Web Programming Step by Step

Chapter 6
HTML Forms and Server-side Data

6.1: Form Basics

Web data

- most interesting web pages revolve around data
  - examples: Google, IMDB, Digg, Facebook, YouTube, Rotten Tomatoes
  - can take many formats: text, HTML, XML, multimedia
- many of them allow us to access their data
- some even allow us to submit our own new data
- most server-side web programs accept **parameters** that guide their execution

Query strings and parameters (6.1.1)

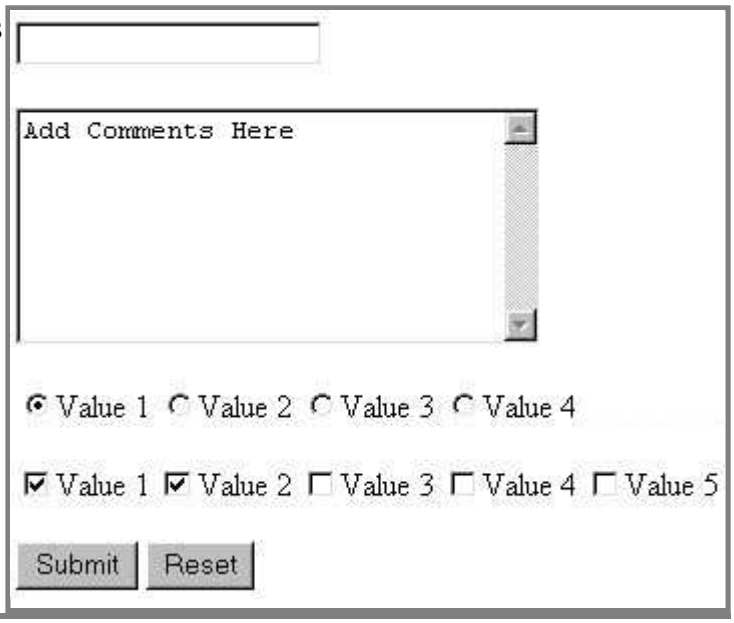
```
URL?name=value&name=value...
```

```
http://example.com/student_login.php?username=stepp&sid=1234567
```

- **query string**: a set of parameters passed from a browser to a web server
  - often passed by placing name/value pairs at the end of a URL
  - above, parameter `username` has value `stepp`, and `sid` has value `1234567`
- PHP code on the server can examine and utilize the value of parameters

HTML forms

- **form**: a group of UI controls that accepts information from the user and sends the information to a web server
- forms use HTML UI controls (buttons, checkboxes, text fields, etc.)
- the information is sent to the server as a **query string**
- JavaScript can be used to create interactive controls (seen later)



HTML form: `<form>` (6.1.2)

```
<form action="web service URL">
  form controls
</form>
```
HTML

- required `action` attribute gives the URL of the server web service that will process this form's data

Form example

```
<form action="http://www.google.com/search">
  <div>
    Let's search Google:
    <input name="q" />
    <input type="submit" />
  </div>
</form>
```

HTML

Let's search Google: Submit Query

output

- should wrap the form's controls in a block element such as `div`

Form controls: `<input>`

```
<input type="text" name="q" value="Colbert Report" />
<input type="submit" value="Booyah!" />
```

HTML

Colbert Report Booyah!

output

- `input` element is used to create many UI controls
  - an inline element that MUST be self-closed
- `name` attribute specifies name of query parameter to pass to server
- `type` can be `button`, `checkbox`, `file`, `hidden`, `password`, `radio`, `reset`, `submit`, `text`, ...
- `value` attribute specifies control's initial text

6.2: Form Controls

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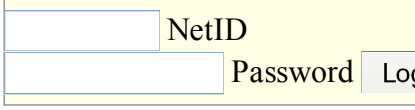
Text fields: `<input>` (6.2.1)

```
<input type="text" size="10" maxlength="8" /> NetID<br />
<input type="password" size="16" /> Password
<input type="submit" value="Log In" />
```

HTML



output

- `input` attributes: `disabled`, `maxlength`, `readonly`, `size`, `value`
- `size` attribute controls onscreen width of text field
- `maxlength` limits how many characters user is able to type into field

Text boxes: <textarea> (6.2.2)

a multi-line text input area (inline)

```
<textarea rows="4" cols="20">
Type your comments here.
</textarea>
```
HTML

Type your comments here.

output

- initial text is placed inside `textarea` tag (optional)
- required `rows` and `cols` attributes specify height/width in characters
- optional `readonly` attribute means text cannot be modified

