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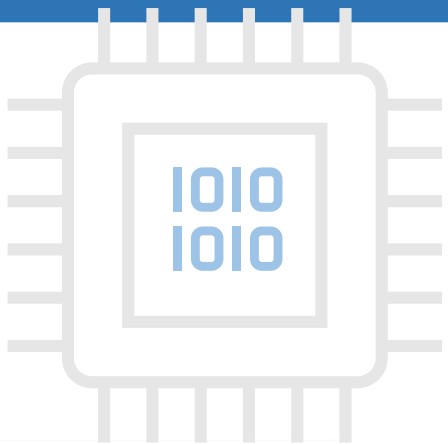
CAP912
MIDDLEWARE ARCHITECTURE
CA-2

SET - A



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Section: DE436

Prajwol Manandhar – 11900471

CAP912 – Middleware Architecture

1. Explain the installation steps of Apache tomcat server with picture demonstration?

Answer:

Since I use a Mac computer, I am going to explain the Apache Tomcat installation on a Mac computer. Also, since the GUI version of Apache Tomcat is not available for MacOS, the installation and implementation is going to be on the command line i.e. Terminal.

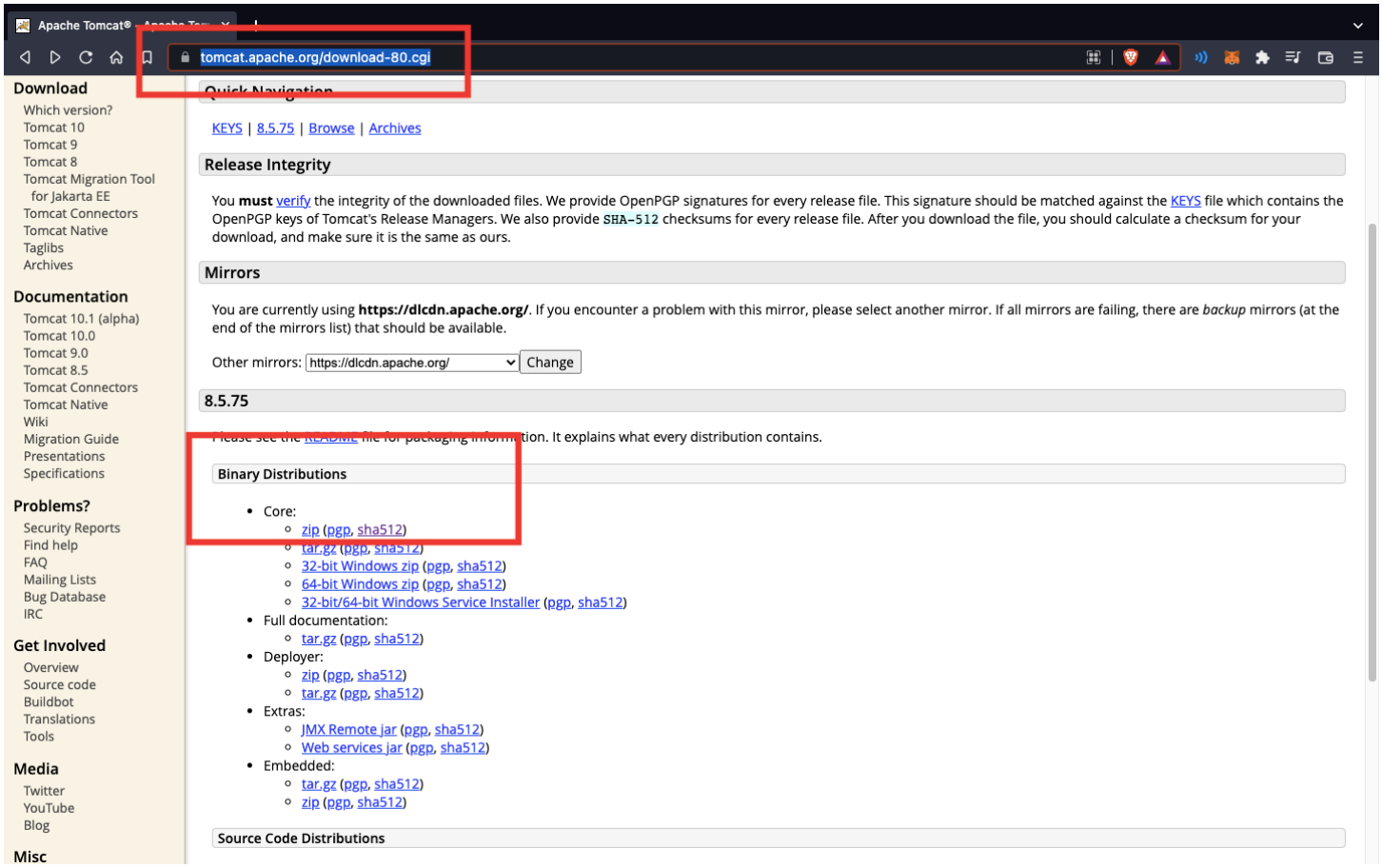
The installation steps of Apache tomcat server are briefly explained below:

Step 1: Go to Apache Tomcat download website:
https://tomcat.apache.org/download-80.cgi

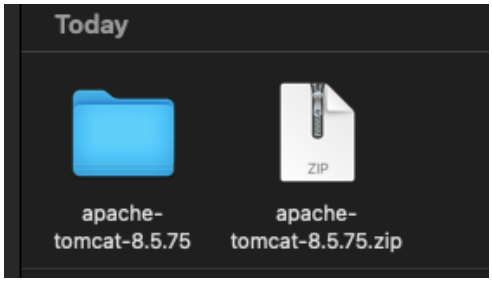
Step 2: Find a section titled 'Binary Distributions'.

Step 3: Under 'Binary Distributions' find a section titled 'Core'.

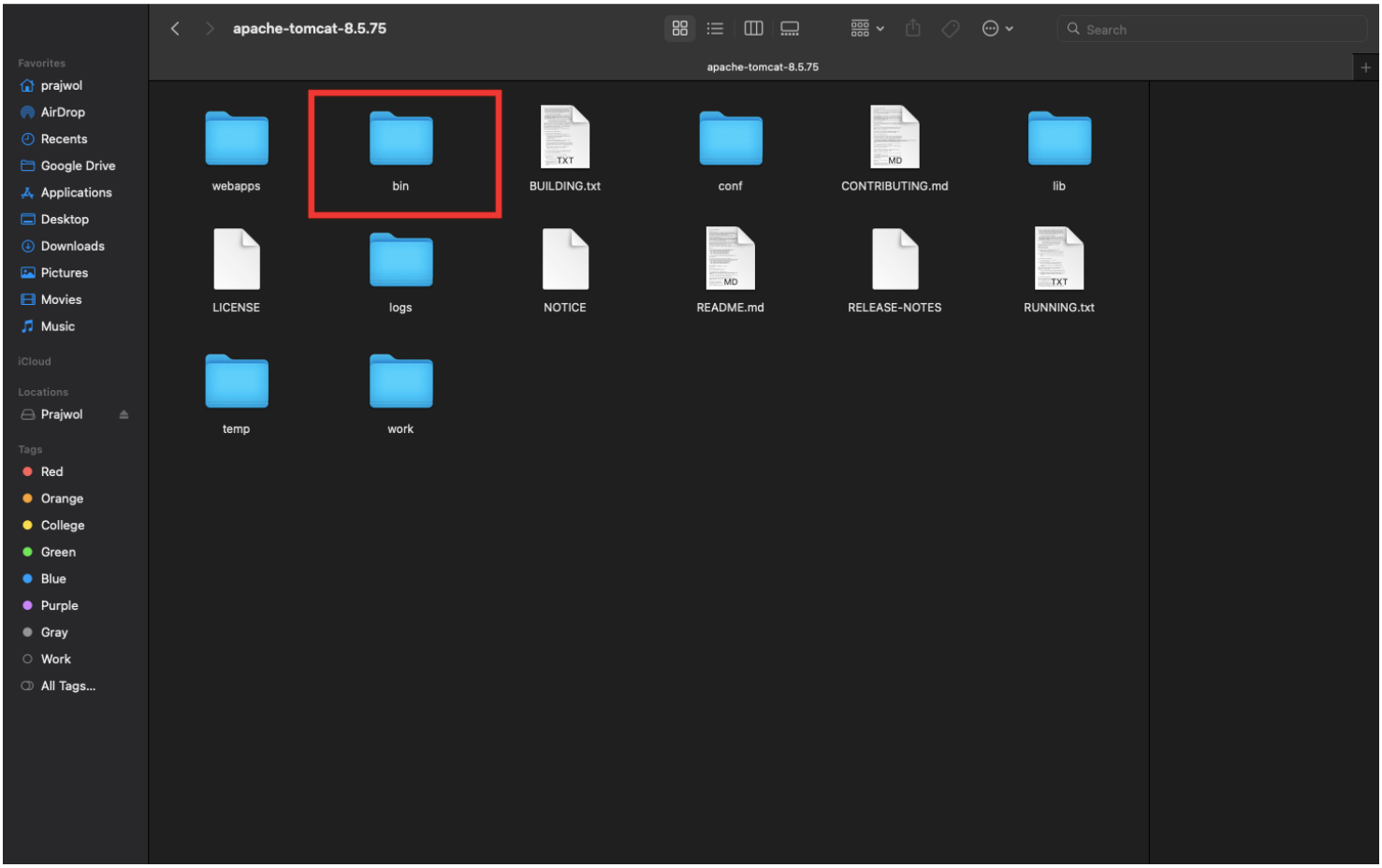
Step 4: From there download the first file which is titled 'zip (pgp, sha512)'.



