

# Computer Networks Lab

UE19CS255

Week 10

Name: Sreenath Saikumar

Semester: 4      Section: G

**SRN:** PES2UG19CS406

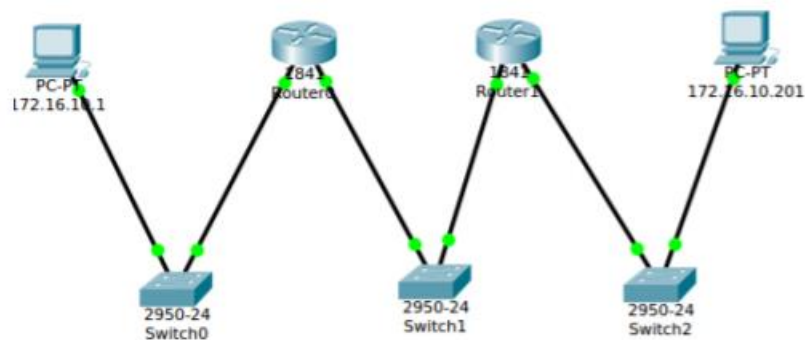
Date: 11/04/21

## Objectives:

To setup a network with 2 routers and exchange packets across routers.

## Topology Description:

Design a network with atleast 2 router networks. Host **Ha** should be able to communicate with Host **Hd** using newly assigned addresses.



# Host Ha:

```
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:84:73 brd ff:ff:ff:ff:ff:ff  
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.10.1/24 dev enp1s0  
[sudo] password for student:  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:84:73 brd ff:ff:ff:ff:ff:ff  
    inet 172.16.10.1/24 scope global enp1s0  
        valid_lft forever preferred_lft forever  
student@pesu-OptiPlex-3070:~$ sudo sysctl -w net.ipv4.conf.all.accept_redirects=0  
net.ipv4.conf.all.accept_redirects = 0  
student@pesu-OptiPlex-3070:~$ ping 172.16.10.1  
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.  
64 bytes from 172.16.10.1: icmp_seq=1 ttl=64 time=0.052 ms  
64 bytes from 172.16.10.1: icmp_seq=2 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=3 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=4 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=5 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=6 ttl=64 time=0.045 ms  
^C  
--- 172.16.10.1 ping statistics ---  
6 packets transmitted, 6 received, 0% packet loss, time 5116ms  
rtt min/avg/max/ndev = 0.045/0.048/0.052/0.002 ms  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.12.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.11.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 dev enp1s0 proto kernel scope link src 172.16.10.1  
172.16.11.0/24 via 172.16.10.201 dev enp1s0  
172.16.12.0/24 via 172.16.10.201 dev enp1s0  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
^C
```

```
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:84:73 brd ff:ff:ff:ff:ff:ff  
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.10.1/24 dev enp1s0  
[sudo] password for student:  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:84:73 brd ff:ff:ff:ff:ff:ff  
    inet 172.16.10.1/24 scope global enp1s0  
        valid_lft forever preferred_lft forever  
student@pesu-OptiPlex-3070:~$ sudo sysctl -w net.ipv4.conf.all.accept_redirects=0  
net.ipv4.conf.all.accept_redirects = 0  
student@pesu-OptiPlex-3070:~$ ping 172.16.10.1  
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.  
64 bytes from 172.16.10.1: icmp_seq=1 ttl=64 time=0.052 ms  
64 bytes from 172.16.10.1: icmp_seq=2 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=3 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=4 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=5 ttl=64 time=0.048 ms  
64 bytes from 172.16.10.1: icmp_seq=6 ttl=64 time=0.045 ms  
^C  
--- 172.16.10.1 ping statistics ---  
6 packets transmitted, 6 received, 0% packet loss, time 5116ms  
rtt min/avg/max/ndev = 0.045/0.048/0.052/0.002 ms  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.12.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.11.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 dev enp1s0 proto kernel scope link src 172.16.10.1  
172.16.11.0/24 via 172.16.10.201 dev enp1s0  
172.16.12.0/24 via 172.16.10.201 dev enp1s0  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
^C
```

```
student@pesu-OptiPlex-3070: ~  
rtt min/avg/max/mdev = 0.045/0.048/0.052/0.002 ms  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.12.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.11.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 dev enp1s0 proto kernel scope link src 172.16.10.1  
172.16.11.0/24 via 172.16.10.201 dev enp1s0  
172.16.12.0/24 via 172.16.10.201 dev enp1s0  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
^C  
--- 172.16.11.201 ping statistics ---  
7 packets transmitted, 0 received, 100% packet loss, time 6124ms  
  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 STALE  
student@pesu-OptiPlex-3070:~$ ^C  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 DELAY  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 STALE  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
64 bytes from 172.16.11.201: icmp_seq=1 ttl=63 time=1.39 ms  
64 bytes from 172.16.11.201: icmp_seq=2 ttl=63 time=1.47 ms  
64 bytes from 172.16.11.201: icmp_seq=3 ttl=63 time=1.50 ms  
64 bytes from 172.16.11.201: icmp_seq=4 ttl=63 time=1.22 ms  
^C  
--- 172.16.11.201 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3006ms  
rtt min/avg/max/mdev = 1.223/1.396/1.497/0.107 ms  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 REACHABLE  
student@pesu-OptiPlex-3070:~$ ping 172.16.12.201  
PING 172.16.12.201 (172.16.12.201) 56(84) bytes of data.  
64 bytes from 172.16.12.201: icmp_seq=1 ttl=62 time=2.16 ms  
64 bytes from 172.16.12.201: icmp_seq=2 ttl=62 time=2.21 ms  
64 bytes from 172.16.12.201: icmp_seq=3 ttl=62 time=2.26 ms  
64 bytes from 172.16.12.201: icmp_seq=4 ttl=62 time=1.74 ms  
64 bytes from 172.16.12.201: icmp_seq=5 ttl=62 time=2.25 ms  
^C  
--- 172.16.12.201 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4007ms  
rtt min/avg/max/mdev = 1.743/2.122/2.258/0.193 ms  
student@pesu-OptiPlex-3070:~$
```

```
student@pesu-OptiPlex-3070: ~  
rtt min/avg/max/mdev = 0.045/0.048/0.052/0.002 ms  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.12.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.11.0/24 via 172.16.10.201  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 dev enp1s0 proto kernel scope link src 172.16.10.1  
172.16.11.0/24 via 172.16.10.201 dev enp1s0  
172.16.12.0/24 via 172.16.10.201 dev enp1s0  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
^C  
--- 172.16.11.201 ping statistics ---  
7 packets transmitted, 0 received, 100% packet loss, time 6124ms  
  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 STALE  
student@pesu-OptiPlex-3070:~$ ^C  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 DELAY  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 STALE  
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201  
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.  
64 bytes from 172.16.11.201: icmp_seq=1 ttl=63 time=1.39 ms  
64 bytes from 172.16.11.201: icmp_seq=2 ttl=63 time=1.47 ms  
64 bytes from 172.16.11.201: icmp_seq=3 ttl=63 time=1.50 ms  
64 bytes from 172.16.11.201: icmp_seq=4 ttl=63 time=1.22 ms  
^C  
--- 172.16.11.201 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3006ms  
rtt min/avg/max/mdev = 1.223/1.396/1.497/0.107 ms  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.10.201 dev enp1s0 lladdr 00:4e:01:a2:94:78 REACHABLE  
student@pesu-OptiPlex-3070:~$ ping 172.16.12.201  
PING 172.16.12.201 (172.16.12.201) 56(84) bytes of data.  
64 bytes from 172.16.12.201: icmp_seq=1 ttl=62 time=2.16 ms  
64 bytes from 172.16.12.201: icmp_seq=2 ttl=62 time=2.21 ms  
64 bytes from 172.16.12.201: icmp_seq=3 ttl=62 time=2.26 ms  
64 bytes from 172.16.12.201: icmp_seq=4 ttl=62 time=1.74 ms  
64 bytes from 172.16.12.201: icmp_seq=5 ttl=62 time=2.25 ms  
^C  
--- 172.16.12.201 ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4007ms  
rtt min/avg/max/mdev = 1.743/2.122/2.258/0.193 ms  
student@pesu-OptiPlex-3070:~$
```

