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USING HTML FORMS

Topics in This Chapter

- Sending data from forms
- Text controls
- Push buttons
- Check boxes and radio buttons
- Combo boxes and list boxes
- File upload controls
- Server-side image maps
- Hidden fields
- Grouping controls
- Tab ordering
- A Web server for debugging forms

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Chapter 16

This chapter discusses using HTML forms as front ends to servlets or other server-side programs. These forms provide simple and reliable user interface controls to collect data from the user and transmit it to the servlet. The following chapter discusses the use of applets as servlet front ends. Using applets in this role requires considerably more effort and has some security limitations. However, it permits a much richer user interface and can support significantly more efficient and flexible network communication.

To use forms, you'll need to know where to place regular HTML files in order to make them accessible to the Web server. This location varies from server to server, but with the JSWDK and Tomcat, you place an HTML file in `install_dir/webpages/path/file.html` and then access it via `http://localhost/path/file.html` (replace `localhost` with the real hostname if running remotely).

16.1 How HTML Forms Transmit Data

HTML forms let you create a variety of user interface controls to collect input on a Web page. Each of the controls typically has a name and a value, where the name is specified in the HTML and the value comes either from the HTML or by means of user input. The entire form is associated with the

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URL of a program that will process the data, and when the user submits the form (usually by pressing a button), the names and values of the controls are sent to the designated URL as a string of the form

```
Name1=Value1&Name2=Value2...NameN=ValueN
```

This string can be sent to the designated program in one of two ways. The first, which uses the HTTP `GET` method, appends the string to the end of the specified URL, after a question mark. The second way data can be sent is by the HTTP `POST` method. Here, the `POST` request line, the HTTP request headers, and a blank line are first sent to the server, and then the data string is sent on the following line.

For example, Listing 16.1 (HTML code) and Figure 16–1 (typical result) show a simple form with two textfields. The HTML elements that make up this form are discussed in detail in the rest of this chapter, but for now note a couple of things. First, observe that one text field has a name of `firstName` and the other has a name of `lastName`. Second, note that the GUI controls are considered text-level (inline) elements, so you need to use explicit HTML formatting to make sure that the controls appear next to the text describing them. Finally, notice that the `FORM` element designates `http://localhost:8088/SomeProgram` as the URL to which the data will be sent.

Before submitting the form, I start a server program called `EchoServer` on port 8088 of my local machine. `EchoServer`, shown in Section 16.12, is a mini "Web server" used for debugging. No matter what URL is specified and what data is sent to it, it merely returns a Web page showing all the HTTP information sent by the browser. As shown in Figure 16–2, when the form is submitted with `Joe` in the first textfield and `Hacker` in the second, the browser simply requests the URL `http://localhost:8088/SomeProgram?firstName=Joe&lastName=Hacker`. Listing 16.2 (HTML code) and Figure 16–3 (typical result) show a variation that uses `POST` instead of `GET`. As shown in Figure 16–4, submitting the form with textfield values of `Joe` and `Hacker` results in the line `firstName=Joe&lastName=Hacker` being sent to the browser on a separate line after the HTTP request headers and a blank line.

That's the general idea behind HTML forms: GUI controls gather data from the user, each control has a name and a value, and a string containing all the name/value pairs is sent to the server when the form is submitted. Extracting the names and values on the server is straightforward in servlets: that was covered in Chapter 3 (Handling the Client Request: Form Data). The remainder of this chapter covers options in setting up forms and the various GUI controls you can put in them.

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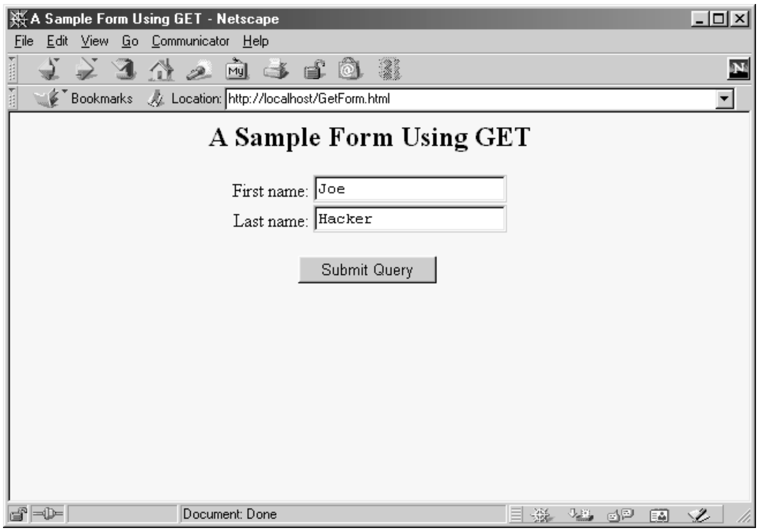
Listing 16.1 `GetForm.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>A Sample Form Using GET</TITLE>
</HEAD>

<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">A Sample Form Using GET</H2>

<FORM ACTION="http://localhost:8088/SomeProgram">
  <CENTER>
  First name:
  <INPUT TYPE="TEXT" NAME="firstName" VALUE="Joe"><BR>
  Last name:
  <INPUT TYPE="TEXT" NAME="lastName" VALUE="Hacker"><P>
  <INPUT TYPE="SUBMIT"> <!-- Press this button to submit form -->
  </CENTER>
</FORM>

</BODY>
</HTML>
```


A Sample Form Using GET - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost/GetForm.html

A Sample Form Using GET

First name: Joe
Last name: Hacker

Submit Query
Document: Done

Figure 16–1 Initial result of `GetForm.html`.

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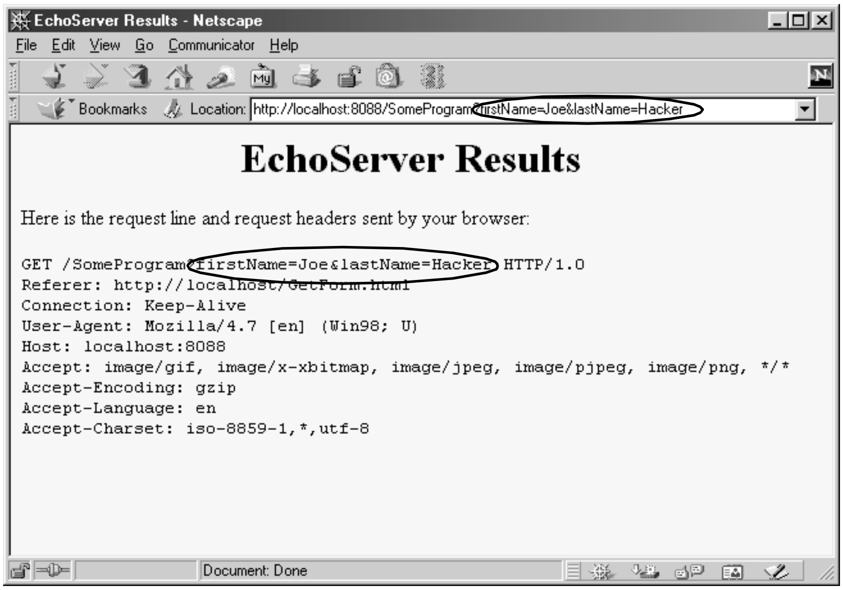
EchoServer Results - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8088/SomeProgram?firstName=Joe&lastName=Hacker
Document: Done

EchoServer Results

Here is the request line and request headers sent by your browser:

```
GET /SomeProgram?firstName=Joe&lastName=Hacker HTTP/1.0
Referer: http://localhost/GetForm.html
Connection: Keep-Alive
User-Agent: Mozilla/4.7 [en] (Win98; U)
Host: localhost:8088
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, image/png, */*
Accept-Encoding: gzip
Accept-Language: en
Accept-Charset: iso-8859-1,*,utf-8
```

Figure 16–2 HTTP request sent by Netscape 4.7 when submitting `GetForm.html`.

Listing 16.2 `PostForm.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>A Sample Form Using POST</TITLE>
</HEAD>

<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">A Sample Form Using POST</H2>

<FORM ACTION="http://localhost:8088/SomeProgram"
      METHOD="POST">
  <CENTER>
  First name:
  <INPUT TYPE="TEXT" NAME="firstName" VALUE="Joe"><BR>
  Last name:
  <INPUT TYPE="TEXT" NAME="lastName" VALUE="Hacker"><P>
  <INPUT TYPE="SUBMIT">
  </CENTER>
</FORM>

</BODY>
</HTML>
```

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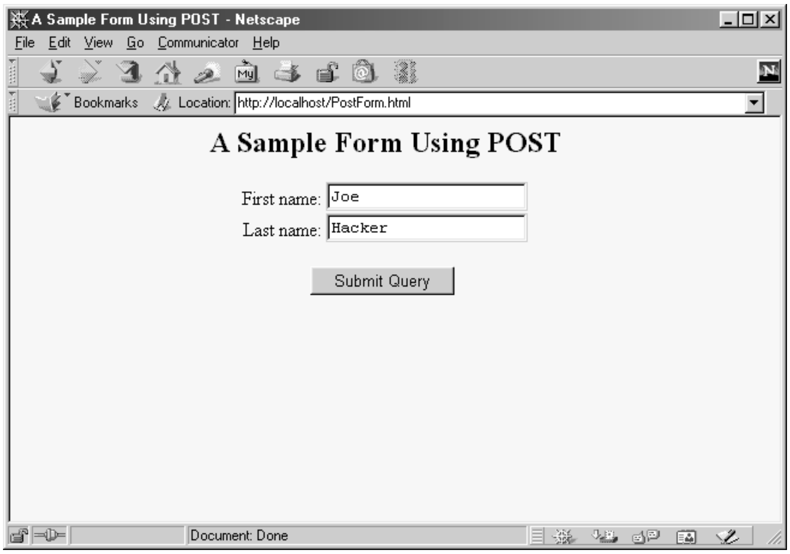
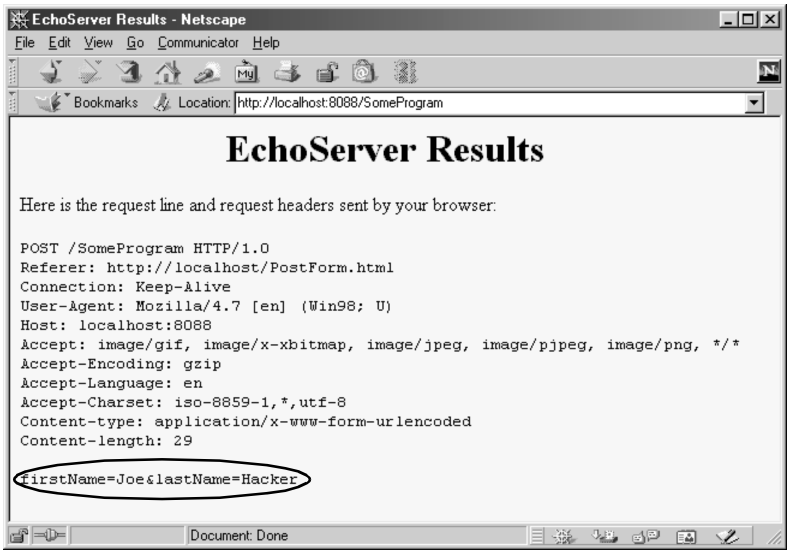

A Sample Form Using POST - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost/PostForm.html
A Sample Form Using POST
First name: Joe
Last name: Hacker
Submit Query
Document: Done

Figure 16–3 Initial result of `PostForm.html`.


