Stateless Session Bean

Stateful Session Bean Developing EJB applications

Stateless beans are used in the case when the process or action can be completed in one go. In this case, object state will not be preserved in a series of linked invocation. Each invocation of bean will be unique in itself in a Stateless Session Bean. A stateless session bean in represented by **@Stateless** annotation.

Here is an example of Simple Stateless Session Bean:

StatelessBean.java

```
@Stateless
public class StatelessBean implements StatelessBeanRemote
{
public void SimpleFunction()
{
System.out.println("This is a stateless session bean");
}
}
```

As can be seen in the code, @Stateless defines a simple POJO as a Stateless Session bean.

The above gives a very high level idea of what is a stateless session bean and how is it implemented using EJB3 annotations. While working with examples we will try to make you understand stateless session beans in-depth.

Stateless Session Bean Sample

This sample application will take you through the basics of Stateless Session Bean. This application will demonstrate how annotations like @Stateless, @Resource, @PostConstruct, @PreDestroy are used in an EJB3 application.

The application walks through a authentication page, where the user has to authenticate to move to the resource page of Apache Geronimo. In case of a new user, the user has to go through the registration process. Later the user will be directed to login page again once the registration is done. In the login page the bean class will check for the username and password entered by the user against a database.

Basically a Stateless Session EJB is used whenever there is a single step process and maintaining a session is obsolete. In this sample the user registration form is a one step process and hence we have used stateless session bean for its implementation. The login page is a misnomer and should not be considered as an implementation for stateless session EJB. This is because once logged in you have to maintain the session and stateless session beans are not meant to maintain the session.

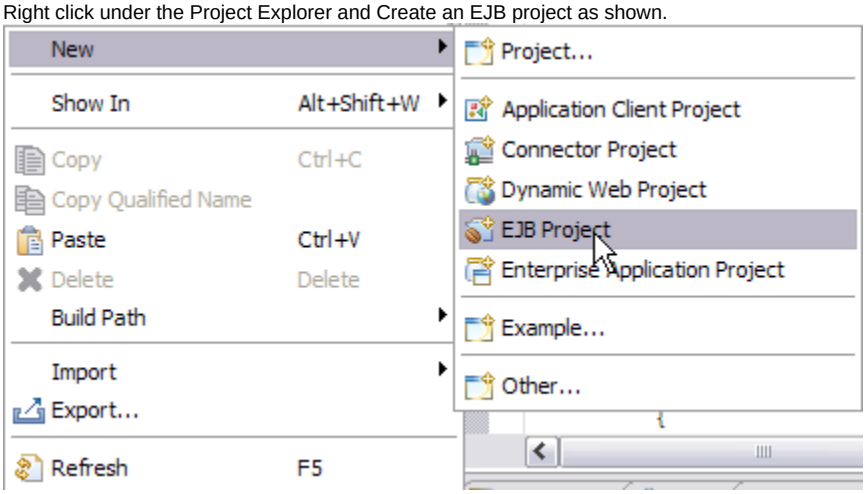
To run this tutorial, as a minimum you will be required to have installed the following prerequisite software.

- Sun JDK 5.0+ (J2SE 1.5)
- Eclipse 3.3.1.1 (Eclipse Classic package of Europa distribution), which is platform specific
- Web Tools Platform (WTP) 2.0.1
- Data Tools Platform (DTP) 1.5.1
- Eclipse Modeling Framework (EMF) 2.3.1
- Graphical Editing Framework (GEF) 3.3.1

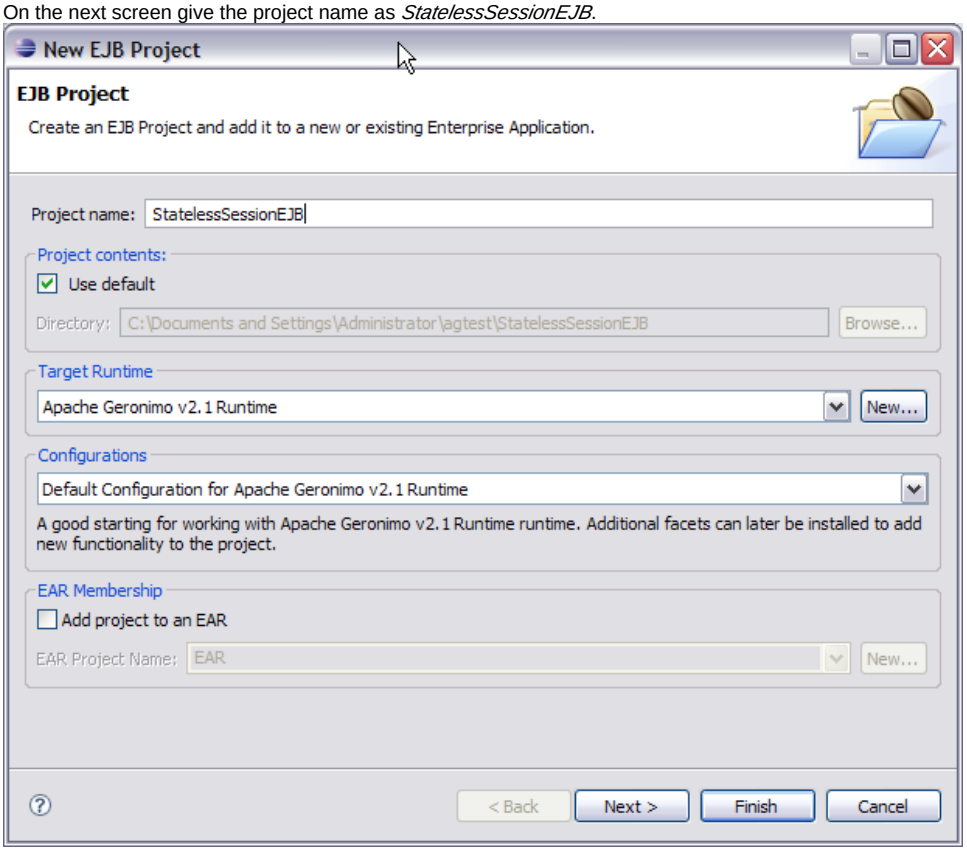
Details on installing eclipse are provided in the Development environment section.
This tutorial is organized in the following sections:

Creating a Stateless Session EJB project

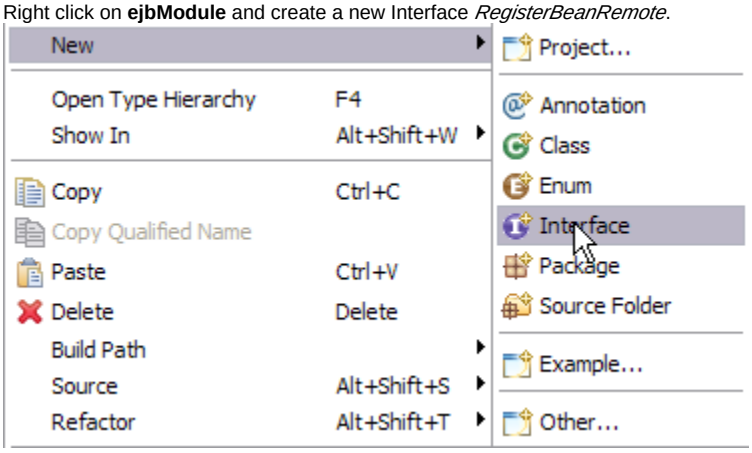
1. Right click under the Project Explorer and Create an EJB project as shown.



