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of vulnerabilities may or may not be exploitable; reconnaissance can help them by identifying things like open ports or outdated software on the target machine.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engage in passive reconnaissance by reading a publicly-available changelog hinting that a target website is running outdated software and active reconnaissance by downloading a complete copy of the target website in order to locally test whether that software can be exploited.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 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

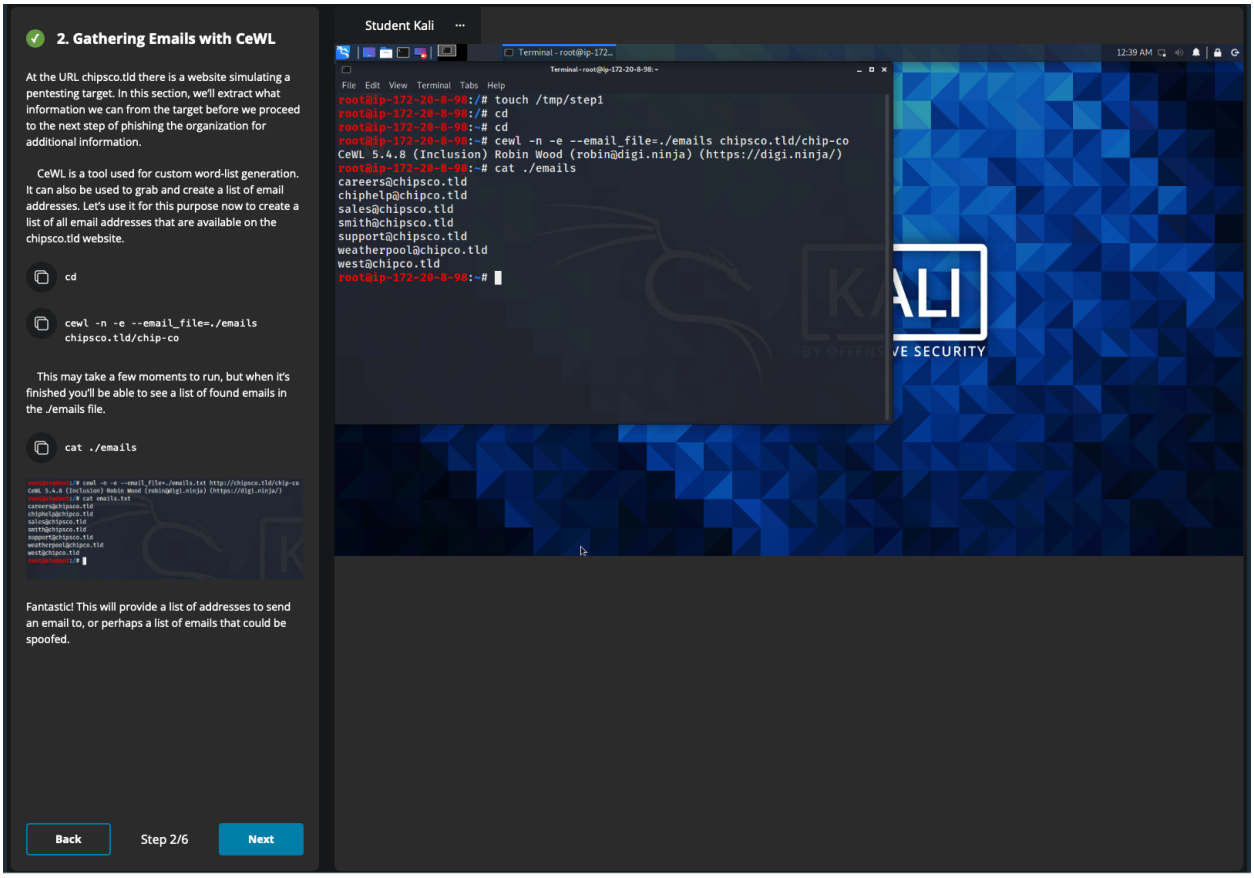

Figure 1. Reading the emails file.