Step 5: When the zip file is downloaded, unzip the file into your computer. The file after unzipping will look something like this.



Step 6: Inside the unzipped folder, there you can find various other files and folders. From all these folders, ‘bin’ folder is the one from where we are going to start the Tomcat server.



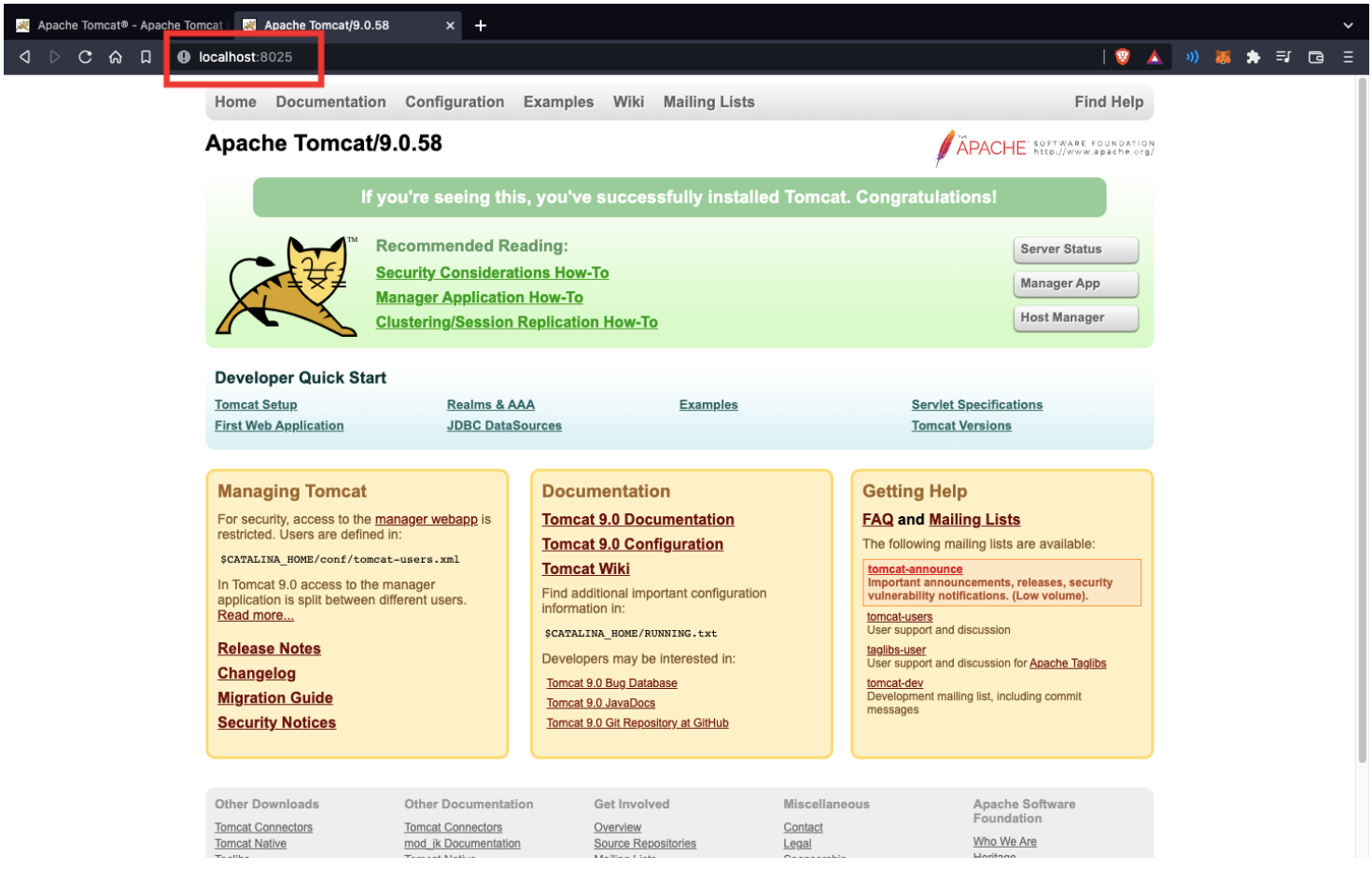
Step 7: Now we are going to open the bin folder in the terminal.

Step 8: Inside the bin folder, we can find startup.sh and shutdown.sh. Here, we are going to trigger ‘startup.sh’ by typing *./startup.sh* to start the Tomcat server and trigger ‘shutdown.sh’ by typing *./shutdown.sh* to stop the Tomcat server.

```
Last login: Mon Feb  7 12:06:38 on ttys000
(base) prajwol@Prajwols-MacBook-Air ~ % cd Downloads/tomcat/apache-tomcat-9.0.58
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % ls
BUILDING.txt    LICENSE         README.md       RUNNING.txt     conf            logs            webapps
CONTRIBUTING.md NOTICE          RELEASE-NOTES   bin             lib             temp            work
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % cd bin
(base) prajwol@Prajwols-MacBook-Air bin % ls
bootstrap.jar                   configtest.sh                   shutdown.sh
catalina-tasks.xml              daemon.sh                       startup.bat
catalina.bat                    digest.bat                      startup.sh
catalina.sh                     digest.sh                       tomcat-juli.jar
ciphers.bat                     makebase.bat                    tomcat-native.tar.gz
ciphers.sh                      makebase.sh                     tool-wrapper.bat
commons-daemon-native.tar.gz    setclasspath.bat                tool-wrapper.sh
commons-daemon.jar              setclasspath.sh                 version.bat
configtest.bat                  shutdown.bat                    version.sh
(base) prajwol@Prajwols-MacBook-Air bin %
```

In the following image, we can see that the Tomcat server has been started. To check if the server is running, we can type localhost:*(port number)* in the browser, and if the website of Apache Tomcat is showing, the Tomcat server is successfully working.

