Building an Apache Tomcat / OpenEJB / MySQL Stack

Introduction

An "ATOM" Stack is a development and production environment for Enterprise Java development that consists of **A**pache **T**omcat, **O**penEJB, and **M**ySQL. It's the JavaEE analogue to the popular "LAMP Stack" software bundle. The ATOM stack has nothing to do with the ATOM project and I apologize in advance for the namespace collision.

In this tutorial, I'll show you how to build an ATOM stack for development and production purposes, and how to create your first JavaEE application. These tutorials are geared toward developing in an OS X environment, but the illustrated principles will hold on any operating system or development environment. I recommend that you transplant your software to a hardened OpenSolaris machine at production time, because OpenSolaris has military-grade security features and because it's Open Source.

It is worth mentioning that the author is neither a developer of OpenEJB, Tomcat, or MySQL, nor an official representative of the University of Minnesota, but an independent developer and *OpenEJB enthusiast* who has found the documentation about developing with OpenEJB and MySQL in need of improvement. I also have some experience writing technical documentation for Sun Microsystems and the University of Minnesota. This work does not constitute an oficial endorsement of MySQL, Apache Tomcat, Mac OS X, OpenEJB, or OpenJPA on behalf of the U of MN. It is rather the independent effort of one student.

The purpose of producing this tutorial is to speed up the process of writing other, more useful tutorials about EJB 3 development in OpenEJB and MySQL. In addition to screenshots and recorded terminal outputs, I've also added video versions of each tutorial segment.

Special thanks go out to David Blevins, Dain Sundstrom, and the rest of the OpenEJB, Tomcat, OpenJPA and MySQL developers, and finally their community members whose support and participation helps to bring great software to life.
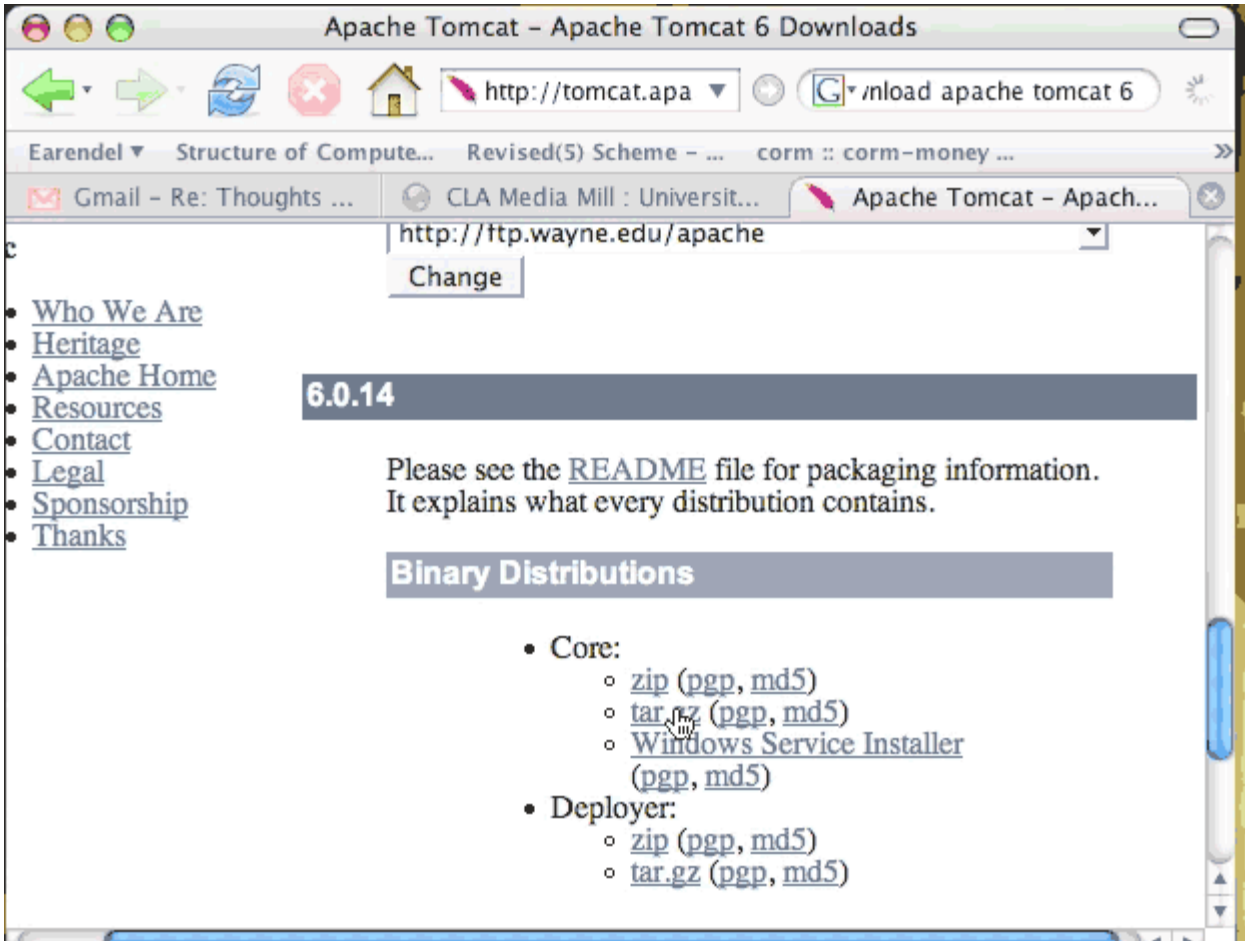
And those of you who are just getting involved, I sincerely hope you find the following materials helpful.

