource name="jdbc/ds" auth="Container"
    type="javax.sql.DataSource" username="root"
    password="root" driverClassName="com.mysql.jdbc.Driver"
    url="jdbc:mysql://localhost:3306/testdb" maxActive="8" />
</Context>
```

b. Copy context.xml file to <YourApp>/META-INF folder

```
$cp context.xml TestDataSource/META-INF/
```

c. Repeat Steps of Option1 (d,e and f)

Lab8: Configure 2 virtual hosts in Tomcat and test

Step1: Modify your /etc/hosts file to include the virtual hosts

```
vi /etc/hosts
<your machine ip>    redhost
<your machine ip>    bluehost
```

Step2: make 2 webapps directories for the 2 virtual hosts

```
mkdir $CATALINA_HOME/redapps
mkdir $CATALINA_HOME/blueapps
```

Step3: Modify \$CATALINA_HOME/conf/server.xml as given below:

```
<Engine name="Catalina" defaultHost="ren">
  <Host name="redhost"      appBase="redapps" />
  <Host name="bluehost"     appBase="blueapps" />
</Engine>
```

Step3:Deploy Web Applications in the respective webapps directories to test your application.

Step4: Restart tomcat and test virtual hosts

Lab9: Configure Form based Authentication using

1. tomcat-users.xml

- a. add the following highlighted lines to `/opt/tomcat/conf/tomcat-users.xml`

```
<role rolename="tomcat"/>
<role rolename="manager"/>
<role rolename="role1"/>
<user username="shantanu" password="welcome1" roles="manager"/>
<user username="tomcat" password="tomcat" roles="tomcat"/>
<user username="both" password="tomcat" roles="tomcat,role1"/>
<user username="role1" password="tomcat" roles="role1"/>
```

- b. Edit `/home/training/Downloads/apps/FormAuth/WEB-INF/web.xml` and add the following xml block

```
<security-constraint>
  <web-resource-collection>
    <web-resource-name>All resources</web-resource-name>
    <url-pattern>/*</url-pattern>
    <http-method>GET</http-method>
    <http-method>POST</http-method>
  </web-resource-collection>
  <auth-constraint>
    <role-name>manager</role-name>
  </auth-constraint>
</security-constraint>
<login-config>
  <auth-method>FORM</auth-method>
  <realm-name>java</realm-name>
  <form-login-config>
    <form-login-page>/login.jsp</form-login-page>
    <form-error-page>/error.jsp</form-error-page>
  </form-login-config>
</login-config>

<security-role>
  <role-name>manager</role-name>
</security-role>
```

- c. Create a WAR File named FormAuth.war and Deploy

```
$cd /home/training/Downloads/apps/FormAuth
$jar -cvf FormAuth.war .
$scp FormAuth.war /opt/tomcat/webapps/
```

- d. Restart Tomcat Server

```
$ssh /opt/tomcat/bin/shutdown.sh
$ssh /opt/tomcat/bin/startup.sh
```

- e. Open a Browser and enter the following url to test the application

<http://localhost:8080/FormAuth/demo.jsp>

use username and password configured to test

2. Database Realm OR JDBCRealm

- a. Create the necessary tables in MySQL Database (**Assumption: mysql is running**)

\$mysql -u root -p

- b. Create the tables as per the given Schema

```
create table users (  
    user_name          varchar(15) not null primary key,  
    user_pass          varchar(15) not null  
);
```

```
create table user_roles (  
    user_name          varchar(15) not null,  
    role_name          varchar(15) not null,  
    primary key (user_name, role_name)  
);
```

- c. Insert some data for users and roles

- d. Copy the following xml block and paste it to

/opt/tomcat/conf/server.xml inside **<Host.../>** tag

```
<Realm className="org.apache.catalina.realm.JDBCRealm" debug="99"  
driverName="com.mysql.jdbc.Driver"  
connectionURL="jdbc:mysql://localhost:3306/tomcatdb"  
connectionName="root" connectionPassword="root"  
userTable="users" userNameCol="user_name"  
userCredCol="user_pass" userRoleTable="user_roles"  
roleNameCol="role_name" />
```

- e. Edit **/home/training/Downloads/apps/FormAuth/WEB-INF/web.xml** and add the following xml block

