ZanGOlie

Building a RESTful Web Service in Java

*This entry was posted in **Server-Side Development** and tagged Eclipse Java JAX-RS JAXB JEE 7 JPA Maven MySQL REST RESTful on **2014/03/29** by **ZanGOlie***

Objectives

The objective of this post, is to create an extremely simple RESTful Web Service using Java EE (Enterprise Edition) that maps HTTP POST, GET, PUT and DELETE methods (which are CRUD operation; Create, Read, Update and Delete respectively) to a single resource that is persisted to a MySQL Database. The intention is to create a starting point of an Application Programming Interface (API), that can be used by any client that can interact with a RESTful API, such as single-page HTML5 applications, mobile applications etc.

Contents [hide]

Technology

- Database: MySQL 5.6.16
- MySQL Workbench 6
- Application Server: GlassFish 4.0
  - JPA 2.1: EclipseLink
  - JAX-RS 2.0: Jersey
  - JAXB: MOXy
- IDE: Eclipse IDE for Jave EE Developers – Kepler
- Java EE 7

The Java Persistence API

The Java Persistence API (JPA) is a lightweight framework for mapping POJOS's to database tables. In other words, it is an Object Relational Mapper. Classes annotated with JPA are called Entities. Creating an Entity is as simple as annotating a POJO with @Entity.
The built in JPA provider in GlassFish is EclipseLink (which is also the reference JPA implementation). Other JPA providers include Hibernate and DataNucleus.

Representational State Transfer – REST

REST is an architectural style based on a set of principles that reduce the complexity in the server and allows for easy scaling.

- Addressable Resources: In REST, everything is a resource, and these resources are found at unique addresses,

URI's.
- A Uniform, Constrained Interface: We interact with the server through simple methods. In HTTP, the main ones are POST, GET, PUT and DELETE.
- Representation-Oriented: Representation of the resource (eg. JSON and XML) are what is exchanged between the client and server.
- Communicate Statelessly: No state is stored on the server.
- Hypermedia As The Engine Of Application State (HATEOAS): The client discovers new related resources by using hyper-links returned by the server. We do not implement this however.

The Java API for RESTful Web Services

The Java API for RESTful Web Services (JAX-RS) simplifies the creation of RESTful web service by using annotations on a POJO that defines the URI path and the functions that handle HTTP request.
Jersey is the reference implementation of JAX-RS and comes built into GlassFish.

The Java Architecture for XML Binding

The Java Architecture for XML Binding (JAXB) gives the ability to marshal Java objects to and from XML.
EclipseLink MOXy is a JAXB provider in GlassFish and is also the default JSON-Binding provider in GlassFish 4.
This is how we can get JSON representation even though the annotation are JAXB.

Method

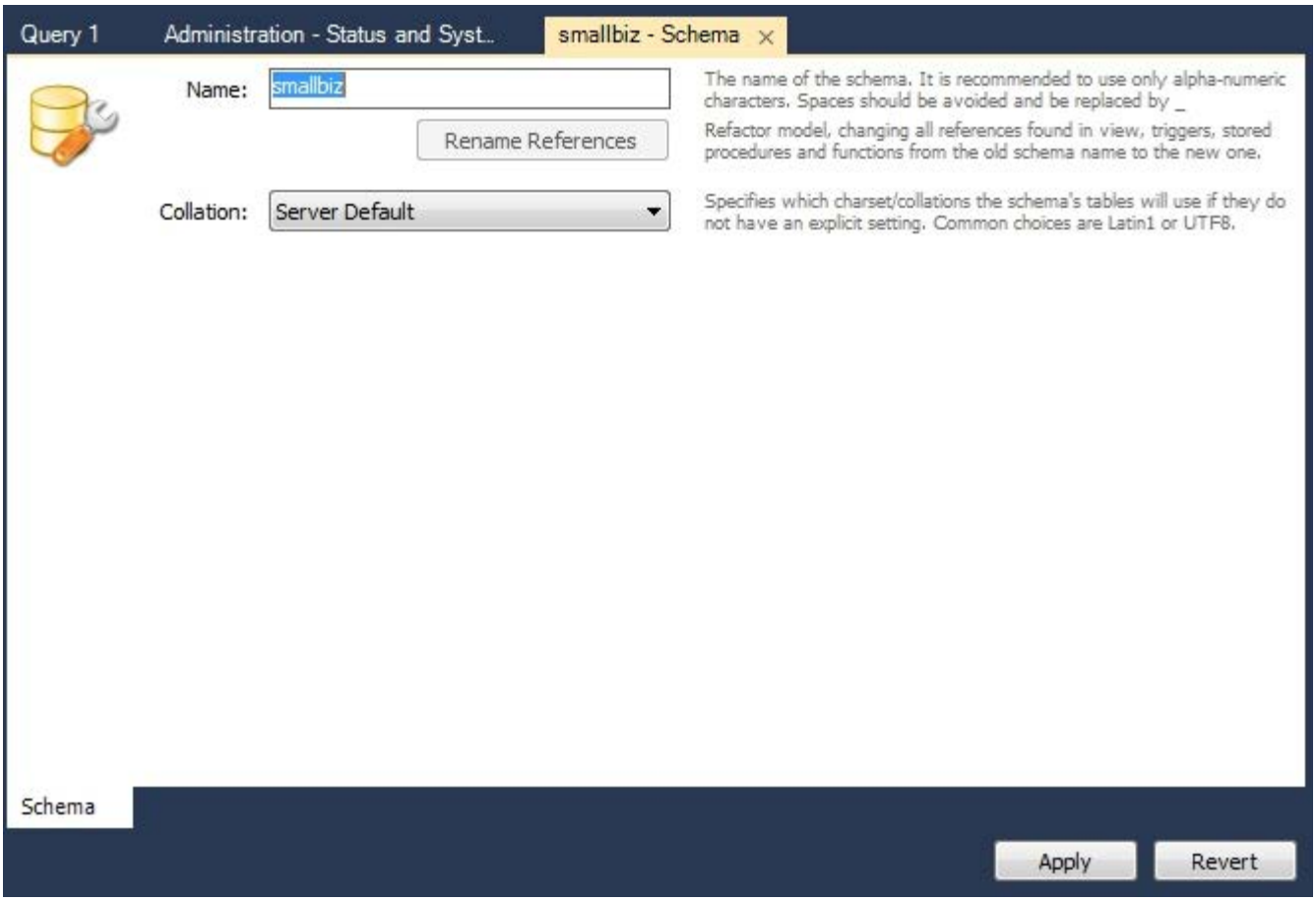
Overview

The premise is, we are creating a web service for a small business, and the first aspect of this service is the ability to create and edit a simple text-based product (item) price list. We go about this by creating a single database table in MySQL called 'item', from which a Java Persistence API (JPA) Entity will be derived to create the persistence layer. A JAX-RS annotated POJO (Plain Old Java Object) will then be created to implement the RESTful service layer. The application will be deployed on a local GlassFish server and interacted with using the Postman HTTP client. The post will cover configuration, but not installation of the various technologies.

Configuration

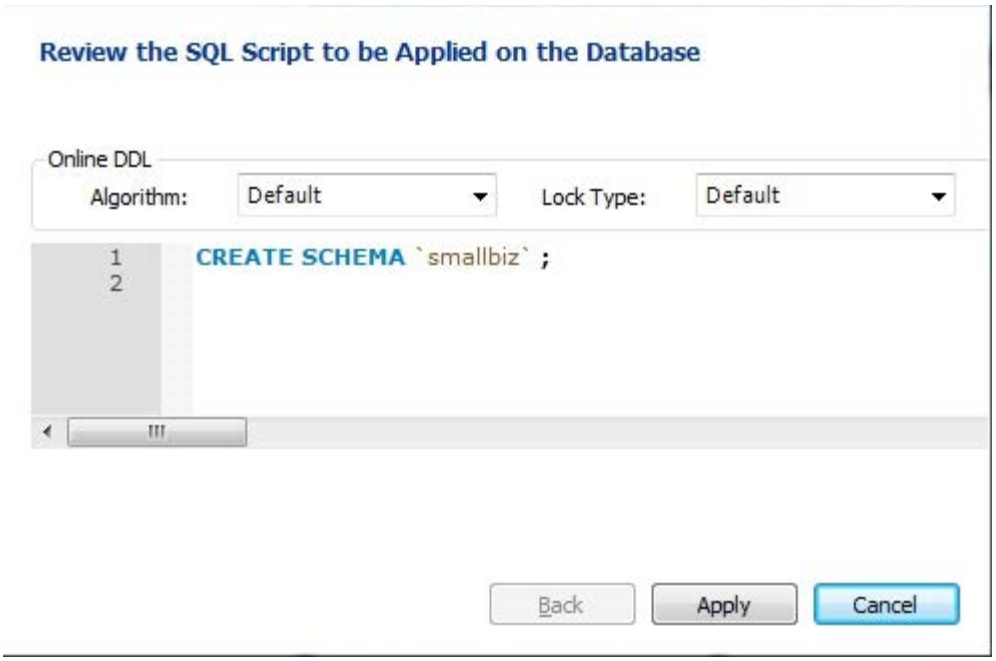
Create a New MySQL Database Schema

We can use MySQL Workbench 6 to create a new schema to use for this project. Log into the workbench and click the '***create a new schema in connected server***' icon. In the window that appears type the name of the schema (smallbiz) and apply.



Create a new schema

Apply the SQL Script



Apply SQL Script

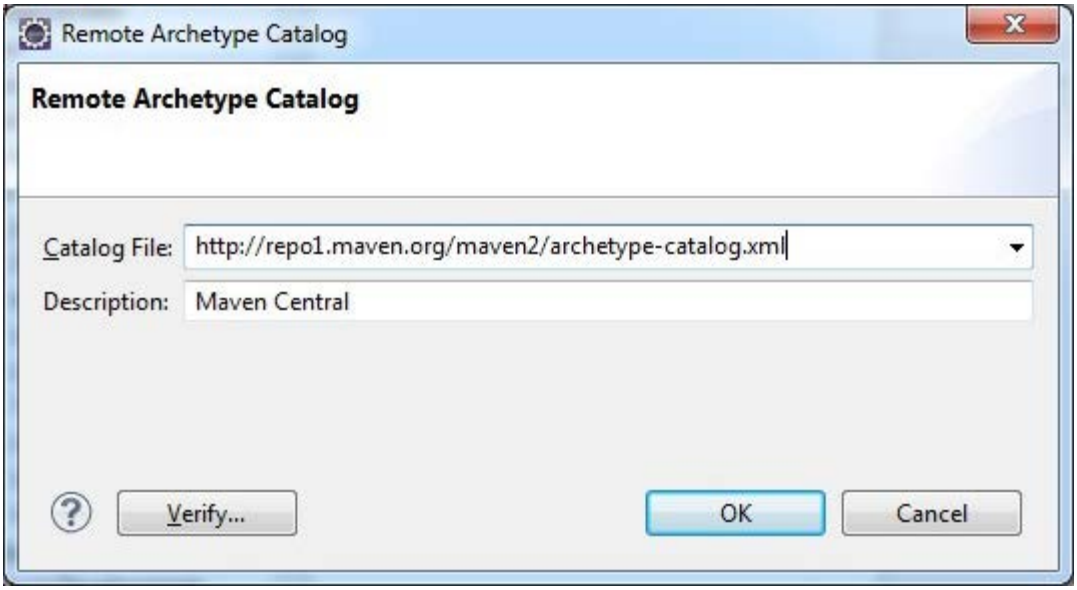
Click ***Finish***. We now have an empty database to work with.

Configure the Eclipse IDE for Java EE – Kepler

Eclipse for Java EE comes with built in Maven capabilities via m2e (formerly m2eclipse) and m2e-wtp. We will use these to manage the project dependencies and facets.

Add Maven Central Archetype Catalogue

Eclipse JEE does not seem to come with the Maven Central Archetype Catalogue by default. Ensure that the Maven Central Repository, http://repo1.maven.org/maven2/archetype-catalog.xml, is added to the catalogue. Go to ***Window > Preferences > Maven > Archetypes***. Click on ***Add Remote Catalog...*** button and add the url mentioned earlier. Though we do not do it for this project, this will become useful when creating projects from the numerous Maven Archetypes that are available from from this repository.



Add Maven Central Remote Archetype Catalogue

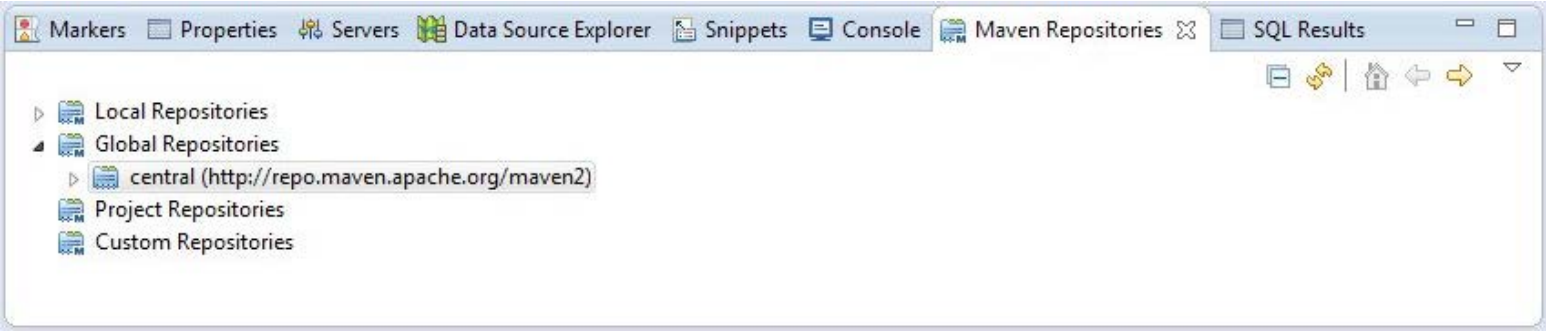
Enable Maven to Download JavaDocs

JavaDocs can be viewed from right within the Eclipse IDE in certain contexts, such as hovering the cursor over a class, or opened in a browser. This is extremely important to the process of learning what the code does, especially for the parts that are not explained in detail for this post. For the JavaDocs to be available for the dependencies Maven downloads, we enable download JavaDoc by going ***Window > Preferences > Maven*** and enable ***Download Artifact JavaDoc***

Update Maven Index

If the Maven Index in Eclipse was never updated, it may be empty. To populate it, select the Maven view by going ***Window > Show View > Other...*** Under the Maven folder, select ***Maven Repositories.***

In the ***Maven Repositories*** view, expand ***Global Reposities,*** then right click ***central*** and select ***Rebuild Index.*** Click ***OK*** at the dialogue that follows. It may take a while for this operation to compete.