# Wireshark Captures

The image shows a Wireshark capture of network traffic. The top pane displays a list of 20 packets, all of which are ICMP Echo (ping) requests and replies between the source IP 172.16.10.1 and the destination IP 172.16.12.201. The middle pane shows the details of the selected packet (packet 1), including the Ethernet II header, Internet Protocol Version 4 header, and Internet Control Message Protocol header. The bottom pane shows the raw packet data in hexadecimal and ASCII format.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=1/256, ttl=64 (reply in 2)
2	0.002123259	172.16.10.1	172.16.12.201	ICMP Echo (ping) reply	60	Id=8x0003, seq=1/256, ttl=64 (request in 1)
3	1.001577391	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=2/512, ttl=64 (reply in 4)
4	1.003582854	172.16.10.1	172.16.12.201	ICMP Echo (ping) reply	60	Id=8x0003, seq=2/512, ttl=64 (request in 3)
5	2.003123521	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=3/768, ttl=64 (reply in 6)
6	2.005281996	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=3/768, ttl=62 (request in 5)
7	3.004192899	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=4/1024, ttl=64 (reply in 8)
8	3.006185638	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=4/1024, ttl=62 (request in 7)
9	4.005390524	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=5/1280, ttl=64 (reply in 10)
10	4.007392354	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=5/1280, ttl=62 (request in 9)
11	5.006878432	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=6/1536, ttl=64 (reply in 12)
12	5.009080880	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=6/1536, ttl=62 (request in 11)
13	5.105801378	Del1 a2:84:78	172.16.10.1	ARP	62	Who has 172.16.10.1? Tell 172.16.10.201
14	5.105824927	Del1 a2:84:78	172.16.10.1	ARP	44	172.16.10.1 is at 00:4e:01:a2:84:73
15	6.008451968	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=7/1792, ttl=64 (reply in 16)
16	6.010564545	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=7/1792, ttl=62 (request in 15)
17	7.009818084	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=8/2048, ttl=64 (reply in 18)
18	7.011767892	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=8/2048, ttl=62 (request in 17)
19	8.011257598	172.16.10.1	172.16.12.201	ICMP Echo (ping) request	60	Id=8x0003, seq=9/2304, ttl=64 (reply in 20)
20	8.013483051	172.16.12.201	172.16.10.1	ICMP Echo (ping) reply	60	Id=8x0003, seq=9/2304, ttl=62 (request in 19)

