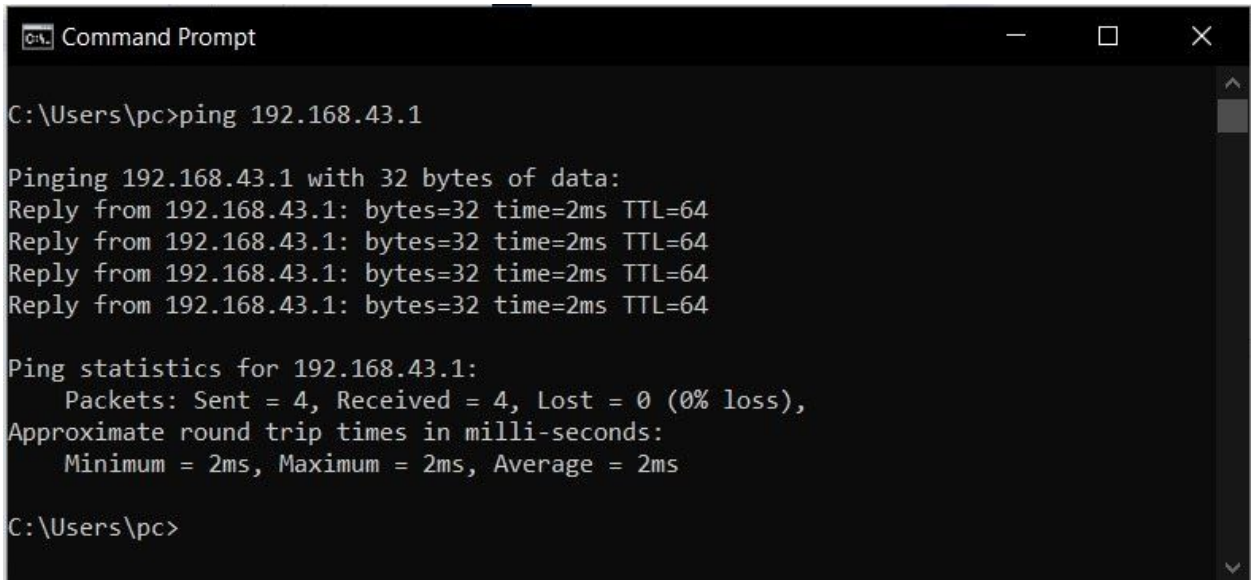
EXPERIMENT - 1

NETWORKS LAB

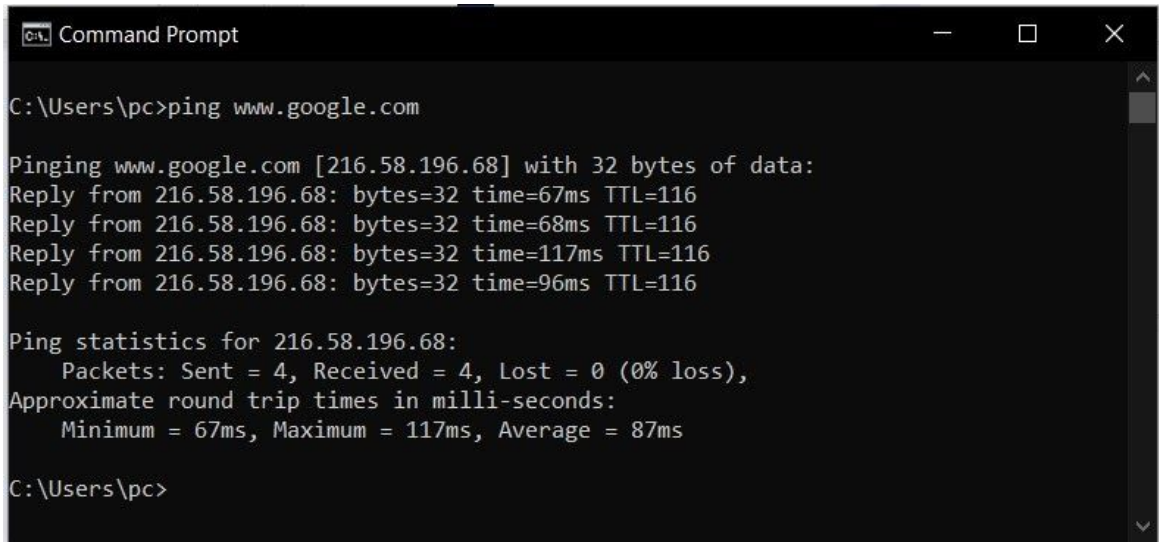
Submitted by
Mohammed Ismail C
B180437CS
B Batch

1.ping

The Ping network command uses the echo request, and echo reply messages within the Internet Control Message Protocol (ICMP), an integral part of any IP network. When a ping command is issued, an echo request packet is sent to the address specified. When the remote host receives the echo request, it responds with an echo reply packet.

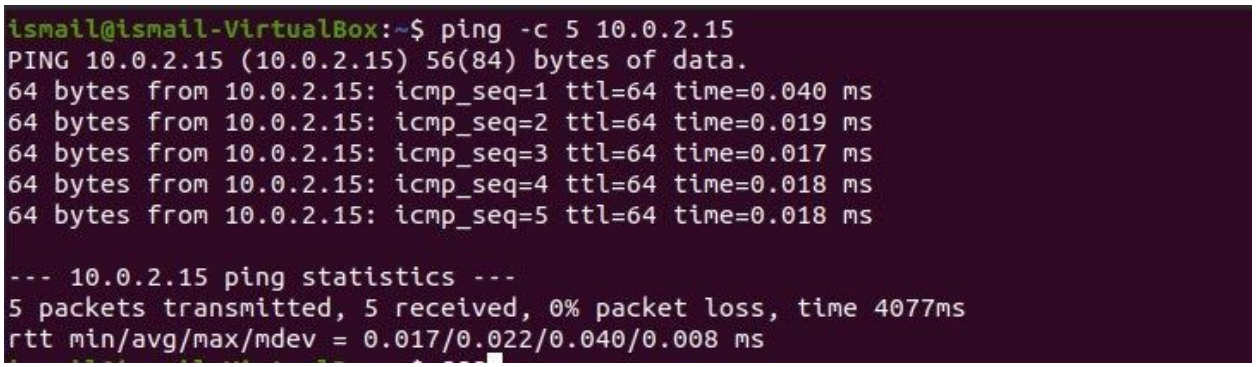


My home router IP address is 192.168.43.1 .We are sending 4 ICMP data packets and upon recieving it sends back same packets as response. You can see in summary, data packet lost is 0%. So there is a successful connection with remote system.



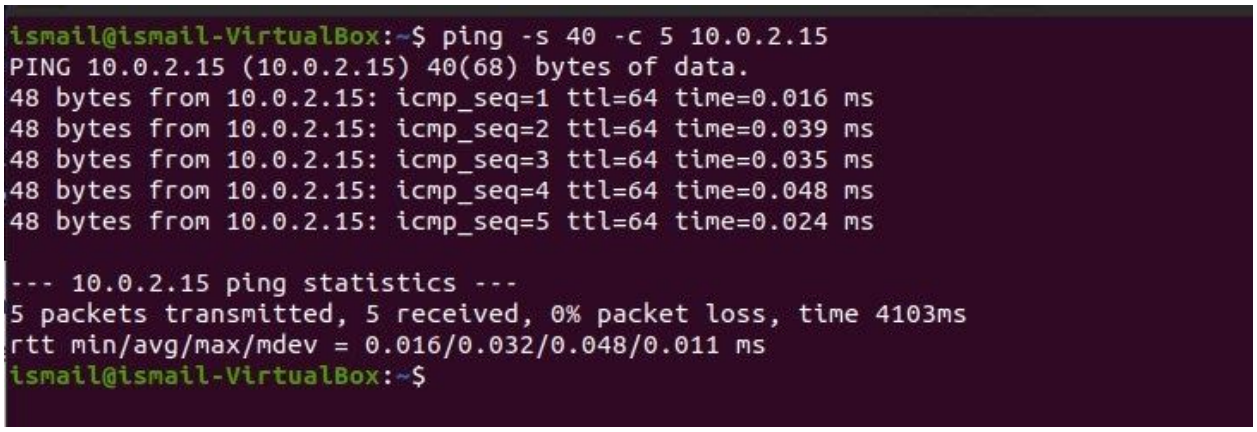
We can also ping using domain name as shown above.

1.1 controlling the number of pings

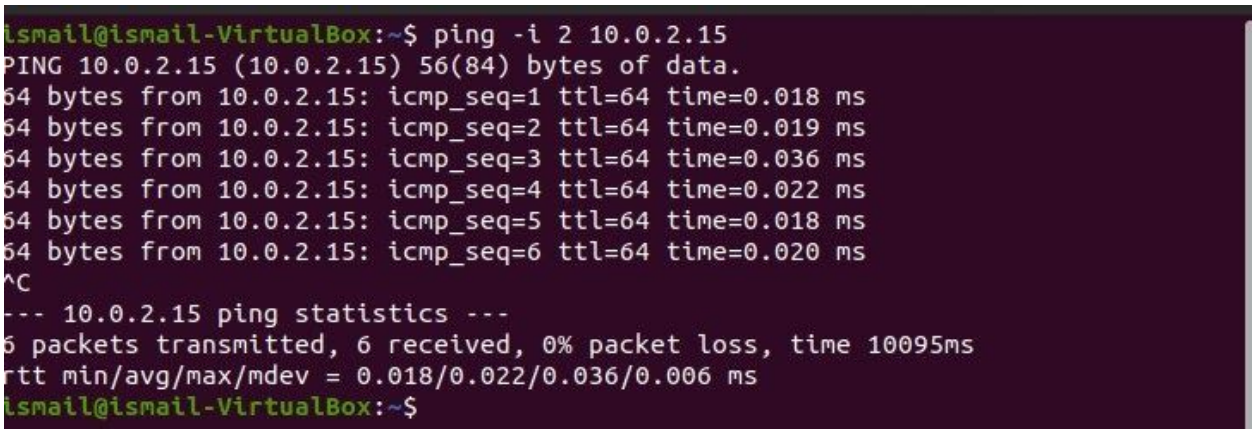


Here 5 packets will be send to the destination address.

1.2 Controlling the size of packets send



1.3 Changing the time interval:



By default ping wait for 1 sec to send next packet, Now it will wait for 2 seconds.

1.4 To get only summary

```
ismail@ismail-VirtualBox:~$ ping -c 5 -q 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.

--- 10.0.2.15 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4081ms
rtt min/avg/max/mdev = 0.015/0.021/0.035/0.007 ms
ismail@ismail-VirtualBox:~$
```

1.5 To timeout ping

```
ismail@ismail-VirtualBox:~$ ping -w 3 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.012 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.022 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.019 ms

--- 10.0.2.15 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2027ms
rtt min/avg/max/mdev = 0.012/0.017/0.022/0.004 ms
```

Pinging stopped after 3 seconds.

1.6 To add timestamp only

```
ismail@ismail-VirtualBox:~$ ping -T tsonly -c 2 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(124) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.012 ms
TS:     18379867 absolute
        0
        0
        0

64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.024 ms
TS:     18380878 absolute
        0
        0
        0


--- 10.0.2.15 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1010ms
rtt min/avg/max/mdev = 0.012/0.018/0.024/0.006 ms
```

1.7 To add timestamp and address

```
ismail@ismail-VirtualBox:~$ ping -c 2 -T tsandaddr 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(124) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.012 ms
TS:     10.0.2.15       18513509 absolute
        10.0.2.15       0
        10.0.2.15       0
        10.0.2.15       0

64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.040 ms
TS:     10.0.2.15       18514548 absolute
        10.0.2.15       0
        10.0.2.15       0
        10.0.2.15       0


--- 10.0.2.15 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1039ms
rtt min/avg/max/mdev = 0.012/0.026/0.040/0.014 ms
```

1.8 To fill packet with data

```
ismail@ismail-VirtualBox:~$ ping -c 5 -p ff 10.0.2.15
PATTERN: 0xff
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.017 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.018 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.018 ms
64 bytes from 10.0.2.15: icmp_seq=4 ttl=64 time=0.019 ms
64 bytes from 10.0.2.15: icmp_seq=5 ttl=64 time=0.018 ms

--- 10.0.2.15 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4097ms
rtt min/avg/max/mdev = 0.017/0.018/0.019/0.000 ms
```

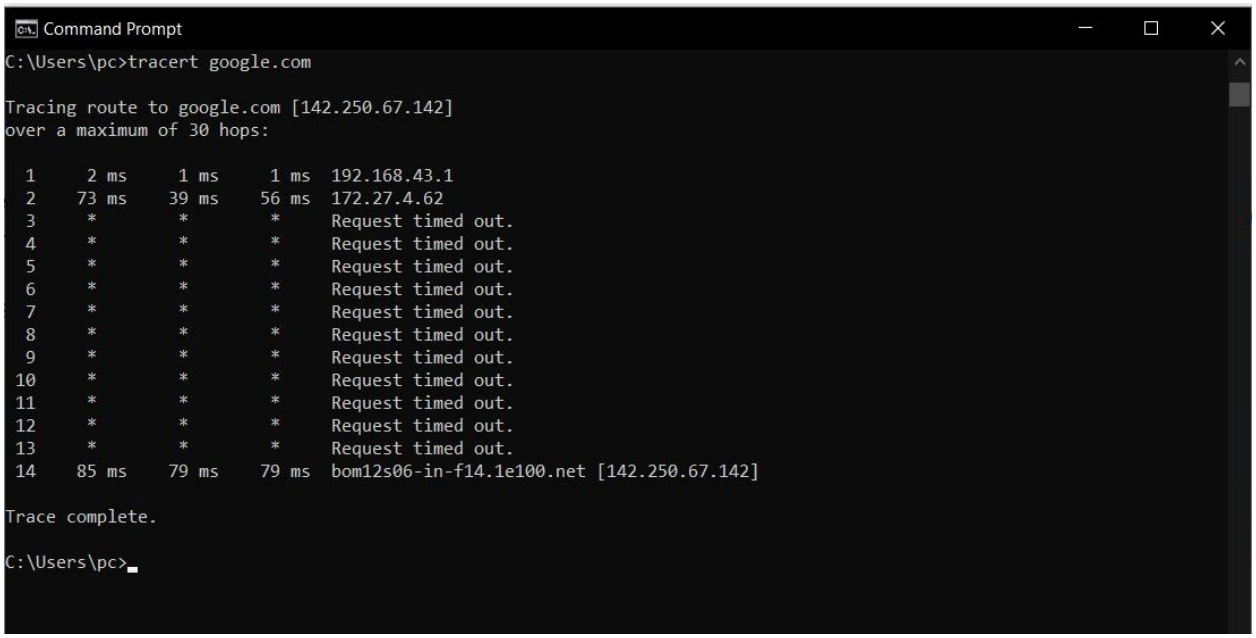
We can fill data in packet using **-p** option. Like -p ff will fill packet with ones.

