

Lab 5 Report

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IST 894-001: Capstone Experience

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General Context

This lab introduces participants to three cybersecurity concepts: reconnaissance, pivoting, and defense evasion.

Reconnaissance is the process of gathering information about a prospective cyberattack target (Odun-Ayo et al., 2022). Before launching an attack, cyber attackers must know what kinds of vulnerabilities may or may not be exploitable; reconnaissance can help them by identifying things like open ports or outdated software on the target machine.

Reconnaissance can be either passive (conducted without interacting with the target system) or active (conducted by interacting directly with the target system) (Roy et al., 2021). In the lab, participants engage in passive reconnaissance by reading a publicly-available changelog hinting that a target website is running outdated software and active reconnaissance by downloading a complete copy of the target website in order to locally test whether that software can be exploited.

Once an attacker has used information gained from reconnaissance to access a system, they will often look to expand that access. One way they can accomplish this is **pivoting** – using the system they have already compromised as a stepping stone to move deeper into a network (Husak et al., n.d.). In the lab, participants pivot through several intermediary machines to learn for themselves how attackers can gain lateral movement within a network.

After gaining initial access and lateral movement, attackers must avoid detection by both human security professionals and automated tools. This is where **defense evasion** – the collective name for tactics and techniques that allow attackers to skirt cybersecurity defense systems and processes — comes into play. Defense evasion can come in many forms, from forcefully shutting down antivirus software to obfuscating malicious code (Imamverdiyev & Baghirov, 2024). In the lab, participants remotely shut down in antivirus program, then install a backdoor program on a target machine to make it easy for their illicit access to be maintained.

Technical Context

This lab introduces participants to three complimentary skills: reconnaissance, pivoting, and defense evasion.

The first part of the lab is about reconnaissance. Participants learn to conduct both passive and active reconnaissance; they obtain a target server's IP address by examining their system's hosts file, scan for open ports on that server using nmap, and use a publicly-available changelog to learn that an exploitable version of the Grav CMS software is running on the target system.

The second part of the lab introduces participants to pivoting and shows them firsthand how attackers can use compromised systems to access deeper parts of a network that would otherwise be out of their reach. Participants employ the ProxyChains software to access an intermediary jump host, then use SSH tunneling to create a SOCKS proxy that gives them access to a target system. This enables them to execute attacks on the target system without a direct connection to it.

The final part of the lab covers defense evasion tactics. Participants explore several ways of disabling security tools and maintaining persistent access to a system after initially compromising it. Participants deploy a trojanized version of a PAM module to act as a backdoor, allowing them to maintain root access even after the target system reboots or

updates — but not before using Metasploit to shut down an instance of the ClamAV antivirus program to prevent it from flagging the trojanized PAM module.

References

- Husak, M., Apruzzese, G., Yang, S. J., & Werner, G. (n.d.). *Towards an efficient detection of pivoting activity*.
- Imamverdiyev, Y., & Baghirov, E. (2024). Evasion techniques in malware detection: Challenges and countermeasures. *Problems of Information Technology*, 15(2), 9–15.
<https://doi.org/10.25045/jpit.v15.i2.02>
- Odun-Ayo, I., Owoka, E., Okuoyo, O., Ogunsola, O., Ikoh, O., Adeosun, O., Etukudo, D., Robert, V., & Oyeyemi, G. (2022). Evaluating common reconnaissance tools and techniques for information gathering. *Journal of Computer Science*, 18(2), 103–115.
<https://doi.org/10.3844/jcssp.2022.103.115>
- Roy, S., Sharmin, N., Acosta, J. C., Kiekintveld, C., & Laszka, A. (2021). *Survey and taxonomy of adversarial reconnaissance techniques* (Version 2). arXiv.
<https://doi.org/10.48550/ARXIV.2105.04749>

