Building Collaborative CRUD Applications With ICEfaces and NetBeans

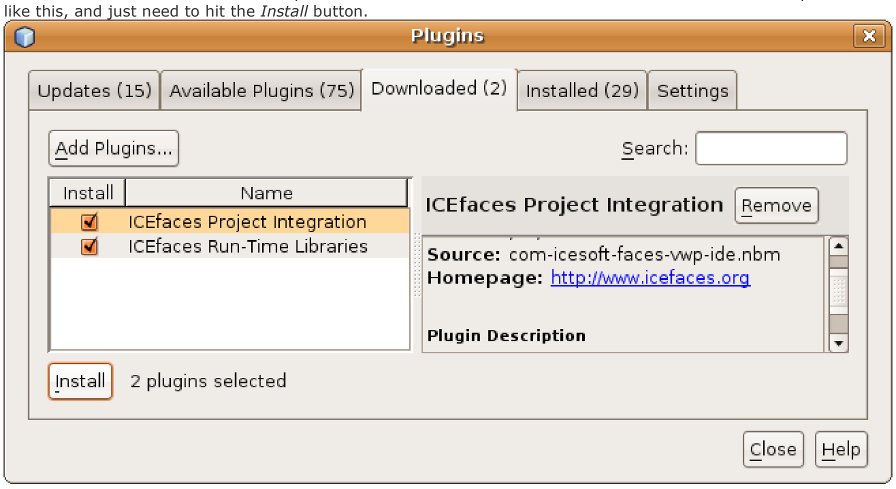
CRUD-style applications remain the mainstay of enterprise application development, but more and more, application developers are looking to add Rich Internet Application (RIA) capabilities into their development process. ICEfaces provides a comprehensive development framework for building RIAs using pure Java techniques based on JavaServer Faces (JSF), but beyond RIA features ICEfaces can truly revolutionize web applications by facilitating real time collaboration using Ajax Push. The latest ICEfaces 1.7 release includes complete integration with NetBeans 6.0.1 making it easy to build collaborative RIA-style applications; Glassfish combined with the Asynchronous Request Processing (ARP) features of Grizzly provides the scalable deployment infrastructure required for push-style web applications.

Essentially, CRUD-style applications enable users to interact with enterprise data, including **C**reating, **R**eading, **U**pdating and **D**eleting data, thus the CRUD acronym. If we apply RIA techniques to a CRUD application, our primary motivation is to make interactions between user and data more effective. This might mean providing sortable table headers, improving data navigation through hierarchical tree representations, and enriching master/detail views onto the data. While making the user interaction with the application more effective is a worthwhile exercise onto itself, it does nothing to enhance the interactions between the users of that data. This is where Ajax Push techniques come into play, as they enable asynchronous real time data push to the user when data changes. Now, when those changes occur as the result of one user manipulating the data, all users interested in that particular data can be instantaneously informed of the change. Web-based collaboration is the essence of Web 2.0 and Ajax Push enables it, fundamentally changing what is possible in web applications and turning dusty old CRUD applications into rich, interactive, collaboration platforms.

So what does it take to build collaborative CRUD applications? In the remainder of this article we will work through a very basic example using ICEfaces and NetBeans to illustrate how easily attainable they are. While the example is simplistic, it fully exposes all the technique you will require to leverage rich ICEfaces features and Ajax Push all through the NetBeans JSF Visual Design Editor. The example uses the ICEfaces 1.7, and NetBeans 6.0.1 releases. The completed NetBeans project can be download from the ICEfaces tutorial page under the *IDE Tutorials* tab.

Installing the ICEfaces Plugins in NetBeans

1. Registered ICEfaces community members can download the ICEfaces/NetBeans integration bundle here. The bundle is located under *IDE Tool Integrations > NetBeans*, and is called *ICEfaces-1.7.0-Netbeans-6.0.1-modules.zip*. Unpack the bundle somewhere that you can access it from NetBeans.
2. Install the ICEfaces plugins into NetBeans from *Tools > Plugins* dialog, using the *Downloaded* tab. The *Add Plugins* button is used to select the ICEfaces plugins which are called *com-icesoft-faces-vwp-ide.nbm* and *com-icesoft-ide-netbeans-libs-module.nbm*. Once you have selected the plugins, you should see something like this, and just need to hit the *Install* button.



Install	Name
✓	ICEfaces Project Integration
✓	ICEfaces Run-Time Libraries

ICEfaces Project Integration

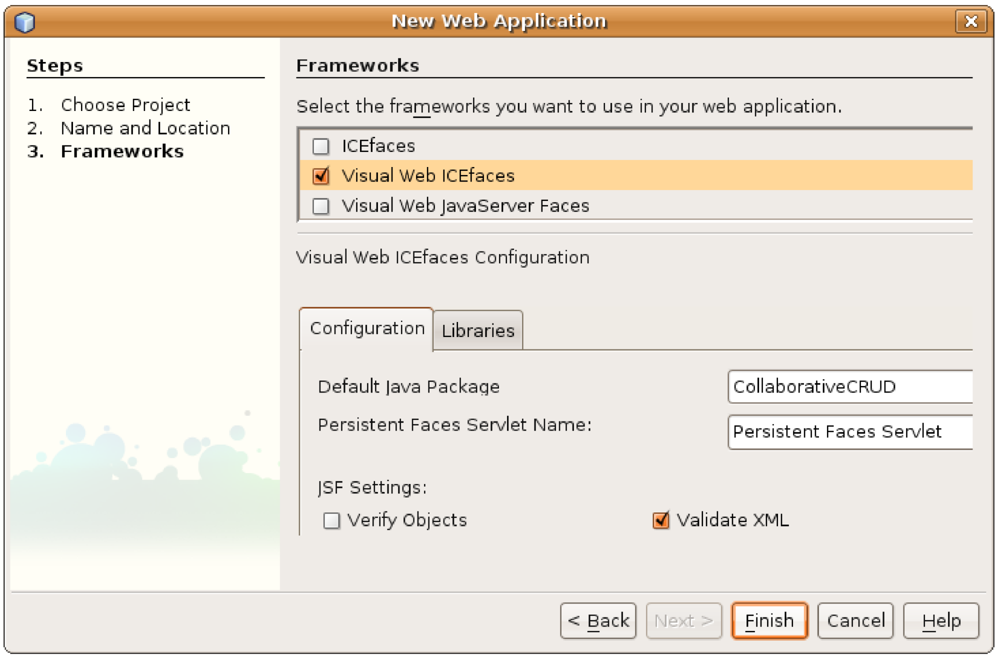
Source: com-icesoft-faces-vwp-ide.nbm
Homepage: http://www.icefaces.org

Plugin Description

2 plugins selected

Creating an ICEfaces Project

1. Create a new project using *File > New Project* wizard, and select *Web > Web Application* for the project type and hit *Next >* button.
2. Name the project *CollaborativeCRUD* and select GlassFish V2 server, and Java EE 5, then hit the *Next >* button.
3. Select the Visual Web ICEfaces framework, as illustrated below, and hit Finished button.



