



# UNIVERSITY OF DHAKA

Department of Computer Science and Engineering

CSE-3111 : Computer Networking Lab

**Lab Report 1 :** Lab exercises on LAN configuration and troubleshooting tools

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# 1 Introduction

In this lab session, our emphasis was on acquiring practical knowledge related to the establishment of local area networks (LANs) and the utilization of tools for identifying and resolving issues. The primary aim was to enhance our comprehension of key concepts in network management. Our objectives included becoming proficient in the application of tools such as PING, Traceroute, ARP, static routing, netstat, ifconfig, nslookup etc. The purpose of this study was to establish a connection between theoretical understanding and the practical utilization of tools crucial for effective network management and diagnostics.

## 1.1 Objectives

- To develop practical skills in using a variety of LAN configuration and troubleshooting tools such as PING, Traceroute, ARP, Static routing, netstat, ifconfig, nslookup,
- To explore the different settings available and to grasp the fundamental functions of these tools.

# 2 Theory

This part provides an explanation of the theoretical background for the commands used, including their functions and significance in LAN configuration and troubleshooting.

1. **PING:** PING, also known as Packet Internet Groper, is a network diagnostic tool utilized to examine the accessibility of a host on an Internet Protocol (IP) network. This diagnostic utility assesses the capability to reach a host by sending ICMP Echo Request messages. The time taken for the round trip is measured, and the confirmation of the remote host's availability is determined based on this measurement.
2. **TRACEROUTE:** Traceroute is a tool designed to trace the route taken by a packet to reach its destination. It reveals the network pathways and the round-trip duration for each intermediate stop encountered along the way.

3. **IFCONFIG:** Ifconfig, an abbreviation for Interface Configuration, is a command employed to retrieve and exhibit comprehensive information about network interfaces on Unix-like systems. It facilitates the administration of IP configurations.
4. **ARP:** ARP, which stands for Address Resolution Protocol, is a command-line utility utilized in networking to display the address resolution cache. In IPv4 networks, ARP is used to establish a mapping between IP addresses and MAC (Media Access Control) addresses.
5. **RARP:** Reverse Address Resolution Protocol (RARP) is a networking protocol used to obtain the IP address linked to a specific MAC address. It is frequently used for dynamically assigning IP addresses.
6. **NSLOOKUP:** It is used to inquire with a DNS server for domain and IP information, aiding in the diagnosis of DNS-related issues.
7. **NETSTAT:** Netstat is utilized for monitoring and debugging network activities by providing information on network connections, routing tables, and interface data.

### 3 Methodology

To get insights regarding networking resources, we went into different sources, including web articles. Once we comprehended the core principles, we continued to install and run commands, evaluating the outcomes and assuring alignment with expectations. Communication includes accessing public websites like Google and locally networked PCs in the lab. Any differences from projected results required a careful assessment of underlying factors. With a core understanding established, we studied further aspects and applications linked with the commands, attempting to detect their various importance in diverse areas. Here all the commands have been run except *rarp* because of it being outdated.

## 4 Experimental result

### 4.1 PING

```
ping facebook.com
```

```

reckless_mehrun@LAPTOP-QQEY4AP4:~$ ping facebook.com
PING facebook.com (31.13.64.35) 56(84) bytes of data.
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=1 ttl=55 time=12.9 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=2 ttl=55 time=41.5 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=3 ttl=55 time=11.3 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=4 ttl=55 time=33.1 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=5 ttl=55 time=12.9 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=6 ttl=55 time=16.0 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=7 ttl=55 time=37.7 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=8 ttl=55 time=40.4 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=9 ttl=55 time=14.7 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=10 ttl=55 time=31.2 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=11 ttl=55 time=14.4 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=12 ttl=55 time=11.0 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=13 ttl=55 time=10.3 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=14 ttl=55 time=17.4 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=15 ttl=55 time=10.7 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=16 ttl=55 time=9.87 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=17 ttl=55 time=11.1 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=18 ttl=55 time=31.2 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=19 ttl=55 time=26.8 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=20 ttl=55 time=13.0 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=21 ttl=55 time=19.2 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=22 ttl=55 time=14.9 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=23 ttl=55 time=15.5 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=24 ttl=55 time=32.5 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=25 ttl=55 time=16.3 ms
^C
--- facebook.com ping statistics ---
25 packets transmitted, 25 received, 0% packet loss, time 24037ms
rtt min/avg/max/mdev = 9.865/20.232/41.500/10.247 ms
reckless_mehrun@LAPTOP-QQEY4AP4:~$
```

Figure 1: Sending ping to facebook

### Limiting ping count

-c flag is used to fix the number of echo request to be sent in order to avoid sending infinite echo requests.

```

reckless_mehrun@LAPTOP-QQEY4AP4:~$ ping -c 3 facebook.com
PING facebook.com (31.13.64.35) 56(84) bytes of data.
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=1 ttl=55 time=11.8 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=2 ttl=55 time=19.4 ms
64 bytes from edge-star-mini-shv-02-ccu1.facebook.com (31.13.64.35): icmp_seq=3 ttl=55 time=14.7 ms
--- facebook.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 11.795/15.296/19.400/3.133 ms
reckless_mehrun@LAPTOP-QQEY4AP4:~$
```

Figure 2: Limiting ping count to 3

## 4.2 TRACEROUTE

traceroute youtube.com

```

reckless_meherun@LAPTOP-QQEVE4AP4:~$ traceroute youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
1 LAPTOP-QQEVE4AP4 (172.29.96.1) 0.448 ms 0.420 ms 0.412 ms
2 192.168.0.1 (192.168.0.1) 2.855 ms 2.836 ms 3.853 ms
3 10.150.106.1 (10.150.106.1) 5.360 ms 4.423 ms 5.029 ms
4 * * *
5 * * *
6 103.179.62.95 (103.179.62.95) 5.953 ms 3.699 ms 3.483 ms
7 72.14.221.138 (72.14.221.138) 37.585 ms 36.909 ms 55.319 ms
8 * * *
9 209.85.248.210 (209.85.248.210) 36.011 ms 209.85.247.250 (209.85.247.250) 36.415 ms 74.125.242.129 (74.125.242.129) 38.048 ms
10 74.125.242.130 (74.125.242.130) 36.410 ms 74.125.242.139 (74.125.242.139) 38.074 ms 142.251.55.69 (142.251.55.69) 35.993 ms
11 108.178.250.113 (108.178.250.113) 36.305 ms 36.303 ms maa03s39-in-f14.1e100.net (142.250.195.110) 32.264 ms
reckless_meherun@LAPTOP-QQEVE4AP4:~$
```