-- Alexander Saint Croix

Part 1: Installing Apache Tomcat on OS X

Watch a video version of this tutorial at https://mediamill.cla.umn.edu/mediamill/embed/6992
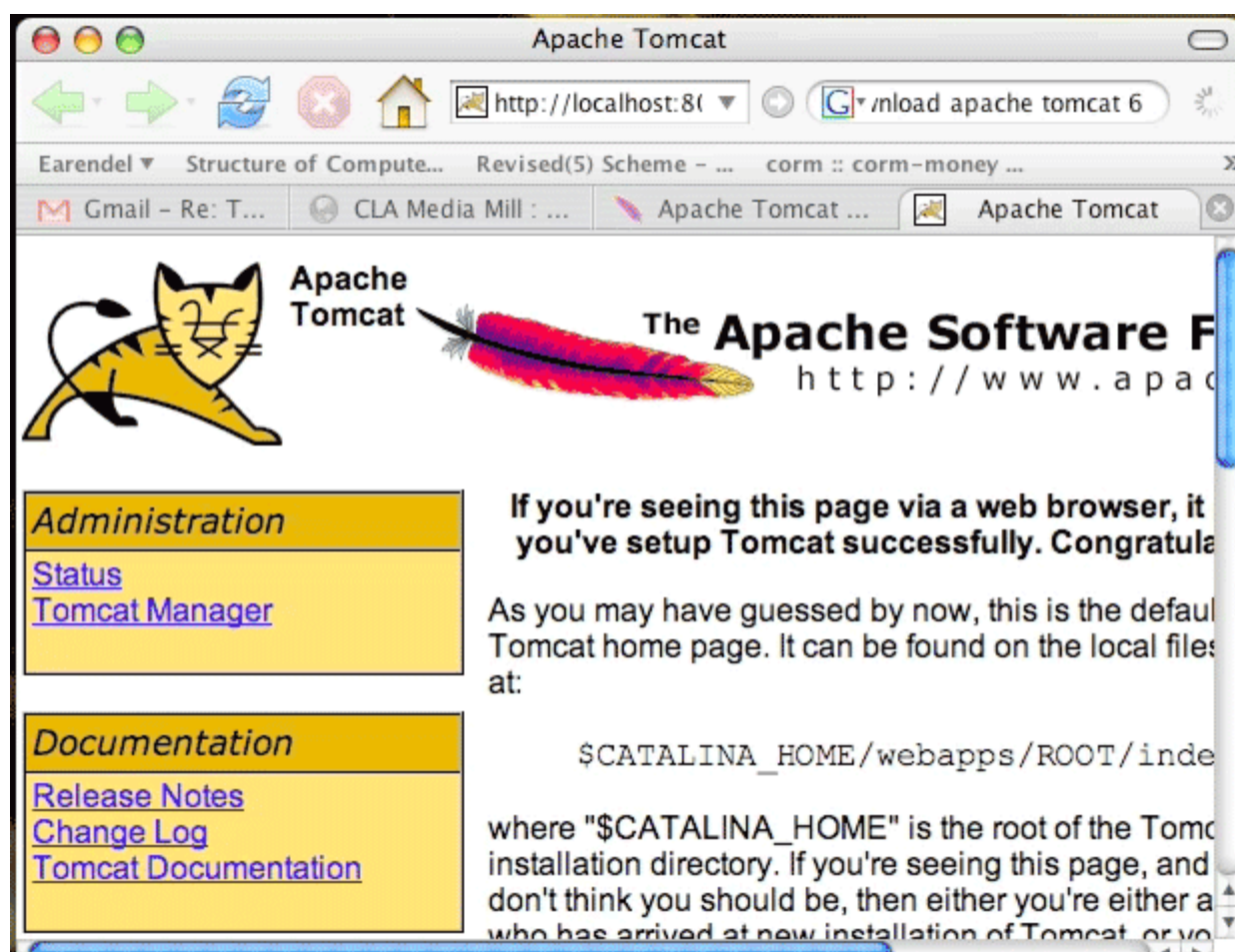
1. In order to download Apache Tomcat 6, go to the Apache Tomcat 6 Downloads page, scroll down, and under the **Core** build section for **6.0.14** or later, click on the **tar.gz** option, and save the apache-tomcat-6.0.14.tar.gz distribution file to your desktop.

