Overview

PHPoC (PHP on Chip) is a scripting language developed by Sollae Systems for programmable devices such as PHPoC Black, PHPoC Blue and etc. PHPoC is, as the name suggests, based on the PHP (PHP: Hypertext Preprocessor) a widely-used as a general-purpose programming language. PHP is originally designed for web development on a server-side. And PHPoC also has this charateristic. But there are some differences between PHPoC and PHP, because PHPoC is used to program embedded systems.

PHPoC not only provides a powerful tool for making dynamic and interactive Web but also provides functions to access peripherals of embedded systems. Therefore, anyone can use it easily.

※ PHPoC is built similarly to PHP, but not all grammars are fully compatible. This document does not cover the differences between PHPoC and PHP, so please refer to PHPoC vs PHP for details.

Syntax

Basic Syntax

PHPoC tags

PHPoC script consists of two tags: opening tag (<?php or <?) and closing tag (?>). Meaning of these tags is start and end of script. Everything outside of a pair of these tags is ignored by PHPoC parser and printed to standard output port. In case of webpage, the ignored text is sent to web browser.

```
<?php                    // opening tag
  echo "Hello PHPoC!";  // script
?>                       // closing tag
```

Inserting PHPoC Script into Webpage (HTML)

Features of everything outside of a pair of opening and closing tags are ignored by the PHPoC parser which allows PHPoC to be embedded in HTML documents.

```
<p>This will be ignored by PHPoC and displayed by the browser. </p>
<?php echo "While this will be parsed."; ?>
<p>This will also be ignored by PHPoC and displayed by the browser. </p>
```

By using conditional statement, PHPoC can determine the outcome of text which is outside of PHPoC tags. See the example below.

```
<?php if(true){ ?>
This will show if the expression is true. <!-- This will be displayed -->
<?php } else { ?>
Otherwise this will show.                 <!-- This will not be displayed -->
<?php } ?>
```

Instruction Separation

As in C, PHPoC requires instructions to be terminated with a semicolon at the end of each statement. The closing tag of a block of PHPoC statements automatically implies a semicolon; you do not need to type a semicolon.

```
<?php
  echo "the first statement.₩r₩n";          // the first line, ';' is used
  echo "the last statement.₩r₩n"             // the last line, ';' can be omitted
?>
<?php echo "single line statement.₩r₩n" ?>  // single line, ';' can be omitted
```

※ Although you can omit a semicolon, we recommend using semicolon at all times because it is not correct syntax.

Comments

As 'C' and 'C++', PHPoC supports one-line and multiple-line comments.

```
<?php
  echo "the first statement.₩r₩n";          // one-line comment
  /* This
  is
  multiple-line comment. */
  echo "the last statement.₩r₩n";
?>
```

※ UNIX shell-style comment '#' is not supported in PHPoC.

Types

PHPoC supports 5 types: Boolean, integer, floating-point number, string and arrays.

- Boolean
- Integer
- Floating Point Numbers
- String
- Array
- Type Juggling

※ Not support objects and NULL.

Boolean

This is the simplest type which can be either TRUE or FALSE. Both TRUE and FALSE are case-insensitive.

To explicitly convert a value to Boolean, use the (bool) or (boolean) casts and this is also case-insensitive.

```
<?php
  $bool_true = TRUE;              // Boolean true
  $int_test = 3;                  // integer 3
  $bool_test = (bool)$int_test;  // convert integer to Boolean
?>
```

When converting to Boolean, the following values are considered as FALSE.

- the integer 0 (zero)
- the float 0.0 (zero)
- the empty string ("")

The others are considered as TRUE. (Including string "0")

Integer

Integers can be specified in decimal (base 10), hexadecimal (base 16) and octal (base 8), and binary (base 2) notation, optionally preceded by a sign (- or +).

To explicitly convert a value to integer, use either the (int) or (integer) casts and this is case-insensitive.

```
<?php
$octal = 010;                // 8 - base 8
$decimal = 10;               // 10 - base 10
$hexadecimal = 0x10;         // 16 - base 16
$binary = 0b10;              // 2 - base 2
$str_test = "10";            // string "10"
$int_test = (int)$str_test;  // convert string to integer
?>
```

Floating Point Numbers

Floating point numbers can be specified using any of the following syntaxes:

```
$float0 = 3.14;             // 3.14
$float1 = 3.14e3;           // 3140
$float2 = 3.14E-3;          // 0.00314
```

E3 (e3) above means multiplication by 1000 which is 10 cubed. E-3 (e-3) means multiplication by 1/1000 which is reciprocal number of 10 cubed.

To explicitly convert a value to floating point number, use the (float) casts and this is case-insensitive.

- Precision Floating point numbers have limited precision. Computer cannot show the correct value of rational number in base 10, like 0.1 or 0.3, because it calculates the number in base 2.

```
$a = 0.1 / 0.3;
printf("%.20e₩r₩n", $a);   // print $a down to 20 places of decimals
```

```
[result]
3.33333333333333370341e-1
```

As you can see the result above, the value does not correct down to fifteen places of decimals. Because of these limitations, it is better not to use direct comparing operation of floating point numbers.

- NAN
  Some numeric operations can result in a value represented by the constant NAN. This result represents an undefined or unpresentable value in floating point calculations. Any loose or strict comparisons of this value against any other value, including itself, will have a result of FALSE.

```
<?php
$float0 = acos(2);
if($float0 == $float0)
    echo "True₩r₩n";          // result: FALSE
else
    echo "$float0₩r₩n";
?>
```

```
[result]
NAN
```

- INF
  Constant INF represents a number which is beyond the representable range in floating point calculations.

```
<?php
$float0 = 1.8E+309;
echo "$float0";
?>
```

```
[result]
INF
```

String

A string is a series of characters. This can be specified in both single quoted and double quoted ways.

