

Study Unit 9: SERVER-SIDE PROGRAMMING

Outline

- Server-Side Basics • Dynamic web page
- Introduction to PHP
- PHP Basic Syntax.

Learning Outcomes of Study Unit 9

Students will learn the basic concepts of web Static and Dynamic pages and server side languages. PHP Lifecycle.

Variables types, Arrays and loops and PHP syntax

1.1: Server-Side Basics • Dynamic web page

- Server-side programming

1.2: Introduction to PHP

- Lifecycle of PHP Web Request
- PHP code must be executed!

1.3 PHP Basic Syntax

- Comments, print/echo
- Variables, types, int/float, arithmetic operators

-
- bool, NULL
 - String, string functions, interpreted strings
 - Array, array functions
 - for, if/else, while, foreach
 - Math functions
 - PHP syntax template

Outline

- **1.1: Server-Side Basics**
- Introduction to PHP
- PHP Basic Syntax

URLs and Web Servers

<http://www.aw-bc.com:80/info/regesstepp/index.html>

~~~ ~~~~~  
protocol host port path

- Usually when you type a URL in your browser:
  - Your computer looks up the server's IP address using DNS
  - Your browser connects to that IP address and requests the given file
  - The web server software (e.g. Apache) grabs that file from the server's local file system, and sends back its content to you
- Some URLs actually specify **programs** that the web server should run, and then send their output back to you
- as the result: <http://php.net/manual/en/function.sqrt.php> • The above URL tells the server php.net to run the program `manual/en/function.sqrt.php` and send back its output

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# Dynamic Vs. Static

- Static Page

- Client/Consumer's viewpoint: a URL referring to an identical HTML file
- Server/Producer's viewpoint: a file stored within or sub-within the root folder of a Web Server
- It is an HTML...
- Can be displayed directly in a browser

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- Dynamic Page

- Client/Consumer's viewpoint: a URL referring to a dynamic HTML (may vary each time requested)
- Server/Producer's viewpoint: a program/script produces HTML
- It is **NOT an HTML**, but a program producing HTML(s)
- Can't be displayed directly in a browser

- Dynamic Web Page vs. Dynamic HTML ( DHTML )

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# Server-Side Web Programming



- Server-side pages are programs written by one of many web programming languages/frameworks
  - i.e. [PHP](#), [Java/JSP](#), [Ruby on Rails](#), [ASP.NET](#), [Python](#), [Perl](#)
- The web server contains software that allows it to run those programs and send back their output as responses to web requests
- Each language/framework has its pros and cons
  - We use PHP for server-side programming in this course

# Outline

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- Server-Side Basics
- **1.2: Introduction to PHP**
- PHP Basic Syntax

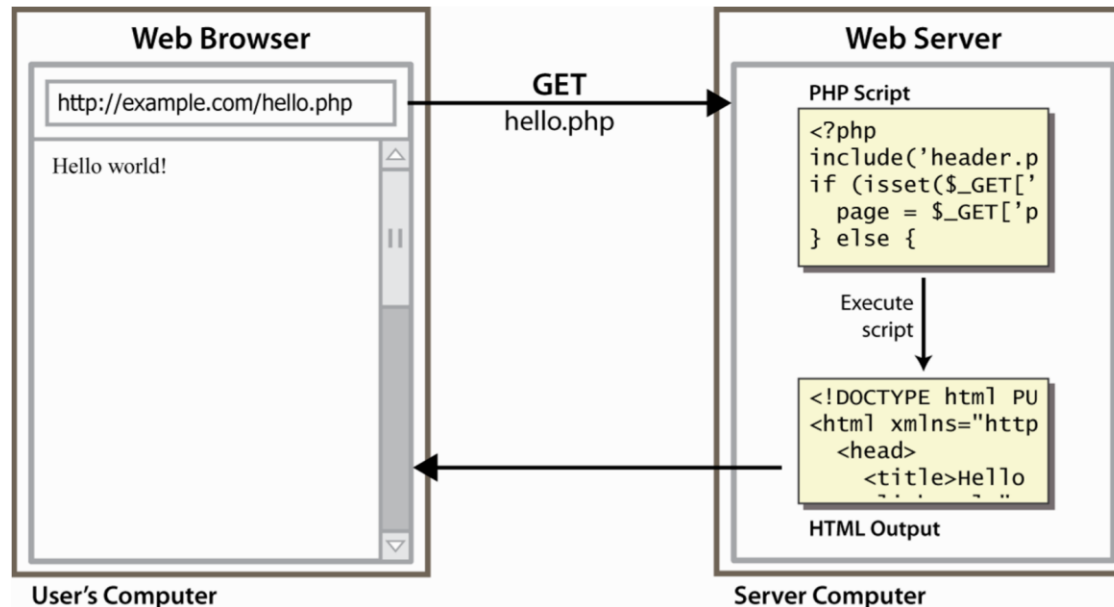
# What is PHP?

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- PHP stands for "PHP Hypertext Preprocessor" ● A server-side scripting language ● Used to make web pages dynamic:
  - Provide different contents depending on context ● Interface with other services: database, e-mail, etc.
  - Authenticate users
  - Process form information
- PHP code can be embedded in XHTML code



# Lifecycle of PHP Web Request



- Browser requests an HTML file (**static content**): server just sends that file
- Browser requests a PHP file (**dynamic content**): server reads it, runs any script code inside it, then sends result across the network
  - Script produces output as the response sent back

# Why PHP?

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- There are many other options for server-side languages: Ruby on Rails, JSP, ASP.NET, etc.
- Why choose PHP?
  - Free and open source: anyone can run a PHP enabled server free of charge
  - **Compatibility**: supported by most popular web servers
  - **Simplicity**: lots of built-in functionality; familiar syntax
  - **Availability**: already installed on most commercial web hosts

## Hello, World!