Checkboxes: <input> (6.2.3)

yes/no choices that can be checked and unchecked (inline)

```
<input type="checkbox" name="lettuce" /> Lettuce
<input type="checkbox" name="tomato" checked="checked" /> Tomato
<input type="checkbox" name="pickles" /> Pickles
```
HTML

☐ Lettuce ☑ Tomato ☐ Pickles Submit Query

output

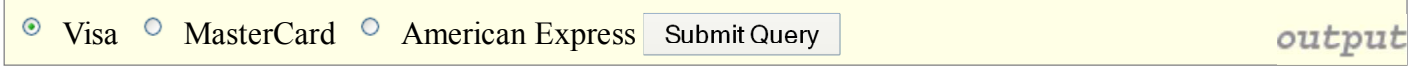
- none, 1, or many checkboxes can be checked at same time
- when sent to server, any checked boxes will be sent with value `on`:
  - `http://webster.cs.washington.edu/params.php?tomato=on&pickles=on`
- use `checked="checked"` attribute in HTML to initially check the box

Radio buttons: <input> (6.2.4)

sets of mutually exclusive choices (inline)

```
<input type="radio" name="cc" value="visa" checked="checked" /> Visa
<input type="radio" name="cc" value="mastercard" /> MasterCard
<input type="radio" name="cc" value="amex" /> American Express
```

HTML



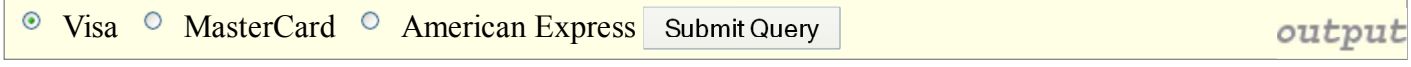
output

- grouped by `name` attribute (only one can be checked at a time)
- must specify a `value` for each one or else it will be sent as value `on`

Text labels: <label> (6.2.5)

```
<label><input type="radio" name="cc" value="visa" checked="checked" /> Visa</label>
<label><input type="radio" name="cc" value="mastercard" /> MasterCard</label>
<label><input type="radio" name="cc" value="amex" /> American Express</label>
```

HTML



output

- associates nearby text with control, so you can click text to activate control
- can be used with checkboxes or radio buttons
- `label` element can be targeted by CSS style rules

Drop-down list: <select>, <option> (6.2.6)

menus of choices that collapse and expand (inline)

```
<select name="favoritecharacter">
  <option>Jerry</option>
  <option>George</option>
  <option>Kramer</option>
  <option>Elaine</option>
</select>
```

HTML

output

- `option` element represents each choice
- `select` optional attributes: `disabled`, `multiple`, `size`
- may need to specify a `value` for each `option` on IE6

Using <select> for lists

```
<select name="favoritecharacter[]" size="3" multiple="multiple">
  <option>Jerry</option>
  <option>George</option>
  <option>Kramer</option>
  <option>Elaine</option>
  <option selected="selected">Newman</option>
</select>
```

HTML

output

- optional `multiple` attribute allows selecting multiple items with shift- or ctrl-click
  - must declare parameter's name with `[]` if you allow multiple selections
- `option` tags can be set to be initially `selected`

Option groups: <optgroup>

```
<select name="favoritecharacter">
  <optgroup label="Major Characters">
    <option>Jerry</option>
    <option>George</option>
    <option>Kramer</option>
    <option>Elaine</option>
  </optgroup>
  <optgroup label="Minor Characters">
    <option>Newman</option>
    <option>Susan</option>
  </optgroup>
</select>
```

HTML

Jerry Submit Query

output

- What should we do if we don't like the bold italic?

Reset buttons (6.2.7)

```
Name: <input type="text" name="name" /> <br />
Food: <input type="text" name="meal" value="pizza" /> <br />
<label>Meat? <input type="checkbox" name="meat" /></label> <br />
<input type="reset" />
```

HTML

Name:
Food: pizza
Meat?
Reset Submit Query

output

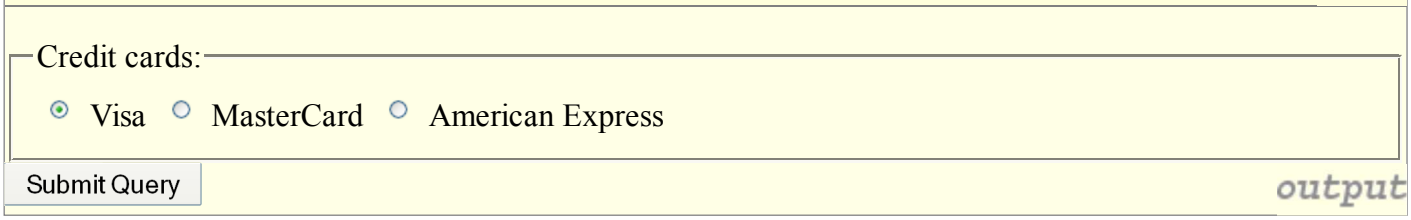
- when clicked, returns all form controls to their initial values
- specify custom text on the button by setting its `value` attribute

