SAP NetWeaver
How-To Guide

How To... Call An EJB From JSF Using Data Tables

Applicable Releases:

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User Interface Technology

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1.00	First official release of this guide

Typographic Conventions

Type Style	Description
Example Text	Words or characters quoted from the screen. These include field names, screen titles, pushbuttons labels, menu names, menu paths, and menu options. Cross-references to other documentation
Example text	Emphasized words or phrases in body text, graphic titles, and table titles
`Example text`	File and directory names and their paths, messages, names of variables and parameters, source text, and names of installation, upgrade and database tools.
`Example text`	User entry texts. These are words or characters that you enter in the system exactly as they appear in the documentation.
`<Example text>`	Variable user entry. Angle brackets indicate that you replace these words and characters with appropriate entries to make entries in the system.
`EXAMPLE TEXT`	Keys on the keyboard, for example, F2 or ENTER.

Icons

Icon	Description
	Caution
	Note or Important
	Example
	Recommendation or Tip

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1. Business Scenario

The following guide will explain you how to create a JSF application that calls an EJB Module. The EJB Module will contain the Student *JavaBean* and the *StudentList* Session Bean where the business logic of the application is defined. In addition, this example demonstrates the use of Java EE annotation that gives developers an easy and natural way for declaring resource dependencies simplifying the existing development practices.

It will also explain how to use the *DataTable* UI element in your JSF view to easily add a new student in the student list.

2. Background Information

Enterprise JavaBeans (EJB) Technology 3.0 has new updates features in the Java Platform, Enterprise Edition 5 (Java EE 5). JavaBeans has been defined by SUN as “reusable software programs that you can develop and assemble easily to create sophisticated applications”. To learn more about Java EE 5 Technologies, please visit Java EE Technologies at a Glance

Java EE Annotations are Java modifiers, similar to *public* and *private*, that simplify the application development process by allowing developers to specify within the Java class itself how the application component behaves in the container and requests for dependency injection. To learn more about Java EE Annotations you can visit Introduction to Java EE 5 Technology

The *DataTable* UI element renders an HTML 4.01 compliant table element and contains one or more column tags that define the columns of the table. The look and feel of the table can be manipulated with CSS classes. To learn more about the *DataTable* UI element, please visit the Tag Library Documentation

3. Prerequisites

The following is a list of all you need for developing JSF applications and invoking Enterprise Services.

- AS Java 7.1 (CE 7.1 or NW 7.1)
- NWDS 7.1 (SP3 or higher with latest patch level).

  Note

  While this tutorial is geared towards to the SAP AS Java (the build/deploy steps of the guide), it wouldn’t be hard to replace the build/deploy portions with similar steps for any other Java EE 5 platform

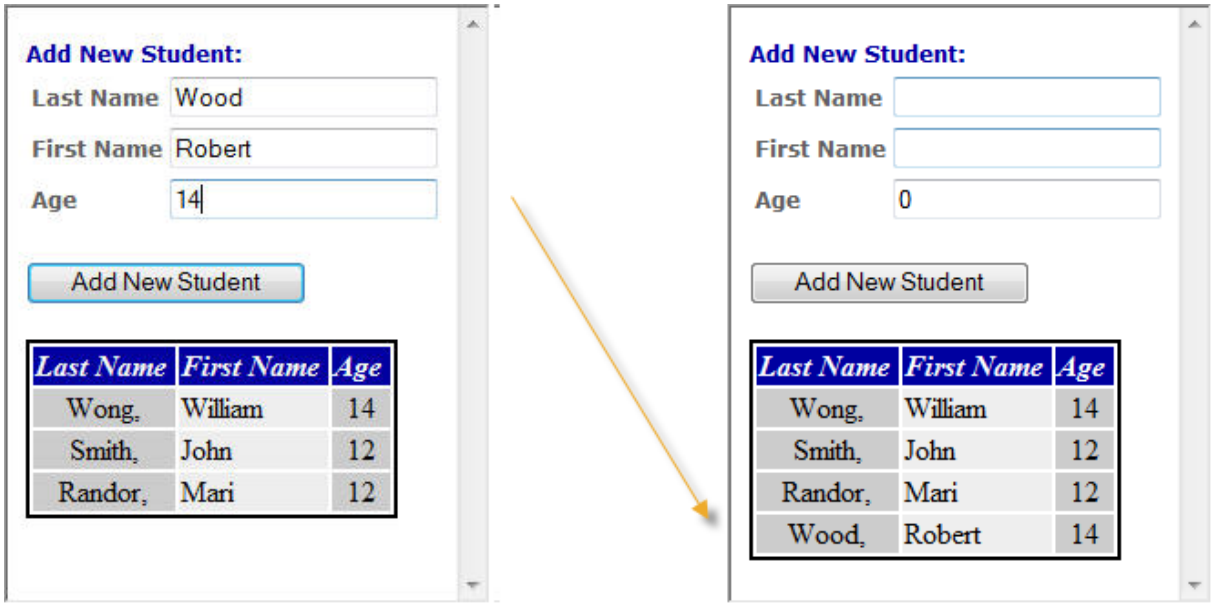
Knowledge

- You have a basic knowledge of Java Enterprise Edition
- You have acquired some basic experience with JSF applications, for example by working through the JSF tutorials (Create a Hello World Application using JavaServer Faces [Extern] and Create Your First JSF Application [Extern])

4. Step-by-Step Procedure

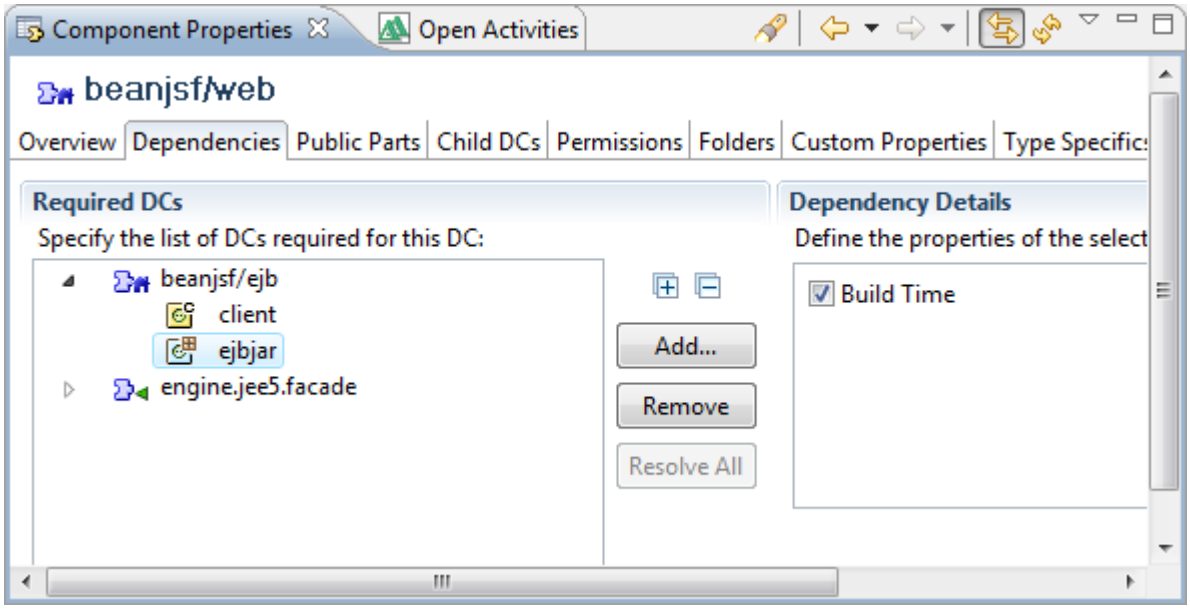
The following guide will step you thru the creation of a simple Java EE 5 application comprising a java bean, a stateless session bean and a JSF view. You will create an EJB Module to manage the student information, a Web Module which contains the JSF view and uses resources from the EJB Module and an Enterprise Application needed to deploy the web module

The user interface for this Web application consists of one JSF view with a Form UI element and a DataTable UI element. Once the user provides the student information and press *the Add New Student* Button, the student will be added to the table dynamically.



