



CORSO DI LAUREA IN INFORMATICA

# Tecnologie Software per il Web

DEPLOYING APPS WITH ECLIPSE AND TOMCAT

a.a. 2020-2021

# 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 latest version from Oracle

- <http://www.oracle.com/technetwork/java/javase/downloads/>
  - 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 homepage. At the top left is the Tomcat logo. In the center is the text "Apache Tomcat®". To the right are links for "SUPPORT APACHE" and "THE APACHE SOFTWARE FOUNDATION". Below the header is a search bar with "Search..." and "GO" buttons. A red banner says "APACHE EVENTS" and "LEARN MORE". A blue button says "Save the date!". On the left, there's a sidebar with "Apache Tomcat" links for "Home", "Taglibs", and "Maven Plugin", and a "Download" section with links for "Which version?", "Tomcat 10", and "Tomcat 9". The main content area contains text about Tomcat being an open source implementation of Java Servlet, JSP, and WebSocket, developed under the Java Community Process. It also mentions the Apache License version 2 and the Apache Software Foundation. The footer notes that Tomcat is a trademark of the Apache Software Foundation.

Apache Tomcat®

SUPPORT APACHE

THE APACHE SOFTWARE FOUNDATION

Apache Tomcat

Search... GO

APACHE EVENTS LEARN MORE

Save the date!

Apache Tomcat

Home Taglibs Maven Plugin

Download

Which version? Tomcat 10 Tomcat 9

The Apache Tomcat® software is an open source implementation of the Java Servlet, JavaServer Pages, Java Expression Language and Java WebSocket technologies. The Java Servlet, JavaServer Pages, Java Expression Language and Java WebSocket specifications are developed under the [Java Community Process](#).

The Apache Tomcat software is developed in an open and participatory environment and released under the [Apache License version 2](#). The Apache Tomcat project is intended to be a collaboration of the best-of-breed developers from around the world. We invite you to participate in this open development project. To learn more about getting involved, [click here](#).

Apache Tomcat software powers numerous large-scale, mission-critical web applications across a diverse range of industries and organizations. Some of these users and their stories are listed on the [PoweredBy](#) wiki page.

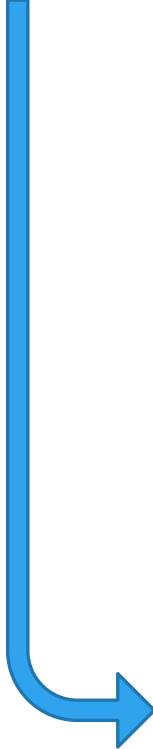
Apache Tomcat, Tomcat, Apache, the Apache feather, and the Apache Tomcat project logo are trademarks of the Apache Software Foundation.

# 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 of the Eclipse Foundation website shows the navigation bar with "ECLIPSE FOUNDATION" logo, "Members", "Working Groups", "Projects", "More", and a prominent "Download" button. Below the navigation is a breadcrumb trail: Home / Downloads / Packages / Release / Eclipse IDE 2019-12 / R. Underneath, there are links for "Eclipse Installer", "Eclipse Packages" (which is underlined in orange), and "Eclipse Developer Builds".

**Eclipse IDE 2019-12 R Packages**

**Eclipse IDE for Enterprise Java Developers**

Tools for Java developers creating Enterprise Java and Web applications, including a Java IDE, tools for Enterprise Java, JPA, JSF, Mylyn, Maven, Git and more.

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.

**Download**

Mac OS X 64 bit  
Windows 64 bit  
Linux 64 bit

**eBook**

Fulfilling the Vision for Open Source, Cloud Native Java

**Get Eclipse IDE 2019-12**

Install your favorite desktop IDE packages.