Select the frameworks you want to use in your web application.

- [ ] ICEfaces
- [✓] Visual Web ICEfaces
- [ ] Visual Web JavaServer Faces

Visual Web ICEfaces Configuration

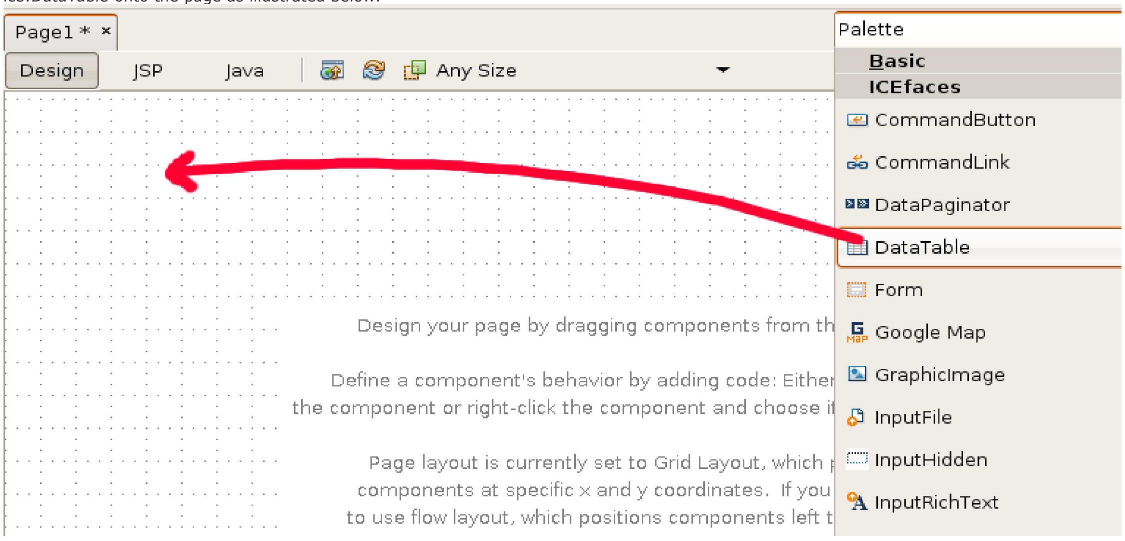
Default Java Package	CollaborativeCRUD
Persistent Faces Servlet Name:	Persistent Faces Servlet

JSF Settings:
[ ] Verify Objects [✓ Validate XML]

4.

Connecting an ice:DataTable to a Database Table

1. In the Visual Design Editor, you see the template for an ICEfaces page called Page1. Delete the default *InputTextarea*, and from the ICEfaces Palette drag an *ice:DataTable* onto the page as illustrated below.

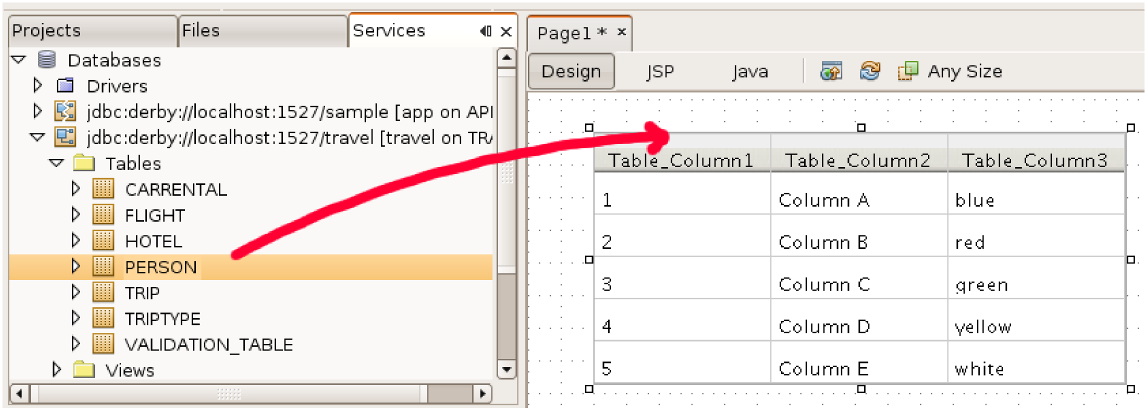


Design your page by dragging components from th

Define a component's behavior by adding code: Either
the component or right-click the component and choose i

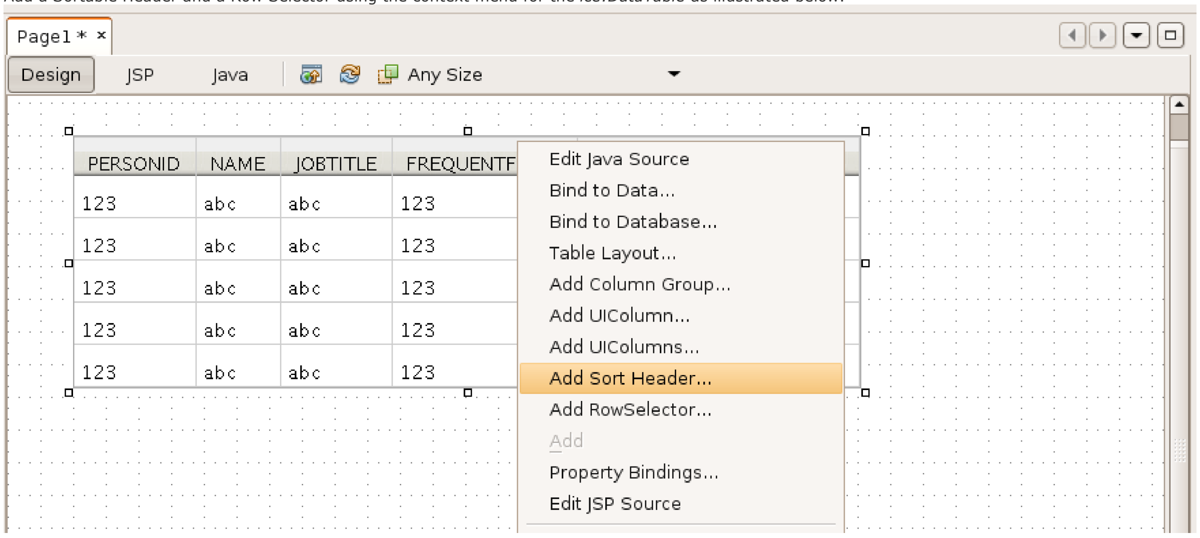
Page layout is currently set to Grid Layout, which p
components at specific x and y coordinates. If you
to use flow layout, which positions components left t

2. Next, drag a database table onto the *ice:DataTable*. This can be done from the *Services* tab under *Databases*, as illustrated below. For this example you will use the *Person* table, from the *Travel* database. Make sure the drag target is the *dataTable* and not the *htmlForm*. You will see that the column data in the *ice:DataTable* now reflect the content of the *Person* database table.



