



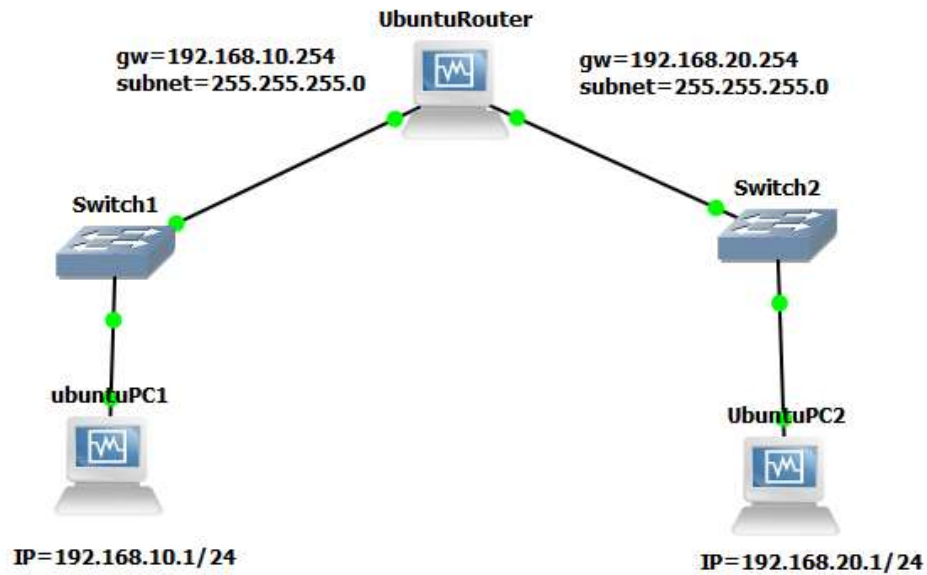
SCS2205 COMPUTER NETWORKS 1 ASSIGNMENT -02

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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

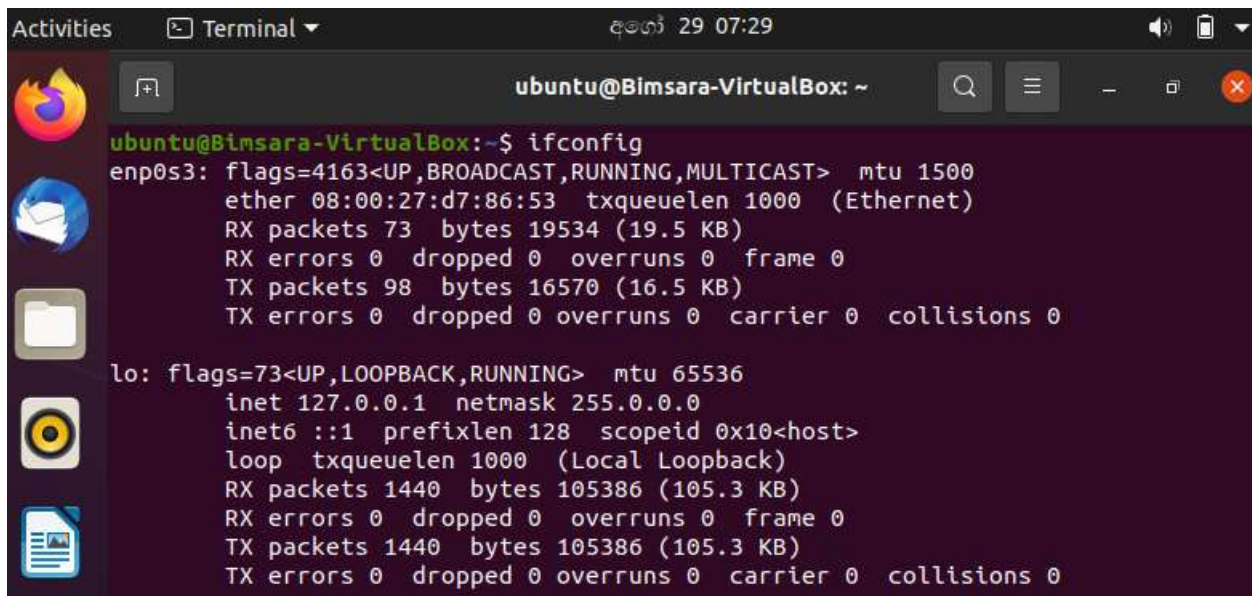
Part 1

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.

