3003

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TYBSC

Practical-3 : **Nmap scanner**

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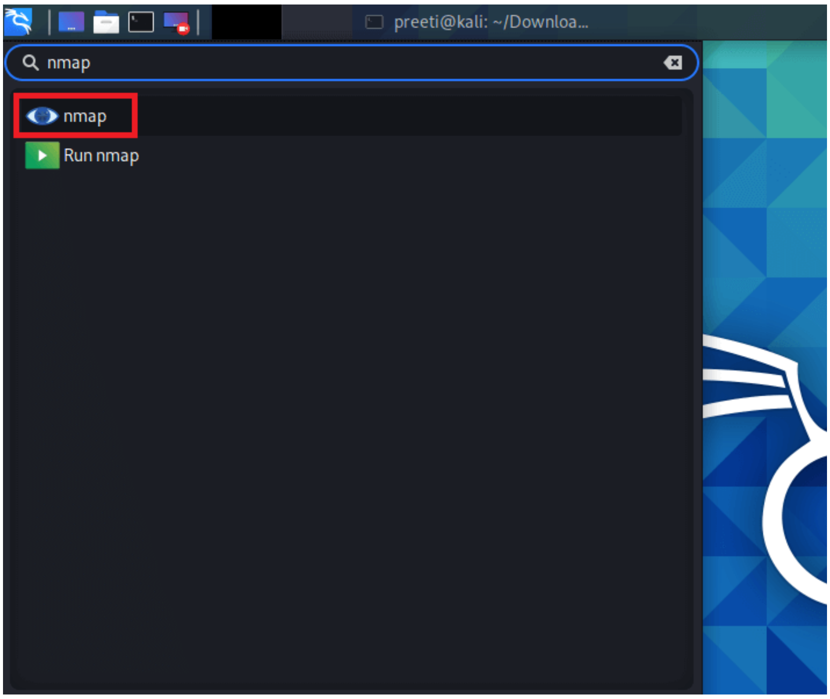
Write-up:

- **NMAP**
- **Features of NMAP**
- **Nmap commands**

- **Using Nmap scanner to perform port scanning of various forms**

Nmap Commands in Kali Linux

Nmap stands for **"Network Mapper".** In Kali Linux, Nmap means a utility that is widely used by **penetration testers** for **network discovery** and **system security audits.** Users find Nmap useful for various activities, including **network inventory, service uptime tracking, managing schedules, host monitoring,** etc. Nmap uses new methods to determine the number of hosts on a network, services provided by the **hosts, operating systems** they are running on, **types of packets** or **firewalls** they use, and several other features. It's also worth noting that Nmap has been named a security product of the year by **Linux Journal, Info World**, and other organizations.



How to Use Nmap in Kali Linux?

- Nmap can be used for specific utilities, and specific tasks can be accomplished using the various options available in Nmap. Nmap's main goal is to protect the network by sniffing traffic and performing extensive network analysis. Detailed network analysis enables the administrator who has built the system for security on the network to get complete information about the packet traffic. Being alert and prepared allows the administrator to speedily respond to attacks.
- The command to scan a single IP address is the initial way to use Nmap. With the help of this, a **"threat sniffer"** who notices some unusual activity from a single IP can scan to distinguish between false positives and false negatives and hit the target if the IP is notorious. False positives trigger warnings unnecessarily, which can hide any attack. Using utility to differentiate false positives from false negatives will allow false positives to be exposed, keeping the network analyst on their toes to respond to any true positive attack without worrying about false positives.
- Nmap can also be used to scan a host for information that could make it a high-value target on a network that hacking is looking for. For example, attackers target a specific host that comprises financial information.
- In a more advanced situation of scanning an IP address, a user can also use Nmap to scan a range of IP addresses for instances or vulnerabilities via which an attack could be launched. Nmap might also be utilized extensively in a more

complex port selection situation. Nmap permits users to scan ports along with the utility, like scanning IP address and range of IP address. With the help of the scanning port, anyone can immediately determine if malware is attacking as malware usually targets a specific port in the host. Now, if we are unsure which ports are malfunctioning, we can scan a range of ports, just like one we had for scanning the range of IP addresses.

Nmap also has the ability to scan the top 100 most commonly used ports, as well as all **65535 ports** (this scan will take a lot of time).

What Does Nmap Do?

Nmap is used to offer detailed, real-time information on our networks and the devices connected to them. Nmap's primary use s can be divided into three categories. First, the program provides detailed information about each **IP** active on our networks, after which each IP can be scanned. This helps administrators determine whether an IP address is being used by a legitimate service or by a malicious outsider.

Second, Nmap gives us information about the entire network. It can be used to display a list of **active hosts** and **open ports**, as well as **identify the operating system** of all connected devices. This makes it an important aspect of penetration as well as a handy tool for ongoing system monitoring. Nmap can be used with the **Metasploit** framework to probe and then patch network vulnerabilities.

