Working with Files and Processes in PHP

Files, Directories, Permissions

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Working with Files

Opening, Reading, and Writing

Opening a file

- Open a file and return the associated resource:

```
fopen($name, $mode, $use_include_path, $context)
```

- **$name** – the file to open
- **$mode** – the mode of file opening:
  - "w" – open for writing, clear all content
  - "r" – open for reading
  - "a" – open for writing, keep content, append
  - "x" – open new file for writing, if file exists – fail

Opening a file (2)

- All file modes can be used with a "+"
  - Open the file for both reading and writing
  - Examples: "r+", "w+", "a+", "x+"
- All file modes can be used with a "b" flag
  - Safe binary access
  - Used only on Windows-like systems which make difference between text files and binary files
  - Examples: "rb", "wb", "ab", "xb"

Opening a file (3)

- **$use_include_path** – optional
  - If true, the file will be searched in the PHP **include_path**
- **$context** – optional
  - Additional settings for writing streams
- Returns:
  - On success, a pointer to the file resource
  - On failure, **false**

```
// Example – open “text.txt” for reading, binary-safe
$file = fopen(“text.txt”, “rb”);
```

Reading from a file

- Read the specified number of characters from a file resource:

```
fread($resource, $length)
```

- **`$resource`** – a pointer to a file
  - The same type that `fopen()` returns
- **`$length`** – the number of bytes to read
  - 8192 (8 KB) by default
  - Reading stops when **`$length`** bytes have been read

Reading from a file (2)

- Returns:
  - On success, the read bytes (as string)
  - On failure, **`false`**
- Moves the internal file pointer by **`$length`** bytes

```
// Example – open “text.txt” for binary-safe reading
// and read the first 20 characters
$file = fopen(“text.txt”, “rb”);
if($file) {
    $contents = fread($file, 20);
    echo $contents;
}
```

Determining the file end

- `feof($file_pointer)`
  - Returns true if the internal file pointer has reached the end
- `filesize($filename)`
  - Returns the size of the file or `false` on error
  - Results of this function are cached!

```
// Example – print the entire file contents
$file = fopen(“text.txt”, “rb”);
while(!feof($file)) {
    echo fread($file, 32);
}
```

Writing to a file

- Write the specified string to a file:

```
fwrite($resource, $string, $length)
```

  - Works in a binary-safe manner

- **`$resource`** – a pointer to a file
- **`$string`** – the contents to write
- **`$length`** – optional
  - the number of bytes to write

Writing to a file (2)

- Returns:
  - On success, the number of bytes written
  - On failure, **`false`**
- Note that the file must be open in a proper mode for writing
  - Otherwise `fwrite()` will return **`false`**

```
// Example: clear a file and write “Hello World” to it
$file = fopen(“hello.txt”, “w”);
if($file) {
    fwrite($file, “Hello World”);
}
```

Closing a file

- Close a file, resource or a socket connection:

```
fclose($resource)
```

- **`$resource`** – a pointer to the resource to close
- Returns:
  - On success, **`true`**
  - On failure, **`false`**
- Clears all locks to the resource
- Changes made to a file may not be saved until it is closed

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Basic Operations on Files

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Reading entire file at once

- Read an entire stream:

```
stream_get_contents($resource)
```

- Read an entire file:

```
file_get_contents($filename, $file_include_path,
        $context, $offset, $max_length)
```

- **`$filename, $file_include_path, $context`**
  - Like fopen() parameters

Reading entire file at once (2)

- **`$offset`**
  - Specifies the start point of reading
- **`$max_length`**
  - Specifies the maximum number of bytes to read
- Returns:
  - On success, the read content as string
  - On error, **`false`**

```
// Example: display the contents of the file “text.txt”
echo file_get_contents(“text.txt”);
```

Writing a string at once

- Open a file, write the data, and close it:

```
file_put_contents($filename, $data, $flags, $context)
```

- **`$filename`, `$context`**
  - Like fopen() parameters
- **`$data`**
  - The string to write

Writing a string at once (2)

- **`$flags`** – one or more of the following:
  - `FILE_USE_INCLUDE_PATH`
  - `FILE_APPEND`
  - `LOCK_EX`
  - Combining flags – bitwise OR
- Returns:
  - On success, the number of bytes written
  - On failure, **`false`**

```
file_put_contents("hello.txt", "Hello World")
```

Accessing URL resources

- We can download files given as URLs with the same functions:

```
// Example: Read and display the contents of the SoftUni site
<?php
    $file = fopen("http://softuni.bg", "r");
    $content = "";
    while(!feof($file)) {
        $content .= fread($file, 512);
    }

    fclose($file);
    echo $content;
?>
```

More reading and writing

- PHP also has the C-style functions:
  - **`fscanf`**, **`fprintf`**
    - Read / write data parsed according to a format
  - **`fgets`**, **`fputs`**
    - Read / write entire line from / to file
  - **`fgetc`**, **`fputc`**
    - Read / write single character from / to file

More reading and writing (2)