2. Double-click on the apache-tomcat-6.0.14.tar.gz on your desktop to unzip it.
3. Move the resulting unzipped directory to `~/dev`
4. Open up a Terminal Window
5. From your Terminal Window, type `cd dev/apache-tomcat-6.0.14/bin/` and press [Enter].
6. From this Tomcat bin directory, you can immediately start the server by typing `./startup.sh`. You should get the following:

```
[18:10:24 alex bin]$ ./startup.sh
Using CATALINA_BASE:    /Users/alex/dev/apache-tomcat-6.0.14
Using CATALINA_HOME:    /Users/alex/dev/apache-tomcat-6.0.14
Using CATALINA_TMPDIR: /Users/alex/dev/apache-tomcat-6.0.14/temp
Using JRE_HOME:        /System/Library/Frameworks/JavaVM.framework/Versions/1.5/Home
```

7. Having done that, open a web browser and go to http://localhost:8080
8. If you've done everything correctly, you should see something like this:

Congratulations! You've installed Tomcat on OS X.

Part 2: Installing OpenEJB 3.0 in Tomcat

Watch a video version of this tutorial at https://mediamill.cla.umn.edu/mediamill/embed/6994

1. Open a web browser and to go http://www.google.com
2. Run a search for "download openejb.war".
3. You'll find a link to the OpenEJB - Tomcat at openejb.apache.org.
4. Once the page loads, scroll down to the "Installation for the Impatient" section.
5. Click on openejb.war link to go to the Apache mirrors page.
6. Download the openejb.war file from the first mirror.
7. Once the openejb.war file is finished downloading, drop it into the `~/apache-tomcat-6.0.14/webapps/` directory.
8. Count to ten while Tomcat unpacks and loads the web archive.
9. Now, visit http://localhost:8080/openejb/installer, scroll down, and press the **Install** button. You'll see something like the following:

10. When you are finished, go back to the Terminal Window, and **RESTART TOMCAT** by typing the following:

```
[19:09:19 alex bin]$ ./shutdown.sh
Using CATALINA_BASE:   /Users/alex/apache-tomcat-6.0.14
Using CATALINA_HOME:   /Users/alex/apache-tomcat-6.0.14
Using CATALINA_TMPDIR: /Users/alex/apache-tomcat-6.0.14/temp
Using JRE_HOME:        /System/Library/Frameworks/JavaVM.framework/Versions/1.5/Home
[19:41:39 alex bin]$ ./startup.sh
Using CATALINA_BASE:   /Users/alex/apache-tomcat-6.0.14
Using CATALINA_HOME:   /Users/alex/apache-tomcat-6.0.14
Using CATALINA_TMPDIR: /Users/alex/apache-tomcat-6.0.14/temp
Using JRE_HOME:        /System/Library/Frameworks/JavaVM.framework/Versions/1.5/Home
[19:41:54 alex bin]$
```
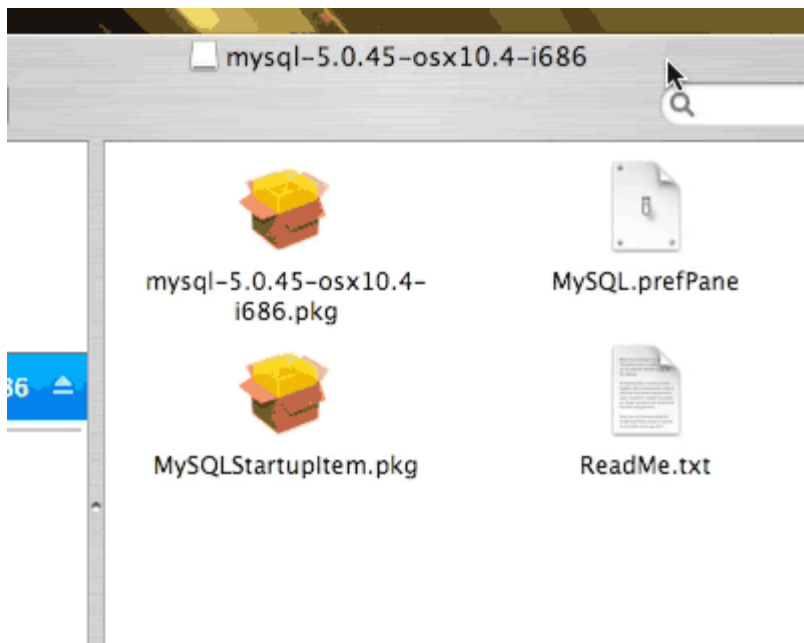
Congratulations! You have turned Tomcat into an EJB Server.
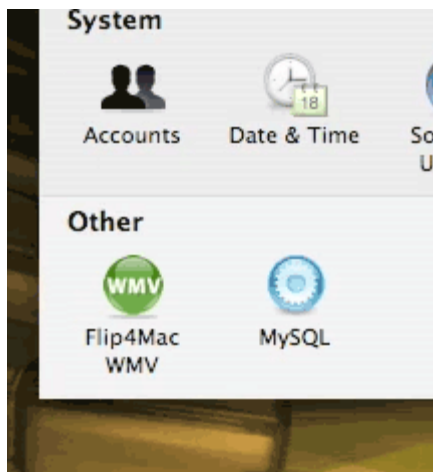
Part 3: Installing MySQL on OS X

Watch a video version of this tutorial at https://mediamill.cla.umn.edu/mediamill/embed/6996

1. From your web browser, go to http://www.google.com
2. Run a search for "download mysql os x"
3. Click on the first link to go to the MySQL 5.0 download page.
4. Scroll down and click on the Mac OS X (package format) link.
5. Choose the download appropriate to your processor type. (Example: x86)
6. Download the installer .pkg file to your desktop. This might take several minutes.

7. Double click on the .DMG installation file on your desktop. You'll see the following two package installers:

8. Install the `mysql-5.0.45-osx10.4` .PKG file first by double clicking on it and following the instructions in the wizard, like you would any other Mac OS X application.
9. Install the `MySQLStartupItem` for MySQL.
10. Open up your System Preferences pane. At the bottom you will notice a MySQL icon:

11. Click on the MySQL icon. In the window that appears, click on the **Start MySQL Server** button. You will be asked to enter your system password.
12. At this time you should see the red "stopped" text switch to a green "running" state.