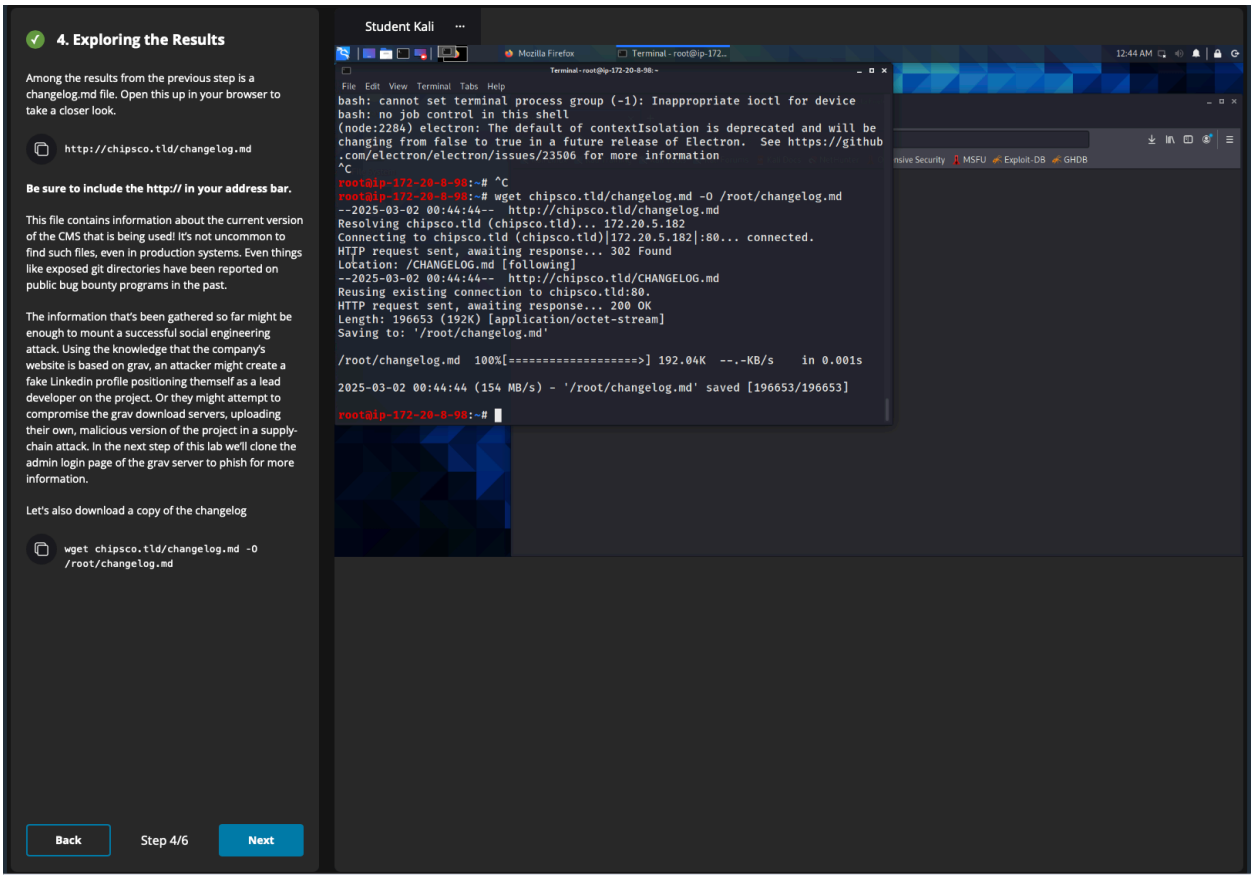

Figure 2. Downloading changelog.md.

