COMP284 Scripting Languages
Lecture 9: PHP (Part 1)
Handouts

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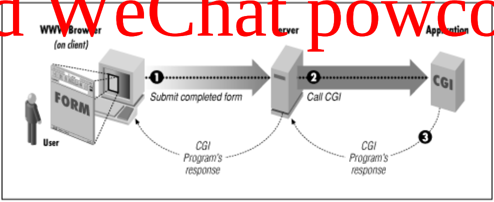
Contents

Common Gateway Interface — CGI

The Common Gateway Interface (CGI) is a standard method for web servers to use external applications, a CGI program, to dynamically generate web pages

1. A web client generates a client request, for example, from a HTML form, and sends it to a web server
2. The web server selects a CGI program to handle the request, converts the client request to a CGI request, executes the program
3. The CGI program then processes the CGI request and the server passes the program's response back to the client



Disadvantages of CGI/Perl

- A distinction is made between static web pages and dynamic web pages created by an external program
- Using Perl scripting it is difficult to add 'a little bit' of dynamic content to a web page
  – can be alleviated to some extent by using here documents
- Use of an external program requires
  - starting a separate process every time an external program is requested
  - exchanging data between web server and external program

  ⇝ resource-intensive

If our main interest is the creation of dynamic web pages, then the scripting language we use

- should integrate well with HTML
- should not require a web server to execute an external program

PHP

- PHP is (now) a recursive acronym for PHP: Hypertext Preprocessor
- Development started in 1994 by Rasmus Lerdorf
- Originally designed as a tool for tracking visitors at Lerdorf's website
- Developed into full-featured, scripting language for server-side web programming
- Inherits a lot of the syntax and features from Perl
- Easy-to-use interface to databases
- Free, open-source
- Probably the most widely used server-side web programming language
- Negatives: Inconsistent, muddled API; no scalar objects

The departmental web server uses PHP 5.6.25 (released August 2014)
PHP 7 was released in December 2015 (PHP 6 was never released)

PHP processing

- Server plug-ins exist for various web servers
  ⇝ avoids the need to execute an external program
- PHP code is embedded into HTML pages using tags
  ⇝ static web pages can easily be turned into dynamic ones

PHP satisfies the criteria we had for a good web scripting language

Processing proceeds as follows:

1. The web server receives a client request
2. The web server recognizes that the client request is for a HTML page containing PHP code
3. The server executes the PHP code, substitutes output into the HTML page, the resulting page is then send to the client

As in the case of Perl, the client never sees the PHP code, only the HTML web page that is produced

PHP: Applications

- Applications written using PHP
  - activeCollab – Project Collaboration Software
    `http://www.activecollab.com/`
  - Drupal – Content Management System (CMS)
    `http://drupal.org/home`
  - Magento – eCommerce platform
    `http://www.magentocommerce.com/`
  - MediaWiki – Wiki software
    `http://www.mediawiki.org/wiki/MediaWiki`
  - Moodle – Virtual Learning Environment (VLE)
    `http://moodle.org/`
  - Sugar – Customer Relationship Management (CRM) platform
    `http://www.sugarcrm.com/crm/`
  - WordPress – Blogging tool and CMS
    `http://wordpress.org/`

PHP: Websites

- Websites using PHP:
  - Delicious – social bookmarking
    `http://delicious.com/`
  - Digg – social news website
    `http://digg.com`
  - Facebook – social networking
    `http://www.facebook.com`
  - Flickr – photo sharing
    `http://www.flickr.com`
  - Friendster – social gaming
    `http://www.friendster.com`
  - SourceForge – web-based source code repository
    `http://sourceforge.net/`
  - Wikipedia – collaboratively built encyclopedia
    `http://www.wikipedia.org`

Recommended texts

- R. Nixon:
  Learning PHP, MySQL, and JavaScript.
  O'Reilly, 2009.

  Harold Cohen Library: 518.561.N73 or e-book
  (or later editions of this book)

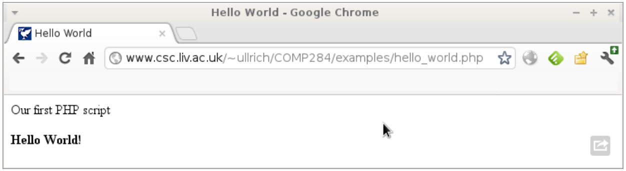
- M. Achour, F. Betz, A. Dovgal, N. Lopes,
  H. Magnusson, G. Richter, D. Seguy, J. Vrana, et al.:
  PHP Manual.
  PHP Documentation Group, 2018.

