

Java Web Calculator

Overview:

A simple Java application that performs basic arithmetic calculations (add,subtract, multiply) using Maven and Tomcat to deploy in two different servers one for building and another for deploying in AWS EC2.

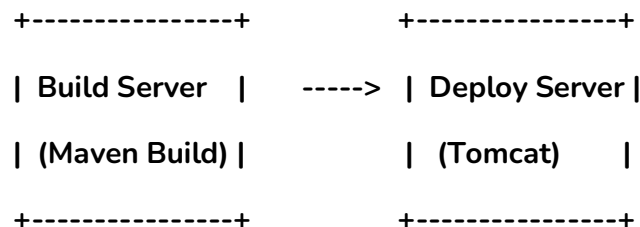
Tech Stack:

- **Language:** Java
- **Build Tool:** Maven
- **Server:** Apache Tomcat
- **Deployment:** Two servers – Build Server & Deploy Server

Prerequisites:

- **Java JDK 17** on both servers
- **Maven** installed on **Build Server**
- **Tomcat** installed on **Deploy Server**
- Both servers **must be in the same network**, typically the same **VPC** in AWS, to **copy files internally using private IPs**

Architecture:



Step-by-Step Guide: Two-Server Java Web Calculator Deployment

1. Create the Servers:

Build Server

1. Launch a Ubuntu EC2.
 - Amazon Machine Image: Ubuntu 24.04 LTS
 - Instance type: t3 micro(2 vCPU, RAM: 1 GB)
2. Create a Key pair(Build-Key.pem) for Secure Login.
3. Create a Security group(SSH-Build) or select an existing group(SSH-Build).
 - Add SSH port(22) to the inbound rule (If creating a Security group).

Deploy Server

1. Launch a Ubuntu EC2.
 - Amazon Machine Image: Ubuntu 24.04 LTS
 - Instance type: t3 micro(2 vCPU, RAM: 1 GB)
2. Create a Key pair(Deploy-Key.pem) for Secure Login.
3. Create a Security group(Tomcat-Deploy) or select an existing group(Tomcat-Deploy).
 - Add SSH port(22) to the inbound rule (If creating a Security group).
 - Add Custom port(8080) to the inbound rule(Tomcat runs on this Port).

Tip: Make sure both servers can communicate (or at least Build Server can SCP files to Deploy Server).

2. Install Prerequisites:

a. On Both Servers:

`sudo apt -y update` (To Update the Server)

`java --version` (Shows the Java Versions to Download)

`sudo apt install openjdk-17-jre-headless` (To install the Java 17 version)

Build-Server:

```
ubuntu@ip-172-31-27-77:~$  
ubuntu@ip-172-31-27-77:~$ sudo apt -y update  
Reading state information... Done  
41 packages can be upgraded. Run 'apt list --upgradable' to see them.  
ubuntu@ip-172-31-27-77:~$ java --version|  
ubuntu@ip-172-31-27-77:~$ sudo apt install openjdk-17-jre-headless  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
 alsa-topology-conf alsa-ucm-conf ca-certificates-java fontconfig-config fonts-dejavu-core fonts-dejavu-mono  
  java-common libasound2-data libasound2t64 libavahi-client3 libavahi-common-data libavahi-common3 libcups2t64  
  libfontconfig1 libgraphite2-3 libharfbuzz0b libjpeg-turbo8 libjpeg8 liblcms2-2 libpcsclite1
```

Deploy-Server:

```
ubuntu@ip-172-31-20-230:~$ sudo apt -y update  
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
41 packages can be upgraded. Run 'apt list --upgradable' to see them.  
ubuntu@ip-172-31-20-230:~$ java --version  
Command 'java' not found, but can be installed with:  
sudo apt install openjdk-17-jre-headless # version 17.0.16+8~us1-0ubuntu1~24.04.1,  
ubuntu@ip-172-31-20-230:~$ sudo apt install openjdk-17-jre-headless  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
  alsa-topology-conf alsa-ucm-conf ca-certificates-java fontconfig-config fonts-dejavu-core fonts-dejavu-mono  
  java-common libasound2-data libasound2t64 libavahi-client3 libavahi-common-data libavahi-common3 libcups2t64  
  libfontconfig1 libgraphite2-3 libharfbuzz0b libjpeg-turbo8 libjpeg8 liblcms2-2 libpcsclite1
```

b. Build Server:

- Install Maven:
 - Sudo apt -y install maven

```
ubuntu@ip-172-31-27-77:~$ sudo apt -y install maven  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:
```

c. Deploy Server:

- Install Tomcat:
 - Using **wget** command and URL from **Tomcat tar.gz**.

```
ubuntu@ip-172-31-20-230:~$ wget https://dldn.apache.org/tomcat/tomcat-9/v9.0.110/bin/apache-tomcat-9.0.110.tar.gz
--2025-10-07 08:30:42-- https://dldn.apache.org/tomcat/tomcat-9/v9.0.110/bin/apache-tomcat-9.0.110.tar.gz
Resolving dldn.apache.org (dldn.apache.org)... 151.101.2.132, 2a04:4e42::644
Connecting to dldn.apache.org (dldn.apache.org)|151.101.2.132|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 13036068 (12M) [application/x-gzip]
Saving to: 'apache-tomcat-9.0.110.tar.gz'

apache-tomcat-9.0.110.tar.gz 100%[=====] 12.43M --.-KB/s in 0.03s

2025-10-07 08:30:43 (361 MB/s) - 'apache-tomcat-9.0.110.tar.gz' saved [13036068/13036068]

ubuntu@ip-172-31-20-230:~$ ls
apache-tomcat-9.0.110.tar.gz
```

3. Setup Project on Build Server:

A. Clone the repository:

- a. Using the command git clone URL of the repository.
- b. Change directory to JavaWebCalculator

```
ubuntu@ip-172-31-27-77:~$ ls
ubuntu@ip-172-31-27-77:~$ git clone https://github.com/akracad/JavaWebCalculator.git
Cloning into 'JavaWebCalculator'...
remote: Enumerating objects: 102, done.
remote: Counting objects: 100% (89/89), done.
remote: Compressing objects: 100% (77/77), done.
remote: Total 102 (delta 14), reused 38 (delta 1), pack-reused 13 (from 1)
Receiving objects: 100% (102/102), 218.17 KiB | 27.27 MiB/s, done.
Resolving deltas: 100% (14/14), done.
ubuntu@ip-172-31-27-77:~$ ls
JavaWebCalculator
ubuntu@ip-172-31-27-77:~$ |
ubuntu@ip-172-31-27-77:~$ cd JavaWebCalculator/
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ ls
pom.xml  src  target
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ |
```

B. Validate and Build with Maven:

- a. Validate with using the command - "mvn validate"

```
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ mvn validate
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.web.cal:webapp >-----
[INFO] Building WebAppCal Maven Webapp 0.1.3
[INFO] -----[ war ]-----
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 0.127 s
[INFO] Finished at: 2025-10-07T08:45:06Z
[INFO] -----
```

- b. Build with using the command - “mvn package”
 - i. Here we will get errors during packaging because the pom.xml file is build for the older version of Java and Maven. So we need to modify the pom.xml file to the correct version of Java and Maven. Normally this is done by the Code Developers.

```
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ mvn package
[INFO] Scanning for projects...
[INFO] -----< com.web.cal:webapp >-----
[INFO] Building WebAppCal Maven Webapp 0.1.3
[INFO] -----[ war ]-----
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.jar
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time: 14.289 s
[INFO] Finished at: 2025-10-07T08:45:53Z
[INFO] -----
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-war-plugin:2.2:war (default-war) on project webapp: Execution default-war of goal org.apache.maven.plugins:maven-war-plugin:2.2:war failed: Unable to load the mojo 'war' in the plugin 'org.apache.maven.plugins:maven-war-plugin:2.2' due to an API incompatibility: org.codehaus.plexus.component.repository.exception.ComponentLookupException: Cannot access defaults field of Properties
[ERROR] -----
[ERROR] realm = plugin>org.apache.maven.plugins:maven-war-plugin:2.2
[ERROR] strategy = org.codehaus.plexus.classworlds.strategy.SelfFirstStrategy
[ERROR] urls[0] = file:/home/ubuntu/.m2/repository/org/apache/maven/plugins/maven-war-plugin/2.2/maven-war-plugin-2.2.jar
```

