Network Scanning

Scanning:

Scanning is a set of procedures for identifying live hosts, ports, and services, discovering Operating system and architecture of target system, identifying Vulnerabilities and threats in the network. Network Scanning is used in identifying active devices on a network by employing features in the network protocol.

What will we get After Scanning:

- Active computer
- Identifying open port and close port
- Operating system Information
- Services and version
- Vulnerabilities
- All Process (Ports) running in networks

Networks and data are transferred with the help of conceptual model (OSI and TCP/IP Model).

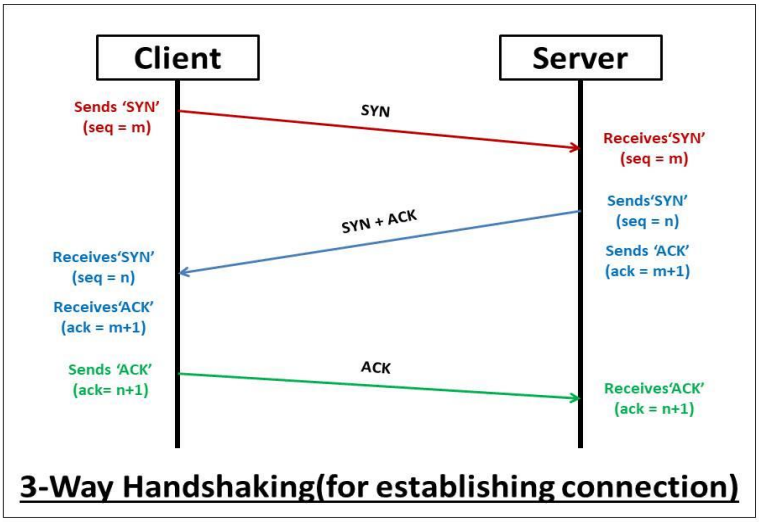
TCP:

- Connection oriented Protocol.
- Connection established between ends of transmission.
- Generate a virtual circuit between Sender and Receiver for the duration of transmission.

UDP:

- Connectionless protocol. Simple protocol and provides non-sequenced transport functionality.
- Reliability and security are less important than speed and size.

TCP Handshake:



Steps:

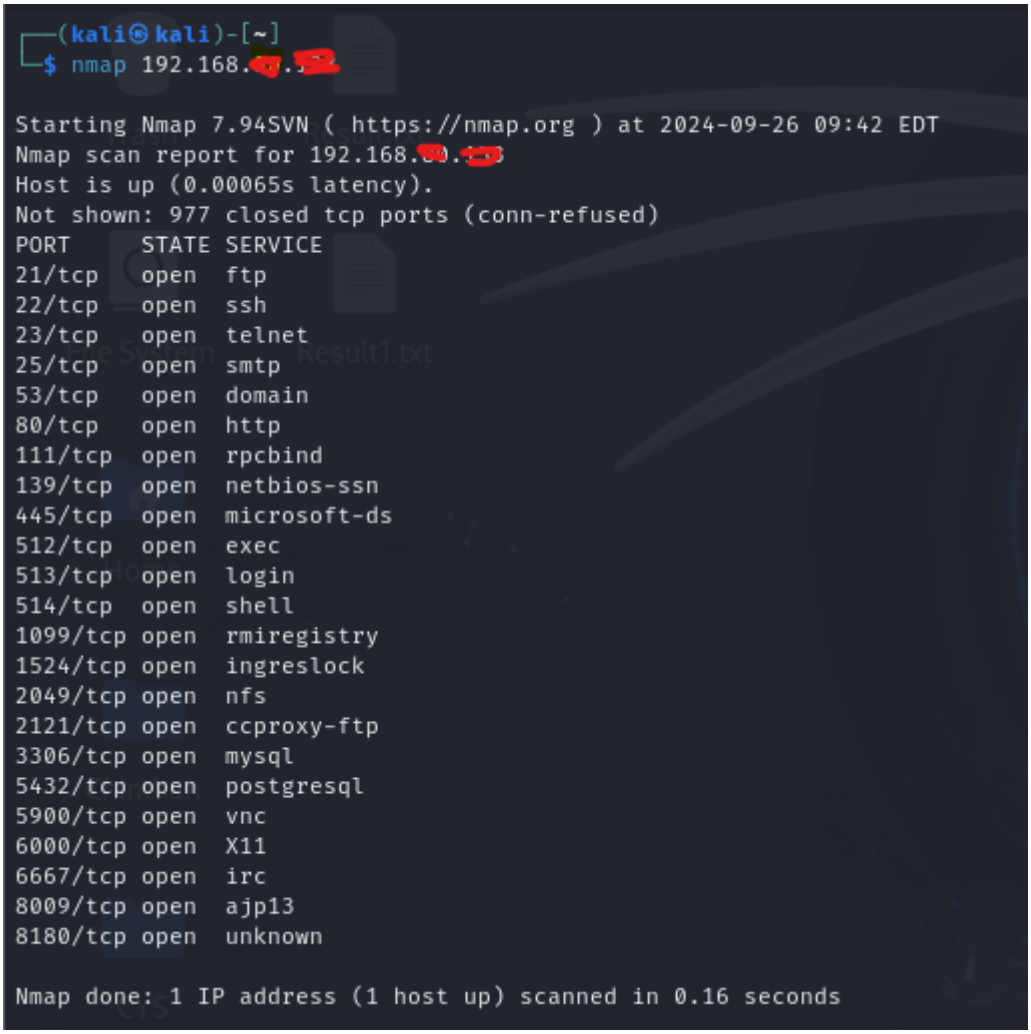
1. **SYN (Synchronize):**
    - **Client** sends a **SYN** (Synchronize) message to the server.
    - It includes an initial **sequence number (m)**, which will be used for ordering packets in future communications.
2. **SYN + ACK (Synchronize and Acknowledge):**
    - **Server** receives the **SYN** request from the client.
    - The server responds with its own **SYN** (sequence number = n) to establish communication.
    - Along with the SYN, the server also sends an **ACK** (acknowledgment) of the client's sequence number (m+1), confirming that it received the client's request.
3. **ACK (Acknowledge):**
    - **Client** receives the server's SYN and ACK.
    - The client sends an **ACK** back to the server to confirm the server's sequence number (n+1).