- PHP also has the C-style functions:
  - `fseek`, `ftell`
    - Get / set the position of the internal file pointer
  - `rewind`
    - Set the file pointer at the beginning

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Advanced Operations on Files

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Directories

Working with the File System

Listing files in a directory

- List items in a directory according to a pattern:

```
glob($pattern, $flags)
```

- **$pattern**
  - Specified in a OS-dependent way
- **$flags** – some of the flags that apply are:
  - GLOB_ONLYDIR – list only directories
  - GLOB_NOSORT – return the items without sorting
  - GLOB_NOESCAPE – backslashes in pattern are not considered esaping characters

Listing files in a directory (2)

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- Returns
  - On success, an array representing the items in the directory
  - On failure, **`false`**

```
foreach(glob(“*.txt”) as $file) {
    echo $file . “: ” . filesize($file);
}
```

Listing files in a directory (3)

- A safer alternative to **`glob`** – **`opendir`** / **`readdir`** / **`closedir`**
  - **`glob`** may allow shell injection
- Open directory handle to be used in subsequent **`readdir()`** calls:

```
opendir($path, $context)
```

- Read next item in the directory:

```
readdir($dir_handle)
```

- Close the directory handle:

```
closedir($dir_handle)
```

Creating a directory

- Create a new directory:

```
mkdir($path, $mode, $recursive, $context)
```

- **$path**
  - The new directory path and name
- **$mode**
  - Specify the directory permissions (0777 by default)
  - Ignored on Windows
- **$recursive**
  - If true, create all subdirectories if they do not exist yet

File system functions

- Check if a file / directory exists:

```
mkdir($path, $mode, $recursive, $context)
```

- Copy file / directory

```
copy($source, $destination)
```

- Rename file / directory (also used for moving):

```
rename($old_name, $new_name)
```

- Delete file:

```
unlink($filename)
```

- Delete directory:

```
rmdir($dirname)
```

Names handling

- Given the full path, get only the file name portion (without the directory parts):

```
basename($filename)
```

- Given the full path, get only the directory parts (without the file name):

```
dirname($filename)
```

```
// Example: Show the file and directories of a given path
$path = “home/avatar/file.txt”;
echo basename($path); // temp.txt
echo dirname($path); // home/avatar
```

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Directories and File System

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Permissions

Reading, writing, and Executing Rights

Permissions

- Linux permissions are defined at three levels – owner, group, and others
  - Each folder / file has owner and group IDs
  - Read, write and execute rights are assigned for owner, group and other users separately
  - In binary the rights are presented as 3 by 3 bits
    - Usual decimal representation is set of 3 numbers from 0 to 7 (octal representation)
    - Example: 777 means full rights for everyone
    - Example: 760 means full rights for owner, read and write for group members, no access for the rest

Read permissions

- Return the group / owner ID of the file / directory:

```
filegroup($filename)
```

```
fileowner($filename)
```

- Get all permissions of the file / directory as an integer:

```
fileperms($filename)
```

  - Including system file type – socket, link, directory, pipe, etc.

Modify permissions

- Change the group / owner ID of the file / directory:

```
chgrp($filename, $group)
```

```
chown($filename, $user)
```

- Change the mode (permissions) of a file / directory:

```
chmod($filename, $mode)
```

  - **$mode** is specified as integer
  - To ensure proper work, **$mode** should be given in octal mode (e. g. 0755)

Simple permission checks

- Check if PHP can access a file for reading / writing:

```
is_readable($filename)
```

```
is_writeable($filename)
```

  - PHP scripts are usually executed with the apache user and interit its rights, but not always
  - These functions check if the user that executes the script has access to the specified file

Permissions

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Accessing External Processes

Executing external commands through PHP

External processes

- PHP can start and communicate with other processes
  - Can start a process, send to its input stream and read output / error data
  - The process inherits the permissions of the PHP / Apache process, unless otherwise specified
  - Common use is sending email or processing uploaded files

Execute a program

- Start a process and wait for it to finish:

```
exec($command, $output, $return)
```

- Returns the last line of output
- **`$output`** – optional
  - Array that receives all output data
- **`$return`** – optional
  - Gets the return code of the process

```
$list = array();
exec("ls -l /", $list);
```

Execute a program through the shell

- Execute a program through the shell:

```
shell_exec($command)
```

- Returns the entire output
- Like **exec**, waits for the program to finish

```
$lines = shell_exec("set");
foreach ($lines as $line) {
    if(preg_match("/BASH=(.*)/", $line, $chunk)) {
        echo $chunk[1];
    }
}
```

Starting processes and attaching pipes

- Pipes are streams – one program writes on one end, another reads at the other
  - FIFO (First In, First Out)
  - Each process has at least three pipes – input, output and error
    - Process reads from input, writes at output and error
  - PHP can start process and define handlers for its pipes
    - Can define more pipes if needed

Open a process

- Start a process with given pipe descriptors, working directory, and other details:

```
proc_open($command, $descriptors, $pipes, $dir, $environment, $other)
```

- **`$dir`** – optional
  - Sets the current directory for the process
- **`$environment`** – array, optional
  - Environment variables to be passed
- **`$other`**
  - Other options, mainly for Windows

