SCS2205 COMPUTER NETWORKS 1 ASSIGNMENT -02

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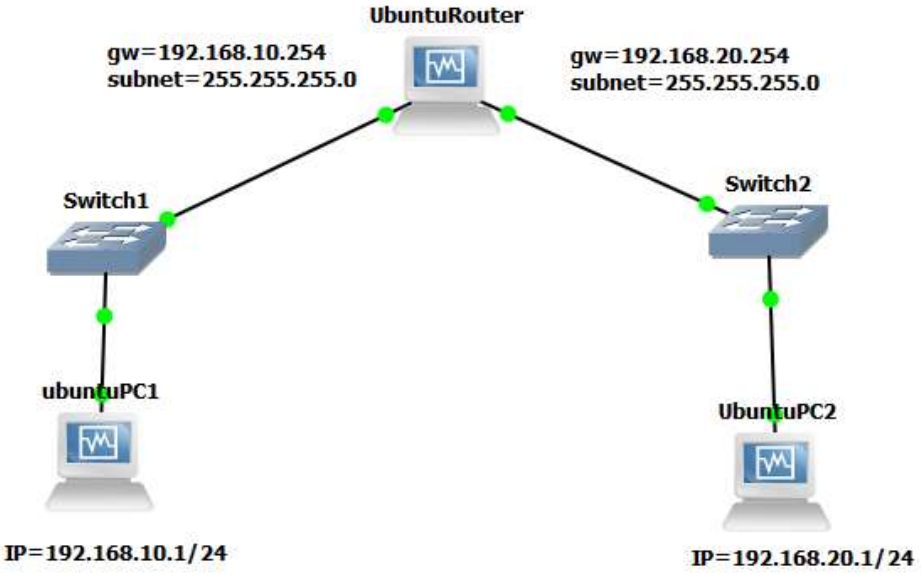
In gns3, the UbuntuRouter and Ubuntu PC machines were configured as shown in the diagram



