Lab 8: Network Scanning & Enumeration with Nmap
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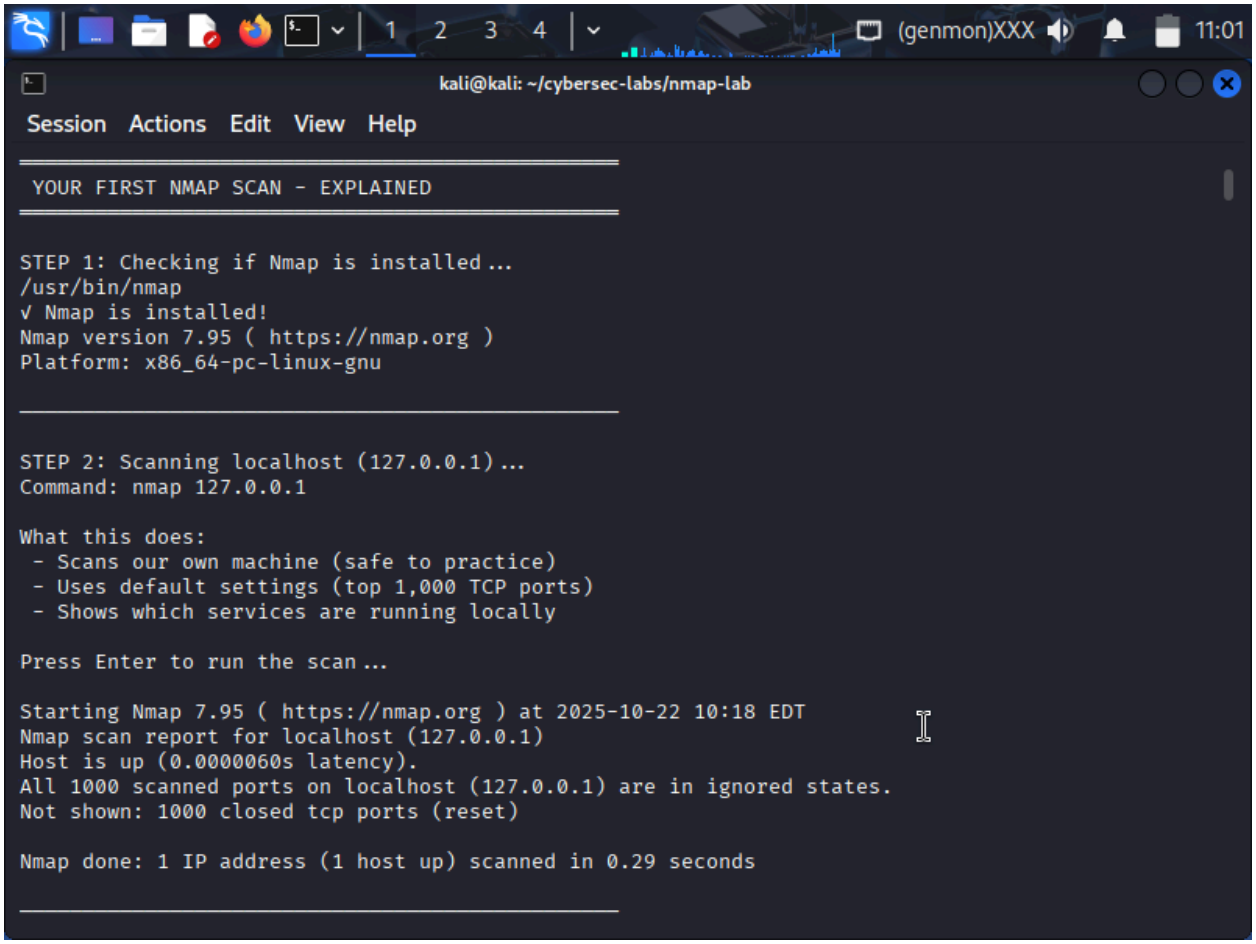
Introduction:

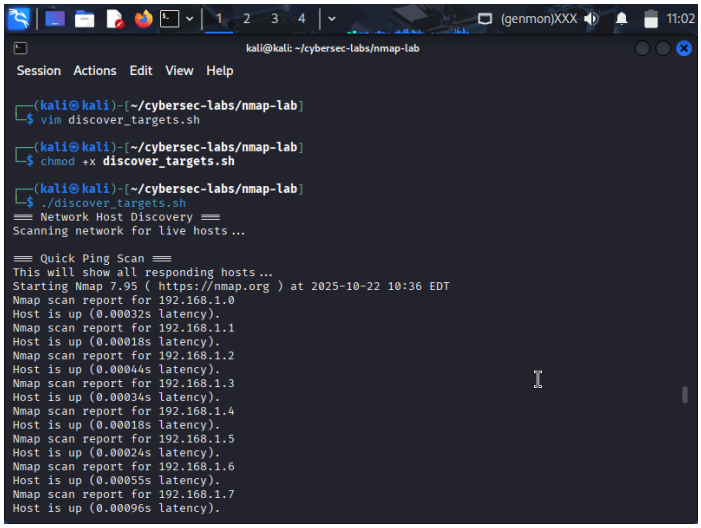
Network scanning and enumeration are foundational steps in penetration testing and security assessments. This lab utilises Nmap for network discovery and security auditing, teaching practical techniques for identifying live hosts, open ports, and running services, as well as determining service versions and operating systems. Through a series of hands-on exercises against Linux (Metasploitable) and Windows (Metasploitable3) targets, I will move from basic host discovery to advanced service enumeration and vulnerability detection using the Nmap Scripting Engine (NSE). Along the way, I will learn to interpret scan results, identify potential attack vectors, and choose appropriate scanning techniques.

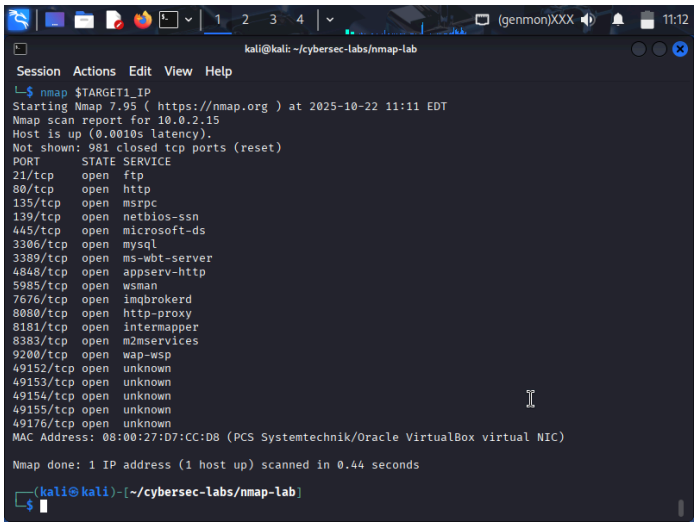
Connectivity Verification

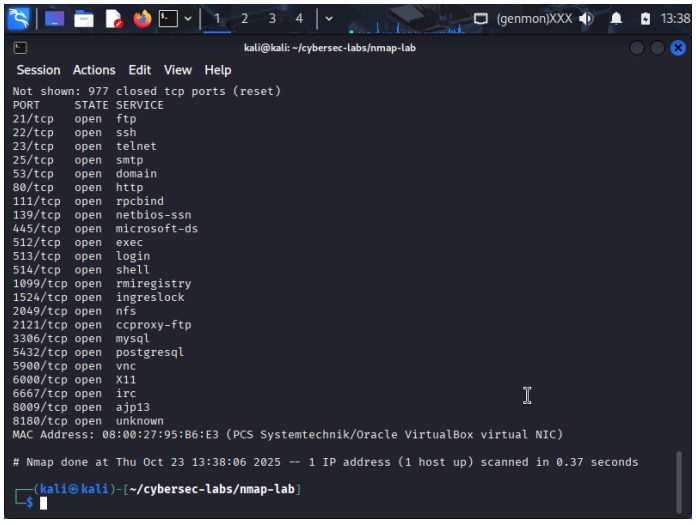
Before beginning scans, I verified connectivity to my Metasploitable3 VM. Several networking issues occurred during setup, but after correcting the virtual network settings, the host became reachable via ICMP (ping).