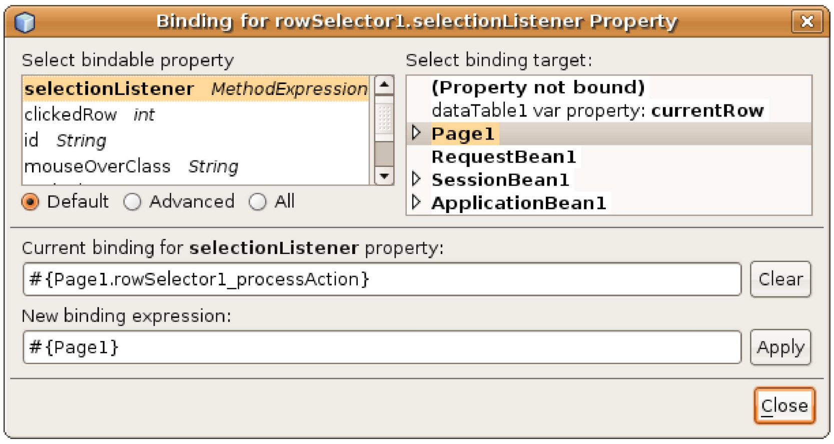
Table_Column1	Table_Column2	Table_Column3
1	Column A	blue
2	Column B	red
3	Column C	green
4	Column D	yellow
5	Column E	white

3. Add a Sortable Header and a Row Selector using the context menu for the *ice:DataTable* as illustrated below.



PERSONID	NAME	JOBTITLE	FREQUENTF
123	abc	abc	123
123	abc	abc	123
123	abc	abc	123
123	abc	abc	123
123	abc	abc	123

4. When the row selector binding dialog appears, simply accept the defaults and close, as illustrated below. Later you will use the *rowSelectior1_processAction* listener to implement the editing logic for selected rows.


Binding for rowSelector1.selectionListener Property

Select bindable property

selectionListener	*MethodExpression*
clickedRow	*int*
id	*String*
mouseOverClass	*String*

[✓ Default] Advanced All

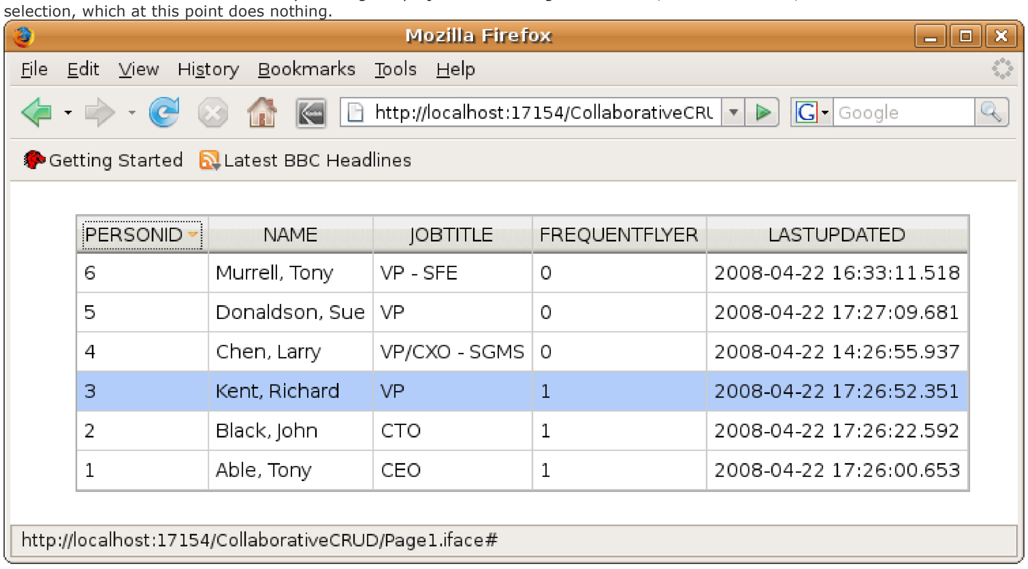
Select binding target:

(Property not bound)
dataTable1 var property: **currentRow**
Page1
RequestBean1
SessionBean1
ApplicationBean1

Current binding for **selectionListener** property:
#{Page1.rowSelector1_processAction}

New binding expression:
#{Page1}

5. You can now test that this all works by building the project and running it. The result, illustrated below, is a sortable table of the *Person* database with row selection, which at this point does nothing.


Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://localhost:17154/CollaborativeCRU
Google
Getting Started
Latest BBC Headlines

PERSONID	NAME	JOBTITLE	FREQUENTFLYER	LASTUPDATED
6	Murrell, Tony	VP - SFE	0	2008-04-22 16:33:11.518
5	Donaldson, Sue	VP	0	2008-04-22 17:27:09.681
4	Chen, Larry	VP/CXO - SGMS	0	2008-04-22 14:26:55.937
3	Kent, Richard	VP	1	2008-04-22 17:26:52.351
2	Black, John	CTO	1	2008-04-22 17:26:22.592
1	Able, Tony	CEO	1	2008-04-22 17:26:00.653

