Using JavaServer Faces Technology in Web Pages

Web pages represent the presentation layer for web applications.

The process of creating web pages of a JavaServer Faces application includes adding components to the page and wiring them to backing beans, validators, converters, and other server-side objects that are associated with the page.

This chapter explains how to create web pages using various types of component and core tags.

In the next chapter, you will learn about adding converters, validators, and listeners to component tags to provide additional functionality to components.

The following topics are addressed here:

- Setting Up a Page
- Adding Components to a Page Using HTML Tags
- Using Core Tags

Setting Up a Page

A typical JavaServer Faces web page includes the following elements:

- A set of namespace declarations that declare the JavaServer Faces tag libraries
- Optionally, the new HTML head (`h:head`) and body (`h:body`) tags

- A form tag (`h:form`) that represents the user input components

To add the JavaServer Faces components to your web page, you need to provide the page access to the two standard tag libraries: the JavaServer Faces HTML tag library and the JavaServer Faces core tag library.

The JavaServer Faces standard HTML tag library defines tags that represent common HTML user interface components.

This library is linked to the HTML render kit at http://download.oracle.com/javaee/6/javaserverfaces/2.1/docs/renderkitdocs/.

The JavaServer Faces core tag library defines tags that perform core actions.

For a complete list of JavaServer Faces Facelets tags and their attributes, refer to the documentation at http://download.oracle.com/javaee/6/javaserverfaces/2.1/docs/vdldocs/facelets/.

To use any of the JavaServer Faces tags, you need to include appropriate directives at the top of each page specifying the tag libraries.

For Facelets applications, the XML namespace directives uniquely identify the tag library URI and the tag prefix.

For example, when creating a Facelets XHTML page, include namespace directives as follows:

```
<html
xmlns=
"http://www.w3.org/1999/xhtml"
```

```
xmlns:h=
"http://java.sun.com/jsf/html"
xmlns:f=
"http://java.sun.com/jsf/core"
>
```

The XML namespace URI identifies the tag library location, and the prefix value is used to distinguish the tags belonging to that specific tag library.

You can also use other prefixes instead of the standard `h` or `f`.

However, when including the tag in the page, you must use the prefix that you have chosen for the tag library.

For example, in the following web page, the `form` tag must be referenced using the `h` prefix because the preceding tag library directive uses the `h` prefix to distinguish the tags defined in HTML tag library:

```
<h:form ...>
```

The sections Adding Components to a Page Using HTML Tags and Using Core Tags describe how to use the component tags from the JavaServer Faces standard HTML tag library and the core tags from the JavaServer Faces core tag library.

Adding Components to a Page Using HTML Tags

The tags defined by the JavaServer Faces standard HTML tag library represent HTML form components and other basic HTML elements.

These components display data or accept data from the user.

This data is collected as part of a form and is submitted to the server, usually when the user clicks a button.

This section explains how to use each of the component tags shown in Table 7-1.

Table 7-1 The Component Tags

Tag	Functions	Rendered as	Appearance
`column`	Represents a column of data in a data component	A column of data in an HTML table	A column in a table
`commandButton`	Submits a form to the application	An HTML `<input type=type>` element, where the `type` value can be `submit`, `reset`, or `image`	A button
`commandLink`	Links to another page or location on a page	An HTML `<a href>` element	A hyperlink

`dataTable`	Represents a data wrapper	An HTML `<table>` element	A table that can be updated dynamicall y
`form`	Represents an input form (inner tags of the form receive the data that will be submitted with the form)	An HTML `<form>` element	No appearance
`graphicImage`	Displays an image	An HTML `<img>` element	An image

`inputHidden`	Allows a page author to include a hidden variable in a page	An HTML `<input type=hidden>` element	No appearance
`inputSecret`	Allows a user to input a string without the actual string appearing in the field	An HTML `<input type=password>` element	A text field, which displays a row of characters instead of the actual string entered
`inputText`	Allows a user to input a string	An HTML `<input type=text>` element	A text field

`inputTextarea`	Allows a user to enter a multiline string	An HTML `<textarea>` element	A multi-row text field
`message`	Displays a localized message	An HTML `<span>` tag if styles are used	A text string
`messages`	Displays localized messages	A set of HTML `<span>` tags if styles are used	A text string
`outputFormat`	Displays a localized message	Plain text	Plain text
`outputLabel`	Displays a nested component as a label for a specified input field	An HTML `<label>` element	Plain text

`outputLink`	Links to another page or location on a page without generating an action event	An HTML `<a>` element	A hyperlink
`outputText`	Displays a line of text	Plain text	Plain text
`panelGrid`	Displays a table	An HTML `<table>` element with `<tr>` and `<td>` elements	A table
`panelGroup`	Groups a set of components under one parent	A HTML `<div>` or `<span>` element	A row in a table
`selectBoolean`	Allows a user to	An HTML `<input`	A check

`Checkbox`	change the value of a Boolean choice	`type=checkbox>` element.	box
`selectItem`	Represents one item in a list of items from which the user must select one	An HTML `<option>` element	No appearance
`selectItems`	Represents a list of items from which the user must select one	A list of HTML `<option>` elements	No appearance
`selectMany` `Checkbox`	Displays a set of check boxes from which the user can select multiple values	A set of HTML `<input>` elements of type `checkbox`	A set of check boxes

`selectMany` `Listbox`	Allows a user to select multiple items from a set of items, all displayed at once	An HTML `<select>` element	A list box
`selectMany` `Menu`	Allows a user to select multiple items from a set of items	An HTML `<select>` element	A scrollable combo box
`selectOne` `Listbox`	Allows a user to select one item from a set of items, all displayed at once	An HTML `<select>` element	A list box

`selectOneMenu`	Allows a user to select one item from a set of items	An HTML `<select>` element	A scrollable combo box
`selectOne` `Radio`	Allows a user to select one item from a set of items	An HTML `<input type=radio>` element	A set of radio buttons

The next section explains the important tag attributes that are common to most component tags.

For each of the components discussed in the following sections, Writing Bean Properties explains how to write a bean property bound to a particular component or its value.

Common Component Tag Attributes

Most of the component tags support the attributes shown in Table 7-2.

Table 7-2 Common Component Tag Attributes

Attribute	Description
`binding`	Identifies a bean property and binds the component instance to it.
`id`	Uniquely identifies the component.
`immediate`	If set to `true`, indicates that any events, validation, and conversion associated with the component should happen when request parameter values are applied,
`rendered`	Specifies a condition under which the component should be rendered. If the condition is not satisfied, the component is not rendered.
`style`	Specifies a Cascading Style Sheet (CSS) style for the tag.
`styleClass`	Specifies a CSS class that contains definitions of the styles.
`value`	Identifies an external data source and binds the component's value to it.

All the tag attributes (except `id`) can accept expressions, as defined by the EL, described in Chapter 6, Expression Language.

The `id` Attribute

The `id` attribute is not usually required for a component tag but is used when another component or a server-side class must refer to the component.

If you don't include an `id` attribute, the JavaServer Faces implementation automatically generates a component ID.

Unlike most other JavaServer Faces tag attributes, the `id` attribute takes expressions using only the evaluation syntax described in The `immediate` Attribute, which uses the `${}` delimiters.

For more information on expression syntax, see Value Expressions.

The `immediate` Attribute

Input components and command components (those that implement the `ActionSource` interface, such as buttons and hyperlinks) can set the `immediate` attribute to `true` to force events, validations, and conversions to be processed when request parameter values are applied.

You need to carefully consider how the combination of an input component's `immediate` value and a command component's `immediate` value determines what happens when the command component is activated.

Assume that you have a page with a button and a field for entering the quantity of a book in a shopping cart.

If the `immediate` attributes of both the button and the field are set to `true`, the new value entered in the field will be available for any processing associated with the event that is generated when the button is clicked.

The event associated with the button as well as the event validation and conversion associated with the field are all handled when request parameter values are applied.

