

Exercise 1

Create and consume a REST Service using Apache CXF and JAX-RS

Prior Knowledge

Basic understanding HTTP verbs, REST architecture
Some Java coding skill

Objectives

Understand what it takes to create REST services. Understand the REST model.
Interact with a REST service using simple web clients in Chrome, on the command line, and in Java.
See how Maven and Tomcat can be used.

Software Requirements

(see separate document for installation of these)

- Java Development Kit 7
- Apache Maven 3.0.4 or later
- Eclipse
- Tomcat 7.0.57 or later
- curl
- Google Chrome/Chromium plus Chrome Advanced REST extension



Step 1. Create a new project using Maven

Maven is a very powerful (and somewhat arcane) build tool. We are going to use Maven to create and build a simple RESTful service project.

Maven has the ability to create new projects using “archetypes”.

- a. First start a Unix Terminal window.
Now create a directory to store your code in.

```
mkdir oxsoa
```

- b. Change to that directory

```
cd oxsoa
```

- c. Test that you have maven properly installed. Execute

```
mvn -v
```

You should see something similar to this (dependent on your machine, JVM, etc)

```
Apache Maven 3.0.5
Maven home: /usr/share/maven
Java version: 1.7.0_65, vendor: Oracle Corporation
Java home: /usr/lib/jvm/java-7-openjdk-amd64/jre
Default locale: en_GB, platform encoding: UTF-8
OS name: "linux", version: "3.13.0-32-generic", arch: "amd64",
family: "unix"
```

- d. Use Maven to create a sample project:
Execute

```
mvn archetype:generate -Dfilter=org.apache.cxf.archetype:
```

This will prompt you for some choices:

Choose archetype:

```
1: remote -> org.apache.cxf.archetype:cxf-jaxrs-service
(Simple CXF JAX-RS webapp service using Spring
configuration)
2: remote -> org.apache.cxf.archetype:cxf-jaxws-javafirst
(Creates a project for developing a Web service starting
from Java code)
```

Choose a number or apply filter (format:

```
[groupId:]artifactId, case sensitive contains): :
```

Select 1 (*type '1' and hit enter!*)

Now it will ask which CXF **version** to use. The default is the latest (at the time of writing 3.0.2). *Just hit enter.*



Now it asks for a default **groupid**.

Define value for property 'groupId': :

This is a namespace. When creating this lab I chose *me.freo.rest*, so that is what you will see in screenshots, etc. Please stick to this, because the code I'm providing you with uses that.

Define value for property 'artifactId': :

This will be the name of the WAR and the overall maven artifact created. We are initially going to create a simple HelloWorld service, so type **HelloWorld**.

Define value for property 'version': 1.0-SNAPSHOT: :

Change this to 1.0 and hit Enter.

Define value for property 'package':
me.freo.rest: :

This will default to the same namespace you chose for the groupId. That should be fine, so hit *Enter* to accept.

It will then ask you to confirm these settings. Hit *Enter* and it will go and generate the code.

You should see plenty of output explaining what is happening, and also a line showing where the resulting code was placed, e.g.:

```
[INFO] Parameter: artifactId, value: HelloWorld  
[INFO] project created from Archetype in dir: /home/ox-  
soa/oxsoa/HelloWorld
```



This will have created a set of code and a tree structure for you. If you are on Linux you can use the nice **tree** command to show this:

```
ox-soa@oxsoa-2014:~/oxsoa$ tree
```

```
├── HelloWorld
│   ├── pom.xml
│   └── src
│       ├── main
│       │   ├── java
│       │   │   ├── me
│       │   │   │   ├── freo
│       │   │   │   │   ├── rest
│       │   │   │   │   │   ├── HelloWorld.java
│       │   │   │   │   │   └── JsonBean.java
│       │   └── webapp
│       │       ├── META-INF
│       │       │   └── context.xml
│       │       ├── WEB-INF
│       │       │   ├── beans.xml
│       │       │   └── web.xml
│       └── test
│           ├── java
│           │   ├── me
│           │   │   ├── freo
│           │   │   │   ├── rest
│           │   │   │   │   └── HelloWorldIT.java
```

15 directories, 7 files

e. You can now build this code:

```
cd ~/oxsoa/HelloWorld [on Linux/Mac]
mvn clean install
```

The first time this is run this will download a lot of stuff from the central maven repositories on the web. Depending how fast the network is, maybe a coffee is in order. You will need an active internet connection for this to work.

