ALL THINGS IN MODERATION

PHP STRING COMPARISON VULNERABILITIES

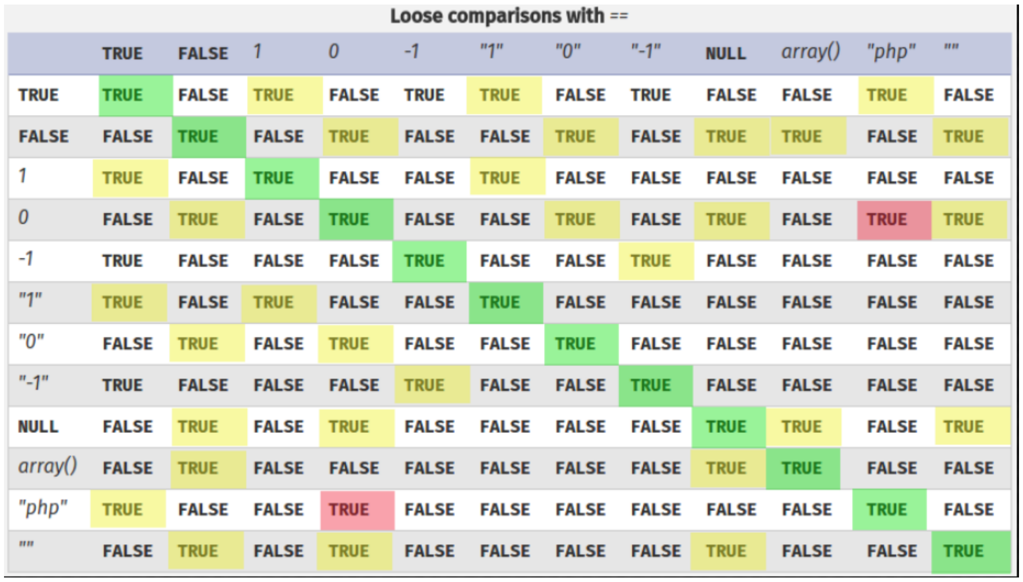
By groot | May 5, 2017 | Network Security | 1 Comment

1. BYPASS PHP '==' AND '!=' COMPARISON OPERATORS

'==' and '!=' is the default comparison in other languages. But in PHP has two main comparison modes, lets call them loose ('==' and '!=')
and strict ('===' and '!==').

Consider 2 following table to see the strict in '===' and the loose in '==':

PHP Comparisons: Loose



Loose comparisons with ==

	TRUE	FALSE	1	0	-1	"1"	"0"	"-1"	NULL	array()	"php"	""
TRUE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE
FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE
1	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
0	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE
-1	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
"1"	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
"0"	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
"-1"	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
NULL	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE
array()	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE
"php"	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE
""	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE

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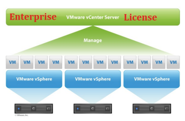

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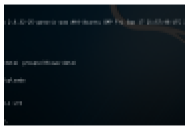

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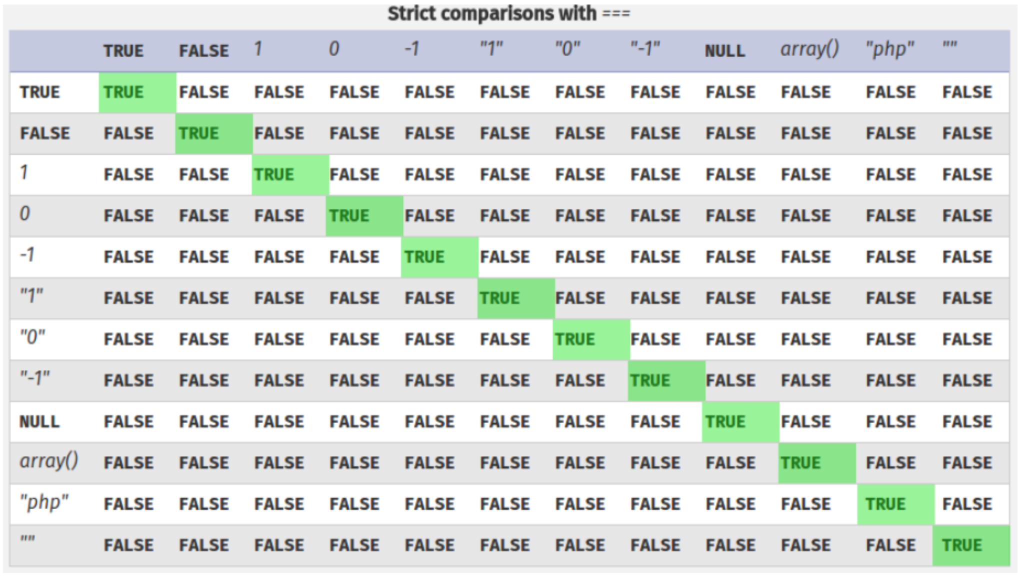
PHP Comparisons: Strict


