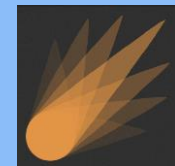


she codes;

CODING SKILLS WEB SERVER DEMO

Using Java 8 and Spark web framework

With Tamar Pinhas



ABOUT ME 😊

- ▶ Live in Beer-Sheva married+1
- ▶ Team leader of Labs scrum at Dalet (Gav-Yam Beer-Sheva)
- ▶ Graduated B.Sc. M.Sc. and Phd in math & CS at BGU
- ▶ Interests: combinatoric algorithms, efficiency, programming languages
- ▶ Goals:
 - ▶ learning new skills and technologies
 - ▶ helping others
 - ▶ developing leadership
 - ▶ having an efficient, balanced and happy life

THE DEMO – TAKE A SHORT POLL

- ▶ A member's phone book service
- ▶ A poll service. Please enter and answer the poll
- ▶ Finding the server's IP address:

<http://192.168.0.109:4567/>

```
C:\Users\Tamar Pinhas>ipconfig

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::8dff:4743:665e:5772%11
    IPv4 Address. . . . . : 192.168.0.109
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.1
```

ABOUT THIS CODING SKILLS SESSION

30 Slides + Demo

0 - Installations

1 - What is a web application framework?

2 - Get started with spark web-app framework

3 - Create a java project in IntelliJ with maven

4 - Java spark hello world

5 - Seeing Network communication in Chrome developer tools

6 - Some background on REST & HTTP

7 - PhoneBook server design (REST routes and data model)

8 - How to submit HTTP requests with Postman

9 - Poll server design – static pages, forms, redirect

0 – INSTALLATIONS

Java SE Development Kit 8

- ▶ Download from [Oracle](#)
- ▶ Set environment variable
- ▶ Verify Java is recognized (in path)

System variables	
Variable	Value
ComSpec	C:\WINDOWS\system32\cmd.exe
JAVA_HOME	C:\Program Files\Java\jdk1.8.0_92
JAVA_HOME_7	C:\Program Files\Java\jdk1.7.0_79
M2_HOME	C:\Program Files (x86)\apache-maven-3.3.9
NUMBER_OF_PROCESSORS	4
OS	Windows_NT
Path	C:\ProgramData\Oracle\Java\javapath;C:\WINDOWS\system32
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE	AMD64

```
Command Prompt
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

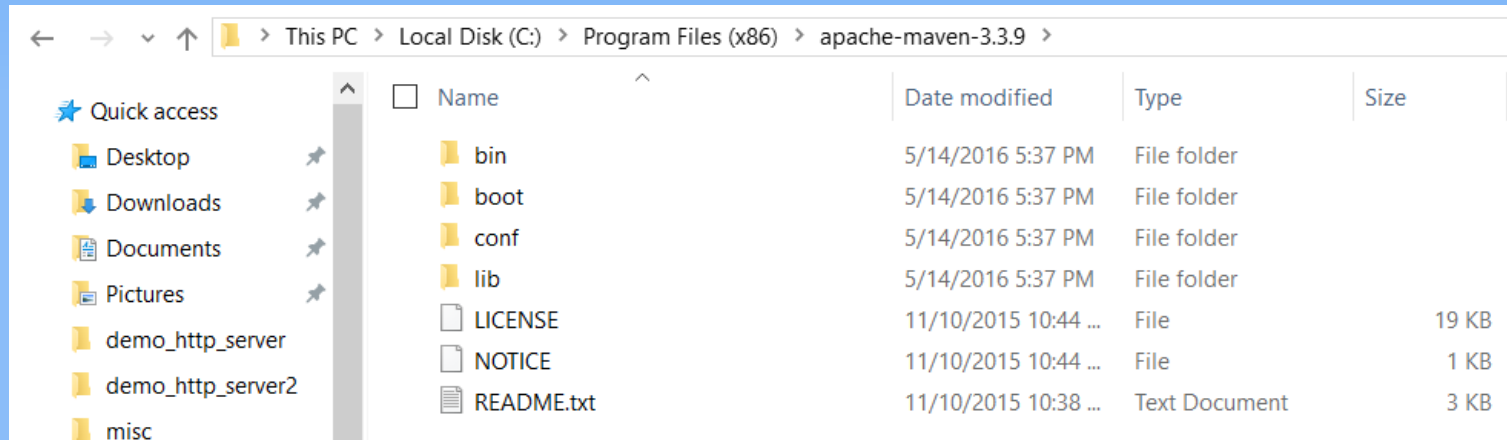
C:\Users\Tamar Pinhas>java -version
java version "1.8.0_92"
Java(TM) SE Runtime Environment (build 1.8.0_92-b14)
Java HotSpot(TM) 64-Bit Server VM (build 25.92-b14, mixed mode)
```



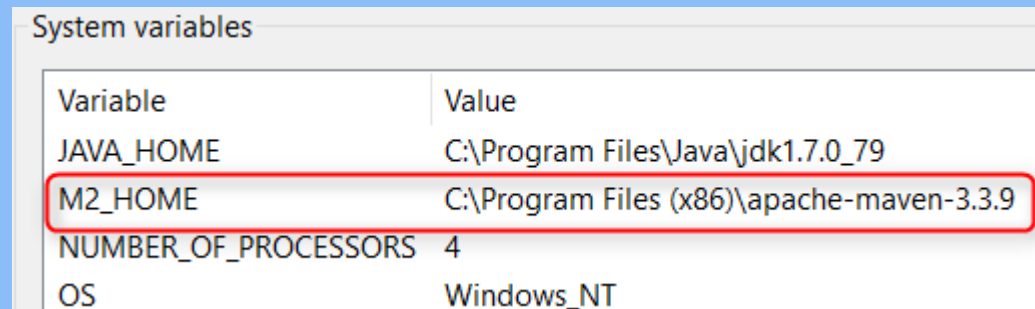
0 – INSTALLATIONS

Maven

- ▶ Maven is a system for building Java projects
- ▶ Download from [Apache](#) (apache-maven-3.3.9-bin.zip)
- ▶ Unzip