This will build **and test** the sample code. Its pretty cool. It actually starts an embedded Tomcat to run the service and call unit tests against it.

f. Assuming your build worked just fine, you now have a WAR file (Web Application aRchive) that you can deploy in Tomcat. Check that there is a file:

```
~/oxsoa/OrderService/target/HelloWorld-1.0.war
```

g. Tomcat is already installed on your VM, in the directory
~/servers/tomcat/



h. Install your webapp (do the following all on one command line!)

```
cp ~/oxsoa/HelloWorld/target/HelloWorld-1.0.war /servers/tomcat/webapps
```

i. Start Tomcat so it runs on the command line (so you can see the logs)

From the tomcat directory:

```
cd ~/servers/tomcat  
bin/catalina.sh run
```

j. Try your REST service

Browse

<http://localhost:8080/HelloWorld-1.0/hello/echo/paul>

You should see “paul”.

You can also try this as a command line:

```
curl http://localhost:8080/HelloWorld-1.0/hello/echo/paul  
-v
```

You should see something like:

```
ox-soa@oxsoa-2014:~$ curl  
http://localhost:8080/HelloWorld-1.0/hello/echo/paul -v  
* Hostname was NOT found in DNS cache  
*   Trying 127.0.0.1...  
* Connected to localhost (127.0.0.1) port 8080 (#0)  
> GET /OrderService-1.0/hello/echo/paul HTTP/1.1  
> User-Agent: curl/7.35.0  
> Host: localhost:8080  
> Accept: */*  
>  
< HTTP/1.1 200 OK  
* Server Apache-Coyote/1.1 is not blacklisted  
< Server: Apache-Coyote/1.1  
< Date: Sun, 23 Nov 2014 21:02:37 GMT  
< Content-Type: text/plain  
< Content-Length: 4  
<  
* Connection #0 to host localhost left intact  
paulox-soa@oxsoa-2014:~$
```

f. You can also build the Eclipse project for this too:

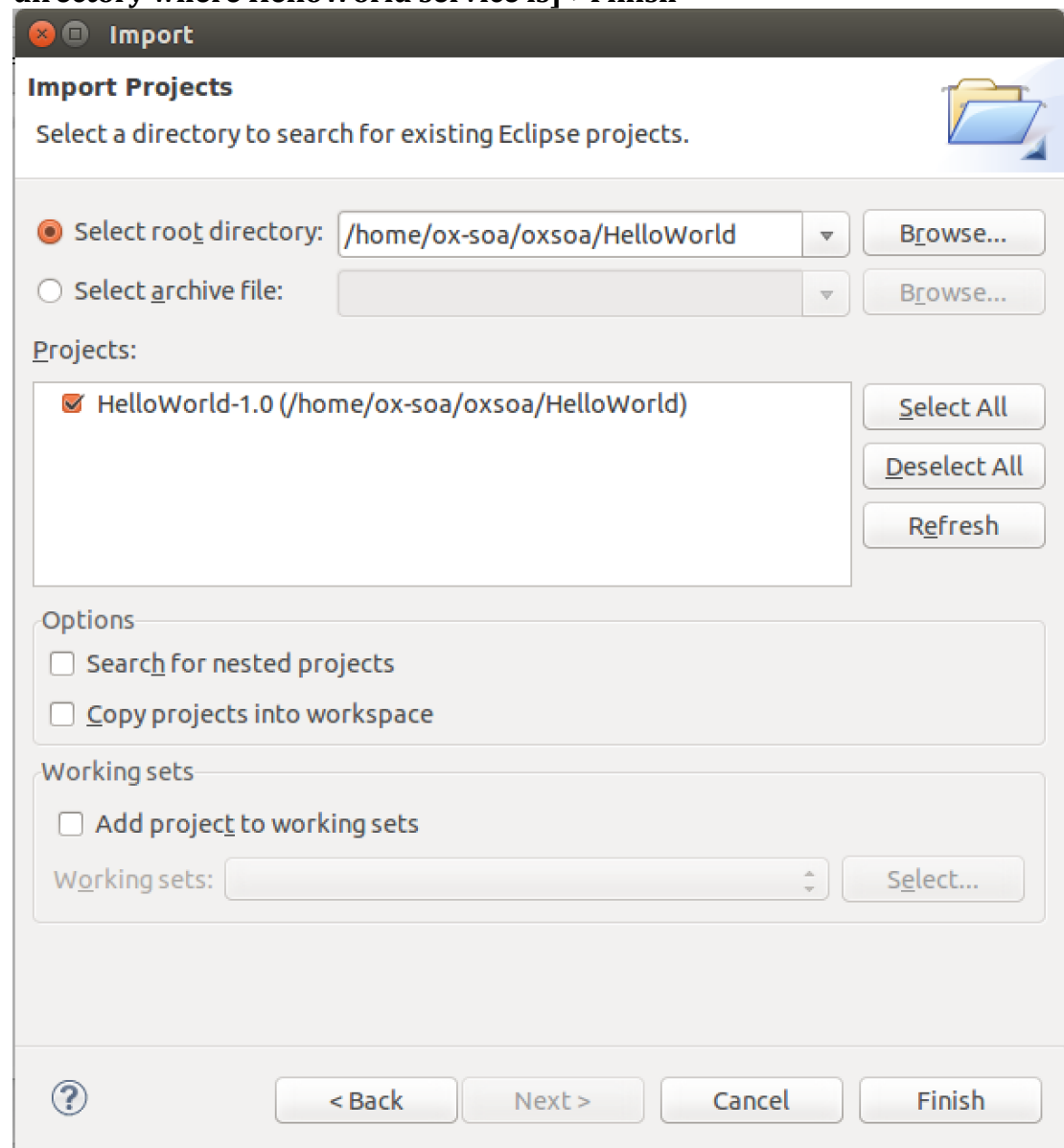
```
mvn eclipse:clean eclipse:eclipse
```