EchoServer Results - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8088/SomeProgram
Document: Done

EchoServer Results

Here is the request line and request headers sent by your browser:

```
POST /SomeProgram HTTP/1.0
Referer: http://localhost/PostForm.html
Connection: Keep-Alive
User-Agent: Mozilla/4.7 [en] (Win98; U)
Host: localhost:8088
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, image/png, */*
Accept-Encoding: gzip
Accept-Language: en
Accept-Charset: iso-8859-1,*,utf-8
Content-type: application/x-www-form-urlencoded
Content-length: 29

firstName=Joe&lastName=Hacker
```

Figure 16–4 HTTP request sent by Netscape 4.7 when submitting `PostForm.html`.

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16.2 The FORM Element

HTML forms allow you to create a set of data input elements associated with a particular URL. Each of these elements is typically given a name and has a value based on the original HTML or user input. When the form is submitted, the names and values of all active elements are collected into a string with `=` between each name and value and with `&` between each name/value pair. This string is then transmitted to the URL designated by the `FORM` element. The string is either appended to the URL after a question mark or sent on a separate line after the HTTP request headers and a blank line, depending on whether `GET` or `POST` is used as the submission method. This section covers the `FORM` element itself, used primarily to designate the URL and to choose the submission method. The following sections cover the various user interface controls that can be used within forms.

HTML Element: **`<FORM ACTION="URL" ...> ... </FORM>`**
Attributes: `ACTION` (required), `METHOD`, `ENCTYPE`, `TARGET`, `ONSUBMIT`, `ONRESET`, `ACCEPT`, `ACCEPT-CHARSET`

The `FORM` element creates an area for data input elements and designates the URL to which any collected data will be transmitted. For example:

```
<FORM ACTION="http://some.isp.com/servlet/SomeServlet">
  FORM input elements and regular HTML
</FORM>
```

The rest of this section explains the attributes that apply to the `FORM` element: `ACTION`, `METHOD`, `ENCTYPE`, `TARGET`, `ONSUBMIT`, `ONRESET`, `ACCEPT`, and `ACCEPT-CHARSET`. Note that I am not discussing attributes like `STYLE`, `CLASS`, and `LANG` that apply to general HTML elements, but only those that are specific to the `FORM` element.

ACTION

The `ACTION` attribute specifies the URL of the servlet or CGI program that will process the `FORM` data (e.g., `http://cgi.whitehouse.gov/bin/schedule-fund-raiser`) or an email address where the `FORM` data will be sent (e.g., `mailto:audit@irs.gov`). Some ISPs do not allow ordinary users to create servlets or CGI programs, or they charge extra for this privilege. In such a case, sending the data by email is a convenient option when you create pages that need to collect data but

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not return results (e.g., for accepting orders for products). You must use the `POST` method (see `METHOD` in the following subsection) when using a `mailto` URL.

METHOD

The `METHOD` attribute specifies how the data will be transmitted to the HTTP server. When `GET` is used, the data is appended to the end of the designated URL after a question mark. For an example, see Section 16.1 (How HTML Forms Transmit Data). `GET` is the default and is also the method that is used when a browser requests a normal URL. When `POST` is used, the data is sent on a separate line.

The advantages of using the `GET` method are twofold: the method is simple; and with servlets that use `GET`, users can access those servlets for testing and debugging without creating a form, simply by entering a URL with the proper data appended. On the other hand, due to URL size restrictions on some browsers, `GET` requests have limits on the amount of data that can be appended, whereas `POST` requests do not. Another disadvantage of `GET` is that most browsers show the URL, including the attached data string, in an address field at the top of the browser. This display makes `GET` inappropriate for sending sensitive data if your computer is in a relatively public place.

ENCTYPE

This attribute specifies the way in which the data will be encoded before being transmitted. The default is `application/x-www-form-urlencoded`, which means that the client converts each space into a plus sign (+) and every other nonalphanumeric character into a percent sign (%) followed by the two hexadecimal digits representing that character (e.g., in ASCII or ISO Latin-1). Those transformations are in addition to placing an equal sign (`=`) between entry names and values and an ampersand (`&`) between entries.

For example, Figure 16–5 shows a version of the `GetForm.html` page (Listing 16.1) where "`Marty (Java Hacker?)`" is entered for the first name. As can be seen in Figure 16–6, this entry gets sent as "`Marty+%28Java+Hacker%3F%29`". That's because spaces become plus signs, 28 is the ASCII value (in hex) for a left parenthesis, 3F is the ASCII value of a question mark, and 29 is a right parenthesis.

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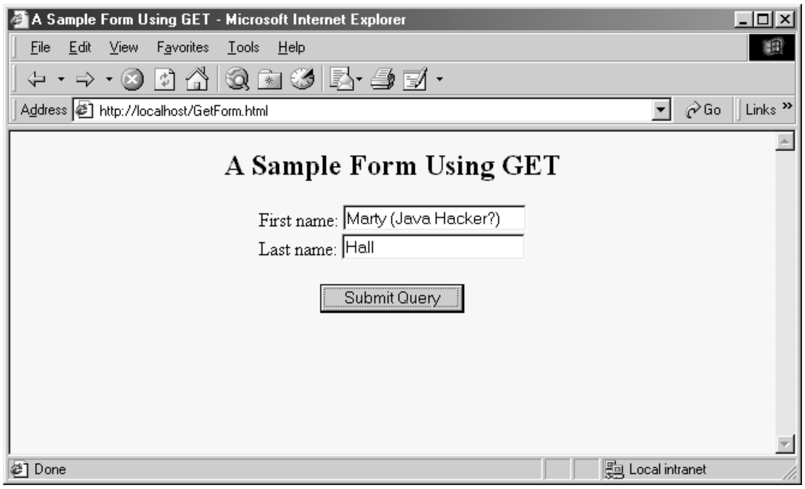
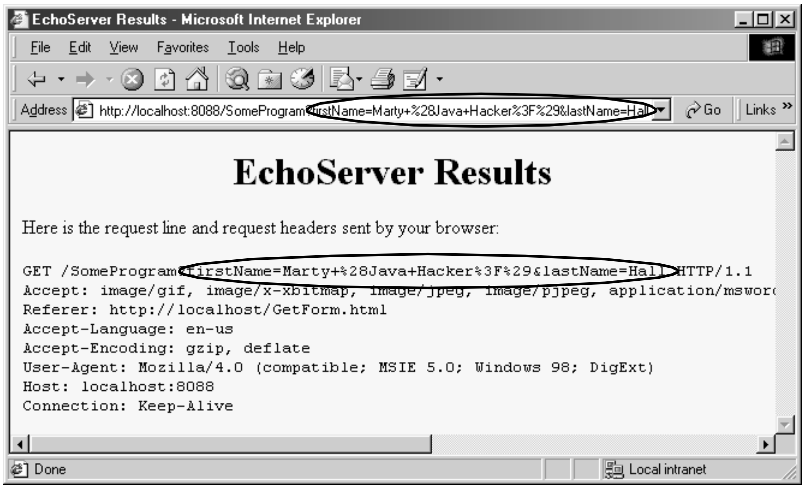

A Sample Form Using GET - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://localhost/GetForm.html
Go
Links
Submit Query
Done
Local intranet

A Sample Form Using GET

First name: Marty (Java Hacker?)
Last name: Hall

Figure 16–5 Customized result of `GetForm.html`.


EchoServer Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Go
Links
Done
Local intranet

Address http://localhost:8088/SomeProgram?firstName=Marty+%28Java+Hacker%3F%29&lastName=Hall

EchoServer Results

Here is the request line and request headers sent by your browser:

```
GET /SomeProgram?firstName=Marty+%28Java+Hacker%3F%29&lastName=Hall HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/mswor
Referer: http://localhost/GetForm.html
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 5.0; Windows 98; DigExt)
Host: localhost:8088
Connection: Keep-Alive
```

Figure 16–6 HTTP request sent by Internet Explorer 5.0 when submitting `GetForm.html` with the data shown in Figure 16–5.

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Most recent browsers support an additional `ENCTYPE` of `multipart/form-data`. This encoding transmits each of the fields as separate parts of a MIME-compatible document and automatically uses `POST` to submit them. This encoding sometimes makes it easier for the server-side program to handle complex data and is required when using file upload controls to send entire documents (see Section 16.7). For example, Listing 16.3 shows a form that differs from `GetForm.html` (Listing 16.1) only in that

```
<FORM ACTION="http://localhost:8088/SomeProgram">
```

has been changed to

```
<FORM ACTION="http://localhost:8088/SomeProgram"
      ENCTYPE="multipart/form-data">
```

Figures 16–7 and 16–8 show the results.

Listing 16.3 `MultipartForm.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>Using ENCTYPE="multipart/form-data"</TITLE>
</HEAD>

<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">Using ENCTYPE="multipart/form-data"</H2>

<FORM ACTION="http://localhost:8088/SomeProgram"
      ENCTYPE="multipart/form-data">
  <CENTER>
  First name:
  <INPUT TYPE="TEXT" NAME="firstName" VALUE="Joe"><BR>
  Last name:
  <INPUT TYPE="TEXT" NAME="lastName" VALUE="Hacker"><P>
  <INPUT TYPE="SUBMIT">
  </CENTER>
</FORM>