Network 1

Network Address:192.168.10.0

Broadcast Address:192.168.10.255

Subnet mask:255.255.255.0

Network 2

Network Address:192.168.10.0

Broadcast Address: 192.168.10.255

Subnet mask: 255.255.255.0

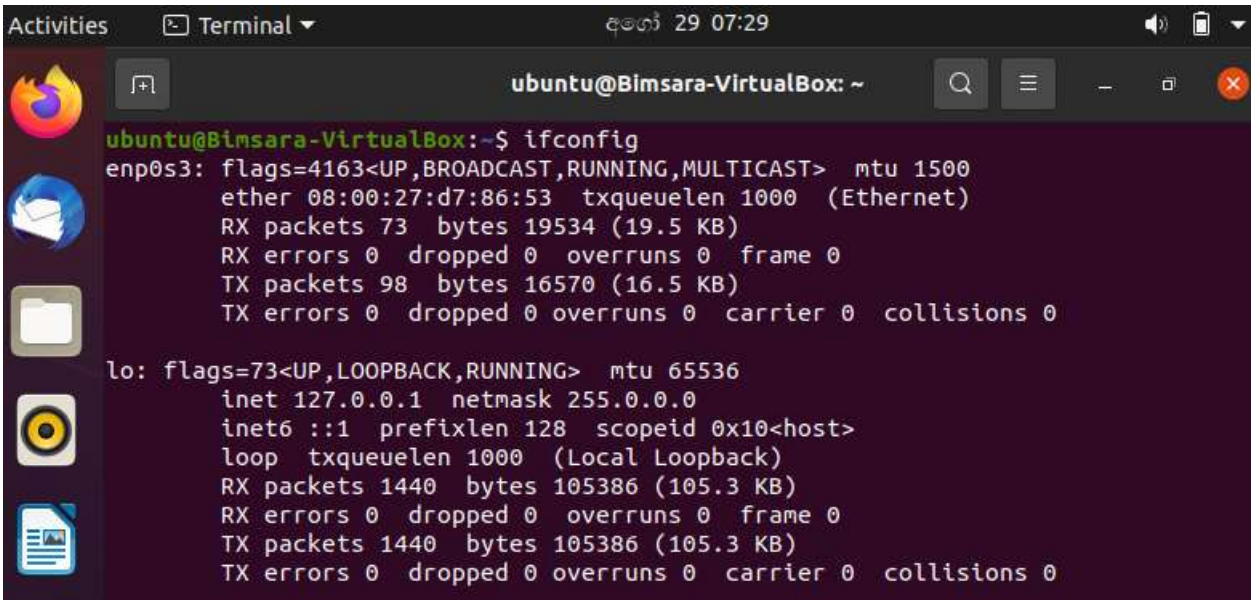
Part 1

Question 1

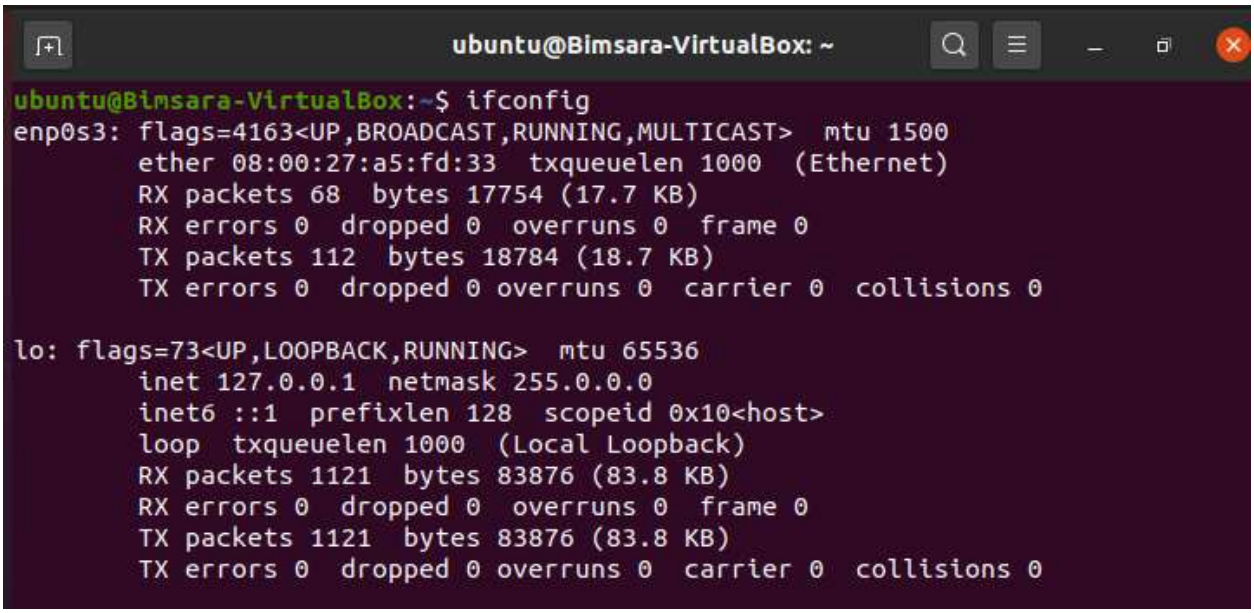
I run the ifconfig command before assigning an IP address to find the associated interfaces on that machine.The ifconfig command gives information about the current network settings. It is used to set up interfaces as needed at boot time.

The ifconfig command and its output are shown in the following figures for both PC1 and PC2.

PC1



PC2



As shown in the figure 1 I assign the IP address for PC1 192.168.10.1 and PC2

192.168.20.1 .

Assigning the relevant IP addresses to PC1 and PC2 by using

PC1-sudo ifconfig enp0s3 192.168.10.1 netmask 255.255.255.0

PC2-sudo ifconfig enp0s3 192.168.20.1 netmask 255.255.255.0

And also to set the default router using the following two commands.

PC1=sudo route add default gw 192.168.10.254

PC2=sudo route add default gw 192.168.20.254

Finally, use the ifconfig command to verify that the interface's addresses were appropriately assigned.

PC1

IP – 192.168.10.1/24 o

Network id – 192.168.10.0

Default gateway – 192.168.10.254

```
ubuntu@Bimsara-VirtualBox:~$ sudo ifconfig enp0s3 192.168.10.1 netmask 255.255.
255.0
[sudo] password for ubuntu:
ubuntu@Bimsara-VirtualBox:~$ sudo route add default gw 192.168.10.254
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.10.1  netmask 255.255.255.0  broadcast 192.168.10.255
        ether 08:00:27:d7:86:53  txqueuelen 1000  (Ethernet)
        RX packets 136  bytes 32599 (32.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 134  bytes 20140 (20.1 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 3328  bytes 239910 (239.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 3328  bytes 239910 (239.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

PC2

IP – 192.168.12.1/24

Network id – 192.168.20.0

Default gateway – 192.168.20.254

```
ubuntu@Bimsara-VirtualBox:~$ sudo ifconfig enp0s3 192.168.20.1 netmask 255.255.
255.0
[sudo] password for ubuntu:
ubuntu@Bimsara-VirtualBox:~$ sudo route add default gw 192.168.20.254
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.20.1  netmask 255.255.255.0  broadcast 192.168.20.255
        ether 08:00:27:a5:fd:33  txqueuelen 1000  (Ethernet)
        RX packets 116  bytes 29739 (29.7 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 147  bytes 22306 (22.3 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 2932  bytes 212991 (212.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2932  bytes 212991 (212.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

After that, I set up the Ubuntu Router.

