

COMPUTER NETWORKS (CN 434) LAB 01

EXERCISE 01: Changing the IP address of an interface. Use the ifconfig command to modify the IP address of the p2p1 interface of computer D.

Initially the system is connected to computer A, we need to use the switch available to which computers A, B, C and D are connected for switching. For this exercise we need to use computer D, so we will shift from computer A to computer D by just pressing button D on the switch. On computer D, run ifconfig -a and save the output.

1. On computer D, run ifconfig -a and save the output.

Once switched to computer D from computer A, open terminal and run the command “ifconfig -a”. It displays the configuration parameters of all network interfaces, including the inactive interfaces. The output can be seen in Fig 1.1.

```
[root@hostD ~]# ifconfig -a
lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
              UP LOOPBACK RUNNING MTU:65536 Metric:1
              RX packets:252 errors:0 dropped:0 overruns:0 frame:0
              TX packets:252 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:0
              RX bytes:19012 (18.5 KiB) TX bytes:19012 (18.5 KiB)

p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:17
        inet addr:10.0.1.14 Bcast:10.0.1.255 Mask:255.255.255.0
        inet6 addr: fe80::213:3bff:fe21:7817/64 Scope:Link
              UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
              RX packets:4 errors:0 dropped:0 overruns:0 frame:0
              TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:1000
              RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)

p2p2    Link encap:Ethernet HWaddr 00:13:3B:21:78:18
        inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
              UP BROADCAST MULTICAST MTU:1500 Metric:1
              RX packets:0 errors:0 dropped:0 overruns:0 frame:0
              TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:1000
              RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

p4p1    Link encap:Ethernet HWaddr D4:BE:D9:C6:ED:C9
              UP BROADCAST MULTICAST MTU:1500 Metric:1
              RX packets:0 errors:0 dropped:0 overruns:0 frame:0
              TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:1000
              RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

[root@hostD ~]#
```

Fig 1.1 Displaying configuration parameters of network interfaces

We can save the output data from terminal to text document by creating an empty document with desired name and run the command “ifconfig > text_filename”. I created my file name as vyaganti_e1.txt. I runed the command and saved the output. The output text file can be seen below.

```
lo      Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:276 errors:0 dropped:0 overruns:0 frame:0
TX packets:276 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:20844 (20.3 KiB) TX bytes:20844 (20.3 KiB)
```

```
p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:17
inet addr:10.0.1.14 Bcast:10.0.1.255 Mask:255.255.255.0
inet6 addr: fe80::213:3bff:fe21:7817/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:4 errors:0 dropped:0 overruns:0 frame:0
TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)
```

```
p2p2    Link encap:Ethernet HWaddr 00:13:3B:21:78:18
inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

```
p4p1    Link encap:Ethernet HWaddr D4:BE:D9:C6:ED:C9
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)
```

2. Change the IP address of interface p2p1 of computer D to 10.0.1.16/24.

In terminal run the command “ifconfig p2p1 10.0.1.16/24 netmask 255.255.255.0 broadcast 10.0.1.255”. This assigns interface p2p1 the IP address 10.0.1.16/24 and a broadcast address of 10.0.1.255. The output can be seen in Fig 1.2.

The screenshot shows a terminal window titled "root@hostD:~". The terminal displays the following command and its usage information:

```
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

[root@hostD ~]# ifconfig > vyaganti.e1.txt
[root@hostD ~]# ifconfig p2p1 10.0.1.16/24 netmask 255.255.255.0 broadcast 10.0.1.255
Usage:
  ifconfig [-a] [-v] [-s] <interface> [<AF>] <address>
  [add <address>[-prefixlen<...>]]
  [del <address>[-prefixlen<...>]]
  [-broadcast <address>] [-pointtopoint [<address>]]
  [netmask <address>] [dstaddr <address>] [tunnel <address>]
  [outfill <NN>] [keepalive <NN>]
  [hw <HW> <address>] [metric <NN>] [mtu <NN>]
  [-trailers] [[-arp] [[-allmulti]
  [multicast] [[-promisc]
  [mem start <NN>] [io_addr <NN>] [irq <NN>] [media <type>]
  [txqueuelen <NN>]
  [-dynamic]
  [up|down] ...

<HW>=Hardware Type.
List of possible hardware types:
  loop (Local Loopback) slip (Serial Line IP) cslip (VJ Serial Line IP)
  slip6 (6-bit Serial Line IP) cslip6 (VJ 6-bit Serial Line IP) adaptive (Adaptive Serial Line IP)
  strip (Metricom Starmode IP) ash (Ash) ether (Ethernet)
  tr (16/4 Mbps Token Ring) tr (16/4 Mbps Token Ring (New)) ax25 (AMPR AX.25)
  netrom (AMPR NET/ROM) rose (AMPR ROSE) tunnel (IPIP Tunnel)
  ppp (Point-to-Point Protocol) hdlc ((Cisco)-HDLC) lapb (LAPB)
  arcnet (ARCnet) dlci (Frame Relay DLCI) frad (Frame Relay Access Device)
  sit (IPv6-in-IPV4) fddi (Fiber Distributed Data Interface) hippi (HIPPI)
  irda (IrLAP) ec (Econet) x25 (generic X.25)
  infiniband (InfiniBand)
<AF>=Address family. Default: inet
List of possible address families:
  unix (UNIX Domain) inet (DARPA Internet) inet6 (IPv6)
  ax25 (AMPR AX.25) netrom (AMPR NET/ROM) rose (AMPR ROSE)
  ipx (Novell IPX) ddp (Appletalk DDP) ec (Econet)
  ash (Ash) x25 (CCITT X.25)
[root@hostD ~]#
```

Fig 1.2 Changing IP address of interface p2p1.

```
lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
              UP LOOPBACK RUNNING MTU:65536 Metric:1
              RX packets:300 errors:0 dropped:0 overruns:0 frame:0
              TX packets:300 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:0
              RX bytes:22676 (22.1 KiB) TX bytes:22676 (22.1 KiB)

p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:17
        inet addr:10.0.1.16 Bcast:10.0.1.255 Mask:255.255.255.0
        inet6 addr: fe80::213:3bff:fe21:7817/64 Scope:Link
              UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
              RX packets:4 errors:0 dropped:0 overruns:0 frame:0
              TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
              Collisions:0 txqueuelen:1000
```

RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)

p2p2 Link encap:Ethernet HWaddr 00:13:3B:21:78:18
inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

p4p1 Link encap:Ethernet HWaddr D4:BE:D9:C6:ED:C9
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

3. Run ifconfig -a again and save the output.

Run the command “ifconfig -a” again after changing the interface of p2p1. The output can be seen in the Fig 1.3.

```
root@hostD:~# ifconfig > vyaganti_e1.txt
root@hostD:~# ifconfig -a
lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING MTU:65536 Metric:1
          RX packets:312 errors:0 dropped:0 overruns:0 frame:0
          TX packets:312 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:23592 (23.0 KiB) TX bytes:23592 (23.0 KiB)

p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:17
        inet addr:10.0.1.16 Bcast:10.0.1.255 Mask:255.255.255.0
        inet6 addr: fe80::213:3bff:fe21:7817/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)

p2p2    Link encap:Ethernet HWaddr 00:13:3B:21:78:18
        inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
          UP BROADCAST MULTICAST MTU:1500 Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

p4p1    Link encap:Ethernet HWaddr D4:BE:D9:C6:ED:C9
          UP BROADCAST MULTICAST MTU:1500 Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

[root@hostD ~]# ifconfig > vyaganti_e1_s3.txt
[root@hostD ~]#
```

Fig 1.3 Displaying configuration parameters of network interfaces again.

The output text file can be seen below.

