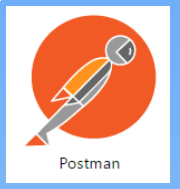
she codes;

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)

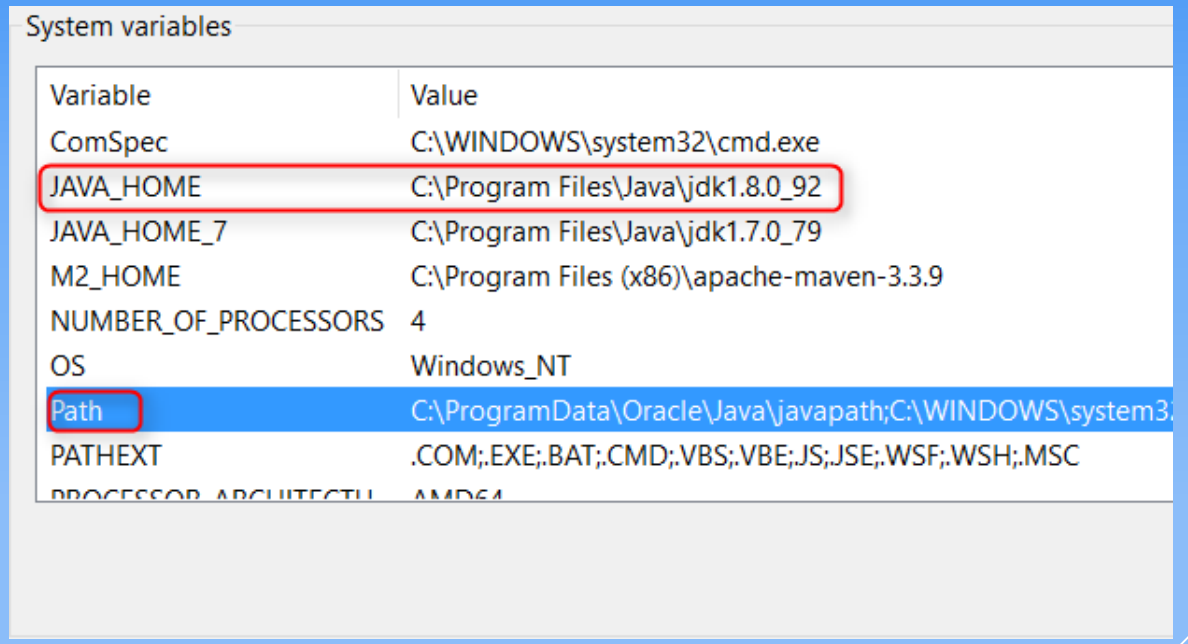
8 - How to submit HTTP requests with Postman

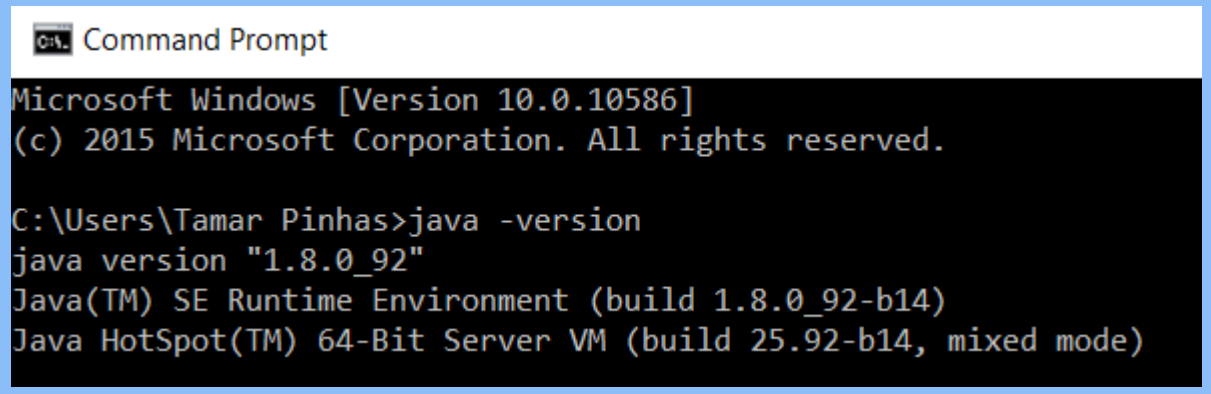
9 - Poll server design – static pages, forms, redirect

0 – INSTALLATIONS

Java SE Development Kit 8

- Download from Oracle
- Set environment variable
- Verify Java is recognized (in path)