Figure 3: Tracking the route of a packet sent to youtube.com

### Limits maximum number of hops

`-m` flag is used to specify the maximum number of hops (max time-to-live value) traceroute will probe. The default is 30.

```

reckless_meherun@LAPTOP-QQEVE4AP4:~$ traceroute -d youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
setsockopt SO_DEBUG: Permission denied
reckless_meherun@LAPTOP-QQEVE4AP4:~$ traceroute -d google.com
traceroute to google.com (142.250.193.110), 30 hops max, 60 byte packets
setsockopt SO_DEBUG: Permission denied
reckless_meherun@LAPTOP-QQEVE4AP4:~$ sudo traceroute -d youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
1 LAPTOP-QQEVE4AP4 (172.29.96.1) 0.344 ms 0.258 ms 0.225 ms
2 192.168.0.1 (192.168.0.1) 1.676 ms 1.590 ms 1.570 ms
3 10.150.106.1 (10.150.106.1) 2.170 ms 2.125 ms 5.270 ms
4 * * *
5 103.131.159.70 (103.131.159.70) 4.869 ms 103.131.159.66 (103.131.159.66) 5.356 ms 103.131.159.70 (103.131.159.70) 19.370 ms
6 103.179.62.95 (103.179.62.95) 24.531 ms 9.223 ms 8.707 ms
7 72.14.221.138 (72.14.221.138) 606.011 ms 1176.490 ms 1178.566 ms
8 * * *
9 142.251.55.30 (142.251.55.30) 35.626 ms 142.251.49.218 (142.251.49.218) 33.071 ms 33.048 ms
10 maa03s39-in-f14.1e100.net (142.250.195.110) 32.748 ms 142.251.55.71 (142.251.55.71) 32.744 ms 74.125.242.147 (74.125.242.147) 33.083 ms
reckless_meherun@LAPTOP-QQEVE4AP4:~$
```