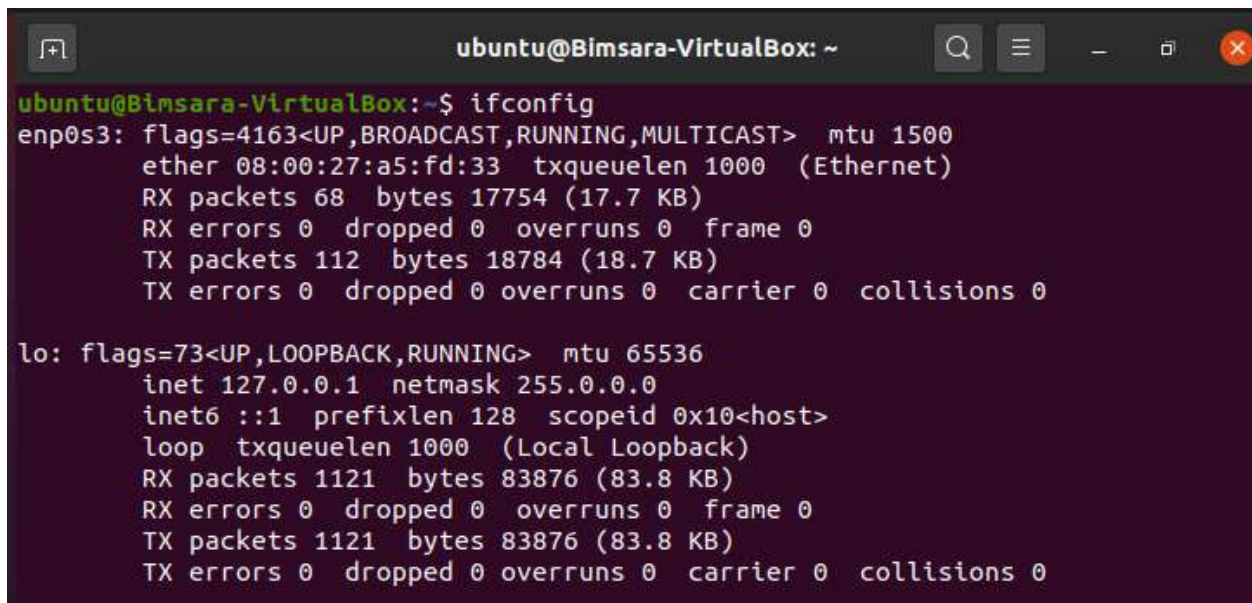
PC1

A terminal window titled 'ubuntu@Bimsara-VirtualBox: ~' showing the output of the 'ifconfig' command. The window has a dark theme and a sidebar with application icons. The output shows details for the 'enp0s3' Ethernet interface and the 'lo' loopback interface.

```
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    ether 08:00:27:d7:86:53 txqueuelen 1000 (Ethernet)
    RX packets 73 bytes 19534 (19.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 98 bytes 16570 (16.5 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 1440 bytes 105386 (105.3 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1440 bytes 105386 (105.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

PC2

A terminal window titled 'ubuntu@Bimsara-VirtualBox: ~' showing the output of the 'ifconfig' command. The window has a dark theme and a sidebar with application icons. The output shows details for the 'enp0s3' Ethernet interface and the 'lo' loopback interface.