1.9 Specify Time to Live(TTL)

```
ismail@ismail-VirtualBox:~$ ping -c 5 -t 64 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.017 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.019 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.025 ms
64 bytes from 10.0.2.15: icmp_seq=4 ttl=64 time=0.025 ms
64 bytes from 10.0.2.15: icmp_seq=5 ttl=64 time=0.019 ms

--- 10.0.2.15 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4073ms
rtt min/avg/max/mdev = 0.017/0.021/0.025/0.003 ms
```

2.tracert

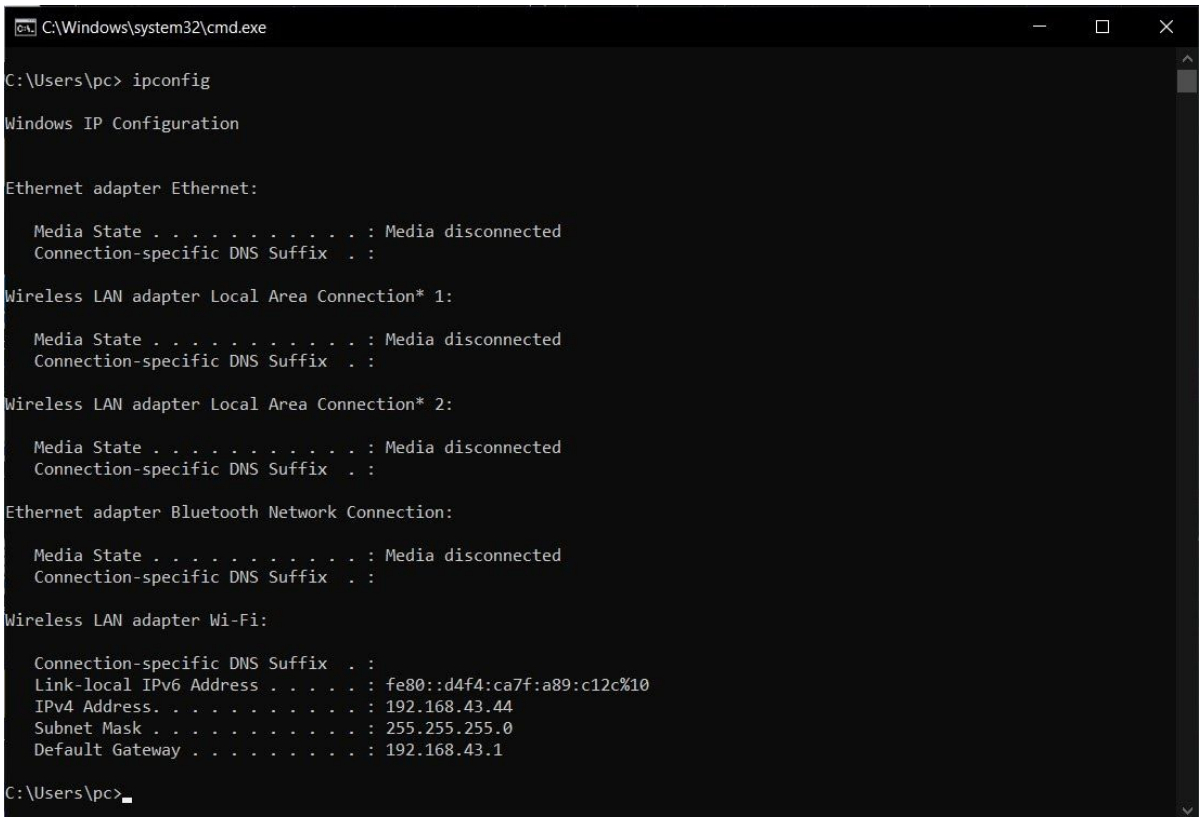
The tracert command used to show several details about the path that a packet takes from the computer to whatever destination you specify.



we can see here that tracert identified 14 network devices including my router(mobile hotspot) at *192.168.43.1* and all the way through to the target of *www.google.com*, which we now know uses the public IP address of *142.250.67.142*, one of Google's many IP addresses.Here some router details are displayed as “*” because many router intentionally discard ping commands.

3.ipconfig/ifconfig

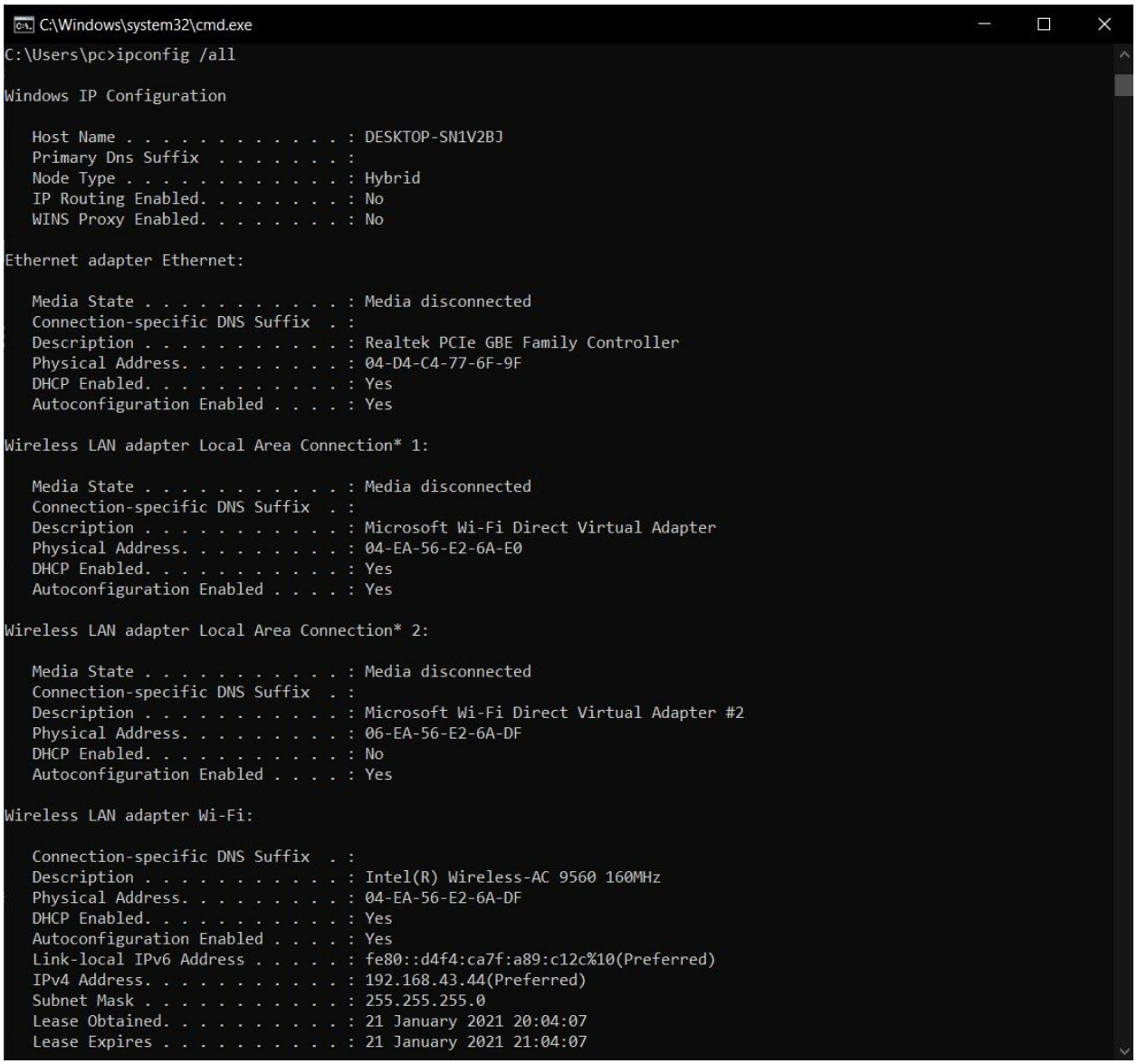
ipconfig displays Internet Protocol version 4 (IPv4) and IPv6 addresses, subnet mask, and default gateway for all adapters.



My computer is connected to internet through the wireless LAN adapter or Wi-Fi whose IP address is *192.168.43.1.*

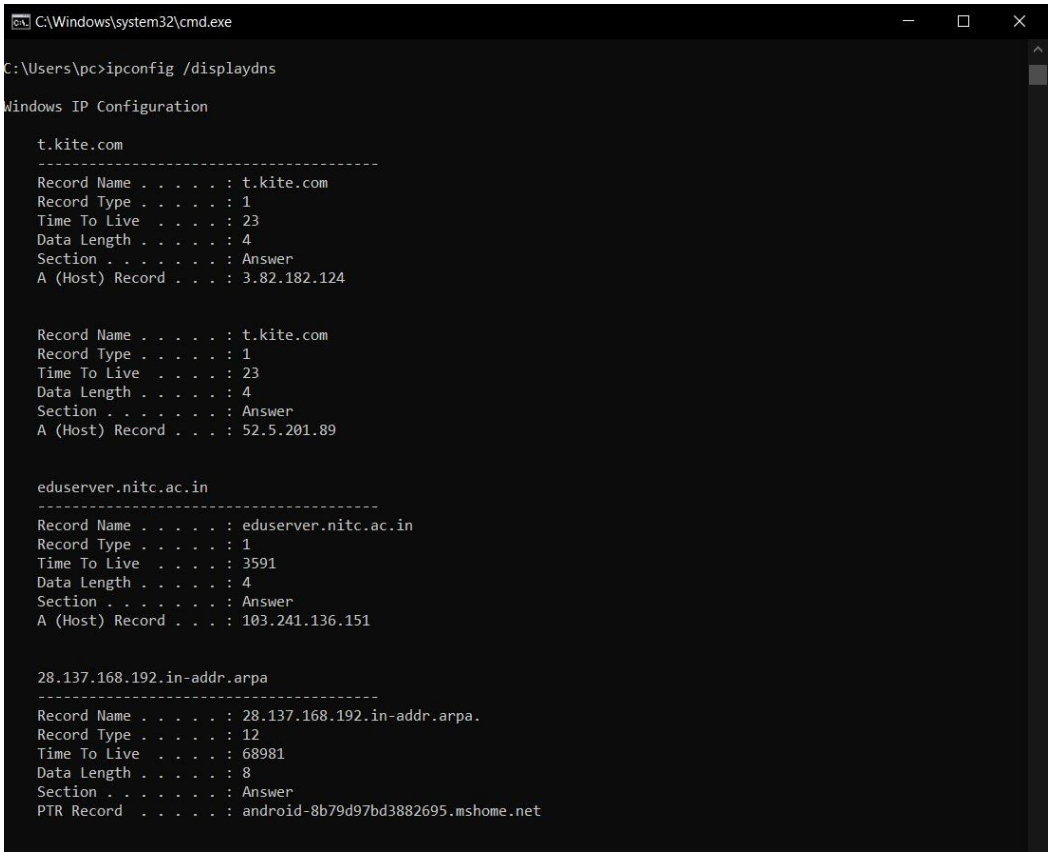
3.1 ipconfig/all

Displays the full TCP/IP configuration for all adapters.



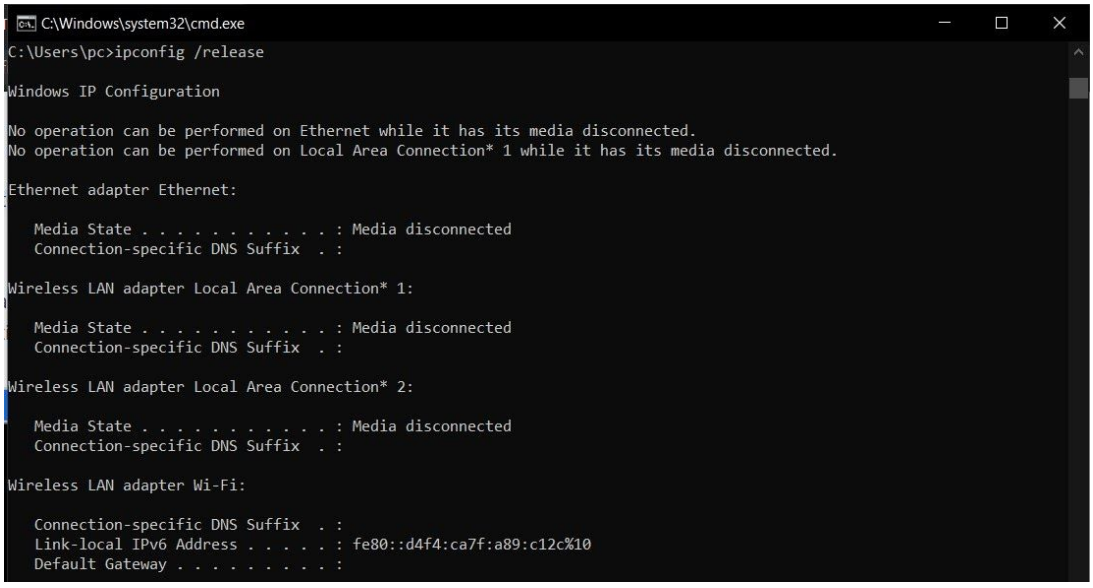
3.2 ipconfig/displaydns

Displays the contents of the DNS client resolver cache, which includes both entries preloaded from the local Hosts file and any recently obtained resource records for name queries resolved by the computer.



