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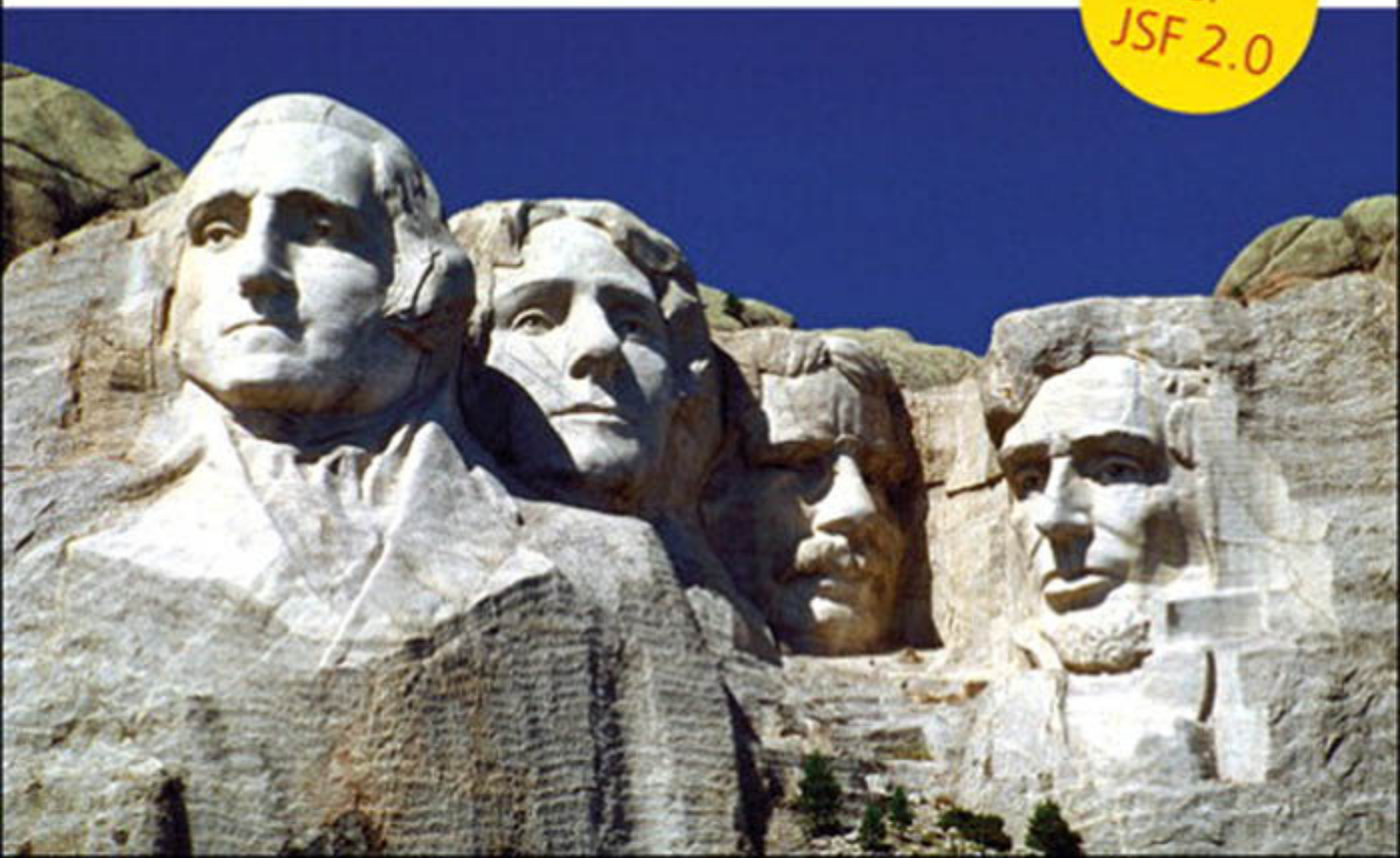
PRENTICE HALL

Core JavaServer™ Faces

THIRD EDITION

Java™

Updated for JSF 2.0



Library of Congress Cataloging-in-Publication Data

Geary, David M.
Core JavaServer faces / David Geary, Cay Horstmann.—3rd ed.
p. cm.
Includes index.
ISBN 978-0-13-701289-3 (pbk. : alk. paper)
1. JavaServer pages. 2. Web site development. 3. Web sites—Design.
I. Horstmann, Cay S., 1959- II. Title.
TK5105.8885.J38G433 2010
006.7'8—dc22

2010011569

ISBN-13: 978-0-13-701289-3
ISBN-10: 0-13-701289-6

Text printed in the United States on recycled paper at Edwards Brothers in Ann Arbor, Michigan.
First printing, May 2010

Preface

When we heard about JavaServer Faces (JSF) at the 2002 JavaOne conference, we were very excited. Both of us had extensive experience with client-side Java programming—David in *Graphic Java*™, and Cay in *Core Java*™, both published by Sun Microsystems Press—and we found web programming with servlets and JavaServer Pages (JSP) to be rather unintuitive and tedious. JSF promised to put a friendly face in front of a web application, allowing programmers to think about text fields and menus instead of dealing with page flips and request parameters. Each of us proposed a book project to our publisher, who promptly suggested that we should jointly write the Sun Microsystems Press book on JSF.

In 2004, the JSF Expert Group (of which David is a member) released the JSF 1.0 specification and reference implementation. A bug fix 1.1 release emerged shortly afterward, and an incremental 1.2 release added a number of cleanups and convenience features in 2006.

The original JSF specification was far from ideal. It was excessively general, providing for use cases that turned out to be uninteresting in practice. Not enough attention was given to API design, forcing programmers to write complex and tedious code. Support for GET requests was clumsy. Error handling was plainly unsatisfactory, and developers cursed the "stack trace from hell".

JSF had one saving grace, however. It was highly extensible, and therefore it was very attractive to framework developers. Those framework developers

built cutting edge open-source software that plugged into JSF, such as Facelets, Ajax4jsf, Seam, JSF Templates, Pretty Faces, RichFaces, ICEFaces, and so on.

JSF 2.0, released in 2009, is built on the experience of those open-source frameworks. Nearly all of the original authors of the aforementioned frameworks participated on the JSF 2 Expert Group, so JSF 2.0, unlike JSF 1.0, was forged from the crucible of real-world open-source projects that had time to mature.

JSF 2.0 is *much* simpler to use and better integrated into the Java EE technology stack than JSF 1.0. Almost every inch of JSF 1.0 has been transformed in JSF 2.0 in some way for the better. In addition, the specification now supports new web technologies such as Ajax and REST.

JSF is now the preeminent server-side Java web framework, and it has fulfilled most of its promises. You really can design web user interfaces by putting components on a form and linking them to Java objects, without having to mix code and markup. A strong point of JSF is its extensible component model, and a large number of third-party components have become available. The flexible design of the framework has allowed it to grow well and accommodate new technologies.

Because JSF is a specification and not a product, you are not at the mercy of a single vendor. JSF implementations, components, and tools are available from multiple sources. We are very excited about JSF 2.0, and we hope you will share in this excitement when you learn how this technology makes you a more effective web application developer.

About This Book

This book is suitable for web developers whose main focus is on implementing user interfaces and business logic. This is in stark contrast to the official JSF specification, a dense and pompously worded document whose principal audience is framework implementors, as well as long-suffering book authors. JSF is built on top of servlets, but from the point of view of the JSF developer, this technology merely forms the low-level plumbing. While it can't hurt to be familiar with servlets, JSP, or Struts, we do not assume any such knowledge.

The first half of the book, extending through Chapter 7, focuses on the JSF *tags*. These tags are similar to HTML form tags. They are the basic building blocks for JSF user interfaces. Anyone with basic HTML skills (for web page design) and standard Java programming (for the application logic) can use the JSF tags to build web applications.

The first part of the book covers these topics:

- Setting up your programming environment (Chapter 1)
- Connecting JSF tags to application logic (Chapter 2)
- Navigating between pages (Chapter 3)
- Using the standard JSF tags (Chapter 4)
- Using Facelets tags for templating (Chapter 5) **NEW**
- Data tables (Chapter 6)
- Converting and validating input (Chapter 7)

Starting with Chapter 8, we begin JSF programming in earnest. You will learn how to perform advanced tasks, and how to extend the JSF framework. Here are the main topics of the second part:

- Event handling (Chapter 8)
- Building composite components—reusable components with sophisticated behavior that are composed from simpler components (Chapter 9) **NEW**
- Ajax (Chapter 10) **NEW**
- Implementing custom components (Chapter 11)
- Connecting to databases and other external services (Chapter 12)

We end the book with a chapter that aims to answer common questions of the form "How do I . . . ?" (Chapter 13). We encourage you to have a peek at that chapter as soon as you become comfortable with the basics of JSF. There are helpful notes on debugging and logging, and we also give you implementation details and working code for features that are missing from JSF, such as file uploads, pop-up menus, and a pager component for long tables.

All chapters have been revised extensively in this edition to stress the new and improved features of JSF 2.0. Chapters 5, 9, and 10 are new to this edition.

Required Software

All software that you need for this book is freely available. You can use an application server that supports Java EE 6 (such as GlassFish version 3) or a servlet runner (such as Tomcat 6) together with a JSF implementation. The software runs on Linux, Mac OS X, Solaris, and Windows. Both Eclipse and NetBeans have extensive support for JSF development with GlassFish or Tomcat.