If the button's `immediate` attribute is set to `true` but the field's `immediate` attribute is set to `false`, the event associated with the button is processed without updating the field's local value to the model layer.

The reason is that any events, conversion, or validation associated with the field occurs after request parameter values are applied.

The `rendered` *Attribute*

A component tag uses a Boolean EL expression along with the `rendered` attribute to determine whether the component will be rendered.

For example, the `commandLink` component in the following section of a page is not rendered if the cart contains no items:

```
<h:commandLink id="check" ...
rendered=
"#{cart.numberOfItems > 0}"
>
<h:outputText
value="#{bundle.CartCheck}"
/>
</h:commandLink>
```

Unlike nearly every other JavaServer Faces tag attribute, the `rendered` attribute is restricted to using rvalue expressions.

As explained in Value and Method Expressions, these rvalue expressions can only read data; they cannot write the data back to the data source.

Therefore, expressions used with `rendered` attributes can use the arithmetic operators and literals that rvalue expressions can use but lvalue expressions cannot use.

For example, the expression in the preceding example uses the `>` operator.

The `style` *and* `styleClass` *Attributes*

The `style` and `styleClass` attributes allow you to specify CSS styles for the rendered output of your tags.

Displaying Error Messages with the `h:message` and `h:messages` Tags describes an example of using the `style` attribute to specify styles directly in the attribute.

A component tag can instead refer to a CSS class.

The following example shows the use of a `dataTable` tag that references the style class `list-background`:

```
<h:dataTable id="books"...
styleClass="list-background"
value="#{bookDBAO.books}"
var="book">
```

The style sheet that defines this class is `stylesheet.css`, which will be included in the application.

For more information on defining styles, see *Cascading Style Sheets Specification* at http://www.w3.org/Style/CSS/.

The `value` *and* `binding` *Attributes*

A tag representing an output component uses the `value` and `binding` attributes to bind its component's value or instance, respectively, to an external data source.

Adding HTML Head and Body Tags

The HTML head (`h:head`) and body (`h:body`) tags add HTML page structure to JavaServer Faces web pages.

- The `h:head` tag represents the head element of an HTML page
- The `h:body` tag represents the body element of an HTML page

The following is an example of an XHTML page using the usual head and body markup tags:

```
<!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"
>
```

```
<head>
<title>Add a title</title>
</head>
<body>
Add Content
</body>
```

The following is an example of an XHTML page using `h:head` and `h:body` tags:

```
<!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>
```

```
Add a title
</h:head>
<h:body>
Add Content
</h:body>
```

Both of the preceding example code segments render the same HTML elements.

The head and body tags are useful mainly for resource relocation.

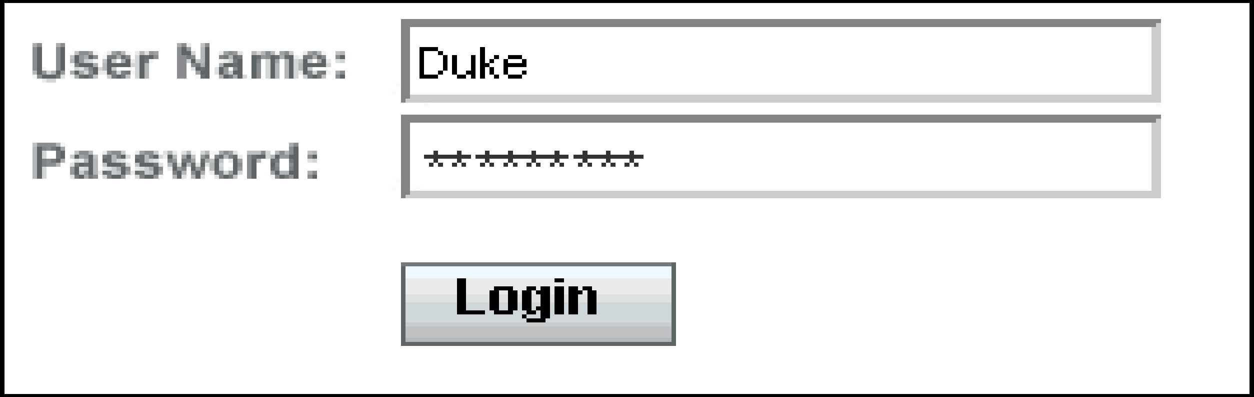
For more information on resource relocation, see Resource Relocation Using `h:output` Tags.

Adding a Form Component

An `h:form` tag represents an input form, which includes child components that can contain data that is either presented to the user or submitted with the form.

Figure 7-1 shows a typical login form in which a user enters a user name and password, then submits the form by clicking the Login button.

Figure 7-1 A Typical Form



The `h:form` tag represents the form on the page and encloses all the components that display or collect data from the user, as shown here:

```
<h:form> ...
other JavaServer Faces tags and
other content...
</h:form>
```

The `h:form` tag can also include HTML markup to lay out the components on the page.

Note that the `h:form` tag itself does not perform any layout; its purpose is to collect data and to declare attributes that can be used by other components in the form.

A page can include multiple `h:form` tags, but only the values from the form submitted by the user will be included in the postback request.

Using Text Components

Text components allow users to view and edit text in web applications.

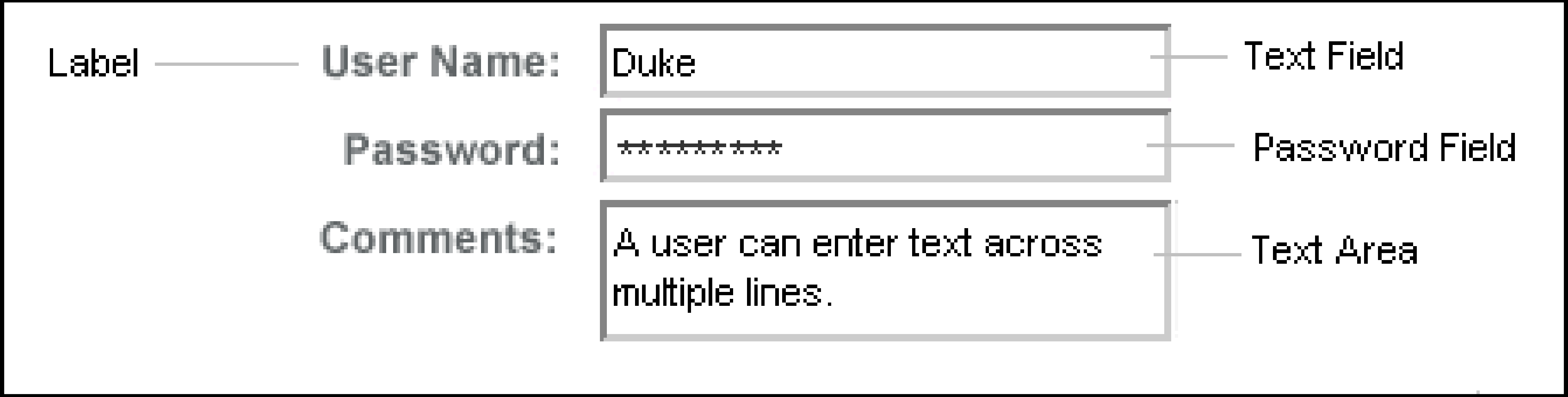
The basic types of text components are as follows:

- Label, which displays read-only text

- Text field, which allows users to enter text, often to be submitted as part of a form
- Text area, which is a type of text field that allows users to enter multiple lines of text
- Password field, which is a type of text field that displays a set of characters, such as asterisks, instead of the password text that the user enters

Figure 7-2 shows examples of these text components.

Figure 7-2 Example Text Components



Text components can be categorized as either input or output.

A JavaServer Faces output component is rendered as read-only text.

An example is a label.

A JavaServer Faces input component is rendered as editable text.

An example is a text field.

The input and output components can each be rendered in various ways to display more specialized text.

Table 7-3 lists the tags that represent the input components.

