Lab 2

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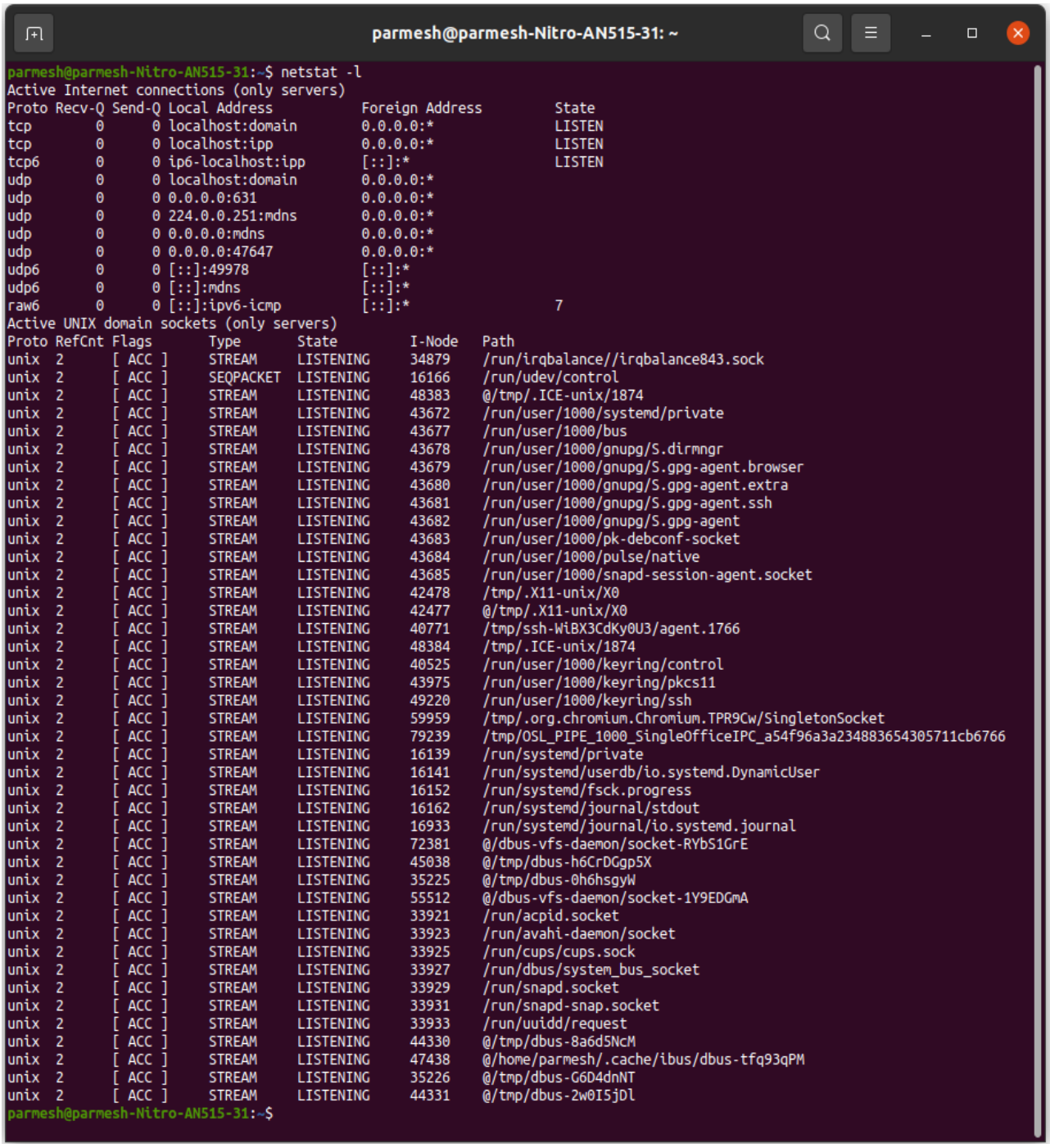
1. See the statistics of TCP and UDP ports on Linux machine