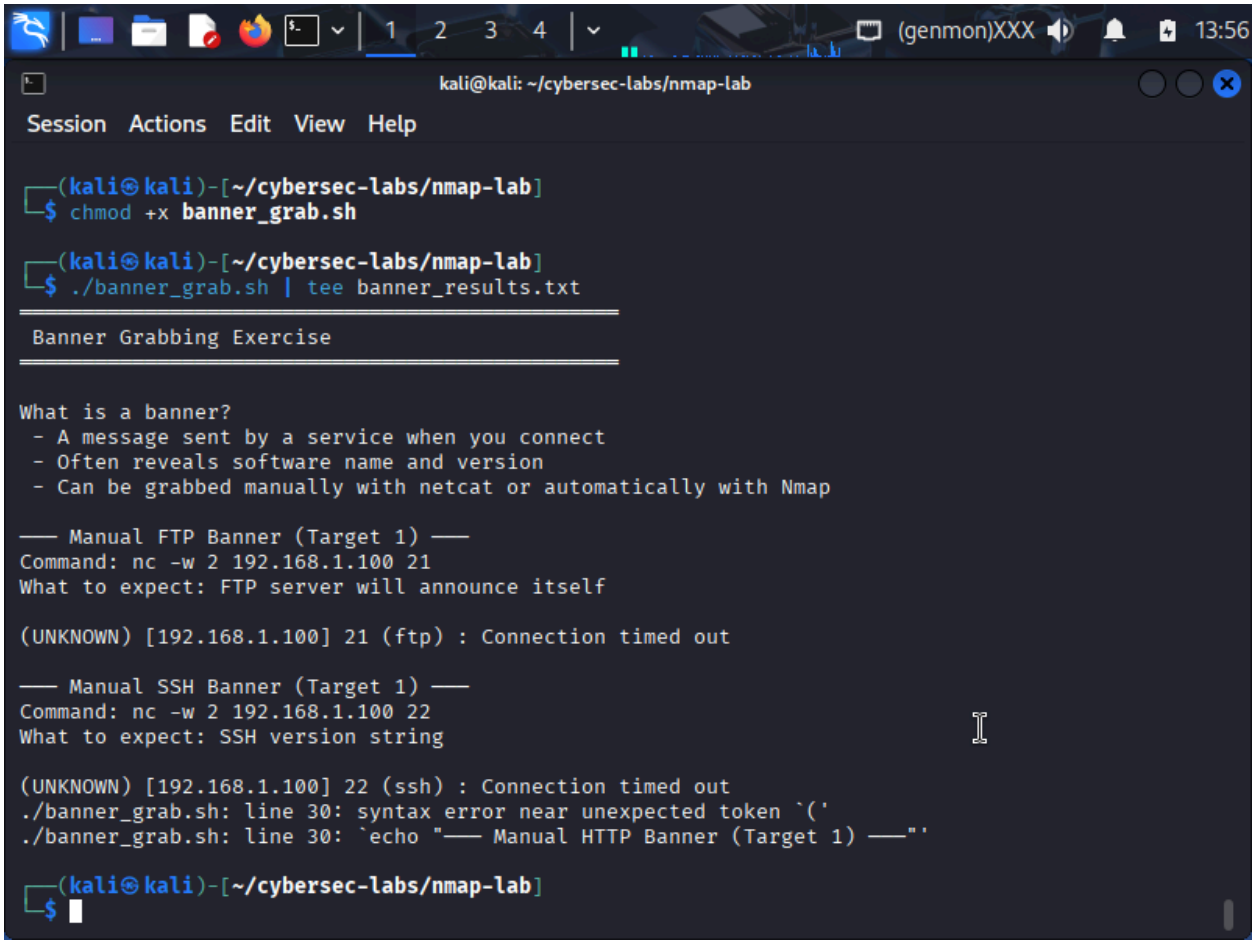


Open port → Service is accepting connections
Filtered port → Nmap cannot determine the state due to firewall or packet filtering
-p flag → Specify ports instead of scanning only the top 1000