Web Support

The web site for this book is `http://corejsf.com`. It contains:

- The source code for all examples in this book
- Useful reference material that we felt is more effective in browseable form than in print
- A list of known errors in the book and the code
- A form for submitting corrections and suggestions

Standard JSF Tags

Topics in This Chapter

- "An Overview of the JSF Core Tags" on page 102
- "An Overview of the JSF HTML Tags" on page 105
- "Panels" on page 115
- "The Head, Body, and Form Tags" on page 118
- "Text Fields and Text Areas" on page 123
- "Buttons and Links" on page 134
- "Selection Tags" on page 145
- "Messages" on page 171

Chapter 4

Development of compelling JSF applications requires a good grasp of the JSF tag libraries. JSF 1.2 had two tag libraries: core and HTML. As of JSF 2.0, there are six libraries with over 100 tags—see Table 4–1. In this chapter, we cover the core library and most of the HTML library. One HTML library component—the data table—is so complex that it is covered separately in Chapter 6.

Table 4–1 JSF Tag Libraries

Library	Namespace Identifier	Commonly Used Prefix	Number of Tags	See Chapter
Core	http://java.sun.com/jsf/core	f:	27	See Table 4–2
HTML	http://java.sun.com/jsf/html	h:	31	4 and 6
Facelets JSF 2.0	http://java.sun.com/jsf/facelets	ui:	11	5
Composite Components JSF 2.0	http://java.sun.com/jsf/composite	composite:	12	9
JSTL Core JSF 2.0	http://java.sun.com/jsp/jstl/core	c:	7	13
JSTL Functions JSF 2.0	http://java.sun.com/jsp/jstl/functions	fn:	16	2

An Overview of the JSF Core Tags

The core library contains the tags that are independent of HTML rendering. The core tags are listed in Table 4–2.

Table 4–2 JSF Core Tags

Tag	Description	See Chapter
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.	8
setPropertyActionListener JSF 1.2	Adds an action listener that sets a property.	8
valueChangeListener	Adds a value change listener to a component.	8
phaseListener JSF 1.2	Adds a phase listener to the parent view.	8
event JSF 2.0	Adds a component system event listener.	8
converter	Adds an arbitrary converter to a component.	7
convertDateTime	Adds a datetime converter to a component.	7
convertNumber	Adds a number converter to a component.	7
validator	Adds a validator to a component.	7
validateDoubleRange	Validates a double range for a component's value.	7
validateLength	Validates the length of a component's value.	7
validateLongRange	Validates a long range for a component's value.	7
validateRequired JSF 2.0	Checks that a value is present.	7
validateRegex JSF 2.0	Validates a value against a regular expression.	7

Table 4–2 JSF Core Tags (cont.)

Tag	Description	See Chapter
validateBean JSF 2.0	Uses the Bean Validation API (JSR 303) for validation.	7
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
viewParam JSF 2.0	Defines a "view parameter" that can be initialized with a request parameter.	3
metadata JSF 2.0	Holds view parameters. May hold other metadata in the future.	3
ajax JSF 2.0	Enables Ajax behavior for components.	11
view	Use for specifying the page locale or a phase listener.	2 and 7
subview	Not needed with facelets.	

Most of the core tags represent objects you add to components, such as the following:

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

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

Attributes, Parameters, and Facets

The f:attribute, f:param, and f:facet tags are general-purpose tags to add information to a component. Any component can store arbitrary 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 289 of Chapter 7, we set the separator character for credit card digit groups like this:

```
<h:outputText value="#{payment.card}">
   <f:attribute name="separator" value="-" />
</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 42 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 8.

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. The root of a Facelets page has two facets named "head" and "body". You will see in "Headers, Footers, and Captions" on page 212 of Chapter 6 how to use facets named "header" and "footer" in data tables.

Table 4–3 shows the attributes for the f:attribute, f:param, and f:facet tags.

Table 4–3 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 4–5 on page 107 (f:param only)

NOTE: All tag attributes in this chapter, 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

Table 4–4 lists all HTML tags. We can group these tags in the following categories:

- Inputs (`input...`)
- Outputs (`output...`, `graphicImage`)
- Commands (`commandButton` and `commandLink`)
- GET Requests (`button`, `link`, `outputLink`)
- Selections (`checkbox`, `listbox`, `menu`, `radio`)
- HTML pages (`head`, `body`, `form`, `outputStylesheet`, `outputScript`)
- Layouts (`panelGrid`, `panelGroup`)
- Data table (`dataTable` and `column`); see Chapter 6
- Errors and messages (`message`, `messages`)

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

Table 4–4 JSF HTML Tags

Tag	Description
`head` JSF 2.0	Renders the head of the page
`body` JSF 2.0	Renders the body of the page
`form`	Renders a HTML form
`outputStylesheet` JSF 2.0	Adds a stylesheet to the page
`outputScript` JSF 2.0	Adds a script to the page
`inputText`	Single-line text input control
`inputTextarea`	Multiline text input control
`inputSecret`	Password input control
`inputHidden`	Hidden field

Table 4–4 JSF HTML Tags (cont.)

Tag	Description
`outputLabel`	Label for another component for accessibility
`outputLink`	Link to another web site
`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
`button` JSF 2.0	Button for issuing a GET request
`link` JSF 2.0	Link for issuing a GET request
`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
`panelGrid`	Tabular layout
`panelGroup`	Two or more components that are laid out as one
`dataTable`	A feature-rich table control (see Chapter 6)
`column`	Column in a `dataTable` (see Chapter 6)

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.

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 4–5, basic attributes are shared by the majority of JSF HTML tags.

Table 4–5 Basic HTML Tag Attributes[a]

Attribute	Component Types	Description
`id`	A (*31*)	Identifier for a component
`binding`	A (*31*)	Links this component with a backing bean property
`rendered`	A (*31*)	A Boolean; `false` suppresses rendering
`value`	I, O, C (*21*)	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

Table 4–5 Basic HTML Tag Attributes[a] (cont.)

Attribute	Component Types	Description
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

All components can have id, binding, and rendered attributes, which we discuss in the following sections.

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 7 for more information about validators and converters.

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 120 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. There is another 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:inputText binding="#{form.nameField}" .../>
```

The `binding` attribute is specified with a value expression. That expression refers to a read-write bean property, such as this one:

```
private UIComponent nameField = new UIInput();
public UIComponent getNameField() { return nameField; }
public void setNameField(UIComponent newValue) { nameField = newValue; }
```

See "Backing Beans" on page 38 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.

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:commandButton value="Logout" .../>
```

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

```
<h:inputText 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 7.

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 115 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 4–6.

Table 4–6 HTML 4.0 Pass-Through Attributes[a]

Attribute	Description
`accesskey` (*16*)	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` (*5*)	Alternative text for nontextual elements such as images or applets.
`border` (*4*)	Pixel value for an element's `border` width.
`charset` (*3*)	Character encoding for a linked resource.
`coords` (*3*)	Coordinates for an element whose shape is a rectangle, circle, or polygon.
`dir` (*26*)	Direction for text. Valid values are `"ltr"` (left to right) and `"rtl"` (right to left).

Table 4–6 HTML 4.0 Pass-Through Attributes[a] (cont.)

Attribute	Description
`disabled` (*14*)	Disabled state of an input element or button.
`hreflang` (*3*)	Base language of a resource specified with the `href` attribute; `hreflang` may only be used with `href`.
`lang` (*26*)	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` (*3*)	Relationship between the current document and a link specified with the `href` attribute.
`rev` (*3*)	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` (*3*)	Shape of a region. Valid values: `default`, `rect`, `circle`, `poly` (`default` signifies the entire region).
`size` (*4*)	Size of an input field.
`style` (*26*)	Inline style information.
`styleClass` (*26*)	Style class; rendered as HTML `class` attribute.
`tabindex` (*16*)	Numerical value specifying a tab index.
`target` (*5*)	The name of a frame in which a document is opened.
`title` (*25*)	A title, used for accessibility, that describes an element. Visual browsers typically create tooltips for the title's value.
`type` (*4*)	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 4–6 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.

Styles

You can use CSS styles, either inline (`style`) or classes (`styleClass`), to influence how components are rendered:

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

CSS style attributes can be value expressions—that gives you programmatic control over styles.

Resources JSF 2.0

You can include a stylesheet in the usual way, with an HTML `link` tag. But that is tedious if your pages are at varying directory nesting levels—you would always need to update the stylesheet directory when you move a page. More importantly, if you assemble pages from different pieces—as described in Chapter 5—you don't even know where your pieces end up.

Since JSF 2.0, there is a better way. You can place stylesheets, JavaScript files, images, and other files into a `resources` directory in the root of your web application. Subdirectories of this directory are called *libraries*. You can create any libraries that you like. In this book, we often use libraries `css`, `images`, and `javascript`.

To include a stylesheet, use the tag:

```
<h:outputStylesheet library="css" name="styles.css"/>
```

The tag adds a link of the form

```
<link href="/context-root/faces/javax.faces.resource/styles.css?ln=css"
   rel="stylesheet" type="text/css"/>
```

to the header of the page.

To include a script resource, use the `outputScript` tag instead:

```
<h:outputScript name="jsf.js" library="javascript" target="head" />
```

If the `target` attribute is `head` or `body`, the script is appended to the `"head"` or `"body"` facet of the root component, which means that it appears at the end of the `head` or `body` in the generated HTML. If there is no `target` element, the script is inserted in the current location.

To include an image from a library, you use the `graphicImage` tag:

```
<h:graphicImage name="logo.png" library="images"/>
```

There is a *versioning* mechanism for resource libraries and individual resources. You can add subdirectories to the library directory and place newer versions of

files into them. The subdirectory names are simply the version numbers. For example, suppose you have the following directories:

```
resources/css/1_0_2
resources/css/1_1
```

Then the latest version (`resources/css/1_1`) will be used. Note that you can add new versions of a library in a running application.

Similarly, you can add new versions of an individual resource, but the naming scheme is a bit odd. You replace the resource with a directory of the same name, then use the version name as the file name. You can add an extension if you like. For example:

```
resources/css/styles.css/1_0_2.css
resources/css/styles.css/1_1.css
```

The version numbers must consist of decimal numbers, separated by underscores. They are compared in the usual way, first comparing the major version numbers and using the minor numbers to break ties.