4.1 Tutorial Setup

1. Create a EJB Module Development Component named **`beanjsf/ejb`**
2. Create a Web Module Development Component named **`beanjsf/web`**.
3. Create the dependency between the Web Module DC and the EJB Module DC. Switch to the Development Infrastructure perspective and select the Web Module DC (**`beanjsf/web)`**. In the *Component Properties* view, select the *Dependencies* tab and add the EJB Module DC (**`beanjsf/ejb`**) in the required DCs section.



4. Switch again to the Java EE perspective and create an Enterprise Application Development Component named **`beanjsf/ear`**. Select the EJB Module and the Web Module in the *Referenced Projects* window.

4.2 Implement the EJB Module

In this step you will implement a *Student* Java bean and a *StudentsList* stateless session bean. The *Student* bean describes a single student and the *StudentsList* session bean describes a list that consists of a number of students and it is responsible for new students to the list.

4.2.1 Create the JavaBean

1. From the context menu of the *ejbmodule* folder in the *EJB Module* project, create a Java class. Enter **`Student`** in the *Name* field, **`com.sap.tutorial.jsf.ejb.beans`** in the *Package* field, declare the attributes and generate a *Constructor* using fields and the corresponding *Getters* and *Setters* methods shown in the following code.

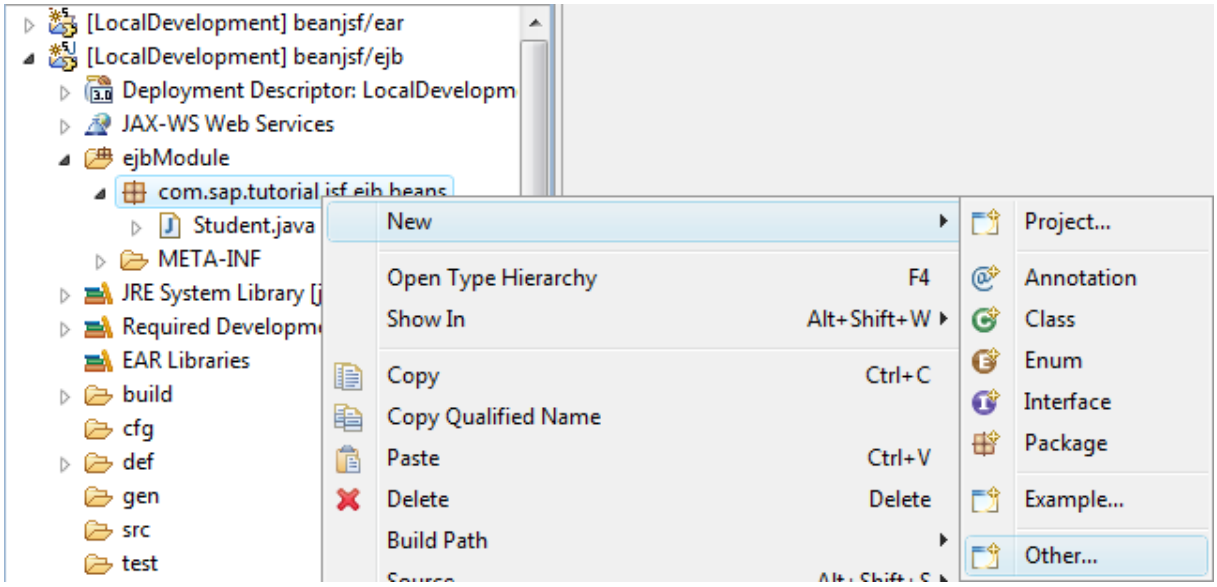
```
public class Student {
      private String lastName;
      private String firstName;
      private int age;

   public Student() {
      super();
   }
   public Student(String lastName, String firstName, int age) {
      super();
      this.lastName = lastName;
```

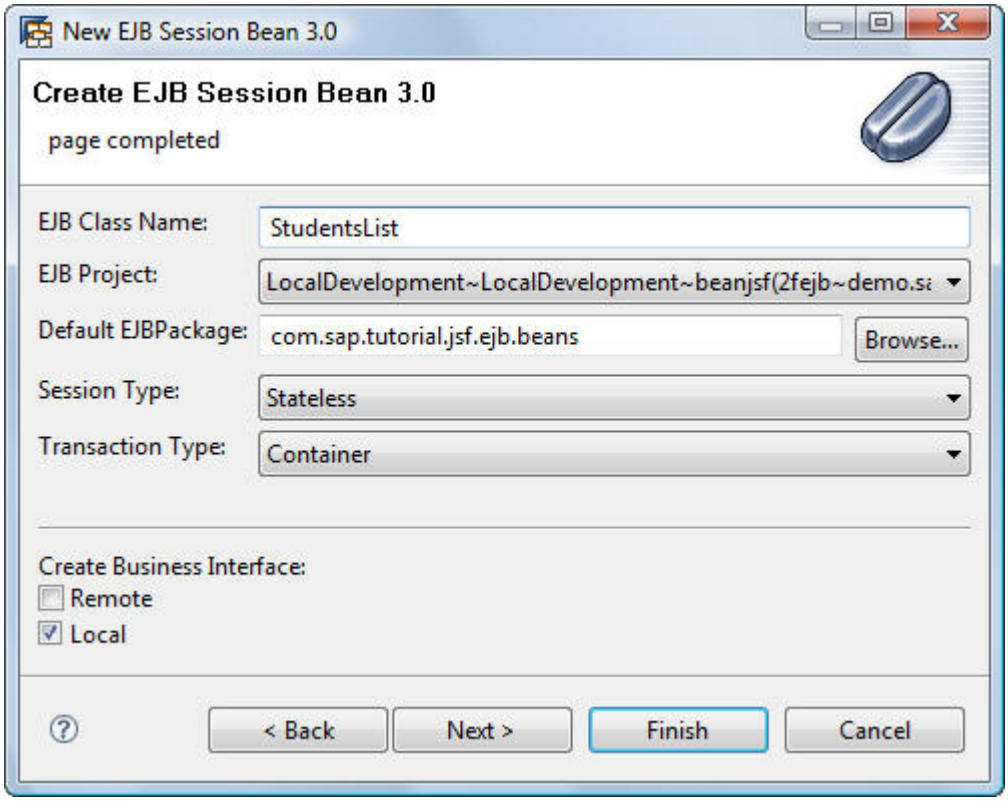
```
        this.firstName = firstName;
        this.age = age;
    }
    public String getLastName() {
        return lastName;
    }
    public void setLastName(String lastName) {
        this.lastName = lastName;
    }
    public String getFirstName() {
        return firstName;
    }
    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }
    public int getAge() {
        return age;
    }
    public void setAge(int age) {
        this.age = age;
    }
}
```

4.2.2 Create the SessionBean

1. Create the stateless session bean. From the context menu of the `com.sap.tutorial.jsf.ejb.beans` package folder, select *New* → *Other*



2. Select *EJB → EJB 3.0 → EJB Session Bean 3.0* on the *New* screen. Click the "Next" button.
3. Enter `StudentsList` in the EJB Class Name field and `com.sap.tutorial.jsf.ejb.beans` in the Default EJBPackage field.
4. Select `Stateless` in the *Session Type* field and `Container` in the *Transaction Type* field.
5. Deselect the Remote checkbox for Create Interface and press the *Finish* button.



