Networking Assessment 1

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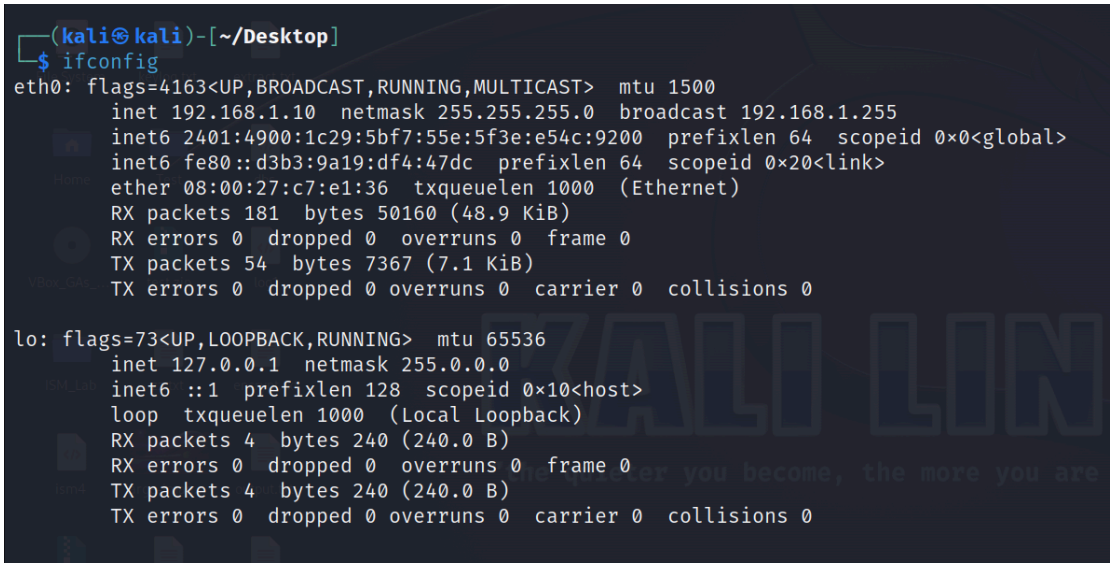
1. Consider a case, a folder has multiple files and how would you copy it to destination machine path (Using SCP and CP options in linux)

   SCP : For transferring or copying files/directories between two different hosts
   CP : For transferring or copying files/directories in the same host device.

SCP :

In Kali Linux Side (host 1) :



```
┌──(kali㉿kali)-[~/Desktop]
└─$ scp -r ~/Desktop/ISM_Lab tkgowtham@192.168.1.9:/home/tkgowtham/Desktop
The authenticity of host '192.168.1.9 (192.168.1.9)' can't be established.
ED25519 key fingerprint is SHA256:GhC3RkWqbe8xaEk5mXS0vQMf94iL8WtnVXA9a5LJTz8.
This host key is known by the following other names/addresses:
    ~/.ssh/known_hosts:1: [hashed name]
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.9' (ED25519) to the list of known hosts.
tkgowtham@192.168.1.9's password:
private.pem                                   100% 1854    38.9KB/s   00:00
lab6                                          100% 2269    71.9KB/s   00:00
public.pem                                    100%  451    12.2KB/s   00:00
msg.txt                                       100%   12     2.7KB/s   00:00
payload                                       100%   51     2.1KB/s   00:00
images.jpeg                                   100%   10KB 599.9KB/s   00:00
lab4.txt                                      100% 2127   133.0KB/s   00:00
lab4                                          100% 2187    49.7KB/s   00:00
portrait.jpg                                  100% 4272   118.5KB/s   00:00
large-text-enrcypt.txt                        100% 2535    85.8KB/s   00:00
large-text.txt                                100% 1848    50.3KB/s   00:00
extract-text-large.txt                        100% 1848   150.3KB/s   00:00
ex4-textfile.txt                              100%  195    18.6KB/s   00:00
ex5.txt                                       100%  616    21.1KB/s   00:00
extract-text.txt                              100%   77     2.4KB/s   00:00
large-text-decrypt.txt                        100% 1848    51.8KB/s   00:00
short-text.txt                                100%   77     4.6KB/s   00:00
extract-text-large1.txt                       100% 2535   322.3KB/s   00:00
ex4-textfile2.txt                             100% 2369   472.6KB/s   00:00
app.py                                        100%  723    22.0KB/s   00:00
decrypt.txt                                   100%   12     3.1KB/s   00:00
cmd                                           100% 1515    28.2KB/s   00:00
login.html                                    100%  933   155.5KB/s   00:00
home.html                                     100%  136     3.6KB/s   00:00
out.txt                                       100%   45    12.6KB/s   00:00
sign                                          100%  256     8.7KB/s   00:00
```