There is also a mechanism for supplying localized versions of resources. Unfortunately, that mechanism is unintuitive and not very useful. Localized resources have a prefix, such as `resources/de_DE/images`, but the prefix is *not* treated in the same way as a bundle suffix. There is no fallback mechanism. That is, if an image is not found in `resources/de_DE/images`, then `resources/de/images` and `resources/images` are *not* consulted.

Moreover, the locale prefix is *not* simply the current locale. Instead, it is obtained by a curious lookup, which you enable by following these steps:

1. Add the line

   `<message-bundle>`*name of a resource bundle used in your application*`</message-bundle>`

   inside the `application` element of `faces-config.xml`
2. Inside each localized version of that resource bundle, place a name/value pair

   `javax.faces.resource.localePrefix=`*prefix*
3. Place the matching resources into `resources/`*prefix*`/`*library*`/...`

For example, if you use the message bundle `com.corejsf.messages`, and the file `com.corejsf.messages_de` contains the entry

```
javax.faces.resource.localePrefix=german
```

then you place the German resources into `resources/german`. (The prefix need not use the standard language and country codes, and in fact it is a good idea not to use them so that you don't raise false hopes.)

CAUTION: Unfortunately, this localization scheme is unappealing in practice. Once you define a locale prefix, that prefix is used for *all* resources. Suppose you wanted to have different images for the German and English versions of your site. Then you would also have to duplicate *every other* resource. Hopefully, this will be fixed in a future version of JSF.

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 *dynamic HTML (DHTML) event attributes*. JSF supports DHTML event attributes for nearly all of the JSF HTML tags. Those attributes are listed in Table 4–7.

Table 4–7 DHTML Event Attributes[a]

Attribute	Description
`onblur` (*16*)	Element loses focus
`onchange` (*11*)	Element's value changes
`onclick` (*17*)	Mouse button is clicked over the element
`ondblclick` (*21*)	Mouse button is double-clicked over the element
`onfocus` (*16*)	Element receives focus
`onkeydown` (*21*)	Key is pressed
`onkeypress` (*21*)	Key is pressed and subsequently released
`onkeyup` (*21*)	Key is released
`onload` (*1*)	Page is loaded
`onmousedown` (*21*)	Mouse button is pressed over the element
`onmousemove` (*21*)	Mouse moves over the element
`onmouseout` (*21*)	Mouse leaves the element's area
`onmouseover` (*21*)	Mouse moves onto an element
`onmouseup` (*21*)	Mouse button is released
`onreset` (*1*)	Form is reset

Table 4–7 DHTML Event Attributes[a] (cont.)

Attribute	Description
onselect (*11*)	Text is selected in an input field
onsubmit (*1*)	Form is submitted
onunload (*1*)	Page is unloaded

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

The DHTML event attributes listed in Table 4–7 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()"...>`

Panels

Up to this point, we have used HTML tables to lay out components. Creating table markup by hand is tedious, so now we'll look at alleviating some of that tedium with `h:panelGrid`, which generates the HTML markup for laying out components in rows and columns.

NOTE: The `h:panelGrid` tag uses HTML tables for layout, which some web designers find objectionable. You can certainly use CSS layout instead of `h:panelGrid`. A future version of `h:panelGrid` may have an option for using CSS layout as well.

You can specify the number of columns 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. The `h:panelGrid` tag 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 10 components, you will have four rows, and in the last row only the first column will contain the tenth component.

Table 4–8 lists `h:panelGrid` attributes.

Table 4–8 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
`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`, `value`	Basic attributes[a]
`dir`, `lang`, `style`, `styleClass`, `title`, `width`	HTML 4.0[b]

Table 4–8 Attributes for h:panelGrid (cont.)

Attributes	Description
onclick, ondblclick, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup	DHTML events[c]

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 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. (We discuss the h:message tag in the section "Messages" on page 171.)

h:panelGroup is a simple tag with only a handful of attributes. Those attributes are listed in Table 4–9.

Table 4–9 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	Basic attributes[a]
style, styleClass	HTML 4.0[b]

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.

The Head, Body, and Form Tags

Table 4–10 shows the attributes of the h:head and h:body tags. All of them are basic or HTML/DHTML attributes.

Table 4–10 Attributes for h:head and h:body

Attributes	Description
id, binding, rendered	Basic attributes[a]
dir, lang h:body only: style, styleClass, target, title	HTML 4.0[b] attributes
h:body only: onclick, ondblclick, onkeydown, onkeypress, onkeyup, onload, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup, onunload	DHTML events[c]

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 for information about DHTML event attributes.

Web applications run on form submissions, and JSF applications are no exception. Table 4–11 lists all h:form attributes.

Table 4–11 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`	Basic attributes[a]
`accept`, `acceptcharset`, `dir`, `enctype`, `lang`, `style`, `styleClass`, `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 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 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.xhtml`, you use an `h:form` tag with no attributes, the `Form` renderer generates HTML like this:

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

If you do not specify the `id` attribute explicitly, a value is generated by the JSF implementation, as is the case for all generated HTML elements. You can explicitly specify the `id` attribute for forms so that it can be referenced in stylesheets 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.

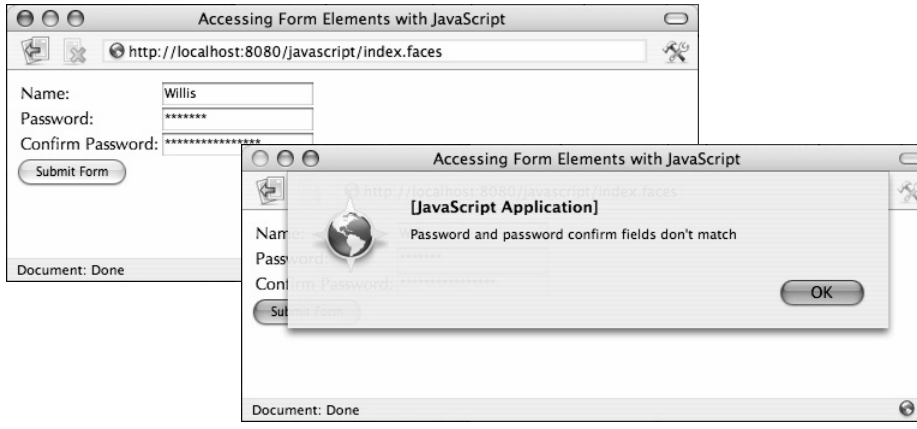


Figure 4–1 Using JavaScript to access form elements

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

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

When the user clicks the button, a JavaScript function `checkPassword` is invoked. Here is the implementation of the function:

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

   if (password == passwordConfirm)
      form.submit();
```

```
    else
       alert("Password and password confirm fields don't match");
}
```

To understand the syntax used to access form elements, look at the HTML produced by the preceding code:

```
<form id="_id0" method="post"
   action="/javascript/faces/index.xhtml"
   enctype="application/x-www-form-urlencoded">
   ...
   <input id="_id0:password"
      type="text" name="registerForm:password"/>
   ...
   <input type="button" name="_id0:_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 implementation creates identifiers for you. In our case, we didn't specify an `id` for the form. Therefore, to access the password field in the preceding example, the script uses the expression:

```
form[form.id + ":password"]
```

NOTE: The ID values generated by the JSF implementation seem to get more complex with every version of JSF. In the past, they were fairly straightforward (such as `_id0`), but more recent versions use IDs such as `j_id2059540600_7ac21823`. For greater clarity, we use the simpler IDs in our examples.

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. The JavaScript code, stylesheets, and resource bundle are listed in Listings 4–2 through 4–4.

Figure 4–2 The JavaScript example directory structure

Listing 4–1 javascript/web/index.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <title>#{msgs.windowTitle}</title>
      <h:outputStylesheet library="css" name="styles.css"/>
      <h:outputScript library="javascript" name="checkPassword.js"/>
   </h:head>
   <h:body>
      <h:form>
         <h:panelGrid columns="2" columnClasses="evenColumns, oddColumns">
            #{msgs.namePrompt}
            <h:inputText/>
            #{msgs.passwordPrompt}
            <h:inputSecret id="password"/>
            #{msgs.confirmPasswordPrompt}
            <h:inputSecret id="passwordConfirm"/>
         </h:panelGrid>
         <h:commandButton type="button" value="Submit Form"
                          onclick="checkPassword(this.form)"/>
      </h:form>
   </h:body>
</html>
```

Listing 4–2 javascript/web/resources/javascript/checkPassword.js

```
1. function checkPassword(form) {
2.    var password = form[form.id + ":password"].value;
3.    var passwordConfirm = form[form.id + ":passwordConfirm"].value;
4.
5.    if (password == passwordConfirm)
6.       form.submit();
7.    else
8.       alert("Password and password confirm fields don't match");
9. }
```

Listing 4–3 javascript/web/resources/css/styles.css

```
1. .evenColumns {
2.    font-style: italic;
3. }
4.
5. .oddColumns {
6.    padding-left: 1em;
7. }
```

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

```
1. windowTitle=Accessing Form Elements with JavaScript
2. namePrompt=Name:
3. passwordPrompt=Password:
4. 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 4–12 lists attributes for all three.

Table 4–12 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, `value`, `validator`, `validatorMessage` JSF 1.2	Basic attributes.[a]
`accesskey`, `alt`, `dir`, `disabled`, `lang`, `maxlength`, `readonly`, `size`, `style`, `styleClass`, `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 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 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 320 of Chapter 8 for more information about the `immediate` attribute.

Three attributes in Table 4–12 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 4–13 shows sample uses of the `h:inputText` and `h:inputSecret` tags.

