



CORSO DI LAUREA IN INFORMATICA

Tecnologie Software per il Web

DEPLOYING APPS WITH ECLIPSE AND TOMCAT

a.a. 2021-2022

Topics

- Setting up the required software
 - Installing Java SE
 - Getting Apache Tomcat
 - Installing Eclipse (Java EE version)
 - Telling Eclipse about Tomcat
- Creating a Dynamic Web Project
 - A project that can run on a Web server
- Deploying a Dynamic Web Project
 - Running it on Apache Tomcat

Need Web server

- Requirement: Using *Servlet, JSP, Ajax, Ajax in jQuery, JSON, JDBC, ...*
- Required
 - Your Web page needs to run on a server that supports HTTP
 - For a static Web project, you could just drag HTML file onto browser to test everything
- Preferred
 - Your server can produce dynamic results (results that change each time or that are based on what is passed to the server)
 - Will work with PHP, .NET, Ruby, as well as Java
 - But even with static text files, your pages must run on server in order for Ajax calls to work

Steps

1. **Install Java**
 - The server will use Java even if you never write or see any Java code
2. **Install Apache Tomcat**
 - A simple Web server that supports Java
3. **Install Eclipse**
 - An editor (development environment) that is good at editing HTML, JavaScript, CSS, etc., but that also knows how to create and deploy applications to Tomcat
4. **Make a dynamic Web app in Eclipse**
 - An app that Eclipse knows how to send to Tomcat
5. **Deploy the Web app**
 - Launch it on Tomcat

Installing Java SE (Standard Edition)

- Download Java SE 11 version from Oracle
 - <https://www.oracle.com/java/technologies/javase/jdk11-archive-downloads.html>
 - Or just Google “download java se”
- Install it
 - Run installer and accept all defaults

Java SE 11 (LTS)

Java SE 11.0.6 is the latest release for the Java SE 11 Platform

- [Documentation](#)
- [Installation Instructions](#)
- [Release Notes](#)
- [Oracle License](#)
 - [Binary License](#)
 - [Documentation License](#)
- [Java SE Licensing Information User Manual](#)
 - [Includes Third Party Licenses](#)
- [Certified System Configurations](#)
- [Readme](#)

Oracle JDK



JDK Download



Documentation Download

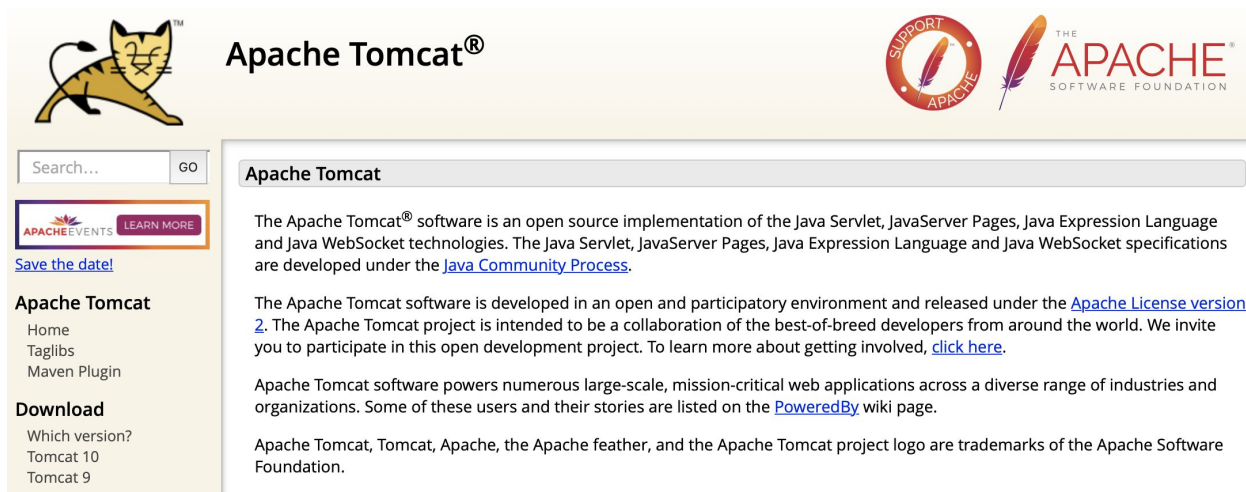


Java SE 8u241

Java SE 8u241 includes important bug fixes. Oracle strongly recommends that all Java SE 8 users upgrade to this release.

Download and unzip Apache Tomcat

- Start at <http://tomcat.apache.org>
 - Choose download link on left, then ZIP version
 - Tomcat 9
- Either way, just unzip the file (Windows)
 - E.g., resulting in something like C:\apache-tomcat-9.0.43
- Remember the location
 - You will tell Eclipse about it later



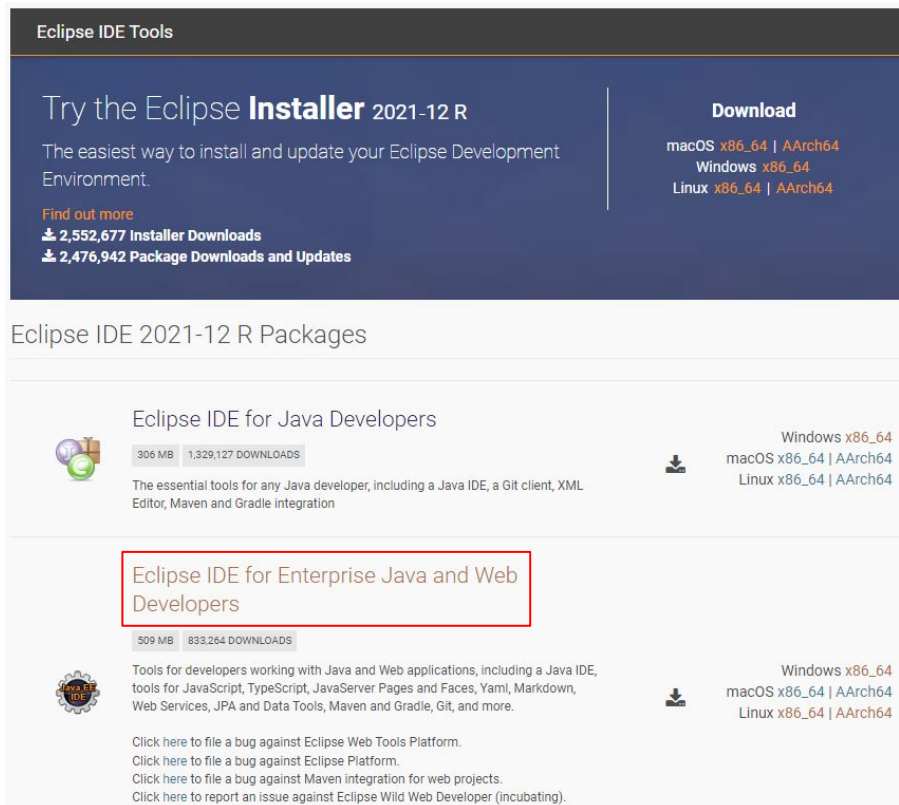
The screenshot shows the Apache Tomcat website. At the top left is the Tomcat logo (a yellow cat). To its right is the text "Apache Tomcat®". Further right are the "SUPPORT" and "APACHE" logos. Below the main header is a search bar with the text "Search..." and a "GO" button. On the left side, there is a sidebar with a "Save the date!" link, a "Learn More" button, and a "Download" section. The "Download" section lists "Which version?", "Tomcat 10", and "Tomcat 9". The main content area on the right has the heading "Apache Tomcat" and contains text about the software being an open source implementation of Java Servlet, JavaServer Pages, Java Expression Language and Java WebSocket technologies. It also mentions the Apache License version 2.0 and provides a link to the Apache License version 2.0 page. At the bottom, it states that Apache Tomcat, Tomcat, Apache, the Apache feather, and the Apache Tomcat project logo are trademarks of the Apache Software Foundation.