The `netstat` command enables us to see the statictics (`-s` flag) of the TCP (`-t` flag) and UDP (`-u` flag). The statistics displayed include number of conections opened, failed attempts etc. It also shows information on other TCP/UDP based protocols in the output (e.g. UdpLite, TcpExt).

```
parmesh@parmesh-Nitro-AN515-31: ~
parmesh@parmesh-Nitro-AN515-31:~$ netstat -ut -s
IcmpMsg:
    InType0: 20
    InType3: 59
    InType11: 33
    OutType3: 54
    OutType8: 40
Tcp:
    1513 active connection openings
    1 passive connection openings
    56 failed connection attempts
    652 connection resets received
    27 connections established
    52922 segments received
    51560 segments sent out
    309 segments retransmitted
    2 bad segments received
    1013 resets sent
Udp:
    24940 packets received
    54 packets to unknown port received
    0 packet receive errors
    17583 packets sent
    0 receive buffer errors
    0 send buffer errors
    IgnoredMulti: 58
UdpLite:
TcpExt:
    260 TCP sockets finished time wait in fast timer
    769 delayed acks sent
    1 delayed acks further delayed because of locked socket
    Quick ack mode was activated 343 times
    30958 packet headers predicted
    8461 acknowledgments not containing data payload received
    3839 predicted acknowledgments
    TCPSackRecovery: 3
    Detected reordering 17 times using SACK
```

2. Enlist the listeing ports on your machine

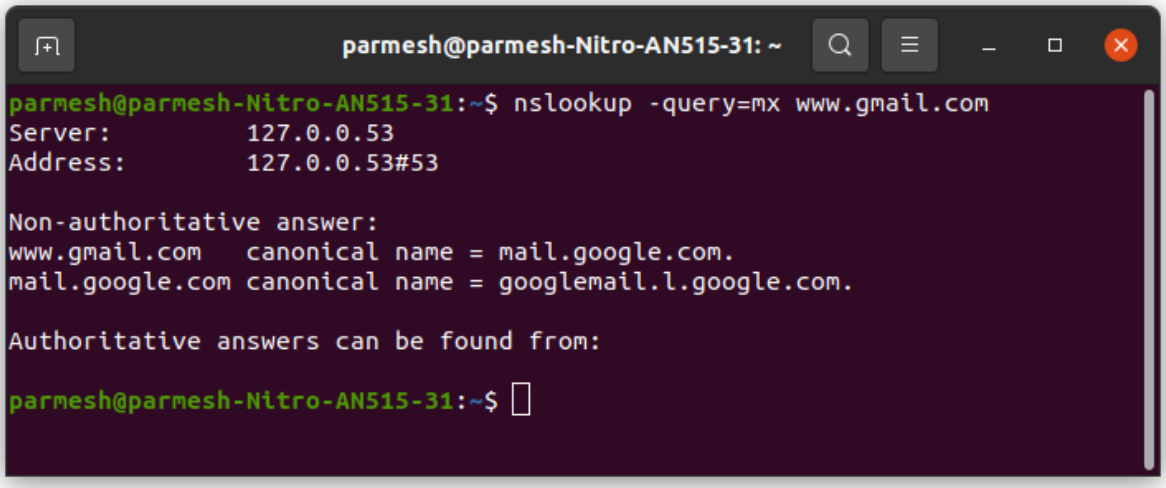
The `netstat` command is used to list the ports using the `-l` flag to filter out only the listening ports (shown in the `State` column of the outputs). As shown, the output is split into two separate lists, one which shoes ports conected to the internet, and another for UNIX domain sockets.



