Network Penetration Testing with RealWorld Exploits and Security Remediation

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Name: Alok Singh

ERP: 6604664

Course: B.Tech CSE (Cybersecurity)

Semester: 4th

Section: CY4A

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Project Objectives

Introduction:

This project involves performing penetration testing in a controlled lab environment to simulate real-world attacks that malicious hackers might use to exploit systems. Using Kali Linux as the attack platform and Metasploitable as the vulnerable target system, I explore various stages of ethical hacking, including reconnaissance, scanning, enumeration, exploitation, privilege escalation, and remediation. The goal is to gain hands-on experience in identifying, exploiting, and mitigating vulnerabilities responsiblities responsibly

Theory About the Project

Network penetration testing is the process of evaluating a system's security by simulating attacks from malicious outsiders and insiders. The objective is to identify security weaknesses before attackers can exploit them. The phases include:

Reconnaissance: Gathering information about the target.

Scanning & Enumeration: Actively probing the target to discover open ports, services, and vulnerabilities.

Exploitation: Gaining unauthorized access using known exploits.

Post-Exploitation: Activities such as privilege escalation or data exfiltration.

Remediation: Recommending security measures to patch vulnerabilities.

Project Requirements

1.Operating Systems:

Kali Linux (Attacking Machine) Metasploitable

(Target Machine)

2.Tools:

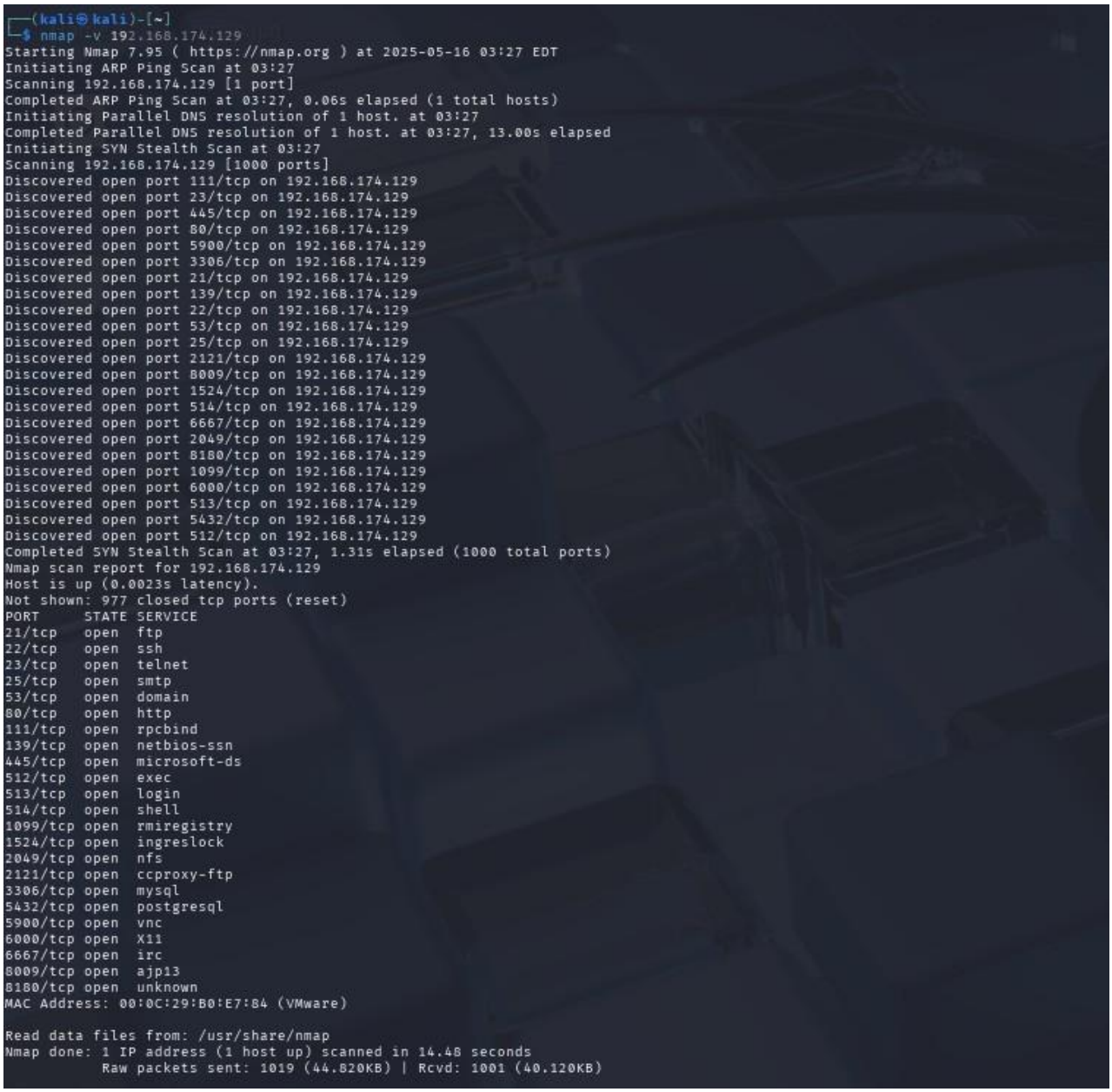
Nmap: For network scanning, port discovery, OS detection, and service enumeration.