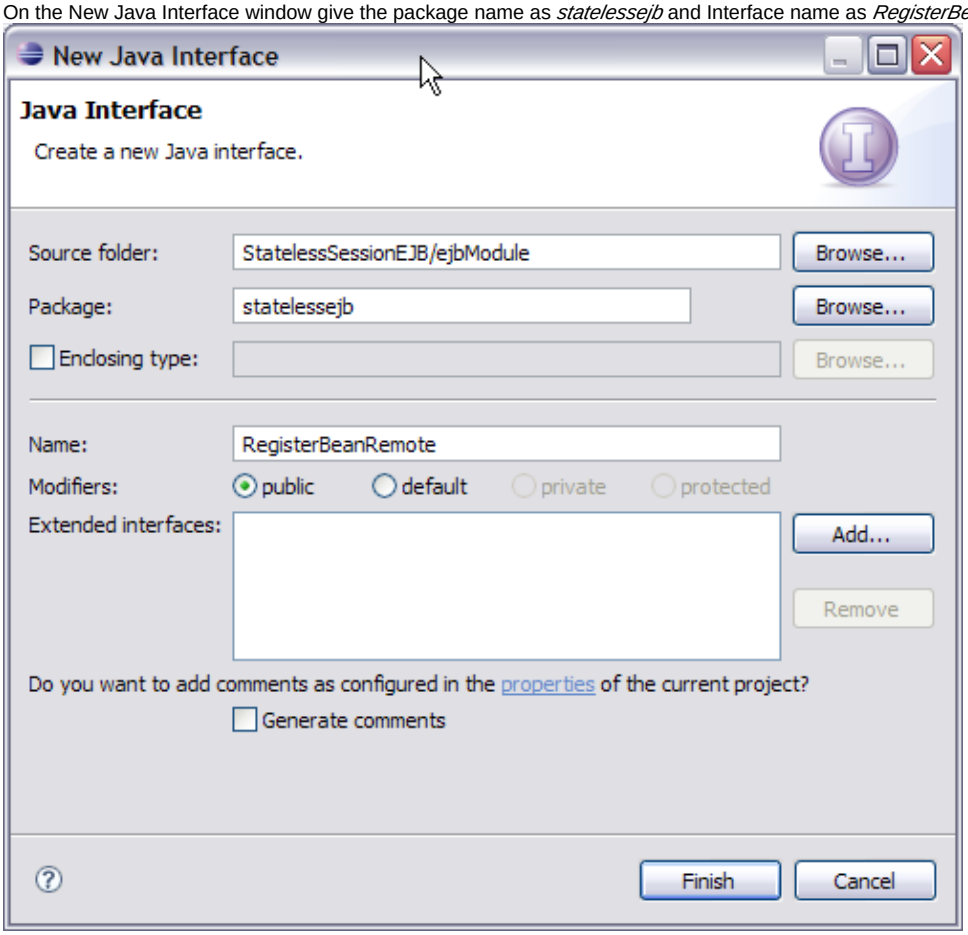
2. On the next screen give the project name as *StatelessSessionEJB*.



3. Right click on **ejbModule** and create a new Interface *RegisterBeanRemote*.



4. On the New Java Interface window give the package name as *statelessejb* and Interface name as *RegisterBeanRemote*.



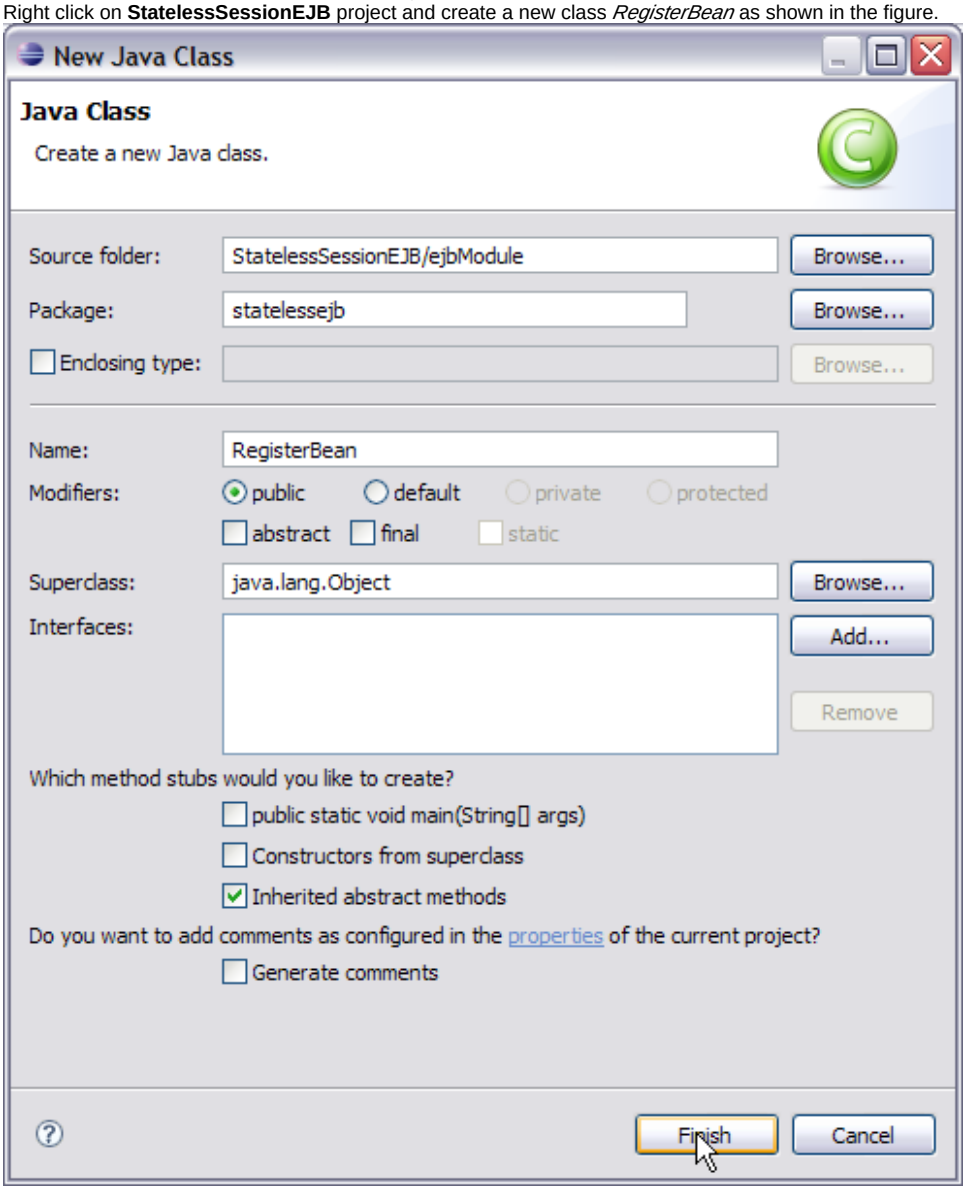
5. Populate the *RegisterBeanRemote* interface with the following code.

RegisterBeanRemote.java

```
package statelessejb;
import javax.ejb.Remote;
@Remote
public interface RegisterBeanRemote
{
public void register(String FirstName, String LastName, String Sex, String UserName, String Password);
public boolean verify(String username, String password);
}
```

In the above code @Remote is a metadata annotation which marks the interface to be a Remote Interface. Metadata annotations are used to declare a class, interface or functions to have particular attributes. In this case the interface is marked to be a Remote Interface.

