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Port Scanning Lab

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Purpose

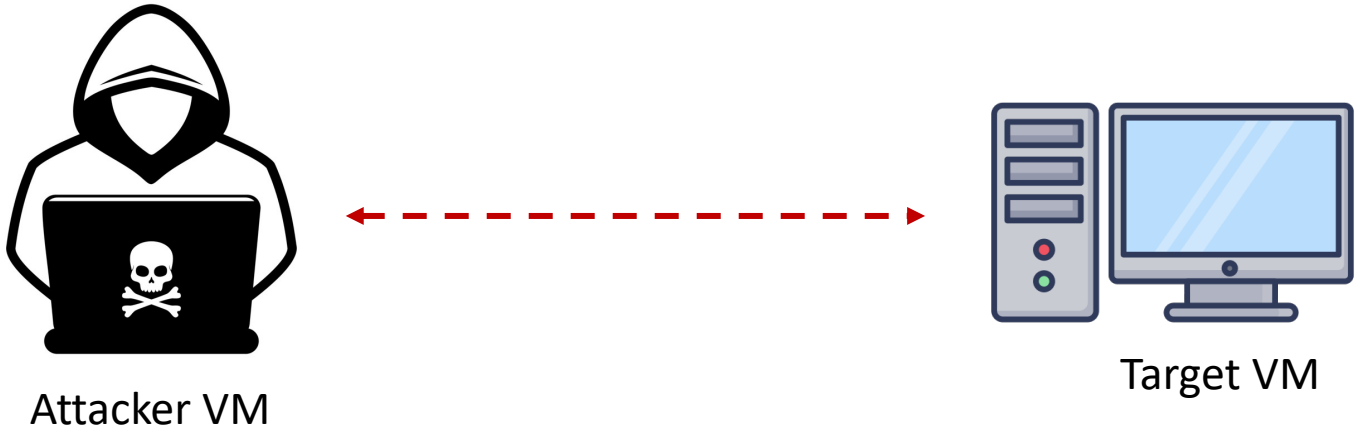
- The purpose of this lab is to familiarize the student with the basics of port scanning
- In this lab, the student will perform port scanning attacks using NMAP
- The students will also use NMAP to identify the different services running on the target system

What is port scanning?

- Attackers use port scanning to perform reconnaissance on the target system
- A successful port scanning attack, informs the attackers of the open ports and services running on the target system
- The attacker uses this information to perform an attack by exploiting an existing vulnerability on one or more services running on the target system

Virtual Lab Setup

- This lab is composed of 2 VMs



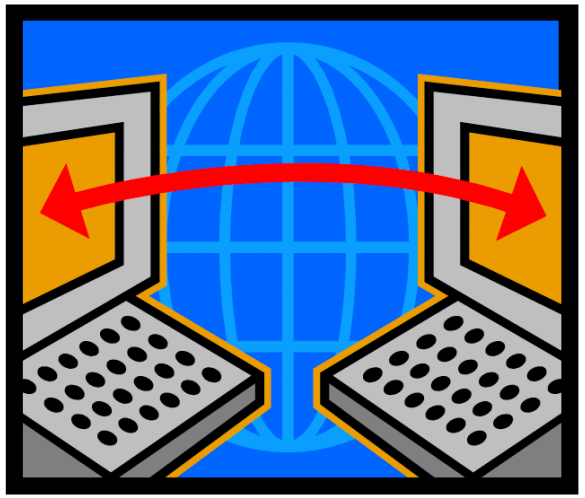
Lab Structure

- The *Port scanning* lab consists of 3 experiments
  1. Port scanning
  2. TCP SYN scan
  3. Detect OS and running services

Lab Software Tools

For this lab, we will be using the following tools:

- **Nmap:** Open-source tool for network discovery. It is used to discover hosts and services on a computer network, creating a map of the network's structure.