Linux Mint Side (host 2) :

```
tkgowtham@tkgowtham-VirtualBox: ~
File  Edit  View  Search  Terminal  Help
tkgowtham@tkgowtham-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.9  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::f18b:36e7:d6d6:337f  prefixlen 64  scopeid 0x20<link>
        inet6 2401:4900:1c29:5bf7:80ab:e74c:9890:8cd6  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c29:5bf7:99e8:dd7a:f341:d3c  prefixlen 64  scopeid 0x0<global>
        ether 08:00:27:d8:25:4b  txqueuelen 1000  (Ethernet)
        RX packets 36534  bytes 53769990 (53.7 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 11977  bytes 1224239 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 247  bytes 27262 (27.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 247  bytes 27262 (27.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

mpqemubr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 10.78.135.1  netmask 255.255.255.0  broadcast 10.78.135.255
        ether 52:54:00:16:f4:9e  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:81:43:97  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ ls -l ISM_Lab
total 60
-rw-r--r-- 1 tkgowtham tkgowtham  723 Feb 28 12:36  app.py
-rw-r--r-- 1 tkgowtham tkgowtham 1515 Feb 28 12:36  cmd
-rw-r--r-- 1 tkgowtham tkgowtham   12 Feb 28 12:36  decrypt.txt
-rw-r--r-- 1 tkgowtham tkgowtham 2187 Feb 28 12:36  lab4
-rw-r--r-- 1 tkgowtham tkgowtham 2127 Feb 28 12:36  lab4.txt
drwxr-xr-x 2 tkgowtham tkgowtham 4096 Feb 25 20:03 'Lab 5'
-rw-r--r-- 1 tkgowtham tkgowtham 2269 Feb 28 12:36  lab6
-rw-r--r-- 1 tkgowtham tkgowtham   12 Feb 28 12:36  msg.txt
-rw-r--r-- 1 tkgowtham tkgowtham   45 Feb 28 12:36  out.txt
-rw-r--r-- 1 tkgowtham tkgowtham   51 Feb 28 12:36  payload
-rw------- 1 tkgowtham tkgowtham 1854 Feb 28 12:36  private.pem
-rw-r--r-- 1 tkgowtham tkgowtham  451 Feb 28 12:36  public.pem
-rw-r--r-- 1 tkgowtham tkgowtham  256 Feb 28 12:36  sign
drwxr-xr-x 2 tkgowtham tkgowtham 4096 Feb 25 20:03  static
drwxr-xr-x 2 tkgowtham tkgowtham 4096 Feb 25 20:03  templates
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

CP :

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ cp -r dir1 backup/
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ ls -l backup
total 15368
drwxrwxr-x 2 tkgowtham tkgowtham    4096 Feb 25 20:44 dir1
-rw-rw-r-- 1 tkgowtham tkgowtham      16 Jan 28 22:01 newfile.txt
-rw-rw-r-- 1 tkgowtham tkgowtham 1048576 Jan 28 22:01 text_file1.txt
-rw-rw-r-- 1 tkgowtham tkgowtham 2097152 Jan 28 22:01 text_file2.txt
-rw-rw-r-- 1 tkgowtham tkgowtham 3145728 Jan 28 22:01 text_file3.txt
-rw-rw-r-- 1 tkgowtham tkgowtham 4194304 Jan 28 22:01 text_file4.txt
-rw-rw-r-- 1 tkgowtham tkgowtham 5242880 Jan 28 22:01 text_file5.txt
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

2. Host a FTP and SFTP server and try put and get operation

   FTP : File transfer protocol to share files between devices
   SFTP : FTP with SSH protocol to securely share files between devices

FTP :

Following these steps to create a FTP Server on my Linux Mint machine

1. sudo apt install vsftpd

2. sudo systemctl enable vsftpd

3. sudo nano /etc/vsftpd.conf

4. chroot_local_user=YES, write_enable=YES, user_sub_token=$USER,
   local_root=/home/$USER/ftp, pasv_min_port=10000, pasv_max_port=10100,
   userlist_enable=YES, userlist_file=/etc/vsftpd.userlist, userlist_deny=NO,
   force_local_data_ssl=YES, force_local_logins_ssl=YES

   rsa_cert_file=/etc/ssl/private/vsftpd.pem
   rsa_private_key_file=/etc/ssl/private/vsftpd.pem
   ssl_enable=YES

5. sudo ufw allow from any to any port 20, 21, 10000:10100 proto tcp

6. sudo adduser phil

7. sudo mkdir /home/phil/ftp

8. sudo chown nobody:nogroup /home/phil/ftp

9. sudo chmod a-w /home/phil/ftp

10. sudo mkdir /home/phil/ftp/upload

11. sudo chown phil:phil /home/phil/ftp/upload

12. echo "My FTP Server Tkgowtham" | sudo tee /home/phil/ftp/upload/demo.txt

13. echo "phil" | sudo tee -a /etc/vsftpd.userlist

14. sudo systemctl restart vsftpd

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ sudo systemctl status vsftpd
● vsftpd.service - vsftpd FTP server
     Loaded: loaded (/lib/systemd/system/vsftpd.service; enabled; vendor preset: enabled)
     Active: active (running) since Fri 2025-02-28 12:21:50 IST; 24min ago
   Main PID: 914 (vsftpd)
      Tasks: 1 (limit: 3428)
     Memory: 1.1M
        CPU: 12ms
     CGroup: /system.slice/vsftpd.service
             └─914 /usr/sbin/vsftpd /etc/vsftpd.conf

Feb 28 12:21:50 tkgowtham-VirtualBox systemd[1]: Starting vsftpd FTP server...
Feb 28 12:21:50 tkgowtham-VirtualBox systemd[1]: Started vsftpd FTP server.
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

In Kali Linux (Device 2) :

1. Open a terminal, and type ftp <ip-addr>

2. Type lcd to change directory

3. Use get for downloading a file or mget to download multiple files

4. Use put for uploading a file or mput to upload multiple files