Installing Tomcat on Mac

1. Download a binary distribution of the core module: `apache-tomcat-9.0.43.tar.gz` in Binary Distributions / Core section
2. Opening/unarchiving the archive will create a folder structure in your Downloads folder `~/Downloads/apache-tomcat-9.0.43`
3. Open to Terminal app to move the unarchived distribution to `/usr/local`:
 - **`sudo mkdir -p /usr/local`**
 - **`sudo mv ~/Downloads/apache-tomcat-9.0.43 /usr/local`**
4. To make it easy to replace this release with future releases, we are going to create a symbolic link that we are going to use when referring to Tomcat:
 - **`sudo rm -f /Library/Tomcat`**
 - **`sudo ln -s /usr/local/apache-tomcat-9.0.43 /Library/Tomcat`**
5. Change ownership of the `/Library/Tomcat` folder hierarchy:
 - **`sudo chown -R <your_username> /Library/Tomcat`**
6. Make all scripts executable:
 - **`sudo chmod +x /Library/Tomcat/bin/*.sh`**

Download and unzip Eclipse (Java EE Version)

- Start at <http://www.eclipse.org/>
 - Choose download link on top right,...
 - <https://www.eclipse.org/downloads/packages>



The screenshot shows the "Eclipse IDE Tools" page. At the top, it says "Try the Eclipse **Installer** 2021-12 R" and "The easiest way to install and update your Eclipse Development Environment." Below this, it says "Find out more" and "2,552,677 Installer Downloads" and "2,476,942 Package Downloads and Updates". To the right, under "Download", it lists "macOS x86_64 | AArch64", "Windows x86_64", and "Linux x86_64 | AArch64". Below this, it says "Eclipse IDE 2021-12 R Packages". There are two main sections: "Eclipse IDE for Java Developers" and "Eclipse IDE for Enterprise Java and Web Developers". The "Eclipse IDE for Enterprise Java and Web Developers" section is highlighted with a red box. It shows a download icon, "509 MB", "833,264 DOWNLOADS", and a list of download links for "Windows x86_64", "macOS x86_64 | AArch64", and "Linux x86_64 | AArch64". Below this, there are links to file bugs against the Eclipse Web Tools Platform, Eclipse Platform, Maven integration for web projects, and Eclipse Wild Web Developer (incubating).

Eclipse IDE Tools

Try the Eclipse **Installer** 2021-12 R

The easiest way to install and update your Eclipse Development Environment.

Find out more

2,552,677 Installer Downloads

2,476,942 Package Downloads and Updates

Download

macOS x86_64 | AArch64

Windows x86_64

Linux x86_64 | AArch64

Eclipse IDE 2021-12 R Packages

Eclipse IDE for Java Developers

306 MB 1,329,127 DOWNLOADS

The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration

Windows x86_64

macOS x86_64 | AArch64

Linux x86_64 | AArch64

Eclipse IDE for Enterprise Java and Web Developers

509 MB 833,264 DOWNLOADS

Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JavaServer Pages and Faces, Yaml, Markdown, Web Services, JPA and Data Tools, Maven and Gradle, Git, and more.

Windows x86_64

macOS x86_64 | AArch64

Linux x86_64 | AArch64

Click here to file a bug against Eclipse Web Tools Platform.

Click here to file a bug against Eclipse Platform.

Click here to file a bug against Maven integration for web projects.

Click here to report an issue against Eclipse Wild Web Developer (incubating).

Download and unzip Eclipse (Java EE Version)

- Download Zip file: just unzip the file
 - E.g., resulting in something like C:\eclipse
- Remember the location
 - You will later launch Eclipse by clicking on [eclipse.exe](#) in the folder where you unzipped Eclipse