3.3 ipconfig/release

Sends a DHCPRELEASE message to the DHCP server to release the current DHCP configuration and discard the IP address configuration for either all adapters (if an adapter is not specified) or for a specific adapter if the adapter parameter is included.



3.4 display all the interfaces available

```
ismail@ismail-VirtualBox:~$ ifconfig -a
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::bc3f:b4c8:e1b7:6548  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:3b:62:e0  txqueuelen 1000  (Ethernet)
        RX packets 36895  bytes 21354278 (21.3 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 33632  bytes 5233973 (5.2 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 8555  bytes 954924 (954.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 8555  bytes 954924 (954.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ismail@ismail-VirtualBox:~$
```

3.5 display a shortlist instead of all information

```
ismail@ismail-VirtualBox:~$ ifconfig -s
Iface      MTU    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500    37620      0      0 0         34402      0      0      0 BMRU
lo       65536     8700      0      0 0          8700      0      0      0 LRU
```

3.6 Activating and deactivating driver for a given interface

```
ismail@ismail-VirtualBox:~$ ifconfig -s
Iface      MTU    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500    38789      0      0 0         35536      0      0      0 BMRU
lo       65536     9017      0      0 0          9017      0      0      0 LRU
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$ sudo ifconfig enp0s3 down
[sudo] password for ismail:
ismail@ismail-VirtualBox:~$ ifconfig -s
Iface      MTU    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
lo       65536     9129      0      0 0          9129      0      0      0 LRU
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$ sudo ifconfig enp0s3 up
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$ ifconfig -s
Iface      MTU    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500    38913      0      0 0         35683      0      0      0 BMRU
lo       65536     9918      0      0 0          9918      0      0      0 LRU
ismail@ismail-VirtualBox:~$
```

3.7 View network setting for specific interface

```
ismail@ismail-VirtualBox:~$ ifconfig enp0s3
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::bc3f:b4c8:e1b7:6548  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:3b:62:e0  txqueuelen 1000  (Ethernet)
        RX packets 43714  bytes 24689447 (24.6 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 40136  bytes 6246051 (6.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

3.8 Assign IP address to a network interface

```
ismail@ismail-VirtualBox:~$ sudo ifconfig lo 192.168.1.1
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$ ifconfig lo
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 192.168.1.1  netmask 255.255.255.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 11120  bytes 1216978 (1.2 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 11120  bytes 1216978 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ismail@ismail-VirtualBox:~$
```

3.9 Assign netmask to a network interface

```
ismail@ismail-VirtualBox:~$ sudo ifconfig lo netmask 255.255.255.224
ismail@ismail-VirtualBox:~$
ismail@ismail-VirtualBox:~$ ifconfig lo
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.255.255.224
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 11243  bytes 1231138 (1.2 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 11243  bytes 1231138 (1.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ismail@ismail-VirtualBox:~$
```

4.nslookup

nslookup is a command-line administrative tool for testing and troubleshooting DNS servers (Domain Name Server). It is used to query specific DNS resource records (RR) as well.

4.1 display IP address of domain

```
ismail@ismail-VirtualBox:~$ nslookup yahoo.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
Name:   yahoo.com
Address: 74.6.143.25
Name:   yahoo.com
Address: 74.6.143.26
Name:   yahoo.com
Address: 98.137.11.163
Name:   yahoo.com
Address: 74.6.231.21
Name:   yahoo.com
Address: 74.6.231.20
Name:   yahoo.com
Address: 98.137.11.164
Name:   yahoo.com
Address: 2001:4998:24:120d::1:0
Name:   yahoo.com
Address: 2001:4998:44:3507::8000
Name:   yahoo.com
Address: 2001:4998:44:3507::8001
Name:   yahoo.com
Address: 2001:4998:124:1507::f000
Name:   yahoo.com
Address: 2001:4998:24:120d::1:1
Name:   yahoo.com
Address: 2001:4998:124:1507::f001
```

4.2 Reverse domain lookup

```
ismail@ismail-VirtualBox:~$ nslookup 209.191.122.70
70.122.191.209.in-addr.arpa     name = unknown.yahoo.com.

Authoritative answers can be found from:

ismail@ismail-VirtualBox:~$
```

4.3 To query Mail Exchange(MX) record

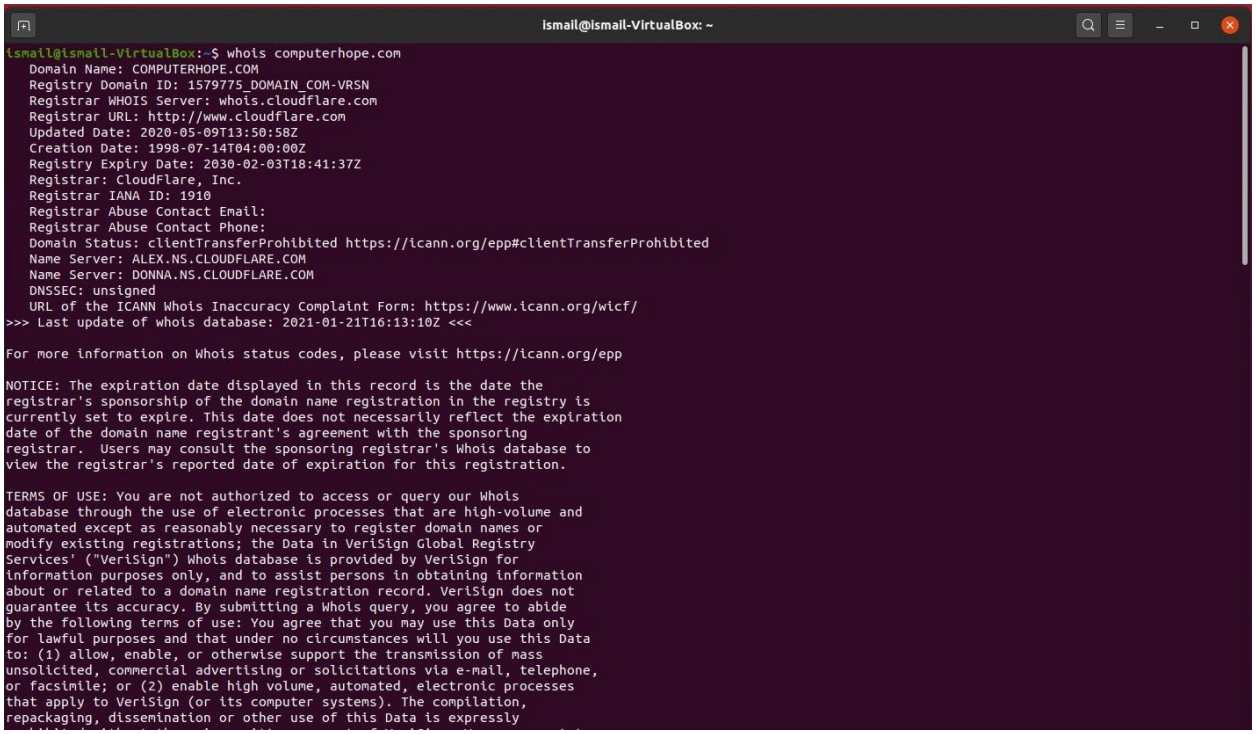
```
ismail@ismail-VirtualBox:~$ nslookup -query=mx www.yahoo.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
www.yahoo.com   canonical name = new-fp-shed.wg1.b.yahoo.com.

Authoritative answers can be found from:
```

4.4 To enable debug mode

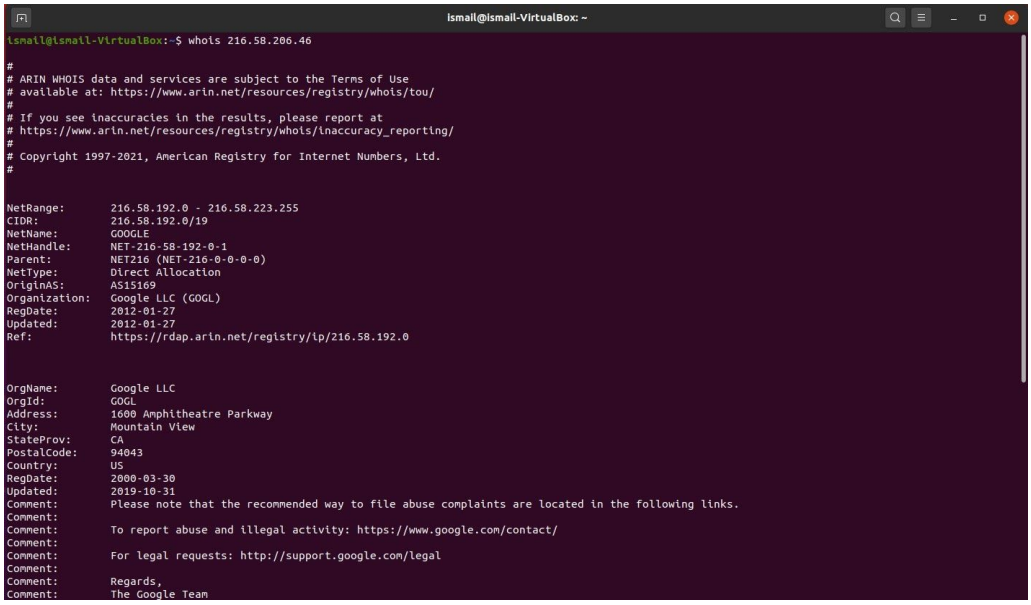
```
ismail@ismail-VirtualBox:~$ nslookup -debug yahoo.com
Server:         127.0.0.53
Address:        127.0.0.53#53

