Computer Networks Lab – 1

(26/07/2023)

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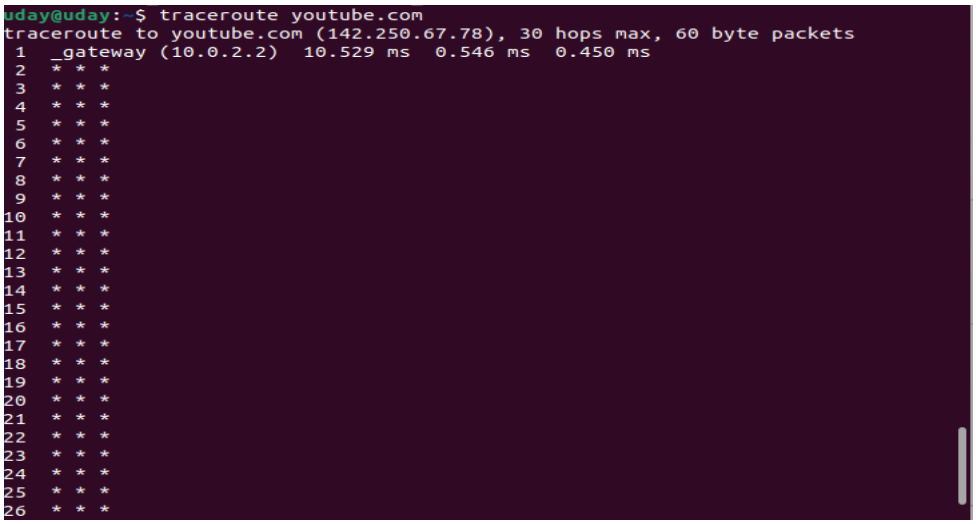
1) Ifconfig : interface configuration shows information about active network interfaces on our computer. We can see the IPv4 and IPv6 addresses and MAC address of the device.

```
uday@uday:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::d56b:e8b:1e0d:be95  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:ba:77:48  txqueuelen 1000  (Ethernet)
        RX packets 53211  bytes 72311197 (72.3 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 10734  bytes 1207973 (1.2 MB)
        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 2759  bytes 241353 (241.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2759  bytes 241353 (241.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

uday@uday:~$
```

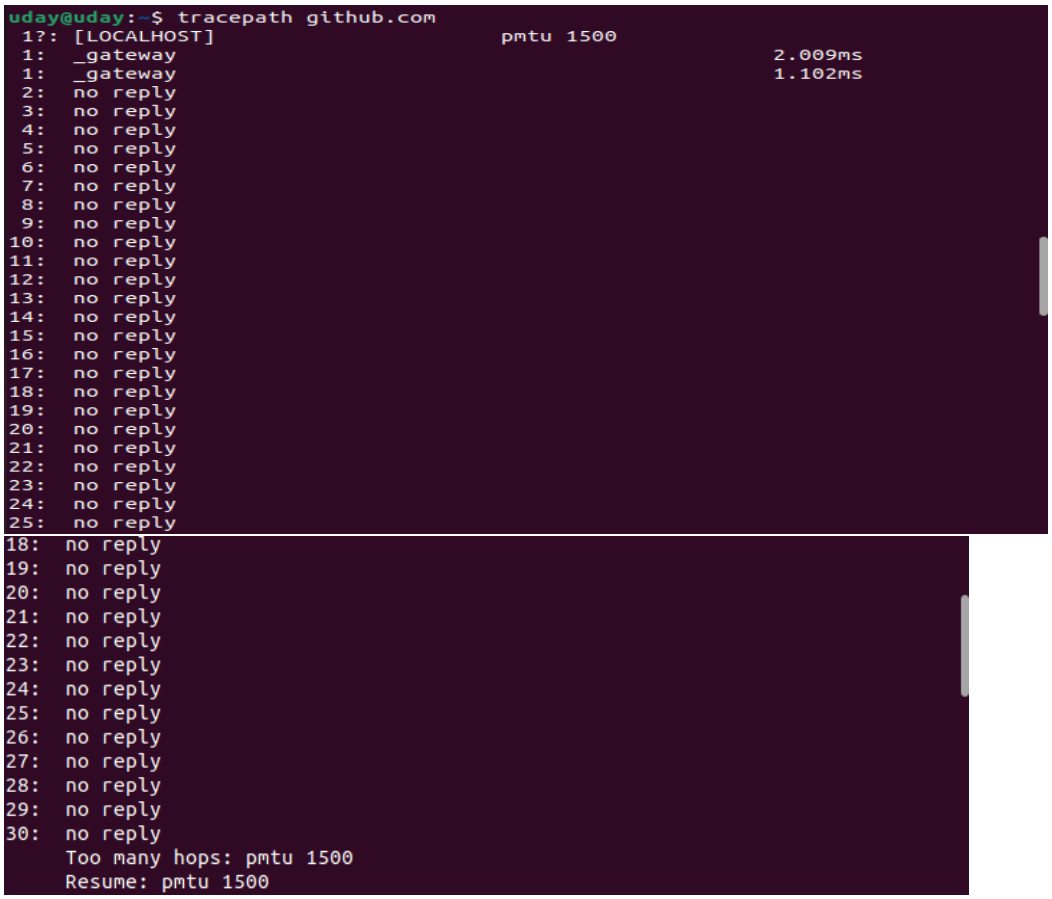
2) ip addr : This is displaying the IP addresses, MAC address and network interfaces of this device.

```
uday@uday:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt 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: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:ba:77:48 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 85951sec preferred_lft 85951sec
    inet6 fe80::d56b:e8b:1e0d:be95/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
uday@uday:~$
```