```
ubuntu@Bimsara-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    ether 08:00:27:a5:fd:33 txqueuelen 1000 (Ethernet)
    RX packets 68 bytes 17754 (17.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 112 bytes 18784 (18.7 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 1121 bytes 83876 (83.8 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1121 bytes 83876 (83.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

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 255.255.255.0
ubuntu@Bimsara-VirtualBox:~$ sudo ifconfig enp0s3 192.168.20.254 netmask 255.255.255.0
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)
    RX packets 0  bytes 0 (0.0 KB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 0  bytes 0 (0.0 KB)
    TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

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.

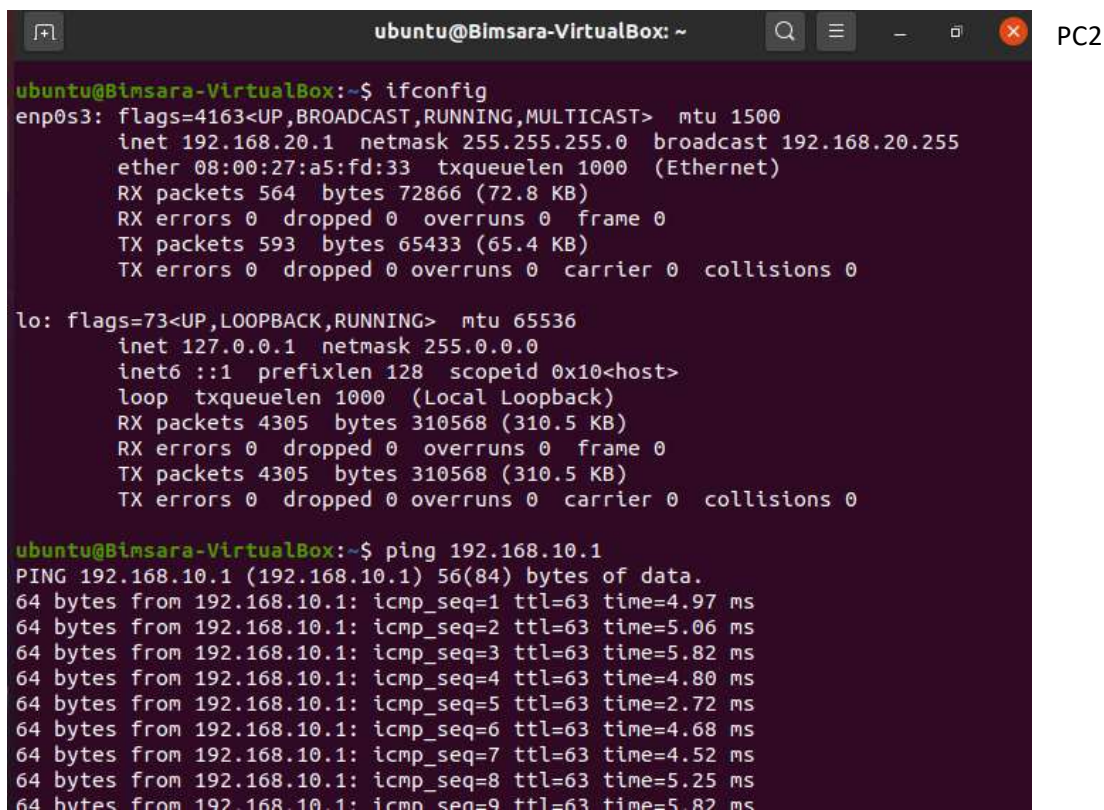
Check the routing table once more; the outcome is as follows

```
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

A terminal window titled 'ubuntu@Bimsara-VirtualBox: ~' with standard window controls. The terminal shows the output of the 'ifconfig' command for the 'enp0s3' interface, displaying IP address 192.168.20.1, netmask 255.255.255.0, and broadcast 192.168.20.255. It also shows the 'lo' loopback interface with IP 127.0.0.1. Following this, a 'ping' command is executed to reach 192.168.10.1, showing successful connectivity with 9 pings and response times ranging from 2.72 ms to 5.82 ms.