Table 4–13 `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 4–13 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;
}
```

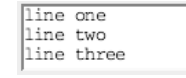
The h:inputSecret examples illustrate the use of the redisplay attribute. If that attribute is true, the text field stores its value between requests and, therefore, the value is redisplayed when the page reloads. If redisplay is false, the value is discarded and is not redisplayed.

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 4–13, 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 4–14 shows examples of the h:inputTextarea tag.

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.

Table 4–14 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"/>`	

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 4–14. 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 4–14 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 the thankYou.xhtml 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 stylesheets exclusively to make global style changes easier to manage.

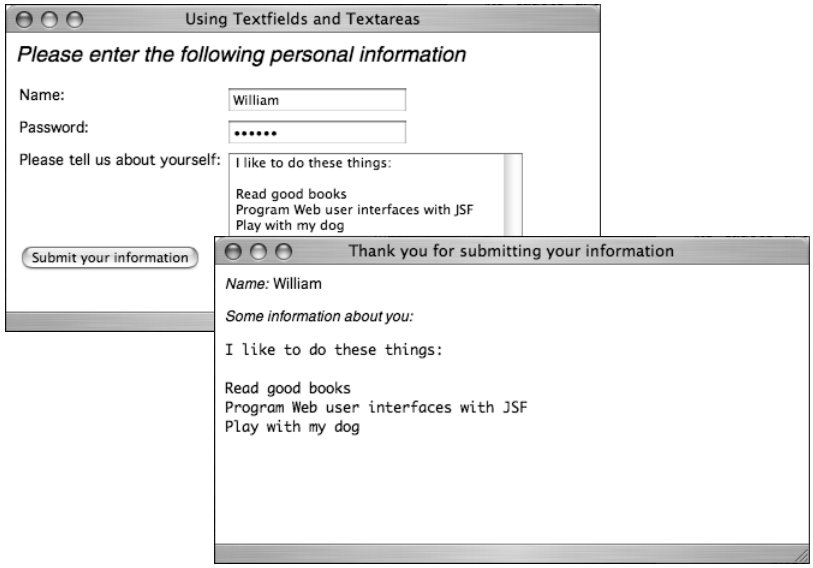


Figure 4–3 Using text fields and text areas

Figure 4–4 shows the directory structure for the application shown in Figure 4–3. Listings 4–5 through 4–8 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 4–5 personalData/web/index.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <title>#{msgs.indexWindowTitle}</title>
   </h:head>
   <h:body>
      <h:outputText value="#{msgs.indexPageTitle}"
                    style="font-style: italic; font-size: 1.5em"/>
      <h:form>
         <h:panelGrid columns="2">
            #{msgs.namePrompt}
            <h:inputText value="#{user.name}"/>
            #{msgs.passwordPrompt}
            <h:inputSecret value="#{user.password}"/>
            #{msgs.tellUsPrompt}
            <h:inputTextarea value="#{user.aboutYourself}" rows="5" cols="35"/>
         </h:panelGrid>
         <h:commandButton value="#{msgs.submitPrompt}" action="thankYou"/>
      </h:form>
   </h:body>
</html>
```

Listing 4–6 personalData/web/thankYou.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <title>#{msgs.thankYouWindowTitle}</title>
   </h:head>
   <h:body>
      <h:outputText value="#{msgs.namePrompt}" style="font-style: italic"/>
      #{user.name}
      <br/>
      <h:outputText value="#{msgs.aboutYourselfPrompt}" style="font-style: italic"/>
      <br/>
      <pre>#{user.aboutYourself}</pre>
   </h:body>
</html>
```

Listing 4–7 personalData/src/java/com/corejsf/UserBean.java

```
1. package com.corejsf;
2.
3. import java.io.Serializable;
4.
5. import javax.inject.Named;
6.    // or import javax.faces.bean.ManagedBean;
7. import javax.enterprise.context.SessionScoped;
8.    // or import javax.faces.bean.SessionScoped;
9.
10. @Named("user") // or @ManagedBean(name="user")
11. @SessionScoped
12. public class UserBean implements Serializable {
13.    private String name;
14.    private String password;
15.    private String aboutYourself;
16.
17.    public String getName() { return name; }
18.    public void setName(String newValue) { name = newValue; }
19.
20.    public String getPassword() { return password; }
21.    public void setPassword(String newValue) { password = newValue; }
22.
23.    public String getAboutYourself() { return aboutYourself; }
24.    public void setAboutYourself(String newValue) { aboutYourself = newValue; }
25. }
```

Listing 4–8 personalData/src/java/com/corejsf/messages.properties

```
1. indexWindowTitle=Using Textfields and Textareas
2. thankYouWindowTitle=Thank you for submitting your information
3. thankYouPageTitle=Thank you!
4. indexPageTitle=Please enter the following personal information
5. namePrompt=Name:
6. passwordPrompt=Password:
7. tellUsPrompt=Please tell us about yourself:
8. aboutYourselfPrompt=Some information about you:
9. 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.

In JSF 2.0, you don't usually need the `h:outputText` tag since you can simply insert value expressions, such as `#{msgs.namePrompt}` into your page. You would use `h:outputText` in the following circumstances:

- To produce styled output
- In a panel grid to make sure that the text is considered one cell of the grid
- To generate HTML markup

The `h:outputText` and `h:outputFormat` tags have one attribute that is unique among all JSF tags: `escape`. By default, the `escape` attribute is `true`, which causes the characters < > & to be 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.) Set this attribute to `false` if you want to programmatically generate HTML markup.

NOTE: The `value` attribute of `h:outputText` can never contain < characters. The only way to produce HTML markup with `h:outputText` is with a value expression.

NOTE: When you include a value expression such as `#{msgs.namePrompt}` in your page, the resulting value is always escaped. You must use `h:outputText` if you want to generate HTML markup.

Table 4–15 lists all `h:outputText` attributes.

Table 4–15 Attributes for `h:outputText` and `h:outputFormat`

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

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 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.

The `h:graphicImage` tag generates an HTML `img` element. You can specify the image location with the `url` or `value` attribute, as a context-relative path—meaning relative to the web application's context root. As of JSF 2.0, you can place images into the `resources` directory and specify a library and name:

```
<h:graphicImage library="images" name="de_flag.gif"/>
```

Here, the image is located in `resources/images/de_flag.gif`. Alternatively, you can use this:

```
<h:graphicImage url="/resources/images/de_flag.gif"/>
```

You can also use the `resources` map:

```
<h:graphicImage value="#{resources['images:de_flag.gif']}"/>
```

Table 4–16 shows all the attributes for `h:graphicImage`.

Table 4–16 Attributes for h:graphicImage

Attributes	Description
binding, id, rendered, value	Basic attributes[a]
alt, dir, height, ismap, lang, longdesc, style, styleClass, title, url, usemap, width	HTML 4.0[b]
onclick, ondblclick, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup	DHTML events[c]
library, name JSF 2.0	The resource library and name for this image

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 for information about DHTML event attributes.

Table 4–17 shows some examples of using h:outputText and h:graphicImage.

Table 4–17 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="#{form.htmlCode}" escape="false"/>` where the getHtmlCode method returns the string `"<input type='text' value='hello'/>"`	hello
`<h:outputText value="#{form.htmlCode}"/>` where the getHtmlCode method returns the string `"<input type='text' value='hello'/>"`	`<input type="text" value="hello">`
`<h:graphicImage value="/tjefferson.jpg"/>`	
`<h:graphicImage library="images" name="tjefferson.jpg" style="border: thin solid black"/>`	

The third and fourth examples in Table 4–17 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 4–17—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 4–17—that output is transformed to harmless text, thereby thwarting a potential attack.

The final two examples in Table 4–17 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:button`
- `h:link`
- `h:outputLink`

The `h:commandButton` and `h:commandLink` are the primary components for navigating within a JSF application. When a button or link is activated, a POST request sends the form data back to the server.

JSF 2.0 introduced the `h:button` and `h:link` components. These components also render buttons and links, but clicking on them issues a bookmarkable GET request instead. We discussed this mechanism in Chapter 3.

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. These links are most suitable for navigating to a different web site.

Table 4–18 lists the attributes shared by `h:commandButton`, `h:commandLink`, `h:button`, and `h:link`.

Table 4–18 Attributes for h:commandButton, h:commandLink, h:button, and h:link

Attribute	Description
action (h:commandButton and h:commandLink only)	*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. *If omitted:* Activating the button or link redisplays the current page.
outcome (h:button and h:link only)	The outcome, used by the navigation handler to determine the target view when the component is rendered.
fragment (h:button and h:link only)	A fragment that is to be appended to the target URL. The # separator is applied automatically and should not be included in the fragment.
actionListener	A method expression that refers to a method with this signature: `void methodName(ActionEvent)`.
image (h:commandButton and h:button only)	The path to an image displayed in a button. If you specify this attribute, the HTML input's type will be image. If the path starts with a /, the application's context root is prepended.
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 8 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 and h:link—The content type of the linked resource; for example, text/html, image/gif, or audio/basic.

Table 4–18 Attributes for h:commandButton, h:commandLink, h:button, and h:link (cont.)

Attribute	Description
value	The label displayed by the button or link. You can specify a string or a value expression.
binding, id, rendered	Basic attributes.[a]
accesskey, charset (h:commandLink and h:link only), coords (h:commandLink and h:link only), dir JSF 1.1, disabled (h:commandButton only in JSF 1.1), hreflang (h:commandLink and h:link only), lang, rel (h:commandLink and h:link only), rev (h:commandLink and h:link only), shape (h:commandLink and h:link only), style, styleClass, tabindex, target (h:commandLink and h:link only), title	HTML 4.0.[b]
onblur, onclick, ondblclick, onfocus, onkeydown, onkeypress, onkeyup, onmousedown, onmousemove, onmouseout, onmouseover, onmouseup	DHTML events.[c]

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 for information about DHTML event attributes.

Using Buttons

The h:commandButton and h:button tags generate an HTML input element whose type is button, image, submit, or reset, depending on the attributes you specify. Table 4–19 illustrates some uses of these tags.