6. The stateless *StudentsListBean* session bean was created. There are two types of session beans, stateless and stateful. The @Stateless annotation indicates to the EJB container that this class is a stateless session bean.

   Note

   Notice that StudentslistBean implements an interface called StudentsListLocal. This interface is the bean's business interface.

```
@Stateless
public class StudentsListBean implements StudentsListLocal {
```

7. Declare two attributes: students and model

```
//ArrayList<Student> describes the list of students
private ArrayList<Student> students;
//ListDataModel represents the data over which the JSF UI element
// dataTable will iterates
private DataModel model = null;
```

…

8. Implement the *Constructor* to initialize the list of students and the `DataModel` that will be used by the `h:dataTable` JSF UI element, when the JSF view is displayed for the first time

```
public StudentsListBean() {
    students = new ArrayList<Student>();
    students.add(new Student("William", "Wong", 14));
    students.add(new Student("John", "Smith", 12));
    students.add(new Student("Mari", "Beckley", 12));
    model = new ListDataModel(students);
}
```

…

9. Generate the *Get* method for the `model` attribute

```
public DataModel getModel() {
    return model;
}
```

…

10. Create the `addStudent` method as shown in the following code

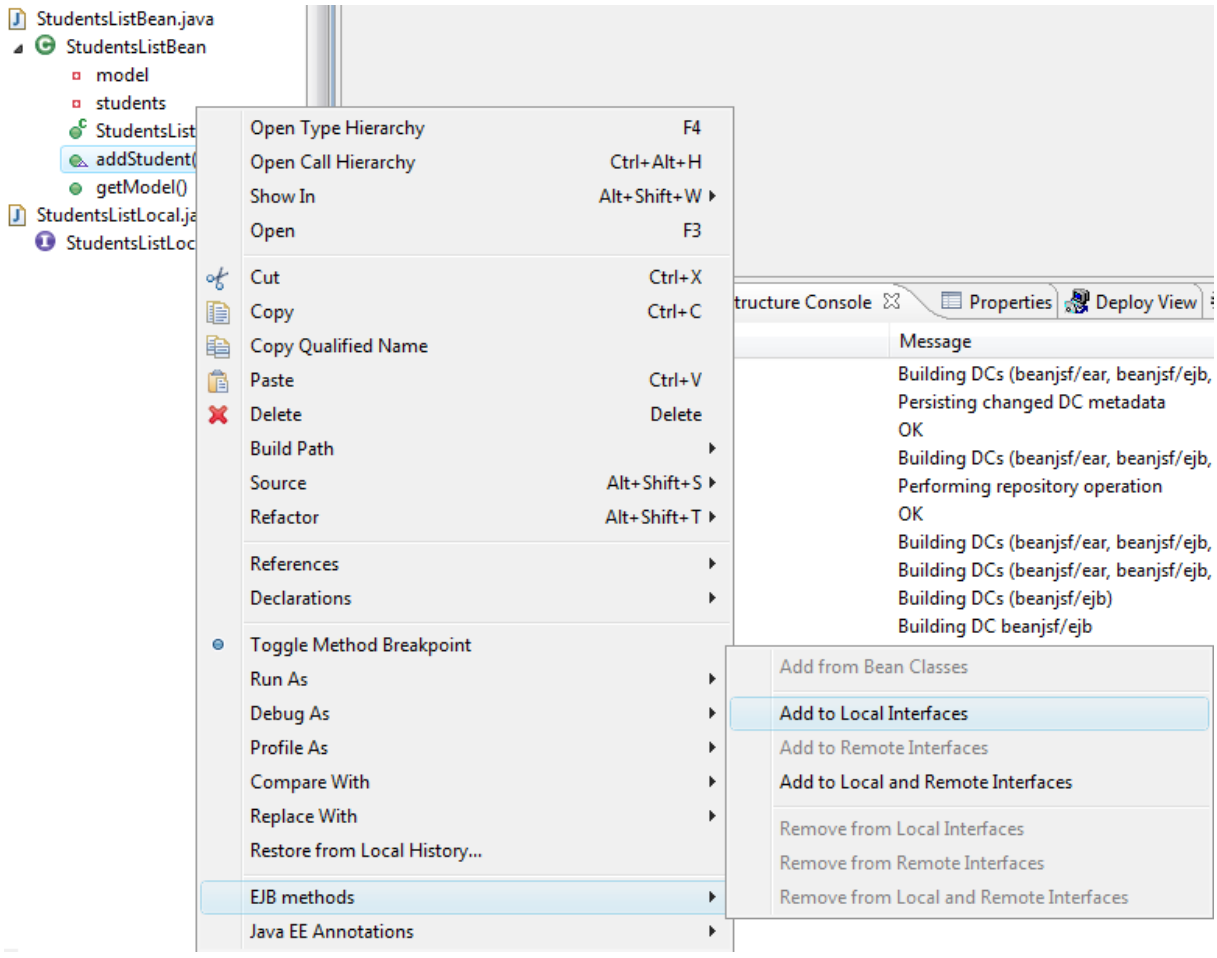
    Important

    To add or delete rows in the `h:dataTable` JSF UI element, you have to use the methods `getWrappedData()` and `setWrappedData()`.The `getWrappedData()` method gets a reference to the student's list to add the new student. Once students' list is modified, the method `setWrappedData()` resets the model with the new list, so it can be displayed on the screen.

```
public void addStudent(Student student) {
   ArrayList<Student> currentStudents =
         (ArrayList<Student>) model.getWrappedData();
   currentStudents.add(student);
   model.setWrappedData(currentStudents);
}
```

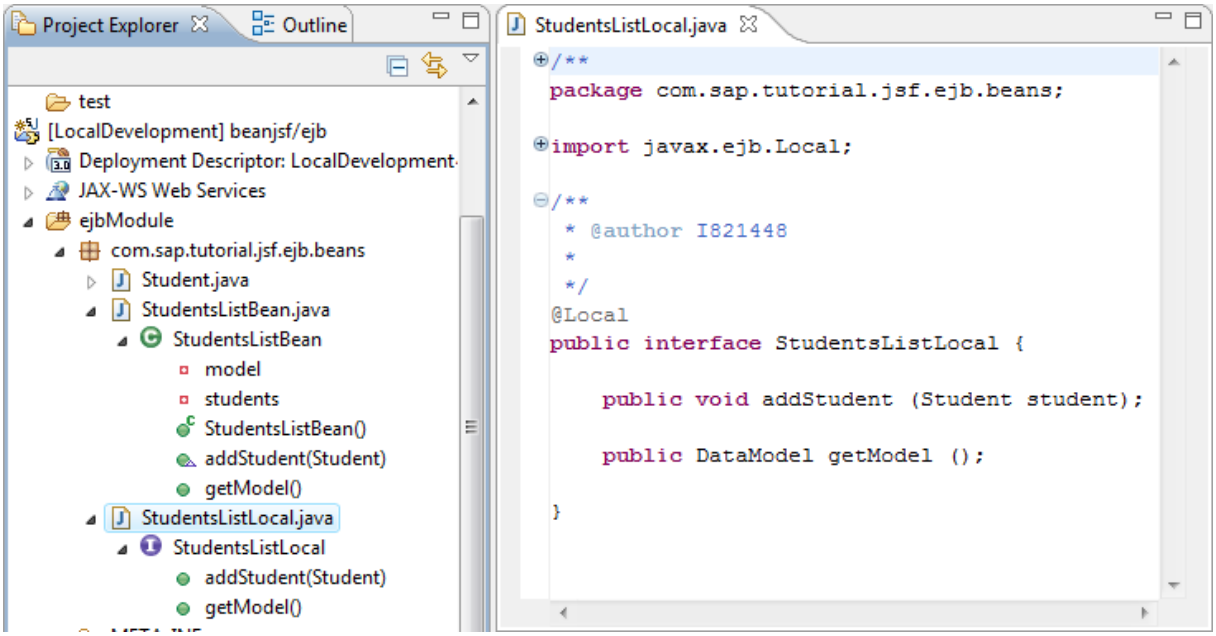
4.2.3 Add SessionBean methods to local interface

1. Add the `addStudent` method to local interfaces. Locate the *Outline* view and from the context menu of the addStudentmethod choose *EJB Methods* → *Add to Local Interfaces*.



