

# Developing Web Content: CGI Forms

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1

## HTML Forms

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- ◆ Form elements are elements that allow the user to enter information
  - » text fields
  - » radio buttons
  - » checkboxes
  - » buttons
  - » drop-down menus
  - » textareas
- ◆ The definition and layout of a form is HTML, but CGI is needed to process the data provided to the forms.

2

# What is CGI?

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- ◆ Common Gateway Interface
- ◆ It's not a language, but a protocol
  - » common to refer to a program that uses CGI as “a CGI program”
- ◆ CGI program can be written in almost any programming language
  - » C, C++, Perl (most popular for CGI), Visual Basic
- ◆ Most typically used for processing form data and returning results in HTML format

3

# Forms

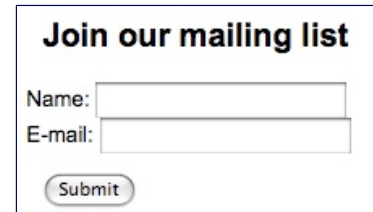
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- ◆ Defined with the <form> tag:  
<form>  
<label> <input /> </label>  
...  
<label> <input /> </label>  
</form>
- ◆ User input fields are defined by the <input> tag
  - » attributes: type (type of input), name (used for referencing)
- ◆ Text label associated with an input field is defined with the <label> tag

4

## Form Example

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Join our mailing list

Name:

E-mail:

```
<form action="../cgi-bin/maillist.pl" method="post">
```

```
<h2>Join our mailing list</h2>
```

```
<label>Name: <input type="text" name="realname" /> </label>
```

```
<br /><label>E-mail: <input type="text" name="email" /></label>
```

```
<p><input type="submit" value="Submit" /></p>
```

```
</form>
```

5

## Forms and Actions

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Join our mailing list

Name:

E-mail:

- ◆ The main attribute of a form tag is *action*
  - » ex: `<form action="/cgi-bin/maillist.pl">`
  - » action is required by XHTML
    - ❖ if no action to be taken, then `action=""` will validate
- ◆ *action* tells the browser where to send the data for processing
- ◆ `input type="submit"` creates the submit button
  - » when pressed, the data is sent to the action defined

6

# Forms and Methods

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- ◆ If the method is *get*
  - » query string of the arguments is tacked onto the end of the URL (of action attribute)
    - ❖ *name=value*
    - ❖ “?” is separator between data-value pairs
  - » URL is sent to the web server
  - » should only be used when doing a search or requesting data
- ◆ If the method is *post*
  - » client sends the query string directly to the server, separately from the URL
  - » should be used when updating data on the server, for example, in a database

7

## Form Processing

### What Happens When Submit is Pressed?

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- ◆ User presses “Submit” button
- ◆ Browser sends form data to web server
  - » specifically to CGI program defined in `<form action>`
- ◆ Web server launches the CGI program
- ◆ CGI program executes taking the data from the form as input
- ◆ CGI program typically will generate a web page using HTML
- ◆ CGI program passes the HTML page back to the web server
- ◆ Web server passes the HTML page back to the browser

8

## Forms and CGI

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- ◆ For now, we'll use the HTML Code Tutorial's (<http://www.htmlcodetutorial.com>) mycgi.pl script
- ◆ Displays name=value pairs that are sent to it
- ◆ We'll look at writing our own CGI programs later

9

## Form Input Types

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- |                 |  |
|-----------------|--|
| ◆ Text          | ◆ Non-Input Types                      |
| ◆ Submit Button | » select (scrolling or drop-down list) |
| ◆ Reset Button  | » textarea                             |
| ◆ Password      |  |
| ◆ Radio Button  |  |
| ◆ Checkbox      |  |
| ◆ File Upload   |  |

10

## Text Type

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- ◆ A one-line text entry field

- `<input type="text" name="user" value="Donald Smith" size=30 />`

- ◆ Attributes:

- » `type`
  - » name of this parameter
  - » `value` (optional) – default input value
  - » `size` (optional) – field width
  - » `maxlength` (optional) – limit the number of characters the user can enter

A screenshot of a web browser showing a single-line text input field. The field is rectangular with a thin border and contains the text "Donald Smith". The background of the slide is a light yellow color.