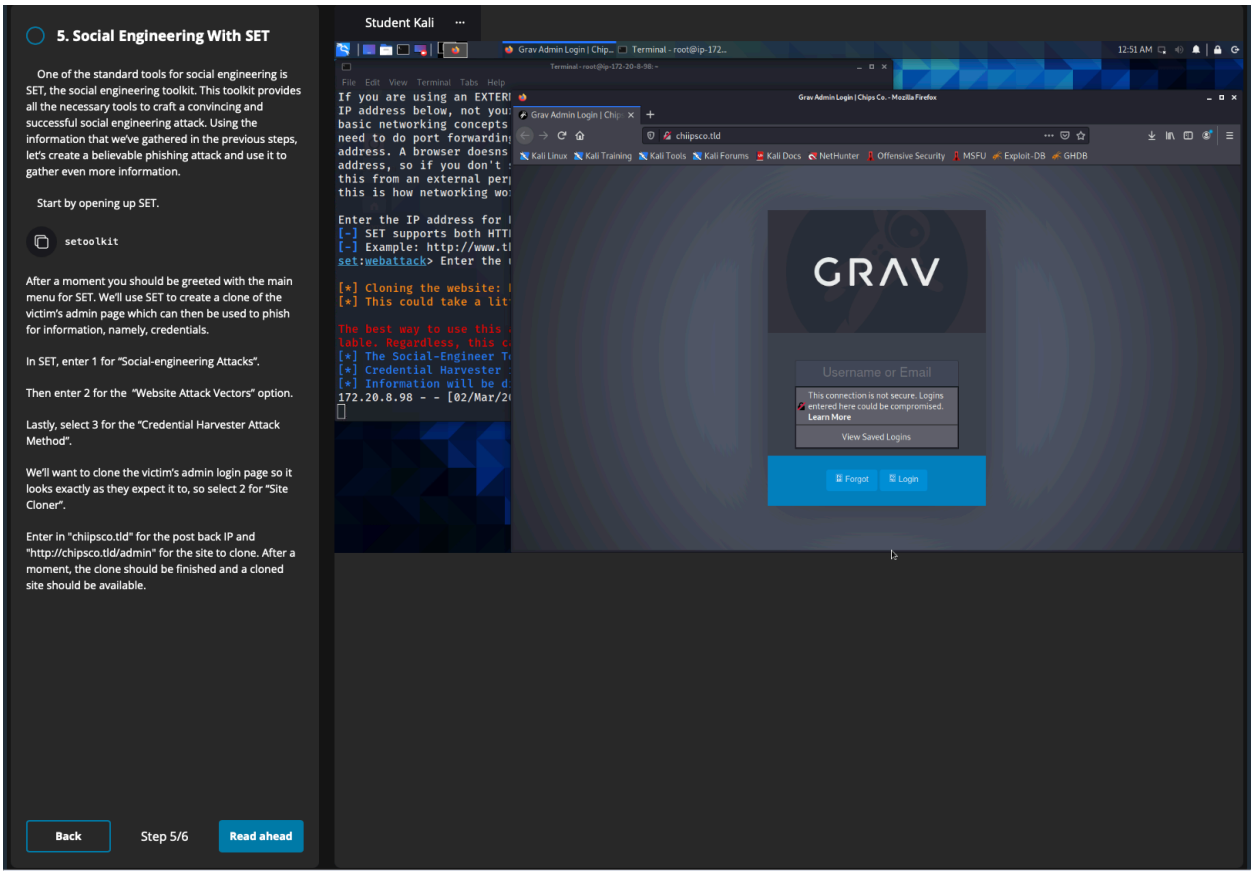

Figure 3. Visiting the fake chipsco.tld site.