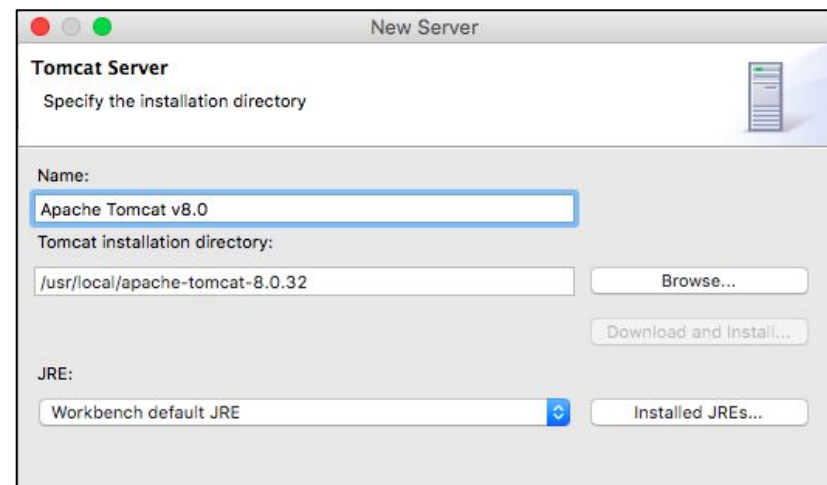
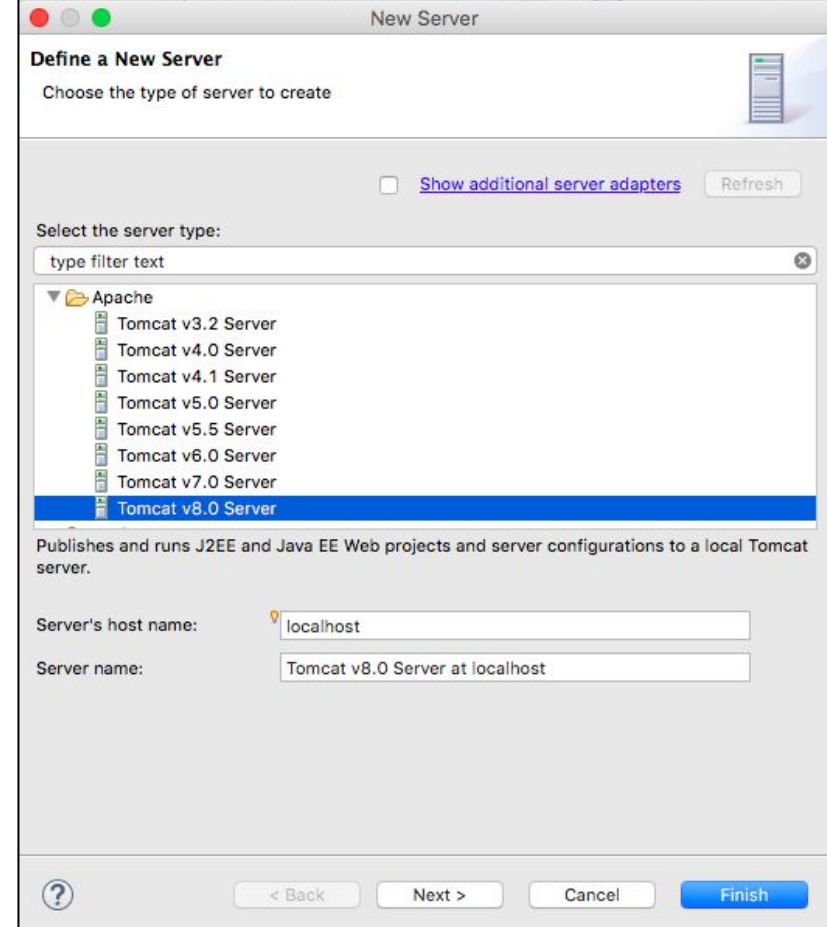
Running Eclipse

- Unzip the downloaded file (no installer!)
 - Unzip anywhere; call the folder you unzip into “installDir”
- Double click **eclipse.exe**
 - From *installDir*
- Shortcut
 - Many developers put Eclipse link on their desktop
 - R-click eclipse.exe, Copy, then go to desktop, R-click, and Paste Shortcut (not just Paste!)
- Set/switch workspace



Configuring Eclipse

- Tell Eclipse about Tomcat
 - Open the “JavaEE” perspective
 - Click on **Servers tab** at bottom R-click in window
 - New, Server, Apache, Tomcat v9.0
 - Next, navigate to folder where you unzipped Tomcat
 - Next, finish



Configuring Eclipse

- Change the Tomcat port to 80
 - Double click Tomcat at the bottom
 - Change HTTP/1.1 port on right side from 8080 to 80, then Save
 - You can use: `http://localhost/...`
 - otherwise: `http://localhost:8080/...`

Overview

General Information
Specify the host name and other common settings.

Server name: Tomcat v8.0 Server at localhost

Host name: localhost

Runtime Environment: Apache Tomcat v8.0

Configuration path: /Servers/Tomcat v8.0 Server at loca [Browse...](#)

[Open launch configuration](#)

Server Locations
Specify the server path (i.e. catalina.base) and deploy path. Server must be published with no modules present to make changes.

☒ Use workspace metadata (does not modify Tomcat installation)

☐ Use Tomcat installation (takes control of Tomcat installation)

☐ Use custom location (does not modify Tomcat installation)

Server path: .metadata/.plugins/org.eclipse.wst.server.c [Browse...](#)

[Set deploy path to the default value \(currently set\)](#)

Deploy path: wtpwebapps [Browse...](#)

Publishing

Timeouts
Specify the time limit to complete server operations.

Start (in seconds): 45

Stop (in seconds): 15

Ports
Modify the server ports.

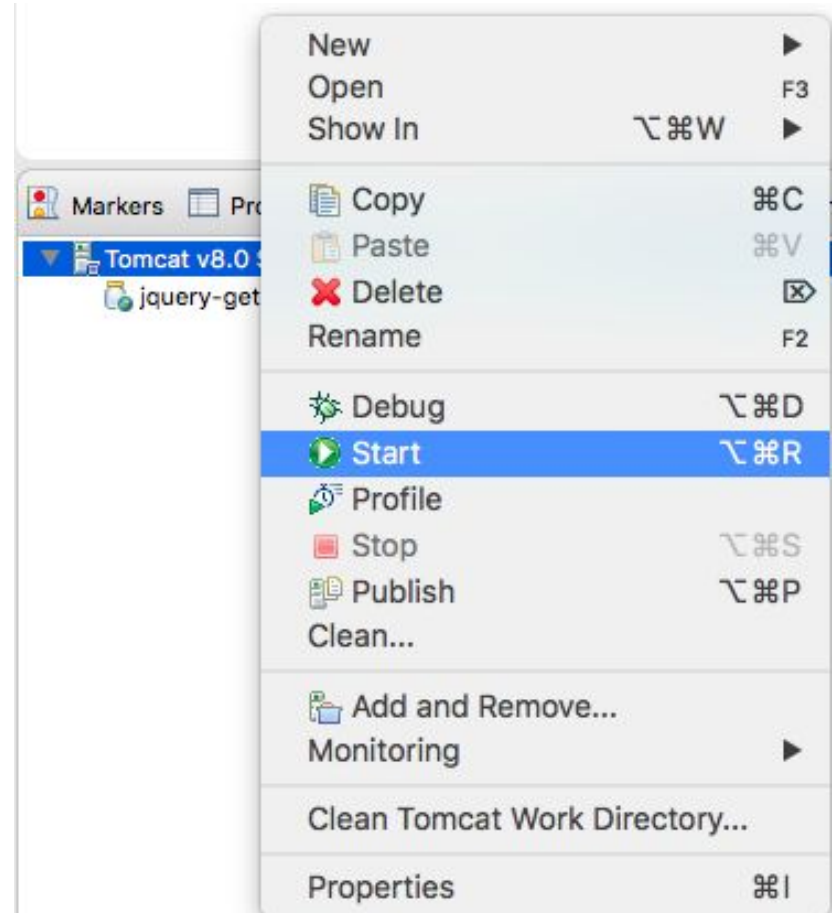
Port Name	Port Number
Tomcat admin port	8005
HTTP/1.1	80
AJP/1.3	8009