Table 7-3 Input Tags

Tag	Function
`h:inputHidden`	Allows a page author to include a hidden variable in a page
`h:inputSecret`	The standard password field: accepts one line of text with no spaces and displays it as a set of asterisks as it is typed
`h:inputText`	The standard text field: accepts a one-line text string
`h:inputTextarea`	The standard text area: accepts multiple lines of text

The input tags support the tag attributes shown in Table 7-4 in addition to those described in Common Component Tag Attributes.

Note that this table does not include all the attributes supported by the input tags but just those that are used most often.

For the complete list of attributes, refer to the documentation at http://download.oracle.com/javaee/6/javaserverfaces/2.1/docs/vdldocs/facelets/.

Table 7-4 Input Tag Attributes

Attribute	Description
`converter`	Identifies a converter that will be used to convert the component's local data. See Using the Standard Converters for more information on how to use this attribute.
`converterMessage`	Specifies an error message to display when the converter registered on the component fails.
`dir`	Specifies the direction of the text displayed by this component. Acceptable values are `LTR`, meaning left-to-right, and `RTL`, meaning right-to-left.

`label`	Specifies a name that can be used to identify this component in error messages.
`lang`	Specifies the code for the language used in the rendered markup, such as `en_US`.
`required`	Takes a `boolean` value that indicates whether the user must enter a value in this component.
`requiredMessage`	Specifies an error message to display when the user does not enter a value into the component.
`validator`	Identifies a method expression pointing to a backing bean method that performs validation on the component's data.

	See Referencing a Method That Performs Validation for an example of using the `f:validator` tag.
`f:validatorMessage`	Specifies an error message to display when the validator registered on the component fails to validate the component's local value.
`valueChange` `Listener`	Identifies a method expression that points to a backing bean method that handles the event of entering a value in this component. See Referencing a Method That Handles a Value-Change Event for an example of using `valueChangeListener`.

Table 7-5 lists the tags that represent the output components.

Table 7-5 Output Tags

Tag	Function
`h:outputFormat`	Displays a localized message
`h:outputLabel`	The standard read-only label: displays a component as a label for a specified input field
`h:outputLink`	Displays an `<a href>` tag that links to another page without generating an action event
`h:outputText`	Displays a one-line text string

The output tags support the `converter` tag attribute in addition to those listed in Common Component Tag Attributes.

The rest of this section explains how to use some of the tags listed in Table 7-3 and Table 7-5.

The other tags are written in a similar way.

Rendering a Text Field with the `h:inputText` Tag

The `h:inputText` tag is used to display a text field.

A similar tag, the `h:outputText` tag, displays a read-only, single-line string.

This section shows you how to use the `h:inputText` tag.

The `h:outputText` tag is written in a similar way.

Here is an example of an `h:inputText` tag:

```
<h:inputText id="name"
label="Customer Name" size="50"
value="#{cashier.name}"
required="true"
requiredMessage=
"#{customMessages.CustomerName}"
>
<f:valueChangeListener
type=
"com.sun.bookstore6.listeners.NameChanged"/>
</h:inputText>
```

The `label` attribute specifies a user-friendly name that will be used in the substitution parameters of error messages displayed for this component.

The `value` attribute refers to the `name` property of a backing bean named `CashierBean`.

This property holds the data for the `name` component.

After the user submits the form, the value of the `name` property in `CashierBean` will be set to the text entered in the field corresponding to this tag.

The `required` attribute causes the page to reload, displaying errors, if the user does not enter a value in the `name` text field.

The JavaServer Faces implementation checks whether the value of the component is null or is an empty string.

If your component must have a non-null value or a `String` value at least one character in length, you should add a `required` attribute to your tag and set its value to `true`.

If your tag has a `required` attribute that is set to `true` and the value is null or a zero-length string, no other validators that are registered on the tag are called.

If your tag does not have a `required` attribute set to `true`, other validators that are registered on the tag are called, but those validators must handle the possibility of a null or zero-length string. See Validating Null and Empty Strings for more information.

Rendering a Password Field with the `h:inputSecret` Tag

The `h:inputSecret` tag renders an `<input type="password">` HTML tag.

When the user types a string into this field, a row of asterisks is displayed instead of the text typed by the user.

Here is an example:

```
<h:inputSecret redisplay="false"
value="#{LoginBean.password}"
/>
```

In this example, the `redisplay` attribute is set to `false`.

This will prevent the password from being displayed in a query string or in the source file of the resulting HTML page.

Rendering a Label with the `h:outputLabel` Tag

The `h:outputLabel` tag is used to attach a label to a specified input field for the purpose of making it accessible.

The following page uses an `h:outputLabel` tag to render the label of a check box:

```
<h:selectBooleanCheckbox
id="fanClub"
binding="#{cashier.specialOffer}"
/>
<h:outputLabel for="fanClub"
binding=
"#{cashier.specialOfferText}"
>
<h:outputText id="fanClubLabel"
value="#{bundle.DukeFanClub}"
/></h:outputLabel>...
```

The `for` attribute of the `h:outputLabel` tag maps to the `id` of the input field to which the label is attached.

The `h:outputText` tag nested inside the `h:outputLabel` tag represents the label component.

The `value` attribute on the `h:outputText` tag indicates the text that is displayed next to the input field.

Instead of using an `h:outputText` tag for the text displayed as a label, you can simply use the `h:outputLabel` tag's `value` attribute.

The following code snippet shows what the previous code snippet would look like if it used the `value` attribute of the `h:outputLabel` tag to specify the text of the label:

```
<h:selectBooleanCheckbox
id="fanClub"
binding="#{cashier.specialOffer}"
/>
<h:outputLabel for="fanClub"
binding=
"#{cashier.specialOfferText}"
value="#{bundle.DukeFanClub}"
/>
</h:outputLabel>
...
```

Rendering a Hyperlink with the `h:outputLink` Tag

The `h:outputLink` tag is used to render a hyperlink that, when clicked, loads another page but does not generate an action event.

You should use this tag instead of the `h:commandLink` tag if you always want the URL specified by the `h:outputLink` tag's `value` attribute to open and do not want any processing to be performed when the user clicks the link.

Here is an example:

```
<h:outputLink value="javadocs">
Documentation for this demo
</h:outputLink>
```

The text in the body of the `outputLink` tag identifies the text that the user clicks to get to the next page.

Displaying a Formatted Message with the `h:outputFormat` Tag

The `h:outputFormat` tag allows display of concatenated messages as a `MessageFormat` pattern, as described in the API documentation for `java.text.MessageFormat`.

Here is an example of an `outputFormat` tag:

```
<h:outputFormat
value="Hello, {0}!">
<f:param value="#{hello.name}"/>
</h:outputFormat>
```

The `value` attribute specifies the `MessageFormat` pattern.

The `param` tag specifies the substitution parameters for the message.

The value of the parameter replaces the `{0}` in the sentence.

If the value of `"#{hello.name}"` is “Bill”, the message displayed in the page is as follows:

```
Hello, Bill!
```

An `h:outputFormat` tag can include more than one `param` tag for those messages that have more than one parameter that must be concatenated into the message.

If you have more than one parameter for one message, make sure that you put the `param` tags in the proper order so that the data is inserted in the correct place in the message.

Here is the preceding example modified with an additional parameter:

```
<h:outputFormat value="Hello, {0}!
You are visitor number {1} to the
page.">
<f:param value="#{hello.name}" />
<f:param
value="#{bean.numVisitor}"/>
</h:outputFormat>
```

The value of `{1}` is replaced by the second parameter.

The parameter is an EL expression, `bean.numVisitor`, where the property `numVisitor` of the backing bean `bean` keeps track of visitors to the page.

This is an example of a value-expression-enabled tag attribute accepting an EL expression.

The message displayed in the page is now as follows:

```
Hello, Bill! You are visitor number
10 to the page.
```

Using Command Component Tags for Performing Actions and Navigation

In JavaServer Faces applications, the button and hyperlink component tags are used to perform actions, such as submitting a form, and for navigating to another page.