Screenshots

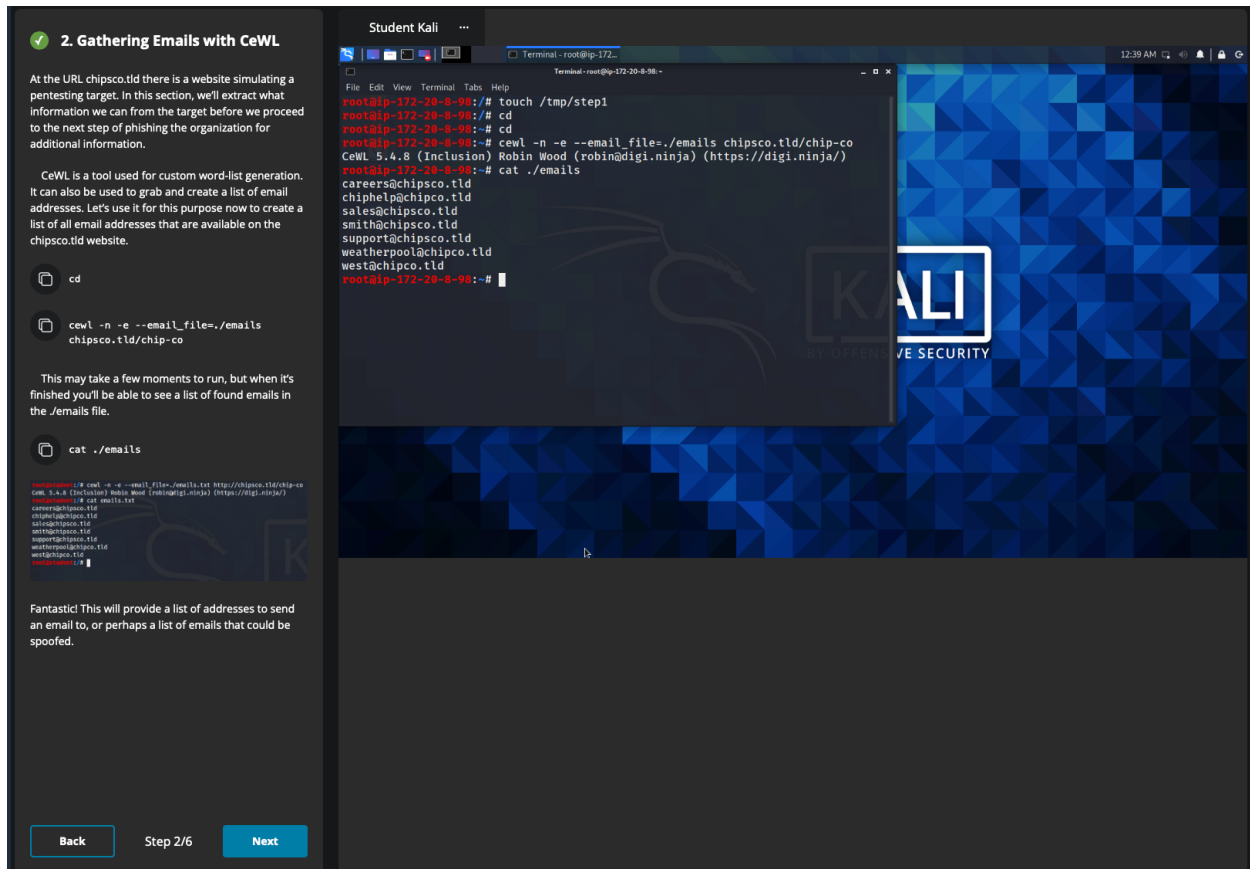


Figure 1. Reading the emails file.

4. Exploring the Results

Among the results from the previous step is a changelog.md file. Open this up in your browser to take a closer look.

<http://chipsco.tld/changelog.md>

Be sure to include the http:// in your address bar.

This file contains information about the current version of the CMS that is being used! It's not uncommon to find such files, even in production systems. Even things like exposed git directories have been reported on public bug bounty programs in the past.

The information that's been gathered so far might be enough to mount a successful social engineering attack. Using the knowledge that the company's website is based on grav, an attacker might create a fake LinkedIn profile positioning themselves as a lead developer on the project. Or they might attempt to compromise the grav download servers, uploading their own, malicious version of the project in a supply-chain attack. In the next step of this lab we'll clone the admin login page of the grav server to phish for more information.

