STANDARD JSF TAGS

Topics in This Chapter

Chapter 4

Development of compelling JSF applications requires a good grasp of the JSF tag libraries—core and HTML—that represent a combined total of 45 tags. Because of the prominence of those tags in the JSF framework, this chapter and Chapter 5, "Data Tables," provide in-depth coverage of tags, their attributes, and how you can best use them.

Even simple JSF pages use tags from both libraries. Many JSF pages have a structure similar to this:

```
<%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
<%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>

<f:view>
   <h:form>
      ...
   </h:form>
</f:view>
```

To use the JSF tag libraries, you must import them with `taglib` directives, as in the preceding code fragment. You can choose any name you want for the prefixes. The convention is `f` and `h`, for the core and HTML libraries, respectively.

This chapter starts with a brief look at the core library. That library, with 18 tags, is smaller than its HTML sibling, which has 25. It is also considerably simpler than the HTML library. Because of that simplicity and because most of the core tags are discussed elsewhere in this book, the majority of this chapter focuses on the HTML library.

We then move to the HTML library with a look at common attributes shared by most JSF HTML tags. Finally, we discuss each tag individually with attribute tables for reference and useful code examples that you can adapt to your own applications.

NOTE: The core library has an average of 3.5 attributes per tag; the HTML library has 28.9.

An Overview of the JSF Core Tags

The core library contains the tags that are independent of the rendering technology. The core tags are listed in Table 4–1.

Table 4–1 JSF Core Tags

Tag	Description	See Chapter
`view`	Creates the top-level view	1
`subview`	Creates a subview of a view	8
`attribute`	Sets an attribute (key/value) in its parent component	4
`param`	Adds a parameter child component to its parent component	4
`facet`	Adds a facet to a component	4
`actionListener`	Adds an action listener to a component	7
`setPropertyActionListener` (JSF 1.2)	Adds an action listener that sets a property	7
`valueChangeListener`	Adds a value change listener to a component	7
`phaseListener` (JSF 1.2)	Adds a phase listener to the parent view	7
`converter`	Adds an arbitrary converter to a component	6
`convertDateTime`	Adds a datetime converter to a component	6
`convertNumber`	Adds a number converter to a component	6
`validator`	Adds a validator to a component	6
`validateDoubleRange`	Validates a `double` range for a component's value	6
`validateLength`	Validates the length of a component's value	6

Table 4–1 JSF Core Tags (cont.)

Tag	Description	See Chapter
validateLongRange	Validates a long range for a component's value	6
loadBundle	Loads a resource bundle, stores properties as a Map	2
selectitems	Specifies items for a select one or select many component	4
selectitem	Specifies an item for a select one or select many component	4
verbatim	Turns text containing markup into a component	4

Most of the core tags represent *objects you add to components:*

- Attributes
- Listeners
- Converters
- Validators
- Facets
- Parameters
- Select items

The core library also contains tags for defining views and subviews, loading resource bundles, and adding arbitrary text to a page.

All of the core tags are discussed at length elsewhere in this book, as shown in Table 4–1.

We briefly describe the f:attribute, f:param, and f:facet tags here. Any component can store artibrary name/value pairs in its *attribute map*. You can set an attribute in a page and later retrieve it programatically. For example, in "Supplying Attributes to Converters" on page 260 of Chapter 6, we set the separator character for credit card digit groups like this:

```
<h:outputText value = "#{payment.card}">
   <f:attribute name = "separator" vlude = "-" />
</h:outputText>
```

The converter that formats the output retrieves the attribute from the component.

The f:param tag also lets you define a name/value pair, but the value is placed in a separate child component, a much bulkier storage mechanism. However, the child components form a list, not a map. You use f:param if you need to supply a number of values with the same name (or no name at all). You saw an example in "Messages with Variable Parts" on page 44 of Chapter 2, where the h:outputFormat component contains a list of f:param children.

NOTE: the h:commandlink component turns its f:param children into HTTP request name/value pairs. The event listener that is activated when the user clicks the link can then retrieve the name/value pairs from the request map. We demonstrate this technique in Chapter 7.

Finally, f:facet adds a named component to a component's *facet map*. A facet is not a child component; each component has *both* a list of child components and a map of named facet components. The facet components are usually rendered in a special place. You will see in "Headers, Footers, and Captions" on page 178 of Chapter 5 how to use facets named "header" and "footer" in data tables.

Table 4–2 shows the attributes for the f:attribute, f:param, and f:facet tags.

Table 4–2 Attributes for f:attribute, f:param, and f:facet

Attribute	Description
name	The attribute, parameter component, or facet name
value	The attribute or parameter component value (does not apply to f:facet)
binding, id	See Table 4–4 on page 97 (f:param only)

NOTE: All tag attributes, except for var and id, accept value or method expressions. The var attribute must be a string. The id attribute can be a string or an immediate ${...} expression.

An Overview of the JSF HTML Tags

JSF HTML tags represent the following kinds of components:

- Inputs
- Outputs
- Commands

- Selection
- Others

The "others" category includes forms, messages, and components that lay out other components. Table 4–3 lists all the HTML tags.

Table 4–3 JSF HTML Tags

Tag	Description
`form`	HTML form
`inputText`	Single-line text input control
`inputTextarea`	Multiline text input control
`inputSecret`	Password input control
`inputHidden`	Hidden field
`outputLabel`	Label for another component for accessibility
`outputLink`	HTML anchor
`outputFormat`	Like `outputText`, but formats compound messages
`outputText`	Single-line text output
`commandButton`	Button: submit, reset, or pushbutton
`commandLink`	Link that acts like a pushbutton
`message`	Displays the most recent message for a component
`messages`	Displays all messages
`graphicImage`	Displays an image
`selectOneListbox`	Single-select listbox
`selectOneMenu`	Single-select menu
`selectOneRadio`	Set of radio buttons
`selectBooleanCheckbox`	Checkbox
`selectManyCheckbox`	Set of checkboxes
`selectManyListbox`	Multiselect listbox
`selectManyMenu`	Multiselect menu

Table 4–3 JSF HTML Tags (cont.)

Tag	Description
panelGrid	HTML table
panelGroup	Two or more components that are laid out as one
dataTable	A feature-rich table control
column	Column in a dataTable

We can group the HTML tags in the following categories:

- Inputs (input...)
- Outputs (output...)
- Commands (commandButton and commandLink)
- Selections (checkbox, listbox, menu, radio)
- Layouts (panelGrid)
- Data table (dataTable); see Chapter 5
- Errors and messages (message, messages)

The JSF HTML tags share common attributes, HTML pass-through attributes, and attributes that support dynamic HTML.

NOTE: The HTML tags may seem overly verbose—for example, selectManyListbox could be more efficiently expressed as multiList. But those verbose names correspond to a component/renderer combination, so selectManyListbox represents a selectMany component paired with a listbox renderer. Knowing the type of component a tag represents is crucial if you want to access components programmatically.

NOTE: Both JSF and Struts developers implement web pages with JSP custom tags. But Struts tags generate HTML directly, whereas JSF tags represent a component that is independent of the markup technology, and a renderer that generates HTML. That key difference makes it easy to adapt JSF applications to alternative display technologies. For an example, see the chapter on wireless JSF applications that is available on the book's companion web site (http://corejsf.com).

Common Attributes

Three types of tag attributes are shared among multiple HTML component tags:

- Basic
- HTML 4.0
- DHTML events

Next, we look at each type.

Basic Attributes

As you can see from Table 4–4, basic attributes are shared by the majority of JSF HTML tags.

Table 4–4 Basic HTML Tag Attributes[a]

Attribute	Component Types	Description
`id`	A (*25*)	Identifier for a component
`binding`	A (*25*)	Links this component with a backing bean property
`rendered`	A (*25*)	A Boolean; `false` suppresses rendering
`styleClass`	A (*23*)	CSS (Cascading Style Sheet) class name
`value`	I, O, C (*19*)	A component's value, typically a value expression
`valueChangeListener`	I (*11*)	A method expression to a method that responds to value changes
`converter`	I, O (*15*)	Converter class name
`validator`	I (*11*)	Class name of a validator that is created and attached to a component
`required`	I (*11*)	A Boolean; if `true`, requires a value to be entered in the associated field
`converterMessage`, `validatorMessage`, `requiredMessage` (JSF 1.2)	I (*11*)	A custom message to be displayed when a conversion or validation error occurs, or when required input is missing

a. A = all, I = input, O = output, C = commands, (*n*) = number of tags with attribute

The id and binding attributes, applicable to all HTML tags, reference a component—the former is used primarily by page authors and the latter is used by Java developers.

The value and converter attributes let you specify a component value and a means to convert it from a string to an object, or vice versa.

The validator, required, and valueChangeListener attributes are available for input components so that you can validate values and react to changes to those values. See Chapter 6 for more information about validators and converters.

The ubiquitous rendered and styleClass attributes affect how a component is rendered.

Now we take a brief look at these important attributes.

IDs and Bindings

The versatile id attribute lets you do the following:

- Access JSF components from other JSF tags
- Obtain component references in Java code
- Access HTML elements with scripts

In this section, we discuss the first two tasks listed above. See "Form Elements and JavaScript" on page 105 for more about the last task.

The id attribute lets page authors reference a component from another tag. For example, an error message for a component can be displayed like this:

```
<h:inputText id="name" .../>
<h:message for="name"/>
```

You can also use component identifiers to get a component reference in your Java code. For example, you could access the name component in a listener like this:

```
UIComponent component = event.getComponent().findComponent("name");
```

The preceding call to findComponent has a caveat: The component that generated the event and the name component must be in the same form (or data table). There is a better way to access a component in your Java code. Define the component as an instance field of a class. Provide property getters and setters for the component. Then use the binding attribute, which you specify in a JSF page, like this:

```
<h:outputText binding="#{form.statePrompt}" .../>
```

The binding attribute is specified with a value expression. That expression refers to a read-write bean property. See "Backing Beans" on page 53 of Chapter 2 for

more information about the `binding` attribute. The JSF implementation sets the property to the component, so you can programatically manipulate components.

You can also *programmatically create a component* that will be used in lieu of the component specified in the JSF page. For example, the form bean's `statePrompt` property could be implemented like this:

```
private UIComponent statePrompt = new UIOutput();
public UIComponent getStatePrompt() { return statePrompt; }
public void setStatePrompt(UIComponent statePrompt) {...}
```

When the `#{form.statePrompt}` value expression is first encountered, the JSF framework calls `Form.getStatePrompt()`. If that method returns `null`—as is typically the case—the JSF implementation creates the component specified in the JSF page. But *if that method returns a reference to a component*—as is the case in the preceding code fragment—*that component is used instead*.

Values, Converters, and Validators

Inputs, outputs, commands, and data tables all have values. Associated tags in the HTML library, such as `h:inputText` and `h:dataTable`, come with a `value` attribute. You can specify values with a string, like this:

```
<h:outputText value="William"/>
```

Most of the time you will use a value expression—for example:

```
<h:outputText value="#{customer.name}"/>
```

The `converter` attribute, shared by inputs and outputs, lets you attach a converter to a component. Input tags also have a `validator` attribute that you can use to attach a validator to a component. Converters and validators are discussed at length in Chapter 6.

Styles

You can use CSS styles, either inline (`style`) or classes (`styleClass`), to influence how components are rendered. Most of the time you will specify string constants instead of value expressions for the `style` and `styleClass` attributes—for example:

```
<h:outputText value="#{customer.name}" styleClass="emphasis"/>
<h:outputText value="#{customer.id}" style="border: thin solid blue"/>
```

Value expressions are useful when you need programmatic control over styles. You can also control whether components are rendered at all with the `rendered` attribute. That attribute comes in handy in all sorts of situations—for example, an optional table column.

TIP: Instead of using a hardwired style, it is better to use a style sheet. Define a CSS style such as

```
.prompts {
   color:red;
}
```

Place it in a style sheet, say, `styles.css`. Add a `link` element inside the head element in your JSF page:

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

Then use the `styleClass` attribute:

```
<h:outputText value="#{msgs.namePrompt}" styleClass="prompts"/>
```

Now you can change the appearance of all prompts by updating the style sheet.

Conditional Rendering

You use the rendered attribute to include or exclude a component, depending on a condition. For example, you may want to render a "Logout" button only if the user is currently logged in:

```
<h:commandButton ... rendered = "#{user.loggedIn}"/>
```

To conditionally include a group of components, include them in an `h:panelGrid` with a `rendered` attribute. See "Panels" on page 163 for more information.

TIP: Remember, you can use operators in value expressions. For example, you might have a view that acts as a tabbed pane by optionally rendering a panel depending on the selected tab. In that case, you could use `h:panelGrid` like this:

```
<h:panelGrid rendered='#{bean.selectedTab == "Movies"}'/>
```

The preceding code renders the movies panel when the user selects the `Movies` tab.

NOTE: Sometimes, you will see the JSTL `c:if` construct used for conditional rendering. However, that is less efficient than the `rendered` attribute.

HTML 4.0 Attributes

JSF HTML tags have appropriate HTML 4.0 pass-through attributes. Those attribute values are passed through to the generated HTML element. For example, `<h:inputText value="#{form.name.last}" size="25"...>` generates this HTML: `<input type="text" size="25"...>`. Notice that the `size` attribute is passed through to HTML.

The HTML 4.0 attributes are listed in Table 4–5.

Table 4–5 HTML 4.0 Pass-Through Attributes[a]

Attribute	Description
`accesskey` (*14*)	A key, typically combined with a system-defined metakey, that gives focus to an element.
`accept` (*1*)	Comma-separated list of content types for a form.
`acceptcharset` (*1*)	Comma- or space-separated list of character encodings for a form. The HTML `accept-charset` attribute is specified with the JSF attribute named `acceptcharset`.
`alt` (*4*)	Alternative text for nontextual elements such as images or applets.
`border` (*4*)	Pixel value for an element's `border` width.
`charset` (*2*)	Character encoding for a linked resource.
`coords` (*2*)	Coordinates for an element whose shape is a rectangle, circle, or polygon.
`dir` (*22*)	Direction for text. Valid values are `"ltr"` (left to right) and `"rtl"` (right to left).
`disabled` (*13*)	Disabled state of an input element or button.
`hreflang` (*2*)	Base language of a resource specified with the `href` attribute; `hreflang` may only be used with `href`.
`lang` (*22*)	Base language of an element's attributes and text.
`maxlength` (*2*)	Maximum number of characters for text fields.
`readonly` (*11*)	Read-only state of an input field; text can be selected in a read-only field but not edited.
`rel` (*2*)	Relationship between the current document and a link specified with the `href` attribute.

