CS3009D: NETWORKS LABORATORY

ASSIGNMENT 1

Name: **Tom Saju** Roll Number: **B191290CS**

Batch: **A** Date: **16th January 2022**

Use the following tools/commands to explore and summarize the network environment available in your system:

1. **ping**
2. **tracert/traceroute**
3. **ip/ifconfig/ipconfig**
4. **dig/nslookup/host**
5. **whois**
6. **route**
7. **tcpdump**
8. **netstat/ss**
9. **dstat**
10. **ifstat**
11. **wget**
12. **tracepath**

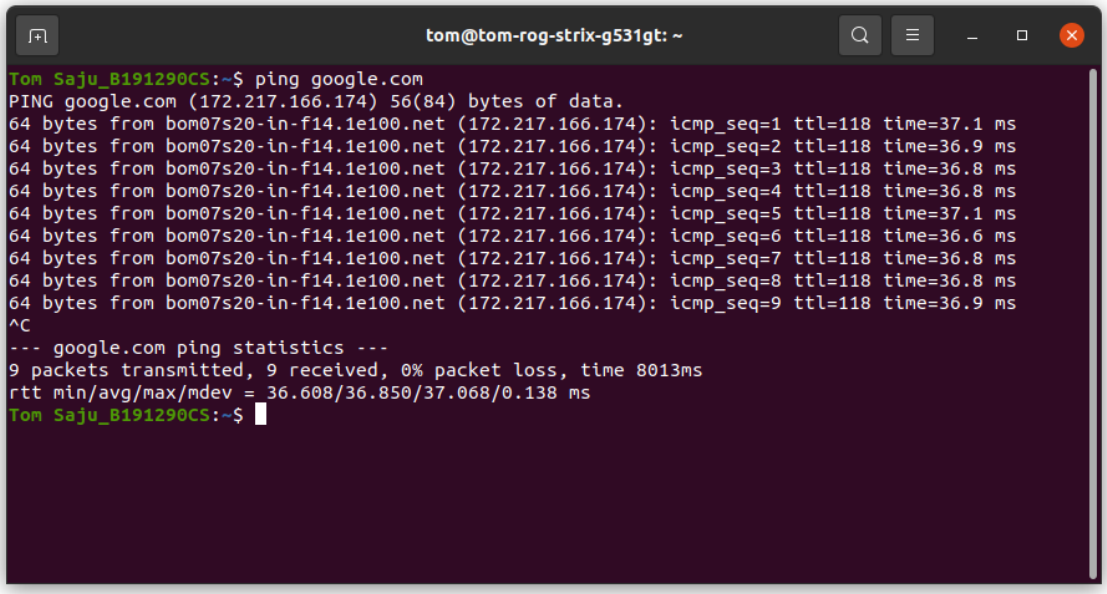
1. ping

Packet Internet Groper (PING) command is used to check the network connectivity between host and server/host. It is used to check whether a network is available and if a host is reachable. With this command, you can check if a server is up and running. When you “ping” a remote short, your machine starts sending Internet Control Message Protocol (ICMP) echo requests and waits for a response. If the connection is established, you’ll receive an echo reply for every request. The output of the ping command contains the amount of time it takes for every packet to reach its destination and return. Also in the terminal, it keeps printing responses until it is stopped.