</BODY>
</HTML>
```

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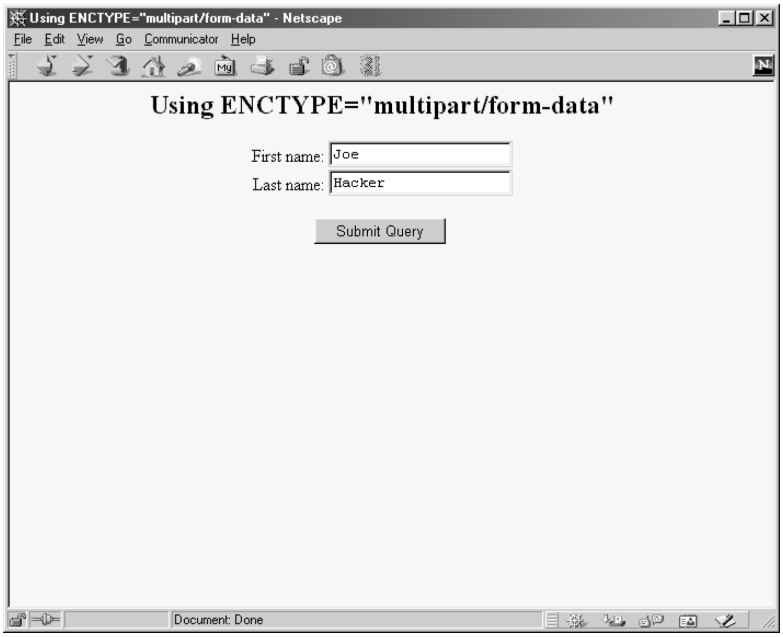
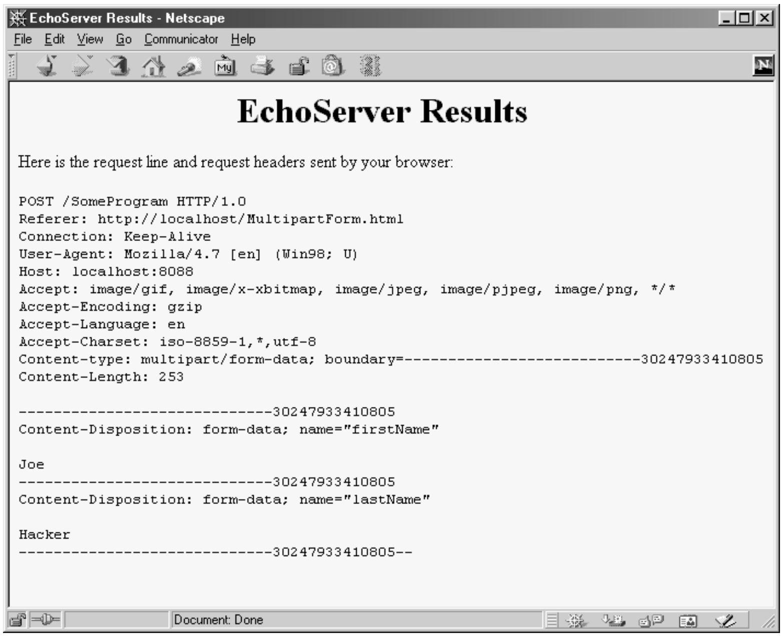

Using ENCTYPE="multipart/form-data" - Netscape
File Edit View Go Communicator Help
Using ENCTYPE="multipart/form-data"
First name: Joe
Last name: Hacker
Submit Query
Document: Done

Figure 16–7 Initial result of `MultipartForm.html`.


EchoServer Results - Netscape
File Edit View Go Communicator Help
Document: Done

EchoServer Results

Here is the request line and request headers sent by your browser:

```
POST /SomeProgram HTTP/1.0
Referer: http://localhost/MultipartForm.html
Connection: Keep-Alive
User-Agent: Mozilla/4.7 [en] (Win98; U)
Host: localhost:8088
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, image/png, */*
Accept-Encoding: gzip
Accept-Language: en
Accept-Charset: iso-8859-1,*,utf-8
Content-type: multipart/form-data; boundary=---------------------------30247933410805
Content-Length: 253

-----------------------------30247933410805
Content-Disposition: form-data; name="firstName"

Joe
-----------------------------30247933410805
Content-Disposition: form-data; name="lastName"

Hacker
-----------------------------30247933410805--
```

Figure 16–8 HTTP request sent by Netscape 4.7 when submitting `MultipartForm.html`.

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TARGET
The `TARGET` attribute is used by frame-capable browsers to determine which frame cell should be used to display the results of the servlet or other program handling the form submission. The default is to display the results in whatever frame contains the form being submitted.

ONSUBMIT and ONRESET
These attributes are used by JavaScript to attach code that should be evaluated when the form is submitted or reset. For `ONSUBMIT`, if the expression evaluates to `false`, the form is not submitted. This case lets you invoke JavaScript code on the client that checks the format of the form field values before they are submitted, prompting the user for missing or illegal entries.

ACCEPT and ACCEPT-CHARSET
These attributes are new in HTML 4.0 and specify the MIME types (`ACCEPT`) and character encodings (`ACCEPT-CHARSET`) that must be accepted by the servlet or other program processing the form data. The MIME types listed in `ACCEPT` could also be used by the client to limit which file types are displayed to the user for file upload elements.

16.3 Text Controls

HTML supports three types of text-input elements: textfields, password fields, and text areas. Each is given a name, and the value is taken from the content of the control. The name and value are sent to the server when the form is submitted, which is typically done by means of a submit button (see Section 16.4).

Textfields

HTML Element: **`<INPUT TYPE="TEXT" NAME="..." ...>`**
(No End Tag)
Attributes: `NAME` (required), `VALUE`, `SIZE`, `MAXLENGTH`, `ONCHANGE`, `ONSELECT`, `ONFOCUS`, `ONBLUR`, `ONKEYDOWN`, `ONKEYPRESS`, `ONKEYUP`

This element creates a single-line input field where the user can enter text, as illustrated earlier in Listings 16.1, 16.2, and 16.3. For multiline fields, see

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TEXTAREA in the following subsection. TEXT is the default TYPE in INPUT forms, although it is recommended that TEXT be supplied explicitly. You should remember that the normal browser word wrapping applies inside FORM elements, so be careful to make sure the browser will not separate the descriptive text from the associated textfield.

Core Approach

Use explicit HTML constructs to group textfields with their descriptive text.

Some browsers submit the form when the user presses Enter when the cursor is in a textfield, but you should avoid depending on this behavior because it is not standard. For instance, Netscape submits the form when the user types a carriage return only if the current form has a single textfield, regardless of the number of forms on the page. Internet Explorer submits the form on Enter only when there is a single form on the page, regardless of the number of textfields in the form. Mosaic submits the form on Enter only when the cursor is in the last textfield on the entire page.

Core Warning

Don't rely on the browser submitting the form when the user presses Enter when in a textfield. Always include a button or image map that submits the form explicitly.

The following subsections describe the attributes that apply specifically to textfields. Attributes that apply to general HTML elements (e.g., STYLE, CLASS, ID) are not discussed. The TABINDEX attribute, which applies to *all* form elements, is discussed in Section 16.11 (Controlling Tab Order).

NAME

The NAME attribute identifies the textfield when the form is submitted. In standard HTML the attribute is required. Because data is always sent to the server in the form of name/value pairs, no data is sent from form controls that have no NAME.

VALUE

A VALUE attribute, if supplied, specifies the *initial* contents of the textfield. When the form is submitted, the *current* contents are sent; these can reflect user input. If the textfield is empty when the form is submit-

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ted, the form data simply consists of the name and an equal sign (e.g., `other-data&`**`textfieldname=`**`&other-data`).

SIZE
This attribute specifies the width of the textfield, based on the average character width of the font being used. If text beyond this size is entered, the textfield scrolls to accommodate it. This could happen if the user enters more characters than the `SIZE` or enters `SIZE` number of wide characters (e.g., capital W) if a proportional-width font is being used. Netscape automatically uses a proportional font in textfields. Internet Explorer, unfortunately, does not, and you cannot change the font by embedding the `INPUT` element in a `FONT` or `CODE` element.

MAXLENGTH
`MAXLENGTH` gives the maximum number of *allowable* characters. This number is in contrast to the number of *visible* characters, which is specified via `SIZE`.

ONCHANGE, ONSELECT, ONFOCUS, ONBLUR, ONDBLDOWN, ONKEYPRESS, and ONKEYUP
These attributes are used only by browsers that support JavaScript. They specify the action to take when the mouse leaves the textfield after a change has occurred, when the user selects text in the textfield, when the textfield gets the input focus, when it loses the input focus, and when individual keys are pressed.

Password Fields

HTML Element: **`<INPUT TYPE="PASSWORD" NAME="..." ...>`**
(No End Tag)
Attributes: `NAME` (required), `VALUE`, `SIZE`, `MAXLENGTH`, `ONCHANGE`, `ONSELECT`, `ONFOCUS`, `ONBLUR`, `ONKEYDOWN`, `ONKEYPRESS`, `ONKEYUP`

Password fields are created and used just like textfields, except that when the user enters text, the input is not echoed but instead some obscuring character, usually an asterisk, is displayed (see Figure 16–9). Obscured input is useful for collecting data such as credit card numbers or passwords that the user would not want shown to people who may be near his computer. The regular, unobscured text is transmitted as the value of the field when the form is submitted. Since `GET` data is appended to the URL after a question mark, you

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will want to use the POST method when using a password field so that a bystander cannot read the unobscured password from the URL display at the top of the browser.

Core Approach

To protect the user's privacy, always use POST *when creating forms with password fields.*

NAME, VALUE, SIZE, MAXLENGTH, ONCHANGE, ONSELECT, ONFOCUS, ONBLUR, ONKEYDOWN, ONKEY-PRESS, and ONKEYUP

Attributes for password fields are used in exactly the same manner as with textfields.

Figure 16–9 A password field created by means of `<INPUT TYPE="PASSWORD" ...>`.

Text Areas

HTML Element: **`<TEXTAREA NAME="..." ROWS=xxx COLS=yyy> ... </TEXTAREA>`**

Attributes: NAME (required), ROWS (required), COLS (required), WRAP (nonstandard), ONCHANGE, ONSELECT, ONFOCUS, ONBLUR, ONKEYDOWN, ONKEYPRESS, ONKEYUP

The TEXTAREA element creates a multiline text area; see Figure 16–10. There is no VALUE attribute; instead, text between the start and end tags is used as the initial contents of the text area. The initial text between `<TEXTAREA ...>` and `</TEXTAREA>` is treated similarly to text inside the now-obsolete XMP element. That is, white space in this initial text is maintained and HTML markup between the start and end tags is taken literally, except for character entities such as `&lt;`, `&copy;`, and so forth, which are interpreted normally. Unless a custom ENCTYPE is used in the form (see Section 16.2, "The FORM

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Element”), characters, including those generated from character entities, are URL-encoded before being transmitted. That is, spaces become plus signs and other nonalphanumeric characters become `%XX`, where *XX* is the numeric value of the character in hex.

NAME

This attribute specifies the name that will be sent to the server.

ROWS

`ROWS` specifies the number of visible lines of text. If more lines of text are entered, a vertical scrollbar will be added to the text area.

COLS

`COLS` specifies the visible width of the text area, based on the average width of characters in the font being used. If the text on a single line contains more characters than the specified width allows, the result is browser dependent. In Netscape, horizontal scrollbars are added (but see the `WRAP` attribute, described next, to change this behavior). In Internet Explorer, the word wraps around to the next line.

WRAP

The Netscape-specific `WRAP` attribute specifies what to do with lines that are longer than the size specified by `COLS`. A value of `OFF` disables word wrap and is the default. The user can still enter explicit line breaks in such a case. A value of `HARD` causes words to wrap in the text area *and* the associated line breaks to be transmitted when the form is submitted. Finally, a value of `SOFT` causes the words to wrap in the text area but no extra line breaks to be transmitted when the form is submitted.

ONCHANGE, ONSELECT, ONFOCUS, ONBLUR, ONKEY-DOWN, ONKEYPRESS, and ONKEYUP

These attributes apply only to browsers that support JavaScript; they specify code to be executed when certain conditions arise. `ONCHANGE` handles the situation when the input focus leaves the text area after it has changed, `ONSELECT` describes what to do when text in the text area is selected by the user, `ONFOCUS` and `ONBLUR` specify what to do when the text area acquires or loses the input focus, and the remaining attributes determine what to do when individual keys are typed.

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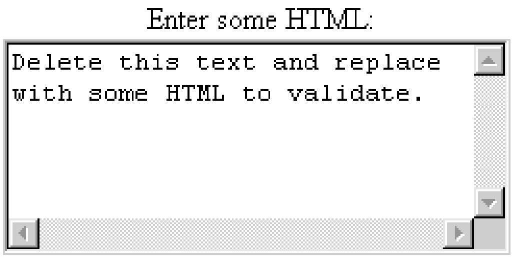
The following example creates a text area with 5 visible rows that can hold about 30 characters per row. The result is shown in Figure 16–10.