These tags are called command component tags because they perform an action when activated.

The `h:commandButton` tag is rendered as a button.

The `h:commandLink` tag is rendered as a hyperlink.

In addition to the tag attributes listed in Common Component Tag Attributes, the `h:commandButton` and `h:commandLink` tags can use the following attributes:

- `action`, which is either a logical outcome `String` or a method expression pointing to a bean method that returns a logical outcome `String`.

In either case, the logical outcome `String` is used to determine what page to access when the command component tag is activated.

- `actionListener`, which is a method expression pointing to a bean method that processes an action event fired by the command component tag.

See Referencing a Method That Performs Navigation for more information on using the `action` attribute. See Referencing a Method That Handles an Action Event for details on using the `actionListener` attribute.

Rendering a Button with the `h:commandButton` Tag

If you are using a `commandButton` component tag, the data from the current page is processed when a user clicks the button, and the next page is opened.

Here is an example of the `h:commandButton` tag:

```
<h:commandButton value="Submit"
action="#{cashier.submit}"/>
```

Clicking the button will cause the `submit` method of `CashierBean` to be invoked because the `action` attribute references this method.

The `submit` method performs some processing and returns a logical outcome.

The `value` attribute of the example `commandButton` tag references the button's label.

For information on how to use the `action` attribute, see Referencing a Method That Performs Navigation.

Rendering a Hyperlink with the `h:commandLink` Tag

The `h:commandLink` tag represents an HTML hyperlink and is rendered as an HTML `<a>` element.

This tag acts like a form's Submit button and is used to submit an action event to the application.

A `h:commandLink` tag must include a nested `h:outputText` tag, which represents the text that the user clicks to generate the event.

Here is an example:

```
<h:commandLink id="NAmerica"
action="bookstore"
actionListener=
"#{localeBean.chooseLocaleFromLink}">
```

```
<h:outputText
value="#{bundle.English}"
/>
</h:commandLink>
```

This tag will render the following HTML:

```
<a id="_id3:NAmerica" href="#"
```

```
onclick=
"document.forms['_id3']
['_id3:NAmerica'].
value='_id3:NAmerica';
document.forms['_id3'].submit();
return false;"
>
English
</a>
```

Note - The `h:commandLink` tag will render JavaScript programming language.

If you use this tag, make sure that your browser is enabled for JavaScript technology.

Adding Graphics and Images with the `h:graphicImage` Tag

In a JavaServer Faces application, use the `h:graphicImage` tag to render an image on a page:

```
<h:graphicImage id="mapImage"
url="/template/world.jpg"
/>
```

The `url` attribute specifies the path to the image.

The URL of the example tag begins with a `/`, which adds the relative context path of the web application to the beginning of the path to the image.

Alternatively, you can use the facility described in Resources to point to the image location.

Here is an example:

```
<h:graphicImage
value=
"#{resource['images:wave.med.gif']}"
/>
```

Laying Out Components with the `h:panelGrid` and `h:panelGroup` Tags

In a JavaServer Faces application, you use a panel as a layout container for a set of other components.

A panel is rendered as an HTML table.

Table 7-6 lists the tags used to create panels.

Table 7-6 Panel Component Tags

Tag	Attributes	Function
`h:panelGrid`	`columns`, `columnClasses`, `footerClass`, `headerClass`, `panelClass`, `rowClasses`	Displays a table
`h:panelGroup`	`layout`	Groups a set of components under one parent

The `h:panelGrid` tag is used to represent an entire table.

The `h:panelGroup` tag is used to represent rows in a table.

Other tags are used to represent individual cells in the rows.

The `columns` attribute defines how to group the data in the table and therefore is required if you want your table to have more than one column.

The `h:panelGrid` tag also has a set of optional attributes that specify CSS classes:

`columnClasses`, `footerClass`, `headerClass`, `panelClass`, and `rowClasses`.

If the `headerClass` attribute value is specified, the `panelGrid` must have a header as its first child.

Similarly, if a `footerClass` attribute value is specified, the `panelGrid` must have a footer as its last child. Here is an example:

```
<h:panelGrid columns="3"
headerClass="list-header"
rowClasses=
"list-row-even, list-row-odd"
styleClass="list-background"
title="#{bundle.Checkout}"
>
<f:facet name="header">
```

```
<h:outputText
value="#{bundle.Checkout}"/>
</f:facet>
<h:outputText
value="#{bundle.Name}" />
<h:inputText id="name" size="50"
value="#{cashier.name}"
required="true"
>

<f:valueChangeListener
```

```
type="listeners.NameChanged" />
</h:inputText>
<h:message
styleClass="validationMessage"
for="name"/>
<h:outputText
value="#{bundle.CCNumber}"/>
<h:inputText id="ccno" size="19"
converter="CreditCardConverter"
required="true">
<bookstore:formatValidator
```

```
formatPatterns="
9999999999999999|
9999 9999 9999 9999|
9999-9999-9999-9999"
/>
</h:inputText>
<h:message
styleClass="validationMessage"
for="ccno"/> ...
</h:panelGrid>
```

The preceding `h:panelGrid` tag is rendered as a table that contains components in which a customer inputs personal information.

This `h:panelGrid` tag uses style sheet classes to format the table.

The following code shows the `list-header` definition:

```
.list-header {
background-color: #ffffff;
color: #000000;
text-align: center;
}
```

Because the `h:panelGrid` tag specifies a `headerClass`, the `panelGrid` must contain a header.

The example `panelGrid` tag uses a `facet` tag for the header.

Facets can have only one child, so an `h:panelGroup` tag is needed if you want to group more than one component within a `facet`.

The example `h:panelGrid` tag has only one cell of data, so an `h:panelGroup` tag is not needed.

The `h:panelGroup` tag has an attribute, `layout`, in addition to those listed in Common Component Tag Attributes.

If the `layout` attribute has the value `block`, an HTML `div` element is rendered to enclose the row; otherwise, an HTML `span` element is rendered to enclose the row.

If you are specifying styles for the `h:panelGroup` tag, you should set the `layout` attribute to `block` in order for the styles to be applied to the components within the `h:panelGroup` tag.

You should do this because styles, such as those that set width and height, are not applied to inline elements, which is how content enclosed by the `span` element is defined.

An `h:panelGroup` tag can also be used to encapsulate a nested tree of components so that the tree of components appears as a single component to the parent component.

Data, represented by the nested tags, is grouped into rows according to the value of the `columns` attribute of the `h:panelGrid` tag.

The `columns` attribute in the example is set to `3`, and therefore the table will have three columns.

The column in which each component is displayed is determined by the order in which the component is listed on the page modulo 3.

So, if a component is the fifth one in the list of components, that component will be in the 5 modulo 3 column, or column 2.

Displaying Components for Selecting One Value

Another commonly used component is one that allows a user to select one value, whether it is the only value available or one of a set of choices.