Open a process (2)

- **`$descriptors`** – indexed array of arrays
  - 0 is input (stdin), 1 is output (stdout), 2 is error (stderr)
  - For each must be specified indexed array
    - The first element is either "file" or "pipe"
    - In case of "pipe", the second element is "r" for reading pipe or "w" for writing pipe
    - In case of "file", the second element is the file, third is "r", "w" or "a" for read, write or append
  - For each of the items in **`$descriptors`**, an element with the same index is created in the **`$pipes`** array
    - The items in **`$pipes`** are used to read / write data

Open a process (3)

- Opening a process – example:

```
$spec = array (
          0 => array (“pipe”, “r”),
          1 => array (“pipe”, “w”),
          2 => array (“file”, “/var/log/mylog.log”, “a”));
$env = array (“PATH” => “/bin/bash”);
$process = proc_open(“/bin/bash”, $spec, $pipes, “/”, $env);
$stdIn = $pipes[0];
$stdOut = $pipes[1];
fwrite($stdIn, “date”);
echo fread($stdOut, 128);
fclose($stdIn);
fclose($stdOut);
proc_close($process);
```

- Pipes can be read and written like ordinary files
- A process is closed with **`proc_close`**

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Accessing External Processes

Live Demo

Summary

- PHP provides various functions for working with files and directories
  - Opening
  - Creating
  - Reading / writing
  - Closing
- There are ways to access external processes from the PHP code
  - We can get the result from the process from our code

Working with Files and Processes in PHP

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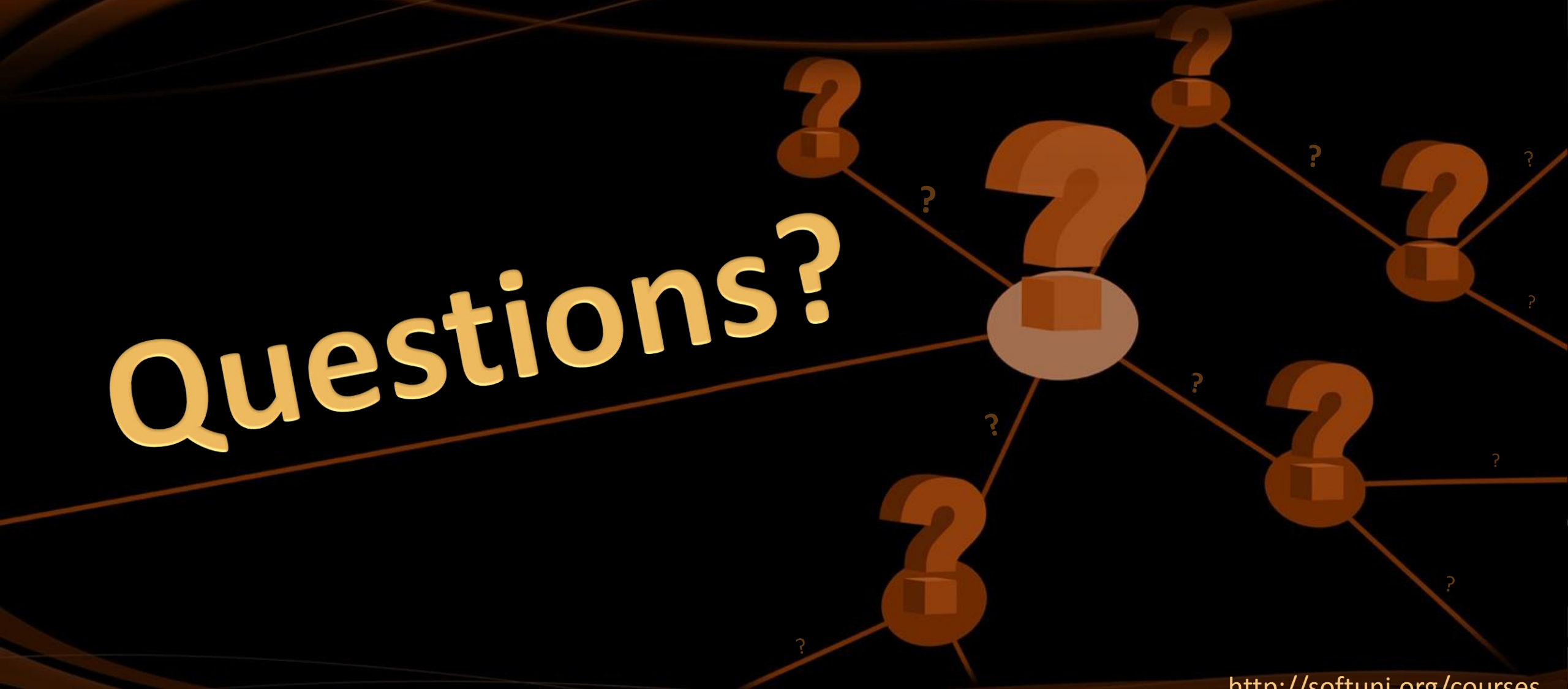

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