To explicitly convert a value to string, use the (string) casts and this is case-insensitive.

```
<?php
$int_test = 10;                    // 10
$str_test = (string)$int_test;      // convert integer to string
?>
```

- Single quoted
  The simplest way to specify a string is to enclose it in single quotes. To specify a literal single quote, escape it with a backslash (). To specify a literal backslash, double it (₩). All other instances of backslash will be treated as a literal backslash.

```
<?php
echo 'This is a simple string';
echo "₩r₩n";
echo 'insert
newlines';
echo "₩r₩n";
echo 'specify ₩' (single quotation)';
echo "₩r₩n";
echo 'specify ₩₩ (back slash)';
echo "₩r₩n";
echo 'specify ₩ (back slash)';
echo "₩r₩n";
echo 'nothing happened ₩r₩n';
echo "₩r₩n";
echo 'nothing $a happened';
?>
```

```
[result]
This is a simple string
insert
newlines
specify ' (single quotation)
specify ₩ (back slash)
specify ₩ (back slash)
nothing happened ₩r₩n
nothing $a happened
```

- Double quoted
  If the string is enclosed in double-quotes ("), PHPoC will interpret more escape sequences for special characters. The special characters below can be interpreted by double quoted string. All other instances of backslash will be treated as a literal backslash.

Sequence	Meaning
₩n	linefeed (LF)
₩r	carriage return (CR)
₩t	horizontal tab (HT)
₩₩	backslash
₩"	double-quote
₩$	dollar sign
₩[0-7]{base 8}	character in octal notation
₩x[0-9][A-F][a-f]{base 16}	character in hexadecimal notation

```
<?php
echo "This is a simple string";
echo "₩r₩n";
echo "insert ₩r₩n newlines";
echo "₩r₩n";
echo "Specify ₩" (Double quotation)";
?>
```

```
[result]
This is a simple string
insert
newlines
Specify " (Double quotation)
```

※ PHPoC is not supporting ₩e, ₩v and ₩f sequences.

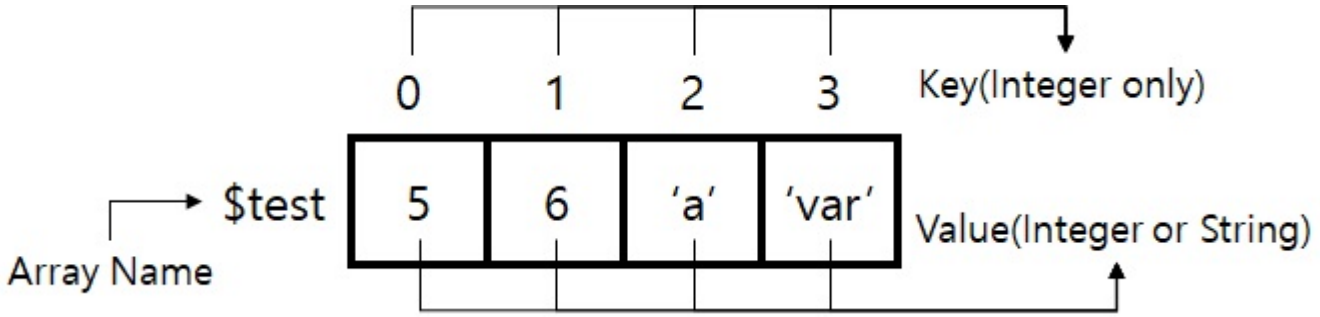
Also, PHPoC interpret variables in this manner.

```
<?php
$a = "a variable";
echo "Process $a";
?>
```

```
[result]
Process a variable
```

Array

Array is a gathering of character, arrays or integers in order. Array in PHPoC consists of value and key. Key is only numbers starting from 0.



- Array Definition
  When define array in PHPoC, initial value should be given. You can give the initial values to array directly or indirectly by variables.

```
<?php
    $int1 = 1;
    $char1 = 's';
    $str1 = 'sollae';
    $array1 = array(1, 2, 3);                  // array only with integer
    $array2 = array('a', 'b', 'c');            // array only with string
    $array3 = array($int1, $char1, $str1);     // array with mix of integers and string
?>
```

- Array Use
  Elements of array can be access by putting key value in square bracket.

```
<?php
    $array1 = array(1, 2, 3);                  // define and initialize array
    $array1[0] = 5;                            // set the value of key 0 to 5
    echo $array1[0];                           // print the value of key 0
?>
```

```
[result]
5
```

- String and Array
  String can be used as array like examples below.

```
<?php
    $str = "test";                  // define a string variable
    $str[0] = 'T';                  // set the first character to T
    echo $str;
?>
```

```
[result]
Test
```

- Multi-dimension Array
  PHPoC supports multi-dimension array.

```
<?php
    $array0 = array(0, 1, 2);                       // one-dimension
    $array1 = array(3, 4, 5);
    $array2 = array($array0, $array1, array(6, 7, 8));    // two-dimension
?>
```

Type Juggling

- Arithmetic Operator: addition(+), subtraction(-), multiplication(*), division(/)

Types	Boolean	Integer	Float Point	String
Boolean	X	X	X	X
Integer	X	O	O	X
Float Point	X	O	O	X
String	X	X	X	X

- Arithmetic Operator: the rest (%)

Types	Boolean	Integer	Float Point	String
Boolean	X	X	X	X
Integer	X	O	X	X
Float Point	X	X	X	X
String	X	X	X	X

- Bitwise Operator: AND(&), OR(|), XOR(^), left shift(<<), right shift(>>)

Types	Boolean	Integer	Float Point	String
Boolean	X	X	X	X
Integer	X	O	X	X
Float Point	X	X	X	X
String	X	X	X	X

- Bitwise Operator: compliment(~)

Boolean	Integer	Float Point	String
X	O	X	X

- Comparison Operator
  less than(<), greater than(>), less or equal(<=), greater or equal(>=)

Types	Boolean	Integer	Float Point	String
Boolean	X	X	X	X
Integer	X	O	O	X
Float Point	X	O	O	X
String	X	X	X	O

- Comparison Operator: equal(==), not equal(!= and <>)

Types	Boolean	Integer	Float Point	String
Boolean	O	X	X	X
Integer	X	O	X	X
Float Point	X	X	O	X
String	X	X	X	O

- Increment/Decrement Operator: increment(++), decrement(--)

Boolean	Integer	Float Point	String
X	O	X	X

- Logical Operator: AND(&&), OR(||)

Types	Boolean	Integer	Float Point	String
Boolean	O	O	X	O
Integer	O	O	X	O
Float Point	X	X	X	X
String	O	O	X	O

- Logical Operator: NOT(!)