2. Repeat step 12 and add the `getModel` method to local interfaces.
3. The methods are included in the **`StudentsListLocal`** interface.

> **Note**
>
> The @Local annotation indicates that the business interface is a local business interface. Local business interface implementations must be in the same JVM as the client application invoking their methods



4. Save the changes

4.3 Implement the Web Module

4.3.1 Create a JSF Managed bean

1. Create a new package **`com.sap.tutorial.jsf.ejb.util`** from the context menu of the *Java Resources: source* folder in the *Web Module* project,
2. Create a Java class that will handle the user interface logic. From the context menu of the newly created package, select new → *class.* Enter **`StudentListClient`** in the *Name* field.
3. Declare an instance variable of type **`StudentsListLocal`**, which is the business interface for the StudentsListSession session bean using the @EJB annotation as follows

```
@EJB
private StudentsListLocal studentList;
```

4. Declare the **`currentStudent`** attribute that describes the new student that will be added on the list and generate the corresponding *Get* and *Set* methods

```
private Student currentStudent = new Student();
public Student getCurrentStudent() {
   return currentStudent;
}
public void setCurrentStudent(Student currentStudent) {
   this.currentStudent = currentStudent;
}
```

5. Complete the User Interface logic with the following methods

```
public DataModel getStudents() {
   return this.studentList.getModel();
}
public void addStudent() {
   Student student =
         new Student(this.currentStudent.getFirstName(),
                     this.currentStudent.getLastName(),
                     this.currentStudent.getAge());
   this.studentList.addStudent(student);
}
```

6. Configure the *StudentListClient* bean in the application configuration resource file faces-config.xml using the managed-bean XML element in the Web Module project. Enter **`studentList`** in the *Name* field to reference the *Student* java bean and select **`session`** in the *Scope* field. The following XML code will be added in the Source tab

```
<managed-bean>
   <managed-bean-name>studentsList</managed-bean-name>
   <managed-bean-class>
      com.sap.tutorial.jsf.ejb.util.StudentListClient
   </managed-bean-class>
   <managed-bean-scope>session</managed-bean-scope>
</managed-bean>
```

7. Save the changes

4.3.2 Create the ResourceBundle

1. Create the ResourceBundle choosing the **`com.sap.tutorial.jsf.ejb.util`** package and entering **`messages.properties`** in the *File Name*
2. Enter the following keys and values for the English version of the localized messages

```
windowTitle=Students List
pageTitle=Add New Student:
addButtonText=Add New Student
firstColumnHeader=First Name
lastColumnHeader=Last Name
ageColumnHeader=Age
```

3. For simplicity, only the English version of the localized message is created. Optionally you can create other versions of the localized messages and specify which languages are supported for

this application as indicated in the Product Offer tutorial Part 3 (International JSF application [extern]).

4. Expose the ResourceBundles by adding the following XML code in the Source tab of the faces-config.xml file

```
<application>
   <resource-bundle>
      <base-name>com.sap.tutorial.jsf.ejb.util.messages</base-name>
      <var>msgs</var>
   </resource-bundle>
</application>
```

4.3.3 Create the Style file

1. Create a Style file and define the following CSS classes

```
.title {
   font-family: Verdana, Arial, Sans-Serif;
    font-weight: bold;
    font-size: 12px;
    color: #0000A0;
    font-style: normal;
}
.label {
   font-family: Verdana, Arial, Sans-Serif;
    font-weight: bold;
    font-size: 12px;
    color: #606060;
    font-style: normal;
}
.columnHeader {
   text-align: center;
   font-style: italic;
   font-weight: bold;
   color: #FFFFFF;
   background: #0000A0;
}
.students {
   border: thin solid black;
}
```

```
.last {
   text-align: center;
   background: #CCCCCC;
}
.first {
   text-align: left;
   background: #EEEEEE;
}
```

4.3.4 Create the JSF view

1. Drill into the Web Module project and right click on the *WebContent* folder and in the context menu select *New → JSP.*
2. Enter the file name **`index.jsp`** and click the *Finish* button. The JSP page will be created. The *index.jsp* page should be opened in the *Web Page Editor*
3. Include the style sheet by adding a *link* element inside the *head* element as shown in the following code

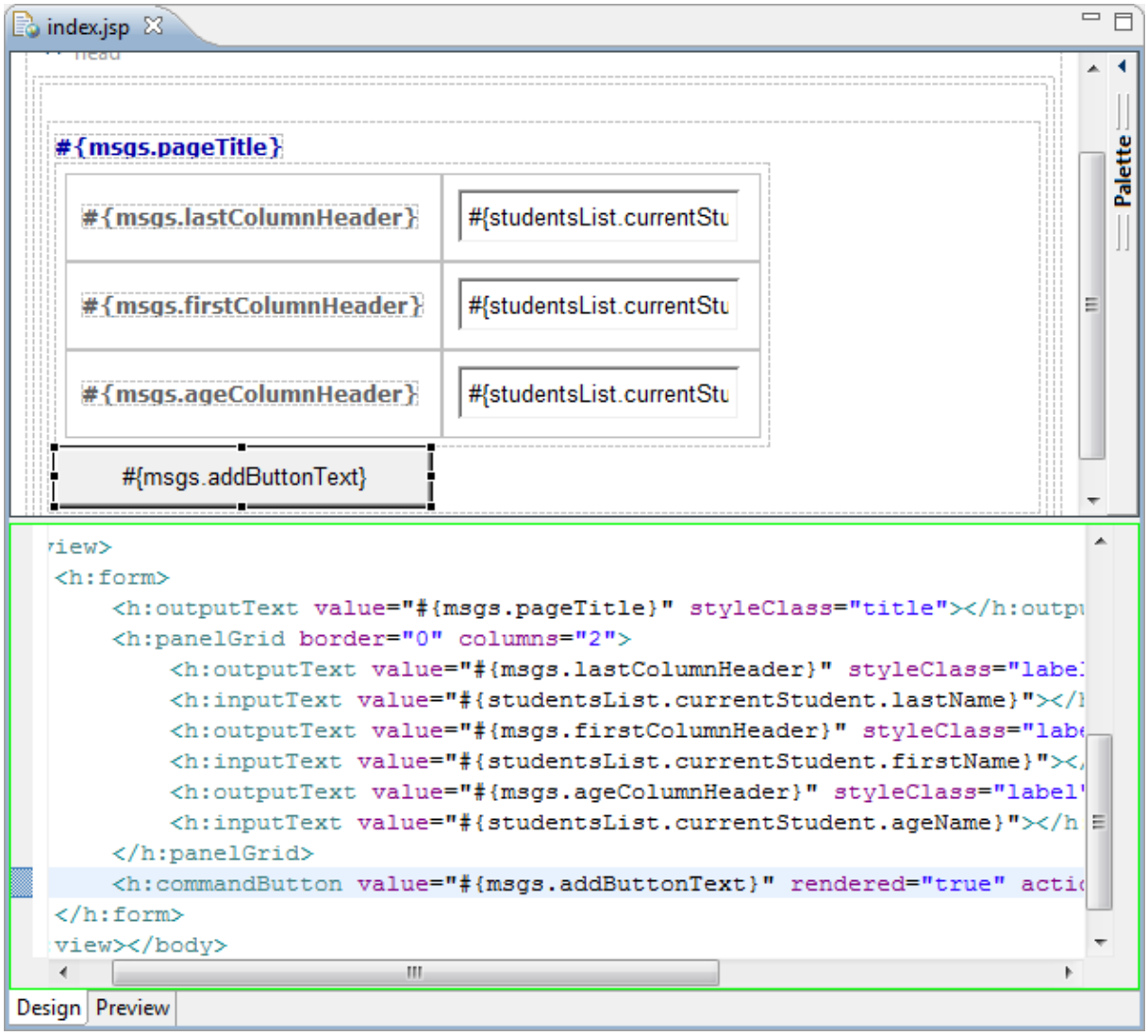
```
<head>
    <link href="styles.css" rel="stylesheet" type="text/css"/>
    …
</head>
```