Example: ping google.com

ping geeksforgeeks.org

ping duckduckgo.com

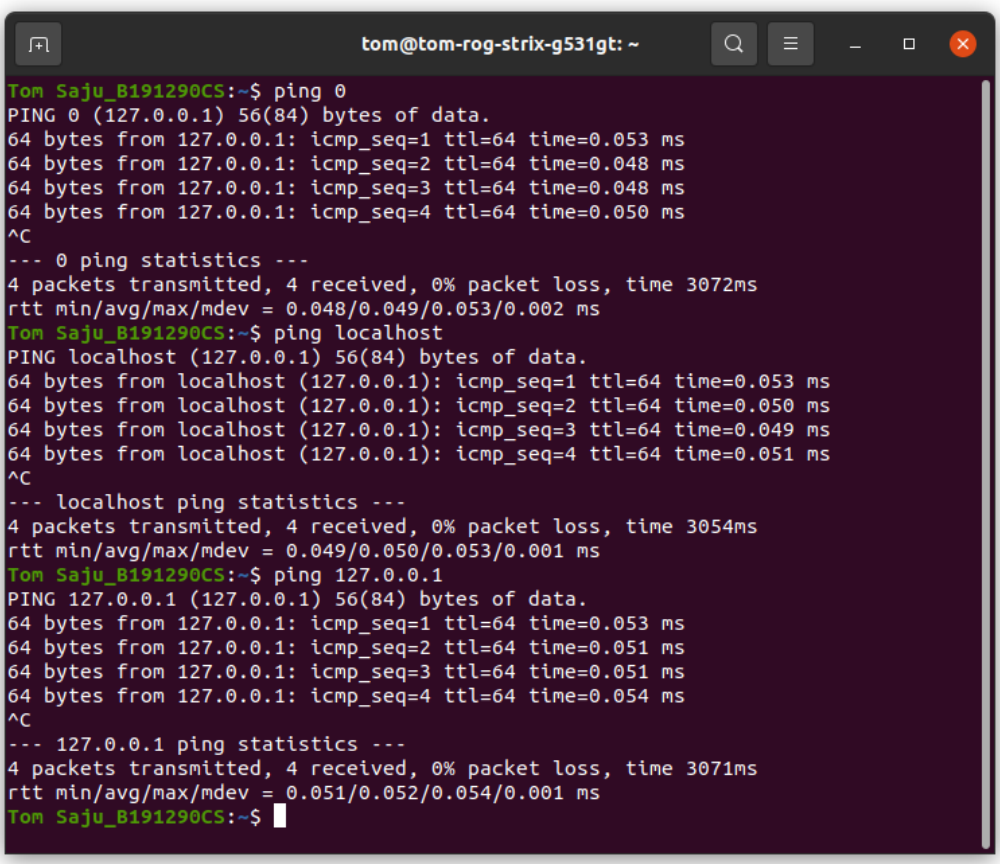


Here,

from	:	The destination and its IP address.
icmp_seq	:	The sequence number of each ICMP packet. Increase by one for every echo request.
ttl	:	TTL (Time to Live) represents the number of network hops a packet can take before a router discards it.
time	:	The time it took for a packet to reach its destination and comes back to the source. Expressed in milliseconds.

Note: We can ping to localhost using

ping 0 / ping localhost / ping 127.0.0.1



OUTPUTS

Case 1: If we did not get any reply from the destination then it means that there is no network connectivity between host and server/host.

Case 2: If the output is “request timed out” then it means the host is down or blocking our ICMP requests.

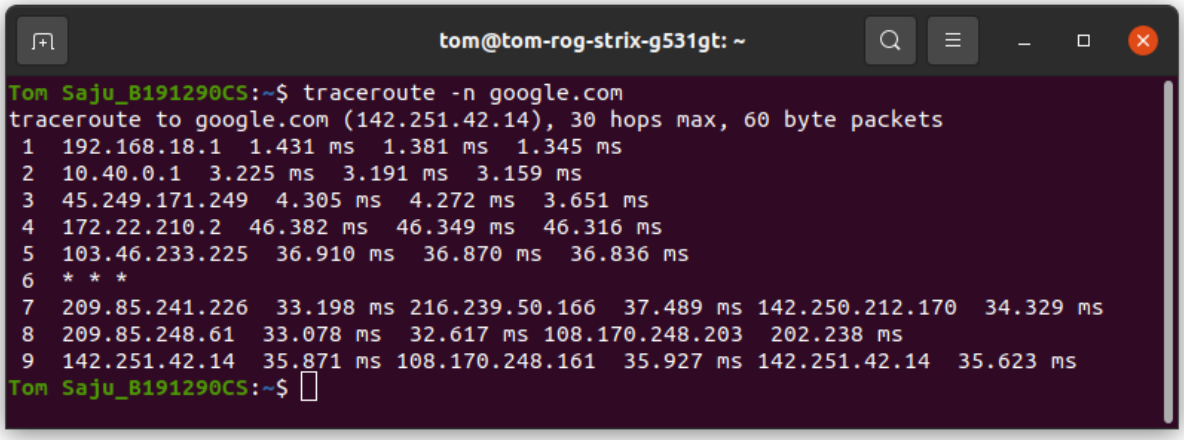
Case 3: If the output is "destination not reachable” then it means that a route to the destination cannot be found.

2. tracert/traceroute

The **“**traceroute” command in Linux prints the route that the packet takes to reach the host or destination. It displays details about all the hops that the packet visits in between i.e it displays IP addresses and the time it took between each hop. The main use of this tool is to find where the error lies in the network if a data packet is unable to reach the destination.