  `http://www.php.net/manual/en/index.php`

PHP: Hello World!

```
<html>
<head><title>Hello World</title></head>
<body>
<p>Our first PHP script</p>
<?php
  print ("<p><b>Hello␣World!</b></p>\n");
?>
</body></html>
```

- PHP code is enclosed between `<?php` and `?>`
- File must be stored in a directory accessible by the web server, for example `$HOME/public_html`, and be readable by the web server
- File name must have the extension `.php`, e.g. `hello_world.php`


Hello World - Google Chrome
Hello World
www.csc.liv.ac.uk/~ullrich/COMP284/examples/hello_world.php

Our first PHP script

Hello World!

PHP: Hello World!

Since version 4.3.0, PHP also has a command line interface

```
#!/usr/bin/php
<?php
  /* Author: Ullrich Hustadt
      A "Hello World" PHP script. */
  print ("Hello␣World!\n");
  // A single-line comment
?>
```

- PHP code still needs to be enclosed between `<?php` and `?>`
- Code must be stored in an executable file
- File name does not need to have any particular format

⇝ PHP can be used as scripting language outside a web programming context

Output:

```
Hello World!
```

PHP: Hello World!

```
<html>
<head><title>Hello World</title></head>
<body><p>Our first PHP script</p>
<?php
  print("<p><b>Hello␣World!</b></p>\n");
?>
</body></html>
```

- Can also 'executed' using

```
php filename
```

- File does not need to exectuable, only readable for the user

Output:

```
<html>
<head><title>Hello World</title></head>
<body><p>Our first PHP script</p>
<p><b>Hello World!</b></p>
</body></html>
```

PHP scripts

- PHP scripts are typically embedded into HTML documents and are enclosed between `<?php` and `?>` tags
- A PHP script consists of one or more statements and comments
  ⇝ there is no need for a main function (or classes)
  - Statements end in a semi-colon
  - Whitespace before and in between statements is irrelevant
    (This does *not* mean its irrelevant to someone reading your code)
  - One-line comments start with // or # and run to the end of the line or ?>
  - Multi-line comments are enclosed in /* and */

Types

PHP has eight primitive types

- Four scalar types:
  - bool – booleans
  - int – integers
  - float – floating-point numbers
  - string – strings
- Two compound types:
  - array – arrays
  - object – objects
- Two special types:
  - resource
  - NULL

- Integers, floating-point numbers, and strings do not differ significantly from the corresponding Perl scalars, including the pecularities of single-quoted versus double-quoted strings
- In contrast to Perl, PHP does distinguish between different types including between the four scalar types

Variables

- All PHP variable names start with $ followed by a PHP identifier
- A PHP identifier consists of letters, digits, and underscores, but cannot start with a digit
  PHP identifiers are case sensitive
- In PHP, a variable does not have to be declared before it can be used
- A variable also does not have to be initialised before it can be used, although initialisation is a good idea
- Uninitialized variables have a default value of their type depending on the context in which they are used

Type	Default	Type	Default
`bool`	FALSE	`string`	empty string
`int`/`float`	0	`array`	empty array

If there is no context, then the default value is `NULL`

Assignments

- Just like Java and Perl, PHP uses the equality sign = for assignments

```
$student_id = 200846369;
```

As in Perl, this is an assignment expression

- The value of an assignment expression is the value assigned

```
$b = ($a = 0) + 1;
// $a has value 0
// $b has value 1
```

Binary assignments

PHP also supports the standard binary assignment operators:

Binary assignment	Equivalent assignment
$a += $b	$a = $a + $b
$a -= $b	$a = $a - $b
$a *= $b	$a = $a * $b
$a /= $b	$a = $a / $b
$a %= $b	$a = $a % $b
$a **= $b	$a = $a ** $b
$a .= $b	$a = $a . $b

Example:

```
// Convert Fahrenheit to Celsius:
// Subtract 32, then multiply by 5, then divide by 9
$temperature = 105;               // temperature in Fahrenheit
$temperature -= 32;
$temperature *= 5/9;              // converted to Celsius
```

Constants

- `bool define(string, expr [, case_insensitive])`
  - defines a constant that is globally accessible within a script
  - *string* should be a string consisting of a PHP identifier (preferably all upper-case)
    The PHP identifier is the name of the constant
  - *expr* is an expression that should evaluate to a scalar value
  - *case_insensitive* is an optional boolean argument, indicating whether the name of the constant is case-insensitive (default is FALSE)
  - returns TRUE on success or FALSE on failure

```
define("PI",3.14159);
define("SPEED_OF_LIGHT",299792458,true);
```

Constants

- To use a constant we simply use its name

```
define("PI",3.14159);
define("SPEED_OF_LIGHT",299792458,true);
$circumfence = PI * $diameter;
$distance     = speed_of_light * $time;
```