Boolean	Integer	Float Point	String
O	O	X	O

- Sign Operator: positive(+), negative(-)

Boolean	Integer	Float Point	String
X	O	O	X

- Expression in Control Structure: if, for, (do) while

Boolean	Integer	Float Point	String
O	O	X	O

- printf function output format

Types	Boolean	Integer	Float Point	String
%b, %o, %x	X	O	X	X
%d, %u	X	O	X	X
%c	X	O	X	X
%e, %f, %g	X	X	O	X
%s	X	X	X	O

Variables

Variables

A variable consists of variable name and mark in PHPoC.

Sign	Name	
	The first letter	The rest
$	Alphabet or _ (underscore)	Alphabet, number or _ (underscore)

Examples are as follows:

Correct Example	$_var = 0; $var1 = 0; $var_1 = 0;

Incorrect Example	$123 = 0; // name begins with number
	$var_#% = 0; // name with special characters (#, %)

When defining a variable in PHPoC, the initial value should be given. More than one variable cannot be defined in a single line.

Correct Example	$var1 = 0; $var2 = 1; $var3 = 2;

Incorrect Example	$var1; // no initial value
	$var2 = 0, $var3 = 1; // two values are defined in a line

※ The maximum size of variable name is 31 bytes. The rest will be ignored.

Predefined Variables

$GLOBALS

This variable is a superglobal. Superglobals are always available in all scopes without the global keyword. The initial type of this varibale is integer but user can change it to an array as follows:

```
if(!is_array($GLOBALS))
    $GLOBALS = array(0, 0, 0, 0);
$GLOBALS[0] = 1;
$GLOBALS[1] = "abc";
$GLOBALS[2] = 3.14;
$GLOBALS[3] = array("a", "b", "c", "d");
```

Variable Scope

The scope of a variable is the context within which it is defined in PHPoC.

```
<?php
    $var1 = 0;       // $var1 is only available outside the function test
```

```
    function test()
    {
        $var2 = 1;      // $var2 is only available inside the function test
    }
?>
```

- The global Keyword
  To expand the scope of variables, use the global keyword.

```
<?php
    $var1 = 0;
    function test()
    {
        global $var1;  // $var1 is available inside the function test
    }
?>
```

Variable Variables

PHPoC is not supporting variable variables.

Constants

A constant is an identifier for a simple value which is not changed in running script. A constant can be specified with define keyword.

```
<?php
  define("TEST_CONST", 16);                 // integer constant
  define("TEST_NAME", "constant");          // string constant
?>
```

※ PHPoC is not supporting to define constants by const keyword.

※ PHPoC is not supporting Magic constants.

Operators

An operator is something that takes one or more values and yields another value. PHPoC supports assignment, arithmetic, incrementing / decrementing, comparison, logical, string, bitwise and conditional operators.

※ PHPoC does not support Error Control Operators, Execution Operators and Array Operators.

Operators

Operator Precedence

The precedence of an operator specifies how "tightly" it binds two expressions together. The operator precedence is as follows:

Precedence	Operator Mark	Operators
High	[(	Parenthesis
	++ -- ~ (int) (string) (bool)	Types/Increment/Decrement
	!	Logical
	* / %	Arithmetic
	+ - .	Arithmetic
	<>	Bitwise
	< <= > >=	Comparison
	== != === !== <>	Comparison
	&	Bitwise
	^	Bitwise
	|	Bitwise
	&&	Logical
	||	Logical
	? :	Ternary
Low	= += -= *= /= .= %= &= |= ^= <>=	Assignment

When operators which have the same priority are used repeatedly, calculation is started from the left. However, for the assignment, increment/decrement, cast and logical operator'!', the operation starts from the right.

- Example of Operator Precedence

```
<?php
    $var0 = 3 * 3 % 5;          // (3 * 3) % 5 = 4 (from left)

    $var1 = 1;
    $var2 = 2;
    $var1 = $var2 += 3;         // $var1 = ($var2 += 3), $var1, $var2 = 5 (from right)
?>
```

Operators

Arithmetic Operators

Operator	Sign	Syntax	Additional Information
addition	+	$var1 + $var2	-
subtraction	-	$var1 - $var2	-
multiplication	*	$var1 * $var2	-
division	/	$var1 / $var2	quotient of division in integer operation
the rest	%	$var1 % $var2	remainder of division

Operators

Assignment Operators

Assignment operator assigns right value or result of expression to the left.

Operator	Sign	Syntax	Additional Information
assignment	=	$var = 1	assign 1 to $var
addition	+=	$var += 1	assign result of $var + 1 to $var
subtraction	-=	$var -= 1	assign result of $var - 1 to $var
multiplication	*=	$var *= 2	assign result of $var * 2 to $var
division	/=	$var /= 2	assign result of $var / 2 to $var
the rest	%=	$var %= 2	assign result of $var % 2 to $var
concatenate	.=	$var .= "string"	assign result of $var . "string" to $var
bitwise AND	&=	$var &= 0x02	assign result of $var & 0x02 to $var
bitwise OR	|=	$var |= 0x02	assign result of $var | 0x02 to $var
bitwise XOR	^=	$var ^= 0x02	assign result of $var ^ 0x02 to $var
left shift	<<=	$var <<= 4	assign result of $var << 4 to $var
right shift	>>=	$var >>= 4	assign result of $var >> 4 to $var

Operators

Bitwise Operators

Operator	Sign	Syntax	Additional Information
bitwise AND	&	$b1 & $b2	bit AND $b1 and $b2
bitwise OR	|	$b1 | $b2	bit OR $b1 and $b2
complement	~	~$b1	invert $b1 (0 to 1, 1 to 0)
bitwise XOR	^	$b1 ^ $b2	bit XOR $b1 and $b2
left shift	<<	$b1 << 8	8 digits left shift $b1
right shift	>>	$b1 >> 8	8 digits right shift $b1