C. Edit the pom.xml file and upload it to the Build server.

- a. To read the pom.xml file we use the command:
 - i. Cat pom.xml

```
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ cat pom.xml
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4_0_0.xsd">
  <modelVersion>4.0.0</modelVersion>
```

- b. Clear and Edit the pom.xml file using the command:
 - i. > pom.xml
 - ii. vi pom.xml (vi is the text editor).

```
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ >pom.xml
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ vi pom.xml
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ |
```

D. Clean maven package:

- a. mvn clean

```

ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ mvn clean
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.web.cal:webapp >-----
[INFO] Building WebAppCal Maven Webapp 0.1.3
[INFO] -----[ war ]-----
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom (3.9 kB at 9.7 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar (25 kB at 432 kB/s)
[INFO]
[INFO] --- maven-clean-plugin:2.5:clean (default-clean) @ webapp ---
[INFO] Deleting /home/ubuntu/JavaWebCalculator/target
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] -----
[INFO] Total time: 1.033 s
[INFO] Finished at: 2025-10-07T09:00:55Z
[INFO] -----

```

E. Build the Webapp:

a. mvn package

```

ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.web.cal:webapp >-----
[INFO] Building WebAppCal Maven Webapp 0.1.3
[INFO] -----[ war ]-----
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom (3.9 kB at 9.7 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.jar (25 kB at 432 kB/s)
[INFO]
[INFO] Packaging webapp
[INFO] Assembling webapp [webapp] in [/home/ubuntu/JavaWebCalculator/target/webapp]
[INFO] Processing war project
[INFO] Copying webapp resources [/home/ubuntu/JavaWebCalculator/src/main/webapp]
[INFO] Building war: /home/ubuntu/JavaWebCalculator/target/webapp.war
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] -----
[INFO] Total time: 10.040 s
[INFO] Finished at: 2025-10-07T09:06:36Z
[INFO] -----

```

F. Result:

- a. After Successful Building of webapp you will get a folder target in it you will have the Artifact file or WAR file.

```

ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ ls
pom.xml  src  target
ubuntu@ip-172-31-27-77:~/JavaWebCalculator$ cd target/
ubuntu@ip-172-31-27-77:~/JavaWebCalculator/target$ ls
classes          generated-test-sources  maven-status  test-classes  webapp.war
generated-sources  maven-archiver         surefire-reports  webapp
ubuntu@ip-172-31-27-77:~/JavaWebCalculator/target$ |

```

4.Setup project on Deploy server:

A. Tomcat Zipped Tar file:

```
ubuntu@ip-172-31-20-230:~$ ls
apache-tomcat-9.0.110.tar.gz
ubuntu@ip-172-31-20-230:~$ tar -xvf apache-tomcat-9.0.110.tar.gz
```

B. Extract the tar file content:

```
ubuntu@ip-172-31-20-230:~$ ls
apache-tomcat-9.0.110  apache-tomcat-9.0.110.tar.gz
ubuntu@ip-172-31-20-230:~$ |
```

C. Change Directory to tomcat file:

```
ubuntu@ip-172-31-20-230:~$ cd apache-tomcat-9.0.110/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ ls
BUILDING.txt  LICENSE  README.md  RUNNING.txt  conf  logs  webapps
CONTRIBUTING.md  NOTICE  RELEASE-NOTES  bin  lib  temp  work
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ |
```

D. Start Tomcat:

a. Go to bin directory using cd bin/

```
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ cd bin/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ls
bootstrap.jar  ciphers.sh  commons-daemon-native.tar.gz  daemon.sh  digest.bat  setclasspath.bat  startup.sh  tomcat-juli.jar  version.bat
catalina-tasks.xml  catalina.bat  commons-daemon.jar  configtest.bat  digest.sh  shutdown.bat  tomcat-native.tar.gz  version.sh
catalina.sh  ciphers.bat  configtest.sh  makebase.bat  shutdown.sh  tool-wrapper.bat
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ |
```

b. Run the Script [startup.sh](#): using [./startup.sh](#)

```
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ./startup.sh
Using CATALINA_BASE:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_HOME:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_TMPDIR: /home/ubuntu/apache-tomcat-9.0.110/temp
Using JRE_HOME:        /usr
Using CLASSPATH:       /home/ubuntu/apache-tomcat-9.0.110/bin/bootstrap.jar:/home/ubuntu/apache-tomcat-9.0.110/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
```