Strict comparisons with ===

	TRUE	FALSE	1	0	-1	"1"	"0"	"-1"	NULL	array()	"php"	""
TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
1	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
0	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
-1	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
"1"	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
"0"	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
"-1"	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
NULL	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
array()	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
"php"	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE
""	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE

So PHP will do type juggling before compare using '==' operator (http://php.net/manual/en/language.operators.comparison.php)

Type juggling means If PHP decides that both operands look like numbers, even if they are actually strings, it will convert them both and perform a numeric comparison:

- TRUE: "0e12345" == "0e54321"
- TRUE: "0e12345" <= "1"
- TRUE: "0e12345" == "0"
- TRUE: "0xF" == "15"

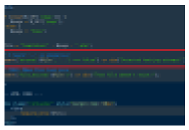
Or if we comparing a string to a number, PHP will attempt to convert the string to a number then perform a numeric comparison:

- TRUE: "0000" == int(0)
- TRUE: "0e12" == int(0)
- TRUE: "1abc" == int(1)
- TRUE: "0abc" == int(0)
- TRUE: "abc" == int(0)

FOR EXAMPLE BYPASS AUTHENTICATION USING '==' AND '!=' COMPARISON OPERATORS

Consider following PHP code handling to check for valid user's token.

```
<php
        $token = "0e124656823434657657655654324342";
```



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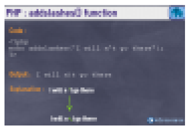

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```
        if(isset($_COOKIE['token']) && $_COOKIE['token'] ==
                // access to privilege area
        }
        else {
                // login require
        }
?>
```

or

```
<php
        $token = "0e124656823434657657655654324342";
        if(isset($_COOKIE['token']) && $_COOKIE['token'] !=
                 // login require
        }
        else {
                // access to privilege area
        }
?>
```

So If we input to application $COOKIE['token']='0'. What happen next?

$COOKIE['token'] == $token ('0e124656823434657657655654324342' == '0') will return TRUE
$COOKIE['token'] != $token ('0e124656823434657657655654324342' != '0') will return FALSE

=> authentication passed.

RECOMMENDATIONS

Use === as your default comparison. Only reach for == if you really need it

2. BYPASS PHP STRCMP() FUNCTION

strcmp is a function created to compare strings.

int strcmp(string $str1, string $str2);

- Return <0 if $str1 < $str2
- Return 0 if $str1 === $str2
- Return &Gt;0 if $str1 > $str2

For example: Consider following PHP code handling to check for valid user's token.

- March 2017
- February 2017
- January 2017
- December 2016
- November 2016
- October 2016
- September 2016
- August 2016
- July 2016
- June 2016
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- April 2016

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Stephen Stinson
Network Security and Malware Analysis

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```
<php
        $token = "0e37bd1f669d8bb5eae47ef80013e4d3d8287c11'
        if(isset($_COOKIE['token']) && strcmp($_COOKIE['tol
                // access to privilege area
        }
        else {
                // login require
        }
?>
```

If we request with cookie token is an array to pass an array instead of a string to strcmp(), it will gives a warning ('WARNING strcmp() expects parameter 2 to be string, array given on line number …!') but the compare result return 0.

This request look like:

```
GET / HTTP 1.1
Host: example.com
Cookie: token[]=''
.....
```

=> $_COOKIE['token'] = array(0 => "");

strcmp(array(0 => ""), "0a37bd1f669d8bb5eae47ef80013e4d3d8287c11") will return 0.

=> authentication passed.

RECOMMENDATIONS

Don't use this function to compare 2 variables which you don't know types.

Perform type conversions to string using the cast (string) before put into strcmp().

REFERENCES

https://www.owasp.org/images/6/6b/PHPMagicTricks-TypeJuggling.pdf

Tags: bug, php security, string comparison

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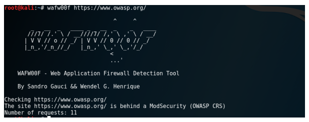


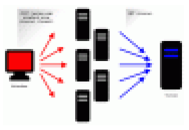
```
root@kali:~# wafw00f https://www.owasp.org/

                                 ^     ^
        _   __  _   ____ _   __  _    _   ____
       ///7/ /.' \ / __////7/ /,' \ ,' \ / __/
      | V V // o // _/ | V V // 0 // 0 // _/
      |_n_,'/_n_//_/   |_n_,' \_,' \_,'/_/
                                <
                                 ...'

    WAFW00F - Web Application Firewall Detection Tool

    By Sandro Gauci && Wendel G. Henrique

Checking https://www.owasp.org/
The site https://www.owasp.org/ is behind a ModSecurity (OWASP CRS)
Number of requests: 11
```



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ABOUT THE AUTHOR

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ONE RESPONSE

Frederic AUGUST 22, 2017

I agree: don't use loose comparison.
But, your are wrong in your "vulnerability" sample.
Here an 3v4l:
https://3v4l.org/VqDnL

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