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Experiment 0:
Getting ready to start

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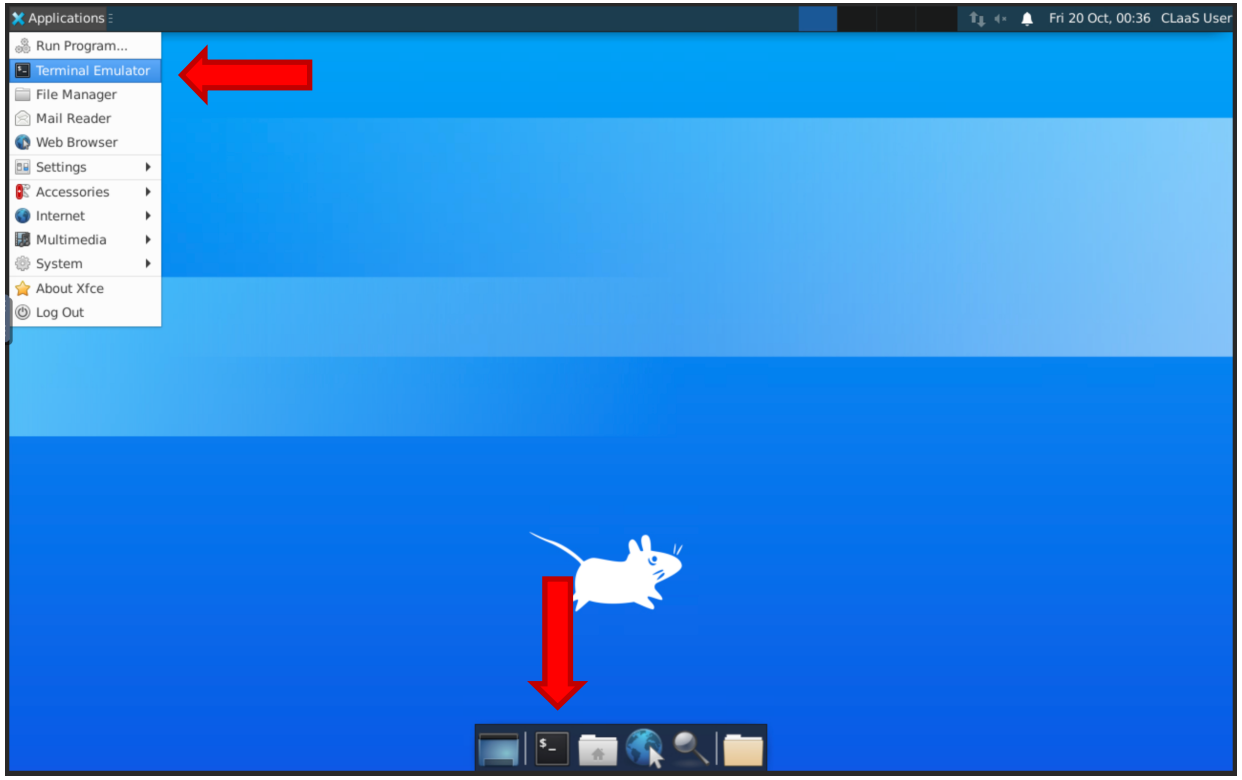
Experiment Instructions

- Step 1: Open a terminal
  - For this lab we will be using the terminal.
  - There are two ways to open it.
    - From the menu
    - Or by clicking the icon on the dock:

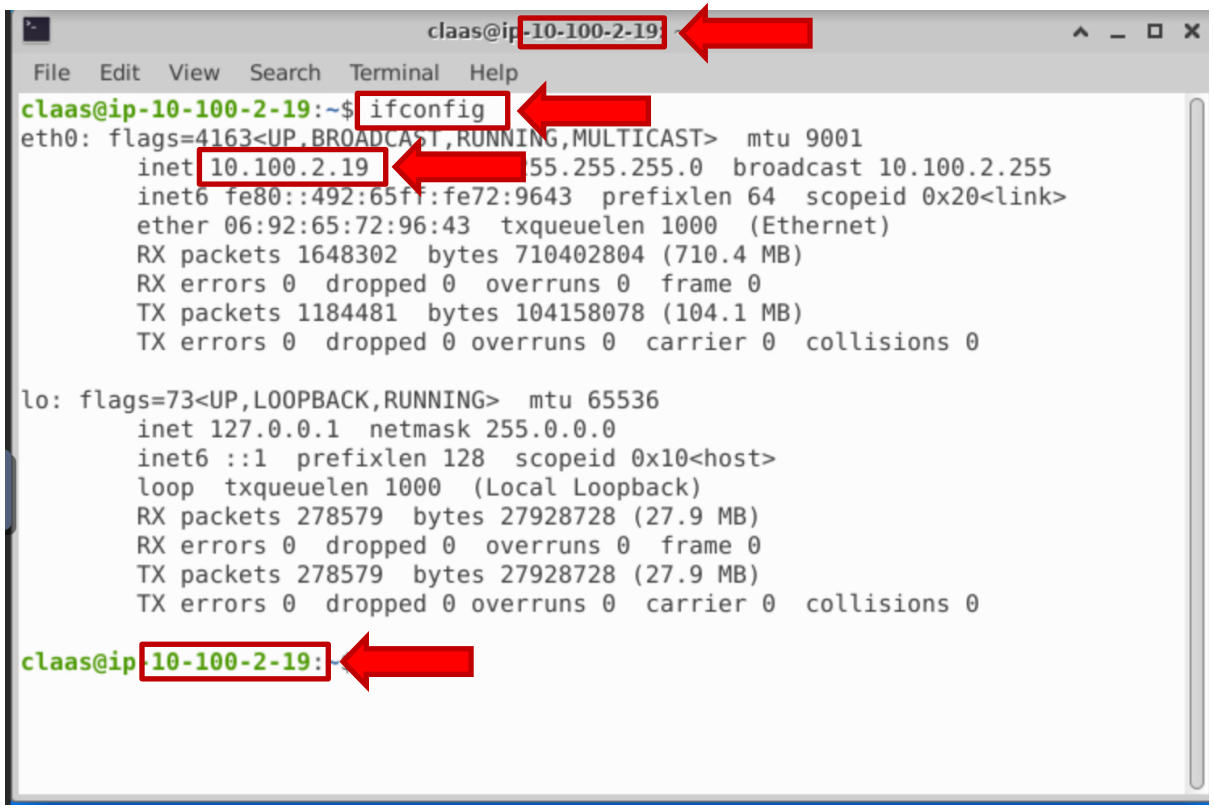


Experiment Instructions

- Step 2: Get the IP addresses
  - We can see the IP address as soon as we open the terminal
  - Or by typing

    `ifconfig`

  - *You will need the IPs of all the VMs, for the rest of the lab.*



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Experiment 1: Port Scanning

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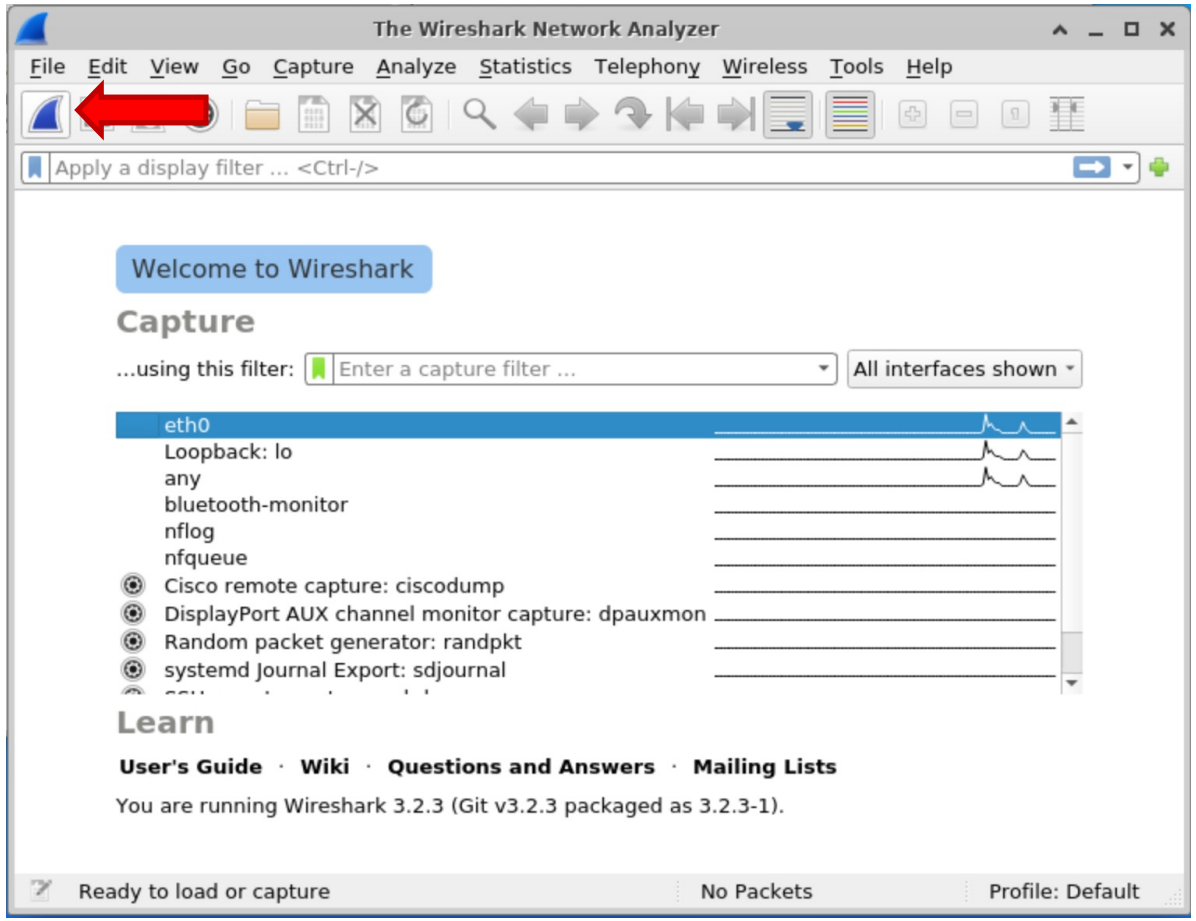
Experiment Instructions