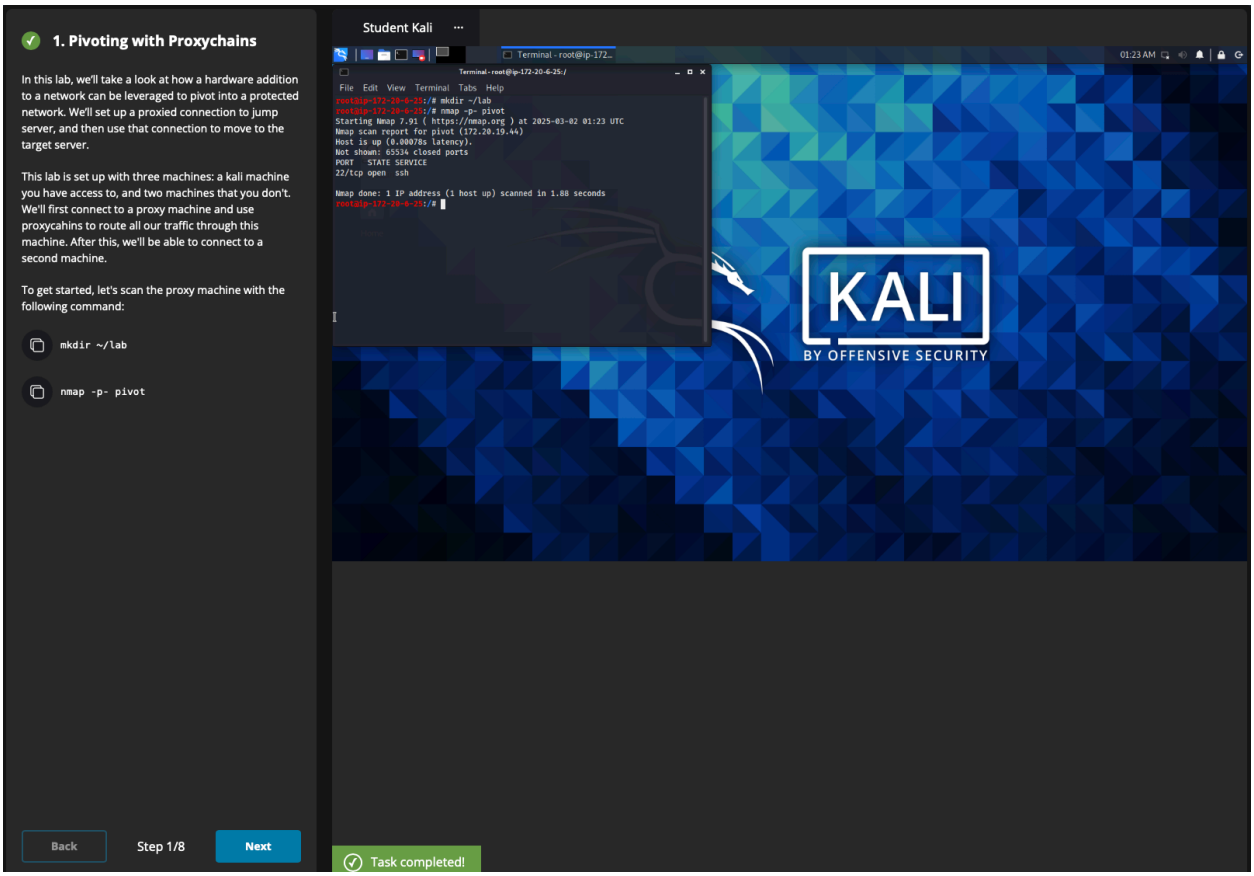

Figure 4. Scanning host "pivot".

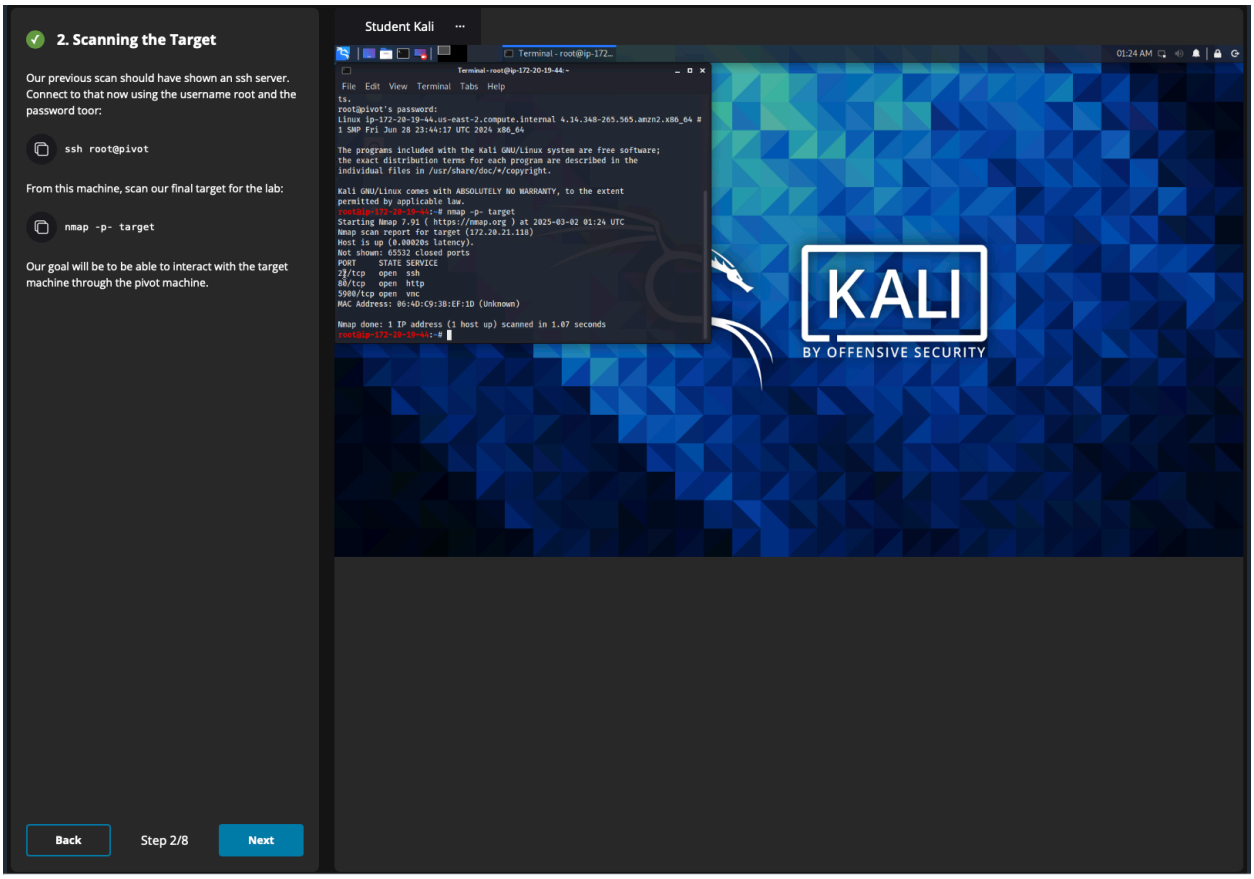

Figure 5. Scanning host "target".