Table 4–5 HTML 4.0 Pass-Through Attributes[a] (cont.)

Attribute	Description
rev (*2*)	Reverse link from the anchor specified with href to the current document. The value of the attribute is a space-separated list of link types.
rows (*1*)	Number of visible rows in a text area. h:dataTable has a rows attribute, but it is not an HTML pass-through attribute.
shape (*2*)	Shape of a region. Valid values: default, rect, circle, poly (default signifies the entire region).
size (*4*)	Size of an input field.
style (*23*)	Inline style information.
tabindex (*14*)	Numerical value specifying a tab index.
target (*3*)	The name of a frame in which a document is opened.
title (*22*)	A title, used for accessibility, that describes an element. Visual browsers typically create tooltips for the title's value.
type (*3*)	Type of a link—for example, "stylesheet".
width (*3*)	Width of an element.

a. (*n*) = number of tags with attribute

The attributes listed in Table 4–5 are defined in the HTML specification, which you can access online at http://www.w3.org/TR/REC-html40. That web site is an excellent resource for deep digging into HTML.

DHTML Events

Client-side scripting is useful for all sorts of tasks, such as syntax validation or rollover images, and it is easy to use with JSF. HTML attributes that support scripting, such as onclick and onchange are called *DHTML (dynamic HTML) event attributes*. JSF supports DHTML event attributes for nearly all of the JSF HTML tags. Those attributes are listed in Table 4–6.

Table 4–6 DHTML Event Attributes[a]

Attribute	Description
onblur (*14*)	Element loses focus
onchange (*11*)	Element's value changes

Table 4–6 DHTML Event Attributes[a] (cont.)

Attribute	Description
onclick (*17*)	Mouse button is clicked over the element
ondblclick (*18*)	Mouse button is double-clicked over the element
onfocus (*14*)	Element receives focus
onkeydown (*18*)	Key is pressed
onkeypress (*18*)	Key is pressed and subsequently released
onkeyup (*18*)	Key is released
onmousedown (*18*)	Mouse button is pressed over the element
onmousemove (*18*)	Mouse moves over the element
onmouseout (*18*)	Mouse leaves the element's area
onmouseover (*18*)	Mouse moves onto an element
onmouseup (*18*)	Mouse button is released
onreset (*1*)	Form is reset
onselect (*11*)	Text is selected in an input field
onsubmit (*1*)	Form is submitted

a. (*n*) = number of tags with attribute

The DHTML event attributes listed in Table 4–6 let you associate client-side scripts with events. Typically, JavaScript is used as a scripting language, but you can use any scripting language you like. See the HTML specification for more details.

TIP: You will probably add client-side scripts to your JSF pages soon after you start using JSF. One common use is to submit a request when an input's value is changed so that value change listeners are immediately notified of the change, like this: `<h:selectOneMenu onchange="submit()"...>`

Forms

Web applications run on form submissions, and JSF applications are no exception. Table 4–7 lists all `h:form` attributes.

Table 4–7 Attributes for `h:form`

Attributes	Description
`prependId` (JSF 1.2)	`true` (default) if the ID of this form is prepended to the IDs of its components; `false` to suppress prepending the form ID (useful if the ID is used in JavaScript code)
`binding`, `id`, `rendered`, `styleClass`	Basic attributes[a]
`accept`, `acceptcharset`, `dir`, `enctype`, `lang`, `style`, `target`, `title`	HTML 4.0[b] attributes
`onclick`, `ondblclick`, `onfocus`, `onkeydown`, `onkeypress`, `onkeyup`, `onmousedown`, `onmousemove`, `onmouseout`, `onmouseover`, `onmouseup`, `onreset`, `onsubmit`	DHTML events[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

Although the HTML `form` tag has `method` and `action` attributes, `h:form` does not. Because you can save state in the client—an option that is implemented as a hidden field—posting forms with the GET method is disallowed. The contents of that hidden field can be quite large and may overrun the buffer for request parameters, so all JSF form submissions are implemented with the POST method.

There is no need for an `anchor` attribute since JSF form submissions always post to the current page. (Navigation to a new page happens after the form data have been posted.)

The `h:form` tag generates an HTML `form` element. For example, if, in a JSF page named `/index.jsp`, you use an `h:form` tag with no attributes, the `Form` renderer generates HTML like this:

```
<form id="_id0" method="post" action="/forms/faces/index.jsp"
   enctype="application/x-www-form-urlencoded">
```

`h:form` comes with a full complement of DHTML event attributes. You can also specify the `style` or `styleClass` attributes for `h:form`. Those styles will then be applied to all output elements contained in the form.

Finally, the `id` attribute is passed through to the HTML `form` element. If you do not specify the `id` attribute explicitly, a value is generated by the JSF implementa-

tion, as is the case for all generated HTML elements. The `id` attribute is often explicitly specified for forms so that it can be referenced from style sheets or scripts.

Form Elements and JavaScript

Java*Server* Faces is all about *server*-side components, but it is also designed to work with scripting languages, such as JavaScript. For example, the application shown in Figure 4–1 uses JavaScript to confirm that a password field matches a password confirm field. If the fields do not match, a JavaScript dialog is displayed. If they do match, the form is submitted.

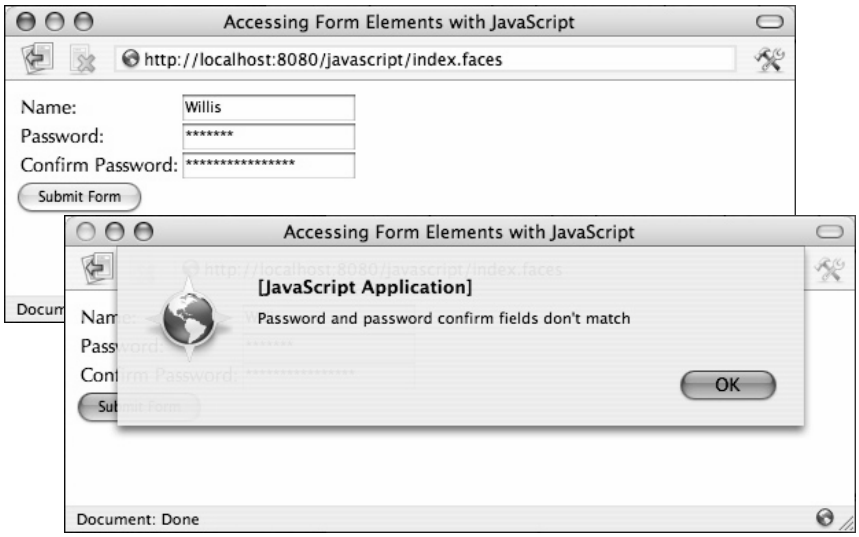


Figure 4–1 Using JavaScript to access form elements

We use the `id` attribute to assign names to the relevant HTML elements so that we can access them with JavaScript:

```
<h:form id="registerForm">
   ...
   <h:inputText id="password" .../>
   <h:inputText id="passwordConfirm" .../>
   ...
   <h:commandButton type="button"
      onclick="checkPassword(this.form)"/>
   ...
</h:form>
```

When the user clicks the button, a JavaScript function—checkPassword—is invoked, as follows:

```
function checkPassword(form) {
   var password = form["registerForm:password"].value;
   var passwordConfirm = form["registerForm:passwordConfirm"].value;

   if (password == passwordConfirm)
      form.submit();
   else
      alert("Password and password confirm fields don't match");
}
```

Notice the syntax used to access form elements. You might think you could access the form elements with a simpler syntax, like this:

```
documents.forms.registerForm.password
```

But that will not work. Now we look at the HTML produced by the preceding code to find out why:

```
<form id="registerForm" method="post"
   action="/javascript/faces/index.jsp"
   enctype="application/x-www-form-urlencoded">
   ...
   <input id="registerForm:password"
      type="text" name="registerForm:password"/>
   ...
   <input type="button" name="registerForm:_id5"
      value="Submit Form" onclick="checkPassword(this.form)"/>
   ...
</form>
```

All form controls generated by JSF have names that conform to

formName:componentName

where *formName* represents the name of the control's form and *componentName* represents the control's name. If you do not specify `id` attributes, the JSF framework creates identifiers for you, as you can see from the button in the preceding HTML fragment. Therefore, to access the password field in the preceding example, you must do this instead:

```
documents.forms.registerForm["registerForm:password"].value
```

The directory structure for the application shown in Figure 4–1 is shown in Figure 4–2. The JSF page is listed in Listing 4–1 and the English resource bundle is listed in Listing 4–2.

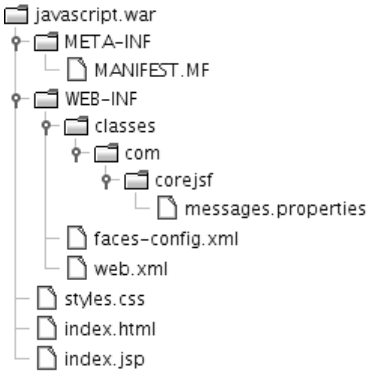


Figure 4–2 The JavaScript example directory structure

Listing 4–1 javascript/web/index.jsp

```
1. <html>
2.    <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
3.    <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
4.    <f:view>
5.       <head>
6.          <title>
7.             <h:outputText value="#{msgs.windowTitle}"/>
8.          </title>
9.       </head>
10.      <body>
11.         <h:form id="registerForm">
12.            <table>
13.               <tr>
14.                  <td>
15.                     <h:outputText value="#{msgs.namePrompt}"/>
16.                  </td>
17.                  <td>
18.                     <h:inputText/>
19.                  </td>
20.               </tr>
21.               <tr>
22.                  <td>
23.                     <h:outputText value="#{msgs.passwordPrompt}"/>
24.                  </td>
25.                  <td>
26.                     <h:inputSecret id="password"/>
27.                  </td>
28.               </tr>
```

Listing 4–1 javascript/web/index.jsp (cont.)

```
            <tr>
               <td>
                  <h:outputText value="#{msgs.confirmPasswordPrompt}"/>
               </td>
               <td>
                  <h:inputSecret id="passwordConfirm"/>
               </td>
            </tr>
         </table>
         <h:commandButton type="button" value="Submit Form"
            onclick="checkPassword(this.form)"/>
      </h:form>
   </body>
   <script type="text/javascript">
   <!--
      function checkPassword(form) {
         var password = form["registerForm:password"].value;
         var passwordConfirm = form["registerForm:passwordConfirm"].value;

         if(password == passwordConfirm)
            form.submit();
         else
            alert("Password and password confirm fields don't match");
      }
   -->
   </script>
 </f:view>
</html>
```

Listing 4–2 javascript/src/java/com/corejsf/messages.properties

```
windowTitle=Accessing Form Elements with JavaScript
namePrompt=Name:
passwordPrompt=Password:
confirmPasswordPrompt=Confirm Password:
```

Text Fields and Text Areas

Text inputs are the mainstay of most web applications. JSF supports three varieties represented by the following tags:

- h:inputText
- h:inputSecret
- h:inputTextarea

Since the three tags use similar attributes, Table 4–8 lists attributes for all three.

Table 4–8 Attributes for `h:inputText`**,** `h:inputSecret`**,** `h:inputTextarea`**, and** `h:inputHidden`

Attributes	Description
`cols`	For `h:inputTextarea` only—number of columns.
`immediate`	Process validation early in the life cycle.
`redisplay`	For `h:inputSecret` only—when true, the input field's value is redisplayed when the web page is reloaded.
`required`	Require input in the component when the form is submitted.
`rows`	For `h:inputTextarea` only—number of rows.
`valueChangeListener`	A specified listener that is notified of value changes.
`label` (JSF 1.2)	A description of the component for use in error messages. Does not apply to `h:inputHidden`.
`binding`, `converter`, `converterMessage` (JSF 1.2), `id`, `rendered`, `required`, `requiredMessage` (JSF 1.2), `styleClass`, `value`, `validator`, `validatorMessage` (JSF 1.2)	Basic attributes[a]. `styleClass` does not apply to `h:inputHidden`.
`accesskey`, `alt`, `dir`, `disabled`, `lang`, `maxlength`, `readonly`, `size`, `style`, `tabindex`, `title`	HTML 4.0 pass-through attributes[b]—`alt`, `maxlength`, and `size` do not apply to `h:inputTextarea`. None apply to `h:inputHidden`.
`autocomplete`	If the value is `"off"`, render the nonstandard HTML attribute `autocomplete="off"` (`h:inputText` and `h:inputSecret` only).
`onblur`, `onchange`, `onclick`, `ondblclick`, `onfocus`, `onkeydown`, `onkeypress`, `onkeyup`, `onmousedown`, `onmousemove`, `onmouseout`, `onmouseover`, `onmouseup`, `onselect`	DHTML events. None apply to `h:inputHidden`.[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

All three tags have immediate, required, value, and valueChangeListener attributes. The immediate attribute is used primarily for value changes that affect the user interface and is rarely used by these three tags. Instead, it is more commonly used by other input components such as menus and listboxes. See "Immediate Components" on page 287 of Chapter 7 for more information about the immediate attribute.

Three attributes in Table 4–8 are each applicable to only one tag: cols, rows, and redisplay. The rows and cols attributes are used with h:inputTextarea to specify the number of rows and columns, respectively, for the text area. The redisplay attribute, used with h:inputSecret, is a boolean that determines whether a secret field retains its value—and therefore redisplays it—when the field's form is resubmitted.

Table 4–9 shows sample uses of the h:inputText and h:inputSecret tags.