Maven Repositories View

Add GlassFish Tools to Eclipse

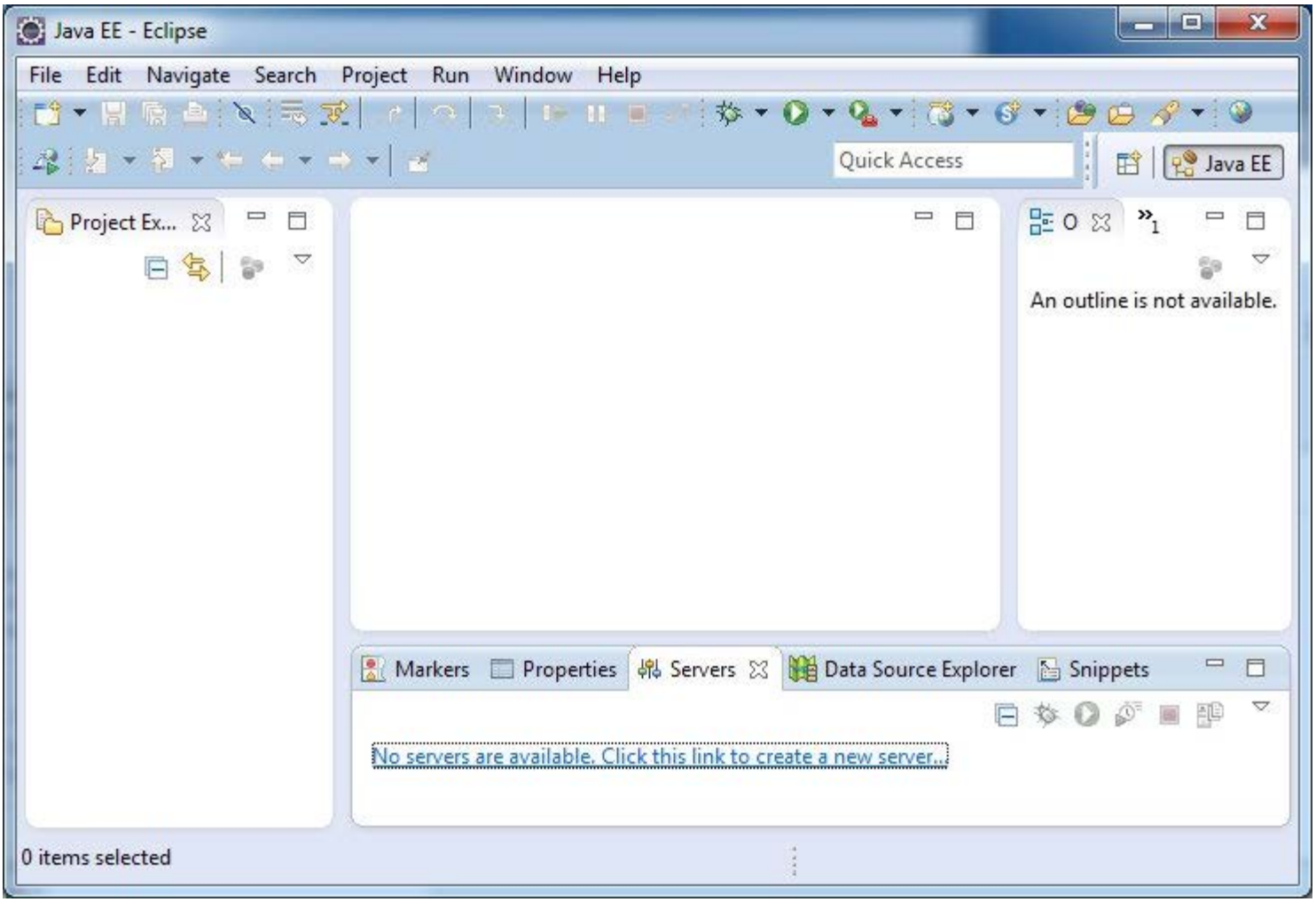
In order to connect to the GlassFish Server from within Eclipse, we add GlassFish Tools. Go to ***Help > Eclipse Marketplace*** and search for GlassFish Tools. Install the version that matches the Eclipse version (Kepler in this case)

Install GlassFish Tools

Click ***Install***, ***Confirm*** and then ***Accept*** the license agreement on the following screens. Click ***Yes*** to restart Eclipse after the installation is complete.

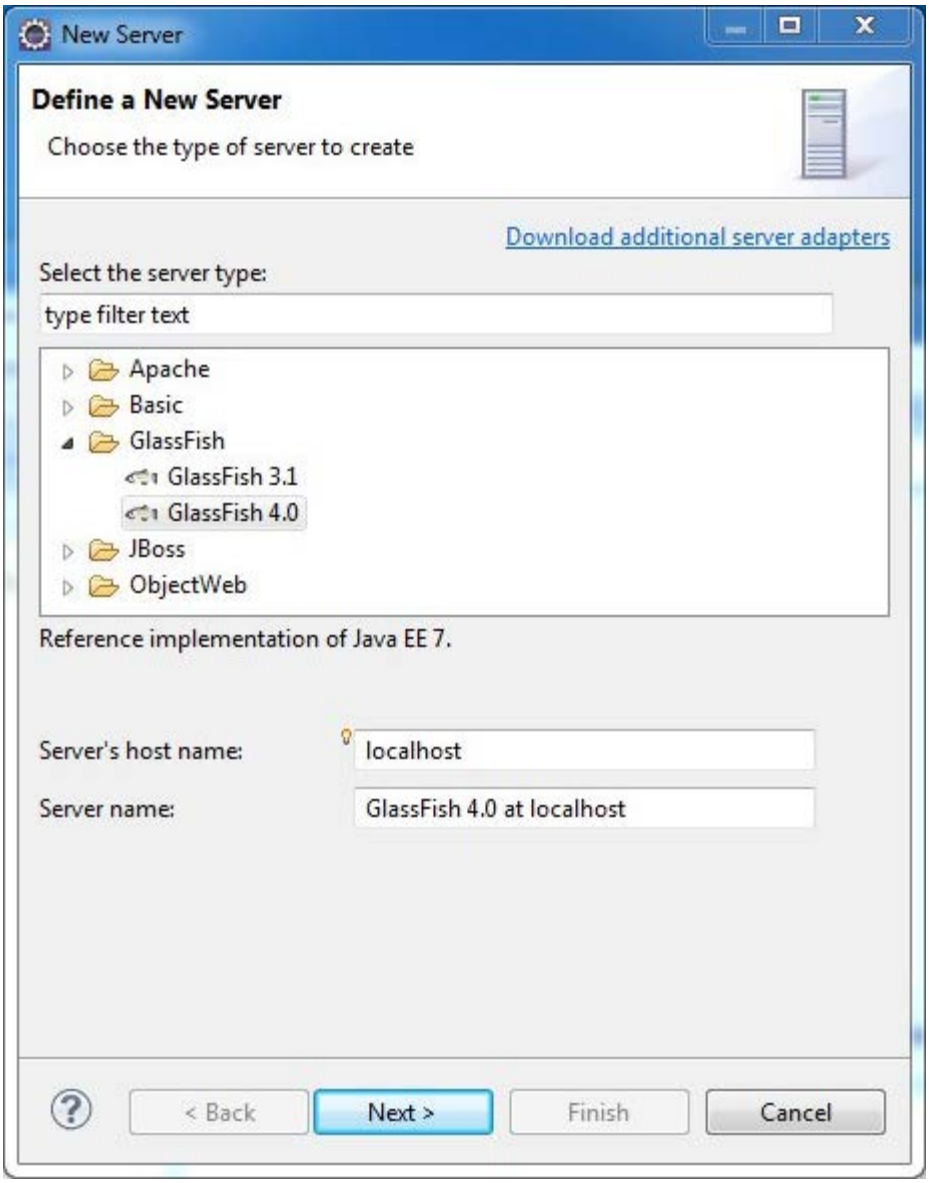
Connect Eclipse to GlassFish

The default layout of the Java EE perspective in eclipse has a ***Servers*** tab located in the bottom section. If there are currently no servers, click on text in the content area of the tab to create a new connection to a server. Else, right click in the content are of the tab and select ***New > Server.***



Create New Server Connection

Select GlassFish 4.0 from the list and click ***Next.***

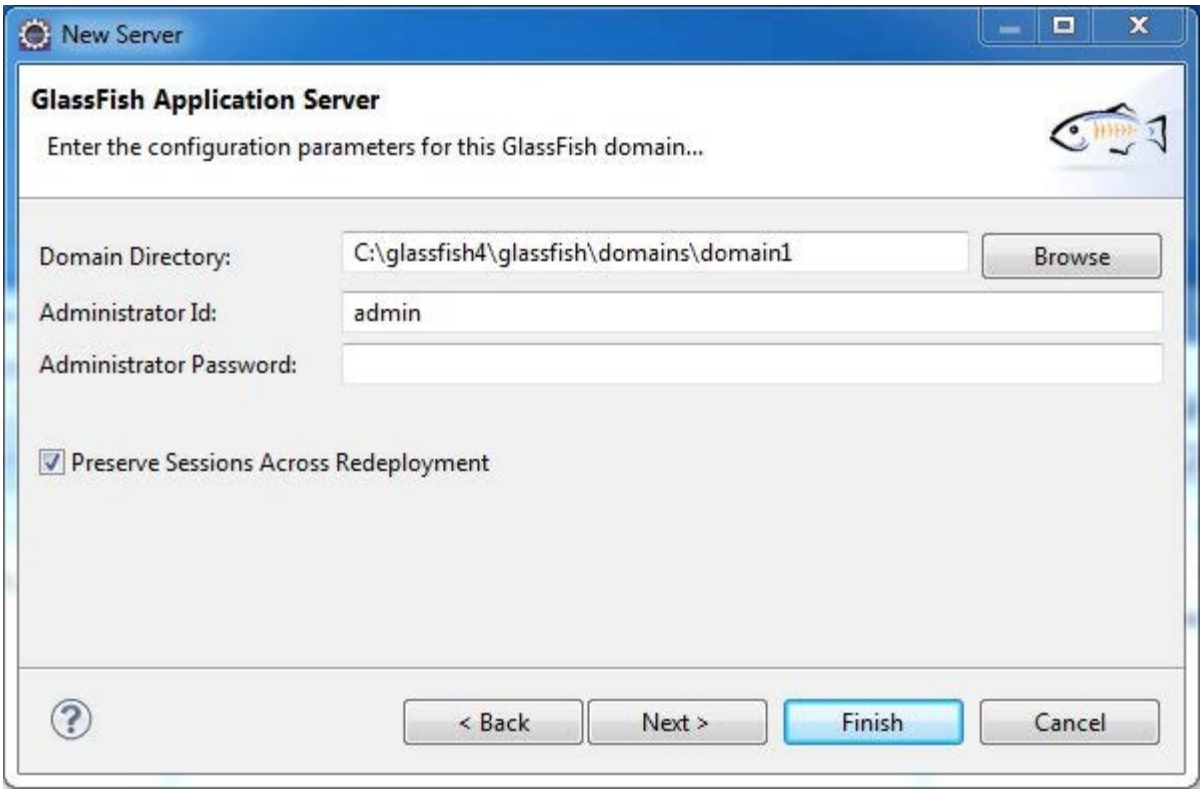


Define a New Server

Select jdk7 as the JDK and browse to the folder where GlassFish is installed. Confirmatory text will be displayed below the last input field if it is found.

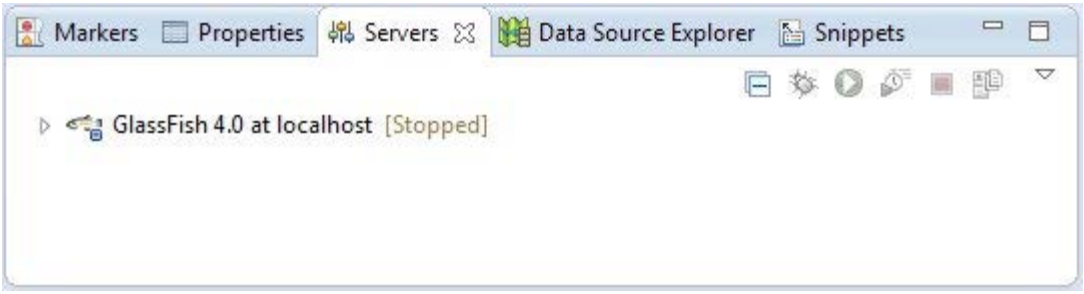
Define a New GlassFish 4.0 Runtime

Ensure the correct domain directory is selected (the default is domain1) and enter the Administrator credentials (default Id is 'admin', there is no password as the default)



Enter the Configuration Parameters

The GlassFish Server should now be present in the Servers view.

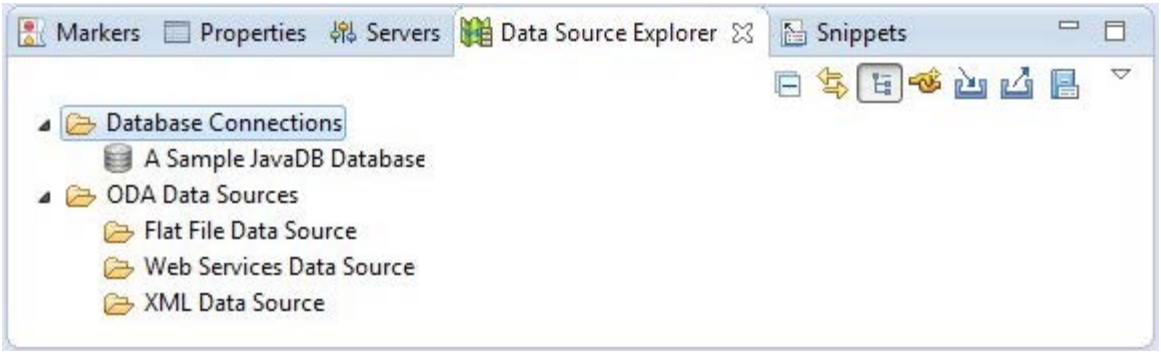


GassFish Application Server Connected

Connect Eclipse to MySQL

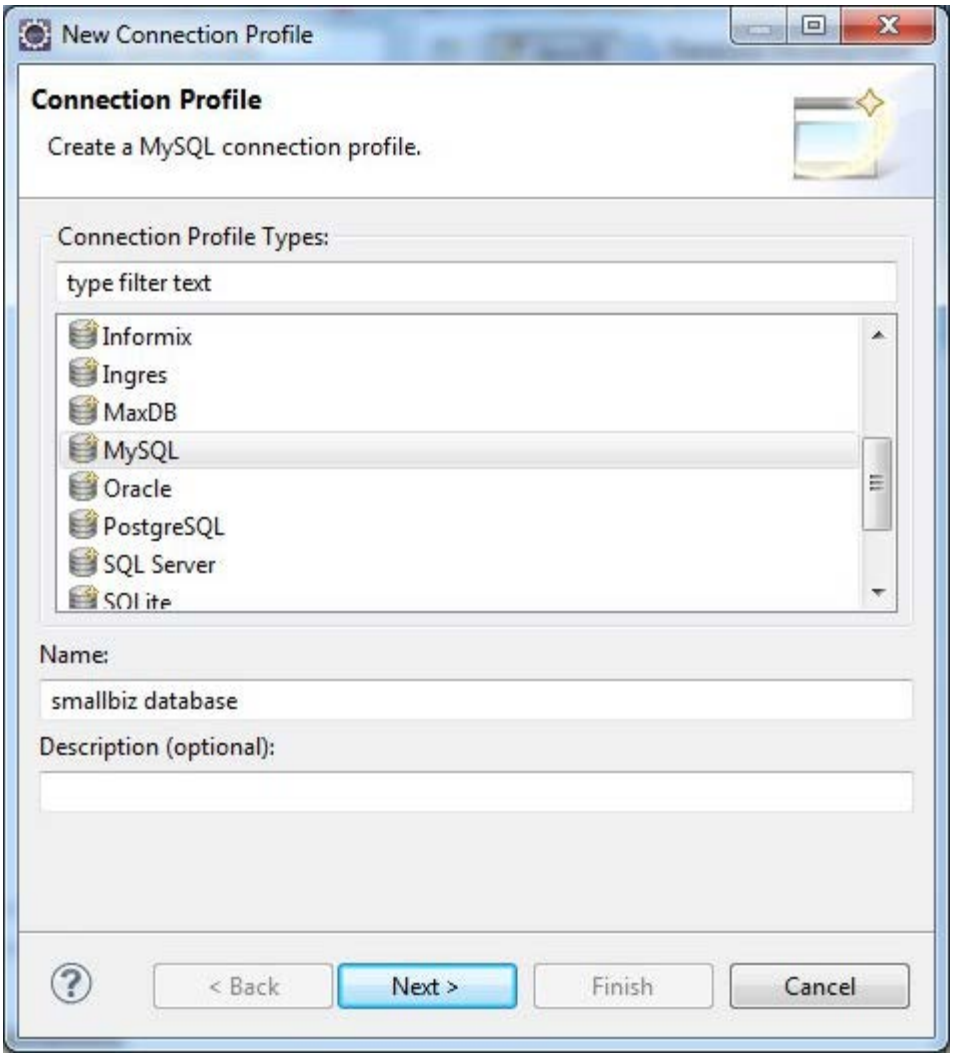
Download the MySQL JDBC driver (you can find it here) and extract the files to a convenient folder.