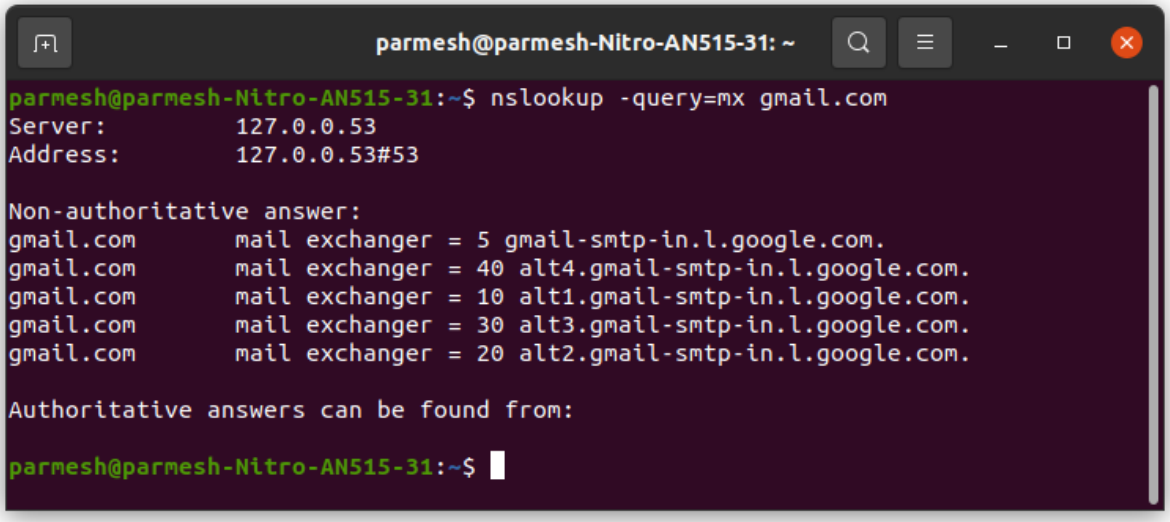
```
parmesh@parmesh-Nitro-AN515-31: ~
parmesh@parmesh-Nitro-AN515-31:~$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
udp        0      0 localhost:domain        0.0.0.0:*
udp        0      0 0.0.0.0:631             0.0.0.0:*
udp        0      0 224.0.0.251:mdns        0.0.0.0:*
udp        0      0 0.0.0.0:mdns            0.0.0.0:*
udp        0      0 0.0.0.0:47647           0.0.0.0:*
udp6       0      0 [::]:49978              [::]:*
udp6       0      0 [::]:mdns               [::]:*
raw6       0      0 [::]:ipv6-icmp          [::]:*                  7
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  2      [ ACC ]     STREAM     LISTENING     34879    /run/irqbalance//irqbalance843.sock
unix  2      [ ACC ]     SEQPACKET  LISTENING     16166    /run/udev/control
unix  2      [ ACC ]     STREAM     LISTENING     48383    @/tmp/.ICE-unix/1874
unix  2      [ ACC ]     STREAM     LISTENING     43672    /run/user/1000/systemd/private
unix  2      [ ACC ]     STREAM     LISTENING     43677    /run/user/1000/bus
unix  2      [ ACC ]     STREAM     LISTENING     43678    /run/user/1000/gnupg/S.dirmngr
unix  2      [ ACC ]     STREAM     LISTENING     43679    /run/user/1000/gnupg/S.gpg-agent.browser
unix  2      [ ACC ]     STREAM     LISTENING     43680    /run/user/1000/gnupg/S.gpg-agent.extra
unix  2      [ ACC ]     STREAM     LISTENING     43681    /run/user/1000/gnupg/S.gpg-agent.ssh
unix  2      [ ACC ]     STREAM     LISTENING     43682    /run/user/1000/gnupg/S.gpg-agent
unix  2      [ ACC ]     STREAM     LISTENING     43683    /run/user/1000/pk-debconf-socket
unix  2      [ ACC ]     STREAM     LISTENING     43684    /run/user/1000/pulse/native
unix  2      [ ACC ]     STREAM     LISTENING     43685    /run/user/1000/snapd-session-agent.socket
unix  2      [ ACC ]     STREAM     LISTENING     42478    /tmp/.X11-unix/X0
unix  2      [ ACC ]     STREAM     LISTENING     42477    @/tmp/.X11-unix/X0
unix  2      [ ACC ]     STREAM     LISTENING     40771    /tmp/ssh-WiBX3CdKy0U3/agent.1766
unix  2      [ ACC ]     STREAM     LISTENING     48384    /tmp/.ICE-unix/1874
