

Environment Setup

Maven:

All of the projects for this class will be based on maven (<http://maven.apache.org/>). Maven is a utility to organize and build a project (similar to what IDE's do, but without the GUI part).

Maven uses an XML file called pom.xml (Project Object Model) that keeps track of where your source code is, where your class files should go, what jar files (libraries) your project depends on, and even where to download these libraries from.

Although many IDEs come with Maven, Visual Studio Code (what I use in most of the examples) requires you to install it.

```
<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/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <groupId>edu.mum.cs544</groupId>
  <artifactId>exercise02_1</artifactId>
  <version>1.0-SNAPSHOT</version>
  <packaging>jar</packaging>

  <name>exercise02_1</name>
  <url>http://maven.apache.org</url>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
  </properties>

  <dependencies>
    <dependency>
      <groupId>junit</groupId>
      <artifactId>junit</artifactId>
      <version>4.12</version>
      <scope>test</scope>
    </dependency>
    <dependency>
      <groupId>org.hibernate</groupId>
      <artifactId>hibernate-core</artifactId>
      <version>5.3.5.Final</version>
    </dependency>
    <dependency>
      <groupId>mysql</groupId>
      <artifactId>mysql-connector-java</artifactId>
      <version>5.1.42</version>
    </dependency>
    <dependency>
      <groupId>org.apache.logging.log4j</groupId>
      <artifactId>log4j-core</artifactId>
      <version>2.11.1</version>
    </dependency>
  </dependencies>
</project>
```

Basic project naming,
no need to specify
directories, uses
defaults

Jar files that
we need for
this project

Integrated Development Environment:

I'm happy for students to use whatever IDE they want. Nevertheless people sometimes just want to follow along with screenshots, and to that extend I will illustrate certain actions with Visual Studio Code.

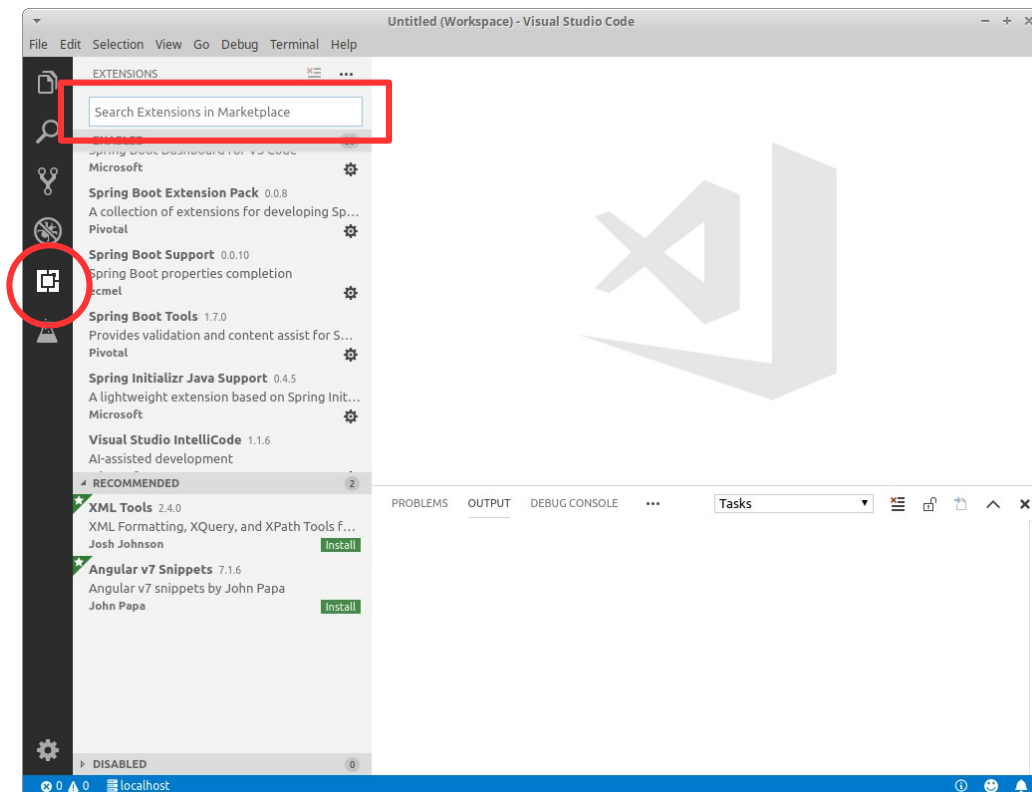
This does not mean you have to use Visual Studio Code, as there always are ways to achieve the same thing with a different IDE as well.