- Once this is done, the connection is fully established, and communication can begin.

NMAP:

- **nmap <target ip-address> :**

  used to scan the open ports.



- **arp:**

  used to get the arp table of the system (contains MAC and ip-address).

```
┌──(kali㉿kali)-[~]
└─$ arp
Address                  HWtype  HWaddress           Flags Mask            Iface
192.168.[redacted].254           ether   00:50:56:e0:95:68   C                     eth0
192.168.[redacted].133           ether   00:0c:29:14:72:41   C                     eth0
192.168.[redacted].1             ether   00:50:56:c0:00:08   C                     eth0
192.168.[redacted].2             ether   00:50:56:e8:6a:ab   C                     eth0

┌──(kali㉿kali)-[~]
└─$
```

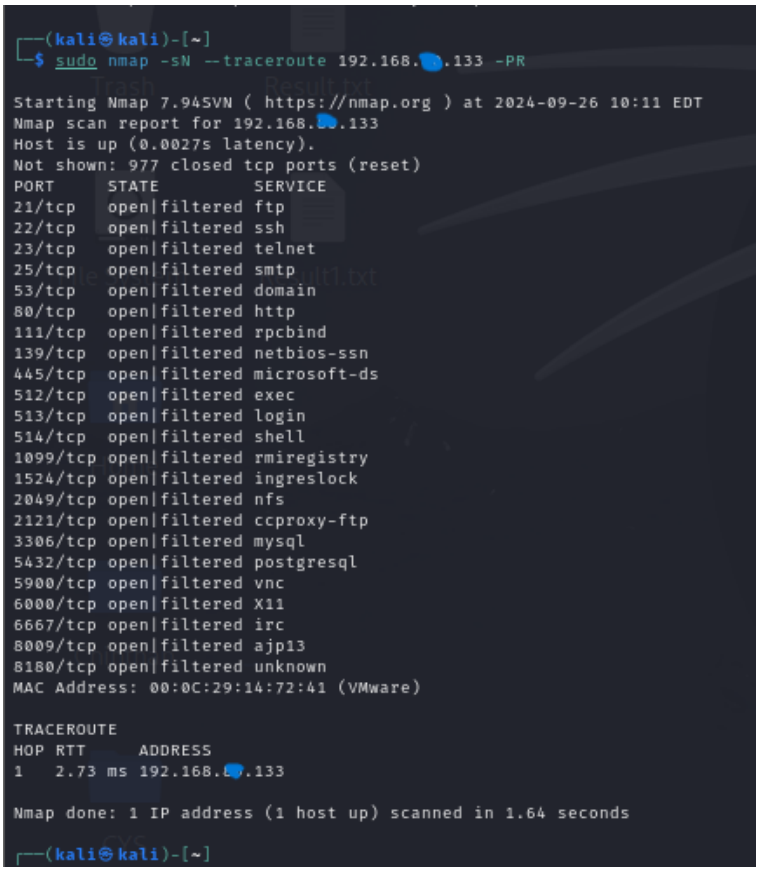
- **sudo nmap -sN <target ip-address> -PR:**

```
┌──(kali㉿kali)-[~]
└─$ sudo nmap -sN 192.168.[redacted].133 -PR

[sudo] password for kali:
Starting Nmap 7.945VN ( https://nmap.org ) at 2024-09-26 10:00 EDT
Nmap scan report for 192.168.[redacted].133
Host is up (0.00080s latency).
Not shown: 977 closed tcp ports (reset)
PORT     STATE         SERVICE
21/tcp   open|filtered ftp
22/tcp   open|filtered ssh
23/tcp   open|filtered telnet