1 2 3 4
(genmon)XXX
11:02
kali@kali: ~/cybersec-labs/nmap-lab
Session Actions Edit View Help
┌──(kali㉿kali)-[~/cybersec-labs/nmap-lab]
└─$ vim discover_targets.sh
┌──(kali㉿kali)-[~/cybersec-labs/nmap-lab]
└─$ chmod +x discover_targets.sh
┌──(kali㉿kali)-[~/cybersec-labs/nmap-lab]
└─$ ./discover_targets.sh
== Network Host Discovery ==
Scanning network for live hosts ...
== Quick Ping Scan ==
This will show all responding hosts ...
Starting Nmap 7.95 (https://nmap.org) at 2025-10-22 10:36 EDT
Nmap scan report for 192.168.1.0
Host is up (0.00032s latency).
Nmap scan report for 192.168.1.1
Host is up (0.00018s latency).
Nmap scan report for 192.168.1.2
Host is up (0.00044s latency).
Nmap scan report for 192.168.1.3
Host is up (0.00034s latency).
Nmap scan report for 192.168.1.4
Host is up (0.00018s latency).
Nmap scan report for 192.168.1.5
Host is up (0.00024s latency).
Nmap scan report for 192.168.1.6
Host is up (0.00055s latency).
Nmap scan report for 192.168.1.7
Host is up (0.00096s latency).