Frame 1: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface any, id 0

- Linux cooked capture
- Internet Protocol Version 4, Src: 172.16.10.1, Dst: 172.16.12.201
- Internet Control Message Protocol

```
0000 00 04 00 01 00 06 00 4e 01 a2 84 73 00 00 00 00  - . . . N . . . S . . .
0010 45 00 00 54 09 8c 40 00 40 01 62 32 ac 10 0a 01  E . T 1 0 0 b2 . . .
0020 ac 10 0c c9 08 00 16 3c 00 03 00 01 f8 07 5f 60  . . . . . < . . . . .
0030 00 00 00 00 c7 84 04 00 00 00 00 00 10 11 12 13  . . . . .
0040 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23  . . . . . ! * #
0050 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33  S N & ( ) * + , . - / 0 1 2 3
0060 34 35 36 37 4567
```



No.	Time	Source	Destination	Protocol	Length	Info
70	13.825481422	127.0.0.1	127.0.0.53	DNS	87	Standard query 0xcd01 A ntp.ubuntu.com OPT
71	13.825509462	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x123a AAAA ntp.ubuntu.com OPT
72	13.825678748	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0xcd01 Server failure A ntp.ubuntu.co.
73	13.825842543	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x123a Server failure AAAA ntp.ubuntu.
74	13.825933112	127.0.0.1	127.0.0.53	DNS	87	Standard query 0xcd01 A ntp.ubuntu.com OPT
75	13.825946342	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x123a AAAA ntp.ubuntu.com OPT
76	13.826103215	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0xcd01 Server failure A ntp.ubuntu.co.
77	13.826232356	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x123a Server failure AAAA ntp.ubuntu.
78	13.826749292	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x7682 A ntp.ubuntu.com OPT
79	13.826765663	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x319e AAAA ntp.ubuntu.com OPT
80	13.826928634	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x7682 Server failure A ntp.ubuntu.co.
81	13.827064794	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x319e Server failure AAAA ntp.ubuntu.
82	13.827193954	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x7682 A ntp.ubuntu.com OPT
83	13.827211755	127.0.0.1	127.0.0.53	DNS	87	Standard query 0x319e AAAA ntp.ubuntu.com OPT
84	13.827427662	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x7682 Server failure A ntp.ubuntu.co.
85	13.827583555	127.0.0.53	127.0.0.1	DNS	87	Standard query response 0x319e Server failure AAAA ntp.ubuntu.
86	14.497126290	172.16.10.201	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
87	15.499659477	172.16.10.201	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
88	17.499871394	172.16.10.201	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
89	21.503962181	172.16.10.201	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
90	26.277374087	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=1/256, ttl=64 (reply in 9.
91	26.277955951	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=1/256, ttl=64 (request in.
92	29.279891134	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=2/512, ttl=64 (reply in 9.
93	29.280655423	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=2/512, ttl=64 (request in.
94	29.512180561	172.16.10.201	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
95	30.304009957	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=3/768, ttl=64 (reply in 9.
96	30.304681881	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=3/768, ttl=64 (request in.
97	31.327894679	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=4/1024, ttl=64 (reply in .
98	31.328488013	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=4/1024, ttl=64 (request i.
99	32.003995884	172.16.10.1	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
100	32.003172871	127.0.0.1	224.0.0.251	MDNS	162	Standard query 0x0000 PTR _ftp._tcp.local, "QM" question PTR -
101	32.351883773	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=5/1280, ttl=64 (reply in .
102	32.352471248	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=5/1280, ttl=64 (request i.
103	33.279826183	De11:a2:84:73		ARP	44	Who has 172.16.10.201? Tell 172.16.10.1
104	33.280291520	De11:a2:94:78		ARP	62	172.16.10.201 is at 00:4e:01:a2:94:78
105	33.375733970	172.16.10.1	172.16.11.1	ICMP	100	Echo (ping) request id=0x0004, seq=6/1536, ttl=64 (reply in .
106	33.376316889	172.16.11.1	172.16.10.1	ICMP	100	Echo (ping) reply id=0x0004, seq=6/1536, ttl=64 (request i.
107	33.479368480	De11:a2:94:78		ARP	62	172.16.10.1 is at 00:4e:01:a2:94:78
108	33.479392895	De11:a2:84:73		ARP	44	172.16.10.1 is at 00:4e:01:a2:84:73

Frame 1: 162 bytes on wire (1296 bits), 162 bytes captured (1296 bits) on interface any, id 0

- Linux cooked capture
- Internet Protocol Version 4, Src: 172.16.10.1, Dst: 224.0.0.251
- User Datagram Protocol, Src Port: 5353, Dst Port: 5353
- Multicast Domain Name System (query)

0000 00 04 00 01 00 06 00 4e 01 a2 84 73 00 00 00 00 .....N...s....  
0018 45 00 00 92 36 20 40 00 ff 11 a0 1f ac 10 0a 01 E...>.g.....

wireshark\_any\_20210327155627\_nMh5DY.pcapng Packets: 108 - Displayed: 108 (100.0%) Profile: Default