- c. Using the public ip of the Deploy server and port number of tomcat we can observe tomcat.
 - i. <PUBLIC-IP-OF-THE-DEPLOY-SERVER>:8080
 - ii. Access Manager App in the website. We will be Access Denied.

Not secure 52.207.224.89:8080

Home Documentation Configuration Examples Wiki Mailing Lists Find Help

Apache Tomcat/9.0.110

If you're seeing this, you've successfully installed Tomcat. Congratulations!



Recommended Reading:

- [Security Considerations How-To](#)
- [Manager Application How-To](#)
- [Clustering/Session Replication How-To](#)

Server Status
Manager App
Host Manager

Developer Quick Start

- [Tomcat Setup](#)
- [Realms & AAA](#)
- [Examples](#)
- [Servlet Specifications](#)
- [First Web Application](#)
- [JDBC DataSources](#)
- [Tomcat Versions](#)

Managing Tomcat

For security, access to the [manager webapp](#) is restricted. Users are defined in:

`$CATALINA_HOME/conf/tomcat-users.xml`

In Tomcat 9.0 access to the manager application is split between different users. [Read more...](#)

[Release Notes](#)

[Changelog](#)

[Migration Guide](#)

[Security Notices](#)

Documentation

[Tomcat 9.0 Documentation](#)

[Tomcat 9.0 Configuration](#)

[Tomcat Wiki](#)

Find additional important configuration information in:

`$CATALINA_HOME/RUNNING.txt`

Developers may be interested in:

- [Tomcat 9.0 Bug Database](#)
- [Tomcat 9.0 JavaDocs](#)
- [Tomcat 9.0 Git Repository at GitHub](#)

Getting Help

[FAQ and Mailing Lists](#)

The following mailing lists are available:

- [tomcat-announce](#)
Important announcements, releases, security vulnerability notifications. (Low volume).
- [tomcat-users](#)
User support and discussion
- [taglibs-user](#)
User support and discussion for [Apache Taglibs](#)
- [tomcat-dev](#)
Development mailing list, including commit messages

Not secure 52.207.224.89:8080/manager/html

403 Access Denied

You are not authorized to view this page.

By default the 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 Manager's `context.xml` file.

If you have already configured the Manager application to allow access and you have used your browser's back button, used a saved book-mark or similar then you may have triggered the cross-site request forgery (CSRF) protection that has been enabled for the HTML interface Manager application. You will need to reset this protection by returning to the [main Manager page](#). Once you return to this page, you will be able to continue using the Manager application's HTML interface normally. If you continue to see this access denied message, check if have the necessary permissions to access this application.

If you have not changed any configuration files, please examine the file `conf/tomcat-users.xml` in your installation. That file must contain the credentials to let you use this webapp.

For example, to add the `manager-gui` role to a user named `tomcat` with a password of `js3cret`, add the following to the config file listed above.

```
<role rolename="manager-gui"/>
<user username="tomcat" password="js3cret" roles="manager-gui"/>
```

Note that for Tomcat 7 onwards, the roles required to use the manager application were changed from the single `manager` role to the following four roles. You will need to assign the role(s) required for the functionality you wish to access.

- `manager-gui` - allows access to the HTML GUI and the status pages
- `manager-script` - allows access to the text interface and the status pages
- `manager-jmx` - allows access to the JMX proxy and the status pages
- `manager-status` - allows access to the status pages only

The HTML interface is protected against CSRF but the text and JMX interfaces are not. To maintain the CSRF protection:

- Users with the `manager-gui` role should not be granted either the `manager-script` or `manager-jmx` roles.
- If the text or jmx interfaces are accessed through a browser (e.g. for testing since these interfaces are intended for tools not humans) then the browser must be closed afterwards to terminate the session.

