



Apache Tomcat Web Server

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Apache Tomcat

- ➔ Apache Tomcat is a web server
- ➔ Tomcat is used to run Java Web Applications
- ➔ Tomcat is free & open-source software
- ➔ Tomcat developed by Apache Organization
- ➔ Tomcat developed by using 'Java' programming language
- ➔ Tomcat server runs on 8080 port by default (we can change that port in server.xml file)

Download Apache Tomcat in Windows Machine

We can download Apache tomcat server from official website

URL : <https://tomcat.apache.org/download-90.cgi>

9.0.65

Please see the [README](#) file for packaging information. It explains what every distribution contains.

Binary Distributions

- Core:
 - [zip \(pgp, sha512\)](#)
 - [tar.gz \(pgp, sha512\)](#)
 - [32-bit Windows zip \(pgp, sha512\)](#)
 - [64-bit Windows zip \(pgp, sha512\)](#)
 - [32-bit/64-bit Windows Service Installer \(pgp, sha512\)](#)
- Full documentation:
 - [tar.gz \(pgp, sha512\)](#)
- Deployer:
 - [zip \(pgp, sha512\)](#)
 - [tar.gz \(pgp, sha512\)](#)
- Embedded:
 - [tar.gz \(pgp, sha512\)](#)
 - [zip \(pgp, sha512\)](#)

- ➔ Download Apache Tomcat zip file and extract it (we can see below folder structure)



Name	Date modified	Type	Size
bin	27	File folder	
conf	27	File folder	
lib	27	File folder	
logs	27	File folder	
temp	27	File folder	
webapps	27	File folder	
work	27	File folder	
BUILDING.txt	14	Text Document	20 KB
CONTRIBUTING.md	14	Markdown Source File	7 KB
LICENSE	14	File	56 KB
NOTICE	14	File	3 KB
README.md	14	Markdown Source File	4 KB
RELEASE-NOTES	14	File	7 KB
RUNNING.txt	14	Text Document	17 KB

Directories and Files

These are some of the key tomcat directories:

- **/bin** - Startup, shutdown, and other scripts. The *.sh files (for Unix systems) are functional duplicates of the *.bat files (for Windows systems). Since the Win32 command-line lacks certain functionality, there are some additional files in here.
- **/conf** - Configuration files and related DTDs. The most important file in here is server.xml. It is the main configuration file for the container.
- **/logs** - Log files are here by default.
- **/webapps** - This is where your webapps go.

Apache Tomcat Setup in Linux Machine

➔ To run Apache Tomcat Server first we need to install Java

```
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$ sudo yum install java-1.8.0-openjdk  
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd  
amzn2-core  
Package 1:java-1.8.0-openjdk-1.8.0.332.b09-1.amzn2.0.2.x86_64 already installed and latest version | 3.7 kB 00:00:00  
Nothing to do  
[ec2-user@ip-172-31-39-68 ~]$
```

➔ Download Apache Tomcat using 'wget' command
(Apache URL we can get from Apache website)

wget <https://d1cdn.apache.org/tomcat/tomcat-9/v9.0.65/bin/apache-tomcat-9.0.65.tar.gz>

```
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$ wget https://d1cdn.apache.org/tomcat/tomcat-9/v9.0.65/bin/apache-tomcat-9.0.65.tar.gz  
--2022-08-27 06:40:35-- https://d1cdn.apache.org/tomcat/tomcat-9/v9.0.65/bin/apache-tomcat-9.0.65.tar.gz  
Resolving d1cdn.apache.org (d1cdn.apache.org) ... 151.101.2.132, 2a04:4e42::644  
Connecting to d1cdn.apache.org (d1cdn.apache.org)|151.101.2.132|:443 ... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 11593900 (11M) [application/x-gzip]  
Saving to: 'apache-tomcat-9.0.65.tar.gz'  
  
100%[=====] 11,593,900 --K/s in 0.05s  
2022-08-27 06:40:36 (231 MB/s) - 'apache-tomcat-9.0.65.tar.gz' saved [11593900/11593900]
```

➔ Extract Apache Tomcat tar file using tar command

\$ tar apache-tomcat-9.0.65.tar.gz

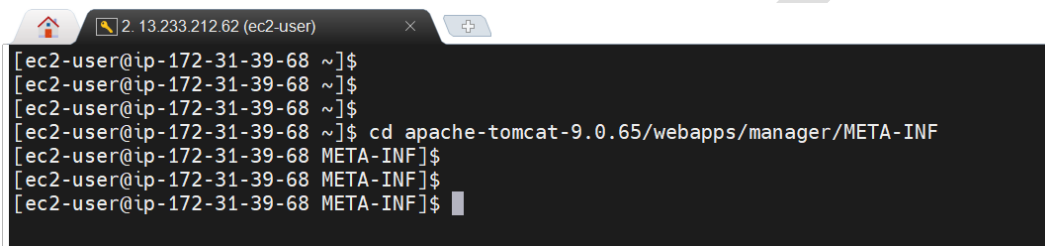
```
2. 13.233.212.62 (ec2-user) x
[ec2-user@ip-172-31-39-68 ~]$ clear
[ec2-user@ip-172-31-39-68 ~]$
[ec2-user@ip-172-31-39-68 ~]$
[ec2-user@ip-172-31-39-68 ~]$ tar -xvf apache-tomcat-9.0.65.tar.gz
apache-tomcat-9.0.65/conf/
apache-tomcat-9.0.65/conf/catalina.policy
apache-tomcat-9.0.65/conf/catalina.properties
apache-tomcat-9.0.65/conf/context.xml
apache-tomcat-9.0.65/conf/jaspic-providers.xml
apache-tomcat-9.0.65/conf/jaspic-providers.xsd
apache-tomcat-9.0.65/conf/logging.properties
apache-tomcat-9.0.65/conf/server.xml
apache-tomcat-9.0.65/conf/tomcat-users.xml
apache-tomcat-9.0.65/conf/tomcat-users.xsd
apache-tomcat-9.0.65/conf/web.xml
apache-tomcat-9.0.65/bin/
apache-tomcat-9.0.65/lib/
apache-tomcat-9.0.65/logs/
apache-tomcat-9.0.65/temp/
apache-tomcat-9.0.65/webapps/
apache-tomcat-9.0.65/webapps/ROOT/
apache-tomcat-9.0.65/webapps/ROOT/WEB-INF/
apache-tomcat-9.0.65/webapps/docs/
apache-tomcat-9.0.65/webapps/docs/WEB-INF/
apache-tomcat-9.0.65/webapps/docs/annotationapi/
apache-tomcat-9.0.65/webapps/docs/api/
apache-tomcat-9.0.65/webapps/docs/appdev/
apache-tomcat-9.0.65/webapps/docs/appdev/sample/
```