------------
    QUESTIONS:
        yahoo.com, type = A, class = IN
    ANSWERS:
    ->  yahoo.com
        internet address = 98.137.11.164
        ttl = 1017
    ->  yahoo.com
        internet address = 74.6.231.20
        ttl = 1017
    ->  yahoo.com
        internet address = 74.6.231.21
        ttl = 1017
    ->  yahoo.com
        internet address = 98.137.11.163
        ttl = 1017
    ->  yahoo.com
        internet address = 74.6.143.26
        ttl = 1017
    ->  yahoo.com
        internet address = 74.6.143.25
        ttl = 1017
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
```

5.whois

whois is a TCP-based query and response protocol that is commonly used to provide information services to Internet users. It returns information about the registered Domain Names, an IP address block, Name Servers and a much wider range of information services.



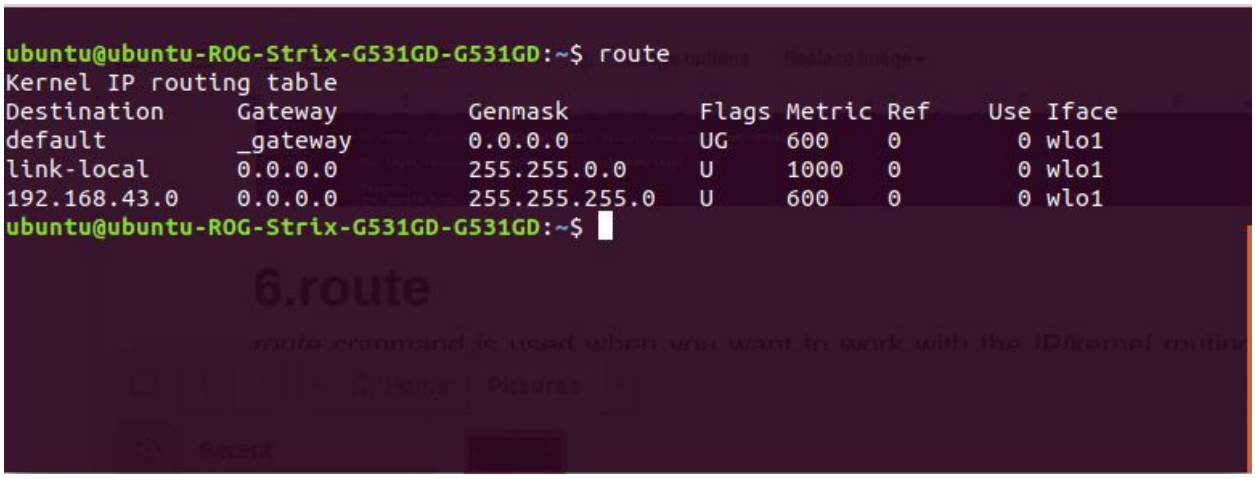
Whois can be used to get the information about specific IP Address issue the command as shown in the below screenshot.



6.route

route command is used when you want to work with the IP/kernel routing table. It is mainly used to set up static routes to specific hosts or networks via an interface. It is used for showing or update the IP/kernel routing table.

6.1 To display the IP/kernel routing table.



It displays the routing table entries.

6.2 To display routing table in full numeric form

It is even useful when you have to determine why the route to nameserver has even vanished.

6.3 To add a default gateway

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo route add default gw 169.254.0.0
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         169.254.0.0     0.0.0.0         UG    0      0        0 wlo1
default         _gateway        0.0.0.0         UG    20600  0        0 wlo1
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 wlo1
192.168.43.0    0.0.0.0         255.255.255.0   U     600    0        0 wlo1
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This assigns a gateway address on which all the packets that do not belong to the network are forwarded.

6.4 To get details of the kernel/IP routing table using ip command

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ip route
default via 192.168.43.1 dev wlo1 proto dhcp metric 20600
169.254.0.0/16 dev wlo1 scope link metric 1000
192.168.43.0/24 dev wlo1 proto kernel scope link src 192.168.43.44 metric 600
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This will give the details of the kernel/IP routing table and in this case, we have used IP command.

6.5 To get output related to IPv4

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ip -4 route
default via 192.168.43.1 dev wlo1 proto dhcp metric 20600
169.254.0.0/16 dev wlo1 scope link metric 1000
192.168.43.0/24 dev wlo1 proto kernel scope link src 192.168.43.44 metric 600
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This will only display the entries with ipv4.

6.6 To get output related to IPv6

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ip -6 route
fe80::/64 dev wlo1 proto kernel metric 256 pref medium
fe80::/64 dev wlo1 proto kernel metric 600 pref medium
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This will only display the entries with ipv6.

7.tcpdump

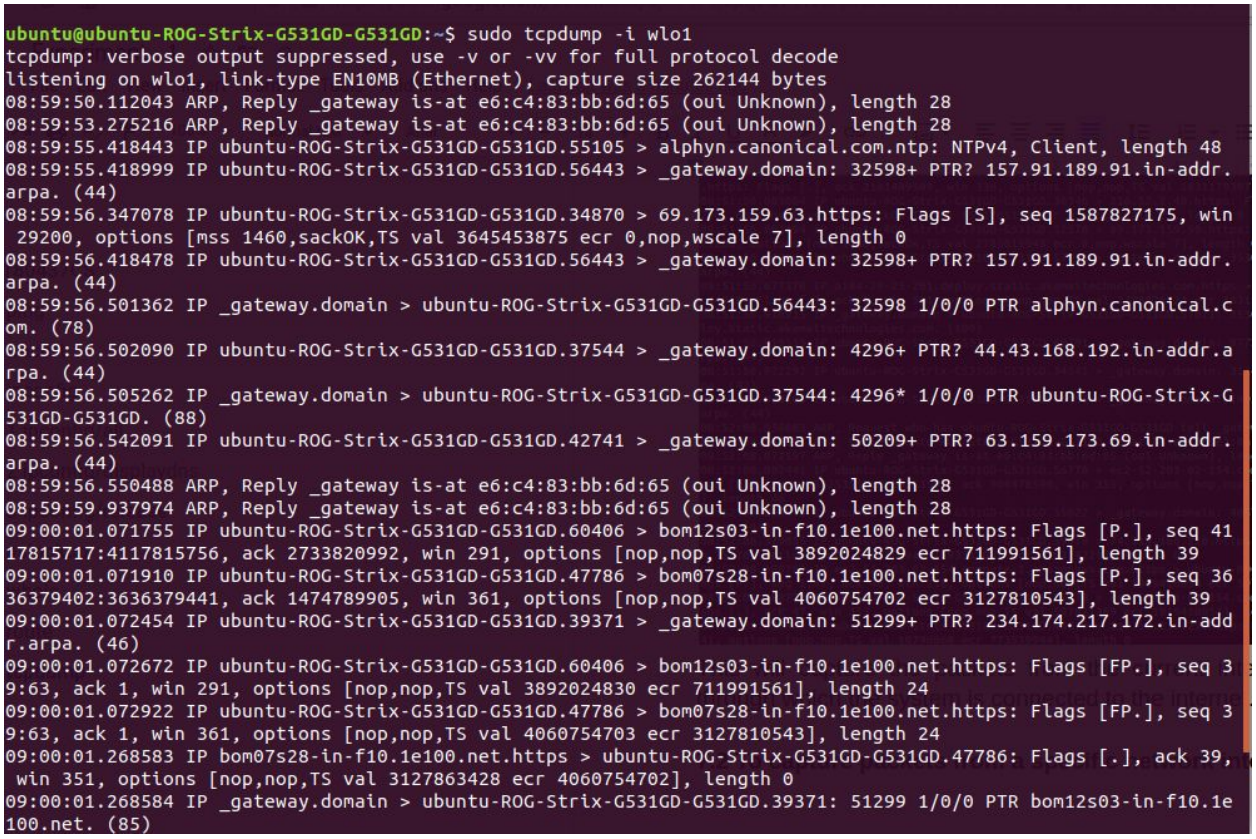
tcpdump is a packet sniffing and packet analyzing tool for a System Administrator to troubleshoot connectivity issues in Linux. It is used to capture, filter, and analyze network traffic such as TCP/IP packets going through your system. It is many times used as a security tool as well.

7.1 To capture the packets of current network interface

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
08:51:56.603055 IP ubuntu-ROG-Strix-G531GD-G531GD.44810 > a184-29-25-201.deploy.static.akamaitechnologies.com
.https: Flags [.], ack 2161489509, win 336, options [nop,nop,TS val 1631179307 ecr 2798866284], length 0
08:51:56.603084 IP ubuntu-ROG-Strix-G531GD-G531GD.36346 > 216.52.2.48.https: Flags [S], seq 980087995, win 29
200, options [mss 1460,sackOK,TS val 1511765110 ecr 0,nop,wscale 7], length 0
08:51:56.603094 IP ubuntu-ROG-Strix-G531GD-G531GD.52578 > 69.173.159.50.https: Flags [S], seq 903862319, win
29200, options [mss 1460,sackOK,TS val 2785019945 ecr 0,nop,wscale 7], length 0
08:51:56.603582 IP ubuntu-ROG-Strix-G531GD-G531GD.57071 > _gateway.domain: 35302+ PTR? 201.25.29.184.in-addr.
arpa. (44)
08:51:56.677370 IP a184-29-25-201.deploy.static.akamaitechnologies.com.https > ubuntu-ROG-Strix-G531GD-G531GD
.44810: Flags [.], ack 1, win 501, options [nop,nop,TS val 2798876524 ecr 1631148578], length 0
08:51:56.918915 IP _gateway.domain > ubuntu-ROG-Strix-G531GD-G531GD.57071: 35302 1/0/0 PTR a184-29-25-201.dep
loy.static.akamaitechnologies.com. (109)
08:51:56.919515 IP ubuntu-ROG-Strix-G531GD-G531GD.60791 > _gateway.domain: 9773+ PTR? 44.43.168.192.in-addr.a
rpa. (44)
08:51:56.922292 IP ubuntu-ROG-Strix-G531GD-G531GD.34541 > _gateway.domain: 31148+ PTR? 48.2.52.216.in-addr.ar
pa. (42)
08:52:06.933505 IP ubuntu-ROG-Strix-G531GD-G531GD.56155 > _gateway.domain: 14939+ PTR? 50.159.173.69.in-addr.
arpa. (44)
08:52:08.058683 ARP, Request who-has ubuntu-ROG-Strix-G531GD-G531GD tell _gateway, length 28
08:52:08.058697 ARP, Reply ubuntu-ROG-Strix-G531GD-G531GD is-at 04:ea:56:e2:6a:df (oui Unknown), length 28
08:52:08.072597 ARP, Reply _gateway is-at e6:c4:83:bb:6d:65 (oui Unknown), length 28
08:52:08.092441 IP ubuntu-ROG-Strix-G531GD-G531GD.56778 > ec2-52-203-62-154.compute-1.amazonaws.com.https: Fl
ags [P.], seq 1196253537:1196253583, ack 908478590, win 355, options [nop,nop,TS val 597821081 ecr 1919396274
], length 46
08:52:08.093048 IP ubuntu-ROG-Strix-G531GD-G531GD.35622 > _gateway.domain: 46575+ PTR? 154.62.203.52.in-addr.
arpa. (44)
08:52:08.379055 IP ubuntu-ROG-Strix-G531GD-G531GD.39978 > 74.118.186.210.https: Flags [.], ack 1354732310, wi
n 35376, options [nop,nop,TS val 1193313883 ecr 759314221], length 0
08:52:08.380760 IP ec2-52-203-62-154.compute-1.amazonaws.com.https > ubuntu-ROG-Strix-G531GD-G531GD.56778: Fl
ags [P.], seq 1:47, ack 46, win 118, options [nop,nop,TS val 1919410854 ecr 597821081], length 46
08:52:08.380772 IP ubuntu-ROG-Strix-G531GD-G531GD.56778 > ec2-52-203-62-154.compute-1.amazonaws.com.https: Fl
ags [.], ack 47, win 355, options [nop,nop,TS val 597821369 ecr 1919410854], length 0
08:52:08.635062 IP ubuntu-ROG-Strix-G531GD-G531GD.46870 > 117.18.237.29.http: Flags [.], ack 254144806, win 2
41, options [nop,nop,TS val 10796868 ecr 7735399441, length 0
```

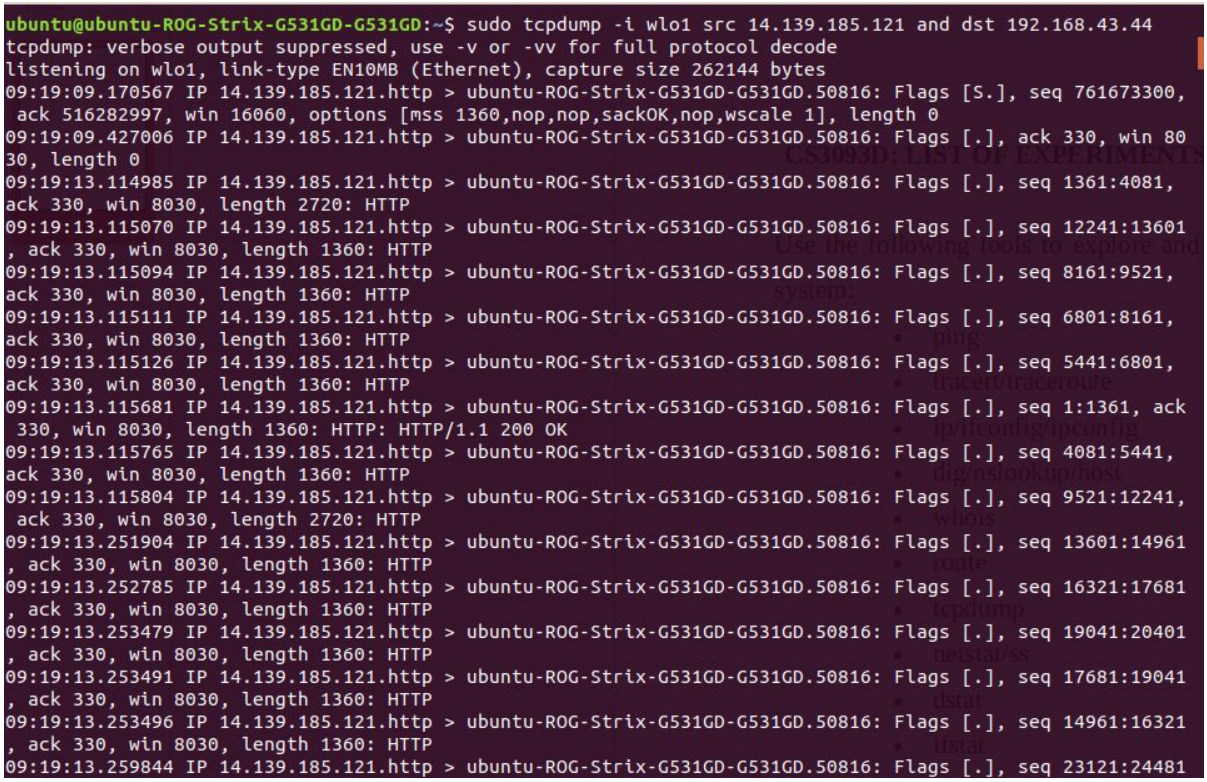
This will capture the packets from the current interface of the network through which the system is connected to the internet. Ie., *wlo1*

7.2 To capture packets from a specific network interface



This command will now capture the packets from wlo1 network interface.

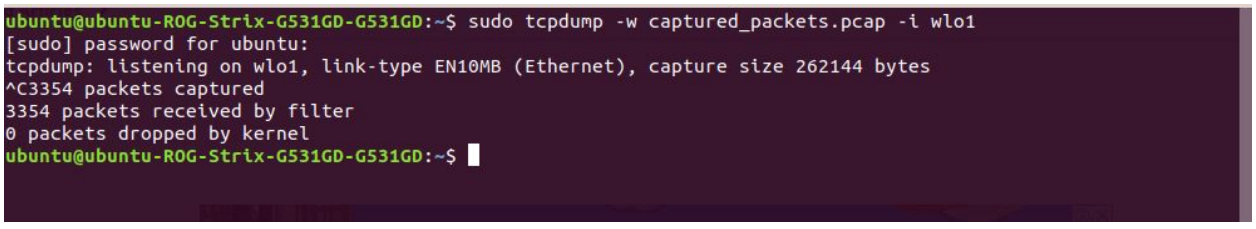
7.3 Packet Analysing from a given source and destination IP