I use ifconfig to check for interfaces before assigning IP.

```
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet6 fe80::2962:63ac:6403:7833  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:4b:bd:ae  txqueuelen 1000  (Ethernet)
        RX packets 1  bytes 344 (344.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 100  bytes 16457 (16.4 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet6 fe80::4444:5adc:7da2:8730  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:19:8d:b5  txqueuelen 1000  (Ethernet)
        RX packets 37  bytes 9137 (9.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 101  bytes 16697 (16.6 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 781  bytes 60129 (60.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 781  bytes 60129 (60.1 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Then, using the commands below, I allocate the appropriate IP addresses to the appropriate interfaces.

sudo ifconfig enp0s8 192.168.10.254 netmask 255.255.255.0

sudo ifconfig enp0s3 192.168.20.254 netmask 255.255.255.0

enp0s8 interface

IP – 192.168.10.254/24

Network id – 192.168.10.0

enp0s3 interface

IP – 192.168.20.254/24

Network id – 192.168.20.

```
ubuntu@Bimsara-VirtualBox:~$ sudo ifconfig enp0s8 192.168.10.254 netmask 255.25
5.255.0
ubuntu@Bimsara-VirtualBox:~$ sudo ifconfig enp0s3 192.168.20.254 netmask 255.25
5.255.0
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.20.254  netmask 255.255.255.0  broadcast 192.168.20.255
        ether 08:00:27:4b:bd:ae  txqueuelen 1000  (Ethernet)
        RX packets 20  bytes 2177 (2.1 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 239  bytes 38330 (38.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.10.254  netmask 255.255.255.0  broadcast 192.168.10.255
        ether 08:00:27:19:8d:b5  txqueuelen 1000  (Ethernet)
        RX packets 54  bytes 10823 (10.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 224  bytes 37350 (37.3 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)
```

Then use IP route to display IP routing table.

```
ubuntu@Bimsara-VirtualBox:~$ ip route
169.254.0.0/16 dev enp0s8 scope link metric 1000
192.168.10.0/24 dev enp0s8 proto kernel scope link src 192.168.10.254
192.168.20.0/24 dev enp0s3 proto kernel scope link src 192.168.20.254
ubuntu@Bimsara-VirtualBox:~$
```

After that, I make static IP routes.

Check the routing table once more; the outcome is as follows