```
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

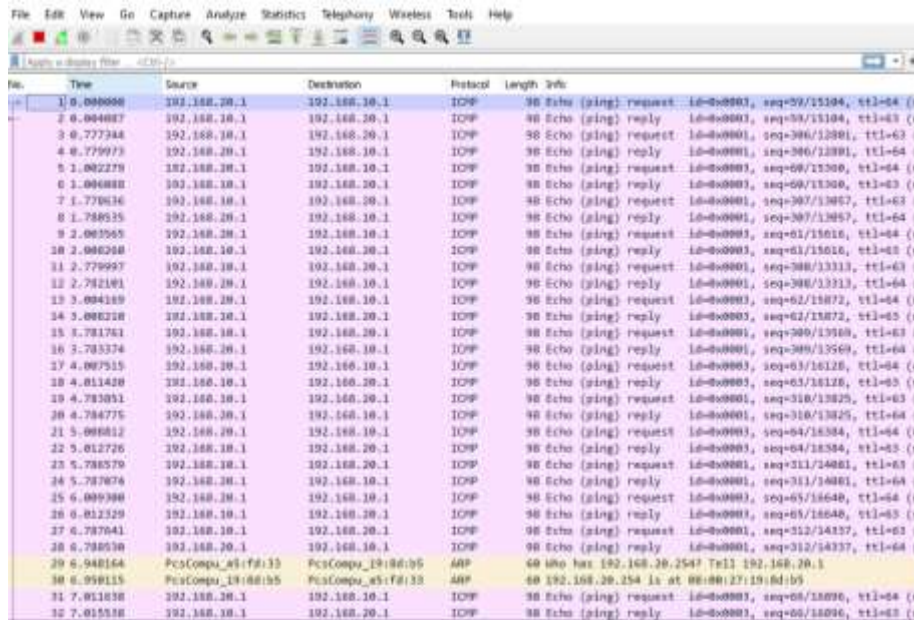
ubuntu@Bimsara-VirtualBox:~$ ping 192.168.10.1
PING 192.168.10.1 (192.168.10.1) 56(84) bytes of data.
64 bytes from 192.168.10.1: icmp_seq=1 ttl=63 time=4.97 ms
64 bytes from 192.168.10.1: icmp_seq=2 ttl=63 time=5.06 ms
64 bytes from 192.168.10.1: icmp_seq=3 ttl=63 time=5.82 ms
64 bytes from 192.168.10.1: 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: ~  
ix 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  
64 bytes from 192.168.20.1: icmp_seq=26 ttl=63 time=5.27 ms
```

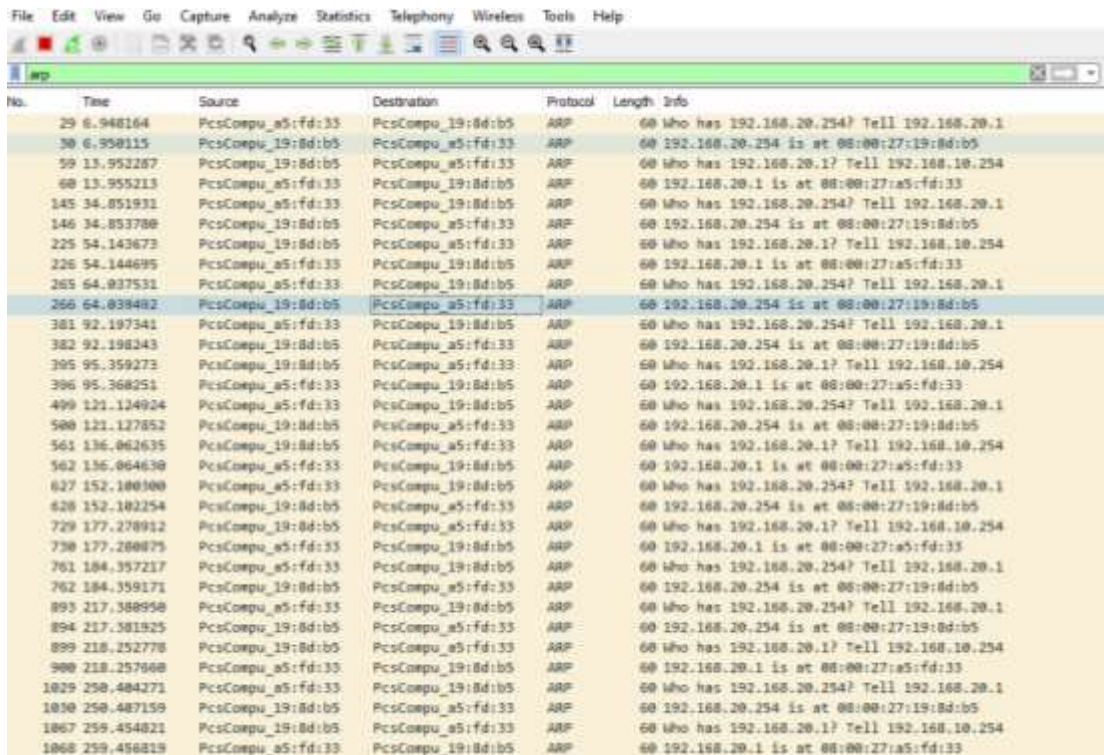

Question 3

Then I use Wireshark to record the data packets



No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=59/15104, ttl=64 (r)
2	0.004087	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=59/15104, ttl=63 (r)
3	0.777344	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=306/12301, ttl=63 (r)
4	0.779973	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=306/12301, ttl=64 (r)
5	1.002279	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=60/15300, ttl=64 (r)
6	1.004088	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=60/15300, ttl=63 (r)
7	1.778036	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=307/13057, ttl=63 (r)
8	1.780535	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=307/13057, ttl=64 (r)
9	2.003565	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=61/15016, ttl=64 (r)
10	2.006204	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=61/15016, ttl=63 (r)
11	2.779997	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=308/13313, ttl=63 (r)
12	2.782191	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=308/13313, ttl=64 (r)
13	3.004189	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=62/15872, ttl=64 (r)
14	3.006210	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=62/15872, ttl=63 (r)
15	3.781761	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=309/13568, ttl=63 (r)
16	3.783374	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=309/13568, ttl=64 (r)
17	4.007515	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=63/16128, ttl=64 (r)
18	4.011420	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=63/16128, ttl=63 (r)
19	4.783051	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=310/13825, ttl=63 (r)
20	4.784775	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=310/13825, ttl=64 (r)
21	5.009812	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=64/16384, ttl=64 (r)
22	5.012726	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=64/16384, ttl=63 (r)
23	5.780579	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=311/14081, ttl=63 (r)