25/tcp   open|filtered smtp
53/tcp   open|filtered domain
80/tcp   open|filtered http
111/tcp  open|filtered rpcbind
139/tcp  open|filtered netbios-ssn
445/tcp  open|filtered microsoft-ds
512/tcp  open|filtered exec
513/tcp  open|filtered login
514/tcp  open|filtered shell
1099/tcp open|filtered rmiregistry
1524/tcp open|filtered ingreslock
2049/tcp open|filtered nfs
2121/tcp open|filtered ccproxy-ftp
3306/tcp open|filtered mysql
5432/tcp open|filtered postgresql
5900/tcp open|filtered vnc
6000/tcp open|filtered X11
6667/tcp open|filtered irc
8009/tcp open|filtered ajp13
8180/tcp open|filtered unknown
MAC Address: 00:0C:29:14:72:41 (VMware)

Nmap done: 1 IP address (1 host up) scanned in 1.58 seconds

┌──(kali㉿kali)-[~]
└─$
```

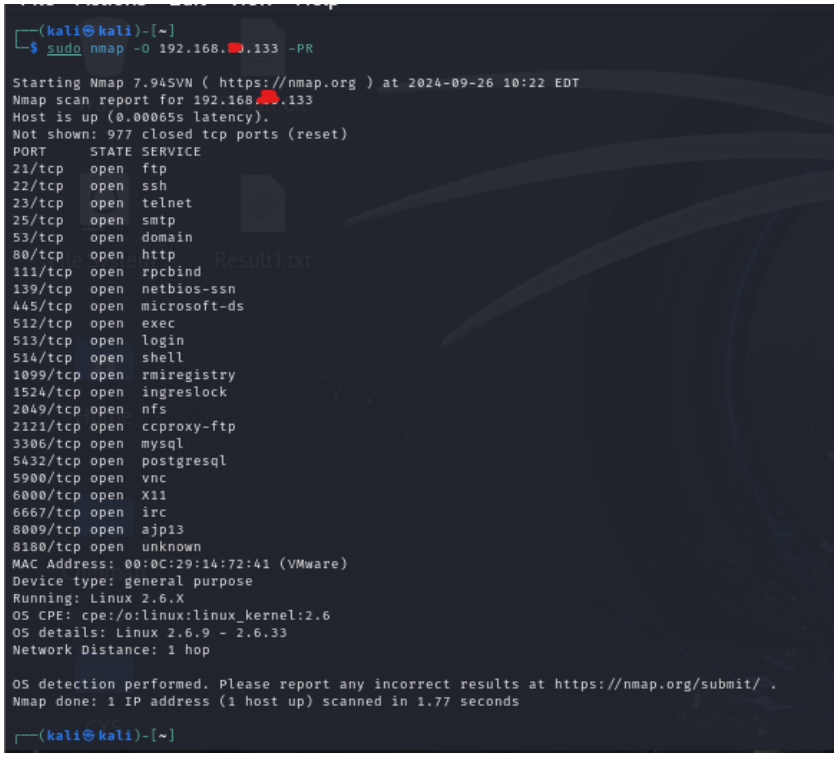
  - The open|filtered state suggests these ports may be protected by a firewall or access control.
  - **Null Scan (-sN)**: Sends TCP packets with no flags set. It helps determine port status:
  - **Closed ports** send back RST (reset) packets.
  - **Open ports** don't respond, making this scan stealthy.
  - **ARP Ping (-PR)**: Sends ARP (Address Resolution Protocol) requests to the target IP to discover if the host is active. This is used only on local networks.