The third example in Table 4–19 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.

Table 4–19 `h:commandButton` and `h:button` Examples

Example	Result
`<h:commandButton value="submit" type="submit" action="#{form.submitAction}"/>`	submit
`<h:commandButton value="reset" type="reset"/>`	reset
`<h:commandButton value="click this button..." onclick="alert('button clicked')" type="button"/>`	click this button to execute JavaScript
`<h:commandButton value="disabled" disabled="#{not form.buttonEnabled}"/>`	disabled
`<h:button value="#{form.buttonText}" outcome="#{form.pressMeOutcome}"/>`	press me

CAUTION: In JSF 1.1, there was an inconsistency in the handling of image paths between `h:graphicImage` and `h:commandButton`. The context root is automatically added by `h:graphicImage`, but not by `h:commandButton`. 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"/>
```

This was annoying because it required the page to know the context root. The `h:commandButton` behavior changed in JSF 1.2. Now the context root is automatically added if the path starts with a `/`.

To preserve a level of annoyance, this feature interacts poorly with a `resource` map. You cannot use

```
<h:commandButton image="#{resources['images:imageFile.jpg']}"/>
```

because the string returned by the `resource` map starts with */context-root*. The result would be `<input type="image" src="/context-root/context-root/..."/>`

The `h:commandLink` and `h:link` tags generates an HTML `anchor` element that acts like a form submit button. Table 4–20 shows some examples.

Table 4–20 h:commandLink and h:link Examples

Example	Result
`<h:commandLink>register</h:commandLink>`	register

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

`<h:commandLink>`
`  #{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:link value="welcome"`
`  outcome="#{form.welcomeOutcome}">`
`  <f:param name="id" value="#{form.userId}"/>`
`</h:link>`
	welcome

The h:commandLink and h:link tags generate JavaScript to make links act like buttons. For example, here is the HTML generated by the first example in Table 4–20:

```
<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.

You can place as many children 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 4–20, the link's form will be submitted.

The next-to-last example in Table 4–20 attaches an action listener, in addition to an action, to a link. Action listeners are discussed in "Action Events" on page 312 of Chapter 8.

The last example in Table 4–20 embeds an f:param tag in the body of the h:link 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. In Chapter 2, we discussed how the request parameters can be processed. You can also use request parameters with an h:commandLink or h:commandButton. See "Passing Data from the UI to the Server" on page 324 of Chapter 8 for an example.

Like h:commandLink and h:link, 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 4–21 lists all attributes for h:outputLink., and Table 4–22 shows some h:outputLink examples.

Table 4–21 Attributes for h:outputLink

Attributes	Description
binding, converter, id, lang, rendered, value	Basic attributes[a]
accesskey, charset, coords, dir, disabled JSF 1.2, hreflang, lang, rel, rev, shape, style, styleClass, 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 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 for information about DHTML event attributes.

Table 4–22 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}"> #{form.welcomeLinkText} </h:outputLink>	go to welcome page

Table 4–22 `h:outputLink` **Examples (cont.)**

Example	Result

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

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

`<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 4–22 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 4–22 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 when you want to place text inside a tag. For example, the last example in Table 4–22 had to be:

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

In JSF 1.1, the text would appear outside the link. The remedy is to place the text inside 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 127, 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.

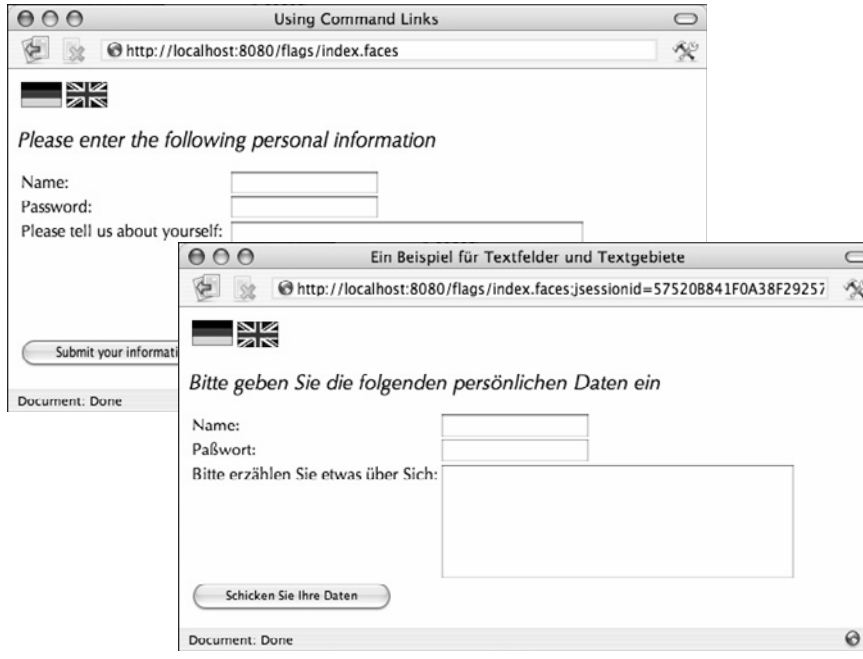


Figure 4–5 Using command links to change locales

The links are implemented like this:

```
<h:commandLink action="#{localeChanger.englishAction}">
   <h:graphicImage library="images" name="en_flag.gif" style="border: 0px" />
</h:commandLink>
```

Both links specify an image and an action method. The method to change to the English locale looks like this:

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

Because we have not specified any navigation for this action, 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 Listings 4–9 through 4–11 show the associated JSF pages and Java classes.

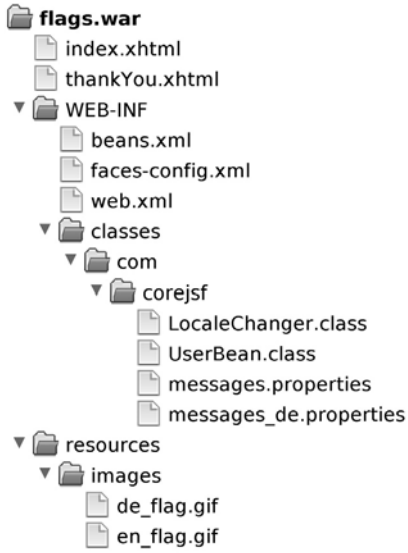


Figure 4–6 Directory structure of the flags example

Listing 4–9 flags/web/index.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <title>#{msgs.indexWindowTitle}</title>
   </h:head>
   <h:body>
      <h:form>
         <h:commandLink action="#{localeChanger.germanAction}">
            <h:graphicImage library="images" name="de_flag.gif"
                            style="border: 0px; margin-right: 1em;"/>
         </h:commandLink>
         <h:commandLink action="#{localeChanger.englishAction}">
            <h:graphicImage library="images"
                            name="en_flag.gif" style="border: 0px"/>
         </h:commandLink>
         <p><h:outputText value="#{msgs.indexPageTitle}"
         style="font-style: italic; font-size: 1.3em"/></p>
         <h:panelGrid columns="2">
            #{msgs.namePrompt}
            <h:inputText value="#{user.name}"/>
            #{msgs.passwordPrompt}
            <h:inputSecret value="#{user.password}"/>
            #{msgs.tellUsPrompt}
            <h:inputTextarea value="#{user.aboutYourself}" rows="5" cols="35"/>
         </h:panelGrid>
         <h:commandButton value="#{msgs.submitPrompt}" action="thankYou"/>
      </h:form>
   </h:body>
</html>
```

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

```
package com.corejsf;

import java.io.Serializable;

import javax.inject.Named;
   // or import javax.faces.bean.ManagedBean;
import javax.enterprise.context.SessionScoped;
   // or import javax.faces.bean.SessionScoped;

```

```
@Named("user") // or @ManagedBean(name="user")
@SessionScoped
public class UserBean implements Serializable {
   private String name;
   private String password;
   private String aboutYourself;

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

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

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

Listing 4–11 flags/src/java/com/corejsf/LocaleChanger.java

```
package com.corejsf;

import java.io.Serializable;
import java.util.Locale;

import javax.inject.Named;
   // or import javax.faces.bean.ManagedBean;
import javax.enterprise.context.SessionScoped;
   // or import javax.faces.bean.SessionScoped;
import javax.faces.context.FacesContext;

@Named // or @ManagedBean
@SessionScoped
public class LocaleChanger implements Serializable {
   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;
   }
}
```

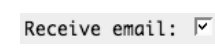
Selection Tags

JSF has seven tags for making selections:

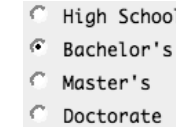
- h:selectBooleanCheckbox
- h:selectManyCheckbox
- h:selectOneRadio
- h:selectOneListbox
- h:selectManyListbox
- h:selectOneMenu
- h:selectManyMenu

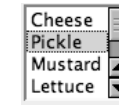
Table 4–23 shows examples of each tag.

Table 4–23 Selection Tag Examples

Tag	Generated HTML	Examples
h:selectBooleanCheckbox	`<input type="checkbox">`	

h:selectManyCheckbox	`<table>`
	`...`
	`<label>`
	`<input type="checkbox"/>`
	`</label>`
	`...`
	`</table>`
		

h:selectOneRadio	`<table>`
	`...`
	`<label>`
	`<input type="radio"/>`
	`</label>`
	`...`
	`</table>`
		

h:selectOneListbox	`<select>`
	`<option value="Cheese">`
	`Cheese`
	`</option>`
	`...`
	`</select>`
		

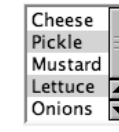
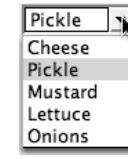
h:selectManyListbox	`<select multiple>`
	`<option value="Cheese">`
	`Cheese`
	`</option>`
	`...`
	`</select>`
		

Table 4–23 Selection Tag Examples (cont.)

Tag	Generated HTML	Examples
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 4–24.