```
<CENTER>
<P>
Enter some HTML:<BR>
<TEXTAREA NAME="HTML" ROWS=5 COLS=30>
Delete this text and replace
with some HTML to validate.
</TEXTAREA>
<CENTER>
```



Delete this text and replace
with some HTML to validate.

Figure 16–10 A text area.

16.4 Push Buttons

Push buttons are used for two main purposes in HTML forms: to submit forms and to reset the controls to the values specified in the original HTML. Browsers that use JavaScript can also use buttons for a third purpose: to trigger arbitrary JavaScript code.

Traditionally, buttons have been created by the INPUT element used with a TYPE attribute of SUBMIT, RESET, or BUTTON. In HTML 4.0, the BUTTON element was introduced but is currently supported only by Internet Explorer. This new element lets you create buttons with multiline labels, images, font changes, and the like, so is preferred if you are sure your users will all be using browsers that support it (e.g., in a corporate intranet). Since the element is not supported by Netscape, at least as of Netscape version 4.7, for now you should reserve BUTTON for intranets that use Internet Explorer exclusively.

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Core Warning

Netscape does not support the BUTTON *element.*

Submit Buttons

HTML Element: **`<INPUT TYPE="SUBMIT" ...>`** **(No End Tag)**
Attributes: NAME, VALUE, ONCLICK, ONDBLCLICK, ONFOCUS, ONBLUR

When a submit button is clicked, the form is sent to the servlet or other server-side program designated by the ACTION parameter of the FORM. Although the action can be triggered other ways, such as the user clicking on an image map, most forms have at least one submit button. Submit buttons, like other form controls, adopt the look and feel of the client operating system, so will look slightly different on different platforms. Figure 16–11 shows a submit button on Windows 98, created by

```
<INPUT TYPE="SUBMIT">
```

Figure 16–11 A submit button with the default label.

NAME and VALUE

Most input elements have a name and an associated value. When the form is submitted, the names and values of active elements are concatenated to form the data string. If a submit button is used simply to initiate the submission of the form, its name can be omitted and then it does not contribute to the data string that is sent. If a name *is* supplied, then only the name and value of the button that was actually clicked are sent. The label is used as the value that is transmitted. Supplying an explicit VALUE will change the default label. For instance, the following code snippet creates a textfield and two submit buttons, shown in Figure 16–12. If, for example, the first button is selected, the data string sent to the server would be
`Item=256MB+SIMM&Add=Add+Item+to+Cart`.

```
<CENTER>
Item:
<INPUT TYPE="TEXT" NAME="Item" VALUE="256MB SIMM"><BR>
```

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```
<INPUT TYPE="SUBMIT" NAME="Add"
       VALUE="Add Item to Cart">
<INPUT TYPE="SUBMIT" NAME="Delete"
       VALUE="Delete Item from Cart">
</CENTER>
```

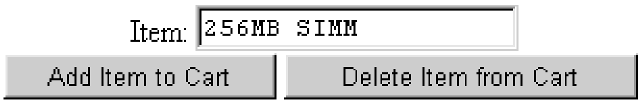

Figure 16–12 Submit buttons with user-defined labels.

ONCLICK, ONDBLCLICK, ONFOCUS, and ONBLUR

These nonstandard attributes are used by JavaScript-capable browsers to associate JavaScript code with the button. The `ONCLICK` and `ONDBLCLICK` code is executed when the button is pressed, the `ONFOCUS` code when the button gets the input focus, and the `ONBLUR` code when the button loses the focus. If the code attached to a button returns `false`, the submission of the form is suppressed. HTML attributes are not case sensitive, and these attributes are traditionally called `onClick`, `onDblClick`, `onFocus`, and `onBlur` by JavaScript programmers.

HTML Element: **`<BUTTON TYPE="SUBMIT" ...>`**
`HTML Markup`
`</BUTTON>`

Attributes: `NAME`, `VALUE`, `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, `ONBLUR`

This alternative way of creating submit buttons, supported only by Internet Explorer, lets you use arbitrary HTML markup for the content of the button. This element lets you to have multiline button labels, button labels with font changes, image buttons, and so forth. Listing 16.4 gives a few examples, with results shown in Figure 16–13.

NAME, VALUE, ONCLICK, ONDBLCLICK, ONFOCUS, and ONBLUR

These attributes are used in the same way as with `<INPUT TYPE="SUBMIT" ...>`.

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Listing 16.4 `ButtonElement.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>The BUTTON Element</TITLE>
</HEAD>
<BODY BGCOLOR="WHITE">
<H2 ALIGN="CENTER">The BUTTON Element</H2>

<FORM ACTION="http://localhost:8088/SomeProgram">
<CENTER>
<BUTTON TYPE="SUBMIT">Single-line Label</BUTTON>
&nbsp;&nbsp;
<BUTTON TYPE="SUBMIT">Multi-line<BR>label</BUTTON>
<P>
<BUTTON TYPE="SUBMIT">
<B>Label</B> with <I>font</I> changes.
</BUTTON>
<P>
<BUTTON TYPE="SUBMIT">
<IMG SRC="images/Java-Logo.gif" WIDTH=110 HEIGHT=101
     ALIGN="LEFT" ALT="Java Cup Logo">
Label<BR>with image
</BUTTON>
</CENTER>
</FORM>

</BODY>
</HTML>
```

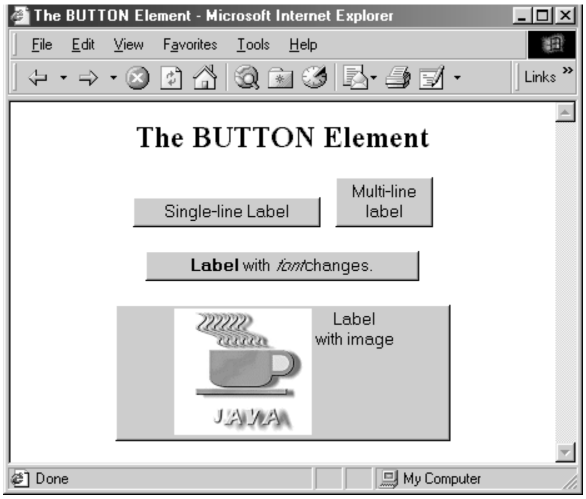
The BUTTON Element - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links
The BUTTON Element
Single-line Label
Multi-line label
Label with *font* changes.
Label with image
JAVA
Done
My Computer

Figure 16–13 Submit buttons created with the `BUTTON` element.

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Reset Buttons

HTML Element: **`<INPUT TYPE="RESET" ...>`** **(No End Tag)**
Attributes: `VALUE`, `NAME`, `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, `ONBLUR`

Reset buttons serve to reset the values of all items in the `FORM` to those specified in the original `VALUE` parameters. Their value is never transmitted as part of the form's contents.

VALUE
The `VALUE` attribute specifies the button label; "Reset" is the default.

NAME
Because reset buttons do not contribute to the data string transmitted when the form is submitted, they are not named in standard HTML. However, JavaScript permits a `NAME` attribute to be used to simplify reference to the element.

ONCLICK, ONDBLCLICK, ONFOCUS, and ONBLUR
These nonstandard attributes are used by JavaScript-capable browsers to associate JavaScript code with the button. The `ONCLICK` and `ONDBLCLICK` code is executed when the button is pressed, the `ONFOCUS` code when the button gets the input focus, and the `ONBLUR` code when it loses the focus. HTML attributes are not case sensitive, and these attributes are traditionally called `onClick`, `onDblClick`, `onFocus`, and `onBlur` by JavaScript programmers.

HTML Element:
```
<BUTTON TYPE="RESET" ...>
HTML Markup
</BUTTON>
```
Attributes: `VALUE`, `NAME`, `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, `ONBLUR`

This alternative way of creating reset buttons, supported only by Internet Explorer, lets you use arbitrary HTML markup for the content of the button. All attributes are used identically to those in `<INPUT TYPE="RESET" ...>`.

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JavaScript Buttons

HTML Element: **`<INPUT TYPE="BUTTON" ...>`** **(No End Tag)**
Attributes: `NAME`, `VALUE`, `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, `ONBLUR`

The `BUTTON` element is recognized only by browsers that support JavaScript. It creates a button with the same visual appearance as a `SUBMIT` or `RESET` button and allows the author to attach JavaScript code to the `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, or `ONBLUR` attributes. The name/value pair associated with a JavaScript button is not transmitted as part of the data when the form is submitted. Arbitrary code can be associated with the button, but one of the most common uses is to verify that all input elements are in the proper format before the form is submitted to the server. For instance, the following would create a button where the user-defined `validateForm` function would be called whenever the button is activated.

```
<INPUT TYPE="BUTTON" VALUE="Check Values"
       onClick="validateForm()">
```

HTML Element: **`<BUTTON TYPE="BUTTON" ...>`**
`HTML Markup`
`</BUTTON>`
Attributes: `NAME`, `VALUE`, `ONCLICK`, `ONDBLCLICK`, `ONFOCUS`, `ONBLUR`

This alternative way of creating JavaScript buttons, supported only by Internet Explorer, lets you use arbitrary HTML markup for the content of the button. All attributes are used identically to those in `<INPUT TYPE="BUTTON" ...>`.

16.5 Check Boxes and Radio Buttons

Check boxes and radio buttons are useful controls for allowing the user to select among a set of predefined choices. While each individual check box can be selected or deselected individually, radio buttons can be grouped so that only a single member of the group can be selected at a time.

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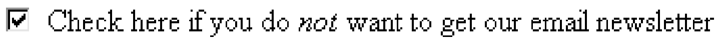
Check boxes

HTML Element: `<INPUT TYPE="CHECKBOX" NAME="..." ...>` **(No End Tag)**
Attributes: `NAME` (required), `VALUE`, `CHECKED`, `ONCLICK`, `ONFOCUS`, `ONBLUR`

This input element creates a check box whose name/value pair is transmitted *only* if the check box is checked when the form is submitted. For instance, the following code results in the check box shown in Figure 16–14.