**Download 64 bit**

[Download Packages](#) | [Need Help?](#)

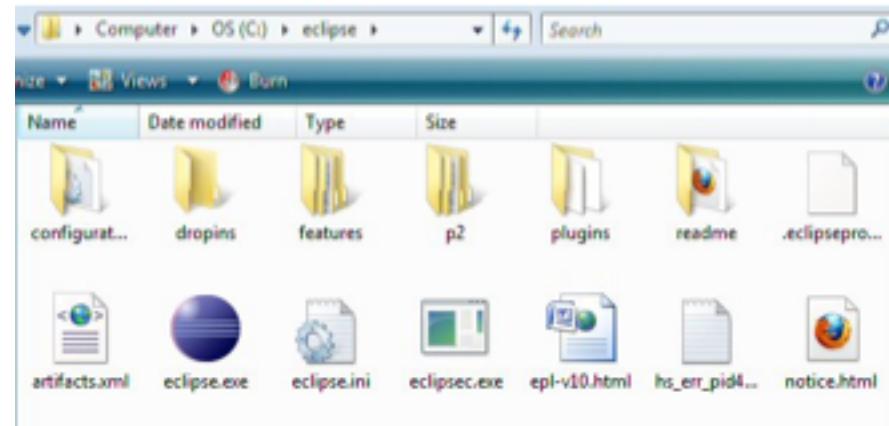
# Download and unzip Eclipse (Java EE Version)

- Get installer
  - Run installer, resulting in something like C:\eclipse
- Or, get Zip version: 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

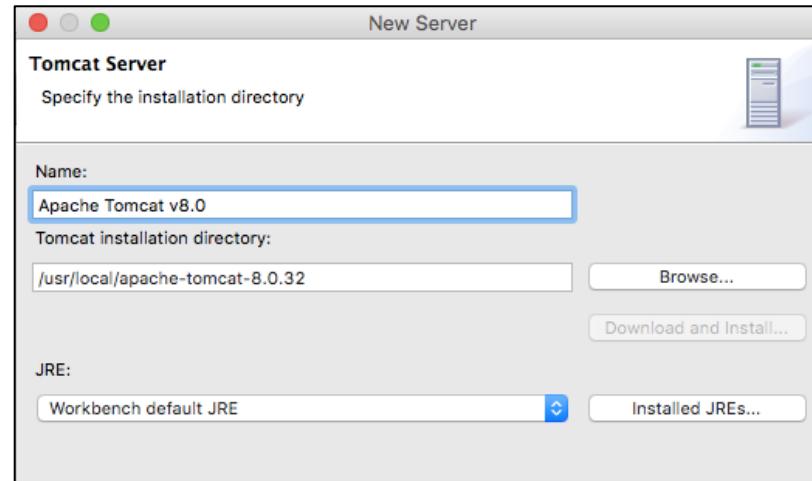
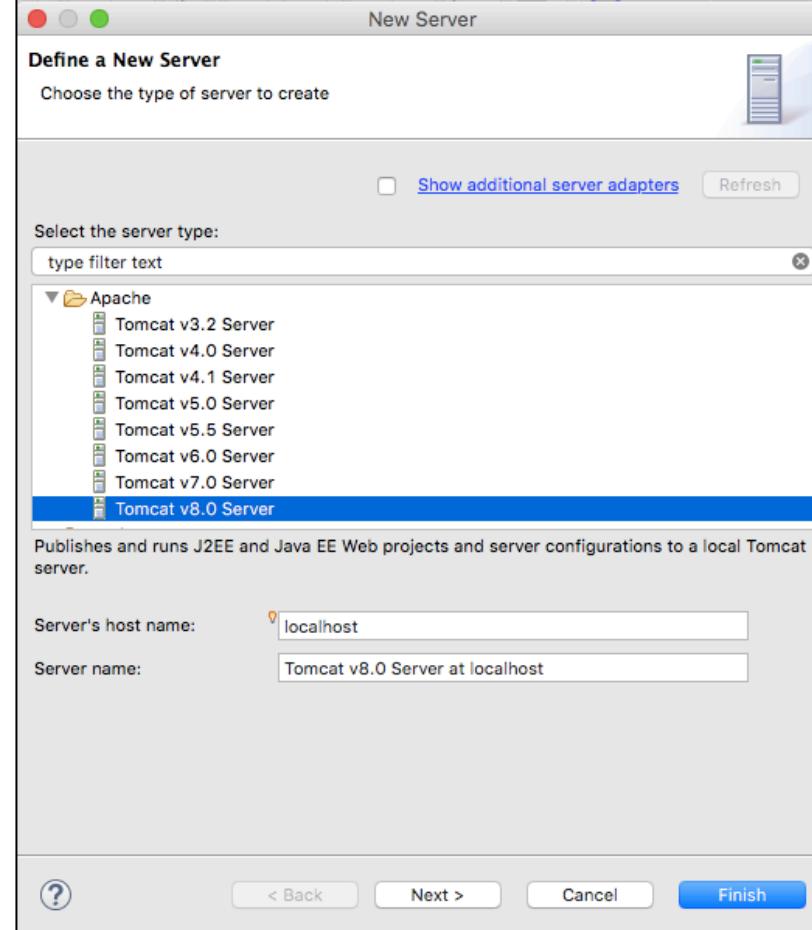
- Unzip the downloaded file (no installer!)
  - Unzip anywhere; call the folder you unzip into “installDir”
- Double click **eclipse.exe**
  - From *installDir*
- Click on “Workbench” icon
  - Next time you bring up Eclipse, it will come up in workbench automatically
- Shortcut
  - Many developers put 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