Table 4–24 Attributes for h:selectBooleanCheckbox, h:selectManyCheckbox, h:selectOneRadio, h:selectOneListbox, h:selectManyListbox, h:selectOneMenu, and h:selectManyMenu

Attributes	Description
enabledClass, disabledClass JSF 2.0	CSS class for enabled or disabled elements—for h:selectOneRadio and h:selectManyCheckbox only.
selectedClass, unselectedClass JSF 2.0	CSS class for selected or unselected elements—for h:selectManyCheckbox only.
layout	Specification for how elements are laid out: lineDirection (horizontal) or pageDirection (vertical)—for h:selectOneRadio and h:selectManyCheckbox only.

Table 4–24 Attributes for h:selectBooleanCheckbox, h:selectManyCheckbox, h:selectOneRadio, h:selectOneListbox, h:selectManyListbox, h:selectOneMenu, and h:selectManyMenu (cont.)

Attributes	Description
label JSF 1.2	A description of the component for use in error messages.
collectionType JSF 2.0	(selectMany tags only) A string or a value expression that evaluates to a fully qualified collection class name, such as java.util.TreeSet. See "The value Attribute and Multiple Selections" on page 162.
hideNoSelectionOption JSF 2.0	Hide any item that is marked as the "no selection option". See "The f:selectItem Tag" on page 153.
binding, converter, converterMessage JSF 1.2, requiredMessage JSF 1.2, id, immediate, required, rendered, validator, validatorMessage JSF 1.2, value, valueChangeListener	Basic attributes.[a]
accesskey, border, dir, disabled, lang, readonly, style, styleClass, 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]

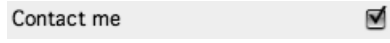
a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.
c. See Table 4–7 on page 114 for information about DHTML event attributes.

Checkboxes and Radio Buttons

Two JSF tags represent checkboxes:

- h:selectBooleanCheckbox
- h:selectManyCheckbox

The h:selectBooleanCheckbox tag 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 153 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 153) or f:selectItems (page 155).

The h:selectManyCheckbox tag generates an HTML table element; 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>
```

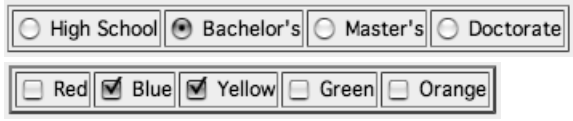
Like h:selectManyCheckbox, h:selectOneRadio generates an HTML table. Here is the table generated by the preceding tag:

```
<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:



The `enabledClass` and `disabledClass` attributes 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

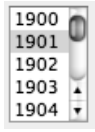
Menus and listboxes are represented by the following tags:

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

The attributes for the preceding tags are listed in Table 4–24 on page 146, 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:



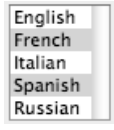
The corresponding listbox tag looks like this:

```
<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="1" itemLabel="Sunday"/>
   <f:selectItem itemValue="2" itemLabel="Monday"/>
   <f:selectItem itemValue="3" itemLabel="Tuesday"/>
   <f:selectItem itemValue="4" itemLabel="Wednesday"/>
   <f:selectItem itemValue="5" itemLabel="Thursday"/>
   <f:selectItem itemValue="6" itemLabel="Friday"/>
   <f:selectItem itemValue="7" itemLabel="Saturday"/>
</h:selectOneMenu>
```

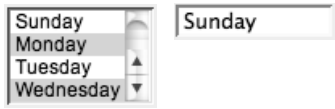
Here is the generated HTML:

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

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

```
<select name="_id2:_id17" multiple size="1">
   <option value="1">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 (Internet Explorer) or no scrollbar at all, leaving you to navigate with arrow keys (Firefox).

Items

Starting with "Checkboxes and Radio Buttons" on page 148, we have used multiple `f:selectItem` tags to populate `select` components. Now that we are familiar with the visual appearance of selection tags, we take a closer look at `f:selectItem` and the related `f:selectItems` tags.

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. Sometimes 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 161 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 4–25.

As of JSF 2.0, there is a noSelectionOption attribute for marking an item that is included for navigational purposes, such as "Select a condiment". This attribute is used in conjunction with validation. If an entry is required and the user selects the "no selection option", a validation error occurs.

Table 4–25 Attributes for f:selectItem

Attribute	Description
binding, id	Basic attributes[a]
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, 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
noSelectionOption JSF 2.0	true if this item is the "no selection" option that, when selected, indicates that the user intends to made no selection

a. See Table 4–5 on page 107 for information about basic attributes.

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.
- SelectItem(Object value, String label, String description, boolean disabled, boolean noSelectionOption) JSF 2.0
  Creates a SelectItem with a value, label, description, disabled state, and "no selection option" flag.

The f:selectItems Tag

As we saw in "The f:selectItem Tag" on page 153, 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
- An array
- A map whose entries represent labels and values

The first option is not very useful. We discuss the other options in the following sections.

NOTE: Can't remember what you can specify for the `f:selectItems` `value` attribute? It's a SCAM: Single select item, Collection, Array, or 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.

Table 4–26 summarizes the attributes of the `f:selectItems` tag.

Table 4–26 Attributes for `f:selectItems`

Attribute	Description
`binding`, `id`	Basic attributes[a]
`value`	Value expression that points to a `SelectItem` instance, an array or collection, or a map
`var` JSF 2.0	The name of a variable, used in the value expressions below when traversing an array or collection of objects other than `SelectItem`
`itemLabel` JSF 2.0	Value expression yielding the text shown by the item referenced by the `var` variable

Table 4–26 Attributes for `f:selectItems` (cont.)

Attribute	Description
`itemValue` JSF 2.0	Value expression yielding the value of the item referenced by the `var` variable
`itemDescription` JSF 2.0	Value expression yielding the description of the item referenced by the `var` variable; the description is intended for use by tools
`itemDisabled` JSF 2.0	Value expression yielding the `disabled` HTML attribute of the item referenced by the `var` variable
`itemLabelEscaped` JSF 2.0	Value expression yielding `true` if special characters in the item's value should be converted to character entities (default), `false` if the value should be emitted without change
`noSelectionOption` JSF 2.0	Value expression that yields the "no selection option" item or string that equals the value of the "no selection option" item

a. See Table 4–5 on page 107 for information about basic attributes.

Using Collections and Arrays with `f:selectItems`

Before JSF 2.0, collections and arrays had to contain `SelectItem` instances. That was unfortunate because it coupled your business logic to the JSF API. As of JSF 2.0, the `value` of `f:selectItems` can be a collection or array containing objects of *any* type.

If they are instances of `SelectItem`, no further processing is done. Otherwise, the labels are obtained by calling `toString` on each object.

Alternatively, you cau use the `var` attribute to define a variable that iterates over the array or collection. Then you supply value expressions for the label and value in the attributes `itemLabel` and `itemValue`.

For example, suppose you want users to select objects of the following class:

```
public class Weekday {
   public String getDayName() { ... } // name in current locale, such as "Monday"
   public int getDayNumber() { ... } // number such as Calendar.MONDAY (2)
   ...
}
```

Use the following tag:

```
<f:selectItems value="#{form.daysOfTheWeek}"
   var="w"
```

```
    itemLabel="#{w.dayName}"
    itemValue="#{w.dayNumber}" />
```

Here, `#{form.daysOfTheWeek}` yields an array or collection of `Weekday` objects. The variable `w` is set to each of the elements. Then a `SelectItem` object is constructed with the results of the `itemLabel` and `itemValue` expressions.

NOTE: The `var` attribute in the `f:selectItems` tag is conceptually similar to the use of the `var` attribute in the `h:dataTable` which we will discuss in Chapter 6.

Using Maps with `f:selectItems`

If the `value` attribute of the `f:selectItems` tag yields 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 static Map<String, Object> condimentItems;
static {
   condimentItems = new LinkedHashMap<String, Object>();
   condimentItems.put("Cheese",  1);  // label, value
   condimentItems.put("Pickle",  2);
   condimentItems.put("Mustard", 3);
   condimentItems.put("Lettuce", 4);
   condimentItems.put("Onions",  5);
}

public Map<String, Object> getCondimentItems() {
   return condimentItems;
}
```

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

Pay attention to these two issues when using a map:

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

Whether you are using a set of checkboxes, a menu, or a listbox, you will want to keep track of the item or items selected by the user. For that purpose, you use the `value` attribute of the `selectOne` and `selectMany` tags. Consider this example:

```
<h:selectOneMenu value="#{form.bestDay}">
   <f:selectItems value="#{form.weekdays}"/>
</h:selectOneRadio>
```

The value attribute of h:selectOneMenu refers to the value that the user selects. The value attribute of f:selectItems specifies all possible values.

Suppose the radio buttons were specified with an array of SelectItem objects, containing the following:

```
new SelectItem(1, "Sunday"),   // value, label
new SelectItem(2, "Monday"),
...
```

The user sees the labels (Sunday, Monday, ...), but the application uses the values (1, 2, ...).

There is an important but subtle issue about the Java type of the values. In the web page, *the values are always strings*:

```
<option value="1">Sunday</option>
<option value="2">Monday</option>
```

When the page is submitted, the server receives the selected string and must convert it to an appropriate type. The JSF implementation knows how to convert to numbers and enumerated types, but for other types you need to define a converter. (We discuss converters in Chapter 7.)

In our example, the #{form.bestDay} value expression should refer to a property of type int or Integer. Listing 4–13 has an example where the value is an enumerated type.

CAUTION: Because the value of a SelectItem is an Object, it can be tempting to set it to the value that you actually need in your application. However, keep in mind that the value is turned into a string when it is sent to the client. For example, consider a SelectItem(Color.RED, "Red"). The client receives the client is the string "java.awt.Color[r=255,g=0,b=0]". That string is returned when the user selects the option with label "Red". You would have to parse it to turn it back into a color. It is easier to send the RGB value of the color instead.