MIME Mappings

Make a reference to the real Tomcat distribution

Deploy the App to Tomcat

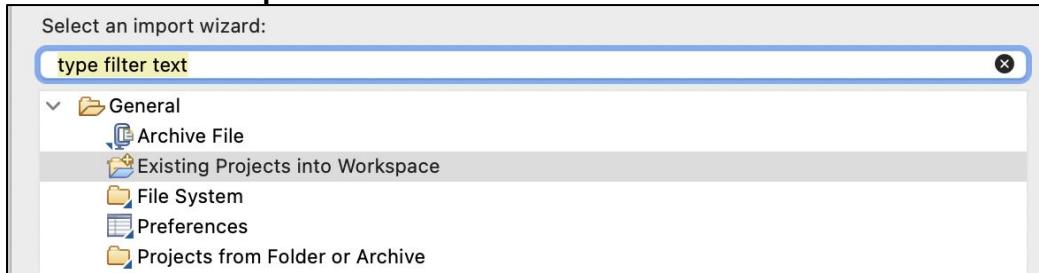
- Deploy project
 - Select **Servers** tab at bottom
 - R-click on Tomcat
 - Choose “Add and Remove”
 - Choose project
 - Press “Add”
 - Click “Finish”
- Start Server
 - R-click Tomcat at bottom
 - Start (use “Restart” if Tomcat already running)
- Test URL
 - <http://localhost:port/your-project/your-file.html>



Example

- Import **jquery-getting-started**

- File ☐ Import



- Deploy app to Tomcat

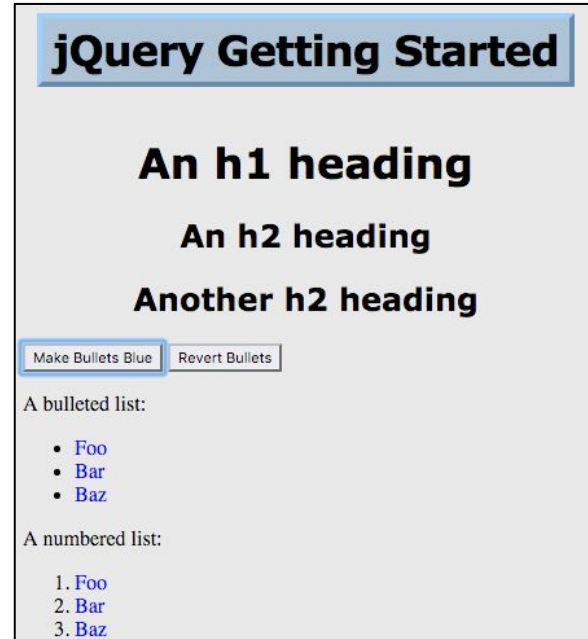
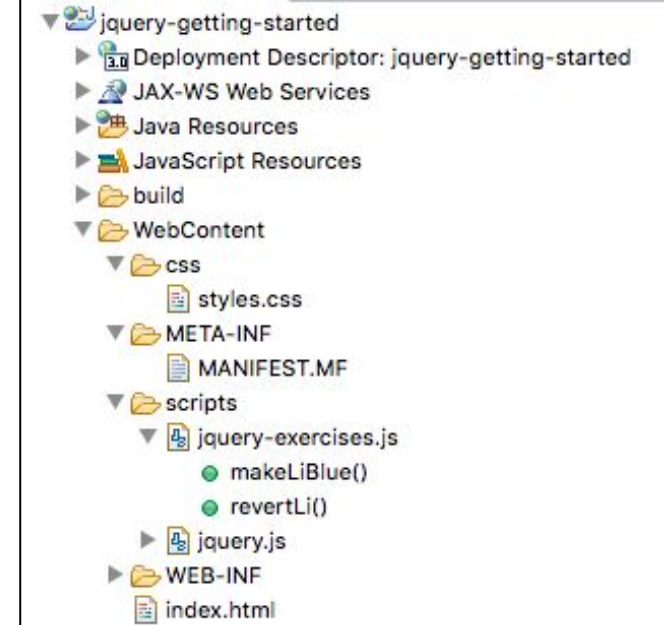
- R-click Tomcat at bottom
- Choose Add and Remove
- Select *jquery-getting-started* and press Add arrow
- Press Finish

- Start Tomcat

- R-click Tomcat at bottom
- Choose Start (or Restart if running previously)

- Access page

- **`http://localhost/jquery-getting-started/index.html`**
- or
`http://localhost:8080/jquery-getting-started/index.html` if you did not change Tomcat port



Setting the facets

The screenshot shows the 'Properties for test' dialog box. On the left is a sidebar with a search bar 'type filter text' and a list of categories: Resource, Builders, Coverage, Deployment Assembly, Java Build Path, Java Code Style, Java Compiler, Javadoc Location, Java Editor, JavaScript, JSP Fragment, **Project Facets** (selected), Project Natures, Project References, Refactoring History, Run/Debug Settings, Server, Service Policies, Targeted Runtimes, Task Repository, Task Tags, Validation, Web Content Settings, Web Page Editor, Web Project Settings, WikiText, and XDoclet.

The main area is titled 'Project Facets'. It has a 'Configuration:' dropdown set to '<custom>'. Below it is a table of project facets:

Project Facet	Version
<input type="checkbox"/> > Axis2 Web Services	
<input type="checkbox"/> CXF 2.x Web Services	1.0
<input checked="" type="checkbox"/> Dynamic Web Module	4.0
<input checked="" type="checkbox"/> Java	11
<input checked="" type="checkbox"/> JavaScript	1.0
<input type="checkbox"/> JavaServer Faces	2.3
<input type="checkbox"/> JAX-RS (REST Web Services)	1.1
<input type="checkbox"/> JAXB	2.2
<input type="checkbox"/> JPA	2.2
<input type="checkbox"/> WebDoclet (XDoclet)	1.2.3

At the top right of the main area are buttons for 'Save As...' and 'Delete'. On the right side, there is a 'Runtimes' tab. Under this tab, 'Java 11' is selected, with a description: 'Adds support for writing applications using Java programming language.' At the bottom right are buttons for 'Revert', 'Apply', 'Cancel', and 'Apply and Close'.

Setting the targeted runtimes

type filter text

> Resource

Builders

Coverage

Deployment Assembly

Java Build Path

> Java Code Style

> Java Compiler

Javadoc Location

> Java Editor

> JavaScript

JSP Fragment

Project Facets

Project Natures

Project References

Refactoring History

Run/Debug Settings

Server

Service Policies

Targeted Runtimes

> Task Repository

Task Tags

> Validation

Web Content Settings

Web Page Editor

Web Project Settings


WikiText

> XDoclet

Properties for test

Targeted Runtimes

✓

 Apache Tomcat v9.0

☐ Show all runtimes

Make Primary

New...