- Example of Bitwise operators

```
<?php
    $b1 = 0x11;                // 0001 0001
    echo "$b1₩r₩n";
    $b2 = 0x23;                // 0010 0011
    echo "$b2₩r₩n";
    $b3 = $b1 & $b2;             // 0000 0001, bit AND
    echo "$b3₩r₩n";
    $b3 = $b1 | $b2;            // 0011 0011, bit OR
    echo "$b3₩r₩n";
    $b3 = ~$b1;                 // 1110 1110, NOT
    echo "$b3₩r₩n";
    $b3 = $b1 << 1;              // 0010 0010, left shift 1 digit > double
    echo "$b3₩r₩n";
    $b3 = $b1 >> 1;              // 0000 1000, right shift 1 digit > half
    echo "$b3₩r₩n";
?>
```

```
[result]
17
35
1
51
-18
34
8
```

- Left Shift
  Added bits by left shift operation are always 0.

```
<?php
   $b1 = 0xFFFFFFFFFFFFFFFF;  // -1
   $b2 = $b1 << 1;            // 0xFFFFFFFFFFFFFFFE (added bit is 0)
   echo "$b2";
?>
```

```
[result]
-2
```

- Right Shift
  Added bits by right shift operation are always the same with sign bit.

```
<?php
   $b1 = 0xFFFFFFFFFFFFFFFF;  // -1
   $b2 = $b1 >> 1;            // 0xFFFFFFFFFFFFFFFF (added bit is 1)
   echo "$b2";
?>
```

```
[result]
-1
```

Operators

Comparison Operators

The result of comparison operators is always Boolean type.

Operator	Sign	Syntax	Additional Information
Equal (value)	==	$var1 == $var2	TRUE if $var1 is equal to $var2
Identical (value+type)	===	$var1 === $var2	TRUE if $var1 is equal to $var2 and they are of the same type
Not equal (value)	!=	$var1 != $var2	TRUE if $var1 is not equal to $var2
Not identical (value+type)	!==	$var1 !== $var2	TRUE if $var1 is not equal to $var2 or they are not of the same type
Not equal (value)	<>	$var1 <> $var2	TRUE if $var1 is not equal to $var2
Less than	<	$var1 < $var2	TRUE if $var1 is strictly less than $var2
Greater than	>	$var1 > $var2	TRUE if $var1 is strictly greater than $var2
Less than or equal to	<=	$var1 <= $var2	TRUE if $var1 is strictly less than or equal to $var2
Greater than or equal to	>=	$var1 >= $var2	TRUE if $var1 is strictly greater than or equal to $var2

- Example of Comparison Operator

```
<?php
    $var1 = 1;
    $var2 = 2;
    $var3 = $var1 == $var2;    // $var3 = False (0 - False)
    $var4 = $var1 != $var2;    // $var4 = True (1 - True)
    $var5 = $var1 <> $var2;    // $var5 = True (1 - True)
    $var6 = $var1 < $var2;     // $var6 = True (1 - True)
    $var7 = $var1 > $var2;     // $var7 = False (0 - False)
    $var8 = $var1 <= $var2;    // $var8 = True (1 - True)
    $var9 = $var1 >= $var2;    // $var9 = False (0 - False)
?>
```

Operators

Incrementing / Decrementing Operators

Operator	Sign	Syntax	Additional Information
Increment	++	$var++	Returns $var, then increments $var by one
		++$var	Increments $var by one, then returns $var
Decrement	--	$var--	Returns $var, then decrements $var by one
		--$var	Decrements $var by one, then returns $var

- Example of Incrementing / Decrementing Operators

```
<?php
    $var = 3;

    echo $var++;        // echo $var, then increments $var by one
    echo $var;

    echo ++$var;        // increments $var by one, then echo $var
    echo $var;

    echo $var--;        // echo $var, then decrements $var by one
    echo $var;

    echo --$var;        // decrements $var by one, then echo $var
    echo $var;
?>
```

```
[result]
34555433
```

Operators

Logical Operators

Operator	Sign	Syntax	Additional Information
AND	&&	(expr1) && (expr2)	TRUE if both expr1 and expr2 are TRUE
OR	||	(expr1) || (expr2)	TRUE if either expr1 or expr2 is TRUE
NOT	!	!(expr1)	TRUE if expr1 is not TRUE

- Example of Logical Operators

```
<?php
    $var1 = true;
    $var2 = false;

    $var3 = $var1 && $var2;
    $var4 = $var1 || $var2;
    $var5 = !$var1;

    echo (int)$var3, "₩r₩n";     // 0 - FALSE
    echo (int)$var4, "₩r₩n";     // 0 - TRUE
    echo (int)$var5, "₩r₩n";     // 0 - FALSE
?>
```

```
[result]

1
```

Operators

String Operators

Operator	Sign	Syntax	Additional Information
Concatenation	.	$str1 . $str2	Concatenates $str1 and $str2
	.=	$str1 .= $str2	Assigns result of concatenating $str1 and $str2 to $str1

- Example of String Operators

```
<?php
    $str1 = "Hel";
    $str2 = "lo";

    $str3 = $str1 . $str2;  // $str3 = "Hello"
    $str3 .= " PHPoC!";     // $str3 = "Hello PHPoC!"

    echo $str3;
?>
```

```
[result]
Hello PHPoC!
```

Operators

Conditional Operator

Operator	Sign	Syntax	Additional Information
Ternary	? :	(expr) ? $a : $b	evaluates to $a if expr evaluates to TRUE, and $b if expr evaluates to FALSE

- Example of Ternary Operator

```
<?php
    $var1 = $var2 = 1;
    $var3 = ($var1 == $var2) ? true : false;
    $var4 = ($var1 != $var2) ? true : false;
    echo (int)$var3, "₩r₩n";
    echo (int)$var4;
?>
```

```
[result]
1
```

※ It is recommended that you avoid "stacking" ternary expressions because PHPoC's behavior when using more than one ternary operator within a single statement is non-obvious.