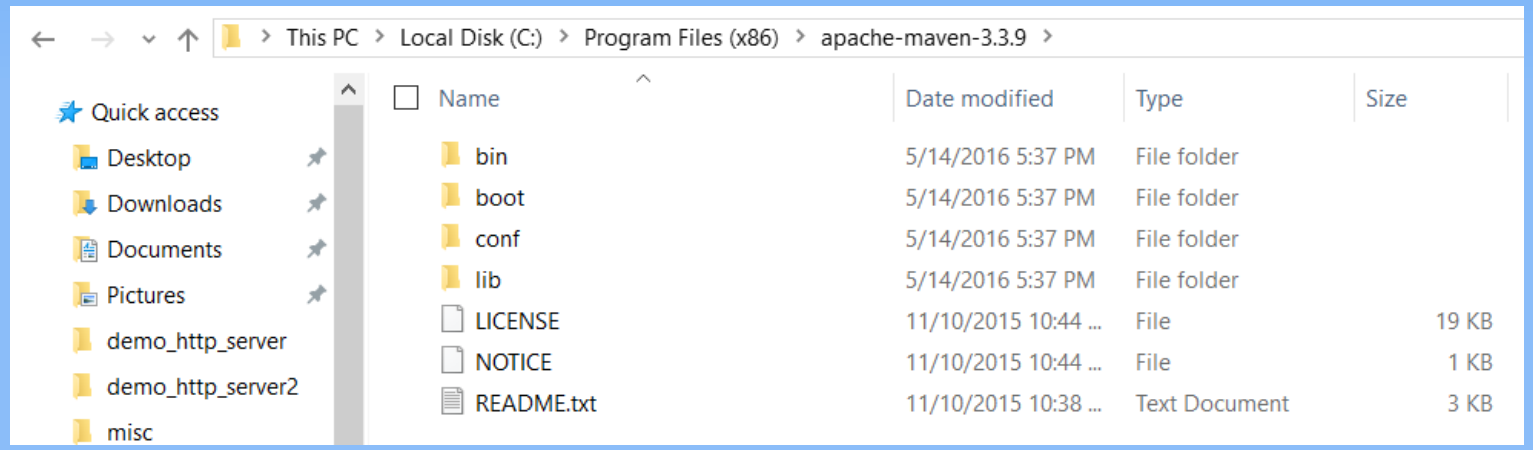




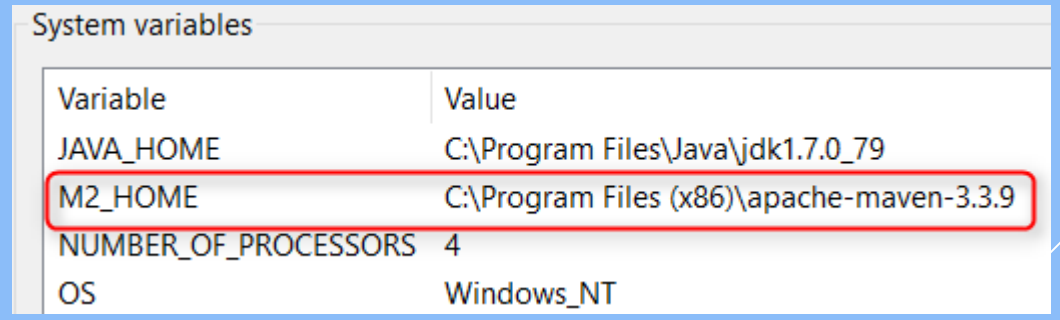
0 – INSTALLATIONS

Maven

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

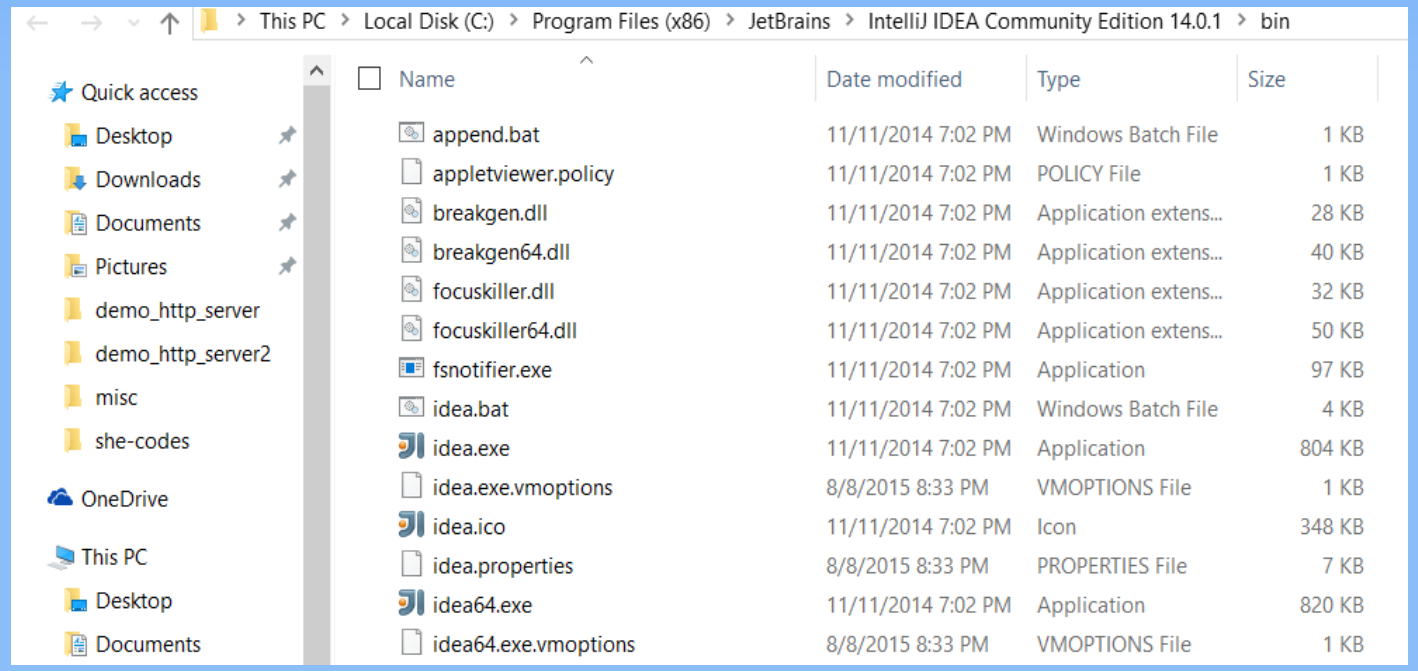


- Set environment variable
- Add maven bin to path



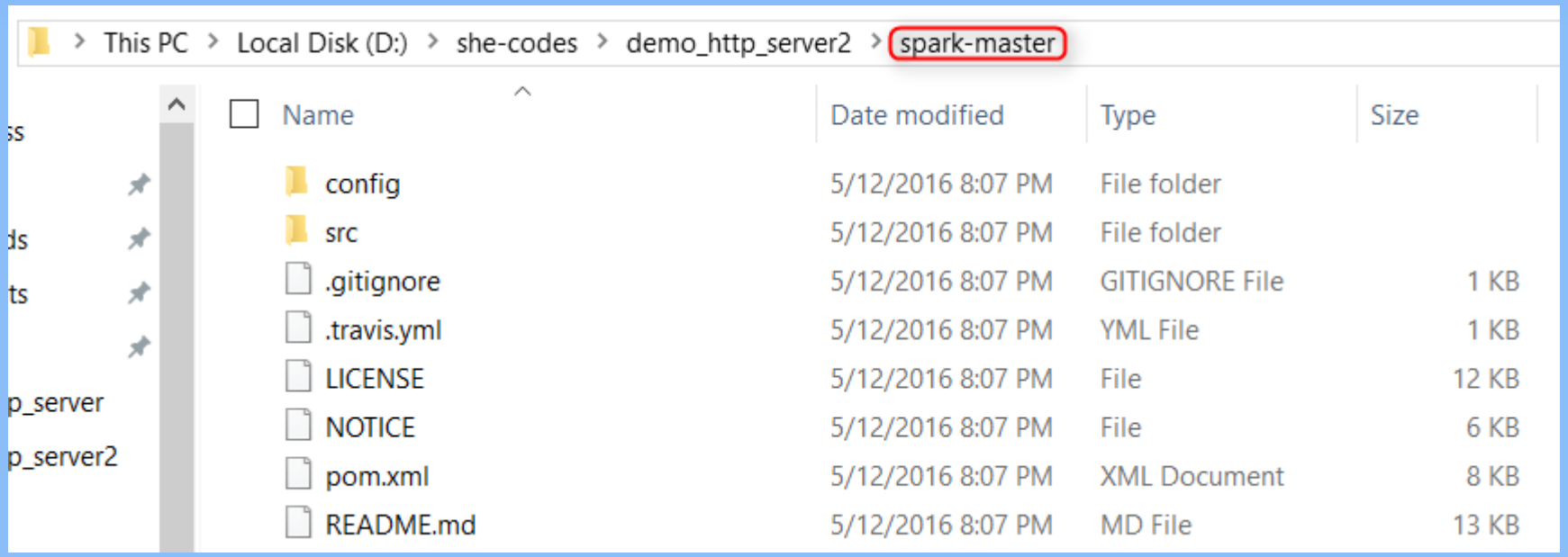
0 – INSTALLATIONS

- IntelliJ Software Development Environment
  - Download from JetBrains and install (community edition)