- Step 1: Open Wireshark
  - On the Target VM
  - Open a terminal and type

    `wireshark`

- Step 2: Prepare Wireshark
  - Once Wireshark is open select the *eth0* interface
  - Click the blue button to *Start capturing packets*



Experiment Instructions

- Step 3: Scan a single IP
  - On the Attacker VM
  - Open a terminal and type

```
nmap <IP of target>
```

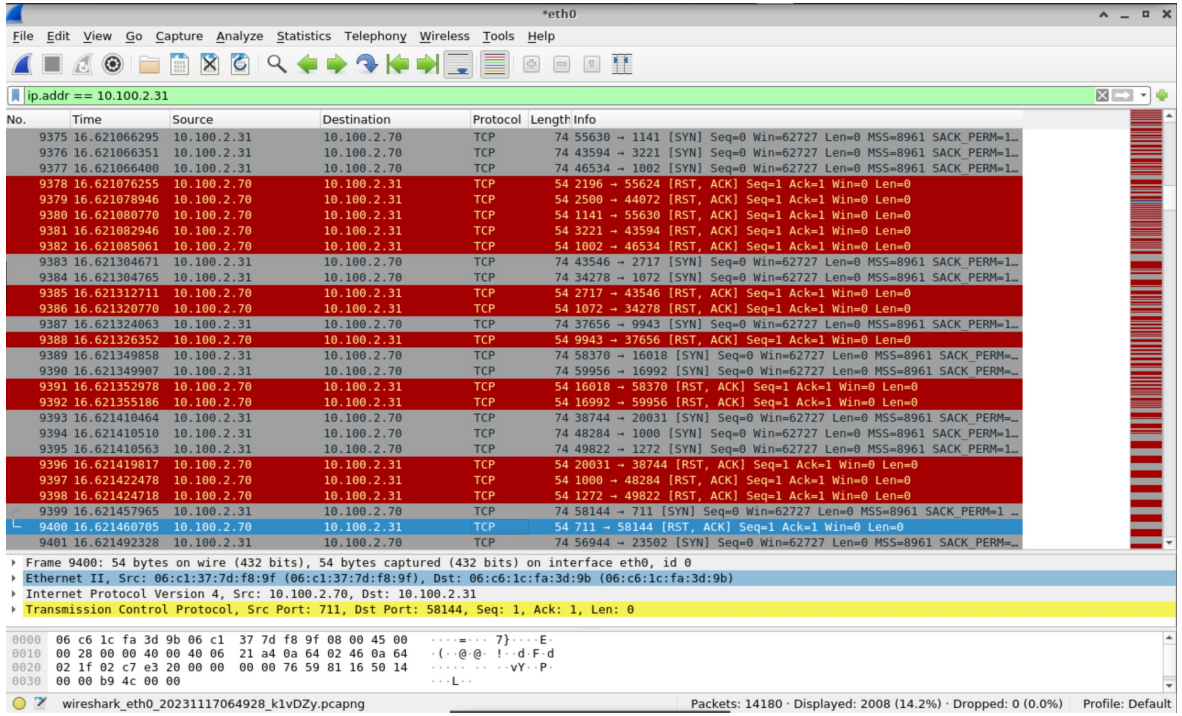
```
claas@ip-10-100-2-31:~$ nmap 10.100.2.70
Starting Nmap 7.80 ( https://nmap.org ) at 2023-11-17 06:48 UTC
Nmap scan report for ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)
Host is up (0.0070s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE
22/tcp   open  ssh
5901/tcp open  vnc-1

Nmap done: 1 IP address (1 host up) scanned in 0.15 seconds
```