My version of Visual Studio Code has the following extensions installed:

- Java Extension Pack
- Spring Boot Extension Pack
- Tomcat for Java
- XML by Redhat
- MySQL by Jun Han

If you want to use Visual Studio Code, you can download it from:

<https://code.visualstudio.com/download> . Once installed go to extensions (on the toolbar on the left, it's the square looking icon, 5th from the top). Then use the “Search Extensions in Marketplace” textbox to find and install the extensions mentioned above. (I use the Light+ color theme in my screenshots)



Maven and Visual Studio Code:

Visual Studio code does not provide the Maven command line tool. Go to: <http://maven.apache.org/download.cgi> and download the binary zip archive.

The screenshot shows the Apache Maven Project download page for version 3.6.1. The page includes a sidebar with navigation links, a main content area with the title "Downloading Apache Maven 3.6.1", and a table of download links and checksums. The link for the binary zip archive is highlighted with a red box.

	Link	Checksums	Signature
Binary tar.gz archive	apache-maven-3.6.1-bin.tar.gz	apache-maven-3.6.1-bin.tar.gz.sha512	apache-maven-3.6.1-bin.tar.gz.asc
Binary zip archive	apache-maven-3.6.1-bin.zip	apache-maven-3.6.1-bin.zip.sha512	apache-maven-3.6.1-bin.zip.asc
Source tar.gz archive	apache-maven-3.6.1-src.tar.gz	apache-maven-3.6.1-src.tar.gz.sha512	apache-maven-3.6.1-src.tar.gz.asc
Source zip archive	apache-maven-3.6.1-src.zip	apache-maven-3.6.1-src.zip.sha512	apache-maven-3.6.1-src.zip.asc

Unpack it wherever you want (say: C:\Program Files\apache-maven\) and then add the bin directory (**C:\Program Files\apache-maven\bin**) to your path.

Very important: if you don't know what you're doing (have never worked with the path before) then only add to the PATH value, do not overwrite or remove parts of it!

For a guide on how to add something to your path on Windows 10 see:

<https://www.architectryan.com/2018/03/17/add-to-the-path-on-windows-10/>

MySQL Database:

Many of the exercises in this course (especially those related to Hibernate) require a database. We will use MySQL since it is free and relatively widely used in the industry. You can download MySQL from any of the following locations:

The MySQL windows installer, which will run MySQL on startup found at:

<http://dev.mysql.com/downloads/mysql/>

See screenshot on the next page.

MySQL Community Downloads

MySQL Community Server

General Availability (GA) Releases Archives

MySQL Community Server 8.0.27

Select Operating System:
Linux - Generic

Select OS Version:
All

Looking for previous GA versions?

Generic Linux Minimal tarballs excludes debug binaries, and regular binaries are stripped

Operating System / Architecture	Version	Size	Action
Linux - Generic (glibc 2.12) (x86, 32-bit), Compressed TAR Archive (mysql-8.0.27-linux-glibc2.12-i686.tar.xz)	8.0.27	1058.5M	Download
Linux - Generic (glibc 2.12) (x86, 64-bit), Compressed TAR Archive (mysql-8.0.27-linux-glibc2.12-x86_64.tar.xz)	8.0.27	1141.2M	Download

The latest version is 8.0.27, although I personally still prefer 5.7 (they went from 5 to 8, skipping version numbers 6 and 7). On the download page you can get 5.7 by clicking on “Looking for previous GA versions” Be sure to download the Windows Installer, the zip version takes a lot more steps to setup.

MySQL Community Server 5.7.26



Select Version:
5.7.26

Select Operating System:
Microsoft Windows

Select OS Version:
All

Looking for the latest GA version?

Recommended Download:

All MySQL Products. For All Windows Platforms. In One Package.

Starting with MySQL 5.6 the MySQL Installer package replaces the standalone MSI packages.