- **Superuser Privileges (sudo)**: Allows Nmap to send raw packets, which is required for both the Null scan and ARP ping.

- **<u>sudo nmap -sN --traceroute <target ip-address>-PR :</u>**
  - The open|filtered state suggests these ports may be protected by a firewall or access control.
  - **Null Scan (-sN)**: Sends TCP packets with no flags set to detect open/closed ports. Closed ports respond with RST (reset) packets, and open ports do not respond.
  - **Traceroute (--traceroute)**: Maps the path (hops) that packets take from your machine to the target IP. It helps in identifying network devices and intermediate routers along the path.
  - **ARP Ping (-PR)**: Sends ARP requests to discover active hosts on a local network (used for host discovery).
  - **Superuser Privileges (sudo)**: Required to send raw packets for the scan and perform ARP requests.



- **sudo nmap -O <target ip-address> :**
    - **-O**: This option enables OS detection. Nmap tries to determine the operating system of the target by analyzing TCP/IP stack characteristics.
    - **-PR** can used at the end, then ARP scanning works when ICMP or TCP/UDP ping requests are blocked by a firewall.



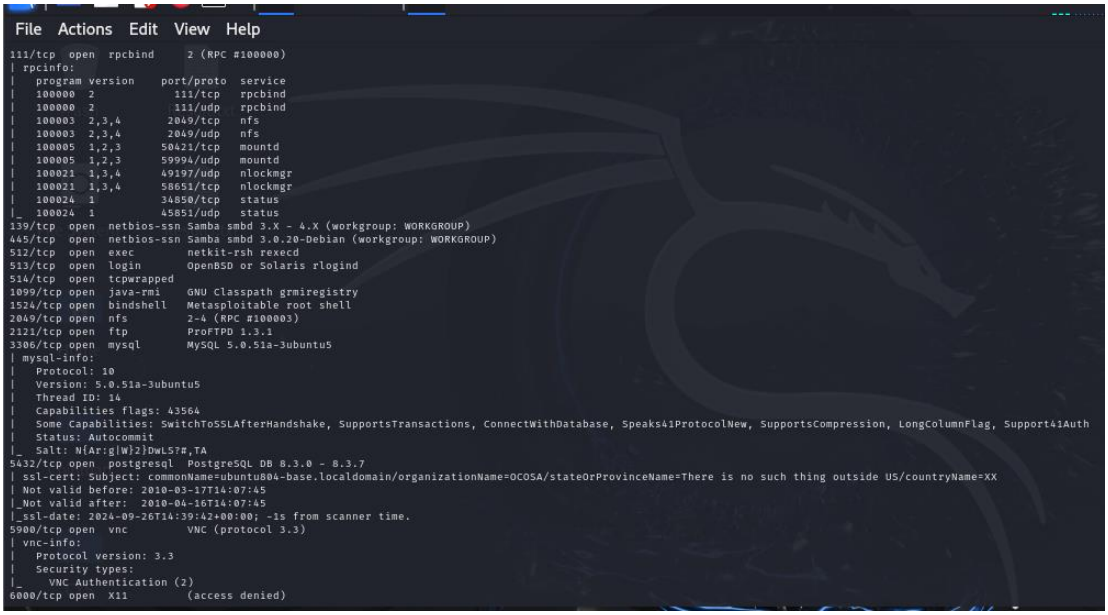
- **nmap -sV <target ip-address> :**
    - **-sV:** This option enables version detection. Nmap attempts to determine the version of services (like web servers, FTP, SSH, etc.) running on open ports.
    - **-PR** can used at the end, then ARP scanning works when ICMP or TCP/UDP ping requests are blocked by a firewall.

```
┌──(kali㉿kali)-[~]
└─$ nmap -sV 192.168.[redacted].133

Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-09-26 10:26 EDT
Nmap scan report for 192.168.[redacted].133
Host is up (0.84s latency).
Not shown: 977 closed tcp ports (conn-refused)
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
53/tcp   open  domain      ISC BIND 9.4.2
80/tcp   open  http        Apache httpd 2.2.8 ((Ubuntu) DAV/2)
111/tcp  open  rpcbind     2 (RPC #100000)
139/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp  open  netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
512/tcp  open  exec        netkit-rsh rexecd
513/tcp  open  login?
514/tcp  open  tcpwrapped
1099/tcp open  java-rmi    GNU Classpath grmiregistry
1524/tcp open  bindshell   Metasploitable root shell
2049/tcp open  nfs         2-4 (RPC #100003)
2121/tcp open  ftp         ProFTPD 1.3.1
3306/tcp open  mysql       MySQL 5.0.51a-3ubuntu5
5432/tcp open  postgresql  PostgreSQL DB 8.3.0 - 8.3.7
5900/tcp open  vnc         VNC (protocol 3.3)
6000/tcp open  X11         (access denied)
6667/tcp open  irc         UnrealIRCd
8009/tcp open  ajp13       Apache Jserv (Protocol v1.3)
8180/tcp open  http        Apache Tomcat/Coyote JSP engine 1.1
Service Info: Hosts:  metasploitable.localdomain, irc.Metasploitable.LAN; OSs: Unix, Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 13.36 seconds
```