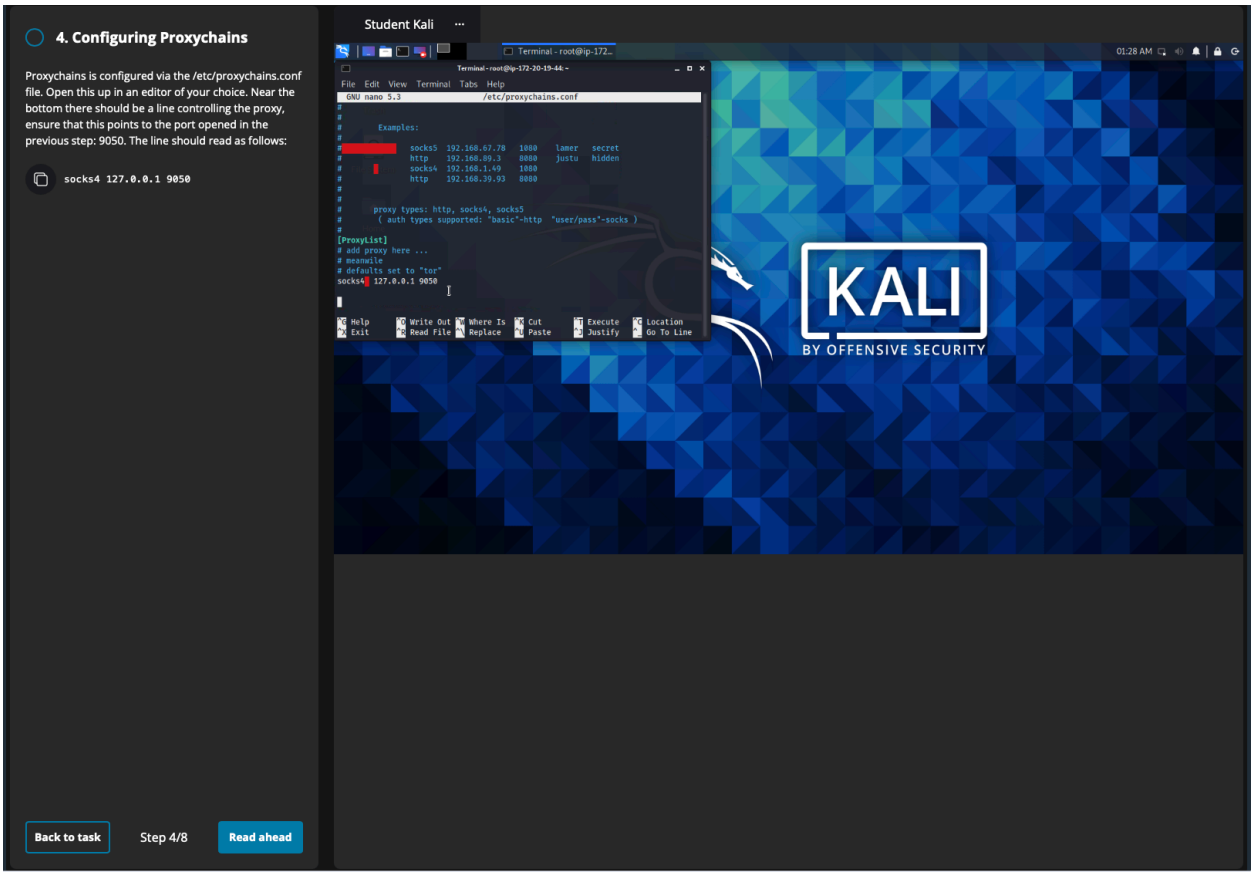

Figure 6. Reading /etc/proxychains.conf.