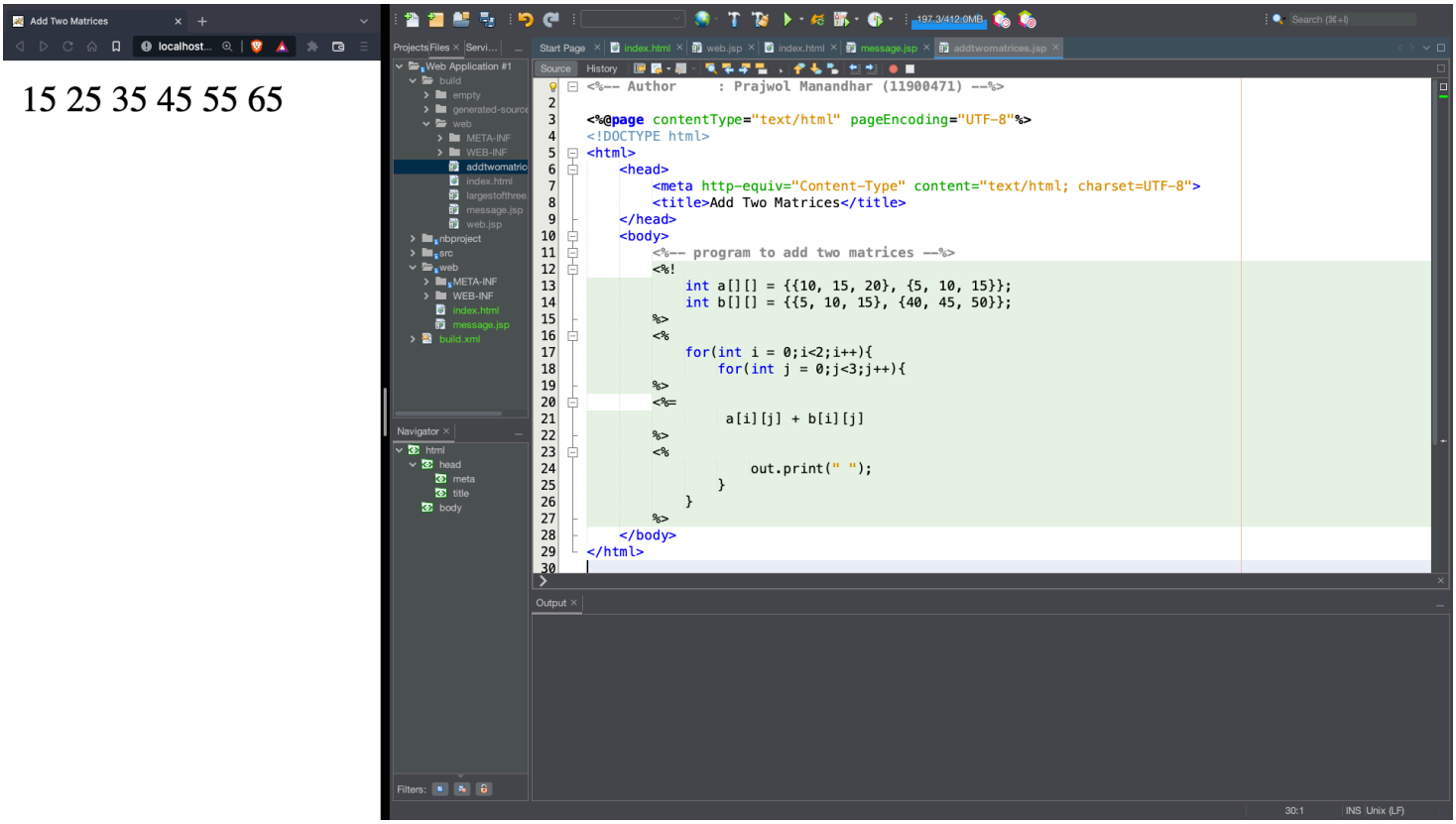
```
Last login: Mon Feb  7 12:06:38 on ttys000
(base) prajwol@Prajwols-MacBook-Air ~ % cd Downloads/tomcat/apache-tomcat-9.0.58
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % ls
BUILDING.txt    LICENSE         README.md       RUNNING.txt     conf            logs            webapps
CONTRIBUTING.md NOTICE          RELEASE-NOTES   bin             lib             temp            work
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % cd bin
(base) prajwol@Prajwols-MacBook-Air bin % ls
bootstrap.jar                   configtest.sh                   shutdown.sh
catalina-tasks.xml              daemon.sh                       startup.bat
catalina.bat                    digest.bat                      startup.sh
catalina.sh                     digest.sh                       tomcat-juli.jar
ciphers.bat                     makebase.bat                    tomcat-native.tar.gz
ciphers.sh                      makebase.sh                     tool-wrapper.bat
commons-daemon-native.tar.gz    setclasspath.bat                tool-wrapper.sh
commons-daemon.jar              setclasspath.sh                 version.bat
configtest.bat                  shutdown.bat                    version.sh
(base) prajwol@Prajwols-MacBook-Air bin % ./startup.sh
Using CATALINA_BASE:   /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58
Using CATALINA_HOME:   /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58
Using CATALINA_TMPDIR: /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/temp
Using JRE_HOME:        /Library/Java/JavaVirtualMachines/jdk-14.0.1.jdk/Contents/Home
Using CLASSPATH:       /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/bin/bootstrap.jar:/Users/prajwol/Download
s/tomcat/apache-tomcat-9.0.58/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
(base) prajwol@Prajwols-MacBook-Air bin %
```