4. The main UI elements contained in the index.jsp view are a Form and a DataTable. The following table contains the hierarchy of the Form UI elements

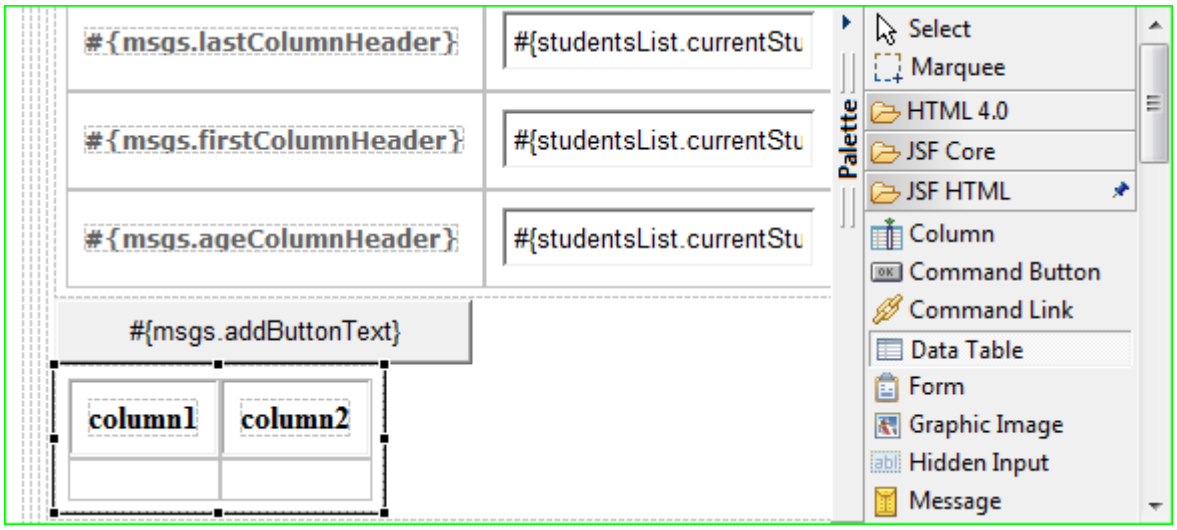
Property	Value
***ViewRoot* UI element**	
Form* UI element in the UI-element *ViewRoot	
OutputText* UI element in the UI-element *Form	
value	#{msgs.pageTitle}
styleClass	title
PanelGrid* UI element in the UI-element *Form	
Border	0
Columns	2
OutputText UI element in the UI-element *PanelGrid*	
value	#{msgs.lastColumnHeader}
styleClass	label
InputText UI element in the UI-element *PanelGrid*	
value	#{studentsList.currentStudent.lastName}
OutputText UI element in the UI-element *PanelGrid*	

value	#{msgs.firstColumnHeader}
styleClass	label
InputText UI element in the UI-element *PanelGrid*	
value	#{studentsList.currentStudent.firstName}
OutputText UI element in the UI-element *PanelGrid*	
value	#{msgs.ageColumnHeader}
styleClass	label
InputText UI element in the UI-element *PanelGrid*	
value	#{studentsList.currentStudent.ageName}
CommandButton UI element in the UI-element *Form*	
value	#{msgs.addButtonText}
action	#{studentsList.addStudent}

5. Result of the Form UI element added in the index.jsp view



6. Now you are going to add the *DataTable* UI element that represents the student's list. Click the *JSF HTML* toolset in the Palette, this will show all the UI elements available within it
7. Drag and drop a *Data Table* element (found in the *JSF HTML* elements) to the *Web Page Editor*.



8. Take a look at the tags that were inserted into the JSP page.

> **Note**
>
> The body of `h:dataTable` tag typically contains one or more `h:column` tags that define the columns of the table. A column component is rendered as a single <td> element.
> The body of `h:dataTable` tag can also contain header and footer facets. The header facets `f:facet name="header"` are rendered as a single <th> element in a row at the top of the table and the footer facets are rendered as a single <td> element in a row at the bottom of the table.

```
        <h:commandButton value="#{msgs.addButtonText}" rendered="t:
        <h:dataTable border="1">
            <h:column id="column1">
                <f:facet name="header">
                    <h:outputText value="column1"></h:outputText>
                </f:facet>
            </h:column>
            <h:column id="column2">
                <f:facet name="header">
                    <h:outputText value="column2"></h:outputText>
                </f:facet>
            </h:column>
        </h:dataTable>
    </h:form>
```

9. Select the *DataTable* UI element and then select the *Properties* view in the bottom window pane. Enter the text `#{studentsList.students}` in the *Value* property and `student` in the *Var* property