http://localhost:17154/CollaborativeCRUD/Page1.iface#

Implement Simple Data Model To Support Editing

1. First you need to create a wrapper class for the person data.

```
package CollaborativeCRUD;

import java.sql.Timestamp;
import java.util.TreeMap;

public class Person {
   private Integer personId;
   private String name;
   private String jobTitle;
   private Integer frequentFlyer;
   private Timestamp lastDateUpdated;

   public Integer getFrequentFlyer() {
      return frequentFlyer;
   }
   public void setFrequentFlyer(Integer frequentFlyer) {
      this.frequentFlyer = frequentFlyer;
   }
   public String getJobTitle() {
      return jobTitle;
   }
   public void setJobTitle(String jobTitle) {
      this.jobTitle = jobTitle;
   }
   public Timestamp getLastDateUpdated() {
      return lastDateUpdated;
   }
   public void setLastDateUpdated(Timestamp lastDateUpdated) {
      this.lastDateUpdated = lastDateUpdated;
   }
   public String getName() {
      return name;
   }
   public void setName(String name) {
      this.name = name;
   }
   public Integer getPersonId() {
      return personId;
   }
   public void setPersonId(Integer personId) {
      this.personId = personId;
   }
```

```
    public Person() {
    }
    public Person(Integer personId, String name, String jobTitle, Integer frequentFlyer, Timestamp lastDateUpdated) {
        this.personId = personId;
        this.name = name;
        this.jobTitle = jobTitle;
        this.frequentFlyer = frequentFlyer;
        this.lastDateUpdated = lastDateUpdated;
    }
    public Person(TreeMap data) {
        this.personId = (Integer) data.get("PERSON.PERSONID");
        this.name = (String) data.get("PERSON.NAME");
        this.jobTitle = (String) data.get("PERSON.JOBTITLE");
        this.frequentFlyer = (Integer) data.get("PERSON.FREQUENTFLYER");
        this.lastDateUpdated = (Timestamp) data.get("PERSON.LASTUPDATED");
    }
}
```

2. Next you will establish some state in your page bean to support editing of the selected row. You need to capture the selected person, and maintain a boolean indicating whether editing is disabled.

```
public class Page1 extends AbstractPageBean {
    // Managed Component Definitions
   ...
    private Person blankPerson = new Person(0, "", "", 0, null);
    private Person selectedPerson = blankPerson;
    private boolean editDisabled = true;

    public boolean isEditDisabled() {
        return editDisabled;
    }
    public void setEditDisabled(boolean editDisabled) {
        this.editDisabled = editDisabled;
    }
    public Person getSelectedPerson() {
        return selectedPerson;
    }
    public void setSelectedPerson(Person selectedPerson) {
        this.selectedPerson = selectedPerson;
    }
```

3. Next you need to implement the row selection logic in the action listener previously defined for this. You need to extract the row out of the data model associated with the *ice:DataTable*, in this case the *dataTableSortableDataModel*. You also need to enable editing when the row is selected.

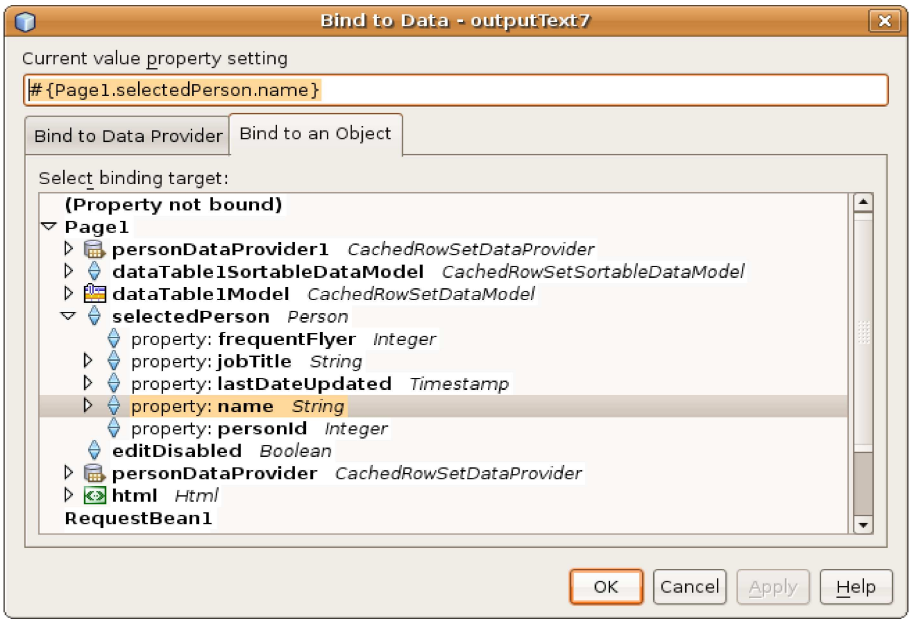
```
    public void rowSelector1_processAction(RowSelectorEvent rse) {
        int selectedRowIndex = rse.getRow();
        editDisabled = false;
        dataTable1SortableDataModel.setRowIndex(selectedRowIndex);
        selectedPerson = new Person((TreeMap) dataTable1SortableDataModel.getRowData());
    }
```

4. Build the project so that the new objects will be available for binding into the page.

Create Editing Form

1. Add a second *ice:Form* by dragging one from the ICEfaces component palette onto the page. Make sure the new form follows the existing one, and is not nested inside it. You will also have to resize the form to accept the editing controls that you will add next.

2. To keep the example as simple as possible, the editing feature will display the selected name in an *ice:OutputText*, and allow editing of the job description in an *ice:InputText*. Start by dragging an *ice:OutputText* onto the new form. Right click the *OutputText* to display the context menu, and select *Bind To Data*. You need to create the binding *#{Page1.selectedPerson.name}* as illustrated below.


Bind to Data - outputText7

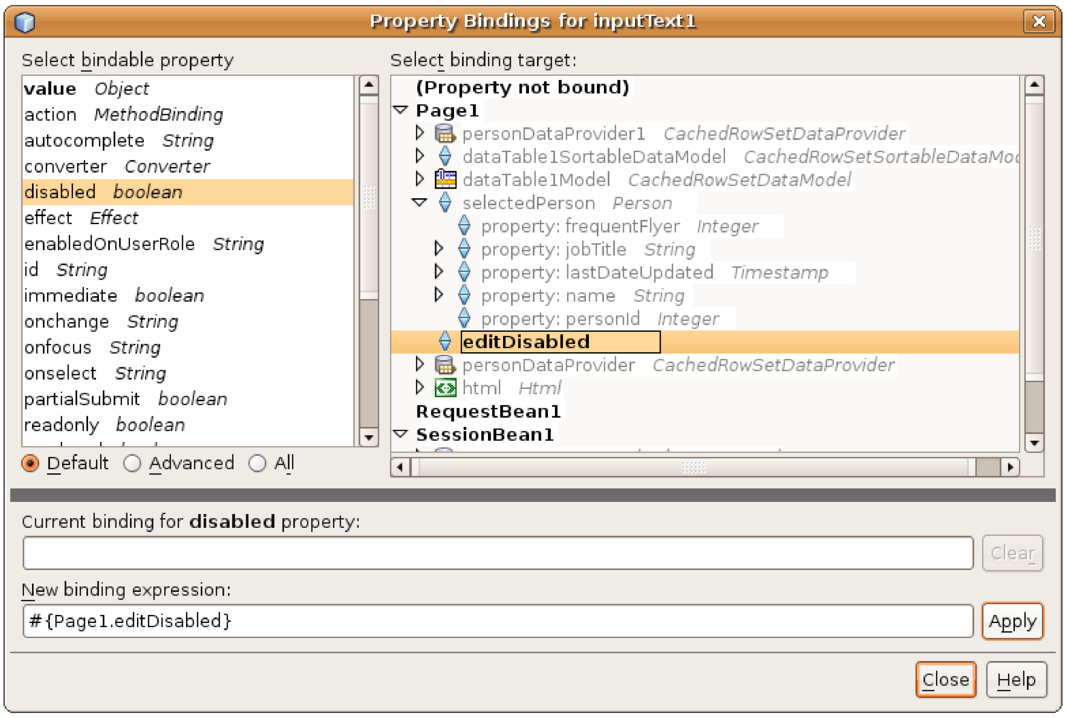
Current value property setting: #{Page1.selectedPerson.name}