For more information - please see the [Manager App How-To](#).

E. Edit Manager's context.xml files:

- a. Search Manager's context.xml files using command
Find -name context.xml


```
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ find -name context.xml
./conf/context.xml
./webapps/manager/META-INF/context.xml
./webapps/host-manager/META-INF/context.xml
./webapps/docs/META-INF/context.xml
./webapps/examples/META-INF/context.xml
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ |
```

- b. Edit the files that contain manager words or remove the highlighted lines.

```
vi ./webapps/manager/META-INF/context.xml
```

```
vi ./webapps/host-manager/META-INF/context.xml
```

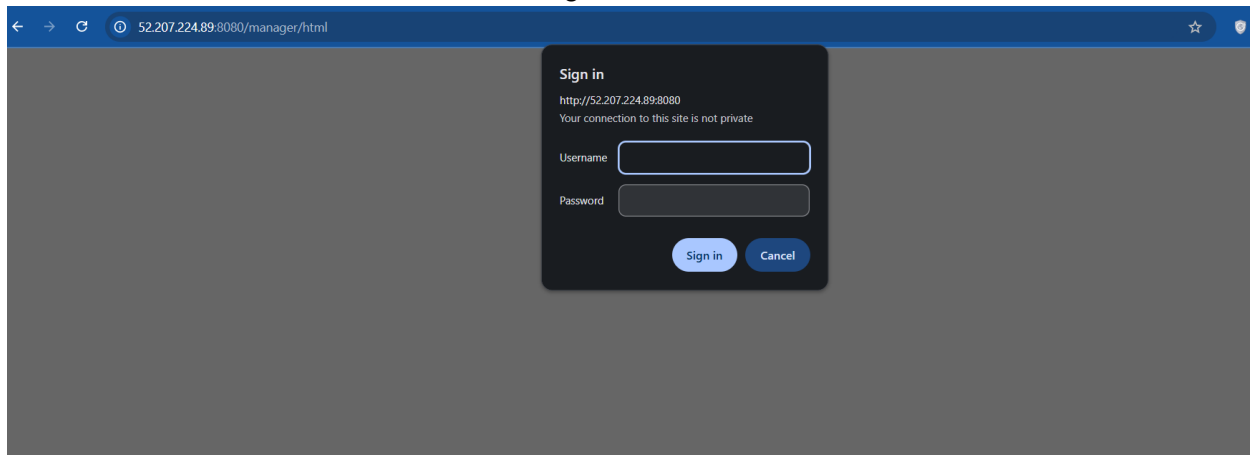
```
<Context antiResourceLocking="false" privileged="true" >
  <CookieProcessor className="org.apache.tomcat.util.http.Rfc6265CookieProcessor"
    sameSiteCookies="strict" />
  <Valve className="org.apache.catalina.valves.RemoteAddrValve"
    allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" />
  <Manager sessionAttributeValueClassNameFilter="java\.lang\.(?:Boolean|Integer|Long|Number|string)|org\.apache\.catalin
a\.filters\.CsrfPreventionFilter\$LruCache(?:\$1)?|java\.util\.(?:Linked)?HashMap"/>
</Context>
```

```
<!--<Valve className="org.apache.catalina.valves.RemoteAddrValve"
allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" /> -->
```