Figure 4: limiting maximum hop count to 3

```

reckless_meherun@LAPTOP-QQEVE4AP4:~$ traceroute -N 4 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
1 LAPTOP-QQEVE4AP4 (172.29.96.1) 0.280 ms 0.297 ms 0.259 ms
2 192.168.0.1 (192.168.0.1) 23.685 ms 7.589 ms 7.547 ms
3 10.150.106.1 (10.150.106.1) 8.971 ms 3.474 ms 3.360 ms
4 * 103.7.250.201 (103.7.250.201) 11.264 ms *
5 hu-cig1-0000-cig2-0000.pico.net.bd (163.47.159.93) 8.954 ms 103.131.159.70 (103.131.159.70) 12.812 ms *
6 103.131.159.185 (103.131.159.185) 5.762 ms 103.179.62.95 (103.179.62.95) 12.209 ms 103.131.159.185 (103.131.159.185) 16.580 ms
7 72.14.221.138 (72.14.221.138) 75.415 ms 40.274 ms 36.501 ms
8 * * *
9 216.239.47.142 (216.239.47.142) 34.800 ms maa03s39-in-f14.1e100.net (142.250.195.110) 31.505 ms 142.251.55.240 (142.251.55.240) 33.182 ms
s
reckless_meherun@LAPTOP-QQEVE4AP4:~$
```

```

reckless_meherun@LAPTOP-QQEVE4AP4:~$ traceroute -m 6 youtube.com
traceroute to youtube.com (142.250.195.110), 6 hops max, 60 byte packets
1 LAPTOP-QQEVE4AP4 (172.29.96.1) 0.307 ms 0.290 ms 0.284 ms
2 192.168.0.1 (192.168.0.1) 1.550 ms 0.998 ms 1.761 ms
3 10.150.106.1 (10.150.106.1) 2.330 ms 2.406 ms 3.131 ms
4 * * *
5 hu-cig1-0000-cig2-0000.pico.net.bd (163.47.159.93) 35.672 ms * *
6 103.179.62.95 (103.179.62.95) 35.714 ms 103.131.159.185 (103.131.159.185) 7.122 ms 15.849 ms
reckless_meherun@LAPTOP-QQEVE4AP4:~$
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ traceroute -q 1 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 1 LAPTOP-QQEY4AP4 (172.29.96.1)  0.421 ms
 2 192.168.0.1 (192.168.0.1)  3.180 ms
 3 10.150.106.1 (10.150.106.1)  3.186 ms
 4 103.7.250.201 (103.7.250.201)  2.880 ms
 5 *
 6 103.131.159.185 (103.131.159.185)  14.677 ms
 7 72.14.221.138 (72.14.221.138)  40.941 ms
 8 *
 9 142.251.55.232 (142.251.55.232)  39.073 ms
10 74.125.242.130 (74.125.242.130)  39.168 ms
11 maa03s39-in-f14.1e100.net (142.250.195.110)  39.643 ms
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ traceroute -n youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 1 172.29.96.1  2.080 ms  2.066 ms  1.354 ms
 2 192.168.0.1  1.988 ms  4.763 ms  5.746 ms
 3 10.150.106.1  8.389 ms  5.895 ms  5.886 ms
 4 103.7.250.201  9.000 ms * *
 5 * 103.131.159.70  72.660 ms *
 6 103.131.159.185  76.363 ms 103.179.62.95  75.615 ms  77.188 ms
 7 72.14.221.138  78.897 ms  78.187 ms  76.636 ms
 8 * * *
 9 74.125.252.90  78.773 ms 142.251.55.88  78.242 ms 142.251.55.216  69.007 ms
10 74.125.242.130  68.500 ms 74.125.242.155  65.026 ms 74.125.242.154  74.250 ms
11 142.250.195.110  61.367 ms  61.818 ms  60.217 ms
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ traceroute -f 10 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 10 74.125.242.154 (74.125.242.154)  47.563 ms 74.125.242.147 (74.125.242.147)  55.013 ms 74.125.242.154 (74.125.242.154)  47.954 ms
 11 108.170.253.97 (108.170.253.97)  55.238 ms maa03s39-in-f14.1e100.net (142.250.195.110)  46.696 ms  53.639 ms
reckless_meherun@LAPTOP-QQEY4AP4:~$
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ traceroute -w 3.6 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 1 LAPTOP-QQEY4AP4 (172.29.96.1)  0.501 ms  0.464 ms  0.433 ms
 2 192.168.0.1 (192.168.0.1)  7.818 ms  7.959 ms  7.968 ms
 3 10.150.106.1 (10.150.106.1)  8.116 ms  8.111 ms  8.009 ms
 4 103.7.250.201 (103.7.250.201)  11.932 ms * 18.276 ms
 5 * 103.131.159.66 (103.131.159.66)  18.249 ms *
 6 103.131.159.185 (103.131.159.185)  19.038 ms 103.179.62.95 (103.179.62.95)  57.004 ms 103.131.159.185 (103.131.159.185)  42.203 ms
 7 72.14.221.138 (72.14.221.138)  63.239 ms  36.937 ms  42.084 ms
 8 * *
 9 142.251.55.30 (142.251.55.30)  31.974 ms 142.251.55.40 (142.251.55.40)  29.876 ms 74.125.253.16 (74.125.253.16)  32.855 ms
10 142.251.55.71 (142.251.55.71)  30.338 ms 74.125.242.146 (74.125.242.146)  36.893 ms 74.125.242.155 (74.125.242.155)  44.190 ms
11 maa03s39-in-f14.1e100.net (142.250.195.110)  39.700 ms  39.692 ms  39.683 ms
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ traceroute -z 2 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 1 LAPTOP-QQEY4AP4 (172.29.96.1)  0.478 ms  0.441 ms  0.368 ms
 2 192.168.0.1 (192.168.0.1)  14.748 ms  13.335 ms  16.765 ms
 3 10.150.106.1 (10.150.106.1)  5.457 ms  2.287 ms  1.966 ms
 4 103.7.250.201 (103.7.250.201)  3.088 ms * *
 5 103.131.159.66 (103.131.159.66)  18.062 ms *
 6 103.179.62.95 (103.179.62.95)  30.108 ms  7.715 ms  40.328 ms
 7 72.14.221.138 (72.14.221.138)  649.719 ms  55.773 ms  42.734 ms
 8 * *
 9 * 74.125.242.129 (74.125.242.129)  36.479 ms 142.251.55.240 (142.251.55.240)  31.907 ms
10 142.251.55.69 (142.251.55.69)  32.705 ms 74.125.242.155 (74.125.242.155)  39.693 ms 142.251.55.71 (142.251.55.71)  29.371 ms
11 maa03s39-in-f14.1e100.net (142.250.195.110)  33.448 ms 108.170.253.113 (108.170.253.113)  39.842 ms maa03s39-in-f14.1e100.net (142.250.195.1
10)  36.918 ms
```

```
reckless_mehlerun@LAPTOP-QQEY4AP4:~$ traceroute -i eth0 youtube.com
traceroute to youtube.com (142.250.195.110), 30 hops max, 60 byte packets
 1 LAPTOP-QQEY4AP4 (172.29.96.1) 0.495 ms 0.466 ms 0.481 ms
 2 192.168.0.1 (192.168.0.1) 5.730 ms 4.417 ms 4.230 ms
 3 10.150.106.1 (10.150.106.1) 5.761 ms 4.683 ms 4.672 ms
 4 * * *
 5 * * *
 6 103.131.159.185 (103.131.159.185) 9.510 ms 103.179.62.95 (103.179.62.95) 66.620 ms 103.131.159.185 (103.131.159.185) 66.217 ms
 7 72.14.221.138 (72.14.221.138) 97.811 ms 44.248 ms 49.719 ms
 8 * * *
 9 * 142.251.55.232 (142.251.55.232) 42.952 ms *
10 74.125.242.155 (74.125.242.155) 44.818 ms 74.125.242.146 (74.125.242.146) 46.129 ms 74.125.242.131 (74.125.242.131) 44.600 ms
11 188.170.253.97 (188.170.253.97) 44.279 ms 44.447 ms *
12 maa03s39-in-f14.1e100.net (142.250.195.110) 32.878 ms 33.000 ms 142.251.55.69 (142.251.55.69) 100.274 ms
```

### 4.3 IFCONFIG

**ifconfig**

```
reckless_mehlerun@LAPTOP-QQEY4AP4:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.29.96.128 netmask 255.255.240.0 broadcast 172.29.111.255
          inet6 fe80::215:5dff:feb4:a63b prefixlen 64 scopeid 0x20<link>
            ether 00:15:5d:b4:a6:3b txqueuelen 1000 (Ethernet)
              RX packets 18030 bytes 23352430 (23.3 MB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 4975 bytes 454101 (454.1 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 2 bytes 100 (100.0 B)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 2 bytes 100 (100.0 B)
              TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

reckless_mehlerun@LAPTOP-QQEY4AP4:~$
```

Figure 5: Getting currently active interfaces information using ifconfig

### Getting all interfaces

-a flag is to display all interfaces which are currently available, even if down.

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ ifconfig -a
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.29.96.128 netmask 255.255.240.0 broadcast 172.29.111.255
          inet6 fe80::215:5dff:feb4:a63b prefixlen 64 scopeid 0x20<link>
            ether 00:15:5d:b4:a6:3b txqueuelen 1000 (Ethernet)
              RX packets 18036 bytes 23352982 (23.3 MB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 4975 bytes 454101 (454.1 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)
```

Figure 6: Getting all interfaces

### Specifying an interface

Providing the name of an interface shows information about that only.

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.29.96.128 netmask 255.255.240.0 broadcast 172.29.111.255
          inet6 fe80::215:5dff:feb4:a63b prefixlen 64 scopeid 0x20<link>
            ether 00:15:5d:b4:a6:3b txqueuelen 1000 (Ethernet)
              RX packets 18050 bytes 23355270 (23.3 MB)
              RX errors 0 dropped 0 overruns 0 frame 0
              TX packets 4975 bytes 454101 (454.1 KB)
              TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Figure 7: Getting information of eth0 interface

### Activating an interface

*up* is used to activate an interface.