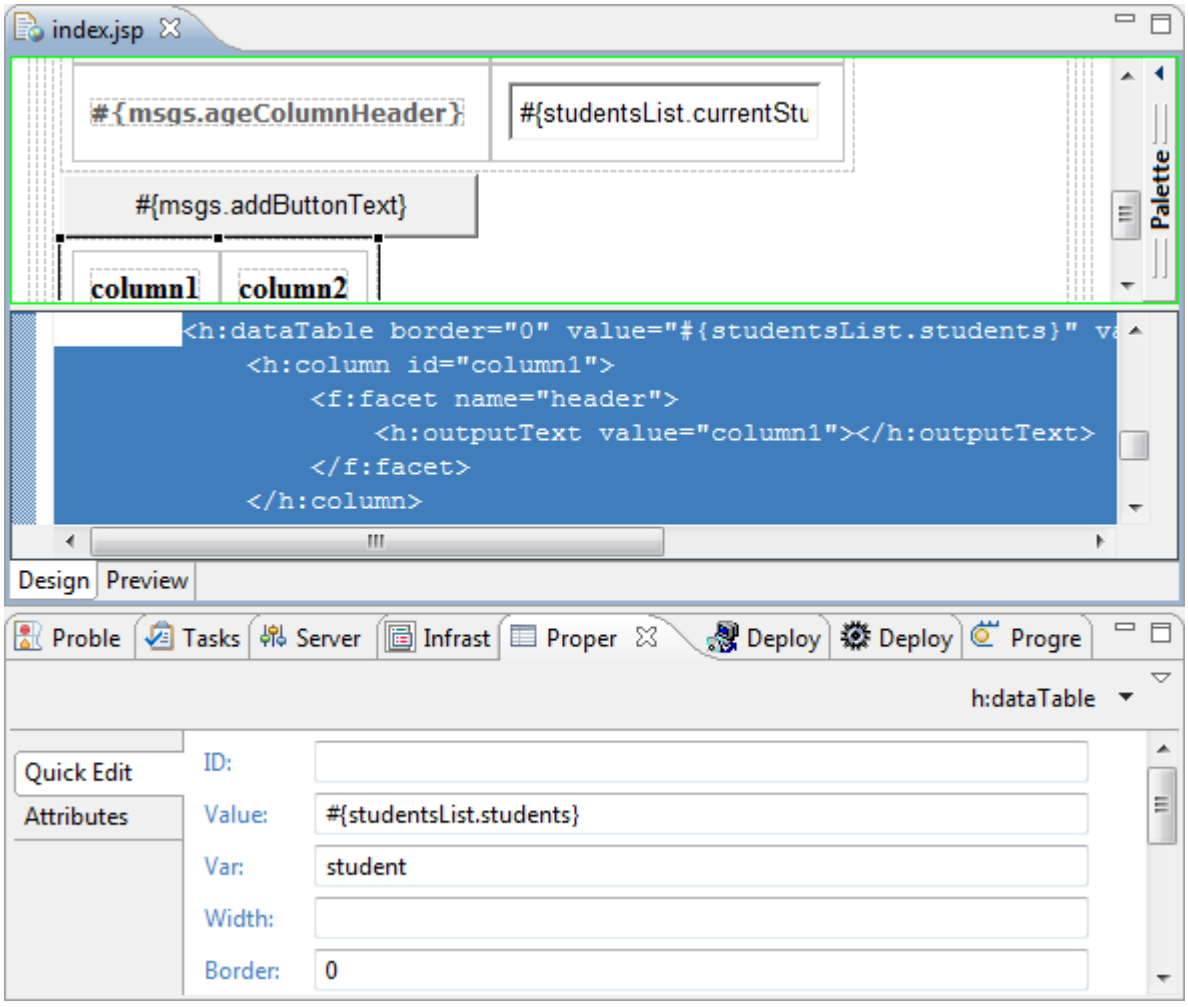
Important

The *Value* property is bound to properties of the StudentListClient java bean. When this page is displayed, the `getStudents` method is called to obtain the element over which the *DataTable* will iterate (in this case an instance of the javax.faces.model.DataModel).

The *Var* property indicates the object in the array, list, result set, etc. that will be available for each iteration (in this case the Student JavaBean)

Note

The *Value* property has to be bound to a property of the following types:
A Java object
An array
An instance of java.util.List
An instance of java.sql.ResultSet
An instance of javax.servlet.jsp.jstl.sqlResult
An instance of javax.faces.model.DataModel.



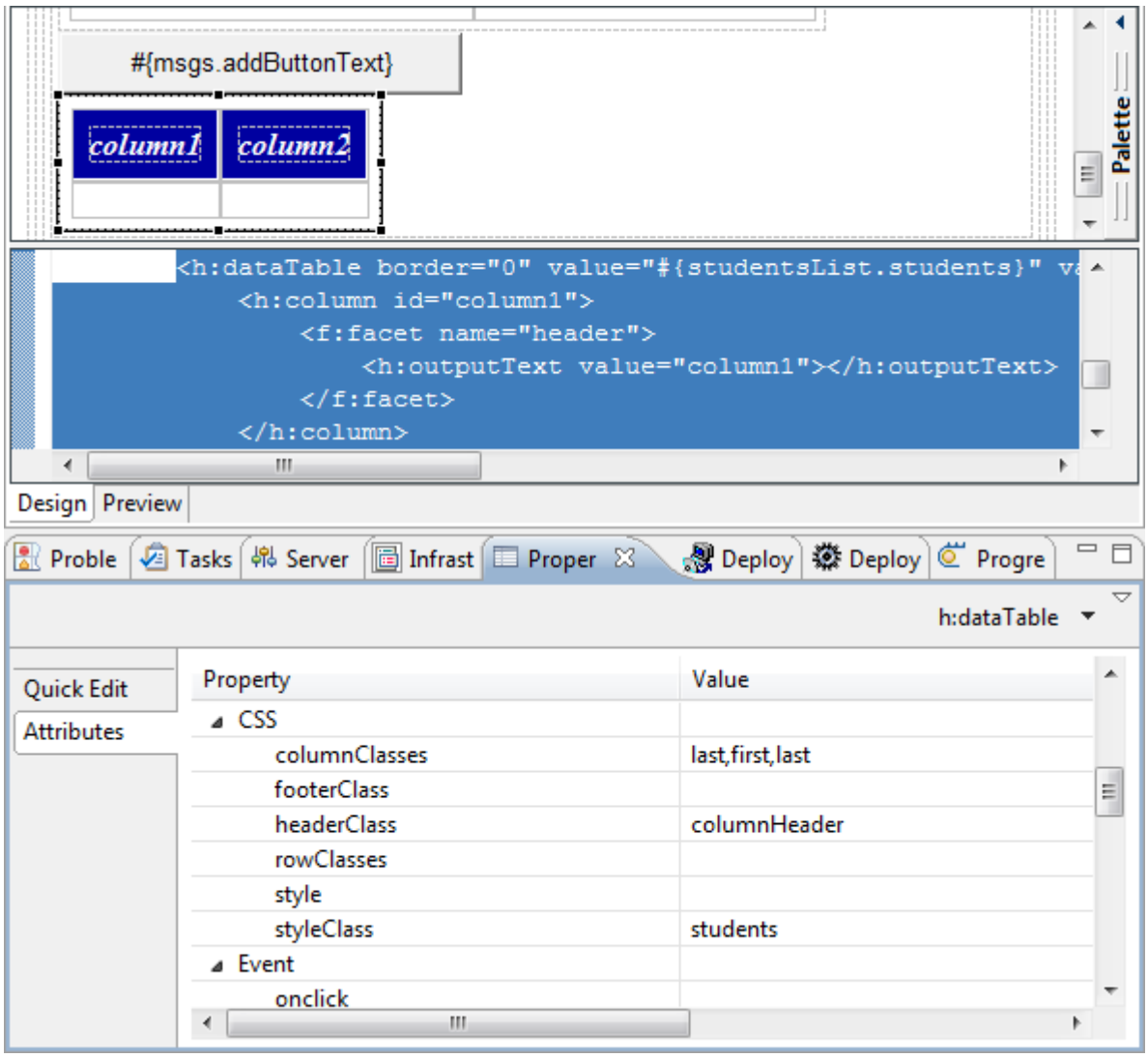
10. The *DataTable* UI element can be customized extensively using the styles classes. Click the *Attributes* tab on your left in the *Properties* view and enter **`last,first,last`** in the *columnClasses* property, **`columnHeader`** in the *headerClass* property and **`students`** in the *styleClass* property.

Note

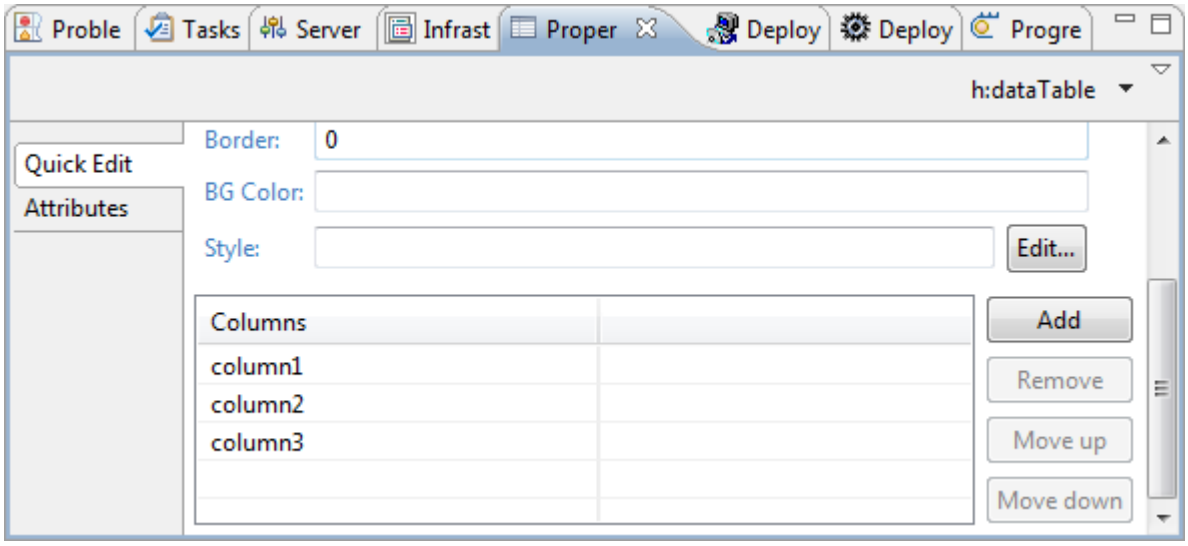
The *columnClasses* property receives a comma-delimited list of style classes to be applied to the columns of the table.