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo tcpdump -i wlo1 src 14.139.185.121 and dst 192.168.43.44
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
09:19:09.170567 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [S.], seq 761673300,
 ack 516282997, win 16060, options [mss 1360,nop,nop,sackOK,nop,wscale 1], length 0
09:19:09.427006 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], ack 330, win 80
30, length 0
09:19:13.114985 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 1361:4081,
ack 330, win 8030, length 2720: HTTP
09:19:13.115070 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 12241:13601
, ack 330, win 8030, length 1360: HTTP
09:19:13.115094 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 8161:9521,
ack 330, win 8030, length 1360: HTTP
09:19:13.115111 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 6801:8161,
ack 330, win 8030, length 1360: HTTP
09:19:13.115126 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 5441:6801,
ack 330, win 8030, length 1360: HTTP
09:19:13.115681 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 1:1361, ack
 330, win 8030, length 1360: HTTP: HTTP/1.1 200 OK
09:19:13.115765 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 4081:5441,
ack 330, win 8030, length 1360: HTTP
09:19:13.115804 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 9521:12241,
 ack 330, win 8030, length 2720: HTTP
09:19:13.251904 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 13601:14961
, ack 330, win 8030, length 1360: HTTP
09:19:13.252785 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 16321:17681
, ack 330, win 8030, length 1360: HTTP
09:19:13.253479 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 19041:20401
, ack 330, win 8030, length 1360: HTTP
09:19:13.253491 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 17681:19041
, ack 330, win 8030, length 1360: HTTP
09:19:13.253496 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 14961:16321
, ack 330, win 8030, length 1360: HTTP
09:19:13.259844 IP 14.139.185.121.http > ubuntu-ROG-Strix-G531GD-G531GD.50816: Flags [.], seq 23121:24481
```

Here the source IP is *14.139.185.121* which is the IP address of nitc server and source IP is *192.168.43.44* which is my system IP address. So whenever i access *www.nitc.ac.in* , all packets that i receive to my system from that particular server is displayed.

7.4 To save captured packets into a file



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo tcpdump -w captured_packets.pcap -i wlo1
[sudo] password for ubuntu:
tcpdump: listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
^C3354 packets captured
3354 packets received by filter
0 packets dropped by kernel
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This command will now output all the captures packets in a file named as captured_packets.pcap.

7.5 To read captured packets from a file

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo tcpdump -r captured_packets.pcap
reading from file captured_packets.pcap, link-type EN10MB (Ethernet)
09:39:16.171937 ARP, Reply _gateway is-at e6:c4:83:bb:6d:65 (oui Unknown), length 28
09:39:17.179143 IP ubuntu-ROG-Strix-G531GD-G531GD.46150 > ec2-44-240-93-245.us-west-2.compute.amazonaws.com.h
ttps: Flags [S], seq 2517212871, win 29200, options [mss 1460,sackOK,TS val 325880858 ecr 0,nop,wscale 7], le
ngth 0
09:39:17.179177 IP ubuntu-ROG-Strix-G531GD-G531GD.47300 > a184-29-25-201.deploy.static.akamaitechnologies.com
.https: Flags [.], ack 2178566681, win 353, options [nop,nop,TS val 1634019792 ecr 2801706761], length 0
09:39:17.252023 IP a184-29-25-201.deploy.static.akamaitechnologies.com.https > ubuntu-ROG-Strix-G531GD-G531GD
.47300: Flags [.], ack 1, win 501, options [nop,nop,TS val 2801717021 ecr 1633968511], length 0
09:39:17.947109 IP ubuntu-ROG-Strix-G531GD-G531GD.36212 > bom07s31-in-f14.1e100.net.https: Flags [S], seq 352
21923, win 29200, options [mss 1460,sackOK,TS val 3002498773 ecr 0,nop,wscale 7], length 0
09:39:17.950468 ARP, Request who-has ubuntu-ROG-Strix-G531GD-G531GD tell _gateway, length 28
09:39:17.950490 ARP, Reply ubuntu-ROG-Strix-G531GD-G531GD is-at 04:ea:56:e2:6a:df (oui Unknown), length 28
09:39:18.203077 IP ubuntu-ROG-Strix-G531GD-G531GD.36214 > bom07s31-in-f14.1e100.net.https: Flags [S], seq 196
8082206, win 29200, options [mss 1460,sackOK,TS val 3002499030 ecr 0,nop,wscale 7], length 0
09:39:19.441126 ARP, Reply _gateway is-at e6:c4:83:bb:6d:65 (oui Unknown), length 28
09:39:19.668481 IP ubuntu-ROG-Strix-G531GD-G531GD.35787 > _gateway.domain: 15583+ AAAA? ib.sin1.geoadnxs.com.
 (38)
09:39:19.995097 IP ubuntu-ROG-Strix-G531GD-G531GD.60664 > bom05s12-in-f14.1e100.net.https: Flags [S], seq 274
9277502, win 29200, options [mss 1460,sackOK,TS val 3279448490 ecr 0,nop,wscale 7], length 0
09:39:20.352581 IP ubuntu-ROG-Strix-G531GD-G531GD.57600 > bom12s08-in-f3.1e100.net.https: Flags [P.], seq 109
6381787:1096381826, ack 2704220483, win 291, options [nop,nop,TS val 1934951443 ecr 980988573], length 39
09:39:20.439589 IP bom12s08-in-f3.1e100.net.https > ubuntu-ROG-Strix-G531GD-G531GD.57600: Flags [.], ack 39,
win 271, options [nop,nop,TS val 981047104 ecr 1934951443], length 0
09:39:20.439617 IP bom12s08-in-f3.1e100.net.https > ubuntu-ROG-Strix-G531GD-G531GD.57600: Flags [P.], seq 1:4
0, ack 39, win 271, options [nop,nop,TS val 981047104 ecr 1934951443], length 39
09:39:20.483151 IP ubuntu-ROG-Strix-G531GD-G531GD.57600 > bom12s08-in-f3.1e100.net.https: Flags [.], ack 40,
win 291, options [nop,nop,TS val 1934951574 ecr 981047104], length 0
09:39:20.896032 IP ubuntu-ROG-Strix-G531GD-G531GD.43156 > maa05s13-in-f2.1e100.net.https: Flags [P.], seq 351
2861950:3512861989, ack 761560252, win 355, options [nop,nop,TS val 3204624795 ecr 3703742951], length 39
09:39:20.896165 IP ubuntu-ROG-Strix-G531GD-G531GD.43154 > maa05s13-in-f2.1e100.net.https: Flags [P.], seq 117
3797457:1173797496, ack 1866289901, win 352, options [nop,nop,TS val 3204624795 ecr 1518670058], length 39
09:39:20.896646 IP ubuntu-ROG-Strix-G531GD-G531GD.43154 > maa05s13-in-f2.1e100.net.https: Flags [FP.], seq 39
:63, ack 1, win 352, options [nop,nop,TS val 3204624796 ecr 1518670058], length 24
09:39:20.896873 IP ubuntu-ROG-Strix-G531GD-G531GD.43156 > maa05s13-in-f2.1e100.net.https: Flags [FP.], seq 39
:63, ack 1, win 355, options [nop,nop,TS val 3204624796 ecr 3703742951], length 24
```

This command will now read the captured packets from the captured_packets.pcap file.

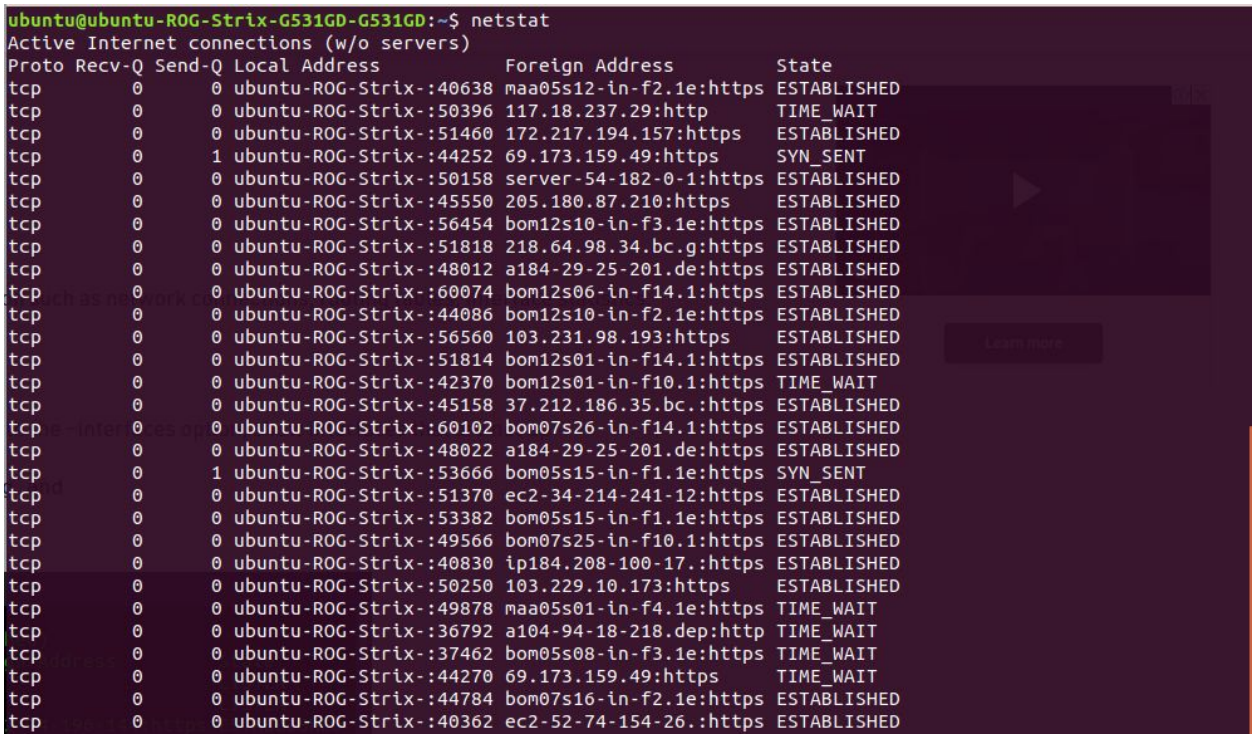
7.6 To capture only TCP packets

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ sudo tcpdump -i wlo1 tcp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
09:44:25.465270 IP ubuntu-ROG-Strix-G531GD-G531GD.40638 > maa05s12-in-f2.1e100.net.https: Flags [P.], seq 308
5957581:3085957620, ack 1578784187, win 1444, options [nop,nop,TS val 1278619412 ecr 1188174331], length 39
09:44:25.539154 IP maa05s12-in-f2.1e100.net.https > ubuntu-ROG-Strix-G531GD-G531GD.40638: Flags [.], ack 39,
win 698, options [nop,nop,TS val 1188233001 ecr 1278619412], length 0
09:44:25.539193 IP maa05s12-in-f2.1e100.net.https > ubuntu-ROG-Strix-G531GD-G531GD.40638: Flags [P.], seq 1:4
0, ack 39, win 698, options [nop,nop,TS val 1188233001 ecr 1278619412], length 39
09:44:25.583119 IP ubuntu-ROG-Strix-G531GD-G531GD.40638 > maa05s12-in-f2.1e100.net.https: Flags [.], ack 40,
win 1444, options [nop,nop,TS val 1278619529 ecr 1188233001], length 0
09:44:26.427694 IP ubuntu-ROG-Strix-G531GD-G531GD.48022 > a184-29-25-201.deploy.static.akamaitechnologies.com
.https: Flags [.], ack 2166040396, win 254, options [nop,nop,TS val 1634329221 ecr 2802016211], length 0
09:44:26.427732 IP ubuntu-ROG-Strix-G531GD-G531GD.48012 > a184-29-25-201.deploy.static.akamaitechnologies.com
.https: Flags [.], ack 2165942046, win 254, options [nop,nop,TS val 1634329221 ecr 2802016213], length 0
09:44:26.499786 IP a184-29-25-201.deploy.static.akamaitechnologies.com.https > ubuntu-ROG-Strix-G531GD-G531GD
.48022: Flags [.], ack 1, win 501, options [nop,nop,TS val 2802026451 ecr 1634278355], length 0
09:44:26.512048 IP a184-29-25-201.deploy.static.akamaitechnologies.com.https > ubuntu-ROG-Strix-G531GD-G531GD
.48012: Flags [.], ack 1, win 501, options [nop,nop,TS val 2802026463 ecr 1634278251], length 0
09:44:27.466236 IP ubuntu-ROG-Strix-G531GD-G531GD.47998 > bom07s15-in-f1.1e100.net.https: Flags [P.], seq 321
0852524:3210852563, ack 3066962796, win 1444, options [nop,nop,TS val 3139690544 ecr 118439286], length 39
09:44:27.555181 IP bom07s15-in-f1.1e100.net.https > ubuntu-ROG-Strix-G531GD-G531GD.47998: Flags [P.], seq 1:4
0, ack 39, win 287, options [nop,nop,TS val 118498326 ecr 3139690544], length 39
09:44:27.555227 IP ubuntu-ROG-Strix-G531GD-G531GD.47998 > bom07s15-in-f1.1e100.net.https: Flags [.], ack 40,
win 1444, options [nop,nop,TS val 3139690632 ecr 118498326], length 0
^C
11 packets captured
11 packets received by filter
0 packets dropped by kernel
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

This command will now capture only TCP packets from wlo1.

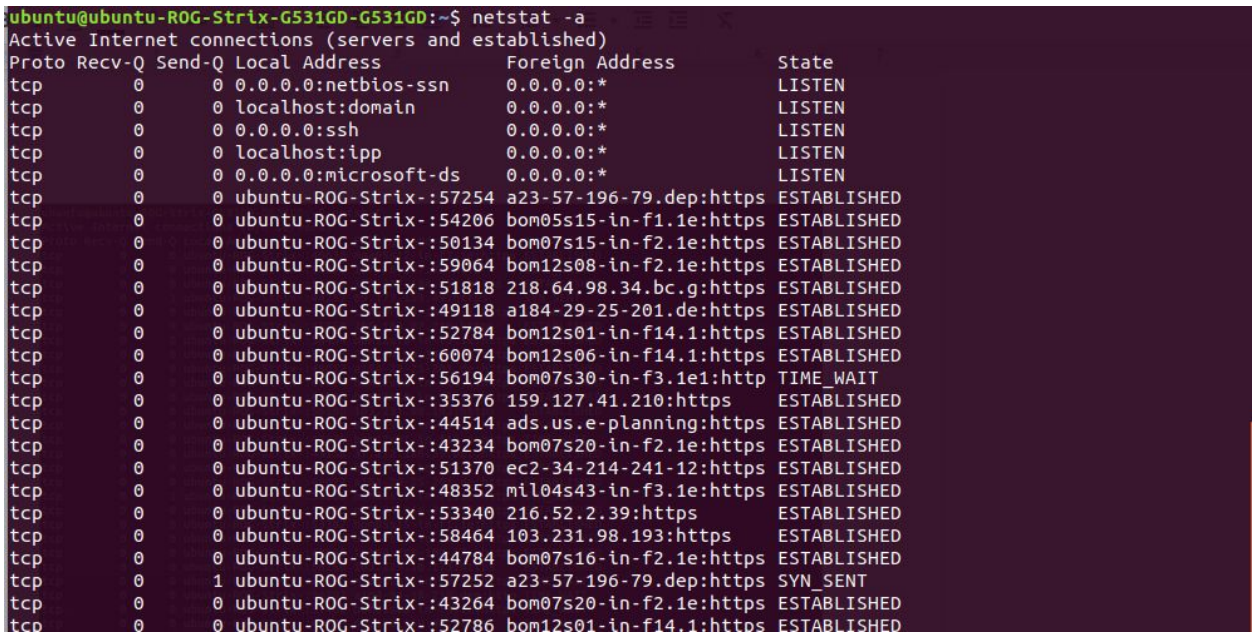
8. Netstat

Netstat command displays various network related information such as network connections, routing tables, interface statistics, masquerade connections, multicast memberships etc.