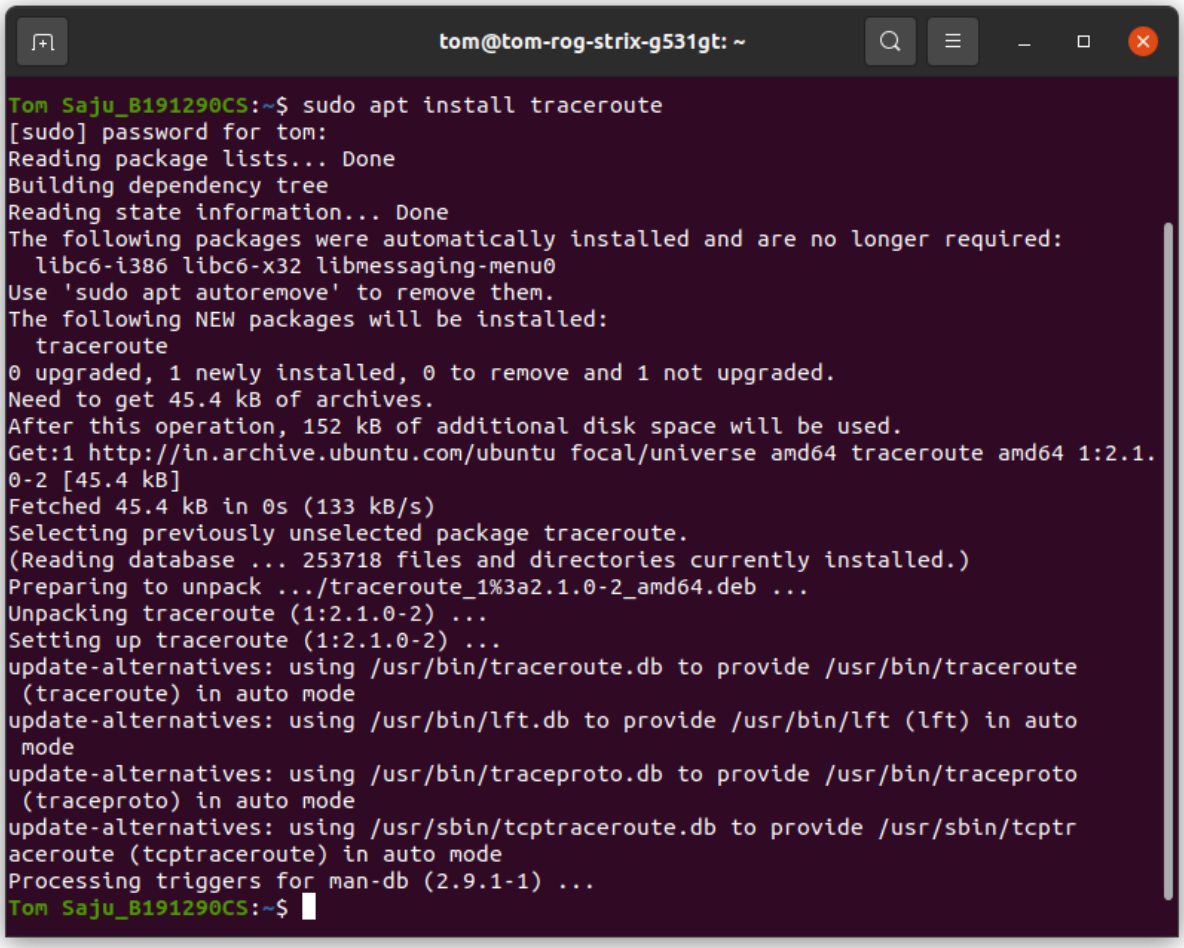
Example: traceroute facebook.com

traceroute -n google.com



Note: To install traceroute, use command

"**sudo apt install traceroute**"