Grouping input: <fieldset>, <legend> (6.2.8)

groups of input fields with optional caption (block)

```
<fieldset>
  <legend>Credit cards:</legend>
    <input type="radio" name="cc" value="visa" checked="checked" /> Visa
    <input type="radio" name="cc" value="mastercard" /> MasterCard
    <input type="radio" name="cc" value="amex" /> American Express
</fieldset>
```

HTML



output

- `fieldset` groups related input fields; `legend` supplies an optional caption

Common UI control errors

- "I changed the checkbox's `checked` property, the `textarea`'s inner text, the text box's `value` ... but when I refresh, the page doesn't reflect this change!"
  - By default, when you refresh a page in your browser, it leaves the previous values in all UI controls
  - it does this in case you were filling out a long form and needed to refresh it, but didn't want it to clear out all the info you'd entered
  - if you want it to clear out all UI controls' state and values, you must do a **full refresh**
    - Firefox: Shift-Ctrl-R
    - Mac: Shift-Command-R

Styling form controls (6.2.9)

```css
element[attribute="value"] {
  property : value;
  property : value;
  ...
  property : value;
}
```

```css
input[type="text"] {
  background-color: yellow;
  font-weight: bold;
}
```

Borat

output

- **attribute selector**: matches only elements that have a particular attribute value
- useful for controls because many share the same element (`input`)

Styling Text Boxes

```html
<textarea rows="3" cols="40"></textarea>
```

```js
body { height: 100%; }
textarea {
  position: absolute;
  width: 50%;
  height: 15%;
}
```

- XHTML validator requires `rows` and `cols` on a `textarea`
- if you want a `textarea` at a specific width/height in pixels or %, you must specify `rows`/`cols` in the XHTML *and* `width`/`height` in the CSS
  - the `rows`/`cols` will be ignored but must be there anyway...
  - sometimes specifying a `height` on the page's `body` helps
  - sometimes using absolute/fixed positioning on the `textarea` helps

6.3: Submitting Data

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Problems with submitting data

```
<label><input type="radio" name="cc" /> Visa</label>
<label><input type="radio" name="cc" /> MasterCard</label> <br />
Favorite Star Trek captain:
<select name="startrek">
  <option>James T. Kirk</option>
  <option>Jean-Luc Picard</option>
</select> <br />
```

HTML

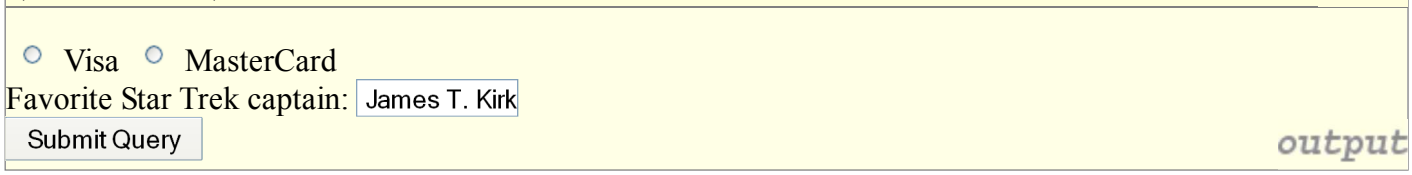
output

- the following form may look correct, but when you submit it...
- `[cc] => on, [startrek] => Jean-Luc Picard`

The `value` attribute

```
<label><input type="radio" name="cc" value="visa" /> Visa</label>
<label><input type="radio" name="cc" value="mastercard"/> MasterCard</label> <br />
Favorite Star Trek captain:
<select name="startrek">
  <option value="kirk">James T. Kirk</option>
  <option value="picard">Jean-Luc Picard</option>
</select> <br />
```

HTML



output

- `value` attribute controls what will be submitted if a control is selected
- `[cc] => visa, [startrek] => picard`

URL-encoding (6.3.1)

- certain characters are not allowed in URL query parameters:
  - examples: `" "`, `"/"`, `"="`, `"&"`
- when passing a parameter that contains one of these, it is **URL-encoded**
  - `"Marty's cool!?"` → `"Marty%27s+cool%3F%21"`
- you don't usually need to worry about this:
  - the browser automatically URL-encodes parameters before sending them
  - PHP scripts that accept query parameters automatically URL-decode them
  - ... but occasionally the weird encoded version does pop up
    (e.g. when debugging in Firebug)