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 ubuntu-ROG-Strix-:40638 maa05s12-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:50396 117.18.237.29:http      TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:51460 172.217.194.157:https   ESTABLISHED
tcp        0      1 ubuntu-ROG-Strix-:44252 69.173.159.49:https     SYN_SENT
tcp        0      0 ubuntu-ROG-Strix-:50158 server-54-182-0-1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:45550 205.180.87.210:https    ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:56454 bom12s10-in-f3.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51818 218.64.98.34.bc.g:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:48012 a184-29-25-201.de:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:60074 bom12s06-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:44086 bom12s10-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:56560 103.231.98.193:https    ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51814 bom12s01-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:42370 bom12s01-in-f10.1:https TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:45158 37.212.186.35.bc.:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:60102 bom07s26-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:48022 a184-29-25-201.de:https ESTABLISHED
tcp        0      1 ubuntu-ROG-Strix-:53666 bom05s15-in-f1.1e:https SYN_SENT
tcp        0      0 ubuntu-ROG-Strix-:51370 ec2-34-214-241-12:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:53382 bom05s15-in-f1.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:49566 bom07s25-in-f10.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:40830 ip184.208-100-17.:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:50250 103.229.10.173:https    ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:49878 maa05s01-in-f4.1e:https TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:36792 a104-94-18-218.dep:http TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:37462 bom05s08-in-f3.1e:https TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:44270 69.173.159.49:https     TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:44784 bom07s16-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:40362 ec2-52-74-154-26.:https ESTABLISHED
```

8.1 Show both listening and non-listening sockets



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:netbios-ssn     0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:microsoft-ds    0.0.0.0:*               LISTEN
tcp        0      0 ubuntu-ROG-Strix-:57254 a23-57-196-79.dep:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:54206 bom05s15-in-f1.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:50134 bom07s15-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:59064 bom12s08-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51818 218.64.98.34.bc.g:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:49118 a184-29-25-201.de:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:52784 bom12s01-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:60074 bom12s06-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:56194 bom07s30-in-f3.1e1:http TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:35376 159.127.41.210:https    ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:44514 ads.us.e-planning:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:43234 bom07s20-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51370 ec2-34-214-241-12:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:48352 mil04s43-in-f3.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:53340 216.52.2.39:https       ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:58464 103.231.98.193:https    ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:44784 bom07s16-in-f2.1e:https ESTABLISHED
tcp        0      1 ubuntu-ROG-Strix-:57252 a23-57-196-79.dep:https SYN_SENT
tcp        0      0 ubuntu-ROG-Strix-:43264 bom07s20-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:52786 bom12s01-in-f14.1:https ESTABLISHED
```

8.2 List all tcp ports

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -at
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:netbios-ssn     0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:microsoft-ds    0.0.0.0:*               LISTEN
tcp        0      0 ubuntu-ROG-Strix-:50134 bom07s15-in-f2.1e:https TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:59064 bom12s08-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51818 218.64.98.34.bc.g:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:52784 bom12s01-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:60074 bom12s06-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:35376 159.127.41.210:https    TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:43234 bom07s20-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:51370 ec2-34-214-241-12:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:48352 mil04s43-in-f3.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:44784 bom07s16-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:52786 bom12s01-in-f14.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:59230 kul01s09-in-f74.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:59226 kul01s09-in-f74.1:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:52278 172.217.194.157:https   TIME_WAIT
tcp        0      0 ubuntu-ROG-Strix-:59050 bom12s08-in-f2.1e:https ESTABLISHED
tcp        0      0 ubuntu-ROG-Strix-:53636 bom07s25-in-f2.1e:https ESTABLISHED
```

8.3 List only listening ports

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:netbios-ssn     0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:microsoft-ds    0.0.0.0:*               LISTEN
tcp6       0      0 [::]:netbios-ssn        [::]:*                  LISTEN
tcp6       0      0 [::]:1716               [::]:*                  LISTEN
tcp6       0      0 [::]:ssh                [::]:*                  LISTEN
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
tcp6       0      0 [::]:microsoft-ds       [::]:*                  LISTEN
udp        0      0 0.0.0.0:51862           0.0.0.0:*
udp        0      0 localhost:domain        0.0.0.0:*
udp        0      0 0.0.0.0:bootpc          0.0.0.0:*
udp        0      0 0.0.0.0:ipp             0.0.0.0:*
udp        0      0 0.0.0.0:mdns            0.0.0.0:*
udp6       0      0 [::]:34896              [::]:*
udp6       0      0 [::]:mdns               [::]:*
udp6       0      0 [::]:1716               [::]:*
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     26521    @/tmp/.ICE-unix/1286
unix  2      [ ACC ]     SEQPACKET  LISTENING     1401     /run/udev/control
unix  2      [ ACC ]     STREAM     LISTENING     22020    /run/user/1000/systemd/private
unix  2      [ ACC ]     STREAM     LISTENING     22024    /run/user/1000/gnupg/S.gpg-agent
unix  2      [ ACC ]     STREAM     LISTENING     22025    /run/user/1000/gnupg/S.dirmngr
unix  2      [ ACC ]     STREAM     LISTENING     22026    /run/user/1000/gnupg/S.gpg-agent.browser
unix  2      [ ACC ]     STREAM     LISTENING     22027    /run/user/1000/bus
unix  2      [ ACC ]     STREAM     LISTENING     22028    /run/user/1000/gnupg/S.gpg-agent.extra
unix  2      [ ACC ]     STREAM     LISTENING     22029    /run/user/1000/gnupg/S.gpg-agent.ssh
unix  2      [ ACC ]     STREAM     LISTENING     21784    @irqbalance854.sock
unix  2      [ ACC ]     STREAM     LISTENING     38756    /run/NetworkManager/private-dhcp
unix  2      [ ACC ]     STREAM     LISTENING     21944    @/tmp/.X11-unix/X0
unix  2      [ ACC ]     STREAM     LISTENING     19139    /run/uuidd/request
```

8.4 List all udp ports

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -au
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 0.0.0.0:51862           0.0.0.0:*
udp        0      0 localhost:domain        0.0.0.0:*
udp        0      0 0.0.0.0:bootpc          0.0.0.0:*
udp        0      0 0.0.0.0:ipp             0.0.0.0:*
udp        0      0 0.0.0.0:mdns            0.0.0.0:*
udp        0      0 ubuntu-ROG-Strix-:38215 _gateway:domain         ESTABLISHED
udp6       0      0 [::]:34896              [::]:*
udp6       0      0 [::]:mdns               [::]:*
udp6       0      0 [::]:1716               [::]:*
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