3. ip/ifconfig/ipconfig

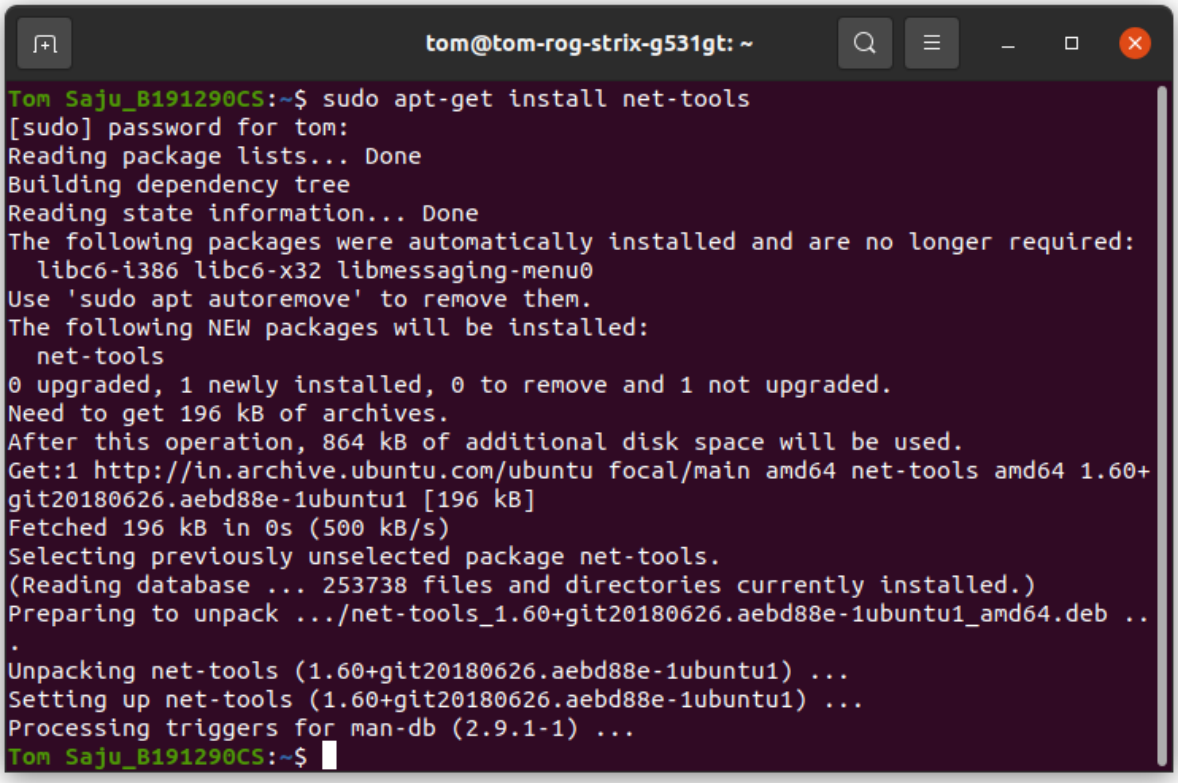
IP: IP (Internet Protocol) Address is an address of your network hardware. It helps in connecting your computer to other devices on your network and all over the world.

ipconfig stands for Internet Protocol Configuration, while ifconfig stands for Interface Configuration. It is often used for troubleshooting network connections. It's generally used to display the TCP/IP address of the system. Ifconfig is used at the boot time to set up the interfaces as necessary.

After that, it is usually used when needed during debugging or when you need system tuning.

Note: In ubuntu install them using the command:

"sudo apt-get install net-tools"



"ip r": Find the gateway address in the starting line. 192.168.1.1 is the default gateway in the given image.

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ip r
default via 192.168.18.1 dev eno2 proto dhcp metric 100
169.254.0.0/16 dev eno2 scope link metric 1000
192.168.18.0/24 dev eno2 proto kernel scope link src 192.168.18.250 metric 100
Tom Saju_B191290CS:~$
```

"ifconfig -a": Check for IPv4 address beside inet below wlo1, 192.168.1.124 is the IP address in the given image.

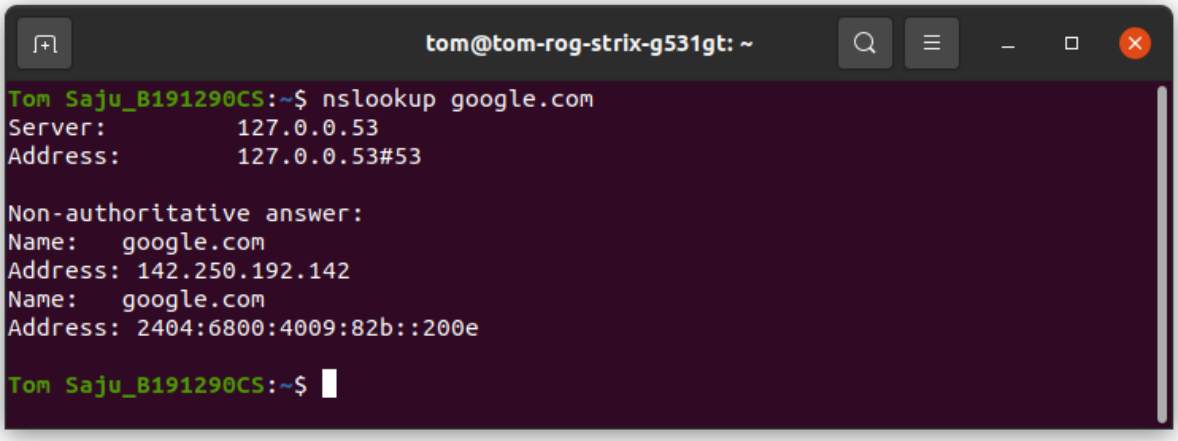
```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ifconfig -a
eno2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.18.250  netmask 255.255.255.0  broadcast 192.168.18.255
        inet6 fe80::61c9:57c:ab9e:e786  prefixlen 64  scopeid 0x20<link>
        ether 04:d4:c4:e0:9b:cd  txqueuelen 1000  (Ethernet)
        RX packets 671645  bytes 710350359 (710.3 MB)
        RX errors 0  dropped 171992  overruns 0  frame 0
        TX packets 185754  bytes 18296678 (18.2 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 6184  bytes 570088 (570.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 6184  bytes 570088 (570.0 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4098<BROADCAST,MULTICAST>  mtu 1500
        ether 40:74:e0:7b:f3:27  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