Table 4–9 h:inputText **and** h:inputSecret **Examples**

Example	Result
`<h:inputText value="#{form.testString}" readonly="true"/>`	12345678901234567890
`<h:inputSecret value="#{form.passwd}" redisplay="true"/>`	********** (shown after an unsuccessful form submit)
`<h:inputSecret value="#{form.passwd}" redisplay="false"/>`	(shown after an unsuccessful form submit)
`<h:inputText value="inputText" style="color: Yellow; background: Teal;"/>`	inputText
`<h:inputText value="1234567" size="5"/>`	12345
`<h:inputText value="1234567890" maxlength="6" size="10"/>`	123456

The first example in Table 4–9 produces the following HTML:

```
<input type="text" name="_id0:_id4" value="12345678901234567890"
   readonly="readonly"/>
```

The input field is read-only, so our form bean defines only a getter method:

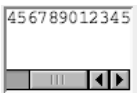
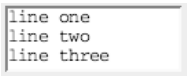
```
private String testString = "12345678901234567890";
public String getTestString() {
   return testString;
}
```

The h:inputSecret examples illustrate the use of the redisplay attribute. If that attribute is true, the text field stores its value between requests and, therefore, the value is redisplayed when the page reloads. If redisplay is false, the value is discarded and is not redisplayed.

The size attribute specifies the number of visible characters in a text field. But because most fonts are variable width, the size attribute is not precise, as you can see from the fifth example in Table 4–9, which specifies a size of 5 but displays six characters. The maxlength attribute specifies the maximum number of characters a text field will display. That attribute is precise. Both size and maxlength are HTML pass-through attributes.

Table 4–10 shows examples of the h:inputTextarea tag.

Table 4–10 h:inputTextarea **Examples**

Example	Result
`<h:inputTextarea rows="5"/>`	
`<h:inputTextarea cols="5"/>`	
`<h:inputTextarea value="123456789012345" rows="3" cols="10"/>`	
`<h:inputTextarea value="#{form.dataInRows}" rows="2" cols="15"/>`	

The h:inputTextarea has cols and rows attributes to specify the number of columns and rows, respectively, in the text area. The cols attribute is analogous to the size attribute for h:inputText and is also imprecise.

If you specify one long string for h:inputTextarea's value, the string will be placed in its entirety in one line, as you can see from the third example in Table 4–10. If you want to put data on separate lines, you can insert newline characters (\n) to force a line break. For example, the last example in Table 4–10 accesses the dataInRows property of a backing bean. That property is implemented like this:

```
private String dataInRows = "line one\nline two\nline three";
public void setDataInRows(String newValue) {
   dataInRows = newValue;
}
public String getDataInRows() {
   return dataInRows;
}
```

Hidden Fields

JSF provides support for hidden fields with h:inputHidden. Hidden fields are often used with JavaScript actions to send data back to the server. The h:inputHidden tag has the same attributes as the other input tags, except that it does not support the standard HTML and DHTML tags.

Using Text Fields and Text Areas

Next, we take a look at a complete example that uses text fields and text areas. The application shown in Figure 4–3 uses h:inputText, h:inputSecret, and h:inputTextarea to collect personal information from a user. The values of those components are wired to bean properties, which are accessed in a Thank You page that redisplays the information the user entered.

Three things are noteworthy about the following application. First, the JSF pages reference a user bean (com.corejsf.UserBean). Second, the h:inputTextarea tag transfers the text entered in a text area to the model (in this case, the user bean) as one string with embedded newlines (\n). We display that string by using the HTML <pre> element to preserve that formatting. Third, for illustration, we use the style attribute to format output. A more industrial-strength application would presumably use style sheets exclusively to make global style changes easier to manage.

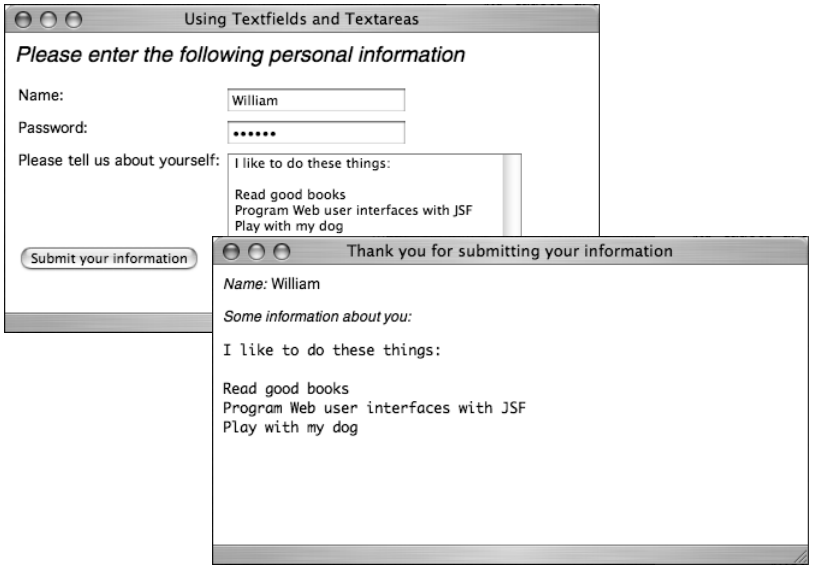


Figure 4–3 Using text fields and text areas

Figure 4–4 shows the directory structure for the application shown in Figure 4–3. Listing 4–3 through Listing 4–7 show the pertinent JSF pages, managed beans, faces configuration file, and resource bundle.

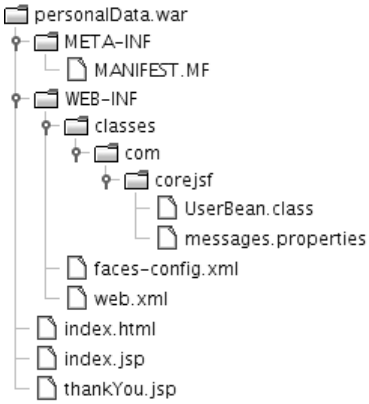


Figure 4–4 Directory structure of the text fields and text areas example

Listing 4–3 personalData/web/index.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <title>
            <h:outputText value="#{msgs.indexWindowTitle}"/>
         </title>
      </head>
      <body>
         <h:outputText value="#{msgs.indexPageTitle}"
            style="font-style: italic; font-size: 1.5em"/>
         <h:form>
            <table>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.namePrompt}"/>
                  </td>
                  <td>
                     <h:inputText value="#{user.name}"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.passwordPrompt}"/>
                  </td>
                  <td>
                     <h:inputSecret value="#{user.password}"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.tellUsPrompt}"/>
                  </td>
                  <td>
                     <h:inputTextarea value="#{user.aboutYourself}" rows="5"
                        cols="35"/>
                  </td>
               </tr>
            </table>
            <h:commandButton value="#{msgs.submitPrompt}" action="thankYou"/>
         </h:form>
      </body>
   </f:view>
</html>
```

Listing 4–4 personalData/web/thankYou.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <title>
            <h:outputText value="#{msgs.thankYouWindowTitle}"/>
         </title>
      </head>
      <body>
         <h:outputText value="#{msgs.namePrompt}" style="font-style: italic"/>
         <h:outputText value="#{user.name}"/>
         <br/>
         <h:outputText value="#{msgs.aboutYourselfPrompt}"
            style="font-style: italic"/>
         <br/>
         <pre><h:outputText value="#{user.aboutYourself}"/></pre>
      </body>
   </f:view>
</html>
```

Listing 4–5 personalData/src/java/com/corejsf/UserBean.java

```
package com.corejsf;

public class UserBean {
   private String name;
   private String password;
   private String aboutYourself;

   // PROPERTY: name
   public String getName() { return name; }
   public void setName(String newValue) { name = newValue; }

   // PROPERTY: password
   public String getPassword() { return password; }
   public void setPassword(String newValue) { password = newValue; }

   // PROPERTY: aboutYourself
   public String getAboutYourself() { return aboutYourself; }
   public void setAboutYourself(String newValue) { aboutYourself = newValue; }
}
```

Listing 4–6 personalData/web/WEB-INF/faces-config.xml

```
<?xml version="1.0"?>
<faces-config 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-facesconfig_1_2.xsd"
   version="1.2">
   <navigation-rule>
      <from-view-id>/index.jsp</from-view-id>
      <navigation-case>
         <from-outcome>thankYou</from-outcome>
         <to-view-id>/thankYou.jsp</to-view-id>
      </navigation-case>
   </navigation-rule>
   <managed-bean>
      <managed-bean-name>user</managed-bean-name>
      <managed-bean-class>com.corejsf.UserBean</managed-bean-class>
      <managed-bean-scope>session</managed-bean-scope>
   </managed-bean>
   <application>
      <resource-bundle>
         <base-name>com.corejsf.messages</base-name>
         <var>msgs</var>
      </resource-bundle>
   </application>
</faces-config>
```

Listing 4–7 personalData/src/java/com/corejsf/messages.properties

```
indexWindowTitle=Using Textfields and Textareas
thankYouWindowTitle=Thank you for submitting your information
thankYouPageTitle=Thank you!
indexPageTitle=Please enter the following personal information
namePrompt=Name:
passwordPrompt=Password:
tellUsPrompt=Please tell us about yourself:
aboutYourselfPrompt=Some information about you:
submitPrompt=Submit your information
```

Displaying Text and Images

JSF applications use the following tags to display text and images:

- h:outputText
- h:outputFormat
- h:graphicImage

The h:outputText tag is one of JSF's simplest tags. With only a handful of attributes, it does not typically generate an HTML element. Instead, it generates mere text—with one exception: If you specify the style or styleClass attributes, h:outputText will generate an HTML span element. Also, h:outputText and h:outputFormat have one attribute that is unique among all JSF HTML tags: escape.

By default, the escape attribute is false, but if you set it to true, the following characters < > & are converted to < > and & respectively. Changing those characters helps prevent cross-site scripting attacks. See http://www.cert.org/advisories/CA-2000-02.html for more information about cross-site scripting attacks. Table 4–11 lists all h:outputText attributes.

Table 4–11 Attributes for h:outputText and h:outputFormat

Attributes	Description
escape	If set to true, escapes <, >, and & characters. Default value is false.
binding, converter, id, rendered, styleClass, value	Basic attributes.[a]
style, title, dir (JSF 1.2), lang (JSF 1.2)	HTML 4.0.[b]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.

The h:outputFormat tag formats a compound message with parameters specified in the body of the tag—for example:

```
<h:outputFormat value="{0} is {1} years old">
   <f:param value="Bill"/>
   <f:param value="38"/>
</h:outputFormat>
```

In the preceding code fragment, the compound message is {0} is {1} years old and the parameters, specified with f:param tags, are Bill and 38. The output of the preceding code fragment is: Bill is 38 years old. The h:outputFormat tag uses a java.text.MessageFormat instance to format its output.

Table 4–11 lists all the attributes for h:outputFormat.

The h:graphicImage tag lets you use a context-relative path—meaning relative to the web application's top-level directory—to display images. h:graphicImage generates an HTML img element.

Table 4–12 shows all the attributes for h:graphicImage.

Table 4–12 Attributes for h:graphicImage

Attributes	Description
binding, id, rendered, styleClass, value	Basic attributes[a]
alt, dir, height, ismap, lang, longdesc, style, title, url, usemap, width	HTML 4.0[b]
onclick, ondblclick, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup	DHTML events[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

Table 4–13 shows some examples of using h:outputText and h:graphicImage.

Table 4–13 h:outputText **and** h:graphicImage **Examples**

Example	Result
`<h:outputText value="#{form.testString}"/>`	12345678901234567890
`<h:outputText value="Number #{form.number}"/>`	Number 1000
`<h:outputText value="<input type='text' value='hello'/>"/>`	hello
`<h:outputText escape="true" value='<input type="text" value="hello"/>'/>`	`<input type="text" value="hello">`
`<h:graphicImage value="/tjefferson.jpg"/>`	
`<h:graphicImage value="/tjefferson.jpg" style="border: thin solid black"/>`	

The third and fourth examples in Table 4–13 illustrate use of the escape attribute. If the value for h:outputText is <input type='text' value='hello'/>, and the escape attribute is false—as is the case for the third example in Table 4–13—the h:outputText tag generates an HTML input element. Unintentional generation of HTML elements is exactly the sort of mischief that enables miscreants to carry

out cross-site scripting attacks. With the `escape` attribute set to `true`—as in the fourth example in Table 4–13—that output is transformed to harmless text, thereby thwarting a potential attack.

The final two examples in Table 4–13 show you how to use `h:graphicImage`.

Buttons and Links

Buttons and links are ubiquitous among web applications, and JSF provides the following tags to support them:

- `h:commandButton`
- `h:commandLink`
- `h:outputLink`

The `h:commandButton` and `h:commandLink` actions both represent JSF command components—the JSF framework fires action events and invokes actions when a button or link is activated. See "Action Events" on page 275 of Chapter 7 for more information about event handling for command components.

The `h:outputLink` tag generates an HTML `anchor` element that points to a resource such as an image or a web page. Clicking the generated link takes you to the designated resource without further involving the JSF framework.

Table 4–14 lists the attributes shared by `h:commandButton` and `h:commandLink`.

Table 4–14 Attributes for `h:commandButton` and `h:commandLink`

Attribute	Description
`action`	*If specified as a string:* Directly specifies an outcome used by the navigation handler to determine the JSF page to load next as a result of activating the button or link. *If specified as a method expression:* The method has this signature: `String methodName()`; the string represents the outcome.
`actionListener`	A method expression that refers to a method with this signature: `void methodName(ActionEvent)`.
`charset`	For `h:commandLink` only—The character encoding of the linked reference.
`image`	For `h:commandButton` only—The path to an image displayed in a button. If you specify this attribute, the HTML `input`'s type will be `image`.

Table 4–14 Attributes for `h:commandButton` and `h:commandLink` (cont.)

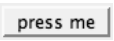
Attribute	Description
`immediate`	A Boolean. If `false` (the default), actions and action listeners are invoked at the end of the request life cycle; if `true`, actions and action listeners are invoked at the beginning of the life cycle. See Chapter 6 for more information about the `immediate` attribute.
`type`	For `h:commandButton`—The type of the generated `input` element: `button`, `submit`, or `reset`. The default, unless you specify the `image` attribute, is `submit`. For `h:commandLink`—The content type of the linked resource; for example, `text/html`, `image/gif`, or `audio/basic`.
`value`	The label displayed by the button or link. You can specify a string or a value expression.
`binding`, `id`, `rendered`, `styleClass`	Basic attributes.[a]
`accesskey`, `alt` (`h:commandLink` only), `coords` (`h:commandLink` only), `dir` (in JSF 1.1), `disabled` (`h:commandButton` only in JSF 1.1), `hreflang` (`h:commandLink` only), `lang`, `readonly` (`h:commandLink` only), `rel` (`h:commandLink` only), `rev` (`h:commandLink` only), `shape` (`h:commandLink` only), `style`, `tabindex`, `target` (`h:commandLink` only), `title`	HTML 4.0.[b]
`onblur`, `onchange` (`h:commandLink` only), `onclick`, `ondblclick`, `onfocus`, `onkeydown`, `onkeypress`, `onkeyup`, `onmousedown`, `onmousemove`, `onmouseout`, `onmouseover`, `onmouseup`, `onselect` (`h:commandLink` only)	DHTML events.[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

Using Command Buttons

The h:commandButton tag generates an HTML input element whose type is button, image, submit, or reset, depending on the attributes you specify. Table 4–15 illustrates some uses of h:commandButton.