0 – INSTALLATIONS

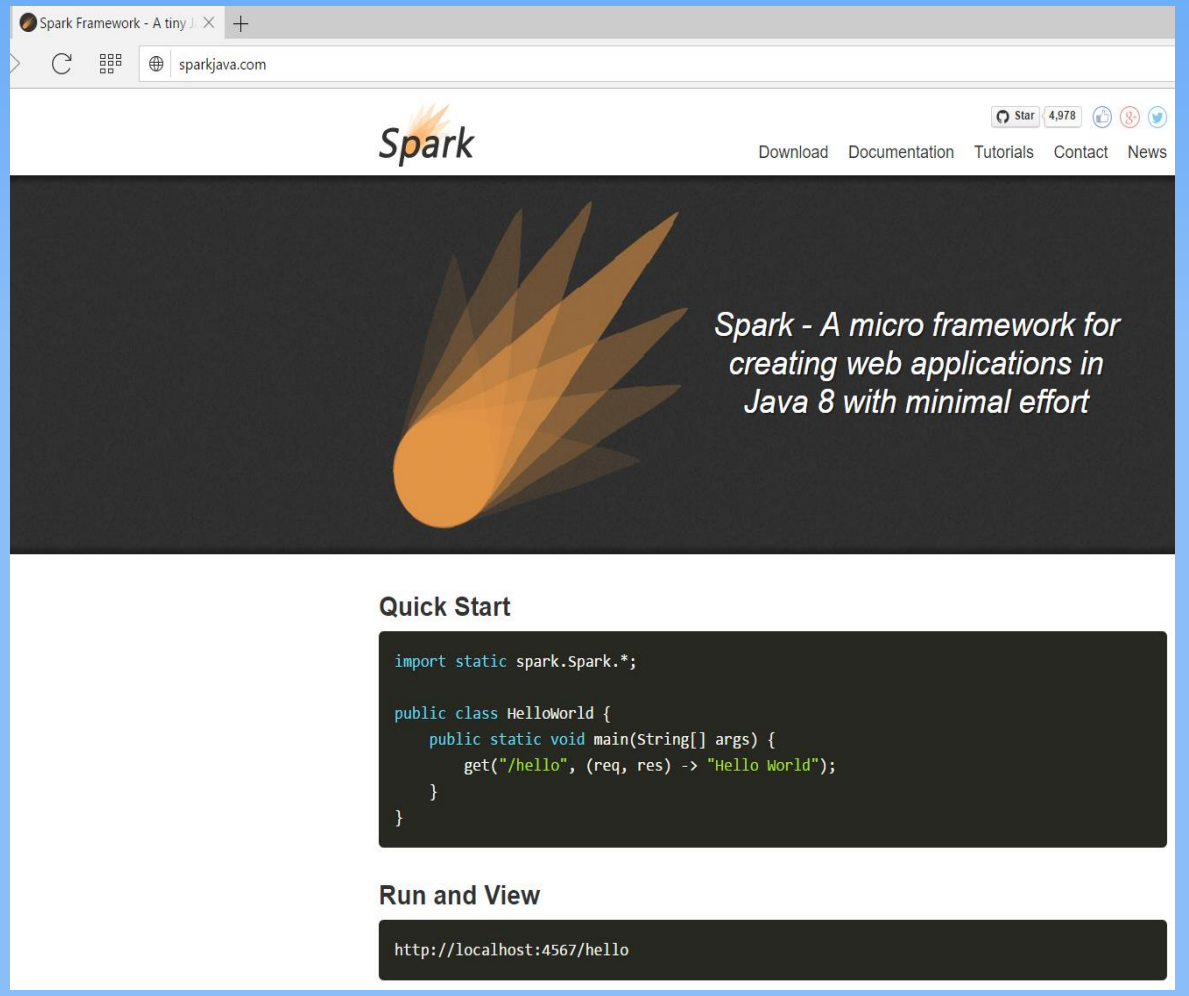
- Get Spark from GitHub (spark-master.zip)
- Create a folder for your project and unzip there



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



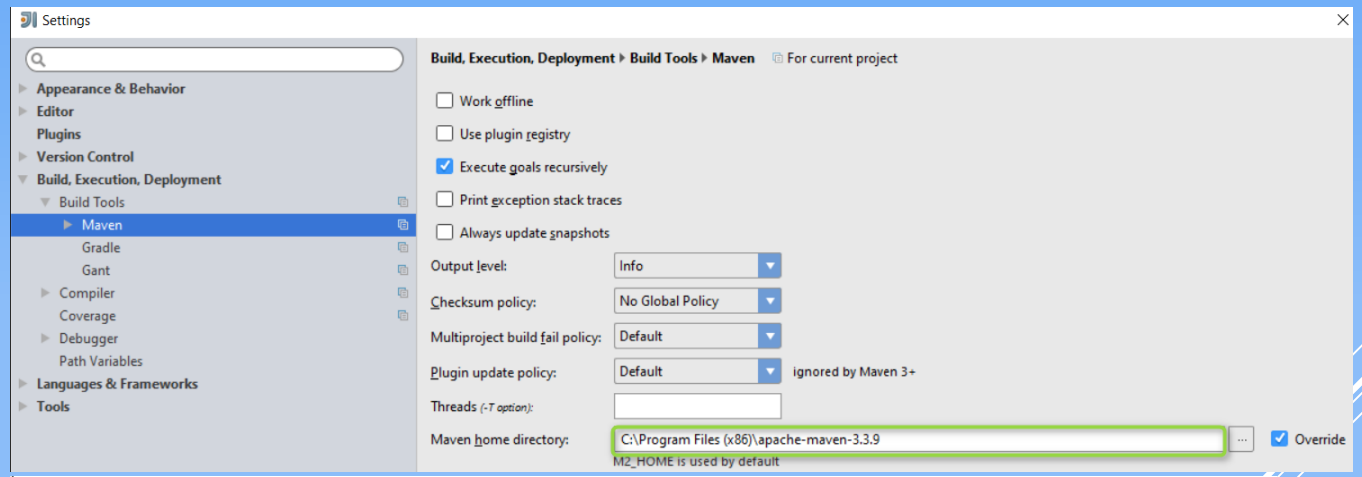
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELLIJ WITH MAVEN