Third, Nmap is also a useful tool for users who want to secure their personal and corporate websites. Scanning our **web server** with **Nmap**, especially if we are hosting our website from home, is effectively replicating how a hacker would attack our site. This method of **"attacking"** our own site is a very effective means of finding security vulnerabilities.

Nmap is easy to use, and majority of its tools are familiar to system admins from other programs. Nmap has the advantages of combining a variety of these capabilities into a single package, rather than forcing us to switch between other network monitoring tools. You must be familiar with the **command-line** interface in order to use Nmap.

Although most sophisticated users can write scripts to automate common operations, but basic network monitoring does not require this.

Syntax of Kali Linux Nmap

In Kali Linux, in the context of **network analysis** or **hacking,** we call it **"sniffing network"** a crucial skill and tool for **network analysis** and **hacking undoubtedly** the absolute necessity so that we can uncover potential attacks in vulnerable points. Fix them to protect the network and our systems.

The following are some syntaxes which help in **"network sniffing".**

1. Syntax for Scanning a Single IP

The following syntax is used to scan a single IP:

1. nmap **<ip** addrenmap ss**>** -

Here, <ip address> should be changed with the **actual IP address** for which the sniff is required.

2. Syntax for Scanning a Single Port

The following syntax is used to scan a single port:

1. nmap -p **<port** number>**<IP** address>

3. Syntax for Scanning Range of Ports

The following syntax is used to scan range of ports:

1. nmap -p **<range** of port number**><IP** address**>**

4. Syntax for Scanning 100 Most Common Ports

The following syntax is used to scan 100 most common ports:

1. nmap -f**<IP** address**>**

5. Syntax for Scanning a Host

The following syntax is used to scan a host:

1. Nmap **<host** name**>** nma

Here, <host name> should be changed with the actual host address, which one would need to sniff:

6. Syntax to Scan Using TCP SYN Scan

The following syntax is used to Scan Using TCP SYN Scan:

1. nmap -sS**<IP** address**>**

7. Syntax for Scanning a Range of Ip s

The following syntax is used to scan a range of IPs:

1. nmap **<ip** address range**>**

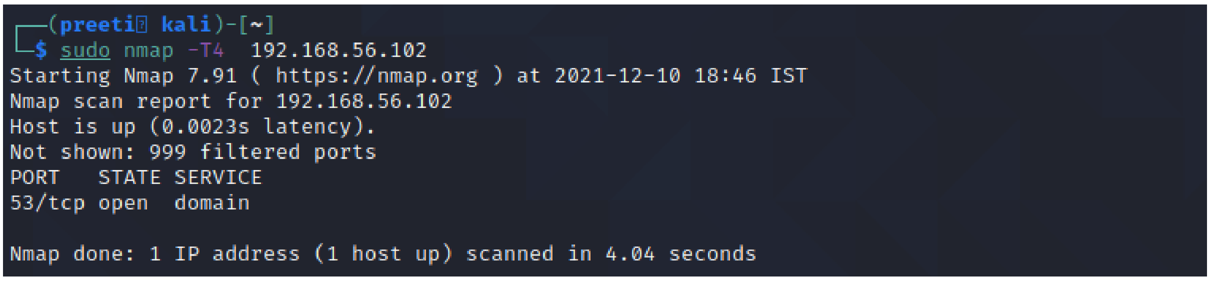
Nmap Commands in Kali Linux

Nmap Command 1: nmap -T4 for Timing

In the scanning process, nmap transmits packets to the target machine in a specific time period (interval). We can use the **namp -T** switch to increase or decrease the time period. However, the **-T** option requires an attribute, we should use **1,2,3,4** as needed. **T4** has fast speed tsudhan **T1, T2,** and **T3**.

Syntax:

1. $ sudo nmap -T4 192.168.56.102



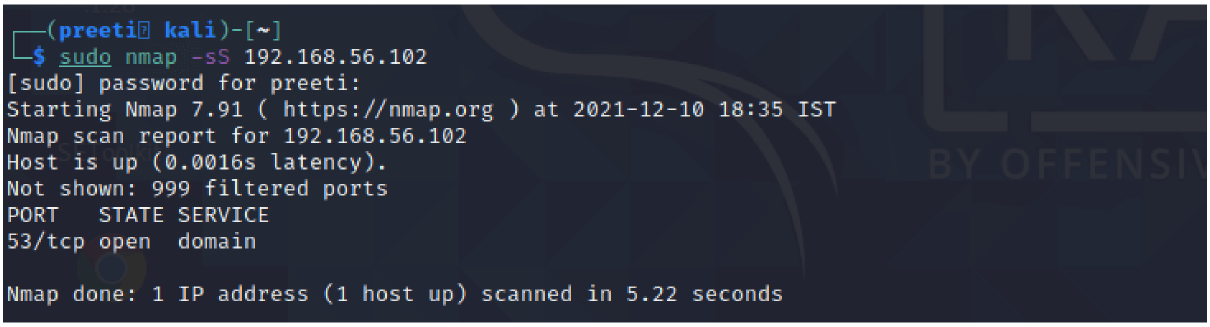
```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -T4  192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:46 IST
Nmap scan report for 192.168.56.102
Host is up (0.0023s latency).
Not shown: 999 filtered ports
PORT   STATE SERVICE
53/tcp open  domain

Nmap done: 1 IP address (1 host up) scanned in 4.04 seconds
```