- Caveat: PHP does not resolve constants within double-quoted strings (or here documents)

```
print "1 - Value of PI: PI\n";
print "2 - Value of PI: ".PI."\n";
```

```
1 - Value of PI: PI
2 - Value of PI: 3.14159
```

Values, Variables and Types

PHP provides several functions that explore the type of an expression:

string gettype(*expr*)	returns the type of *expr* as string
bool is_*type*(*expr*)	checks whether *expr* is of type *type*
void var_dump(*expr*)	displays structured information about *expr* that includes its type and value

```
<?php print "Type of 23:   ".gettype(23)."\n";
      print "Type of 23.0: ".gettype(23.0)."\n";
      print "Type of \"23\": ".gettype("23")."\n";

      if (is_int(23)) { echo "23 is an integer\n"; }
        else { echo "23 is not an integer\n"; }
?>
```

```
Type of 23:   integer
Type of 23.0: double
Type of "23": string
23 is an integer
```

Type juggling and Type casting

- PHP automatically converts a value to the appropriate type as required by the operation applied to the value (type juggling)

```
2 . "␣worlds"           ⇝  "2␣worlds"
"2" * 3                 ⇝  6
"1.23e2" + 0            ⇝  123
"hello" * 3             ⇝  0
"10hello5" + 5          ⇝  15
```

- PHP also supports explicit type casting via (*type*)

```
(int) "12"              ⇝  12   | (bool) "0"          ⇝  FALSE
(int) "1.23e2"          ⇝  1    | (bool) "foo"        ⇝  TRUE
(int) ("1.23e2" + 0)    ⇝  123  | (float) "1.23e2"    ⇝  123
(int) "10hello5"        ⇝  10   |
(int) 10.5              ⇝  10   |
(array) "foo"           ⇝  array(0 => "foo")
```

Comparison operators

Type juggling also plays a role in the way PHP comparison operators work:

expr1 == *expr2*	Equal	TRUE iff *expr1* is equal to *expr2* after type juggling
expr1 != *expr2*	Not equal	TRUE iff *expr1* is not equal to *expr2* after type juggling
expr1 <> *expr2*	Not equal	TRUE iff *expr1* is not equal to *expr2* after type juggling
expr1 === *expr2*	Identical	TRUE iff *expr1* is equal to *expr2*, and they are of the same type
expr1 !== *expr2*	Not identical	TRUE iff *expr1* is not equal to *expr2*, or they are not of the same type

Note: For ==, !=, and <>, numerical strings are converted to numbers and compared numerically

```
"123" == 123           ⤳  TRUE     | "123" === 123           ⤳  FALSE
"123" != 123           ⤳  FALSE    | "123" !== 123           ⤳  TRUE
"1.23e2" == 123        ⤳  TRUE     | 1.23e2 === 123          ⤳  FALSE
"1.23e2" == "12.3e1"   ⤳  TRUE     | "1.23e2" === "12.3e1"   ⤳  FALSE
5 == TRUE              ⤳  TRUE     | 5 === TRUE              ⤳  FALSE
```

Comparison operators

Type juggling also plays a role in the way PHP comparison operators work:

expr1 < *expr2*	Less than	TRUE iff *expr1* is strictly less than *expr2* after type juggling
expr1 > *expr2*	Greater than	TRUE iff *expr1* is strictly greater than *expr2* after type juggling
expr1 <= *expr2*	Less than or equal to	TRUE iff *expr1* is less than or equal to *expr2* after type juggling
expr1 >= *expr2*	Greater than or equal to	TRUE iff *expr1* is greater than or equal to *expr2* after type juggling

```
'35.5' > 35          ⇝  TRUE     | '35.5' >= 35          ⇝  TRUE
'ABD' > 'ABC'        ⇝  TRUE     | 'ABD' >= 'ABC'        ⇝  TRUE
'1.23e2' > '12.3e1'  ⇝  FALSE    | '1.23e2' >= '12.3e1'  ⇝  TRUE
"F1" < "G0"          ⇝  TRUE     | "F1" <= "G0"          ⇝  TRUE
TRUE > FALSE         ⇝  TRUE     | TRUE >= FALSE         ⇝  TRUE
5 > TRUE             ⇝  FALSE    | 5 >= TRUE             ⇝  TRUE
```

Revision

Read

- Chapter 3: Introduction to PHP

of

R. Nixon:
Learning PHP, MySQL, and JavaScript.
O'Reilly, 2009.

Also read

- http://uk.php.net/manual/en/language.types.intro.php
- http://uk.php.net/manual/en/language.types.type-juggling.php
- http://uk.php.net/manual/en/language.operators.comparison.php
- http://uk.php.net/manual/en/types.comparisons.php