Experiment Instructions

- Step 4: Observe the traffic on the target VM
  - Go back to the target VM
  - On Wireshark select *Stop capturing packets*
  - Filter the traffic using the following display filter

```
ip.addr == <IP of attacker>
```



Experiment Instructions

- Step 5: Scan a range of ports
  - On the Attacker VM
  - Open a terminal and type

```
nmap –p 1-100 <IP of target>
```

```
claas@ip-10-100-2-31:~$ nmap -p 1-100 10.100.2.70
Starting Nmap 7.80 ( https://nmap.org ) at 2023-11-17 06:59 UTC
Nmap scan report for ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)
Host is up (0.0012s latency).
Not shown: 99 closed ports
PORT   STATE SERVICE
22/tcp open  ssh

Nmap done: 1 IP address (1 host up) scanned in 0.04 seconds
```

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Experiment 2: TCP SYN Scan

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Experiment Instructions

- Step 1: Scan using TCP SYN scan
  - On the Attacker VM
  - Open a terminal and type

```
sudo nmap -sS <IP of target>
```

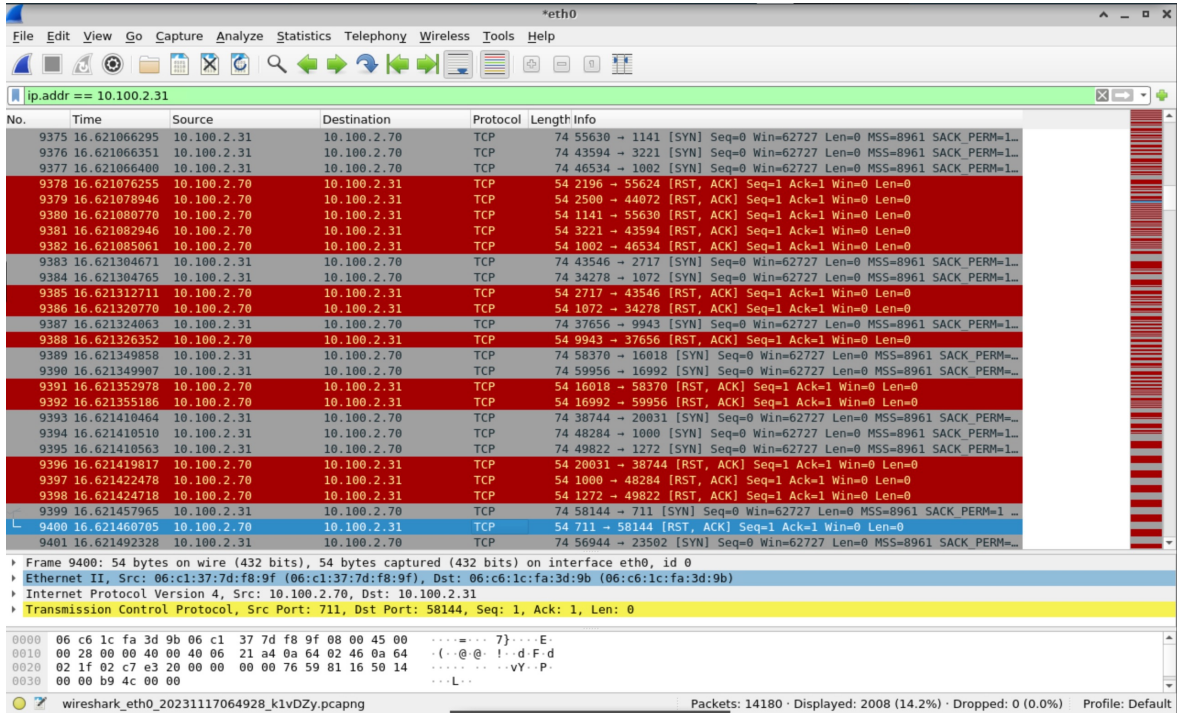
```
claas@ip-10-100-2-31:~$ sudo nmap -sS 10.100.2.70
[sudo] password for claas:
Starting Nmap 7.80 ( https://nmap.org ) at 2023-11-17 07:03 UTC
Nmap scan report for ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)
Host is up (0.0052s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE
22/tcp   open  ssh
5901/tcp open  vnc-1
MAC Address: 06:C1:37:7D:F8:9F (Unknown)

Nmap done: 1 IP address (1 host up) scanned in 0.16 seconds
```