```
┌──(kali㉿kali)-[~/Desktop]
└─$ ftp 192.168.1.9
Connected to 192.168.1.9.
220 (vsFTPd 3.0.5)
Name (192.168.1.9:kali): tkgowtham_ftp
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> lpwd
Local directory: /home/kali/Desktop
ftp> pwd
Remote directory: /
ftp> ls
229 Entering Extended Passive Mode (|||10066|)
150 Here comes the directory listing.
drwxrwxrwx    2 1001     1001         4096 Feb 26 10:13 upload
226 Directory send OK.
ftp> ls upload
229 Entering Extended Passive Mode (|||10009|)
150 Here comes the directory listing.
-rw-r--r--    1 1001     1001           29 Feb 26 10:13 demo.txt
226 Directory send OK.
```

PUT Command :

```
ftp> put ~/Desktop/output.txt output_new.txt
local: /home/kali/Desktop/output.txt remote: output_new.txt
229 Entering Extended Passive Mode (|||10019|)
150 Ok to send data.
100% |***********************************************************
226 Transfer complete.
374 bytes sent in 00:00 (1.23 KiB/s)
ftp>
```

GET Command :

```
ftp> get your-image.jpg
local: your-image.jpg remote: your-image.jpg
229 Entering Extended Passive Mode (|||10016|)
150 Opening BINARY mode data connection for your-image.jpg (52092 bytes).
100% |***********************************************************************
226 Transfer complete.
52092 bytes received in 00:00 (8.81 MiB/s)
```

SFTP :

Create SFTP Server on Linux Mint (Device 1)

1. sudo apt install ssh

2. sudo systemctl start ssh

3. sudo addgroup sftp

4. sudo adduser sftp_tkgowtham

5. sudo usermod -a -G stfp stfp_tkgowtham

6. Verify using : grep sftp /etc/group

7.sudo mkdir -p /var/sftp/Files

8. sudo chown root:root /var/sftp

9. sudo chmod 755 /var/sftp

10. sudo chown stfp_tkgowtham:sftp_tkgowtham /var/sftp/Files

11. sudo nano /etc/ssh/sshd_config

12. Add following script to the config file:

Match User sftp_tkgowtham
ChrootDirectory /var/sftp
X11Forwarding no
AllowTcpForwarding no
ForceCommand internal-sftp

13. sudo systemctl restart ssh

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
     Active: active (running) since Fri 2025-02-28 12:21:52 IST; 42min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
   Main PID: 950 (sshd)
      Tasks: 1 (limit: 3428)
     Memory: 3.4M
        CPU: 196ms
     CGroup: /system.slice/ssh.service
             └─950 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Feb 28 12:21:50 tkgowtham-VirtualBox systemd[1]: Starting OpenBSD Secure Shell server...
Feb 28 12:21:52 tkgowtham-VirtualBox sshd[950]: Server listening on 0.0.0.0 port 22.
Feb 28 12:21:52 tkgowtham-VirtualBox sshd[950]: Server listening on :: port 22.
Feb 28 12:21:52 tkgowtham-VirtualBox systemd[1]: Started OpenBSD Secure Shell server.
Feb 28 12:36:26 tkgowtham-VirtualBox sshd[4649]: Accepted password for tkgowtham from 192.168.1.10 port 59998 ssh2
Feb 28 12:36:26 tkgowtham-VirtualBox sshd[4649]: pam_unix(sshd:session): session opened for user tkgowtham(uid=1000) by (uid=0)
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

<u>On Kali Linux (Device 2) :</u>

1. sftp sftp_tkgowtham@<ip-addr>

2. Use get and put command as similarly to ftp