➔ We can see Apache Tomcat files using ls command like below

```
[ec2-user@ip-172-31-39-68 ~]$
[ec2-user@ip-172-31-39-68 ~]$ cd apache-tomcat-9.0.65/
[ec2-user@ip-172-31-39-68 apache-tomcat-9.0.65]$ ls -l
total 128
drwxr-x--- 2 ec2-user ec2-user 4096 Aug 27 06:41 bin
-rw-r----- 1 ec2-user ec2-user 19992 Jul 14 12:28 BUILDING.txt
drwx----- 2 ec2-user ec2-user 238 Jul 14 12:28 conf
-rw-r----- 1 ec2-user ec2-user 6210 Jul 14 12:28 CONTRIBUTING.md
drwxr-x--- 2 ec2-user ec2-user 4096 Aug 27 06:41 lib
-rw-r----- 1 ec2-user ec2-user 57092 Jul 14 12:28 LICENSE
drwxr-x--- 2 ec2-user ec2-user 6 Jul 14 12:28 logs
-rw-r----- 1 ec2-user ec2-user 2333 Jul 14 12:28 NOTICE
-rw-r----- 1 ec2-user ec2-user 3398 Jul 14 12:28 README.md
-rw-r----- 1 ec2-user ec2-user 6901 Jul 14 12:28 RELEASE-NOTES
-rw-r----- 1 ec2-user ec2-user 16505 Jul 14 12:28 RUNNING.txt
drwxr-x--- 2 ec2-user ec2-user 30 Aug 27 06:41 temp
drwxr-x--- 7 ec2-user ec2-user 81 Jul 14 12:28 webapps
drwxr-x--- 2 ec2-user ec2-user 6 Jul 14 12:28 work
[ec2-user@ip-172-31-39-68 apache-tomcat-9.0.65]$
```

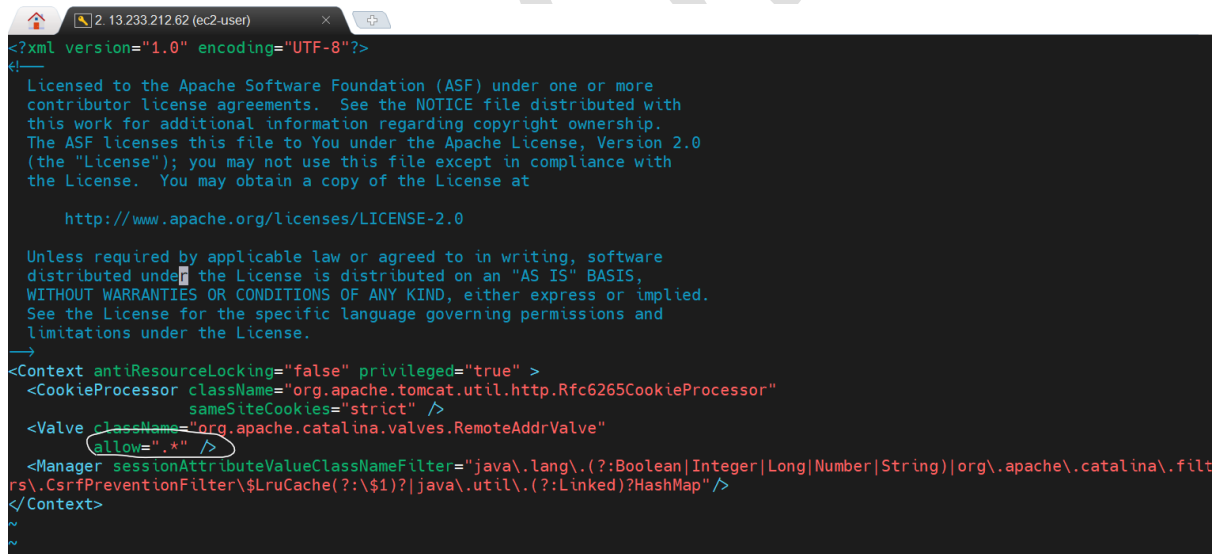
- ➔ To deploy applications into Tomcat server we will use Host Manager
- ➔ By default, the Host Manager is only accessible from a browser running on the same machine as Tomcat. If you wish to modify this restriction, you'll need to edit the Host Manager's context.xml file.