After we are done working with the Tomcat server, we can simply write, *./shutdown.sh* in the terminal and the Tomcat server will stop.

```
Last login: Mon Feb  7 12:06:38 on ttys000
(base) prajwol@Prajwols-MacBook-Air ~ % cd Downloads/tomcat/apache-tomcat-9.0.58
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % ls
BUILDING.txt    LICENSE         README.md       RUNNING.txt     conf            logs            webapps
CONTRIBUTING.md NOTICE          RELEASE-NOTES   bin             lib             temp            work
(base) prajwol@Prajwols-MacBook-Air apache-tomcat-9.0.58 % cd bin
(base) prajwol@Prajwols-MacBook-Air bin % ls
bootstrap.jar                   configtest.sh                   shutdown.sh
catalina-tasks.xml              daemon.sh                       startup.bat
catalina.bat                    digest.bat                      startup.sh
catalina.sh                     digest.sh                       tomcat-juli.jar
ciphers.bat                     makebase.bat                    tomcat-native.tar.gz
ciphers.sh                      makebase.sh                     tool-wrapper.bat
commons-daemon-native.tar.gz    setclasspath.bat                tool-wrapper.sh
commons-daemon.jar              setclasspath.sh                 version.bat
configtest.bat                  shutdown.bat                    version.sh
(base) prajwol@Prajwols-MacBook-Air bin % ./startup.sh
Using CATALINA_BASE:   /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58
Using CATALINA_HOME:   /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58
Using CATALINA_TMPDIR: /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/temp
Using JRE_HOME:        /Library/Java/JavaVirtualMachines/jdk-14.0.1.jdk/Contents/Home
Using CLASSPATH:       /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/bin/bootstrap.jar:/Users/prajwol/Download
s/tomcat/apache-tomcat-9.0.58/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
(base) prajwol@Prajwols-MacBook-Air bin % ./shutdown.sh
Using CATALINA_BASE:   /Users/prajwol/Do                    che-tomcat-9.0.58
Using CATALINA_HOME:   /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58
Using CATALINA_TMPDIR: /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/temp
Using JRE_HOME:        /Library/Java/JavaVirtualMachines/jdk-14.0.1.jdk/Contents/Home
Using CLASSPATH:       /Users/prajwol/Downloads/tomcat/apache-tomcat-9.0.58/bin/bootstrap.jar:/Users/prajwol/Download
s/tomcat/apache-tomcat-9.0.58/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.io=ALL-UNNA
MED --add-opens=java.base/java.util=ALL-UNNAMED --add-opens=java.base/java.util.concurrent=ALL-UNNAMED --add-opens=ja
va.rmi/sun.rmi.transport=ALL-UNNAMED
(base) prajwol@Prajwols-MacBook-Air bin %
```