```
<?php  
print "Hello, world!";  
?>
```

PHP

Hello, world!

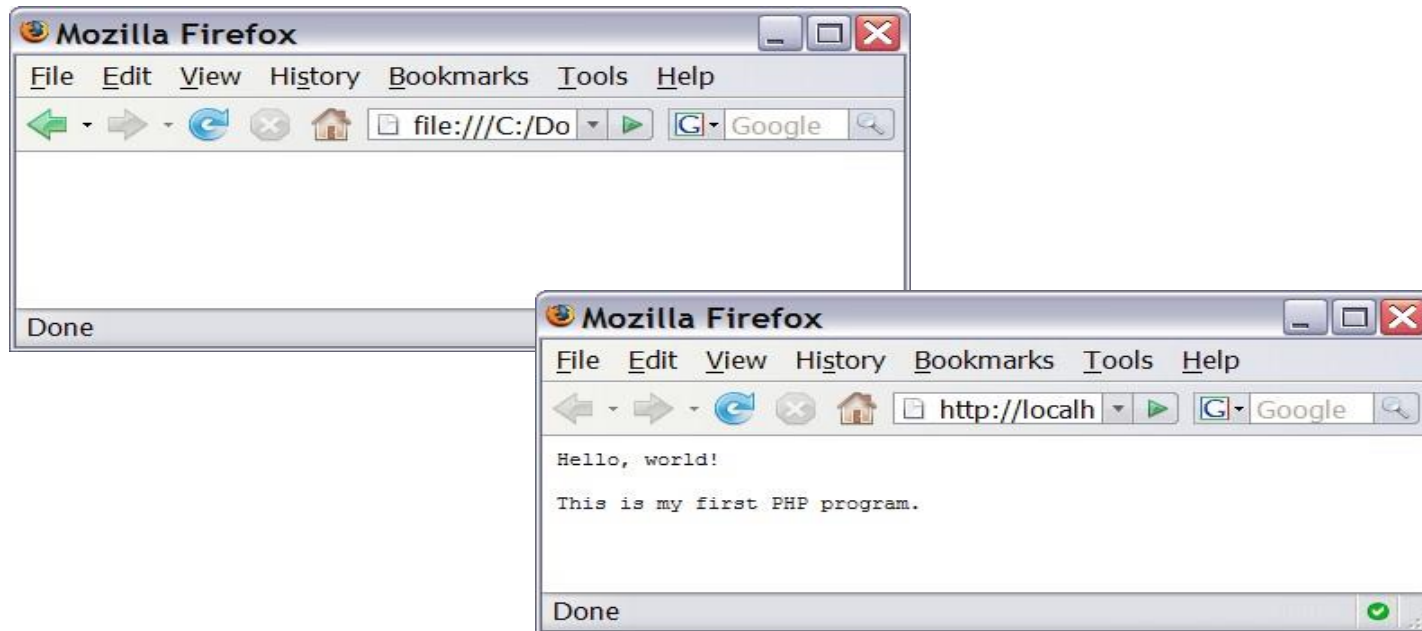
output

- A block or file of PHP code begins with **<?php** and ends with **?>**
- PHP statements, function declarations, etc. appear between these endpoints

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# Viewing PHP Output

- **Your PHP code must be run/executed first, before it reaches a browser!**



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# Outline

- Server-Side Basics
- Introduction to PHP
- **1.3: PHP Basic Syntax**

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# Comments