Nmap Command 2: nmap -sS for TCP SYN Scan

It is required privilege access and identifies **TCP** ports. TCP SYN Scan is a standard method for **detecting open ports** without going through the **Three-way Handshake** process. When an open port is spotted, the **TCP handshake** is reset before accomplishment. Hence this scanning is also called **Half Open** scanning.

Syntax

1. sudo nmap -sS 192.168.56.102



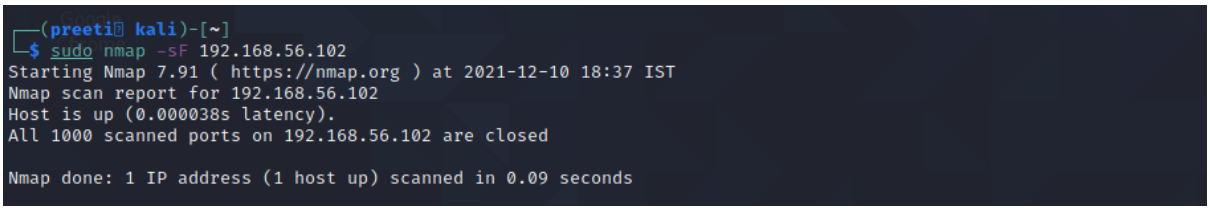
```
┌──(preeti▯ kali)-[~]
└─$ sudo nmap -sS 192.168.56.102
[sudo] password for preeti:
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:35 IST
Nmap scan report for 192.168.56.102
Host is up (0.0016s latency).
Not shown: 999 filtered ports
PORT   STATE SERVICE
53/tcp open  domain

Nmap done: 1 IP address (1 host up) scanned in 5.22 seconds
```

Nmap Command 3: nmap -sF for FIN Scan

FIN scan transmits packets with a **FIN flag** to the target machine; therefore, these frames are abnormal as they are sent to the destination before the **Three-way handshaking** process can be completed. If there is no active TCP session, then the port is formally closed. If the destination machine's port is closed then the RST packet in the FIN Scan response is **reversed.**

Syntax

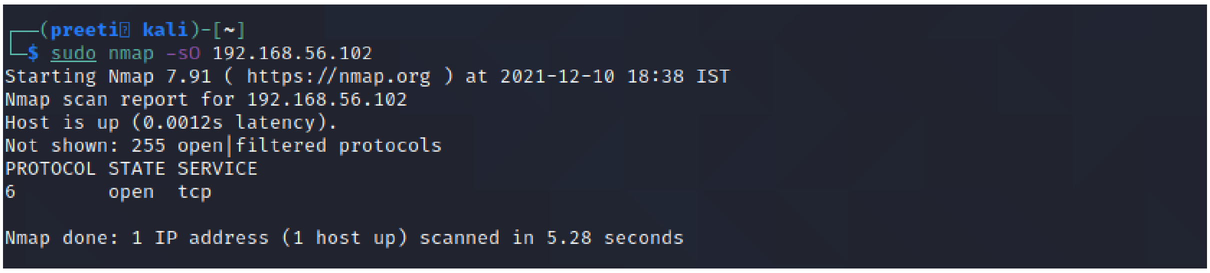
1. sudo nmap -sF 192.168.56.102



```
┌──(preeti▯ kali)-[~]
└─$ sudo nmap -sF 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:37 IST
Nmap scan report for 192.168.56.102
Host is up (0.000038s latency).
All 1000 scanned ports on 192.168.56.102 are closed

Nmap done: 1 IP address (1 host up) scanned in 0.09 seconds
```

Compared to other nmap scans, an **IP Protocol** scan has a major difference. It's looking for other **IP protocols** utilized by the Target system, such as **ICMP, TCP**, and **UDP.** The additional IP protocol, such as **EGP,** or **IGP.**