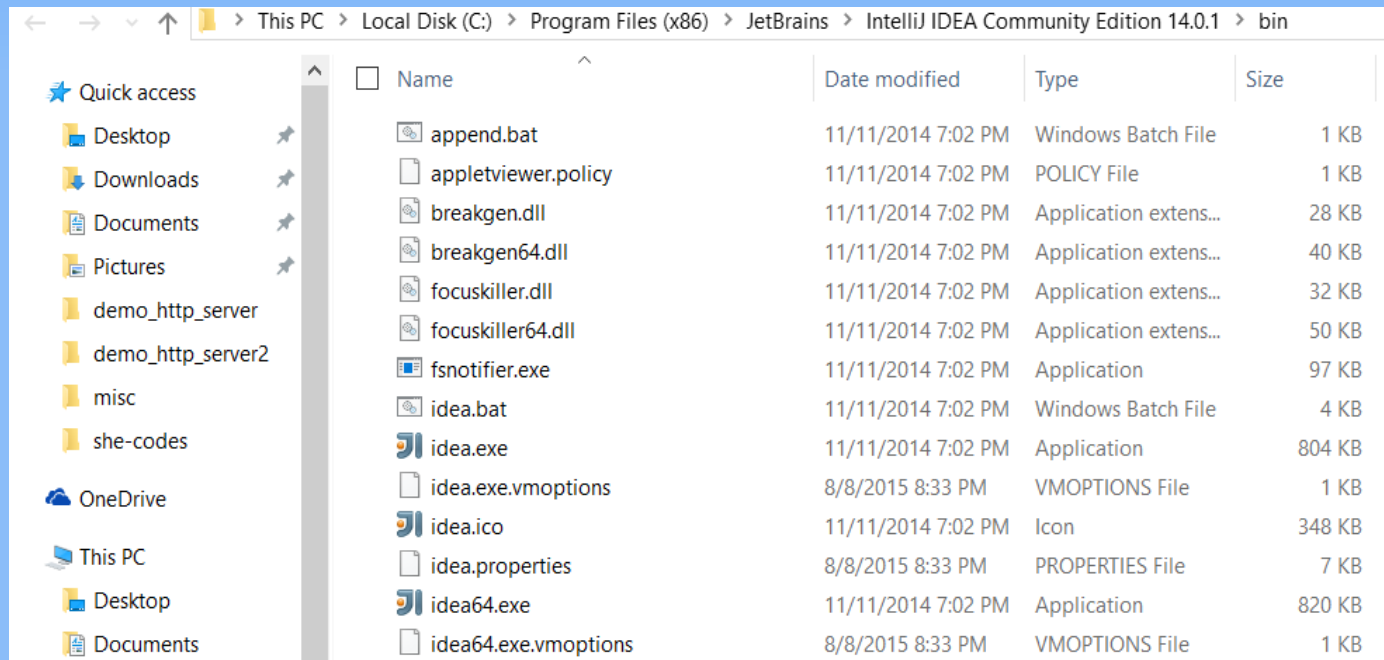


- ▶ Set environment variable
- ▶ Add maven bin to path



0 – INSTALLATIONS

- ▶ IntelliJ Software Development Environment
 - ▶ Download from [JetBrains](#) and install (community edition)

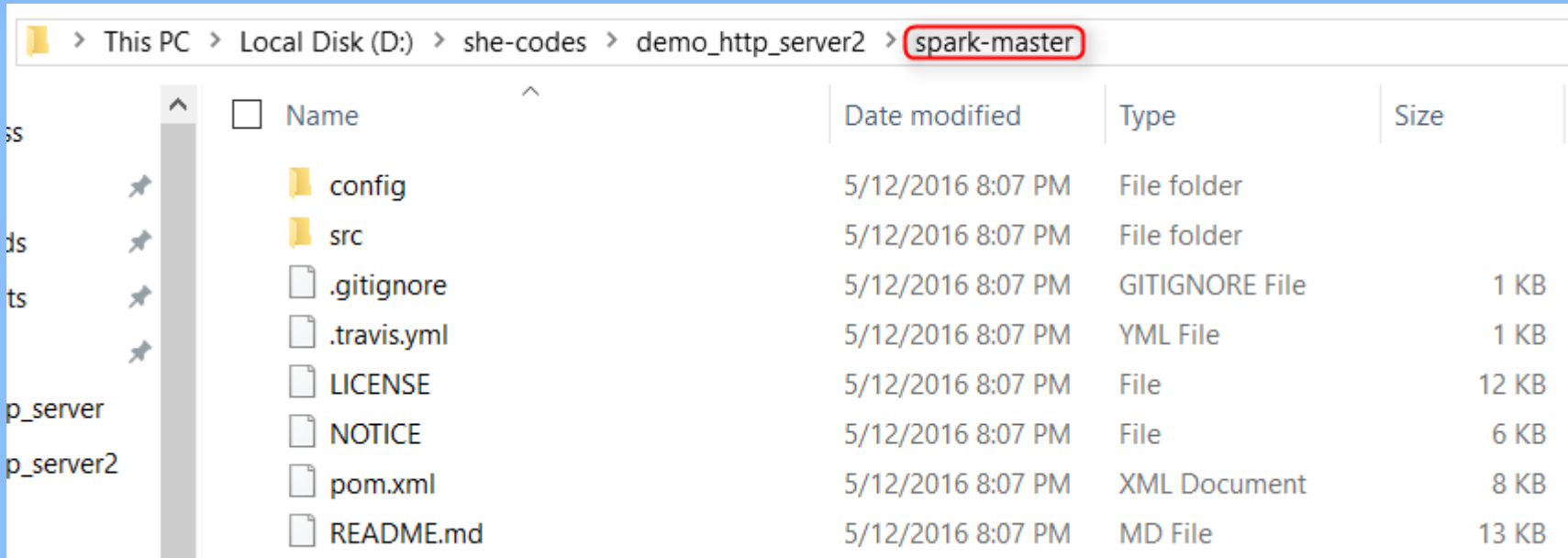


Name	Date modified	Type	Size
append.bat	11/11/2014 7:02 PM	Windows Batch File	1 KB
appletviewer.policy	11/11/2014 7:02 PM	POLICY File	1 KB
breakgen.dll	11/11/2014 7:02 PM	Application extens...	28 KB
breakgen64.dll	11/11/2014 7:02 PM	Application extens...	40 KB
focuskiller.dll	11/11/2014 7:02 PM	Application extens...	32 KB
focuskiller64.dll	11/11/2014 7:02 PM	Application extens...	50 KB
fsnotifier.exe	11/11/2014 7:02 PM	Application	97 KB
idea.bat	11/11/2014 7:02 PM	Windows Batch File	4 KB
idea.exe	11/11/2014 7:02 PM	Application	804 KB
idea.exe.vmoptions	8/8/2015 8:33 PM	VMOPTIONS File	1 KB
idea.ico	11/11/2014 7:02 PM	Icon	348 KB
idea.properties	8/8/2015 8:33 PM	PROPERTIES File	7 KB
idea64.exe	11/11/2014 7:02 PM	Application	820 KB
idea64.exe.vmoptions	8/8/2015 8:33 PM	VMOPTIONS File	1 KB

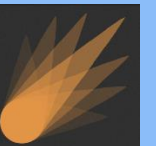


0 – INSTALLATIONS

- ▶ Get Spark from [GitHub](#) (spark-master.zip)
- ▶ Create a folder for your project and unzip there