```
jamal@LAPTOP-VM6JRRKS:~$ ifconfig eth0 up
SIOCSIFFLAGS: Operation not permitted
```

Figure 8: Activating eth0

#### 4.4 ARP

`arp`

```
#reckless_meherun@LAPTOP-QQEY4AP4:~$ more /etc/hosts
# This file was automatically generated by WSL. To stop automatic generation of this file, add the following entry to /etc/wsl.conf:
# [network]
# generateHosts = false
127.0.0.1      localhost
127.0.1.1      LAPTOP-QQEY4AP4

# The following lines are desirable for IPv6 capable hosts
::1      ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
reckless_meherun@LAPTOP-QQEY4AP4:~$
```

Figure 9: Showing the current table content

#### Verbose

`-V` flag provides a more verbose description.

#### Numeric address

`-n` flag shows numeric addresses instead of symbolic names

```
#reckless_meherun@LAPTOP-QQEY4AP4:~$ arp -v
Address          HWtype  HWaddress           Flags Mask     Iface
172.29.96.4      ether   00:15:5d:8f:62:38  C       eth0
172.29.96.2      ether   00:15:5d:8f:62:38  C       eth0
172.29.96.5      ether   00:15:5d:8f:62:38  C       eth0
LAPTOP-QQEY4AP4  ether   00:15:5d:8f:62:38  C       eth0
Entries: 4        Skipped: 0    Found: 4
reckless_meherun@LAPTOP-QQEY4AP4:~$ arp -n
Address          HWtype  HWaddress           Flags Mask     Iface
172.29.96.4      ether   00:15:5d:8f:62:38  C       eth0
172.29.96.2      ether   00:15:5d:8f:62:38  C       eth0
172.29.96.5      ether   00:15:5d:8f:62:38  C       eth0
172.29.96.1      ether   00:15:5d:8f:62:38  C       eth0
reckless_meherun@LAPTOP-QQEY4AP4:~$
```

Figure 10: Different arp flags

## 4.5 RARP

```
rarp
```

```
jamal@LAPTOP-VM6JRRKS:~$ rarp -a
This kernel does not support RARP.
jamal@LAPTOP-VM6JRRKS:~$
```

Figure 11: RARP not usable for being outdated

## 4.6 NSLOOKUP

```
traceroute youtube.com
```

```
reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup youtube.com
Server:      172.29.96.1
Address:     172.29.96.1#53

Non-authoritative answer:
Name:   youtube.com
Address: 142.250.195.110
Name:   youtube.com
Address: 2404:6800:4007:824::200e

reckless_meherun@LAPTOP-QQEY4AP4:~$
```

Figure 12: Printing the name and requested information for a youtube.com.

### **View all available records.**

*-type=any* flag is used to view all available records about the host. We can also specify what type of information we want.

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup -type=any google.com 8.8.8.8
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
Name:  google.com
Address: 142.250.183.46
Name:  google.com
Address: 2404:6800:4009:821::200e
google.com
    origin = ns1.google.com
    mail addr = dns-admin.google.com
    serial = 601064098
    refresh = 900
    retry = 900
    expire = 1800
    minimum = 60
google.com  text = "webdomainverification.8YX66=6e6922db-e3e6-4a36-904e-a805c28087fa"
google.com  rdata_257 = 0 issue "pki.goog"
google.com  text = "MS=E4A65B9AB2BB96708CE15412F62916164C0B20BB"
google.com  text = "facebook-domain-verification=22rm551cu4kab0bxsw536tlds4h95"
google.com  nameserver = ns1.google.com.
google.com  text = "google-site-verification=wD8N7i1JNTkezJ49svvWW48f8_9xveREV4oB-0Hf5o"
google.com  nameserver = ns4.google.com.
google.com  text = "apple-domain-verification=30afIBcvSuDV2PLX"
google.com  text = "docusign=05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
google.com  mail exchanger = 10 smtp.google.com.
google.com  text = "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cpoJM0nikft0jAgjmsQ"
google.com  nameserver = ns2.google.com.
google.com  text = "atlassian-domain-verification=5YjTmWmj192ewqkx2oXmbaD60fd9zWon9r6eakvHX6B77zzkFQt08PQ9QsKnbF4I"
google.com  text = "globalsign-smime-dv=CDYX+XFHUw2wm16/Gb8+59BsH31KzUr6c1l2BPvqKX8-"
google.com  nameserver = ns3.google.com.
google.com  text = "v=spf1 include: spf.google.com ~all"
google.com  rdata_65 = 1 : alpn="h2,h3"
google.com  text = "docusign=1b0a6754-49b1-4db5-8540-d2c12664b289"
google.com  text = "onetrust-domain-verification=d01ed2f2fa4d8781cbc3ffb89cf4ef"

Authoritative answers can be found from:

```

Figure 13: View all available records of youtube.com

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup -type=ns google.com 8.8.8.8
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
google.com  nameserver = ns3.google.com.
google.com  nameserver = ns1.google.com.
google.com  nameserver = ns4.google.com.
google.com  nameserver = ns2.google.com.

Authoritative answers can be found from:

```

Figure 14: View name server records of youtube.com

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup -type=a google.com 8.8.8.8
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.193.110

reckless_meherun@LAPTOP-QQEY4AP4:~$ -

```

Figure 15: View DNS A address records of youtube.com

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup -type=mx google.com 8.8.8.8
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
google.com    mail exchanger = 10 smtp.google.com.