File Location: <tomcat-folder>/webapps/manager/META-INF/context.xml



```
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$  
[ec2-user@ip-172-31-39-68 ~]$ cd apache-tomcat-9.0.65/webapps/manager/META-INF  
[ec2-user@ip-172-31-39-68 META-INF]$  
[ec2-user@ip-172-31-39-68 META-INF]$  
[ec2-user@ip-172-31-39-68 META-INF]$
```

- ➔ In Manager context.xml file, change <Valve> section like below (allow attribute value changed)

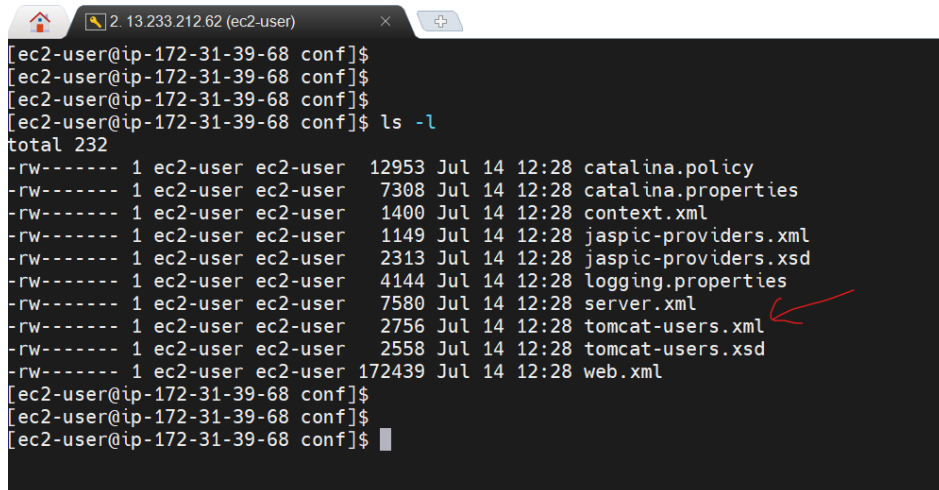


```
<?xml version="1.0" encoding="UTF-8"?>  
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 contributor license agreements. See the NOTICE file distributed with  
 this work for additional information regarding copyright ownership.  
 The ASF licenses this file to You under the Apache License, Version 2.0  
 (the "License"); you may not use this file except in compliance with  
 the License. You may obtain a copy of the License at  
  
 http://www.apache.org/licenses/LICENSE-2.0  
  
 Unless required by applicable law or agreed to in writing, software  
 distributed under the License is distributed on an "AS IS" BASIS,  
 WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
 See the License for the specific language governing permissions and  
 limitations under the License.  
->  
 <Context antiResourceLocking="false" privileged="true" >  
   <CookieProcessor className="org.apache.tomcat.util.http.Rfc6265CookieProcessor"  
     sameSiteCookies="strict" />  
   <Valve className="org.apache.catalina.valves.RemoteAddrValve"  
     allow="*" />  
   <Manager sessionAttributeValueClassNameFilter="java\\.lang\\.?(Boolean|Integer|Long|Number|string)|org\\.apache\\.catalina\\.filt  
rs\\.CsrfPreventionFilter|LruCache(?:\\$1)?|java\\.util\\.?(?:Linked)?HashMap"/>  
 </Context>  
~  
~
```

Adding Users in Tomcat Server

➔ We need to add users in tomcat server to perform admin activities

File Location: <tomcat-folder>/conf/tomcat-users.xml



```

[ec2-user@ip-172-31-39-68 conf]$
[ec2-user@ip-172-31-39-68 conf]$
[ec2-user@ip-172-31-39-68 conf]$
[ec2-user@ip-172-31-39-68 conf]$ ls -l
total 232
-rw-r--r-- 1 ec2-user ec2-user 12953 Jul 14 12:28 catalina.policy
-rw-r--r-- 1 ec2-user ec2-user 7308 Jul 14 12:28 catalina.properties
-rw-r--r-- 1 ec2-user ec2-user 1400 Jul 14 12:28 context.xml
-rw-r--r-- 1 ec2-user ec2-user 1149 Jul 14 12:28 jaspic-providers.xml
-rw-r--r-- 1 ec2-user ec2-user 2313 Jul 14 12:28 jaspic-providers.xsd
-rw-r--r-- 1 ec2-user ec2-user 4144 Jul 14 12:28 logging.properties
-rw-r--r-- 1 ec2-user ec2-user 7580 Jul 14 12:28 server.xml
-rw-r--r-- 1 ec2-user ec2-user 2756 Jul 14 12:28 tomcat-users.xml
-rw-r--r-- 1 ec2-user ec2-user 2558 Jul 14 12:28 tomcat-users.xsd
-rw-r--r-- 1 ec2-user ec2-user 172439 Jul 14 12:28 web.xml
[ec2-user@ip-172-31-39-68 conf]$
[ec2-user@ip-172-31-39-68 conf]$
[ec2-user@ip-172-31-39-68 conf]$
  