Table 4–15 h:commandButton **Examples**

Example	Result
`<h:commandButton value="submit" type="submit"/>`	
`<h:commandButton value="reset" type="reset"/>`	
`<h:commandButton value="click this button..." onclick="alert('button clicked')" type="button"/>`	
`<h:commandButton value="disabled" disabled="#{not form.buttonEnabled}"/>`	
`<h:commandButton value="#{form.buttonText}" type="reset"/>`	

The third example in Table 4–15 generates a push button—an HTML input element whose type is button—that does not result in a form submit. The only way to attach behavior to a push button is to specify a script for one of the DHTML event attributes, as we did for onclick in the example.

CAUTION: h:graphicImage and h:commandButton can both display images, but in JSF 1.1, the way in which you specify the image was not consistent between the two tags. h:commandButton required a context path, whereas the context path was added automatically by h:graphicImage. For example, for an application named myApp, here is how you specified the same image for each tag:

```
<h:commandButton image="/myApp/imageFile.jpg"/> <!-- JSF 1.1 -->
<h:graphicImage value="/imageFile.jpg"/>
```

In JSF 1.2, you do not add the context path for either attribute. If the path is absolute (starting with a /), the context path is automatically added. If the path is relative to the enclosing page (i.e., not starting with a /), it is used without change.

The h:commandLink tag generates an HTML anchor element that acts like a form submit button. Table 4–16 shows some h:commandLink examples.

Table 4–16 h:commandLink **Examples**

Example	Result

`<h:commandLink>`
`  <h:outputText value="register"/>`
`</h:commandLink>`
	register

`<h:commandLink style="font-style: italic">`
`  <h:outputText value="#{msgs.linkText}"/>`
`</h:commandLink>`
	click here to register

`<h:commandLink>`
`  <h:outputText value="#{msgs.linkText}"/>`
`  <h:graphicImage value="/registration.jpg"/>`
`</h:commandLink>`
	click here to register 

`<h:commandLink value="welcome"`
`  actionListener="#{form.useLinkValue}"`
`  action="#{form.followLink}">`
	welcome

`<h:commandLink>`
`  <h:outputText value="welcome"/>`
`  <f:param name="outcome" value="welcome"/>`
`</h:commandLink>`
	welcome

h:commandLink generates JavaScript to make links act like buttons. For example, here is the HTML generated by the first example in Table 4–16:

```
<a href="#" onclick="document.forms['_id0']['_id0:_id2'].value='_id0:_id2';
   document.forms['_id0'].submit()">register</a>
```

When the user clicks the link, the anchor element's value is set to the h:commandLink's client ID, and the enclosing form is submitted. That submission sets the JSF life cycle in motion and, because the href attribute is "#", the current page will be reloaded unless an action associated with the link returns a non-null outcome. See Chapter 3 for more information about JSF navigation.

You can place as many JSF HTML tags as you want in the body of an h:commandLink tag—each corresponding HTML element is part of the link. So, for example, if you click on either the text or image in the third example in Table 4–16, the link's form will be submitted.

The next-to-last example in Table 4–16 attaches an action listener, in addition to an action, to a link. Action listeners are discussed in "Action Events" on page 275 of Chapter 7.

The last example in Table 4–16 embeds an f:param tag in the body of the h:commandLink tag. When you click the link, a request parameter with the name and value specified with the f:param tag is created by the link. You can use that request parameter any way you like. See "Passing Data from the UI to the Server" on page 291 of Chapter 7 for an example.

Both h:commandButton and h:commandLink submit requests and subsequently invoke the JSF life cycle. Although those tags are useful, sometimes you just need a link that loads a resource without invoking the JSF life cycle. In that case, you can use the h:outputLink tag. Table 4–17 lists all attributes for h:outputLink.

Table 4–17 Attributes for h:outputLink

Attributes	Description
binding, converter, id, lang, rendered, styleClass, value	Basic attributes[a]
accesskey, charset, coords, dir, disabled (JSF 1.2), hreflang, lang, rel, rev, shape, style, tabindex, target, title, type	HTML 4.0[b]
onblur, onclick, ondblclick, onfocus, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup	DHTML events[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

Like h:commandLink, h:outputLink generates an HTML anchor element. But unlike h:commandLink, h:outputLink does not generate JavaScript to make the link act like a submit button. The value of the h:outputLink value attribute is used for the anchor's href attribute, and the contents of the h:outputLink body are used to populate the body of the anchor element. Table 4–18 shows some h:outputLink examples.

Table 4–18 h:outputLink **Examples**

Example	Result

`<h:outputLink value="http://java.net">`
`  <h:graphicImage value="java-dot-net.jpg"/>`
`  <h:outputText value="java.net"/>`
`</h:outputLink>`
	

`<h:outputLink value="#{form.welcomeURL}">`
`  <h:outputText value="#{form.welcomeLinkText}"/>`
`</h:outputLink>`
	go to welcome page

`<h:outputLink value="#introduction">`
`  <h:outputText value="Introduction"`
`  style="font-style: italic"/>`
`</h:outputLink>`
	Introduction

`<h:outputLink value="#conclusion"`
`  title="Go to the conclusion">`
`  <h:outputText value="Conclusion"/>`
`</h:outputLink>`
	

`<h:outputLink value="#toc"`
`  title="Go to the table of contents">`
`  <h2>Table of Contents</h2>`
`</h:outputLink>`
	Table of Contents

The first example in Table 4–18 is a link to `http://java.net`. The second example uses properties stored in a bean for the link's URL and text. Those properties are implemented like this:

```
private String welcomeURL = "/outputLinks/faces/welcome.jsp";
public String getWelcomeURL() {
   return welcomeURL;
}
private String welcomeLinkText = "go to welcome page";
public String getWelcomeLinkText() {
   return welcomeLinkText;
}
```

The last three examples in Table 4–18 are links to named anchors in the same JSF page. Those anchors look like this:

```
<a name="introduction">Introduction</a>
...
<a name="conclusion">Conclusion</a>
...
```

```
<a name="toc">Table of Contents</a>
...
```

CAUTION: If you use JSF 1.1, you need to use the `f:verbatim` tag for the last example in Table 4–18:

```
<h:outputLink...><f:verbatim>Table of Contents</f:verbatim></h:outputLink>
```

You cannot simply place text inside the `h:outputLink` tag—the text would appear outside the link. In JSF 1.1, children of a component had to be another component, such as `h:outputText` or `f:verbatim`. This problem has been fixed in JSF 1.2.

Using Command Links

Now that we have discussed the details of JSF tags for buttons and links, we take a look at a complete example. Figure 4–5 shows the application discussed in "Using Text Fields and Text Areas" on page 112, with two links that let you select either English or German locales. When a link is activated, an action changes the view's locale and the JSF implementation reloads the current page.

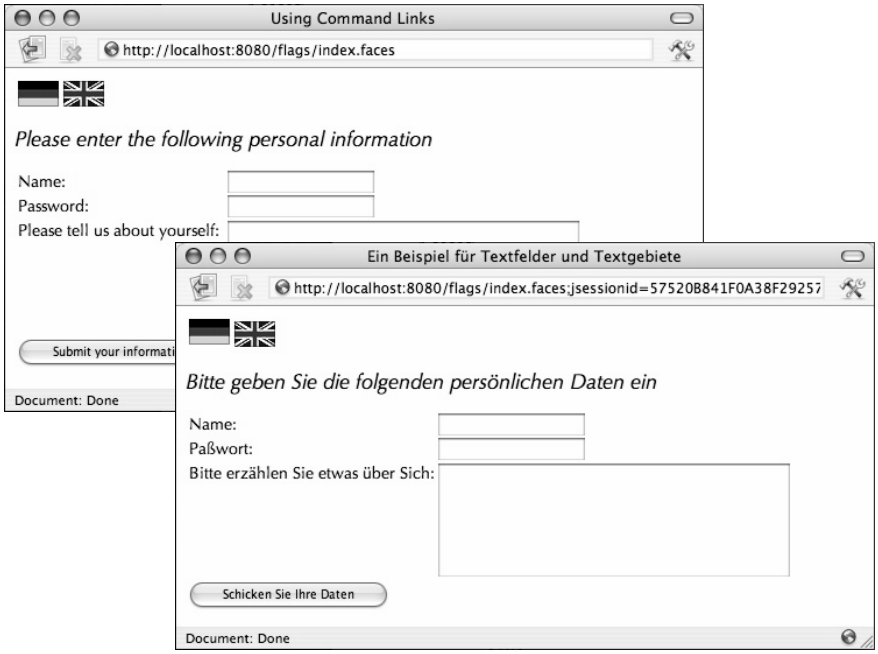


Figure 4–5 Using command links to change locales

The two links are implemented like this:

```
<h:form>
   ...
   <h:commandLink action="#{localeChanger.germanAction}">
      <h:graphicImage value="/german_flag.gif"
         style="border: 0px"/>
   </h:commandLink>

   <h:commandLink action="#{localeChanger.englishAction}">
      <h:graphicImage value="/britain_flag.gif"
         style="border: 0px"/>
   </h:commandLink>
   ...
</h:form>
```

Both links specify an image, a request parameter, and an action method. Those methods look like this:

```
public class ChangeLocaleBean {
   public String germanAction() {
      FacesContext context = FacesContext.getCurrentInstance();
      context.getViewRoot().setLocale(Locale.GERMAN);
      return null;
   }
   public String englishAction() {
      FacesContext context = FacesContext.getCurrentInstance();
      context.getViewRoot().setLocale(Locale.ENGLISH);
      return null;
   }
}
```

Both actions set the locale of the view. And because we have not specified any navigation for this application, the JSF implementation will reload the current page after the form is submitted. When the page is reloaded, it is localized for English or German, and the page redisplays accordingly.

Figure 4–6 shows the directory structure for the application, and Listing 4–8 through Listing 4–11 show the associated JSF pages Java classes. Listing 4-11 shows the faces configuration file.

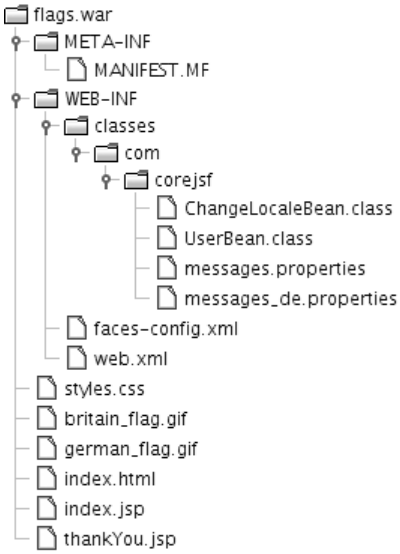


Figure 4–6 Directory structure of the flags example

Listing 4–8 flags/web/index.jsp

```
1. <html>
2.    <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
3.    <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
4.    <f:view>
5.       <head>
6.          <link href="styles.css" rel="stylesheet" type="text/css"/>
7.          <title>
8.             <h:outputText value="#{msgs.indexWindowTitle}"/>
9.          </title>
10.      </head>
11.      <body>
12.         <h:form>
13.            <table>
14.               <tr>
15.                  <td>
16.                     <h:commandLink immediate="true"
17.                        action="#{localeChanger.germanAction}">
18.                        <h:graphicImage value="/german_flag.gif"
19.                           style="border: 0px"/>
20.                     </h:commandLink>
21.                  </td>
22.                  <td>
23.                     <h:commandLink immediate="true"
24.                        action="#{localeChanger.englishAction}">
```

Listing 4–8 flags/web/index.jsp (cont.)

```
                        <h:graphicImage value="/britain_flag.gif"
                           style="border: 0px"/>
                     </h:commandLink>
                  </td>
               </tr>
            </table>
            <p>
               <h:outputText value="#{msgs.indexPageTitle}"
                  style="font-style: italic; font-size: 1.3em"/>
            </p>
            <table>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.namePrompt}"/>
                  </td>
                  <td>
                     <h:inputText value="#{user.name}"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.passwordPrompt}"/>
                  </td>
                  <td>
                     <h:inputSecret value="#{user.password}"/>
                  </td>
               </tr>
               <tr>
                  <td style="vertical-align: top">
                     <h:outputText value="#{msgs.tellUsPrompt}"/>
                  </td>
                  <td>
                     <h:inputTextarea value="#{user.aboutYourself}" rows="5"
                        cols="35"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:commandButton value="#{msgs.submitPrompt}"
                        action="thankYou"/>
                  </td>
               </tr>
            </table>
         </h:form>
      </body>
   </f:view>
</html>
```

Listing 4–9 flags/src/java/com/corejsf/UserBean.java

```
1. package com.corejsf;
2.
3. public class UserBean {
4.    private String name;
5.    private String password;
6.    private String aboutYourself;
7.
8.    // PROPERTY: name
9.    public String getName() { return name; }
10.   public void setName(String newValue) { name = newValue; }
11.
12.   // PROPERTY: password
13.   public String getPassword() { return password; }
14.   public void setPassword(String newValue) { password = newValue; }
15.
16.   // PROPERTY: aboutYourself
17.   public String getAboutYourself() { return aboutYourself; }
18.   public void setAboutYourself(String newValue) { aboutYourself = newValue; }
19. }
```

Listing 4–10 flags/src/java/com/corejsf/ChangeLocaleBean.java

```
1. package com.corejsf;
2.
3. import java.util.Locale;
4. import javax.faces.context.FacesContext;
5.
6. public class ChangeLocaleBean {
7.    public String germanAction() {
8.       FacesContext context = FacesContext.getCurrentInstance();
9.       context.getViewRoot().setLocale(Locale.GERMAN);
10.      return null;
11.   }
12.
13.   public String englishAction() {
14.      FacesContext context = FacesContext.getCurrentInstance();
15.      context.getViewRoot().setLocale(Locale.ENGLISH);
16.      return null;
17.   }
18. }
```

Listing 4–11 flags/web/WEB-INF/faces-config.xml

```
<?xml version="1.0"?>
<faces-config 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-facesconfig_1_2.xsd"
   version="1.2">
   <navigation-rule>
      <from-view-id>/index.jsp</from-view-id>
      <navigation-case>
         <from-outcome>thankYou</from-outcome>
         <to-view-id>/thankYou.jsp</to-view-id>
      </navigation-case>
   </navigation-rule>

   <managed-bean>
      <managed-bean-name>localeChanger</managed-bean-name>
      <managed-bean-class>com.corejsf.ChangeLocaleBean</managed-bean-class>
      <managed-bean-scope>session</managed-bean-scope>
   </managed-bean>

   <managed-bean>
      <managed-bean-name>user</managed-bean-name>
      <managed-bean-class>com.corejsf.UserBean</managed-bean-class>
      <managed-bean-scope>session</managed-bean-scope>
   </managed-bean>

   <application>
      <resource-bundle>
         <base-name>com.corejsf.messages</base-name>
         <var>msgs</var>
      </resource-bundle>
   </application>
</faces-config>
```

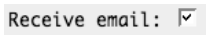
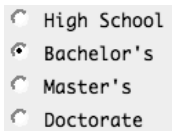
Selection Tags

JSF has seven tags for making selections:

- h:selectBooleanCheckbox
- h:selectManyCheckbox
- h:selectOneRadio
- h:selectOneListbox
- h:selectManyListbox
- h:selectOneMenu
- h:selectManyMenu

Table 4–19 shows examples of each tag.