In the ***Data Source Explorer*** tab, right click the ***Database Connections*** folder and select ***New***



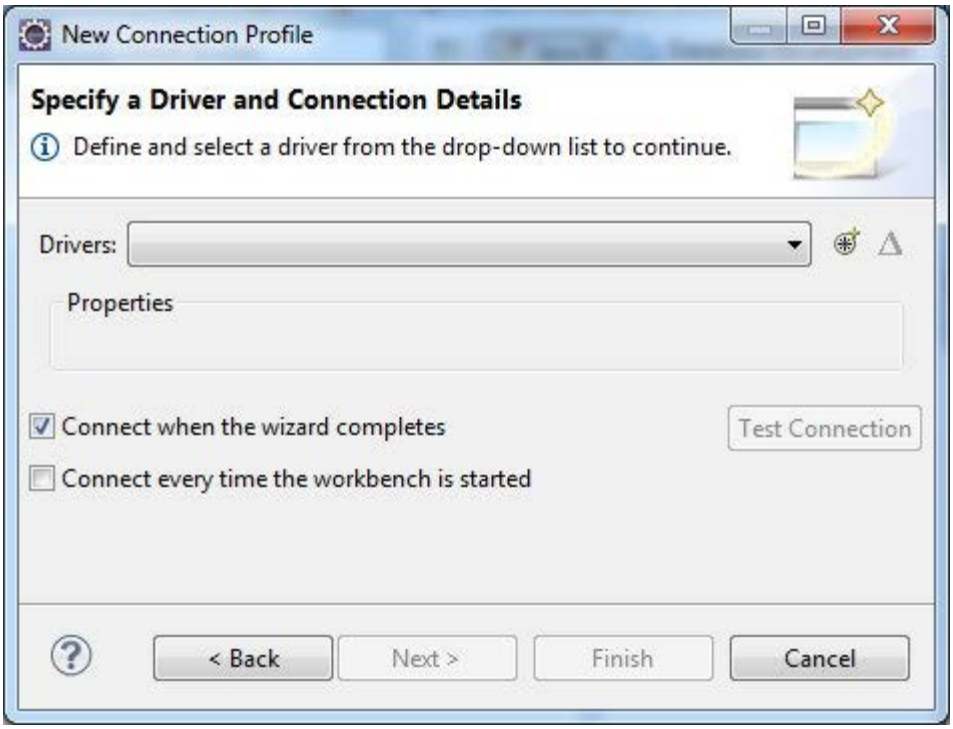
Database Connections

Select MySQL as the connection profile type and give the connection a name (smallbiz database). Select next.



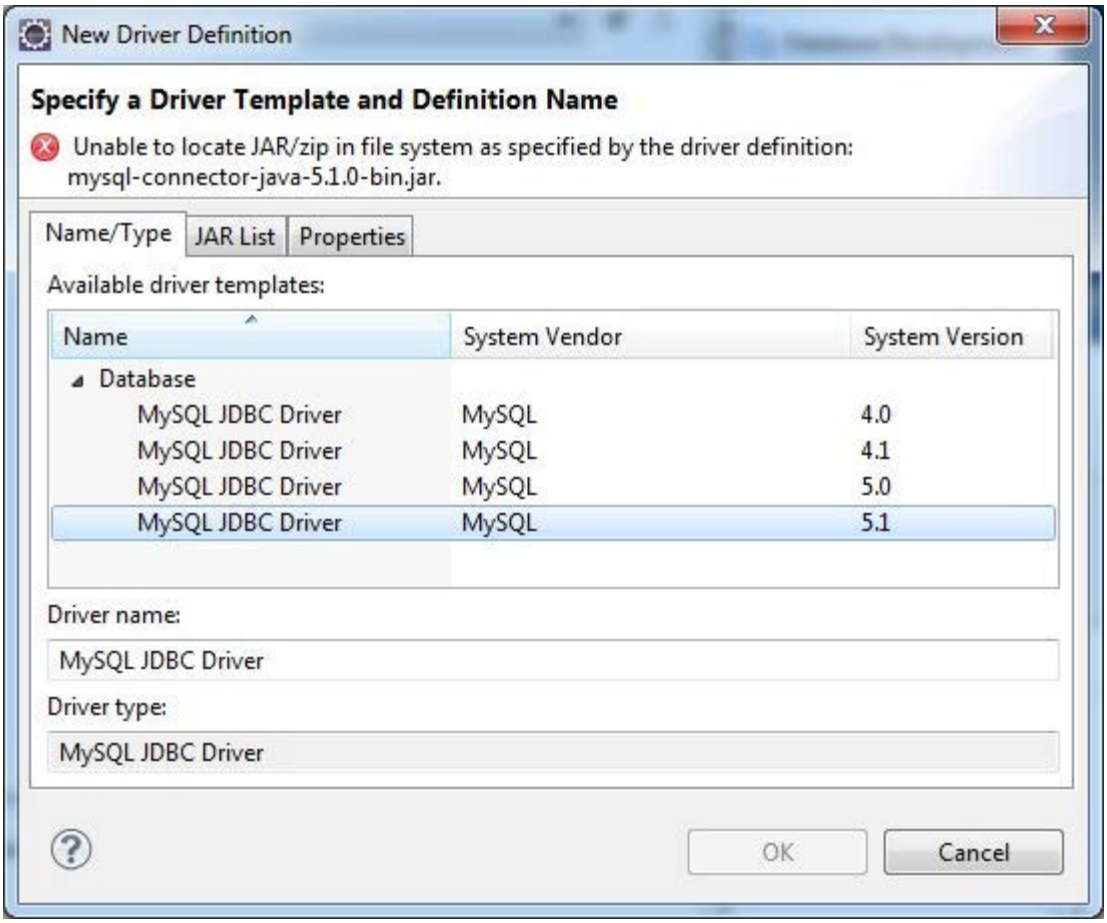
Create a MySQL Connection Profile

Click the icon to the right of the ***Drivers*** drop down list for ***New Driver Definition***



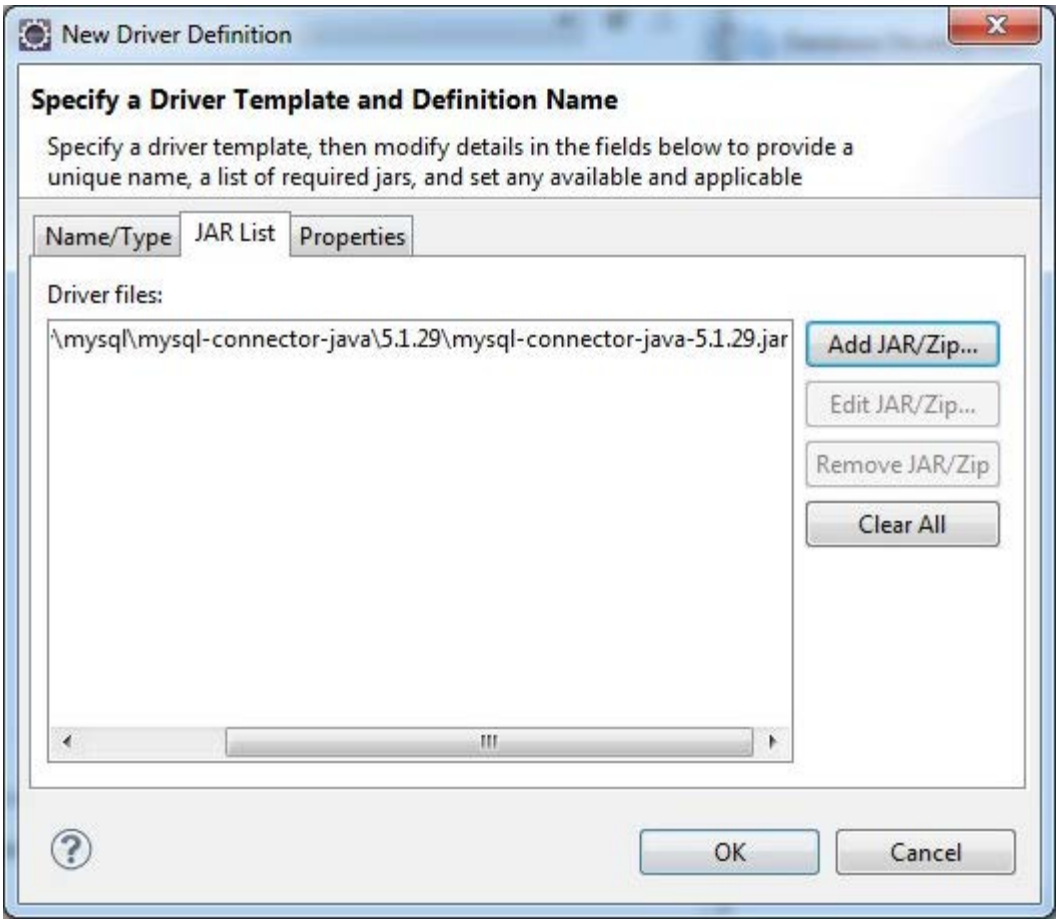
Specify a Driver Connection Detail

On the ***Name/Type*** tab, select an appropriate MySQL driver template (5.1 for this project), then click the ***Jar List*** tab.



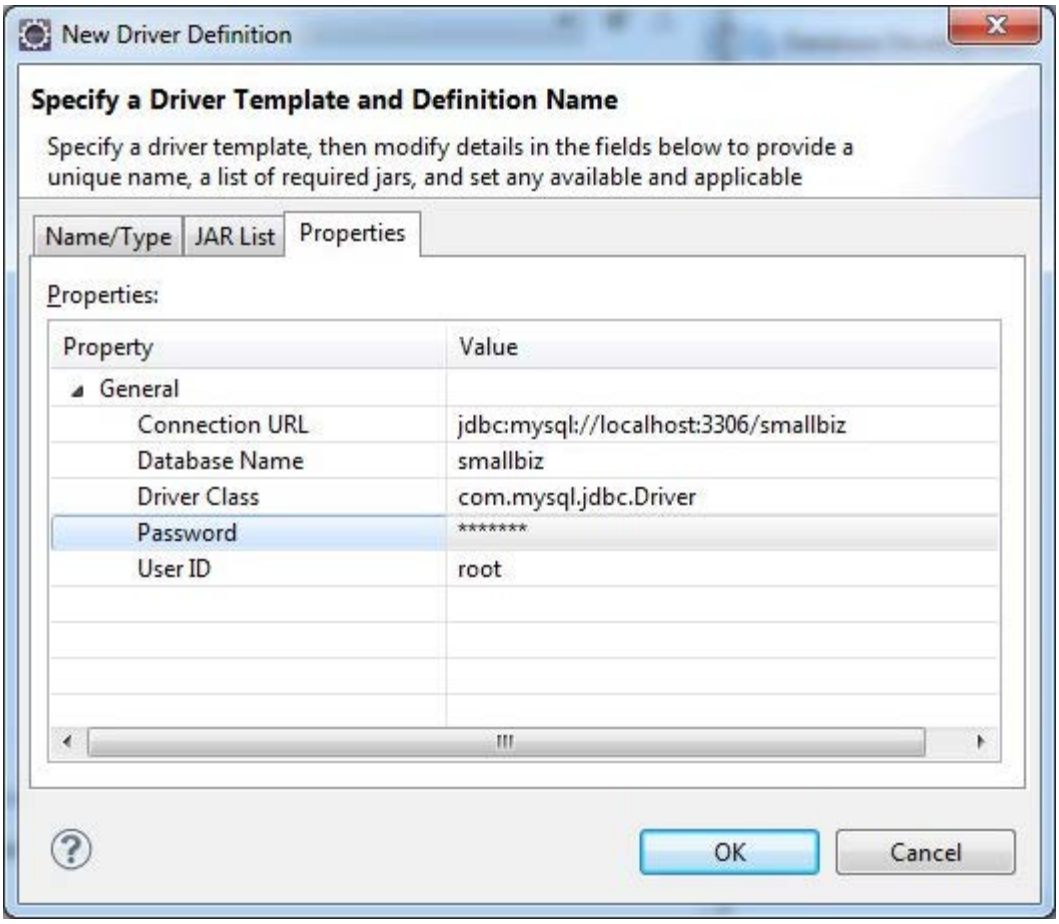
Specify a Driver Template

Remove the existing Driver File then click ***Add JAR/Zip...*** Browse to folder where the MySQL connector is located and select it.



Select MySQL Connector JAR

On the properties tab, enter the ***Connection URL*** (jdbc:mysql://localhost:3306/smallbiz), ***Database Name*** (smallbiz), ***Password*** and ***User ID*** if different from the default. Click ***OK***.

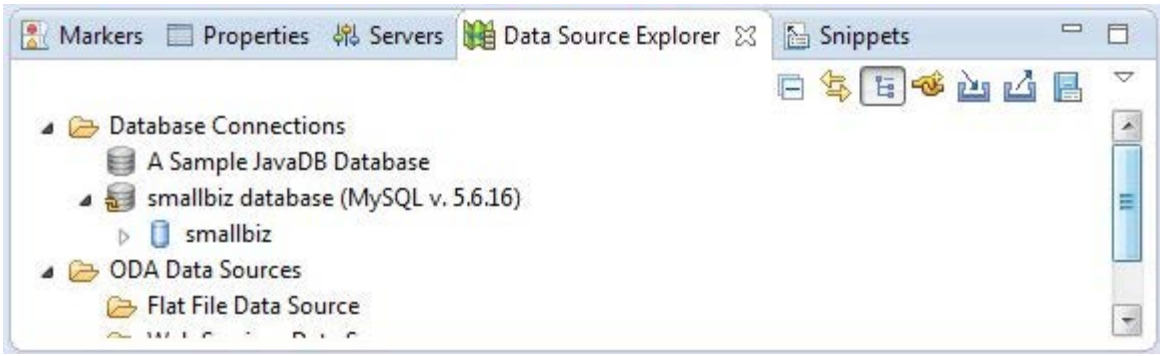


Enter Database Properties

Check the box to ***Save password*** for convenience. Click ***Test Connection*** then ***Finish*** (or ***Next*** to see the summary then ***Finish***)

Complete Database Connection

The new connection is shown in the Data Source Explorer.

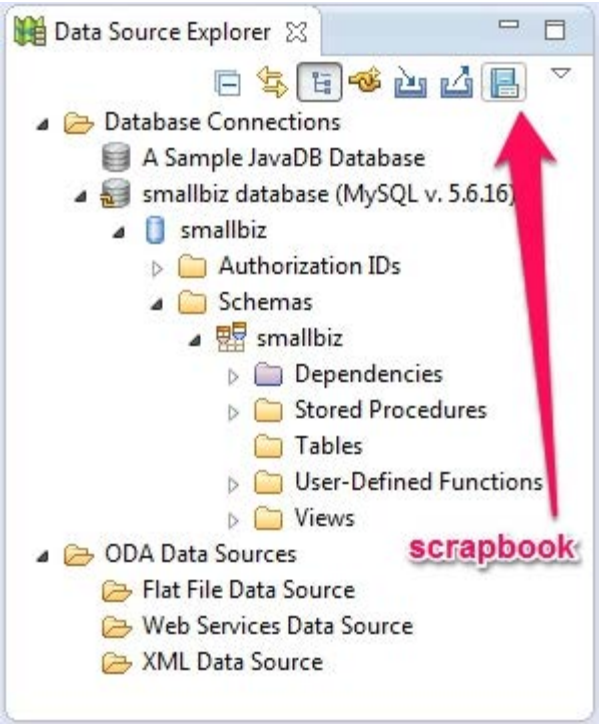


Eclipse Coneected to Database

Create a Database Table Using Eclipse

To make life easier when working with the database from within Eclipse, we can switch to the Database Perspective, ***Window > Open Perspective > Other... > Database Development***

The database currently has no tables. We will create a table by writing SQL in the Scrapbook. Click the Scrapbook icon, located at the top right of the ***Data Source Explorer*** tab.