```
┌──(kali㉿kali)-[~/Desktop]
└─$ sftp tkgowtham@192.168.1.9
tkgowtham@192.168.1.9's password:
Connected to 192.168.1.9.
sftp> ls
Desktop                 Documents               Downloads               Music                   Pictures                Public
Python-3.10.11.tgz      Templates               Videos                  Warpinator              format_for_assignment.txt  snap
sftp> lls
dbs          demo.txt          encrypt.txt  ism4     ISM_Lab.txt  keylogger.py  large-image.jpg  log1        Test      your-image.jpg
decrypt.txt  encrypt_text.txt  extract.txt  ISM_Lab  ISM_Lab.zip  keylog.txt    large_text.txt   output.txt  test.zip  zz.txt
sftp> lpwd
Local working directory: /home/kali/Desktop
sftp> pwd
Remote working directory: /home/tkgowtham
sftp>
```

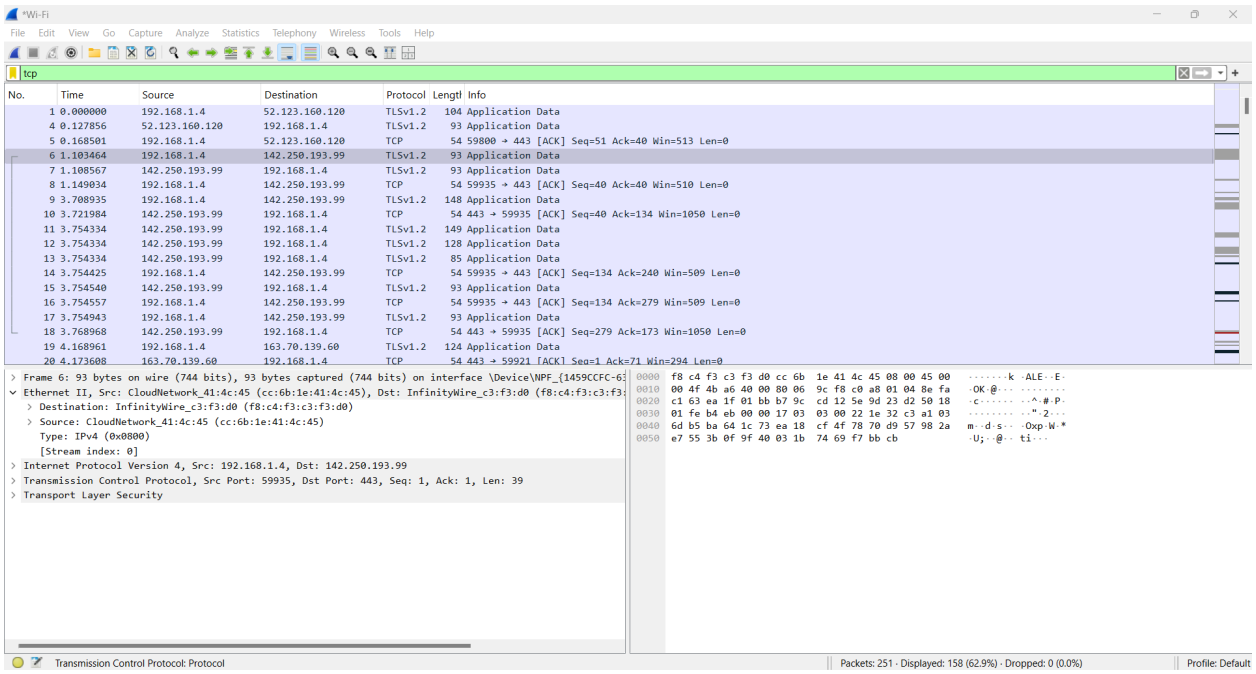
```
sftp> get script.sh
Fetching /home/tkgowtham/Desktop/script.sh to script.sh
script.sh
sftp>
```