24	5.787874	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=311/14081, ttl=64 (r)
25	6.009390	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=65/16640, ttl=64 (r)
26	6.012329	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=65/16640, ttl=63 (r)
27	6.787041	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=312/14337, ttl=63 (r)
28	6.788530	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=312/14337, ttl=64 (r)
29	6.948164	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
30	6.958115	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
31	7.011838	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) request 10-00-0001, seq=66/16896, ttl=64 (r)
32	7.015538	192.168.20.1	192.168.20.1	ICMP	98	Echo (ping) reply 10-00-0001, seq=66/16896, ttl=63 (r)

Then Filtered the ARP packets.



No.	Time	Source	Destination	Protocol	Length	Info
29	6.948164	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
30	6.958115	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
59	13.953267	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
60	13.955213	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
145	34.851931	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
146	34.853780	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
225	54.143673	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
226	54.144695	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
265	64.937531	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
266	64.938402	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
381	92.197341	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
382	92.198243	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
395	95.359273	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
396	95.368251	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
499	121.124924	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
500	121.127852	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
561	136.062635	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
562	136.064630	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
627	152.100300	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
628	152.102254	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
729	177.278912	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
730	177.280875	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
761	184.357217	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
762	184.359171	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
893	217.388950	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
894	217.381925	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
899	218.1252770	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