Congratulations! You have successfully installed MySQL on OS X.

3.1: Disable anonymous access in MySQL

MySQL is installed into /usr/local/mysql by the OS X installer. One of the first things you need to do after installing it is remove anonymous access. You can do that by opening a Terminal Window and entering the following commands:

```
[16:37:58 alex alex]$ /usr/local/mysql/bin/mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
```

```
Your MySQL connection id is 247
Server version: 5.0.45 MySQL Community Server (GPL)


Type 'help;' or '\h' for help. Type '\c' to clear the buffer.


mysql> DROP USER '';
Query OK, 0 rows affected (0.06 sec)


mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('whatever password you think is appropriate');
Query OK, 0 rows affected (0.00 sec)
```

Congratulations! You've successfully removed anonymous access to your MySQL server. Now, don't forget that password.
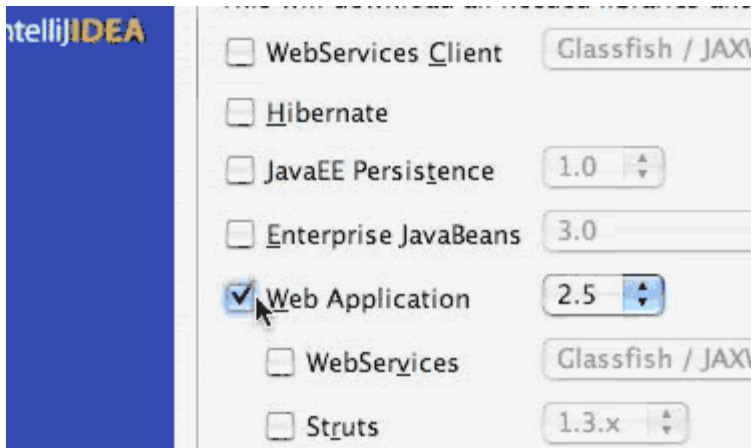
Part 4: HelloWorld Tutorial for OpenEJB

Before you get started

This tutorial assumes you are using IntelliJ IDEA 7. The actual .WAR file that we produce in the tutorial can be written in any IDE.

- Download the hello-openejb example code
- **Watch a video version of this tutorial** at https://mediamill.cla.umn.edu/mediamill/embed/7008

4.1: Creating the project

1. In IntelliJ IDEA, click on the **Create New Project** link to start the "New Project" wizard.
2. Select **Create a project from scratch** and click **Next >**
3. Name your project "hello-openejb" and click **Next >**
4. Do not change anything on the third screen. Use the default source directory name "src" and click **Next >**
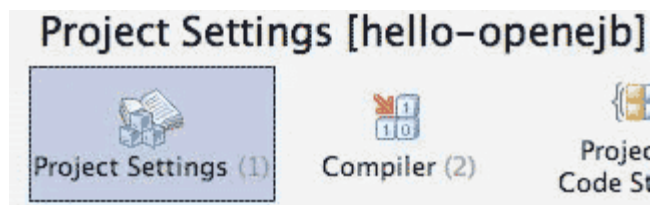5. Select **Web Application** from the "desired technologies" checklist:

6. Click **Finish**.

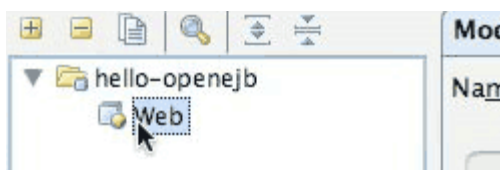## 4.2: Configure the packaging and production options

1. Once your project is loaded and open, click on the **Settings** button in the top right corner:
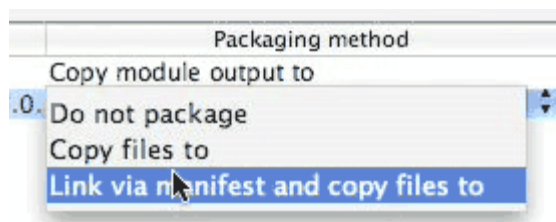
2. From the Settings screen, click on **Project Settings**:

3. In the left column, click on **Modules**.
4. In the second column, click on the arrow to the left of the **hello-openejb** module to activate the drop-down menu.
5. Click on the **Web** icon:

6. In the "Facet 'Web'" window change the **Packaging method** dropdown for the **javaee.jar** to **Copy files to**:

This will ensure that the javaee.jar gets packaged into the /WEB-INF/lib directory of your web archive later on.
7. Click on the **Java EE Build Settings** tab to continue configuring your build:

8. Select **Create web module war file:**
9. Enter the full name for your Web Archive file. It should end up inside your Tomcat webapps directory. (I entered
   `/Users/alex/apache-tomcat-6.0.14/webapps/hello-openejb.war`)
10. Click **OK** to save your changes.
11. Exit the Settings screen to finish.

4.3: Writing the HelloServlet

1. Inside of the `src` directory for your project, create an **example** package.
2. Inside of the `example` package, create a new class, named **HelloServlet**.
3. Copy the following into your HelloServlet class:

```
package example;
```

```
import javax.servlet.ServletOutputStream;

import javax.servlet.http.HttpServlet;

import javax.servlet.http.HttpServletRequest;

import javax.servlet.http.HttpServletResponse;

import java.io.IOException;


public class HelloServlet extends HttpServlet {

    protected void doGet(HttpServletRequest req,
                          HttpServletResponse res)
              throws IOException {

        res.setContentType("text/plain");
        ServletOutputStream out = res.getOutputStream();

        out.println("Hello World!");
    }
}
```

4. Now, open the `WEB-INF/web.xml` file and enter the following data:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns="http://java.sun.com/xml/ns/javaee"
          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
          xsi:schemaLocation="http://java.sun.com/xml/ns/javaee
       http://java.sun.com/xml/ns/javaee/web-app_2_5.xsd"
          version="2.5">


    <servlet>
        <servlet-name>HelloServlet</servlet-name>
        <servlet-class>example.HelloServlet</servlet-class>
    </servlet>

    <servlet-mapping>
        <servlet-name>HelloServlet</servlet-name>
        <url-pattern>/hello/*</url-pattern>
    </servlet-mapping>

</web-app>
```
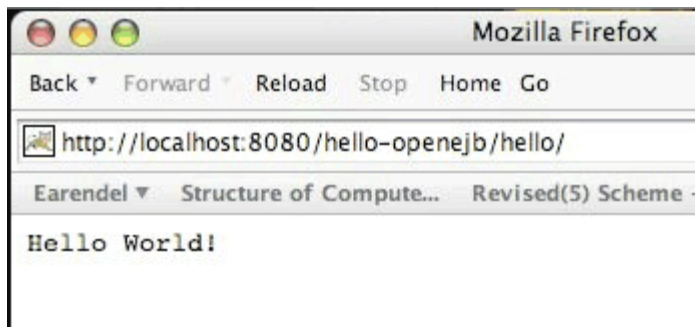
5. When you are finished editing your `web.xml` file, to to the **Build** menu and choose **Rebuild Project**. This will build your entire project, package the output into the .WAR file you specified earlier, and deploy the .WAR file to your `webapps` directory in Tomcat.

6. After about 10 seconds you should be able to http://localhost:8080/hello-openejb/hello and see the following:

4.4: Creating the Local Interface

1. Create an interface in your `hello` package called **Hello**.
2. Enter the following contents into your `Hello` interface:

```
package example;

import javax.ejb.Local;

@Local
public interface Hello {

    public String greet(String s);

}
```

4.5: Creating the Stateless Session Bean

Once you have the `Hello` interface defined, you need to write its implementation bean.
1. Create a class inside of your `hello` packaged called **HelloBean**
2. Enter the following contents into your `HelloBean` class:

```
package example;

import javax.ejb.Stateless;