```
# single-line comment  
  
// single-line comment  
  
/*  
multi-line comment  
*/
```

PHP

- Like Java, but # is also allowed
  - A lot of PHP code use # comments instead of //

## Console Output: print

```
print "text"; PHP  
- print "Hello, World!\n";  
print "Escape \"chars\" are the SAME as in Java!\n";  
  
print "You can have  
line breaks in a string.";   
  
print 'A string can use "single-quotes". It\'s cool!'; PHP
```

Hello, World! Escape "chars" are the SAME as in Java! You can have line breaks in a string. A string can use "single-quotes". It's cool!

output

- Some PHP programmers use the equivalent **echo** instead of **print**

# Variables

```
$name = expression; PHP
```

```
$user_name = "PinkHeartLuvr78";  
$age = 16;  
$drinking_age = $age + 5;  
$this_class_rocks = TRUE; PHP
```

- Names are case sensitive; separate multiple words with
- Names always begin with **\$**, on both declaration and usage
- Always implicitly declared by assignment (**type is not written**)
- A weak-typing language (like JavaScript or Python)

# Types Web 2.0 Programming

- Basic types: int, float, boolean, string, array, object, NULL
  - Test what type a variable is with `is_type` functions, i.e. is string
    - gettype function returns a variable's type as a string (not often needed)
- PHP converts between types automatically in many cases:
  - string → int: auto-conversion on +
  - int → float: auto-conversion on /
- Explicit type-casting with *(type)*:
  - *\$age = (int) "21";*

## int and float Types

```
$a = 7 / 2;           # float: 3.5
$b = (int) $a;        # int: 3
$c = round($a);       # float: 4.0
$d = "123";           # string: "123"
$e = (int) $d;         # int: 123
```

PHP

- **int** for integers and **float** for reals
- Division between two **int** values can produce a **float**

## Arithmetic Operators

- **+ - \* / % . ++ --**  
**= += -= \*= /= %= . =**
- Many operators auto-convert types: **5 + "7"** is **12**

## bool (Boolean) Type

```
$feels_like_summer = FALSE;  
$php_is_rad = TRUE;  
  
$student_count = 217;  
$nonzero = (bool) $student_count;      # TRUE
```

*PHP*

- The following values are considered to be **FALSE** (all others are **TRUE**):
  - 0 and 0.0 (but NOT 0.00 or 0.000)
  - "", "0", and **NULL** ( includes unset variables )
  - arrays with 0 elements
- Can cast to boolean using (**bool**)
- **FALSE** is printed as an empty string (no output); **TRUE** is printed as a "1"

# NULL