Let's also download a copy of the changelog

```
wget chipsco.tld/changelog.md -O /root/changelog.md
```

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Next

Student Kali

Firefox

Terminal - root@ip-172-20-8-98

```
File Edit View Terminal Tabs Help
Terminal - root@ip-172-20-8-98 ~
bash: cannot set terminal process group (-1): Inappropriate ioctl for device
bash: no job control in this shell
(node:2284) electron: The default of contextIsolation is deprecated and will be
changing from false to true in a future release of Electron. See https://github
.com/electron/electron/issues/23506 for more information
^C
root@ip-172-20-8-98:~# ^C
root@ip-172-20-8-98:~# wget chipsco.tld/changelog.md -O /root/changelog.md
--2025-03-02 00:44:44-- http://chipsco.tld/changelog.md
Resolving chipsco.tld (chipsco.tld)... 172.20.5.182
Connecting to chipsco.tld (chipsco.tld)[172.20.5.182]:80... connected.
HTTP request sent, awaiting response... 302 Found
Location: /CHANGELOG.md [following]
--2025-03-02 00:44:44-- http://chipsco.tld/CHANGELOG.md
Reusing existing connection to chipsco.tld:80.
HTTP request sent, awaiting response... 200 OK
Length: 196653 (192K) [application/octet-stream]
Saving to: '/root/changelog.md'

/root/changelog.md 100%[=====] 192.04K --.-KB/s in 0.001s

2025-03-02 00:44:44 (154 MB/s) - '/root/changelog.md' saved [196653/196653]


root@ip-172-20-8-98:~#
```

Figure 2. Downloading changelog.md.

5. Social Engineering With SET

One of the standard tools for social engineering is SET, the social engineering toolkit. This toolkit provides all the necessary tools to craft a convincing and successful social engineering attack. Using the information that we've gathered in the previous steps, let's create a believable phishing attack and use it to gather even more information.

Start by opening up SET.

 **setoolkit**

After a moment you should be greeted with the main menu for SET. We'll use SET to create a clone of the victim's admin page which can then be used to phish for information, namely, credentials.

In SET, enter 1 for "Social-engineering Attacks".

Then enter 2 for the "Website Attack Vectors" option.

Lastly, select 3 for the "Credential Harvester Attack Method".

We'll want to clone the victim's admin login page so it looks exactly as they expect it to, so select 2 for "Site Cloner".

Enter in "chipsco.tld" for the post back IP and "http://chipsco.tld/admin" for the site to clone. After a moment, the clone should be finished and a cloned site should be available.

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Student Kali ...

Grav Admin Login | Chips Co. - Mozilla Firefox

Grav Admin Login | Chips Co. - Mozilla Firefox

chipsco.tld

Kali Linux Kali Training Kali Tools Kali Forums Kali Docs NetHunter Offensive Security MSFU Exploit-DB GHDB

GRAV

Username or Email

This connection is not secure. Logins entered here could be compromised. [Learn More](#)

[View Saved Logins](#)

[Forgot](#) [Login](#)

Figure 3. Visiting the fake chipsco.tld site.

✓ 1. Pivoting with Proxychains

In this lab, we'll take a look at how a hardware addition to a network can be leveraged to pivot into a protected network. We'll set up a proxied connection to jump server, and then use that connection to move to the target server.

This lab is set up with three machines: a kali machine you have access to, and two machines that you don't. We'll first connect to a proxy machine and use proxychains to route all our traffic through this machine. After this, we'll be able to connect to a second machine.

To get started, let's scan the proxy machine with the following command:

mkdir ~/lab

nmap -p- pivot

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Next

Student Kali

Terminal - root@ip-172-...

Terminal: root@ip-172-20-4-26:/
File Edit View Terminal Tabs Help
root@ip-172-20-4-26:/# mkdir ~/lab
root@ip-172-20-4-26:/# nmap -p- pivot
Starting Nmap 7.91 (<https://nmap.org>) at 2025-03-02 01:23 UTC
Nmap scan report for pivot (172.20.19.44)
Host is up (0.00078s latency).
Not shown: 65534 closed ports
PORT STATE SERVICE
22/tcp open ssh
Nmap done: 1 IP address (1 host up) scanned in 1.88 seconds
root@ip-172-20-4-26:/#

KALI

BY OFFENSIVE SECURITY

✓ Task completed!

Figure 4. Scanning host "pivot".