Click Scrapbook

Enter the SQL to create a (item) table.

```
CREATE TABLE item (
        id VARCHAR(36) NOT NULL,
        itemName TEXT NOT NULL,
        itemDescription TEXT,
        itemPrice DOUBLE,
        PRIMARY KEY (id)
)
```

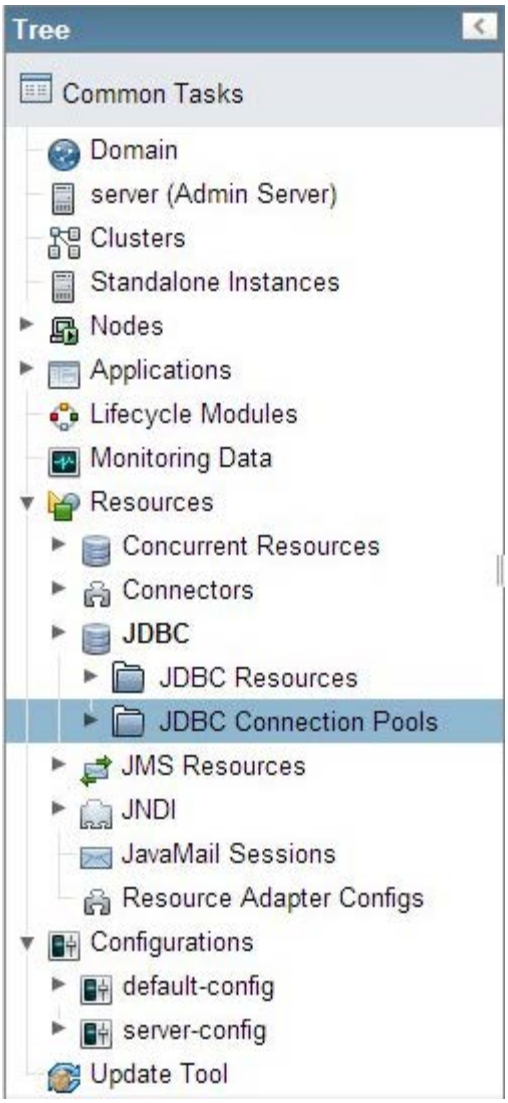
Right click within the Scrapbook window and ***Execute All***.

Create a MySQL JDBC Connection Pool and Resource in GlassFish

The application needs to be able to communicate with the MySQL database when it is deployed to the GlassFish Server. To enable this, we first copy the MySQL JDBC driver to ***$glassfish_install_folde\glassfish\lib\ext.***

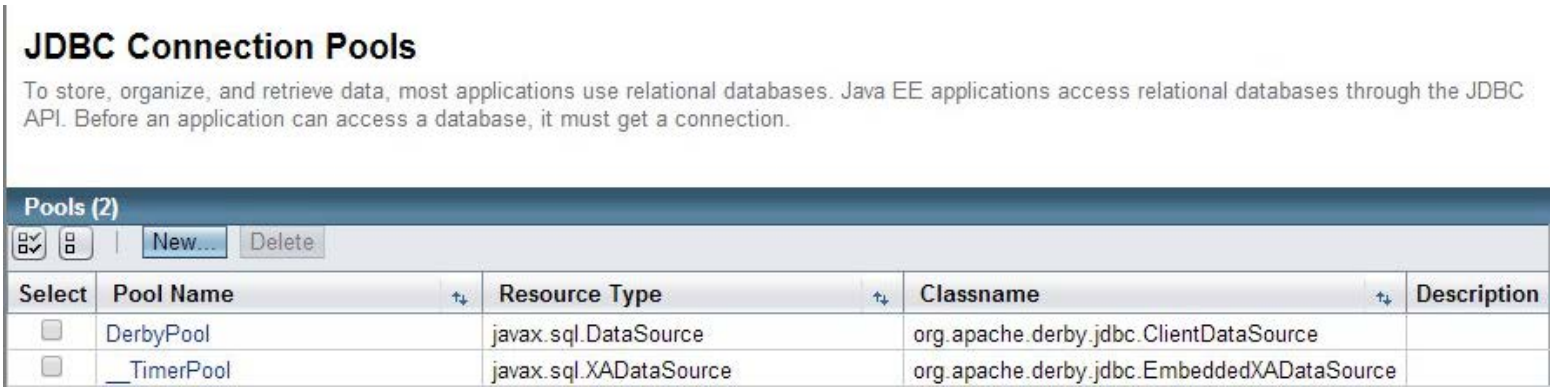
Once the JDBC driver is in place, Start GlassFish (or restart GlassFish if already started). You can do so by right clicking the connection created in the ***Server*** tab of Eclipse.

Login to the GlassFish Server Administration Console (located at http://localhost:4848 by default) and select JDBC connection pool



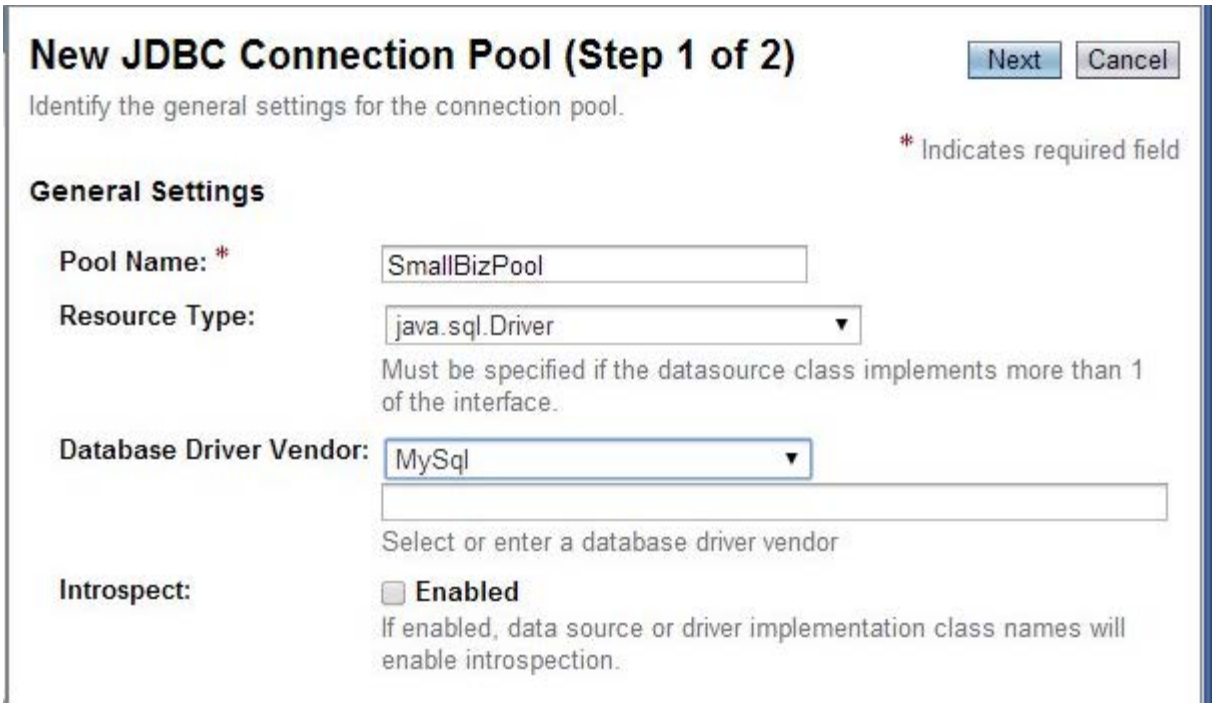
Select JDBC Connction Pools

Click the ***New...*** button to create a new JDBC Connection Pool



Create New JDBC Connection Pool

Enter a ***Pool Name*** (SmallBizPool), select the ***Resource Type*** as javax.sql.Driver (this will give the simplest set of ***Addition Properties*** on the next screen) and the ***Database Driver Vendor*** as MySQL and click ***Next***.



New JDBC Connection Pool (Step 1)

The ***Initial Minimum Pool Size*** can be set to zero since there is no need for eight on a development machine. The focus however, is the bottom section of the screen ***Additional Properties,*** which we set as follows

URL: jdbc:mysql://localhost:3306/smallbiz

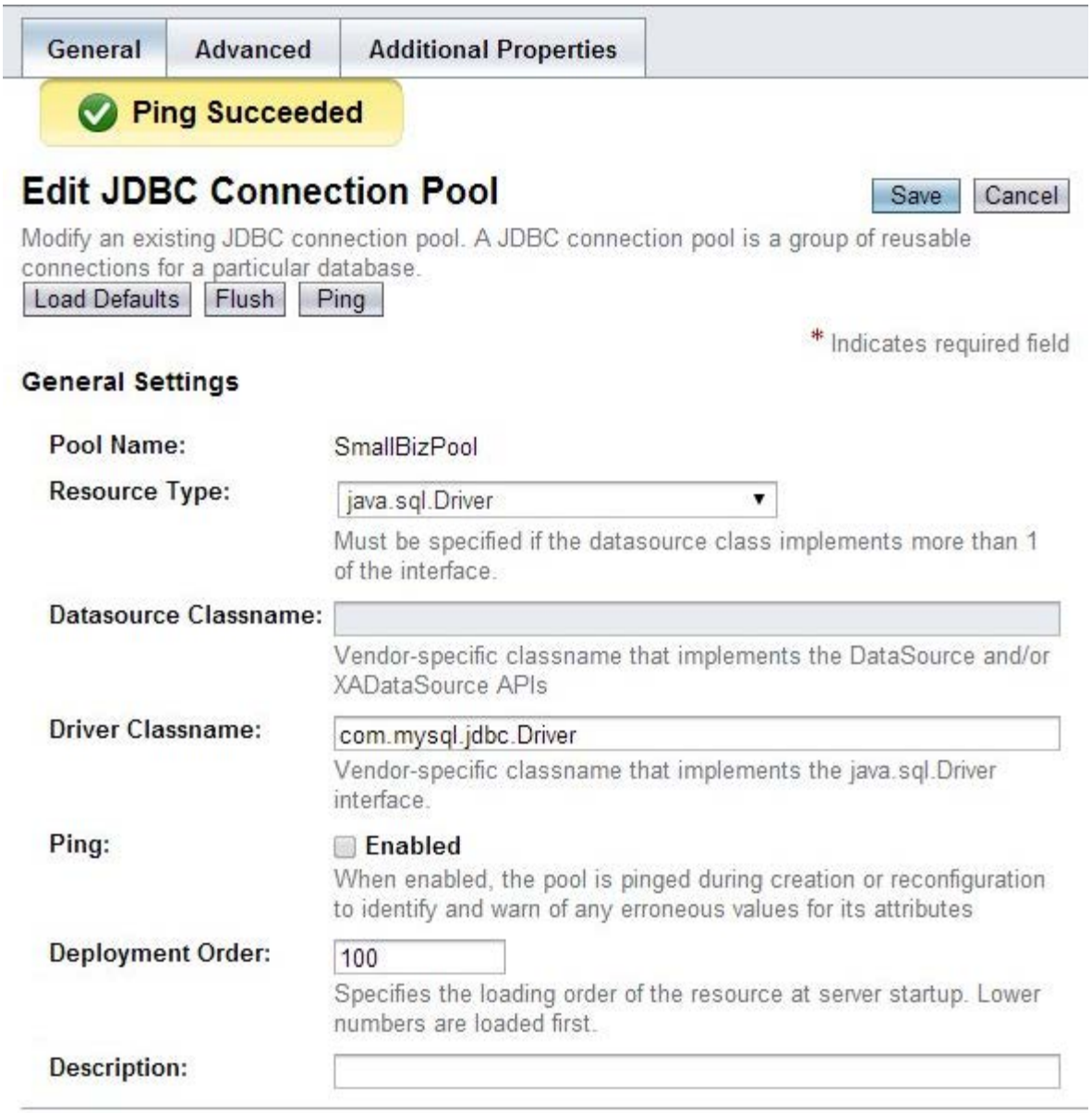
user: yourUser (root in my set-up)

password: yourPassword

Click ***Finish***.

New JDBC Connection Pool (Step 2)

Now that we have created the pool, click on the ***Pool Name*** then ***Ping*** the connection on the screen that follows to ensure that GlassFish can connect.



Ping the Connection Pool

To create the JDBC Resource go to ***Resources > JDBC > JDBC Resources*** and click ***New***.

Click New JDBC Resource

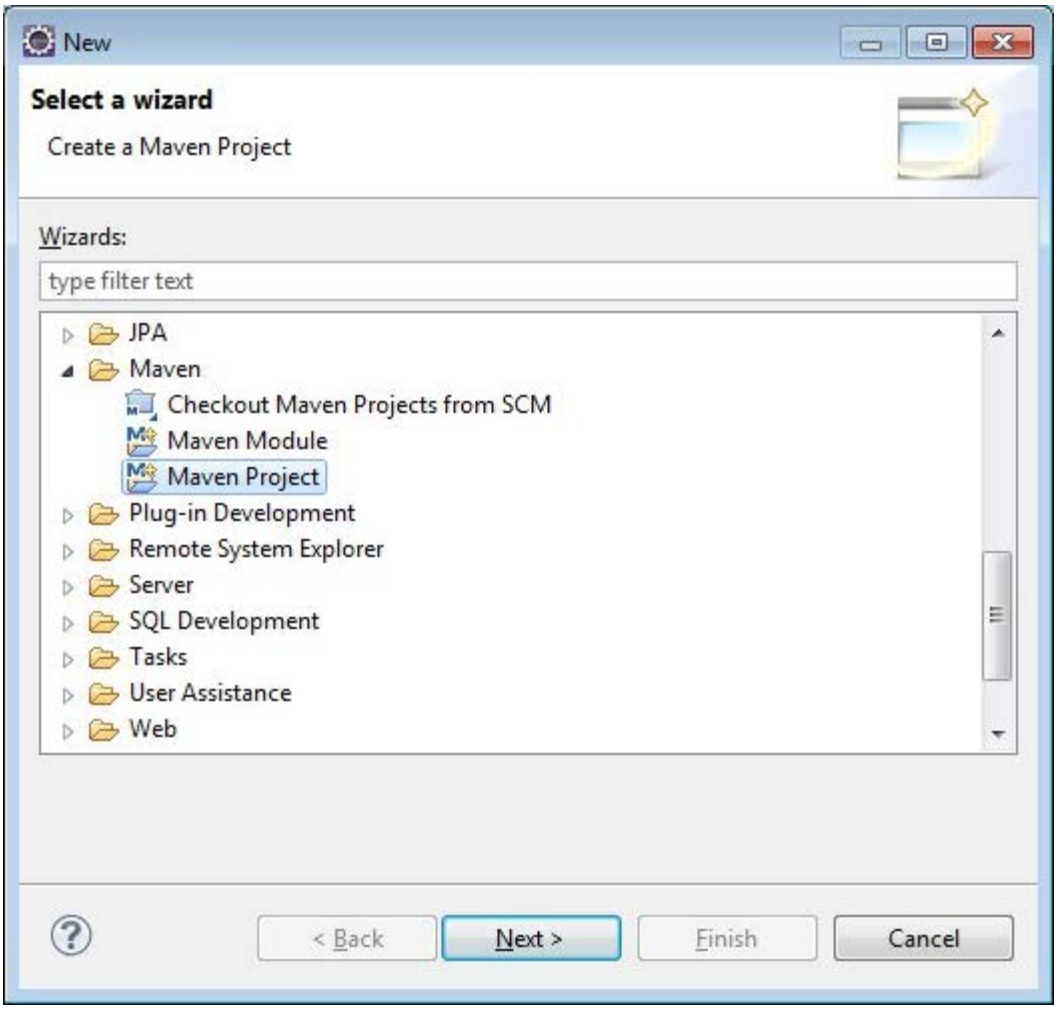
Create a ***JNDI Name*** (jdbc/SmallBiz) and select the ***Pool Name*** (SmallBizPool). Click ***OK.***