Control Structures

Any PHP scripts is built out of a series of statements. A statement can be an assignment, a function call, a loop, a conditional statement or even a statement that does nothing (an empty statement). Statements usually end with a semicolon. In addition, statements can be grouped into a statement-group by encapsulating a group of statements with curly braces.

All of statements and grouped statements are normally executed in order but you can skip or repeat statements by specifying condition.

Most control structures provided by PHPoC are very similar with other programming language including C.

- if
- else
- elseif / else if
- while
- do-while
- for
- break
- continue
- switch
- return
- include
- include_once

※ PHPoC does not support foreach, declare, require, require_once and goto in PHP.

Control Structures

if

if construct is one of the most important features of PHPoC. It allows for conditional execution of code fragments.

- Structure of if

Syntax	Description
if (expr) stmt;	Execute stmt if expr is TRUE, otherwise skip stmt.

- Example of Single if

```
<?php
    $var1 = $var2 = 1;
    if($var1 == $var2)                  // expression is TRUE
      echo "var1 and var2 are equal";  // statement will be executed
?>
```

```
[result]
var1 and var2 are equal
```

- Example of Multi-line if

```
<?php
    $var1 = 1;
    $var2 = 2;
    if($var1 < $var2)
    {                                   // grouping by curly braces
        echo "var1 is smaller than var2";
        echo "₩r₩nbye!";
    }                                   // grouping by curly braces
?>
```

```
[result]
var1 is smaller than var2
bye!
```

- Example of Recursive if

```
<?php
    $var1 = $var2 = 1;
    $var3 = 2;
    if($var1 == $var2)                    // expression is TRUE
    {
      if($var1 < $var3)                   // expression is TRUE
        echo "var1 and var2 are equal";  // statement will be executed
    }
?>
```

Control Structures

else

else extends an if statement to execute a statement in case the expression in the if statement evaluates to FALSE. By using else, you can specify statements when the result of expression is both true and false. The else statement does not have expression and cannot be used without if statement.

- Structure of if-else

Syntax	Description

if(expr)
  stmt1;
else
  stmt2;
	1) executes stmt1 if expr is TRUE
	2) executes stmt2 if expr is not TRUE

- Example of if-else

```
<?php
    $var1 = $var2 = 2;
    if($var1 == $var2)                    // expression is FALSE
      echo "var1 and var2 are equal";
    else
      echo "var1 and var2 are not equal";  // statement will be executed
?>
```

```
[result]
var1 and var2 are equal
```

- Example of Recursive if-else

```
<?php
    $var1 = $var2 = 1;
    $var3 = 2;
    if($var1 > $var2)                  // expression is FALSE
      echo "var1 and var2 are equal";
    else
    {
      if($var1 > $var3)                // expression is FALSE
        echo "good";
      else
        echo "bad";                    // statement will be executed
    }
?>
```

```
[result]
bad
```

Control Structures

elseif / else if

elseif is a combination of if and else. Like else, it extends an if statement to execute a different statement in case the original if expression evaluates to FALSE. However, unlike else, it will execute that alternative expression only if the elseif conditional expression evaluates to TRUE.

The elseif statement cannot be used without if statement. Multiple elseif statements can be used in a single if statement.

- Structure of elseif

Syntax	Description

if(expr1)
  stmt1;
elseif(expr2)
  stmt2;
elseif(expr3)
  stmt3;
else
  stmt4;
	1)stmt1 will be executed if expr1 is TRUE
	2)stmt2 will be executed if expr2 is TRUE
	3)stmt3 will be executed if expr3 is TRUE
	4) stmt4 will be executed if none of expr1, expr2 or expr3 is TRUE

- Structure of elseif

```
<?php
    $var1 = 1;
    $var2 = 2;
    $var3 = 3;
    if($var1 == 0)                // expression is FALSE
      echo "var1 = 0";
    elseif($var2 == 0)            // expression is FALSE
      echo "var2 = 0";
    elseif($var3 == 0)            // expression is FALSE
      echo "var3 = 0";
    elseif($var3 == 3)            // expression is TRUE
      echo "var3 = 3";            // statement will be executed
    else
      echo "No Result";
?>
```

```
[result]
var3 = 3
```

Control Structures

while

while loops are the simplest type of loop. This executes the nested statements repeatedly, as long as the while expression evaluates to TRUE.

- Structure of while

Syntax	Description
while(expr) stmt;	stmt is repeatedly executed when expr is true

- Example of while

```
<?php
    $var = 0;
    while($var < 3)      // expression will be TRUE till third comparison
    {
      echo "$var₩r₩n";  // statement will be executed three times
      $var++;             // increase $var by one
      sleep(1);          // 1 second delay
    }
?>
```

```
[result]

1
2
```

- Infinite Loop
  You have to keep it in mind that repetitive statement can be repeated infinitely as if the result of expression is always TRUE. In this case, statement in the structure will be infinitely executed. This situation is called infinite loop.

```
<?php
    $var = 0;
    while(1)              // expression will always be TRUE
    {
      echo "$var₩r₩n";
      $var++;             // increase $var by one, $var = 1, 2, 3, ...
      sleep(1);           // 1 second delay
    }
?>
```

Control Structures

do-while

do-while loops are very similar to while loops, except the truth expression is checked at the end of each iteration instead of in the beginning.

- Structure of do-while

Syntax	Description

do
{
  stmt;
}
while(expr);
	1) execute stmt first, then check expr
	2) execute stmt repeatedly as long as expr is TRUE

- Example of do-while

```
<?php
    $var = 0;
    do
    {
      echo "$var₩r₩n";  //  execute statement at least once
      $var++;
      sleep(1);
    }while($var < 3);
?>
```

```
[result]

1
2
```

Control Structures

for

for loops are mainly used to iterate statement for specific number.