2. Scanning the Target

Our previous scan should have shown an ssh server. Connect to that now using the username root and the password toor:

ssh root@pivot

From this machine, scan our final target for the lab:

nmap -p- target

Our goal will be to be able to interact with the target machine through the pivot machine.

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Step 2/8

Next

Student Kali

Terminal - root@ip-172...

File Edit View Terminal Tabs Help

ts.
root@pivot's password:
Linux ip-172-20-19-44.us-east-2.compute.internal 4.14.34-265.565.amzn2.x86_64 #1 SMP Fri Jun 28 23:54:17 UTC 2025 x86_64

The programs included with the Kali GNU/Linux system are free software; the exact distribution terms for each program are described in the individual files in /usr/share/doc/*/*copyright.

Kali GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.
root@pivot:~# nmap -p- target
Starting Nmap 7.91 (https://nmap.org) at 2025-03-02 01:24 UTC
Nmap scan report for target (172.20.21.118)
Host is up (5.800000s latency).
Not shown: 65532 closed ports
PORT STATE SERVICE
22/tcp open ssh
80/tcp open http
3946/tcp open vnc
MAC Address: 06:40:C9:3B:EF:1D (Unknown)

Nmap done: 1 IP address (1 host up) scanned in 1.07 seconds
root@ip-172-20-19-44:~#

KALI

BY OFFENSIVE SECURITY

Figure 5. Scanning host "target".

4. Configuring Proxychains

Proxychains is configured via the `/etc/proxychains.conf` file. Open this up in an editor of your choice. Near the bottom there should be a line controlling the proxy, ensure that this points to the port opened in the previous step: 9050. The line should read as follows:

```
socks4 127.0.0.1 9050
```

Back to task

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Read ahead

Student Kali

Terminal - root@ip-172...

GNU nano 3.3 /etc/proxychains.conf

```
#
#
# Examples:
# socks5 192.168.67.78 1888 lamer secret
# http 192.168.89.3 8080 justu hidden
# socks4 192.168.1.49 1888
# http 192.168.39.33 8080
#
# proxy types: http, socks4, socks5
# ( auth types supported: "basic"-http "user/pass"-socks )
#
[ProxyList]
# add proxy here ...
# example
# defaults set to "top"
socks4 127.0.0.1 9050
```

Help

Exit

Write Out

Read File

Where Is

Replace

Cut

Paste

Execute

Justify

Location

Go To Line

KALI

BY OFFENSIVE SECURITY

Figure 6. Reading `/etc/proxychains.conf`.

2. Loading a exploit

For this exploit we'll use the auxiliary/scanner/misc/clamav_control exploit. Select this exploit by running:

```
use
auxiliary/scanner/misc/clamav_control
```

This will select the correct exploit. For more information on the exploit, you can run info

In order to continue we'll need to set the target by setting the RHOST variable. You can get the IP of the target by inspecting the contents of /etc/hosts

```
cat /etc/hosts
```

Before running the exploit for real we'll want to make sure clamAV is actually running on the remote server. We can do this by setting the action to VERSION and then running the exploit.

Please be patient if the version is not returned on the first run of this command as the ClamAV service may take up to ten minutes to start up.

```
set RHOST <TARGET IP>
set ACTION VERSION
run
```

Move to the next step by writing the version to the /tmp/version file.

```
echo "ClamAV X.XXX.X" > /tmp/version
```

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Read ahead

Target ... Kali ...

Terminal - root@ip-172-20-7-97

File Edit View Terminal Tabs Help

```
#damn_sadboi+tdaaaa=null2root+HowestCSP+fezfezf+LordVader+Fl@_Hunt3rs+bluenet+PgGe2mE*

[+] metasploit v6.0.30-dev
+ -- --[ 2099 exploits - 1128 auxiliary - 357 post
+ -- --[ 592 payloads - 45 encoders - 10 nops
+ -- --[ 7 evasion

Metasploit tip: When in a module, use back to go
back to the top level prompt

msf6 > use auxiliary/scanner/misc/clamav_control
msf6 auxiliary(scanner/misc/clamav_control) > cat /etc/hosts
[*] exec: cat /etc/hosts

127.0.0.1 localhost
::1 localhost ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
172.20.7.97 ip-172-20-7-97-us-east-2-compute.internal

172.20.17.250 labs.infosecinstitute.com
172.20.0.51 labs.infosecinstitute.com

172.20.1.1 target
172.20.7.97 kali
msf6 auxiliary(scanner/misc/clamav_control) > set RHOST 172.20.1.1
RHOST => 172.20.1.1
msf6 auxiliary(scanner/misc/clamav_control) > set ACTION VERSION
ACTION => VERSION
msf6 auxiliary(scanner/misc/clamav_control) > run

[*] 172.20.1.1:3310 - ClamAV 0.103.2/20239/Wed Jul 21 03:19:54 2021
[*] 172.20.1.1:3310 - Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf6 auxiliary(scanner/misc/clamav_control) > 
```