Authoritative answers can be found from:

reckless_meherun@LAPTOP-QQEY4AP4:~$ -

```

Figure 16: View mail exchange records of youtube.com

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ nslookup -type=txt google.com 8.8.8.8
;; Truncated, retrying in TCP mode.
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
google.com    text = "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb89cf4ef"
google.com    text = "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0J0nikft0jAgjmsQ"
google.com    text = "globesign-smime-dv=CDVX-xFHUw2m16/Gb8+598shH31kzUr6c1l2BPvqKX8="
google.com    text = "MS-E4A68B9AB2BB96708CE15412F62916164C0B20BB"
google.com    text = "facebook-domain-verification=2rm551cu4kab0bxsw536tlds4h95"
google.com    text = "docsign=1b0a6754-49b1-4db5-8540-d2c12664b289"
google.com    text = "atlassian-domain-verification=5VjtTmWmj92ewqkx2oXmbaD60Td9zWn9r6eakvHX6B77zzkF0to8PQ90sKnbf4I"
google.com    text = "apple-domain-verification=30afIBcvSUDV2PLX"
google.com    text = "webdomainverification.8YXG6-6e6922db-e3e6-4a36-904e-a805c28007fa"
google.com    text = "docsign=@05958488-4752-4ef2-95eb-aa7ba8a3bd0e"
google.com    text = "google-site-verification=w0BN7iiJNTkezJ49swyWn48f8_9xveREV4oB-0Hf5o"
google.com    text = "v=spf1 include:_spf.google.com ~all"

Authoritative answers can be found from:

reckless_meherun@LAPTOP-QQEY4AP4:~$ -

```

Figure 17: View txt records of youtube.com

## 4.7 NETSTAT

`netstat`

reckless_mehrun@LAPTOP-QQEY4AP4:~\$ netstat						
Active Internet connections (w/o servers)						
Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State	
Active UNIX domain sockets (w/o servers)						
Proto	RefCnt	Flags	Type	State	I-Node	Path
unix	2	[ ]	DGRAM		22539	/var/run/chrony/chronyd.sock
unix	2	[ ]	DGRAM		23719	/run/user/1000/systemd/notify
unix	4	[ ]	DGRAM	CONNECTED	20512	/run/systemd/notify
unix	2	[ ]	DGRAM		20521	/run/systemd/journal/syslog
unix	10	[ ]	DGRAM	CONNECTED	20529	/run/systemd/journal/dev-log
unix	7	[ ]	DGRAM	CONNECTED	20531	/run/systemd/journal/socket
unix	3	[ ]	STREAM	CONNECTED	23724	
unix	3	[ ]	STREAM	CONNECTED	21695	
unix	3	[ ]	STREAM	CONNECTED	23587	
unix	2	[ ]	DGRAM	CONNECTED	17674	
unix	2	[ ]	DGRAM	CONNECTED	19256	
unix	3	[ ]	STREAM	CONNECTED	22695	
unix	3	[ ]	STREAM	CONNECTED	22555	
unix	3	[ ]	STREAM	CONNECTED	21646	
unix	3	[ ]	STREAM	CONNECTED	23672	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	28806	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	16516	
unix	3	[ ]	STREAM	CONNECTED	21788	
unix	3	[ ]	DGRAM	CONNECTED	20514	
unix	3	[ ]	STREAM	CONNECTED	19535	
unix	3	[ ]	STREAM	CONNECTED	20678	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	16588	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	20679	
unix	3	[ ]	STREAM	CONNECTED	16631	/run/systemd/journal/stdout
unix	3	[ ]	DGRAM	CONNECTED	19546	
unix	2	[ ]	DGRAM	CONNECTED	23713	
unix	3	[ ]	STREAM	CONNECTED	17507	
unix	3	[ ]	STREAM	CONNECTED	16596	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	23586	
unix	2	[ ]	DGRAM	CONNECTED	20699	
unix	2	[ ]	DGRAM	CONNECTED	16691	
unix	3	[ ]	STREAM	CONNECTED	19262	/run/dbus/system_bus_socket
unix	3	[ ]	STREAM	CONNECTED	20694	/run/systemd/journal/stdout
unix	3	[ ]	STREAM	CONNECTED	17808	/run/dbus/system_bus_socket
unix	3	[ ]	STREAM	CONNECTED	22694	
unix	3	[ ]	STREAM	CONNECTED	22558	
unix	3	[ ]	STREAM	CONNECTED	23681	
unix	3	[ ]	STREAM	CONNECTED	22642	
unix	3	[ ]	STREAM	CONNECTED	19676	/mnt/wslg/PulseAudioRDPSink
unix	3	[ ]	STREAM	CONNECTED	23242	

Figure 18: Displaying all open sockets

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ netstat -a | more
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp      0      0 localhost:33060          0.0.0.0:*
tcp      0      0 127.0.0.53:domain       0.0.0.0:*
tcp      0      0 localhost:mysql          0.0.0.0:*
udp      0      0 127.0.0.53:domain       0.0.0.0:*
udp      0      0 localhost:323           0.0.0.0:*
udp6     0      0 ip6-localhost:323        [::]:*
raw      0      0 0.0.0.0:255           0.0.0.0:*
                                            7

