Web

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PHP

(Submitting & Processing Form Data, Form Validation, Databases & PHP)

Problems with submitting data

```
<form action="http://localhost/test1.php" method="get">
<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 />
</form>
```

HTML

- the form may look correct, but when you submit it...
- `[cc] => on, [startrek] => Jean-Luc Picard`
- How can we resolve this conflict?

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>
<input type="submit" value="submit" />
</select> <br />
```

HTML

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

URL-encoding

- certain characters are not allowed in URL query parameters:
  - examples: " ", "/", "=", "&"
- when passing a parameter, it is URL-encoded
  - “Xenia's cool!?" → “Xenia%27s+cool%3F%21"
- you don't usually need to worry about this:
  - the browser automatically encodes parameters before sending them
  - the PHP $_REQUEST array automatically decodes them
  - ... but occasionally the encoded version does pop up (e.g. in Firebug)

Submitting data to a web server

- though browsers mostly retrieve data, sometimes you want to submit data to a 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

- **GET** : asks a server for a page or data
  - if the 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 the request has parameters, they are embedded in the request's HTTP packet, not the URL

HTTP **GET** vs. **POST** requests

- 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://localhost/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

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 pages process both GET and POST requests
- to find out which kind of request we are currently processing, look at the global `$_SERVER` array's "`REQUEST_METHOD`" element

Uploading files

```
<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

- 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
- The content type "multipart/form-data" should be used for submitting forms that contain files, non-ASCII data, and binary data.

"Superglobal" arrays

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

- PHP superglobal arrays contain information about the current request, server, etc.
- These are special kinds of arrays called associative arrays.

Associative arrays

```
$blackbook = array();
$blackbook[“folan”] = "206-685-2181";
$blackbook[“elfolani”] = "206-685-9138";
...
print “Xenia's number is " . $blackbook[“xenia"] . ".\n";
```
PHP

- associative array (a.k.a. map, dictionary, hash table) : uses non-integer indexes
- associates a particular index "key" with a value
  - key “folan" maps to value "206-685-2181“
- PHP file needs to be in C:\xampp\htdocs\

Processing an uploaded file in PHP

- 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 files

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

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

```
Array
(
    [file1] => Array
        (
            [name] => MyFile.txt (comes from the browser, so
treat as tainted)
            [type] => text/plain  (not sure where it gets this
from - assume the browser, so treat as tainted)
            [tmp_name] => /tmp/php/php1h4j1o (could be anywhere
on your system, depending on your config settings, but the user
has no control, so this isn't tainted)
            [error] => UPLOAD_ERR_OK  (= 0)
            [size] => 123   (the size in bytes)
        )
   [file2] => Array
        (
            [name] => MyFile.jpg
            [type] => image/jpeg
            [tmp_name] => /tmp/php/php6hst32
            [error] => UPLOAD_ERR_OK
            [size] => 98174
        )
)
```

PHP

Processing uploaded file example

```
$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";
}
```
PHP

- 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
- We had to create the directory C:\xampp\htdocs\folan to upload the file