Runtime composition:

<no runtime selected>

If a runtime that you want to select is not displayed or is disabled you may need to uninstall one or more of the currently installed project facets.
[Uninstall Facets...](#)

Restore Defaults

Apply

Cancel

Apply and Close

Check the build path

Properties for test

type filter text

- > Resource
- Builders
- Coverage
- Deployment Assembly
- Java Build Path**
- > Java Code Style
- > Java Compiler
- Javadoc Location
- > Java Editor
- > JavaScript
- JSP Fragment
- Project Facets
- Project Natures
- Project References
- Refactoring History
- Run/Debug Settings
- Server
- Service Policies
- Targeted Runtimes
- > Task Repository
- Task Tags
- > Validation
- Web Content Settings
- Web Page Editor
- Web Project Settings
- WikiText
- > XDoclet

Java Build Path

Source Projects Order and Export Module Dependencies

JARs and class folders on the build path:

- Modulepath
 - JRE System Library [Java SE 15.0.1]
- Classpath
 - Apache Tomcat v9.0 [Apache Tomcat v9.0]
 - EAR Libraries
 - Web App Libraries

Add JARs...
Add External JARs...
Add Variable...
Add Library...
Add Class Folder...
Add External Class Folder...
Edit...
Remove
Migrate JAR File...

Apply

Cancel Apply and Close

Context root setting

The screenshot shows a window titled "Properties for jquery-getting-started". On the left is a tree view of project settings. The "Web Project Settings" item is selected and highlighted in blue. The main area on the right is titled "Web Project Settings" and contains a single setting: "Context root:" followed by a text box containing the value "tsw". At the bottom right of the dialog are two buttons: "Restore Defaults" and "Apply".

type filter text

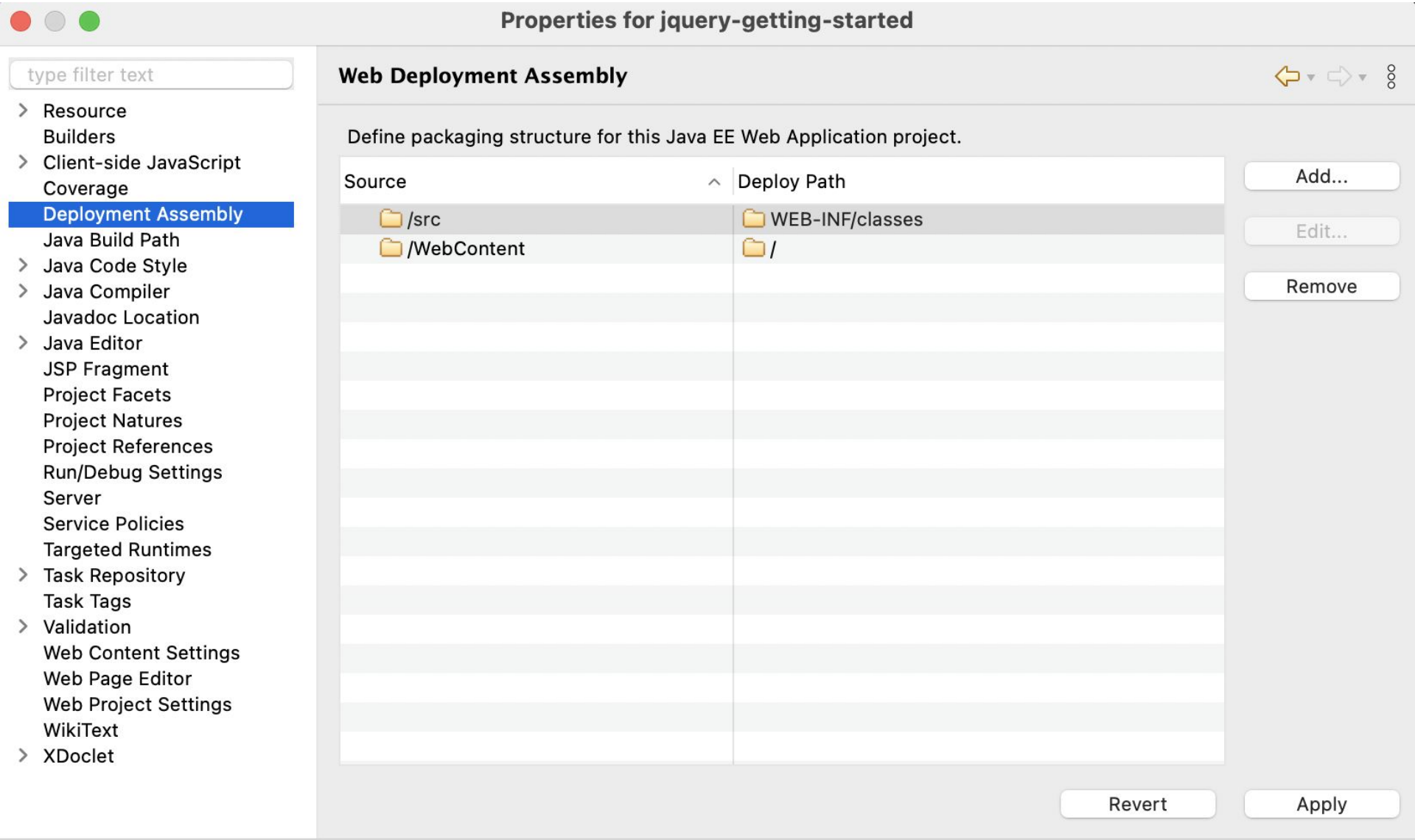
- > Resource Builders
- > Client-side JavaScript Coverage
- Deployment Assembly
- Java Build Path
- > Java Code Style
- > Java Compiler
- Javadoc Location
- > Java Editor
- JSP Fragment
- Project Facets
- Project Natures
- Project References
- Run/Debug Settings
- Server
- Service Policies
- Targeted Runtimes
- > Task Repository
- Task Tags
- > Validation
- Web Content Settings
- Web Page Editor
- Web Project Settings**
- WikiText
- > XDoclet

Web Project Settings

Context root: tsw

Restore Defaults Apply

Deployment assembly



Project References

Properties for jquery-getting-started

type filter text

> Resource

Builders

Coverage

Deployment Assembly

Java Build Path

> Java Code Style

> Java Compiler

Javadoc Location

> Java Editor

> JavaScript

JSP Fragment

Project Facets

Project Natures

Project References

Run/Debug Settings

Server

Service Policies

Targeted Runtimes

> Task Repository

Task Tags

> Validation

Web Content Settings

Web Page Editor

Web Project Settings

WikiText


> XDoclet

Project References

Projects may refer to other projects in the workspace.
Use this page to specify what other projects are referenced by the project.