```
<P>
<INPUT TYPE="CHECKBOX" NAME="noEmail" CHECKED>
Check here if you do <I>not</I> want to
get our email newsletter
```



☑ Check here if you do *not* want to get our email newsletter

Figure 16–14 An HTML check box.

Note that the descriptive text associated with the check box is normal HTML, and care should be taken to guarantee that it appears next to the check box. Thus, the `<P>` in the preceding example ensures that the check box isn't part of the previous paragraph.

Core Approach

Paragraphs inside a `FORM` are filled and wrapped just like regular paragraphs. So, be sure to insert explicit HTML markup to keep input elements with the text that describes them.

NAME
This attribute supplies the name that is sent to the server. It is required for standard HTML check boxes but optional when used with JavaScript.

VALUE
The `VALUE` attribute is optional and defaults to `on`. Recall that the name and value are only sent to the server if the check box is checked when the form is submitted. For instance, in the preceding example, `noEmail=on` would be added to the data string since the box is checked, but nothing would be added if the box was unchecked. As a result, servlets or CGI programs often check only for the existence of the check box name, ignoring its value.

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CHECKED
If the CHECKED attribute is supplied, then the check box is initially checked when the associated Web page is loaded. Otherwise, it is initially unchecked.

ONCLICK, ONFOCUS, and ONBLUR
These attributes supply JavaScript code to be executed when the button is clicked, receives the input focus, and loses the focus, respectively.

Radio Buttons

HTML Element: **`<INPUT TYPE="RADIO" NAME="..." VALUE="..." ...>`** **(No End Tag)**
Attributes: NAME (required), VALUE (required), CHECKED, ONCLICK, ONFOCUS, ONBLUR

Radio buttons differ from check boxes in that only a single radio button in a given group can be selected at any one time. You indicate a group of radio buttons by providing all of them with the same NAME. Only one button in a group can be depressed at a time; selecting a new button when one is already selected results in the previous choice becoming deselected. The value of the one selected is sent when the form is submitted. Although radio buttons technically need not appear near to each other, this proximity is almost always recommended.

An example of a radio button group follows. Because input elements are wrapped as part of normal paragraphs, a DL list is used to make sure that the buttons appear under each other in the resultant page and are indented from the heading above them. Figure 16–15 shows the result. In this case, creditCard=java would get sent as part of the form data when the form is submitted.

```
<DL>
  <DT>Credit Card:
  <DD><INPUT TYPE="RADIO" NAME="creditCard" VALUE="visa">
      Visa
  <DD><INPUT TYPE="RADIO" NAME="creditCard" VALUE="mastercard">
      Master Card
  <DD><INPUT TYPE="RADIO" NAME="creditCard"
             VALUE="java" CHECKED>
      Java Smart Card
  <DD><INPUT TYPE="RADIO" NAME="creditCard" VALUE="amex">
      American Express
  <DD><INPUT TYPE="RADIO" NAME="creditCard" VALUE="discover">
      Discover
</DL>
```

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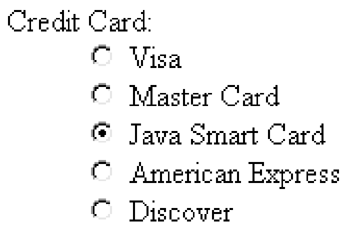
Credit Card:
- ○ Visa
- ○ Master Card
- ● Java Smart Card
- ○ American Express
- ○ Discover

Figure 16–15 Radio buttons in HTML.

NAME

Unlike the `NAME` attribute of most input elements, this `NAME` is shared by multiple elements. All radio buttons associated with the same name are grouped logically so that no more than one can be selected at any given time. Note that attribute values are case sensitive, so the following would result in two radio buttons that are *not* logically connected.

```
<INPUT TYPE="RADIO" NAME="Foo" VALUE="Value1">
<INPUT TYPE="RADIO" NAME="FOO" VALUE="Value2">
```

Core Warning

Be sure the `NAME` *of each radio button in a logical group matches exactly.*

VALUE

The `VALUE` attribute supplies the value that gets transmitted with the `NAME` when the form is submitted. It doesn't affect the appearance of the radio button. Instead, normal text and HTML markup are placed around the radio button, just as with check boxes.

CHECKED

If the `CHECKED` attribute is supplied, then the radio button is initially checked when the associated Web page is loaded. Otherwise, it is initially unchecked.

ONCLICK, ONFOCUS, and ONBLUR

These attributes supply JavaScript code to be executed when the button is clicked, receives the input focus, and loses the focus, respectively.

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16.6 Combo Boxes and List Boxes

A SELECT element presents a set of options to the user. If only a single entry can be selected and no visible size has been specified, the options are presented in a combo box (drop-down menu); list boxes are used when multiple selections are permitted or a specific visible size has been specified. The choices themselves are specified by OPTION entries embedded in the SELECT element. The typical format is as follows:

```
<SELECT NAME="Name" ...>
  <OPTION VALUE="Value1">Choice 1 Text
  <OPTION VALUE="Value2">Choice 2 Text
  ...
  <OPTION VALUE="ValueN">Choice N Text
</SELECT>
```

The HTML 4.0 specification suggests the use of OPTGROUP (with a single attribute of LABEL) to enclose OPTION elements in order to create cascading menus, but neither Netscape nor Internet Explorer supports this element.

HTML Element: **`<SELECT NAME="..." ...> ... </SELECT>`**
Attributes: NAME (required), SIZE, MULTIPLE, ONCLICK, ONFOCUS, ONBLUR, ONCHANGE

SELECT creates a combo box or list box for selecting among choices. You specify each choice with an OPTION element enclosed between <SELECT ...> and </SELECT>.

NAME
NAME identifies the form to the servlet or CGI program.

SIZE
SIZE gives the number of visible rows. If SIZE is used, the SELECT menu is usually represented as a list box instead of a combo box. A combo box is the normal representation when neither SIZE nor MULTIPLE is supplied.

MULTIPLE
The MULTIPLE attribute specifies that multiple entries can be selected simultaneously. If MULTIPLE is omitted, only a single selection is permitted.

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ONCLICK, ONFOCUS, ONBLUR, and ONCHANGE
These nonstandard attributes are supported by browsers that understand JavaScript. They indicate code to be executed when the entry is clicked on, gains the input focus, loses the input focus, and loses the focus after having been changed, respectively.

HTML Element: `<OPTION ...>` (End Tag Optional)
Attributes: `SELECTED`, `VALUE`

Only valid inside a `SELECT` element, this element specifies the menu choices.

VALUE
`VALUE` gives the value to be transmitted with the `NAME` of the `SELECT` menu if the current option is selected. This is *not* the text that is displayed to the user; that is specified by separate text listed after the `OPTION` tag.

SELECTED
If present, `SELECTED` specifies that the particular menu item shown is selected when the page is first loaded.

The following example creates a menu of programming language choices. Because only a single selection is allowed and no visible `SIZE` is specified, it is displayed as a combo box. Figures 16–16 and 16–17 show the initial appearance and the appearance after the user activates the menu by clicking on it. If the entry `Java` is active when the form is submitted, then `language=java` is sent to the server-side program. Notice that it is the `VALUE` attribute, not the descriptive text, that is transmitted.

```
Favorite language:
<SELECT NAME="language">
  <OPTION VALUE="c">C
  <OPTION VALUE="c++">C++
  <OPTION VALUE="java" SELECTED>Java
  <OPTION VALUE="lisp">Lisp
  <OPTION VALUE="perl">Perl
  <OPTION VALUE="smalltalk">Smalltalk
</SELECT>
```

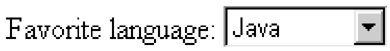

Figure 16–16 A `SELECT` element displayed as a combo box (drop-down menu).

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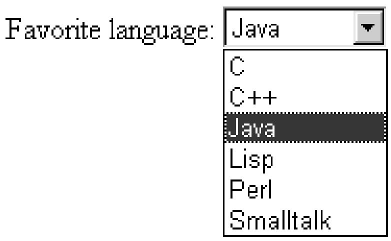

Figure 16–17 Choosing options from a `SELECT` menu.

The second example shows a `SELECT` element rendered as a list box. If more than one entry is active when the form is submitted, then more than one value is sent, listed as separate entries (repeating the `NAME`). For instance, in the example shown in Figure 16–18, `language=java&language=perl` gets added to the data being sent to the server. Multiple entries that share the same name is the reason servlet authors need be familiar with the `getParameterValues` method of `HttpServletRequest` in addition to the more common `getParameter` method. See Chapter 3 (Handling the Client Request: Form Data) for details.

```
Languages you know:<BR>
<SELECT NAME="language" MULTIPLE>
  <OPTION VALUE="c">C
  <OPTION VALUE="c++">C++
  <OPTION VALUE="java" SELECTED>Java
  <OPTION VALUE="lisp">Lisp
  <OPTION VALUE="perl" SELECTED>Perl
  <OPTION VALUE="smalltalk">Smalltalk
</SELECT>
```

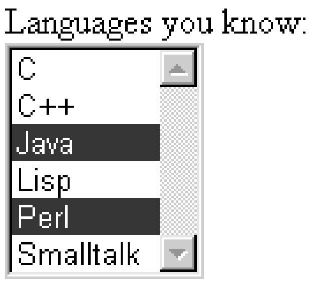

Figure 16–18 A `SELECT` element that specifies `MULTIPLE` or `SIZE` results in a list box.

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16.7 File Upload Controls

HTML Element: **`<INPUT TYPE="FILE" ...>`** **(No End Tag)**

Attributes: `NAME` (required), `VALUE` (ignored), `SIZE`, `MAXLENGTH`, `ACCEPT`, `ONCHANGE`, `ONSELECT`, `ONFOCUS`, `ONBLUR` (nonstandard)

This element results in a filename textfield next to a Browse button. Users can enter a path directly in the textfield or click on the button to bring up a file selection dialog that lets them interactively choose the path to a file. When the form is submitted, the *contents* of the file are transmitted as long as an `ENCTYPE` of `multipart/form-data` was specified in the initial `FORM` declaration. This element provides a convenient way to make user-support pages, where the user sends a description of the problem along with any associated data or configuration files.

Core Tip

Always specify `ENCTYPE="multipart/form-data"` *in forms with file upload controls.*

NAME

The `NAME` attribute identifies the textfield when the form is submitted.

VALUE

For security reasons, this attribute is ignored. Only the end user can specify a filename.

SIZE and MAXLENGTH

The `SIZE` and `MAXLENGTH` attributes are used the same way as in textfields, specifying the number of visible and maximum allowable characters, respectively.

ACCEPT

The `ACCEPT` attribute is intended to be a comma-separated list of MIME types used to restrict the available filenames. However, very few browsers support this attribute.

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ONCHANGE, ONSELECT, ONFOCUS, and ONBLUR

These attributes are used by browsers that support JavaScript to specify the action to take when the mouse leaves the textfield after a change has occurred, when the user selects text in the textfield, when the textfield gets the input focus, and when it loses the input focus, respectively.

For example, the following code creates a file upload control. Figure 16–19 shows the initial result, and Figure 16–20 shows a typical pop-up window that results when the Browse button is activated.