```

➔ Add below Roles and Users in tomcat-users.xml file

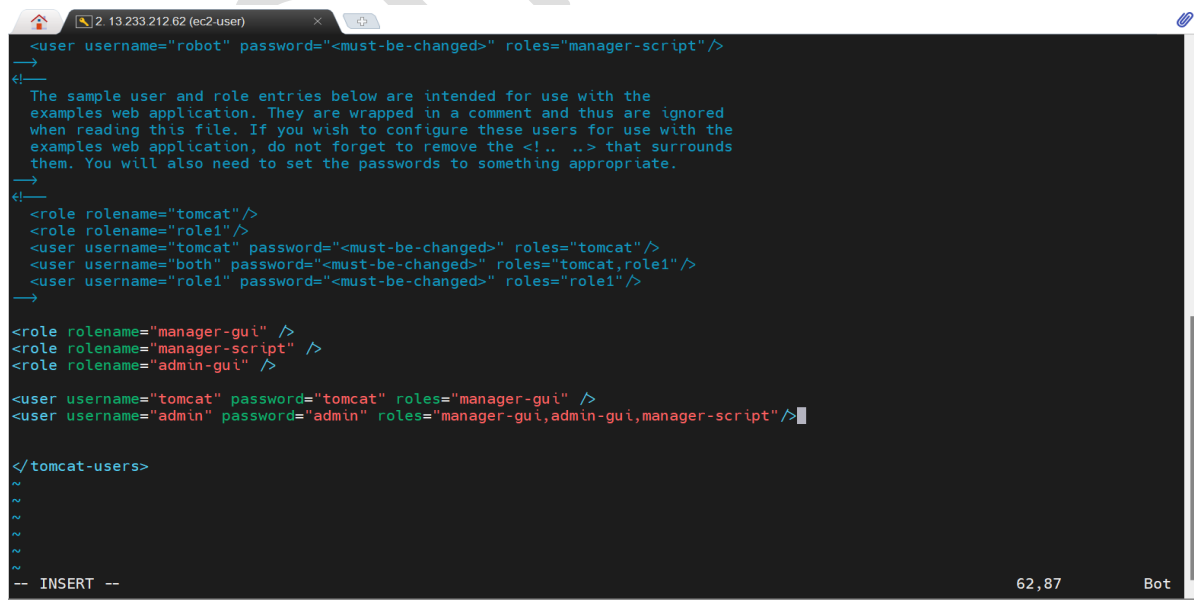
```
<role rolename="manager-gui" />
```

```
<role rolename="manager-script" />
```

```
<role rolename="admin-gui" />
```

```
<user username="tomcat" password="tomcat" roles="manager-gui" />
```

```
<user username="admin" password="admin" roles="manager-gui,admin-gui,manager-script"/>
```



```

<user username="robot" password="<must-be-changed>" roles="manager-script"/>
<!--
The sample user and role entries below are intended for use with the
examples web application. They are wrapped in a comment and thus are ignored
when reading this file. If you wish to configure these users for use with the
examples web application, do not forget to remove the <!-- .. --> that surrounds
them. You will also need to set the passwords to something appropriate.
-->
<role rolename="tomcat"/>
<role rolename="role1"/>
<user username="tomcat" password="<must-be-changed>" roles="tomcat"/>
<user username="both" password="<must-be-changed>" roles="tomcat,role1"/>
<user username="role1" password="<must-be-changed>" roles="role1"/>

<role rolename="manager-gui" />
<role rolename="manager-script" />
<role rolename="admin-gui" />

<user username="tomcat" password="tomcat" roles="manager-gui" />
<user username="admin" password="admin" roles="manager-gui,admin-gui,manager-script"/>

</tomcat-users>
~
~
~
~
-- INSERT --
  
```

to connect MakeVScode to the professional editor, please visit: <https://code.visualstudio.com/docs/editor/remote>

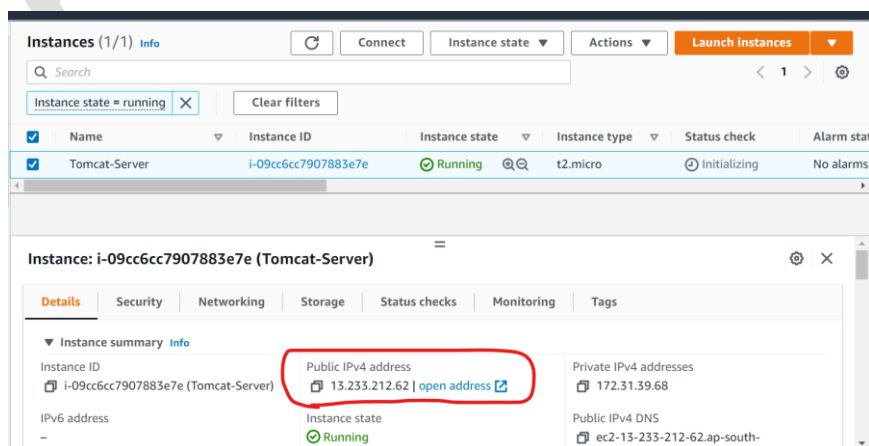
➔ After adding users, go to bin directory and start the Tomcat server

```
[ec2-user@ip-172-31-39-68 bin]$  
[ec2-user@ip-172-31-39-68 bin]$  
[ec2-user@ip-172-31-39-68 bin]$ ls -l  
total 892  
-rw-r----- 1 ec2-user ec2-user 34700 Jul 14 12:28 bootstrap.jar  
-rw-r----- 1 ec2-user ec2-user 16840 Jul 14 12:28 catalina.bat  
-rwxr-x--- 1 ec2-user ec2-user 25294 Jul 14 12:28 catalina.sh  
-rw-r----- 1 ec2-user ec2-user 1664 Jul 14 12:28 catalina-tasks.xml  
-rw-r----- 1 ec2-user ec2-user 2123 Jul 14 12:28 ciphers.bat  
-rwxr-x--- 1 ec2-user ec2-user 1997 Jul 14 12:28 ciphers.sh  
-rw-r----- 1 ec2-user ec2-user 25410 Jul 14 12:28 commons-daemon.jar  
-rw-r----- 1 ec2-user ec2-user 211777 Jul 14 12:28 commons-daemon-native.tar.gz  
-rw-r----- 1 ec2-user ec2-user 2040 Jul 14 12:28 configtest.bat  
-rwxr-x--- 1 ec2-user ec2-user 1922 Jul 14 12:28 configtest.sh  
-rwxr-x--- 1 ec2-user ec2-user 9100 Jul 14 12:28 daemon.sh  
-rw-r----- 1 ec2-user ec2-user 2091 Jul 14 12:28 digest.bat  
-rwxr-x--- 1 ec2-user ec2-user 1965 Jul 14 12:28 digest.sh  
-rw-r----- 1 ec2-user ec2-user 3606 Jul 14 12:28 makebase.bat  
-rwxr-x--- 1 ec2-user ec2-user 3382 Jul 14 12:28 makebase.sh  
-rw-r----- 1 ec2-user ec2-user 3460 Jul 14 12:28 setclasspath.bat  
-rwxr-x--- 1 ec2-user ec2-user 3708 Jul 14 12:28 setclasspath.sh  
-rw-r----- 1 ec2-user ec2-user 2020 Jul 14 12:28 shutdown.bat  
-rwxr-x--- 1 ec2-user ec2-user 1902 Jul 14 12:28 shutdown.sh  
-rw-r----- 1 ec2-user ec2-user 2022 Jul 14 12:28 startup.bat  
-rwxr-x--- 1 ec2-user ec2-user 1904 Jul 14 12:28 startup.sh  
-rw-r----- 1 ec2-user ec2-user 47050 Jul 14 12:28 tomcat-juli.jar  
-rw-r----- 1 ec2-user ec2-user 436593 Jul 14 12:28 tomcat-native.tar.gz  
-rw-r----- 1 ec2-user ec2-user 4574 Jul 14 12:28 tool-wrapper.bat  
-rwxr-x--- 1 ec2-user ec2-user 5540 Jul 14 12:28 tool-wrapper.sh  
-rw-r----- 1 ec2-user ec2-user 2026 Jul 14 12:28 version.bat  
-rwxr-x--- 1 ec2-user ec2-user 1908 Jul 14 12:28 version.sh  
[ec2-user@ip-172-31-39-68 bin]$
```