900	218.1257060	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
1029	250.484271	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
1030	250.487159	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
1067	259.454821	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
1068	259.456819	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33

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

No.	Time	Source	Destination	Protocol	Length	Info
29	6.948164	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
30	6.950115	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
59	13.952287	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
60	13.955213	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
145	34.851931	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
146	34.853780	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
225	54.143673	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.1? Tell 192.168.10.254
226	54.144695	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	192.168.20.1 is at 08:00:27:a5:fd:33
265	64.037531	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
266	64.039492	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5
381	92.197341	PcsCompu_a5:fd:33	PcsCompu_19:8d:b5	ARP	60	Who has 192.168.20.254? Tell 192.168.20.1
382	92.198243	PcsCompu_19:8d:b5	PcsCompu_a5:fd:33	ARP	60	192.168.20.254 is at 08:00:27:19:8d:b5

Wireshark · Packet 382 · -	
> Frame 382: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface -, id 0	
> Ethernet II, Src: PcsCompu_19:8d:b5 (08:00:27:19:8d:b5), Dst: PcsCompu_a5:fd:33 (08:00:27:a5:fd:33)	
▼ Address Resolution Protocol (reply)	
Hardware type: Ethernet (1)	
Protocol type: IPv4 (0x0800)	
Hardware size: 6	
Protocol size: 4	
Opcode: reply (2)	
Sender MAC address: PcsCompu_19:8d:b5 (08:00:27:19:8d:b5)	
Sender IP address: 192.168.20.254	
Target MAC address: PcsCompu_a5:fd:33 (08:00:27:a5:fd:33)	
Target IP address: 192.168.20.1	

Offset	Hex	ASCII
0000	08 00 27 a5 fd 33 08 00 27 19 8d b5 08 06 00 01	..'.3.. '.....
0010	08 00 06 04 00 02 08 00 27 19 8d b5 c0 a8 14 fe '.....
0020	08 00 27 a5 fd 33 c0 a8 14 01 00 00 00 00 00 00	..'.3.. ..
0030	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

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:

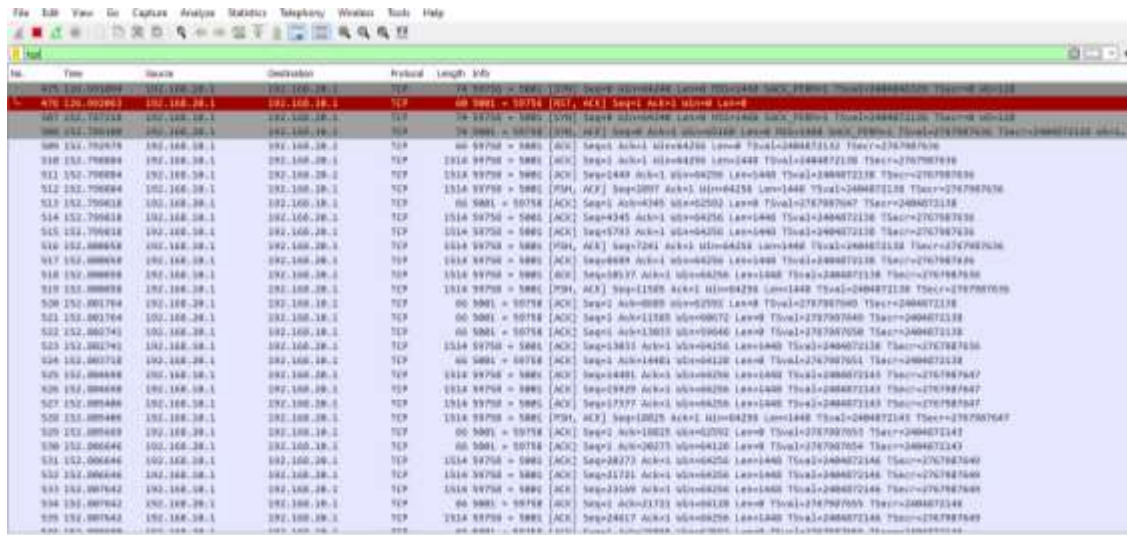
```
ubuntu@Bimsara-VirtualBox:~$ iperf -c 192.168.20.1
-----
Client connecting to 192.168.20.1, TCP port 5001
TCP window size: 110 KByte (default)
-----
[ 3] local 192.168.10.1 port 53788 connected with 192.168.20.1 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 3] 0.0-10.0 sec   105 MBytes  87.9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