```
lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING MTU:65536 Metric:1
          RX packets:312 errors:0 dropped:0 overruns:0 frame:0
          TX packets:312 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:23592 (23.0 KiB) TX bytes:23592 (23.0 KiB)
```

```
p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:17
        inet addr:10.0.1.16 Bcast:10.0.1.255 Mask:255.255.255.0
        inet6 addr: fe80::213:3bff:fe21:7817/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)
```

p2p2 Link encap:Ethernet HWaddr 00:13:3B:21:78:18
inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

p4p1 Link encap:Ethernet HWaddr D4:BE:D9:C6:ED:C9
UP BROADCAST MULTICAST MTU:1500 Metric:1
RX packets:0 errors:0 dropped:0 overruns:0 frame:0
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

EXPLANATION:

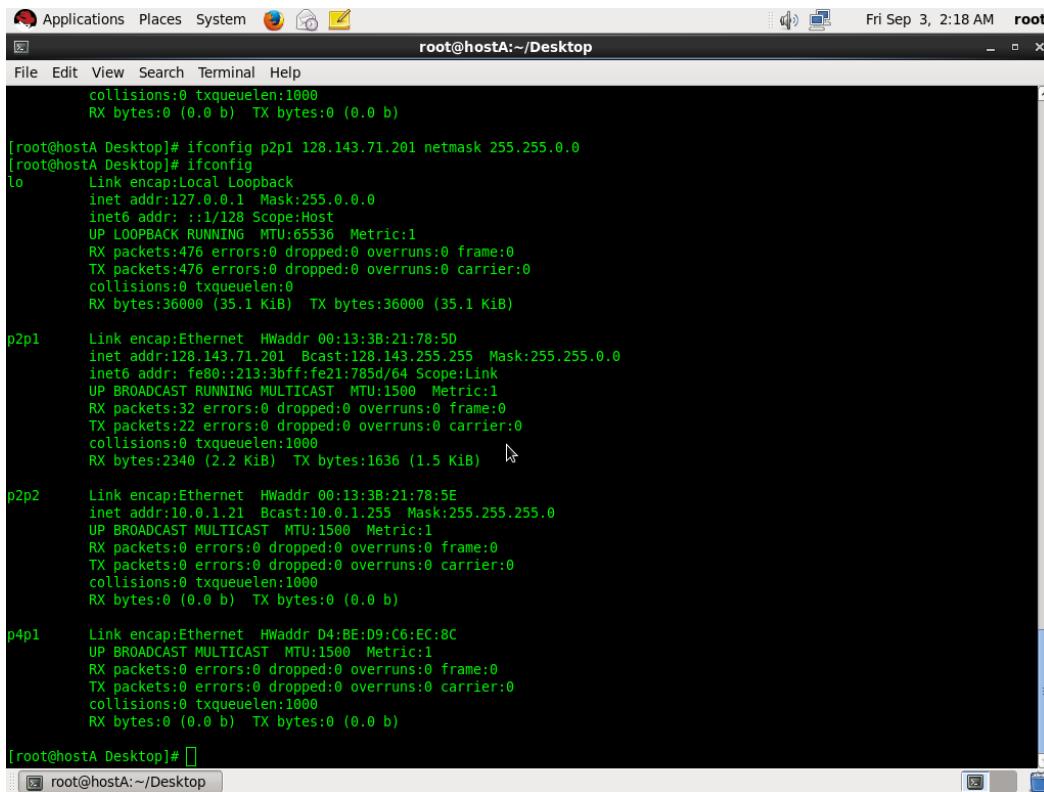
Where the 10.0.1.16/24 number pertains to the IP address of your machine. A private IP address. 255.255.255.0 denotes the network mask which decides the potential size of our network and the number 10.0.1.255 denotes the broadcast address. We've configured the interface IP from 10.0.1.14 to 10.0.1.16 with same broadcast address.

EXERCISE 2: Changing netmasks.

Configure the interfaces of the hosts as shown in Table 2.

For this task we need to use the command “ifconfig p2p1 < IP Address of Ethernet Interface p2p1 > netmask <network mask>” for configuring the interfaces of each computer.

For computer A by using the table 2: IP addresses for exercise 2, get the IP Address of Ethernet Interface p2p1 and Network mask address. Run the command Ifconfig p2p1 128.143.71.201 netmask 255.255.0.0. The output can be seen in below Fig 2.1.1.



The screenshot shows a terminal window titled "root@hostA:~/Desktop". The window displays the output of the "ifconfig" command. It lists several interfaces: p2p1, p2p2, p4p1, and lo. The p2p1 interface is configured with an IP address of 128.143.71.201 and a netmask of 255.255.0.0. The other interfaces show standard loopback and broadcast configurations. The terminal window has a standard Linux desktop interface with icons at the top and bottom.

```
[root@hostA Desktop]# ifconfig p2p1 128.143.71.201 netmask 255.255.0.0
[root@hostA Desktop]# ifconfig
lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
              UP LOOPBACK RUNNING MTU:65536 Metric:1
              RX packets:476 errors:0 dropped:0 overruns:0 frame:0
              TX packets:476 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:0
              RX bytes:36000 (35.1 Kib)  TX bytes:36000 (35.1 Kib)

p2p1    Link encap:Ethernet HWaddr 00:13:3B:21:78:5D
        inet addr:128.143.71.201  Bcast:128.143.255.255  Mask:255.255.0.0
        inet6 addr: fe00::213:3bff:fe21:785d/64 Scope:Link
              UP BROADCAST RUNNING MULTICAST  MTU:1500 Metric:1
              RX packets:32 errors:0 dropped:0 overruns:0 frame:0
              TX packets:22 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:1000
              RX bytes:2340 (2.2 Kib)  TX bytes:1636 (1.5 Kib)

p2p2    Link encap:Ethernet HWaddr 00:13:3B:21:78:5E
        inet addr:10.0.1.21  Bcast:10.0.1.255  Mask:255.255.255.0
        inet6 addr: fe00::213:3bff:fe21:785e/64 Scope:Link
              UP BROADCAST MULTICAST  MTU:1500 Metric:1
              RX packets:0 errors:0 dropped:0 overruns:0 frame:0
              TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
              collisions:0 txqueuelen:1000
              RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)

p4p1    Link encap:Ethernet HWaddr D4:BE:D9:C6:EC:8C
        UP BROADCAST MULTICAST  MTU:1500 Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 (0.0 b)  TX bytes:0 (0.0 b)