Table 4–19 Selection Tag Examples

Tag	Generated HTML	Examples
h:selectBooleanCheckbox	<input type="checkbox">	
h:selectManyCheckbox	<table> ... <label> ☐ </label> ... </table>	
h:selectOneRadio	<table> ... <label> ☐ </label> ... </table>	
h:selectOneListbox	<select> <option value="Cheese"> Cheese </option> ... </select>	
h:selectManyListbox	<select multiple> <option value="Cheese"> Cheese </option> ... </select>	
h:selectOneMenu	<select size="1"> <option value="Cheese"> Cheese </option> ... </select>	
h:selectManyMenu	<select multiple size="1"> <option value="Sunday"> Sunday </option> ... </select>	

The h:selectBooleanCheckbox is the simplest selection tag—it renders a checkbox you can wire to a boolean bean property. You can also render a set of checkboxes with h:selectManyCheckbox.

Tags whose names begin with selectOne let you select one item from a collection. The selectOne tags render sets of radio buttons, single-select menus, or listboxes. The selectMany tags render sets of checkboxes, multiselect menus, or listboxes.

All selection tags share an almost identical set of attributes, listed in Table 4–20.

Table 4–20 Attributes for h:selectBooleanCheckbox**,** h:selectManyCheckbox**,** h:selectOneRadio**,** h:selectOneListbox**,** h:selectManyListbox**,** h:selectOneMenu**, and** h:selectManyMenu

Attributes	Description
disabledClass	CSS class for disabled elements—for h:selectOneRadio and h:selectManyCheckbox only.
enabledClass	CSS class for enabled elements—for h:selectOneRadio and h:selectManyCheckbox only.
layout	Specification for how elements are laid out: lineDirection (horizontal) or pageDirection (vertical)—for h:selectOneRadio and h:selectManyCheckbox only.
label (JSF 1.2)	A description of the component for use in error messages.
binding, converter, converterMessage (JSF 1.2), requiredMessage (JSF 1.2), id, immediate, styleClass, required, rendered, validator, validatorMessage (JSF 1.2), value, valueChangeListener	Basic attributes.[a]
accesskey, border, dir, disabled, lang, readonly, style, size, tabindex, title	HTML 4.0[b]—border is applicable to h:selectOneRadio and h:selectManyCheckbox only. size is applicable to h:selectOneListbox and h:selectManyListbox only.
onblur, onchange, onclick, ondblclick, onfocus, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup, onselect	DHTML events.[c]

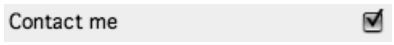
a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

Checkboxes and Radio Buttons

Two JSF tags represent checkboxes:

- h:selectBooleanCheckbox
- h:selectManyCheckbox

h:selectBooleanCheckbox represents a single checkbox that you can wire to a boolean bean property. Here is an example:



In your JSF page, you do this:

```
<h:selectBooleanCheckbox value="#{form.contactMe}"/>
```

In your backing bean, provide a read-write property:

```
private boolean contactMe;
public void setContactMe(boolean newValue) {
   contactMe = newValue;
}
public boolean getContactMe() {
   return contactMe;
}
```

The generated HTML looks something like this:

```
<input type="checkbox" name="_id2:_id7"/>
```

You can create a group of checkboxes with h:selectManyCheckbox. As the tag name implies, you can select one or more of the checkboxes in the group. You specify that group within the body of h:selectManyCheckbox, either with one or more f:selectItem tags or one f:selectItems tag. See "Items" on page 138 for more information about those core tags. For example, here is a group of checkboxes for selecting colors:

The h:selectManyCheckbox tag looks like this:

```
<h:selectManyCheckbox value="#{form.colors}">
   <f:selectItem itemValue="Red" itemLabel="Red"/>
   <f:selectItem itemValue="Blue" itemLabel="Blue"/>
   <f:selectItem itemValue="Yellow" itemLabel="Yellow"/>
   <f:selectItem itemValue="Green" itemLabel="Green"/>
   <f:selectItem itemValue="Orange" itemLabel="Orange"/>
</h:selectManyCheckbox>
```

The checkboxes are specified with f:selectItem (page 138) or f:selectItems (page 140).

The h:selectManyCheckbox tag generates an HTML table element; for example, here is the generated HTML for our color example:

```
<table>
   <tr>
      <td>
         <label for="_id2:_id14">
            <input name="_id2:_id14" value="Red" type="checkbox"> Red</input>
         </label>
      </td>
   </tr>
   ...
</table>
```

Each color is an input element, wrapped in a label for accessibility. That label is placed in a td element.

Radio buttons are implemented with h:selectOneRadio. Here is an example:

The value attribute of the h:selectOneRadio tag specifies the currently selected item. Once again, we use multiple f:selectItem tags to populate the radio buttons:

```
<h:selectOneRadio value="#{form.education}">
   <f:selectItem itemValue="High School" itemLabel="High School"/>
   <f:selectItem itemValue="Bachelor's" itemLabel="Bachelor's"/>
   <f:selectItem itemValue="Master's" itemLabel="Master's"/>
   <f:selectItem itemValue="Doctorate" itemLabel=Doctorate"/>
</h:selectOneRadio>
```

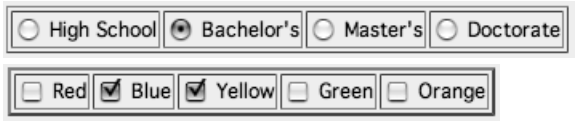
Like h:selectManyCheckbox, h:selectOneRadio generates an HTML table. Here is the table generated by the preceding tag:

```
<table>
   <tr>
      <td>
         <label for="_id2:_id14">
            <input name="_id2:_id14" value="High School" type="radio">
               High School
            </input>
         </label>
      </td>
   </tr>
   ...
</table>
```

Besides generating HTML tables, `h:selectOneRadio` and `h:selectManyCheckbox` have something else in common—a handful of attributes unique to those two tags:

- `border`
- `enabledClass`
- `disabledClass`
- `layout`

The `border` attribute specifies the width of the border. For example, here are radio buttons and checkboxes with borders of 1 and 2, respectively:



`enabledClass` and `disabledClass` specify CSS classes used when the checkboxes or radio buttons are enabled or disabled, respectively. For example, the following picture shows an enabled class with an italic font style, blue color, and yellow background:

The `layout` attribute can be either `lineDirection` (horizontal) or `pageDirection` (vertical). For example, the following checkboxes on the left have a `pageDirection` layout and the checkboxes on the right are `lineDirection`.

NOTE: You might wonder why `layout` attribute values are not `horizontal` and `vertical`, instead of `lineDirection` and `pageDirection`, respectively. Although `lineDirection` and `pageDirection` are indeed horizontal and vertical for Latin-based languages, that is not always the case for other languages. For example, a Chinese browser that displays text top to bottom could regard `lineDirection` as vertical and `pageDirection` as horizontal.

Menus and Listboxes

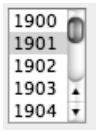
Menus and listboxes are represented by the following tags:

- `h:selectOneListbox`
- `h:selectManyListbox`
- `h:selectOneMenu`
- `h:selectManyMenu`

The attributes for the preceding tags are listed in Table 4–20 on page 132, so that discussion is not repeated here.

Menu and listbox tags generate HTML `select` elements. The menu tags add a `size="1"` attribute to the `select` element. That size designation is all that separates menus and listboxes.

Here is a single-select listbox:



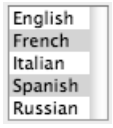
The corresponding listbox tag looks like this:

```
<h:selectOneListbox value="#{form.year}" size="5">
   <f:selectItem itemValue="1900" itemLabel="1900"/>
   <f:selectItem itemValue="1901" itemLabel="1901"/>
   ...
</h:selectOneListbox>
```

Notice that we've used the `size` attribute to specify the number of visible items. The generated HTML looks like this:

```
<select name="_id2:_id11" size="5">
   <option value="1900">1900</option>
   <option value="1901">1901</option>
   ...
</select>
```

Use `h:selectManyListbox` for multiselect listboxes like this one:



The listbox tag looks like this:

```
<h:selectManyListbox value="#{form.languages}">
   <f:selectItem itemValue="English" itemLabel="English"/>
   <f:selectItem itemValue="French" itemLabel="French"/>
   <f:selectItem itemValue="Italian" itemLabel="Italian"/>
   <f:selectItem itemValue="Spanish" itemLabel="Spanish"/>
   <f:selectItem itemValue="Russian" itemLabel="Russian"/>
</h:selectManyListbox>
```

This time we do not specify the `size` attribute, so the listbox grows to accommodate all its items. The generated HTML looks like this:

```
<select name="_id2:_id11" multiple>
   <option value="English">English</option>
   <option value="French">French</option>
   ...
</select>
```

Use `h:selectOneMenu` and `h:selectManyMenu` for menus. A single-select menu looks like this:

`h:selectOneMenu` created the preceding menu:

```
<h:selectOneMenu value="#{form.day}">
   <f:selectItem itemValue="Sunday" itemLabel="Sunday"/>
   <f:selectItem itemValue="Monday" itemLabel="Monday"/>
   <f:selectItem itemValue="Tuesday" itemLabel="Tuesday"/>
   <f:selectItem itemValue="Wednesday" itemLabel="Wednesday"/>
   <f:selectItem itemValue="Thursday" itemLabel="Thursday"/>
   <f:selectItem itemValue="Friday" itemLabel="Friday"/>
   <f:selectItem itemValue="Saturday" itemLabel="Saturday"/>
</h:selectOneMenu>
```

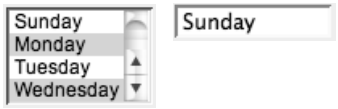
Here is the generated HTML:

```
<select name="_id2:_id17" size="1">
   <option value="Sunday">Sunday</option>
   ...
</select>
```

`h:selectManyMenu` is used for multiselect menus. That tag generates HTML, which looks like this:

```
<select name="_id2:_id17" multiple size="1">
   <option value="Sunday">Sunday</option>
   ...
</select>
```

That HTML does not yield consistent results among browsers. For example, here is `h:selectManyMenu` on Internet Explorer (left) and Netscape (right):



NOTE: In HTML, the distinction between menus and listboxes is artificial. Menus and listboxes are both HTML `select` elements. The only distinction: Menus always have a `size="1"` attribute.

Browsers consistently render single-select menus as drop-down lists, as expected. But they do not consistently render multiple select menus, specified with `size="1"` and `multiple` attributes. Instead of rendering a drop-down list with multiple selection, as you might expect, some browsers render absurdities such as tiny scrollbars that are nearly impossible to manipulate (Windows IE 6) or no scrollbar at all, leaving you to navigate with arrow keys (Firefox 1.5).

Starting with "Selection Tags" on page 130, we have consistently used multiple `f:selectItem` to populate `select` components. Now that we are familiar with the fundamentals of selection tags, we take a closer look at `f:selectItem` and the related `f:selectItems` tags.

Items

All selection tags except `h:selectBooleanCheckbox` use `f:selectItem` or `f:selectItems` to specify their items. Next, we look at those core tags, starting with `f:selectItem`.

The `f:selectItem` *Tag*

You use `f:selectItem` to specify single selection items, like this:

```
<h:selectOneMenu value="#{form.condiments}">
   <f:selectItem itemValue="Cheese" itemLabel="Cheese"/>
   <f:selectItem itemValue="Pickle" itemLabel="Pickle"/>
   <f:selectItem itemValue="Mustard" itemLabel="Mustard"/>
   <f:selectItem itemValue="Lettuce" itemLabel="Lettuce"/>
   <f:selectItem itemValue="Onions" itemLabel="Onions"/>
</h:selectOneMenu>
```

The values—`Cheese`, `Pickle`, etc.—are transmitted as request parameter values when a selection is made from the menu and the menu's form is subsequently submitted. The `itemLabel` values are used as labels for the menu items. Some-

times you want to specify different values for request parameter values and item labels:

```
<h:selectOneMenu value="#{form.condiments}">
   <f:selectItem itemValue="1" itemLabel="Cheese"/>
   <f:selectItem itemValue="2" itemLabel="Pickle"/>
   <f:selectItem itemValue="3" itemLabel="Mustard"/>
   <f:selectItem itemValue="4" itemLabel="Lettuce"/>
   <f:selectItem itemValue="5" itemLabel="Onions"/>
</h:selectOneMenu>
```

In the preceding code, the item values are strings. "Binding the `value` Attribute" on page 145 shows you how to use different data types for item values.