6. Right click on **StatelessSessionEJB** project and create a new class *RegisterBean* as shown in the figure.



7. Populate the class *RegisterBean* with the following data:

RegisterBean.java

```
package statelessejb;
import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import javax.annotation.PostConstruct;
import javax.annotation.PreDestroy;
import javax.annotation.Resource;
import javax.ejb.Stateless;
import javax.sql.DataSource;
@Stateless
public class RegisterBean implements RegisterBeanRemote{
        @Resource(name="jdbc/userds")
        private DataSource dbsource;
        private Connection dbconnect;
```

```
        @PostConstruct
        public void initialize()
        {
                try{
                        dbconnect= dbsource.getConnection();
                }
                catch(Exception e)
                {
                        e.printStackTrace();
                }
        }
        public void register(String FirstName, String LastName, String Sex, String UserName, String
Password)
        {
                try
                {
                        String insert="INSERT INTO USERINFO (" + "FIRSTNAME," + "LASTNAME," + "SEX," +
"USERNAME," + "PASSWORD)" + " VALUES(?,?,?,?,?)";
                        PreparedStatement ps=dbconnect.prepareStatement(insert);
                        ps.setString(1,FirstName);
                        ps.setString(2,LastName);
                        ps.setString(3,Sex);
                        ps.setString(4,UserName);
                        ps.setString(5,Password);
                        int rs =ps.executeUpdate();
                }
                catch(Exception e)
                {
                        e.printStackTrace();
                }
        }
        public boolean verify(String username, String password)
        {
                boolean ret=false;
                String select="SELECT * FROM USERINFO";
                try{
                PreparedStatement ps=dbconnect.prepareStatement(select);
                ResultSet rs= ps.executeQuery();
                while(rs.next())
                {
                        String str=(rs.getString("USERNAME")).trim();
                        String str1=(rs.getString("PASSWORD")).trim();
                        if (str.compareTo(username)==0)
                        {
                        if(str1.compareTo(password)==0)

                                {
                                ret=true;
                                break;
                                }

                        else
                            ret=false;
                        }
                        else
                                ret=false;
                }
                }
                catch(Exception e)
                {
                        e.printStackTrace();
                }
                System.out.println(ret);
                return ret;
        }
        @PreDestroy
        public void destroy(){
                try
                {
                dbconnect.close();
                dbconnect=null;
```

```
                }
                catch(Exception e)
                {
                        e.printStackTrace();
                }

        }
}
```

Lets try to understand this code.

a. The very first line has an annotation **@Stateless** which declares the POJO to be a Stateless Session Bean. This annotation tells the container that the class is a Stateless Session Bean class. The container now automatically takes care of the various services like pooling, thread safety, transactions and so on.
b. The second line suggests that the bean class implements the remote interface. Every EJB application has to have at least one interface. In this case we are having a remote interface.
c. Next we have the **@Resource(name="jdbc/userds")** annotation which suggests *jdbc/userds* datasource being injected on to EJB. This is called dependency injection. The main idea behind dependency injection is that a component should call the resource through interfaces. This in turn will create a loosely coupled architecture between component and resource. Dependency injection is actually JNDI lookup in reverse order. In JNDI lookup the Bean looks up the resources itself and that is why it has to be hardcoded in the bean code itself whereas in Dependency Injection the Container reads the Bean and finds out what resources are required by the bean class. Later it injects the resources at runtime. How to create **jdbc/userds** datasource is discussed in the next section.
d. Next interesting part is the **@PostConstruct** annotation. This annotation is used for lifecycle callbacks. A lifecycle callback method is used by container to inform the bean class of the state transitions in the bean lifecycle. @PostConstruct annotation is used once a bean instance is created. In our example we have our bean instance created and Dependency injected. Later @PostConstruct callback is invoked and a connection to the datasource is established.
e. Next we have the **register** function which is used to populate the database **USERINFO** with user information. This function uses PreparedStatement to query the database.
f. Next is the **verify** function which is used for the authentication of user credentials.
g. **@PreDestroy** is again a lifecycle callback which suggests to release the resources before the bean is destroyed.

Warning

Due to some limitations in Geronimo Eclipse Plugin the generated deployment plan(`openejb-jar.xml`) does not have the correct namespace. Replace the existing namespace as shown in the figure with the following
<openejb-jar xmlns="http://www.openejb.org/xml/ns/openejb-jar-2.2" xmlns:nam="http://geronimo.apache.org/xml/ns/naming-1.2" xmlns:pkgen="http://www.openejb.org/xml/ns/pkgen-2.0" xmlns:sec="http://geronimo.apache.org/xml/ns/security-1.2" xmlns:sys="http://geronimo.apache.org/xml/ns/deployment-1.2">

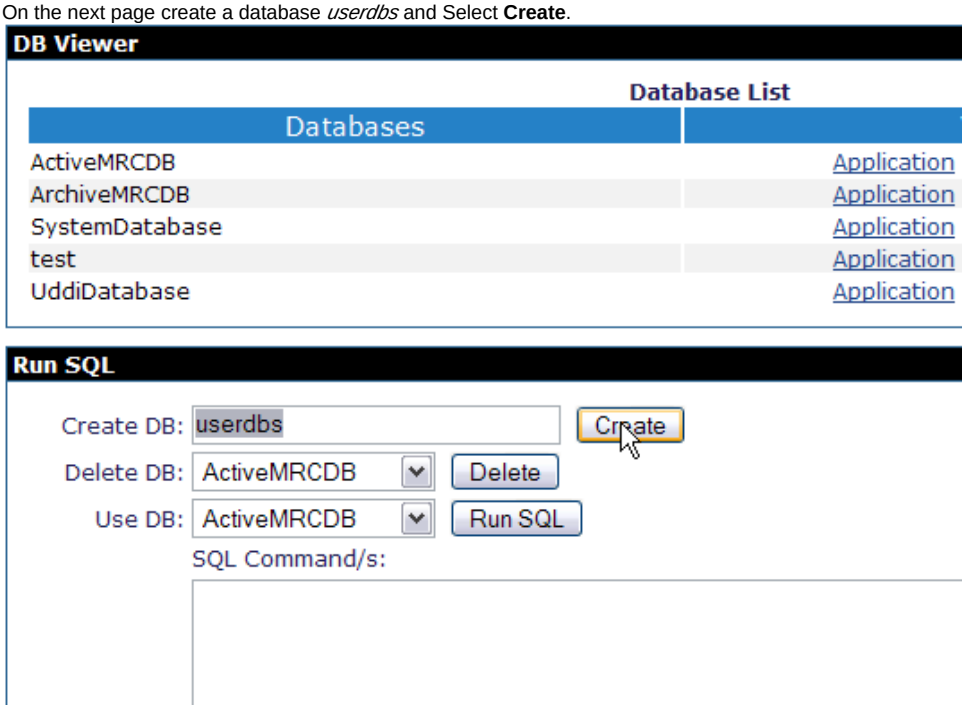
This completes the development of EJB project.

Creating a database using the administrative console

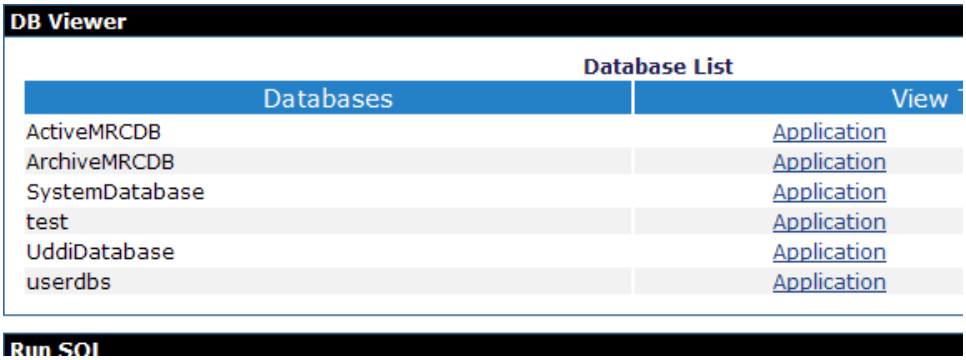
1. Start the server and launch the Administrative Console using the URL http://localhost:8080/console.
2. Enter default username and password.