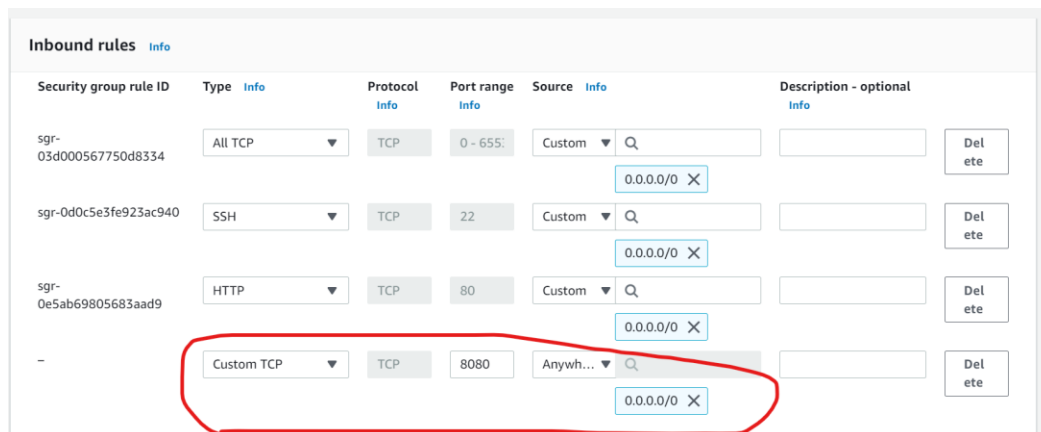
➔ Start the tomcat server using 'sh startup.sh' command

```
[ec2-user@ip-172-31-39-68 bin]$  
[ec2-user@ip-172-31-39-68 bin]$  
[ec2-user@ip-172-31-39-68 bin]$ sh startup.sh  
Using CATALINA_BASE:   /home/ec2-user/apache-tomcat-9.0.65  
Using CATALINA_HOME:   /home/ec2-user/apache-tomcat-9.0.65  
Using CATALINA_TMPDIR: /home/ec2-user/apache-tomcat-9.0.65/temp  
Using JRE_HOME:         /usr  
Using CLASSPATH:        /home/ec2-user/apache-tomcat-9.0.65/bin/bootstrap.jar:/home/ec2-user/apache-tomcat-9.0.65/bin/tomcat-juli.jar  
Using CATALINA_OPTS:  
Tomcat started.  
[ec2-user@ip-172-31-39-68 bin]$
```

➔ Once Tomcat Server started, we can access Tomcat Server admin console using EC2 Instance Public IP