New JDBC Resource

Implementation

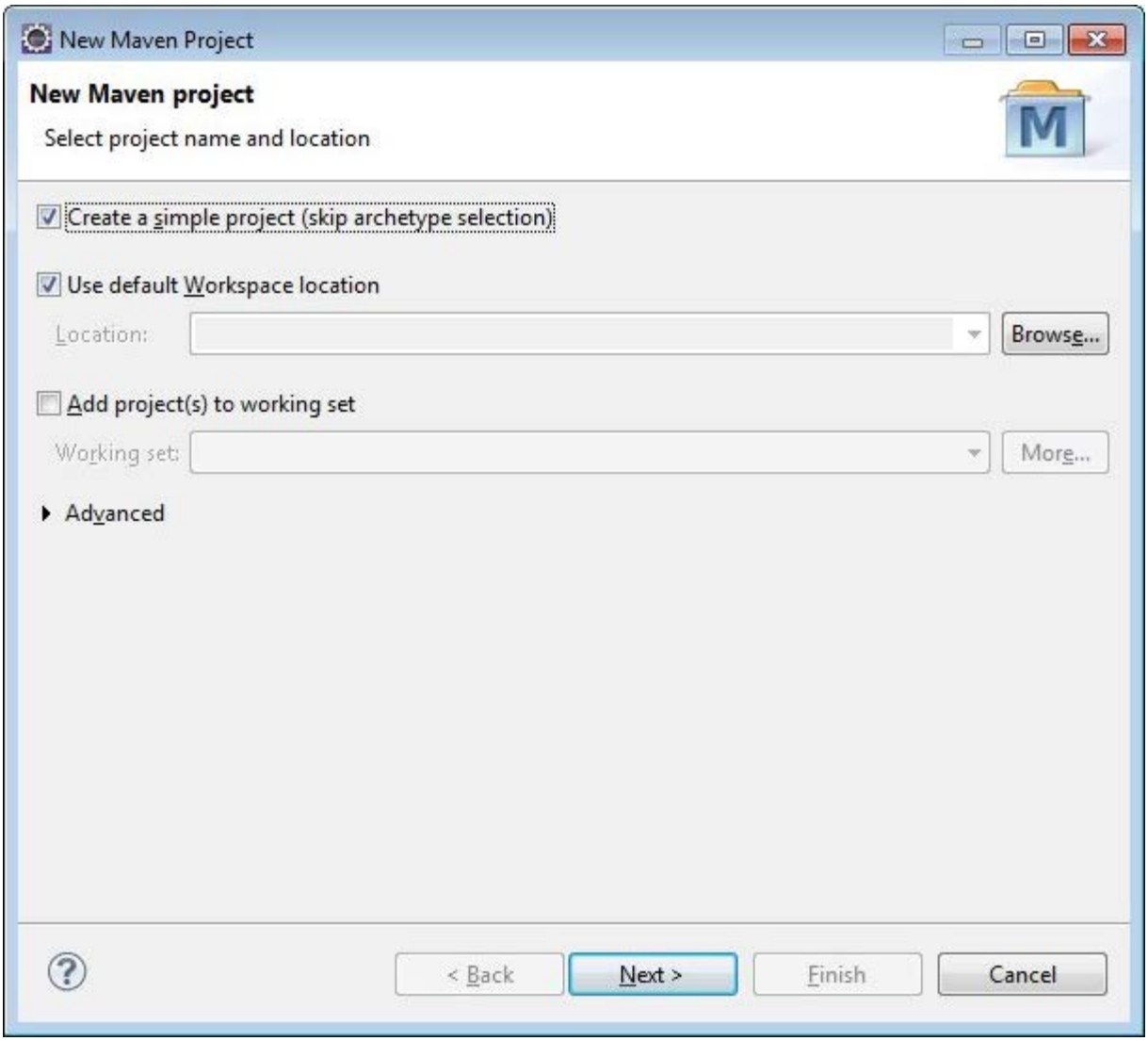
Create a New Maven Project in Eclipse

We will create a Maven Project from scratch. Go to ***File > New > Other...*** then select ***Maven Project*** from under the ***Maven*** folder.



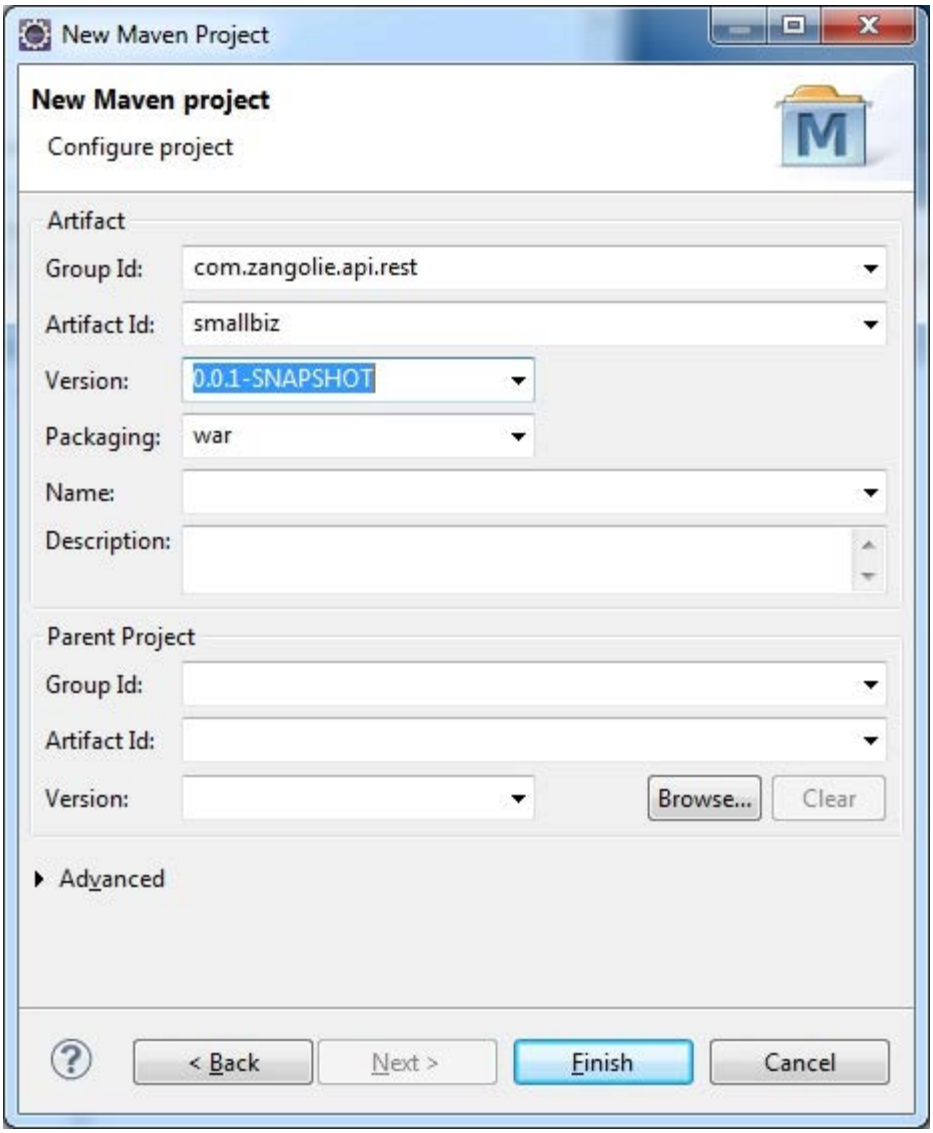
Create new maven project

Since we're doing everything from scratch, choose create a simple project.



Choose create a simple maven project

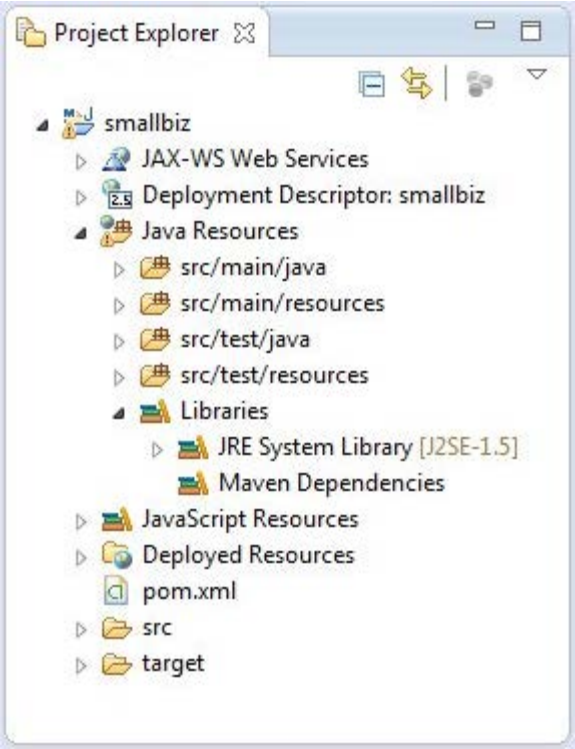
Enter the coordinates (Group Id, Artifact Id, Version) and Package type (war), then click Finish



Enter Maven Co-ordinates

Set the Maven Compiler to 1.7

Notice, if the ***Java Resources > Libraries*** folder is expanded, we see that ***JRE System Library*** is J2SE-1.5



JRE System Library is J2SE-1.5

Right click the ***pom.xml*** file and select ***Open With > Maven POM Editor.*** Add the following just before the closing tag

```
<build>
	<plugins>
		<plugin>
			<artifactId>maven-compiler-plugin</artifactId>
			<version>3.1</version>
			<configuration>
				<source>1.7</source>
				<target>1.7</target>
			</configuration>
		</plugin>
	</plugins>
</build>
```

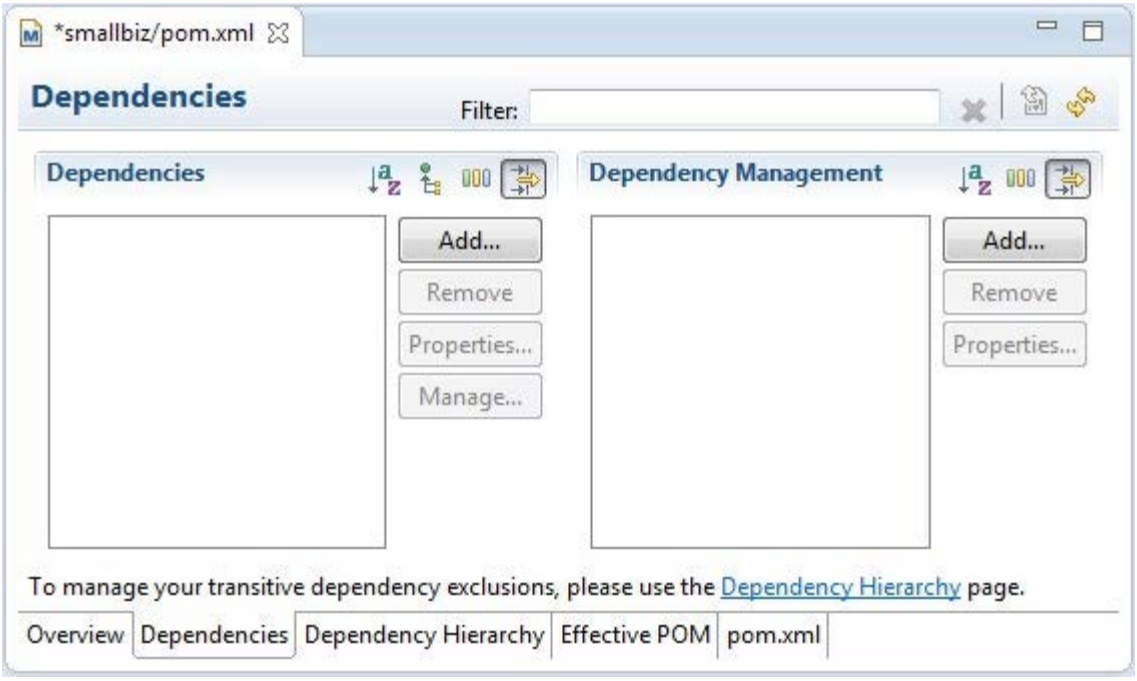
Right click the project ***Maven > Update Project*** the click ***OK*** on the screen that follows

JRE System Library is now J2SE-1.7

Create a JPA Persistence Layer

Add EclipseLink Dependency

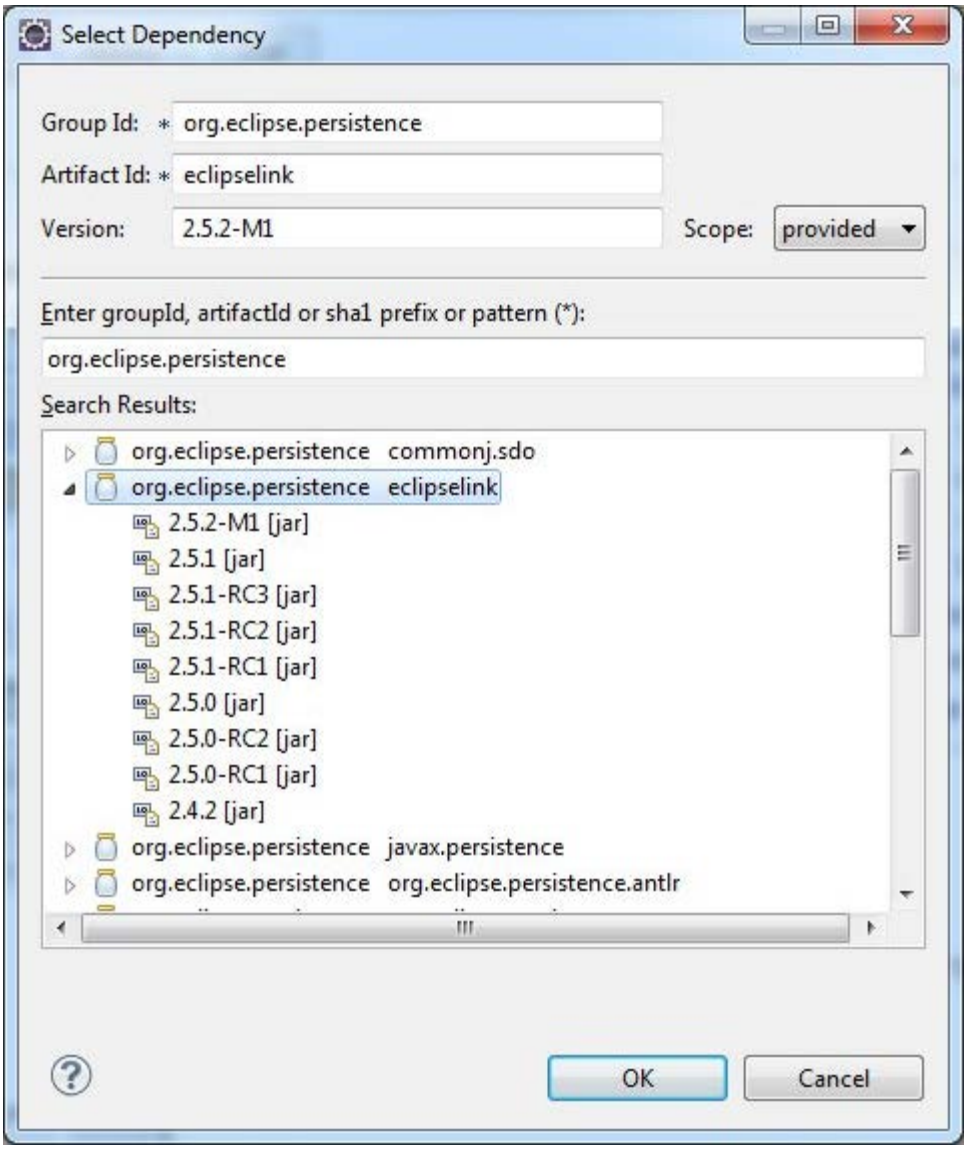
In the open pom.xml file, select the ***Dependencies*** tab click the ***Add*** button that is at the centre of the screen.



Add Maven Dependencies

EclipseLink's Maven dependency is available at Maven Central under the Group Id org.eclipse.persistence.

In the search field titled ***"Enter groupId, artifactId or sha1 prefix or pattern (*):"*** enter org.eclipse.persistence. You can click on "org.eclipse.persistence eclipselink" to select the most recent version, or expand the list and select a previous version.



EclipseLink Maven Dependency

Notice we use provided as the scope since GlassFish 4 includes EclipseLink as the default JPA provider. Click ***OK*** to add the dependency.

Add persistence.xml File

Create folder ***src | main | webapp | WEB-INF | classes | META-INF*** and create a ***persistence.xml*** file.

```
<?xml version="1.0" encoding="UTF-8"?>

<persistence version="2.1"
        xmlns="http://xmlns.jcp.org/xml/ns/persistence" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"
        xsi:schemaLocation="http://xmlns.jcp.org/xml/ns/persistence
http://xmlns.jcp.org/xml/ns/persistence/persistence_2_1.xsd">
        <persistence-unit name="testPU" transaction-type="JTA">
                <jta-data-source>jdbc/SmallBiz</jta-data-source>
        </persistence-unit>
</persistence>
```

Right click the project ***Maven > Update Project*** the click ***OK*** on the screen that follows

Now right click the project and go ***Properties > Project Facets*** and see that m2e-wtp enabled the JPA facet.