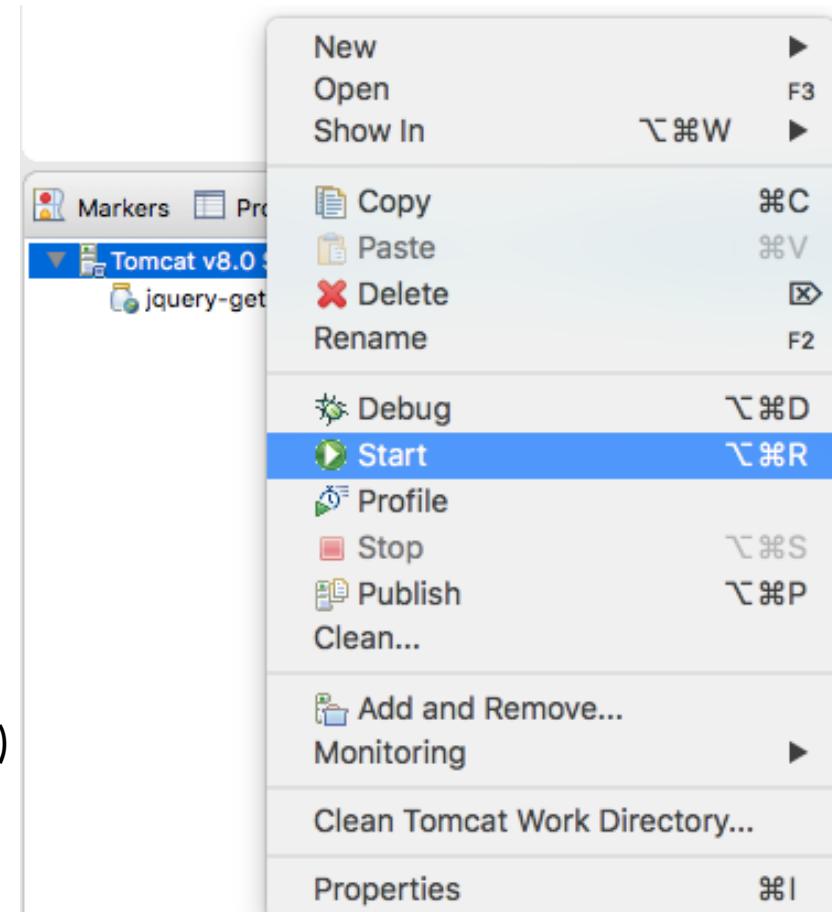
**Ports**  
Modify the server ports.