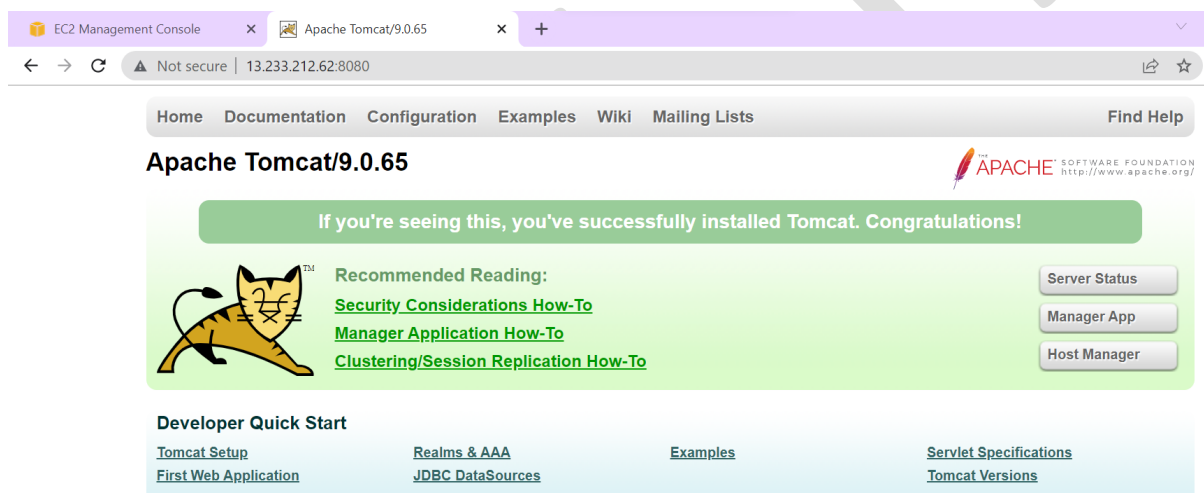


➔ Make 8080 port number is enabled in your EC2 Instance Security Group

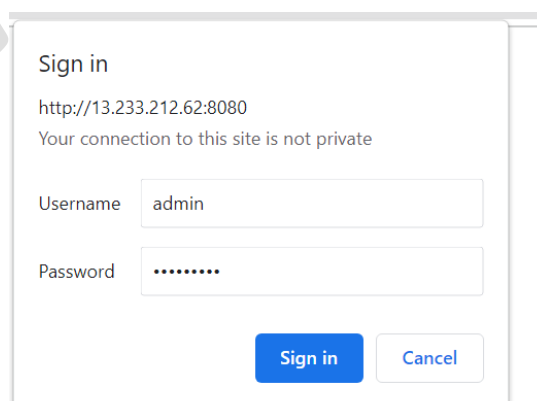


Security group rule ID	Type	Protocol	Port range	Source	Description - optional	
sgr-03d000567750d8334	All TCP	TCP	0 - 65535	Custom 0.0.0.0/0		Delete
sgr-0d0c5e3fe923ac940	SSH	TCP	22	Custom 0.0.0.0/0		Delete
sgr-0e5ab69805683aad9	HTTP	TCP	80	Custom 0.0.0.0/0		Delete
-	Custom TCP	TCP	8080	Anywh... 0.0.0.0/0		Delete

➔ We can access Tomcat Server in our Browser like below



➔ Click on Host Manager to deploy the application (It will ask credentials, enter the credentials which we have configured in 'tomcat-users.xml' file)