- ◆ When form is submitted, the information will be passed as

- » `user=Donald+Smith`

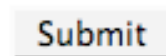
11

## Submit Type

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- ◆ A submit button

- » `<input type="submit" value="Submit" />`



- ◆ Value indicates the text that will be placed on the button

- » if nothing given, default is "Submit Query"

- ◆ When pressed, the form data is submitted to the script specified the form's *action* attribute

12

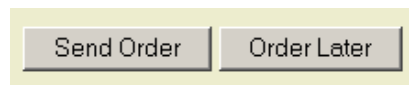
## Submit Button

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- ◆ Can have multiple submit buttons in the same form
- ◆ We can have multiple submit buttons, e.g., two labeled Send Order and Order Later, respectively.

`<input type="submit" name="action" value="Send Order" />`

`<input type="submit" name="action" value="Order Later" />`



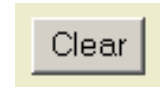
13

## Reset Type

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- ◆ A reset button

`<input type="reset" value="Clear" />`



- ◆ Value indicates the text that will be placed on the button
  - » if nothing given, default is “Reset”
- ◆ When pressed, the all field data and selections in the form are reset back to their original, default values

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

14

## Multiple Submit Buttons

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- ◆ When multiple submit buttons are used in a single form, they should have the *same name* but *different values*
- ◆ Only one submit button can be clicked/effective.
  - » If the user clicked on the button labeled Send Order, then the corresponding part of the query string will be `action=Send+Order`

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

15

## Image as Submit Button

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- ◆ An image can also be used as a submit button, typically the image is some icon.  
`<input type="image" name="lion" src="../odulion.gif" />`

- ◆ The type is *image*, not submit
- ◆ Must specify the source URL for src
- ◆ When the image is clicked, the corresponding part of the query string will be:
  - » `lion.x=xvalue&lion.y=yvalue`
- ◆ *xvalue*, *yvalue* are location in pixels where the mouse was clicked on the image
  - » a bit like image map



<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

16



## Hidden Field

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- ◆ Used to pass some value, not given in any current input fields, to the called procedure.

`<input type="hidden" name="to" value="weigle" />`

- ◆ In the query string, this field and value pair are passed as

» `to=weigle`

- ◆ But, nothing is shown in the document text or form

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

17

## Password Type

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- ◆ A one-line password entry field



`<input type="password" name="passwd" value="xyzy" size=10 />`

- ◆ All characters, default or user input, in the password field are shown as asterisks or dots.

- ◆ When form is submitted, the information will be passed as

» `passwd=xyzy`

» no encryption is performed (plain-text)

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

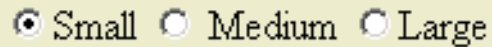
18

## Radio Button Type

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### ◆ A group of radio buttons

- » Similar to checkboxes, but the user can select only one out of a group



```
<input type="radio" name="size" value="small" checked />Small
```

```
<input type="radio" name="size" value="medium" /> Medium
```

```
<input type="radio" name="size" value="large" />Large
```

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

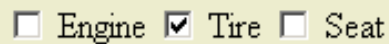
19

## Checkbox Type

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### ◆ A group of checkboxes

- » Used to select multiple items.



```
<input type="checkbox" name="items" value="engine" />Engine
```

```
<input type="checkbox" name="items" value="tire" checked /> Tire
```

```
<input type="checkbox" name="items" value="seat" /> Seat
```

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

20

## File Upload Type

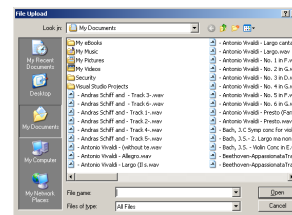
- ◆ A file upload field

```
<input type="file" name="upload" size=40 />
```

- ◆ An input field and a Browse button will appear



- ◆ When the Browse button is clicked, a File Upload window will show up for selecting a file



<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

21

## File Upload

- ◆ Additional requirement for file upload:
  - » The form must specify an enclosure type of multipart/form-data, and use POST submission method.