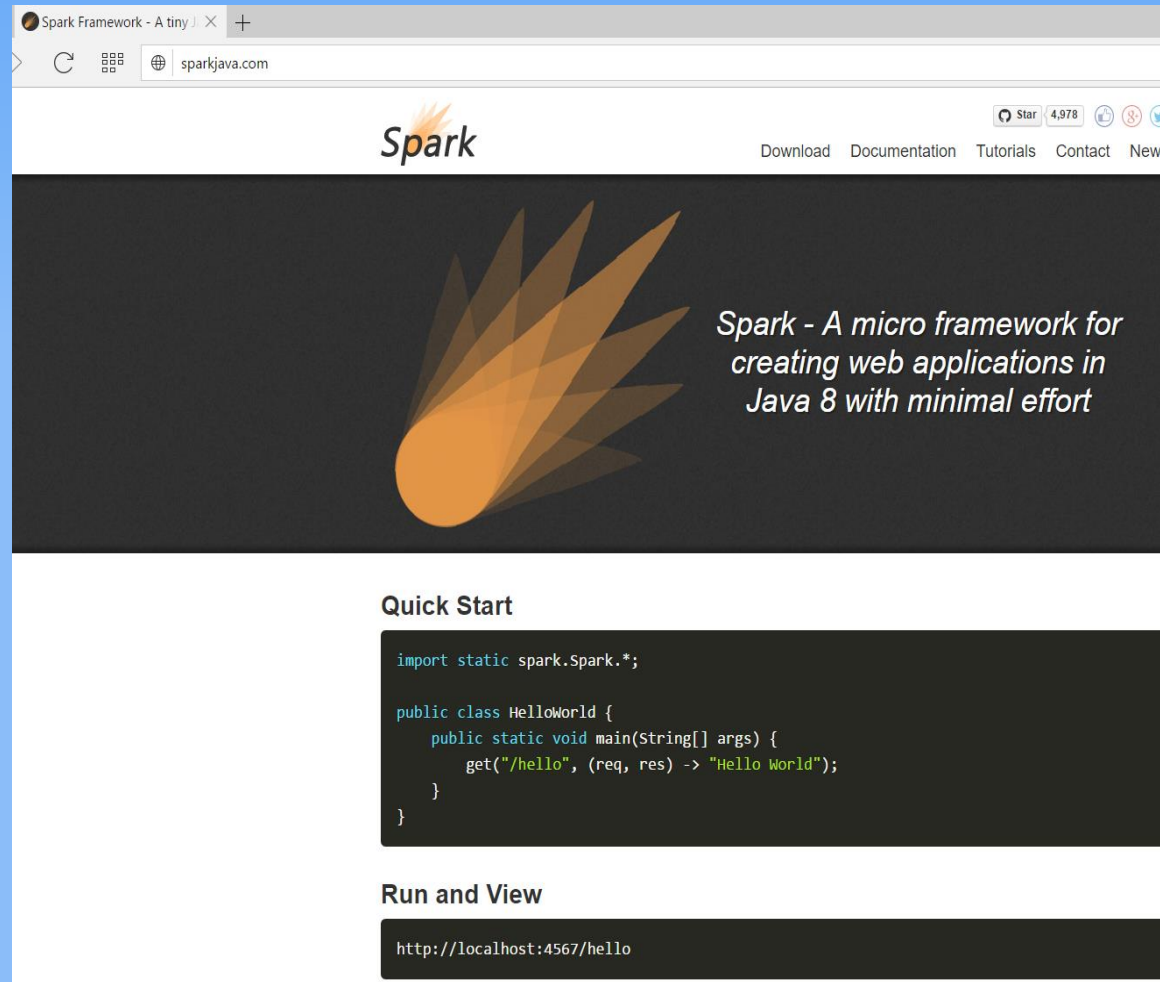
Name	Date modified	Type	Size
config	5/12/2016 8:07 PM	File folder	
src	5/12/2016 8:07 PM	File folder	
.gitignore	5/12/2016 8:07 PM	GITIGNORE File	1 KB
.travis.yml	5/12/2016 8:07 PM	YML File	1 KB
LICENSE	5/12/2016 8:07 PM	File	12 KB
NOTICE	5/12/2016 8:07 PM	File	6 KB
pom.xml	5/12/2016 8:07 PM	XML Document	8 KB
README.md	5/12/2016 8:07 PM	MD File	13 KB



1 – WHAT IS A WEB APPLICATION FRAMEWORK?

- ▶ A software framework that supports development of web applications.
- ▶ Web frameworks aim to alleviate the overhead associated with **common activities performed in web development**.
 - ▶ Routing – mapping URLs to server functions
- ▶ Many frameworks for various languages

2 – SPARK WEB-APP FRAMEWORK



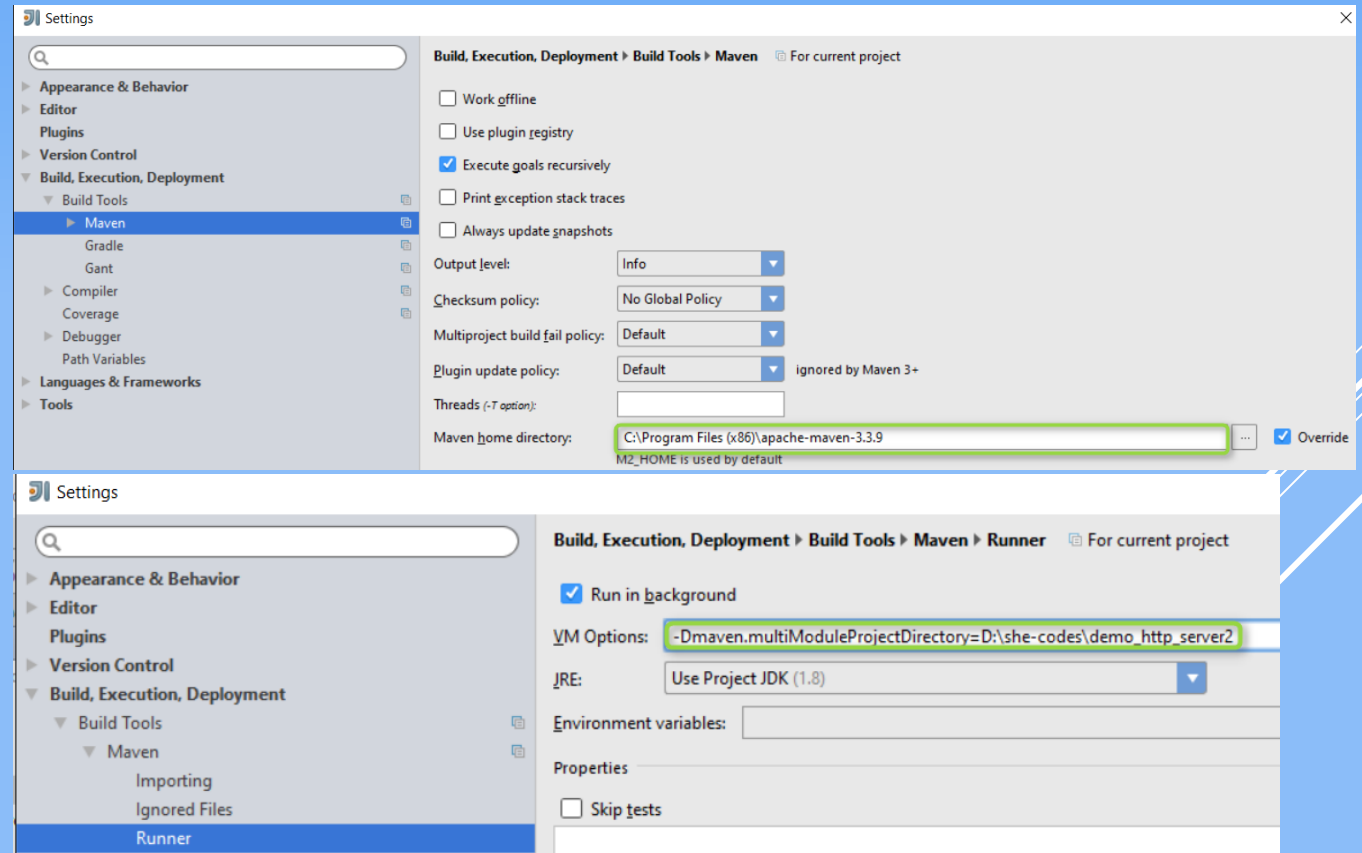
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELIJ WITH MAVEN