3. In the welcome page, Under *Embedded DB*, Select **DB Manager**.

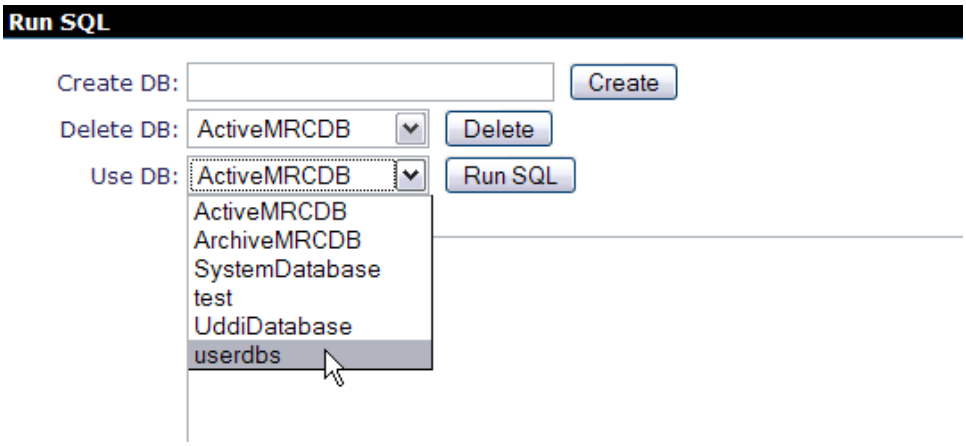
4. On the next page create a database *userdbs* and Select **Create**.



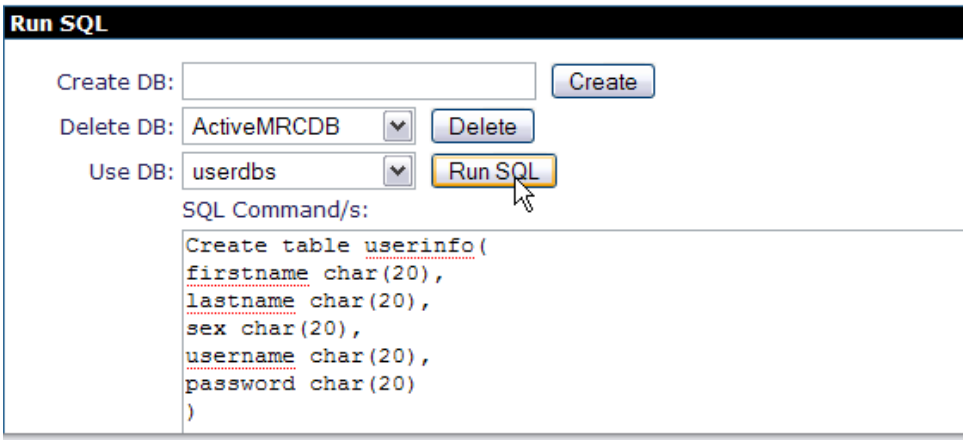
5. Once done you can see the **userdbs** database listed in DB Viewer portlet under Databases. This confirms that the database has been successfully created.



6. As shown in the figure under *Use DB*, select **userdbs** from the dropdown box.



7. Run the query as shown in the figure. This query will create table **USERINFO** with the columns *FIRSTNAME*, *LASTNAME*, *SEX*, *USERNAME*, *PASSWORD*.

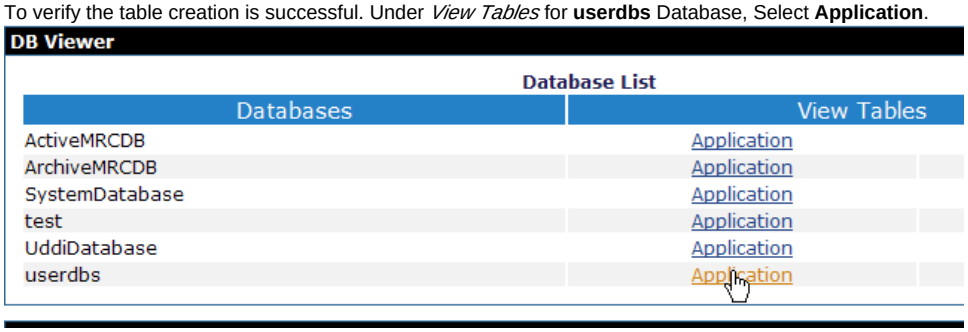


CreateTable.sql

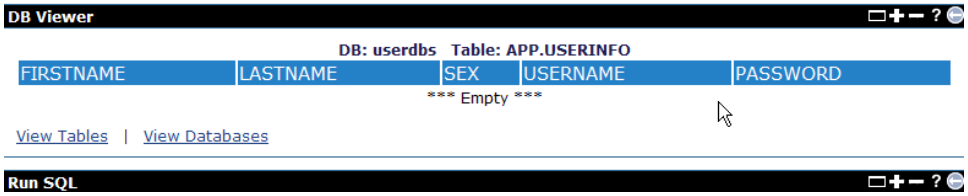
```
CREATE TABLE USERINFO
(
FIRSTNAME char(20),
LASTNAME  char(20),
SEX       char(7),
USERNAME  char(20),
```

```
PASSWORD  char(20)
)
```

8. To verify the table creation is successful. Under *View Tables* for **userdbs** Database, Select **Application**.



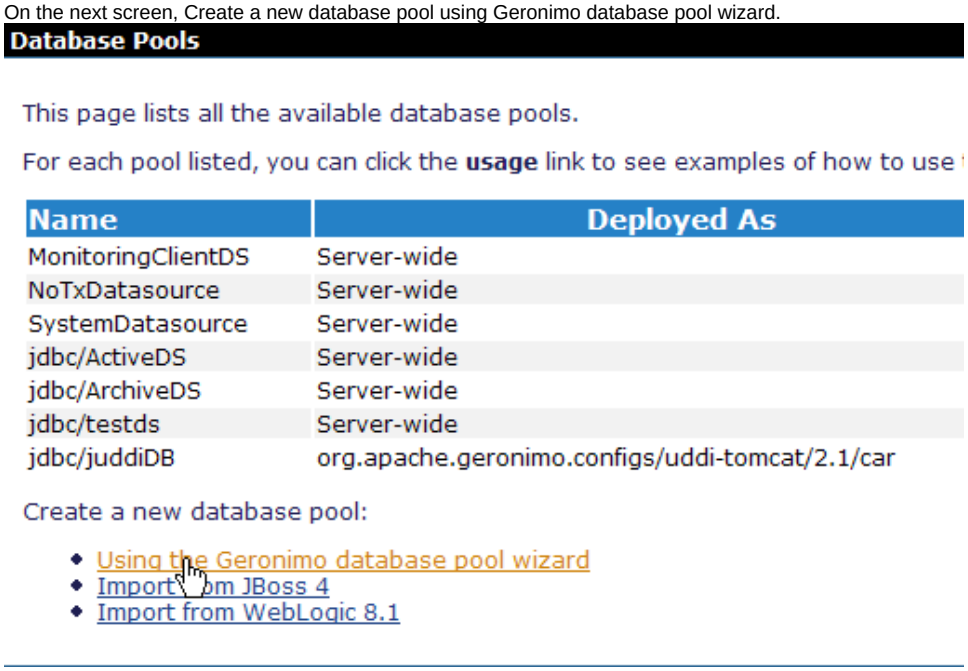
9. The next window will show the table **USERINFO** associated with **userdbs** Database.



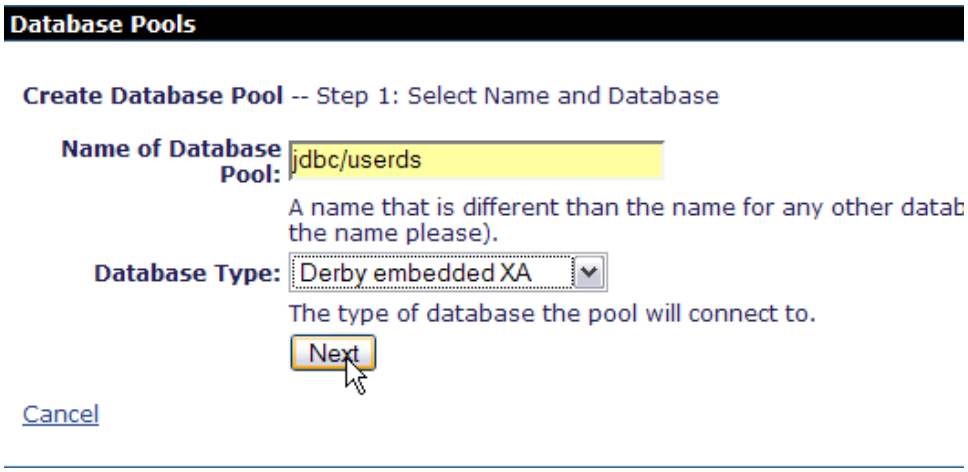
Creating a datasource using Administrative Console

1. Start the server and Launch the Administrative Console using the URL http://localhost:8080/console.
2. Enter default username and password.
3. Once in the welcome page. In console navigation, Under *Services*, Select **Database Pools**.