Tom Saju_B191290CS:~$
```

4. dig/nslookup/host

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.

DNS: The Domain Name System (DNS) is the phone book of the Internet. Humans access information online through domain names, like leetcode.com or espn.com. Web browsers interact through Internet Protocol (IP) addresses. DNS translates domain names to IP addresses so browsers can load Internet resources.

Example: nslookup google.com



Note: To set the servers to mail servers enter interactive mode by giving the command "**nslookup**"

>set type=mx

>google.com

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ nslookup
> set type=mx
> google.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
google.com      mail exchanger = 10 aspmx.l.google.com.
google.com      mail exchanger = 50 alt4.aspmx.l.google.com.
google.com      mail exchanger = 30 alt2.aspmx.l.google.com.
google.com      mail exchanger = 20 alt1.aspmx.l.google.com.
google.com      mail exchanger = 40 alt3.aspmx.l.google.com.

Authoritative answers can be found from:
> exit

Tom Saju_B191290CS:~$
```

Note: To perform reverse DNS, enter your ip address

Reverse DNS: A reverse DNS lookup or reverse DNS resolution is the querying technique of the Domain Name System to determine the domain name associated with an IP address – the reverse of the usual "forward" DNS lookup of an IP address from a domain name.

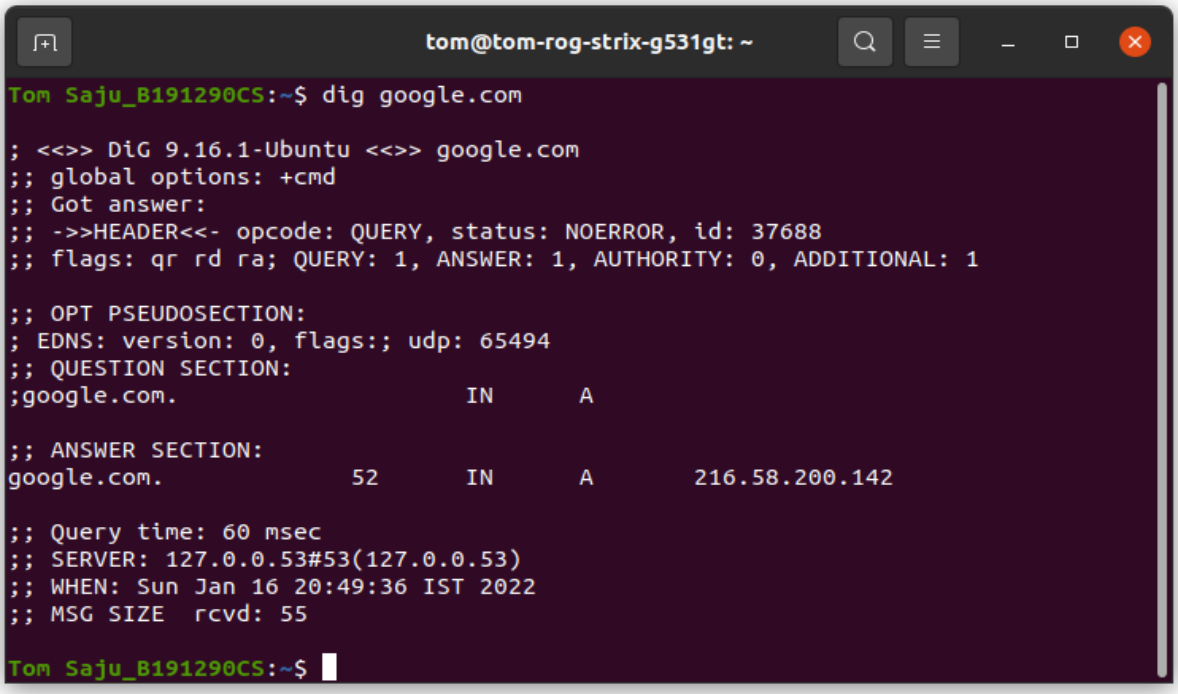
```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ nslookup
> 192.168.43.41
41.43.168.192.in-addr.arpa      name = tom-rog-strix-g531gt.
41.43.168.192.in-addr.arpa      name = tom-rog-strix-g531gt.local.

Authoritative answers can be found from:
> exit

Tom Saju_B191290CS:~$
```