## Router R1

```

student@pesu-OptiPlex-3070: ~/Desktop
student@pesu-OptiPlex-3070:~/Desktop$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default q
    len 1000
    link/ether 00:4e:01:a2:94:78 brd ff:ff:ff:ff:ff:ff
3: enx2Bee5200690b: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN g
    roup default qlen 1000
    link/ether 28:ee:52:00:69:0b brd ff:ff:ff:ff:ff:ff
student@pesu-OptiPlex-3070:~/Desktop$ sudo ip addr add 172.16.10.201/24 dev wnp1s0
[sudo] password for student:
Cannot find device "wnp1s0"
student@pesu-OptiPlex-3070:~/Desktop$ sudo ip addr add 172.16.10.201/24 dev enp1s0
student@pesu-OptiPlex-3070:~/Desktop$ sudo ip addr add 172.16.11.1/24 dev enx2Bee5200690b
student@pesu-OptiPlex-3070:~/Desktop$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default q
    len 1000
    link/ether 00:4e:01:a2:94:78 brd ff:ff:ff:ff:ff:ff
    inet 172.16.10.201/24 scope global enp1s0
        valid_lft forever preferred_lft forever
3: enx2Bee5200690b: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN g
    roup default qlen 1000
    link/ether 28:ee:52:00:69:0b brd ff:ff:ff:ff:ff:ff
    inet 172.16.11.1/24 scope global enx2Bee5200690b
        valid_lft forever preferred_lft forever
student@pesu-OptiPlex-3070:~/Desktop$ sudo sysctl -w net.ipv4.conf.all.send_redirects=0
net.ipv4.conf.all.send_redirects = 0
student@pesu-OptiPlex-3070:~/Desktop$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 0
student@pesu-OptiPlex-3070:~/Desktop$ sudo sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1

```

```
student@pesu-OptiPlex-3070: ~/Desktop
student@pesu-OptiPlex-3070:~/Desktop$ sudo ip route add 172.16.12.0/24 via 172.16.11.201
student@pesu-OptiPlex-3070:~/Desktop$ ip route show
169.254.0.0/16 dev enp1s0 scope link metric 1000
172.16.10.0/24 dev enp1s0 proto kernel scope link src 172.16.10.201
172.16.11.0/24 dev enx28ee5200690b proto kernel scope link src 172.16.11.1
172.16.12.0/24 via 172.16.11.201 dev enx28ee5200690b
student@pesu-OptiPlex-3070:~/Desktop$ ip neigh show
student@pesu-OptiPlex-3070:~/Desktop$ ping 172.16.11.201
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.
64 bytes from 172.16.11.201: icmp_seq=1 ttl=64 time=1.14 ms
64 bytes from 172.16.11.201: icmp_seq=2 ttl=64 time=0.741 ms
64 bytes from 172.16.11.201: icmp_seq=3 ttl=64 time=0.752 ms
64 bytes from 172.16.11.201: icmp_seq=4 ttl=64 time=0.668 ms
64 bytes from 172.16.11.201: icmp_seq=5 ttl=64 time=0.651 ms
^C
--- 172.16.11.201 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4058ms
rtt min/avg/max/mdev = 0.651/0.790/1.141/0.179 ms
student@pesu-OptiPlex-3070:~/Desktop$ ip neigh show
172.16.11.201 dev enx28ee5200690b lladdr 28:ee:52:00:13:6b DELAY
172.16.10.1 dev enp1s0 lladdr 00:4e:01:a2:84:73 STALE
student@pesu-OptiPlex-3070:~/Desktop$ ip neigh show
172.16.11.201 dev enx28ee5200690b lladdr 28:ee:52:00:13:6b DELAY
172.16.10.1 dev enp1s0 lladdr 00:4e:01:a2:84:73 STALE
student@pesu-OptiPlex-3070:~/Desktop$ ip neigh show
172.16.11.201 dev enx28ee5200690b lladdr 28:ee:52:00:13:6b REACHABLE
172.16.10.1 dev enp1s0 lladdr 00:4e:01:a2:84:73 STALE
student@pesu-OptiPlex-3070:~/Desktop$ ping 172.16.10.1
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.
64 bytes from 172.16.10.1: icmp_seq=1 ttl=64 time=0.601 ms
64 bytes from 172.16.10.1: icmp_seq=2 ttl=64 time=0.700 ms
^C
--- 172.16.10.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1016ms
rtt min/avg/max/mdev = 0.601/0.650/0.700/0.049 ms
student@pesu-OptiPlex-3070:~/Desktop$ ip neigh show
172.16.11.201 dev enx28ee5200690b lladdr 28:ee:52:00:13:6b STALE
172.16.10.1 dev enp1s0 lladdr 00:4e:01:a2:84:73 DELAY
student@pesu-OptiPlex-3070:~/Desktop$ ping 172.16.10.1
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.
64 bytes from 172.16.10.1: icmp_seq=1 ttl=64 time=0.531 ms
```

## Interface enp1s0 Wireshark Capture

The image shows a Wireshark capture of interface enp1s0. The packet list pane displays 16 packets, including ICMP Echo (ping) requests and replies. The packet details pane shows the structure of a ping request, including the Ethernet II header, Internet Protocol Version 4 header, and User Datagram Protocol header. The packet bytes pane shows the raw data of the captured packet.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.0000000	172.16.10.201	224.0.0.251	IGMP	88	Standard query 0x0000 818 1pps -lcp local -NQU Question P18
2	13.107142611	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=1/256, ttl=64 (reply in 3)
3	13.107727952	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=1/256, ttl=64 (request in..)
4	14.125405356	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=2/512, ttl=64 (reply in 5)
5	14.125977984	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=2/512, ttl=64 (request in..)
6	15.149160690	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=3/768, ttl=64 (reply in 7)
7	15.149676160	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=3/768, ttl=64 (request in..)
8	16.173260893	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=4/1024, ttl=64 (reply in ..)
9	16.173936694	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=4/1024, ttl=64 (request i..)
10	17.197402662	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=5/1280, ttl=64 (reply in ..)
11	17.198978369	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=5/1280, ttl=64 (request i..)
12	18.213424168	00:11:a2:84:73	00:11:a2:84:73	ARP	60	Who has 172.16.10.201? Tell 172.16.10.1
13	18.213440221	00:11:a2:84:73	00:11:a2:84:73	ARP	42	172.16.10.201 is at 00:4e:01:a2:84:73
14	18.221156779	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=6/1536, ttl=64 (reply in ..)
15	18.221647934	172.16.10.1	172.16.10.201	ICMP	98	Echo (ping) reply id=0x0004, seq=6/1536, ttl=64 (request i..)
16	18.245391506	172.16.10.201	172.16.10.1	ICMP	98	Echo (ping) request id=0x0004, seq=7/1792, ttl=64 (reply in ..)