```
<security-constraint>  
    <web-resource-collection>  
        <web-resource-name>All resources</web-resource-name>  
        <url-pattern>/*</url-pattern>  
        <http-method>GET</http-method>  
        <http-method>POST</http-method>  
    </web-resource-collection>  
    <auth-constraint>  
        <role-name>manager</role-name>  
    </auth-constraint>  
</security-constraint>  
<login-config>  
    <auth-method>FORM</auth-method>  
    <realm-name>java</realm-name>  
    <form-login-config>  
        <form-login-page>/login.jsp</form-login-page>  
        <form-error-page>/error.jsp</form-error-page>  
    </form-login-config>  
</login-config>  
  
<security-role>  
    <role-name>manager</role-name>  
</security-role>
```

- f. Create a WAR File named FormAuth.war and Deploy

```
$cd /home/training/Downloads/apps/FormAuth  
$jar -cvf FormAuth.war .  
$ cp FormAuth.war /opt/tomcat/webapps/
```

- g. Restart Tomcat Server

```
$ssh /opt/tomcat/bin/shutdown.sh
$ssh /opt/tomcat/bin/startup.sh
```

h. Open a Browser and enter the following url to test the application

<http://localhost:8080/FormAuth/demo.jsp>

use username and password configured to test

3. LDAP Realm (JNDIRealm) → Follow a separate document supplied.

Lab10: Create a self-signed certificate and use it to configure one way SSL for Tomcat Server

Step1: Create a directory for key database

```
$mkdir /opt/tomcat/ssl
```

Step2: Create the self signed certificate using java 'keytool'

```
$cd /opt/tomcat/ssl
$keytool -genkey -alias mykey -keystore mykeys.jks -keyalg
RSA -validity 365 -storepass tomcat -keypass tomcat
```

Note: the -storepass and -keypass must be the same for Apache Tomcat

Step3: edit /opt/tomcat/conf/server.xml to include SSL Configuration. Add the following block within <Service.> element.

```
<Connector port="8443" protocol="HTTP/1.1" SSLEnabled="true"
maxHttpHeaderSize="8192" maxThreads="150" minSpareThreads="25"
maxSpareThreads="75" enableLookups="false"
disableUploadTimeout="true" acceptCount="100" scheme="https"
secure="true" sslProtocol="TLS"
keystoreFile="/opt/tomcat/ssl/mykeys.jks" keystorePass="tomcat" />
```

Lab 11: Compile and build mod_jk for Apache Web Server 2.2 (Assumption: httpd and httpd-devel packages are installed)

1. `$tar -zxvf /home/training/Downloads/tomcat-connectors-1.2.37-src.tar.gz`
2. `$cd /home/training/Downloads/tomcat-connectors-1.2.37-src/native`
3. `./configure --with-apxs`
4. `$make`
5. After **make** the mod_jk.so file will be generated under /home/training/Downloads/tomcat-connectors-1.2.37-src/native/apache-2.0

6. This is your expected result

Lab 12: Configure Apache to use mod_jk with Tomcat Server (Assumption: TestWebApp.war is already deployed to Tomcat)

Step1: install mod_jk.so into Apache Web Server

```
$sudo cp /home/training/Downloads/tomcat-connectors-1.2.37-  
src/native/apache-2.0 /etc/httpd/modules
```

Step2: Copy the configuration files to Apache Web Server

```
$sudo cp /home/training/Downloads/cluster-config/mod_jk.conf  
/etc/httpd/conf/
```

```
$sudo cp /home/training/Downloads/cluster-config/mod-jk.conf  
/etc/httpd/conf/
```

Step3: Edit /etc/httpd/conf/mod-jk.conf as follows:

```
LoadModule jk_module modules/mod_jk.so  
JkWorkersFile conf/workers.properties  
JkLogFile logs/mod_jk.log  
JkLogLevel info  
JkLogStampFormat "[%a %b %d %H:%M:%S %Y]"  
JkRequestLogFormat "%w %V %T"  
JkMount /TestWebApp/* loadbalancer
```

Step4: Configure workers.properties file as follows:

```
worker.list=loadbalancer,status  
worker.nodeA.port=8009  
worker.nodeA.host=127.0.0.1  
worker.nodeA.type=ajp13  
worker.nodeA.lbfactor=1  
worker.loadbalancer.type=lb  
worker.loadbalancer.balance_workers=nodeA  
# Status worker for managing load balancer  
worker.status.type=status
```

Step5: Include mod-jk.conf file to /etc/httpd/conf/httpd.conf

```
$sudo vi /etc/httpd/conf/httpd.conf
```

At the end of httpd.conf file enter
Include conf/mod-jk.conf

Step6: Restart Apache Web Server and Restart Apache Tomcat