```
ubuntu@Bimsara-VirtualBox:~$ sudo ip route delete 192.168.10.0/24
ubuntu@Bimsara-VirtualBox:~$ sudo ip route delete 192.168.20.0/24
ubuntu@Bimsara-VirtualBox:~$ ip route
169.254.0.0/16 dev enp0s8 scope link metric 1000
ubuntu@Bimsara-VirtualBox:~$ sudo ip route add 192.168.10.0/24 via 192.168.20.2
54
ubuntu@Bimsara-VirtualBox:~$ sudo ip route add 192.168.20.0/24 via 192.168.10.2
54
ubuntu@Bimsara-VirtualBox:~$ ip route
169.254.0.0/16 dev enp0s8 scope link metric 1000
192.168.10.0/24 via 192.168.20.254 dev enp0s3
192.168.20.0/24 via 192.168.10.254 dev enp0s8
ubuntu@Bimsara-VirtualBox:~$
```

Question 2

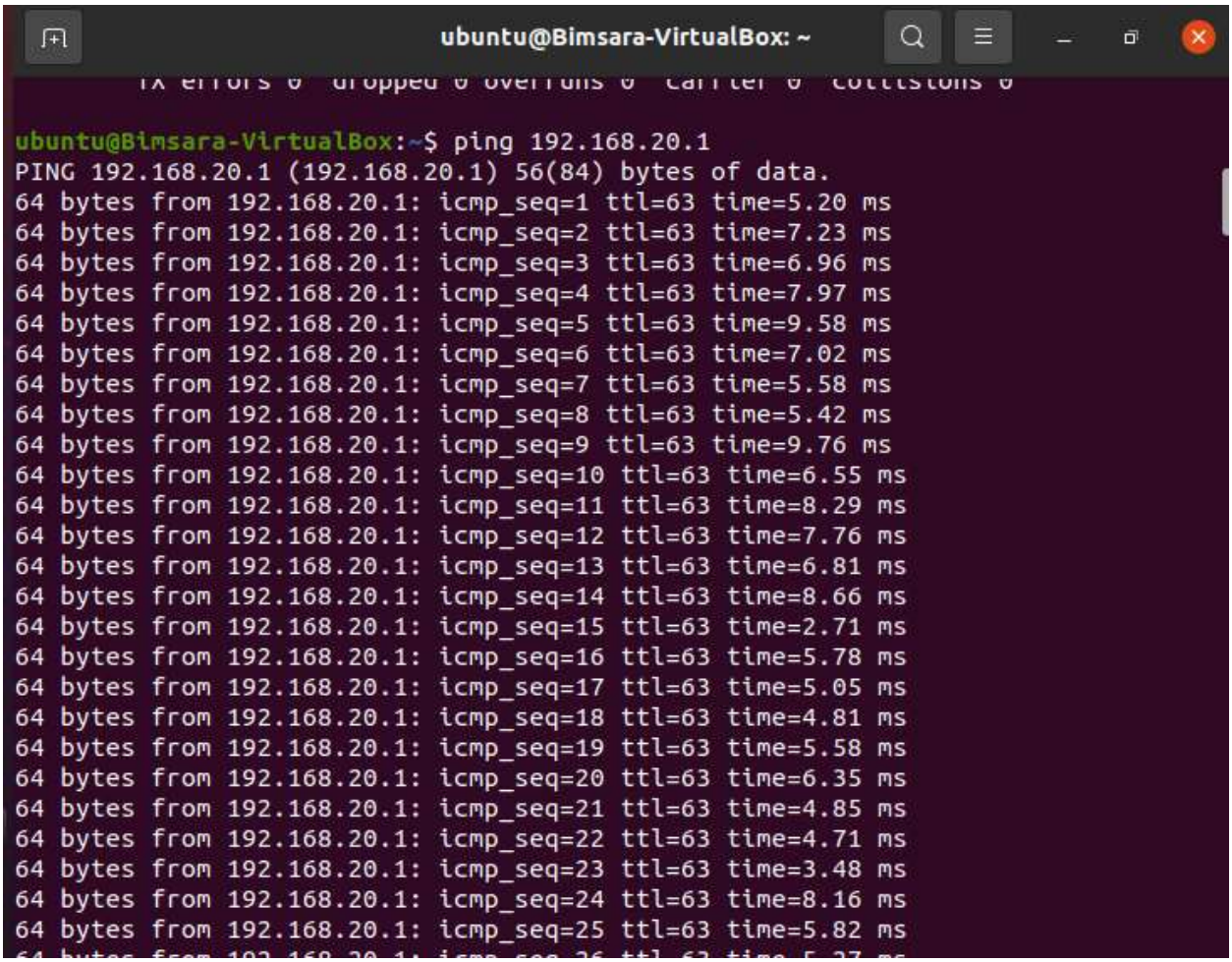
Then I use ping commands to check connectivity between PC1 and PC2, which yields the following results.

Connectivity between PC1 and PC2

PC2

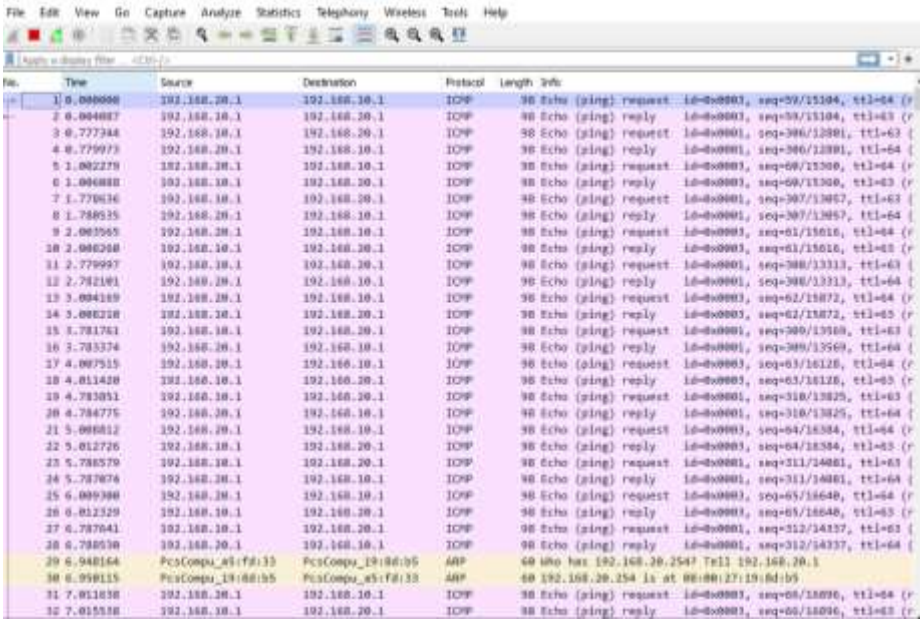
```
ubuntu@Bimsara-VirtualBox: ~

ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.20.1  netmask 255.255.255.0  broadcast 192.168.20.255
        ether 08:00:27:a5:fd:33  txqueuelen 1000  (Ethernet)
        RX packets 564  bytes 72866 (72.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 593  bytes 65433 (65.4 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 4305  bytes 310568 (310.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 4305  bytes 310568 (310.5 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ubuntu@Bimsara-VirtualBox:~$ ping 192.168.10.1
PING 192.168.10.1 (192.168.10.1) 56(84) bytes of data.
64 bytes from 192.168.10.1: icmp_seq=1 ttl=63 time=4.97 ms
64 bytes from 192.168.10.1: icmp_seq=2 ttl=63 time=5.06 ms
64 bytes from 192.168.10.1: icmp_seq=3 ttl=63 time=5.82 ms
64 bytes from 192.168.10.1: icmp_seq=4 ttl=63 time=4.80 ms
64 bytes from 192.168.10.1: icmp_seq=5 ttl=63 time=2.72 ms
64 bytes from 192.168.10.1: icmp_seq=6 ttl=63 time=4.68 ms
64 bytes from 192.168.10.1: icmp_seq=7 ttl=63 time=4.52 ms
64 bytes from 192.168.10.1: icmp_seq=8 ttl=63 time=5.25 ms
64 bytes from 192.168.10.1: icmp_seq=9 ttl=63 time=5.82 ms
```

PC2

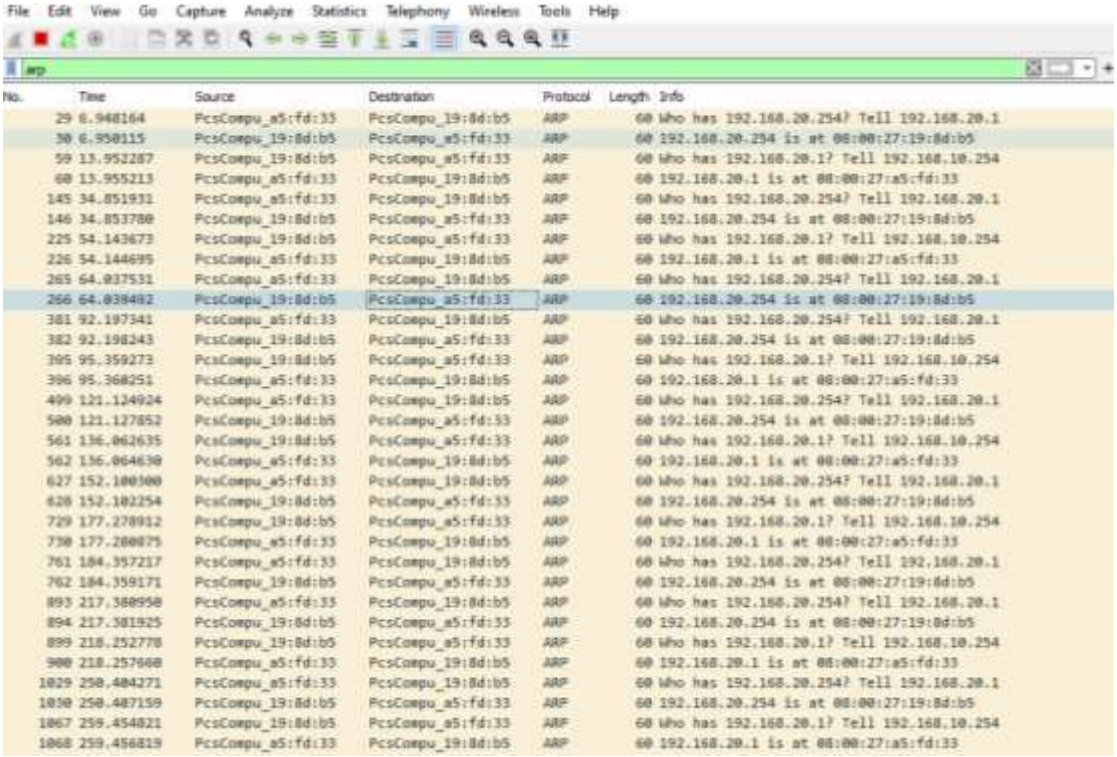

ubuntu@Bimsara-VirtualBox: ~
RX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
ubuntu@Bimsara-VirtualBox:~$ ping 192.168.20.1
PING 192.168.20.1 (192.168.20.1) 56(84) bytes of data.
64 bytes from 192.168.20.1: icmp_seq=1 ttl=63 time=5.20 ms
64 bytes from 192.168.20.1: icmp_seq=2 ttl=63 time=7.23 ms
64 bytes from 192.168.20.1: icmp_seq=3 ttl=63 time=6.96 ms
64 bytes from 192.168.20.1: icmp_seq=4 ttl=63 time=7.97 ms
64 bytes from 192.168.20.1: icmp_seq=5 ttl=63 time=9.58 ms
64 bytes from 192.168.20.1: icmp_seq=6 ttl=63 time=7.02 ms
64 bytes from 192.168.20.1: icmp_seq=7 ttl=63 time=5.58 ms