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

**MIME Mappings**

# Deploy the App to Tomcat

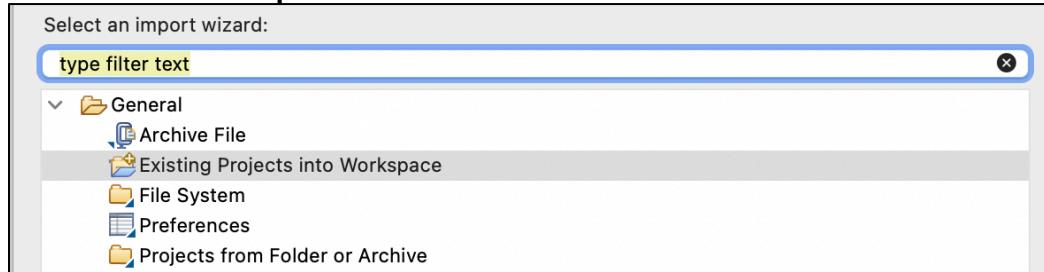
- Deploy project
  - Select **Servers tab** at bottom
  - R-click on Tomcat
  - Choose “Add and Remove”
  - Choose project
  - Press “Add”
  - Click “Finish”
- Start Server
  - R-click Tomcat at bottom
  - Start (use “Restart” if Tomcat already running)
- Test URL
  - ***http://localhost:port/your-project/your-file.html***



# Example

- Import **jquery-getting-started**

- File → Import



- Deploy app to Tomcat

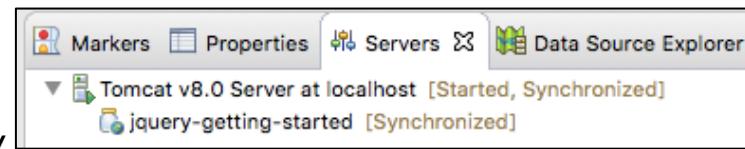
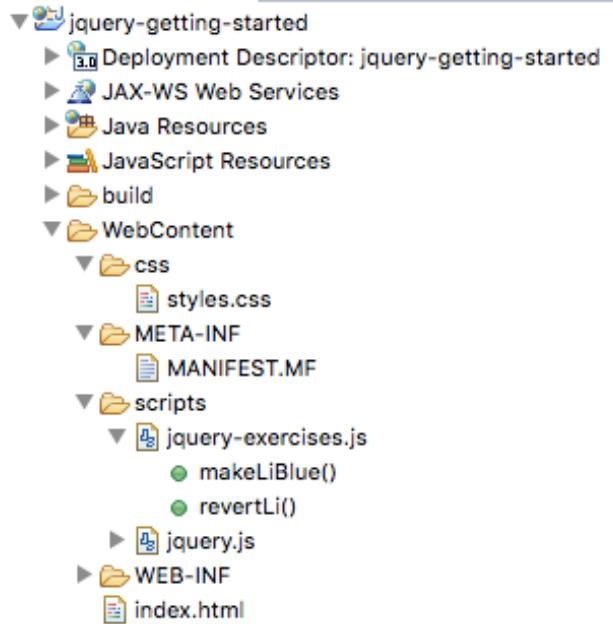
- R-click Tomcat at bottom
  - Choose Add and Remove
  - Select *jquery-getting-started* and press Add arrow
  - Press Finish

- 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



## jQuery Getting Started

An h1 heading

An h2 heading

Another h2 heading

Make Bullets Blue Revert Bullets

A bulleted list:

- Foo
- Bar
- Baz

A numbered list:

1. Foo
2. Bar
3. Baz

# Setting the facets

Properties for test

Project Facets

Configuration: <custom>

Save As... Delete

Project Facet	Version
<input type="checkbox"/> Axis2 Web Services	1.0
<input type="checkbox"/> CXF 2.x Web Services	4.0
<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

Runtimes

Java 11

Adds support for writing applications using Java programming language.

Revert Apply

Cancel Apply and Close

?