```
sftp> put large-image.jpg
Uploading large-image.jpg to /home/tkgowtham/Desktop/large-image.jpg
large-image.jpg
sftp>
```

3. Explore with Wireshark, TCP Dump and Cisco Packet Tracer and learn about packet filters

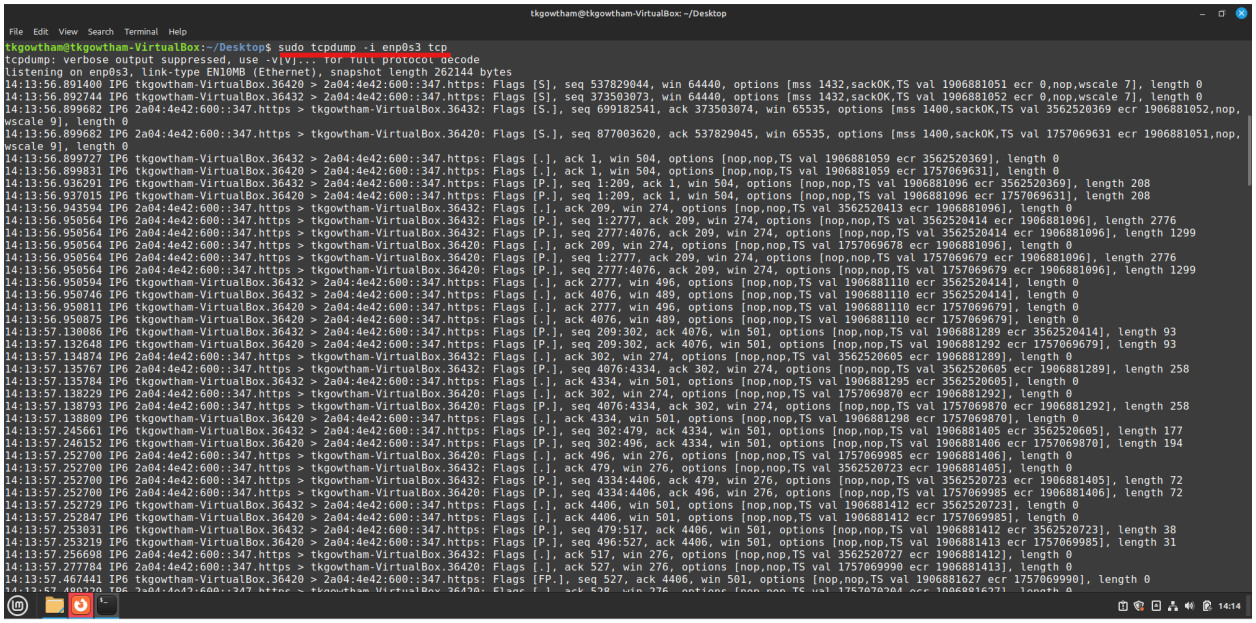
Wireshark : It is a GUI based Packet analyzer which can be used for deep packet analysis with visualization. It captures packets in real time. It supports thousands of protocols and is heavy on resources.

Filters such as tcp, udp, ip, arp, http, and many more can be used, like tcp.port == 80.



TCP Dump : It is a CLI based packet analyzer and it is used for light weight resources and capturing and logging. It supports textual protocols and it best for packet capturing and remote troubleshooting.

For filtering it used berkeley packet filter. Eg :
Tcpdump -i eth0 → capture all packets on eth0
Tcpdump -i eth0 tcp
Tcpdump -i eth0 udp
Tcpdump -i eth0 icmp
Tcpdump -i eth0 host <ip-addr>
Tcpdump -i eth0 port <port-no>



Cisco Packet Tracer : It is a network simulator used for creating network topology simulation and testing. It is a GUI and doesn't support real time packet filtering. It can simulate how a packet travels between devices.

You can create a topology and create a vlan or access control list to filter the packets

4. Understand linux utility commands ping and arp and understand each parameters of ifconfig output

Ping : Used to test network connectivity between two devices
options :

-c No of packet count
-i interval time between packet
-s set packet size
-t set ttl for packet

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ ping 192.168.1.3 -c 4
PING 192.168.1.3 (192.168.1.3) 56(84) bytes of data.
64 bytes from 192.168.1.3: icmp_seq=1 ttl=64 time=2493 ms
64 bytes from 192.168.1.3: icmp_seq=2 ttl=64 time=1475 ms
64 bytes from 192.168.1.3: icmp_seq=3 ttl=64 time=451 ms
64 bytes from 192.168.1.3: icmp_seq=4 ttl=64 time=270 ms

--- 192.168.1.3 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3042ms
rtt min/avg/max/mdev = 270.381/1172.196/2492.878/890.143 ms, pipe 3
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

Arp : It is address resolution protocol used for manipulating the ARP table, mapping IP address to MAC address. It is used for troubleshooting network issues.
Options :

-a show all arp entries
-n display numeric ip address
-d delete a entry

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ arp -a
_gateway (192.168.1.1) at f8:c4:f3:c3:f3:d0 [ether] on enp0s3
? (192.168.1.3) at 70:5f:a3:61:85:d3 [ether] on enp0s3
? (192.168.1.10) at 08:00:27:c7:e1:36 [ether] on enp0s3
tkgowtham@tkgowtham-VirtualBox:~/Desktop$
```