64 bytes from 192.168.20.1: icmp_seq=8 ttl=63 time=5.42 ms
64 bytes from 192.168.20.1: icmp_seq=9 ttl=63 time=9.76 ms
64 bytes from 192.168.20.1: icmp_seq=10 ttl=63 time=6.55 ms
64 bytes from 192.168.20.1: icmp_seq=11 ttl=63 time=8.29 ms
64 bytes from 192.168.20.1: icmp_seq=12 ttl=63 time=7.76 ms
64 bytes from 192.168.20.1: icmp_seq=13 ttl=63 time=6.81 ms
64 bytes from 192.168.20.1: icmp_seq=14 ttl=63 time=8.66 ms
64 bytes from 192.168.20.1: icmp_seq=15 ttl=63 time=2.71 ms
64 bytes from 192.168.20.1: icmp_seq=16 ttl=63 time=5.78 ms
64 bytes from 192.168.20.1: icmp_seq=17 ttl=63 time=5.05 ms
64 bytes from 192.168.20.1: icmp_seq=18 ttl=63 time=4.81 ms
64 bytes from 192.168.20.1: icmp_seq=19 ttl=63 time=5.58 ms
64 bytes from 192.168.20.1: icmp_seq=20 ttl=63 time=6.35 ms
64 bytes from 192.168.20.1: icmp_seq=21 ttl=63 time=4.85 ms
64 bytes from 192.168.20.1: icmp_seq=22 ttl=63 time=4.71 ms
64 bytes from 192.168.20.1: icmp_seq=23 ttl=63 time=3.48 ms
64 bytes from 192.168.20.1: icmp_seq=24 ttl=63 time=8.16 ms
64 bytes from 192.168.20.1: icmp_seq=25 ttl=63 time=5.82 ms

Question 3

Then I use wireshark to record the data packets

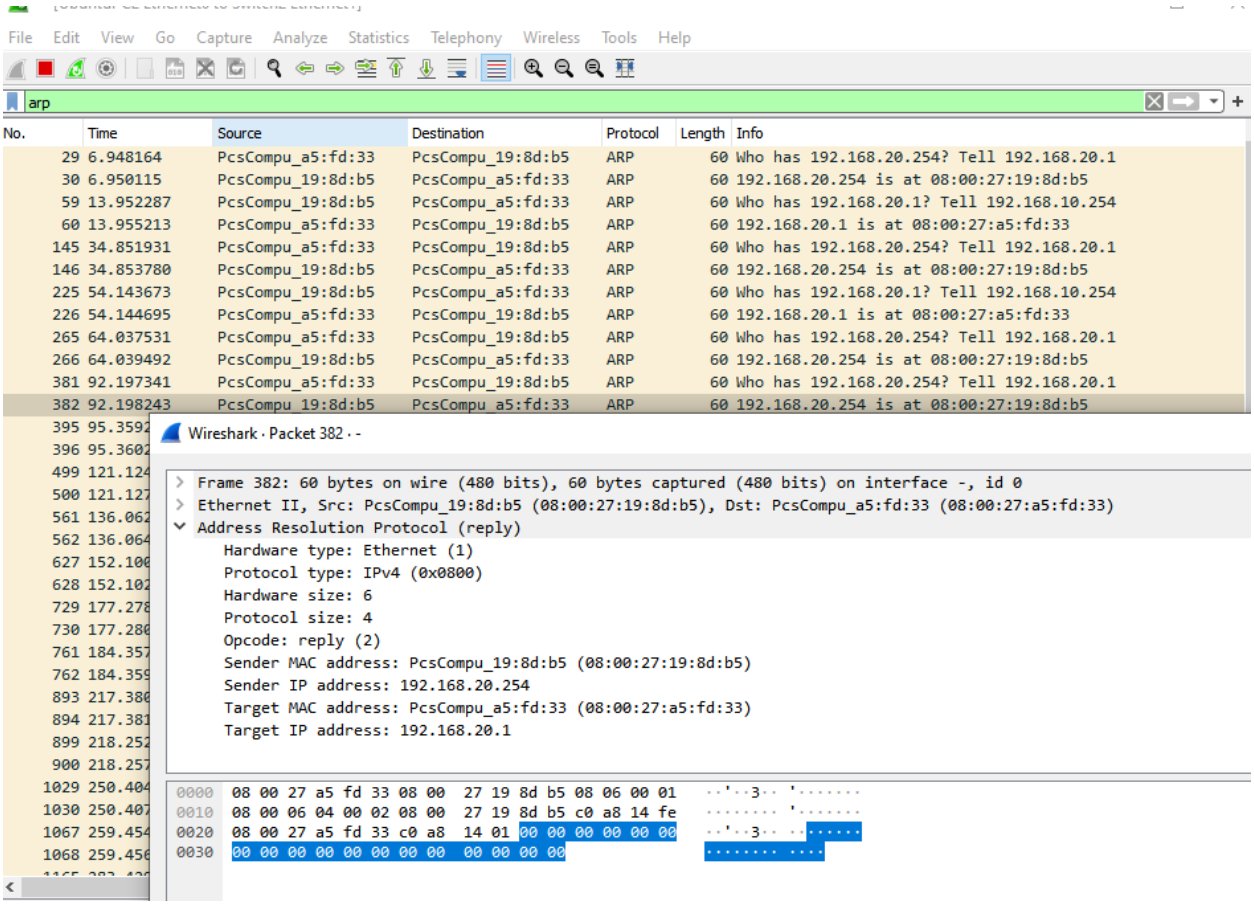


Then Filtered the ARP packets.



Then I looked into one data packer associated with that ARP packet.

The MAC and IP addresses of the source and receiver of some packets have been determined



Sender

IP address=192.168.20.254

MAC address 08:00:27:19:8d:b5

Receiver

IP address =192.168.20.1

MAC address 08:00:27:a5:fd:33

Part 2

Question 1

Install iperf first, as shown in the diagram.Because one system must act as a server and the other as a client, iperf requires two systems. The client establishes a connection with the server being tested for speed.