Example:

```
<form action="URL" method="post"
  enctype="multipart/form-data">
  <input type="file" name="upload" size=40 />
  ...
</form>
```

*The actual processing of the file upload is a little complicated.*

22

## Button Type

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- ◆ A push button  
`<input type="button" value="Press Me!" />`
- ◆ Used to implement *client-side* scripts
  - » e.g., Javascript
  - » nothing is sent to the server
- ◆ Example with simple Javascript  
`<input type="button" value="Click!"  
onclick="javascript:alert('Clicked!');" />`

<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

23

## Select Tag

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- ◆ A drop-down or scrolling list  
`<select name="cars">` *drop-down*  
  
`<select name="favorites" size=4 multiple="multiple">` *scrolling*
- ◆ Each option in the list is surrounded by `<option>...</option>` tags
  - » ex: `<option>jogging</option>`
  - » for default selection, use selected attribute on option tag
    - ❖ ex: `<option selected>swimming</option>`



<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

24

## Textarea Tag

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- ◆ textarea tag, not an input tag
  - » For defining a large input text area, not just a field of a single line, use **textarea** tag.

```
<textarea name="longtext" rows=5 cols=60>
```

```
</textarea>
```



<http://www.cs.odu.edu/~mweigle/cs312/forms/form.html>

25

## Server-Side Actions

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*When a web server receives a CGI request:*

- ◆ It creates a set of environment variables containing information about
  - » the server itself
  - » the remote browser
  - » the current request, including QUERY\_STRING
- ◆ It calls the corresponding script with any arguments in the environment variable QUERY\_STRING.

26

## Server-Side Actions

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- ◆ The script picks up any information it wants from the environment variables, particularly the arguments from QUERY\_STRING,
  - » i.e. the parameters with corresponding values,
- ◆ The script then executes its own instructions
- ◆ Many programming languages provide tools for easy picking of parameter values by procedures
- ◆ The output by the script, typically a HTML page, is sent back to the client by the server

27

## Communicating with Scripts Via URLs

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- ◆ Scripts may or may not require arguments from users.
- ◆ The arguments are called a query string and may be appended at the end of a URL with the question mark "?" leading it.
- ◆ If argument has blank space
  - » use "+" or "%20"
- ◆ If there are two or more name/value pairs
  - » use "&" to delimit

28

## Examples

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- ◆ One argument with parameter and value
  - » <http://www.google.com/search?q=titanic>
- ◆ Argument value has blank space
  - » <http://www.google.com/search?q=john+smith>
- ◆ Two or more parameters, using ‘&’ to link pairs
  - » <http://finance.yahoo.com/q/bc?s=AAPL&t=2y>

29

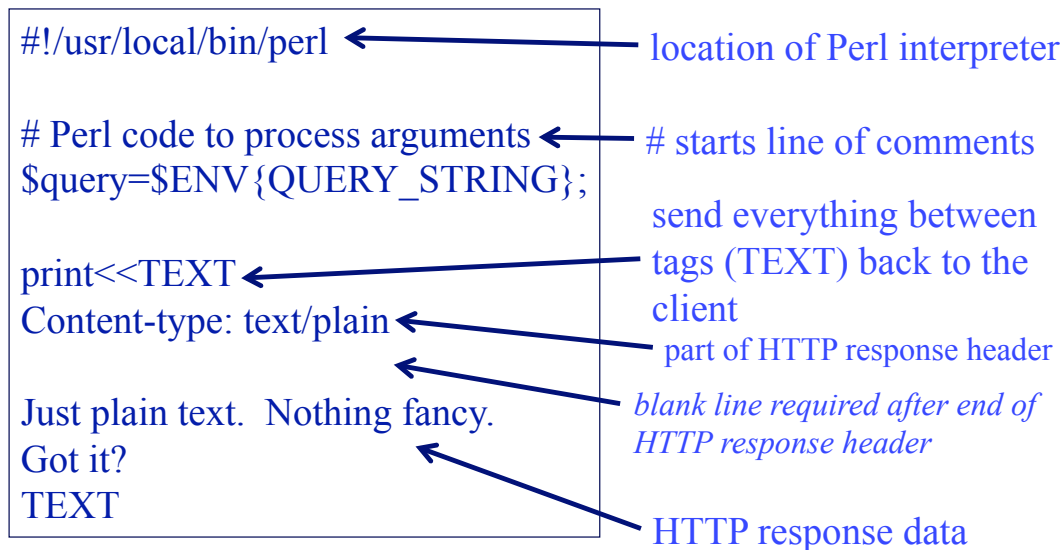
## ODU-CS CGI Implementation

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- ◆ CGI scripts must be stored under ~/public\_html
- ◆ CGI scripts are best, but not required, stored under ~/public\_html/cgi-bin/
- ◆ The cgi-bin directory and all programs in the directory should have access mode 755 so that it can be executed by the web server.