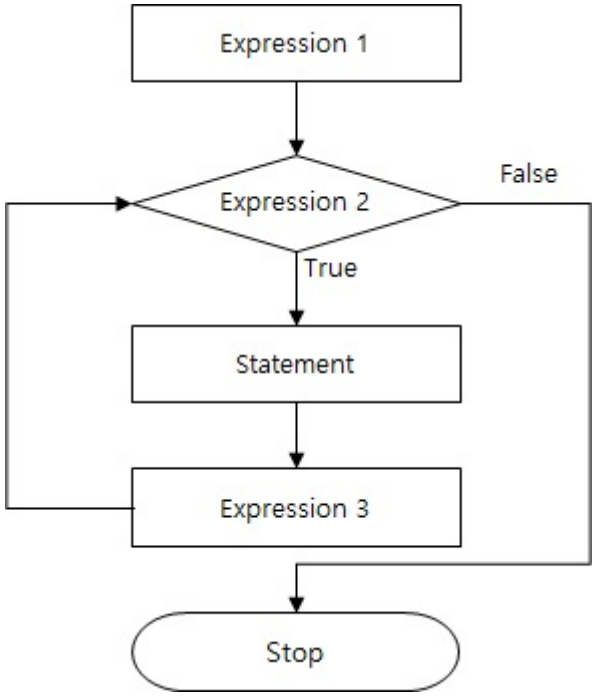
- Structure of for

Syntax	Description

for(expr1;expr2;expr3)
{
  stmt;
}
	1) expr1 is evaluated once at the beginning of the loop
	2) stmt will be executed if expr2 is TRUE
	3) expr3 is evaluated at the end of iteration

In general, initializing a variable is given in expr1 and conditional expression is specified in expr2. In expr3, incrementing or decrementing operation is used to determine amount of iteration.

- Flowchart of for



- Example of for

```
<?php
    for($i = 0; $i < 5; $i++)  // increase $i by one from 0 and compare with 5
    {
      echo $i;                 // statement is executed if $i is less than 5
    }
?>
```

```
[result]
01234
```

Each expression can be omitted.

- Example of Omitting Expression 1

```
<?php
    for($i = 1; ; $i++)  // Omit the second expression
    {
      if($i > 10)
        break;           // Break the for loop
      echo $i;
    }
?>
```

```
[result]
12345678910
```

- Example of Omitting Expression 2

```
<?php
    $i = 0;
    for( ; ; )      // Omit all of expressions
    {
      if($i > 10)
        break;      // Break the for loop
      echo $i;
      $i++;
    }
?>
```

```
[result]
012345678910
```

- Combination of for and array
  for loops are very suitable for proceeding elements of an array in order.

```
<?php
    $arr = array(1, 2, 3);      // arr[0] = 1, arr[1] = 2, arr[2] = 3
    for($i = 0; $i < 3; $i++)  // increase $i by one from 0 and compare with 3
    {
      echo $arr[$i];            // statement is executed if $i is less than 3
    }
?>
```

```
[result]
123
```

Control Structures

break

break ends execution of the current for, while, do-while or switch structure.

- Structure of break

Syntax	Description

for(; ;)
{
  if(expr)
  {
  stmt;
  break;
  }
}
	executes stmt and exit iteration and
	get out of for loop if expr is TRUE

- Example of break

```
<?php
  for($i = 0; ; $i++)  // infinite loop
  {
    if($i > 10)
      break;            // exit for loop
    echo $i;
  }
?>
```

```
[result]
012345678910
```

- Option of break
  break accepts an optional numeric argument which tells it how many nested enclosing structures are to be broken out of.

```
<?php
  $j = 1;
  for($i = 0; ; $i++)  // infinite loop(level 1)
  {
    while($j != 0)      // infinite loop(level 2)
    {
      if($j > 10)
        break 2;        // exit for loop as well as while loop
      echo $j;
      $j++;
    }
  }
?>
```

```
[result]
12345678910
```

Control Structures

continue

continue is used within looping structures to skip the rest of the current loop iteration and continue execution at the condition evaluation and then the beginning of the next iteration.

- Structure of continue

Syntax	Description

for(; ;)
{
  if(expr)
  {
  stmt1;
  continue;
  }
  stmt2;
}
	executes stmt1 and go to the beginning of for loop if expr is TRUE

- Example of continue

```
<?php
  for($i = 1; ; $i++)  // infinite loop
  {
    if($i % 5)
      continue;         // go to the beginning of for loop
    echo "$i₩r₩n";      // statement is executed if expression is FALSE
    sleep(1);
  }
?>
```

```
[result]
5
10
15
... (repetition)
```

- Option of continue
  continue accepts an optional numeric argument which tells it how many levels of enclosing loops it should skip to the end of.

```
<?php
  $j = 0;
  for($i = 0; ; $i++)                          // infinite loop(level 1)
  {
    sleep(1);
    if($i)
      echo "This is for statement ₩$i = $i₩r₩n";  // repeated by continue 2
    while(1)                                   // infinite loop(level 2)
    {
      $j++;
      if(($j % 5) == 0)
        continue 2;                            // go to the beginning of for loop
      echo "$j, ";
      sleep(1);
    }
  }
?>
```

```
[result]
1, 2, 3, 4, This is for statement $i = 1
6, 7, 8, 9, This is for statement $i = 2
11, 12, 13, 14, This is for statement $i = 3
... (repetition)
```

Control Structures

switch

The switch statement is similar to a series of if statements on the same expression. In many occasions, you may want to compare the same variable (or expression) with many different values, and execute a different piece of code depending on which value it equals to. A special case is the default case. This case matches anything that wasn't matched by the other cases.