Figure 7. Running the clamav_control exploit.

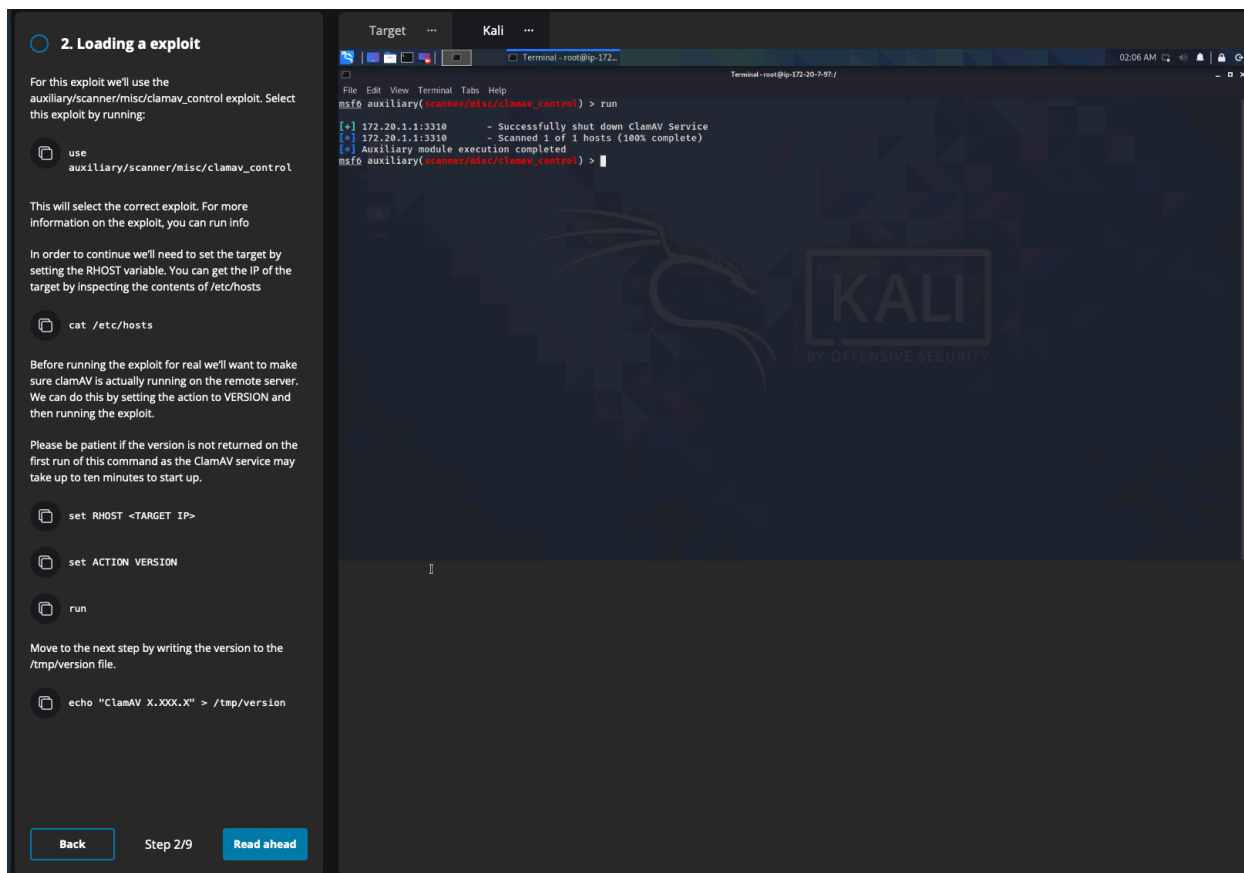


Figure 8. Shutting down the clamAV service.