ifconfig : Used for checking the network interface

interface : eth0 - Name of the network interface
Status flags : UP, BROADCAST, RUNNING, MULTICAST
MTU :Maximum transfer unit of the largest packet size
inet : IPv4 address
inet6 : IPv6 address
subnet mask : network portion of the ip address
MAC address : address of NIC card.
Transmit queue length : the number of packets waiting to be sent
Packet Statistics : RX and TX packets, bytes, errors, dropped and overruns

```
tkgowtham@tkgowtham-VirtualBox:~/Desktop$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.9  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::f18b:36e7:d6d6:337f  prefixlen 64  scopeid 0x20<link>
        inet6 2401:4900:1c28:52d6:2050:cb5d:126:285e  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c28:1266:d5a8:bd58:18dc:cc36  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c29:5bf7:80ab:e74c:9890:8cd6  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c28:52d6:bdfc:15ea:306c:2814  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c28:6d29:5865:2030:260:4e40  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c28:1266:5d68:eda1:ae71:ce61  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c29:5bf7:99e8:dd7a:f341:d3c  prefixlen 64  scopeid 0x0<global>
        inet6 2401:4900:1c28:6d29:ca3e:c485:84cc:15a3  prefixlen 64  scopeid 0x0<global>
        ether 08:00:27:d8:25:4b  txqueuelen 1000  (Ethernet)
        RX packets 79684  bytes 109083094 (109.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 24128  bytes 2661009 (2.6 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 1294  bytes 157943 (157.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1294  bytes 157943 (157.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

5. Understand what happens when a duplicate IP is configured in a network.

When two IP addresses are duplicated in a network, there will be an IP conflict leading to network instability. Because of this, packets may get dropped, misrouted and fail to reach their destination and the address resolution protocol (ARP) table may have incorrect MAC address mappings.

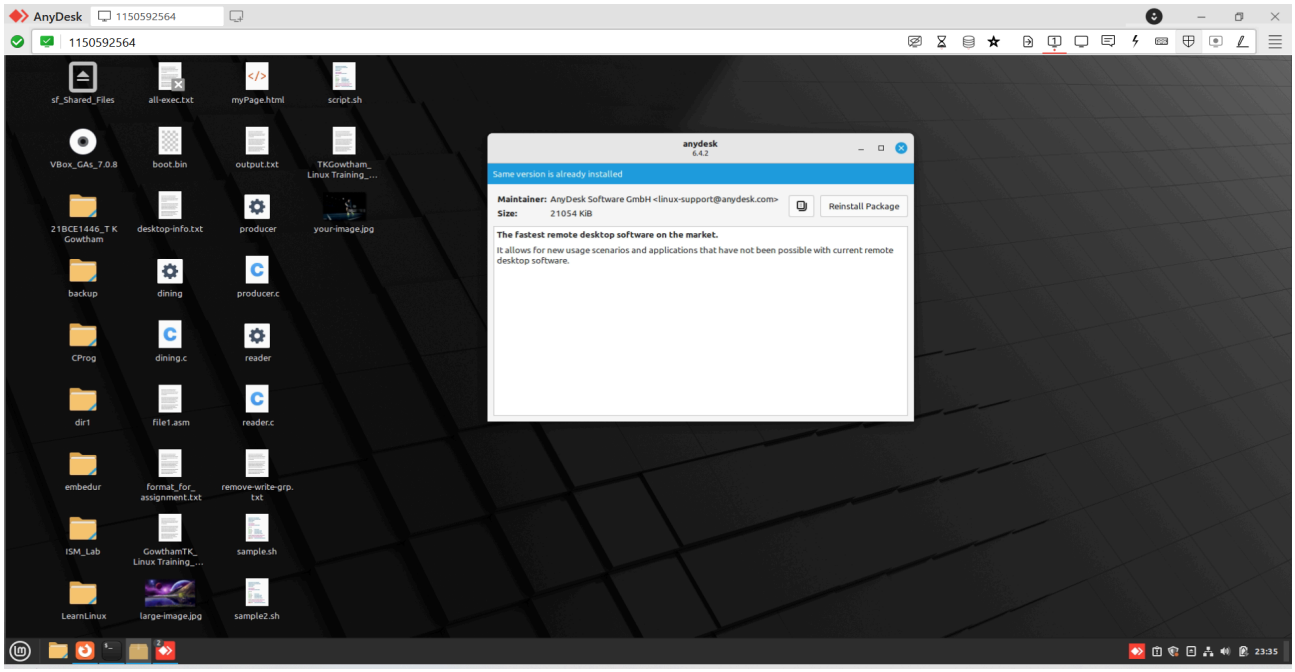
To detect this use arp -a command to check if there is any duplicate IP and monitor the system logs.

6. Understand how to access remote systems using RDC, VNC Viewer, Anydesk and teamviewer.

<u>AnyDesk :</u>

AnyDesk is a fast and lightweight remote desktop tool with low latency. It works across Windows, Linux, macOS, and mobile devices via the internet. Users connect using a unique 9-digit address without complex setup. It supports file transfers, unattended access, and session recording.

(Accessing Linux Mint VM via AnyDesk)



Remote Desktop Connection : RDC is a built-in Windows tool for remote access over a LAN or VPN. It requires enabling Remote Desktop on the target PC and knowing its IP. Users can connect using mstsc.exe and enter login credentials. It works only on Windows and does not support cross-platform access.

VNC Viewer : VNC (Virtual Network Computing) allows remote desktop control across platforms. It requires installing a VNC server on the remote machine and a viewer on the client. Connections use IP addresses and work best within the same network (LAN). It is open-source and widely used for Linux, but setup is complex.

Team Viewer : TeamViewer is a powerful remote access tool used for IT support and collaboration. It connects devices via a Partner ID and password, working over the internet. Supports features like chat, file sharing, multi-user access, and meetings. It is free for personal use but requires a license for commercial purposes.

7. How to check if your default gateway is reachable or not and understand the default gateway.

   To check if the default gateway is accessible or not use :

   ip route | grep "default"
   ping <ip_addr>

use the command ip route | grep "default" to identify the default route and then verify connectivity by pinging the gateway using ping <ip_addr> and the default gateway acts as the primary route for forwarding traffic from the local network to external networks, such as the internet.