- Structure of switch

Syntax	Description

switch(expr)
{
  case val1:
  stmt1;
  break;
  case val2:
  stmt2;
  break;
  default:
  stmt3;
  break;
}
	1) compare val1 and expr1 if they are the same
	2) execute stmt1 and exit switch if val1 is the same with expr
	3) compare val2 and expr1 if they are the same
	4) execute stmt2 and exit switch if val2 is the same with expr
	5) execute stmt3 if neither val1 nor val2 is the same with expr

- Example of switch

```
<?php
  $var = 1;
  switch($var)
  {
    case 1:
      echo "var is 1";
      break;
    case 2:
      echo "var is 2";
      break;
    default:
      echo "Error";
      break;
  }
?>
```

```
[result]
var is 1
```

- Example of default
  default case can be omitted in switch statement.

```
<?php
  $var = 1;
  switch($var)
  {
    case 1:
      echo "var is 1";
      break;
    case 2:
      echo "var is 2";
      break;
  }
?>
```

```
[result]
var is 1
```

Not every case needs to contain a break. If no break appears, the flow of control will fall through to subsequent cases until a break is reached.

- case statement without break

```
<?php
  $var = 1;
  switch($var)
  {
    case 1:
      echo "3";
    case 2:
      echo "3";
    case 3:
      echo "3";
      break;
    case 4:
      echo "4";
  }
?>
```

```
[result]
333
```

※ You cannot use semicolon (;) behind the case statement instead of colon (:).

Control Structures

return

If return statement is called from within a function, it immediately ends execution of the current function, and returns its argument as the value of the function call. If it is called from the global scope, then execution of the current script file is ended. If the current script file was included, then control is passed back to the calling file. Furthermore, if the current script file was included, then the value given to return will be returned as the value of the include call.

If return is called from within the init.php file, then script execution ends.

Syntax	Description
return argument;	ends execution of current function or script and returns argument. The argument can be omitted.

- Example of return in function call

```
<?php
function func()          // declare a user-define function fun()
{
  $var1 = 1;
  return $var1;          // return $var1 (1)
}

$var2 = 2;
$var3 = func();          // assign $var1 to $var3 by func()
$result = $var2 + $var3;  // 2 + 1 = 3
echo $result;
?>
```

```
[result]
3
```

- Example of return in script file

test.php

```
<?php
$var2 = 2;
$var3 = 3;
return ($var2 + $var3); // return 5
?>
```

init.php

```
<?php
$var1 = include_once "test.php";
echo $var1;
?>
```

```
[result]
5
```

- Example of return in init.php

```
<?php
$var1 = 1;
echo ++$var1;  // statement is executed
echo ++$var1;  // statement is executed
return;        // ends script
echo ++$var1;  // statement will be never executed
?>
```

```
[result]
23
```

Control Structures

include

The include statement includes and evaluates the specified file.

Syntax	Description
include filename;	includes the specified file into current script filename can be referenced by a variable filename is case-sensitive

- Example of include

test.php

```
<?php
$var1 = 1;
$var2 = 2;
?>
```

init.php

```
<?php
$var1 = $var2 = 0;
echo $var1 + $var2;
include "test.php";  // includes test.php
echo $var1 + $var2;
?>
```

```
[result]
03
```

- Example of include within functions
  If the include occurs inside a function within the calling file, then all of the code contained in the called file will behave as though it had been defined inside that function. So, they are declared to global variables if you want to use them in global scope.

test.php

```
<?php
$var1 = 1;
$var2 = 2;
?>
```

init.php

```
<?php
$var1 = $var2 = 0;
function func()
{
  global $var1;         // only $var1 is global
  include "test.php";  // includes test.php
  echo $var1 + $var2;
}
func();
echo $var1 + $var2;
?>
```

```
[result]
31
```

- Example of include with return
  If included file has no return argument, include returns 1 on success. On failure, it causes PHPoC error.

test1.php

```
<?php
// return $var
$var = 3;
return $var;
?>
```

test2.php

```
<?php
// no return
$var = 3;
return;
?>
```

init.php

```
<?php
$var1 = include "test1.php";
echo $var1;
$var2 = include "test2.php";
echo $var2;
?>
```

```
[result]
31
```

Control Structures

include_once

The include_once statement includes and evaluates the specified file during the execution of the script. This is a behavior similar to the include statement, with the only difference being that if the code from a file has already been included, it will not be included again.

Syntax	Description
include_once filename;	includes the specified file into current script filename can be referenced by a variable filename is case-sensitive

- Example of include_once

test.php

```
<?php
echo "Hello₩r₩n";
?>
```

init.php

```
<?php
include "test.php";       // include test.php
include "test.php";       // include test.php again
include_once "test.php";  // not include test.php
?>
```

```
[result]
Hello
Hello
```

Functions

※ PHPoC does not support variable functions.

※ PHPoC does not support anonymous functions.

Functions

User-defined Functions

User-defined function can help to reduce size of source code and to give easy analyzation. You can define frequently used code as a function and then call only function name whenever you need. A function consists of name, argument, statement and return value. The naming rule is the same as variables.

User-defined function name	
The first letter	The rest
Alphabet or _(underscore)	Alphabet, number or _(underscore)

- Structure of Defining Function

Syntax	Description

function name(argument)
{
  statement;
  return value;
}
	Create function with specified name
	Multiple or no argument can be allowed
	return or return value can be omitted

- Structure of Calling Function

Syntax	Description
name(argument1, argument2, ...);	argument can be referenced by variable function name is case-sensitive

- Example of Using Function
  User-defined function should be called after defining.

```
<?php

function func()         // define function func()
{
  echo "Hello PHPoC";
}
func();                 // call function func()

?>
```

- Example of return value of Function

```
<?php

function func()         // define function func()
{
  return 5;
}
$var = func();          // call function func()
echo $var;

?>
```

```
[result]
5
```

- Example of Using Arguments
  Information may be passed to functions via the argument list, which is a commadelimited list of expressions.

```
<?php

function func($arg)    // define function func() with $arg
{
  return $arg + 1;     // add one to $arg, then return it
}
$var = func(2);        // pass function func() to 2, then receive 3
echo $var;
$var = func($var);     // pass function func() to $var(= 3)
echo $var;
$var = func($var+1);   // pass function func() to $var+1(=5)
echo $var;

?>
```

```
[result]
346
```

- Example of Recursive Function Call
  Functions can be called inside a function including itself.

```
<?php

function func($arg)   // define function func() with $arg
{
  if($arg < 6)
  {
    echo "$arg₩r₩n";  // print value of $arg
    $arg++;           // increases $arg by one
    func($arg);       // call function func() and pass func() $arg
  }
}
func(1);              // call function func() and pass 1 for argument

?>
```

```
[result]
1
2
3
4
5
```

Functions

Function Arguments

PHPoC supports pass by value, pass by reference and default argument values.