3) traceroute : This command is used to trace packets from my computer to a destination host on a network. When I ran ‘traceroute youtube.com’, ‘traceroute google.com’, etc I did not get any response from. When I searched this problem in the internet, I got to know it might be caused due to network or router blocking.



4) tracepath : This is quite similar to traceroute. This command traces the path that packets take from your computer to a destination host on a network. When I tried to run tracepath using different destination hosts, I did not get any response.

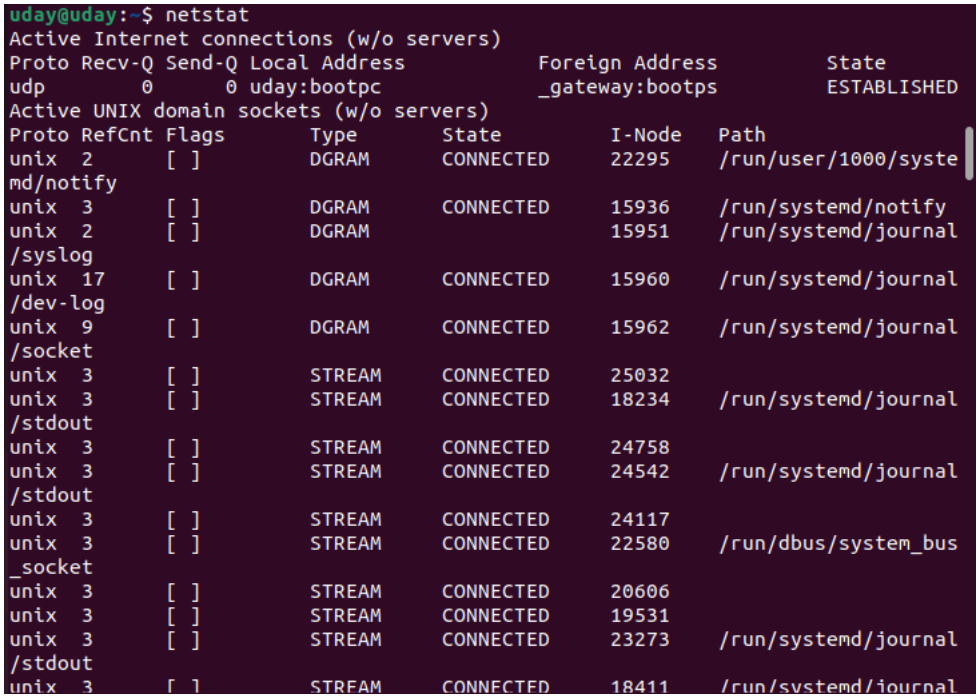


```
uday@uday:~$ tracepath youtube.com
 1?: [LOCALHOST]                      pmtu 1500
 1:  _gateway                                              0.653ms
 1:  _gateway                                              1.250ms
 2:  no reply
 3:  no reply
^C
uday@uday:~$ tracepath freecodecamp.com
 1?: [LOCALHOST]                      pmtu 1500
 1:  _gateway                                              0.568ms
 1:  _gateway                                              0.742ms
 2:  no reply
 3:  no reply
 4:  no reply
 5:  no reply
^C
uday@uday:~$ tracepath google.com
 1?: [LOCALHOST]                      pmtu 1500
 1:  _gateway                                              0.505ms
 1:  _gateway                                              0.896ms
 2:  no reply
 3:  no reply

uday@uday:~$
```