Hidden input parameters (6.3.2)

```
<input type="text" name="username" /> Name <br />
<input type="text" name="sid" /> SID <br />
<input type="hidden" name="school" value="UW" />
<input type="hidden" name="quarter" value="48sp" />
```

HTML

Name
SID
Submit Query

output

- an invisible parameter that is still passed to the server when form is submitted
- useful for passing on additional state that isn't modified by the user

Submitting data to a web server

- though web browsers mostly retrieve data from servers, sometimes they also want to send new data onto the server
  - Hotmail: Send a message
  - Flickr: Upload a photo
  - Google Calendar: Create an appointment
- the data is sent in HTTP requests to the server
  - with HTML forms
  - with **Ajax** (seen later)
- the data is placed into the request as parameters

HTTP `GET` vs. `POST` requests (6.3.3)

- **`GET`** : asks a server for a page or data
  - if request has parameters, they are sent in the URL as a query string
- **`POST`** : submits data to a web server and retrieves the server's response
  - if request has parameters, they are embedded in the request packet, not the URL
- For submitting data, a `POST` request is more appropriate than a `GET`
  - `GET` requests embed their parameters in their URLs
  - URLs are limited in length (~ 1024 characters)
  - URLs cannot contain special characters without encoding
  - private data in a URL can be seen or modified by users

Form POST example

```
<form action="http://foo.com/app.php" method="post">
  <div>
    Name: <input type="text" name="name" /> <br />
    Food: <input type="text" name="meal" /> <br />
    <label>Meat? <input type="checkbox" name="meat" /></label> <br />
    <input type="submit" />
  <div>
</form>
```

HTML

Name:
Food:
Meat?
Submit Query

output

Uploading files (6.3.4)

```
<form action="http://webster.cs.washington.edu/params.php"
      method="post" enctype="multipart/form-data">
  Upload an image as your avatar:
  <input type="file" name="avatar" />
  <input type="submit" />
</form>
```

HTML

output

- add a file upload to your form as an `input` tag with `type` of `file`
- must also set the `enctype` attribute of the form

- it makes sense that the form's request method must be `post` (an entire file can't be put into a URL!)
- form's `enctype` (data encoding type) must be set to `multipart/form-data` or else the file will not arrive at the server

6.4: Processing Form Data in PHP

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"Superglobal" arrays (6.4.1)

- PHP **superglobal** arrays (global variables) contain information about the current request, server, etc.:

Array	Description
`$_GET`, `$_POST`	parameters passed to GET and POST requests
`$_REQUEST`	parameters passed to any type of request
`$_SERVER`, `$_ENV`	information about the web server
`$_FILES`	files uploaded with the web request
`$_SESSION`, `$_COOKIE`	"cookies" used to identify the user (seen later)

- These are special kinds of arrays called **associative arrays**.

Associative arrays (6.4.1)

```php
$blackbook = array();
$blackbook["marty"] = "206-685-2181";
$blackbook["stuart"] = "206-685-9138";
...
print "Marty's number is " . $blackbook["marty"] . ".\n";
```

- **associative array** (a.k.a. **map**, **dictionary**, **hash table**) : an array that uses non-integer indexes
- associates a particular index "key" with a value
  - key `"marty"` maps to value `"206-685-2181"`
- syntax for embedding an associative array element in interpreted string:

```php
print "Marty's number is {$blackbook['marty']}.\n";
```

Creating an associative array

```
$name = array();
$name["key"] = value;
...
$name["key"] = value;
```
PHP

```
$name = array(key => value, ..., key => value);
```
PHP

```
$blackbook = array("marty"  => "206-685-2181",
                   "stuart" => "206-685-9138",
                   "jenny"  => "206-867-5309");
```
PHP

- an associative array can be declared either initially empty, or with a set of predeclared key/value pairs

Printing an associative array

```
print_r($blackbook);
```
PHP

```
Array
(
    [jenny] => 206-867-5309
    [stuart] => 206-685-9138
    [marty] => 206-685-2181
)
```
output

- `print_r` function displays all keys/values in the array
- `var_dump` function is much like `print_r` but prints more info
- unlike `print`, these functions require parentheses

Associative array functions

```php
if (isset($blackbook["marty"])) {
  print "Marty's phone number is {$blackbook['marty']}\n";
} else {
  print "No phone number found for Marty Stepp.\n";
}
```