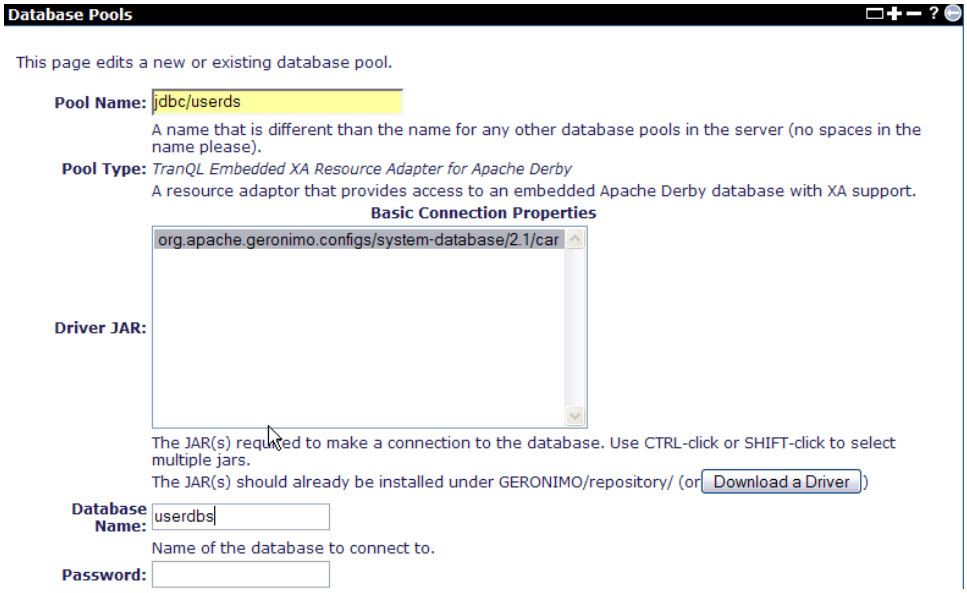
4. On the next screen, Create a new database pool using Geronimo database pool wizard.



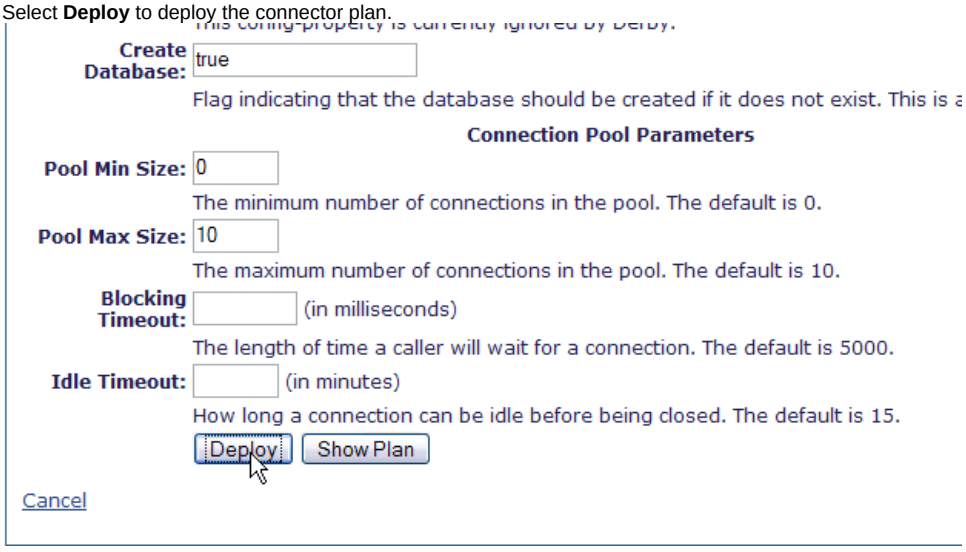
5. On the next screen give the name as suggested in the figure. This will initiate the process to create a Derby Embedded XA datasource.



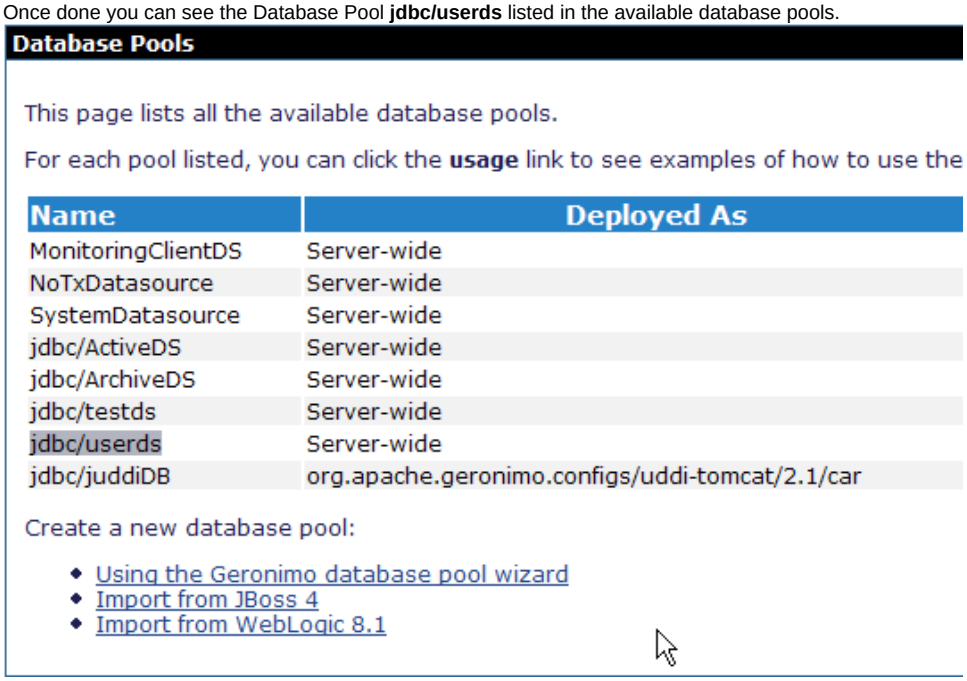
6. Select the Driver jar and give the database name as *userdbs* (Remember this is the database we created in the previous step). The rest of fields can be set to default.