5) ping : ping tells us if the destination host is reachable or not by sending packets. If there is a response for each packet, then we can say that the host is available.

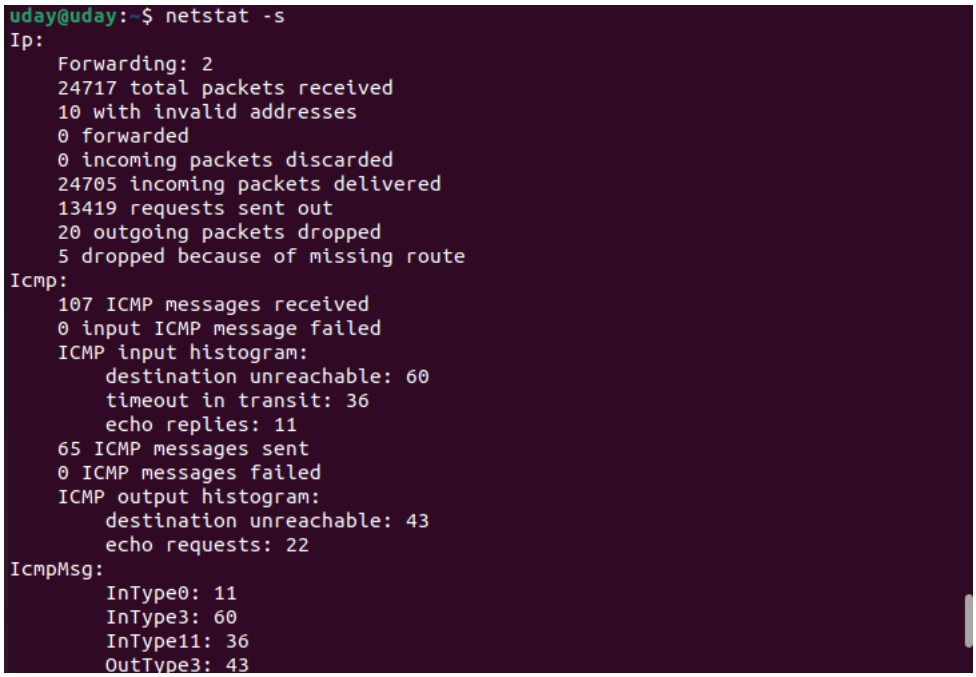
```
uday@uday:~$ ping youtube.com
PING youtube.com (142.250.67.78) 56(84) bytes of data.
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=1 ttl=118 tim
e=8.85 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=2 ttl=118 tim
e=6.66 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=3 ttl=118 tim
e=6.82 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=4 ttl=118 tim
e=8.35 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=5 ttl=118 tim
e=5.85 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=6 ttl=118 tim
e=6.87 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=7 ttl=118 tim
e=8.31 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=8 ttl=118 tim
e=6.45 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=9 ttl=118 tim
e=6.53 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=10 ttl=118 ti
me=11.7 ms
64 bytes from maa05s13-in-f14.1e100.net (142.250.67.78): icmp_seq=11 ttl=118 ti
me=7.54 ms
^C
--- youtube.com ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10030ms
rtt min/avg/max/mdev = 5.849/7.625/11.652/1.555 ms
uday@uday:~$
```