The most common tags for this kind of component are as follows:

- An `h:selectBooleanCheckbox` tag, displayed as a check box, which represents a Boolean state

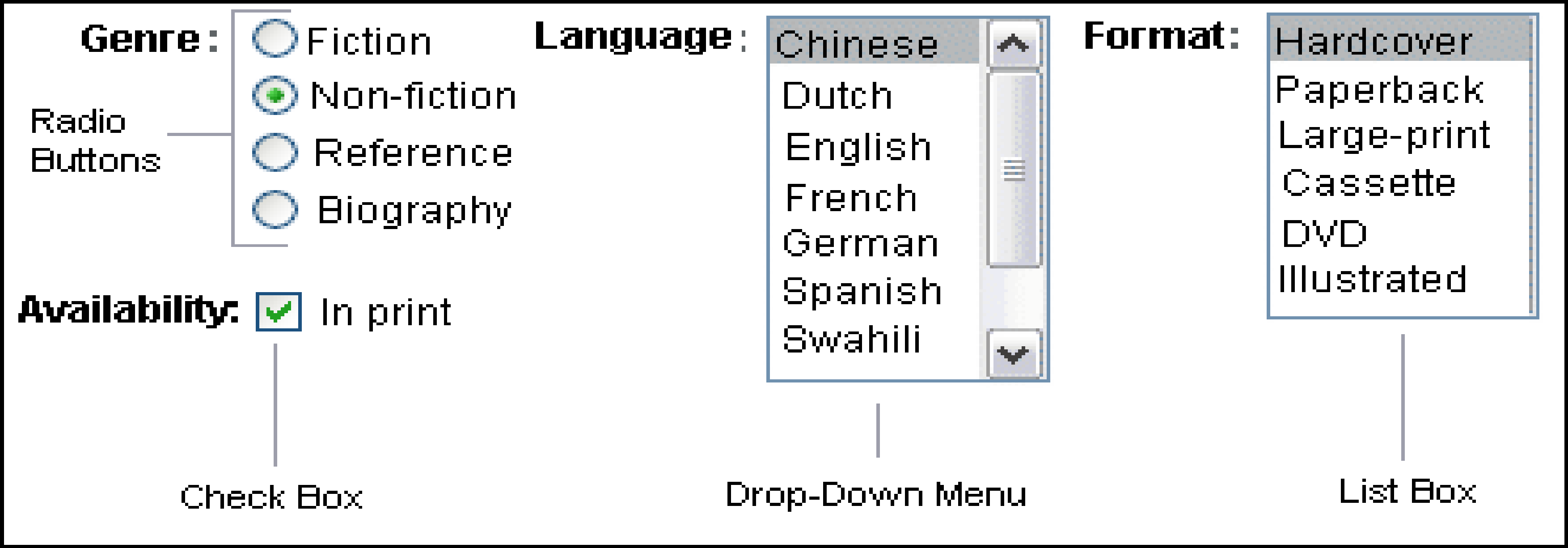
- An `h:selectOneRadio` tag, displayed as a set of radio buttons

- An `h:selectOneMenu` tag, displayed as a drop-down menu, with a scrollable list

- An `h:selectOneListbox` tag, displayed as a list box, with an unscrollable list

Figure 7-3 shows examples of these components.

Figure 7-3 Example Components for Selecting One Item



Displaying a Check Box Using the `h:selectBooleanCheckbox` Tag

The `h:selectBooleanCheckbox` tag is the only tag that JavaServer Faces technology provides for representing a Boolean state.

Here is an example that shows how to use the `h:selectBooleanCheckbox` tag:

```
<h:selectBooleanCheckbox
id="fanClub" rendered="false"
binding="#{cashier.specialOffer}"
/>
<h:outputLabel
for="fanClub"
rendered="false"
binding=
"#{cashier.specialOfferText}"
>
```

```
<h:outputText
id="fanClubLabel"
value="#{bundle.DukeFanClub}"
/>
</h:outputLabel>
```

This example tag displays a check box to allow users to indicate whether they want to join the Duke Fan Club.

The label for the check box is rendered by the `outputLabel` tag.

The text is represented by the nested `outputText` tag.

Displaying a Menu Using the `h:selectOneMenu` Tag

A component that allows the user to select one value from a set of values can be rendered as a list box, a set of radio buttons, or a menu.

This section describes the `h:selectOneMenu` tag.

The `h:selectOneRadio` and `h:selectOneListbox` tags are used in a similar way.

The `h:selectOneListbox` tag is similar to the `h:selectOneMenu` tag except that `h:selectOneListbox` defines a `size` attribute that determines how many of the items are displayed at once.

The `h:selectOneMenu` tag represents a component that contains a list of items from which a user can choose one item.

This menu component is also commonly known as a drop-down list or a combo box.

The following code snippet shows how the `h:selectOneMenu` tag is used to allow the user to select a shipping method:

```
<h:selectOneMenu
id="shippingOption" required="true"
value="#{cashier.shippingOption}"
>
<f:selectItem itemValue="2"
itemLabel="#{bundle.QuickShip}"
/>
<f:selectItem itemValue="5"
itemLabel="#{bundle.NormalShip}"
/>
```

```
<f:selectItem itemValue="7"
itemLabel="#{bundle.SaverShip}"
/>
</h:selectOneMenu>
```

The `value` attribute of the `h:selectOneMenu` tag maps to the property that holds the currently selected item's value.

You are not required to provide a value for the currently selected item.

If you don’t provide a value, the first item in the list is selected by default.

Like the `h:selectOneRadio` tag, the `selectOneMenu` tag must contain either an `f:selectItems` tag or a set of `f:selectItem` tags for representing the items in the list.

Using the `f:selectItem` and `f:selectItems` Tags describes these tags.

Displaying Components for Selecting Multiple Values

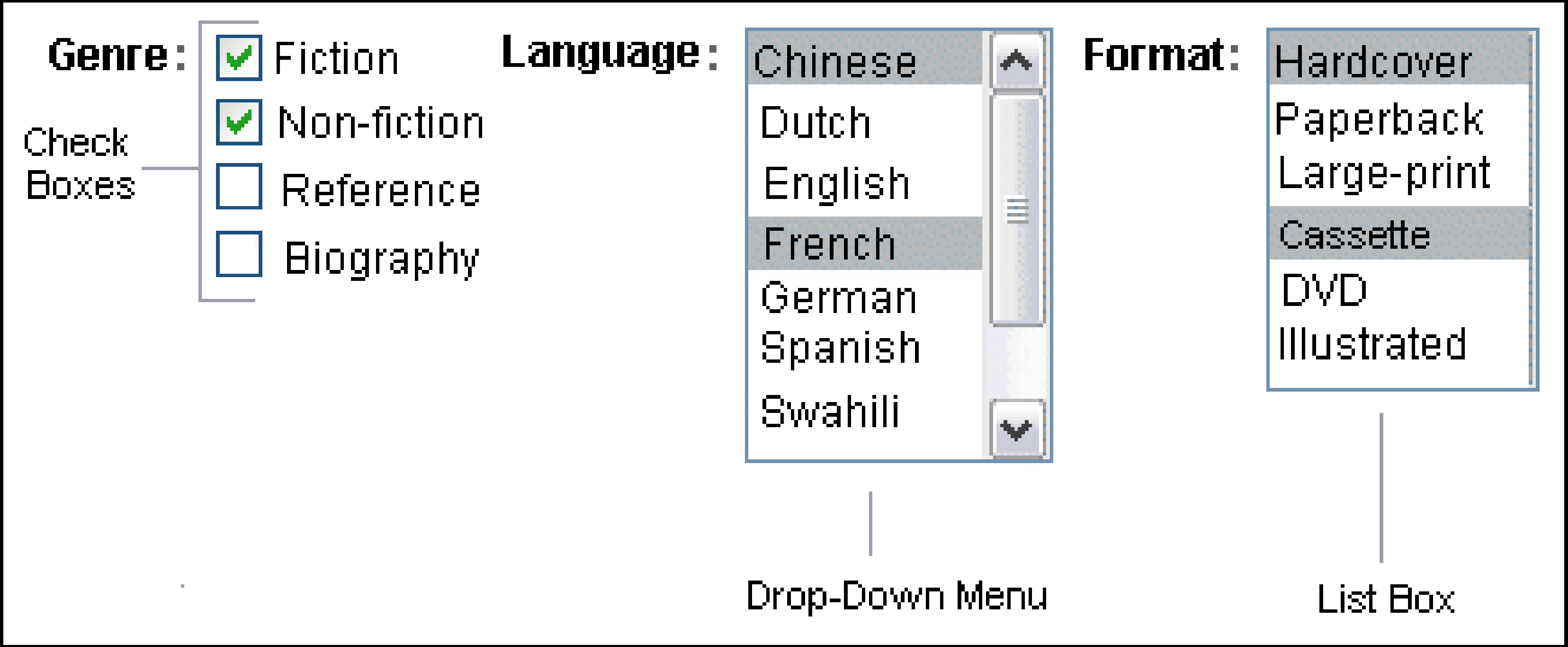
In some cases, you need to allow your users to select multiple values rather than just one value from a list of choices.