1. sudo nmap -sO 192.168.56.102



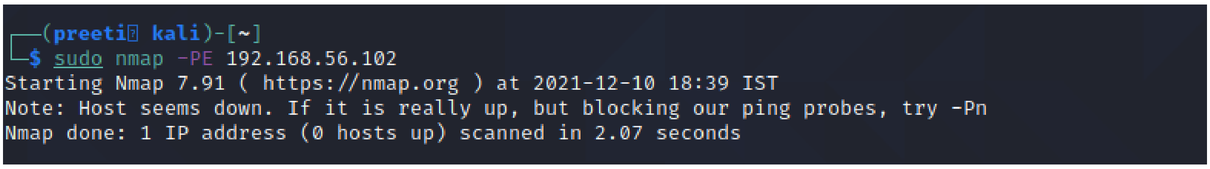
```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -sO 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:38 IST
Nmap scan report for 192.168.56.102
Host is up (0.0012s latency).
Not shown: 255 open|filtered protocols
PROTOCOL STATE SERVICE
6        open  tcp

Nmap done: 1 IP address (1 host up) scanned in 5.28 seconds
```

Nmap Command 4: nmap-PE for ICMP Echo Request Ping

The **ICMP** echo request ping sends an ICMP echo request to the IP address of the destination machine. In the normal type of ICMP echo request, a combination of **TCP** and **ACK pings** is sent. Using option **-PE**, the **ICMP** echo request can be specified as the nmap ping method without coupling **TCP ACK ping**.

Syntax

1. nmap -PE 192.168.56.102



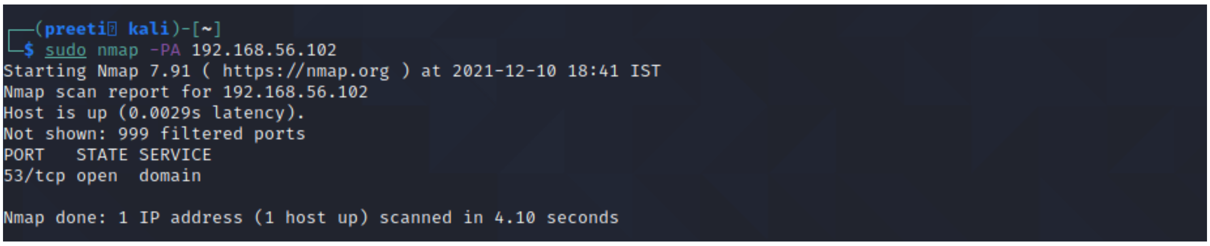
```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -PE 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:39 IST
Note: Host seems down. If it is really up, but blocking our ping probes, try -Pn
Nmap done: 1 IP address (0 hosts up) scanned in 2.07 seconds
```

Nmap Command 5: nmap -PA for TCP ACP Ping

Instead of using the default option of both an **ICMP** echo request and a **TCP ACK**, the -**PA** option sends a **TCP ACK** and discards any **ICMP** echo requests. This is a decent option when **ICMP** is not an option due to packet filtering or firewalls.

Syntax

1. nmap -PA 192.168.56.102



```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -PA 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:41 IST
Nmap scan report for 192.168.56.102
Host is up (0.0029s latency).
Not shown: 999 filtered ports
PORT   STATE SERVICE
53/tcp open  domain

Nmap done: 1 IP address (1 host up) scanned in 4.10 seconds
```

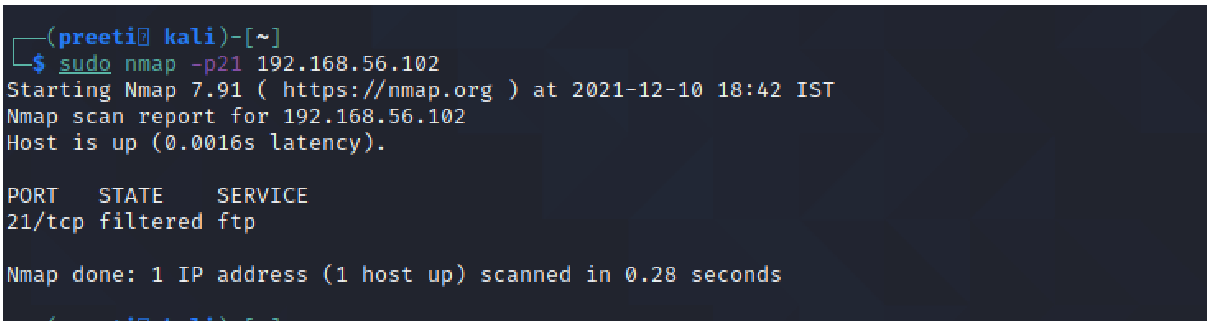
Nmap Command 6: nmap -p for Port Scan

Nmap is mostly used to scan ports; it scans all ports by default, but we can scan single, multiple, or within range protocols.