Including files: `include`

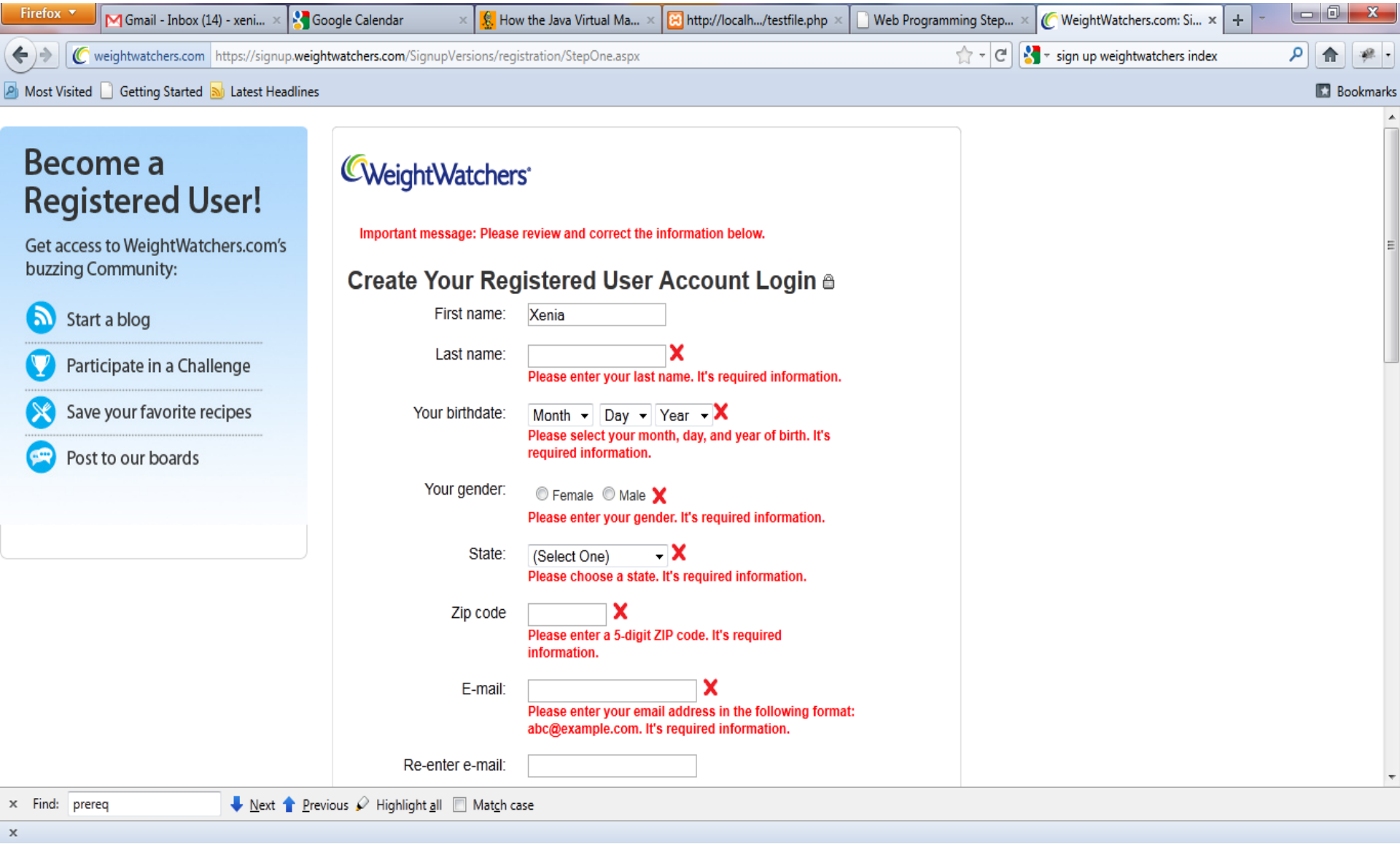
```php
include("header.php");
```

- inserts the entire contents of the given file into the PHP script's output page
- encourages modularity
- useful for defining reused functions needed by multiple pages

What is form validation?

- **validation:** ensuring that form's values are correct
- some types of validation:
  - preventing blank values (email address)
  - ensuring the type of values
    - integer, real number, currency, phone number, Social Security number, postal
  - address, email address, date, credit card number, ...
  - ensuring the format and range of values (ZIP code must be a 5-digit integer)
  - ensuring that values fit together (user types email twice, and the two must match)

A real Form that uses validation



Client vs. server-side validation

- Validation can be performed:
  - **client-side** (before the form is submitted)
    - can lead to a better user experience, but not secure
  - **server-side** (in PHP code, after the form is submitted)
    - needed for truly secure validation, but slower
  - both
  - best mix of convenience and security, but requires most effort to program

An example form to be validated

```
<form action="http://foo.com/foo.php" method="get">
	<div>
		City: <input name="city" /> <br />
		State: <input name="state" size="2" maxlength="2"
			/> <br />
		ZIP: <input name="zip" size="5" maxlength="5" />
			<br />
		<input type="submit" />
	</div>
</form>
```

HTML

- Let's validate this form's data on the server...

Basic server-side validation code

```
$city = $_REQUEST["city"];
$state = $_REQUEST["state"];
$zip = $_REQUEST["zip"];
if (!$city || strlen($state) != 2 || strlen($zip) !=
5) {
      ?>
      <h2>Error, invalid city/state submitted.</h2>
      <?php
   }
     ?>
```

PHP

- basic idea: examine parameter values, and if they are bad, show an error message and abort

Basic server-side validation code

- validation code can take a lot of time / lines to write
  - How do you test for integers vs. real numbers vs. strings?
  - How do you test for a valid credit card number?
  - How do you test that a person's name has a middle initial?
  - How do you test whether a given string matches a particular complex format?