- Open IntelliJ and create a new Maven project
  3-create-project-1.mp4

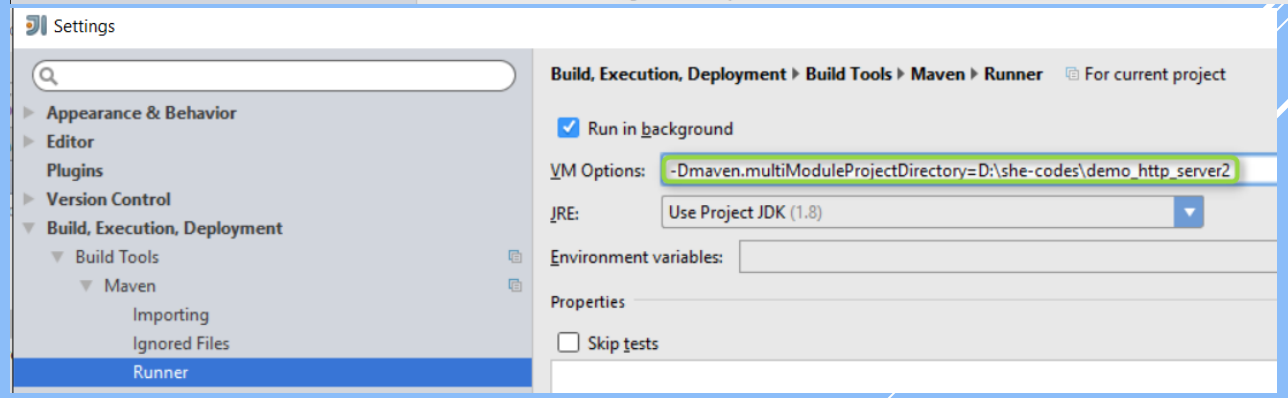
- Maven is a build automation tool.
  - It describes how to build the project.
  - It describes its dependencies.
  - For this, Maven uses a configuration file called pom.xml .

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

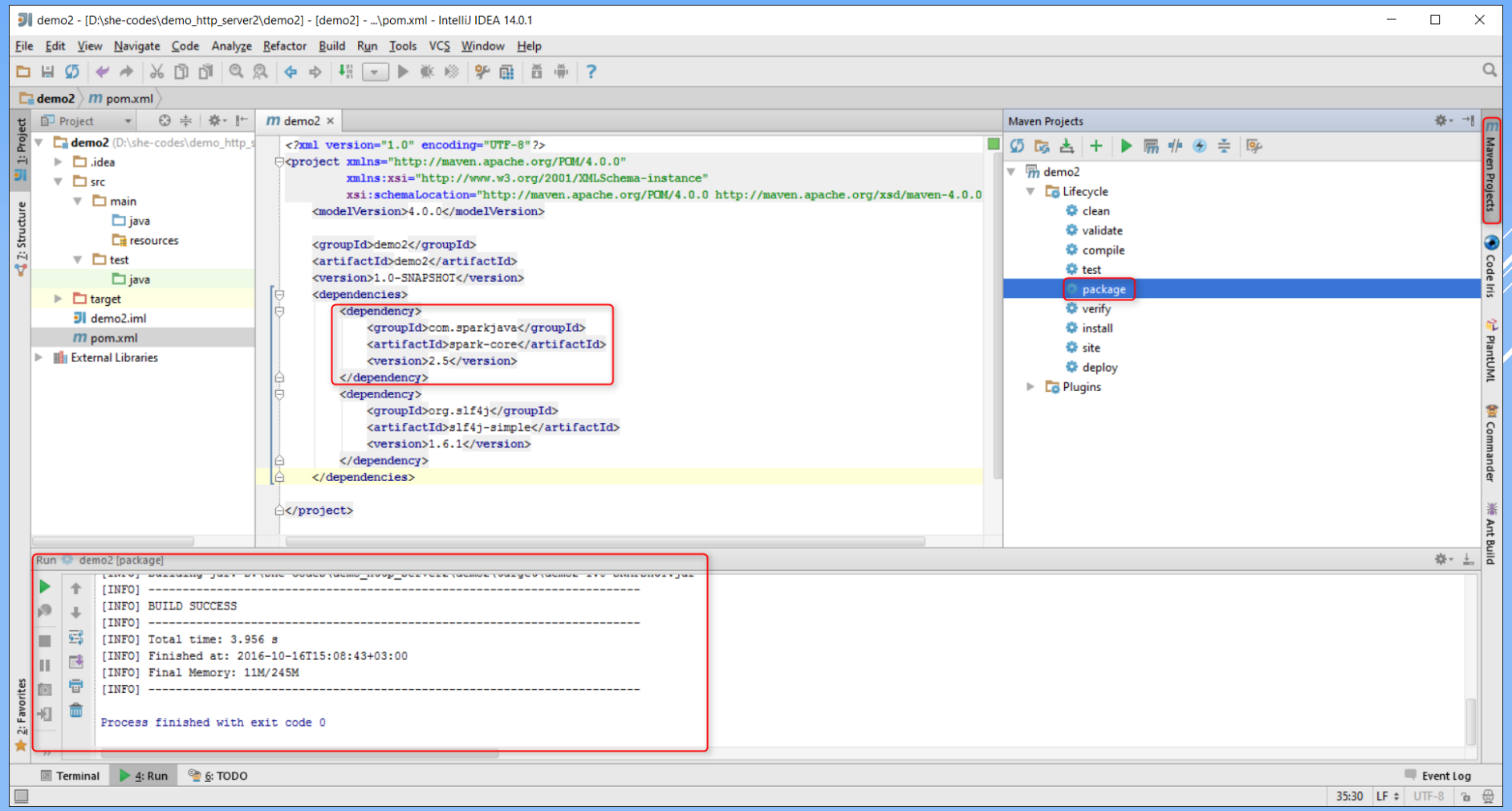
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELLIJ WITH MAVEN

- Import java spark module
- Set the project's Java language level.