Single port scan:

Syntax

1. Sudo nmap -p21 192.168.56.102

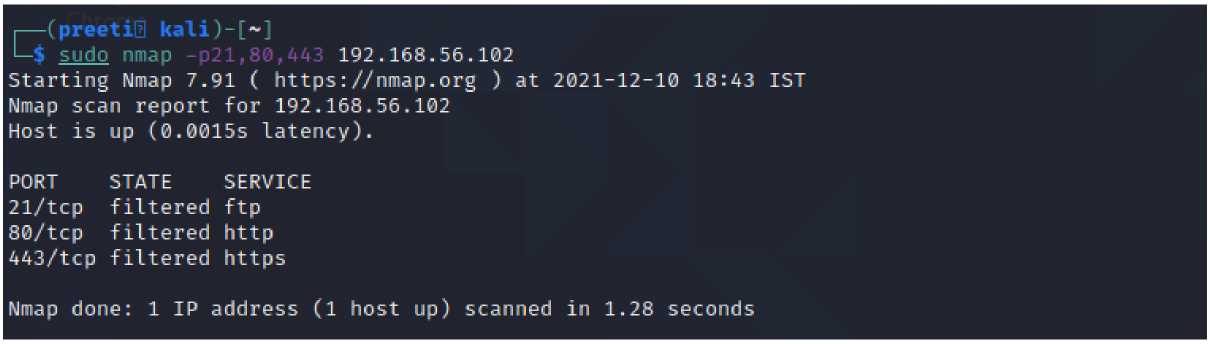


```
┌──(preeti□ kali)-[~]
└─$ sudo nmap -p21 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:42 IST
Nmap scan report for 192.168.56.102
Host is up (0.0016s latency).

PORT   STATE    SERVICE
21/tcp filtered ftp

Nmap done: 1 IP address (1 host up) scanned in 0.28 seconds
```

Multiple scan ports:

Syntax

1. Sudo nmap -p21, 80, 443 192.168.56.102

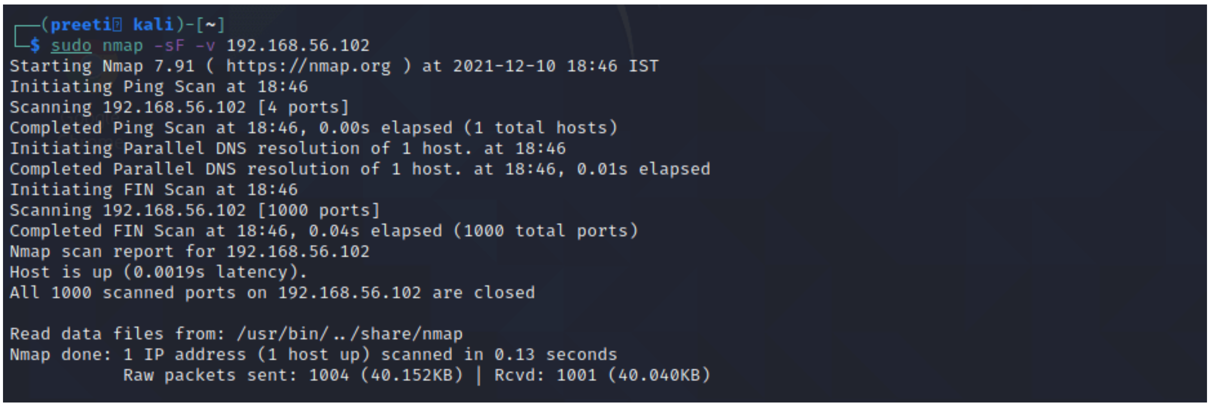


```
┌──(preeti□ kali)-[~]
└─$ sudo nmap -p21,80,443 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:43 IST
Nmap scan report for 192.168.56.102
Host is up (0.0015s latency).

PORT    STATE    SERVICE
21/tcp  filtered ftp
80/tcp  filtered http
443/tcp filtered https

Nmap done: 1 IP address (1 host up) scanned in 1.28 seconds
```

Nmap Command 7: nmap -v for Verbose Mode

The verbose mode of **nmap** allows us to get more information from the scan output. The verbose option does not affect on what happens during the scan; it only modifies the amount of information that **nmap** shows on its output.