- ▶ Open IntelliJ and create a new Maven project
3-create-project-1.mp4
- ▶ Maven is a build automation tool.
 - ▶ It describes how to build the project.
 - ▶ It describes its dependencies.
 - ▶ For this, Maven uses a configuration file called pom.xml .

3 – JAVA SPARK HELLO WORLD PROJECT IN INTELLIJ WITH MAVEN

► Tell IntelliJ where Maven is installed.

► Tell IntelliJ where your projects are.



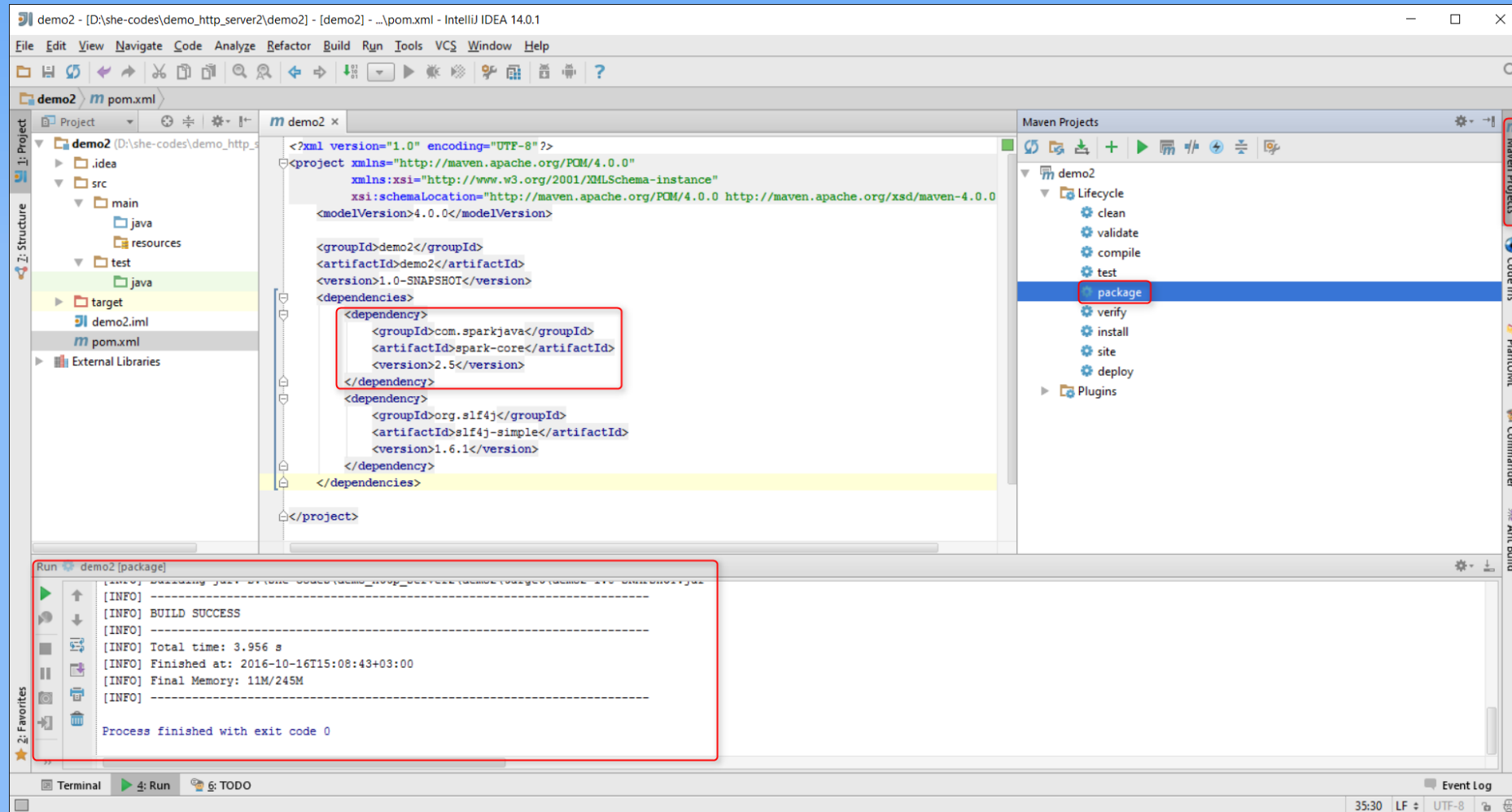
-Dmaven.multiModuleProjectDirectory=D:\she-codes\demo_http_server2

3 – JAVA SPARK HELLO WORLD PROJECT IN INTELIJ WITH MAVEN

- ▶ Import java spark module
- ▶ Set the project's Java language level.
- ▶ **4-import-java-spark-2.mp4**