  - *Sudo password: Claas2022*

Experiment Instructions

- Step 2: Observe the traffic on the target VM
  - Go back to the target VM
  - On Wireshark select *Stop capturing packets*
  - Filter the traffic using the following display filter

```
ip.addr == <IP of attacker>
```



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Experiment 3: Detect OS and running services

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Experiment Instructions

- Step 1: Scan OS and running services
  - On the Attacker VM
  - Open a terminal and type

    `nmap -A <IP of target>`

  - Then, type

    `sudo nmap -A <IP of target>`

  - Observe the differences
  - *Sudo password: Claas2022*

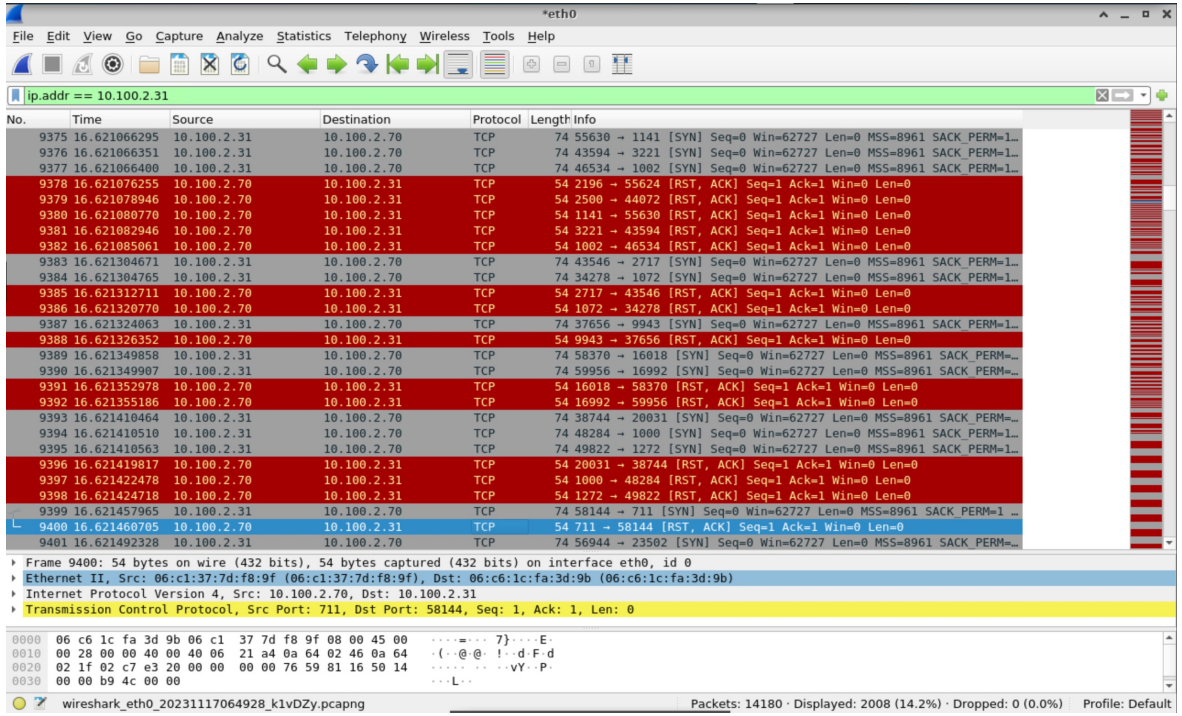
```
claas@ip-10-100-2-31:~$ nmap -A 10.100.2.70
Starting Nmap 7.80 ( https://nmap.org ) at 2023-11-17 07:17 UTC
Nmap scan report for ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)
Host is up (0.0076s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE VERSION
22/tcp   open  ssh     OpenSSH 8.2p1 Ubuntu 4ubuntu0.5 (Ubuntu Linux; protocol 2
.0)
5901/tcp open  vnc     VNC (protocol 3.8)
|_sslv2: ERROR: Script execution failed (use -d to debug)
|_tls-nextprotoneg: ERROR: Script execution failed (use -d to debug)
|_vnc-info: ERROR: Script execution failed (use -d to debug)
Service Info: OS: 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 0.95 seconds
```

```
claas@ip-10-100-2-31:~$ sudo nmap -A 10.100.2.70
Starting Nmap 7.80 ( https://nmap.org ) at 2023-11-17 07:17 UTC
Nmap scan report for ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)
Host is up (0.00041s latency).
Not shown: 998 closed ports
PORT     STATE SERVICE VERSION
22/tcp   open  ssh     OpenSSH 8.2p1 Ubuntu 4ubuntu0.5 (Ubuntu Linux; protocol 2
.0)
5901/tcp open  vnc     VNC (protocol 3.8)
MAC Address: 06:C1:37:7D:F8:9F (Unknown)
No exact OS matches for host (If you know what OS is running on it, see https://
nmap.org/submit/ ).
TCP/IP fingerprint:
OS:SCAN(V=7.80%E=4%D=11/17%OT=22%CT=1%CU=33744%PV=Y%DS=1%DC=D%G=Y%M=06C137%
OS:TM=65571394%P=x86_64-pc-linux-gnu)SEQ(SP=102%GCD=1%ISR=10D%TI=Z%CI=Z%II=