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

# Setting the targeted runtimes

Properties for test

type filter text

Targeted Runtimes

Apache Tomcat v9.0

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

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

Java Build Path

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

Source | Projects | Order and Export | Module Dependencies

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

Apply

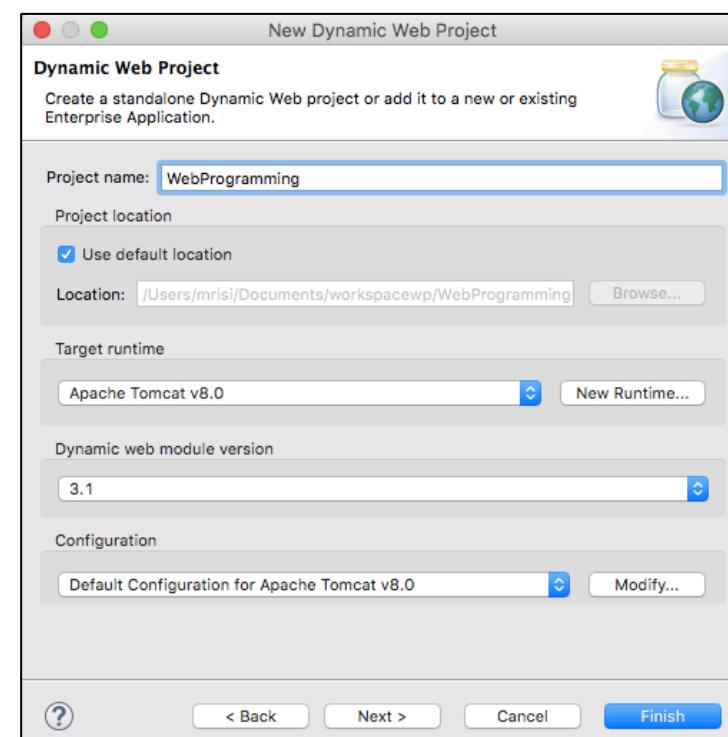
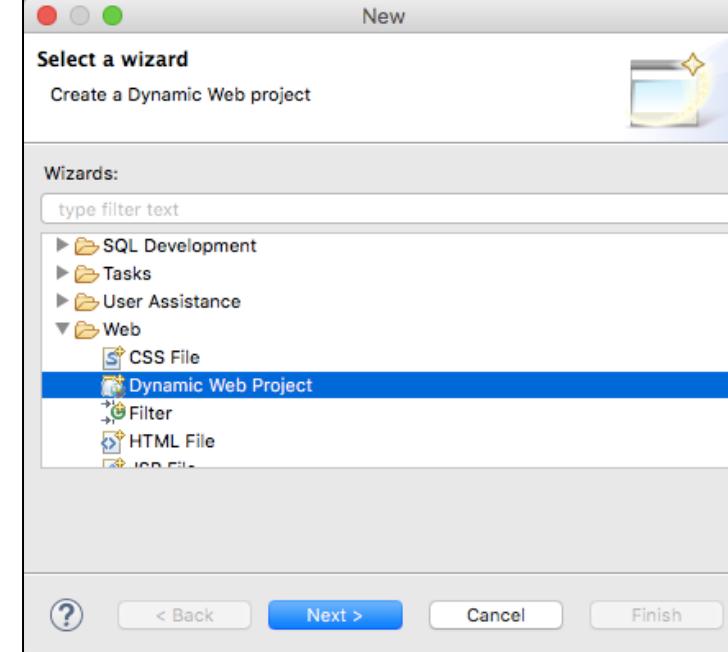
Cancel | Apply and Close