Create the JPA Entity from the Database Table

Create a new package under ***Java Resources > src/main/java*** (....smallbiz.entities)

Right click the package and select ***New > JPA Entities from Table***

Select Table

Since there is only one table in this database. There are no Table Association to edit

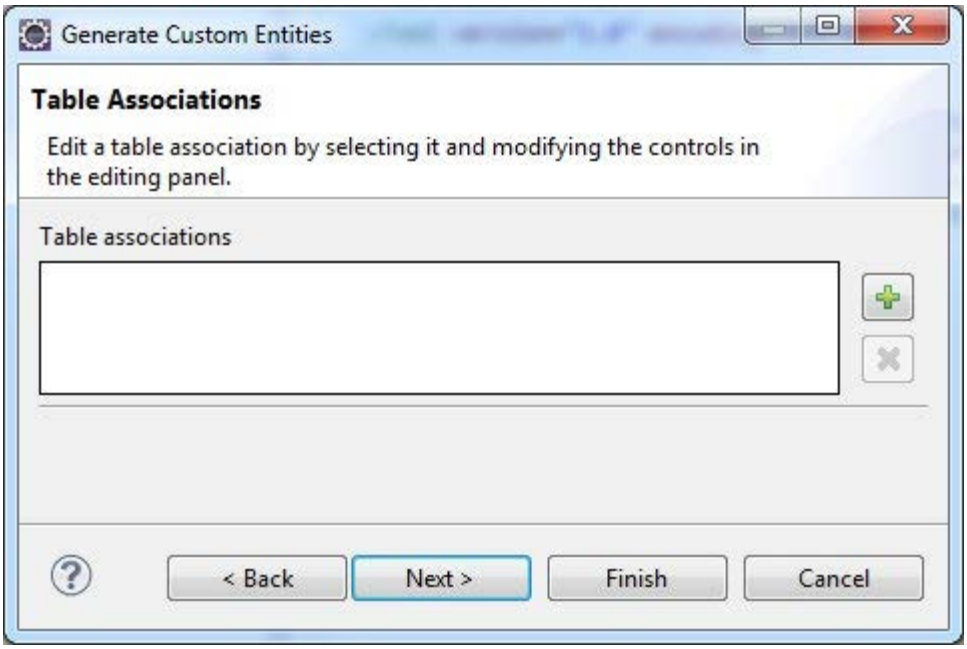
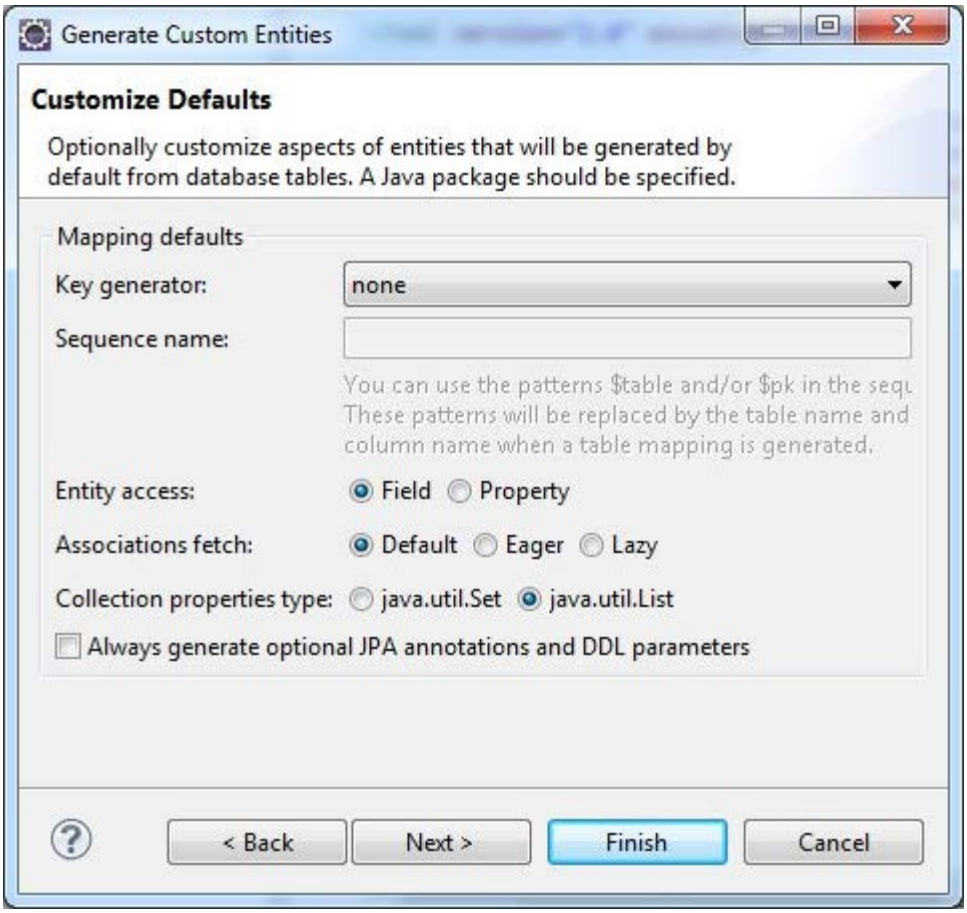
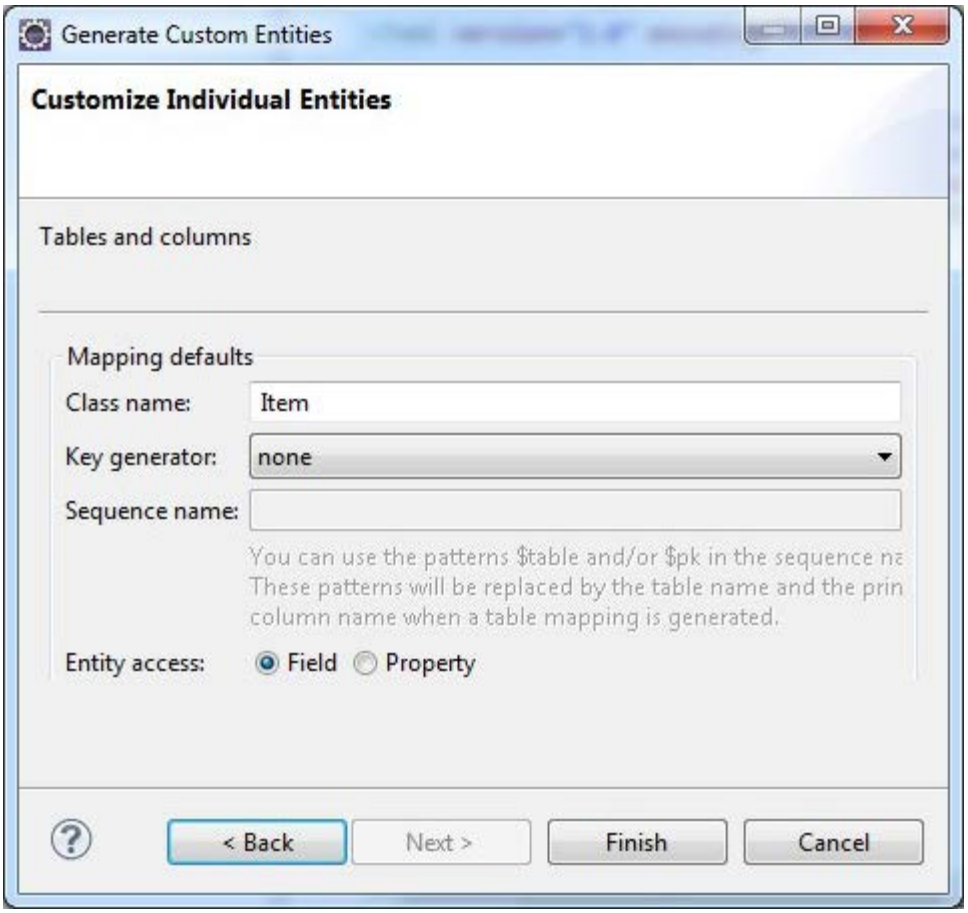


Table Associations

Our database does not generate the keys for the database table



Customize Defaults



Customize Individual Entities

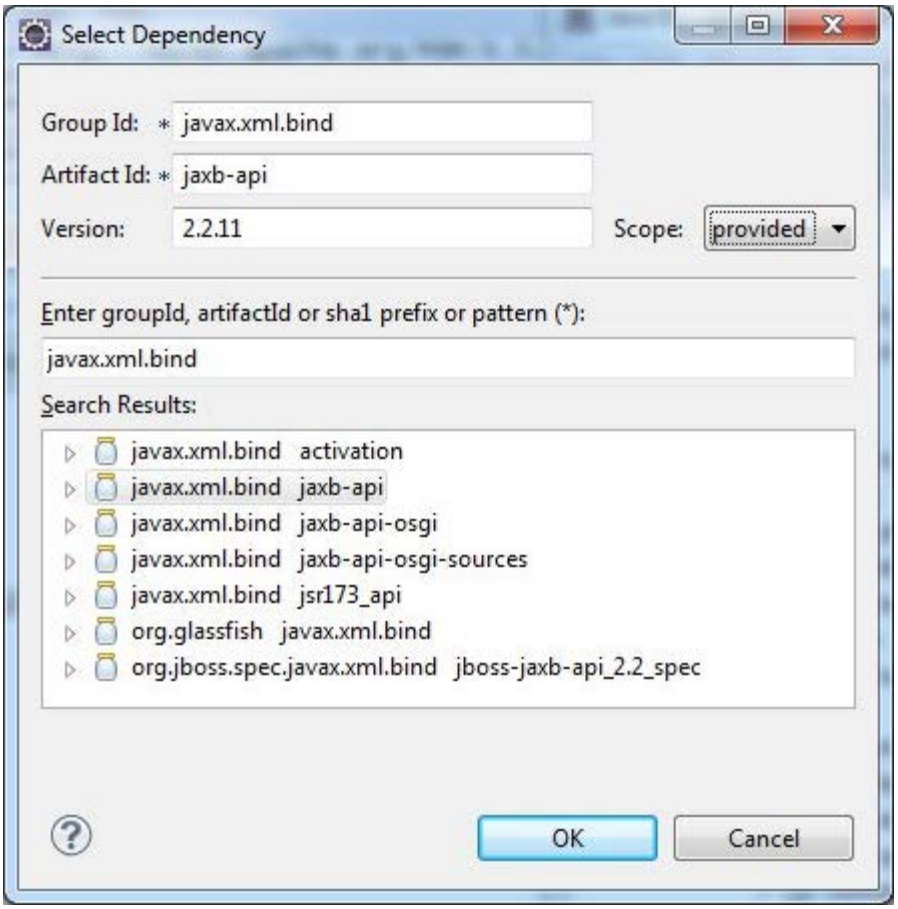
The code generated

```
1  package com.zangolie.smallbiz.entities;
2
3  import java.io.Serializable;
4
5  import javax.persistence.*;
6
7
8  /**
9   * The persistent class for the item database table.
10  *
11  */
12
13 @Entity
14 @NamedQuery(name="Item.findAll", query="SELECT i FROM Item i")
15 public class Item implements Serializable {
16         private static final long serialVersionUID = 1L;
17
18         @Id
19         private String id;
20
21         @Lob
22         private String itemDescription;
23
24         @Lob
25         private String itemName;
26
27         private double itemPrice;
28
29         public Item() {
30         }
31
32         public String getId() {
33                 return this.id;
```

```
34          }
35
36          public void setId(String id) {
37                  this.id = id;
38          }
39
40          public String getItemDescription() {
41                  return this.itemDescription;
42          }
43
44          public void setItemDescription(String itemDescription) {
45                  this.itemDescription = itemDescription;
46          }
47
48          public String getItemName() {
49                  return this.itemName;
50          }
51
52          public void setItemName(String itemName) {
53                  this.itemName = itemName;
54          }
55
56          public double getItemPrice() {
57                  return this.itemPrice;
58          }
59
60          public void setItemPrice(double itemPrice) {
61                  this.itemPrice = itemPrice;
62          }
63
64  }
```

Annotate JPA Entity with JAXB

In order to be able to convert the entity to xml or json we must annotate it as a JAXB XmlRootElement. First we add the JAXB dependency



Then we annotate the code

```
//...
import javax.persistence.*;
import javax.xml.bind.annotation.XmlRootElement;

/**
 * The persistent class for the item database table.
 *
 */
@XmlRootElement
@Entity
@NamedQuery(name="Item.findAll", query="SELECT i FROM Item i")
public class Item implements Serializable {
	private static final long serialVersionUID = 1L;
//...
```

Annotate with EclipseLink's UuidGenerator

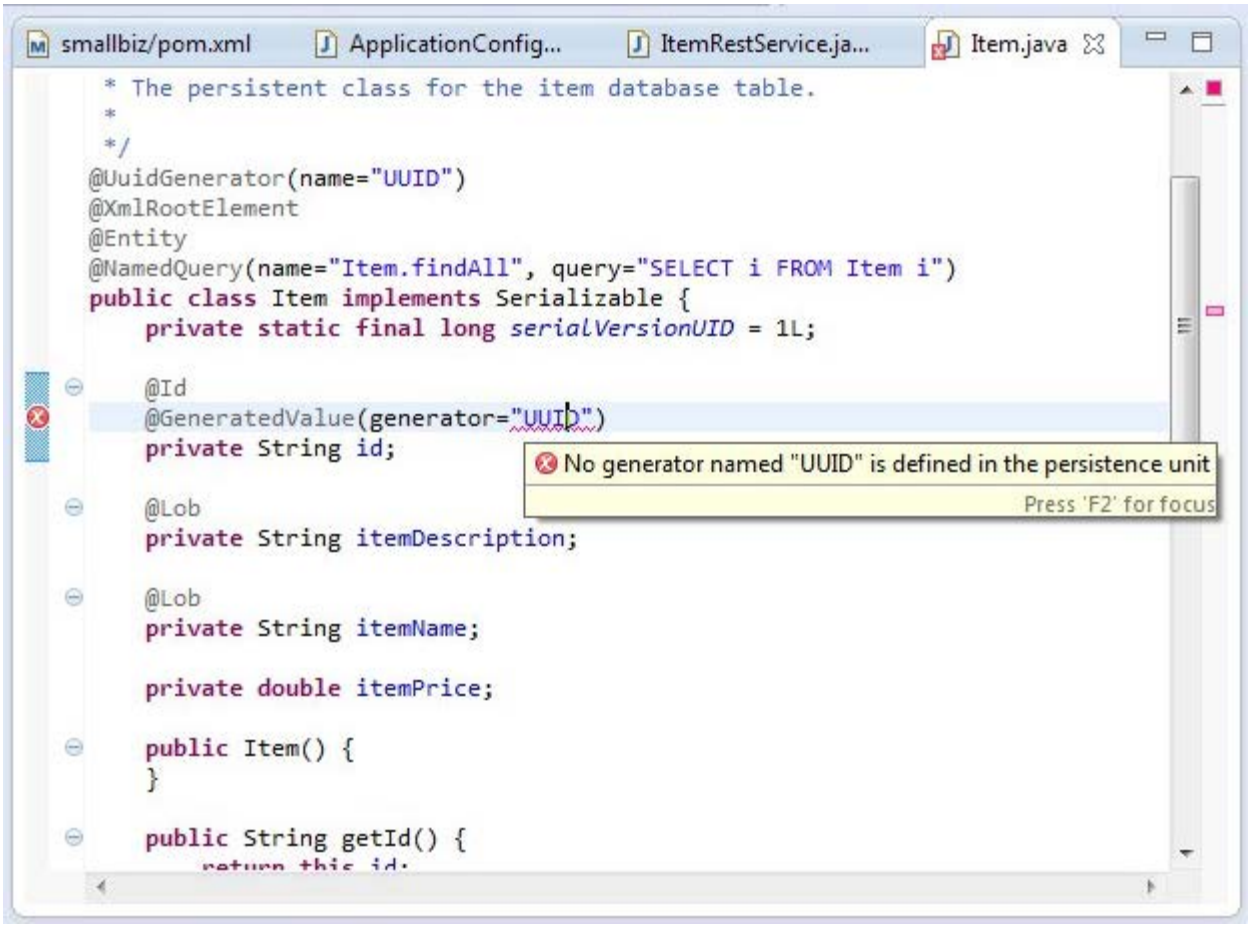
We are using UUID's as the primary key so that it can be generated anywhere. EclipseLink has an @UuidGenerator annotation we can use to generate UUID's.

```
//...
import org.eclipse.persistence.annotations.UuidGenerator;


/**
 * The persistent class for the item database table.
 *
 */
@UuidGenerator(name="UUID")
@XmlRootElement
@Entity
@NamedQuery(name="Item.findAll", query="SELECT i FROM Item i")
public class Item implements Serializable {
	private static final long serialVersionUID = 1L;

	@Id
	@GeneratedValue(generator="UUID")
	private String id;
//...
```

There seems to be a bug in Eclipse, because it kicks up a fuss about the generator name not being defined in the persistence unit, but the generator name is defined with the @UuidGenerator annotation.