```
<FORM ACTION="http://localhost:8088/SomeProgram"
      ENCTYPE="multipart/form-data">
Enter data file below:<BR>
<INPUT TYPE="FILE" NAME="fileName">
</FORM>
```

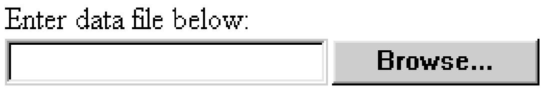
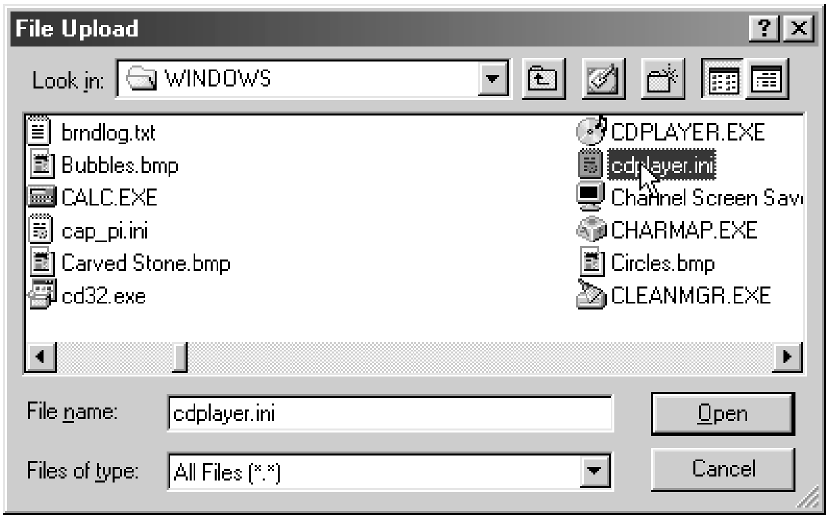


Figure 16–19 Initial look of a file upload control.



File name: cdplayer.ini

Files of type: All Files (*.*)

Figure 16–20 A file chooser resulting from the user clicking on Browse in a file upload control.

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16.8 Server-Side Image Maps

In HTML, an element called `MAP` lets you associate URLs with various regions of an image; then, when the image is clicked in one of the designated regions, the browser loads the appropriate URL. This form of mapping is known as a *client-side image map*, since the determination of which URL to contact is made on the client and no server-side program is involved. HTML also supports *server-side image maps* that can be used within HTML forms. With such maps, an image is drawn, and when the user clicks on it, the coordinates of the click are sent to a server-side program.

Client-side image maps are simpler and more efficient than server-side ones and should be used when all you want to do is associate a fixed set of URLs with some predefined image regions. However, server-side image maps are appropriate if the URL needs to be computed (e.g,. for weather maps), the regions change frequently, or other form data needs to be included with the request. This section discusses two approaches to server-side image maps.

IMAGE—Standard Server-Side Image Maps

The usual way to create server-side image maps is by means of an `<INPUT TYPE="IMAGE" ...>` element inside a form.

HTML Element: **`<INPUT TYPE="IMAGE" ...>`** **(No End Tag)**
Attributes: `NAME` (required), `SRC`, `ALIGN`

This element displays an image that, when clicked, sends the form to the servlet or other server-side program specified by the enclosing form's `ACTION`. The name itself is not sent; instead, *`name`*`.x=`*`xpos`* and *`name`*`.y=`*`ypos`* are transmitted, where *`xpos`* and *`ypos`* are the coordinates of the mouse click relative to the upper-left corner of the image.

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NAME
The NAME attribute identifies the textfield when the form is submitted.

SRC
SRC designates the URL of the associated image.

ALIGN
The ALIGN attribute has the same options (TOP, MIDDLE, BOTTOM, LEFT, RIGHT) and default (BOTTOM) as the ALIGN attribute of the IMG element and is used in the same way.

Listing 16.5 shows a simple example, where the form's ACTION specifies the EchoServer developed in Section 16.12. Figures 16–21 and 16–22 show the results before and after the image is clicked.

Listing 16.5 ImageMap.html

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>The IMAGE Input Control</TITLE>
</HEAD>

<BODY>
<H1 ALIGN="CENTER">The IMAGE Input Control</H1>
Which island is Java? Click and see if you are correct.

<FORM ACTION="http://localhost:8088/GeographyTester">
  <INPUT TYPE="IMAGE" NAME="map" SRC="images/indonesia.gif">
</FORM>

Of course, image maps can be implemented <B>in</B>
Java as well. :-)

</BODY>
</HTML>
```

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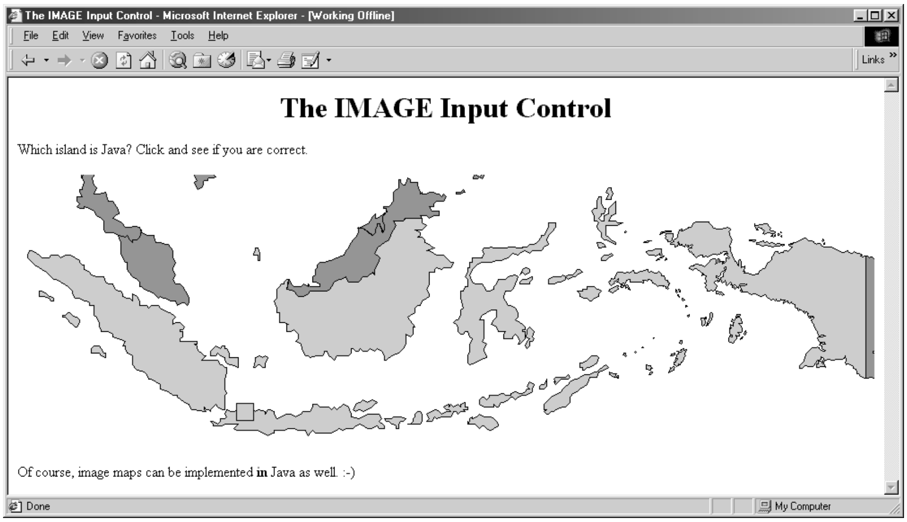
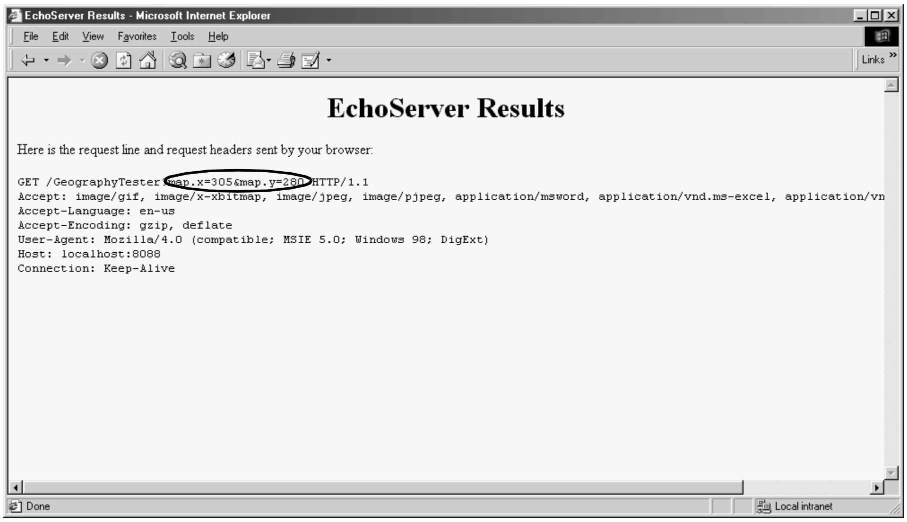

The IMAGE Input Control - Microsoft Internet Explorer - [Working Offline]
File Edit View Favorites Tools Help
Links
Done
My Computer

The IMAGE Input Control

Which island is Java? Click and see if you are correct.

Of course, image maps can be implemented in Java as well. :-)

Figure 16–21 An `IMAGE` input control with `NAME="map"`.


EchoServer Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links
Done
Local intranet

EchoServer Results

Here is the request line and request headers sent by your browser:

```
GET /GeographyTester?map.x=305&map.y=280 HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/msword, application/vnd.ms-excel, application/vn
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 5.0; Windows 98; DigExt)
Host: localhost:8088
Connection: Keep-Alive
```

Figure 16–22 Clicking on the image at (305, 280) submits the form and adds `map.x=305&map.y=280` to the form data.

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ISMAP—Alternative Server-Side Image Maps

ISMAP is an optional attribute of the IMG element and can be used in a similar manner to the <INPUT TYPE="IMAGE" ...> FORM entry. ISMAP is not actually a FORM element at all, but can still be used for simple connections to servlets or CGI programs. If an image with ISMAP is inside a hypertext link, then clicking on the image results in the coordinates of the click being sent to the specified URL. Coordinates are separated by commas and are specified in pixels relative to the top-left corner of the image.

For instance, Listing 16.6 embeds an image that uses the ISMAP attribute inside a hypertext link to http://localhost:8088/ChipTester, which is answered by the mini HTTP server developed in Section 16.12. Figure 16–23 shows the initial result, which is identical to what would have been shown had the ISMAP attribute been omitted. However, when the mouse button is pressed 271 pixels to the right and 184 pixels below the top-left corner of the image, the browser requests the URL http://localhost:8088/ChipTester?271,184 (as is shown in Figure 16–24).

If a server-side image map is used simply to select among a static set of destination URLs, then a client-side MAP element is a much better option because the server doesn't have to be contacted just to decide which URL applies. If the image map is intended to be mixed with other input elements, then the IMAGE input type is preferred instead. However, for a stand-alone image map where the URL associated with a region changes frequently or requires calculation, an image with ISMAP is a reasonable choice.