- isset, array_key_exists : whether the array contains value for given key
- array_keys, array_values : list of all keys or all values in the array
- asort, arsort : sorts by value, in normal or reverse order
- ksort, krsort : sorts by key, in normal or reverse order

foreach loop and associative arrays

```php
foreach ($blackbook as $key => $value) {
  print "$key's phone number is $value\n";
}
```

```
jenny's phone number is 206-867-5309
stuart's phone number is 206-685-9138
marty's phone number is 206-685-2181
```

- both the key and the value are given a variable name
- the elements will be processed in the order they were added to the array

Query parameters: $_REQUEST (6.4.2)

```php
$user_name = $_REQUEST["username"];
$student_id = (int) $_REQUEST["sid"];
$eats_meat = FALSE;
if (isset($_REQUEST["meat")) {
  $eats_meat = TRUE;
}
```

- `$_REQUEST["`*parameter name*`"]` returns param's value as a string
- if no such parameter was passed, you'll get a warning when trying to access it; test for this with `isset`

Form response pages

```php
<?php
$name = $_REQUEST["name"];
$email = $_REQUEST["emailaddress"];
...
print("Thank you, $name, for creating
an account with address $email.\n");
?>
```

```output
Thank you, Marty, for creating an account with address foo@bar.com.
```

- users expect an HTML response page when they submit forms
- the above code is not a complete page...

Embedded PHP and response pages

```php
<?php
$name = $_REQUEST["name"];
$email = $_REQUEST["emailaddress"];
?>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.1//EN"
 "http://www.w3.org/TR/xhtml11/DTD/xhtml11.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head><title>Account Creation</title></head>
  <body>
    <h1>New account created.</h1>
    <p>
      Thank you, <?= $name ?>, for creating an
      account with address <?= $email ?>.
    </p>
  </body>
</html>
```
PHP

- expression blocks get rid of `print` statement in previous example

Example: Exponents

```php
<?php
$base = $_REQUEST["base"];
$exp = $_REQUEST["exponent"];
$result = pow($base, $exp);
?>

<?= $base ?> ^ <?= $exp ?> = <?= $result ?>
```
PHP

```
http://example.com/exponent.php?base=3&exponent=4
```

```
3 ^ 4 = 81
```
output

Example: Print all parameters

```php
<?php
foreach ($_REQUEST as $param => $value) {
  ?>

  <p>Parameter <?= $param ?> has value <?= $value ?></p>

  <?php
}
?>
```

PHP

```
http://example.com/print_params.php?name=Marty+Stepp&sid=1234567
```

Parameter name has value Marty Stepp

Parameter sid has value 1234567

output

GET or POST?

```php
if ($_SERVER["REQUEST_METHOD"] == "GET") {
  # process a GET request
  ...
} elseif ($_SERVER["REQUEST_METHOD"] == "POST") {
  # process a POST request
  ...
}
```

PHP

- some PHP web services process both GET and POST requests
- can find out which kind of request we are currently processing by looking at the "REQUEST_METHOD" key of the global $_SERVER array

Processing an uploaded file in PHP (6.4.3)

- uploaded files are placed into global array `$_FILES`, not `$_REQUEST`
- each element of `$_FILES` is itself an associative array, containing:
  - `name` - the local filename that the user uploaded
  - `type` - the MIME type of data that was uploaded, such as `image/jpeg`
  - `size` - file's size in bytes
  - `tmp_name` - a filename where PHP has temporarily saved the uploaded file
    - to permanently store the file, move it from this location into some other file

Uploading details

```
<input type="file" name="avatar" />
```
HTML

output

- example: if you upload `borat.jpg` as a parameter named `avatar`,
  - `$_FILES["avatar"]["name"]` will be `"borat.jpg"`
  - `$_FILES["avatar"]["type"]` will be `"image/jpeg"`
  - `$_FILES["avatar"]["tmp_name"]` will be something like `"/var/tmp/phpZtR4TI"`

Processing uploaded file, example

```php
$username = $_REQUEST["username"];
if (is_uploaded_file($_FILES["avatar"]["tmp_name"])) {
  move_uploaded_file($_FILES["avatar"]["tmp_name"], "$username/avatar.jpg");
  print "Saved uploaded file as $username/avatar.jpg\n";
} else {
  print "Error: required file not uploaded";
}
```

- functions for dealing with uploaded files:
  - `is_uploaded_file(`*filename*`)`
    returns `TRUE` if the given filename was uploaded by the user
  - `move_uploaded_file(`*from*`, `*to*`)`
    moves from a temporary file location to a more permanent file
- proper idiom: check `is_uploaded_file`, then do `move_uploaded_file`