The *headerClass* property receives the style class to be applied to the headers of the table

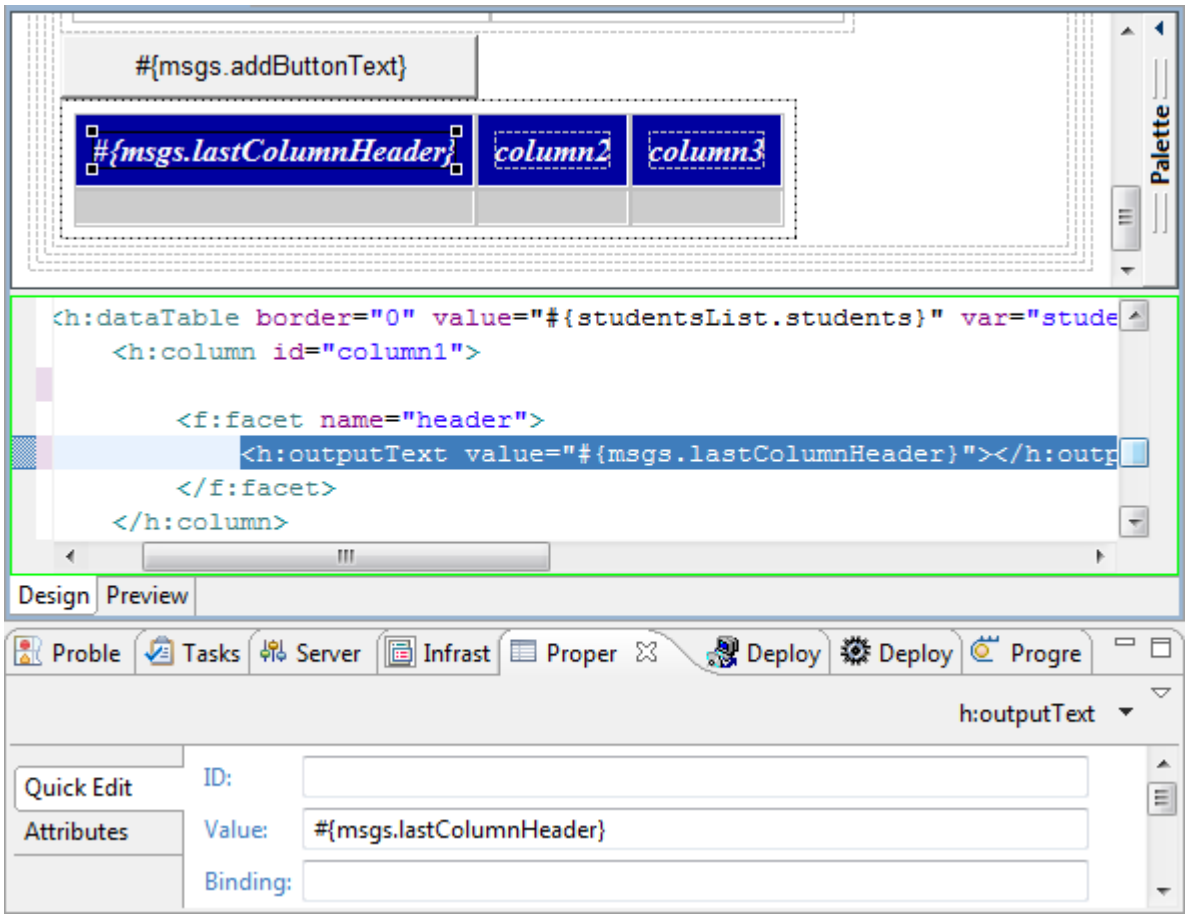
The *styleClass* attribute sets the style class to apply to the *DataTable* UI element when it is rendered



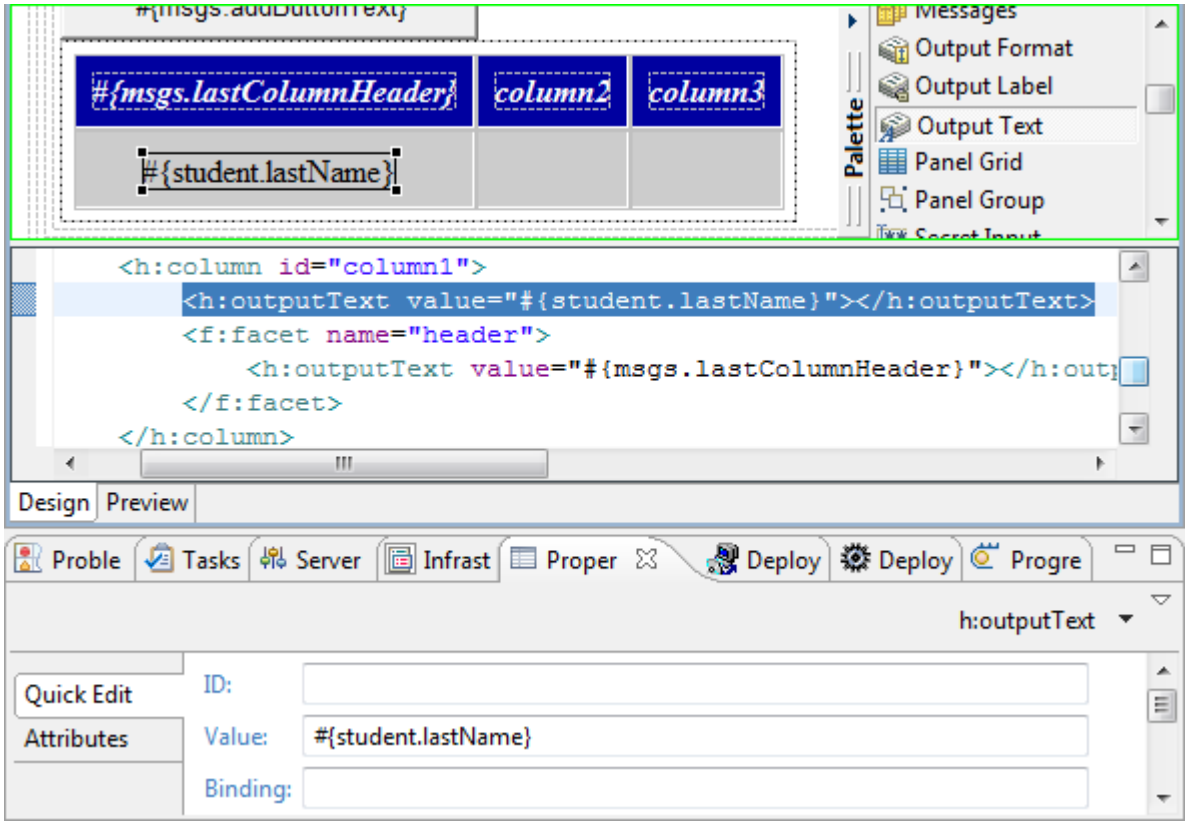
11. By default the DataTable UI element is created with two columns, create another column using the *Quick Edit* tab on your left in the *Properties* view. Push the *Add* button and add the third column *column3*



12. Change the header of the first column, by entering **#{msgs.lastColumnHeader}** in the *Value* property of the *OutputText* element placed inside the header facets.