7. Select **Deploy** to deploy the connector plan.



8. Once done you can see the Database Pool **jdbc/userds** listed in the available database pools.



Creating application client

1. Create a new dynamic Web Project with the name *ApplicationClient*.
2. Right click on **WebContent** and create the following `login.jsp`:

login.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<title>Welcome to Apache Geronimo</title>
</head>
<body bgcolor="white">
<form method="post" action="passCredentials.jsp">
<h2 align="center"><font color="blue">Welcome to Apache Geronimo</font></h2>
<h2 align="center"><font color="blue">Enter your credentials</font></h2>
Enter your Username
<input type="text" name="username" size=20><br>
Enter your Password
<input type="password" name="password" size=20><br>
<input type="submit" value="Login">
<a href="http://localhost:8080/ApplicationClient/register.jsp">NewUser</a>
</form>
</body>
</html>
```

This form is the login page for our application. Once the user enters his/her credentials, these are passed to another jsp `passCredentials.jsp` (checkout the action in the form tag) to verify the authenticity of user credentials. In case the user is new he has to go through the registration process. This statement **NewUser** is used to route the user to registration page.

passCredentials.jsp

```
<%@ page import="java.util.Properties,javax.naming.Context,javax.naming.InitialContext,statelessejb.
```

```
RegisterBeanRemote" %>
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<title>Insert title here</title>
</head>
<body bgcolor="white">
<%!boolean i; %>
<%
Properties prop=new Properties();
prop.put(Context.INITIAL_CONTEXT_FACTORY, "org.apache.openejb.client.RemoteInitialContextFactory");
        prop.put("java.naming.provider.url", "ejbd://localhost:4201");
Context context = new InitialContext(prop);
RegisterBeanRemote myejb=(RegisterBeanRemote)context.lookup("RegisterBeanRemote");
String s= request.getParameter("username");
String s1= request.getParameter("password");
i=myejb.verify(s,s1);
%>
<%
        if (i==true){
%>
<jsp:forward page="/resources.jsp"></jsp:forward>
<%
        } else {
%>
        <jsp:forward page="/login.jsp"></jsp:forward>
<%
}
%>
</body>
</html>
```

<%!boolean i; %> is a declaration for a global variable. The other part is a scriptlet which does a JNDI lookup to the remote interface. Later the user credentials are passed to **verify** function. In case the credentials are correct user is routed to the resources page else he is redirected to login page to re-login.
Why is the lookup name RegisterBeanRemote??

This will be explained in the deploy an run section

resources.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<title>Welcome to Apache Geronimo</title>
</head>
<body bgcolor="white">
<h3><font color="blue">Welcome to Apache Geronimo Resource Center</font></h3>
Apache Geronimo Home Page
<a href="http://geronimo.apache.org">Apache Geronimo Home page</a><br>
Join our mailing list
<a href="http://geronimo.apache.org/mailing-lists.html">Apache Geronimo Mailing List</a><br>
Come and Contribute to Apache Geronimo V2.1 Documentation
<a href="http://cwiki.apache.org/GMOxDOC22/">Apache Geronimo V2.1 Documentation</a>
</body>
</html>
```

This is the final page of the application which displays the various resources.

register.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
```

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<title>Welcome to Apache Geronimo</title>
</head>
<body bgcolor="white">
<script type="text/javascript">
function valForm()
{
        if (this.document.form1.username.value=="" || this.document.form1.username.value=="")
        {
                alert("You cannot leave the field blank");
                this.document.form1.firstname.focus();
                return false;
        }
        else
        {
                return true;
        }
}
</script>
<h2 align="center"><font color="blue">Welcome to Apache Geronimo User Registration</font></h2>
<form method="post" name="form1" action="passVariables.jsp" onSubmit=" return valForm();">
FirstName
<INPUT type="text" name="firstname" SIZE=20><br>
LastName
<INPUT type="text" name="lastname" SIZE=20 ><br>
Sex<br>
<input type="radio" name="sex" value="male"> Male
<br>
<input type="radio" name="sex" value="female"> Female
<br>
Select a UserName<br>
<input type="text" name="username" size=20><br>
Select a Password<br>
<input type="password" name="password"  size=20><br>
<br>
<input type="submit" value="Submit">
</form>
</body>
</html>
```

This page is the registration page. Once th user fills up the form and press Submit a **valform()** function is called which validates the field username and password. In case any of them is empty an alert is send which suggests empty fields in the form. If all is fine `passVariables.jsp` is called.

passVariables.jsp

```
<%@ page import="java.util.Properties,javax.naming.Context,javax.naming.InitialContext,statelessejb.
RegisterBeanRemote" %>

<html>
<head>

<meta http-equiv="Refresh" content="5;URL=http://localhost:8080/ApplicationClient/login.jsp">
<title>Welcome to Apache Geronimo</title>
</head>

<%
Properties prop=new Properties();
prop.put(Context.INITIAL_CONTEXT_FACTORY, "org.apache.openejb.client.RemoteInitialContextFactory");
        prop.put("java.naming.provider.url", "ejbd://localhost:4201");
Context context = new InitialContext(prop);
RegisterBeanRemote myejb=(RegisterBeanRemote)context.lookup("RegisterBeanRemote");
String s= request.getParameter("firstname");
String s1= request.getParameter("lastname");
String s2= request.getParameter("sex");
```

```
String s3= request.getParameter("username");
String s4= request.getParameter("password");
myejb.register(s,s1,s2,s3,s4);
%>

<h3 align="center"><font color="blue">Thank you for registering with Apache Geronimo</font></h3>
<h3 align="center"><font color="blue">Redirecting to Login Page</font></h3>
</html>
```

In this page the fields are retrieved from `register.jsp` and the register function in the bean class is called to populate the database.
The code **<meta http-equiv="Refresh" content="5;URL=http://localhost:8080/ApplicationClient/login.jsp">** suggests to wait for 5 seconds and then move to login.jsp

index.jsp

```
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<body>
<jsp:forward page="/login.jsp" />
</body>
</html>
```

Few more configurations

1. In the EJB Project. Under *META-INF*, edit `openejb-jar.xml` and add the following

datasource dependency

```
<sys:dependencies>
            <sys:dependency>
                <sys:groupId>console.dbpool</sys:groupId>
                <sys:artifactId>jdbc_userds</sys:artifactId>
            </sys:dependency>
</sys:dependencies>
```

Finally the `openejb-jar.xml` will look like this

openejb-jar.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<openejb-jar xmlns="http://www.openejb.org/xml/ns/openejb-jar-2.2"
xmlns:nam="http://geronimo.apache.org/xml/ns/naming-1.2"
xmlns:pkgen="http://www.openejb.org/xml/ns/pkgen-2.0"
xmlns:sec="http://geronimo.apache.org/xml/ns/security-1.2"
xmlns:sys="http://geronimo.apache.org/xml/ns/deployment-1.2">
  <sys:environment>
    <sys:moduleId>
      <sys:groupId>default</sys:groupId>
      <sys:artifactId>StatelessSessionEJB</sys:artifactId>
      <sys:version>1.0</sys:version>
      <sys:type>car</sys:type>
    </sys:moduleId>
    <sys:dependencies>
            <sys:dependency>
                <sys:groupId>console.dbpool</sys:groupId>
                <sys:artifactId>jdbc_userds</sys:artifactId>
            </sys:dependency>
</sys:dependencies>
  </sys:environment>
```

```
  <enterprise-beans/>
</openejb-jar>
```

Where did the above dependencies come from??

To make the datasource visible to EJB we need to add a dependency to the EJB deployment plan that is openejb-jar.xml. The above element can be obtained automatically from Geronimo Database Pool wizard. Select usage against the database pool jdbc/userds

2. In the WEB Project. Under WEB-INF, Edit geronimo-web.xml and add the following

EJB dependency

```
<sys:dependencies>
       <sys:dependency>
            <sys:groupId>default</sys:groupId>
                     <sys:artifactId>StatelessSessionEJB</sys:artifactId>
                     <sys:version>1.0</sys:version>
                     <sys:type>car</sys:type>
       </sys:dependency>
</sys:dependencies>
```

Finally the `geronimo-web.xml` will look like this

geronimo-web.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app xmlns="http://geronimo.apache.org/xml/ns/j2ee/web-1.2"
xmlns:nam="http://geronimo.apache.org/xml/ns/naming-1.2"
xmlns:sec="http://geronimo.apache.org/xml/ns/security-1.2"
xmlns:sys="http://geronimo.apache.org/xml/ns/deployment-1.2">
  <sys:environment>
    <sys:moduleId>
      <sys:groupId>default</sys:groupId>
      <sys:artifactId>ApplicationClient</sys:artifactId>
      <sys:version>1.0</sys:version>
      <sys:type>car</sys:type>
    </sys:moduleId>
    <sys:dependencies>
       <sys:dependency>
            <sys:groupId>default</sys:groupId>
                     <sys:artifactId>StatelessSessionEJB</sys:artifactId>
                     <sys:version>1.0</sys:version>
                     <sys:type>car</sys:type>
       </sys:dependency>
</sys:dependencies>
  </sys:environment>
  <context-root>/ApplicationClient</context-root>
</web-app>
```