8.5 List the statistics for all ports

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -s
Ip:
    Forwarding: 2
    141154 total packets received
    3 with invalid addresses
    0 forwarded
    0 incoming packets discarded
    141149 incoming packets delivered
    142888 requests sent out
    9 dropped because of missing route
Icmp:
    277 ICMP messages received
    0 input ICMP message failed
    ICMP input histogram:
        destination unreachable: 277
    369 ICMP messages sent
    0 ICMP messages failed
    ICMP output histogram:
        destination unreachable: 352
        echo requests: 17
IcmpMsg:
        InType3: 277
        OutType3: 352
        OutType8: 17
Tcp:
    2931 active connection openings
    0 passive connection openings
    5 failed connection attempts
    17 connection resets received
    23 connections established
    117691 segments received
    116596 segments sent out
    5991 segments retransmitted
    33 bad segments received
    1487 resets sent
```

8.6 Display PID and program names in the output

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ 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
tcp        0      0 ubuntu-ROG-Strix-:58566 103.231.98.193:https    ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:41260 bom05s11-in-f2.1e:https ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:51818 218.64.98.34.bc.g:https ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:47226 bom07s16-in-f2.1e:https TIME_WAIT   -
tcp        0      0 ubuntu-ROG-Strix-:52784 bom12s01-in-f14.1:https ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:60074 bom12s06-in-f14.1:https ESTABLISHED 2339/firefox
tcp        0      1 ubuntu-ROG-Strix-:51884 a104-96-204-135.d:https SYN_SENT    2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:43234 bom07s20-in-f2.1e:https ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:51370 ec2-34-214-241-12:https ESTABLISHED 2339/firefox
tcp        0      0 ubuntu-ROG-Strix-:51264 maa05s01-in-f4.1e:https ESTABLISHED 2339/firefox
^C
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

8.7 The kernel routing information

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
default         _gateway        0.0.0.0         UG        0 0          0 wlo1
link-local      0.0.0.0         255.255.0.0     U         0 0          0 wlo1
192.168.43.0    0.0.0.0         255.255.255.0   U         0 0          0 wlo1
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

8.8 Which process is using a particular port

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -an | grep ':443'
tcp        0      0 192.168.43.44:52000     104.96.204.135:443      ESTABLISHED
tcp        0      0 192.168.43.44:51818     34.98.64.218:443        ESTABLISHED
tcp        0      1 192.168.43.44:45340     142.250.76.194:443      SYN_SENT
tcp        0      0 192.168.43.44:52784     172.217.167.174:443     ESTABLISHED
tcp        0      0 192.168.43.44:60074     142.250.67.142:443      ESTABLISHED
tcp        0      0 192.168.43.44:49720     216.52.2.19:443         ESTABLISHED
tcp        0      0 192.168.43.44:51370     34.214.241.122:443      ESTABLISHED
tcp        0     39 192.168.43.44:44784     172.217.160.194:443     ESTABLISHED
tcp        0      0 192.168.43.44:52786     172.217.167.174:443     ESTABLISHED
tcp        0      0 192.168.43.44:59230     216.58.196.74:443       ESTABLISHED
tcp        0      0 192.168.43.44:59226     216.58.196.74:443       ESTABLISHED
tcp        0      0 192.168.43.44:46520     103.43.90.19:443        ESTABLISHED
tcp        0      0 192.168.43.44:56774     172.217.166.34:443      ESTABLISHED
tcp        0      0 192.168.43.44:56778     172.217.166.34:443      ESTABLISHED
tcp        0      1 192.168.43.44:46528     103.43.90.19:443        SYN_SENT
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

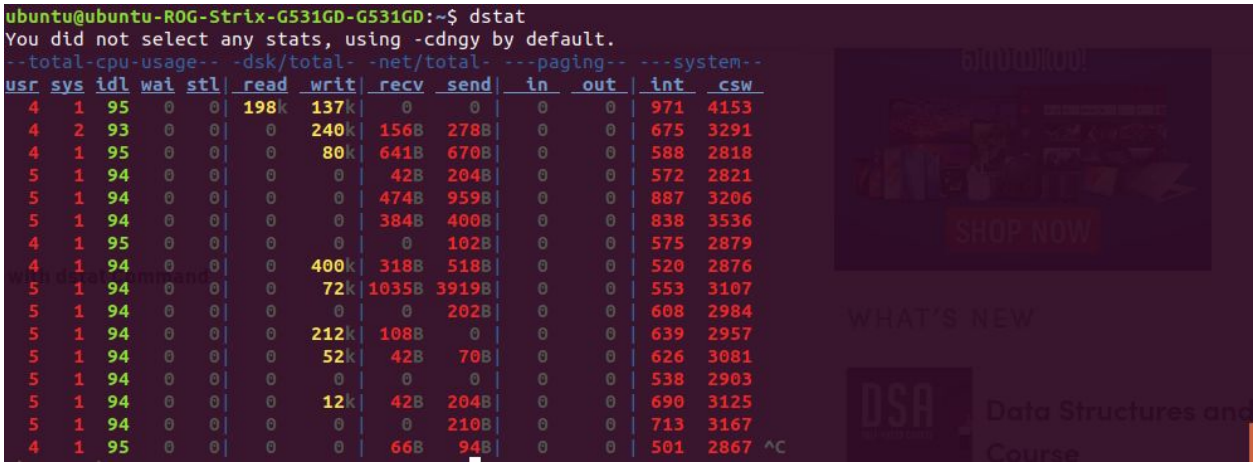
8.9 List of network interfaces

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ netstat -i
Kernel Interface table
Iface      MTU    RX-OK RX-ERR RX-DRP RX-OVR    TX-OK TX-ERR TX-DRP TX-OVR Flg
eno2      1500        0      0      0 0             0      0      0      0 BMU
lo       65536    21592      0      0 0         21592      0      0      0 LRU
wlo1      1500   137741      0      0 0        131145      0      0      0 BMRU
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

9.dstat

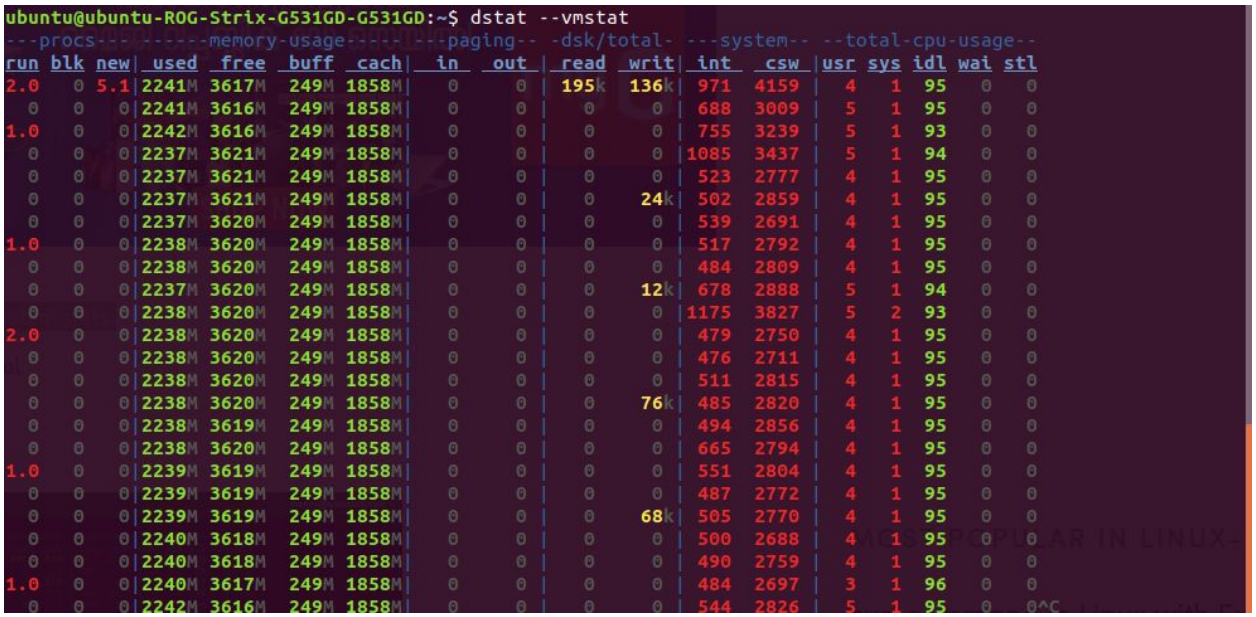
dstat is a tool that is used to retrieve information or statistics form components of the system such as network connections, IO devices, or CPU, etc. It is generally used by system administrators to retrieve a handful of information about the above-mentioned components of the system. By using this tool one can even see the throughput for block devices that make up a single filesystem or storage system.

9.1 To display statistics of major OS components



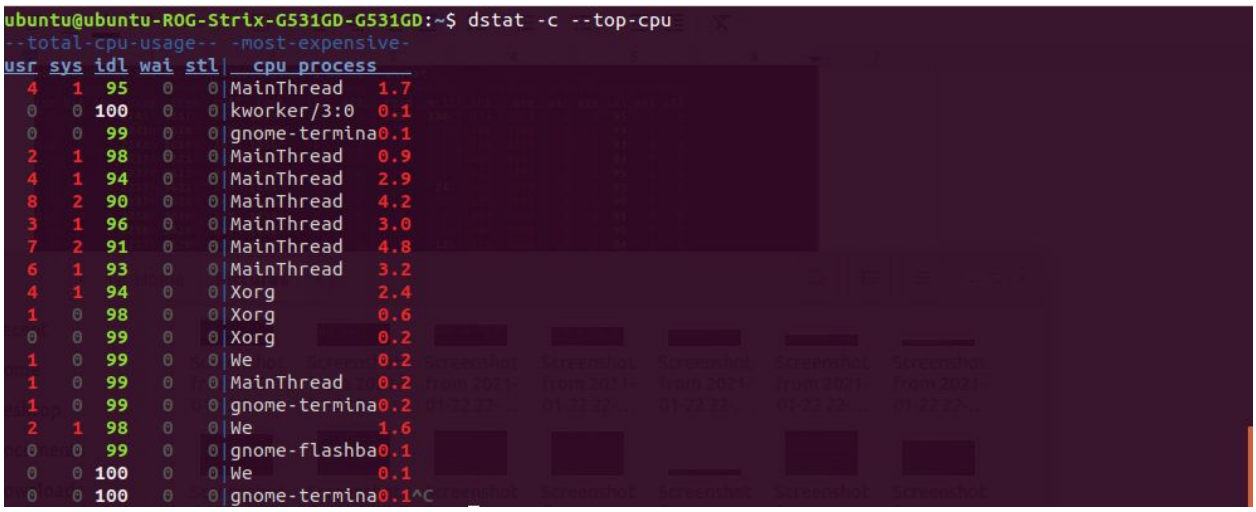
This command will display CPU, Disk, Network, Paging and System stats.

9.2 To display information that was to be displayed by vmstat tool



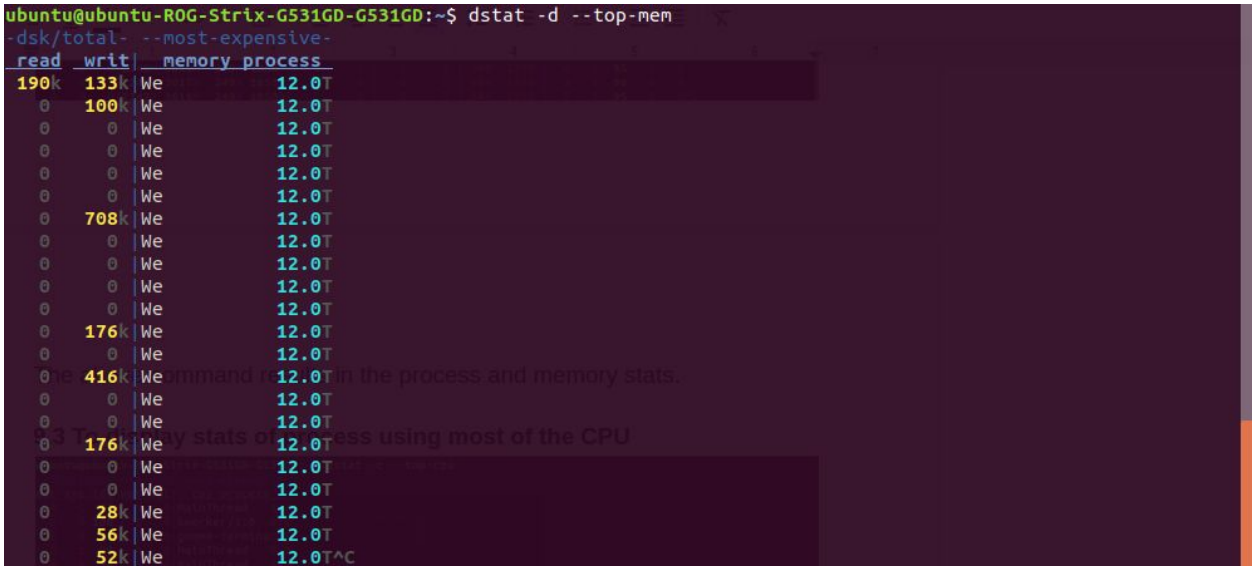
The above command results in the process and memory stats.

9.3 To display stats of process using most of the CPU



This will display the stats of the process which is consuming most of the CPU.

9.4 To display stats of process using most of the memory



This will display the stats of the process which is consuming most of the memory.

9.5 To display the list of all plugins

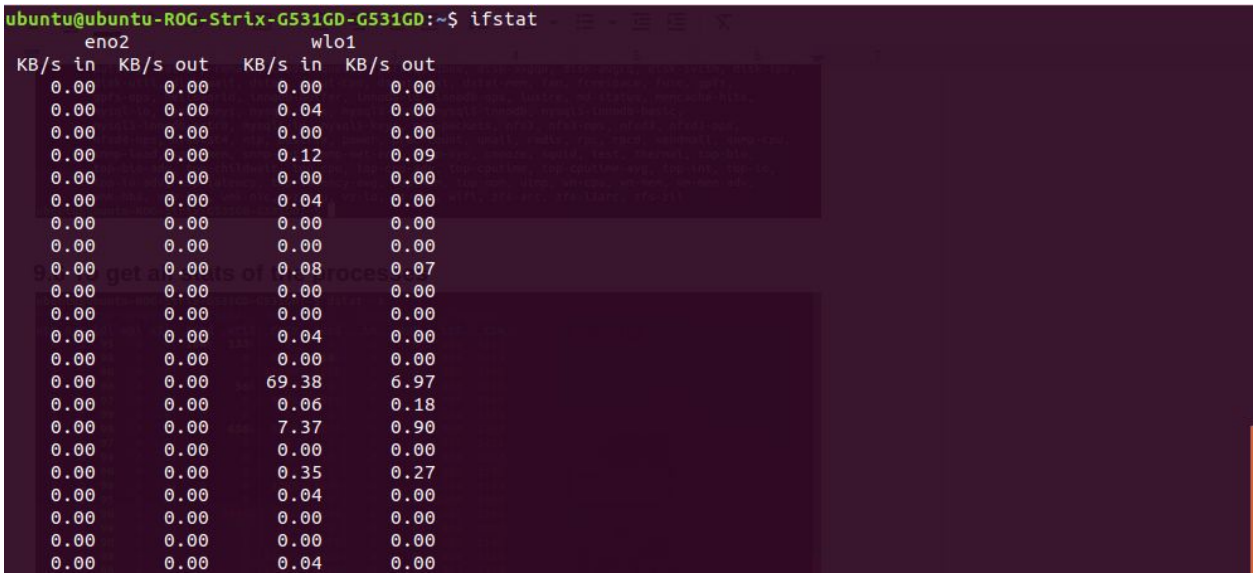
```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ dstat --list
internal:
        aio, cpu, cpu-adv, cpu-use, cpu24, disk, disk24, disk24-old, epoch, fs, int, int24, io, ipc, load,
        lock, mem, mem-adv, net, page, page24, proc, raw, socket, swap, swap-old, sys, tcp, time, udp,
        unix, vm, vm-adv, zones
/usr/share/dstat:
        battery, battery-remain, condor-queue, cpufreq, dbus, disk-avgqu, disk-avgrq, disk-svctm, disk-tps,
        disk-util, disk-wait, dstat, dstat-cpu, dstat-ctxt, dstat-mem, fan, freespace, fuse, gpfs,
        gpfs-ops, helloworld, innodb-buffer, innodb-io, innodb-ops, lustre, md-status, memcache-hits,
        mysql-io, mysql-keys, mysql5-cmds, mysql5-conn, mysql5-innodb, mysql5-innodb-basic,
        mysql5-innodb-extra, mysql5-io, mysql5-keys, net-packets, nfs3, nfs3-ops, nfsd3, nfsd3-ops,
        nfsd4-ops, nfsstat4, ntp, postfix, power, proc-count, qmail, redis, rpc, rpcd, sendmail, snmp-cpu,
        snmp-load, snmp-mem, snmp-net, snmp-net-err, snmp-sys, snooze, squid, test, thermal, top-bio,
        top-bio-adv, top-childwait, top-cpu, top-cpu-adv, top-cputime, top-cputime-avg, top-int, top-io,
        top-io-adv, top-latency, top-latency-avg, top-mem, top-oom, utmp, vm-cpu, vm-mem, vm-mem-adv,
        vmk-hba, vmk-int, vmk-nic, vz-cpu, vz-io, vz-ubc, wifi, zfs-arc, zfs-l2arc, zfs-zil
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

9.6 To get all stats of the processes

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ dstat -a
--total-cpu-usage-- -dsk/total- -net/total- ---paging-- ---system--
usr sys idl wai stl| read  writ| recv  send|  in   out | int   csw
  4   1  95   0   0| 184k  133k|   0     0 |   0     0 | 969  4177
  1   1  98   0   0|   0     0 | 408B   10k|   0     0 | 318  1413
  2   1  98   0   0|   0     0 |1306B  227B|   0     0 | 353  1495
  2   0  98   0   0|   0    56k|  42B    0 |   0     0 | 335  1310
  2   1  97   0   0|   0     0 | 330B  451B|   0     0 | 767  1883
  1   0  98   0   0|   0     0 |   0     0 |   0     0 | 276  1469
  2   1  98   0   0|   0   656k| 487B  465B|   0     0 | 308  1244
  2   0  97   0   0|   0     0 |   0     0 |   0     0 | 317  1421
  2   0  98   0   0|   0     0 |   0     0 |   0     0 | 256  1587
  2   0  98   0   0|   0     0 |  42B    0 |   0     0 | 232  1195
  2   0  98   0   0|   0     0 | 108B  164B|   0     0 | 225  1133
  4   1  95   0   0|   0     0 |   0     0 |   0     0 |1206  1989
  2   0  98   0   0|   0  4096B| 337B  419B|   0     0 | 267  1392
  2   1  98   0   0|   0     0 |  42B    0 |   0     0 | 305  1407
  2   1  98   0   0|   0     0 |  74B  807B|   0     0 | 293  1182
  2   1  98   0   0|   0     0 |4442B  506B|   0     0 | 326  1358
  2   0  98   0   0|   0     0 |1956B  812B|   0     0 | 323  1319
  2   1  98   0   0|   0   272k|   0     0 |   0     0 | 307  1399 ^C
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$
```

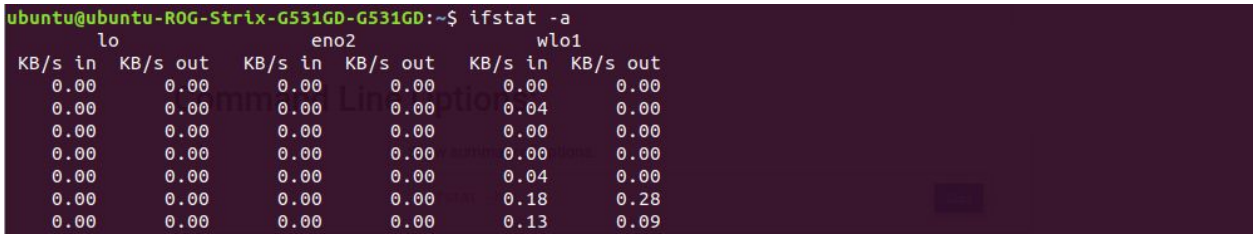
10.ifstat

ifstat neatly prints out network interface statistics. The utility keeps records of the previous data displayed in history files and by default only shows difference between the last and the current call.



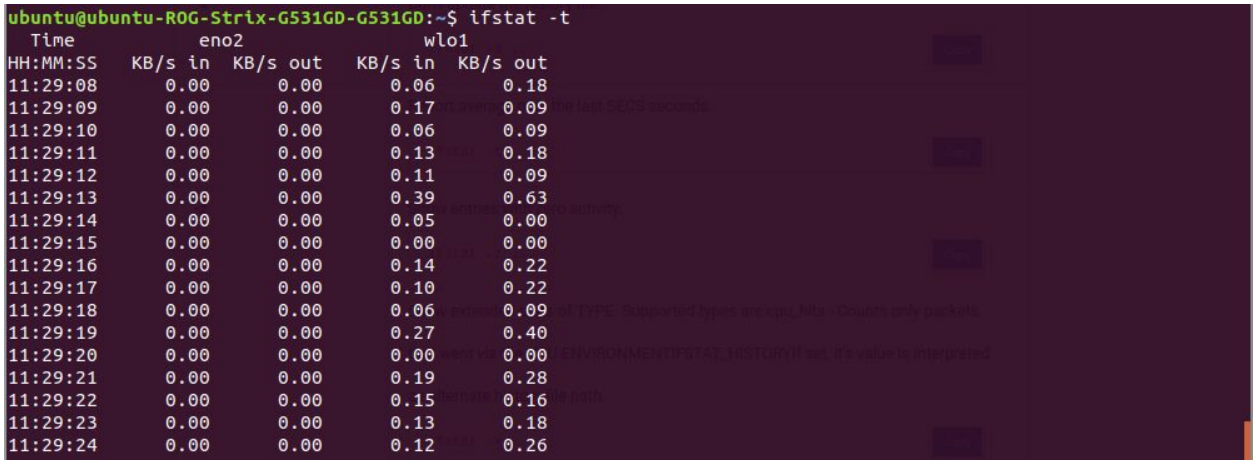
```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ifstat
       eno2                wlo1
 KB/s in  KB/s out   KB/s in  KB/s out
    0.00      0.00      0.00      0.00
    0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.12      0.09
    0.00      0.00      0.00      0.00
    0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.08      0.07
    0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00     69.38      6.97
    0.00      0.00      0.06      0.18
    0.00      0.00      7.37      0.90
    0.00      0.00      0.00      0.00
    0.00      0.00      0.35      0.27
    0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00
    0.00      0.00      0.04      0.00
```

10.1 ignoring history file



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ifstat -a
       lo                eno2                wlo1
 KB/s in  KB/s out   KB/s in  KB/s out   KB/s in  KB/s out
    0.00      0.00      0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00      0.00      0.00
    0.00      0.00      0.00      0.00      0.04      0.00
    0.00      0.00      0.00      0.00      0.18      0.28
    0.00      0.00      0.00      0.00      0.13      0.09
```