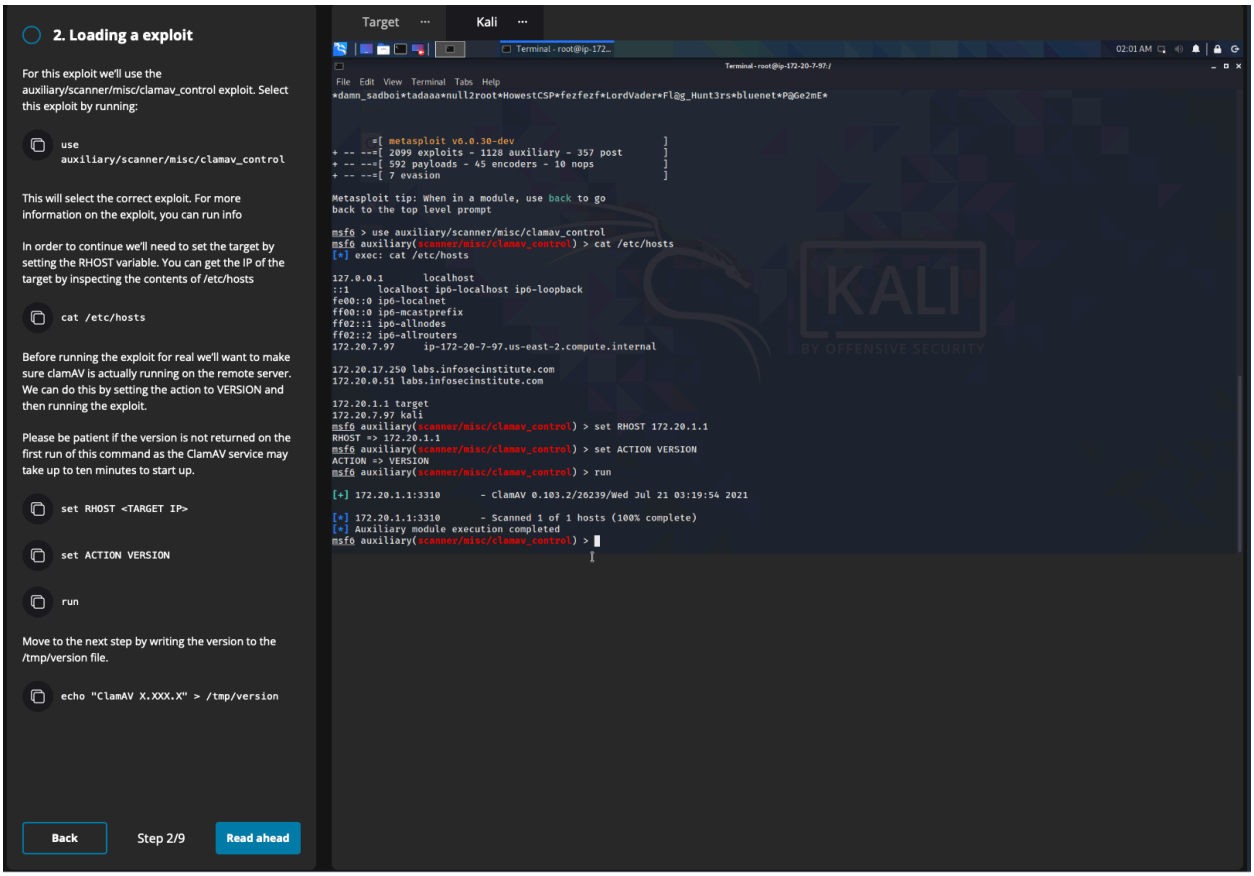

Figure 7. Running the clamav_control exploit.