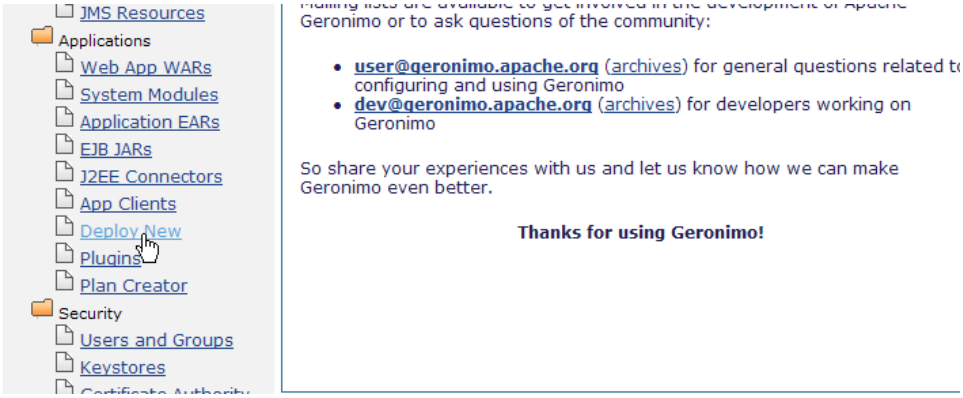
3. Right click on the **ApplicationClient** Project and select **properties**. Select Java Build Path->Projects. Click **Add** and add Stateless Session EJB. This is required for the compilation of the Client code.

Deploy and Run

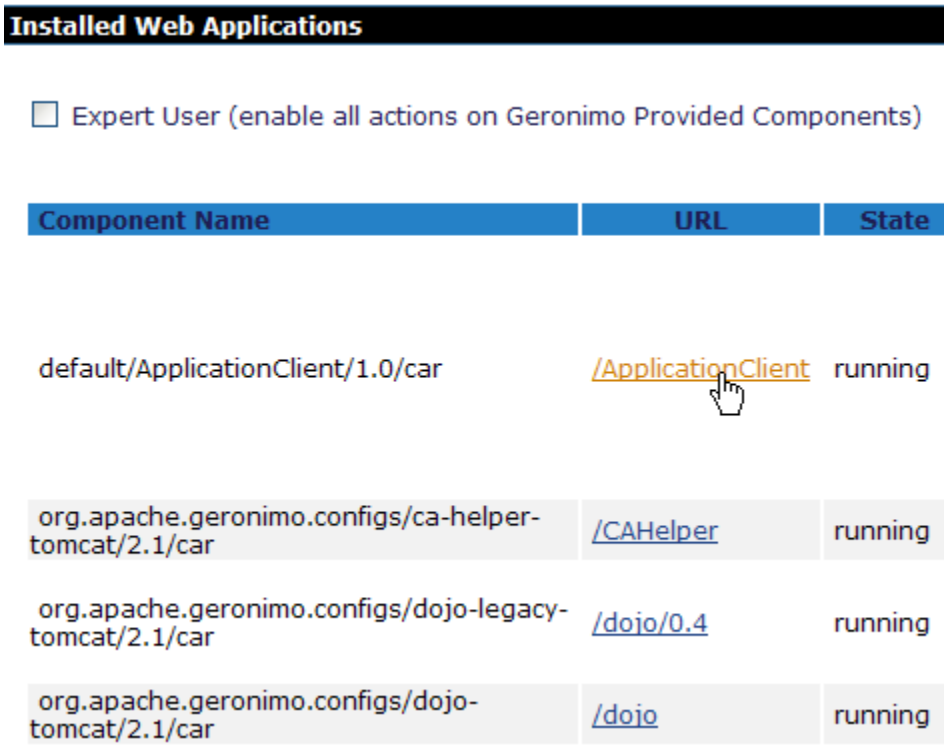
warning

Due to limitation with Geronimo Eclipse Plugin, you will have to export the Stateless Session EJB project and Web Application project as a jar and war respectively.

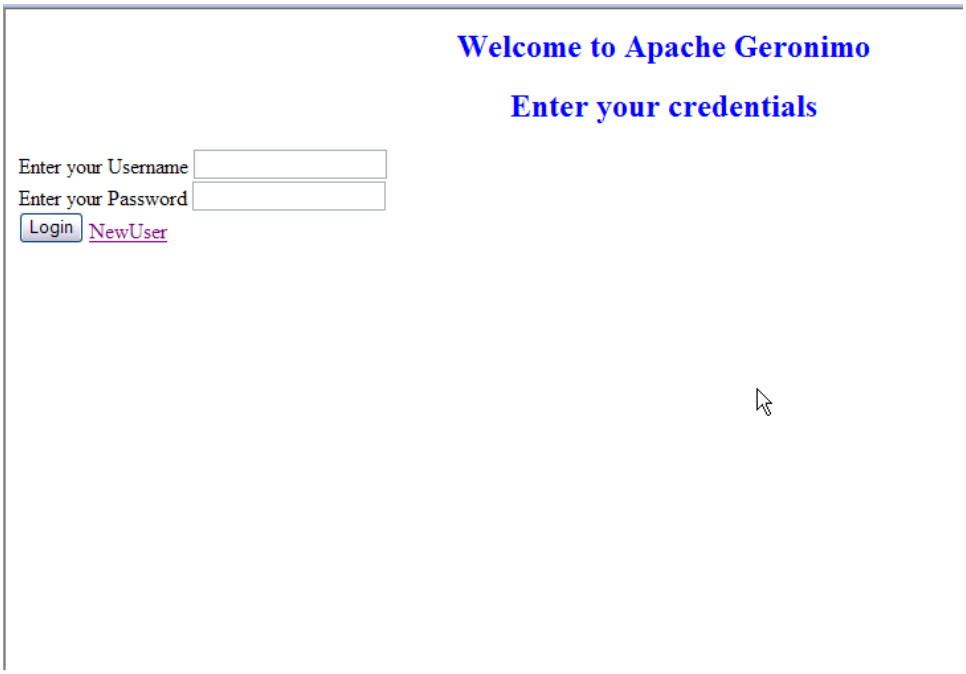
1. Export the projects to your local disk as `StatelessSessionEJB.jar` and `ApplicationClient.war`.
2. Start the server and launch the Administrative console using http://localhost:8080/console/. Enter default username and password.
3. In the welcome page, under Applications. Select Deploy New.



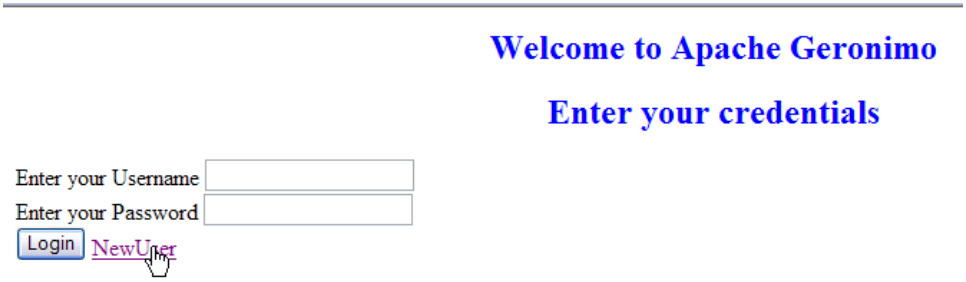
4. Browse and Select StatelessSessionEJB.jar. Once done Select Install. This will deploy the EJB application on to server.
5. Browse and Select ApplicationClient.war. Once done select Install. This will deploy the Web application on to server.
6. Under Applications, Select Web App WARs and Run ApplicationClient project as show in the figure.