```
$sudo service httpd restart  
$sh /opt/tomcat/bin/shutdown.sh  
$sh /opt/tomcat/bin/startup.sh
```

Step: Open a browser and enter the given url

<http://localhost/TestWebApp>

You should get the Test Page from the application deployed in Tomcat Server

Lab 13: Configure a 2 node cluster with Tomcat Server

Step1: make 2 fresh copies of Tomcat Server Installation

```
$sudo mkdir /opt/cluster  
$sudo chown training:training /opt/cluster  
$unzip /home/training/Downloads/apache-tomcat-6.0.37 -d  
/opt/cluster  
$mv /opt/cluster/apache-tomcat-6.0.37 tomcat1  
$cp -R /opt/cluster/tomcat1 /opt/tomcat2
```

Step2: Edit and make the following changes in the respective "server.xml" as per the table given below:

Server.xml in	Port Name	Value
tomcat1	shutdown	8105
	ajp	8109
	http	8180
tomcat2	shutdown	8205
	Ajp	8209
	http	8280

Step3: In tomcat1/server.xml and tomcat2/server.xml add the given block of XML just below the <Engine ...> tag

```
<Cluster className="org.apache.catalina.ha.tcp.SimpleTcpCluster"  
    channelSendOptions="8">  
    <Manager className="org.apache.catalina.ha.session.DeltaManager"  
        expireSessionsOnShutdown="false"  
        notifyListenersOnReplication="true"/>  
    <Channel className="org.apache.catalina.tribes.group.GroupChannel">  
        <Membership  
className="org.apache.catalina.tribes.membership.McastService"  
        address="224.0.0.0"  
        port="45564"  
        frequency="500"  
        dropTime="3000"/>  
        <Receiver  
className="org.apache.catalina.tribes.transport.nio.NioReceiver"  
        address="auto"  
        port="4000"  
        autoBind="100"  
        selectorTimeout="5000"  
        maxThreads="6"/>  
    </Channel>  
</Cluster>
```

```

        <Sender
className="org.apache.catalina.tribes.transport.ReplicationTransmitter">
        <Transport
className="org.apache.catalina.tribes.transport.nio.PooledParallelSender"/>
        </Sender>
        <Interceptor
className="org.apache.catalina.tribes.group.interceptors.TcpFailureDetector"/>
        <Interceptor
className="org.apache.catalina.tribes.group.interceptors.MessageDispatch15Intercep
ptor"/>
        </Channel>
        <Valve className="org.apache.catalina.ha.tcp.ReplicationValve"
filter=".*\..gif;.*\..js;.*\..jpg;.*\..png;.*\..css;.*\..txt;"/>
        <ClusterListener
className="org.apache.catalina.ha.session.ClusterSessionListener"/>
        </Cluster>

```

Step 4: Start tomcat1 and tomcat2

```

$ssh /opt/cluster/tomcat1/bin/startup.sh
$ssh /opt/cluster/tomcat2/bin/startup.sh

```

Step5: verify the logs for cluster up status and check the respective urls for the started servers

<http://localhost:8180>

<http://localhost:8280>

If the cluster is started successfully you should be able to see the commincation log between the servers.

Lab 14: Configure Apache to Load balance Tomcat Cluster (Refer to Lab 12)

Step1: Step3: Edit /etc/httpd/conf/mod-jk.conf as follows:

```

LoadModule jk_module modules/mod_jk.so

JkWorkersFile conf/workers.properties

JkLogFile logs/mod_jk.log

JkLogLevel info

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

JkRequestLogFormat "%w %V %T"

JkMount /ClusterApp/* loadbalancer

```

This is your clustered Application which is load balanced by loadbalancer

Step2: Step4:Configure workers.properties file for the cluster as follows:

```
worker.list=loadbalancer,status  
worker.nodeA.port=8109  
worker.nodeA.host=127.0.0.1  
worker.nodeA.type=ajp13  
worker.nodeA.lbfactor=1  
worker.nodeB.port=8209  
worker.nodeB.host=127.0.0.1  
worker.nodeB.type=ajp13  
worker.nodeB.lbfactor=1  
worker.loadbalancer.type=lb  
worker.loadbalancer.balance_workers=nodeA,nodeB  
  
# Status worker for managing load balancer  
worker.status.type=status
```

Step3:

1. On tomcat1 (where ajp port is 8109): enter the following value within the <Engine..> elements as given

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

2. On tomcat2 (where ajp port is 8209): enter the following value within the <Engine..> elements as given

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

Step4: Restart the Cluster you configured in Lab 13 and use the following url to test your clustered application:

```
http://localhost/ClusterApp/
```

Lab 15: Integrate WebSphere MQ with Tomcat Server(Optional)
Follow the separate document provided