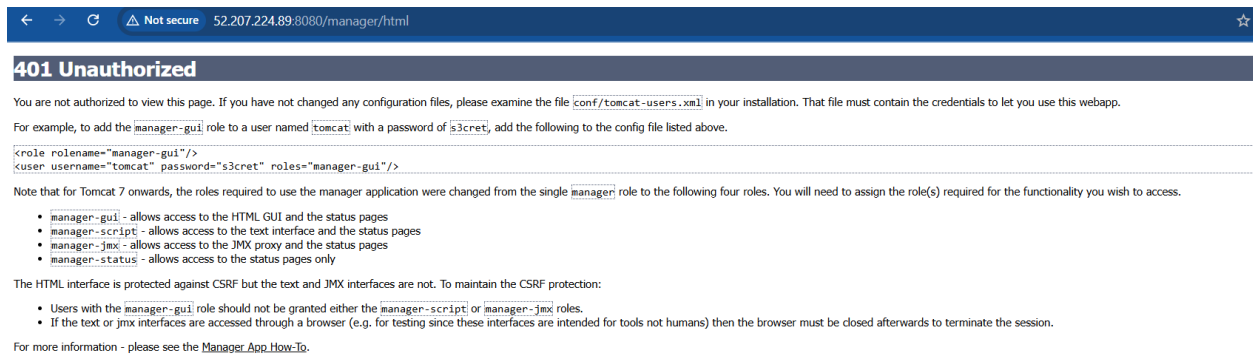
```
<Context antiResourceLocking="false" privileged="true" >
  <CookieProcessor className="org.apache.tomcat.util.http.Rfc6265CookieProcessor"
    sameSiteCookies="strict" />
  <Valve className="org.apache.catalina.valves.RemoteAddrValve"
    allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" />
  <Manager sessionAttributeValueClassNameFilter="java\.lang\.(?:Boolean|Integer|Long|Number|string)|org\.apache\.catalin
a\.filters\.CsrfPreventionFilter\$LruCache(?:\$1)?|java\.util\.(?:Linked)?HashMap"/>
</Context>
```

```
<Context antiResourceLocking="false" privileged="true" >
  <CookieProcessor className="org.apache.tomcat.util.http.Rfc6265CookieProcessor"
    sameSiteCookies="strict" />
  <Manager sessionAttributeValueClassNameFilter="java\.lang\.(?:Boolean|Integer|Long|Number|string)|org\.apache\.catalin
a\.filters\.CsrfPreventionFilter\$LruCache(?:\$1)?|java\.util\.(?:Linked)?HashMap"/>
</Context>
```

- c. Now go to Tomcat Website again it'll ask for username and password which we didn't configure:



- i. Select Cancel which takes us to this page:



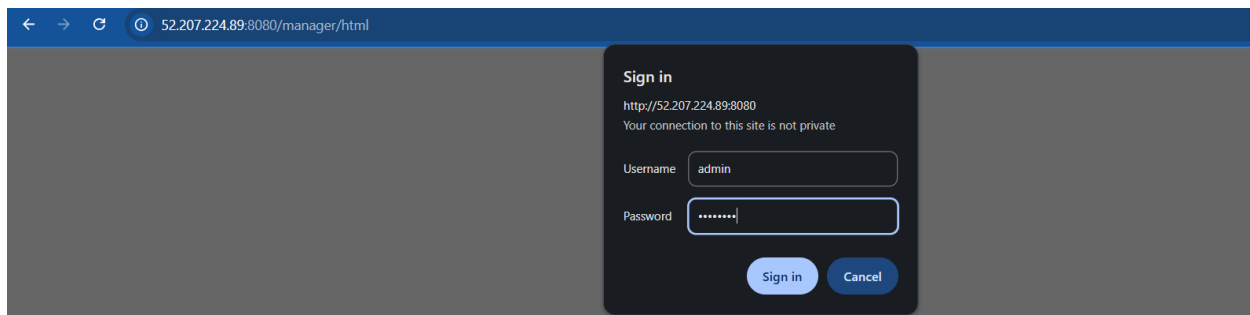
- d. To avoid this we need to configure a username and password in the conf directory in it we need to edit the tomcat-users.xml file

```
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ ls
BUILDING.txt  LICENSE  README.md  RUNNING.txt  conf  logs  webapps
CONTRIBUTING.md  NOTICE  RELEASE-NOTES  bin  lib  temp  work
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ cd conf/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/conf$ ls
Catalina  catalina.properties  jaspic-providers.xml  logging.properties  tomcat-users.xml  web.xml
catalina.policy  context.xml  jaspic-providers.xsd  server.xml  tomcat-users.xsd
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/conf$ vi tomcat-users.xml |
```

- e. Here we need to add the user and password to this file.

```
<!--
<user username="admin" password="<must-be-changed>" roles="manager-gui"/>
<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"/>
<user username="tomcat" password="s3cret" roles="manager-gui"/>
</tomcat-users>
-- INSERT (paste) --
```

- f. Now, reload the Webpage and Enter credentials we have given in tomcat webpage.



