Java RESTful Web Services with Jersey and Tomcat

1. Create Project and Specify Jersey Dependency

In Eclipse IDE, create a Dynamic Java Web project named as **HelloREST**. And convert it to Maven project by right clicking on the project, click **Configure > Convert to Maven project**. Open the `pom.xml` file and declare the following dependency:

```
<dependencies>
    <dependency>
        <groupId>org.glassfish.jersey.containers</groupId>
        <artifactId>jersey-container-servlet</artifactId>
        <version>2.25.1</version>
    </dependency>
</dependencies>
```

This dependency is required to develop RESTful web services in Java, using Jersey framework – an implementation of Java API for RESTful Web Services (JAX-RS).
Use the version 2.25.x if your Tomcat running on JDK 8. In case you use JDK 11 or later, you should use newer version, e.g. Jersey 2.29.1 like this:

```
<dependency>
    <groupId>org.glassfish.jersey.containers</groupId>
    <artifactId>jersey-container-servlet</artifactId>
    <version>2.29.1</version>
</dependency>
<dependency>
    <groupId>org.glassfish.jersey.inject</groupId>
    <artifactId>jersey-hk2</artifactId>
    <version>2.29.1</version>
</dependency>
```

For Jersey 2.26.x or newer, you must also declare the Jersey Inject dependency as shown above. So let use the Jersey version 2.29.1 because it works well both on JDK 8 and recent JDK versions (JDK 11 or newer).

2. Code a Hello World RESTful Web Service

Create a new class `Hello` under the package `net.codejava` with the following code:

```
package net.codejava;


import javax.ws.rs.GET;
import javax.ws.rs.Path;
import javax.ws.rs.Produces;
import javax.ws.rs.core.MediaType;

@Path("/bonjour")
public class HelloResource {

    @GET
    @Produces(MediaType.TEXT_PLAIN)
    public String direBonjour() {
```

```
        return "Bonjour, tout le monde!";
    }
}

```

Look, this is your first class for RESTful web services. Let me explain:
The `@Path` annotation defines the relative URL that forms the URI that identifies a resource. You can use this annotation on both class level or method level.
The `@GET` annotation specifies that the annotated method, `direBonjour()` handles HTTP GET request. Jersey provides annotations corresponding to HTTP methods: `@POST`, `@PUT`, `@DELETE`…
The `@Produces` annotation specifies the content type of the response, which is text plain in our code. You can also specify text/xml, text/html, JSON, etc.
And you can see the method `direBonjour()` returns a plain text, saying hello world in French – as response to the clients.

3. Configure Jersey Servlet Container

Next, we need configure Jersey servlet in the web deployment descriptor (web.xml) file like this:

```
<servlet>
    <servlet-name>Jersey REST Service</servlet-name>
    <servlet-class>org.glassfish.jersey.servlet.ServletContainer</servlet-class>
    <init-param>
        <param-name>jersey.config.server.provider.packages</param-name>
        <param-value>net.codejava</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
</servlet>

<servlet-mapping>
    <servlet-name>Jersey REST Service</servlet-name>
    <url-pattern>/rest/*</url-pattern>
</servlet-mapping>
```

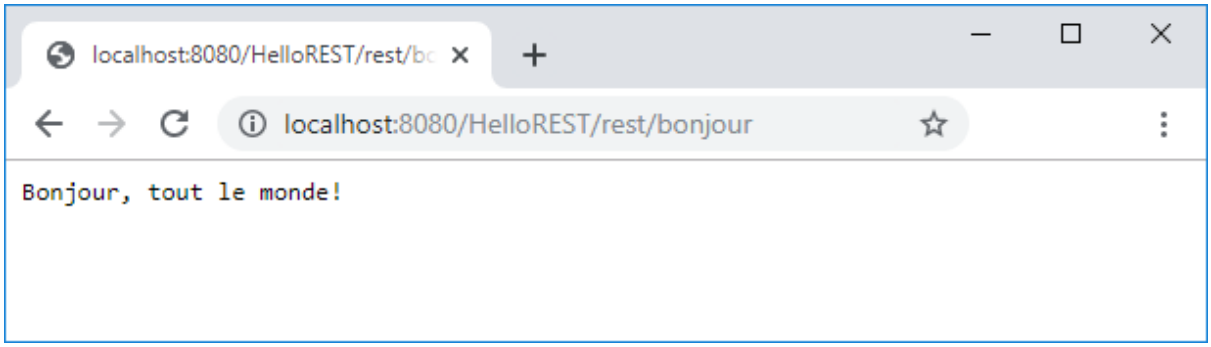
Note that we need to specify the package name that contains the classes that need to be exposed as RESTful web services, as an initialization parameter of Jersey servlet; and the URL pattern will be handled by Jersey servlet container.
Now, you can add this project to Tomcat and start the server to test the web service.