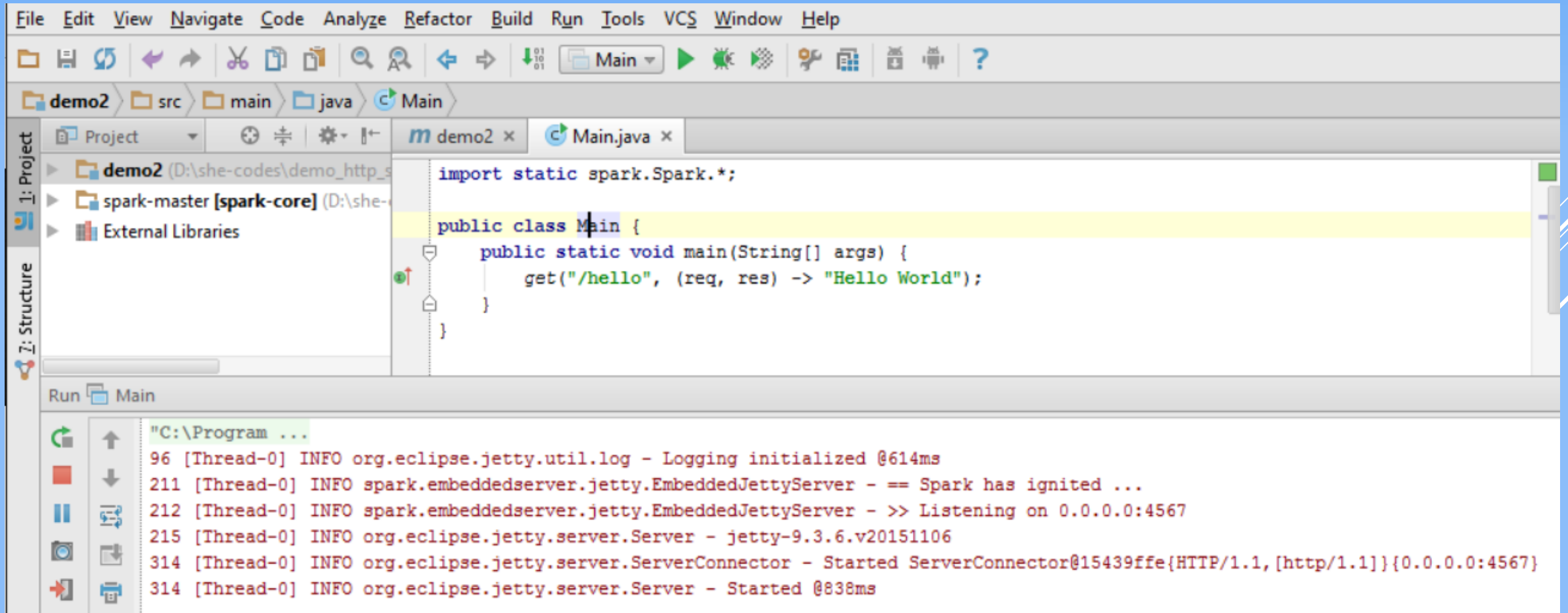
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELIJ WITH MAVEN

- ▶ Add sparkjava as a dependency of your project and build
- ▶ pom.xml



3 – JAVA SPARK HELLO WORLD PROJECT IN INTELIJ WITH MAVEN

- All this explained in <http://sparkjava.com>



```
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Main
demo2 src main java Main
Project
demo2 (D:\she-codes\demo_http_s
spark-master [spark-core] (D:\she-
External Libraries
Main
import static spark.Spark.*;

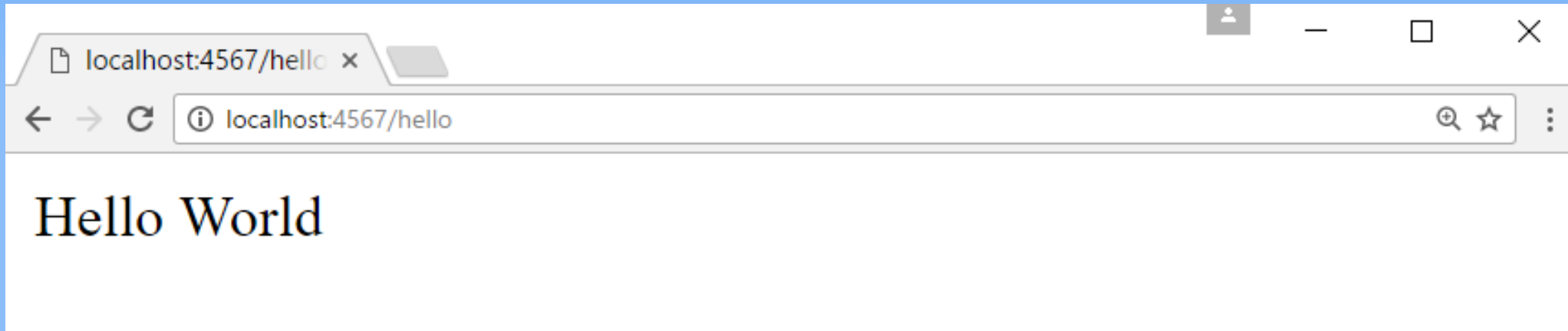
public class Main {
    public static void main(String[] args) {
        get("/hello", (req, res) -> "Hello World");
    }
}

Run Main
"C:\Program ...
96 [Thread-0] INFO org.eclipse.jetty.util.log - Logging initialized @614ms
211 [Thread-0] INFO spark.embeddedserver.jetty.EmbeddedJettyServer - == Spark has ignited ...
212 [Thread-0] INFO spark.embeddedserver.jetty.EmbeddedJettyServer - >> Listening on 0.0.0.0:4567
215 [Thread-0] INFO org.eclipse.jetty.server.Server - jetty-9.3.6.v20151106
314 [Thread-0] INFO org.eclipse.jetty.server.ServerConnector - Started ServerConnector@15439ffe{HTTP/1.1,[http/1.1]}{0.0.0.0:4567}
314 [Thread-0] INFO org.eclipse.jetty.server.Server - Started @838ms
```