```
$name = "Victoria";  
$name = NULL;  
if (isset($name)) {  
    print "This line isn't going to be reached.\n";  
}
```

PHP

- A variable is **NULL** if
  - It has not been set to any value (undefined variables)
  - It has been assigned the constant **NULL**
  - It has been deleted using the unset function
- Can test if a variable is **NULL** using the isset function
- **NULL** is printed as an empty string (no output)

## String Type

```
$favorite_food = "Ethiopian";  
print $favorite_food[2];           # h           PHP
```

- Zero-based indexing using bracket notation
- String concatenation operator is **.** (**period**), not **+**
  - `5 + "2 turtle doves" === 7`
  - `5 . "2 turtle doves" === "52 turtle doves"`
- Can be specified with `" "` or `' '`

## String Operations

```
# index 0123456789012345
$name = "Stefanie Hatcher";
$length = strlen($name);           # 16
$cmp = strcmp($name, "Brian Le");  # > 0
$index = strpos($name, "e");        # 2
$first = substr($name, 9, 5);       # "Hatch"
$name = strtoupper($name);          # "STEFANIE HATCHER"
```

| Name                                  | Java Equivalent          |
|---------------------------------------|--------------------------|
| <u>strlen</u>                         | length                   |
| <u>strpos</u>                         | indexOf                  |
| <u>substr</u>                         | substring                |
| <u>strtolower</u> , <u>strtoupper</u> | toLowerCase, toUpperCase |

|                                 |             |
|---------------------------------|-------------|
| <u>trim</u>                     | trim        |
| <u>explode</u> , <u>implode</u> | split, join |
| <u>strcmp</u>                   | compareTo   |

## Interpreted Strings

- Strings inside " " are interpreted, and variables inside a " " string will have their values inserted into the string

```
$age = 16;  
print "You are " . $age . " years old.\n";  
print "You are $age years old.\n";      # You are 16 years old. PHP
```

- Strings inside ' ' are *not* interpreted:

```
print 'You are $age years old.\n';      # You are $age years old.\n PHP
```

# Arrays

T

```
$name = array();           # create
$name = array(value0, value1, ..., valueN);

$name[index]              # get element value
$name[index] = value;     # set element value
$name[] = value;          # append PHP

$a = array();             # empty array (length 0)
$a[0] = 23;               # stores 23 at index 0 (length 1)
$a2 = array("some", "strings", "in", "an", "array");
$a2[] = "Ooh!";           # add string to end (at index 5) PHP
```

d, use bracket notation without specifying an index

- Element type is not specified; mixed types are allowed

# Array Functions

| Function Name(s)                                                | Description                     |
|-----------------------------------------------------------------|---------------------------------|
| <u>count</u>                                                    | number of elements in the array |
| <u>print_r</u>                                                  | print array's content           |
| <u>array_pop</u> , <u>array_push</u>                            | using array as a stack/queue    |
| <u>array_shift</u> , <u>array_unshift</u>                       |                                 |
| <u>in_array</u> , <u>array_search</u> , <u>array_reverse</u>    | searching and reordering        |
| <u>sort</u> , <u>rsort</u> , <u>shuffle</u>                     |                                 |
| <u>array_fill</u> , <u>array_merge</u> , <u>array_intersect</u> | creating, filling, filtering    |
| <u>array_diff</u> , <u>array_slice</u> , <u>range</u>           |                                 |
| <u>array_sum</u> , <u>array_product</u> , <u>array_unique</u>   | processing elements             |
| <u>array_filter</u> , <u>array_reduce</u>                       |                                 |

## Array Function Example

```

$tas = array("MD", "BH", "KK", "HM", "JP");
for ($i = 0; $i < count($tas); $i++) {
    $tas[$i] = strtolower($tas[$i]);
}
# ("md", "bh", "kk", "hm", "jp")
$morgan = array_shift($tas);
# ("bh", "kk", "hm", "jp")
array_pop($tas);
# ("bh", "kk", "hm")
array_push($tas, "ms");
# ("bh", "kk", "hm", "ms")
array_reverse($tas);
# ("ms", "hm", "kk", "bh")
sort($tas);
# ("bh", "hm", "kk", "ms")
$best = array_slice($tas, 1, 2);
# ("hm", "kk")

```

PHP

- The array in PHP acts as many other collections in Java
  - List, stack, queue, set, map, ...

## for Loop (same as C)