Regular expressions

```
[a-z]at              #cat, rat, bat…
[aeiou]
[a-zA-Z]
[^a-z]               #not a-z
[[:alnum:]]+         #at least one alphanumeric char
(very) *large        #large, very very very large…
(very){1, 3}               #counting “very” up to 3
^bob                 #bob at the beginning
com$                 #com at the end
```

PHPRegExp

- Regular expression: a pattern in a piece of text
- PHP has:
  - POSIX
  - Perl regular expressions

Delimiters

```
/[a-z]/at           #cat, rat, bat…
#[aeiou]#
/[a-zA-Z]/
~[^a-z]~            #not a-z
/[[:alnum:]]+/      #at least one alphanumeric char
#(very) *#large     #large, very very very large…
~(very){1, 3}~            #counting “very” up to 3
/^bob/                    #bob at the beginning
/com$/                    #com at the end

/http:\/\
// #http://#              #better readability
                                          PHPRegExp
```

- Used for Perl regular expressions (preg)

Basic Regular Expression

```
/abc/
```

- in PHP, **regexes** are strings that begin and end with /
- the simplest regexes simply match a particular substring
- the above regular expression matches any string containing "abc":
  - YES: "abc", "abcdef", "defabc", ".=.abc.=.", ...
  - NO: "fedcba", "ab c", "PHP", ...

Wildcards

- A dot . matches any character except a \n line break
  - "/.oo.y/" matches "Doocy", "goofy", "LooNy", ...
- A trailing i at the end of a regex (after the closing /) signifies a case-insensitive match
  - "/xen/i" matches “Xenia", “xenophobic", “Xena the warrior princess", “XEN technologies” ...

Special characters: |, (), ^, \

- | means *OR*
  - "/abc|def|g/" matches "abc", "def", or "g"
  - There's no *AND* symbol. Why not?
- () are for grouping
  - "/(Homer|Marge) Simpson/" matches "Homer Simpson" or "Marge Simpson"
- ^ matches the beginning of a line; $ the end
  - "/^<!--$/" matches a line that consists entirely of "<!--"

Special characters: |, (), ^, \

- \ starts an escape sequence
  - many characters must be escaped to match them literally: / \ $. [ ] ( ) ^ * + ?
  - "/<br \/>/" matches lines containing
 tags

Quantifiers: *, +, ?

- * means 0 or more occurrences
  - "/abc*/" matches "ab", "abc", "abcc", "abccc", ...
  - "/a(bc)*/" matches "a", "abc", "abcbc", "abcbcbc", ...
  - "/a.*a/" matches "aa", "aba", "a8qa", "a!?_a", ...
- + means 1 or more occurrences
  - "/a(bc)+/" matches "abc", "abcbc", "abcbcbc", ...
  - "/Goo+gle/" matches "Google", "Gooogle", "Goooogle", ...
- ? means 0 or 1 occurrences
  - "/a(bc)?/" matches "a" or "abc"

More quantifiers: {min,max}

- {min,max} means between min and max occurrences (inclusive)
  - "/a(bc){2,4}/" matches "abcbc", "abcbcbc", or "abcbcbcbc"
- min or max may be omitted to specify any number
  - {2,} means 2 or more
  - {,6} means up to 6
  - {3} means exactly 3

Character sets: []

- [] group characters into a character set; will match any single character from the set
  - "/[bcd]art/" matches strings containing "bart", "cart", and "dart"
  - equivalent to "/(b|c|d)art/" but shorter
- inside [], many of the modifier keys act as normal characters
  - "/what[!*?]*/" matches "what", "what!", "what?**!", "what??!",
- What regular expression matches DNA (strings of A, C, G, or T)?
  - "/[ACGT]+/"

Character ranges: [start-end]

- inside a character set, specify a range of characters with -
  - "/[a-z]/" matches any lowercase letter
  - "/[a-zA-Z0-9]/" matches any lower- or uppercase letter or digit
- an initial ^ inside a character set negates it
  - "/[^abcd]/" matches any character other than a, b, c, or d

Character ranges: [start-end]

- inside a character set, - must be escaped to be matched
  - "/[+\-]?[0-9]+/" matches an optional + or -, followed by at least one digit
- What regular expression matches letter grades such as A, B+, or D- ?
  - "/[ABCDF][+\-]?/"