Next we'll need to create the backdoored PAM module. Run the following command to generate the module and wait for it to compile and complete. This will instruct the code to create a backdoor for PAM version 1.3.1 and use a backdoor password of password1234

When the script has finished your terminal should look like the following

[illegible]

Read ahead

Figure 9. Creating the backdoored PAM module.

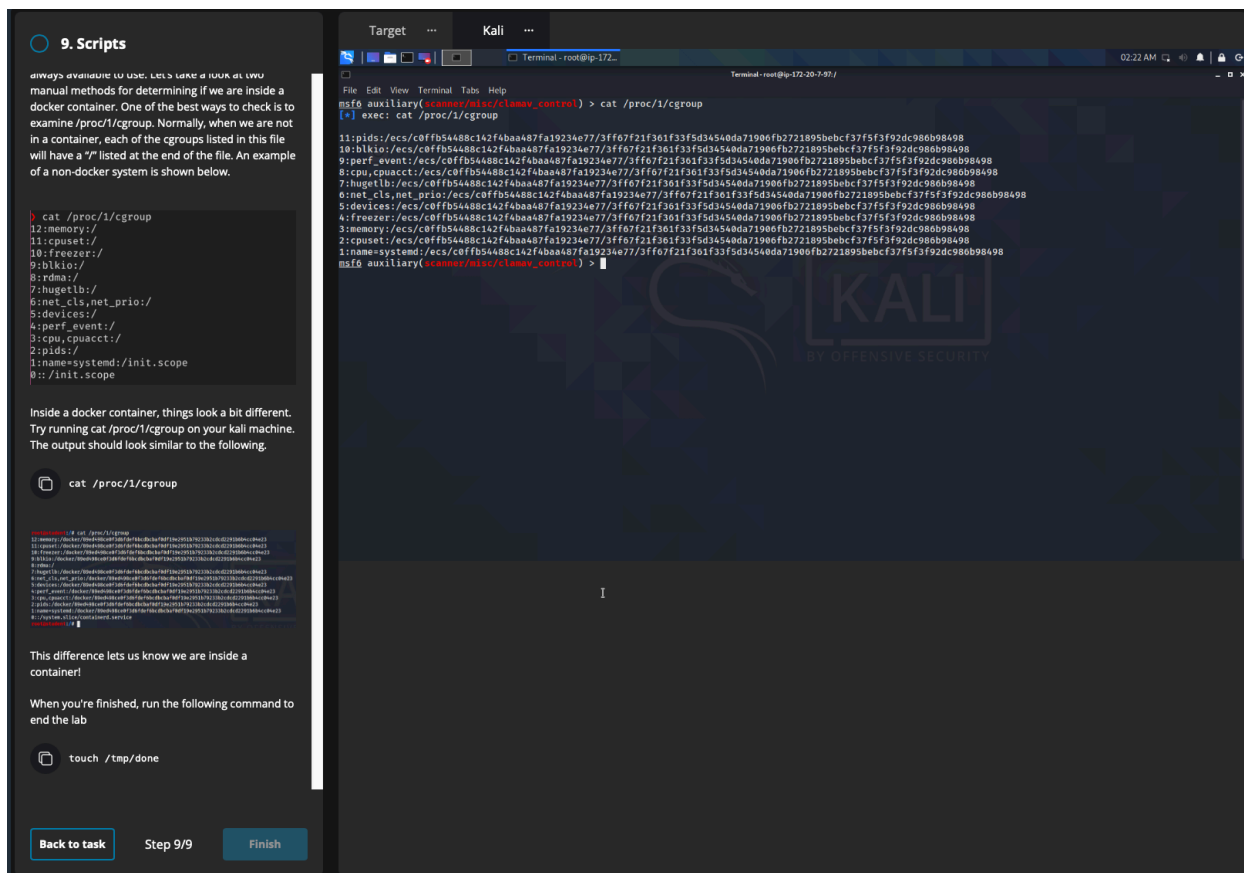


Figure 10. Reading /proc/1/cgroup.