You can do this using one of the following component tags:

- An `h:selectManyCheckbox` tag, displayed as a set of check boxes
- An `h:selectManyMenu` tag, displayed as a drop-down menu
- An `h:selectManyListbox` tag, displayed as a list box

Figure 7-4 shows examples of these components.

Figure 7-4 Example Components for Selecting Multiple Values



These tags allow the user to select zero or more values from a set of values.

This section explains the `h:selectManyCheckbox` tag.

The `h:selectManyListbox` and `h:selectManyMenu` tags are used in a similar way.

Unlike a menu, a list box displays a subset of items in a box; a menu displays only one item at a time when the user is not selecting the menu.

The `size` attribute of the `h:selectManyListbox` tag determines the number of items displayed at one time.

The list box includes a scroll bar for scrolling through any remaining items in the list.

The `h:selectManyCheckbox` tag renders a set of check boxes, with each check box representing one value that can be selected:

```
<h:selectManyCheckbox
id="newsletters"
layout="pageDirection"
value="#{cashier.newsletters}">
<f:selectItems
value="#{newsletters}"
/>
</h:selectManyCheckbox>
```

The `value` attribute of the `h:selectManyCheckbox` tag identifies the `newsletters` property of the `Cashier` backing bean.

This property holds the values of the currently selected items from the set of check boxes.

You are not required to provide a value for the currently selected items.

If you don’t provide a value, the first item in the list is selected by default.

The `layout` attribute indicates how the set of check boxes is arranged on the page.

Because layout is set to `pageDirection`, the check boxes are arranged vertically.

The default is `lineDirection`, which aligns the check boxes horizontally.

The `h:selectManyCheckbox` tag must also contain a tag or set of tags representing the set of check boxes.

To represent a set of items, you use the `f:selectItems` tag.

To represent each item individually, you use a `f:selectItem` tag.

The following subsection explains these tags in more detail.

Using the `f:selectItem` and `f:selectItems` Tags

The `f:selectItem` and `f:selectItems` tags represent components that can be nested inside a component that allows you to select one or multiple items.

An `f:selectItem` tag contains the value, label, and description of a single item.

An `f:selectItems` tag contains the values, labels, and descriptions of the entire list of items.

You can use either a set of `f:selectItem` tags or a single `f:selectItems` tag within your component tag.

The advantages of using the `f:selectItems` tag are as follows.

- Items can be represented by using different data structures, including `Array`, `Map`, and `Collection`.

The value of the `f:selectItems` tag can represent even a generic collection of POJOs.

- Different lists can be concatenated into a single component, and the lists can be grouped within the component.
- Values can be generated dynamically at runtime.

The advantages of using `f:selectItem` are as follows:

- Items in the list can be defined from the page.
- Less code is needed in the bean for the `selectItem` properties.

The rest of this section shows you how to use the `f:selectItems` and `f:selectItem` tags.

Using the `f:selectItems` Tag

The following example from Displaying Components for Selecting Multiple Values shows how to use the `h:selectManyCheckbox` tag:

```
<h:selectManyCheckbox
id="newsletters"
layout="pageDirection"
value="#{cashier.newsletters}"
>
<f:selectItems
value="#{newsletters}"
/>
</h:selectManyCheckbox>
```

The `value` attribute of the `f:selectItems` tag is bound to the backing bean `newsletters`.

You can also create the list of items programmatically in the backing bean.

See Writing Bean Properties for information on how to write a backing bean property for one of these tags.

Using the `f:selectItem` Tag

The `f:selectItem` tag represents a single item in a list of items.

Here is the example from Displaying a Menu Using the `h:selectOneMenu` Tag once again:

```
<h:selectOneMenu
id="shippingOption" required="true"
value="#{cashier.shippingOption}"
>
<f:selectItem
itemValue="2"
itemLabel="#{bundle.QuickShip}"
/>
<f:selectItem itemValue="5"
itemLabel="#{bundle.NormalShip}"
/>
```

```
<f:selectItem itemValue="7"
itemLabel="#{bundle.SaverShip}"
/>
</h:selectOneMenu>
```

The `itemValue` attribute represents the default value for the `selectItem` tag.

The `itemLabel` attribute represents the `String` that appears in the drop-down menu component on the page.

The `itemValue` and `itemLabel` attributes are value-binding-enabled, meaning that they can use value-binding expressions to refer to values in external objects.

These attributes can also define literal values, as shown in the example `h:selectOneMenu` tag.

Using Data-Bound Table Components

Data-bound table components display relational data in a tabular format.

In a JavaServer Faces application, the `h:dataTable` component tag supports binding to a collection of data objects and displays the data as an HTML table.

The `h:column` tag represents a column of data within the table, iterating over each record in the data source, which is displayed as a row.

Here is an example:

```
<h:dataTable id="items"
captionClass="list-caption"
columnClasses="list-column-center,
list-column-left,list-column-right,
list-column-center"
footerClass="list-footer"
headerClass="list-header"
rowClasses=
"list-row-even, list-row-odd"
styleClass="list-background">
```

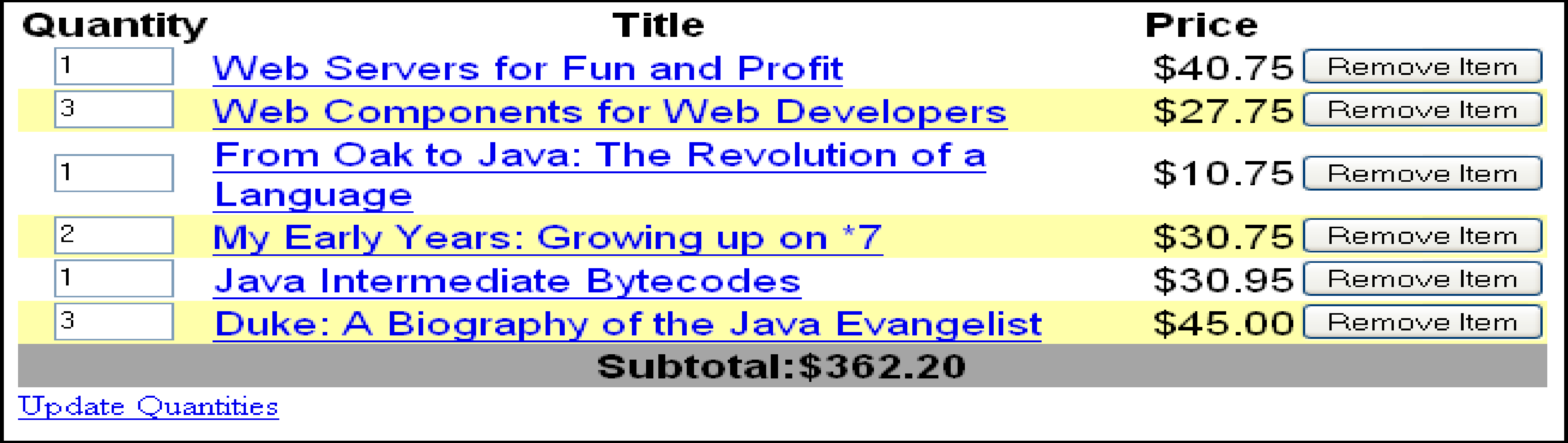
```
<h:column
headerClass="list-header-left">
<f:facet name="header">
<h:outputText value=Quantity"" />
</f:facet>
<h:inputText id="quantity" size="4"
value="#{item.quantity}" > ...
</h:inputText>
...
</h:column>
<h:column>
```

```
<f:facet name="header">
<h:outputText value="Title"/>
</f:facet>
<h:commandLink>
<h:outputText
value="#{item.title}"/>
</h:commandLink>
</h:column> ...
<f:facet name="footer"
<h:panelGroup>
<h:outputText value="Total}"/>
```

```
<h:outputText value="#{cart.total}" />
<f:convertNumber type="currency" />
</h:outputText>
</h:panelGroup>
</f:facet>
</h:dataTable>
```

Figure 7-5 shows a data grid that this `h:dataTable` tag can display.