The value Attribute and Multiple Selections

You can keep track of multiple selections with a selectMany tag. These tags have a value attribute that specifies zero or more selected items, using an array or collection.

Consider an h:selectManyListbox that lets 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 int[] condiments;
public void setCondiments(int[] newValue) {
   condiments = newValue;
}
public int[] getCondiments() {
   return condiments;
}
```

Instead of an int[] array for the condiments property, you could have used an Integer[] array.

The value of a selectMany tag can be a collection instead of an array, but there are two technical issues that you need to keep in mind. Most importantly, the elements cannot be converted because the collection's element type is not known at runtime. (This is an unfortunate aspect of Java generics. At runtime, an ArrayList<Integer> or ArrayList<String> is only a raw ArrayList, and there is no way of determining the element type. In contrast, Integer[] and String[] are distinct types at runtime.) That means, you should use collections only for strings.

The other complexity is more subtle. When the JSF application receives the user choices, it must construct a new instance of the collection, populate it, and pass the collection to the property setter. But suppose the property type is Set<String>. What kind of Set should be constructed?

Before JSF 2.0, this was not clearly specified. JSF 2.0 lays down the following rules:

1. If the tag has a collectionType attribute, its value must be a string or a value expression that evaluates to a fully qualified classname, such as java.util.TreeSet. Instantiate that class.
2. Otherwise, get the existing value and try cloning and clearing it.

3. If that fails (perhaps because the existing value was `null` or not cloneable), look at the type of the `value` expression. If that type is `SortedSet`, `Set`, or `Queue`, construct a `TreeSet`, `HashSet`, or `LinkedList`.
4. Otherwise, construct an `ArrayList`.

For example, suppose you define a `languages` property:

```
private Set<String> languages; // initialized with null
public Set<String> getLanguages() {
   return languages;
}
public void setLanguages(Set<String> newValue) {
   languages = newValue;
}
```

When the form is submitted for the first time, the property setter is called with a `HashSet` that contains the user choices (step 3). In subsequent invocations, that set is cloned (step 2). However, suppose you initialize the set:

```
private Set<String> languages = new TreeSet();
```

Then a clone of that `TreeSet` is always returned.

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 be contacted, and `h:selectOneMenu` lets the user select the best day of the week for us to do so.

The year listbox is implemented with `h:selectOneMenu`, and it demonstrates the use of a "no selection" item. The language checkboxes are implemented with `h:selectManyCheckbox`; the education level is implemented with `h:selectOneRadio`.

Note that the languages are collected in a `Set<String>`. Also note the styles in the color selector. The disabled Orange option is colored gray, and the selected colors are marked in bold. We use the attribute `onchange="submit()"` in order to update the styles immediately upon selection.

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 Listings 4–12 through 4–16.

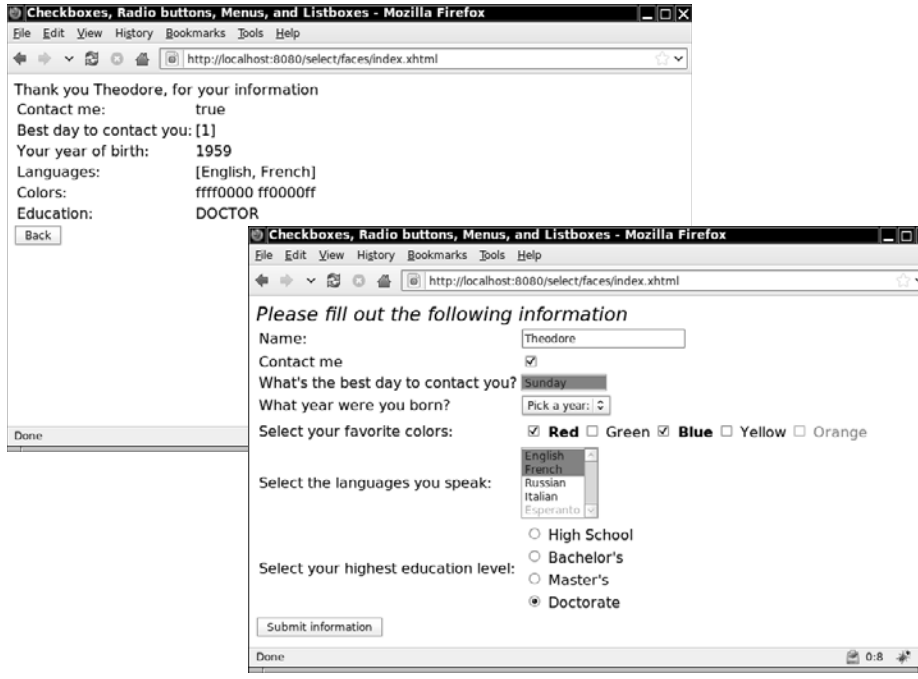


Figure 4–7 Using checkboxes, radio buttons, menus, and listboxes

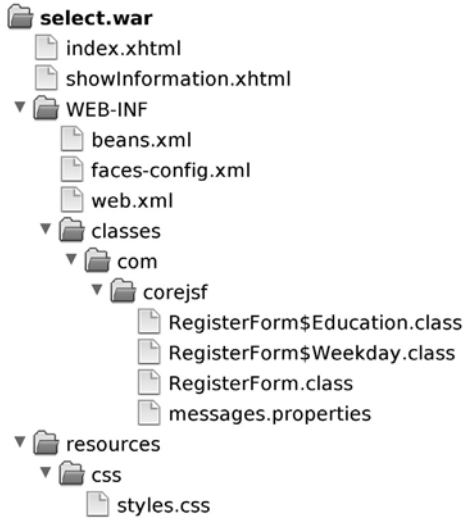


Figure 4–8 The directory structure of the selection example

Listing 4–12 select/web/index.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core" xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <h:outputStylesheet library="css" name="styles.css"/>
      <title>#{msgs.indexWindowTitle}</title>
   </h:head>

   <h:body>
      <h:outputText value="#{msgs.indexPageTitle}" styleClass="emphasis"/>
      <h:form>
         <h:panelGrid columns="2">
            #{msgs.namePrompt}
            <h:inputText value="#{form.name}"/>
            #{msgs.contactMePrompt}
            <h:selectBooleanCheckbox value="#{form.contactMe}"/>
            #{msgs.bestDayPrompt}
            <h:selectManyMenu value="#{form.bestDaysToContact}">
               <f:selectItems value="#{form.daysOfTheWeek}" var="w"
                              itemLabel="#{w.dayName}" itemValue="#{w.dayNumber}"/>
            </h:selectManyMenu>
            #{msgs.yearOfBirthPrompt}
            <h:selectOneMenu value="#{form.yearOfBirth}" required="true">
               <f:selectItems value="#{form.yearItems}"/>
            </h:selectOneMenu>
            #{msgs.colorPrompt}
            <h:selectManyCheckbox value="#{form.colors}"
                                  selectedClass="selected" disabledClass="disabled"
                                  onchange="submit()">
               <f:selectItems value="#{form.colorItems}"/>
            </h:selectManyCheckbox>
            #{msgs.languagePrompt}
            <h:selectManyListbox size="5" value="#{form.languages}">
               <f:selectItems value="#{form.languageItems}"/>
            </h:selectManyListbox>
            #{msgs.educationPrompt}
            <h:selectOneRadio value="#{form.education}"
                              selectedClass="selected" layout="pageDirection">
               <f:selectItems value="#{form.educationItems}"/>
            </h:selectOneRadio>
         </h:panelGrid>
         <h:commandButton value="#{msgs.buttonPrompt}" action="showInformation"/>
```

```
45.       </h:form>
46.       <h:messages/>
47.    </h:body>
48. </html>
```

Listing 4–13 select/web/showInformation.xhtml

```
 1. <?xml version="1.0" encoding="UTF-8"?>
 2. <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
 3. "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
 4. <html xmlns="http://www.w3.org/1999/xhtml"
 5.       xmlns:f="http://java.sun.com/jsf/core" xmlns:h="http://java.sun.com/jsf/html">
 6.    <h:head>
 7.       <title>#{msgs.indexWindowTitle}</title>
 8.    </h:head>
 9.    <h:body>
10.       <h:form>
11.          <h:outputStylesheet library="css" name="styles.css" target="head"/>
12.          <h:outputFormat value="#{msgs.thankYouLabel}">
13.             <f:param value="#{form.name}"/>
14.          </h:outputFormat>
15.          <h:panelGrid columns="2">
16.             #{msgs.contactMeLabel}
17.             <h:outputText value="#{form.contactMe}"/>
18.             #{msgs.bestDayLabel}
19.             <h:outputText value="#{form.bestDaysConcatenated}"/>
20.             #{msgs.yearOfBirthLabel}
21.             <h:outputText value="#{form.yearOfBirth}"/>
22.             #{msgs.languageLabel}
23.             <h:outputText value="#{form.languages}"/>
24.             #{msgs.colorLabel}
25.             <h:outputText value="#{form.colorsConcatenated}"/>
26.             #{msgs.educationLabel}
27.             <h:outputText value="#{form.education}"/>
28.          </h:panelGrid>
29.          <h:commandButton value="#{msgs.backPrompt}" action="index"/>
30.       </h:form>
31.    </h:body>
32. </html>
```