Bind to Data Provider | Bind to an Object

Select binding target:

```
(Property not bound)
Page1
  personDataProvider1  CachedRowSetDataProvider
  dataTable1SortableDataModel  CachedRowSetSortableDataModel
  dataTable1Model  CachedRowSetDataModel
  selectedPerson  Person
    property: frequentFlyer  Integer
    property: jobTitle  String
    property: lastDateUpdated  Timestamp
    property: name  String
    property: personId  Integer
  editDisabled  Boolean
  personDataProvider  CachedRowSetDataProvider
  html  Html
RequestBean1
```

3. Now drag an *ice:InputText* onto the form, and create the binding *#{Page1.selectedPerson.jobTitle}* in the same manner that you did for the *OutputText*. Once you have done that you will add one additional binding to enable and disable the *InputText*. Again, right click the *InputText* and from the context menu select *Property Bindings*. You need to bind the *disabled* property to your *editDisabled* boolean in the page bean, as illustrated below.


Property Bindings for inputText1

Select bindable property

value	*Object*
action	*MethodBinding*
autocomplete	*String*
converter	*Converter*
disabled	*boolean*
effect	*Effect*
enabledOnUserRole	*String*
id	*String*
immediate	*boolean*
onchange	*String*
onfocus	*String*
onselect	*String*
partialSubmit	*boolean*
readonly	*boolean*

[✓ Default] Advanced All

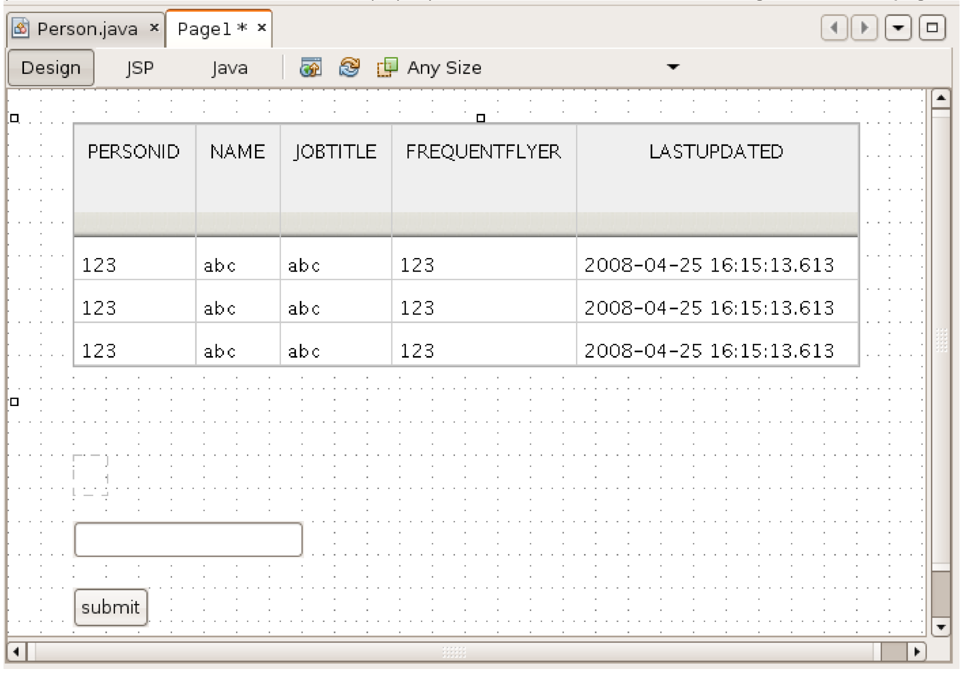
Select binding target:

```
(Property not bound)
Page1
  personDataProvider1   CachedRowSetDataProvider
  dataTable1SortableDataModel   CachedRowSetSortableDataMo
  dataTable1Model   CachedRowSetDataModel
  selectedPerson   Person
    property: frequentFlyer   Integer
    property: jobTitle   String
    property: lastDateUpdated   Timestamp
    property: name   String
    property: personId   Integer
  editDisabled
  personDataProvider   CachedRowSetDataProvider
  html   Html
RequestBean1
SessionBean1
```

Current binding for **disabled** property:

New binding expression: #{Page1.editDisabled}

4. Finally, drag an *ice:CommandButton* onto the form. When you are done, your page design should look something like illustrated below. As with the *InputText*, you want to bind the *CommandButton disabled* property to the *editDisabled* boolean with a binding like *disabled=#{Page1.editDisabled}*.



PERSONID	NAME	JOBTITLE	FREQUENTFLYER	LASTUPDATED
123	abc	abc	123	2008-04-25 16:15:13.613
123	abc	abc	123	2008-04-25 16:15:13.613
123	abc	abc	123	2008-04-25 16:15:13.613

Add The Editing Logic

1. Right click the *submit* button and from the context menu select *Edit Event Handler > processAction*, which will create the Java code for the *button1_processAction()* event listener in the page bean. You need to add logic to this member function to persist the data, and disable editing until the next row selection occurs. To do this you will use the NetBeans data provider that was established automatically when you associated the *Person* table with the *ice:DataTable*. The code for achieving this is shown below.

```
public void button1_processAction(ActionEvent ae) {
    personDataProvider.setCachedRowSet((javax.sql.rowset.CachedRowSet) getValue("#{SessionBean1.personRowSet}"));
    persistPerson(selectedPerson);
    selectedPerson = blankPerson;
    editDisabled = true;
}
```