[root@hostA Desktop]#
```

Fig 2.1.1 Interface configuration for computer A

For computer B by using the table 2: IP addresses for exercise 2, get the IP Address of Ethernet Interface p2p1 and Network mask address. Run the command

Ifconfig p2p1 128.143.71.21 netmask 255.255.255.0. The output can be seen in below Fig 2.1.2.

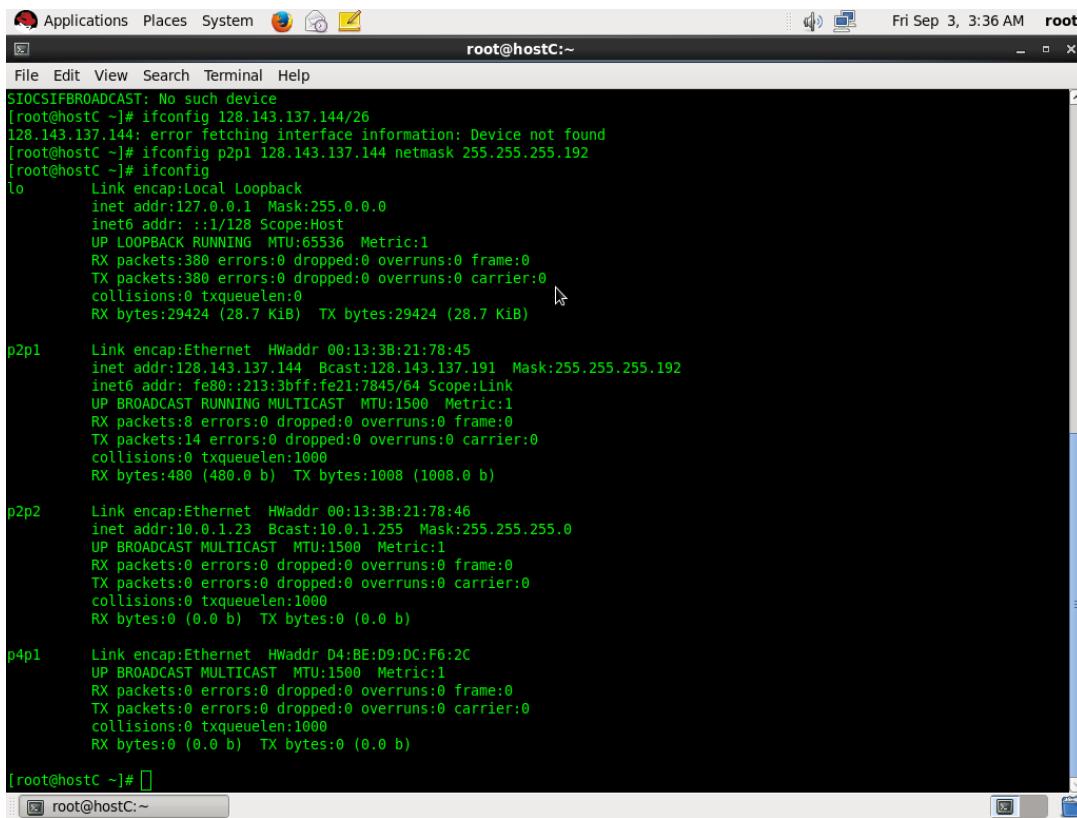
The screenshot shows a terminal window titled "root@hostB:~". The window displays the output of the "ifconfig" command. The output shows several network interfaces:

- lo**: Link encap:Local Loopback. IP address: 127.0.0.1. Mask: 255.0.0.0. UP status. RX/TX packets: 388/388. RX/TX bytes: 30080/30080.
- p2p1**: Link encap:Ethernet. HWaddr 00:13:3B:11:3D:A8. IP address: 128.143.71.21. Broadcast: 128.143.71.255. Mask: 255.255.255.0. UP status. RX/TX packets: 14/14. RX/TX bytes: 840/1008.
- p2p2**: Link encap:Ethernet. HWaddr 00:13:3B:11:3D:A9. IP address: 10.0.1.22. Broadcast: 10.0.1.255. Mask: 255.255.255.0. UP status. RX/TX packets: 0/0. RX/TX bytes: 0/0.
- p4p1**: Link encap:Ethernet. HWaddr D4:BE:D9:C4:0C:31. UP status. RX/TX packets: 0/0. RX/TX bytes: 0/0.

The terminal prompt is "[root@hostB ~]#".

Fig 2.1.2 Interface configuration for computer B

For computer C by using the table 2: IP addresses for exercise 2, get the IP Address of Ethernet Interface p2p1 and Network mask address. Run the command Ifconfig p2p1 128.143.137.144 netmask 255.255.255.192. The output can be seen in below Fig 2.1.3.



The screenshot shows a terminal window titled "root@hostC:~". The window displays the output of the "ifconfig" command. The output shows several network interfaces:

- lo**: Link encap:Local Loopback. IP address: 127.0.0.1. Mask: 255.0.0.0. UP: LOOPBACK RUNNING. MTU: 65536. Metric: 1. RX packets: 380 errors: 0 dropped: 0 overruns: 0 frame: 0. TX packets: 380 errors: 0 dropped: 0 overruns: 0 carrier: 0. Collisions: 0 txqueuelen: 0. RX bytes: 29424 (28.7 KiB). TX bytes: 29424 (28.7 KiB).
- p2p1**: Link encap:Ethernet HWaddr 00:13:3B:21:78:45. IP address: 128.143.137.144. Broadcast: 128.143.137.191. Mask: 255.255.255.192. UP: BROADCAST RUNNING MULTICAST. MTU: 1500. Metric: 1. RX packets: 8 errors: 0 dropped: 0 overruns: 0 frame: 0. TX packets: 14 errors: 0 dropped: 0 overruns: 0 carrier: 0. Collisions: 0 txqueuelen: 1000. RX bytes: 480 (480.0 b). TX bytes: 1008 (1008.0 b).
- p2p2**: Link encap:Ethernet HWaddr 00:13:3B:21:78:46. IP address: 10.0.1.23. Broadcast: 10.0.1.255. Mask: 255.255.255.0. UP: BROADCAST MULTICAST. MTU: 1500. Metric: 1. RX packets: 0 errors: 0 dropped: 0 overruns: 0 frame: 0. TX packets: 0 errors: 0 dropped: 0 overruns: 0 carrier: 0. Collisions: 0 txqueuelen: 1000. RX bytes: 0 (0.0 b). TX bytes: 0 (0.0 b).
- p4p1**: Link encap:Ethernet HWaddr D4:BE:D9:DC:F6:2C. UP: BROADCAST MULTICAST. MTU: 1500. Metric: 1. RX packets: 0 errors: 0 dropped: 0 overruns: 0 frame: 0. TX packets: 0 errors: 0 dropped: 0 overruns: 0 carrier: 0. Collisions: 0 txqueuelen: 1000. RX bytes: 0 (0.0 b). TX bytes: 0 (0.0 b).

[root@hostC ~]#

Fig 2.1.3 Interface configuration for computer C

For computer D by using the table 2: IP addresses for exercise 2, get the IP Address of Ethernet Interface p2p1 and Network mask address. Run the command Ifconfig p2p1 128.143.137.32 netmask 255.255.255.192. The output can be seen in below Fig 2.1.4.

The screenshot shows a terminal window titled "root@hostD:~". The window displays the output of the "ifconfig" command. The output includes information for several network interfaces: "lo" (Local Loopback), "p2p1", "p2p2", and "p4p1". For each interface, it shows the link layer (HWaddr), IP address, broadcast address, netmask, and various statistics like RX/TX bytes and errors. The terminal window has a standard Linux-style header with icons for Applications, Places, System, and Help. The status bar at the bottom shows the date and time as "Fri Sep 3, 3:06 AM" and the user as "root".

```
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

[root@hostD ~]# ifconfig p2p1 128.143.137.32 netmask 255.255.255.192
[root@hostD ~]# ifconfig
lo      Link encap:Local Loopback
        inet addr:127.0.0.1 Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING MTU:65536 Metric:1
        RX packets:376 errors:0 dropped:0 overruns:0 frame:0
        TX packets:376 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:28652 (27.9 KiB) TX bytes:28652 (27.9 KiB)

p2p1    Link encap:Ethernet HWaddr 00:13:38:21:78:17
        inet addr:128.143.137.32 Bcast:128.143.137.63 Mask:255.255.255.192
        inet6 addr: fe80::213:38ff:fe21:7817/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
        RX packets:4 errors:0 dropped:0 overruns:0 frame:0
        TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:240 (240.0 b) TX bytes:1008 (1008.0 b)

p2p2    Link encap:Ethernet HWaddr 00:13:38:21:78:18
        inet addr:10.0.1.24 Bcast:10.0.1.255 Mask:255.255.255.0
          UP BROADCAST MULTICAST MTU:1500 Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

p4p1    Link encap:Ethernet HWaddr D4:BЕ:D9:C6:ED:C9
          UP BROADCAST MULTICAST MTU:1500 Metric:1
        RX packets:0 errors:0 dropped:0 overruns:0 frame:0
        TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)

[root@hostD ~]# [ ]
```

Fig 2.1.4 Interface configuration for computer D

Run Wireshark on computer A and capture the packets for the following ping commands (running each on the “from” computer). Save the Wireshark output to a text file (clearing the Packet details option), and save the output of the ping commands, including any error messages.

- i. From A to C: ping -c 3 128.143.137.144

```
PING 128.143.137.144 (128.143.137.14) 56(84) bytes of data.
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.714 ms
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.237 ms
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.225 ms
```

```
--- 128.143.137.14 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max.mdev = 0.225/0.392/0.714/0.227 ms
```

And got lost.

ii. From A to B: ping -c 3 128.143.71.21

```
PING 128.143.137.144 (128.143.137.14) 56(84) bytes of data.  
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.714 ms  
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.237 ms  
64 bytes from 128.143.137.14: icmp_seq=1 ttl=64 time=0.225 ms
```