- g. We will see this page where all the webapps in the webapp directory contains in the tomcat file.

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

5. Transfer WAR File to Deploy Server:

A. Copying pem file:

- a. We need to make sure the Deploy server PEM file is on the Build server.
 - i. From your **local machine**, copy it to the build server and check in the Build server using:

```
scp -i "C:\Users\chara\Downloads\Build-Key.pem"  
"C:\Users\chara\Downloads\Deploy-Key.pem"  
ubuntu@<PUBLIC_IP_OF_BUILD_SERVER>:~/
```

```
PS C:\Users\chara> scp -i "C:\Users\chara\Downloads\Build-Key.pem" "C:\Users\chara\Downloads\Deploy-Key.pem" ubuntu@54.88.14.128:~/  
The authenticity of host '54.88.14.128 (54.88.14.128)' can't be established.  
ED25519 key fingerprint is SHA256:JaXNieX80eqDfQ+nEWfXwnF29URcwHAQA/xXSJRG2kQ.  
This host key is known by the following other names/addresses:  
C:\Users\chara/.ssh/known_hosts:115: ec2-54-164-78-151.compute-1.amazonaws.com  
C:\Users\chara/.ssh/known_hosts:121: ec2-54-88-14-128.compute-1.amazonaws.com  
Are you sure you want to continue connecting (yes/no/[fingerprint])?  
Warning: Permanently added '54.88.14.128' (ED25519) to the list of known hosts.  
Deploy-Key.pem 100% 1678 5.7KB/s 00:00
```

```
ubuntu@ip-172-31-27-77:~$ ls  
Deploy-Key.pem JavaWebCalculator  
ubuntu@ip-172-31-27-77:~$ |
```

B. Give proper Permissions:

- After copying the pem file we need to give proper(read) permissions to the pem file.

```
ubuntu@ip-172-31-27-77:~$ chmod 400 ~/Deploy-Key.pem  
ubuntu@ip-172-31-27-77:~$ ls -l  
total 8  
-r----- 1 ubuntu ubuntu 1678 Oct 7 11:13 Deploy-Key.pem  
drwxrwxr-x 5 ubuntu ubuntu 4096 Oct 7 09:06 JavaWebCalculator  
ubuntu@ip-172-31-27-77:~$ |
```

C. Copy WAR file to Deploy server:

- Inside the Build server we need to SCP(Secure Copy) the WAR file using:
scp -i ~/Deploy-Key.pem ~/JavaWebCalculator/target/*.war
ubuntu@172.31.20.230:~/apache-tomcat-9.0.110/webapps/

- It will ask confirmation say "yes" it will send the copy to the Deploy server:

```
ubuntu@ip-172-31-27-77:~$ scp -i ~/Deploy-Key.pem ~/JavaWebCalculator/target/*.war ubuntu@172.31.20.230:~/apache-tomcat-9.0.110/webapps/  
The authenticity of host '172.31.20.230 (172.31.20.230)' can't be established.  
ED25519 key fingerprint is SHA256:PjWrX1Er7srZxiWQVEWKeRm82gpFc9LcHDV4pIMrUwo.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '172.31.20.230' (ED25519) to the list of known hosts.  
webapp.war 100% 4189 6.7MB/s 00:00
```

- Check in the Deploy server to find the WAR file in webapps directory.

```

ubuntu@ip-172-31-20-230:~$ ls
apache-tomcat-9.0.110  apache-tomcat-9.0.110.tar.gz
ubuntu@ip-172-31-20-230:~$ cd apache-tomcat-9.0.110/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ ls
BUILDING.txt  LICENSE  README.md  RUNNING.txt  conf  logs  webapps
CONTRIBUTING.md  NOTICE  RELEASE-NOTES  bin  lib  temp  work
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ cd webapps/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/webapps$ ls
ROOT  docs  examples  host-manager  manager  webapp  webapp.war
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/webapps$ |

```

d. Now, check the webpage whether it is reflected in the Applications Table:

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
/webapp	None specified	Servlet	true	0	Start Stop Reload Undeploy Expire sessions with idle ≥ 30 minutes