1. Sudo nmap -sF -v 192.168.56.102

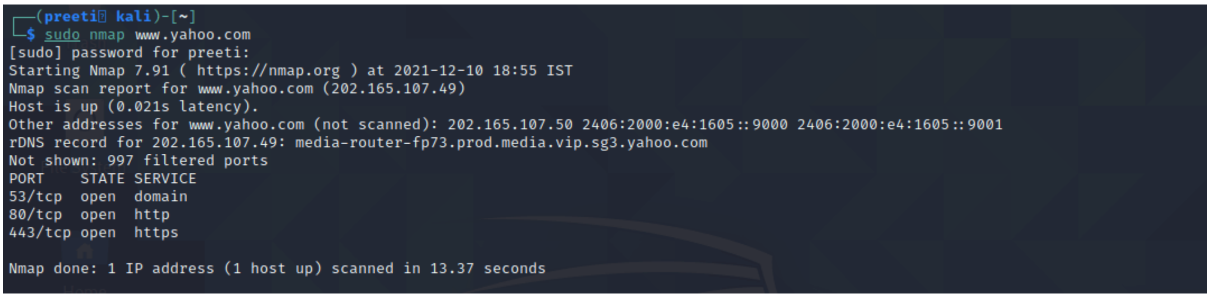


```
┌──(preeti㉿kali)-[~]
└─$ sudo nmap -sF -v 192.168.56.102
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:46 IST
Initiating Ping Scan at 18:46
Scanning 192.168.56.102 [4 ports]
Completed Ping Scan at 18:46, 0.00s elapsed (1 total hosts)
Initiating Parallel DNS resolution of 1 host. at 18:46
Completed Parallel DNS resolution of 1 host. at 18:46, 0.01s elapsed
Initiating FIN Scan at 18:46
Scanning 192.168.56.102 [1000 ports]
Completed FIN Scan at 18:46, 0.04s elapsed (1000 total ports)
Nmap scan report for 192.168.56.102
Host is up (0.0019s latency).
All 1000 scanned ports on 192.168.56.102 are closed

Read data files from: /usr/bin/../share/nmap
Nmap done: 1 IP address (1 host up) scanned in 0.13 seconds
           Raw packets sent: 1004 (40.152KB) | Rcvd: 1001 (40.040KB)
```

Command 8: nmap for scanning a host

Syntax

1. sudo nmap www.yahoo.com



```
┌──(preeti㉿kali)-[~]
└─$ sudo nmap www.yahoo.com
[sudo] password for preeti:
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:55 IST
Nmap scan report for www.yahoo.com (202.165.107.49)
Host is up (0.021s latency).
Other addresses for www.yahoo.com (not scanned): 202.165.107.50 2406:2000:e4:1605::9000 2406:2000:e4:1605::9001
rDNS record for 202.165.107.49: media-router-fp73.prod.media.vip.sg3.yahoo.com
Not shown: 997 filtered ports
PORT    STATE SERVICE
53/tcp  open  domain
80/tcp  open  http
443/tcp open  https

Nmap done: 1 IP address (1 host up) scanned in 13.37 seconds
```

Some Other Nmap Commands

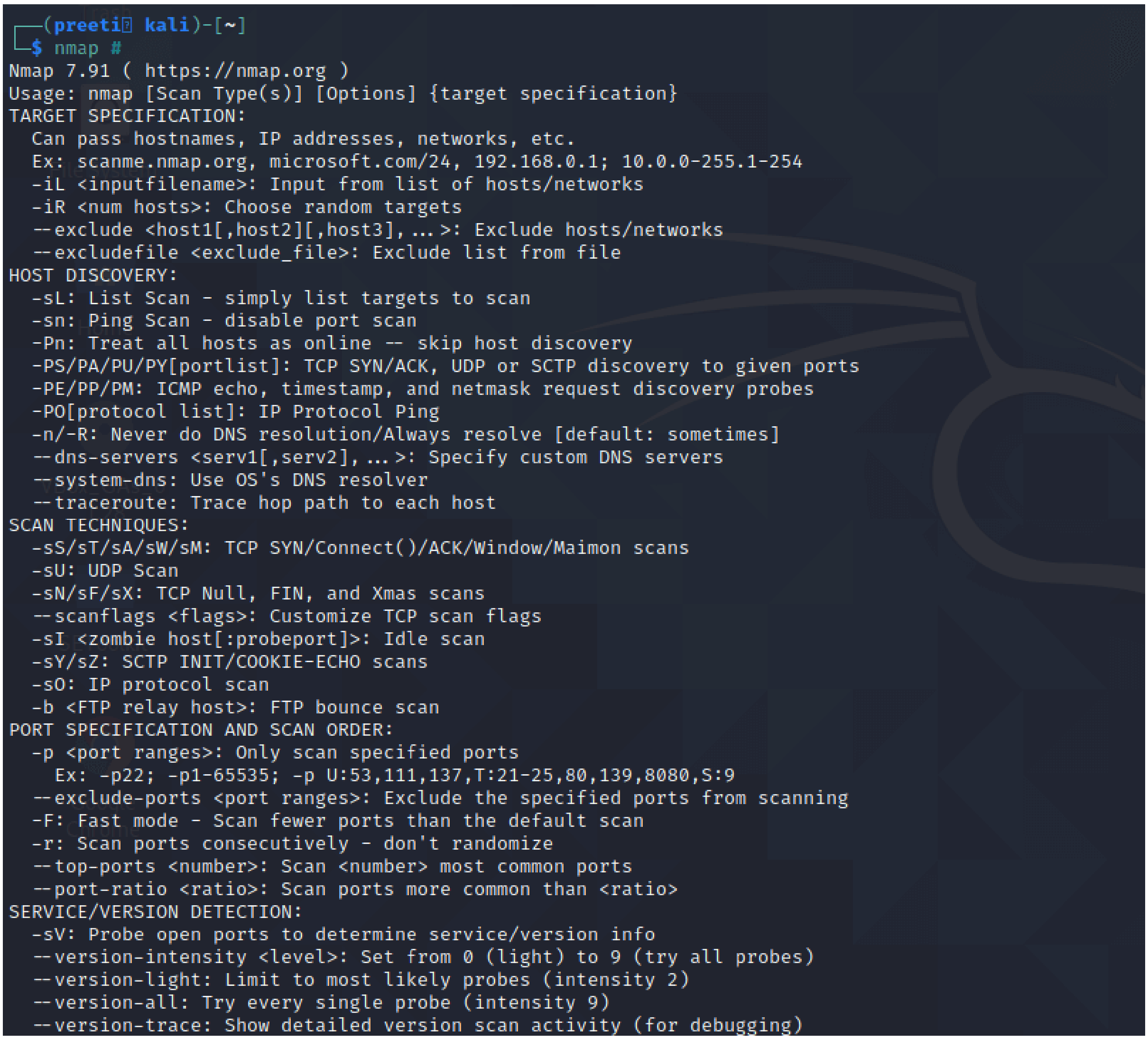
Most of the Nmap's function can be executed with just one command, and the program also uses many **"shortcut"** commands, which can be used to automate common tasks.