```
--- 128.143.137.14 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2000ms  
rtt min/avg/max.mdev = 0.225/0.392/0.714/0.227 ms
```

iii. From A to D: ping -c 3 128.143.137.32

Time	Source	Destination	Protocol	Length	Info
1 0.000000000	00:13:3b:11:3d:9c	ff:ff:ff:ff:ff:ff	ARP	42	Who has
128.143.137.32?	Tell 128.143.71.201				
2 1.000020644	00:13:3b:11:3d:9c	ff:ff:ff:ff:ff:ff	ARP	42	Who has
128.143.137.32?	Tell 128.143.71.201				
3 2.000006769	00:13:3b:11:3d:9c	ff:ff:ff:ff:ff:ff	ARP	42	Who has
128.143.137.32?	Tell 128.143.71.201				

- iv. From D to A: ping -c 3 128.143.71.201 : Network Unreachable
- v. From B to D: ping -c 3 128.143.137.32 : Network Unreachable
- vi. From B to C: ping -c 3 128.143.137.144 : Network Unreachable

WIRESHARK OUTPUT FOR FIRST THREE PINGS:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.0000000000	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.144? Tell 128.143.71.201

Frame 1: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)
Protocol type: IP (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Sender IP address: 128.143.71.201 (128.143.71.201)
Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
Target IP address: 128.143.137.144 (128.143.137.144)

No.	Time	Source	Destination	Protocol	Length	Info
2	1.000018220	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.144? Tell 128.143.71.201

Frame 2: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)
Protocol type: IP (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Sender IP address: 128.143.71.201 (128.143.71.201)
Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
Target IP address: 128.143.137.144 (128.143.137.144)

No.	Time	Source	Destination	Protocol	Length	Info
3	2.000017194	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.144? Tell 128.143.71.201

Frame 3: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)
Protocol type: IP (0x0800)
Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Sender IP address: 128.143.71.201 (128.143.71.201)

Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)

Target IP address: 128.143.137.144 (128.143.137.144)

No.	Time	Source	Destination	Protocol	Length	Info
4	140.869002282	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.71.21? Tell 128.143.71.201

Frame 4: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0

Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)

Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IP (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Sender IP address: 128.143.71.201 (128.143.71.201)

Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)

Target IP address: 128.143.71.21 (128.143.71.21)

No.	Time	Source	Destination	Protocol	Length	Info
5	140.869235185	00:13:3b:11:3d:a8	00:13:3b:21:78:5d	ARP	60	128.143.71.21 is at 00:13:3b:11:3d:a8

Frame 5: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0

Ethernet II, Src: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8), Dst: 00:13:3b:21:78:5d

(00:13:3b:21:78:5d)

Address Resolution Protocol (reply)

Hardware type: Ethernet (1)

Protocol type: IP (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: reply (2)

Sender MAC address: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)

Sender IP address: 128.143.71.21 (128.143.71.21)

Target MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Target IP address: 128.143.71.201 (128.143.71.201)

No.	Time	Source	Destination	Protocol	Length	Info
6	140.869245941	128.143.71.201	128.143.71.21	ICMP	98	Echo (ping) request id=0x7d10, seq=1/256, ttl=64

Frame 6: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)
Internet Protocol Version 4, Src: 128.143.71.201 (128.143.71.201), Dst: 128.143.71.21 (128.143.71.21)
Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
7	140.869383700	128.143.71.21	128.143.71.201	ICMP	98	Echo (ping) reply id=0x7d10, seq=1/256, ttl=64

Frame 7: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8), Dst: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Internet Protocol Version 4, Src: 128.143.71.21 (128.143.71.21), Dst: 128.143.71.201 (128.143.71.201)
Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
8	141.869532178	128.143.71.201	128.143.71.21	ICMP	98	Echo (ping) request id=0x7d10, seq=2/512, ttl=64

Frame 8: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)
Internet Protocol Version 4, Src: 128.143.71.201 (128.143.71.201), Dst: 128.143.71.21 (128.143.71.21)
Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
9	141.869746938	128.143.71.21	128.143.71.201	ICMP	98	Echo (ping) reply id=0x7d10, seq=2/512, ttl=64

Frame 9: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0
Ethernet II, Src: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8), Dst: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Internet Protocol Version 4, Src: 128.143.71.21 (128.143.71.21), Dst: 128.143.71.201 (128.143.71.201)
Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
10	142.869043315	128.143.71.201	128.143.71.21	ICMP	98	Echo (ping) request id=0x7d10, seq=3/768, ttl=64

Frame 10: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0

Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)

Internet Protocol Version 4, Src: 128.143.71.201 (128.143.71.201), Dst: 128.143.71.21 (128.143.71.21)

Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
11	142.869259313	128.143.71.21	128.143.71.201	ICMP	98	Echo (ping) reply id=0x7d10, seq=3/768, ttl=64

Frame 11: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface 0

Ethernet II, Src: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8), Dst: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Internet Protocol Version 4, Src: 128.143.71.21 (128.143.71.21), Dst: 128.143.71.201 (128.143.71.201)

Internet Control Message Protocol

No.	Time	Source	Destination	Protocol	Length	Info
12	145.869046684	00:13:3b:11:3d:a8	00:13:3b:21:78:5d	ARP	60	Who has 128.143.71.201? Tell 128.143.71.21

Frame 12: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0

Ethernet II, Src: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8), Dst: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IP (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)

Sender IP address: 128.143.71.21 (128.143.71.21)

Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)

Target IP address: 128.143.71.201 (128.143.71.201)

No.	Time	Source	Destination	Protocol	Length	Info
13	145.869059214	00:13:3b:21:78:5d	00:13:3b:11:3d:a8	ARP	42	128.143.71.201 is at 00:13:3b:21:78:5d

Frame 13: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0

Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)

Address Resolution Protocol (reply)

Hardware type: Ethernet (1)

Protocol type: IP (0x0800)

Hardware size: 6

Protocol size: 4
Opcode: reply (2)
Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Sender IP address: 128.143.71.201 (128.143.71.201)
Target MAC address: 00:13:3b:11:3d:a8 (00:13:3b:11:3d:a8)
Target IP address: 128.143.71.21 (128.143.71.21)

No.	Time	Source	Destination	Protocol	Length	Info
14	797.889032979	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.32? Tell 128.143.71.201

Frame 14: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)
Protocol type: IP (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Sender IP address: 128.143.71.201 (128.143.71.201)
Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
Target IP address: 128.143.137.32 (128.143.137.32)

No.	Time	Source	Destination	Protocol	Length	Info
15	798.889061181	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.32? Tell 128.143.71.201

Frame 15: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0
Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)
Protocol type: IP (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)
Sender IP address: 128.143.71.201 (128.143.71.201)
Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
Target IP address: 128.143.137.32 (128.143.137.32)

No.	Time	Source	Destination	Protocol	Length	Info
16	799.889058029	00:13:3b:21:78:5d	ff:ff:ff:ff:ff:ff	ARP	42	Who has 128.143.137.32? Tell 128.143.71.201

Frame 16: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0

Ethernet II, Src: 00:13:3b:21:78:5d (00:13:3b:21:78:5d), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IP (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: 00:13:3b:21:78:5d (00:13:3b:21:78:5d)

Sender IP address: 128.143.71.201 (128.143.71.201)

Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)

Target IP address: 128.143.137.32 (128.143.137.32)

EXERCISE 3: Testing ssh keys. Be sure that all screen shots include the ASUrite id of a group member. This should be in the login prompt when you ssh into a VM.

- i. Take a screen shot of your topology once it is ready (it should resemble Figure 3-9) and include it in your report.

GENI Portal

Home Tools Partners Help Venkatesh Yaganti

Resources Aggregates Map Members Info Logs

Slice: vyaganti1 Slice expires in 6 days ✓
Project: ASU-CSE434-Fall2021 Project expires in 97 days ✓

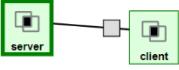
Add Resources Renew Update SSH Keys Tools

Manage Resources

Resources on Kentucky InstaGENI are ready.

Name: server
SSH to: syrotiuk@pc2.lan.sdn.uky.edu:25011, asarabi3@pc2.lan.sdn.uky.edu:25011
Node Type: Other... default-vm
Hardware Type: (any)

View Rspec



Renew Renew Date Delete SSH Restart Snapshot Details Add Resources Expand

GENI Portal Version 3.25
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- ii. Give the interface names and IPv4 addresses of the client and server assigned to the data plane and the control plane and include them in your report. (The data plane interfaces have IPv4 addresses of the form 10.1.x.y.)

For Server:

The control interface: 172.17.1.4

The data interface: 10.10.1.1

```
vyaganti@server: ~
Authenticating with public key "imported-openssh-key" from agent
Welcome to Ubuntu 18.04.1 LTS (GNU/Linux 4.15.0-147-generic x86_64)

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

* Super-optimized for small spaces - read how we shrank the memory
footprint of MicroK8s to make it the smallest full K8s around.

https://ubuntu.com/blog/microk8s-memory-optimisation

* Canonical Livepatch is available for installation.
- Reduce system reboots and improve kernel security. Activate at:
  https://ubuntu.com/livepatch

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.

vyaganti@server:~$ sudo ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.1.4 brd 255.240.0.0 broadcast 172.31.255.255
        netmask 255.240.0.0
        ether 02:0f:fe:97:38:09 txqueuelen 1000 (Ethernet)
        RX packets 154 bytes 161015 (161.0 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 1685 bytes 150893 (150.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.1.1 brd 255.255.255.0 broadcast 10.10.1.255
        netmask 255.255.255.0
        ether 02:c5:28:faf:56:4c txqueuelen 1000 (Ethernet)
        RX packets 47 bytes 3301 (3.3 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 14 bytes 1708 (11.7 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 brd 127.0.0.0
        netmask 255.0.0.0
        loop txqueuelen 128 scopeid 0x10<host>
        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

vyaganti@server:~$
```

For Client:

The control interface: 172.17.1.3
The data interface: 10.10.1.2

```
vyaganti@client:~$ ifconfig
# Authenticating with public key "imported-openssh-key" from agent
Welcome to Ubuntu 18.04.1 LTS (GNU/Linux 4.15.0-147-generic x86_64)

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

 * Super-optimized for small spaces - read how we shrank the memory
 footprint of MicroK8s to make it the smallest full K8s around.

 https://ubuntu.com/blog/microk8s--memory-optimisation

 * Canonical Livepatch is available for installation.
 - Reduce system reboots and improve kernel security. Activate at:
 https://ubuntu.com/livepatch

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.

vyaganti@client:~$ sudo ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.1.3 brd 172.31.255.255 broadcast 172.31.255.255
        netmask 255.240.0.0
        ether 02:43:0B:0A:93:03 txqueuelen 1000 (Ethernet)
            RX packets 1506 bytes 152771 (152.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1648 bytes 141300 (141.3 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.10.1.2 brd 255.255.255.255 broadcast 10.10.1.255
        netmask 255.255.255.255
        ether fe80::ee4aff:feed%eth1 brd fe80::ff:fe4ff:feed
            txqueuelen 1000 (Ethernet)
            RX packets 31 bytes 1928 (1.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 13 bytes 1387 (1.3 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 brd 127.0.0.1
        netmask 255.0.0.0
        ether 00:00:00:00:00:00
            txqueuelen 1000 (Local Loopback)
            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
vyaganti@client:~$
```

iii. Take a screen shot of ping output on the client in 5.1(c) of the instructions.