10.2 Report average over the last seconds



```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ifstat -t
  Time            eno2                wlo1
HH:MM:SS   KB/s in  KB/s out   KB/s in  KB/s out
11:29:08      0.00      0.00      0.06      0.18
11:29:09      0.00      0.00      0.17      0.09
11:29:10      0.00      0.00      0.06      0.09
11:29:11      0.00      0.00      0.13      0.18
11:29:12      0.00      0.00      0.11      0.09
11:29:13      0.00      0.00      0.39      0.63
11:29:14      0.00      0.00      0.05      0.00
11:29:15      0.00      0.00      0.00      0.00
11:29:16      0.00      0.00      0.14      0.22
11:29:17      0.00      0.00      0.10      0.22
11:29:18      0.00      0.00      0.06      0.09
11:29:19      0.00      0.00      0.27      0.40
11:29:20      0.00      0.00      0.00      0.00
11:29:21      0.00      0.00      0.19      0.28
11:29:22      0.00      0.00      0.15      0.16
11:29:23      0.00      0.00      0.13      0.18
11:29:24      0.00      0.00      0.12      0.26
```

10.3 Show entries with zero activity

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ifstat -z
       wlo1
 KB/s in  KB/s out
    0.34      0.21
    0.04      0.32
    0.00      0.10
    0.20      0.41
    6.52      6.52
    1.59      0.62
    0.05      0.28
    3.40     13.05
    1.98      4.97
    0.00      0.00
    4.22     15.38
    0.52      0.51
    0.00      0.10
    3.29     17.69
    0.11      0.00
    0.30      0.47
    2.37     63.86
    3.53      0.72
```

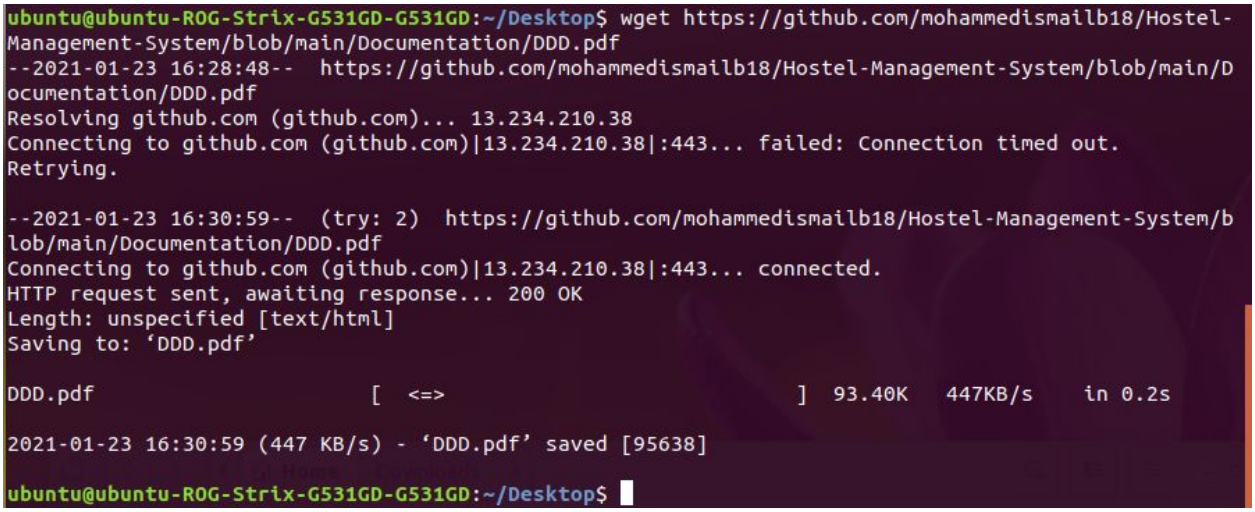
10.4 show ifstat for a particular interface only

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ ifstat -i wlo1
       wlo1
 KB/s in  KB/s out
    0.00      0.00
    2.31      3.98
    2.45      5.45
    2.12     18.69
    1.15      0.60
    0.04      0.09
    0.18      0.09
    0.06      0.13
    0.04      0.00
    0.00      0.10
    1.16     15.00
    2.81      2.09
    7.48     11.00
    4.07      3.74
   13.66     31.10
   10.61      9.90
    6.05      3.96
    2.90     41.29
    4.31      3.76
    8.02      8.67
   11.64     54.37
   16.53     12.90
   11.78     12.01
   10.75     84.58
   10.26     19.33
    8.30      6.37
    3.65     37.44
    1.26      0.50
    0.00      0.21
   13.89     35.26
    2.12      0.51
    0.04      0.00
```

11.wget

Wget is the non-interactive network downloader which is used to download files from the server even when the user has not logged on to the system and it can work in the background without hindering the current process.

11.1 Downloading a file



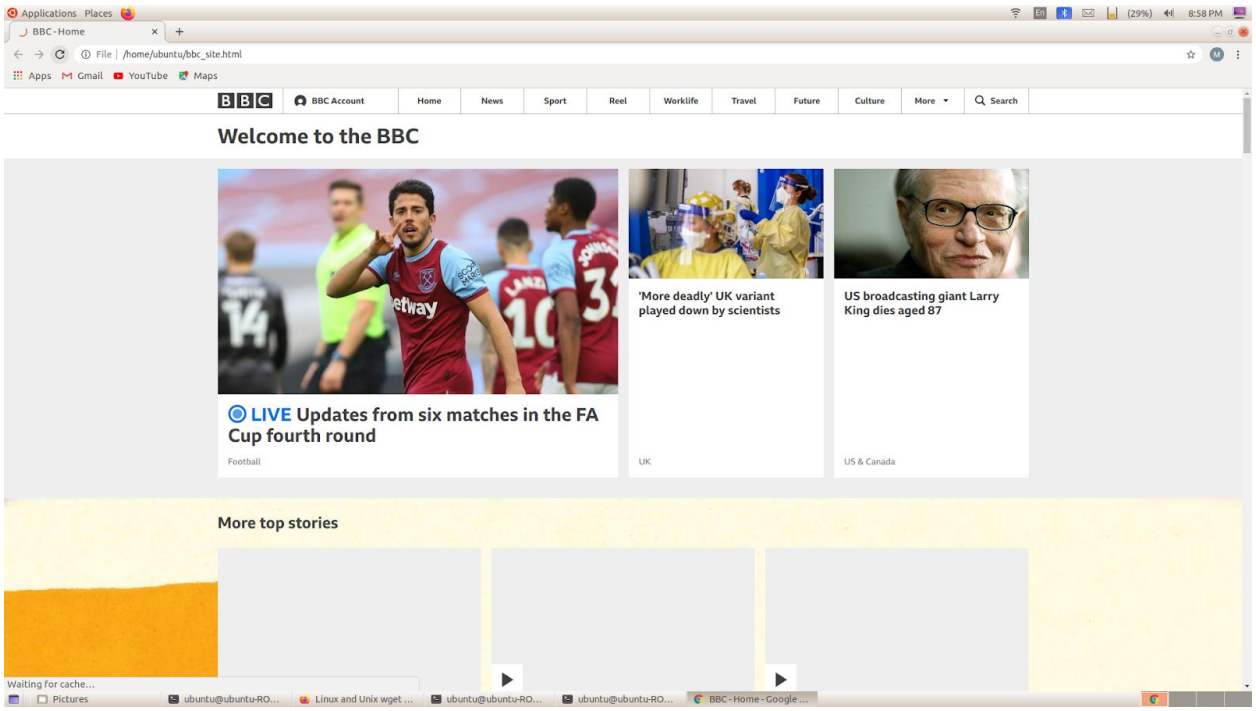
I have downloaded a document from my github page as shown above using wget command.

11.2 turn off output

11.3 turn off verbose output

11.4 download a file with different file name

```
ubuntu@ubuntu-ROG-Strix-G531GD-G531GD:~$ wget http://www.bbc.co.uk -O bbc_site
--2021-01-23 20:46:16--  http://www.bbc.co.uk/
Resolving www.bbc.co.uk (www.bbc.co.uk)... 212.58.237.254, 212.58.233.254
Connecting to www.bbc.co.uk (www.bbc.co.uk)|212.58.237.254|:80... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://www.bbc.co.uk/ [following]
--2021-01-23 20:46:24--  https://www.bbc.co.uk/
Connecting to www.bbc.co.uk (www.bbc.co.uk)|212.58.237.254|:443... failed: Connection tim
ed out.
Connecting to www.bbc.co.uk (www.bbc.co.uk)|212.58.233.254|:443... failed: Connection tim
ed out.
Resolving www.bbc.co.uk (www.bbc.co.uk)... 212.58.237.253, 212.58.233.253
Connecting to www.bbc.co.uk (www.bbc.co.uk)|212.58.237.253|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 342003 (334K) [text/html]
Saving to: ‘bbc_site’

bbc_site              100%[=========================>] 333.99K  73.8KB/s    in 4.5s

2021-01-23 20:50:52 (73.8 KB/s) - ‘bbc_site’ saved [342003/342003]
```



This is the downloaded bbc_site.html file.

11.5 download multiple file

```
ismail@ismail-VirtualBox:~$ wget http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz ftp://ftp.gn
u.org/gnu/wget/wget-1.10.1.tar.gz.sig
--2021-01-23 21:44:25--  http://ftp.gnu.org/gnu/wget/wget-1.5.3.tar.gz
Resolving ftp.gnu.org (ftp.gnu.org)... 209.51.188.20, 2001:470:142:3::b
Connecting to ftp.gnu.org (ftp.gnu.org)|209.51.188.20|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 446966 (436K) [application/x-gzip]
Saving to: ‘wget-1.5.3.tar.gz’

wget-1.5.3.tar.gz   100%[===================>] 436.49K  37.1KB/s    in 10s

2021-01-23 21:44:41 (41.7 KB/s) - ‘wget-1.5.3.tar.gz’ saved [446966/446966]

--2021-01-23 21:44:41--  ftp://ftp.gnu.org/gnu/wget/wget-1.10.1.tar.gz.sig
           => ‘wget-1.10.1.tar.gz.sig’
Connecting to ftp.gnu.org (ftp.gnu.org)|209.51.188.20|:21... connected.
Logging in as anonymous ... Logged in!
==> SYST ... done.    ==> PWD ... done.
==> TYPE I ... done.  ==> CWD (1) /gnu/wget ... done.
==> SIZE wget-1.10.1.tar.gz.sig ... 65
==> PASV ... done.    ==> RETR wget-1.10.1.tar.gz.sig ... done.
Length: 65 (unauthoritative)

wget-1.10.1.tar.gz. 100%[===================>]      65  --.-KB/s    in 0s

2021-01-23 21:47:02 (13.4 MB/s) - ‘wget-1.10.1.tar.gz.sig’ saved [65]

FINISHED --2021-01-23 21:47:02--
Total wall clock time: 2m 37s
Downloaded: 2 files, 437K in 10s (41.7 KB/s)
ismail@ismail-VirtualBox:~$
```

11.6 Read url from a file and download multiple files

Here I have given two links in url_file.txt. Ie., https://en.wikipedia.org/wiki/wikipedia and http://www.google.com.

```
ismail@ismail-VirtualBox:~$ wget -i url_file.txt
--2021-01-23 21:54:51--  https://en.wikipedia.org/wiki/Wikipedia
Resolving en.wikipedia.org (en.wikipedia.org)... 103.102.166.224, 2001:df2:e500:ed1a::1
Connecting to en.wikipedia.org (en.wikipedia.org)|103.102.166.224|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 941998 (920K) [text/html]
Saving to: ‘Wikipedia’

Wikipedia             100%[=========================>] 919.92K  56.4KB/s    in 16s

2021-01-23 21:56:12 (57.7 KB/s) - ‘Wikipedia’ saved [941998/941998]

--2021-01-23 21:56:12--  http://www.google.com/
Resolving www.google.com (www.google.com)... 216.58.199.164, 2404:6800:4009:807::2004
Connecting to www.google.com (www.google.com)|216.58.199.164|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: ‘index.html.2’

index.html.2              [ <=>                   ]  14.83K  --.-KB/s    in 0.07s

2021-01-23 21:56:44 (202 KB/s) - ‘index.html.2’ saved [15186]

FINISHED --2021-01-23 21:56:44--
Total wall clock time: 1m 53s
Downloaded: 2 files, 935K in 16s (58.3 KB/s)
```

11.7 Downloading file in background