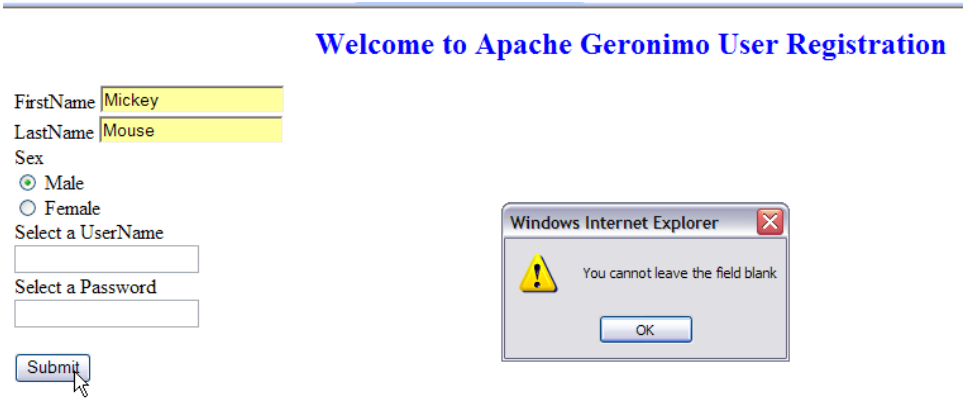
7. Once done a welcome page will be launched.



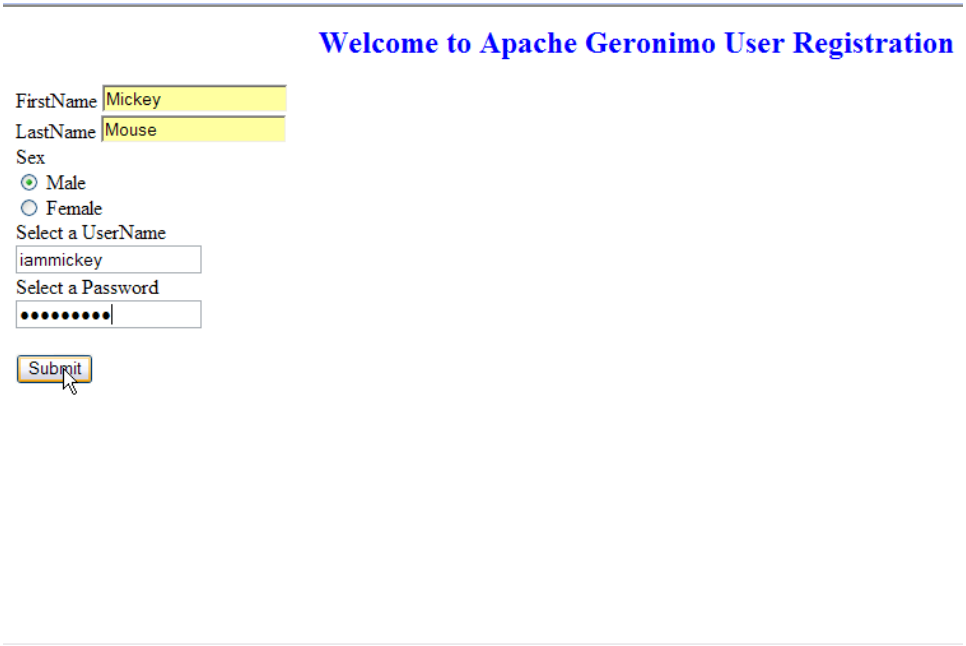
8. If you are New User. Select **New User** as shown in the figure



9. This will display a new registration form. If you leave the mandatory username or password filed empty. You will get the following error message.

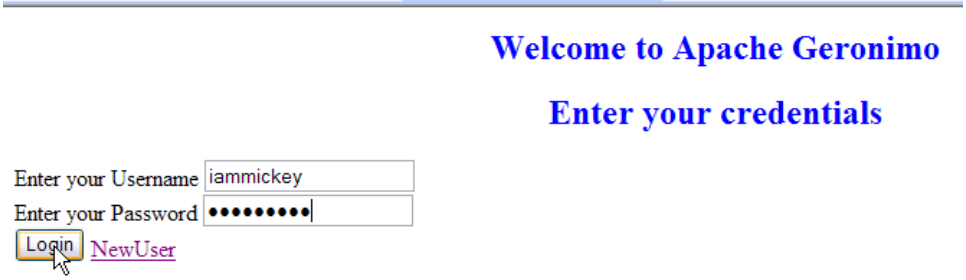


10. Fill the fields as shown in the figure and Select **Submit**.

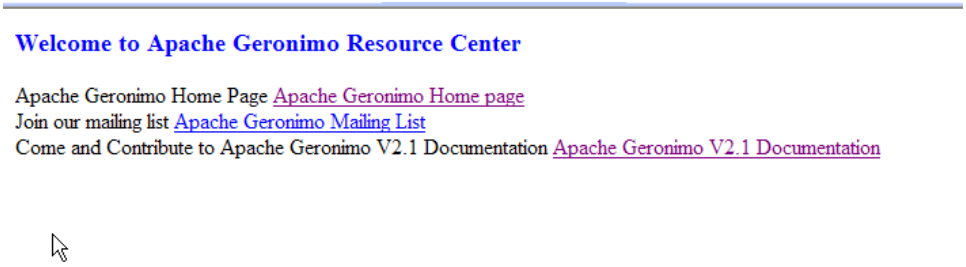


11. Once done a page will be displayed from where you will be automatically redirected to login page to relogin.

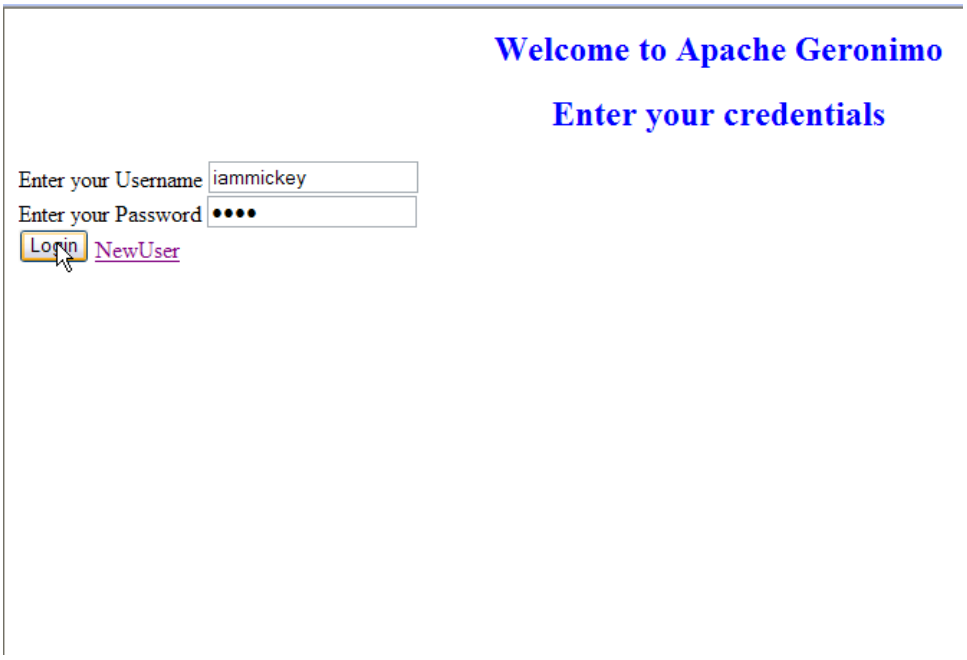
12. Enter the username and password as chosen by you during registration and select **Login**.



13. The next page is the Apache Geronimo Resource Center.



14. In case you give wrong username and password combination you will be redirected to login page.


Welcome to Apache Geronimo
Enter your credentials
Enter your Username iammickey
Enter your Password ••••
Login
NewUser