Note: To troubleshoot DNS problem to perform DNS lookup

"**nslookup -debug google.com**"

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ nslookup -debug google.com
Server:         127.0.0.53
Address:        127.0.0.53#53

------------
    QUESTIONS:
        google.com, type = A, class = IN
    ANSWERS:
    ->  google.com
        internet address = 142.250.182.238
        ttl = 119
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Non-authoritative answer:
Name:   google.com
Address: 142.250.182.238
------------
    QUESTIONS:
        google.com, type = AAAA, class = IN
    ANSWERS:
    ->  google.com
        has AAAA address 2404:6800:4009:81f::200e
        ttl = 118
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Name:   google.com
Address: 2404:6800:4009:81f::200e

Tom Saju_B191290CS:~$
```

dig google.com



5. whois

The whois system is a listing of records that contain details about the ownership of domains and the owners. The Internet corporation for Assigned Names and Numbers (ICANN) regulates domain name registration and ownership, but the list of records is held by many companies, known as registries. Anyone can query the list of records. A whois record contains contact information with the person, company or other entity that registered the DOMAIN name.

Note: Install whois using the command:

"**sudo install whois**"

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ sudo apt install whois
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libc6-i386 libc6-x32 libmessaging-menu0
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  whois
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 44.7 kB of archives.
After this operation, 279 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 whois amd64 5.5.6 [44
.7 kB]
Fetched 44.7 kB in 2s (19.1 kB/s)
debconf: unable to initialize frontend: Dialog
debconf: (Dialog frontend requires a screen at least 13 lines tall and 31 column
s wide.)
debconf: falling back to frontend: Readline
Selecting previously unselected package whois.
(Reading database ... 253787 files and directories currently installed.)
Preparing to unpack .../archives/whois_5.5.6_amd64.deb ...
Unpacking whois (5.5.6) ...
Setting up whois (5.5.6) ...
Processing triggers for man-db (2.9.1-1) ...
Tom Saju_B191290CS:~$
```

Example: whois google.com

tom@tom-rog-strix-g531gt: ~

```
Tom Saju_B191290CS:~$ whois google.com
   Domain Name: GOOGLE.COM
   Registry Domain ID: 2138514_DOMAIN_COM-VRSN
   Registrar WHOIS Server: whois.markmonitor.com
   Registrar URL: http://www.markmonitor.com
   Updated Date: 2019-09-09T15:39:04Z
   Creation Date: 1997-09-15T04:00:00Z
   Registry Expiry Date: 2028-09-14T04:00:00Z
   Registrar: MarkMonitor Inc.
   Registrar IANA ID: 292
   Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
   Registrar Abuse Contact Phone: +1.2083895740
   Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhi
bited
   Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferP
rohibited
   Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhi
bited
   Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhi
bited
   Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferP
rohibited
   Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhi
bited
   Name Server: NS1.GOOGLE.COM
   Name Server: NS2.GOOGLE.COM
   Name Server: NS3.GOOGLE.COM
   Name Server: NS4.GOOGLE.COM
   DNSSEC: unsigned
   URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of whois database: 2022-01-16T07:59:06Z <<<

For more information on Whois status codes, please visit https://icann.org/epp

NOTICE: The expiration date displayed in this record is the date the
registrar's sponsorship of the domain name registration in the registry is
currently set to expire. This date does not necessarily reflect the expiration
date of the domain name registrant's agreement with the sponsoring
registrar.  Users may consult the sponsoring registrar's Whois database to
view the registrar's reported date of expiration for this registration.

TERMS OF USE: You are not authorized to access or query our Whois
database through the use of electronic processes that are high-volume and
automated except as reasonably necessary to register domain names or
modify existing registrations; the Data in VeriSign Global Registry
Services' ("VeriSign") Whois database is provided by VeriSign for
information purposes only, and to assist persons in obtaining information
about or related to a domain name registration record. VeriSign does not
guarantee its accuracy. By submitting a Whois query, you agree to abide
```