D. Restart the Tomcat or Deploy server:

- a. Go to bin/ directory using:
 - i. `cd ~/apache-tomcat-9.0.110/bin/`

```

ubuntu@ip-172-31-20-230:~$ cd apache-tomcat-9.0.110/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ ls
BUILDING.txt  LICENSE  README.md  RUNNING.txt  conf  logs  webapps
CONTRIBUTING.md  NOTICE  RELEASE-NOTES  bin  lib  temp  work
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110$ cd bin/
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ls
bootstrap.jar  ciphers.sh  commons-daemon-native.tar.gz  daemon.sh  setclasspath.bat  startup.sh  version.bat
catalina-tasks.xml  commons-daemon.jar  digest.bat  shutdown.bat  tomcat-juli.jar  version.sh
catalina.sh  configtest.bat  makebase.bat  shutdown.sh  tool-wrapper.bat
ciphers.bat  configtest.sh  makebase.sh  startup.bat  tool-wrapper.sh

```

- b. Run the Shutdown Script in the bin directory:
 - i. `./shutdown.sh`

```

ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ls
bootstrap.jar      ciphers.sh        daemon.sh          setclasspath.bat  startup.sh         version.bat
catalina-tasks.xml commons-daemon-native.tar.gz digest.bat         setclasspath.sh   tomcat-juli.jar    version.sh
catalina.bat       commons-daemon.jar digest.sh          shutdown.bat       tomcat-native.tar.gz
catalina.sh        configtest.bat    makebase.bat      shutdown.sh        tool-wrapper.bat
ciphers.bat        configtest.sh     makebase.sh       startup.bat        tool-wrapper.sh
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ./shutdown.sh
Using CATALINA_BASE:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_HOME:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_TMPDIR: /home/ubuntu/apache-tomcat-9.0.110/temp
Using JRE_HOME:        /usr
Using CLASSPATH:        /home/ubuntu/apache-tomcat-9.0.110/bin/bootstrap.jar:/home/ubuntu/apache-tomcat-9.0.110/bin/tomcat-juli.jar
Using CATALINA_OPTS:
NOTE: Picked up JDK_JAVA_OPTIONS:  --add-opens=java.base/java.lang=ALL-UNNAMED --add-opens=java.base/java.lang.invoke=ALL-UNNAMED --add-opens=java.base/java.lang.reflect=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=java.rmi/sun.rmi.transport=ALL-UNNAMED

```

c. Run the Startup Script in the bin directory:

i. [./startup.sh](#)

```

ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ls
bootstrap.jar      ciphers.sh        daemon.sh          setclasspath.bat  startup.sh         version.bat
catalina-tasks.xml commons-daemon-native.tar.gz digest.bat         setclasspath.sh   tomcat-juli.jar    version.sh
catalina.bat       commons-daemon.jar digest.sh          shutdown.bat       tomcat-native.tar.gz
catalina.sh        configtest.bat    makebase.bat      shutdown.sh        tool-wrapper.bat
ciphers.bat        configtest.sh     makebase.sh       startup.bat        tool-wrapper.sh
ubuntu@ip-172-31-20-230:~/apache-tomcat-9.0.110/bin$ ./startup.sh
Using CATALINA_BASE:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_HOME:   /home/ubuntu/apache-tomcat-9.0.110
Using CATALINA_TMPDIR: /home/ubuntu/apache-tomcat-9.0.110/temp
Using JRE_HOME:        /usr
Using CLASSPATH:        /home/ubuntu/apache-tomcat-9.0.110/bin/bootstrap.jar:/home/ubuntu/apache-tomcat-9.0.110/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.

```

E. Open Webapp in Tomcat Application table:

← → ↺ ⚠ Not secure 52.207.224.89:8080/webapp/

Calculator

first number:
 Second number :
☐ addition
☐ subtraction
☐ product

F. Test the Application:

← → ↺ ⚠ Not secure 52.207.224.89:8080/webapp/firstHome

Addition

30

Substraction

10

Multiplication

200

Calculator

first number:
 Second number :
☐ addition
☐ subtraction
☐ product