Windows (x86, 32 & 64-bit), MySQL Installer MSI

[Go to Download Page >](#)

Other Downloads:

Operating System / Architecture	Version	Size	Action
Windows (x86, 32-bit), ZIP Archive (mysql-5.7.26-win32.zip)	5.7.26	309.3M	Download
Windows (x86, 64-bit), ZIP Archive (mysql-5.7.26-winx64.zip)	5.7.26	321.6M	Download

Once you click download it will try to tell you that you should login or sign up, but you can simply click on the small “No Thanks” further down to get your download

Begin Your Download

mysql-installer-web-community-5.7.26.0.msi

Login Now or Sign Up for a free account.

An Oracle Web Account provides you with the following advantages:

- Fast access to MySQL software downloads
- Download technical White Papers and Presentations
- Post messages in the MySQL Discussion Forums
- Report and track bugs in the MySQL bug system

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using my Oracle Web account

Sign Up »
for an Oracle Web account

MySQL.com is using Oracle SSO for authentication. If you already have an Oracle Web account, click the Login link. Otherwise, you can sign up for a free account by clicking the Sign Up link and following the instructions.

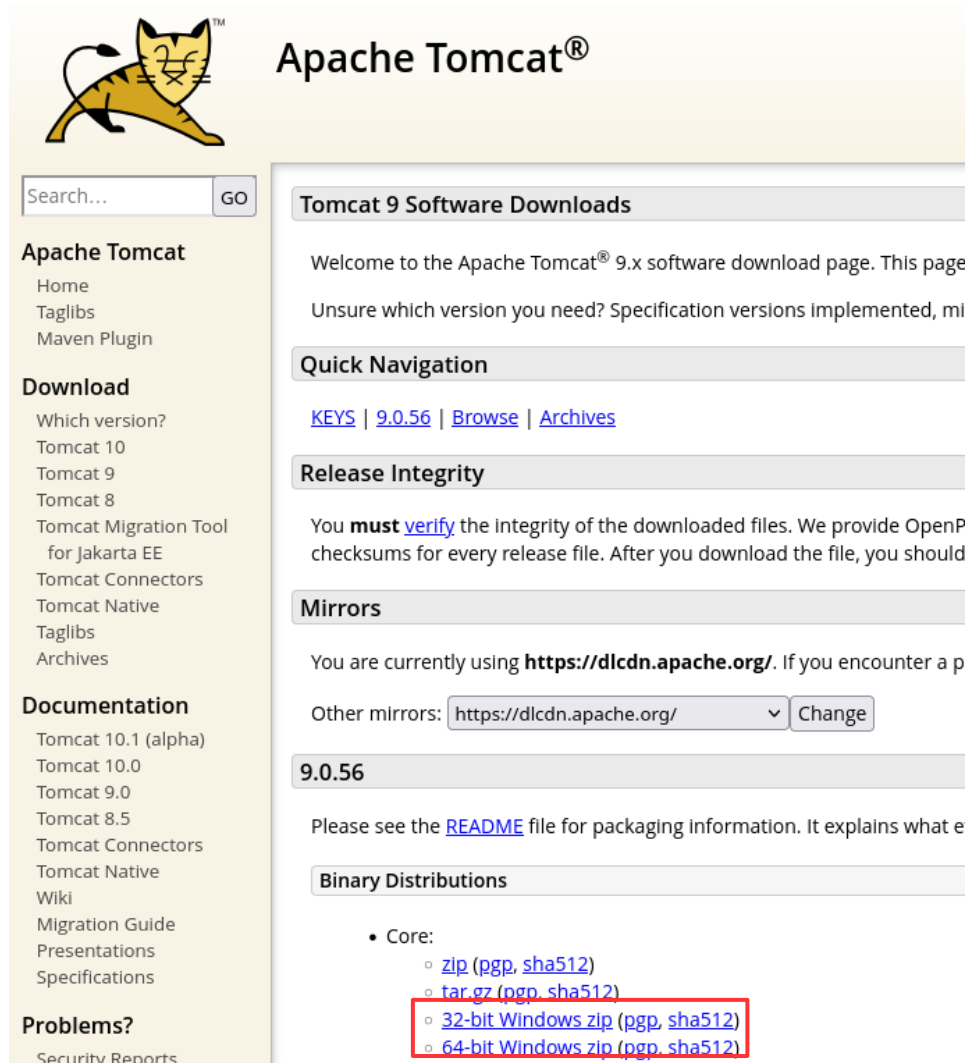
No thanks, just start my download.