unix  2      [ ACC ]     STREAM     LISTENING     40525    /run/user/1000/keyring/control
unix  2      [ ACC ]     STREAM     LISTENING     43975    /run/user/1000/keyring/pkcs11
unix  2      [ ACC ]     STREAM     LISTENING     49220    /run/user/1000/keyring/ssh
unix  2      [ ACC ]     STREAM     LISTENING     59959    /tmp/.org.chromium.Chromium.TPR9Cw/SingletonSocket
unix  2      [ ACC ]     STREAM     LISTENING     79239    /tmp/OSL_PIPE_1000_SingleOfficeIPC_a54f96a3a234883654305711cb6766
unix  2      [ ACC ]     STREAM     LISTENING     16139    /run/systemd/private
unix  2      [ ACC ]     STREAM     LISTENING     16141    /run/systemd/userdb/io.systemd.DynamicUser
unix  2      [ ACC ]     STREAM     LISTENING     16152    /run/systemd/fsck.progress
unix  2      [ ACC ]     STREAM     LISTENING     16162    /run/systemd/journal/stdout
unix  2      [ ACC ]     STREAM     LISTENING     16933    /run/systemd/journal/io.systemd.journal
unix  2      [ ACC ]     STREAM     LISTENING     72381    @/dbus-vfs-daemon/socket-RYbS1GrE
unix  2      [ ACC ]     STREAM     LISTENING     45038    @/tmp/dbus-h6CrDGgp5X
unix  2      [ ACC ]     STREAM     LISTENING     35225    @/tmp/dbus-0h6hsgyW
unix  2      [ ACC ]     STREAM     LISTENING     55512    @/dbus-vfs-daemon/socket-1Y9EDGmA
unix  2      [ ACC ]     STREAM     LISTENING     33921    /run/acpid.socket
unix  2      [ ACC ]     STREAM     LISTENING     33923    /run/avahi-daemon/socket
unix  2      [ ACC ]     STREAM     LISTENING     33925    /run/cups/cups.sock
unix  2      [ ACC ]     STREAM     LISTENING     33927    /run/dbus/system_bus_socket
unix  2      [ ACC ]     STREAM     LISTENING     33929    /run/snapd.socket
unix  2      [ ACC ]     STREAM     LISTENING     33931    /run/snapd-snap.socket
unix  2      [ ACC ]     STREAM     LISTENING     33933    /run/uuidd/request
unix  2      [ ACC ]     STREAM     LISTENING     44330    @/tmp/dbus-8a6d5NcM
unix  2      [ ACC ]     STREAM     LISTENING     47438    @/home/parmesh/.cache/ibus/dbus-tfq93qPM
unix  2      [ ACC ]     STREAM     LISTENING     35226    @/tmp/dbus-G6D4dnNT
unix  2      [ ACC ]     STREAM     LISTENING     44331    @/tmp/dbus-2w0I5jDl
parmesh@parmesh-Nitro-AN515-31:~$
```