- Pass by Value
  By default, function arguments are passed by value. In this case if the value of the argument within the function is changed, it does not get changed outside of the function.

```
<?php

function func($arg1, $arg2)  // pass by value
{
  $temp = $arg1;
  $arg1 = $arg2;
  $arg2 = $temp;
  return $arg1 + 1;
}
$var1 = 1;
$var2 = 2;
func($var1, $var2);           // function call
echo "$var1, $var2";          // $var1 and $var2 are not swapped

?>
```

```
[result]
1, 2
```

- Pass by Reference
  If arguments are passed by reference, the memory address of argument is passed instead of value. Thus, if the value of the argument within the function is changed, it gets changed outside of the function. To have an argument to a function always passed by reference, prepend an ampersand (&) to the argument name in the function definition.

```
<?php

function func(&$arg1, &$arg2)  // pass by reference
{
  $temp = $arg1;
  $arg1 = $arg2;
  $arg2 = $temp;
  return $arg1 + 1;
}
$var1 = 1;
$var2 = 2;
func($var1, $var2);             // function call
echo "$var1, $var2";            // $var1 and $var2 are swapped

?>
```

```
[result]
2, 1
```

- Default Argument Values
  A function may define default values for scalar arguments as follows:

```
<?php

function print_str($str = "Hello PHPoC!₩r₩n")  // set default argument value
{
  echo $str;
}
print_str();                                  // call print_str() without argument

?>
```

```
[result]
Hello PHPoC!
```

Functions

Returning Values

Values are returned by using the optional return statement. In general, only one value can be returned except for array type. You should use array type if you want to return multiple values.

- Example of Returning an Array

```
<?php

function func()
{
  $var1 = 1;
  $var2 = 2;
  $var3 = 3;
  $arr = array($var1, $var2, $var3);
  return $arr;
}

$arr = func();
printf("%d, %d, %d₩r₩n", $arr[0], $arr[1], $arr[2]);

?>
```

```
[result]
1, 2, 3
```

※ PHPoC returns not NULL but 0 if there is no return statement or the argument of return statement is omitted.

※ PHPoC does not support returning a reference from a function.

Functions

Internal Functions

PHPoC supports various internal functions. Refer to the PHPoC Internal Functions document about detailed information.

Classes and Objects

※ PHPoC does not support classes and objects.

Namespaces

Overview

Namespaces in PHPoC are designed to solve name collision. Duplicate names are not allowed in the same namespace.

Sharing Namespace

PHPoC provides one namespace for keyword, function and constants. Thus, no duplicate name is allowed when you create one of them.

Appendix

Appendix

Predefined Constants

PHPoC provides predefined constants as following below.

Name	Description
COUNT_NORMAL	Normal Counting for one-dimension array
COUNT_RECURSIVE	Recursive Counting for multi-dimension array
EPIPE	Broken Pipe, Returning as connection is broken while sending TCP data
EBUSY	Device or Resource Busy
ENOENT	No file entry
FALSE	False
M_PI	Pi (≒ 3.1415926535898)
M_E	Euler's Constant (≒ 2.718281828459)
MAX_STRING_LEN	Maximum length of a string
O_NODIE	avoid to terminate script execution: file open
PHP_VERSION_ID	PHPoC Version
SEEK_CUR	File pointer position: current position of file
SEEK_END	File pointer position: at the end of file
SEEK_SET	File pointer position: at the beginning of file
SSL_CLOSED	SSL status: not connected
SSL_CONNECTED	SSL status: connected
SSL_LISTEN	SSL status: wait for connection
TRUE	True
TCP_CLOSED	TCP status: not connected
TCP_CONNECTED	TCP status: connected
TCP_LISTEN	TCP status: wait for connection

Appendix

Keyword

This table below shows predefined keywords in PHPoC. As keywords, functions and constants share namespace, try not to use duplicated names with those keywords when creating functions or constants.

Alphabet	Keywords
a	array
b	bool boolean break
c	case const continue
d	default define die do
e	echo else elseif exit
f	float for function
g	global goto
i	if int integer include include_once
p	print
r	return
s	static string switch
w	while

Appendix

Restriction about Memory

- Number of Variables
  PHPoC has limited memory size. So both the number of variables and the length of string variables are limited. Maximum number for variable creation is in inverse proportion to the size of variables.

Appendix

Error Messages

PHPoC prints various error messages out for debugging by console.

Error Messages
address already in use
argument count mismatch
cannot break/continue N level(s)
'case' or 'default' expected
device or resource busy
divided by zero
duplicated name
expression syntax error
file name too long
file not found
function not implemented
integer number too large
invalid argument
invalid constant name
invalid device or address
maximum execution time exceeded
missing operator
missing terminating character ''' or '"'
modifiable value required
only variable can be passed by reference
operation not permitted
out of memory
string too long
syntax error
syntax error, unexpected array [, expecting 'token']
syntax error, unexpected character
syntax error, unexpected 'character' [, expecting 'character']
syntax error, unexpected end of file
syntax error, unexpected 'name' [, expecting 'character']
syntax error, unexpected number [, expecting 'character']
syntax error, unexpected 'operator' [, expecting 'token']
syntax error, unexpected string [, expecting 'character']
syntax error, unexpected 'token' [, expecting 'token']
syntax error, unexpected variable [, expecting 'character']
too many open files
undefined name
undefined offset
unsupported argument type
unsupported operand type
unsupported operator
unsupported pid
unsupported type juggling
'while' expected

Revision History

210115 (F/W: 2.3.1)

- Add a predefined variable: $GLOBALS
- Correct some errors and expressions