```
tkgowtham@tkgowtham-VirtualBox:~$ ip route | grep "default"
default via 192.168.1.1 dev enp0s3 proto dhcp metric 100
tkgowtham@tkgowtham-VirtualBox:~$ ping 192.168.1.1 -c 4
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=17.5 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=7.17 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=25.0 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=64 time=22.5 ms

--- 192.168.1.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3006ms
rtt min/avg/max/mdev = 7.166/18.048/25.024/6.841 ms
tkgowtham@tkgowtham-VirtualBox:~$
```

8. Check ifconfig and iwconfig and understand about network interfaces.

   ifconfig is used for managing network interface in wired (ethernet) and loopback

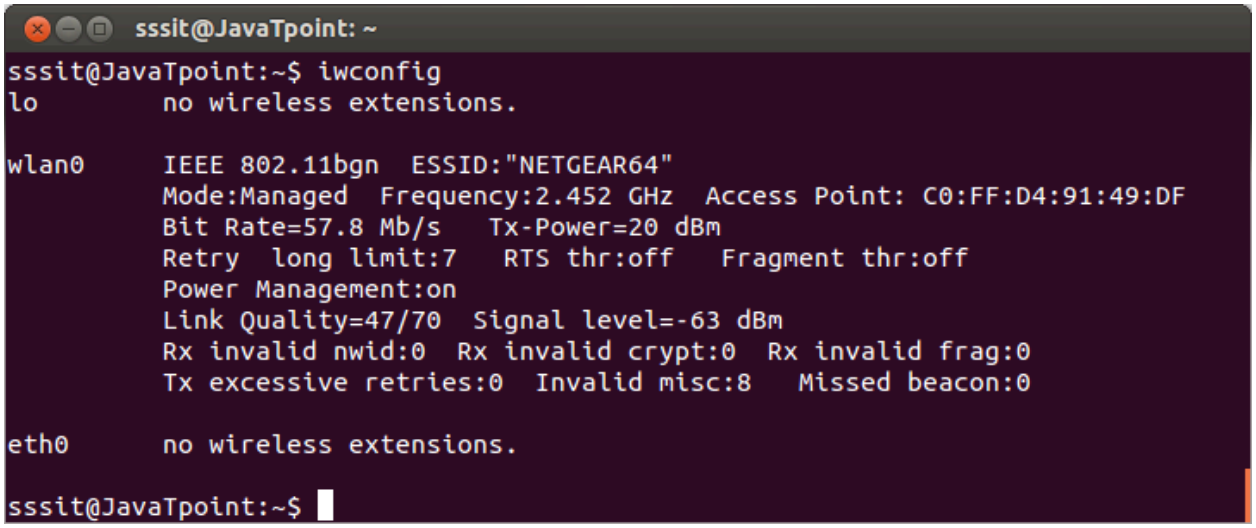
   Flags is the interface status flags
   MTU defines the largest packet size that a network interface can send.
   To check interface speed use ethtool eth0
   netmask for setting subnet mask
   broadcast for setting broadcast address.
   Inet is IPv4 address and inet6 is IPv6 address.
   Ether <> specifies the MAC address
   Rx packets is received packets
   TX packets is transmitted packets