In addition to labels and values, you can also supply item descriptions and specify an item's disabled state:

```
<f:selectItem itemLabel="Cheese" itemValue="#{form.cheeseValue}"
      itemDescription="used to be milk"
      itemDisabled="true"/>
```

Item descriptions are for tools only—they do not affect the generated HTML. The `itemDisabled` attribute, however, is passed to HTML. The `f:selectItem` tag has the attributes shown in Table 4–21.

Table 4–21 Attributes for `f:selectItem`

Attribute	Description
`binding`	Component binding—see Chapter 2 for more information about component bindings
`id`	Component ID
`itemDescription`	Description used by tools only
`itemDisabled`	Boolean value that sets the item's `disabled` HTML attribute
`itemLabel`	Text shown by the item
`itemValue`	Item's value, which is passed to the server as a request parameter
`value`	Value expression that points to a `SelectItem` instance
`escape` (JSF 1.2)	`true` if special characters in the value should be converted to character entities (default), `false` if the value should be emitted without change

You can use f:selectItem's value attribute to access SelectItem instances created in a bean:

```
<f:selectItem value="#{form.cheeseItem}"/>
```

The value expression for the value attribute points to a method that returns a javax.faces.model.SelectItem instance:

```
public SelectItem getCheeseItem()  {
   return new SelectItem("Cheese");
}
```

javax.faces.model.SelectItem

- SelectItem(Object value)
  Creates a SelectItem with a value. The item label is obtained by applying toString() to the value.
- SelectItem(Object value, String label)
  Creates a SelectItem with a value and a label.
- SelectItem(Object value, String label, String description)
  Creates a SelectItem with a value, label, and description.
- SelectItem(Object value, String label, String description, boolean disabled)
  Creates a SelectItem with a value, label, description, and disabled state.

The f:selectItems *Tag*

As we saw in "The f:selectItem Tag" on page 138, f:selectItem is versatile, but it is tedious for specifying more than a few items. The first code fragment shown in that section can be reduced to the following with f:selectItems:

```
<h:selectOneRadio value="#{form.condiments}>
   <f:selectItems value="#{form.condimentItems}"/>
</h:selectOneRadio>
```

The value expression #{form.condimentItems} could point to an array of SelectItem instances:

```
private static SelectItem[] condimentItems = {
   new SelectItem(1, "Cheese"),
   new SelectItem(2, "Pickle"),
   new SelectItem(3, "Mustard"),
   new SelectItem(4, "Lettuce"),
   new SelectItem(5, "Onions")
};
```

```
public SelectItem[] getCondimentItems() {
   return condimentItems;
}
```

The f:selectItems value attribute must be a value expression that points to one of the following:

- A single SelectItem instance
- A collection of SelectItem instances
- An array of SelectItem instances
- A map whose entries represent SelectItem labels and values

NOTE: Can't remember what you can specify for the f:selectItems value attribute? It's a SCAM: Single select item; Collection of select items; Array of select items; Map.

NOTE: A single f:selectItems tag is usually better than multiple f:selectItem tags. If the number of items changes, you have to modify only Java code if you use f:selectItems, whereas f:selectItem may require you to modify both Java code and JSF pages.

If you specify a map, the JSF implementation creates a SelectItem instance for every entry in the map. The entry's key is used as the item's label, and the entry's value is used as the item's value. For example, here are condiments specified with a map:

```
private Map<String, Object> condimentItem = null;

public Map<String, Object> getCondimentItems() {
   if (condimentItem == null) {
       condimentItem = new LinkedHashMap<String, Object>();
       condimentItem.put("Cheese",  1);  // label, value
       condimentItem.put("Pickle",  2);
       condimentItem.put("Mustard", 3);
       condimentItem.put("Lettuce", 4);
       condimentItem.put("Onions",  5);
   }
   return condimentItem;
}
```

Note that you cannot specify item descriptions or disabled status when you use a map.

If you use `SelectItem`, you couple your code to the JSF API. You avoid that coupling when you use a `Map`, which makes it an attractive alternative. However, pay attention to these issues.

1. You will generally want to use a `LinkedHashMap`, not a `TreeMap` or `HashMap`. In a `LinkedHashMap`, you can control the order of the items because items are visited in the order in which they were inserted. If you use a `TreeMap`, the labels that are presented to the user (which are the keys of the map) are sorted alphabetically. That may or may not be what you want. For example, days of the week would be neatly arranged as Friday Monday Saturday Sunday Thursday Tuesday Wednesday. If you use a `HashMap`, the items are ordered randomly.
2. Map keys are turned into item labels and map values into item values. When a user selects an item, your backing bean receives a value in your map, not a key. For example, in the example above, if the backing bean receives a value of 5, you would need to iterate through the entries if you wanted to find the matching `"Onions"`. Since the value is probably more meaningful to your application than the label, this is usually not a problem, just something to be aware of.

Item Groups

You can group menu or listbox items together, like this:

Here are the JSF tags that define the listbox:

```
<h:selectManyListbox>
   <f:selectItems value="#{form.menuItems}"/>
</h:selectManyListbox>
```

The `menuItems` property is a `SelectItem` array:

```
public SelectItem[] getMenuItems() { return menuItems; }
```

The menuItems array is instantiated like this:

```
private static SelectItem[] menuItems = { burgers, beverages, condiments };
```

The burgers, beverages, and condiments variables are SelectItemGroup instances that are instantiated like this:

```
private SelectItemGroup burgers =
   new SelectItemGroup("Burgers",   // value
      "burgers on the menu",        // description
      false,                        // disabled
      burgerItems);                 // select items

private SelectItemGroup beverages =
   new SelectItemGroup("Beverages", // value
      "beverages on the menu",      // description
      false,                        // disabled
      beverageItems);               // select items

private SelectItemGroup condiments =
   new SelectItemGroup("Condiments", // value
      "condiments on the menu",      // description
      false,                         // disabled
      condimentItems);               // select items
```

Notice that we are using SelectItemGroups to populate an array of SelectItems. We can do that because SelectItemGroup extends SelectItem. The groups are created and initialized like this:

```
private SelectItem[] burgerItems = {
   new SelectItem("Qwarter pounder"),
   new SelectItem("Single"),
   new SelectItem("Veggie"),
};
private SelectItem[] beverageItems = {
   new SelectItem("Coke"),
   new SelectItem("Pepsi"),
   new SelectItem("Water"),
   new SelectItem("Coffee"),
   new SelectItem("Tea"),
};
private SelectItem[] condimentItems = {
   new SelectItem("cheese"),
   new SelectItem("pickle"),
   new SelectItem("mustard"),
   new SelectItem("lettuce"),
   new SelectItem("onions"),
};
```

SelectItemGroup instances encode HTML optgroup elements. For example, the preceding code generates the following HTML:

```
<select name="_id0:_id1" multiple size="16">
   <optgroup label="Burgers">
      <option value="1"  selected>Qwarter pounder</option>
      <option value="2">Single</option>
      <option value="3">Veggie</option>
   </optgroup>

   <optgroup label="Beverages">
      <option value="4"  selected>Coke</option>
      <option value="5">Pepsi</option>
      <option value="6">Water</option>
      <option value="7">Coffee</option>
      <option value="8">Tea</option>
   </optgroup>

   <optgroup label="Condiments">
      <option value="9">cheese</option>
      <option value="10">pickle</option>
      <option value="11">mustard</option>
      <option value="12">lettuce</option>
      <option value="13">onions</option>
   </optgroup>
</select>
```

NOTE: The HTML 4.01 specification does not allow nested optgroup elements, which would be useful for things like cascading menus. The specification does mention that future HTML versions may support that behavior.

javax.faces.model.SelectItemGroup

- SelectItemGroup(String label)
  Creates a group with a label but no selection items.
- SelectItemGroup(String label, String description, boolean disabled, SelectItem[] items)
  Creates a group with a label, a description (which is ignored by the JSF Reference Implementation), a boolean that disables all the items when true, and an array of select items used to populate the group.
- setSelectItems(SelectItem[] items)
  Sets a group's array of SelectItems.

Binding the value *Attribute*

In all likelihood, whether you are using a set of checkboxes, a menu, or a listbox, you will want to keep track of selected items. For that purpose, you can exploit selectOne and selectMany tags, which have value attributes that represent selected items. For example, you can specify a selected item with the h:selectOneRadio value attribute, like this:

```
<h:selectOneRadio value="#{form.beverage}">
   <f:selectItems value="#{form.beverageItems}"/>
</h:selectOneRadio>
```

The #{form.beverage} value expression refers to the beverage property of a bean named form. That property is implemented like this:

```
private Integer beverage;
public Integer getBeverage() {
   return beverage;
}
public void setBeverage(Integer newValue) {
   beverage = newValue;
}
```

Notice that the beverage property type is Integer. That means the radio buttons must have Integer values. Those radio buttons are specified with f:selectItems, with a value attribute that points to the beverageItems property of the form bean:

```
private static SelectItem[] beverageItems = {
   new SelectItem(1, "Water"),   // value, label
   new SelectItem(2, "Cola"),
   new SelectItem(3, "Orange Juice")
};
public SelectItem[] getBeverageItems() {
   return beverage;
}
```

In the preceding example, we chose the Integer type to represent beverages. You can choose any type you like as long as the properties for items and selected item have matching types. An enumerated type would be a better choice in this case (see Listing 4–14 for an example).

You can keep track of multiple selections with a selectMany tag. These tags also have a value attribute that lets you specify one or more selected items. That attribute's value must be an array or list of convertible types.

Now we take a look at some different data types. We will use h:selectManyListbox to let a user choose multiple condiments:

```
<h:selectManyListbox value="#{form.condiments}">
   <f:selectItems value="#{form.condimentItems}"/>
</h:selectManyListbox>
```

Here are the `condimentItems` and `condiments` properties:

```
private static SelectItem[] condimentItems = {
   new SelectItem(1, "Cheese"),
   new SelectItem(2, "Pickle"),
   new SelectItem(3, "Mustard"),
   new SelectItem(4, "Lettuce"),
   new SelectItem(5, "Onions"),
};
public SelectItem[] getCondimentItems() {
   return condimentItems;
}

private Integer[] condiments;
public void setCondiments(Integer[] newValue) {
   condiments = newValue;
}
public Integer[] getCondiments() {
   return condiments;
}
```

Instead of an `Integer` array for the `condiments` property, we could have used the corresponding primitive type, `int`:

```
private int[] condiments;
public void setCondiments(int[] newValue) {
   condiments = newValue;
}
public int[] getCondiments() {
   return condiments;
}
```

If you use strings for item values, you can use a string array or list of strings for your selected items property:

```
private static SelectItem[] condimentItems = {
   new SelectItem("cheese", "Cheese"),
   new SelectItem("pickle", "Pickle"),
   new SelectItem("mustard", "Mustard"),
   new SelectItem("lettuce", "Lettuce"),
   new SelectItem("onions", "Onions"),
};
public SelectItem[] getCondimentItems() {
   return condimentItems;
}
```

```
private String[] condiments;
public void setCondiments(String[] newValue) {
   condiments = newValue;
}
public String[] getCondiments() {
   return condiments;
}
```

The preceding `condiments` property is an array of strings. You could use a collection instead:

```
private static Collection<SelectItem> condiments;
static {
   condiments = new ArrayListList<SelectItem>();
   condiments.add(new SelectItem("cheese", "Cheese"));
   condiments.add(new SelectItem("pickle", "Pickle"));
   condiments.add(new SelectItem("mustard", "Mustard"));
   condiments.add(new SelectItem("lettuce", "Lettuce"));
   condiments.add(new SelectItem("onions", "Onions"));
}
public List getCondiments() { return condiments; }
```

All Together: Checkboxes, Radio Buttons, Menus, and Listboxes

We close out our section on selection tags with an example that exercises nearly all those tags. That example, shown in Figure 4–7, implements a form requesting personal information. We use an `h:selectBooleanCheckbox` to determine whether the user wants to receive email, and `h:selectOneMenu` lets the user select the best day of the week for us to call.

The year listbox is implemented with `h:selectOneListbox`; the language checkboxes are implemented with `h:selectManyCheckbox`; the education level is implemented with `h:selectOneRadio`.

When the user submits the form, JSF navigation takes us to a JSF page that shows the data the user entered.

The directory structure for the application shown in Figure 4–7 is shown in Figure 4–8. The JSF pages, `RegisterForm` bean, faces configuration file, and resource bundle are shown in Listing 4–12 through Listing 4–16.

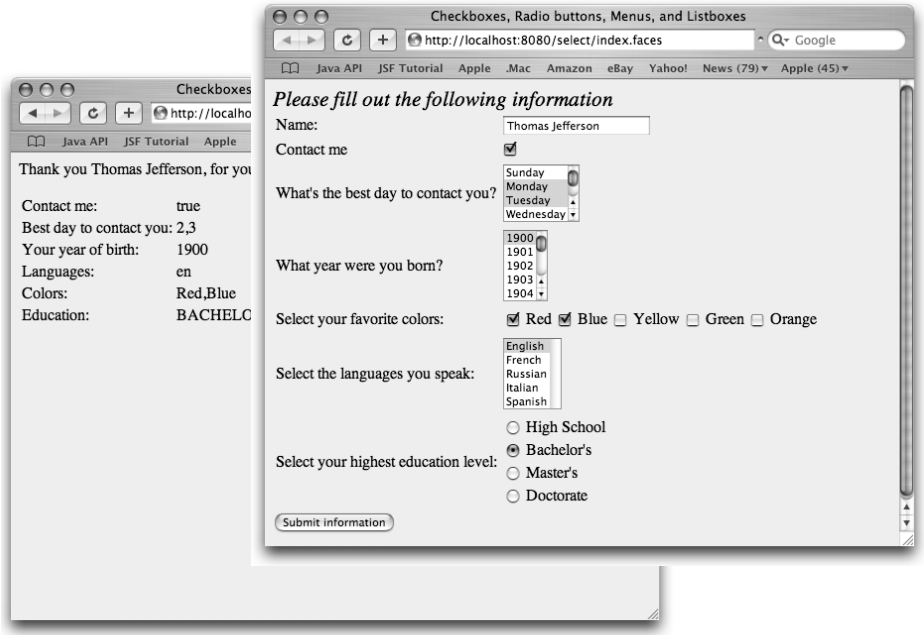


Figure 4–7 Using checkboxes, radio buttons, menus, and listboxes

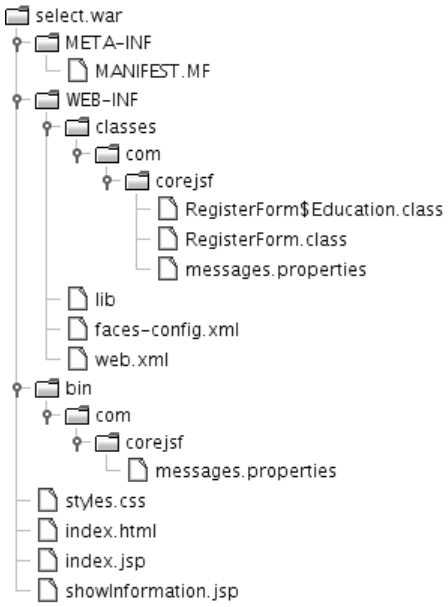


Figure 4–8 The directory structure of the personal information example

Listing 4–12 select/web/index.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <link href="styles.css" rel="stylesheet" type="text/css"/>
         <title>
            <h:outputText value="#{msgs.indexWindowTitle}"/>
         </title>
      </head>

      <body>
         <h:outputText value="#{msgs.indexPageTitle}" styleClass="emphasis"/>
         <h:form>
            <table>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.namePrompt}"/>
                  </td>
                  <td>
                     <h:inputText value="#{form.name}"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.contactMePrompt}"/>
                  </td>
                  <td>
                     <h:selectBooleanCheckbox value="#{form.contactMe}"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.bestDayPrompt}"/>
                  </td>
                  <td>
                     <h:selectManyMenu value="#{form.bestDaysToContact}">
                        <f:selectItems value="#{form.daysOfTheWeekItems}"/>
                     </h:selectManyMenu>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.yearOfBirthPrompt}"/>
                  </td>
```

Listing 4–12 select/web/index.jsp (cont.)