Frame 1: 87 bytes on wire (696 bits), 87 bytes captured (696 bits) on interface enp1s0, id 0  
Ethernet II, Src: Dell\_a2:84:73 (00:11:a2:84:73), Dst: IPv4multicast\_fb (01:00:5e:00:00:fb)  
Internet Protocol Version 4, Src: 172.16.10.201, Dst: 224.0.0.251  
User Datagram Protocol, Src Port: 5353, Dst Port: 5353  
Multicast Domain Name System (query)

0000 01 0e 5e 00 00 fb 00 4e 01 a2 84 78 08 00 45 00 ...N...x...E  
0010 00 49 e8 04 40 00 ff 11 3d ca e8 19 0a c9 e0 00 ...I...S...  
0020 00 fb 14 e9 14 e9 00 35 98 1b 00 00 00 00 00 02 ...S...  
0030 00 00 00 00 00 00 05 5f 69 70 73 04 5f 74 63 ...lpps...to  
0040 70 05 0c 0f 63 61 6c 00 00 00 01 64 5f 69 70 p...l...ip  
0050 70 c8 12 00 0c 00 01 p.....

## Router R2

```

0000 28 ae 52 00 13 6b 28 ee 52 00 69 0b 08 00 45 00 ( R - k ( R 1 - E
0010 00 54 49 02 7f 0f 00 81 82 24 10 0b 01 ac 10 Tib0 0 $ -
0020 0c 01 08 00 7b bf 0f 05 00 20 a2 09 0b 01 00 00
0030 00 00 03 d3 de 04 00 00 00 00 10 11 12 13 14 15
0040 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23 24 25
0050 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 34 35
0060 36 37
&(')*+,.,/012345

```



```
student@pesu-OptiPlex-3070: ~$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:4e:01:a2:82:bb brd ff:ff:ff:ff:ff:ff
3: enx28ee5200136b: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 28:ee:52:00:13:6b brd ff:ff:ff:ff:ff:ff
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.11.201/24 dev enx28ee5200136b
[sudo] password for student:
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.12.1/24 dev enp1s0
student@pesu-OptiPlex-3070:~$ sudo sysctl -w net.ipv4.conf.all.send_redirects=0
net.ipv4.conf.all.send_redirects = 0
student@pesu-OptiPlex-3070:~$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 0
student@pesu-OptiPlex-3070:~$ sudo sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
student@pesu-OptiPlex-3070:~$ ping 172.16.12.1
PING 172.16.12.1 (172.16.12.1) 56(84) bytes of data.
64 bytes from 172.16.12.1: icmp_seq=1 ttl=64 time=0.051 ms
64 bytes from 172.16.12.1: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 172.16.12.1: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 172.16.12.1: icmp_seq=4 ttl=64 time=0.048 ms
^C
--- 172.16.12.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3070ms
rtt min/avg/max/mdev = 0.047/0.048/0.051/0.001 ms
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.
64 bytes from 172.16.11.201: icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from 172.16.11.201: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 172.16.11.201: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 172.16.11.201: icmp_seq=4 ttl=64 time=0.049 ms
^C
--- 172.16.11.201 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.047/0.048/0.052/0.002 ms
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.10.0/24 via 172.16.11.1
student@pesu-OptiPlex-3070:~$ ip route show
169.254.0.0/16 dev enx28ee5200136b scope link metric 1000
172.16.10.0/24 via 172.16.11.1 dev enx28ee5200136b
172.16.11.0/24 dev enx28ee5200136b proto kernel scope link src 172.16.11.201
172.16.12.0/24 dev enp1s0 proto kernel scope link src 172.16.12.1
```

```
64 bytes from 172.16.12.1: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 172.16.12.1: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 172.16.12.1: icmp_seq=4 ttl=64 time=0.048 ms
^C
--- 172.16.12.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3070ms
rtt min/avg/max/mdev = 0.047/0.048/0.051/0.001 ms
student@pesu-OptiPlex-3070:~$ ping 172.16.11.201
PING 172.16.11.201 (172.16.11.201) 56(84) bytes of data.
64 bytes from 172.16.11.201: icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from 172.16.11.201: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 172.16.11.201: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 172.16.11.201: icmp_seq=4 ttl=64 time=0.049 ms
^C
--- 172.16.11.201 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.047/0.048/0.052/0.002 ms
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.10.0/24 via 172.16.11.1
student@pesu-OptiPlex-3070:~$ ip route show
169.254.0.0/16 dev enx28ee5200136b scope link metric 1000
172.16.10.0/24 via 172.16.11.1 dev enx28ee5200136b
172.16.11.0/24 dev enx28ee5200136b proto kernel scope link src 172.16.11.201
172.16.12.0/24 dev enp1s0 proto kernel scope link src 172.16.12.1
student@pesu-OptiPlex-3070:~$ ip neigh show
172.16.11.1 dev enx28ee5200136b lladdr 28:ee:52:00:69:0b STALE
student@pesu-OptiPlex-3070:~$ ip neigh show
172.16.11.1 dev enx28ee5200136b lladdr 28:ee:52:00:69:0b STALE
student@pesu-OptiPlex-3070:~$ ip neigh show
172.16.11.1 dev enx28ee5200136b lladdr 28:ee:52:00:69:0b STALE
172.16.12.201 dev enp1s0 lladdr 00:4e:01:a2:94:2d REACHABLE
student@pesu-OptiPlex-3070:~$ ping 172.16.11.1
PING 172.16.11.1 (172.16.11.1) 56(84) bytes of data.
64 bytes from 172.16.11.1: icmp_seq=1 ttl=64 time=0.664 ms
64 bytes from 172.16.11.1: icmp_seq=2 ttl=64 time=0.762 ms
64 bytes from 172.16.11.1: icmp_seq=3 ttl=64 time=0.744 ms
64 bytes from 172.16.11.1: icmp_seq=4 ttl=64 time=0.665 ms
64 bytes from 172.16.11.1: icmp_seq=5 ttl=64 time=0.645 ms
^C
--- 172.16.11.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4184ms
rtt min/avg/max/mdev = 0.645/0.696/0.762/0.047 ms
student@pesu-OptiPlex-3070:~$ ip neigh show
172.16.11.1 dev enx28ee5200136b lladdr 28:ee:52:00:69:0b REACHABLE
172.16.12.201 dev enp1s0 lladdr 00:4e:01:a2:94:2d STALE
student@pesu-OptiPlex-3070:~$
```