Listing 16.6 IsMap.html

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>The ISMAP Attribute</TITLE>
</HEAD>

<BODY>

<H1 ALIGN="CENTER">The ISMAP Attribute</H1>
<H2>Select a pin:</H2>
<A HREF="http://localhost:8088/ChipTester">
<IMG SRC="images/chip.gif" WIDTH=495 HEIGHT=200 ALT="Chip"
     BORDER=0 ISMAP></A>

</BODY>
</HTML>
```

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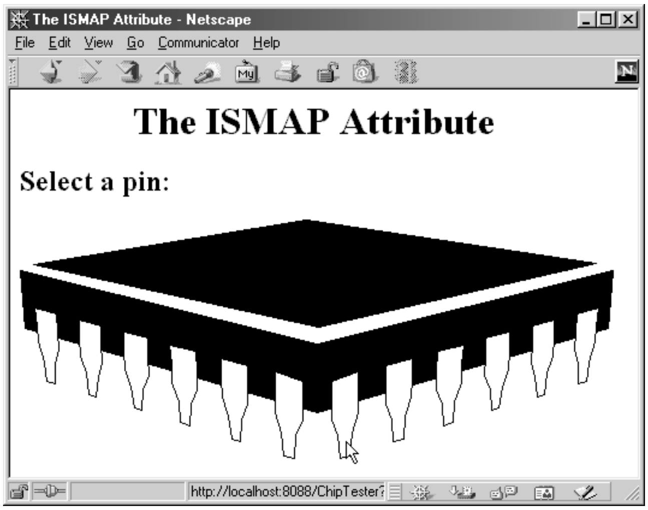
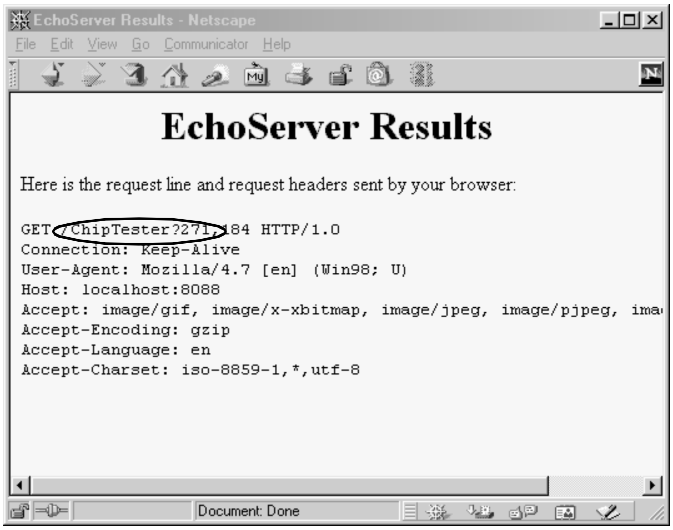

The ISMAP Attribute - Netscape
File Edit View Go Communicator Help
The ISMAP Attribute
Select a pin:
http://localhost:8088/ChipTester?

Figure 16–23 Setting the `ISMAP` attribute of an `IMG` element inside a hypertext link changes what happens when the image is selected.


EchoServer Results - Netscape
File Edit View Go Communicator Help
Document: Done

EchoServer Results

Here is the request line and request headers sent by your browser:

```
GET /ChipTester?271,184 HTTP/1.0
Connection: Keep-Alive
User-Agent: Mozilla/4.7 [en] (Win98; U)
Host: localhost:8088
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, ima
Accept-Encoding: gzip
Accept-Language: en
Accept-Charset: iso-8859-1,*,utf-8
```

Figure 16–24 When an `ISMAP` image is selected, the coordinates of the selection are transmitted with the URL.

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16.9 Hidden Fields

Hidden fields do not affect the appearance of the page that is presented to the user. Instead, they store fixed names and values that are sent unchanged to the server, regardless of user input. Hidden fields are typically used for three purposes.

First, they are one method of tracking users as they move around within a site (see Section 9.1, "The Need for Session Tracking"). Servlet authors typically rely on the servlet session tracking API (Section 9.2) rather than attempting to implement session tracking at this low level.

Second, hidden fields are used to provide predefined input to a server-side program when a variety of static HTML pages act as front ends to the same program on the server. For example, an on-line store might pay commissions to people who refer customers to their site. In this scenario, the referring page could let visitors search the store's catalog by means of a form, but embed a hidden field listing its referral ID.

Third, hidden fields are used to store contextual information in pages that are dynamically generated. For example, in the order confirmation page of the on-line store developed in Section 9.4, each row in the table corresponds to a particular item being ordered (see Figure 9–6). The user can modify the number of items ordered, but there is no visible form element that stores the item ID. So, a hidden form is used (see Listing 9.5).

HTML Element: **`<INPUT TYPE="HIDDEN" NAME="..." VALUE="...">`**
(No End Tag)

Attributes: `NAME` (required), `VALUE`

This element stores a name and a value, but no graphical element is created in the browser. The name/value pair is added to the form data when the form is submitted. For instance, with the following example, `itemID=hall001` will always get sent with the form data.

```
<INPUT TYPE="HIDDEN" NAME="itemID" VALUE="hall001">
```

Note that the term "hidden" does not mean that the field cannot be discovered by the user, since it is clearly visible in the HTML source. Because there is no reliable way to "hide" the HTML that generates a page, authors are cautioned not to use hidden fields to embed passwords or other sensitive information.

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16.10 Grouping Controls

HTML 4.0 defines the `FIELDSET` element, with an associated `LEGEND`, that can be used to visually group controls within a form. This capability is quite useful but is supported only by Internet Explorer. Hopefully, Netscape version 5 will add support for this element. In the meantime, you should reserve use of this element to intranet applications where all your users are using Internet Explorer.

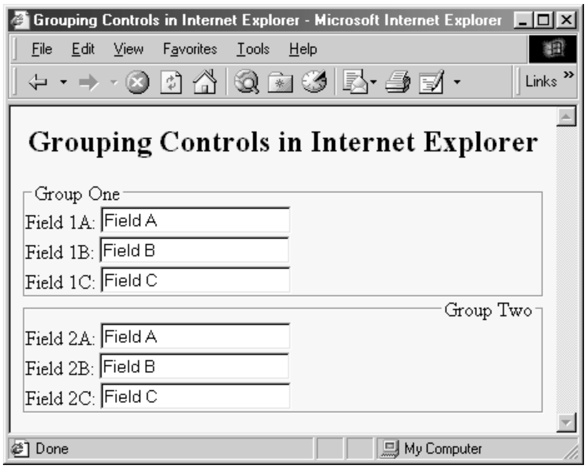
Core Warning

As of version 4.7, Netscape does not support the `FIELDSET` element.

HTML Element: **`<FIELDSET>`**

Attributes: None.

This element is used as a container to enclose controls and, optionally, a `LEGEND` element. It has no attributes beyond the universal ones for style sheets, language, and so forth. Listing 16.7 gives an example, with the result shown in Figure 16–25.


Grouping Controls in Internet Explorer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links
Done
My Computer

Grouping Controls in Internet Explorer

Group One

Field 1A: Field A
Field 1B: Field B
Field 1C: Field C

Group Two

Field 2A: Field A
Field 2B: Field B
Field 2C: Field C

Figure 16–25 The `FIELDSET` element lets you visually group related controls.

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Listing 16.7 `Fieldset.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>Grouping Controls in Internet Explorer</TITLE>
</HEAD>

<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">Grouping Controls in Internet Explorer</H2>

<FORM ACTION="http://localhost:8088/SomeProgram">

<FIELDSET>
<LEGEND>Group One</LEGEND>
Field 1A: <INPUT TYPE="TEXT" NAME="field1A" VALUE="Field A"><BR>
Field 1B: <INPUT TYPE="TEXT" NAME="field1B" VALUE="Field B"><BR>
Field 1C: <INPUT TYPE="TEXT" NAME="field1C" VALUE="Field C"><BR>
</FIELDSET>

<FIELDSET>
<LEGEND ALIGN="RIGHT">Group Two</LEGEND>
Field 2A: <INPUT TYPE="TEXT" NAME="field2A" VALUE="Field A"><BR>
Field 2B: <INPUT TYPE="TEXT" NAME="field2B" VALUE="Field B"><BR>
Field 2C: <INPUT TYPE="TEXT" NAME="field2C" VALUE="Field C"><BR>
</FIELDSET>

</FORM>

</BODY>
</HTML>
```

HTML Element: `<LEGEND>`
Attributes: `ALIGN`

This element, legal only within an enclosing `FIELDSET`, places a label on the etched border that is drawn around the group of controls.

ALIGN

This attribute controls the position of the label. Legal values are `TOP`, `BOTTOM`, `LEFT`, and `RIGHT`, with `TOP` being the default. In Figure 16–25, the first group has the default legend alignment, and the second group stipulates `ALIGN="RIGHT"`. In HTML, style sheets are often a better way to control element alignment, since they permit a single change to be propagated to multiple places.

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16.11 Controlling Tab Order

HTML 4.0 defines a `TABINDEX` attribute that can be used in any of the visual HTML elements. Its value is an integer, and it controls the order in which elements receive the input focus when the TAB key is pressed. Unfortunately, however, it is supported only by Internet Explorer. Nevertheless, you can use `TABINDEX` even for pages that will be viewed by multiple browsers, as long as the designated tabbing order is a convenience to the user, not a necessity for proper operation of the page.

Core Warning

As of version 4.7, Netscape does not support the `TABINDEX` *attribute.*

Listing 16.8 `Tabindex.html`

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD>
  <TITLE>Controlling TAB Order</TITLE>
</HEAD>

<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">Controlling TAB Order</H2>

<FORM ACTION="http://localhost:8088/SomeProgram">
Field 1 (first tab selection):
<INPUT TYPE="TEXT" NAME="field1" TABINDEX=1><BR>
Field 2 (third tab selection):
<INPUT TYPE="TEXT" NAME="field2" TABINDEX=3><BR>
Field 3 (second tab selection):
<INPUT TYPE="TEXT" NAME="field3" TABINDEX=2><BR>
</FORM>

</BODY>
</HTML>
```

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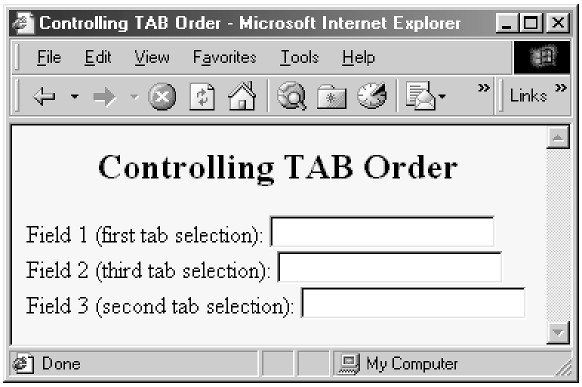
Controlling TAB Order - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links
Done
My Computer

Controlling TAB Order

Field 1 (first tab selection):
Field 2 (third tab selection):
Field 3 (second tab selection):

Figure 16–26 In Internet Explorer, repeatedly pressing the TAB key cycles the input focus among the first, third, and second text fields, in that order (as dictated by `TABINDEX`). In Netscape, the input focus would cycle among the first, second, and third fields, in that order (based on the order the elements appear on the page).

16.12 A Debugging Web Server

This section presents a mini "Web server" that is useful when you are trying to understand the behavior of HTML forms. I used it for many of the examples earlier in the chapter. It simply reads all the HTTP data sent to it by the browser, then returns a Web page with those lines embedded within a `PRE` element. This server is also extremely useful for debugging servlets. When something goes wrong, the first task is to determine if the problem lies in the way in which you collect data or the way in which you process it. Starting the `EchoServer` on, say, port 8088 of your local machine, then changing your forms to specify `http://localhost:8088/` lets you see if the data being collected is in the format you expect.

EchoServer

Listing 16.9 presents the top-level server code. You typically run it from the command line, specifying a port to listen on or accepting the default of 8088. It then accepts repeated HTTP requests from clients, packaging all HTTP data sent to it inside a Web page that is returned to the client. In most cases, the server reads until it gets a blank line, indicating the end of `GET`, `HEAD`, or most other types of HTTP requests. In the case of `POST`, however, the server checks the `Content-Length` request header and reads that many bytes beyond the blank line.

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Listing 16.9 `EchoServer.java`