# 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



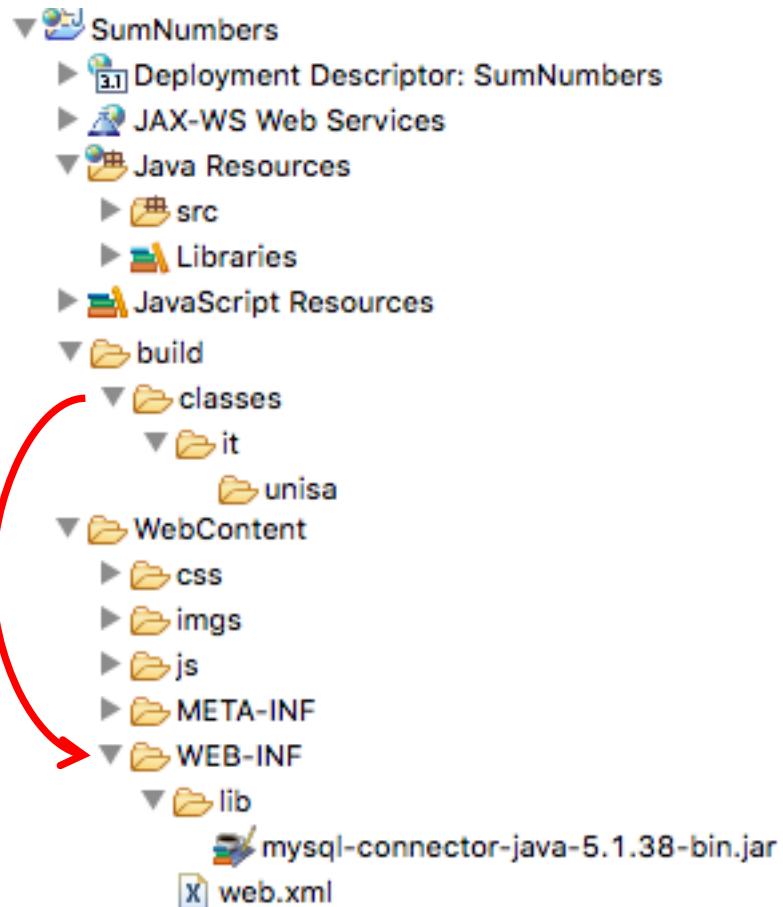
# Put content in your project

- 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”

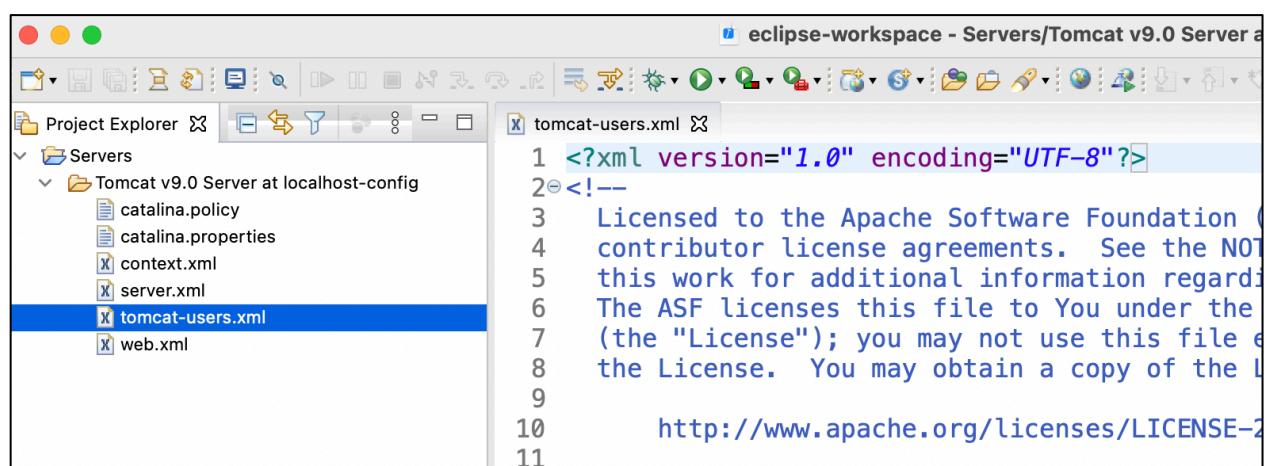
- Nella shell dei comandi:
    - Accedere alla cartella WebContent
    - Creare il file WAR:
      - jar -cvf SumNumbers.war \***
  - Fermare il server Tomcat (se attivo)
  - Copiare il file WAR nella cartella “webapps” di Tomcat
  - Lanciare il server Tomcat
- 
- Il file war si può creare anche da Eclipse (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

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

The screenshot shows a Mac OS X desktop environment. A web browser window is open, displaying the Apache Tomcat 9.0.0.M15 homepage. The address bar shows "localhost". The browser's menu bar includes "File", "Edit", "View", "Window", and "Help". Below the address bar is a toolbar with icons for "Gmail", "Search", "Translator", "Apple", "Amazon", "Social", "News", "Unisa", "Links", "Coding", and "iCloud". The main content area of the browser shows the Tomcat homepage with the Apache logo and the text "The Apache Software Foundation" and "http://www.apache.org/". A green callout box contains the message "If you're seeing this, you've successfully installed Tomcat. Congratulations!". To the left of the message is the Tomcat mascot, a yellow cat with a red collar. Below the mascot is a section titled "Recommended Reading" with links to "Security Considerations HOW-TO", "Manager Application HOW-TO", and "Clustering/Session Replication HOW-TO". On the right side of the page are three buttons: "Server Status", "Manager App", and "Host Manager".