```
vyaganti@server:~$ ping 10.10.1.1 -c 5
PING 10.10.1.1 (10.10.1.1) 56(84) bytes of data.
64 bytes from 10.10.1.1: icmp_seq=1 ttl=64 time=0.035 ms
64 bytes from 10.10.1.1: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.1.1: icmp_seq=3 ttl=64 time=0.051 ms
64 bytes from 10.10.1.1: icmp_seq=4 ttl=64 time=0.049 ms
64 bytes from 10.10.1.1: icmp_seq=5 ttl=64 time=0.050 ms

--- 10.10.1.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4084ms
rtt min/avg/max/mdev = 0.035/0.047/0.051/0.007 ms
vyaganti@server:~$
```

```
vyaganti@server:~$ ping 10.10.1.1 -c 5
PING 10.10.1.1 (10.10.1.1) 56(84) bytes of data.
64 bytes from 10.10.1.1: icmp_seq=1 ttl=64 time=0.035 ms
64 bytes from 10.10.1.1: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.1.1: icmp_seq=3 ttl=64 time=0.051 ms
64 bytes from 10.10.1.1: icmp_seq=4 ttl=64 time=0.049 ms
64 bytes from 10.10.1.1: icmp_seq=5 ttl=64 time=0.050 ms

--- 10.10.1.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4084ms
rtt min/avg/max/mdev = 0.035/0.047/0.051/0.007 ms
vyaganti@server:~$ ping 172.17.1.4 -c 5
PING 172.17.1.4 (172.17.1.4) 56(84) bytes of data.
64 bytes from 172.17.1.4: icmp_seq=1 ttl=64 time=0.037 ms
64 bytes from 172.17.1.4: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 172.17.1.4: icmp_seq=3 ttl=64 time=0.041 ms
64 bytes from 172.17.1.4: icmp_seq=4 ttl=64 time=0.049 ms
64 bytes from 172.17.1.4: icmp_seq=5 ttl=64 time=0.051 ms

--- 172.17.1.4 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4093ms
rtt min/avg/max/mdev = 0.037/0.045/0.051/0.009 ms
vyaganti@server:~$
```

- iv. Delete the resources from this slice when you are finished. This results in an empty slice that can be reused, i.e., other resources can be added to it.

Deleted the resources using the “Delete” button under the slice in GENI portal.

EXERCISE 4: Design Subnets. Solve the subnet design problem posed in the section Challenge: Design Subnets that meets the requirements.

For LAN-A:

1. The subnet mask: 255.255.255.192
2. The network address: 10.10.172.128
3. The smallest IPv4 address that may be assigned to a host in the subnet: 10.10.172.129
4. The broadcast address for the subnet: 10.10.172.191
5. The highest IPv4 address that may be assigned to a host in the subnet: 10.10.172.190

For LAN-B:

1. The subnet mask: 255.255.255.128
2. The network address: 10.10.172.0
3. The smallest IPv4 address that may be assigned to a host in the subnet: 10.10.172.1
4. The broadcast address for the subnet: 10.10.172.127
5. The highest IPv4 address that may be assigned to a host in the subnet: 10.10.172.126

For LAN-C:

1. The subnet mask: 255.255.255.224
2. The network address: 10.10.172.192
3. The smallest IPv4 address that may be assigned to a host in the subnet: 10.10.172.193
4. The broadcast address for the subnet: 10.10.172.223
5. The highest IPv4 address that may be assigned to a host in the subnet: 10.10.172.222

EXERCISE 5: Implement your Design. Configure the IPv4 address and subnet mask of each host in each LAN using your solution to Exercise 4.

- i. Take a screen shot showing the output of the ping -c 5 IP command between the two hosts in the same LAN and include each one in your report.

The screenshot shows two terminal windows side-by-side, both titled "Vyaganti Ubuntu (Running) - Oracle VM VirtualBox". The top window is for host "router-c" and the bottom window is for host "router-b". Both windows show a terminal interface with a dark background and light-colored text. The user has run several commands to configure network interfaces and then perform a ping test between the two routers.

Router-c Terminal Output:

```
ether 02:84:0b:4f:24:f1 txqueuelen 1000 (Ethernet)
RX packets 35 bytes 2722 (2.7 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 9 bytes 1033 (1.0 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 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

vyaganti@router-c:~$ sudo ifconfig eth2 10.10.172.192 netmask 255.255.255.224
vyaganti@router-c:~$ sudo ifconfig eth1 10.10.172.192 netmask 255.255.255.224
vyaganti@router-c:~$ ping -c 5 10.10.172.192
PING 10.10.172.192 (10.10.172.192) 56(84) bytes of data.
64 bytes from 10.10.172.192: icmp_seq=1 ttl=64 time=0.035 ms
64 bytes from 10.10.172.192: icmp_seq=2 ttl=64 time=0.036 ms
64 bytes from 10.10.172.192: icmp_seq=3 ttl=64 time=0.030 ms
64 bytes from 10.10.172.192: icmp_seq=4 ttl=64 time=0.034 ms
64 bytes from 10.10.172.192: icmp_seq=5 ttl=64 time=0.030 ms

--- 10.10.172.192 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4097ms
rtt min/avg/max/mdev = 0.030/0.033/0.036/0.002 ms
vyaganti@router-c:~$
```

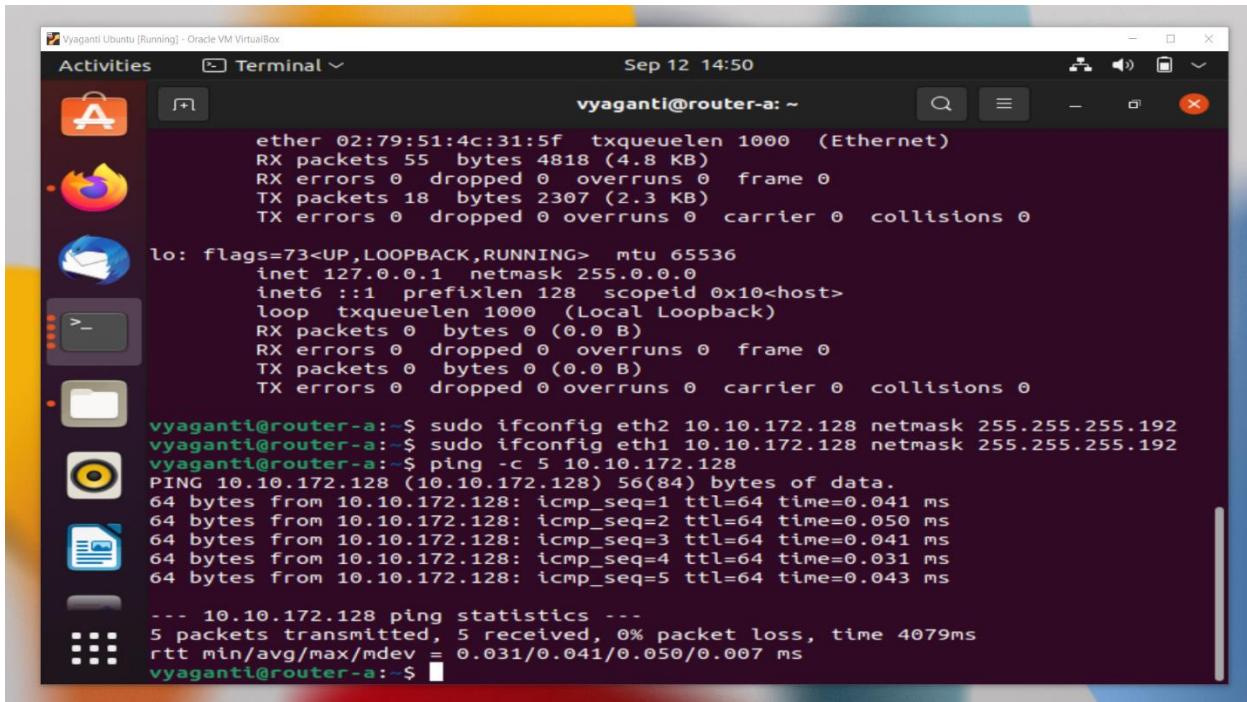
Router-b Terminal Output:

```
ether 02:4e:e9:72:20:65 txqueuelen 1000 (Ethernet)
RX packets 33 bytes 2347 (2.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 23 bytes 3227 (3.2 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 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

vyaganti@router-b:~$ sudo ifconfig eth2 10.10.172.0 netmask 255.255.255.128
vyaganti@router-b:~$ sudo ifconfig eth1 10.10.172.0 netmask 255.255.255.128
vyaganti@router-b:~$ ping -c 5 10.10.172.0
PING 10.10.172.0 (10.10.172.0) 56(84) bytes of data.
64 bytes from 10.10.172.0: icmp_seq=1 ttl=64 time=0.034 ms
64 bytes from 10.10.172.0: icmp_seq=2 ttl=64 time=0.042 ms
64 bytes from 10.10.172.0: icmp_seq=3 ttl=64 time=0.041 ms
64 bytes from 10.10.172.0: icmp_seq=4 ttl=64 time=0.031 ms
64 bytes from 10.10.172.0: icmp_seq=5 ttl=64 time=0.041 ms

--- 10.10.172.0 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4096ms
rtt min/avg/max/mdev = 0.031/0.037/0.042/0.008 ms
vyaganti@router-b:~$
```



Vyaganti Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Sep 12 14:50

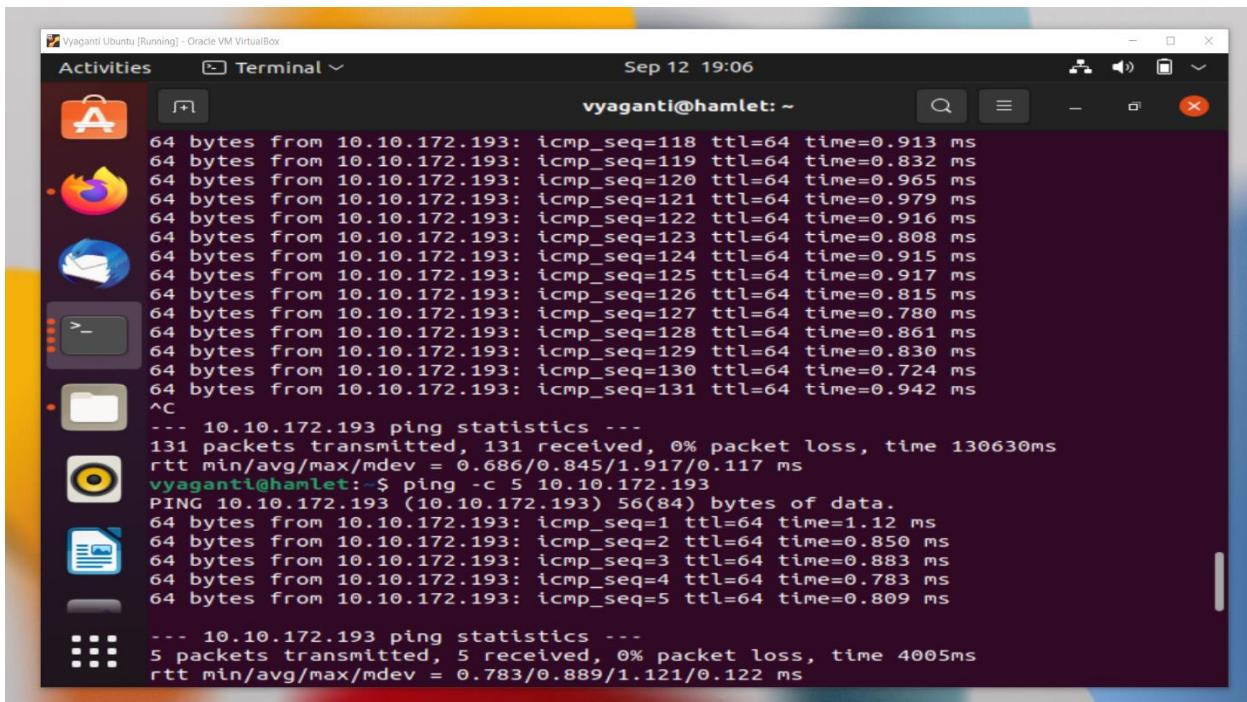
```
vyaganti@router-a: ~
ether 02:79:51:4c:31:5f txqueuelen 1000 (Ethernet)
RX packets 55 bytes 4818 (4.8 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 18 bytes 2307 (2.3 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

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 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

vyaganti@router-a:~$ sudo ifconfig eth2 10.10.172.128 netmask 255.255.255.192
vyaganti@router-a:~$ sudo ifconfig eth1 10.10.172.128 netmask 255.255.255.192
vyaganti@router-a:~$ ping -c 5 10.10.172.128
PING 10.10.172.128 (10.10.172.128) 56(84) bytes of data.
64 bytes from 10.10.172.128: icmp_seq=1 ttl=64 time=0.041 ms
64 bytes from 10.10.172.128: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 10.10.172.128: icmp_seq=3 ttl=64 time=0.041 ms
64 bytes from 10.10.172.128: icmp_seq=4 ttl=64 time=0.031 ms
64 bytes from 10.10.172.128: icmp_seq=5 ttl=64 time=0.043 ms

--- 10.10.172.128 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4079ms
rtt min/avg/max/mdev = 0.031/0.041/0.050/0.007 ms
vyaganti@router-a:~$
```

- ii. Take a screen shot showing the output of the ping -c 5 IP between a host in LAN A and a host in LAN B, between a host in LAN B and a host in LAN C, and between a host in LAN C and a host in LAN A, and include them in your report.



Vyaganti Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Sep 12 19:06

```
vyaganti@hamlet: ~
64 bytes from 10.10.172.193: icmp_seq=118 ttl=64 time=0.913 ms
64 bytes from 10.10.172.193: icmp_seq=119 ttl=64 time=0.832 ms
64 bytes from 10.10.172.193: icmp_seq=120 ttl=64 time=0.965 ms
64 bytes from 10.10.172.193: icmp_seq=121 ttl=64 time=0.979 ms
64 bytes from 10.10.172.193: icmp_seq=122 ttl=64 time=0.916 ms
64 bytes from 10.10.172.193: icmp_seq=123 ttl=64 time=0.808 ms
64 bytes from 10.10.172.193: icmp_seq=124 ttl=64 time=0.915 ms
64 bytes from 10.10.172.193: icmp_seq=125 ttl=64 time=0.917 ms
64 bytes from 10.10.172.193: icmp_seq=126 ttl=64 time=0.815 ms
64 bytes from 10.10.172.193: icmp_seq=127 ttl=64 time=0.780 ms
64 bytes from 10.10.172.193: icmp_seq=128 ttl=64 time=0.861 ms
64 bytes from 10.10.172.193: icmp_seq=129 ttl=64 time=0.830 ms
64 bytes from 10.10.172.193: icmp_seq=130 ttl=64 time=0.724 ms
64 bytes from 10.10.172.193: icmp_seq=131 ttl=64 time=0.942 ms
^C
--- 10.10.172.193 ping statistics ---
131 packets transmitted, 131 received, 0% packet loss, time 130630ms
rtt min/avg/max/mdev = 0.686/0.845/1.917/0.117 ms
vyaganti@hamlet:~$ ping -c 5 10.10.172.193
PING 10.10.172.193 (10.10.172.193) 56(84) bytes of data.
64 bytes from 10.10.172.193: icmp_seq=1 ttl=64 time=1.12 ms
64 bytes from 10.10.172.193: icmp_seq=2 ttl=64 time=0.850 ms
64 bytes from 10.10.172.193: icmp_seq=3 ttl=64 time=0.883 ms
64 bytes from 10.10.172.193: icmp_seq=4 ttl=64 time=0.783 ms
64 bytes from 10.10.172.193: icmp_seq=5 ttl=64 time=0.809 ms

--- 10.10.172.193 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 0.783/0.889/1.121/0.122 ms
```