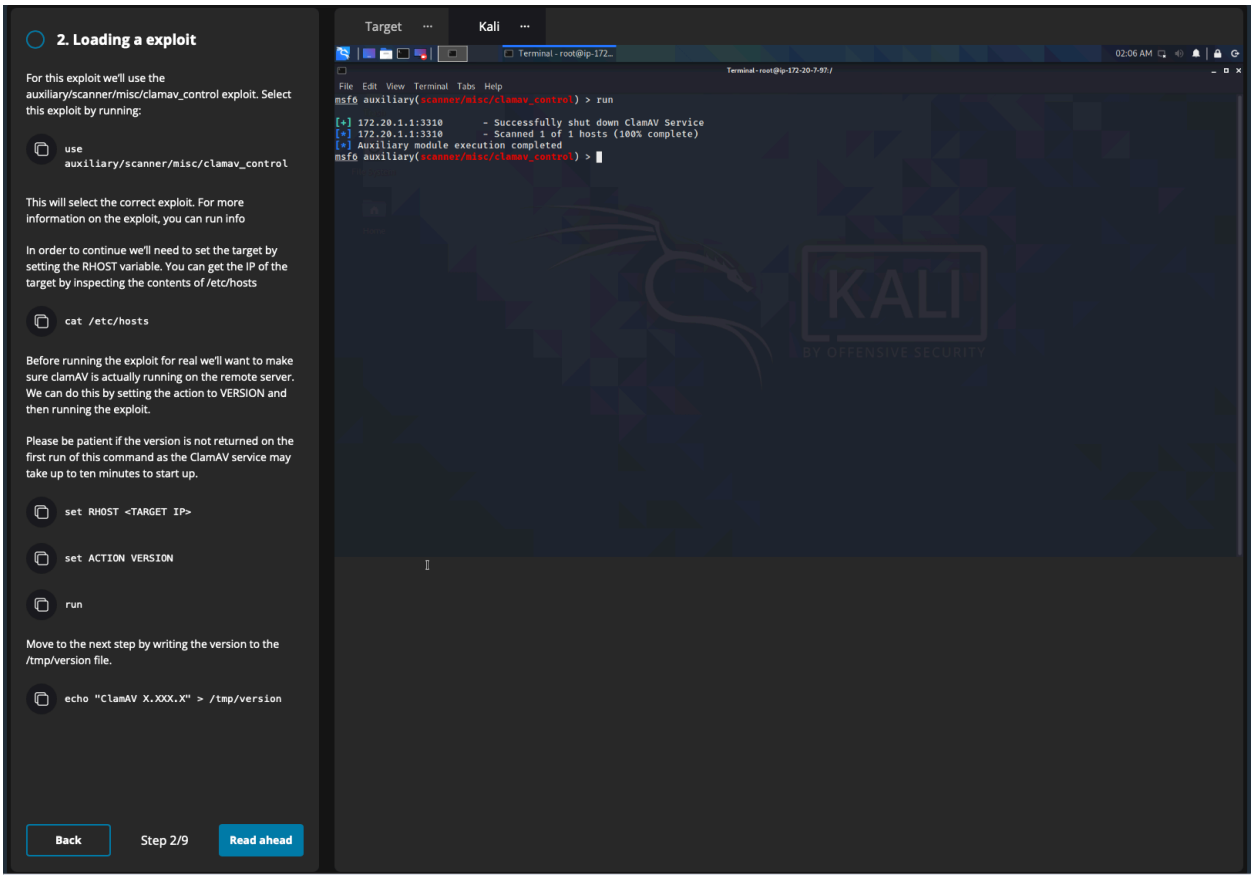

Figure 8. Shutting down the clamAV service.