- ***4-import-java-spark-2.mp4***

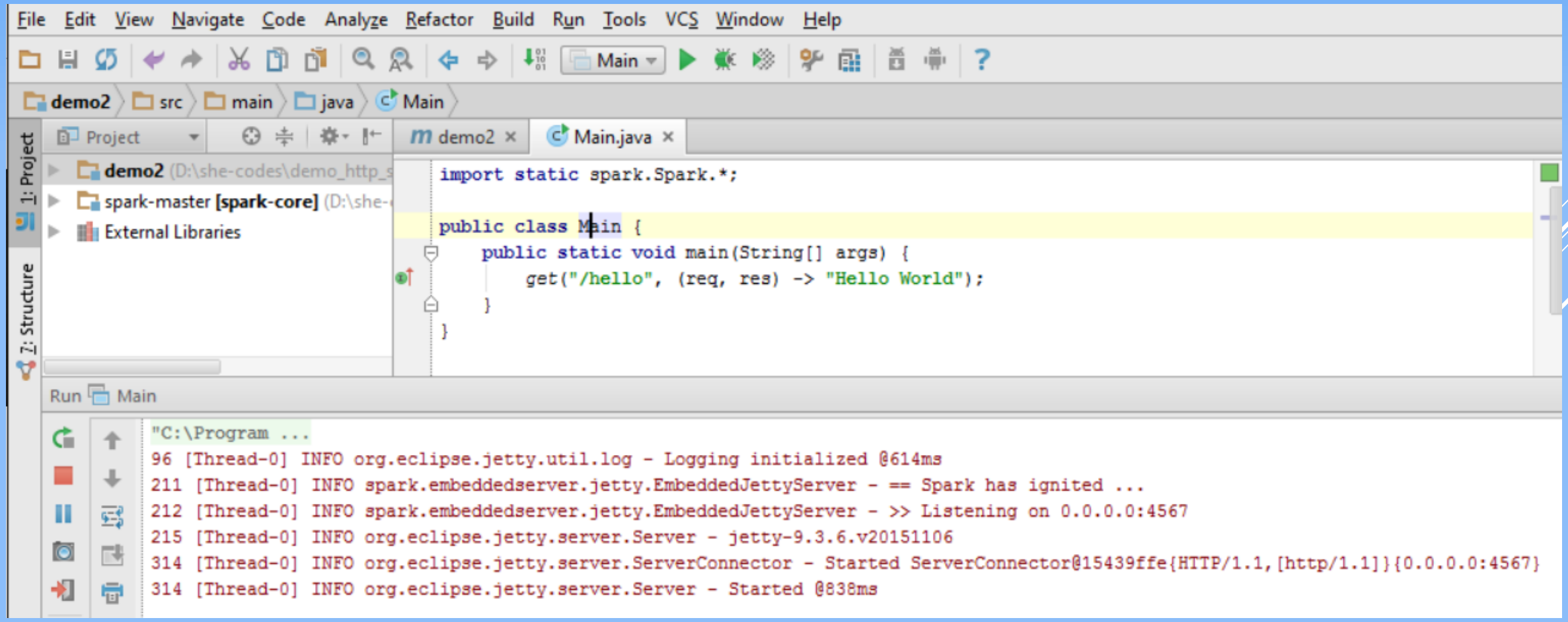
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELLIJ WITH MAVEN

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



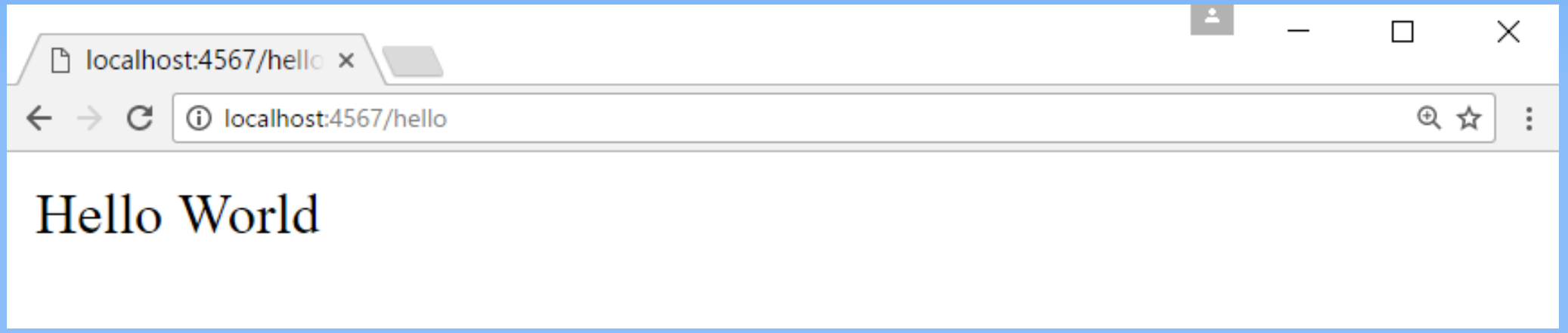
3 – JAVA SPARK HELLO WORLD PROJECT IN INTELLIJ WITH MAVEN

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



4 – JAVA SPARK HELLO WORLD CLIENT-SERVER COMMUNICATION

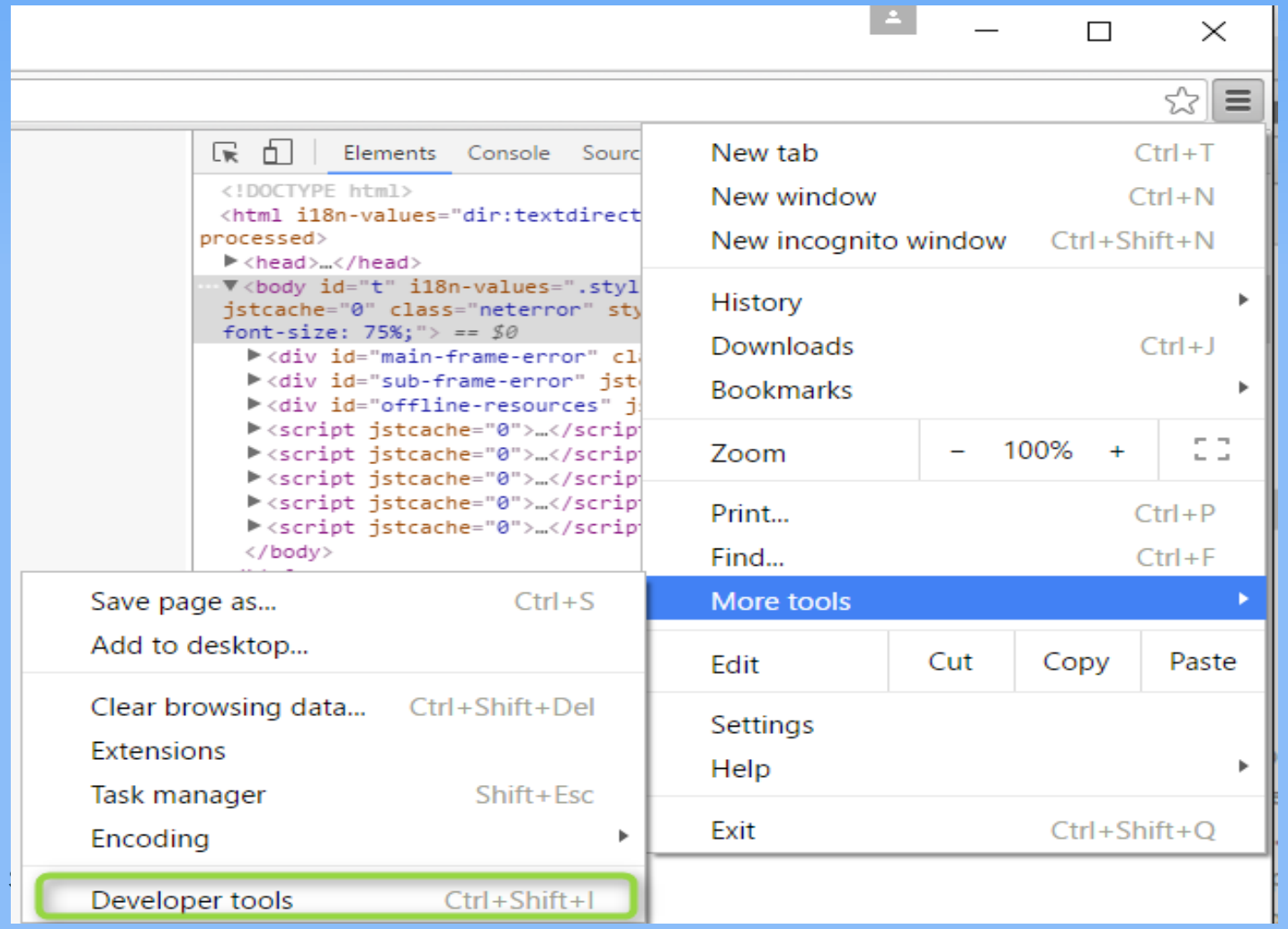
- The client here is the Web browser
- The client can send an HTTP "GET" request to the server:



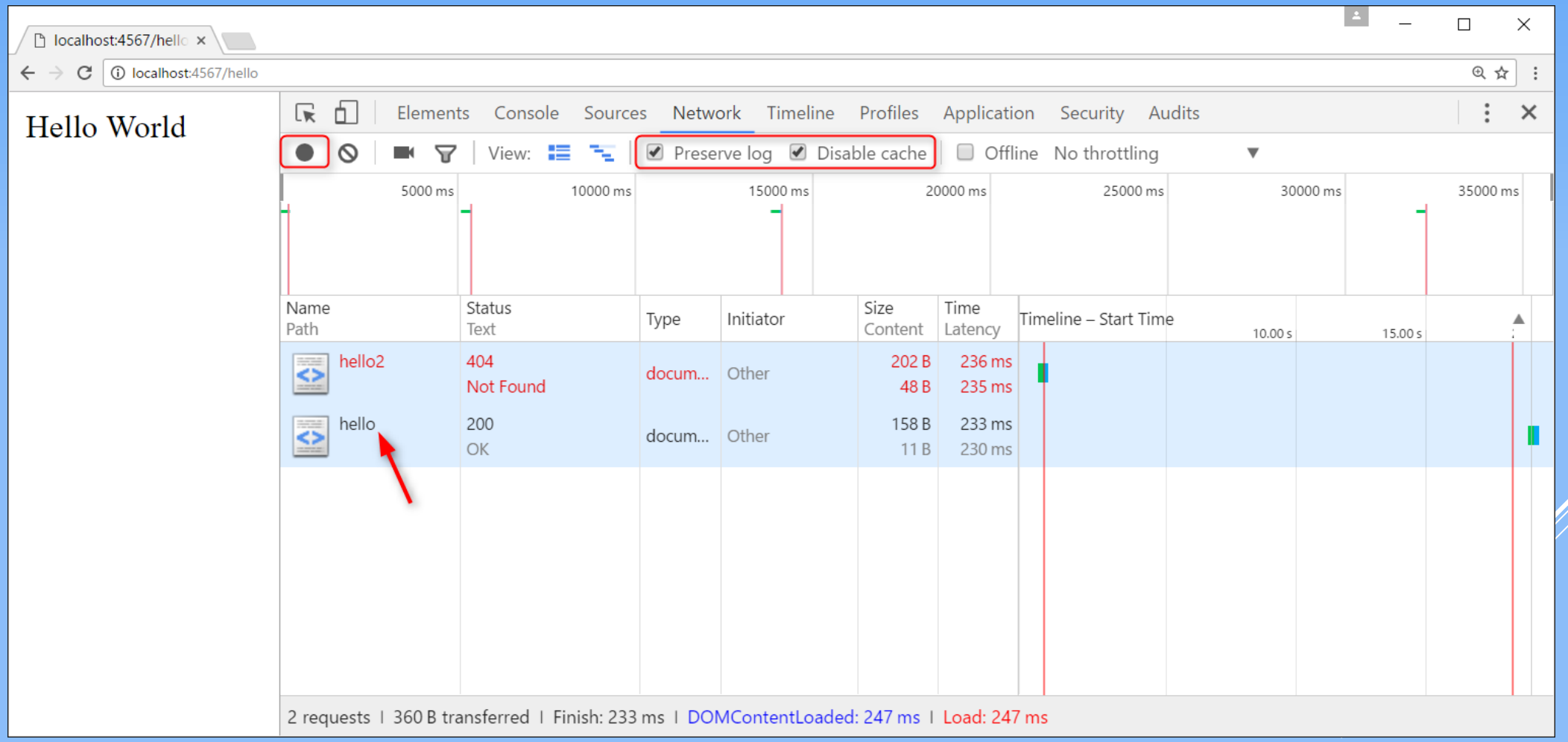
- The HTTP request to the server has the REST route: `"/hello"`
- The server code mapped to the route is this Java 8 anonymous function:

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

5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS



5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS



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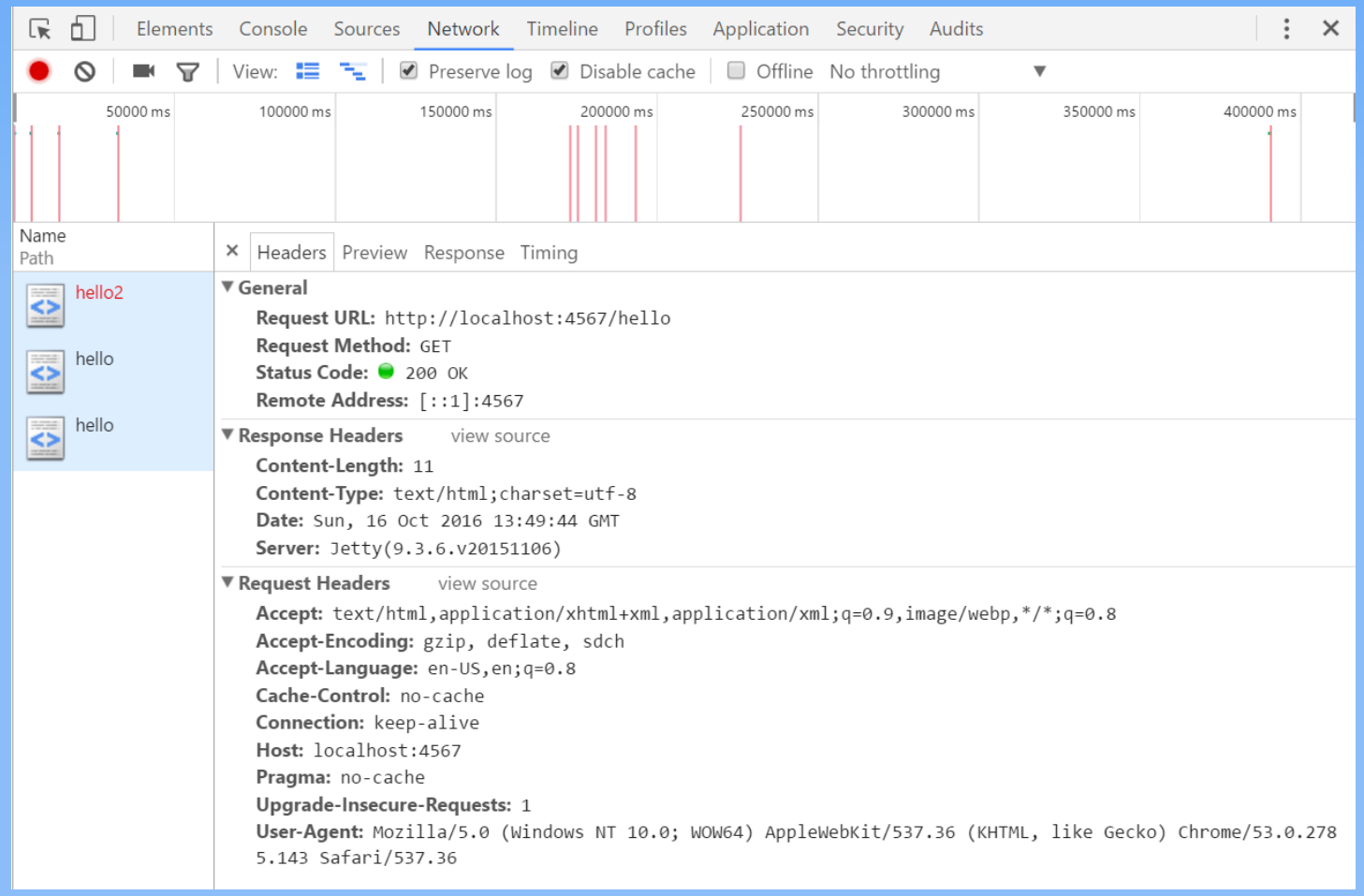
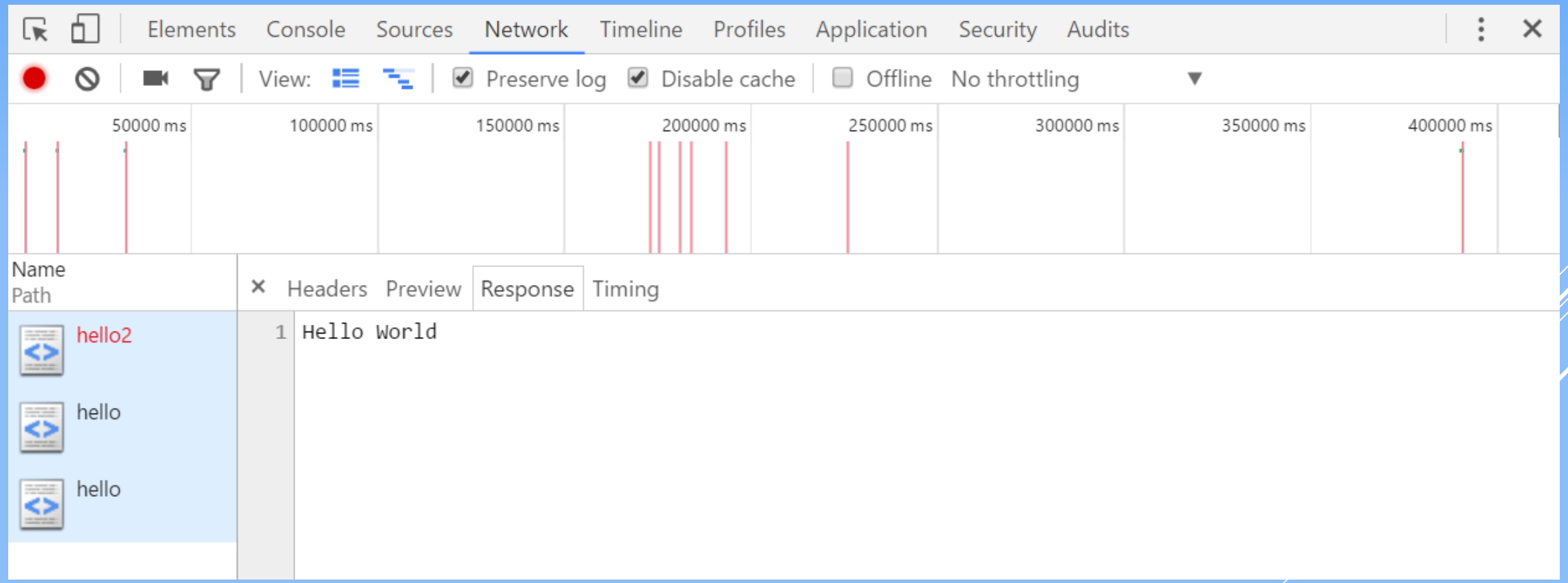