Sign in

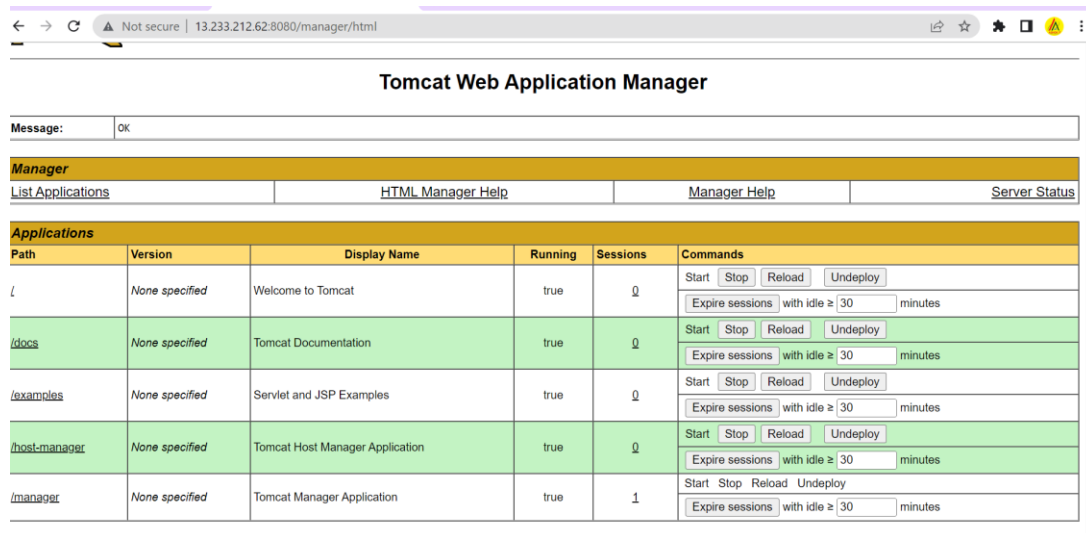
http://13.233.212.62:8080

Your connection to this site is not private

Username

Password

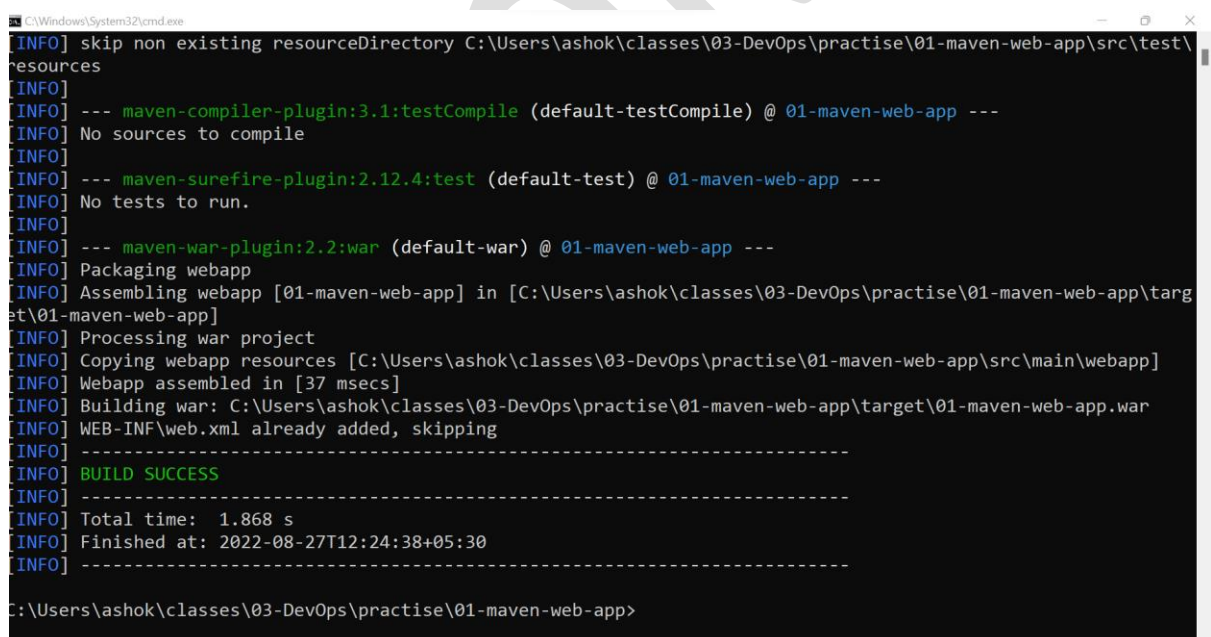
➔ After Login Success we can see below List of Applications Running in Tomcat (these are default applications)



The screenshot shows the Tomcat Web Application Manager interface in a web browser. The address bar indicates the URL is 13.233.212.62:8080/manager/html. The page title is "Tomcat Web Application Manager". Below the title, there is a message bar showing "Message: OK". The main content area is divided into two sections: "Manager" and "Applications". The "Manager" section has links for "List Applications", "HTML Manager Help", "Manager Help", and "Server Status". The "Applications" section is a table listing the default applications running on the Tomcat server.

Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/docs	None specified	Tomcat Documentation	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/examples	None specified	Servlet and JSP Examples	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/host-manager	None specified	Tomcat Host Manager Application	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes
/manager	None specified	Tomcat Manager Application	true	1	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes

➔ Go to maven web application and package that application as war file (war file will be created in target folder)



```
C:\Windows\System32\cmd.exe
[INFO] skip non existing resourceDirectory C:\Users\ashok\classes\03-DevOps\practise\01-maven-web-app\src\test\resources
[INFO]
[INFO] --- maven-compiler-plugin:3.1:testCompile (default-testCompile) @ 01-maven-web-app ---
[INFO] No sources to compile
[INFO]
[INFO] --- maven-surefire-plugin:2.12.4:test (default-test) @ 01-maven-web-app ---
[INFO] No tests to run.
[INFO]
[INFO] --- maven-war-plugin:2.2:war (default-war) @ 01-maven-web-app ---
[INFO] Packaging webapp
[INFO] Assembling webapp [01-maven-web-app] in [C:\Users\ashok\classes\03-DevOps\practise\01-maven-web-app\target\01-maven-web-app]
[INFO] Processing war project
[INFO] Copying webapp resources [C:\Users\ashok\classes\03-DevOps\practise\01-maven-web-app\src\main\webapp]
[INFO] Webapp assembled in [37 msecs]
[INFO] Building war: C:\Users\ashok\classes\03-DevOps\practise\01-maven-web-app\target\01-maven-web-app.war
[INFO] WEB-INF\web.xml already added, skipping
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 1.868 s
[INFO] Finished at: 2022-08-27T12:24:38+05:30
[INFO]
C:\Users\ashok\classes\03-DevOps\practise\01-maven-web-app>
```

➔ We can deploy Maven Web Application 'war' file into Tomcat Server from Host Manager Console

➔ Choose War file and click on 'Deploy' button

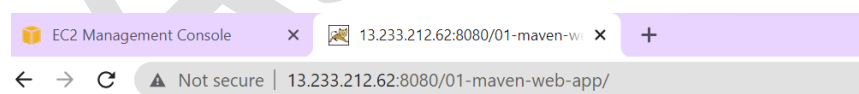
➔ We can see our application which got deployed in Tomcat Server

Manager					
List Applications	HTML Manager Help		Manager Help		Server Status
Applications					
Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>
/01-maven-web-app	None specified	Archetype Created Web Application	true	0	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>
/docs	None specified	Tomcat Documentation	true	0	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>
/examples	None specified	Servlet and JSP Examples	true	0	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>
/host-manager	None specified	Tomcat Host Manager Application	true	0	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>
/manager	None specified	Tomcat Manager Application	true	1	<div>Start Stop Reload Undeploy</div> <div>Expire sessions with idle ≥ 30 minutes</div>

➔ Click on Application name (It will open like below)