4. Test RESTful Web Service using web browser

Open a web browser (e.g. Chrome) and type the following URL:

http://localhost:8080/HelloREST/rest/bonjour

Then you should see the following page:



You see, the browser displays the plain text response sent by the web service. Now, add second method to the `HelloResource` class:

```
@GET
@Produces(MediaType.TEXT_HTML)
public String sayHTMLHello() {
    return "<html><title>Hello</title><body><h1>Bonjour, tout le monde!</h1><body></html>";
}
```

This method returns a HTML response. Refresh the browser and you should see:

You see, the browser now shows the HTML response sent from the web service (a web browser always expects Text/HTML response). That means with the same URI, the response representation can be different, depending on content type accepted by the clients.

5. Using JSON for RESTful web services

JSON is a preferred format for data representation in RESTful web services because of its simplicity and lightweight.
To use JSON with Jersey, you need to add the following dependency to the pom.xml file:

```
<dependency>
    <groupId>org.glassfish.jersey.media</groupId>
    <artifactId>jersey-media-json-jackson</artifactId>
    <version>2.29.1</version>
</dependency>
```

Now, update the `HelloResource` class to have a new method that produces JSON response, as follows:

```
@GET
@Produces(MediaType.APPLICATION_JSON)
public String sayJsonHello() {
    return "{\"name\":\"greeting\", \"message\":\"Bonjour tout le monde!\"}";
}
```

This method returns a simple piece JSON data. If you refresh the browser, you will see nothing changes because the browser doesn't expect JSON response by default.

6. Test RESTful Web Service using curl

curl is a command-line tool which is widely used to test RESTful web services APIs. If you're using Windows 10, curl is shipped with the operating system by default. If not, you can download curl here.

Type the following command to test our web service:

curl http://localhost:8080/HelloREST/rest/bonjour

Then you can see JSON response:

```
{"name":"greeting", "message":"Bonjour tout le monde!"}
```

You can use the –v option (versbose) to see more details such as request headers and response headers. For example:

curl -v http://localhost:8080/HelloREST/rest/bonjour

Then you can see the output something like this:

```
C:\>curl -v http://localhost:8080/HelloREST/rest/bonjour
*   Trying ::1...
* TCP_NODELAY set
* Connected to localhost (::1) port 8080 (#0)
> GET /HelloREST/rest/bonjour HTTP/1.1
> Host: localhost:8080
> User-Agent: curl/7.55.1
> Accept: */*
>
< HTTP/1.1 200
< Content-Type: application/json
< Content-Length: 55
< Date: Wed, 18 Dec 2019 08:59:53 GMT
<
{"name":"greeting", "message":"Bonjour tout le monde!"}* Connection #0 to host localhost left intact
```

You can use the –H option to specify a HTTP header in the request. For example:

```
curl -H "Accept: text/html" http://localhost:8080/HelloREST/rest/bonjour
```

This command tells the server that the client expects response format to be of text/html. Hence the following response:

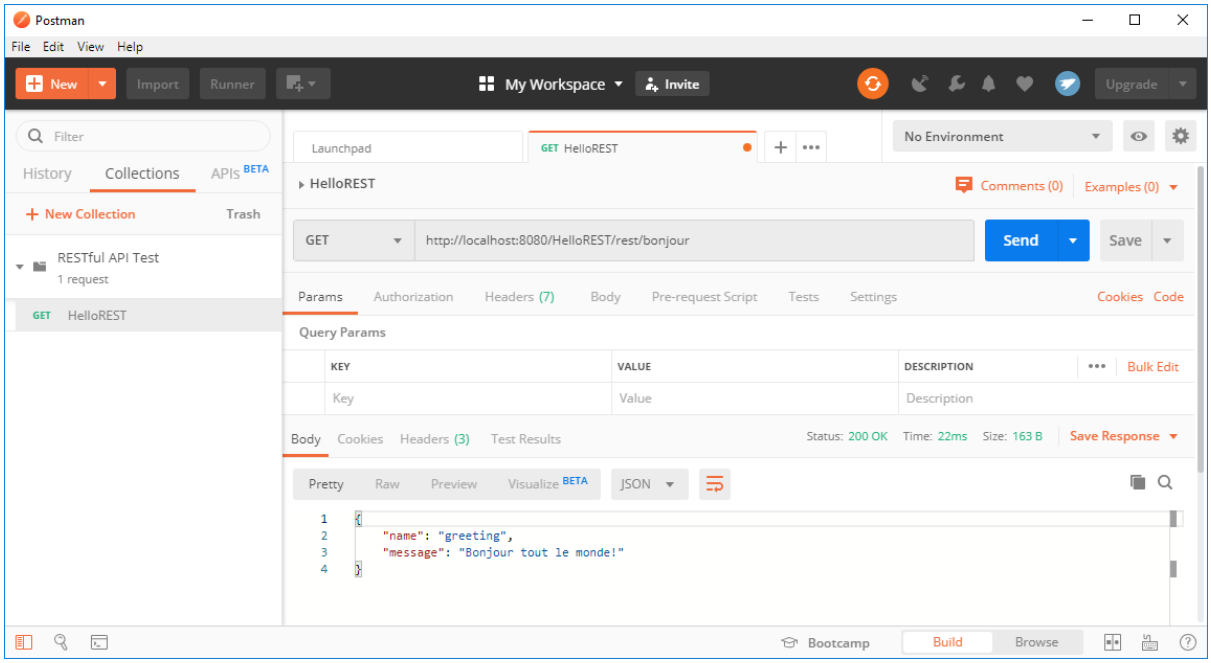
```
<html><title>Hello</title><body><h1>Bonjour, tout le monde!</h1><body></html>
```

And the following curl command will get plain text response from the server:

```
curl -H "Accept: text/plain" http://localhost:8080/HelloREST/rest/bonjour
```

7. Test RESTful Web Service using Postman

Postman is a GUI tool that can be used to test web service APIs. Click here download and install Postman on your computer (you have to create an account to use – free). Then create a new collection and a request under this collection. Then type a URL and click Send, as shown below:



As you can see, Postman is easier to use and more advanced than curl.

8. Code a RESTful Web Service Client program

You can use Jersey Client API to write client programs that consume RESTful web services. Create a new Maven project, e.g. `HelloClient` and add the following dependencies to the `pom.xml` file:

```
<dependency>
    <groupId>org.glassfish.jersey.core</groupId>
    <artifactId>jersey-client</artifactId>
    <version>2.29.1</version>
</dependency>
<dependency>
    <groupId>org.glassfish.jersey.inject</groupId>
    <artifactId>jersey-hk2</artifactId>
    <version>2.29.1</version>
</dependency>
```

Then code a simple RESTful web service client program as follows:

```
package net.codejava;

import javax.ws.rs.client.Client;
import javax.ws.rs.client.ClientBuilder;
import javax.ws.rs.client.WebTarget;
import javax.ws.rs.core.MediaType;

import org.glassfish.jersey.client.ClientConfig;


public class HelloClient {

    public static void main(String[] args) {
        String uri = "http://localhost:8080/HelloREST/rest/bonjour";
        ClientConfig config = new ClientConfig();
```

```
15          Client client = ClientBuilder.newClient(config);
16          WebTarget target = client.target(uri);
17
18          String response = target.request()
19                      .accept(MediaType.APPLICATION_JSON)
20                      .get(String.class);
21
22          System.out.println(response);
23
24      }
25
26  }
27
```

This program simply sends a GET request to the server at the specified URI and reads the response. Run this program and you should see the following output:

```
{"name":"greeting", "message":"Bonjour tout le monde!"}
```