OS:I%TS=A)OPS(O1=M2301ST11NW7%O2=M2301ST11NW7%O3=M2301NNT11NW7%O4=M2301ST11
OS:NW7%O5=M2301ST11NW7%O6=M2301ST11)WIN(W1=F4B3%W2=F4B3%W3=F4B3%W4=F4B3%W5=
OS:F4B3%W6=F4B3)ECN(R=Y%DF=Y%T=40%W=F507%O=M2301NNSNW7%CC=Y%Q=)T1(R=Y%DF=Y%
OS:T=40%S=O%A=S+%F=AS%RD=0%Q=)T2(R=N)T3(R=N)T4(R=Y%DF=Y%T=40%W=0%S=A%A=Z%F=
OS:R%O=%RD=0%Q=)T5(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(R=Y%DF=Y%T
OS:=40%W=0%S=A%A=Z%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=AR%O=%RD=
OS:0%Q=)U1(R=Y%DF=N%T=40%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=G%RUCK=G%RUD=G)IE(
OS:R=Y%DFI=N%T=40%CD=S)

Network Distance: 1 hop
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

TRACEROUTE
HOP RTT     ADDRESS
1   0.41 ms ip-10-100-2-70.us-west-2.compute.internal (10.100.2.70)

OS and Service detection performed. Please report any incorrect results at https
://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 12.38 seconds
```

Experiment Instructions

- Step 2: Observe the traffic on the target VM
  - Go back to the target VM
  - On Wireshark select *Stop capturing packets*
  - Filter the traffic using the following display filter

```
ip.addr == <IP of attacker>
```



Lab Report

- From *Experiment 1 Step 4*: Observe the traffic and describe how nmap knows which ports are open and which are closed.
- Investigate the command used in *Experiment 2 Step 1,* what is half-port scanning, and how it works.
- Observe the differences in Experiment 3 Step 1. Investigate why one command provides more information than the other.
- Based on the traffic observed in Experiment 3 Step 2, how does nmap find the OS and running services?

Conclusion

- In this lab, we used Nmap to perform a comprehensive scan of a target host, identifying a variety of open ports and services.

- We also used Nmap to perform a version scan, which revealed the specific versions of some of the running services. This information can be used to identify potential vulnerabilities that could be exploited by attackers.

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End of Lab

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