4 – JAVA SPARK HELLO WORLD

CLIENT-SERVER COMMUNICATION

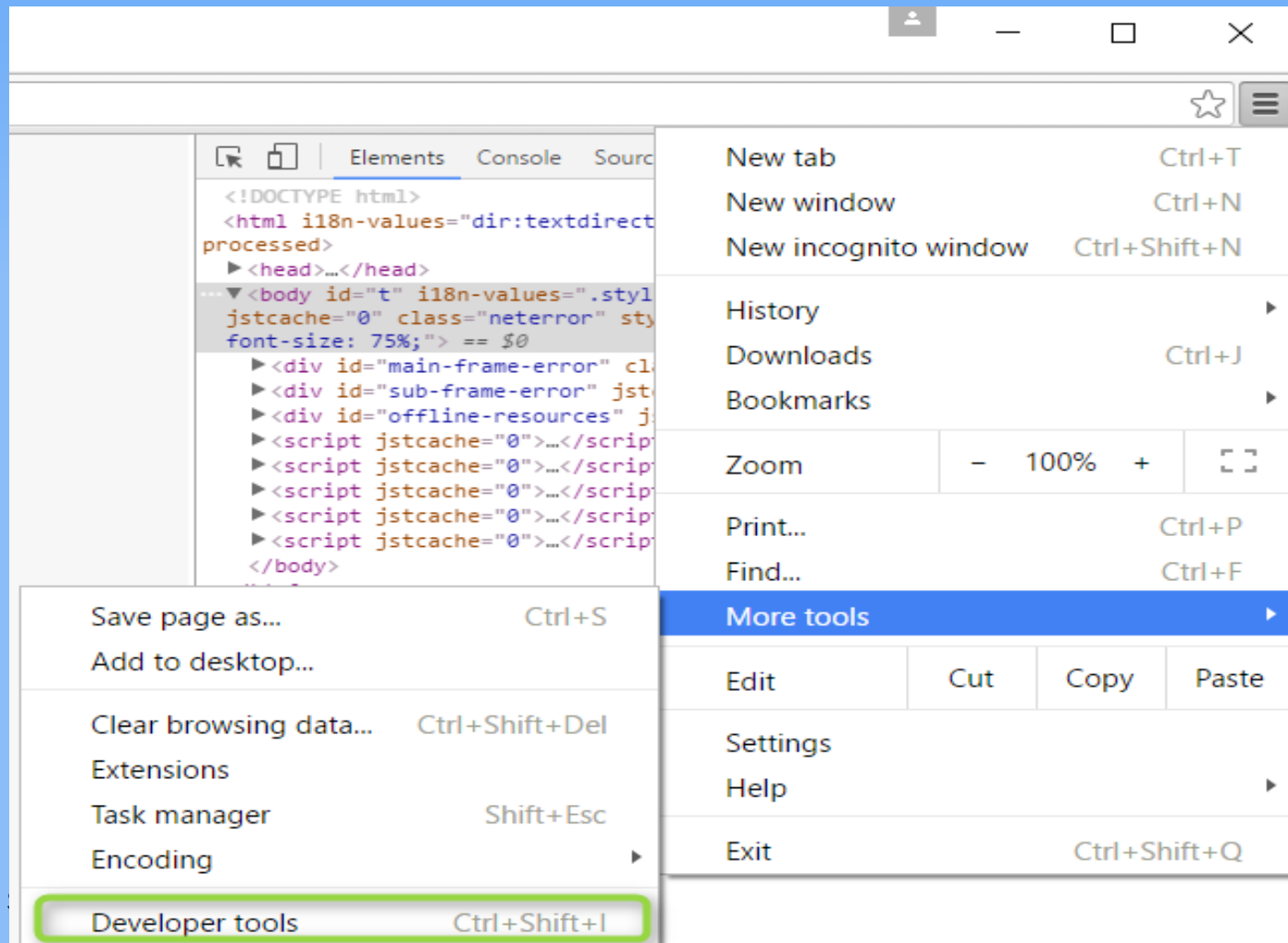
- ▶ The client here is the Web browser
- ▶ The client can send an HTTP “GET” request to the server:



- ▶ The HTTP request to the server has the REST route: `"/hello"`
- ▶ The server code mapped to the route is this Java 8 anonymous function:

```
(req, res) -> "Hello World"
```


5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS



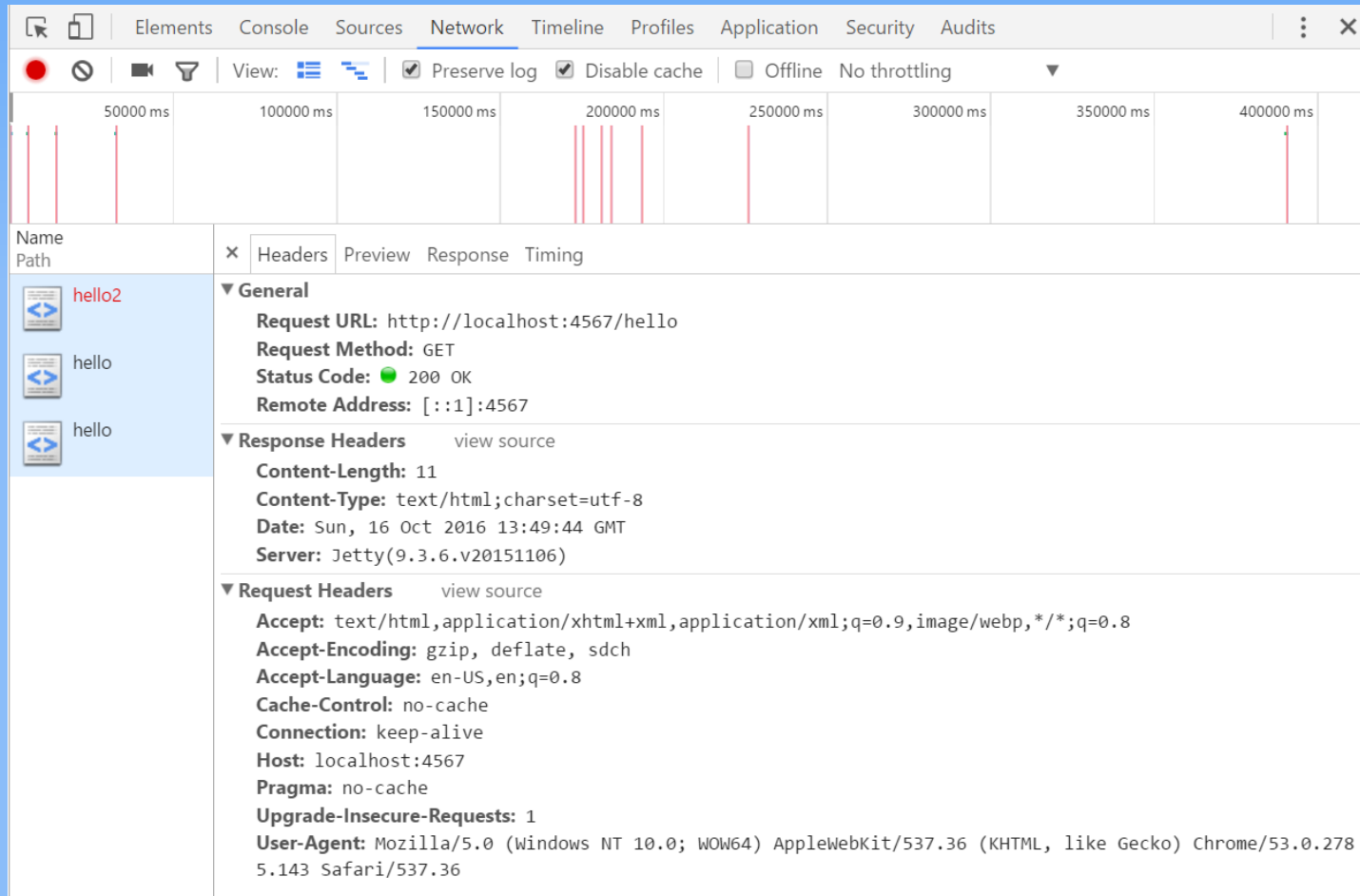
5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS

The screenshot shows the Chrome Developer Tools Network tab. The browser address bar shows 'localhost:4567/hello'. The page content displays 'Hello World'. The Network tab is active, showing a list of requests. The 'hello2' request is highlighted in blue, and a red arrow points to the 'hello' request. The 'hello2' request is a 404 Not Found, and the 'hello' request is a 200 OK. The table below shows the details of the requests.