Project references for 'jquery-getting-started':

☒

 Servers

?

Cancel

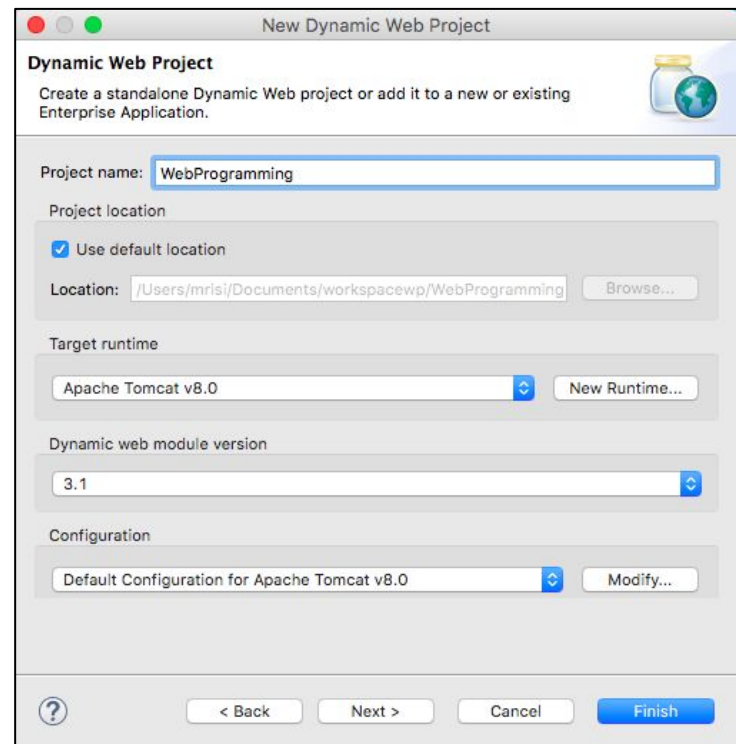
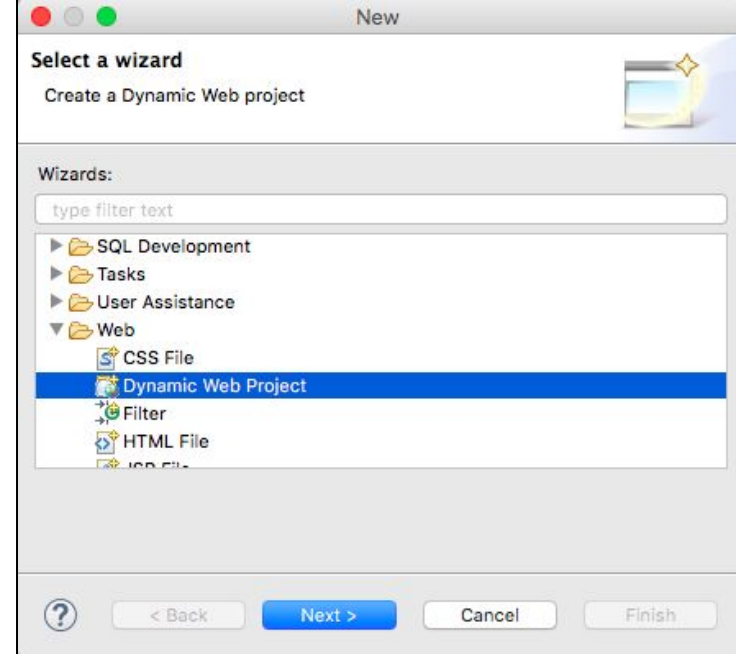
Apply and Close

Example

- Import **test-app**
- Deploy app to Tomcat
 - R-click Tomcat at bottom
 - Choose Add and Remove
 - Select *test-app* and press Add arrow
 - Press Finish
- Start Tomcat
 - R-click Tomcat at bottom
 - Choose Start (or Restart if running previously)
- Access page
 - **<http://localhost/test-app/index.html>**

Create a Dynamic Web Project

- Create project
 - File ☐ New ☐ Project ☐ Web
 - ☐ Dynamic Web Project
 - Next time, you can do
 - File ☐ New ☐ Dynamic Web Project
- Give it a name
 - Choose a name that would be legal in a URL (no spaces)
- Specify it is for Tomcat
 - Choose “Default Configuration for Apache Tomcat 9.0”
- Finish

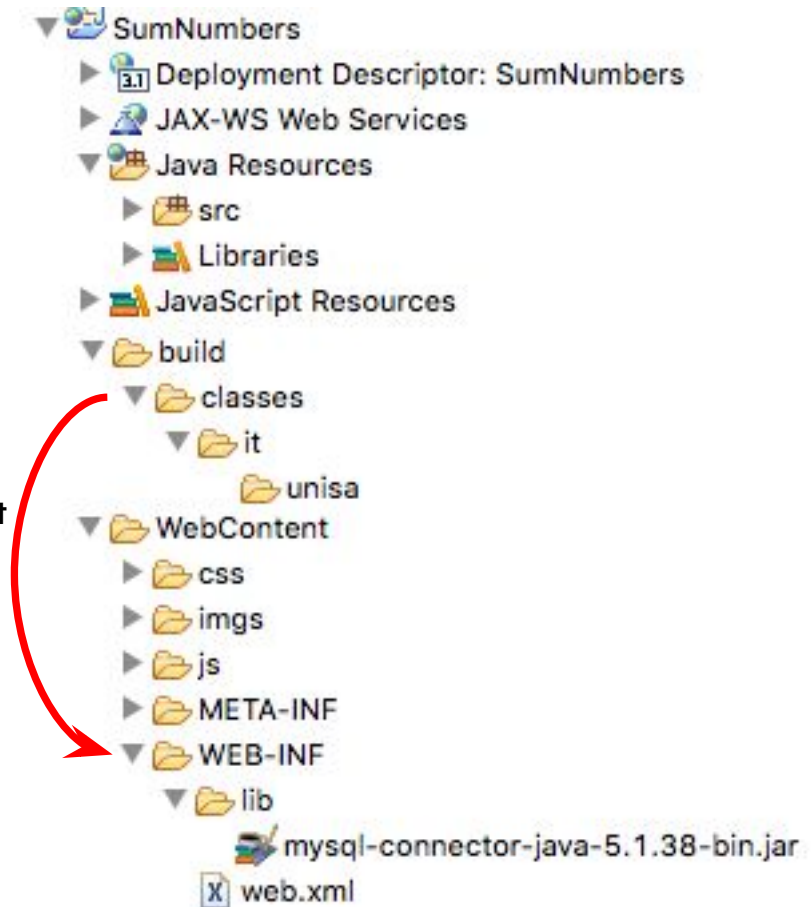


Put content in your project

- Main folder: **WebContent**
 - Other folders are only for Java developers and can be ignored
- Typical layout
 - WebContent
 - Your HTML files
 - For initial testing, just use a simple HTML file you created earlier in the course
 - WebContent/css
 - Your style sheets
 - WebContent/scripts
 - Your JavaScript files
 - WebContent/images
 - Your images
 - ...