Here is a quick run-down:

1. Ping Scanning

A ping scan returns information on every active IP on our network. This command can be used to perform a ping scan:

1. nmap #

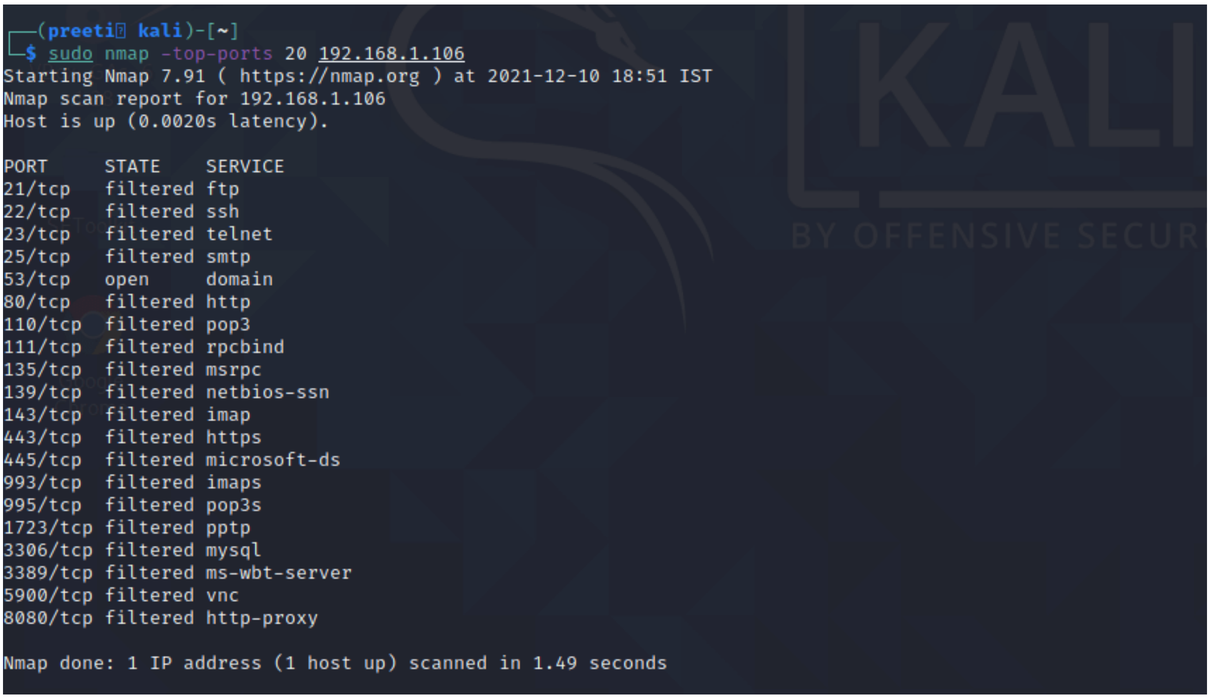


```
┌──(preeti㉿ kali)-[~]
└─$ nmap #
Nmap 7.91 ( https://nmap.org )
Usage: nmap [Scan Type(s)] [Options] {target specification}
TARGET SPECIFICATION:
  Can pass hostnames, IP addresses, networks, etc.
  Ex: scanme.nmap.org, microsoft.com/24, 192.168.0.1; 10.0.0-255.1-254
  -iL <inputfilename>: Input from list of hosts/networks
  -iR <num hosts>: Choose random targets
  --exclude <host1[,host2][,host3],...>: Exclude hosts/networks
  --excludefile <exclude_file>: Exclude list from file
HOST DISCOVERY:
  -sL: List Scan - simply list targets to scan
  -sn: Ping Scan - disable port scan
  -Pn: Treat all hosts as online -- skip host discovery
  -PS/PA/PU/PY[portlist]: TCP SYN/ACK, UDP or SCTP discovery to given ports
  -PE/PP/PM: ICMP echo, timestamp, and netmask request discovery probes
  -PO[protocol list]: IP Protocol Ping
  -n/-R: Never do DNS resolution/Always resolve [default: sometimes]
  --dns-servers <serv1[,serv2],...>: Specify custom DNS servers
  --system-dns: Use OS's DNS resolver
  --traceroute: Trace hop path to each host
SCAN TECHNIQUES:
  -sS/sT/sA/sW/sM: TCP SYN/Connect()/ACK/Window/Maimon scans
  -sU: UDP Scan
  -sN/sF/sX: TCP Null, FIN, and Xmas scans
  --scanflags <flags>: Customize TCP scan flags
  -sI <zombie host[:probeport]>: Idle scan
  -sY/sZ: SCTP INIT/COOKIE-ECHO scans
  -sO: IP protocol scan
  -b <FTP relay host>: FTP bounce scan
PORT SPECIFICATION AND SCAN ORDER:
  -p <port ranges>: Only scan specified ports
    Ex: -p22; -p1-65535; -p U:53,111,137,T:21-25,80,139,8080,S:9
  --exclude-ports <port ranges>: Exclude the specified ports from scanning
  -F: Fast mode - Scan fewer ports than the default scan
  -r: Scan ports consecutively - don't randomize
  --top-ports <number>: Scan <number> most common ports
  --port-ratio <ratio>: Scan ports more common than <ratio>
SERVICE/VERSION DETECTION:
  -sV: Probe open ports to determine service/version info
  --version-intensity <level>: Set from 0 (light) to 9 (try all probes)
  --version-light: Limit to most likely probes (intensity 2)
  --version-all: Try every single probe (intensity 9)
  --version-trace: Show detailed version scan activity (for debugging)
```