Name Path	Status Text	Type	Initiator	Size Content	Time Latency	Timeline – Start Time
hello2	404 Not Found	docum...	Other	202 B 48 B	236 ms 235 ms	
hello	200 OK	docum...	Other	158 B 11 B	233 ms 230 ms	

2 requests | 360 B transferred | Finish: 233 ms | DOMContentLoaded: 247 ms | Load: 247 ms

5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS



5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS

The screenshot shows the Chrome Developer Tools Network tab. The top toolbar includes icons for recording, pausing, and filtering, along with checkboxes for 'Preserve log', 'Disable cache', and 'Offline'. A timeline at the top displays network activity as vertical red lines across a time scale from 0 to 400,000 ms. Below the timeline, a list of network requests is shown with columns for Name, Path, and a status icon. The first request, 'hello2', is selected. The right pane shows the 'Response' tab for this request, displaying '1 Hello World'.

Name	Path	Status
hello2		200
hello		200
hello		200

Headers	Preview	Response	Timing
1 Hello World			

6 – SOME BACKGROUND ON REST & HTTP

REST

- ▶ **URI** (Uniform Resource Identifiers) is a standard for naming web resources.
- ▶ The term **REST** (representational state transfer) was defined by Roy Fielding (2000). He used REST to design the HTTP 1.1 protocol and URIs.
- ▶ RESTful systems communicate with external systems as web resources identified by URIs
- ▶ REST is the software architectural style of the internet.

6 – SOME BACKGROUND ON REST & HTTP

HTTP

- ▶ The Hypertext Transfer Protocol is an application-level communication protocol. Its the foundation for data communication for the internet since 1990.
- ▶ Consists of HTTP request/ HTTP response
- ▶ A request contains
 - ▶ Method type “verb” (GET, POST, PUT, DELETE, ...).
 - ▶ URL of the request:
`http://<host>:<port>/<route>?<query>`
`http://www.acme.com/phonebook/UserDetails/12345`
`http://www.acme.com/phonebook/UserDetails?firstName=John&lastName=Doe`
`http://localhost:4567/hello`
- ▶ URLs are URI's where the network access is http (or https).
- ▶ A response has an error code

7 – PHONEBOOK SERVER DESIGN

REST ROUTES

GET

`http://localhost:4567/about`

`http://localhost:4567/list`

`http://localhost:4567/find/Tamar`

POST

`http://localhost:4567/add/Reut/with/5678`

7 – PHONEBOOK SERVER DESIGN

DATA MODEL

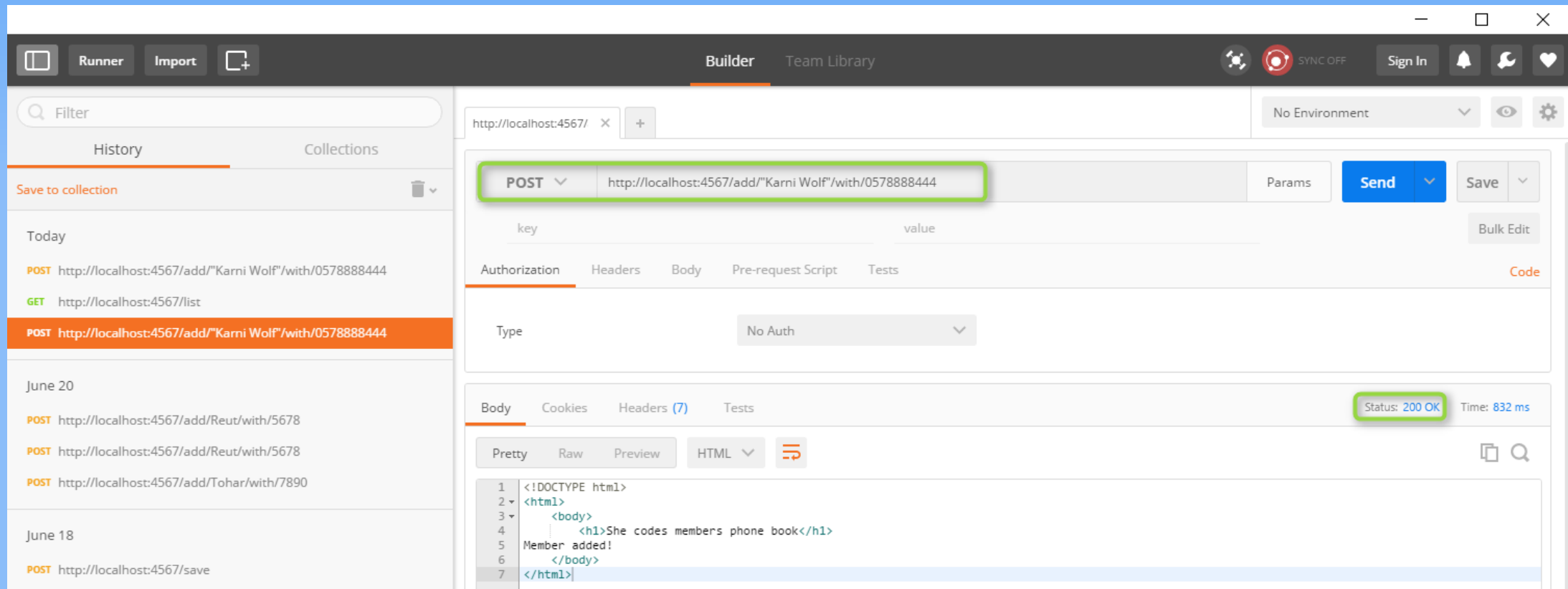
- ▶ Be persistent! Save the server data.
 - ▶ Save the data in a json file on the server phonebook.json
 - ▶ Use google's json-simple package to handle json objects.
 - ▶ Add a dependency to pom.xml
- ▶ What is the data structure we decide on?
 - ▶ Manage phone book in ConcurrentHashMap.
- ▶ What kind of output (content type) do we want? text/html/json/xml?
 - ▶ Response content type will html

7 – PHONEBOOK SERVER DESIGN (REST ROUTES AND DATA MODEL)

- ▶ “Get” requests returning dynamic pages
 - ▶ Class: PhoneBookWebApp
 - ▶ Class: HTMLTemplate
- ▶ “Post” requests add data:
 - ▶ Class: JsonPhoneRepository
 - ▶ Saved to file each add operation
 - ▶ File loaded on server start
 - ▶ Submit in Postman