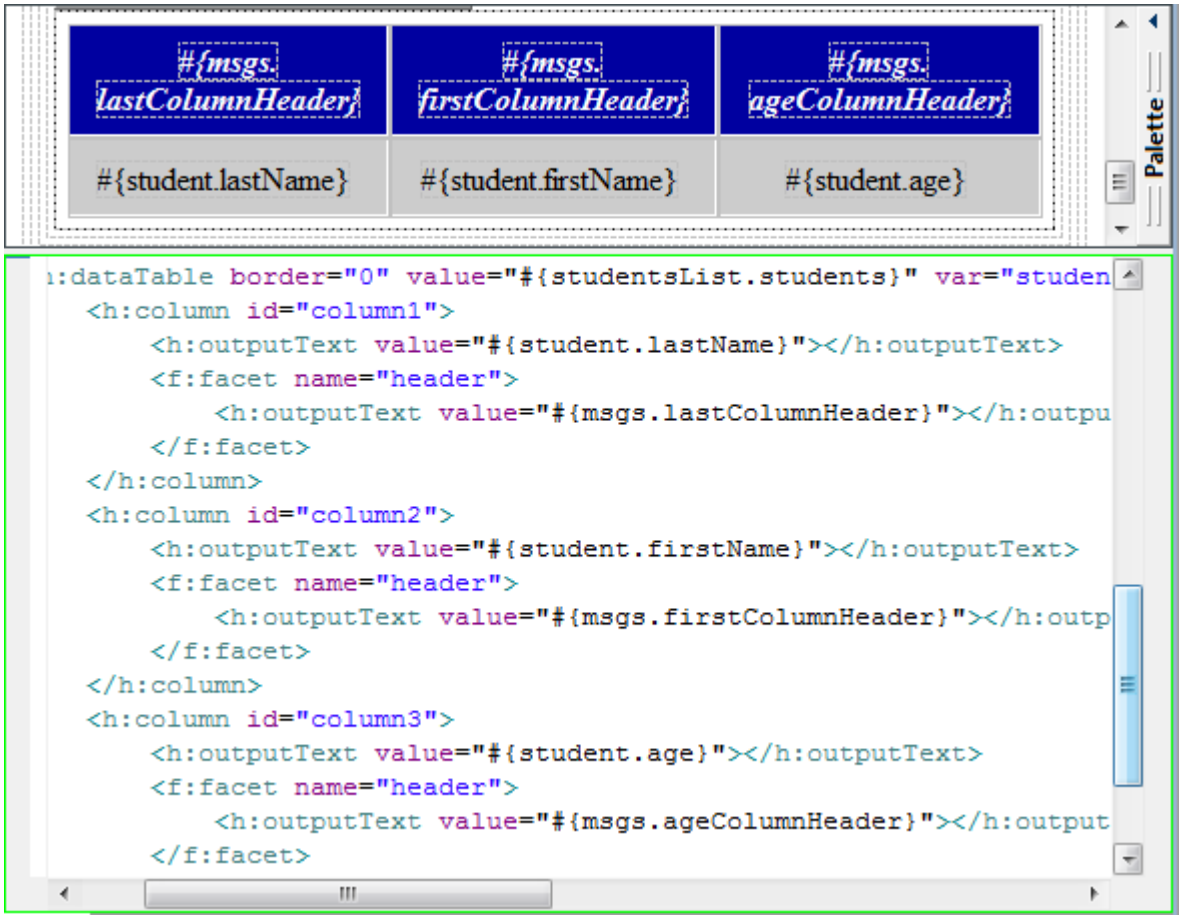
13. Drag and drop a *OutputText* element (found in the *JSF HTML* elements) inside the `h:column` tag and enter **#{student.lastName}** in the *Value* property



14. Repeat steps 20-21 to update columns 2 and 3 of the DataTable UI element. The properties are listed in the following table:

Property	Value
Column2* UI element in the UI-element *DataTable	
Facets2* UI element in the UI-element *Column2	
OutputText* UI element in the UI-element *Facets2	
value	#{msgs.firstColumnHeader}
OutputText* UI element in the UI-element *Column2	
value	#{student.firstName}
Column3* UI element in the UI-element *DataTable	
Facets3* UI element in the UI-element *Column3	
OutputText* UI element in the UI-element *Facets3	
value	#{msgs.ageColumnHeader}
OutputText* UI element in the UI-element *Column3	
value	#{student.age}

15. Result of the *DataTable* UI element added in the index.jsp view



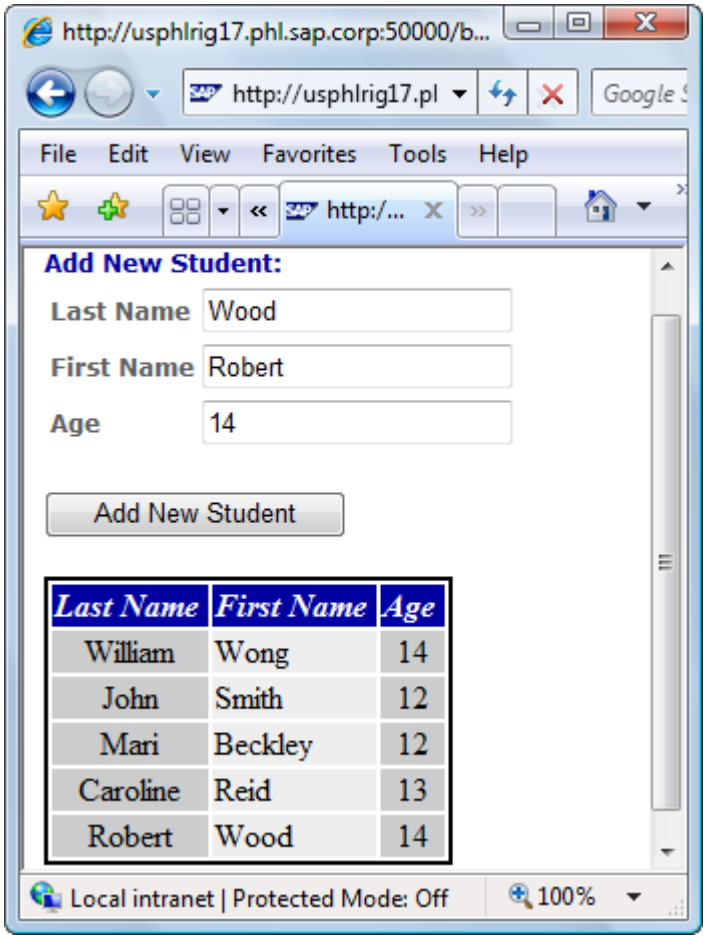
16. Save your changes

4.4 Build, Deploy and Run your application

1. Create the application.xml deployment descriptor, sets the WAR file to “demo.sap.com~beanjsf~web.war” and the context root to “beanjsf” as indicated in the Hello World JSF tutorial (Create a Hello World Application using JavaServer Faces [Extern]).
2. Save changes.
3. Build and deploy the application.
4. Run the application using the following simplified URL:

   http://<servername>:<httpport>/beanjsf/faces/index.jsp

5. Results:


http://usphlrig17.phl.sap.corp:50000/b...
http://usphlrig17.pl
File Edit View Favorites Tools Help
http:/...
Add New Student:
Last Name Wood
First Name Robert
Age 14
Add New Student
Last Name First Name Age
William Wong 14
John Smith 12
Mari Beckley 12
Caroline Reid 13
Robert Wood 14
Local intranet | Protected Mode: Off
100%

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