```

for (initialization; condition; update) {
    statements;
}

```

PHP

```

for ($i = 0; $i < 10; $i++) {
    print "$i squared is " . $i * $i . ".\n";
}

```

PHP

## if/else Statement

```
if (condition) {  
    statements;  
} elseif (condition) {  
    statements;  
} else {  
    statements;  
}
```

PHP

- NOTE: although **elseif** keyword is much more common, **else if** is also supported

## while Loop (same as C)

```
while (condition) {  
    statements;  
}
```

PHP

```
do {  
    statements;  
} while (condition);
```

PHP

- break and continue keywords also behave as in Java and C

## The foreach Loop

```
foreach ($array as $variableName) {  
    ...  
}
```

PHP

```
$stooges = array("Larry", "Moe", "Curly", "Shemp");  
for ($i = 0; $i < count($stooges); $i++) {  
    print "Moe slaps {$stooges[$i]}\n";  
}  
foreach ($stooges as $stooge) {  
    print "Moe slaps $stooge\n";    # even himself!  
}
```

PHP

- A convenient way to traverse each element of an array without indexes

## Math Operations

```
$a = 3;  
$b = 4;  
$c = sqrt(pow($a, 2) + pow($b, 2));
```

PHP

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

# PHP Syntax Template

*HTML content*

```
<?php  
    PHP code  
?>
```

*HTML content*

```
<?php  
    PHP code  
?>
```

*HTML content . . .*

*PHP*

- Any contents of a .php file between **<?php** and **?>** are executed as PHP code
- All other contents are printed as pure HTML
- Can switch back and forth between HTML and PHP "modes"

## Questions For Study Session 9

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Now that you have completed this study unit, you can assess how well you have achieved its Learning Outcomes by answering these questions. Write your answers in your Study Diary and discuss them with your Tutor at the next Study Support Meeting or Online interactive sessions. You can also check your answers at the Self-Review Answers section which is located at the end of this Module.

- |                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1: Draw a UML sequence diagram of interactions between a Web browser and a PHP Web server when the browser requests a PHP page on the server. |
| 2: Write a PHP code snippet to figure out the day of today.                                                                                   |

## Self-Review Answers (SRA) for Study Unit 9

1: Draw a UML sequence diagram of interactions between a Web browser and a PHP Web server when the browser requests a PHP page on the server.

See above slides

2: Write a PHP code snippet to figure out the day of today.

The PHP `date()` function formats a timestamp to a more readable date and time.

### Syntax

`date(format,timestamp)`

| Parameter | Description                                                           |
|-----------|-----------------------------------------------------------------------|
| format    | Required. Specifies the format of the timestamp                       |
| timestamp | Optional. Specifies a timestamp. Default is the current date and time |

|                                                                                                                                                                                                                                                                                                                        |                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <pre>&lt;!DOCTYPE html&gt; &lt;html&gt; &lt;body&gt; &lt;p&gt;Result is :&lt;/p&gt; &lt;?php echo "Today is " . date("Y/m/d") . "&lt;br&gt;"; echo "Today is " . date("Y.m.d") . "&lt;br&gt;"; echo "Today is " . date("Y-m-d") . "&lt;br&gt;"; echo "Today is " . date("l"); ?&gt;  &lt;/body&gt; &lt;/html&gt;</pre> | <p>Result is:<br/>Today is 2020/09/26<br/>Today is 2020.09.26<br/>Today is 2020-09-26<br/>Today is Saturday</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

## References and Additional Reading Materials

- PHP home page:
- W3Schools PHP tutorial: <https://www.w3schools.com/php/default.asp>
- Practical PHP Programming: <http://hudzilla.org/phpwiki/>
- <https://www.php.net/>