When installing MySQL it may complain about missing the Visual C++ Redistributable package 2013. Download and install it from: <https://www.microsoft.com/en-us/download/details.aspx?id=40784>

Important: while installing MySQL it will ask you to provide a root password. Chose something that you will remember! Or just go for something stupid like: **root** (that’s what I did)

Web Server / Apache Tomcat:

Similar to MySQL we won't use the very latest version (10), but instead use the more stable version 9, which you can download from: <http://tomcat.apache.org/download-90.cgi>



Apache Tomcat®

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Tomcat 9
Tomcat 8
Tomcat Migration Tool for Jakarta EE
Tomcat Connectors
Tomcat Native
Taglibs
Archives

Documentation
Tomcat 10.1 (alpha)
Tomcat 10.0
Tomcat 9.0
Tomcat 8.5
Tomcat Connectors
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Specifications

Problems?
Security Reports

Tomcat 9 Software Downloads

Welcome to the Apache Tomcat® 9.x software download page. This page
Unsure which version you need? Specification versions implemented, mi

Quick Navigation
[KEYS](#) | [9.0.56](#) | [Browse](#) | [Archives](#)

Release Integrity
You **must** [verify](#) the integrity of the downloaded files. We provide OpenP checksums for every release file. After you download the file, you should

Mirrors
You are currently using **https://d1cdn.apache.org/**. If you encounter a p
Other mirrors:

9.0.56
Please see the [README](#) file for packaging information. It explains what e

Binary Distributions

- Core:
 - [zip \(pgp, sha512\)](#)
 - [tar.gz \(pgp, sha512\)](#)
 - [32-bit Windows zip \(pgp, sha512\)](#)
 - [64-bit Windows zip \(pgp, sha512\)](#)

I would recommend downloading the 64bit windows zip. Important: when you extract these files they need to be in a path without spaces in it! In other words something like C:\tomcat\ is okay but C:\Program Files\tomcat\ is **not okay** (because of the space between program and files).

W1D1 Exercises

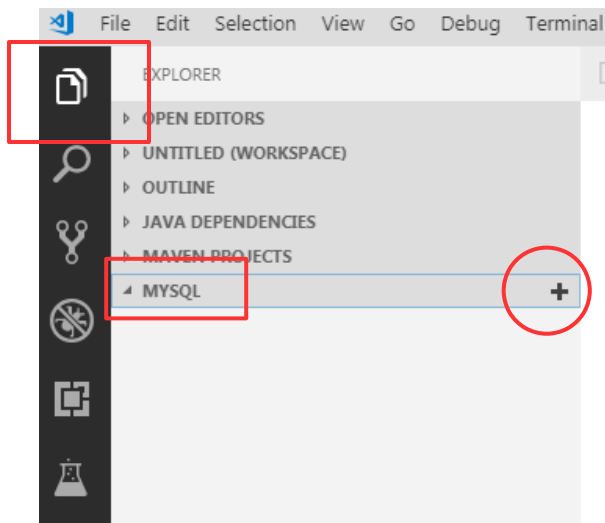
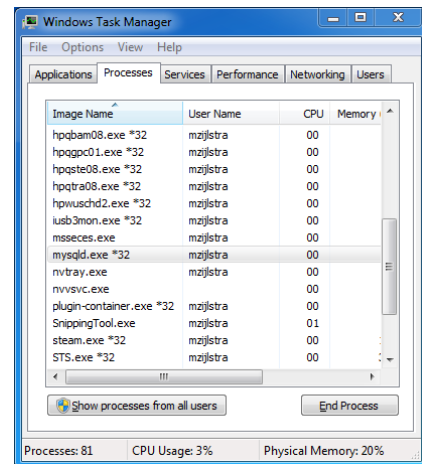
Course Overview 1 – Does it run?

The Database:

The main objective of this exercise is to make sure that your development environment is working.