## Interface enx28ee5200136b Wireshark Capture

Wireshark capture titled "enx28ee5200136b". The packet list shows 22 packets, including ICMP Echo (ping) requests and replies, and ARP requests. The packet details pane shows the selected packet (No. 1) as an ICMP Echo (ping) request from 172.16.11.1 to 172.16.12.1. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=118/30208, ttl=64 (reply in 0.000000000)
2	0.000000000	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=118/30208, ttl=64 (request in 0.000000000)
3	1.024916541	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=119/30464, ttl=64 (reply in 1.024916541)
4	1.024916541	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=119/30464, ttl=64 (request in 1.024916541)
5	2.048067999	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=120/30720, ttl=64 (reply in 2.048067999)
6	2.048067999	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=120/30720, ttl=64 (request in 2.048067999)
7	2.176133516	Tp-LinkT_00:69:00:00	Tp-LinkT_00:13:6b	ARP	60	Who has 172.16.11.201? Tell 172.16.11.1
8	2.176133516	Tp-LinkT_00:13:6b	Tp-LinkT_00:69:00:00	ARP	42	172.16.11.201 is at 28:ee:52:00:13:6b
9	3.072071534	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=121/30976, ttl=64 (reply in 3.072071534)
10	3.072071534	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=121/30976, ttl=64 (request in 3.072071534)
11	4.096318951	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=122/31232, ttl=64 (reply in 4.096318951)
12	4.096318951	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=122/31232, ttl=64 (request in 4.096318951)
13	5.120269571	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=123/31488, ttl=64 (reply in 5.120269571)
14	5.120269571	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=123/31488, ttl=64 (request in 5.120269571)
15	6.144273753	172.16.11.1	172.16.12.1	ICMP	60	Echo (ping) request id=0x0005, seq=124/31744, ttl=64 (reply in 6.144273753)
16	6.144273753	172.16.12.1	172.16.11.1	ICMP	60	Echo (ping) reply id=0x0005, seq=124/31744, ttl=64 (request in 6.144273753)

Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface enx28ee5200136b, id 0  
 Ethernet II, Src: Tp-LinkT\_00:69:00:00 (28:ee:52:00:69:00), Dst: Tp-LinkT\_00:13:6b (28:ee:52:00:13:6b)  
 Internet Protocol Version 4, Src: 172.16.11.1, Dst: 172.16.12.1  
 Internet Control Message Protocol

Wireshark\_enx28ee5200136b\_20210327160330\_OHnv4l.pcapng

Packets: 22 · Displayed: 22 (100.0%)

Profile: Default

## Interface enp1s0 Wireshark Capture

Wireshark capture titled "enp1s0". The packet list shows 20 packets, including ICMP Echo (ping) requests and replies, and ARP requests. The packet details pane shows the selected packet (No. 1) as an ICMP Echo (ping) request from 172.16.12.1 to 172.16.12.201. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=24/6144, ttl=64 (reply in 0.000000000)
2	0.000000000	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=24/6144, ttl=64 (request in 0.000000000)
3	1.024916541	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=25/6400, ttl=64 (reply in 1.024916541)
4	1.024916541	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=25/6400, ttl=64 (request in 1.024916541)
5	2.047993873	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=26/6656, ttl=64 (reply in 2.047993873)
6	2.047993873	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=26/6656, ttl=64 (request in 2.047993873)
7	3.072071534	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=27/6912, ttl=64 (reply in 3.072071534)
8	3.072071534	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=27/6912, ttl=64 (request in 3.072071534)
9	4.096318951	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=28/7168, ttl=64 (reply in 4.096318951)
10	4.096318951	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=28/7168, ttl=64 (request in 4.096318951)
11	5.120269571	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=29/7424, ttl=64 (reply in 5.120269571)
12	5.120269571	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=29/7424, ttl=64 (request in 5.120269571)
13	5.238266558	De11_a2:94:2d	De11_a2:82:bb	ARP	60	Who has 172.16.12.1? Tell 172.16.12.201
14	5.238266558	De11_a2:82:bb	De11_a2:94:2d	ARP	42	172.16.12.1 is at 00:4e:01:a2:82:bb
15	6.144273753	172.16.12.1	172.16.12.201	ICMP	60	Echo (ping) request id=0x0005, seq=30/7680, ttl=64 (reply in 6.144273753)
16	6.144273753	172.16.12.201	172.16.12.1	ICMP	60	Echo (ping) reply id=0x0005, seq=30/7680, ttl=64 (request in 6.144273753)

Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface enp1s0, id 0  
 Ethernet II, Src: De11\_a2:82:bb (00:4e:01:a2:82:bb), Dst: De11\_a2:94:2d (00:4e:01:a2:94:2d)  
 Internet Protocol Version 4, Src: 172.16.12.1, Dst: 172.16.12.201  
 Internet Control Message Protocol

Wireshark\_enp1s0\_20210327160430\_IUjHnw.pcapng

Packets: 20 · Displayed: 20 (100.0%)

Profile: Default

# Host Hd

```
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:94:2d brd ff:ff:ff:ff:ff:ff  
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.12.201/24 dev enp1s0  
[sudo] password for student:  
Sorry, try again.  
[sudo] password for student:  
student@pesu-OptiPlex-3070:~$ sudo ip addr add 172.16.12.201/24 dev enp1s0  
RTNETLINK answers: File exists  
student@pesu-OptiPlex-3070:~$ ip addr show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether 00:4e:01:a2:94:2d brd ff:ff:ff:ff:ff:ff  
    inet 172.16.12.201/24 scope global enp1s0  
        valid_lft forever preferred_lft forever  
student@pesu-OptiPlex-3070:~$ sudo sysctl -w net.ipv4.conf.all.send_redirects=0  
net.ipv4.conf.all.send_redirects = 0  
student@pesu-OptiPlex-3070:~$ ping 172.16.10.201  
ping: connect: Network is unreachable  
student@pesu-OptiPlex-3070:~$ ping 172.16.12.201  
PING 172.16.12.201 (172.16.12.201) 56(84) bytes of data.  
64 bytes from 172.16.12.201: icmp_seq=1 ttl=64 time=0.051 ms  
64 bytes from 172.16.12.201: icmp_seq=2 ttl=64 time=0.048 ms  
64 bytes from 172.16.12.201: icmp_seq=3 ttl=64 time=0.049 ms  
^C  
--- 172.16.12.201 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2046ms  
rtt min/avg/max/mdev = 0.048/0.049/0.051/0.001 ms  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.10.0/24 via 172.16.12.1  
student@pesu-OptiPlex-3070:~$ sudo ip route add 172.16.11.0/24 via 172.16.12.1  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 via 172.16.12.1 dev enp1s0  
172.16.11.0/24 via 172.16.12.1 dev enp1s0
```

```
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070: ~  
student@pesu-OptiPlex-3070:~$ ip route show  
169.254.0.0/16 dev enp1s0 scope link metric 1000  
172.16.10.0/24 via 172.16.12.1 dev enp1s0  
172.16.11.0/24 via 172.16.12.1 dev enp1s0  
172.16.12.0/24 dev enp1s0 proto kernel scope link src 172.16.12.01  
student@pesu-OptiPlex-3070:~$ ping 172.16.12.1  
PING 172.16.12.1 (172.16.12.1) 56(84) bytes of data.  
64 bytes from 172.16.12.1: icmp_seq=1 ttl=64 time=1.10 ms  
64 bytes from 172.16.12.1: icmp_seq=2 ttl=64 time=0.724 ms  
64 bytes from 172.16.12.1: icmp_seq=3 ttl=64 time=0.704 ms  
64 bytes from 172.16.12.1: icmp_seq=4 ttl=64 time=0.714 ms  
^C  
--- 172.16.12.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3038ms  
rtt min/avg/max/mdev = 0.704/0.810/1.098/0.166 ms  
student@pesu-OptiPlex-3070:~$ ip neigh show  
172.16.12.1 dev enp1s0 lladdr 00:4e:01:a2:82:bb REACHABLE  
student@pesu-OptiPlex-3070:~$ ping 172.16.10.1  
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.  
64 bytes from 172.16.10.1: icmp_seq=1 ttl=62 time=1.94 ms  
64 bytes from 172.16.10.1: icmp_seq=2 ttl=62 time=2.13 ms  
64 bytes from 172.16.10.1: icmp_seq=3 ttl=62 time=1.86 ms  
64 bytes from 172.16.10.1: icmp_seq=4 ttl=62 time=2.27 ms  
^C  
--- 172.16.10.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3004ms  
rtt min/avg/max/mdev = 1.861/2.048/2.265/0.158 ms
```



```
student@pesu-OptiPlex-3070: ~  
--- 172.16.10.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3004ms  
rtt min/avg/max/mdev = 1.861/2.048/2.265/0.158 ms  
student@pesu-OptiPlex-3070:~$ ping 172.16.12.1  
PING 172.16.12.1 (172.16.12.1) 56(84) bytes of data.  
64 bytes from 172.16.12.1: icmp_seq=1 ttl=64 time=0.527 ms  
64 bytes from 172.16.12.1: icmp_seq=2 ttl=64 time=0.706 ms  
64 bytes from 172.16.12.1: icmp_seq=3 ttl=64 time=0.623 ms  
64 bytes from 172.16.12.1: icmp_seq=4 ttl=64 time=0.617 ms  
64 bytes from 172.16.12.1: icmp_seq=5 ttl=64 time=0.624 ms  
64 bytes from 172.16.12.1: icmp_seq=6 ttl=64 time=0.709 ms  
64 bytes from 172.16.12.1: icmp_seq=7 ttl=64 time=0.645 ms  
64 bytes from 172.16.12.1: icmp_seq=8 ttl=64 time=0.617 ms  
64 bytes from 172.16.12.1: icmp_seq=9 ttl=64 time=0.547 ms  
64 bytes from 172.16.12.1: icmp_seq=10 ttl=64 time=0.496 ms  
64 bytes from 172.16.12.1: icmp_seq=11 ttl=64 time=0.614 ms  
64 bytes from 172.16.12.1: icmp_seq=12 ttl=64 time=0.525 ms  
64 bytes from 172.16.12.1: icmp_seq=13 ttl=64 time=0.704 ms  
64 bytes from 172.16.12.1: icmp_seq=14 ttl=64 time=0.621 ms  
64 bytes from 172.16.12.1: icmp_seq=15 ttl=64 time=0.701 ms  
^C  
--- 172.16.12.1 ping statistics ---  
15 packets transmitted, 15 received, 0% packet loss, time 14318ms  
rtt min/avg/max/mdev = 0.496/0.618/0.709/0.067 ms  
student@pesu-OptiPlex-3070:~$ ping 172.16.10.1  
PING 172.16.10.1 (172.16.10.1) 56(84) bytes of data.  
64 bytes from 172.16.10.1: icmp_seq=1 ttl=62 time=1.74 ms  
64 bytes from 172.16.10.1: icmp_seq=2 ttl=62 time=2.02 ms  
64 bytes from 172.16.10.1: icmp_seq=3 ttl=62 time=1.97 ms  
64 bytes from 172.16.10.1: icmp_seq=4 ttl=62 time=2.22 ms  
64 bytes from 172.16.10.1: icmp_seq=5 ttl=62 time=2.23 ms  
64 bytes from 172.16.10.1: icmp_seq=6 ttl=62 time=1.99 ms  
64 bytes from 172.16.10.1: icmp_seq=7 ttl=62 time=2.14 ms  
64 bytes from 172.16.10.1: icmp_seq=8 ttl=62 time=1.97 ms  
64 bytes from 172.16.10.1: icmp_seq=9 ttl=62 time=2.11 ms  
64 bytes from 172.16.10.1: icmp_seq=10 ttl=62 time=1.98 ms  
64 bytes from 172.16.10.1: icmp_seq=11 ttl=62 time=1.98 ms  
64 bytes from 172.16.10.1: icmp_seq=12 ttl=62 time=2.28 ms  
^C  
--- 172.16.10.1 ping statistics ---  
12 packets transmitted, 12 received, 0% packet loss, time 11015ms  
rtt min/avg/max/mdev = 1.737/2.051/2.278/0.143 ms  
student@pesu-OptiPlex-3070:~$
```