30

## Layout of Perl CGI Script



31

## Simple Examples of Perl CGI Scripts

### ◆ Generating a plain text page, in perl on Unix

```
#!/usr/local/bin/perl

print<<PLAIN
Content-type: text/plain
```

```
Just plain text. Nothing fancy.
Got it?
PLAIN
```

*You must have the blank line in between the Content-type:text/plain (end of HTTP header) and the data part.*

<http://www.cs.odu.edu/~mweigle/cgi-bin/plainText.cgi>

32



## Simple Examples of Perl CGI Scripts

### ◆ The perl script mapCoord.cgi

```
#!/usr/local/bin/perl
```

```
$queryString = $ENV{QUERY_STRING};
```

```
print <<END;
```

```
Content-type: text/html
```

```
<html>
```

```
<p><b>The coordinates where the mouse was clicked were:</b></p>
```

```
<p>${queryString}</p>
```

```
</html>
```

```
END
```

<http://www.cs.odu.edu/~mweigle/cgi-bin/mapCoord.cgi>

*How can we use this to  
get coordinates clicked in  
an image map?*

33

## Determining Image Map Coordinates

### ◆ Use a form with image submit button

```
<form action=" ../cgi-bin/mapCoord.cgi" method="get">
```

```
<input type="image" name="coordinate" src="shapes.jpg" />
```

```
</form>
```

<http://www.cs.odu.edu/~mweigle/cs312/forms/finding-coord.html>

34

## Improving CGI efficiency

- ◆ CGI technology generally requires a fresh copy of the program to be executed for every CGI request
  - » The interpreter and the script may need to be reloaded each time
  - » The workload may overwhelm the web server when interpreting scripts is needed
- ◆ Integrating script interpreters directly into web servers
  - » `mod_perl` embeds Perl interpreter into the Apache server
- ◆ Caching compiled versions of the scripts in system location so that further requests for the file are automatically directed to the compiled code

35

## Other Efficient Approaches

- ◆ Active Server Pages, ASP
  - » A programming language, Microsoft's server-side technology for Internet Information Service, IIS
  - » An add-on to Internet Information Services (IIS)
  - » Using various built-in objects, each of which corresponds to a group of frequently-used functionality useful for creating dynamic web pages
  - » Can be mixed with HTML

36

## ASP Example

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```
<html>
  Today's date is: <%response.write(date())%>.
  <br>
  The server's local time is: <%response.write(time())%>.
</html>
```

*Would produce something like (does **not** work on our Apache):*

Today's date is: 15.03.2006.

The server's local time is: 10:17:18.

*The syntax is simply <% XXXXX %> where XXXXX is just the script language function calls.*

37

## Apache::ASP

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- ◆ An Active Server Pages port to the Apache Web Server with Perl scripting only

- ◆ Apache::ASP syntax:

<%xxx%>

where xxx is any valid perl code.

Reference, Apache::ASP: <http://www.apache-asp.org/>

38

# PHP (Hypertext Preprocessor)

- ◆ An open-source, scripted programming language
- ◆ Allows interaction with a large number of relational databases
- ◆ Interacts with many major Web servers
- ◆ Can be embedded into HTML

Reference, a PHP tutorial:

<http://www.w3schools.com/php/default.asp>

39

## Simple PHP Example

- ◆ A HTML document calling a php script

```
<html>
<form action="1action.php" method="post">
  <p>Give your name please: <input type="text"
    name="name" /> </p>
  <p>Give your age please: <input type="text"
    name="age" /></p>
  <p><input type="submit" /></p>
</form>
</html>
```

*ASP and PHP scripts all can be called in forms.*

40

- ◆ The php script called in the previous form,
  - » file name `laction.php`:

```
Hi <?php echo $_POST['name']; ?> ! <p>  
You are <?php echo $_POST['age']; ?> years old.
```

*PHP can be mixed with HTML, just use: <?php XXXX ?>*

<http://www.cs.odu.edu/~mweigle/cs312/forms/php.html>

41

## Comparisons of ASP & PHP

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- ◆ Both are languages used to build Dynamic Web sites that can interact with Databases and exchange information
- ◆ ASP programs require IIS on Windows, DB connection is to MS-SQL, both not free
- ◆ PHP programs run on Linux with Apache server, DB connection to MySQL, all free
- ◆ PHP also runs on many other platforms and can connect to many other databases, is faster than ASP, and has many free, open source software

42