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

```
1. package com.corejsf;
2.
3. import java.awt.Color;
4. import java.io.Serializable;
5. import java.text.DateFormatSymbols;
6. import java.util.ArrayList;
7. import java.util.Arrays;
8. import java.util.Calendar;
9. import java.util.Collection;
10. import java.util.LinkedHashMap;
11. import java.util.Map;
12. import java.util.Set;
13. import java.util.TreeSet;
14.
15. import javax.inject.Named;
16.    // or import javax.faces.bean.ManagedBean;
17. import javax.enterprise.context.SessionScoped;
18.    // or import javax.faces.bean.SessionScoped;
19. import javax.faces.model.SelectItem;
20.
21. @Named("form") // or @ManagedBean(name="form")
22. @SessionScoped
23. public class RegisterForm implements Serializable {
24.    public enum Education { HIGH_SCHOOL, BACHELOR, MASTER, DOCTOR };
25.
26.    public static class Weekday {
27.       private int dayOfWeek;
28.       public Weekday(int dayOfWeek) {
29.          this.dayOfWeek = dayOfWeek;
30.       }
31.
32.       public String getDayName() {
33.          DateFormatSymbols symbols = new DateFormatSymbols();
34.          String[] weekdays = symbols.getWeekdays();
35.          return weekdays[dayOfWeek];
36.       }
37.
38.       public int getDayNumber() {
39.          return dayOfWeek;
40.       }
41.    }
42.
43.    private String name;
44.    private boolean contactMe;
```

```
45.    private int[] bestDaysToContact;
46.    private Integer yearOfBirth;
47.    private int[] colors;
48.    private Set<String> languages = new TreeSet<String>();
49.    private Education education = Education.BACHELOR;
50.
51.    public String getName() { return name; }
52.    public void setName(String newValue) { name = newValue; }
53.
54.    public boolean getContactMe() { return contactMe; }
55.    public void setContactMe(boolean newValue) { contactMe = newValue; }
56.
57.    public int[] getBestDaysToContact() { return bestDaysToContact; }
58.    public void setBestDaysToContact(int[] newValue) { bestDaysToContact = newValue; }
59.
60.    public Integer getYearOfBirth() { return yearOfBirth; }
61.    public void setYearOfBirth(Integer newValue) { yearOfBirth = newValue; }
62.
63.    public int[] getColors() { return colors; }
64.    public void setColors(int[] newValue) { colors = newValue; }
65.
66.    public Set<String> getLanguages() { return languages; }
67.    public void setLanguages(Set<String> newValue) { languages = newValue; }
68.
69.    public Education getEducation() { return education; }
70.    public void setEducation(Education newValue) { education = newValue; }
71.
72.    public Collection<SelectItem> getYearItems() { return birthYears; }
73.
74.    public Weekday[] getDaysOfTheWeek() { return daysOfTheWeek; }
75.
76.    public SelectItem[] getLanguageItems() { return languageItems; }
77.
78.    public SelectItem[] getColorItems() { return colorItems; }
79.
80.    public Map<String, Education> getEducationItems() { return educationItems; }
81.
82.    public String getBestDaysConcatenated() {
83.       return Arrays.toString(bestDaysToContact);
84.    }
85.
86.    public String getColorsConcatenated() {
87.       StringBuilder result = new StringBuilder();
88.       for (int color : colors) result.append(String.format("%06x ", color));
89.       return result.toString();
90.    }
91.
```

```
92.    private SelectItem[] colorItems = {
93.       new SelectItem(Color.RED.getRGB(), "Red"), // value, label
94.       new SelectItem(Color.GREEN.getRGB(), "Green"),
95.       new SelectItem(Color.BLUE.getRGB(), "Blue"),
96.       new SelectItem(Color.YELLOW.getRGB(), "Yellow"),
97.       new SelectItem(Color.ORANGE.getRGB(), "Orange", "", true) // disabled
98.    };
99.
100.   private static Map<String, Education> educationItems;
101.   static {
102.      educationItems = new LinkedHashMap<String, Education>();
103.      educationItems.put("High School", Education.HIGH_SCHOOL); // label, value
104.      educationItems.put("Bachelor's", Education.BACHELOR);
105.      educationItems.put("Master's", Education.MASTER);
106.      educationItems.put("Doctorate", Education.DOCTOR);
107.   };
108.
109.   private static SelectItem[] languageItems = {
110.      new SelectItem("English"),
111.      new SelectItem("French"),
112.      new SelectItem("Russian"),
113.      new SelectItem("Italian"),
114.      new SelectItem("Esperanto", "Esperanto", "", true) // disabled
115.   };
116.
117.   private static Collection<SelectItem> birthYears;
118.   static {
119.      birthYears = new ArrayList<SelectItem>();
120.      // The first item is a "no selection" item
121.      birthYears.add(new SelectItem(null, "Pick a year:", "", false, false, true));
122.      for (int i = 1900; i < 2020; ++i) birthYears.add(new SelectItem(i));
123.   }
124.
125.   private static Weekday[] daysOfTheWeek;
126.   static {
127.      daysOfTheWeek = new Weekday[7];
128.      for (int i = Calendar.SUNDAY; i <= Calendar.SATURDAY; i++) {
129.         daysOfTheWeek[i - Calendar.SUNDAY] = new Weekday(i);
130.      }
131.   }
132.}
```

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
backPrompt=Back
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/resources/css/styles.css

```
.emphasis {
   font-style: italic;
   font-size: 1.3em;
}
.disabled {
   color: gray;
}
.selected {
   font-weight: bold;
}
```

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.

NOTE: When you use JSF 2.0 and your project stage is set to `Development`, then an `h:messages` child is automatically added to your page (provided you didn't add one yourself).

The `h:message` and `h:messages` tags share many attributes. Table 4–27 lists all attributes for both tags.

Table 4–27 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.
`fatalStyle`	CSS style applied to fatal messages.

Table 4–27 Attributes for h:message and h:messages (cont.)

Attributes	Description
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	Basic attributes.[a]
style, styleClass, title, dir JSF 1.2, lang JSF 1.2	HTML 4.0.[b]

a. See Table 4–5 on page 107 for information about basic attributes.
b. See Table 4–6 on page 110 for information about HTML 4.0 attributes.

The majority of the attributes in Table 4–27 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.

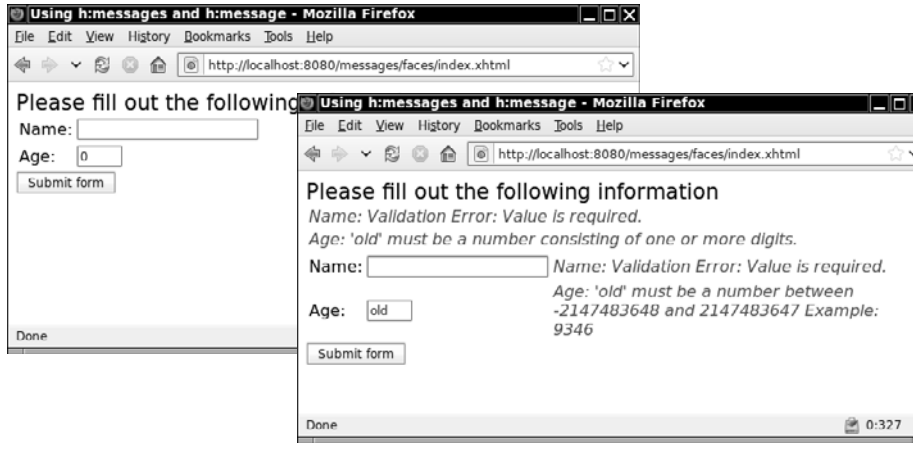


Figure 4–9 Displaying messages

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
```

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;
   color: red;
}
```

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 that shown in Figure 4–10.

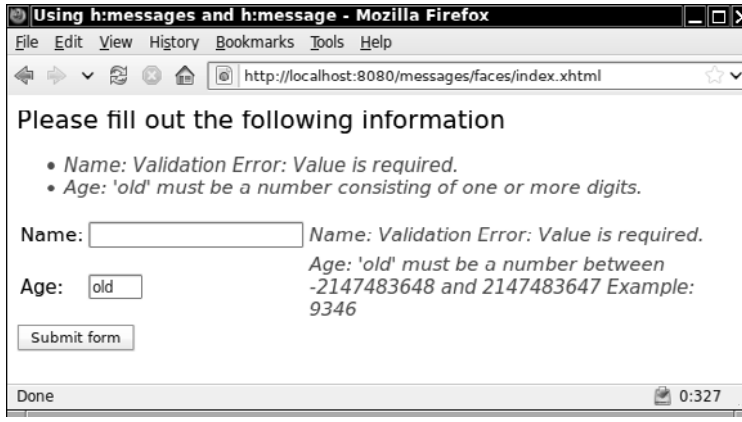


Figure 4–10 Messages displayed as a list

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 4–11 shows the directory structure for the application shown in Figure 4–9. Listings 4–17 through 4–19 list the JSF page, resource bundle, and stylesheet for the application. For this example, we added `getAge` and `setAge` methods to the `UserBean` class.

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.

Figure 4–11 Directory structure for the messages example

Listing 4–17 messages/web/index.xhtml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core" xmlns:h="http://java.sun.com/jsf/html">
   <h:head>
      <title>#{msgs.windowTitle}</title>
      <h:outputStylesheet library="css" name="styles.css"/>
   </h:head>
   <h:body>
      <h:form>
         <h:outputText value="#{msgs.greeting}" styleClass="emphasis"/>
         <br/>
         <h:messages errorClass="errors" layout="table"/>
         <h:panelGrid columns="3">
            #{msgs.namePrompt}:
            <h:inputText id="name" value="#{user.name}" required="true"
                         label="#{msgs.namePrompt}"/>
```

```
            <h:message for="name" errorClass="errors"/>
            #{msgs.agePrompt}:
            <h:inputText id="age" value="#{user.age}" required="true"
                         size="3" label="#{msgs.agePrompt}"/>
            <h:message for="age" errorClass="errors"/>
          </h:panelGrid>
          <h:commandButton value="#{msgs.submitPrompt}"/>
        </h:form>
    </h:body>
</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/resources/css/styles.css

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

Conclusion

You have now seen all HTML tags in the standard library with the exception of the tags used for tables, which are covered in Chapter 6. In the next chapter, you will learn how to use the Facelets tags.

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