- **nmap -A <target ip-address> :**

  - **-A**: This option enables several advanced features:
  - **OS detection**: Attempts to determine the operating system of the target.
  - **Version detection**: Identifies the versions of services running on open ports.
  - **Script scanning**: Runs a set of Nmap scripts against the target to gather more information (e.g., checking for vulnerabilities).
  - **Traceroute**: Determines the network path to the target by performing a traceroute.

```
┌──(kali㉿kali)-[~]
└─$ nmap -A 192.168.[redacted].133

Starting Nmap 7.94SVN ( https://nmap.org ) at 2024-09-26 10:39 EDT
Nmap scan report for 192.168.[redacted].133
Host is up (0.0028s latency).
Not shown: 977 closed tcp ports (conn-refused)
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
| ftp-syst:
|   STAT:
| FTP server status:
|      Connected to 192.168.[redacted].129
|      Logged in as ftp
|      TYPE: ASCII
|      No session bandwidth limit
|      Session timeout in seconds is 300
|      Control connection is plain text
|      Data connections will be plain text
|      vsFTPd 2.3.4 - secure, fast, stable
|_End of status
|_ftp-anon: Anonymous FTP login allowed (FTP code 230)
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
| ssh-hostkey:
|   1024 60:0f:cf:e1:c0:5f:6a:74:d6:90:24:fa:c4:d5:6c:cd (DSA)
|_  2048 56:56:24:0f:21:1d:de:a7:2b:ae:61:b1:24:3d:e8:f3 (RSA)
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
| ssl-cert: Subject: commonName=ubuntu804-base.localdomain/organizationName=OCOSA/stateOrProvinceName=There is no such thing outside US/countryName=XX
| Not valid before: 2010-03-17T14:07:45
|_Not valid after:  2010-04-16T14:07:45
|_smtp-commands: metasploitable.localdomain, PIPELINING, SIZE 10240000, VRFY, ETRN, STARTTLS, ENHANCEDSTATUSCODES, 8BITMIME, DSN
|_ssl-date: 2024-09-26T14:39:41+00:00; -1s from scanner time.
| sslv2:
|   SSLv2 supported
|   ciphers:
|     SSL2_RC2_128_CBC_WITH_MD5
|     SSL2_RC4_128_WITH_MD5
|     SSL2_DES_64_CBC_WITH_MD5
|     SSL2_RC4_128_EXPORT40_WITH_MD5
|     SSL2_DES_192_EDE3_CBC_WITH_MD5
|_    SSL2_RC2_128_CBC_EXPORT40_WITH_MD5
```



PORTS:

- Port is a virtual point where network connections start and end.
- Ports allow computers to easily differentiate between different kinds of traffic.
- Ports are standardized across all network-connected devices, with each port assigned a number. Ports are reserved for certain protocols
  Ex. Http – Port 80
- Port numbers allow targeting specific services or applications within those devices.

Types:

1. Open

- The port is open and accepting connections.
- Indicates that a service is actively running and can be accessed.