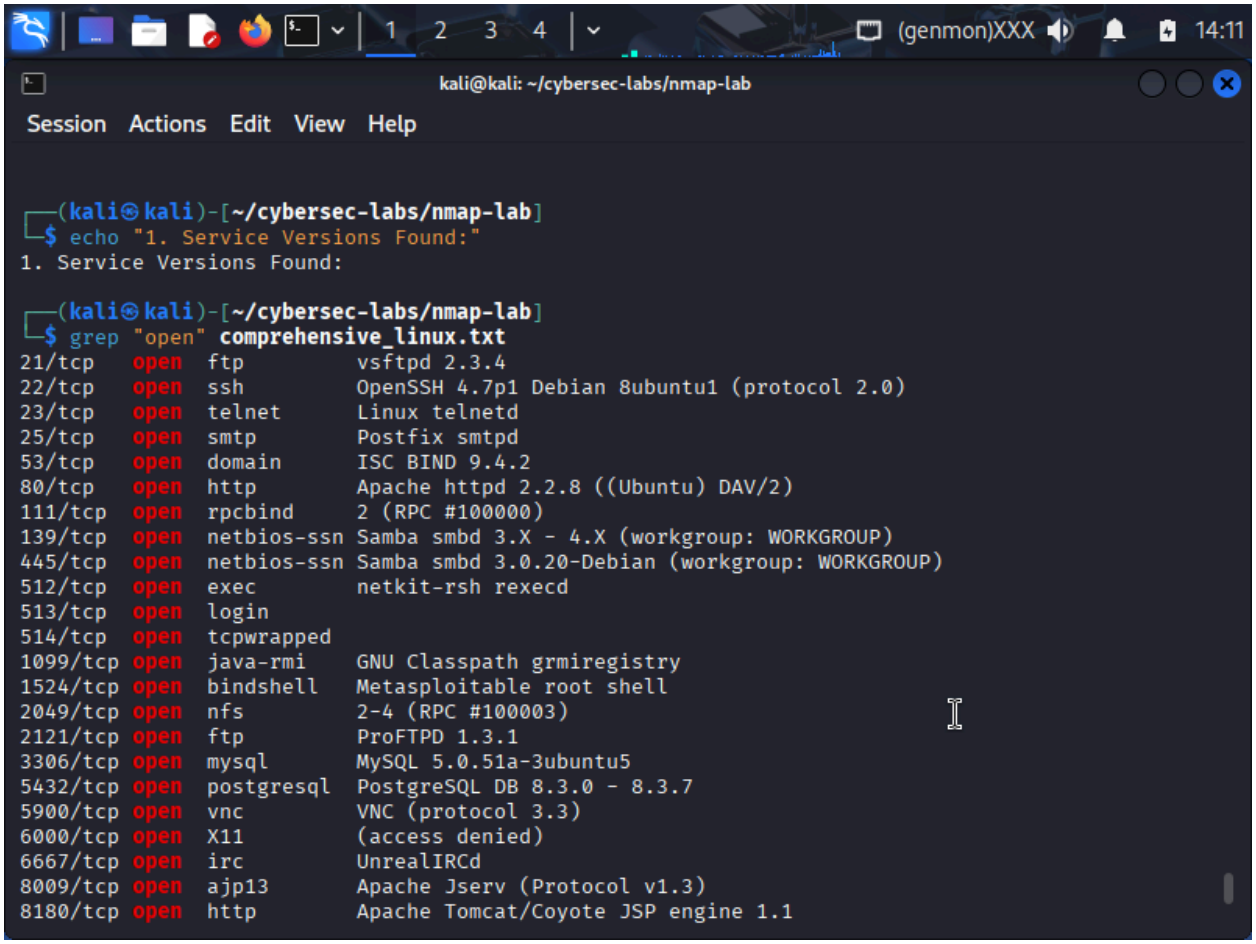

1 2 3 4
(genmon)XXX
11:12
kali@kali: ~/cybersec-labs/nmap-lab
Session Actions Edit View Help
└─$ nmap $TARGET1_IP
Starting Nmap 7.95 (https://nmap.org) at 2025-10-22 11:11 EDT
Nmap scan report for 10.0.2.15
Host is up (0.0010s latency).
Not shown: 981 closed tcp ports (reset)
PORT STATE SERVICE
21/tcp open ftp
80/tcp open http
135/tcp open msrpc
139/tcp open netbios-ssn
445/tcp open microsoft-ds
3306/tcp open mysql
3389/tcp open ms-wbt-server
4848/tcp open appserv-http
5985/tcp open wsman
7676/tcp open imqbrokerd
8080/tcp open http-proxy
8181/tcp open intermapper
8383/tcp open m2mservices
9200/tcp open wap-wsp
49152/tcp open unknown
49153/tcp open unknown
49154/tcp open unknown
49155/tcp open unknown
49176/tcp open unknown
MAC Address: 08:00:27:D7:CC:D8 (PCS Systemtechnik/Oracle VirtualBox virtual NIC)
Nmap done: 1 IP address (1 host up) scanned in 0.44 seconds
┌──(kali㉿kali)-[~/cybersec-labs/nmap-lab]
└─$


1 2 3 4
(genmon)XXX
13:38
kali@kali: ~/cybersec-labs/nmap-lab
Session Actions Edit View Help
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: 08:00:27:95:B6:E3 (PCS Systemtechnik/Oracle VirtualBox virtual NIC)
Nmap done at Thu Oct 23 13:38:06 2025 -- 1 IP address (1 host up) scanned in 0.37 seconds
┌──(kali㉿kali)-[~/cybersec-labs/nmap-lab]
└─$