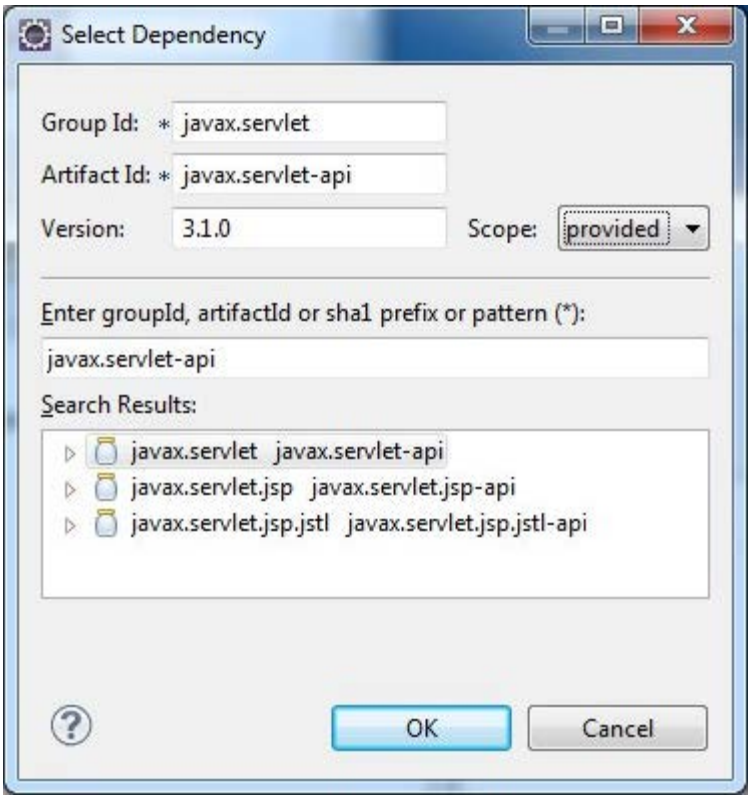
No Generator in the Persistence Unit Error

To get around this, we change the error to a warning in ***Window > Preferences > Java Persistence > JPA > Errors/Warnings > Queries and Generators*** and set the severity level of “Generator is not defined in the persistence unit” to warning.

Create a JAX-RS RESTful Service Layer

Add Servelet 3.1 Dependency

JAX-RS 2.0 requires Servlet 3.1 (as well as JDK 7), so we add the Maven dependency.

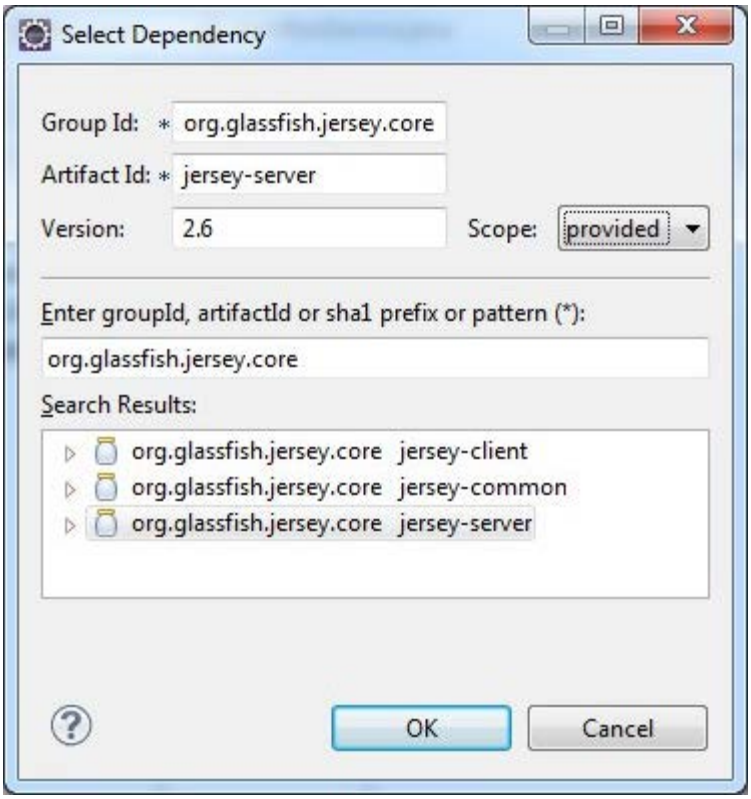


Add Servlet 3.1 Dependency

Right click the project ***Maven > Update Project*** then click ***OK*** on the screen that follows. If you now check the project facets by right clicking the project, then ***Properties > Project Facets***, you will notice m2e-wtp updates the Dynamic Web Module to 3.1

Add Jersey Dependency

Jersey is the JAX-RS implementation in GlassFish. We only need the Jersey Server dependency.

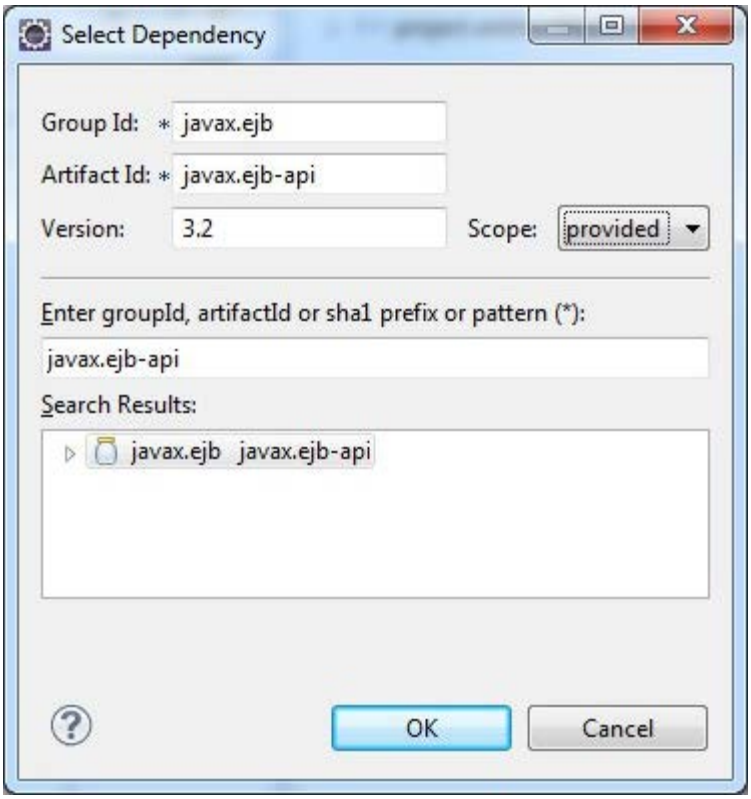


Add Jersey Dependency

Right click the project ***Maven > Update Project*** the click ***OK*** on the screen that follows. If you now check the project facets, you will notice m2e-wtp has enabled JAX-RS 2.0

Add EJB Dependency

We shall annotate the rest resource with @Stateless thus turning it into an Enterprise Java Bean. We therefore add a dependency to javax.ejb-api.



Add EJB Dependency

Write the REST Resource

Though it does not have to be, we put the REST resource in a separate package (...smallbiz.services.rest). We create a new class (ItmeRestResource) and use JAX-RS annotations to create the RESTful service.

```
1  package com.zangolie.smallbiz.services.rest;
2
3  import java.net.URI;
4  import java.util.Collection;
5
6  import javax.ejb.Stateless;
7  import javax.persistence.EntityManager;
8  import javax.persistence.PersistenceContext;
9  import javax.persistence.TypedQuery;
10 import javax.ws.rs.BadRequestException;
11 import javax.ws.rs.Consumes;
12 import javax.ws.rs.DELETE;
13 import javax.ws.rs.GET;
14 import javax.ws.rs.NotFoundException;
15 import javax.ws.rs.POST;
16 import javax.ws.rs.PUT;
17 import javax.ws.rs.Path;
18 import javax.ws.rs.PathParam;
19 import javax.ws.rs.Produces;
20 import javax.ws.rs.core.Context;
21 import javax.ws.rs.core.MediaType;
22 import javax.ws.rs.core.Response;
23 import javax.ws.rs.core.UriInfo;
24
25 import com.zangolie.smallbiz.entities.Item;
26
27 @Path("/item")
28 @Produces ({MediaType.APPLICATION_JSON, MediaType.APPLICATION_XML})
29 @Consumes ({MediaType.APPLICATION_JSON, MediaType.APPLICATION_XML})
30 @Stateless
31 public class ItemRestService {
32         //the PersistenceContext annotation is a shortcut that hides the fact
33         //that, an entity manager is always obtained from an EntityManagerFactory.
```

```
34          //The peristitence.xml file defines persistence units which is supplied by name
35          //to the EntityManagerFactory, thus  dictating settings and classes used by the
36          //entity manager
37          @PersistenceContext(unitName = "testPU")
38          private EntityManager em;
39
40          //Inject UriInfo to build the uri used in the POST response
41          @Context
42          private UriInfo uriInfo;
43
44          @POST
45          public Response createItem(Item item){
46                  if(item == null){
47                          throw new BadRequestException();
48                  }
49                  em.persist(item);
50
51                  //Build a uri with the Item id appended to the absolute path
52                  //This is so the client gets the Item id and also has the path to the resource created
53                  URI itemUri = uriInfo.getAbsolutePathBuilder().path(item.getId()).build();
54
55                  //The created response will not have a body. The itemUri will be in the Header
56                  return Response.created(itemUri).build();
57          }
58
59          @GET
60          @Path("{id}")
61          public Response getItem(@PathParam("id") String id){
62                  Item item = em.find(Item.class, id);
63
64                  if(item == null){
65                          throw new NotFoundException();
66                  }
67
68                  return Response.ok(item).build();
69          }
70
71          //Response.ok() does not accept collections
72          //But we return a collection and JAX-RS will generate header 200 OK and
73          //will handle converting the collection to xml or json as the body
74          @GET
75          public Collection<Item> getItems(){
76                  TypedQuery<Item> query = em.createNamedQuery("Item.findAll", Item.class);
77                  return query.getResultList();
78          }
79
80          @PUT
81          @Path("{id}")
82          public Response updateItem(Item item, @PathParam("id") String id){
83                  if(id == null){
84                          throw new BadRequestException();
85                  }
86
87                  //Ideally we should check the id is a valid UUID. Not implementing for now
88                  item.setId(id);
89                  em.merge(item);
90
91                  return Response.ok().build();
92          }
93
94          @DELETE
95          @Path("{id}")
96          public Response deleteItem(@PathParam("id") String id){
97                  Item item = em.find(Item.class, id);
98                  if(item == null){
99                          throw new NotFoundException();
100                 }
101                 em.remove(item);
102                 return Response.noContent().build();
103         }
104
105 }
```

We annotate the entire class with @Produces and @ Consumes and the media types for JSON and XML in both

cases. This means that the functions annotated with the HTTP methods require no further annotation to produce or consume both JSON or XML.

The first @Path annotation defines the relative path (/item) that exposes the resource to HTTP clients. The relative path to a specific resource is annotated with @Path("{id}") and thus makes use of the Entity's id attribute (/item/someUUID).

The @POST, @GET, @PUT and @DELETE annotations are used for the functions that handle those HTTP requests.

Create the Application Class

We need to tell Jersey which url pattern it must intercept as our JAX-RS endpoint (base URI). We will use an Application Class instead of a web.xml file for this purpose. The class could be added to any package in the project, we choose the same package as the JAX-RS annotated class. We set 'rest' as the path by using the @ApplicationPath. This will result in path of http://localhost:8080/your_project_name/rest (http://localhost:8080/smallbiz/rest) on our local GlassFish server.

```
1  package com.zangolie.smallbiz.services.rest;
2
3  import javax.ws.rs.ApplicationPath;
4  import javax.ws.rs.core.Application;
5
6  @ApplicationPath("rest")
7  public class ApplicationConfig extends Application {
8
9  }
```

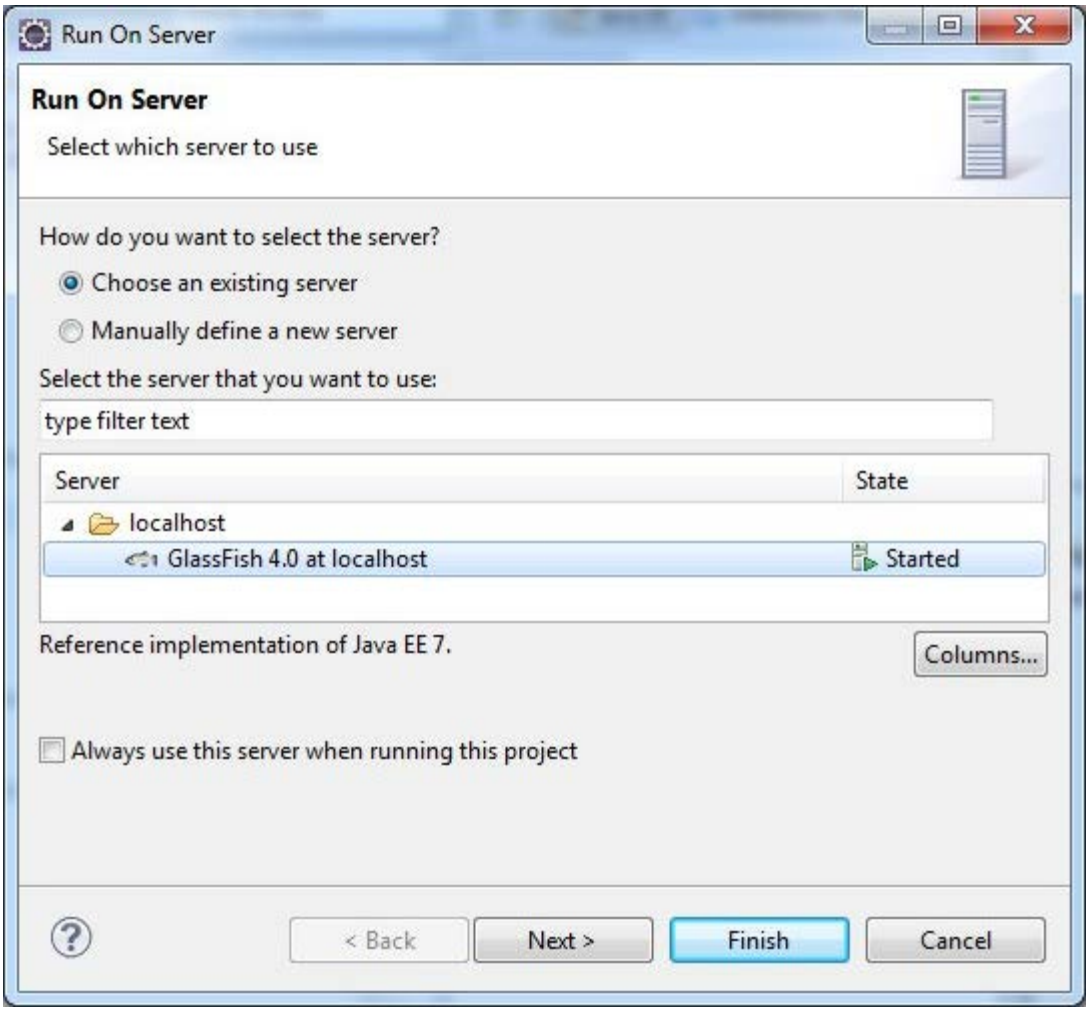
Since we are using an Application Class instead of a web.xml file, we have to add a bit of xml to the pom.xml file to tell Maven not to complain about the missing web.xml file. In the build element of the pom add the following plugin to the plugins.

```
1  <plugin>
2          <artifactId>maven-war-plugin</artifactId>
3          <version>2.4</version>
4          <configuration>
5                  <failOnMissingWebXml>false</failOnMissingWebXml>
6          </configuration>
7  </plugin>
```