2. Closed

- The port is closed and not accepting connections.
- The service is not running on that port, but the port is reachable, meaning the target is aware of it.

3. Filtered

- Nmap cannot determine whether the port is open or closed because a firewall or network device is blocking the scan.
- The packets sent to the port are being dropped or rejected, preventing Nmap from receiving a response.

4. Unfiltered

- The port is reachable, but Nmap cannot determine whether it is open or closed.
- This usually occurs when there's a firewall that does not filter traffic but does not respond to the scan.

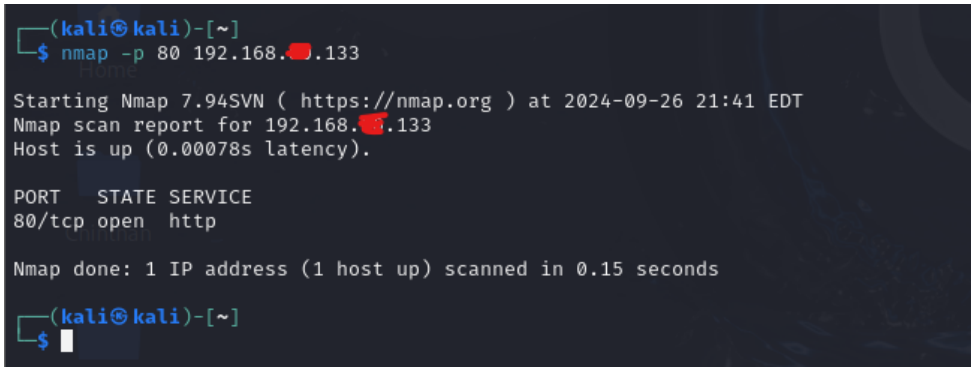
5. Open/Filtered

- Nmap cannot determine if the port is open or filtered.
- This typically happens when no response is received from the port; it may either be open but not responding or filtered by a firewall.

6. Closed/Filtered

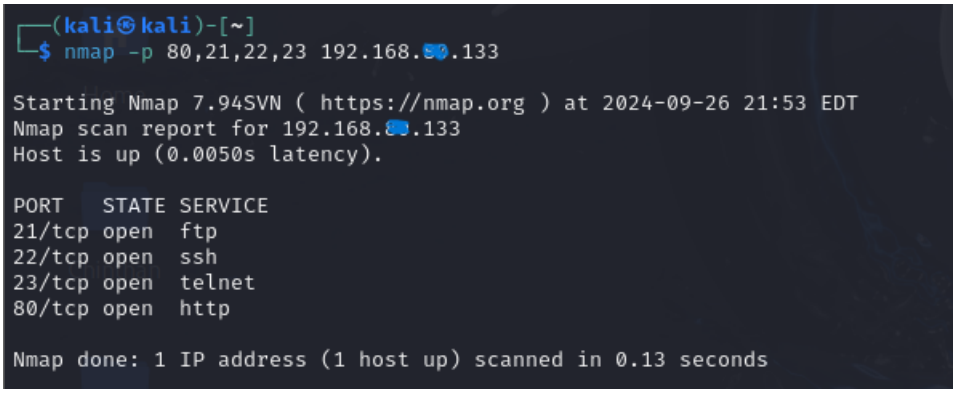
- This is a less common state that indicates that the port is likely closed, but a firewall is also blocking the scan, so Nmap cannot confirm its state.
- Similar to filtered, but it suggests more strongly that the port is closed.

- **nmap -p <port-number/numbers> <target ip-address> :**
  - **-p 80**: This option specifies that Nmap should only scan port 80.
  - Works for single port in this case.



  - **-p 80,21,23**: This option specifies that Nmap should scan port 80,21,23.

- Works for multiple port in this case. (can specify multiple ports)



- **-p 1-1000**: This option specifies that Nmap should scan from port 1 to port 1000.
- Scanning port ranges.

- **nmap -p- <target ip-address> :**
  - **-p-**: This tells Nmap to scan **all ports**, from port 1 through port 65,535. By default, Nmap only scans the 1,000 most common ports, but this option forces a full range scan.
  - Shows open state and which services are running.

- **sudo nmap -sU <target ip-address> :**
  - **-sU**: This option tells Nmap to perform a **UDP scan**, scanning for open UDP ports rather than TCP ports.
  - Takes a little time to scan ports.