Deploy the App to Tomcat (manual and automatic)

- È fondamentale copiare la cartella “classes” presente nella directory “build” all’interno della cartella “WEB-INF”
1. Nella shell dei comandi:
 - Accedere alla cartella WebContent
 - Creare il file WAR:
 - **jar -cvf SumNumbers.war ***
 2. Fermare il server Tomcat (se attivo)
 3. Copiare il file WAR nella cartella “webapps” di Tomcat
 4. Lanciare il server Tomcat
- Il file war si può creare anche da Eclipse (in maniera automatica) con tasto destro sul progetto: Export ☐ WAR file
 - Per il deploy si può anche utilizzare il **manager** di Tomcat



Configure Tomcat users (in tomcat/conf/tomcat-users.xml)

```
<?xml version='1.0' encoding='utf-8'?>
```

```
<tomcat-users>
```

```
  <role rolename="tomcat"/>
```

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

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

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

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

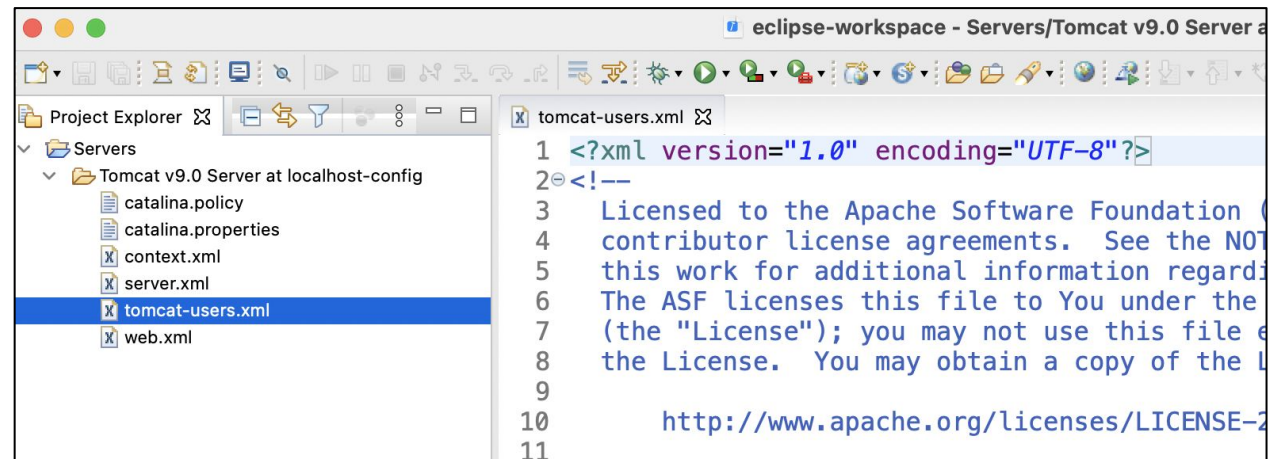
```
  <user username="tomcat" password="tomcat"
```

```
    roles="tomcat, admin, admin-gui, manager, manager-gui"/>
```

```
  <user username="both" password="tomcat" roles="tomcat, manager"/>
```

```
  <user username="role1" password="tomcat" roles="manager-gui"/>
```

```
</tomcat-users>
```



Start Tomcat on Windows

For Windows

Launch a CMD shell. Set the current directory to "<TOMCAT_HOME>\bin", and run "startup.bat" as follows:

```
// Change the current directory to Tomcat's "bin"
// Assume that Tomcat is installed in "d:\myProject\tomcat"
d:                // Change the current drive
cd \myProject\tomcat\bin // Change Directory to YOUR Tomcat's "bin" directory

// Start Tomcat Server
startup
```

Definire il path JAVA_HOME e JRE_HOME

Windows 10

In Cerca cercate e selezionate: Sistema (Pannello di controllo)

Fate clic sul collegamento **Impostazioni di sistema avanzate**

Fate clic su **Variabili di ambiente**. Nella sezione **Variabili di sistema**, creare **Nuova variabile di sistema** specificare il valore della variabile di ambiente JAVA_HOME e JRE_HOME

(e.g., "C:\Program Files\Java\jdk1.XX" e "C:\Program Files\Java\jre1.XX")

Fate clic su **OK**. Chiudere tutte le altre finestre facendo clic su **OK**. Riavviare

Eseguire startup.bat

Start Tomcat on Mac

- To start Tomcat, open a shell command prompt (using, for instance, the Terminal application)
- The path to Tomcat via the Finder is *Macintosh HD* ▢ *Library* ▢ *Tomcat*
- But to get to that directory using the Terminal, type in:

```
cd /Library/Tomcat/bin
```

- you should see a file called ***startup.sh***
- Any file in this directory ending in .sh can be executed in the terminal by putting a period and a slash before the file name (e.g.: `./startup.sh`)

Start Tomcat on Mac

- The following example executes the tomcat startup script:

`./startup.sh && tail -f ../logs/catalina.out`

- Terminal should display four lines looking something like this:

Using CATALINA_BASE: /usr/local/tomcat

Using CATALINA_HOME: /usr/local/tomcat

Using CATALINA_TMPDIR: /usr/local/tomcat/temp

Using JRE_HOME: /Library/Java/JavaVirtualMachines/jdk1.XX.jdk/Contents/Home

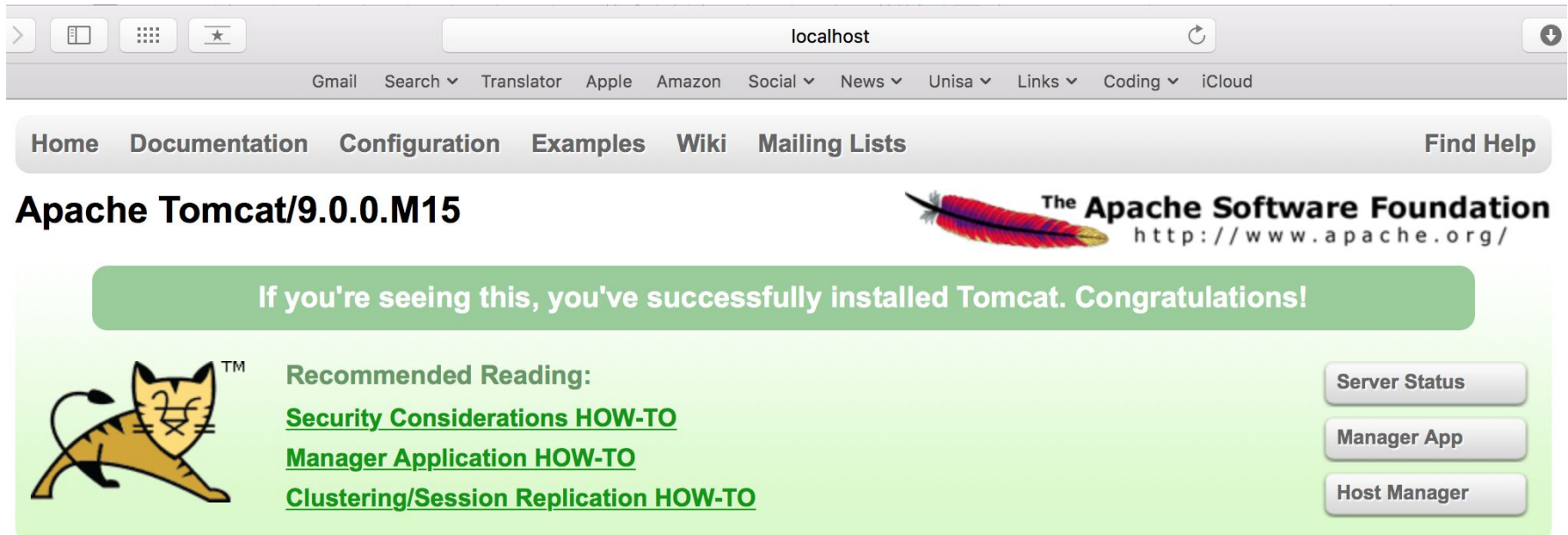
Using CLASSPATH: /usr/local/tomcat/bin/bootstrap.jar:/usr/local/tomcat/bin/tomcat-juli.jar

Tomcat started.

Test installation (real Tomcat)

localhost

- Open a browser window, and enter <http://127.0.0.1:8080> - the default Tomcat page should open
- If you click the *Manager App* links in the right hand side of the default Tomcat page, you will be asked for a user name and password
- As mentioned above, use **tomcat** for the user name, and **tomcat** for the password




Home Documentation Configuration Examples Wiki Mailing Lists Find Help

Apache Tomcat/9.0.0.M15

The Apache Software Foundation
<http://www.apache.org/>

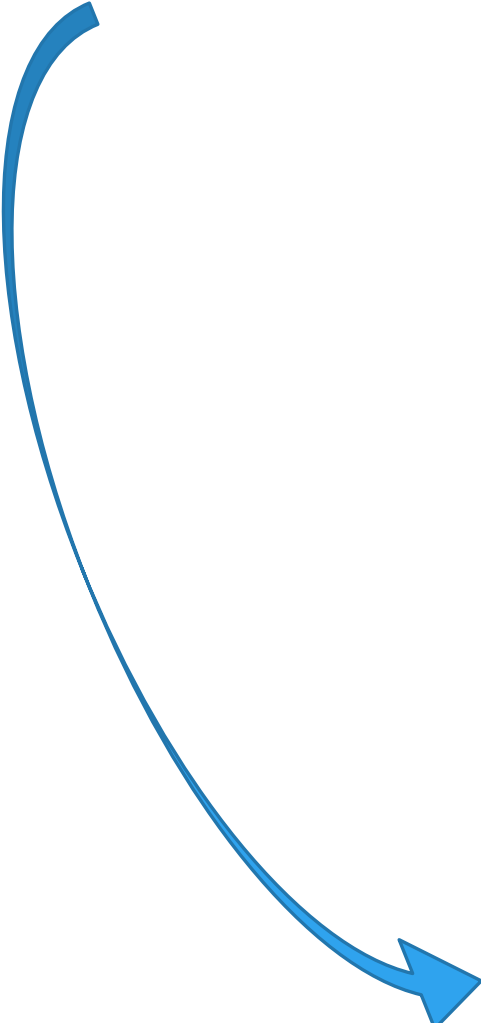
If you're seeing this, you've successfully installed Tomcat. Congratulations!



 **Recommended Reading:**
[Security Considerations HOW-TO](#)
[Manager Application HOW-TO](#)
[Clustering/Session Replication HOW-TO](#)

Server Status
Manager App
Host Manager

Tomcat Manager

- <http://localhost:8080/manager/html>
- Upload and deploy the war file





Tomcat Web Application Manager

Message: OK

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>
/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	1	<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>

Deploy

Deploy directory or WAR file located on server

Context Path (required):

XML Configuration file URL:

WAR or Directory URL:

Deploy

WAR file to deploy

Select WAR file to upload no file selected

Deploy

Stop Tomcat

- Tomcat Server can be stopped from the command line with the following command:
 - Mac: **./shutdown.sh**
 - Windows: **shutdown.bat**
- Stop Tomcat in Eclipse
 - Select **Servers tab** at bottom
 - R-click Tomcat at bottom
 - Choose Stop

ROOT Web application

- Deploying a web application at the root of a Tomcat:
 - **The context path refers to the location relative to the server's address which represents the name of the web application**
- By default, Tomcat derives it from the name of the deployed war-file
 - if we deploy a file ExampleApp.war, it will be available at <http://localhost:8080/ExampleApp>
 - the context path is [/ExampleApp](#)
- Create the app with name ROOT, create ROOT.war, and deploy it
- Our app will now be available at <http://localhost:8080/>

Summary

- Install necessary software
 - Java (run installer)
 - Apache Tomcat (unzip)
 - Eclipse (unzip and then configure)
- Launch Eclipse
 - Click on .exe icon from install folder, or make shortcut on desktop and click that
- Make app in Eclipse
 - File ☐ New ☐ Dynamic Web Project
 - Put files in/under WebContent folder
- Deploy app
 - R-click Tomcat, Add and Remove, start Tomcat
 - Use `http://localhost:port/project-name/file-name.html`
- Deploy app manually
 - Jar the folder, Stop Tomcat, Copy, Start Tomcat

Check: SumNumbers

- Import and deploy **SumNumbers**

- **Run MySQL**



- Input login and password of the MySQL administrator account
- *SumNumbers accesses the DB and runs a comand that sums two numbers in case the login and password are correct*