```
                <td>
                   <h:selectOneListbox size="5" value="#{form.yearOfBirth}">
                      <f:selectItems value="#{form.yearItems}"/>
                   </h:selectOneListbox>
                </td>
             </tr>
             <tr>
                <td>
                   <h:outputText value="#{msgs.colorPrompt}"/>
                </td>
                <td>
                   <h:selectManyCheckbox value="#{form.colors}">
                      <f:selectItems value="#{form.colorItems}"/>
                   </h:selectManyCheckbox>
                </td>
             </tr>
             <tr>
                <td>
                   <h:outputText value="#{msgs.languagePrompt}"/>
                </td>
                <td>
                   <h:selectManyListbox value="#{form.languages}">
                      <f:selectItems value="#{form.languageItems}"/>
                   </h:selectManyListbox>
                </td>
             </tr>
             <tr>
                <td>
                   <h:outputText value="#{msgs.educationPrompt}"/>
                </td>
                <td>
                   <h:selectOneRadio value="#{form.education}"
                      layout="pageDirection">
                      <f:selectItems value="#{form.educationItems}"/>
                   </h:selectOneRadio>
                </td>
             </tr>
          </table>
          <h:commandButton value="#{msgs.buttonPrompt}"
             action="showInformation"/>
       </h:form>
       <h:messages/>
    </body>
 </f:view>
</html>
```

Listing 4–13 select/web/showInformation.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <link href="styles.css" rel="stylesheet" type="text/css"/>
         <title>
            <h:outputText value="#{msgs.indexWindowTitle}"/>
         </title>
      </head>

      <body>
         <h:outputFormat value="#{msgs.thankYouLabel}">
            <f:param value="#{form.name}"/>
         </h:outputFormat>
         <p>
         <table>
            <tr>
               <td><h:outputText value="#{msgs.contactMeLabel}"/></td>
               <td><h:outputText value="#{form.contactMe}"/></td>
            </tr>

            <tr>
               <td><h:outputText value="#{msgs.bestDayLabel}"/></td>
               <td><h:outputText value="#{form.bestDaysConcatenated}"/></td>
            </tr>

            <tr>
               <td><h:outputText value="#{msgs.yearOfBirthLabel}"/></td>
               <td><h:outputText value="#{form.yearOfBirth}"/></td>
            </tr>

            <tr>
               <td><h:outputText value="#{msgs.languageLabel}"/></td>
               <td><h:outputText value="#{form.languagesConcatenated}"/></td>
            </tr>

            <tr>
               <td><h:outputText value="#{msgs.colorLabel}"/></td>
               <td><h:outputText value="#{form.colorsConcatenated}"/></td>
            </tr>

```

Listing 4–13 select/web/showInformation.jsp (cont.)

```
            <tr>
               <td><h:outputText value="#{msgs.educationLabel}"/></td>
               <td><h:outputText value="#{form.education}"/></td>
            </tr>
         </table>
      </body>
   </f:view>
</html>
```

Listing 4–14 select/src/java/com/corejsf/RegisterForm.java

```
package com.corejsf;

import java.text.DateFormatSymbols;
import java.util.ArrayList;
import java.util.Calendar;
import java.util.Collection;
import java.util.HashMap;
import java.util.LinkedHashMap;
import java.util.Map;

import javax.faces.model.SelectItem;

public class RegisterForm {
   enum Education { HIGH_SCHOOL, BACHELOR, MASTER, DOCTOR };

   private String name;
   private boolean contactMe;
   private Integer[] bestDaysToContact;
   private Integer yearOfBirth;
   private String[] colors;
   private String[] languages;
   private Education education;

   // PROPERTY: name
   public String getName() {
      return name;
   }
   public void setName(String newValue) {
      name = newValue;
   }

   // PROPERTY: contactMe
   public boolean getContactMe() {
      return contactMe;
   }
```

Listing 4–14 select/src/java/com/corejsf/RegisterForm.java (cont.)

```
36.    public void setContactMe(boolean newValue) {
37.       contactMe = newValue;
38.    }
39.
40.    // PROPERTY: bestDaysToContact
41.    public Integer[] getBestDaysToContact() {
42.       return bestDaysToContact;
43.    }
44.    public void setBestDaysToContact(Integer[] newValue) {
45.       bestDaysToContact = newValue;
46.    }
47.
48.    // PROPERTY: yearOfBirth
49.    public Integer getYearOfBirth() {
50.       return yearOfBirth;
51.    }
52.    public void setYearOfBirth(Integer newValue) {
53.       yearOfBirth = newValue;
54.    }
55.
56.    // PROPERTY: colors
57.    public String[] getColors() {
58.       return colors;
59.    }
60.    public void setColors(String[] newValue) {
61.       colors = newValue;
62.    }
63.
64.    // PROPERTY: languages
65.    public String[] getLanguages() {
66.       return languages;
67.    }
68.    public void setLanguages(String[] newValue) {
69.       languages = newValue;
70.    }
71.
72.    // PROPERTY: education
73.    public Education getEducation() {
74.       return education;
75.    }
76.
77.    public void setEducation(Education newValue) {
78.       education = newValue;
79.    }
80.
81.    // PROPERTY: yearItems
```

Listing 4–14 select/src/java/com/corejsf/RegisterForm.java (cont.)

```
82.    public Collection<SelectItem> getYearItems() {
83.       return birthYears;
84.    }
85.
86.    // PROPERTY: daysOfTheWeekItems
87.    public SelectItem[] getDaysOfTheWeekItems() {
88.       return daysOfTheWeek;
89.    }
90.
91.    // PROPERTY: languageItems
92.    public Map<String, Object> getLanguageItems() {
93.       return languageItems;
94.    }
95.
96.    // PROPERTY: colorItems
97.    public SelectItem[] getColorItems() {
98.       return colorItems;
99.    }
100.
101.   // PROPERTY: educationItems
102.   public SelectItem[] getEducationItems() {
103.      return educationItems;
104.   }
105.
106.   // PROPERTY: bestDaysConcatenated
107.   public String getBestDaysConcatenated() {
108.      return concatenate(bestDaysToContact);
109.   }
110.
111.   // PROPERTY: languagesConcatenated
112.   public String getLanguagesConcatenated() {
113.      return concatenate(languages);
114.   }
115.
116.   // PROPERTY: colorsConcatenated
117.   public String getColorsConcatenated() {
118.      return concatenate(colors);
119.   }
120.
121.   private static String concatenate(Object[] values) {
122.      if (values == null)
123.         return "";
124.      StringBuilder r = new StringBuilder();
125.      for (Object value : values) {
126.         if (r.length()> 0)
127.            r.append(',');
```

Listing 4–14 select/src/java/com/corejsf/RegisterForm.java (cont.)

```
128.          r.append(value.toString());
129.       }
130.       return r.toString();
131.    }
132.
133.    private static SelectItem[] colorItems = {
134.       new SelectItem("Red"),
135.       new SelectItem("Blue"),
136.       new SelectItem("Yellow"),
137.       new SelectItem("Green"),
138.       new SelectItem("Orange")
139.    };
140.
141.    private static SelectItem[] educationItems = {
142.       new SelectItem(Education.HIGH_SCHOOL, "High School"),
143.       new SelectItem(Education.BACHELOR, "Bachelor's"),
144.       new SelectItem(Education.MASTER, "Master's"),
145.       new SelectItem(Education.DOCTOR, "Doctorate") };
146.
147.    private static Map<String, Object> languageItems;
148.    static {
149.       languageItems = new LinkedHashMap<String, Object>();
150.       languageItems.put("English", "en"); // item, value
151.       languageItems.put("French", "fr");
152.       languageItems.put("Russian", "ru");
153.       languageItems.put("Italian", "it");
154.       languageItems.put("Spanish", "es");
155.    }
156.
157.    private static Collection<SelectItem> birthYears;
158.    static {
159.       birthYears = new ArrayList<SelectItem>();
160.       for (int i = 1900; i < 2000; ++i) {
161.          birthYears.add(new SelectItem(i));
162.       }
163.    }
164.
165.    private static SelectItem[] daysOfTheWeek;
166.    static {
167.       DateFormatSymbols symbols = new DateFormatSymbols();
168.       String[] weekdays = symbols.getWeekdays();
169.       daysOfTheWeek = new SelectItem[7];
170.       for (int i = Calendar.SUNDAY; i <= Calendar.SATURDAY; i++) {
171.          daysOfTheWeek[i - 1] = new SelectItem(new Integer(i), weekdays[i]);
172.       }
173.    }
174. }
```

Listing 4–15 select/src/java/com/corejsf/messages.properties

```
indexWindowTitle=Checkboxes, Radio buttons, Menus, and Listboxes
indexPageTitle=Please fill out the following information

namePrompt=Name:
contactMePrompt=Contact me
bestDayPrompt=What's the best day to contact you?
yearOfBirthPrompt=What year were you born?
buttonPrompt=Submit information
languagePrompt=Select the languages you speak:
educationPrompt=Select your highest education level:
emailAppPrompt=Select your email application:
colorPrompt=Select your favorite colors:

thankYouLabel=Thank you {0}, for your information
contactMeLabel=Contact me:
bestDayLabel=Best day to contact you:
yearOfBirthLabel=Your year of birth:
colorLabel=Colors:
languageLabel=Languages:
educationLabel=Education:
```

Listing 4–16 select/web/WEB-INF/faces-config.xml

```
<?xml version="1.0"?>
<faces-config 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-facesconfig_1_2.xsd"
   version="1.2">
   <navigation-rule>
      <navigation-case>
         <from-outcome>showInformation</from-outcome>
         <to-view-id>/showInformation.jsp</to-view-id>
      </navigation-case>
   </navigation-rule>
   <managed-bean>
      <managed-bean-name>form</managed-bean-name>
      <managed-bean-class>com.corejsf.RegisterForm</managed-bean-class>
      <managed-bean-scope>session</managed-bean-scope>
   </managed-bean>
   <application>
      <resource-bundle>
         <base-name>com.corejsf.messages</base-name>
         <var>msgs</var>
      </resource-bundle>
   </application>
</faces-config>
```

Messages

During the JSF life cycle, any object can create a message and add it to a queue of messages maintained by the faces context. At the end of the life cycle—in the Render Response phase—you can display those messages in a view. Typically, messages are associated with a particular component and indicate either conversion or validation errors.

Although error messages are usually the most prevalent message type in a JSF application, messages come in four varieties:

- Information
- Warning
- Error
- Fatal

All messages can contain a summary and a detail. For example, a summary might be `Invalid Entry` and a detail might be `The number entered was greater than the maximum`.

JSF applications use two tags to display messages in JSF pages: `h:messages` and `h:message`.

The `h:messages` tag displays all messages that were stored in the faces context during the course of the JSF life cycle. You can restrict those messages to global messages—meaning messages not associated with a component—by setting `h:message`'s `globalOnly` attribute to `true`. By default, that attribute is `false`.

The `h:message` tag displays a single message for a particular component. That component is designated with `h:message`'s mandatory `for` attribute. If more than one message has been generated for a component, `h:message` shows only the last one.

`h:message` and `h:messages` share many attributes. Table 4–22 lists all attributes for both tags.

Table 4–22 Attributes for `h:message` and `h:messages`

Attributes	Description
`errorClass`	CSS class applied to error messages.
`errorStyle`	CSS style applied to error messages.
`fatalClass`	CSS class applied to fatal messages.

Table 4–22 Attributes for `h:message` and `h:messages` (cont.)

Attributes	Description
`fatalStyle`	CSS style applied to fatal messages.
`for`	The `id` of the component for which to display the message (`h:message` only).
`globalOnly`	Instruction to display only global messages—applicable only to `h:messages`. Default is `false`.
`infoClass`	CSS class applied to information messages.
`infoStyle`	CSS style applied to information messages.
`layout`	Specification for message layout: `"table"` or `"list"`—applicable only to `h:messages`.
`showDetail`	A Boolean that determines whether message details are shown. Defaults are `false` for `h:messages`, `true` for `h:message`.
`showSummary`	A Boolean that determines whether message summaries are shown. Defaults are `true` for `h:messages`, `false` for `h:message`.
`tooltip`	A Boolean that determines whether message details are rendered in a tooltip; the tooltip is only rendered if `showDetail` and `showSummary` are `true`.
`warnClass`	CSS class for warning messages.
`warnStyle`	CSS style for warning messages.
`binding`, `id`, `rendered`, `styleClass`	Basic attributes.[a]
`style`, `title`, `dir` (JSF 1.2), `lang` (JSF 1.2)	HTML 4.0.[b]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.