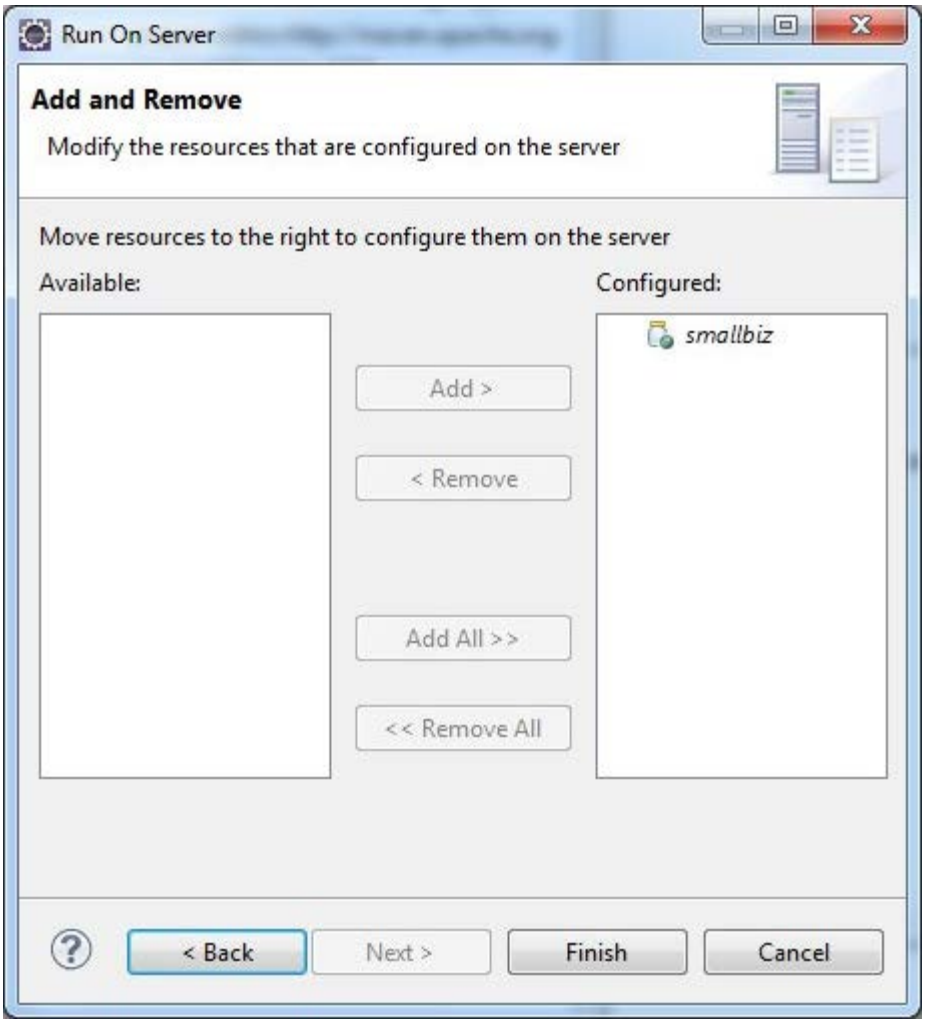
Maven update after the code is added

Deploy the Web Service to GlassFish

Right click the project ***Run As > Run on Server***



Select Server to Run On



smallbiz Configured

We now set Eclipse to automatically publish to GlassFish when we change the code. Double click the GlassFish Server on the ***Server*** view. Expand the ***Publishing*** expandable list and select ***Automatically publish when resources change***.

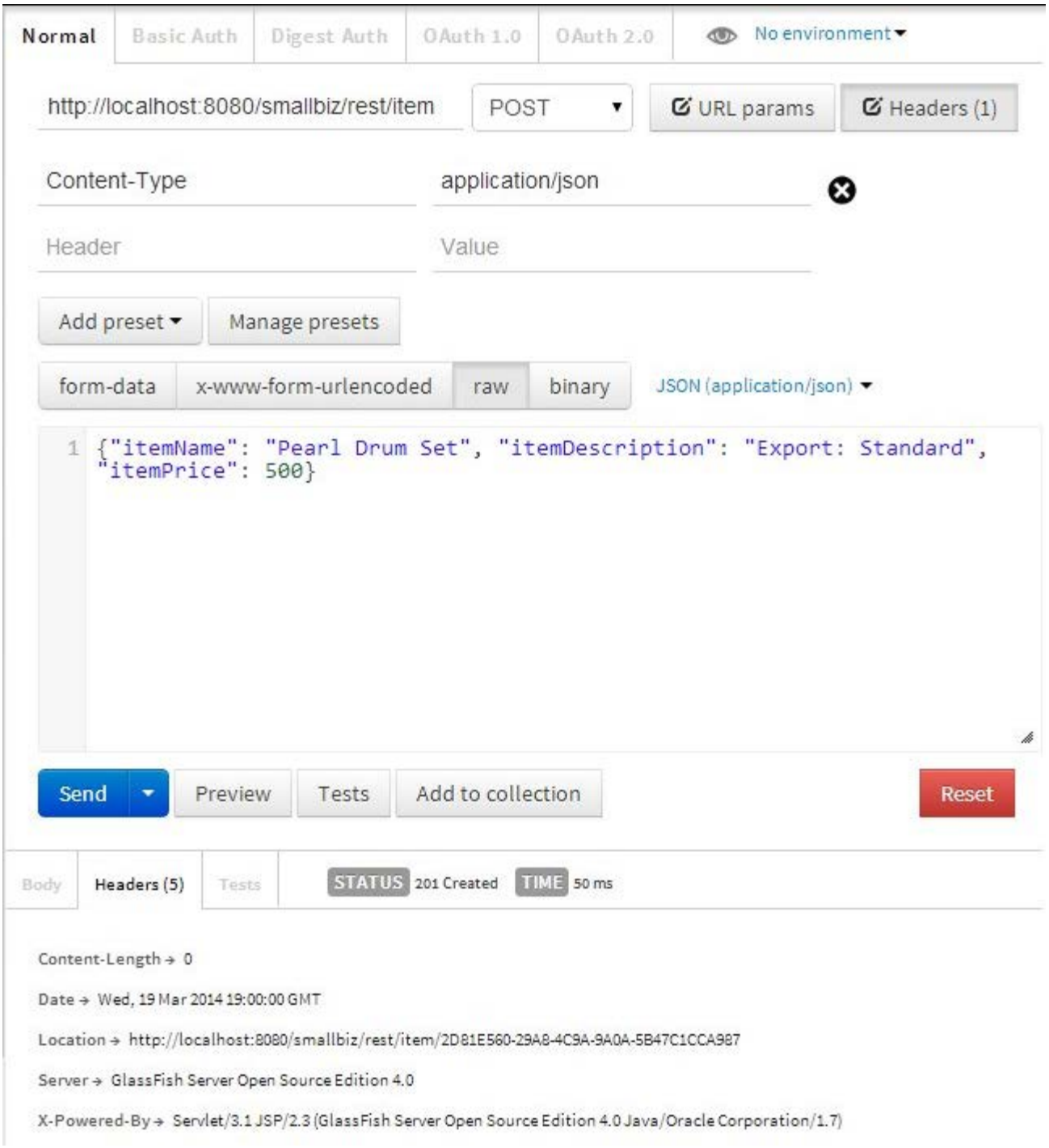
Test the Web Service with an HTTP Client

We will use Postman as the HTTP Client to test the RESTful service. However, any HTTP client should work.

POST

Use http://localhost:8080/your_project_name/rest/item (http://localhost:8080/smallbiz/rest/item) as the request url. Select POST from the drop down list. Click the Headers button then enter Header: Content-Type and Value: application/json. Click the raw button and select application/json from the drop down list to the right of it.

Enter a json object and POST it by clicking ***Send***. You can preview

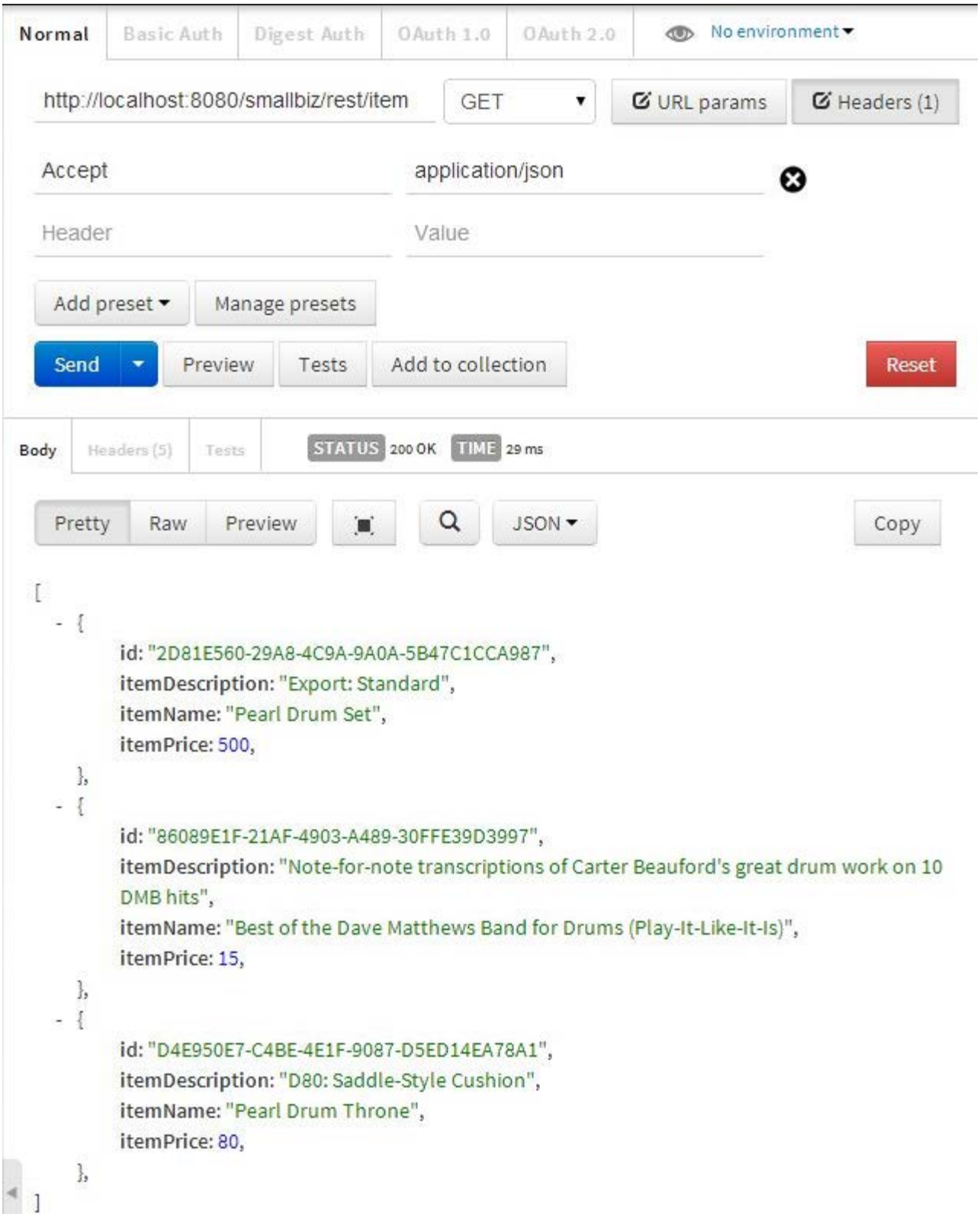


Postman – POST

POST a few json objects to the server.

GET

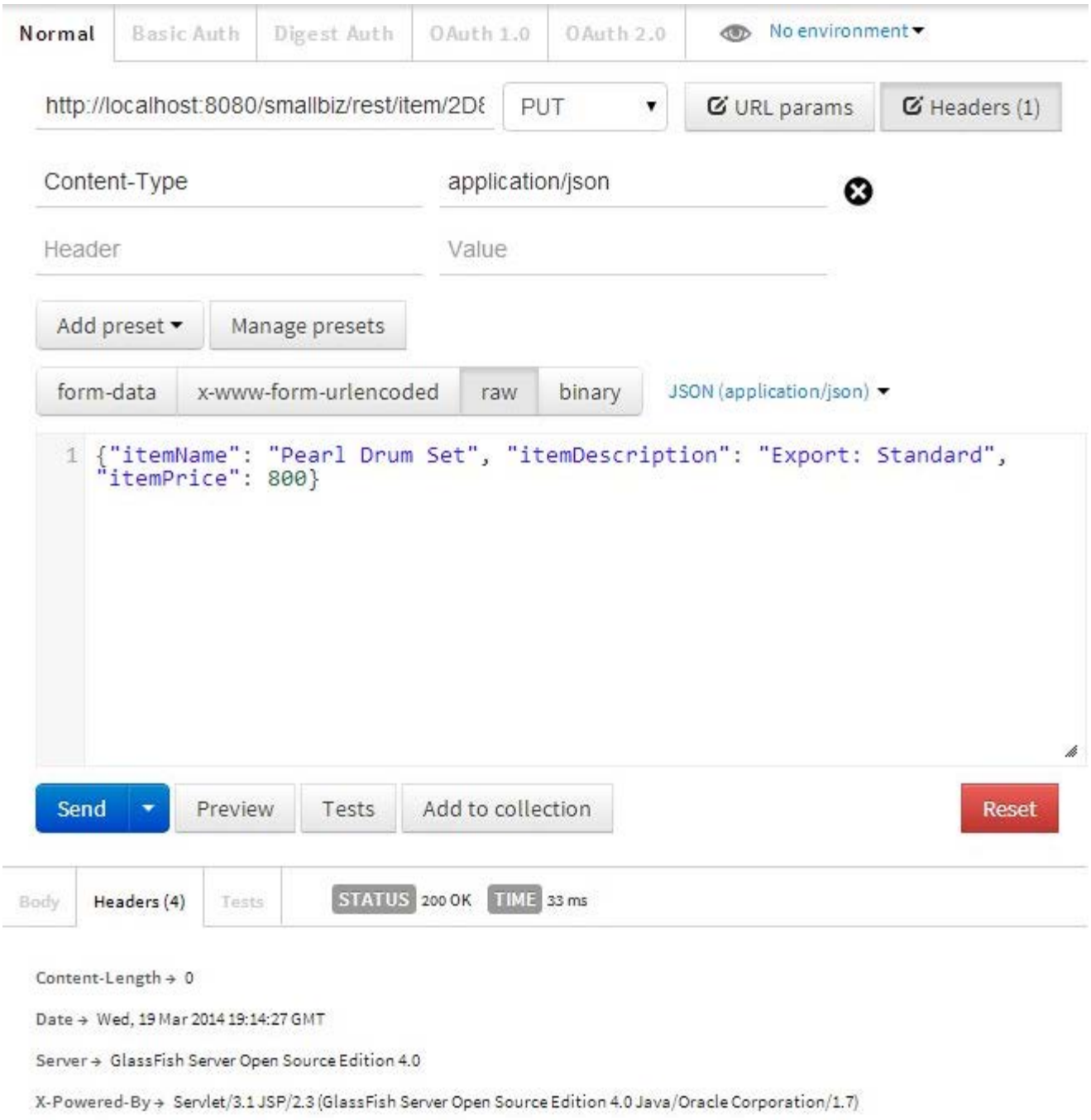
We set the Accept header to either application/json or application/xml. Using the base url will get all items, if an id is appended to the base url, then that item will be returned.



Postman – GET

PUT

PUT can be used to update an existing resource or to save a resource that is created with an id on the client. Note that a partial update is not possible with the HTTP PUT method (will probably look into doing a PATCH update for another post).



Postman – PUT

DELETE

No Accept header etc need to be sent for DELETE. Simply send the DELETE request to a valid id.

Conclusion

I hope this post is a useful starting point for creating as RESTful Web Service in Java that someone can start experimenting with and expanding upon.

Resources and Links

These are some of the resources I found useful while learning how to go about implementing a RESTful Web Service in Java.

Books

Beginning Java EE 7
Pro JPA 2
RESTful Java with JAX-RS 2.0

Web Sites

Create rich data-centric web applications using JAX-RS, JPA, and Dojo

Videos

Java EE 6 Development using GlassFish and Eclipse