You can check to see if the MySQL server is running by looking in the task manager's process list for `mysqld.exe`. If it's not running then something went wrong with the MySQL installation process.

You can then connect to MySQL from Visual Studio Code by going to the MySQL dropdown on the code explorer (see screenshot below) and clicking on the + symbol.

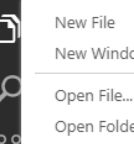


For host enter: **localhost** for username enter: **root**
password: **root** (or whatever you chose). Port:
3306 and simply press enter when it asks for a certificate.

Once connected you can right click on localhost and select “**New Query**”. Which will open a SQL editor window. Enter the following SQL command: **create database cs544**

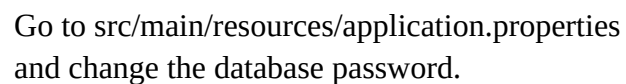
Then right click on the editor window and select “**Run MySQL Query**”. It should notify you of its success in the output window at the bottom.

You can download the W1D1 exercise from the Sakia assignment and extract it to: **C:\CS544\exercises**. To add the exercise to Visual Studio Code click on the menu **File** → **Add Folder to Workspace** and then select the exercise folder.



The screenshot shows the Visual Studio Code application window. The 'File' menu is open, displaying various options. The option 'Add Folder to Workspace...' is highlighted in blue. Other visible options include 'New File', 'New Window', 'Open File...', 'Open Folder...', 'Open Workspace...', 'Open Recent', 'Save', 'Save As...', and 'Save All'. The keyboard shortcuts for each option are listed to the right of the text.

Menu Item	Keyboard Shortcut
New File	Ctrl+N
New Window	Ctrl+Shift+N
Open File...	Ctrl+O
Open Folder...	Ctrl+K Ctrl+O
Open Workspace...	
Open Recent	
Add Folder to Workspace...	
Save	Ctrl+S
Save As...	Ctrl+Shift+S
Save All	Ctrl+K S



Most Spring Boot projects (including this one) have an embedded Tomcat web-server which should startup on port 8080.

the previous page.

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
:: Spring Boot :: (v2.0.4.RELEASE)

WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by org.springframework.cglib.core.ReflectUtils$1 (file:/C:/Users/mzijlstra/.m2/repository/org/springframework/spring-core/5.0.8.RELEASE/spring-core-5.0.8.RELEASE.jar) to method java.lang.ClassLoader.defineClass(java.lang.String,byte[],int,int,java.security.ProtectionDomain)
WARNING: Please consider reporting this to the maintainers of org.springframework.cglib.core.ReflectUtils$1
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release