Escape sequences

- special escape sequence character sets:
  - \d matches any digit (same as [0-9]); \D any non-digit ([^0-9])
  - \w matches any “word character” (same as [a-zA-Z_0-9]); \W any non-word
- char
  - \s matches any whitespace character (, \t, \n, etc.); \S any non-whitespace
- What regular expression matches dollar amounts of at least $100.00 ?
  - "/\$\d{3,}\.\d{2}/"

Regular expressions in PHP

- regex syntax: strings that begin and end with /, such as "/[AEIOU]+/"

function	description
preg_match(regex, string)	returns TRUE if string matches regex
preg_replace(regex, replacement, string)	returns a new string with all substrings that match regex replaced by replacement
preg_split(regex, string)	returns an array of strings from given string broken apart using the given regex as the delimiter (similar to explode but more powerful)

PHP form validation w/ regexes

```
$state = $_REQUEST["state"];
if (!preg_match("/[A-Z]{2}/", $state)) {
?>
<h2>Error, invalid state submitted.</h2>
<?php
}
```

PHP

- using preg_match and well-chosen regexes allows you to quickly validate query parameters against complex patterns

Some PHP MySQL functions

name	description
`mysql_connect`	connects to a database server
`mysql_select_db`	chooses which database on server to use (similar to SQL `USE` ***database;*** command)
`mysql_query`	performs a SQL query on the database
`mysql_real_escape_string`	encodes a value to make it safe for use in a query
`mysql_fetch_array`, ...	returns the query's next result row as an associative array
`mysql_close`	closes a connection to a database

Connecting to MySQL: mysql_connect

```php
mysql_connect("host", "username", "password");
mysql_select_db("database name");
```

```php
# connect to world database on local computer
mysql_connect("localhost", "traveler", "packmybags");
mysql_select_db("world");
```

- mysql_connect opens connection to database on its server
  - any/all of the 3 parameters can be omitted (default: localhost, anonymous)
- mysql_select_db sets which database to examine

Performing queries: mysql_query

```php
mysql_connect("host", "username", "password");
mysql_select_db("database name");

$results = mysql_query("SQL query");
...
```

```php
$results = mysql_query("SELECT * FROM cities WHERE code = 'USA'
                        AND population >= 2000000;");
```

- mysql_query sends a SQL query to the database
- returns a special result-set object that you don't interact with directly, but instead pass to later functions
- SQL queries are in " ", end with ;, and nested quotes can be ' or \"

Result rows: mysql_fetch_array

```php
mysql_connect("host", "username", "password");
mysql_select_db("database name");
$results = mysql_query("SQL query");

while ($row = mysql_fetch_array($results)) {
  do something with $row;
}
```

- mysql_fetch_array returns one result row as an associative array
  - the column names are its keys, and each column's values are its values
  - example: $row["population"] gives the population from that row of the results

Error-checking: mysql_error

```php
if (!mysql_connect("localhost", "traveler", "packmybags")) {
  die("SQL error occurred on connect: " . mysql_error());
}
if (!mysql_select_db("world")) {
  die("SQL error occurred selecting DB: " . mysql_error());
}
$query = "SELECT * FROM countries WHERE population > 100000000;";
$results = mysql_query($query);
if (!$results) {
  die("SQL query failed:\n$query\n" . mysql_error());
}
```

- SQL commands can fail: database down, bad password, bad query, ...
- for debugging, always test the results of PHP's mysql functions
  - if they fail, stop script with die function, and print mysql_error result to see what failed
  - give a descriptive error message and also print the query, if any

Example with error checking#

```
# connect to world database on local computer
check(mysql_connect("localhost", "traveler", "packmybags"), "connect");
check(mysql_select_db("world"), "selecting db");

# execute a SQL query on the database
$query = "SELECT * FROM countries WHERE population > 100000000;";
$results = mysql_query($query);
check($results, "query of $query");

# loop through each country
while ($row = mysql_fetch_array($results)) {
  ?>
  <li> <?= $row["name"] ?>, ruled by <?= $row["head_of_state"] ?> </li>
  <?php
}

# makes sure result is not false/null; else prints error
function check($result, $message) {
  if (!$result) {
    die("SQL error during $message: " . mysql_error());
  }
}
?>
```