6) netstat : This command displays the network statistics and the current status of network connections. When I ran netstat on the terminal, I got a list of active network connections. There are ports which are open and actively listening, which established a connection.



```
uday@uday:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 uday:bootpc             _gateway:bootps         ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  2      [ ]         DGRAM      CONNECTED     22295    /run/user/1000/syste
md/notify
unix  3      [ ]         DGRAM      CONNECTED     15936    /run/systemd/notify
unix  2      [ ]         DGRAM                    15951    /run/systemd/journal
/syslog
unix  17     [ ]         DGRAM      CONNECTED     15960    /run/systemd/journal
/dev-log
unix  9      [ ]         DGRAM      CONNECTED     15962    /run/systemd/journal
/socket
unix  3      [ ]         STREAM     CONNECTED     25032
unix  3      [ ]         STREAM     CONNECTED     18234    /run/systemd/journal
/stdout
unix  3      [ ]         STREAM     CONNECTED     24758
unix  3      [ ]         STREAM     CONNECTED     24542    /run/systemd/journal
/stdout
unix  3      [ ]         STREAM     CONNECTED     24117
unix  3      [ ]         STREAM     CONNECTED     22580    /run/dbus/system_bus
_socket
unix  3      [ ]         STREAM     CONNECTED     20606
unix  3      [ ]         STREAM     CONNECTED     19531
unix  3      [ ]         STREAM     CONNECTED     23273    /run/systemd/journal
/stdout
unix  3      [ ]         STREAM     CONNECTED     18411    /run/systemd/journal
```

7) netstat -s : This command is used to display a summary of network statistics. Using this command we can get to know how many packets are sent and received, how many packets are forwarded, missed, discarded.



```
uday@uday:~$ netstat -s
Ip:
    Forwarding: 2
    24717 total packets received
    10 with invalid addresses
    0 forwarded
    0 incoming packets discarded
    24705 incoming packets delivered
    13419 requests sent out
    20 outgoing packets dropped
    5 dropped because of missing route
Icmp:
    107 ICMP messages received
    0 input ICMP message failed
    ICMP input histogram:
        destination unreachable: 60
        timeout in transit: 36
        echo replies: 11
    65 ICMP messages sent
    0 ICMP messages failed
    ICMP output histogram:
        destination unreachable: 43
        echo requests: 22
IcmpMsg:
        InType0: 11
        InType3: 60
        InType11: 36
        OutType3: 43
```

8) netstat -r : This command displayed the routing table.

```
uday@uday:~$ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
default         _gateway        0.0.0.0         UG        0 0          0 enp0s3
10.0.2.0        0.0.0.0         255.255.255.0   U         0 0          0 enp0s3
link-local      0.0.0.0         255.255.0.0     U         0 0          0 enp0s3
uday@uday:~$
```

9) ss : This command displayed all the sockets which are open. This is used to show socket statistics, network connections, and more.

```
uday@uday:~$ ss
Netid State   Recv-Q  Send-Q                          Local Address:Port
                  Peer Address:Port                  Process
u_dgr ESTAB   0       0                 /run/user/1000/systemd/notify 22295
                      * 0
u_dgr ESTAB   0       0                          /run/systemd/notify 15936
                      * 0
u_dgr ESTAB   0       0                  /run/systemd/journal/dev-log 15960
                      * 0
u_dgr ESTAB   0       0                   /run/systemd/journal/socket 15962
                      * 0
u_str ESTAB   0       0                                          * 25032
                      * 25033
u_str ESTAB   0       0                   /run/systemd/journal/stdout 18234
                      * 18213
u_str ESTAB   0       0                                          * 24758
                      * 24759
u_str ESTAB   0       0                   /run/systemd/journal/stdout 24542
                      * 24537
u_str ESTAB   0       0                                          * 24117
                      * 24360
u_str ESTAB   0       0                   /run/dbus/system_bus_socket 22580
                      * 22579
u_str ESTAB   0       0                                          * 20606
                      * 20607
u_str ESTAB   0       0                                          * 19531
                      * 19530
u_str ESTAB   0       0                   /run/systemd/journal/stdout 23273
                      * 23273
```