2019-05-26 10:08:41.009 WARN 2468 --- [ restartedMain] aWebConfigurations$3aWebMvcConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during
view rendering. Explicitly configure spring.jpa.open-in-view to disable this warning
```

← → ↺ 🏠 ⓘ localhost:8080

8

Clicking on the link should take you to a login page, where you can use the username: **admin** and password: **admin**

Login Page!

Once logged in it will show a list of contacts (empty) and the possibility of adding a contact. Add a contact **Test 123** and clicking on the **Add** button

Username

Password

List of Contacts:

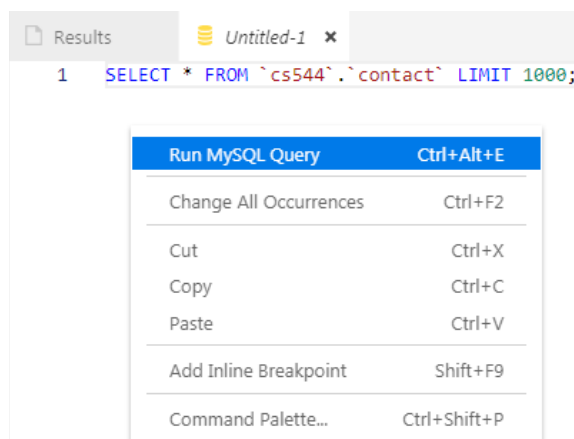
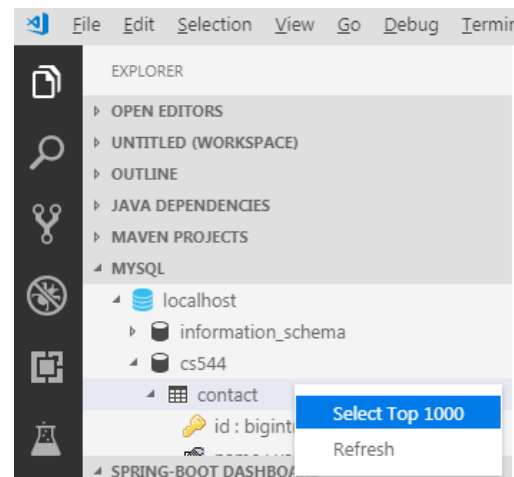
Add a contact:

Name:

Once the contact has been added you should see it on the web page, and we should also be able to see it in the database.

To check the database go back to Visual Studio code, in the MySQL explorer go to localhost, cs544, contacts and right click for “**Select top 1000**”

This will open a SQL editor window showing a query we want to execute. Right click in the editor and select **Run MySQL Query** to check that it was properly inserted into the database



When you're done, you can write the first part of your report on Sakai. You can even submit it already as you have unlimited re-submits.

Also write this report if you are unable to make it work, the most important part is that I know what's going on.

Please write in the textbox on Sakai (do not write a separate file that you attach)

How to Submit:

Please write a brief report on Sakai about your experience with the exercise. Please use the textbox on the site (do not provide it as an attachment). Your report should describe how long it took, and what kind of problems you faced (if any). For example:

Hi Professor, the first assignment it took me about half an hour, I accidentally forgot to change the database password, but I figured it out after reading the errors.

You can already submit this part of your report (even though there is still another exercise) as you have unlimited re-submits.

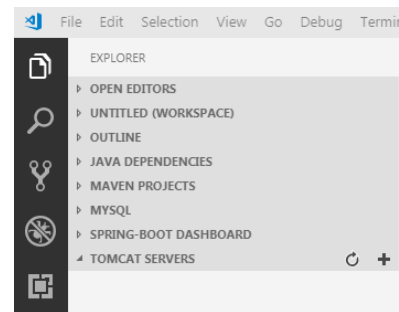
Course Overview 2 – Does it run?

The Web Server:

In **Tomcat Servers** section of the Visual Studio Code explorer click on the + symbol to add a server.

Select the directory where you extracted Tomcat and click on the **Select Tomcat Directory** button

Be sure to shut down the Spring Boot application from the previous exercise by right clicking on int and selecting **Stop** (or by using the stop button at the top of Visual Studio Code). If you forget to stop the port 8080 will still be in use, which this Tomcat server needs to start.

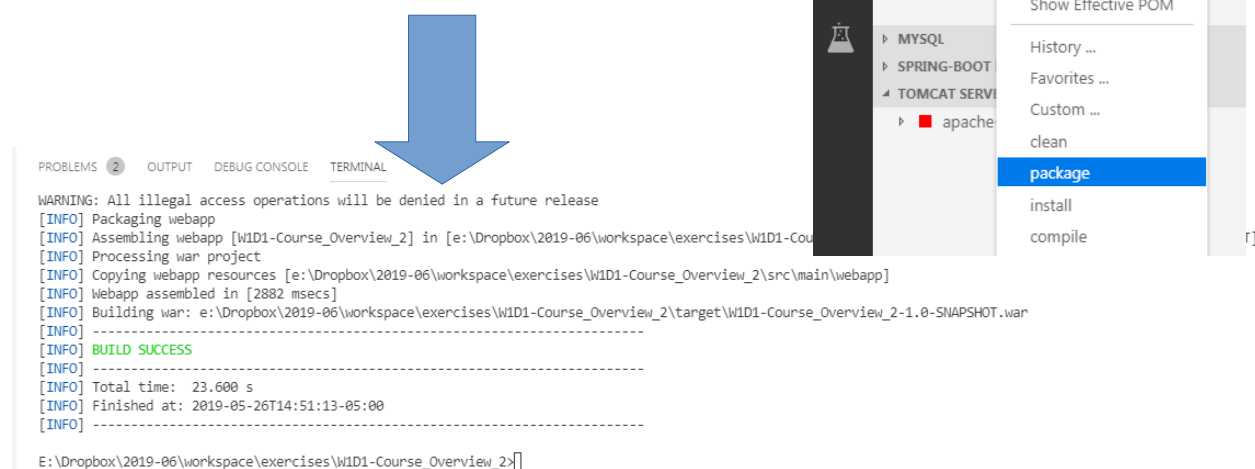


The Exercise:

Download the code for this exercise from the Sakai Assignment, and add it to the workspace similar to how you added the previous exercise.

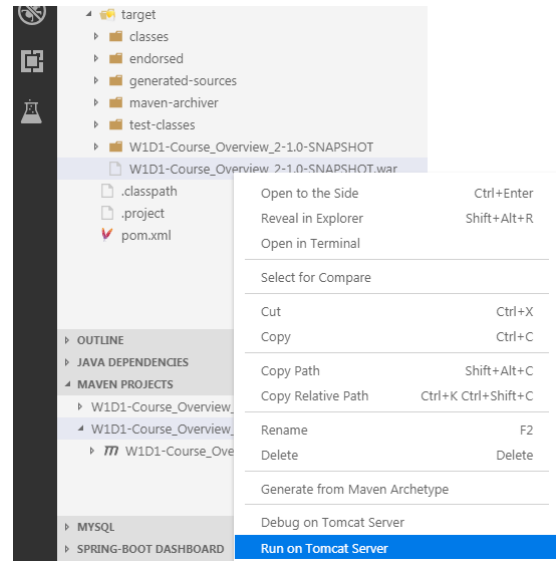
Go to the **Maven Projects** section of the Visual Studio Code explorer, open the project, and you'll see the project name a second time. Right click on it, and select **Package**.

If Maven is correctly installed the Terminal should output something like wide screenshot shown below.



Once the project has been packaged you should be able to see a .war file inside the target directory of the project. Right click on it and select **Run on Tomcat Server**. (also shown in the screenshot on the next page.

This will startup the Tomcat server, the output of which should look something like:

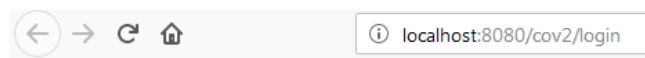