```
inet6 fe80::9d:b7ff:fe1c:8f9c prefixlen 64 scopeid 0x20<link>
ether 02:9d:b7:1c:8f:9c txqueuelen 1000 (Ethernet)
RX packets 55 bytes 4985 (4.9 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 19 bytes 2154 (2.1 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 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

vyaganti@othello:~$ sudo ifconfig eth1 10.10.172.1 netmask 255.255.255.128
vyaganti@othello:~$ ping -c 5 10.10.172.126
PING 10.10.172.126 (10.10.172.126) 56(84) bytes of data.
64 bytes from 10.10.172.126: icmp_seq=1 ttl=64 time=1.90 ms
64 bytes from 10.10.172.126: icmp_seq=2 ttl=64 time=0.864 ms
64 bytes from 10.10.172.126: icmp_seq=3 ttl=64 time=0.838 ms
64 bytes from 10.10.172.126: icmp_seq=4 ttl=64 time=0.679 ms
64 bytes from 10.10.172.126: icmp_seq=5 ttl=64 time=0.677 ms

--- 10.10.172.126 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 0.677/0.993/1.908/0.464 ms
vyaganti@othello:~$
```

```
inet6 fe80::e7:84ff:fee6:c02b prefixlen 64 scopeid 0x20<link>
ether 02:e7:84:e6:c0:2b txqueuelen 1000 (Ethernet)
RX packets 40 bytes 2965 (2.9 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 22 bytes 2683 (2.6 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 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

vyaganti@romeo:~$ sudo ifconfig eth1 10.10.172.129 netmask 255.255.255.192
vyaganti@romeo:~$ ping -c 5 10.10.172.190
PING 10.10.172.190 (10.10.172.190) 56(84) bytes of data.
64 bytes from 10.10.172.190: icmp_seq=1 ttl=64 time=1.38 ms
64 bytes from 10.10.172.190: icmp_seq=2 ttl=64 time=0.480 ms
64 bytes from 10.10.172.190: icmp_seq=3 ttl=64 time=0.525 ms
64 bytes from 10.10.172.190: icmp_seq=4 ttl=64 time=0.554 ms
64 bytes from 10.10.172.190: icmp_seq=5 ttl=64 time=0.480 ms

--- 10.10.172.190 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4047ms
rtt min/avg/max/mdev = 0.480/0.684/1.381/0.349 ms
vyaganti@romeo:~$
```

EXERCISE 6: Add Routing Rules. Configure the route on each host in each LAN, and also on each router.

- i. Take a screen shot of the output of the route -n command on each node and on each router and include it in your report

```
vyaganti@router-a:~$ route -n
Kernel IP routing table
Destination     Gateway      Genmask      Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1  0.0.0.0      UG  1024   0        0 eth0
10.0.0.0        0.0.0.0     255.0.0.0    U     0       0        0 eth2
10.10.172.0     10.10.100.2 255.255.255.128 UG  0       0        0 eth1
10.10.172.128  0.0.0.0     255.255.255.192 U     0       0        0 eth2
10.10.172.192  10.10.100.3 255.255.255.224 UG  0       0        0 eth2
172.16.0.0      0.0.0.0     255.240.0.0   U     0       0        0 eth0
172.16.0.1      0.0.0.0     255.255.255.255 UH  1024   0        0 eth0
vyaganti@router-a:~$
```

```
vyaganti@router-b:~$ route -n
Kernel IP routing table
Destination     Gateway      Genmask      Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1  0.0.0.0      UG  1024   0        0 eth0
10.0.0.0        0.0.0.0     255.0.0.0    U     0       0        0 eth2
10.10.172.0     0.0.0.0     255.255.255.128 U     0       0        0 eth1
10.10.172.128  10.10.100.1 255.255.255.192 UG  0       0        0 eth2
10.10.172.192  10.10.100.3 255.255.255.224 UG  0       0        0 eth2
172.16.0.0      0.0.0.0     255.240.0.0   U     0       0        0 eth0
172.16.0.1      0.0.0.0     255.255.255.255 UH  1024   0        0 eth0
vyaganti@router-b:~$
```

```
5 packets transmitted, 0 received, 100% packet loss, time 4083ms
vyaganti@router-c:~$ ping -c 5 10.10.172.128
PING 10.10.172.128 (10.10.172.128) 56(84) bytes of data.

--- 10.10.172.128 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4077ms

vyaganti@router-c:~$ ifconfig eth1
eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 10.10.172.192 netmask 255.255.255.224 broadcast 10.10.172.223
        inet6 fe80::3e:80ff:fe86:963c prefixlen 64 scopeid 0x20<link>
          ether 02:3e:80:86:96:3c txqueuelen 1000 (Ethernet)
            RX packets 54 bytes 3152 (3.1 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 14 bytes 1708 (1.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

vyaganti@router-c:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1     0.0.0.0       UG   1024   0        0 eth0
10.0.0.0        0.0.0.0        255.0.0.0     U     0       0        0 eth2
10.10.172.0     10.10.100.2   255.255.255.128 UG   0       0        0 eth2
10.10.172.128   10.10.100.1   255.255.255.192 UG   0       0        0 eth2
10.10.172.192   0.0.0.0        255.255.255.224 U     0       0        0 eth1
172.16.0.0      0.0.0.0        255.240.0.0   U     0       0        0 eth0
172.16.0.1      0.0.0.0        255.255.255.255 UH   1024   0        0 eth0
vyaganti@router-c:~$
```

```
inet6 fe80::ce:c4ff:fed6:ac5 prefixlen 64 scopeid 0x20<link>
ether 02:ce:c4:d6:0a:c5 txqueuelen 1000 (Ethernet)
RX packets 29 bytes 1912 (1.9 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 14 bytes 1479 (1.4 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 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

vyaganti@juliet:~$ sudo ifconfig 10.10.172.129 netmask 255.255.255.192
SIOCSIFNETMASK: No such device
vyaganti@juliet:~$ sudo ifconfig 10.10.172.190 netmask 255.255.255.192
SIOCSIFNETMASK: No such device
vyaganti@juliet:~$ sudo ifconfig eth1 10.10.172.190 netmask 255.255.255.192
vyaganti@juliet:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1     0.0.0.0       UG   1024   0        0 eth0
10.10.172.128   0.0.0.0        255.255.255.192 U     0       0        0 eth1
172.16.0.0      0.0.0.0        255.240.0.0   U     0       0        0 eth0
172.16.0.1      0.0.0.0        255.255.255.255 UH   1024   0        0 eth0
vyaganti@juliet:~$
```

```
Activities Terminal Sep 12 16:00 vyaganti@romeo: ~
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 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

vyaganti@romeo:~$ sudo ifconfig eth1 10.10.172.129 netmask 255.255.255.192
vyaganti@romeo:~$ ping -c 5 10.10.172.190
PING 10.10.172.190 (10.10.172.190) 56(84) bytes of data.
64 bytes from 10.10.172.190: icmp_seq=1 ttl=64 time=1.38 ms
64 bytes from 10.10.172.190: icmp_seq=2 ttl=64 time=0.480 ms
64 bytes from 10.10.172.190: icmp_seq=3 ttl=64 time=0.525 ms
64 bytes from 10.10.172.190: icmp_seq=4 ttl=64 time=0.554 ms
64 bytes from 10.10.172.190: icmp_seq=5 ttl=64 time=0.480 ms

--- 10.10.172.190 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4047ms
rtt min/avg/max/mdev = 0.480/0.684/1.381/0.349 ms
vyaganti@romeo:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
0.0.0.0          172.16.0.1   0.0.0.0        UG    1024   0        0 eth0
10.10.172.128   0.0.0.0      255.255.255.192 U     0       0        0 eth1
172.16.0.0        0.0.0.0      255.240.0.0    U     0       0        0 eth0
172.16.0.1        0.0.0.0      255.255.255.255 UH    1024   0        0 eth0
vyaganti@romeo:~$
```

```
Activities Terminal Sep 12 16:00 vyaganti@othello: ~
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 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

vyaganti@othello:~$ sudo ifconfig eth1 10.10.172.1 netmask 255.255.255.128
vyaganti@othello:~$ ping -c 5 10.10.172.126
PING 10.10.172.126 (10.10.172.126) 56(84) bytes of data.
64 bytes from 10.10.172.126: icmp_seq=1 ttl=64 time=1.90 ms
64 bytes from 10.10.172.126: icmp_seq=2 ttl=64 time=0.864 ms
64 bytes from 10.10.172.126: icmp_seq=3 ttl=64 time=0.838 ms
64 bytes from 10.10.172.126: icmp_seq=4 ttl=64 time=0.679 ms
64 bytes from 10.10.172.126: icmp_seq=5 ttl=64 time=0.677 ms