Note: in project 'index.jsp' we can modify web page content

File Location: <project-folder>/src/main/webapp/index.jsp



Welcome to Ashok IT

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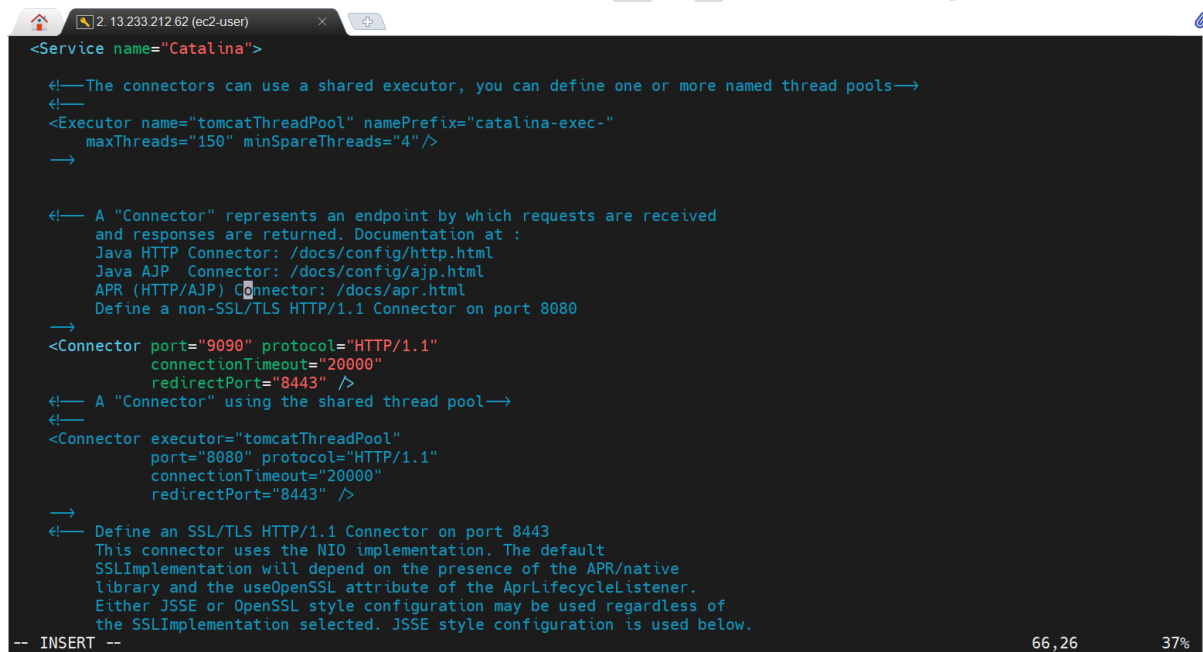
Contact Us : + 91-9985 39 66 77

➔ We can change Tomcat Server port in 'server.xml' file

File Location : <apache-tomcat-folder>/conf

```
total 232
drwxr-x--- 3 ec2-user ec2-user      23 Aug 27 06:51 Catalina
-rw----- 1 ec2-user ec2-user  12953 Jul 14 12:28 catalina.policy
-rw----- 1 ec2-user ec2-user   7308 Jul 14 12:28 catalina.properties
-rw----- 1 ec2-user ec2-user   1400 Jul 14 12:28 context.xml
-rw----- 1 ec2-user ec2-user   1149 Jul 14 12:28 jaspic-providers.xml
-rw----- 1 ec2-user ec2-user   2313 Jul 14 12:28 jaspic-providers.xsd
-rw----- 1 ec2-user ec2-user   4144 Jul 14 12:28 logging.properties
-rw----- 1 ec2-user ec2-user   7580 Jul 14 12:28 server.xml
-rw----- 1 ec2-user ec2-user   3009 Aug 27 06:59 tomcat-users.xml
-rw----- 1 ec2-user ec2-user   2558 Jul 14 12:28 tomcat-users.xsd
-rw----- 1 ec2-user ec2-user 172439 Jul 14 12:28 web.xml
ec2-user@ip-172-31-39-68 conf]$
```

➔ Edit Connector Port like below (Enable this port in Security Group to access Tomcat Server)



```
<Service name="Catalina">
  <!-- The connectors can use a shared executor, you can define one or more named thread pools -->
  <!--
    <Executor name="tomcatThreadPool" namePrefix="catalina-exec-"
      maxThreads="150" minSpareThreads="4"/>
  -->

  <!-- A "Connector" represents an endpoint by which requests are received
    and responses are returned. Documentation at :
    Java HTTP Connector: /docs/config/http.html
    Java AJP  Connector: /docs/config/ajp.html
    APR (HTTP/AJP) Connector: /docs/apr.html
    Define a non-SSL/TLS HTTP/1.1 Connector on port 8080
  -->
  <Connector port="9090" protocol="HTTP/1.1"
    connectionTimeout="20000"
    redirectPort="8443" />
  <!-- A "Connector" using the shared thread pool -->
  <!--
    <Connector executor="tomcatThreadPool"
      port="8080" protocol="HTTP/1.1"
      connectionTimeout="20000"
      redirectPort="8443" />
  -->
  <!-- Define an SSL/TLS HTTP/1.1 Connector on port 8443
    This connector uses the NIO implementation. The default
    SSLImplementation will depend on the presence of the APR/native
    library and the useOpenSSL attribute of the AprLifecycleListener.
    Either JSSE or OpenSSL style configuration may be used regardless of
    the SSLImplementation selected. JSSE style configuration is used below.
  -->
  <Connector port="8443" protocol="HTTP/1.1"
    SSLEngine="true"
    clientAuth="false"
    sslProtocol="TLS"
    keystoreFile="conf/keystore.jks"
    keystorePass="changeit"
    truststoreFile="conf/truststore.jks"
    truststorePass="changeit"
    sslCertificateFile="conf/catalina.x509.pem"
    sslCertificateKeyFile="conf/catalina.key"
    sslCertificateChainFile="conf/catalina.crt"
    sslCertificateChainKeyFile="conf/catalina.crt"
    sslCertificateChainPass="changeit"
    sslCertificateChainFile="conf/catalina.crt"
    sslCertificateChainKeyFile="conf/catalina.crt"
    sslCertificateChainPass="changeit"
  -->
</Service>
```

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