3. **See the mail exchange (MX) record for www.gmail.com**

The `-query=mx` option of `nslookup` is used to obtain the mail exchange records for any domain (specified in the command itself as shown). This command lists out the SMTP servers that handle the traffic for the domain.



The command doesn't work for www.gmail.com, but works for gmail.com, listing out the required server names.



4. **Display the all network interfaces on your machine**

   The `ifconfig` command is used, which lists all the interfaces on the machine using the `-a` flag, and other statistics entailed by each of interface.

```
parmesh@parmesh-Nitro-AN515-31: ~
parmesh@parmesh-Nitro-AN515-31:~$ ifconfig -a
enp2s0f1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 98:29:a6:45:8d:a0  txqueuelen 1000  (Ethernet)
        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

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 4671  bytes 496554 (496.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 4671  bytes 496554 (496.5 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.7  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::346:8027:3304:723c  prefixlen 64  scopeid 0x20<link>
        ether 98:22:ef:58:e1:4f  txqueuelen 1000  (Ethernet)
        RX packets 75777  bytes 56968683 (56.9 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 66914  bytes 17257282 (17.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

parmesh@parmesh-Nitro-AN515-31:~$
```

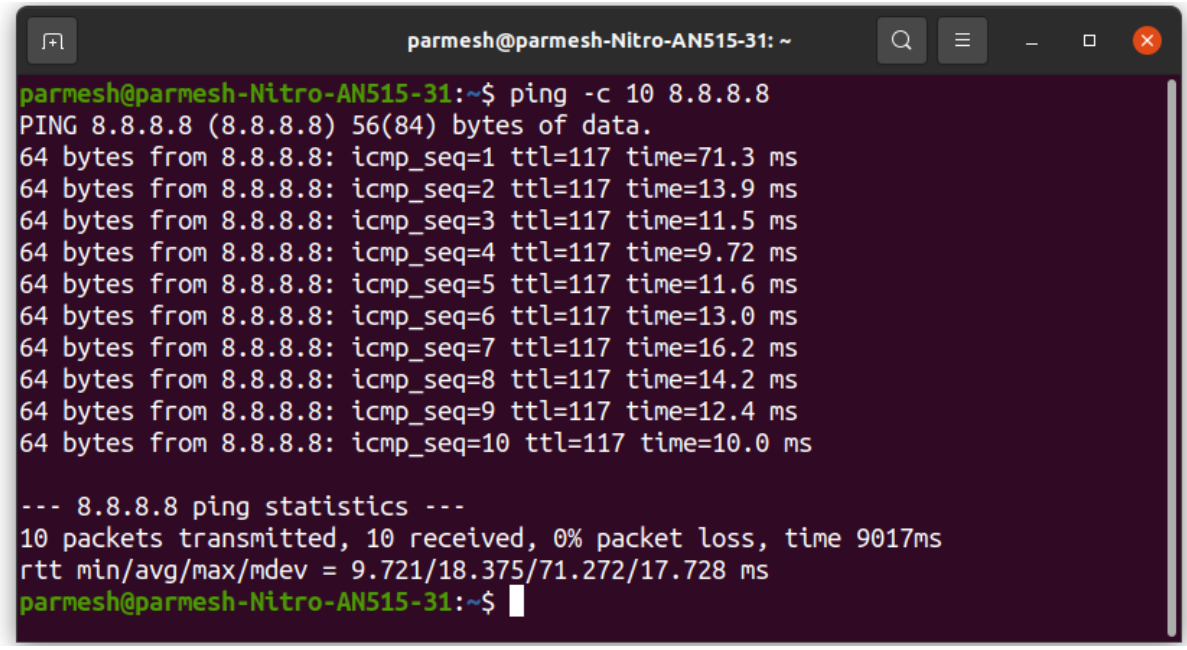
5. **A list of intermediate routers to reach 8.8.8.8 from your machine, with latency**

   The `traceroute` command is used to look up the intermediate addresses that are accessed to reach a particular host (passwd as an argument with the command). The latency for each step is individually in each row, in the latter 3 columns, which show the time for 3 separate packets.

```
parmesh@parmesh-Nitro-AN515-31: ~
parmesh@parmesh-Nitro-AN515-31:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 64 hops max
  1   192.168.1.1  1.158ms  0.941ms  0.915ms
  2   171.76.72.1  4.304ms  3.779ms  3.455ms
  3   125.21.0.185  3.894ms  3.561ms  3.980ms
  4   182.79.152.115  10.173ms  31.749ms  23.878ms
  5   72.14.208.234  11.829ms  11.451ms  8.245ms
  6   10.23.215.158  13.945ms  11.483ms  11.880ms
  7   8.8.8.8  14.113ms  9.669ms  12.579ms
parmesh@parmesh-Nitro-AN515-31:~$
```

6. **Send 10 echo requests to 8.8.8.8 server from your machine**

   We use the `ping` command with the `-c` flag to limit the number of requests to 10. This command sends ICMP echo requests to the address passed in the argument.



7. **Get the IP address of www.bits-pilani.ac.in domain**

   The `nslookup` command can be used to return the IP address for any domain. The site is hosted on two different servers and hence two different IP addresses are shown (under the `Non-authoritative answer`).