This creates a project file that you can import into Eclipse with the right classpath, settings, etc.



Now import the project. To do this, in Eclipse:

File -> Import -> General/Existing Projects Into Workspace->[Choose the directory where HelloWorld service is]->Finish



Now you should have the project installed in your Eclipse and be able to edit and build it. **Take a look at the sample hello service.**

Now we are ready to build our own RESTful Service.

Step 2. Creating the OrderService

Rather than spending a lot of time writing Java, which is not the main point of this exercise, you should focus on the REST and HTTP aspects of this. I have ready written a set of Java classes that:

- 1) Implement a simple "Order Scenario"
- 2) Serialize and Deserialize as JSON



I have also written a test case that validates a service interface.
Your aim is to create a Java Service that utilizes the existing code, and is correctly annotated using JAX-RS annotations so that it meets the test case.
Here is a rough set of documentation that explains the service interface.

Method	URI template	Description	Supported encoding
GET	./orders	Get a list of href links to available orders If no orders are on the system, return an empty list.	Produces application/json
GET	/orders/{id}	Get back a representation of order with identifier id. If no such order is yet in the system, returns HTTP Not Found If the order previously existed but has been deleted, returns HTTP Gone	Produces application/json
POST	/orders	Passes a representation of the order and create a new entry in the order database. On success returns HTTP 201 Created and an HTTP Location header containing the URI of the resulting order	Consumes application/json
PUT	/orders/{id}	Updates an existing order On success return HTTP 200 OK If no such order is yet in the system, returns HTTP 404 Not Found If the order previously existed but has been deleted, returns HTTP 410 Gone	Consumes application/json
DELETE	/orders/{id}	Marks an order as deleted Returns HTTP 200 OK on success If no such order is yet in the system, returns HTTP Not Found If the order previously existed but has been deleted, returns HTTP Gone	No body content



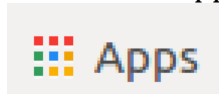
- a) In the directory `~/oxsoa/`
unzip `~/Downloads/OrderService-code.zip`

PS the file is here: <https://github.com/pzfreo/ox-soa/blob/master/lab-exercises/code/OrderService-code.zip?raw=true>

- b) Now `mvn clean install` again. This time it should build, but you will have an Integration Test failure.
- c) Do the same `mvn eclipse:clean eclipse:eclipse` and then import into your Eclipse workspace as before
- d) Look at the following class in your workspace
`me.freo.rest.OrderService`
- e) Now you can incrementally add the correct methods and annotations for `get/post/put/delete` until the test case is met.
- f) ONCE YOU GET YOUR BUILD WORKING:

Re-install the webapp into Tomcat. (It should hot deploy if you've left Tomcat running)

- g) Now you can test it in Chromium, using the Advanced REST Test Client. Start Chromium and get up a blank/empty page (Command-N or Ctrl-N)
- h) Click on the Apps link at the top of the page:



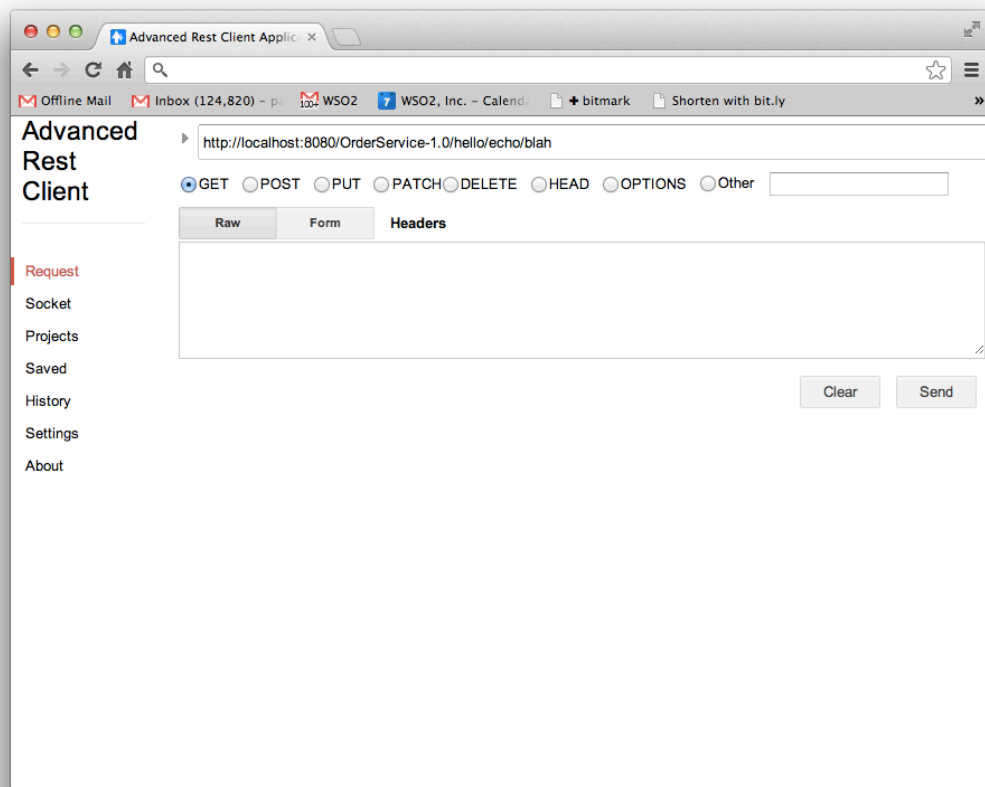
You should now see the following icon:



Advanced REST client



- i) Click on that. You should see a screen like this:



By now you should understand the REST patterns and URLs well enough to be able to test our your app. It should be available at:

<http://localhost:8080/OrderService-1.0/orders/>

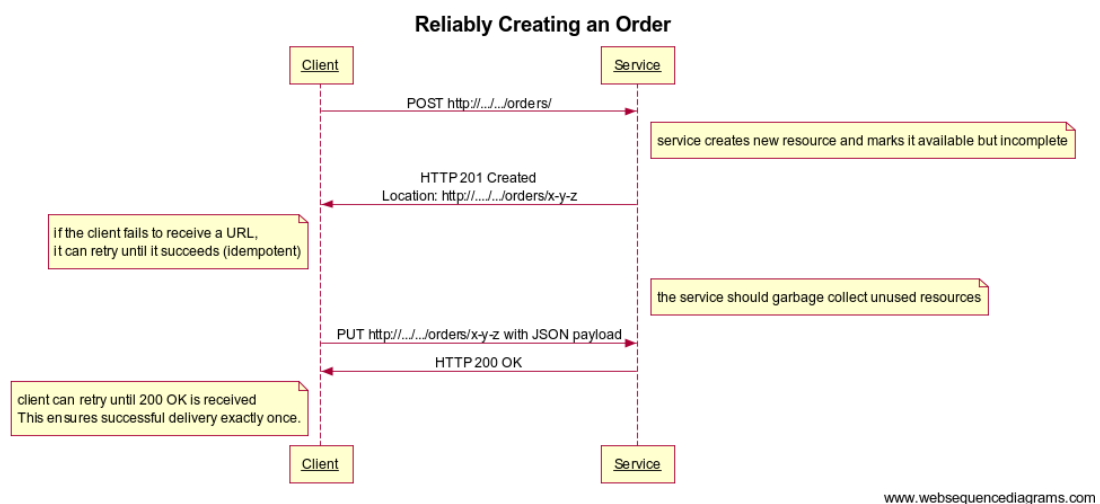
- j) Also try interacting with it using curl commands. See if you can automate posting an order.



EXTENSION

The model we have built does not support reliability. It is impossible to know if you have successfully created a new order. To fix this, we need to implement a different pattern. In this pattern, the POST is empty, and returns a location, and only when the POST has successfully returned a Location and the client has the location, do we PUT an order into the existing location.

Here is a sequence diagram showing this model.



Implement this model by changing the code.