Active UNIX domain sockets (servers and established)
Proto RefCnt Flags     Type      State       I-Node   Path
unix  2      [ ACC ]    STREAM   LISTENING  23593   /run/WSL/2_interop
unix  2      [ ACC ]    STREAM   LISTENING  18457   /run/WSL/1_interop
unix  2      [ ACC ]    STREAM   LISTENING  17503   /var/run/dbus/system_bus_socket
unix  2      [ ACC ]    SEQPACKET LISTENING  21542   /mnt/wslg/weston-notify.sock
unix  2      [ ACC ]    STREAM   LISTENING  22547   /mnt/wslg/runtime-dir/wayland-0
unix  2      [ ACC ]    STREAM   LISTENING  22548   /tmp/.X11-unix/X0
unix  2      [ ACC ]    STREAM   LISTENING  16513   /mnt/wslg/runtime-dir/pulse/native
unix  2      [ ]        DGRAM    LISTENING  22539   /var/run/chrony/chronyd.sock
unix  2      [ ACC ]    STREAM   LISTENING  20613   /mnt/wslg/PulseAudioRDPSource
unix  2      [ ACC ]    STREAM   LISTENING  21728   /mnt/wslg/PulseAudioRDPSink
unix  2      [ ]        DGRAM    LISTENING  23719   /run/user/1000/systemd/notify
unix  2      [ ACC ]    STREAM   LISTENING  23722   /run/user/1000/systemd/private
unix  2      [ ACC ]    STREAM   LISTENING  18616   /run/systemd/resolve/io.systemd.Resolve
unix  2      [ ACC ]    STREAM   LISTENING  22554   /tmp/dbus-WYaJdjdgk
unix  2      [ ACC ]    STREAM   LISTENING  23728   /run/user/1000/gnupg/S.dirmgr
unix  2      [ ACC ]    STREAM   LISTENING  23730   /run/user/1000/gnupg/S.gpg-agent.browser
unix  2      [ ACC ]    STREAM   LISTENING  23732   /run/user/1000/gnupg/S.gpg-agent.extra
unix  2      [ ACC ]    STREAM   LISTENING  23734   /run/user/1000/gnupg/S.gpg-agent.ssh
unix  2      [ ACC ]    STREAM   LISTENING  23736   /run/user/1000/gnupg/S.gpg-agent
unix  2      [ ACC ]    STREAM   LISTENING  23738   /run/user/1000/pk-debconf-socket
unix  2      [ ACC ]    STREAM   LISTENING  23740   /run/user/1000/snapd-session-agent.socket
unix  2      [ ACC ]    STREAM   LISTENING  22028   /run/subiquity/socket
unix  4      [ ]        DGRAM    CONNECTED  20512   /run/systemd/notify
unix  2      [ ACC ]    STREAM   LISTENING  20515   /run/systemd/private
unix  2      [ ACC ]    STREAM   LISTENING  17656   /run/apport.socket
unix  2      [ ACC ]    STREAM   LISTENING  20517   /run/systemd/userdb/io.systemd.DynamicUser

```

Figure 19: Showing all listening and non listening ports

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ netstat -at
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp      0      0 localhost:33060          0.0.0.0:*
tcp      0      0 127.0.0.53:domain       0.0.0.0:*
tcp      0      0 localhost:mysql          0.0.0.0:*
reckless_meherun@LAPTOP-QQEY4AP4:~$ 

```

Figure 20: Showing all tcp sockets

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ netstat -au
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp     0      0 127.0.0.53:domain        0.0.0.0:*
udp     0      0 localhost:323             0.0.0.0:*
udp6    0      0 ip6-localhost:323         [::]:*
reckless_meherun@LAPTOP-QQEY4AP4:~$
```

Figure 21: Showing all udp sockets

```

reckless_meherun@LAPTOP-QQEY4AP4:~$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp     0      0 localhost:33060           0.0.0.0:*
tcp     0      0 127.0.0.53:domain        0.0.0.0:*
tcp     0      0 localhost:mysql          0.0.0.0:*
udp     0      0 127.0.0.53:domain        0.0.0.0:*
udp     0      0 localhost:323             0.0.0.0:*
udp6    0      0 ip6-localhost:323         [::]:*
raw     0      0 0.0.0.255              0.0.0.0:*
                                                7
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type      State         I-Node   Path
unix  2      [ ACC ]     STREAM   LISTENING  23593   /run/WSL/2_interop
unix  2      [ ACC ]     STREAM   LISTENING  18457   /run/WSL/1_interop
unix  2      [ ACC ]     STREAM   LISTENING  17503   /var/run/dbus/system_bus_socket
unix  2      [ ACC ]     SEQPACKET LISTENING  21542   /mnt/wslg/weston-notify.sock
unix  2      [ ACC ]     STREAM   LISTENING  22547   /mnt/wslg/runtime-dir/wayland-0
unix  2      [ ACC ]     STREAM   LISTENING  22548   /tmp/X11-unix/X0
unix  2      [ ACC ]     STREAM   LISTENING  16513   /mnt/wslg/runtime-dir/pulse/native
unix  2      [ ACC ]     STREAM   LISTENING  20613   /mnt/wslg/PulseAudioRDPSource
unix  2      [ ACC ]     STREAM   LISTENING  21728   /mnt/wslg/PulseAudioRDPSink
unix  2      [ ACC ]     STREAM   LISTENING  23722   /run/user/1000/systemd/private
unix  2      [ ACC ]     STREAM   LISTENING  18616   /run/systemd/resolve/io.systemd.Resolve
unix  2      [ ACC ]     STREAM   LISTENING  22554   /tmp/dbus-WaJdjGck
unix  2      [ ACC ]     STREAM   LISTENING  23728   /run/user/1000/gnupg/S.dirmngr
unix  2      [ ACC ]     STREAM   LISTENING  23730   /run/user/1000/gnupg/S.gpg-agent.browser
unix  2      [ ACC ]     STREAM   LISTENING  23732   /run/user/1000/gnupg/S.gpg-agent.extra
unix  2      [ ACC ]     STREAM   LISTENING  23734   /run/user/1000/gnupg/S.gpg-agent.ssh
unix  2      [ ACC ]     STREAM   LISTENING  23736   /run/user/1000/gnupg/S.gpg-agent
unix  2      [ ACC ]     STREAM   LISTENING  23738   /run/user/1000/pk-deconf-socket
unix  2      [ ACC ]     STREAM   LISTENING  23740   /run/user/1000/snappy-session-agent.socket
unix  2      [ ACC ]     STREAM   LISTENING  22028   /run/subiquity/socket
unix  2      [ ACC ]     STREAM   LISTENING  20515   /run/systemd/private
unix  2      [ ACC ]     STREAM   LISTENING  17656   /run/apport.socket
unix  2      [ ACC ]     STREAM   LISTENING  20517   /run/systemd/userdb/io.systemd.DynamicUser
unix  2      [ ACC ]     STREAM   LISTENING  20518   /run/systemd/io.system.ManagedOOM
unix  2      [ ACC ]     STREAM   LISTENING  20533   /run/systemd/journal/stdout
unix  2      [ ACC ]     SEQPACKET LISTENING  20535   /run/udev/control
unix  2      [ ACC ]     STREAM   LISTENING  16703   /mnt/wslg/PulseServer
unix  2      [ ACC ]     STREAM   LISTENING  20653   /run/dbus/system_bus_socket
unix  2      [ ACC ]     STREAM   LISTENING  19485   /run/systemd/journal/io.systemd.journal
unix  2      [ ACC ]     STREAM   LISTENING  19200   /var/run/mysqld/mysql.sock
unix  2      [ ACC ]     STREAM   LISTENING  19203   /var/run/mysqld/mysqld.sock
unix  2      [ ACC ]     STREAM   LISTENING  17069   /run/WSL/945_interop
unix  2      [ ACC ]     STREAM   LISTENING  16580   /run/snapd.socket
unix  2      [ ACC ]     STREAM   LISTENING  16582   /run/snapd-snap.socket
unix  2      [ ACC ]     STREAM   LISTENING  20660   /run/uidd/request
reckless_meherun@LAPTOP-QQEY4AP4:~$
```

Figure 22: Showing only listening sockets