The majority of the attributes in Table 4–22 represent CSS classes or styles that `h:message` and `h:messages` apply to particular types of messages.

You can also specify whether you want to display a message's summary or detail, or both, with the `showSummary` and `showDetail` attributes, respectively.

The `h:messages` `layout` attribute can be used to specify how messages are laid out, either as a list or a table. If you specify `true` for the `tooltip` attribute and you have

also set `showDetail` and `showSummary` to `true`, the message's detail will be wrapped in a tooltip that is shown when the mouse hovers over the error message.

Now that we have a grasp of message fundamentals, we take a look at an application that uses the `h:message` and `h:messages` tags. The application shown in Figure 4–9 contains a simple form with two text fields. Both text fields have `required` attributes.

Moreover, the `Age` text field is wired to an integer property, so its value is converted automatically by the JSF framework. Figure 4–9 shows the error messages generated by the JSF framework when we neglect to specify a value for the `Name` field and provide the wrong type of value for the `Age` field.

Figure 4–9 Displaying messages

At the top of the JSF page, we use `h:messages` to display all messages. We use `h:message` to display messages for each input field:

```
<h:form>
<h:messages layout="table" errorClass="errors"/>
   ...
<h:inputText id="name"
   value="#{user.name}" required="true" label="#{msgs.namePrompt}"/>
<h:message for="name" errorClass="errors"/>
   ...
<h:inputText id="age"
   value="#{form.age}" required="true" label="#{msgs.agePrompt}"/>
<h:message for="age" errorClass="errors"/>
   ...
</h:form>
```

Note that the input fields have `label` attributes that describe the fields. These labels are used in the error messages—for example, the `Age:` label (generated by `#{msgs.agePrompt}`) in this message:

```
Age: old must be a number between -2147483648 and 2147483647 Example: 9346
```

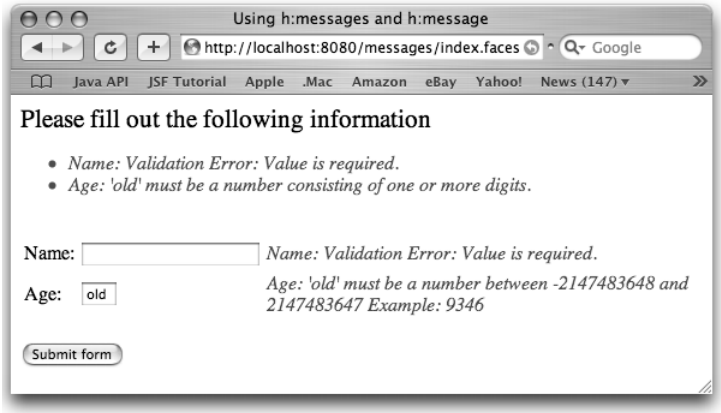
Generally, you will want to use the same expression for the `label` attribute as for the value of the `h:outputText` tag that labels the input field. For example, the age field as preceded by

```
<h:outputText value = "#{msgs.agePrompt}"/>
```

Both message tags in our example specify a CSS class named `errors`, which is defined in `styles.css`. That class definition looks like this:

```
.errors {
   font-style: italic;
}
```

We have also specified `layout="table"` for the `h:messages` tag. If we had omitted that attribute (or alternatively specified `layout="list"`), the output would look like this:



The `list` layout encodes the error messages in an unnumbered list (whose appearance you can control through styles).

CAUTION: In JSF 1.1, the "`list`" style placed the messages one after the other, without any separators, which was not very useful.

Figure 4–10 shows the directory structure for the application shown in Figure 4–9. Listing 4–17 through Listing 4–19 list the JSP page, resource bundle, and style sheet for the application.

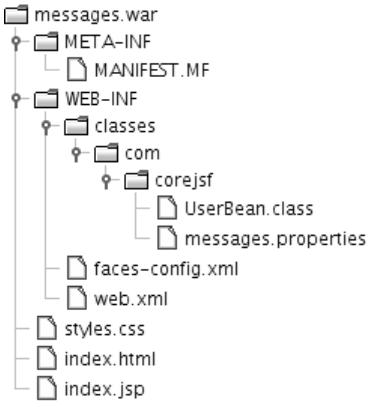


Figure 4–10 Directory structure for the messages example

Listing 4–17 messages/web/index.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <link href="styles.css" rel="stylesheet" type="text/css"/>
         <title>
            <h:outputText value="#{msgs.windowTitle}"/>
         </title>
      </head>
      <body>
         <h:form>
            <h:outputText value="#{msgs.greeting}" styleClass="emphasis"/>
            <br/>
            <h:messages errorClass="errors" layout="table"/>
            <br/>
            <table>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.namePrompt}:"/>
                  </td>
                  <td>
                     <h:inputText id="name"
                        value="#{user.name}" required="true"
                        label="#{msgs.namePrompt}"/>
                  </td>
```

Listing 4–17 messages/web/index.jsp (cont.)

```
                  <td>
                     <h:message for="name" errorClass="errors"/>
                  </td>
               </tr>
               <tr>
                  <td>
                     <h:outputText value="#{msgs.agePrompt}:"/>
                  </td>
                  <td>
                     <h:inputText id="age"
                        value="#{user.age}" required="true" size="3"
                        label="#{msgs.agePrompt}"/>
                  </td>
                  <td>
                     <h:message for="age" errorClass="errors"/>
                  </td>
               </tr>
            </table>
            <br/>
            <h:commandButton value="#{msgs.submitPrompt}"/>
         </h:form>
      </body>
   </f:view>
</html>
```

Listing 4–18 messages/src/java/com/corejsf/messages.properties

```
windowTitle=Using h:messages and h:message
greeting=Please fill out the following information
namePrompt=Name
agePrompt=Age
submitPrompt=Submit form
```

Listing 4–19 messages/web/styles.css

```
.errors {
   font-style: italic;
   color: red;
}
.emphasis {
   font-size: 1.3em;
}
```

NOTE: By default, `h:messages` shows message summaries but not details. `h:message`, on the other hand, shows details but not summaries. If you use `h:messages` and `h:message` together, as we did in the preceding example, summaries will appear at the top of the page, with details next to the appropriate input field.

Panels

Throughout this chapter we have used HTML tables to align form prompts and input fields. Creating table markup by hand is tedious and error prone, so now we'll look at alleviating some of that tediousness with `h:panelGrid`, which generates an HTML `table` element. You can specify the number of columns in the table with the `columns` attribute, like this:

```
<h:panelGrid columns="3">
   ...
</h:panelGrid>
```

The `columns` attribute is not mandatory—if you do not specify it, the number of columns defaults to 1. `h:panelGrid` places components in columns from left to right and top to bottom. For example, if you have a panel grid with three columns and nine components, you will wind up with three rows, each containing three columns. If you specify three columns and ten components, you will have four rows, and in the last row only the first column will contain a component—the tenth component.

Table 4–23 lists `h:panelGrid` attributes.

Table 4–23 Attributes for `h:panelGrid`

Attributes	Description
`bgcolor`	Background color for the table
`border`	Width of the table's border
`cellpadding`	Padding around table cells
`cellspacing`	Spacing between table cells
`columnClasses`	Comma-separated list of CSS classes for columns
`columns`	Number of columns in the table
`footerClass`	CSS class for the table footer

Table 4–23 Attributes for `h:panelGrid` **(cont.)**

Attributes	Description
`frame`	Specification for sides of the frame surrounding the table that are to be drawn; valid values: `none`, `above`, `below`, `hsides`, `vsides`, `lhs`, `rhs`, `box`, `border`
`headerClass`	CSS class for the table header
`rowClasses`	Comma-separated list of CSS classes for rows
`rules`	Specification for lines drawn between cells; valid values: `groups`, `rows`, `columns`, `all`
`summary`	Summary of the table's purpose and structure used for nonvisual feedback such as speech
`captionClass` (JSF 1.2), `captionStyle` (JSF 1.2)	CSS class or style for the caption; a panel caption is optionally supplied by a facet named `"caption"`
`binding`, `id`, `rendered`, `styleClass`, `value`	Basic attributes[a]
`dir`, `lang`, `style`, `title`, `width`	HTML 4.0[b]
`onclick`, `ondblclick`, `onkeydown`, `onkeypress`, `onkeyup`, `onmousedown`, `onmousemove`, `onmouseout`, `onmouseover`, `onmouseup`	DHTML events[c]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.
c. See Table 4–6 on page 102 for information about DHTML event attributes.

You can specify CSS classes for different parts of the table: header, footer, rows, and columns. The `columnClasses` and `rowClasses` specify lists of CSS classes that are applied to columns and rows, respectively. If those lists contain fewer class names than rows or columns, the CSS classes are reused. That makes it possible to specify classes, like this: `rowClasses="evenRows, oddRows"` and `columnClasses="evenColumns, oddColumns"`.

The `cellpadding`, `cellspacing`, `frame`, `rules`, and `summary` attributes are HTML pass-through attributes that apply only to tables. See the HTML 4.0 specification for more information.

`h:panelGrid` is often used with `h:panelGroup`, which groups two or more components so they are treated as one. For example, you might group an input field and its error message, like this:

```
<h:panelGrid columns="2">
   ...
   <h:panelGroup>
      <h:inputText id="name" value="#{user.name}">
      <h:message for="name"/>
   </h:panelGroup>
   ...
</h:panelGrid>
```

Grouping the text field and error message puts them in the same table cell. Without that grouping, the error message component would occupy its own cell. In the absence of an error message, the error message component produces no output but still takes up a cell, so you wind up with an empty cell.

`h:panelGroup` is a simple tag with only a handful of attributes. Those attributes are listed in Table 4–24.

Table 4–24 Attributes for `h:panelGroup`

Attributes	Description
`layout` (JSF 1.2)	If the value is `"block"`, use an HTML `div` to lay out the children. Otherwise, use a `span`.
`binding`, `id`, `rendered`, `styleClass`	Basic attributes.[a]
`style`	HTML 4.0.[b]

a. See Table 4–4 on page 97 for information about basic attributes.
b. See Table 4–5 on page 101 for information about HTML 4.0 attributes.

Figure 4–11 shows a simple example that uses `h:panelGrid` and `h:panelGroup`. The application contains a form that asks for the user's name and age. We have added a required validator—with `h:inputText`'s `required` attribute—to the name field and used an `h:message` tag to display the corresponding error when that constraint is violated. We have placed no restrictions on the `Age` text field.

Notice that those constraints require three columns in the first row—one each for the name prompt, text field, and error message—but only two in the second: the age prompt and text field. Since `h:panelGrid` allows only one value for its `columns` attribute, we can resolve this column quandary by placing the name text field and error message in a panel group, and because those two components will be treated as one, we actually have only two columns in each row.

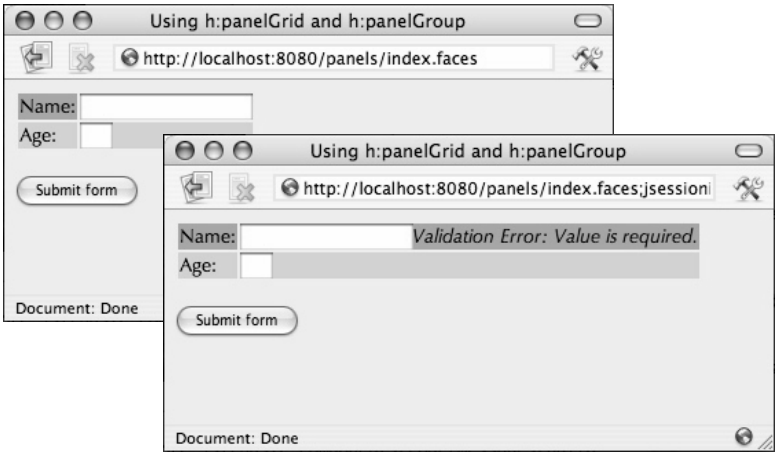


Figure 4–11 Using `h:panelGrid` **and** `h:panelGroup`

The directory structure for the application shown in Figure 4–11 is shown in Figure 4–12. Listings 4–20 through 4–22 contain the code of the JSF page and related files.

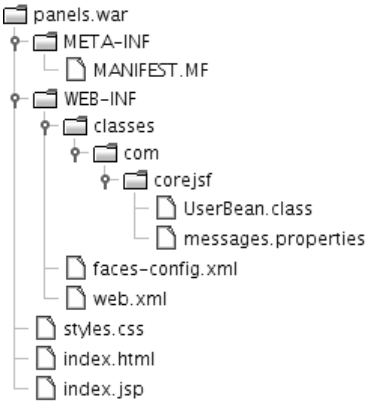


Figure 4–12 Directory structure for the panels example

Listing 4–20 panels/web/index.jsp

```
<html>
   <%@ taglib uri="http://java.sun.com/jsf/core" prefix="f" %>
   <%@ taglib uri="http://java.sun.com/jsf/html" prefix="h" %>
   <f:view>
      <head>
         <link href="styles.css" rel="stylesheet" type="text/css"/>
         <title>
            <h:outputText value="#{msgs.windowTitle}"/>
         </title>
      </head>

      <body>
         <h:form>
            <h:panelGrid columns="2" rowClasses="oddRows,evenRows">
               <h:outputText value="#{msgs.namePrompt}:"/>
               <h:panelGroup>
                  <h:inputText id="name"
                     value="#{user.name}" required="true"
                     label="#{msgs.namePrompt}"/>
                  <h:message for="name" errorClass="errors"/>
               </h:panelGroup>
               <h:outputText value="#{msgs.agePrompt}:"/>
               <h:inputText size="3" value="#{user.age}"
                  label="#{msgs.agePrompt}"/>
            </h:panelGrid>
            <br/>
            <h:commandButton value="#{msgs.submitPrompt}"/>
         </h:form>
      </body>
   </f:view>
</html>
```

Listing 4–21 panels/src/java/com/corejsf/messages.properties

```
windowTitle=Using h:panelGrid and h:panelGroup
namePrompt=Name
agePrompt=Age
submitPrompt=Submit form
```

Listing 4–22 panels/web/styles.css

```
body {
    background: #eee;
}
.errors {
    font-style: italic;
}
.evenRows {
    background: PowderBlue;
}
.oddRows {
    background: MediumTurquoise;
}
```