5 – SEEING NETWORK COMMUNICATION IN CHROME DEVELOPER TOOLS



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

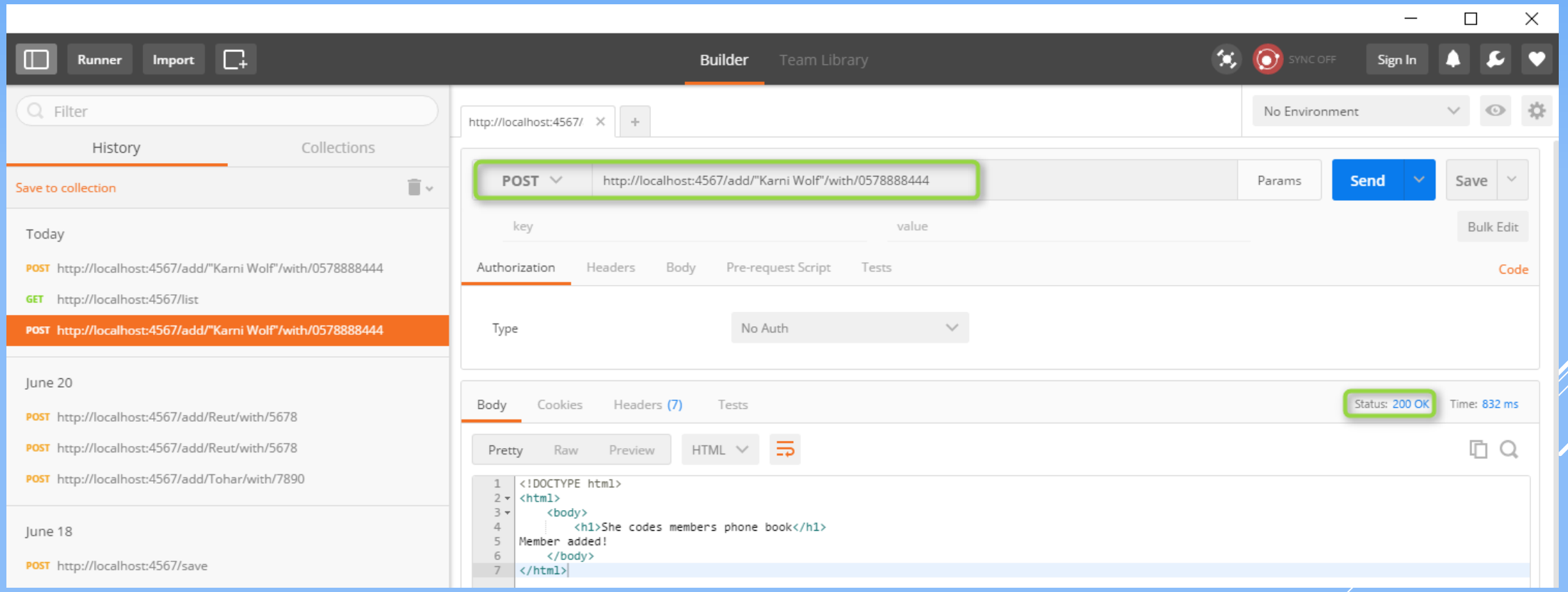
7 – PHONEBOOK SERVER DESIGN (REST ROUTES AND DATA MODEL)

- "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

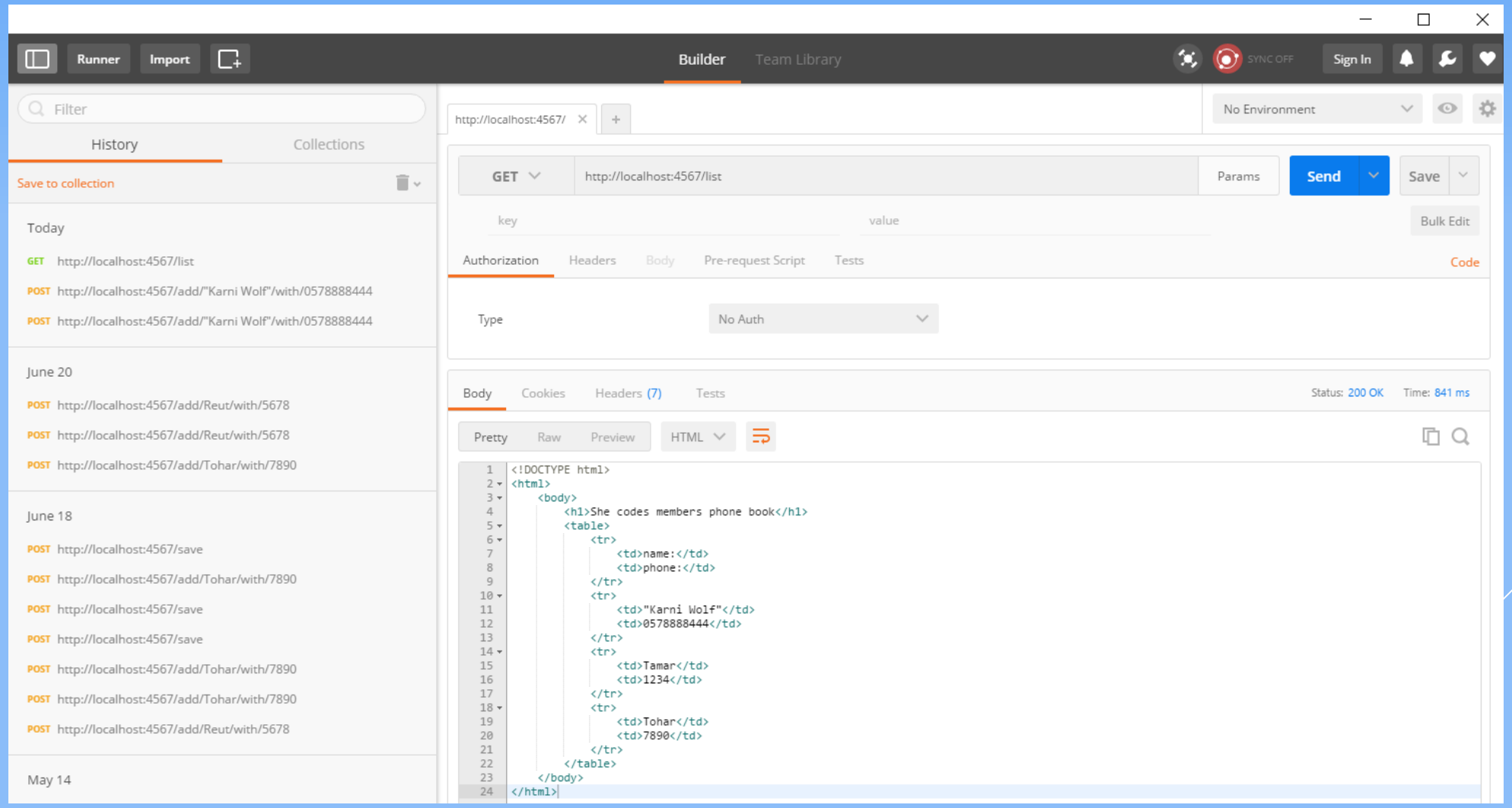
8 – POST REQUEST WITH POSTMAN

Using Postman Chrome app for POST requests



8 – POST REQUEST WITH POSTMAN

Using Postman Chrome app for GET requests

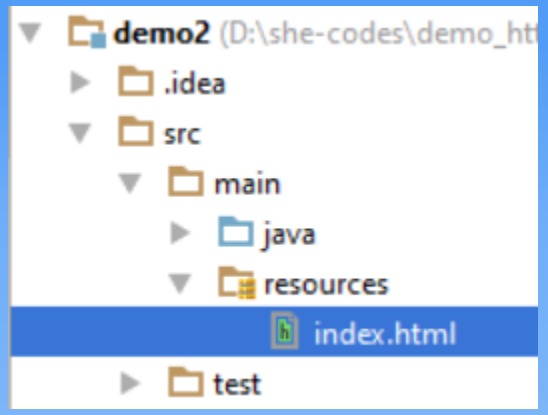


Apps

Postman

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

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