@Stateless
public class HelloBean implements Hello {

    public String greet(String s) {
        return "Hello " + s + "!";
    }
}
```

4.6: Getting the Stateless Session Bean from HelloServlet

1. Now, amend your `HelloServlet` class to the following:

```
package example;

import javax.ejb.EJB;
import javax.servlet.ServletOutputStream;
```

```
import javax.servlet.http.HttpServlet;

import javax.servlet.http.HttpServletRequest;

import javax.servlet.http.HttpServletResponse;

import java.io.IOException;


public class HelloServlet extends HttpServlet {

    @EJB
    Hello bean;

    protected void doGet(HttpServletRequest req,
                         HttpServletResponse res)
            throws IOException {

        res.setContentType("text/plain");
        ServletOutputStream out = res.getOutputStream();

        out.println("Hello World!");
        out.println(bean.greet("OpenEJB User"));
    }
}
```
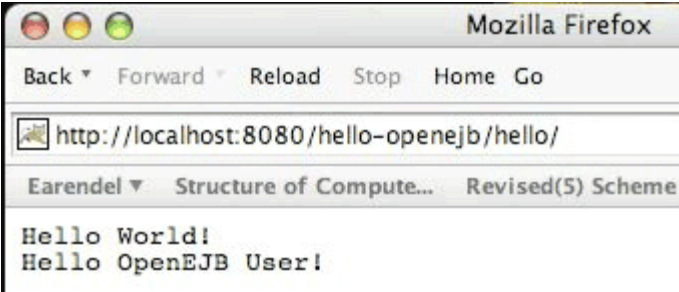
2. When you are finished, go to the **Build** menu and select **Rebuild Project** to repackage and redeploy your .WAR file to Tomcat.
3. After about 10 seconds, you should be able to go to http://localhost:8080/hello-openejb/hello/ and see the new output:

I	Attachment	Action	Size	Date	Who	Comment
	download_apache_06.png	manage	23.5 K	16 Dec 2007 - 00:04	Main.AlexSaintCroix	download apache v6
	hello-openejb_r8.zip	manage	1221.0 K	16 Dec 2007 - 00:39	Main.AlexSaintCroix	hello-openejb example (rev 8)
	hello_openejb.png	manage	16.0 K	16 Dec 2007 - 00:07	Main.AlexSaintCroix	Hello OpenEJB!
	hello_world.png	manage	15.9 K	15 Dec 2007 - 23:54	Main.AlexSaintCroix	hello world
	java_ee_build_settings.png	manage	2.2 K	15 Dec 2007 - 23:55	Main.AlexSaintCroix	Java EE Build Settings

	javaee_packaging_method.png	manage	7.3 K	15 Dec 2007 - 23:55	Main.AlexSaintCroix	Java EE Packaging Method
	mysql_installation_disk.png	manage	11.2 K	15 Dec 2007 - 23:56	Main.AlexSaintCroix	MySQL Installation Disk
	openejb_installed.png	manage	29.1 K	15 Dec 2007 - 23:57	Main.AlexSaintCroix	OpenEJB Installed
	project_settings.png	manage	7.1 K	15 Dec 2007 - 23:57	Main.AlexSaintCroix	Project Settings
	select_web_application.png	manage	10.4 K	15 Dec 2007 - 23:57	Main.AlexSaintCroix	select web application
	settings_button.png	manage	2.3 K	15 Dec 2007 - 23:58	Main.AlexSaintCroix	settings button
	start_mysql.png	manage	9.4 K	15 Dec 2007 - 23:59	Main.AlexSaintCroix	start MySQL
	tomcat_running.png	manage	61.1 K	15 Dec 2007 - 23:59	Main.AlexSaintCroix	Tomcat running
	web_icon.png	manage	5.1 K	16 Dec 2007 - 00:00	Main.AlexSaintCroix	Web module icon

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Parents: WebHome *OpenEJB.Building_the_ATOM_stack moved from OpenEJB.OpenEjbMySqlOSX on 13 Dec 2007 - 03:56 by Main.AlexSaintCroix -* put it back

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