10) dig : This command displayed opcode, global options, server, msg size, etc . This is used to perform DNS lookups and retrieve DNS information from servers.

```
uday@uday:~$ dig youtube.com

; <<>> DiG 9.18.1-1ubuntu1.3-Ubuntu <<>> youtube.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 10825
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;youtube.com.                   IN      A

;; ANSWER SECTION:
youtube.com.            300     IN      A       142.250.67.78

;; Query time: 87 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Jul 26 21:35:14 IST 2023
;; MSG SIZE  rcvd: 56

uday@uday:~$
```

11) nslookup : This command displayed the server, address, name of the destination host provided. This is similar to dig.

```
uday@uday:~$ nslookup youtube.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
Name:   youtube.com
Address: 142.250.67.78
Name:   youtube.com
Address: 2404:6800:4007:805::200e
```

12) route : When this command is used, it displayed the IP routing table, which determines how data is sent.

```
uday@uday:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         _gateway        0.0.0.0         UG    100    0        0 enp0s3
10.0.2.0        0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 enp0s3
uday@uday:~$
```

13) host : This command displays the IPv6 address and where it is hosted.

```
uday@uday:~$ host youtube.com
youtube.com has address 142.250.67.78
youtube.com has IPv6 address 2404:6800:4007:805::200e
youtube.com mail is handled by 0 smtp.google.com.
uday@uday:~$
```

14) arp : This command is used to display which maps IP addresses to MAC addresses on the local network.

```
uday@uday:~$ arp
Address                  HWtype  HWaddress           Flags Mask            Ifac
e
_gateway                 ether   52:54:00:12:35:02   C                     enp0
s3
uday@uday:~$
```

15) iwconfig : This command is used to configure and display information about wireless network interfaces.

```
uday@uday:~$ iwconfig
lo        no wireless extensions.

enp0s3    no wireless extensions.

uday@uday:~$
```

16) hostname : This command displays the name of the host. We can also change the hostname using this command.

```
uday@uday:~$ hostname
udayKiran
uday@uday:~$ sudo hostname uday
uday@uday:~$ hostname
uday
uday@uday:~$
```

17) curl : This command is used to transfer data from destination to local devices using some protocols.

```
uday@uday:~$ curl -O http://web.iiitdm.ac.in/noor/hpcw2021
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100   315  100   315    0     0    291      0  0:00:01  0:00:01 --:--:--   291
uday@uday:~$ ls
Desktop    Downloads  Music     Public  Templates
Documents  hpcw2021   Pictures  snap    Videos
uday@uday:~$
```

18) mtr : This command is used to continuously monitor network connections, showing both ping and traceroute information.

```
                             My traceroute  [v0.95]
uday (127.0.0.1) -> localhost (127.0.0.1)                2023-07-26T21:49:47+0530
Keys:  Help   Display mode   Restart statistics   Order of fields   quit
                                 Packets               Pings
 Host                          Loss%   Snt   Last   Avg  Best  Wrst StDev
 1. localhost                   0.0%    16    0.1   0.1   0.0   0.2   0.0
```

19) whois : This command displayed information about domain names, IP addresses, registrar URL, Domains status, domain id, etc. This is used to display the ownership of network and more.

```
uday@uday:~$ whois youtube.com
   Domain Name: YOUTUBE.COM
   Registry Domain ID: 142504053_DOMAIN_COM-VRSN
   Registrar WHOIS Server: whois.markmonitor.com
   Registrar URL: http://www.markmonitor.com
   Updated Date: 2023-01-14T09:25:19Z
   Creation Date: 2005-02-15T05:13:12Z
   Registry Expiry Date: 2024-02-15T05:13:12Z
   Registrar: MarkMonitor Inc.
   Registrar IANA ID: 292
   Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
   Registrar Abuse Contact Phone: +1.2086851750
   Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProh
ibited
   Domain Status: clientTransferProhibited https://icann.org/epp#clientTransfer
Prohibited
   Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProh
ibited
   Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProh
ibited
   Domain Status: serverTransferProhibited https://icann.org/epp#serverTransfer
Prohibited
   Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProh
ibited
   Name Server: NS1.GOOGLE.COM
   Name Server: NS2.GOOGLE.COM
   Name Server: NS3.GOOGLE.COM
```

20) ifplugstatus : This displayed the link status of the network interfaces.

21) iftop : This command displayed IP address, MAC address, and it is used to view network traffic and connections on an interface.