2. The logic for persisting a person into the database is implemented as follows.

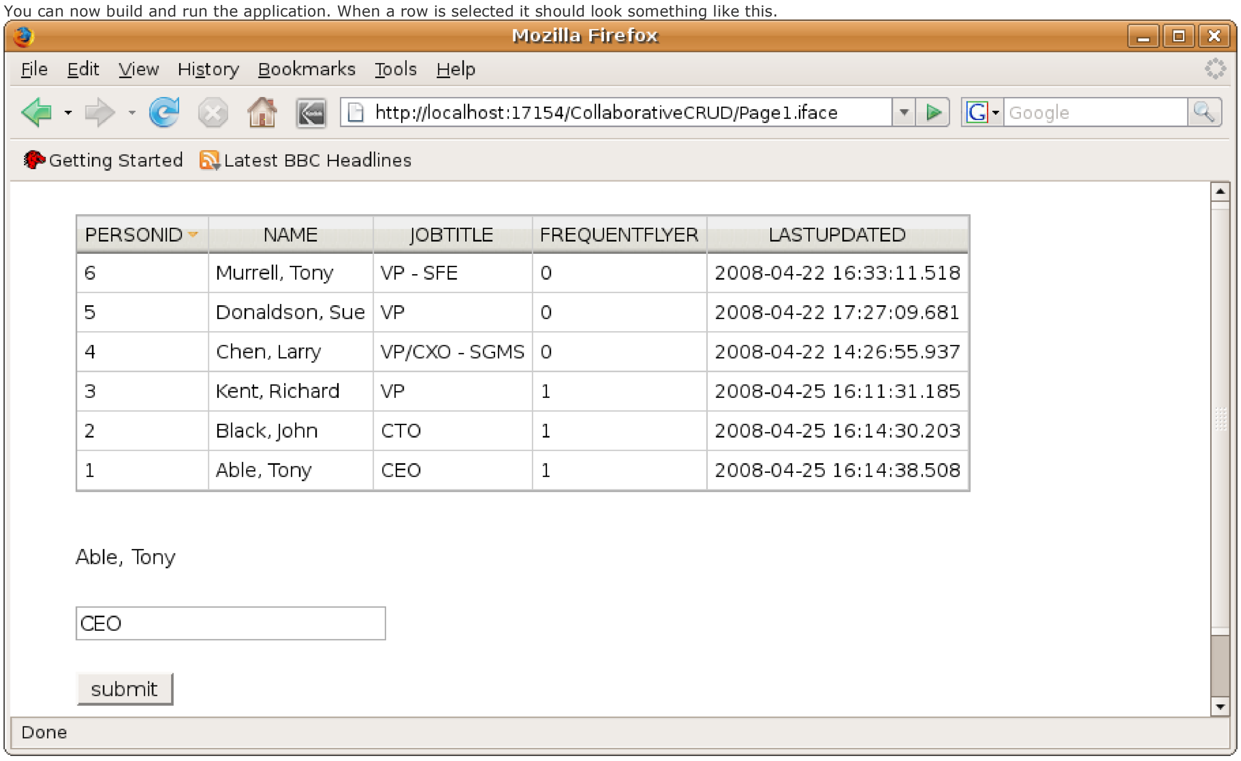
```
private void persistPerson(Person person) {
    if (personDataProvider != null) {
        java.util.Date d = new java.util.Date();
        Timestamp ts = new Timestamp(d.getTime());
        boolean done = false;
        try {
            if (personDataProvider.getRowCount() > 0) {
                personDataProvider.cursorFirst();
                do {
```

```
                if (personDataProvider.getValue("PERSON.PERSONID").equals(person.getPersonId())) {
                    personDataProvider.setValue("PERSON.NAME", person.getName());
                    personDataProvider.setValue("PERSON.JOBTITLE", person.getJobTitle());
                    personDataProvider.setValue("PERSON.FREQUENTFLYER", person.getFrequentFlyer());
                    personDataProvider.setValue("PERSON.LASTUPDATED", ts);
                    done = true;
                }
            } while (!done && personDataProvider.cursorNext());
        }
        personDataProvider.commitChanges();
    } catch (Exception ex) {
        System.out.println("Exception occured: " + ex);
        ex.printStackTrace();
    }
  }
}
```

3. One last thing you need to do is ensure that the table view on the data is refreshed before the render occurs to ensure it is up to date. This is done in the *prerender()* member function as shown below.

```
public void prerender() {
    try {
        CachedRowSet cachedRowSet = (CachedRowSet) getValue("#{SessionBean1.personRowSet}");
        cachedRowSet.execute();
        personDataProvider.refresh();
        dataTable1SortableDataModel.setWrappedData((javax.sql.rowset.CachedRowSet) getValue("#{SessionBean1.personRowSet}"));
    } catch (Exception ex) {
        System.out.println("Exception occured: " + ex);
        ex.printStackTrace();
    }
}
```

4. You can now build and run the application. When a row is selected it should look something like this.


Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://localhost:17154/CollaborativeCRUD/Page1.iface
Google
Getting Started
Latest BBC Headlines
submit
Done

PERSONID	NAME	JOBTITLE	FREQUENTFLYER	LASTUPDATED
6	Murrell, Tony	VP - SFE	0	2008-04-22 16:33:11.518
5	Donaldson, Sue	VP	0	2008-04-22 17:27:09.681
4	Chen, Larry	VP/CXO - SGMS	0	2008-04-22 14:26:55.937
3	Kent, Richard	VP	1	2008-04-25 16:11:31.185
2	Black, John	CTO	1	2008-04-25 16:14:30.203
1	Able, Tony	CEO	1	2008-04-25 16:14:38.508