tom@tom-rog-strix-g531gt: ~

```
Name Server: ns2.google.com
Name Server: ns3.google.com
DNSSEC: unsigned
URL of the ICANN WHOIS Data Problem Reporting System: http://wdprs.internic.net/
>>> Last update of WHOIS database: 2022-01-16T08:00:35+0000 <<<

For more information on WHOIS status codes, please visit:
  https://www.icann.org/resources/pages/epp-status-codes

If you wish to contact this domain’s Registrant, Administrative, or Technical
contact, and such email address is not visible above, you may do so via our web
form, pursuant to ICANN’s Temporary Specification. To verify that you are not a
robot, please enter your email address to receive a link to a page that
facilitates email communication with the relevant contact(s).

Web-based WHOIS:
  https://domains.markmonitor.com/whois

If you have a legitimate interest in viewing the non-public WHOIS details, send
your request and the reasons for your request to whoisrequest@markmonitor.com
and specify the domain name in the subject line. We will review that request and
may ask for supporting documentation and explanation.

The data in MarkMonitor’s WHOIS database is provided for information purposes,
and to assist persons in obtaining information about or related to a domain
name’s registration record. While MarkMonitor believes the data to be accurate,
the data is provided "as is" with no guarantee or warranties regarding its
accuracy.

By submitting a WHOIS query, you agree that you will use this data only for
lawful purposes and that, under no circumstances will you use this data to:
  (1) allow, enable, or otherwise support the transmission by email, telephone,
or facsimile of mass, unsolicited, commercial advertising, or spam; or
  (2) enable high volume, automated, or electronic processes that send queries,
data, or email to MarkMonitor (or its systems) or the domain name contacts (or
its systems).

MarkMonitor reserves the right to modify these terms at any time.

By submitting this query, you agree to abide by this policy.

MarkMonitor Domain Management(TM)
Protecting companies and consumers in a digital world.

Visit MarkMonitor at https://www.markmonitor.com
Contact us at +1.8007459229
In Europe, at +44.02032062220
--
Tom Saju_B191290CS:~$
```

6. route

Routing Table: A routing table is a file containing information on how the information or packets should be transferred: the network path to all nodes or devices within a network. It is a map used by routers and gateways to track paths. The hop-by-hop routing is widely used, the packet contains the routing table to reach the next hop, once reached, it will read the routing table again to reach the next hop.

Using the route command you can communicate with subnets and different networks, you can also block the traffic between networks or devices by modifying the routing table.

Example:

route	To display routing table entries.
route -n	To display routing tables in full numerical entities.
sudo route add default gw 169.154.0.0	To add default gateway.
sudo route add -host 192.168.1.151 reject	To reject a host/network.
route -Cn	To list routing cache information of Device
ip route	To get details of IP routing table
ip route show table local	To get details of local table with destination of localhost.
ip -4/-6 route	To get details of IPv4/IPv6 details.

tom@tom-rog-strix-g531gt: ~

```
Tom Saju_B191290CS:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
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
192.168.1.151   -               255.255.255.255 !H    0      -        0 -
192.168.43.0    0.0.0.0         255.255.255.0   U     600    0        0 wlo1
Tom Saju_B191290CS:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.43.1    0.0.0.0         UG    600    0        0 wlo1
169.254.0.0     0.0.0.0         255.255.0.0     U     1000   0        0 wlo1
192.168.1.151   -               255.255.255.255 !H    0      -        0 -
192.168.43.0    0.0.0.0         255.255.255.0   U     600    0        0 wlo1
Tom Saju_B191290CS:~$ sudo route add default gw 169.154.0.0
SIOCADDRT: Network is unreachable
Tom Saju_B191290CS:~$ sudo route add -host 192.168.1.151 reject
SIOCADDRT: File exists
Tom Saju_B191290CS:~$ route -Cn
Kernel IP routing cache
Source          Destination     Gateway         Flags Metric Ref    Use Iface
Tom Saju_B191290CS:~$ ip route
default via 192.168.43.1 dev wlo1 proto dhcp metric 600
169.254.0.0/16 dev wlo1 scope link metric 1000
unreachable 192.168.1.151 scope host
192.168.43.0/24 dev wlo1 proto kernel scope link src 192.168.43.41 metric 600
Tom Saju_B191290CS:~$ ip route show table local
broadcast 127.0.0.0 dev lo proto kernel scope link src 127.0.0.1
local 127.0.0.0/8 dev lo proto kernel scope host src 127.0.0.1
local 127.0.0.1 dev lo proto kernel scope host src 127.0.0.1
broadcast 127.255.255.255 dev lo proto kernel scope link src 127.0.0.1
broadcast 192.168.43.0 dev wlo1 proto kernel scope link src 192.168.43.41
local 192.168.43.41 dev wlo1 proto kernel scope host src 192.168.43.41
broadcast 192.168.43.255 dev wlo1 proto kernel scope link src 192.168.43.41
Tom Saju_B191290CS:~$ ip -4 route
default via 192.168.43.1 dev wlo1 proto dhcp metric 600
169.254.0.0/16 dev wlo1 scope link metric 1000
unreachable 192.168.1.151 scope host
192.168.43.0/24 dev wlo1 proto kernel scope link src 192.168.43.41 metric 600
Tom Saju_B191290CS:~$ ip -6 route
::1 dev lo proto kernel metric 256 pref medium
2402:3a80:1294:6737::/64 dev wlo1 proto ra metric 600 pref medium
fe80::/64 dev wlo1 proto kernel metric 600 pref medium
default via fe80::c30:9dff:fe7b:c904 dev wlo1 proto ra metric 600 pref high
Tom Saju_B191290CS:~$
```