localhost

Gmail Search Translator Apple Amazon Social News Unisa Links Coding iCloud

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](#)

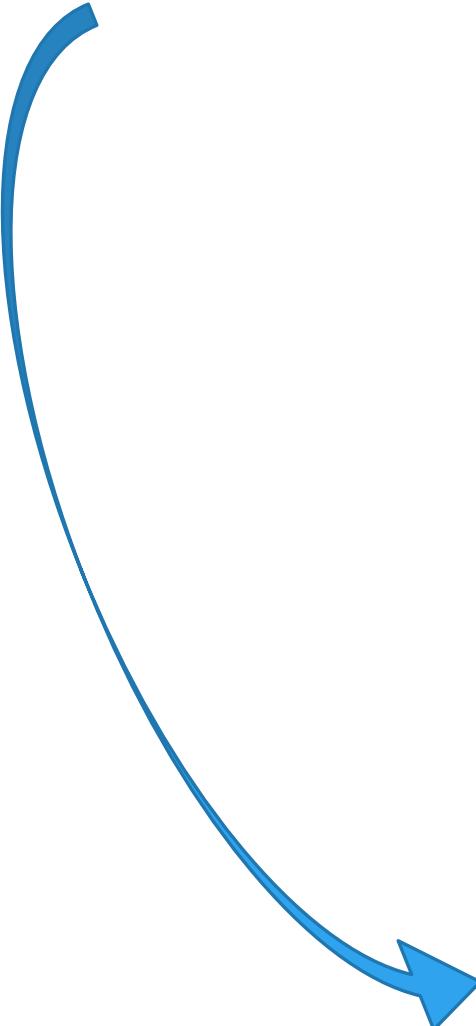
Server Status

Manager App

Host Manager

# Tomcat Manager

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



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

**Tomcat Web Application Manager**

**Manager**

List Applications		HTML Manager Help	Manager Help	Server Status	
<b>Applications</b>					
Path	Version	Display Name	Running	Sessions	Commands
/	None specified	Welcome to Tomcat	true	0	<a href="#">Start</a> <a href="#">Stop</a> <a href="#">Reload</a> <a href="#">Undeploy</a> <a href="#">Expire sessions with idle ≥ 30 minutes</a>
/docs	None specified	Tomcat Documentation	true	0	<a href="#">Start</a> <a href="#">Stop</a> <a href="#">Reload</a> <a href="#">Undeploy</a> <a href="#">Expire sessions with idle ≥ 30 minutes</a>
/examples	None specified	Servlet and JSP Examples	true	0	<a href="#">Start</a> <a href="#">Stop</a> <a href="#">Reload</a> <a href="#">Undeploy</a> <a href="#">Expire sessions with idle ≥ 30 minutes</a>
/host-manager	None specified	Tomcat Host Manager Application	true	1	<a href="#">Start</a> <a href="#">Stop</a> <a href="#">Reload</a> <a href="#">Undeploy</a> <a href="#">Expire sessions with idle ≥ 30 minutes</a>
/manager	None specified	Tomcat Manager Application	true	1	<a href="#">Start</a> <a href="#">Stop</a> <a href="#">Reload</a> <a href="#">Undeploy</a> <a href="#">Expire sessions with idle ≥ 30 minutes</a>

**Deploy**

Deploy directory or WAR file located on server

Context Path (required):

XML Configuration file URL:

WAR or Directory URL:

**WAR file to deploy**

Select WAR file to upload  no file selected

# 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

# Summary

- Install necessary software
  - Java (run installer)
  - Apache Tomcat (unzip)
  - Eclipse (unzip and then configure or use installer 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 command that sums two numbers in case the login and password are correct*