--- 10.10.172.126 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 0.677/0.993/1.908/0.464 ms
vyaganti@othello:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
0.0.0.0          172.16.0.1   0.0.0.0        UG    1024   0        0 eth0
10.10.172.0      0.0.0.0      255.255.255.128 U     0       0        0 eth1
172.16.0.0        0.0.0.0      255.240.0.0    U     0       0        0 eth0
172.16.0.1        0.0.0.0      255.255.255.255 UH    1024   0        0 eth0
vyaganti@othello:~$
```

Vyaganti Ubuntu [Running] - Oracle VM VirtualBox

Activities Terminal Sep 12 16:00

vyaganti@desdemona: ~

```
TX packets 1448 bytes 124664 (124.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet6 fe80::a4:cfbff:fee9:b2d1 prefixlen 64 scopeid 0x20<link>
        ether 02:a4:cf:e9:b2:d1 txqueuelen 1000 (Ethernet)
          RX packets 64 bytes 6121 (6.1 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 23 bytes 2753 (2.7 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 8 bytes 728 (728.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 8 bytes 728 (728.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

vyaganti@desdemona:~$ sudo ifconfig eth1 10.10.172.126 netmask 255.255.255.128
vyaganti@desdemona:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1   0.0.0.0         UG    1024   0        0 eth0
10.10.172.0     0.0.0.0       255.255.255.128 U     0        0        0 eth1
172.16.0.0       0.0.0.0       255.240.0.0     U     0        0        0 eth0
172.16.0.1       0.0.0.0       255.255.255.255 UH    1024   0        0 eth0
vyaganti@desdemona:~$
```

Vyaganti Ubuntu [Running] - Oracle VM VirtualBox

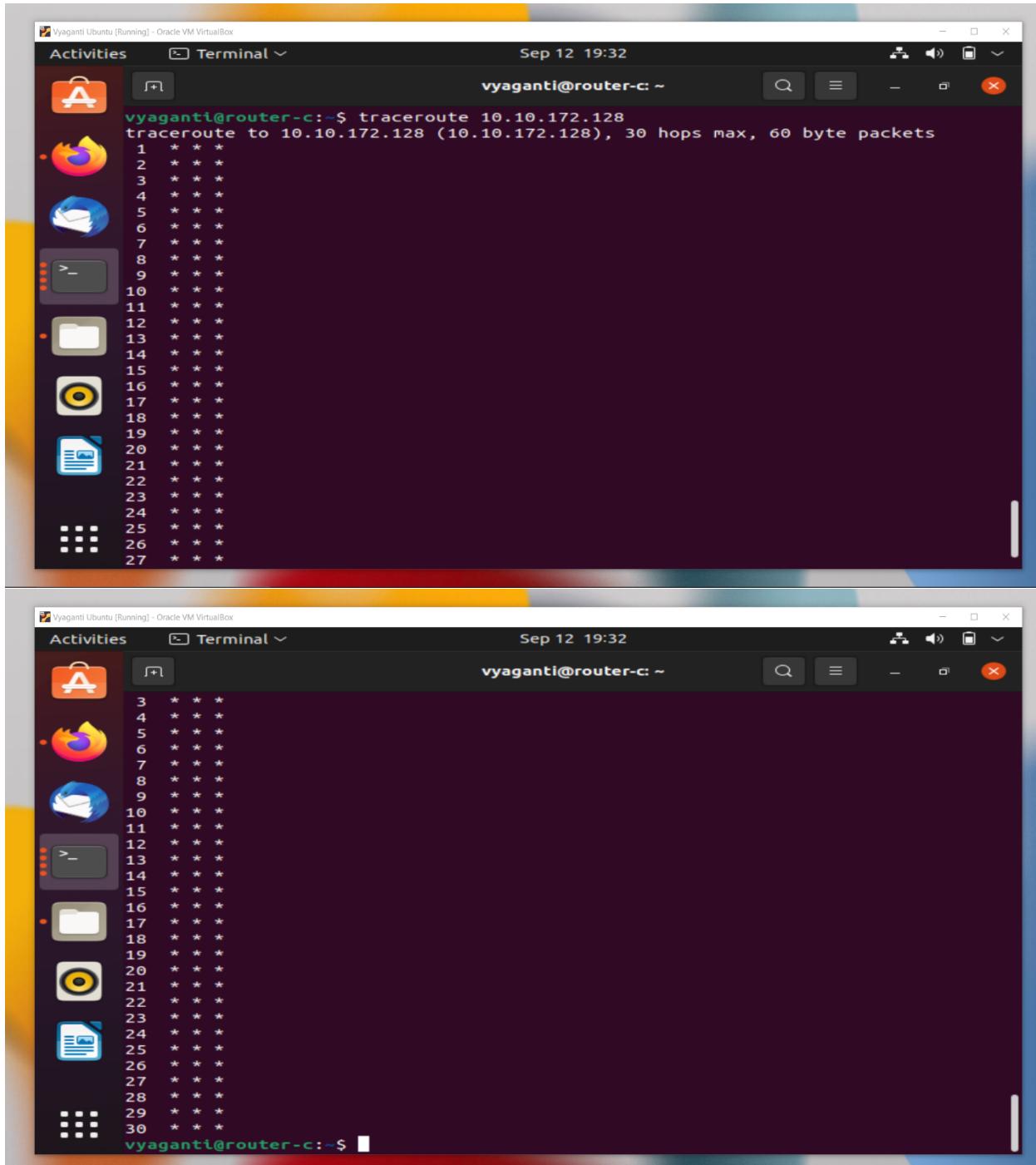
Activities Terminal Sep 12 16:01

vyaganti@hamlet: ~

```
64 bytes from 10.10.172.193: icmp_seq=126 ttl=64 time=0.815 ms
64 bytes from 10.10.172.193: icmp_seq=127 ttl=64 time=0.780 ms
64 bytes from 10.10.172.193: icmp_seq=128 ttl=64 time=0.861 ms
64 bytes from 10.10.172.193: icmp_seq=129 ttl=64 time=0.830 ms
64 bytes from 10.10.172.193: icmp_seq=130 ttl=64 time=0.724 ms
64 bytes from 10.10.172.193: icmp_seq=131 ttl=64 time=0.942 ms
^C
--- 10.10.172.193 ping statistics ---
131 packets transmitted, 131 received, 0% packet loss, time 130630ms
rtt min/avg/max/mdev = 0.686/0.845/1.917/0.117 ms
vyaganti@hamlet:~$ ping -c 5 10.10.172.193
PING 10.10.172.193 (10.10.172.193) 56(84) bytes of data.
64 bytes from 10.10.172.193: icmp_seq=1 ttl=64 time=1.12 ms
64 bytes from 10.10.172.193: icmp_seq=2 ttl=64 time=0.850 ms
64 bytes from 10.10.172.193: icmp_seq=3 ttl=64 time=0.883 ms
64 bytes from 10.10.172.193: icmp_seq=4 ttl=64 time=0.783 ms
64 bytes from 10.10.172.193: icmp_seq=5 ttl=64 time=0.809 ms
--- 10.10.172.193 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 0.783/0.889/1.121/0.122 ms
vyaganti@hamlet:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         172.16.0.1   0.0.0.0         UG    1024   0        0 eth0
10.10.172.192  0.0.0.0       255.255.255.224 U     0        0        0 eth1
172.16.0.0       0.0.0.0       255.240.0.0     U     0        0        0 eth0
172.16.0.1       0.0.0.0       255.255.255.255 UH    1024   0        0 eth0
vyaganti@hamlet:~$
```

- ii. Take a screen shot of the output of the ping -c 5 IP command from node-11 to node-4, from node-5 to node-6, and from node-10 to node-7 and include them in your report.

- iii. Follow the instructions to configure the routing rules for the 10.10.100.0/24 network.
Now, take a screen shot of the output of the traceroute IP command from node-11 to node-4 and include it in your report.



The image contains two vertically stacked screenshots of a terminal window from a Vyaganti Ubuntu virtual machine. Both screenshots show the same command being run: `traceroute 10.10.172.128`. The terminal window has a dark background with light-colored text. The top screenshot shows the command being typed and the results for hops 1 through 27. The bottom screenshot shows the command being typed and the results for hops 3 through 30. The terminal window includes a title bar, a menu bar, and a docked application menu on the left.

```
vyaganti@router-c:~$ traceroute 10.10.172.128
traceroute to 10.10.172.128 (10.10.172.128), 30 hops max, 60 byte packets
 1 * * *
 2 * * *
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *

vyaganti@router-c:~$ traceroute 10.10.172.128
traceroute to 10.10.172.128 (10.10.172.128), 30 hops max, 60 byte packets
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *

vyaganti@router-c:~$
```