Metasploit Framework: For exploiting known vulnerabilities in services.

Task 1: Basic Network Scanning

Steps:

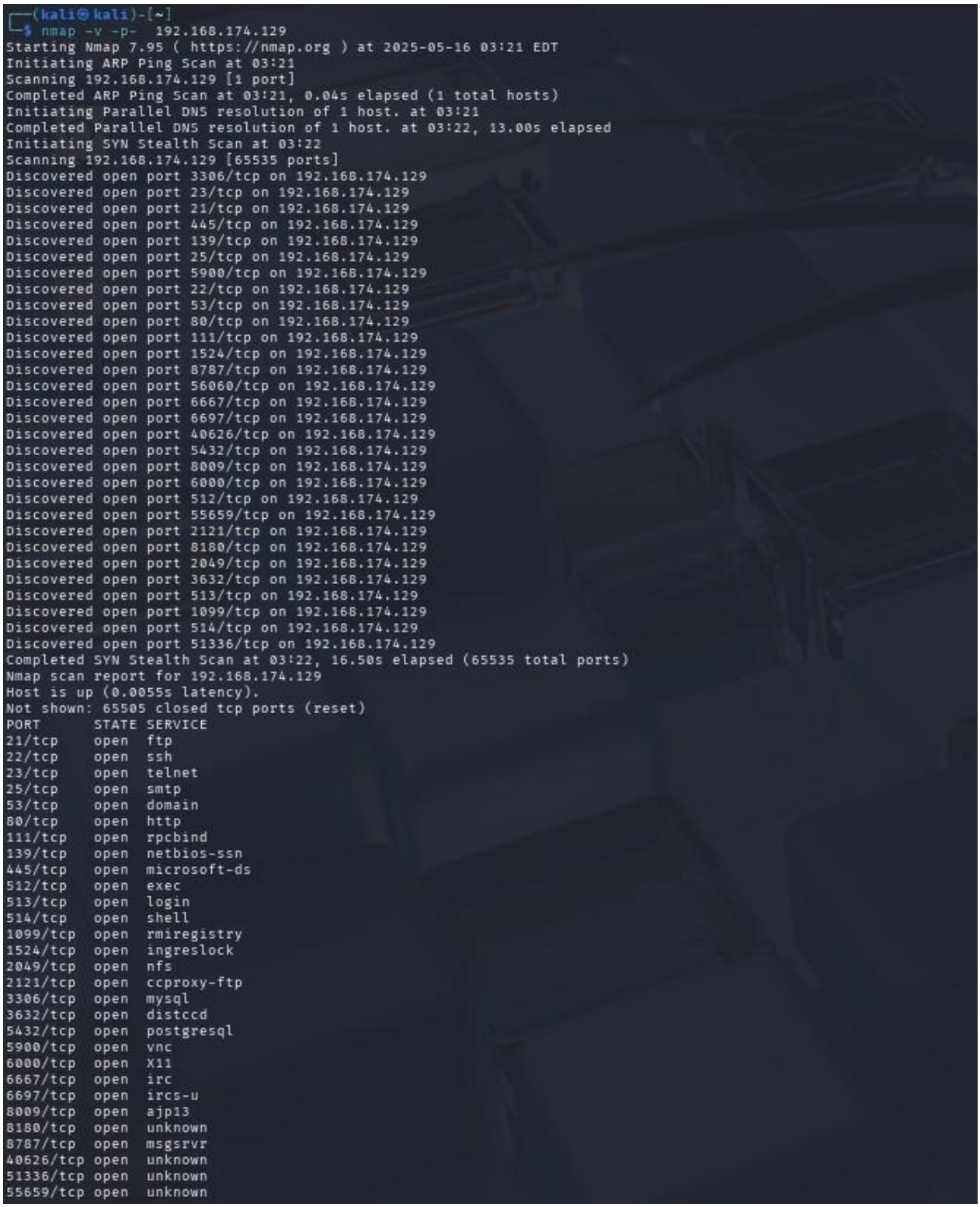
```
$ nmap -v 192.168.99.131
```



Task 2: Scanning for Hidden Ports

Steps:

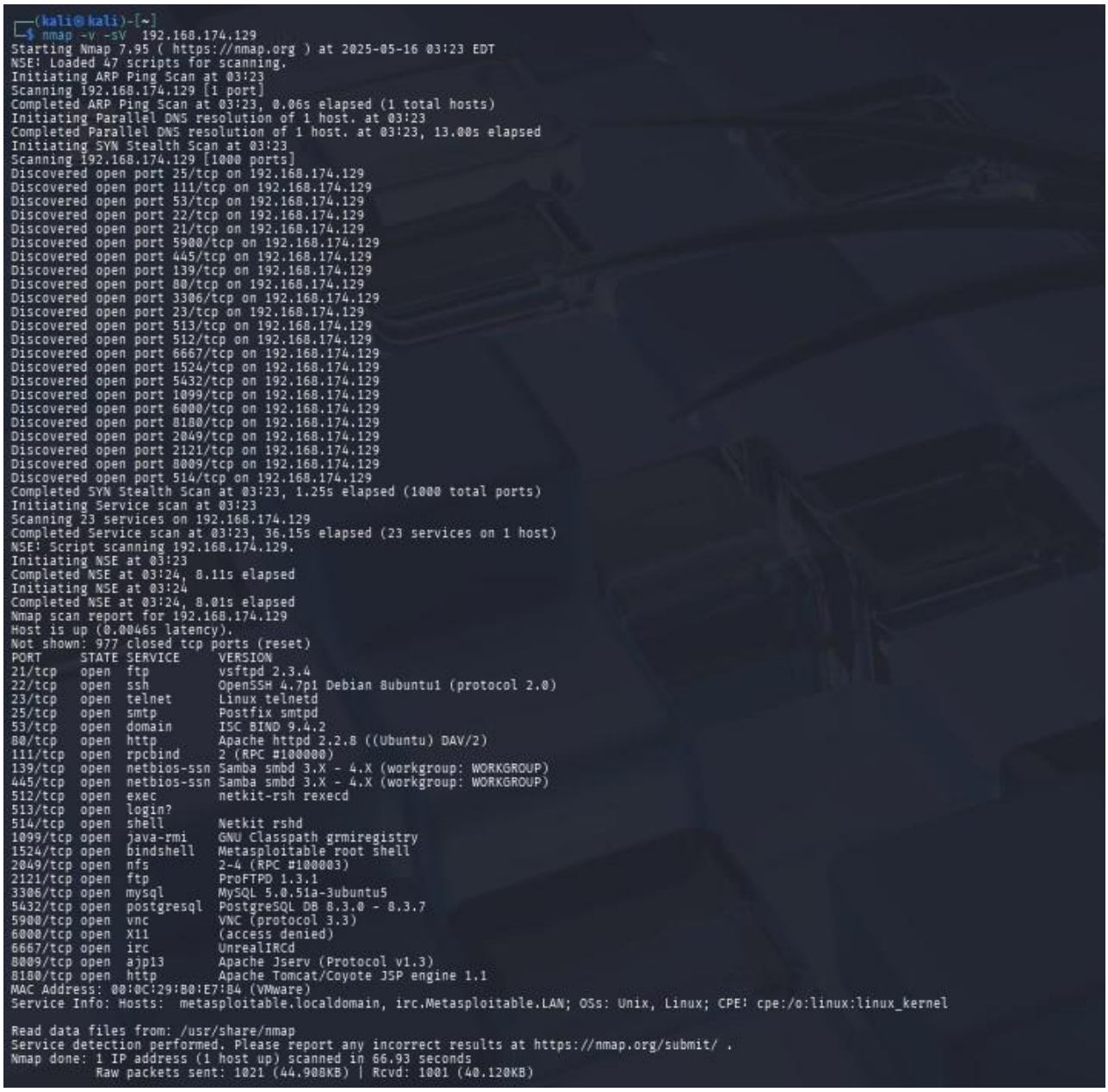
$ nmap -v -p- 192.168.99.131


┌──(kali㉿kali)-[~]
└─$ nmap -v -p- 192.168.174.129
Starting Nmap 7.95 (https://nmap.org) at 2025-05-16 03:21 EDT
Initiating ARP Ping Scan at 03:21
Scanning 192.168.174.129 [1 port]
Completed ARP Ping Scan at 03:21, 0.04s elapsed (1 total hosts)
Initiating Parallel DNS resolution of 1 host. at 03:21
Completed Parallel DNS resolution of 1 host. at 03:22, 13.00s elapsed
Initiating SYN Stealth Scan at 03:22
Scanning 192.168.174.129 [65535 ports]
Discovered open port 3306/tcp on 192.168.174.129
Discovered open port 23/tcp on 192.168.174.129
Discovered open port 21/tcp on 192.168.174.129
Discovered open port 445/tcp on 192.168.174.129
Discovered open port 139/tcp on 192.168.174.129
Discovered open port 25/tcp on 192.168.174.129
Discovered open port 5900/tcp on 192.168.174.129
Discovered open port 22/tcp on 192.168.174.129
Discovered open port 53/tcp on 192.168.174.129
Discovered open port 80/tcp on 192.168.174.129
Discovered open port 111/tcp on 192.168.174.129
Discovered open port 1524/tcp on 192.168.174.129
Discovered open port 8787/tcp on 192.168.174.129
Discovered open port 56060/tcp on 192.168.174.129
Discovered open port 6667/tcp on 192.168.174.129
Discovered open port 6697/tcp on 192.168.174.129
Discovered open port 40626/tcp on 192.168.174.129
Discovered open port 5432/tcp on 192.168.174.129