2. Create JSP page to add two matrices.



Code:

```
<%-- Author     : Prajwol Manandhar (11900471) --%>

<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta     http-equiv="Content-Type"     content="text/html;
charset=UTF-8">
        <title>Add Two Matrices</title>
    </head>
    <body>
        <%-- program to add two matrices --%>
        <%!
            int a[][] = {{10, 15, 20}, {5, 10, 15}};
            int b[][] = {{5, 10, 15}, {40, 45, 50}};
        %>
```

```
        <%
            for(int i = 0;i<2;i++){
                for(int j = 0;j<3;j++){
        %>
        <%=
                 a[i][j] + b[i][j]
        %>
        <%
                    out.print(" ");
                }
            }
        %>
    </body>
</html>
```

In the given code, first two 2x3 matrices a[ ][ ], b[ ][ ] are initialized using declaration tag and then both matrices a[ ][ ] and b[ ][ ] are populated with numbers. Then, we extract all the numbers inside matrices a[ ][ ] and b[ ][ ] by looping them through the i-loop and j-loop. The extracted numbers are then added and printed using the expression tag.

3. Explain Declaration Tag and Expression Tag using appropriate syntax and code examples.

Answer:

JSP Declaration Tag

In JSP, declaration tag one of the scription elements which is used to **declare fields and methods.** We can declare an instance variable, a static member, and methods inside the declaration tag. The code inside declaration tag is placed outside the *service()* method of the auto generated servlet due to which it doesn't get memory at each request.
Declaration tag is denoted by percentage sign which is followed by an exclamation sign .i.e. <%! %>

Features of Declaration Tag:

- It declares one or more variables or methods for use later in the JSP source file.
- We can declare any number of variable or methods within one declaration tag, however they have to be separated by semicolons.
- The declaration must be valid in the scripting language used in the JSP file.
- It must contain at least one complete statement.

Syntax of JSP Declaration Tag:

```
<%! Declaration (inside this tag we can initialize our variables, methods and classes) %>
```

Example of JSP Declaration Tag: Program to find simple interest.

```
<%-- Author: Prajwol Manandhar (11900471) --%>
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html;
          charset   = ISO-8859-1">
        <title>Program to find simple interest </title>
    </head>

    <body>
          (Declaration Tag)
        <%! int p = 100000; int t = 3; int r = 12; int SI; %>
        <%
            SI = (p * t * r) / 100;
            out.print(SI);
        %>
    </body>
</html>
```

JSP Expression Tag

In JSP, expression tag is the scripting element which is used for **writing our content on client side.** In other words, we can use expression tag for displaying information on client browser. This tag converts the code into an expression statement that transforms into a value in the form of string object and insert into the implicit output object.
Expression tag is denoted by percentage sign which is followed by an equal to sign .i.e. <%= %>

Features of Expression Tag:

- It contains a scripting language expression which is converted to a string and then inserted where the expression is converted to a string.
- Since the value of an expression is converted to a string, we can use expression within text in a JSP file.
- We cannot use a semicolon to end an expression.
- We don't need to write *out.println* for printing anything because these are converted into *out.print()* statement and insert into the servlet class by the container.

Syntax of JSP Expression Tag:

```
<%= Expression (inside this tag we can write content to be displayed
in the client side) %>
```

Example of JSP Expression Tag: Program to display current date and time.

```
<%-- Author: Prajwol Manandhar (11900471) --%>
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<!DOCTYPE html>
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html;
          charset = ISO-8859-1">
        <title>Program to display current date abnd time</title>
    </head>

    <body>
          (Expression Tag)
        Today's date: <%= (new java.util.Date()).toLocaleString() %>
    </body>
</html>
```