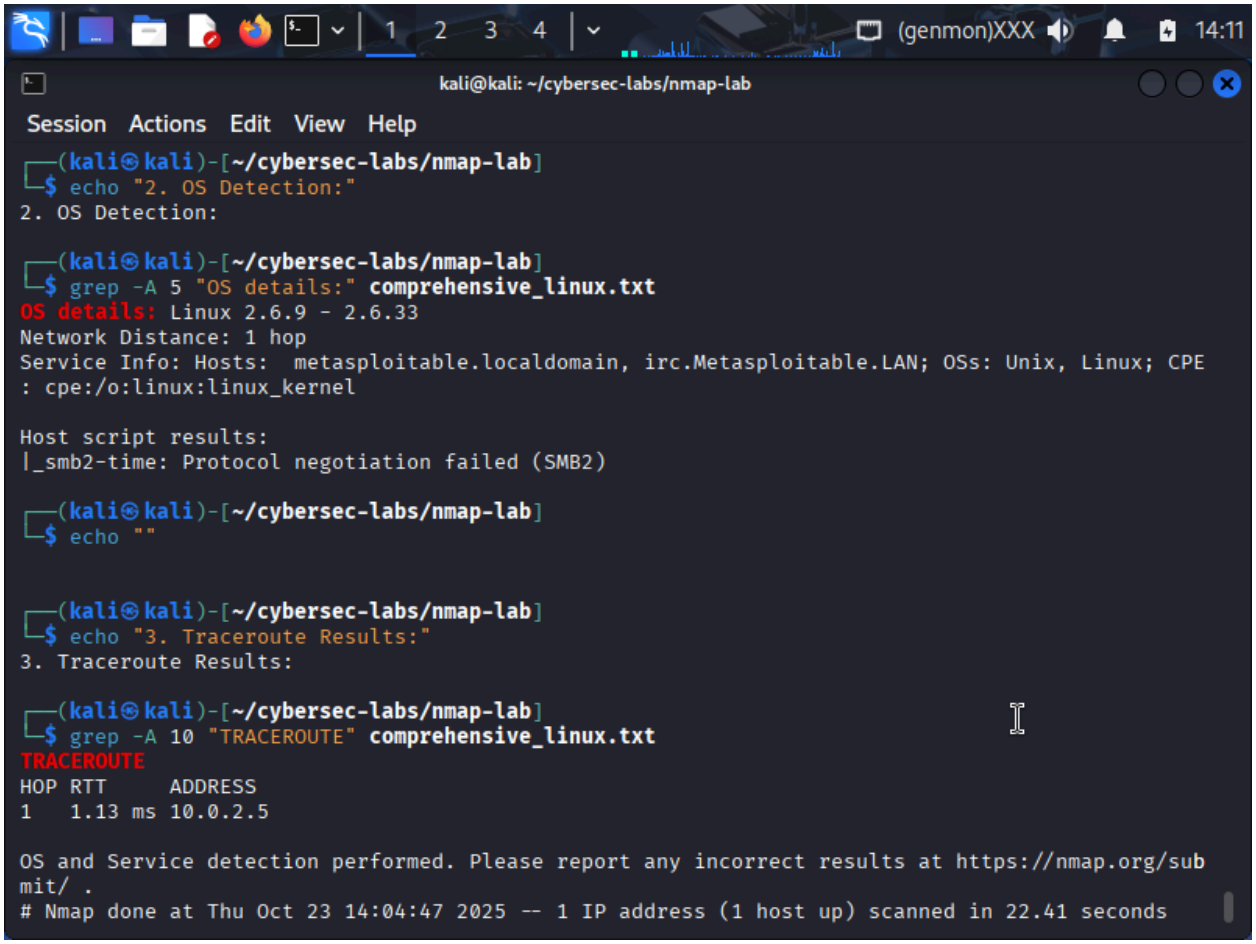
I used both Nmap's service detection and a custom banner-grabbing script: nmap -sV <target>

- Knowing specific versions (e.g., *Apache 2.2.8*) is more valuable than generic service names.
- --version-intensity ranges from 0 (fast/light) to 9 (aggressive/slow).



I used multiple script categories:

- default → Safe, commonly-used enumeration scripts
- safe → Non-intrusive, minimal risk
- vuln → Checks for known vulnerabilities



- OS detection requires root privileges because raw packets must be crafted and analyzed.
- -A enables aggressive scanning, including -O, service detection, traceroute, and NSE scripts.
- A network distance of 1 hop indicates the target is on the same local network. Service banners often provide more reliable OS clues than TCP/IP fingerprinting alone.