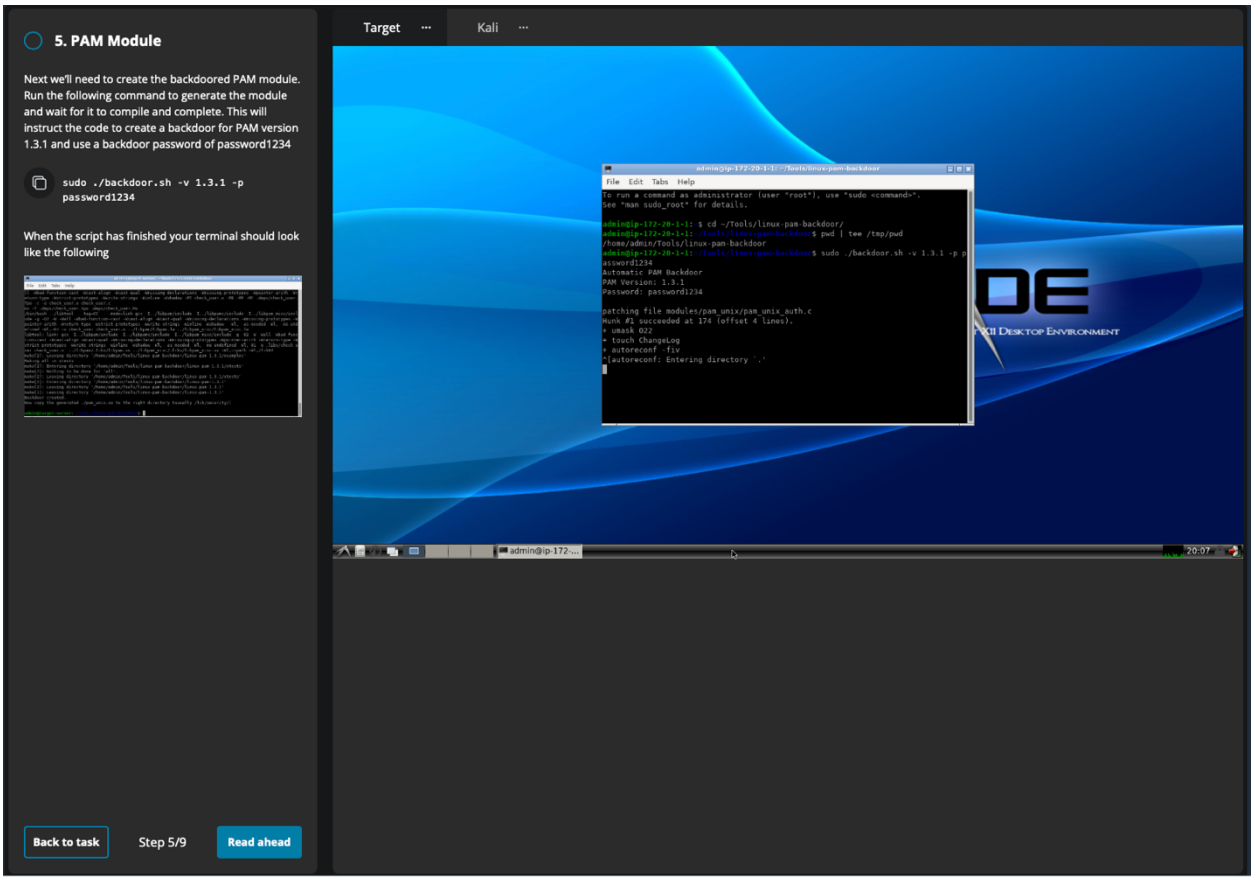

Figure 9. Creating the backdoored PAM module.

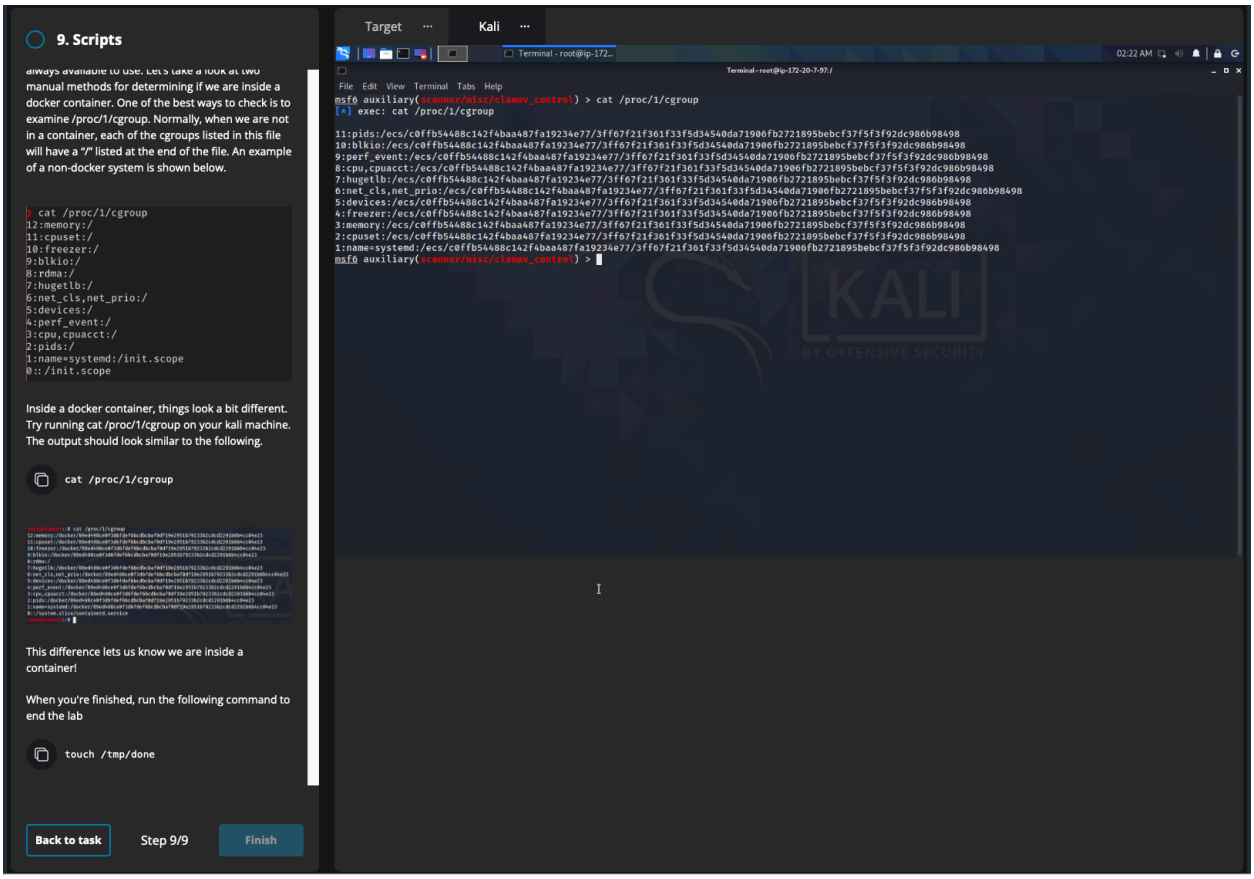

Figure 10. Reading /proc/1/cgroup.