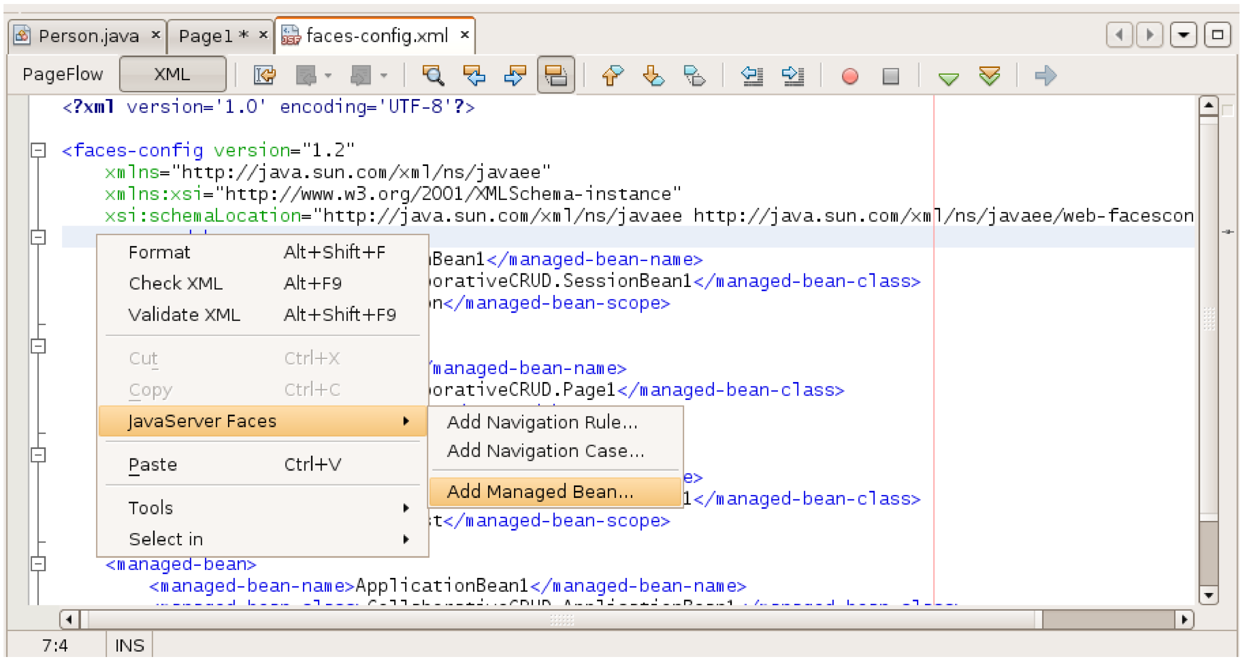
Able, Tony

CEO

5. Now try interacting with the application from 2 different browser clients. You will see that if changes are made in one client, they are not reflected in the other client until you interact with that client, at which time the data is updated to reflect the existing content in the database. Without Ajax Push implemented in this applications, the client's view onto the data can be stale at any moment in time.

Add Ajax Push

1. The Ajax Push infrastructure in ICEfaces is organized under an application scope bean called *RenderManager*. To add this bean to your application open the *faces-config.xml* in XML view in the editor. Right click an existing managed bean definition and from the context menu select *JavaServer Faces > Add Managed Bean*, as illustrated below.



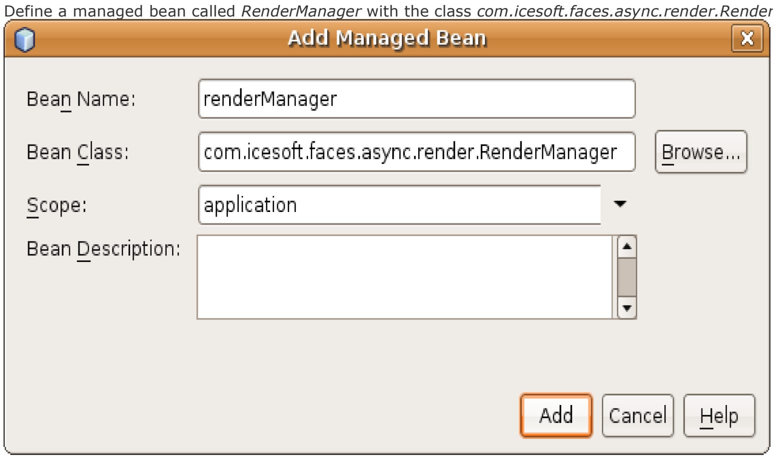
```
<?xml version='1.0' encoding='UTF-8'?>

<faces-config version="1.2"
    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-facescon
                                  Bean1</managed-bean-name>
                                  orativeCRUD.SessionBean1</managed-bean-class>
                                  n</managed-bean-scope>

                                  managed-bean-name>
                                  orativeCRUD.Page1</managed-bean-class>

                                  e>
                                  1</managed-bean-class>
                                  t</managed-bean-scope>
    <managed-bean>
        <managed-bean-name>ApplicationBean1</managed-bean-name>
```

2. Define a managed bean called *RenderManager* with the class *com.icesoft.faces.async.render.RenderManager* in applications scope as illustrated below.



Bean Name: renderManager
Bean Class: com.icesoft.faces.async.render.RenderManager
Scope: application
Bean Description:

3. This will result in the following code being added to your *faces-config.xml*.

```
<managed-bean>
    <managed-bean-name>RenderManager</managed-bean-name>
    <managed-bean-class>com.icesoft.faces.async.render.RenderManager</managed-bean-class>
    <managed-bean-scope>application</managed-bean-scope>
</managed-bean>
```

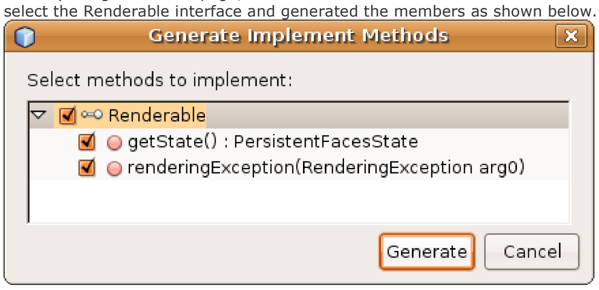
4. You will need access to the *RenderManager* from your page bean so add it as a managed property with the following code.

```
<managed-bean>
    <managed-bean-name>Page1</managed-bean-name>
    <managed-bean-class>CollaborativeCRUD.Page1</managed-bean-class>
    <managed-bean-scope>request</managed-bean-scope>
    <managed-property>
        <property-name>renderManager</property-name>
        <property-class>com.icesoft.faces.async.render.RenderManager</property-class>
        <value>#{renderManager}</value>
    </managed-property>
</managed-bean>
```

5. Next you need your page bean to implement the *Renderable* interface as shown below.

```
public class Page1 extends AbstractPageBean implements Renderable {
```

Now if you right click the page, and select *Insert Code* from the context menu, you will see a dialog from which you can select *Implement Method*. You can now select the Renderable interface and generated the members as shown below.