```
reckless_mehrun@LAPTOP-QQEY4AP4:~$ netstat -lt
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 localhost:33060          0.0.0.0:*
tcp      0      0 127.0.0.53:domain       0.0.0.0:*
tcp      0      0 localhost:mysql         0.0.0.0:*
reckless_mehrun@LAPTOP-QQEY4AP4:~$ -
```

Figure 23: Showing listening tcp sockets

```
reckless_mehrun@LAPTOP-QQEY4AP4:~$ netstat -lu
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
udp      0      0 127.0.0.53:domain       0.0.0.0:*
udp      0      0 localhost:323           0.0.0.0:*
udp6     0      0 ip6-localhost:323       [::]:*
reckless_mehrun@LAPTOP-QQEY4AP4:~$
```

Figure 24: Showing listening udp sockets

```
reckless_mehrun@LAPTOP-QQEY4AP4:~$ netstat -lx
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type      State       I-Node   Path
unix  2      [ ACC ]     STREAM    LISTENING  23593   /run/wsl/2_interop
unix  2      [ ACC ]     STREAM    LISTENING  18457   /run/wsl/1_interop
unix  2      [ ACC ]     STREAM    LISTENING  17503   /var/run/dbus/system_bus_socket
unix  2      [ ACC ]     SEQPACKET LISTENING  21542   /mnt/wslg/weston-notify.sock
unix  2      [ ACC ]     STREAM    LISTENING  22547   /mnt/wslg/runtime-dir/wayland-0
unix  2      [ ACC ]     STREAM    LISTENING  22548   /tmp/X11-unix/X0
unix  2      [ ACC ]     STREAM    LISTENING  16513   /mnt/wslg/runtime-dir/pulse/native
unix  2      [ ACC ]     STREAM    LISTENING  20613   /mnt/wslg/PulseAudioRDPSource
unix  2      [ ACC ]     STREAM    LISTENING  21728   /mnt/wslg/PulseAudioRDPSink
unix  2      [ ACC ]     STREAM    LISTENING  23722   /run/user/1000/systemd/private
unix  2      [ ACC ]     STREAM    LISTENING  18616   /run/systemd/resolve/io.systemd.Resolve
unix  2      [ ACC ]     STREAM    LISTENING  22554   /tmp/dbus-WYaJdjdGck
unix  2      [ ACC ]     STREAM    LISTENING  23728   /run/user/1000/gnupg/S.dirmngr
unix  2      [ ACC ]     STREAM    LISTENING  23730   /run/user/1000/gnupg/S.gpg-agent.browser
unix  2      [ ACC ]     STREAM    LISTENING  23732   /run/user/1000/gnupg/S.gpg-agent.extra
unix  2      [ ACC ]     STREAM    LISTENING  23734   /run/user/1000/gnupg/S.gpg-agent.ssh
unix  2      [ ACC ]     STREAM    LISTENING  23736   /run/user/1000/gnupg/S.gpg-agent
unix  2      [ ACC ]     STREAM    LISTENING  23738   /run/user/1000/pk-deconf-socket
unix  2      [ ACC ]     STREAM    LISTENING  23740   /run/user/1000/snapd-session-agent.socket
unix  2      [ ACC ]     STREAM    LISTENING  22028   /run/subiquity/socket
unix  2      [ ACC ]     STREAM    LISTENING  20515   /run/systemd/private
unix  2      [ ACC ]     STREAM    LISTENING  17656   /run/apport.socket
unix  2      [ ACC ]     STREAM    LISTENING  20517   /run/systemd/userdb/io.systemd.DynamicUser
```

Figure 25: Showing listening unix sockets

```
reckless_meherun@LAPTOP-QQEV4AP4:~$ netstat -s
Ip:
    Forwarding: 2
    9742 total packets received
    0 forwarded
    0 incoming packets discarded
    8558 incoming packets delivered
    5209 requests sent out
Icmp:
    390 ICMP messages received
    0 input ICMP message failed
    ICMP input histogram:
        destination unreachable: 133
        timeout in transit: 219
        echo replies: 38
    602 ICMP messages sent
    0 ICMP messages failed
    ICMP output histogram:
        destination unreachable: 332
        echo requests: 270
IcmpMsg:
    InType0: 38
    InType3: 133
    InType11: 219
    OutType3: 332
    OutType8: 270
Tcp:
    31 active connection openings
    0 passive connection openings
    2 failed connection attempts
    1 connection resets received
    0 connections established
    7267 segments received
    4087 segments sent out
    31 segments retransmitted
```

Figure 26: Displaying summary statistics for each protocol.

```
      0 number of ICMP packets received
reckless_meherun@LAPTOP-QQEVE4AP4:~$ netstat -st
IcmpMsg:
    InType0: 38
    InType3: 133
    InType11: 219
    OutType3: 332
    OutType8: 270
Tcp:
    31 active connection openings
    0 passive connection openings
    2 failed connection attempts
    1 connection resets received
    0 connections established
    7267 segments received
    4087 segments sent out
    31 segments retransmitted
    0 bad segments received
    7 resets sent
UdpLite:
TcpExt:
    7 TCP sockets finished time wait in fast timer
    7 delayed acks sent
    Quick ack mode was activated 3 times
    4116 packet headers predicted
    38 acknowledgments not containing data payload received
    32 predicted acknowledgments
    TCPLostRetransmit: 19
    TCPTimeouts: 30
    TCPLossProbes: 2
    TCPDSACKOldSent: 3
    2 connections reset due to unexpected data
    1 connections reset due to early user close
    1 connections aborted due to timeout
    TCPRcvCoalesce: 4210
```

Figure 27: Displaying summary statistics for tcp protocol.