Figure 7-5 Table on a Web Page



Quantity	Title	Price	
1	Web Servers for Fun and Profit	$40.75	Remove Item
3	Web Components for Web Developers	$27.75	Remove Item
1	From Oak to Java: The Revolution of a Language	$10.75	Remove Item
2	My Early Years: Growing up on *7	$30.75	Remove Item
1	Java Intermediate Bytecodes	$30.95	Remove Item
3	Duke: A Biography of the Java Evangelist	$45.00	Remove Item
Subtotal:$362.20			

Update Quantities

The example `h:dataTable` tag displays the books in the shopping cart, as well as the quantity of each book in the shopping cart, the prices, and a set of buttons the user can click to remove books from the shopping cart.

The `h:column` tags represent columns of data in a data component.

While the data component is iterating over the rows of data, it processes the column component associated with each `h:column` tag for each row in the table.

The `h:dataTable` tag shown in the preceding code example iterates through the list of books (`cart.items`) in the shopping cart and displays their titles, authors, and prices.

Each time the `h:dataTable` tag iterates through the list of books, it renders one cell in each column.

The `h:dataTable` and `h:column` tags use facets to represent parts of the table that are not repeated or updated.

These parts include headers, footers, and captions.

In the preceding example, `h:column` tags include `f:facet` tags for representing column headers or footers.

The `h:column` tag allows you to control the styles of these headers and footers by supporting the `headerClass` and `footerClass` attributes.

These attributes accept space-separated lists of CSS classes, which will be applied to the header and footer cells of the corresponding column in the rendered table.

Facets can have only one child, so an `h:panelGroup` tag is needed if you want to group more than one component within an `f:facet`.

Because the facet tag representing the footer includes more than one tag, the `panelGroup` is needed to group those tags.

Finally, this `h:dataTable` tag includes an `f:facet` tag with its `name` attribute set to `caption`, causing a table caption to be rendered below the table.

This table is a classic use case for a data component because the number of books might not be known to the application developer or the page author when that application is developed.

The data component can dynamically adjust the number of rows of the table to accommodate the underlying data.

The `value` attribute of an `h:dataTable` tag references the data to be included in the table.

This data can take the form of any of the following:

- A list of beans
- An array of beans
- A single bean
- A `javax.faces.model.DataModel` object
- A `java.sql.ResultSet` object
- A `javax.servlet.jsp.jstl.sql.Result` object

- A `javax.sql.RowSet` object

All data sources for data components have a `DataModel` wrapper.

Unless you explicitly construct a `DataModel` wrapper, the JavaServer Faces implementation will create one around data of any of the other acceptable types.

See Writing Bean Properties for more information on how to write properties for use with a data component.

The `var` attribute specifies a name that is used by the components within the `h:dataTable` tag as an alias to the data referenced in the `value` attribute of `dataTable`.

In the example `h:dataTable` tag, the `value` attribute points to a list of books.

The `var` attribute points to a single book in that list.

As the `h:dataTable` tag iterates through the list, each reference to `item` points to the current book in the list.

The `h:dataTable` tag also has the ability to display only a subset of the underlying data.

This feature is not shown in the preceding example.

To display a subset of the data, you use the optional `first` and `rows` attributes.

The `first` attribute specifies the first row to be displayed.

The `rows` attribute specifies the number of rows, starting with the first row, to be displayed.

For example, if you wanted to display records 2 through 10 of the underlying data, you would set `first` to 2 and `rows` to 9.

When you display a subset of the data in your pages, you might want to consider including a link or button that causes subsequent rows to display when clicked.

By default, both `first` and `rows` are set to zero, and this causes all the rows of the underlying data to display.

Table 7-7 shows the optional attributes for the `h:dataTable` tag.

Table 7-7 Optional Attributes for the `h:dataTable` Tag

Attribute	Defines Styles for
`captionClass`	Table caption
`columnClasses`	All the columns
`footerClass`	Footer
`headerClass`	Header
`rowClasses`	Rows
`styleClass`	The entire table

Each of the attributes in Table 7-7 can specify more than one style.

If `columnClasses` or `rowClasses` specifies more than one style, the styles are applied to the columns or rows in the order that the styles are listed in the attribute.

For example, if `columnClasses` specifies styles `list-column-center` and `list-column-right` and if the table has two columns, the first column will have style `list-column-center`, and the second column will have style `list-column-right`.

If the style attribute specifies more styles than there are columns or rows, the remaining styles will be assigned to columns or rows starting from the first column or row.

Similarly, if the style attribute specifies fewer styles than there are columns or rows, the remaining columns or rows will be assigned styles starting from the first style.

Displaying Error Messages with the `h:message` and `h:messages` Tags

The `h:message` and `h:messages` tags are used to display error messages when conversion or validation fails.

The `h:message` tag displays error messages related to a specific input component, whereas the `h:messages` tag displays the error messages for the entire page.

Here is an example `h:message` tag from the `guessnumber` application:

```
<h:inputText id="userNo" value=
"#{UserNumberBean.userNumber}">
```

```
<f:validateLongRange
minimum="0" maximum="10" />
<h:commandButton id="submit"
action="success" value="Submit"
/>
<p>
```

```
<h:message
style="
color: red;
font-family:
'New Century Schoolbook', serif;
font-style: oblique;
text-decoration: overline
"
id="errors1" for="userNo"
/>
```

The `for` attribute refers to the ID of the component that generated the error message.

The error message is displayed at the same location that the `h:message` tag appears in the page.

In this case, the error message will appear after the Submit button.

The `style` attribute allows you to specify the style of the text of the message.

In the example in this section, the text will be red, New Century Schoolbook, serif font family, and oblique style, and a line will appear over the text.

The message and messages tags support many other attributes for defining styles.

For more information on these attributes, refer to the documentation at http://download.oracle.com/javaee/6/javaserverfaces/2.1/docs/vdldocs/facelets/.

Another attribute supported by the `h:messages` tag is the `layout` attribute.

Its default value is `list`, which indicates that the messages are displayed in a bullet list using the HTML `ul` and `li` elements.

If you set the attribute value to `table`, the messages will be rendered in a table using the HTML `table` element.

The preceding example shows a standard validator that is registered on the input component.

The message tag displays the error message that is associated with this validator when the validator cannot validate the input component's value.

In general, when you register a converter or validator on a component, you are queueing the error messages associated with the converter or validator on the component.

The `h:message` and `h:messages` tags display the appropriate error messages that are queued on the component when the validators or converters registered on that component fail to convert or validate the component’s value.

Standard error messages are provided with standard converters and standard validators.

An application architect can override these standard messages and supply error messages for custom converters and validators by registering custom error messages with the application.

Creating Bookmarkable URLs with the `h:button` and `h:link` Tags

The ability to create bookmarkable URLs refers to the ability to generate hyperlinks based on a specified navigation outcome and on component parameters.

In HTTP, most browsers by default send GET requests for URL retrieval and POST requests for data processing.

The GET requests can have query parameters and can be cached, which is not advised for POST requests, which send data to the external servers.

The other JavaServer Faces tags capable of generating hyperlinks use either simple GET requests, as in the case of `h:outputlink`, or POST requests, as in the case of `h:commandLink` or `h:commandButton` tags.

GET requests with query parameters provide finer granularity to URL strings.

These URLs are created with one or more `name=value` parameters appended to the simple URL after a `?` character and separated by either `&;` or `&amp;` strings.

To create a bookmarkable URL, use an `h:link` or `h:button` tag.

Both of these tags can generate a hyperlink based on the `outcome` attribute of the component.