```
import java.net.*;
import java.io.*;
import java.util.StringTokenizer;

/** A simple HTTP server that generates a Web page
 *  showing all the data that it received from
 *  the Web client (usually a browser). To use this,
 *  start it on the system of your choice, supplying
 *  a port number if you want something other than
 *  port 8088. Call this system server.com. Next,
 *  start a Web browser on the same or a different
 *  system, and connect to http://server.com:8088/whatever.
 *  The resultant Web page will show the data that your browser
 *  sent. For debugging in servlet or CGI programming,
 *  specify http://server.com:8088/whatever as the
 *  ACTION of your HTML form. You can send GET
 *  or POST data; either way, the resultant page
 *  will show what your browser sent.
 */

public class EchoServer extends NetworkServer {
  protected int maxRequestLines = 50;
  protected String serverName = "EchoServer";

  /** Supply a port number as a command-line
   *  argument. Otherwise port 8088 will be used.
   */

  public static void main(String[] args) {
    int port = 8088;
    if (args.length > 0) {
      try {
        port = Integer.parseInt(args[0]);
      } catch(NumberFormatException nfe) {}
    }
    new EchoServer(port, 0);
  }

  public EchoServer(int port, int maxConnections) {
    super(port, maxConnections);
    listen();
  }

  /** Overrides the NetworkServer handleConnection
   *  method to read each line of data received, save it
   *  into an array of strings, then send it
   *  back embedded inside a PRE element in an
   *  HTML page.
   */
```

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Listing 16.9 `EchoServer.java` **(continued)**

```
public void handleConnection(Socket server)
    throws IOException{
  System.out.println
      (serverName + ": got connection from " +
       server.getInetAddress().getHostName());
  BufferedReader in = SocketUtil.getReader(server);
  PrintWriter out = SocketUtil.getWriter(server);
  String[] inputLines = new String[maxRequestLines];
  int i;
  for (i=0; i<maxRequestLines; i++) {
    inputLines[i] = in.readLine();
    if (inputLines[i] == null) // Client closed connection
      break;
    if (inputLines[i].length() == 0) { // Blank line
      if (usingPost(inputLines)) {
        readPostData(inputLines, i, in);
        i = i + 2;
      }
      break;
    }
  }
  printHeader(out);
  for (int j=0; j<i; j++) {
    out.println(inputLines[j]);
  }
  printTrailer(out);
  server.close();
}

// Send standard HTTP response and top of a standard Web page.
// Use HTTP 1.0 for compatibility with all clients.

private void printHeader(PrintWriter out) {
  out.println
    ("HTTP/1.0 200 OK\r\n" +
     "Server: " + serverName + "\r\n" +
     "Content-Type: text/html\r\n" +
     "\r\n" +
     "<!DOCTYPE HTML PUBLIC " +
       "\"-//W3C//DTD HTML 4.0 Transitional//EN\">\n" +
     "<HTML>\n" +
     "<HEAD>\n" +
     "  <TITLE>" + serverName + " Results</TITLE>\n" +
     "</HEAD>\n" +
     "\n" +
     "<BODY BGCOLOR=\"#FDF5E6\">\n" +
     "<H1 ALIGN=\"CENTER\">" + serverName +
       " Results</H1>\n" +
```

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Listing 16.9 `EchoServer.java` **(continued)**

```
      "Here is the request line and request headers\n" +
      "sent by your browser:\n" +
      "<PRE>");
  }

  // Print bottom of a standard Web page.

  private void printTrailer(PrintWriter out) {
    out.println
      ("</PRE>\n" +
       "</BODY>\n" +
       "</HTML>\n");
  }

  // Normal Web page requests use GET, so this
  // server can simply read a line at a time.
  // However, HTML forms can also use POST, in which
  // case we have to determine the number of POST bytes
  // that are sent so we know how much extra data
  // to read after the standard HTTP headers.

  private boolean usingPost(String[] inputs) {
    return(inputs[0].toUpperCase().startsWith("POST"));
  }

  private void readPostData(String[] inputs, int i,
                            BufferedReader in)
      throws IOException {
    int contentLength = contentLength(inputs);
    char[] postData = new char[contentLength];
    in.read(postData, 0, contentLength);
    inputs[++i] = new String(postData, 0, contentLength);
  }

  // Given a line that starts with Content-Length,
  // this returns the integer value specified.

  private int contentLength(String[] inputs) {
    String input;
    for (int i=0; i<inputs.length; i++) {
      if (inputs[i].length() == 0)
        break;
      input = inputs[i].toUpperCase();
      if (input.startsWith("CONTENT-LENGTH"))
        return(getLength(input));
    }
    return(0);
  }
```

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Listing 16.9 `EchoServer.java` **(continued)**

```
  private int getLength(String length) {
    StringTokenizer tok = new StringTokenizer(length);
    tok.nextToken();
    return(Integer.parseInt(tok.nextToken()));
  }
}
```

ThreadedEchoServer

Listing 16.10 presents a multithreaded variation of the `EchoServer`, useful when your server needs to accept multiple simultaneous client requests.

Listing 16.10 `ThreadedEchoServer.java`

```
import java.net.*;
import java.io.*;

/** A multithreaded variation of EchoServer. */

public class ThreadedEchoServer extends EchoServer
                                implements Runnable {
  public static void main(String[] args) {
    int port = 8088;
    if (args.length > 0) {
      try {
        port = Integer.parseInt(args[0]);
      } catch(NumberFormatException nfe) {}
    }
    ThreadedEchoServer echoServer =
      new ThreadedEchoServer(port, 0);
    echoServer.serverName = "Threaded Echo Server";
  }

  public ThreadedEchoServer(int port, int connections) {
    super(port, connections);
  }

  /** The new version of handleConnection starts
   *  a thread. This new thread will call back to the
   *  <I>old</I> version of handleConnection, resulting
   *  in the same server behavior in a multithreaded
   *  version. The thread stores the Socket instance
   *  since run doesn't take any arguments, and since
   *  storing the socket in an instance variable risks
   *  having it overwritten if the next thread starts
```

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Listing 16.10 `ThreadedEchoServer.java` **(continued)**

```
   *  before the run method gets a chance to
   *  copy the socket reference.
   */

  public void handleConnection(Socket server) {
    Connection connectionThread = new Connection(this, server);
    connectionThread.start();
  }

  public void run() {
    Connection currentThread =
      (Connection)Thread.currentThread();
    try {
      super.handleConnection(currentThread.serverSocket);
    } catch(IOException ioe) {
      System.out.println("IOException: " + ioe);
      ioe.printStackTrace();
    }
  }
}

/** This is just a Thread with a field to store a
 *  Socket object. Used as a thread-safe means to pass
 *  the Socket from handleConnection to run.
 */

class Connection extends Thread {
  protected Socket serverSocket;

  public Connection(Runnable serverObject,
                    Socket serverSocket) {
    super(serverObject);
    this.serverSocket = serverSocket;
  }
}
```

NetworkServer

Listings 16.11 and 16.12 present some utilities classes that simplify networking. The `EchoServer` is built on top of them.

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Listing 16.11 NetworkServer.java

```
import java.net.*;
import java.io.*;

/** A starting point for network servers. You'll need to
 *  override handleConnection, but in many cases
 *  listen can remain unchanged. NetworkServer uses
 *  SocketUtil to simplify the creation of the
 *  PrintWriter and BufferedReader.
 *  @see SocketUtil
 */

public class NetworkServer {
  private int port, maxConnections;

  /** Build a server on specified port. It will continue
   *  to accept connections, passing each to
   *  handleConnection, until an explicit exit
   *  command is sent (e.g., System.exit) or the
   *  maximum number of connections is reached. Specify
   *  0 for maxConnections if you want the server
   *  to run indefinitely.
   */

  public NetworkServer(int port, int maxConnections) {
    setPort(port);
    setMaxConnections(maxConnections);
  }

  /** Monitor a port for connections. Each time one
   *  is established, pass resulting Socket to
   *  handleConnection.
   */

  public void listen() {
    int i=0;
    try {
      ServerSocket listener = new ServerSocket(port);
      Socket server;
      while((i++ < maxConnections) || (maxConnections == 0)) {
        server = listener.accept();
        handleConnection(server);
      }
    } catch (IOException ioe) {
      System.out.println("IOException: " + ioe);
      ioe.printStackTrace();
    }
  }
```

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Listing 16.11 `NetworkServer.java` **(continued)**

```
/** This is the method that provides the behavior
 *  to the server, since it determines what is
 *  done with the resulting socket. <B>Override this
 *  method in servers you write.</B>
 *  <P>
 *  This generic version simply reports the host
 *  that made the connection, shows the first line
 *  the client sent, and sends a single line
 *  in response.
 */

protected void handleConnection(Socket server)
    throws IOException{
  BufferedReader in = SocketUtil.getReader(server);
  PrintWriter out = SocketUtil.getWriter(server);
  System.out.println
    ("Generic Network Server: got connection from " +
     server.getInetAddress().getHostName() + "\n" +
     "with first line '" + in.readLine() + "'");
  out.println("Generic Network Server");
  server.close();
}

/** Gets the max connections server will handle before
 *  exiting. A value of 0 indicates that server
 *  should run until explicitly killed.
 */

public int getMaxConnections() {
  return(maxConnections);
}

/** Sets max connections. A value of 0 indicates that
 *  server should run indefinitely (until explicitly
 *  killed).
 */

public void setMaxConnections(int maxConnections) {
  this.maxConnections = maxConnections;
}

/** Gets port on which server is listening. */

public int getPort() {
  return(port);
}
```

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Listing 16.11 `NetworkServer.java` **(continued)**

```
  /** Sets port. <B>You can only do before "connect"
   *  is called.</B> That usually happens in the constructor.
   */

  protected void setPort(int port) {
    this.port = port;
  }
}
```

Listing 16.12 `SocketUtil.java`

```
import java.net.*;
import java.io.*;

/** A shorthand way to create BufferedReaders and
 *  PrintWriters associated with a Socket.
*/

public class SocketUtil {
  /** Make a BufferedReader to get incoming data. */

  public static BufferedReader getReader(Socket s)
      throws IOException {
    return(new BufferedReader(
     new InputStreamReader(s.getInputStream())));
  }

  /** Make a PrintWriter to send outgoing data.
   *  This PrintWriter will automatically flush stream
   *  when println is called.
   */

  public static PrintWriter getWriter(Socket s)
      throws IOException {
    // 2nd argument of true means autoflush
    return(new PrintWriter(s.getOutputStream(), true));
  }
}
```

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