Discovered open port 8009/tcp on 192.168.174.129
Discovered open port 6000/tcp on 192.168.174.129
Discovered open port 512/tcp on 192.168.174.129
Discovered open port 55659/tcp on 192.168.174.129
Discovered open port 2121/tcp on 192.168.174.129
Discovered open port 8180/tcp on 192.168.174.129
Discovered open port 2049/tcp on 192.168.174.129
Discovered open port 3632/tcp on 192.168.174.129
Discovered open port 513/tcp on 192.168.174.129
Discovered open port 1099/tcp on 192.168.174.129
Discovered open port 514/tcp on 192.168.174.129
Discovered open port 51336/tcp on 192.168.174.129
Completed SYN Stealth Scan at 03:22, 16.50s elapsed (65535 total ports)
Nmap scan report for 192.168.174.129
Host is up (0.0055s latency).
Not shown: 65505 closed tcp ports (reset)
PORT   STATE SERVICE
21/tcp   open ftp
22/tcp   open ssh
23/tcp   open telnet
25/tcp   open smtp
53/tcp   open domain
80/tcp   open http
111/tcp   open rpcbind
139/tcp   open netbios-ssn
445/tcp   open microsoft-ds
512/tcp   open exec
513/tcp   open login
514/tcp   open shell
1099/tcp open rmiregistry
1524/tcp open ingreslock
2049/tcp open nfs
2121/tcp open ccproxy-ftp
3306/tcp open mysql
3632/tcp open distccd
5432/tcp open postgresql
5900/tcp open vnc
6000/tcp open X11
6667/tcp open irc
6697/tcp open ircs-u
8009/tcp open ajp13
8180/tcp open unknown
8787/tcp open msgsrvr
40626/tcp open unknown
51336/tcp open unknown
55659/tcp open unknown