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

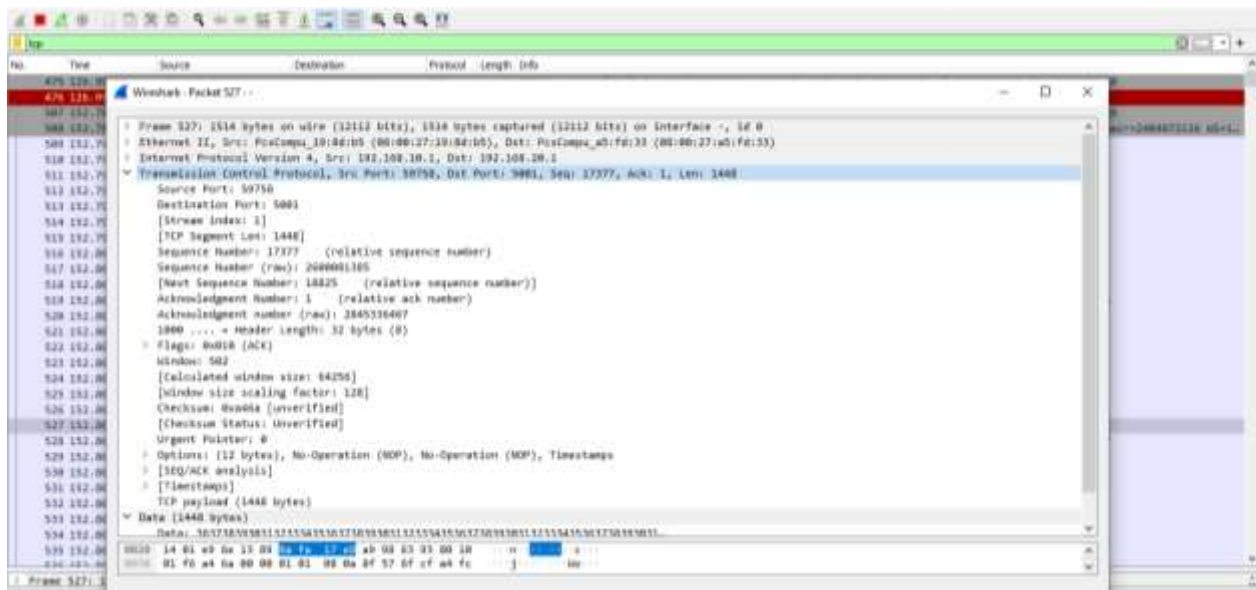
```
ubuntu@Bimsara-VirtualBox:~$ iperf -s
-----
Server listening on TCP port 5001
TCP window size: 128 KByte (default)
-----
[ 4] local 192.168.20.1 port 5001 connected with 192.168.10.1 port 53788
[ ID] Interval      Transfer    Bandwidth
[ 4] 0.0-10.1 sec   105 MBytes  87.1 Mbits/sec
```


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