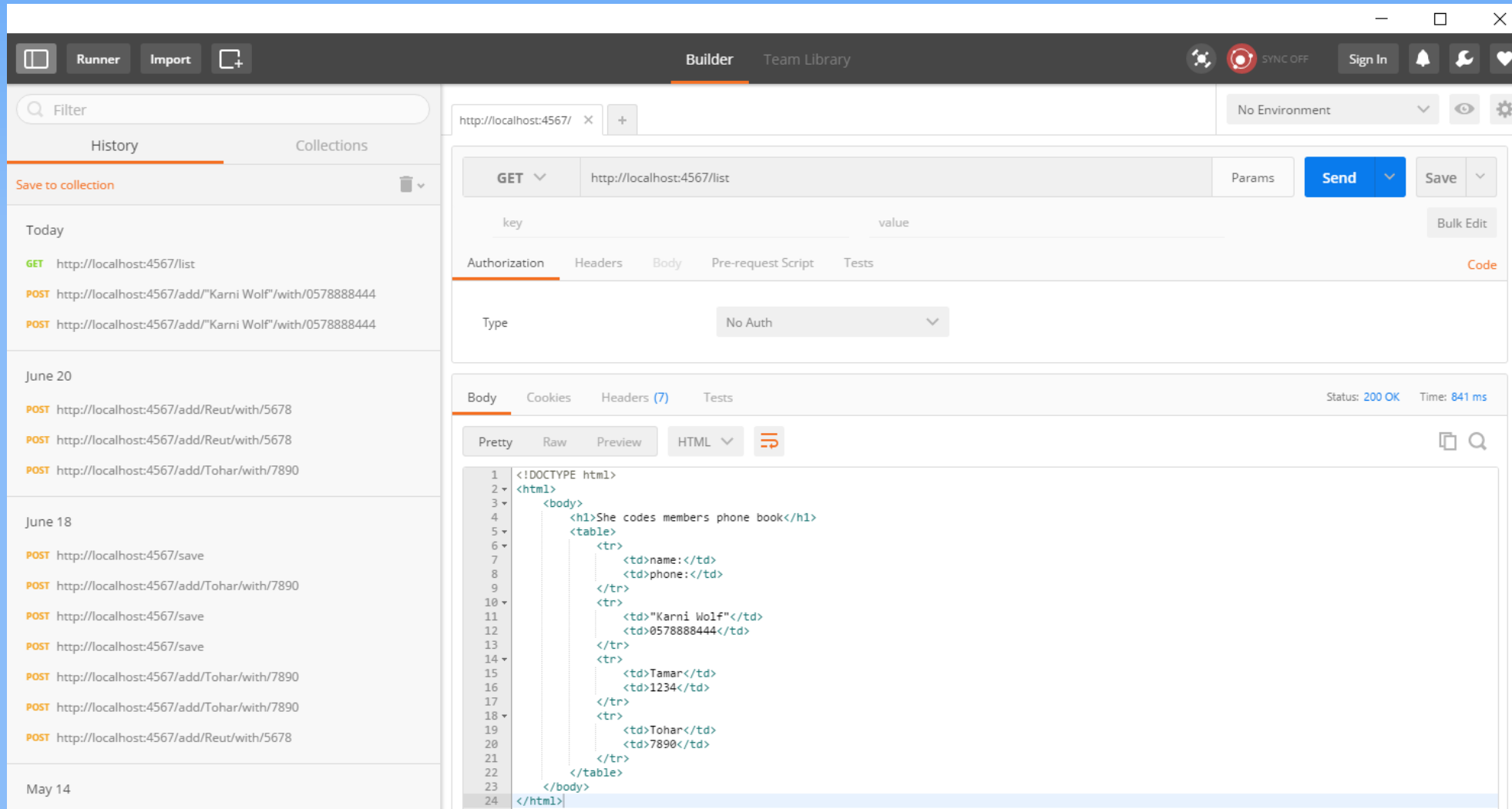
8 – POST REQUEST WITH POSTMAN

Using Postman Chrome app for POST requests



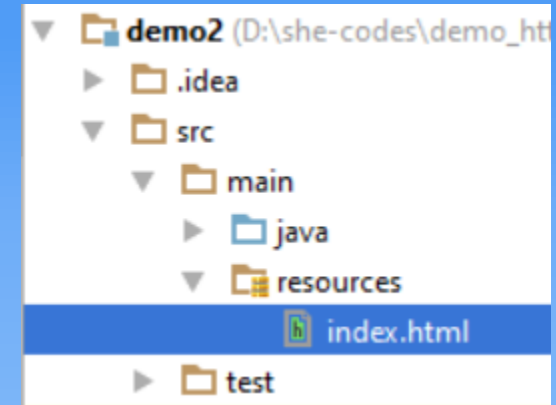
8 – POST REQUEST WITH POSTMAN

Using Postman Chrome app for GET requests



9 – POLL SERVER DESIGN – STATIC PAGES, FORMS, REDIRECT

- ▶ serving a **static page**
 - ▶ Class: PollWebApp
 - ▶ Resource: Index.html



```
// serving a static page  
get("/", (req, res) -> phoneBookWebApp.renderContent("../index.html"));
```

```
// serving a static page  
private String renderContent(String htmlFile) throws URISyntaxException, IOException {  
    return new String(Files.readAllBytes(Paths.get(getClass().getResource(htmlFile).toURI()))), StandardCharsets.UTF_8);  
}
```

9 – POLL SERVER DESIGN – STATIC PAGES, FORMS, REDIRECT

- ▶ Submitting **forms**
 - ▶ Class: PollWebApp
 - ▶ Resource: Index.html
- ▶ When you submit a form, the browser encodes names and values of all form fields and then puts them in the **body of a POST request** in a typical query string format:
 fieldname1=fieldvalue1 &fieldname2=fieldvalue2

9 – POLL SERVER DESIGN – STATIC PAGES, FORMS, REDIRECT

- ▶ href – (redirect) link to another page
 - ▶ Resource: Index.html
 - ▶ Class: HTMLTemplate
 - ▶ Is interpreted as a **GET** request

```
<a href="resultPoll">Go to results</a>
```

DEMO SLIDES AND PROJECT

- ▶ <http://www.cs.bgu.ac.il/~matuskat/>

ADDITIONAL READS

- ▶ More on how to use spark <http://sparkjava.com/documentation.html>
- ▶ List of web server application frameworks on Github
<https://github.com/showcases/web-application-frameworks?s=stars>
- ▶ On Rest and SOAP <http://rest.elkstein.org/>
- ▶ The difference between URLs and URIs
<https://danielmiessler.com/study/url-uri/#gs.NW3Lwiw>

THANKS FOR SHARING THIS EVENING
AND SEE YOU ALL AT
she codes;

This was CODING SKILLS

WEB SERVER DEMO

Using Java 8 and Spark web framework

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