For example:

```
<h:link
outcome="response" value="Message"
>
<f:param name="Result"
value="#{sampleBean.result}"
/>
</h:link>
```

The `h:link` tag will generate a URL link that points to the `response.xhtml` file on the same server, appended with the single query parameter created by the `f:param` tag.

When processed, the parameter `Result` is assigned the value of backing bean's result method `#{sampleBean.result}`.

The following sample HTML is generated from the preceding set of tags, assuming that the value of the parameter is `success`:

```
<a href="http://localhost:8080/
guessnumber/response.xhtml?
Result=success"
>
Response
</a>
```

This is a simple GET request.

To create more complex GET requests and utilize the complete functionality of the `h:link` tag, you can use view parameters.

Using View Parameters to Configure Bookmarkable URLs

The core tags `f:metadata` and `f:viewparam` are used as a source of parameters for configuring the URLs.

View parameters are declared as part of `f:metadata` for a page, as shown in the following example:

```
<h:body>
<f:metadata>
<f:viewParam id="name" name="Name"
value="#{sampleBean.username}"/>
<f:viewParam id="ID" name="uid"
value="#{sampleBean.useridentity}"
/>
```

```
</f:metadata>
<h:link
outcome="response" value="Message"
includeViewParams="true">
</h:link>
</h:body>
```

View parameters are declared with the `f:viewparam` tag and are placed inside the `f:metadata` tag.

If the `includeViewParams` attribute is set on the component, the view parameters are added to the hyperlink.

The resulting URL will look like this:

```
http://localhost:8080/guessnumber/
response.xhtml?Name=Duke&;uid=2001
```

Because the URL can be the result of various parameter values, the order of the URL creation has been predefined.

The order in which the various parameter values are read is as follows:

1. Component
2. Navigation-case parameters
3. View parameters

Resource Relocation Using `h:output` Tags

Resource relocation refers to the ability of a JavaServer Faces application to specify the location where a resource can be rendered.

Resource relocation can be defined with the following HTML tags:

- `h:outputScript`
- `h:outputStylesheet`

These tags have `name` and `target` attributes, which can be used to define the render location.

For a complete list of attributes for these tags, see the documentation at http://download.oracle.com/javaee/6/javaserverfaces/2.1/docs/vdldocs/facelets/.

For the `h:outputScript` tag, the name and target attributes define where the output of a resource may appear.

Here is an example:

```
<html
xmlns=
"http://www.w3.org/1999/xhtml"
xmlns:h=
"http://java.sun.com/jsf/html">
```

```
<h:head id="head">
<title>Resource Relocation</title>
</h:head>
<h:body id="body">
<h:form id="form">
<h:outputScript name="hello.js"/>
<h:outputStylesheet
name="hello.css"/>
</h:form>
</h:body>
</html>
```

Since the `target` attribute is not defined in the tag, the style sheet `hello.css` is rendered in the head, and the `hello.js` script is rendered in the body of the page as defined by the `h:head` tag.

Here is the HTML generated by the preceding code:

```
<html
xmlns=
"http://www.w3.org/1999/xhtml">
```

```
<head>
<title>Resource Relocation</title>
<link type="text/css"
rel="stylesheet"
href=
"/ctx/faces/javax.faces.resource/
hello.css"
/>
</head>
<body>
```

```
<form id="form" name="form"
method="post" action="..."
enctype="...">
<script type="text/javascript"
src="/ctx/faces/
javax.faces.resource/hello.js"
>
</script>
</form>
</body>
</html>
```

The original page can be recreated by setting the `target` attribute for the `h:outputScript` tag, which allows the incoming GET request to provide the location parameter.

Here is an example:

```
<html
xmlns=
"http://www.w3.org/1999/xhtml"
xmlns:h=
"http://java.sun.com/jsf/html"
>
<h:head id="head">
<title>Resource Relocation</title>
</h:head>
<h:body id="body">
<h:form id="form">
```

```
<h:outputScript name="hello.js"
target="#{param.location}"
/>
<h:outputStylesheet
name="hello.css"
/>
</h:form>
</h:body>
</html>
```

In this case, if the incoming request does not provide a location parameter, the default locations will still apply: The style sheet is rendered in the head, and the script is rendered inline.

However, if the incoming request provides the location parameter as the head, both the style sheet and the script will be rendered in the head element.

The HTML generated by the preceding code is as follows:

```
<html
xmlns=
"http://www.w3.org/1999/xhtml"
>
<head>
<title>Resource Relocation</title>
```

```
<link
type="text/css" rel="stylesheet"
href="/ctx/faces/
javax.faces.resource/hello.css"
/>
<script type="text/javascript"
src="/ctx/faces/
javax.faces.resource/hello.js"
>
</script>
</head>
```

```
<body>
<form id="form" name="form"
method="post" action="..."
enctype="...">
</form>
</body>
</html>
```

Similarly, if the incoming request provides the location parameter as the body, the script will be rendered in the body element.

The preceding section describes simple uses for resource relocation.

That feature can add even more functionality for the components and pages.

A page author does not have to know the location of a resource or its placement.

By using a `@ResourceDependency` annotation for the components, component authors can define the resources for the component, such as a style sheet and script.

This allows the page authors freedom from defining resource locations.

Using Core Tags

The tags included in the JavaServer Faces core tag library are used to perform core actions that are not performed by HTML tags.

Commonly used core tags, along with the functions they perform, are listed in Table 7-8.

Table 7-8 The Core Tags

Tag Categories	Tags	Functions
Event handling	`f:actionListener`	Adds an action listener to a parent component
	`f:phaseListener`	Adds a `PhaseListener` to a page
	`f:setProperty ActionListener`	Registers a special action listener whose sole purpose is to push a value into a backing bean when a form is submitted
	`f:valueChange Listener`	Adds a value-change listener to a parent component

Attribute configuration	`f:attribute`	Adds configurable attributes to a parent component
Data conversion	`f:converter`	Adds an arbitrary converter to the parent component
	`f:convertDateTime`	Adds a `DateTimeConverter` instance to the parent component
	`f:convertNumber`	Adds a `NumberConverter` instance to the parent component

Facet	`f:facet`	Adds a nested component that has a special relationship to its enclosing tag
	`f:metadata`	Registers a `facet` on a parent component
Localization	`f:loadBundle`	Specifies a `ResourceBundle` that is exposed as a `Map`
Parameter substitution	`f:param`	Substitutes parameters into a `MessageFormat` instance and adds query string name-value pairs to a URL

Representing items in a list	`f:selectItem`	Represents one item in a list of items
	`f:selectItems`	Represents a set of items
Validator	`f:validateDoubleRange`	Adds a `DoubleRangeValidator` to a component
	`f:validateLength`	Adds a `LengthValidator` to a component
	`f:validateLongRange`	Adds a `LongRangeValidator` to a component
	`f:validator`	Adds a custom validator to a component

	`f:validateRegEx`	Adds a `RegExValidator` to a component
	`f:validateBean`	Delegates the validation of a local value to a `BeanValidator`
	`f:validateRequired`	Enforces the presence of a value in a component
Ajax	`f:ajax`	Associates an Ajax action with a single component or a group of components based on placement

Event	`f:event`	Allows installing a `ComponentSystemEvent` `Listener` on a component

These tags, which are used in conjunction with component tags, are explained in other sections of this tutorial.

Table 7-9 lists the sections that explain how to use specific core tags.

Table 7-9 Where the Core Tags Are Explained

Tags	Where Explained
Event handling tags	Registering Listeners on Components
Data conversion tags	Using the Standard Converters
`facet`	Using Data-Bound Table Components and Laying Out Components with the `h:panelGrid` and `h:panelGroup` Tags
`loadBundle`	Displaying Components for Selecting Multiple Values
`param`	Displaying a Formatted Message with the `h:outputFormat` Tag
`selectItem` and `selectItems`	Using the `f:selectItem` and `f:selectItems` Tags
Validator tags	Using the Standard Validators