```
ubuntu@Bimsara-VirtualBox:~$ sudo apt-get install iperf
[sudo] password for ubuntu:
Reading package lists... Done
Building dependency tree
Reading state information... Done
iperf is already the newest version (2.0.13+dfsg1-1build1).
0 upgraded, 0 newly installed, 0 to remove and 494 not upgraded.
ubuntu@Bimsara-VirtualBox:~$
```

Then, as server, set pc2 as follows:

```
ubuntu@Bimsara-VirtualBox:~$ iperf -s
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
```

Then set pc2 as client as follows:

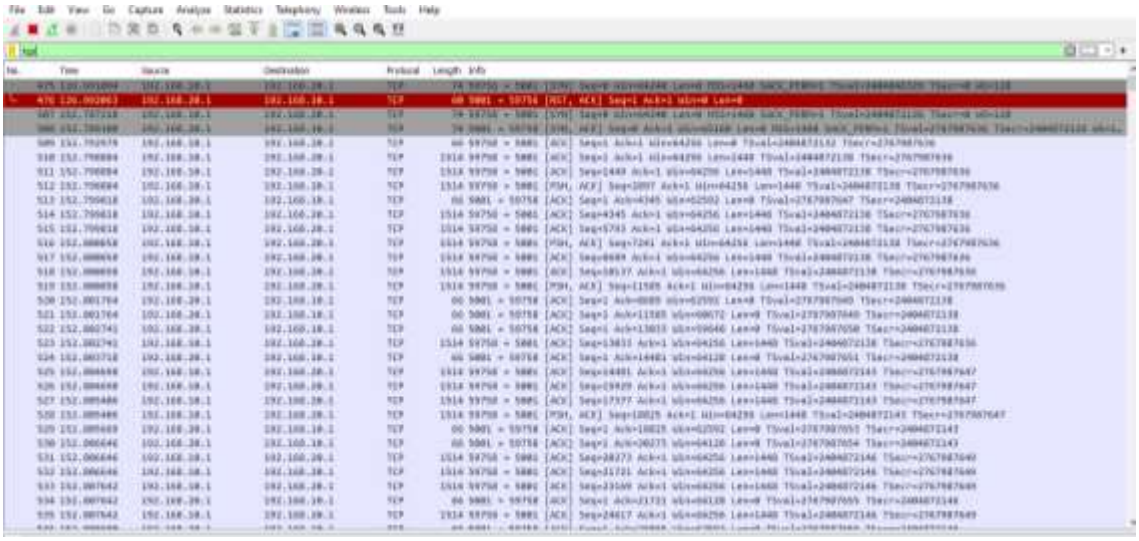
```
ubuntu@Bimsara-VirtualBox:~$ iperf -c 192.168.20.1
------------------------------------------------------------
Client connecting to 192.168.20.1, TCP port 5001
TCP window size:  110 KByte (default)
------------------------------------------------------------
[  3] local 192.168.10.1 port 53788 connected with 192.168.20.1 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec   105 MBytes  87.9 Mbits/sec
ubuntu@Bimsara-VirtualBox:~$
```

When PC1 is set as the client, PC2 output looks like this.

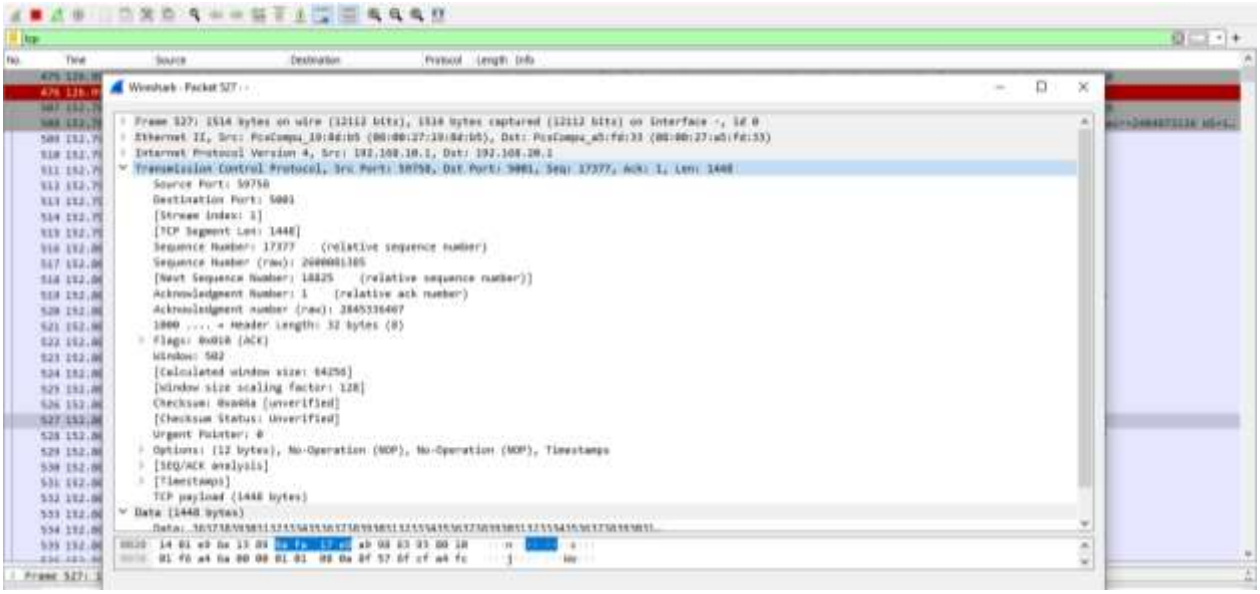
```
ubuntu@Bimsara-VirtualBox:~$ iperf -s
------------------------------------------------------------
Server listening on TCP port 5001
TCP window size:  128 KByte (default)
------------------------------------------------------------
[  4] local 192.168.20.1 port 5001 connected with 192.168.10.1 port 53788
[ ID] Interval       Transfer     Bandwidth
[  4]  0.0-10.1 sec   105 MBytes  87.1 Mbits/sec
```

Question 2

Filtering the TCP packets using wireshark.



Question 3



The following information can be derived from the packets captured by the UbuntuRouter .

Source Port – 59758

Destination Port - 5001

source MAC – 08:00:27: 19:8d: b5

Destination MAC -08:00:27: a5: fd:33

Source IP -192.168.10.1

Destination IP – 192.168.20.1