```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
[C:\Users\mzlj1stra\AppData\Roaming\Code\User\workspaceStorage\63d95035c6dd0b8c1c153d06805e6395\adashen.vscodemat\apache-tomcat\apache-tomcat-8.5.41\webapps\cov2] has finished in [15,278] ms
[apache-tomcat-8.5.41]: May 26, 2019 3:00:21 PM org.apache.catalina.startup.HostConfig deployDirectory
INFO: Deploying web application directory
[C:\Users\mzlj1stra\AppData\Roaming\Code\User\workspaceStorage\63d95035c6dd0b8c1c153d06805e6395\adashen.vscodemat\apache-tomcat\apache-tomcat-8.5.41\webapps\ROOT]
[apache-tomcat-8.5.41]: May 26, 2019 3:00:21 PM org.apache.catalina.startup.HostConfig deployDirectory
INFO: Deployment of web application directory
[C:\Users\mzlj1stra\AppData\Roaming\Code\User\workspaceStorage\63d95035c6dd0b8c1c153d06805e6395\adashen.vscodemat\apache-tomcat\apache-tomcat-8.5.41\webapps\ROOT] has finished in [42] ms
[apache-tomcat-8.5.41]: May 26, 2019 3:00:22 PM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["http-nio-8080"]
[apache-tomcat-8.5.41]: May 26, 2019 3:00:22 PM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["ajp-nio-8009"]
[apache-tomcat-8.5.41]: May 26, 2019 3:00:22 PM org.apache.catalina.startup.Catalina start
INFO: Server startup in 16019 ms

```

Now that the application has started on the Server you should be able to connect to it on the local host at: <http://localhost:8080/cov2/> Note that this is almost exactly the same link as the previous project, the big difference is that it's now running on a separate Tomcat server, and is a project / subdirectory on that server (which adds the cov2 at the end).



Login Page!

Once again you can use username **admin** and password **admin** to login. Then add a Contact and check the database to see that it has been properly inserted.

Username

Password

How to Submit:

Update your report on Sakai about your experience with the exercise. Again telling me how long it took, and what kind of problems you faced (if any). For example:

The second assignment also took about half an hour, I didn't really face any problems.

Thanks!