Capturing from any

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-J>

No.	Time	Source	Destination	Protocol	Length	Info
127	12.288179099	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=131/33536, ttl=64 (reply ...
128	12.288217443	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=131/33536, ttl=64 (request ...
129	12.863363190	172.16.12.201	172.16.10.1	ICMP	100	Echo (ping) request id=0x0005, seq=12/3072, ttl=64 (reply in ...
130	12.865610389	172.16.10.1	172.16.12.201	ICMP	100	Echo (ping) reply id=0x0005, seq=12/3072, ttl=62 (request ...
131	13.312187241	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=132/33792, ttl=64 (reply ...
132	13.312226091	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=132/33792, ttl=64 (request ...
133	14.335947679	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=133/34048, ttl=64 (reply ...
134	14.335964247	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=133/34048, ttl=64 (request ...
135	15.360147600	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=134/34304, ttl=64 (reply ...
136	15.360189925	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=134/34304, ttl=64 (request ...
137	16.384153794	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=135/34560, ttl=64 (reply ...
138	16.384192325	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=135/34560, ttl=64 (request ...
139	17.408138498	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=136/34816, ttl=64 (reply ...
140	17.408176543	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=136/34816, ttl=64 (request ...
141	18.431930338	172.16.12.1	172.16.12.201	ICMP	100	Echo (ping) request id=0x0005, seq=137/35072, ttl=64 (reply ...
142	18.431871280	172.16.12.201	172.16.12.1	ICMP	100	Echo (ping) reply id=0x0005, seq=137/35072, ttl=64 (request ...

Frame 1: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface any, id 0  
Linux cooked capture  
Internet Protocol Version 4, Src: 172.16.12.1, Dst: 172.16.12.201  
Internet Control Message Protocol

0000 00 00 00 01 00 00 00 4e 61 a2 82 bb 00 00 08 00 N  
0010 45 00 00 54 5d 0b 40 00 40 01 0b e3 ac 10 0c 61 E.T] 0 0:k  
0020 ac 10 0c c9 00 00 17 dc 00 05 00 77 97 0a 5f 60 W .  
0030 00 00 00 00 1d 6a 04 00 00 00 00 10 11 12 13 j  
0040 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f 20 21 22 23  
0050 24 25 26 27 28 29 2a 2b 2c 2d 2e 2f 30 31 32 33 %\$()\*+ ,-. /0123  
0060 34 35 36 37 4567

any: <live capture in progress> Packets: 152 · Displayed: 152 (100.0%) Profile: Default