```
tkgowtham@tkgowtham-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.9  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 2401:4900:1c28:6d29:7eb1:34c9:207:8781  prefixlen 64  scopeid 0x0<global>
        inet6 fe80::f18b:36e7:d6d6:337f  prefixlen 64  scopeid 0x20<link>
        inet6 2401:4900:1c28:6d29:5865:2030:260:4e40  prefixlen 64  scopeid 0x0<global>
        ether 08:00:27:d8:25:4b  txqueuelen 1000  (Ethernet)
        RX packets 21724  bytes 30522718 (30.5 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 7185  bytes 731626 (731.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 419  bytes 51769 (51.7 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 419  bytes 51769 (51.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

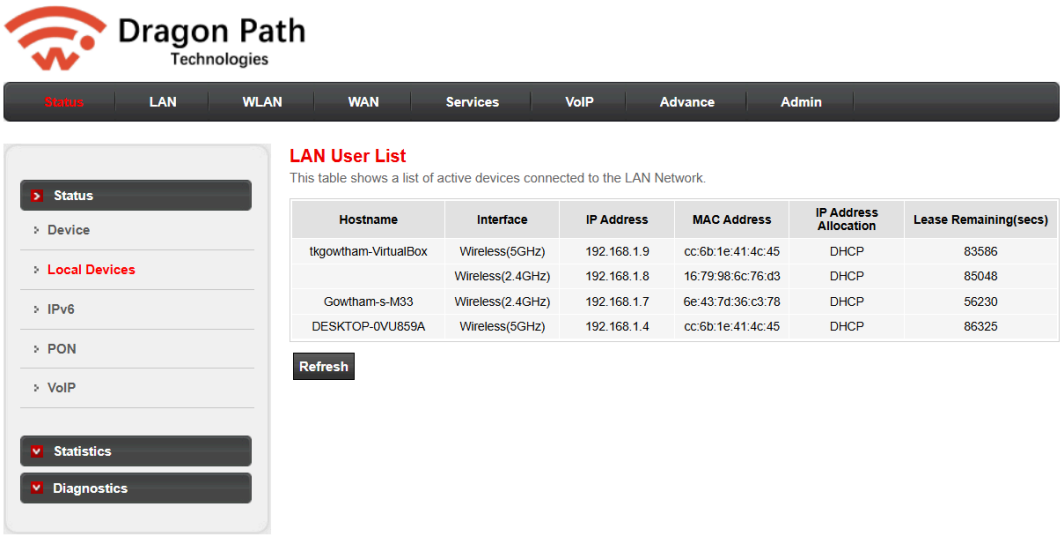
iwconfig is used for managing network interfaces in wireless configuration.

IEEE 802.11bgn → IEEE WiFi standard
ESSID → Network name
Mode → Connected to an access point
Frequency → Operating Wifi Frequency
Access Point → MAC Address
Bit rate → current data transfer speed
Tx power → Transmission power level
Retry long limit → maximum retry before failure
RTS thr → Request to send
Fragment → packet fragmentation
Power Management → power saving mode
Link Quality → signal strength
Signal level → wifi signal strength
Rx → Received packet info
Tx → Transmitted packet related info



(Sample image of iwconfig since I don't have wireless network connected to my VM)

9. Log in to your home router's web interface (usually at 192.168.1.1 or 192.168.0.1) and check the connected devices list.



10. Explain how a DHCP server assigns IP addresses to devices in your network.

A DHCP server assigns IP addresses using the DORA (Discover, Offer, Request, Acknowledge) process:

1. The client broadcasts a DHCP Discover request to find a DHCP server.
2. The server responds with a DHCP Offer, providing an available IP address.

3. The client sends a DHCP Request to accept the offered IP.
4. The server sends a DHCP Acknowledgement (ACK), confirming the assignment and leasing the IP to the device.

11. Using a terminal, connect to a remote machine via ssh and telnet.

SSH is secure shell service which is encrypted and secure and connects to a remote machine's shell

ex: ssh username@ip-addr

Telnet is an unencrypted protocol and is insecure and not used often now.

ex : telnet remote-ip

```
tkgowtham@tkgowtham-VirtualBox:~$ ssh vboxuser@192.168.1.10
The authenticity of host '192.168.1.10 (192.168.1.10)' can't be established.
ED25519 key fingerprint is SHA256:MNlBuBZe9JGRkkwMtlbRnM1agrwouR9Lj2q4Y+ufJrA.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.10' (ED25519) to the list of known hosts.
vboxuser@192.168.1.10's password:
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 6.8.0-52-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

34 updates can be applied immediately.
24 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

vboxuser@Ubuntu:~$
```

Assessment