2. Scan the Most Popular Ports

This command is especially useful for running Nmap on a **home server**. It automatically scans various most popular ports for a host. We can use the following command to run this command:

1. nmap -top-ports 20 192.168.1.106



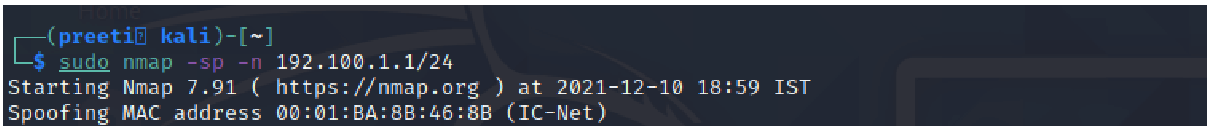
```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -top-ports 20 192.168.1.106
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:51 IST
Nmap scan report for 192.168.1.106
Host is up (0.0020s latency).

PORT     STATE    SERVICE
21/tcp   filtered ftp
22/tcp   filtered ssh
23/tcp   filtered telnet
25/tcp   filtered smtp
53/tcp   open     domain
80/tcp   filtered http
110/tcp  filtered pop3
111/tcp  filtered rpcbind
135/tcp  filtered msrpc
139/tcp  filtered netbios-ssn
143/tcp  filtered imap
443/tcp  filtered https
445/tcp  filtered microsoft-ds
993/tcp  filtered imaps
995/tcp  filtered pop3s
1723/tcp filtered pptp
3306/tcp filtered mysql
3389/tcp filtered ms-wbt-server
5900/tcp filtered vnc
8080/tcp filtered http-proxy

Nmap done: 1 IP address (1 host up) scanned in 1.49 seconds
```

We can replace "20" with the number of ports to scan, and Nmap quickly scans that many ports. It provides a simple output that details the state of the most common ports, allowing us to rapidly determine whether any ports are open needlessly.

3. Disable DNS Name Resolution

We can also speed up our Nmap scans with the help of the **-n parameter** to disable reverse **DNS** resolution. This can be quite handy if we need to scan a huge network. For example, to **turn off DNS resolution** for the basic ping scan mentioned above, add -n:

1. Nmap -sp -n 192.100.1.1/24



```
┌──(preeti㉿ kali)-[~]
└─$ sudo nmap -sp -n 192.100.1.1/24
Starting Nmap 7.91 ( https://nmap.org ) at 2021-12-10 18:59 IST
Spoofing MAC address 00:01:BA:8B:46:8B (IC-Net)
```