```
reckless_meherun@LAPTOP-QQEV4AP4:~$ netstat -su
IcmpMsg:
    InType0: 38
    InType3: 133
    InType11: 219
    OutType3: 332
    OutType8: 270
Udp:
    252 packets received
    346 packets to unknown port received
    0 packet receive errors
    631 packets sent
    0 receive buffer errors
    0 send buffer errors
    IgnoredMulti: 315
UdpLite:
IpExt:
    InBcastPkts: 315
    InOctets: 22692576
    OutOctets: 407731
    InBcastOctets: 24732
    InNoECTPkts: 18126
reckless_meherun@LAPTOP-QQEV4AP4:~$
```

Figure 28: Displaying summary statistics for udp protocol.

```
reckless_meherun@LAPTOP-QQEV4AP4:~$ netstat -pt
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State      PID/Program name
reckless_meherun@LAPTOP-QQEV4AP4:~$
```

Figure 29: Show the PID and name of the program to which tcp sockets belong.

```
reckless_mehlerun@LAPTOP-QQEY4AP4:~$ netstat -c
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State          I-Node Path
unix  2      [ ]       DGRAM    CONNECTED     22539  /var/run/chrony/chronyd.sock
unix  2      [ ]       DGRAM    CONNECTED     23719  /run/user/1000/systemd/notify
unix  4      [ ]       DGRAM    CONNECTED     20512  /run/systemd/notify
unix  2      [ ]       DGRAM    CONNECTED     20521  /run/systemd/journal/syslog
unix 10      [ ]       DGRAM    CONNECTED     20529  /run/systemd/journal/dev-log
unix  7      [ ]       DGRAM    CONNECTED     20531  /run/systemd/journal/socket
unix  3      [ ]       STREAM   CONNECTED    23724
unix  3      [ ]       STREAM   CONNECTED    21695
unix  3      [ ]       STREAM   CONNECTED    23587
unix  2      [ ]       DGRAM    CONNECTED    17674
unix  2      [ ]       DGRAM    CONNECTED    19256
unix  3      [ ]       STREAM   CONNECTED    22695
unix  3      [ ]       STREAM   CONNECTED    22555
unix  3      [ ]       STREAM   CONNECTED    21646
unix  3      [ ]       STREAM   CONNECTED    23672  /run/systemd/journal/stdout
unix  3      [ ]       STREAM   CONNECTED    28806  /run/systemd/journal/stdout
unix  3      [ ]       STREAM   CONNECTED    16516
unix  3      [ ]       STREAM   CONNECTED    21788
unix  3      [ ]       DGRAM    CONNECTED    20514
unix  3      [ ]       STREAM   CONNECTED    19535
unix  3      [ ]       STREAM   CONNECTED    20678  /run/systemd/journal/stdout
unix  3      [ ]       STREAM   CONNECTED    16588  /run/systemd/journal/stdout
unix  3      [ ]       STREAM   CONNECTED    20679
unix  3      [ ]       STREAM   CONNECTED    16631  /run/systemd/journal/stdout
unix  3      [ ]       DGRAM    CONNECTED    19546
unix  2      [ ]       DGRAM    CONNECTED    23713
```

Figure 30: Printing the selected information every second continuously

```
reckless_mehrun@LAPTOP-QQEY4AP4:~$ netstat --verbose
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State         I-Node    Path
unix  2      [ ]     DGRAM           22539    /var/run/chrony/chronyd.sock
unix  2      [ ]     DGRAM           23719    /run/user/1000/systemd/notify
unix  4      [ ]     DGRAM  CONNECTED     20512    /run/systemd/notify
unix  2      [ ]     DGRAM           20521    /run/systemd/journal/syslog
unix 10      [ ]     DGRAM  CONNECTED     20529    /run/systemd/journal/dev-log
unix  7      [ ]     DGRAM  CONNECTED     20531    /run/systemd/journal/socket
unix  3      [ ]     STREAM CONNECTED    23724
unix  3      [ ]     STREAM CONNECTED    21695
unix  3      [ ]     STREAM CONNECTED    23587
unix  2      [ ]     DGRAM CONNECTED    17674
unix  2      [ ]     DGRAM CONNECTED    19256
unix  3      [ ]     STREAM CONNECTED    22695
unix  3      [ ]     STREAM CONNECTED    22555
unix  3      [ ]     STREAM CONNECTED    21646
unix  3      [ ]     STREAM CONNECTED    23672    /run/systemd/journal/stdout
unix  3      [ ]     STREAM CONNECTED    28806    /run/systemd/journal/stdout
unix  3      [ ]     STREAM CONNECTED    16516
unix  3      [ ]     STREAM CONNECTED    21788
unix  3      [ ]     DGRAM CONNECTED    20514
unix  3      [ ]     STREAM CONNECTED    19535
unix  3      [ ]     STREAM CONNECTED    20678    /run/systemd/journal/stdout
unix  3      [ ]     STREAM CONNECTED    16588    /run/systemd/journal/stdout
unix  3      [ ]     STREAM CONNECTED    20679
unix  3      [ ]     STREAM CONNECTED    16631    /run/systemd/journal/stdout
unix  3      [ ]     DGRAM CONNECTED    19546
unix  2      [ ]     DGRAM CONNECTED    23713
unix  3      [ ]     STREAM CONNECTED    17507
unix  3      [ ]     STREAM CONNECTED    16596    /run/systemd/journal/stdout
unix  3      [ ]     STREAM CONNECTED    23586
unix  2      [ ]     DGRAM CONNECTED    20699
```

Figure 31: Telling the user what is going on by being verbose

## 5 Experience

1. We learned how to utilized troubleshooting tools including PING, Traceroute, ARP, and netstat to diagnose and resolve connectivity issues.
2. We used ifconfig to manage network interfaces and nslookup for DNS-related problem-solving..

## References

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- [3] TRACEROUTE: <https://cloudinfrastructureservices.co.uk/how-to-install-traceroute-and-run-on-ubuntu-20-04/>
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