- [✓] Renderable
  - [✓] getState() : PersistentFacesState
  - [✓] renderingException(RenderingException arg0)

6. Before you complete the implementation, you need to add some state to your page bean as shown below. You will need access to the *PersistentFacesState*,

RenderManager, and an *OnDemandRenderer* to hold the list of *Renderables* (1 per client session). The *OnDemandRenderer* is a named singleton that will be created by the *RenderManager*.

```
private PersistentFacesState state = null;
private RenderManager renderManager;
private OnDemandRenderer personGroup = null;

public void setRenderManager(RenderManager renderManager){
   if(renderManager != null){
      this.renderManager = renderManager;
      personGroup = renderManager.getOnDemandRenderer("personGroup");
      personGroup.add(this);
   }
}

public RenderManager getRenderManager(){
   return renderManager;
}
```

7. Make sure the persistentFacesState is initialized in the page bean init() member.

```
public void init() {
   ...
   // Perform application initialization that must complete
   // *after* managed components are initialized
   // TODO - add your own initialization code here
   state = PersistentFacesState.getInstance();
}
```

8. Now you can complete the implementation of the *Renderable* interface with the following code.

```
public PersistentFacesState getState() {
  return state;
}

public void renderingException(RenderingException re) {
   personGroup.remove(this);
}
```

9. Finally, you need to request a render whenever changes are committed to the database. This is done in the action listener for the *submit* button as shown below.

```
public void button1_processAction(ActionEvent ae) {
   personDataProvider.setCachedRowSet((javax.sql.rowset.CachedRowSet) getValue("#{SessionBean1.personRowSet}"));
   persistPerson(selectedPerson);
   selectedPerson = blankPerson;
   editDisabled = true;
   personGroup.requestRender();
}
```

10. You can now build and run the application. If you view it in two different browsers you should see changes pushed to both when changes are made to the data. You now have a fully functional collaborative CRUD application. The application will also work from multiple windows in the same browser instance, but first you will need to turn on *concurrentDOMViews* in the *web.xml* as shown below.

```
<context-param>
   <param-name>com.icesoft.faces.concurrentDOMViews</param-name>
   <param-value>true</param-value>
</context-param>
```

Configure The Grizzly ARP Engine

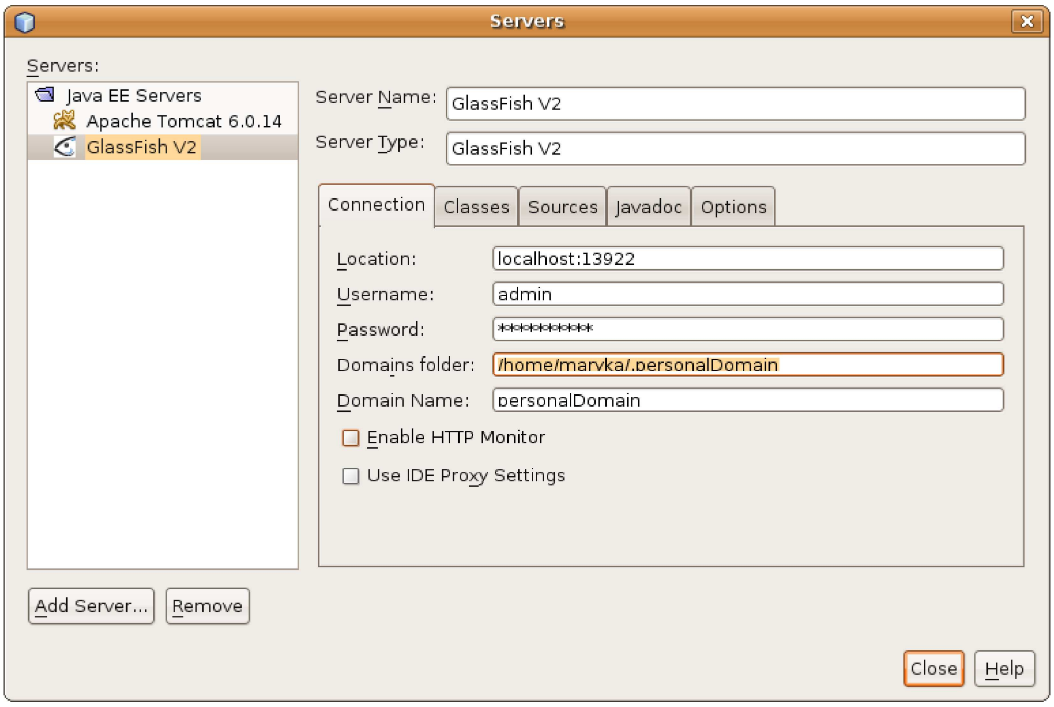
1. The current deployment of the application relies on a standard Servlet to handle the Ajax Push connection, which is not a scalable solution. By configuring Grizzly into the deployment you can make the application scale well for large numbers of concurrent users. In future releases of ICEfaces, Grizzly configuration will be automated, but for now there is a bit of manual configuration that you must do. First you must add the Grizzly Servlet as the first Servlet in your *web.xml*, as shown below.

```
<servlet>
   <servlet-name>Grizzly Push Servlet</servlet-name>
   <servlet-class>
      com.icesoft.faces.webapp.http.servlet.GrizzlyPushServlet
   </servlet-class>
   <load-on-startup> 1 </load-on-startup>
</servlet>

<servlet-mapping>
   <servlet-name>Grizzly Push Servlet</servlet-name>
   <url-pattern>/block/receive-updated-views/*</url-pattern>
</servlet-mapping>

<servlet>
   <servlet-name>Persistent Faces Servlet</servlet-name>
   <servlet-class>com.icesoft.faces.webapp.xmlhttp.PersistentFacesServlet</servlet-class>
   <load-on-startup>1</load-on-startup>
</servlet>
```

2. Next you have to add the *cometSupport* property to the http-listener in your Glassfish *domain.xml* file. NetBeans can tell you the location of this file for your installation from the *Services* tab under *Servers*. Right click the Glassfish server and select properties from the context menu, and you will see the directory path to your *domain.xml* file as illustrated below. Also, you will need to turn off *Enable HTTP Monitor* to see the true performance of the application.



Server Name: GlassFish V2
Server Type: GlassFish V2

Location: localhost:13922
Username: admin
Password: **********
Domains folder: /home/marvka/.personalDomain
Domain Name: personalDomain
[ ] Enable HTTP Monitor
[ ] Use IDE Proxy Settings

Once you have located the *domain.xml* file, you need to add the *cometSuppor*t property as shown below.

```
<http-listener acceptor-threads="1" address="0.0.0.0" blocking-enabled="false" default-virtual-server="server" enabled="true" family="inet"
        id="http-listener-1" port="17154" security-enabled="false" server-name="" xpowered-by="true">
        <property name="proxiedProtocols" value="ws/tcp"/>
        <property name="cometSupport" value="true"/>
</http-listener>
```

3. Now rebuild the application, and restart the server. The application is now running with Grizzly configured to handle all the Ajax Push connections.

Inspiration Time

You have now completed your first collaborative CRUD application. While simplistic, the example illustrates all the key concepts required to build sophisticated collaborative applications with ICEfaces and NetBeans. Take what you have learned here, and apply your own inspiration to future application development. You can change the way your enterprise collaborates, and usher your colleagues and customers into the Web 2.0 era.

(May 2008)