Task 3: Service Version Detection

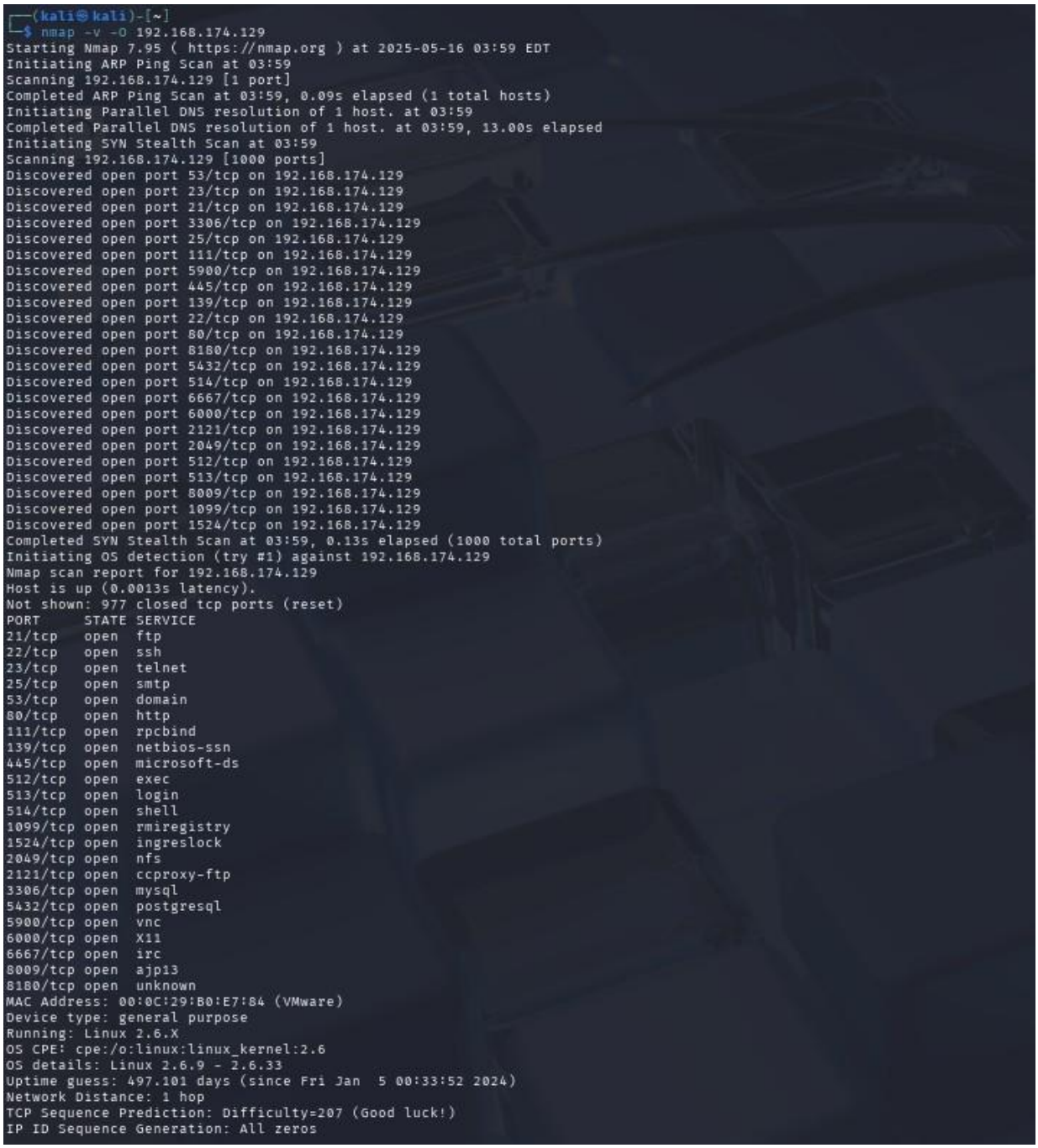
 Steps:

$ nmap -v -sV 192.168.99.131



Task 4: Operating Version Detection

Command: $ nmap -v -O 192.168.174.129



```
┌──(kali㉿kali)-[~]
└─$ nmap -v -O 192.168.174.129
Starting Nmap 7.95 ( https://nmap.org ) at 2025-05-16 03:59 EDT
Initiating ARP Ping Scan at 03:59
Scanning 192.168.174.129 [1 port]
Completed ARP Ping Scan at 03:59, 0.09s elapsed (1 total hosts)
Initiating Parallel DNS resolution of 1 host. at 03:59
Completed Parallel DNS resolution of 1 host. at 03:59, 13.00s elapsed
Initiating SYN Stealth Scan at 03:59
Scanning 192.168.174.129 [1000 ports]
Discovered open port 53/tcp on 192.168.174.129
Discovered open port 23/tcp on 192.168.174.129
Discovered open port 21/tcp on 192.168.174.129
Discovered open port 3306/tcp on 192.168.174.129
Discovered open port 25/tcp on 192.168.174.129
Discovered open port 111/tcp on 192.168.174.129
Discovered open port 5900/tcp on 192.168.174.129
Discovered open port 445/tcp on 192.168.174.129
Discovered open port 139/tcp on 192.168.174.129
Discovered open port 22/tcp on 192.168.174.129
Discovered open port 80/tcp on 192.168.174.129
Discovered open port 8180/tcp on 192.168.174.129
Discovered open port 5432/tcp on 192.168.174.129
Discovered open port 514/tcp on 192.168.174.129
Discovered open port 6667/tcp on 192.168.174.129
Discovered open port 6000/tcp on 192.168.174.129
Discovered open port 2121/tcp on 192.168.174.129
Discovered open port 2049/tcp on 192.168.174.129
Discovered open port 512/tcp on 192.168.174.129
Discovered open port 513/tcp on 192.168.174.129
Discovered open port 8009/tcp on 192.168.174.129
Discovered open port 1099/tcp on 192.168.174.129
Discovered open port 1524/tcp on 192.168.174.129
Completed SYN Stealth Scan at 03:59, 0.13s elapsed (1000 total ports)
Initiating OS detection (try #1) against 192.168.174.129
Nmap scan report for 192.168.174.129
Host is up (0.0013s latency).
Not shown: 977 closed tcp ports (reset)
PORT     STATE SERVICE
21/tcp   open  ftp
22/tcp   open  ssh
23/tcp   open  telnet
25/tcp   open  smtp
53/tcp   open  domain
80/tcp   open  http
111/tcp  open  rpcbind
139/tcp  open  netbios-ssn
445/tcp  open  microsoft-ds
512/tcp  open  exec
513/tcp  open  login
514/tcp  open  shell
1099/tcp open  rmiregistry
1524/tcp open  ingreslock
2049/tcp open  nfs
2121/tcp open  ccproxy-ftp
3306/tcp open  mysql
5432/tcp open  postgresql
5900/tcp open  vnc
6000/tcp open  X11
6667/tcp open  irc
8009/tcp open  ajp13
8180/tcp open  unknown
MAC Address: 00:0C:29:B0:E7:84 (VMware)
Device type: general purpose
Running: Linux 2.6.X
OS CPE: cpe:/o:linux:linux_kernel:2.6
OS details: Linux 2.6.9 - 2.6.33
Uptime guess: 497.101 days (since Fri Jan  5 00:33:52 2024)
Network Distance: 1 hop
TCP Sequence Prediction: Difficulty=207 (Good luck!)
IP ID Sequence Generation: All zeros
```

Task 5: Enumeration 🎯Target

IP: 192.168.174.129

✅MAC Address: 00:0C:29:B0:E7:84 (VMware)

✅Device type: general purpose

✅Running: Linux 2.6.X

OS CPE: cpe:/o:linux:linux_kernel:2.6

OS details: Linux 2.6.9 - 2.6.33

Open Ports & Services:

PORT	STATE	SERVICE
21/tcp	open	ftp
22/tcp	open	ssh
23/tcp	open	telnet
25/tcp	open	smtp
53/tcp	open	domain
80/tcp	open	http
111/tcp	open	rpcbind
139/tcp	open	netbios-ssn
445/tcp	open	microsoft-ds
512/tcp	open	exec
513/tcp	open	login
514/tcp	open	shell
1099/tcp	open	rmiregistry
1524/tcp	open	ingreslock
2049/tcp	open	nfs
2121/tcp	open	ccproxy-ftp
3306/tcp	open	mysql
5432/tcp	open	postgresql
5900/tcp	open	vnc
6000/tcp	open	X11
6667/tcp	open	irc
8009/tcp	open	ajp13
8180/tcp	open	unknown

Task 6: Exploitation

Exploit: Backdoor vulnerability (CVE-2011-2523).

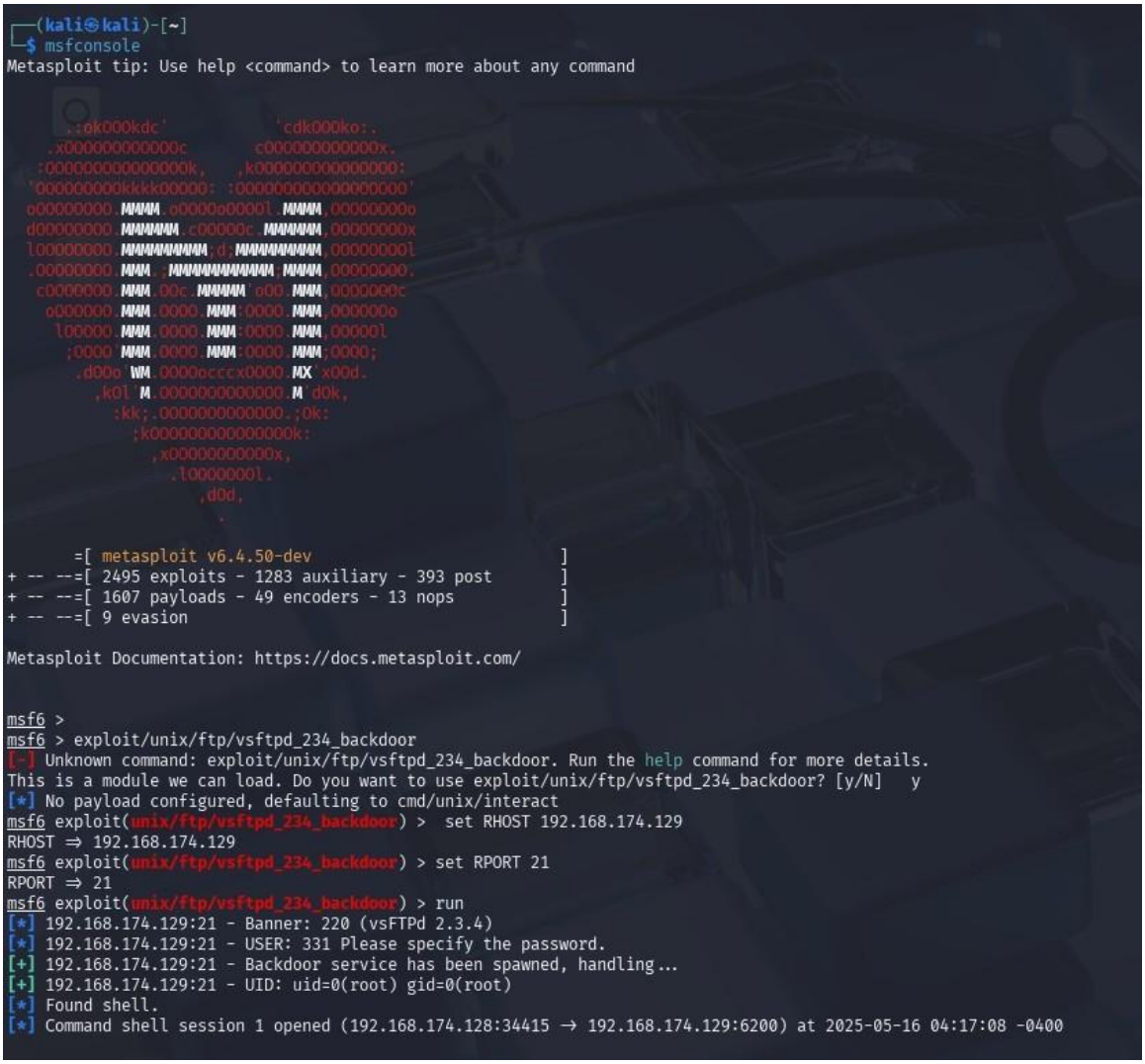
Steps: $ msfconsole

$ exploit/unix/ftp/vsftpd_234_backdoor

$ set RHOST 192.168.174.129

$ set RPORT 21

$ run



Task 7: Privilege Escalation

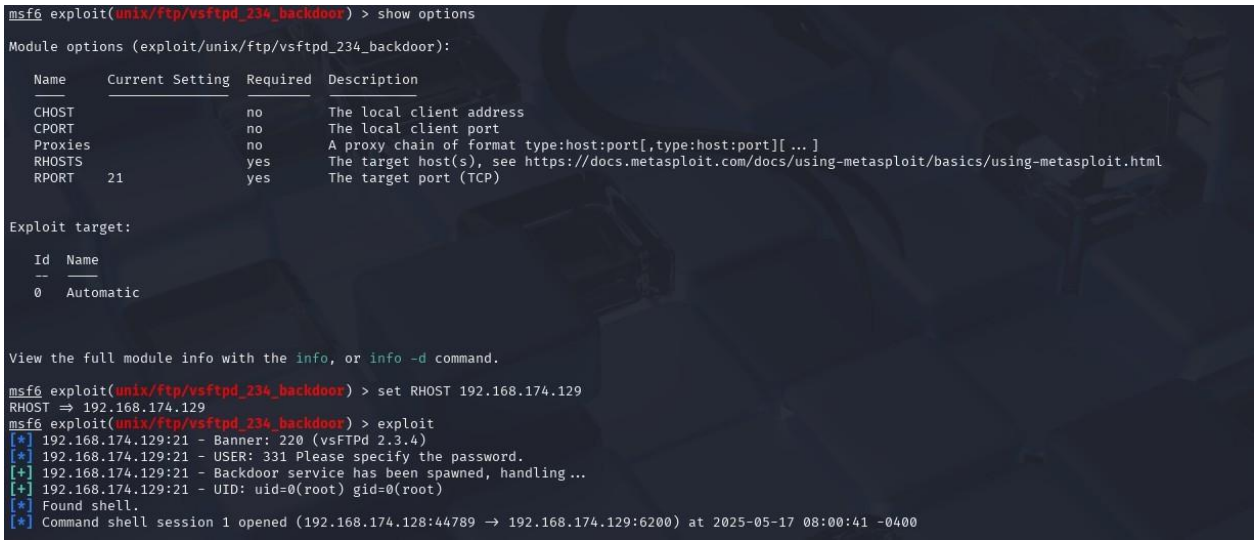
Exploit: Usermap script vulnerability (CVE-2007-2447).

Steps:

$ use exploit/unix/ftp/vsftpd_234_backdoor

$ set RHOST 192.168.174.129

$ exploit



Task 8: Remediation

1. **FTP Service (vsftpd)**

Vulnerability: Backdoor (CVE-2011-2523).

Remediation:

- Upgrade to vsftpd 3.0.5.
- Disable FTP and use SFTP.

2. **SMB Service**

Vulnerability: RCE (CVE-2007-2447).

Remediation:

- Upgrade Samba to the latest version.
- Disable SMBv1 and restrict access.

3. **R Services (Ports 512-514)**

Vulnerability: Plaintext credentials (CVE-1999-0651).

Remediation:

- Disable rsh, rlogin, and rexec services.

Major Learnings from the Project

Through this project, I learned:

- How to perform network scanning and enumeration using Nmap.
- Techniques for exploiting vulnerabilities in services like FTP, SMB, and R services.
- The importance of remediation to secure systems against attacks.

This hands-on experience deepened my understanding of ethical hacking and cybersecurity best practices.