7. tcpdump

"tcpdump" tool allows you to capture and analyze network traffic such as TCP/IP packets going through the system. Normally used to troubleshoot network issues, also used as a security tool.

It scans from all OSI layers (1- 7) and saves the captured information as .pcap file which can be viewed on WIRESHARK or through the command tool itself.

Example:

sudo tcpdump	It will capture packets from the current interface of the network through which the system is connected to the internet.
sudo tcpdump -c 4	It will capture only 4 packets from the interface.
sudo tcpdump -D	It will print all the list of available networks that this tool can capture packets from.
sudo tcpdump -n host 142.250.182.206	To capture packets related to specific host.
sudo tcpdump -n src host 192.168.1.124	packets from source host
sudo tcpdump -n dst port 80	all packets to port 80

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ sudo tcpdump
[sudo] password for tom:
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
20:41:19.692140 ARP, Request who-has 192.168.1.1 tell 192.168.1.1, length 46
20:41:19.737413 IP 192.168.1.6.36320 > multiplay.bsnl.in.domain: 10186+ [1au] PT
R? 1.1.168.192.in-addr.arpa. (53)
20:41:19.918281 ARP, Request who-has 192.168.1.1 tell 192.168.1.6, length 28
20:41:19.924059 ARP, Reply 192.168.1.1 is-at 14:a7:2b:2b:af:48 (oui Unknown), le
ngth 28
20:41:24.738535 IP 192.168.1.6.35164 > multiplay.bsnl.in.domain: 10186+ [1au] PT
R? 1.1.168.192.in-addr.arpa. (53)
20:41:29.744207 IP 192.168.1.6.42045 > multiplay.bsnl.in.domain: 50485+ [1au] PT
R? 97.112.248.218.in-addr.arpa. (56)
20:41:29.744359 IP 192.168.1.6.47494 > multiplay.bsnl.in.domain: 10186+ [1au] PT
R? 1.1.168.192.in-addr.arpa. (53)
```

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ sudo tcpdump -c 4
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on wlo1, link-type EN10MB (Ethernet), capture size 262144 bytes
20:43:00.301168 IP 192.168.1.1 > all-systems.mcast.net: igmp query v2 [max resp
time 1]
20:43:00.302889 IP 192.168.1.6.35164 > multiplay.bsnl.in.domain: 51408+ [1au] PT
R? 1.0.0.224.in-addr.arpa. (51)
20:43:00.309938 IP multiplay.bsnl.in.domain > 192.168.1.6.35164: 51408 1/4/1 PTR
 all-systems.mcast.net. (173)
20:43:00.314240 IP 192.168.1.6 > 224.0.0.251: igmp v2 report 224.0.0.251
4 packets captured
30 packets received by filter
0 packets dropped by kernel
Tom Saju_B191290CS:~$
```

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ sudo tcpdump -D
1.wlo1 [Up, Running]
2.lo [Up, Running, Loopback]
3.any (Pseudo-device that captures on all interfaces) [Up, Running]
4.eno2 [Up]
5.bluetooth-monitor (Bluetooth Linux Monitor) [none]
6.nflog (Linux netfilter log (NFLOG) interface) [none]
7.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
8.bluetooth0 (Bluetooth adapter number 0) [none]
Tom Saju_B191290CS:~$
```

8. netstat/ss

netstat is a command tool which displays network connections for TCP/UDP and stats for Interfaces, Network protocols, routing tables, etc. ss replaces netstat. ss command tool which dumps socket stats and displays information similarly but it is faster than netstat. With below ss we get detailed Information about how Linux is communicating with othermachines, networks, details about network stats, network protocols, linux socket connections. So, using this information, it's easy to troubleshoot network issues.

Example:

ss	Displays all connections.
ss -a	Displays non listening connections.
ss -l	Displays current listening connections.
ss -t	Displays TCP connections.
ss -u	Displays UDP connections.
ss -x	Displays UNIX connections.
ss -s	Displays summary stats.
ss -t -r state established	Displays connections to specific address.
ss -a dst 192.168.1.1	Displays connections to specific address.

A listening connection means the socket is waiting for connection. A non listening socket implies the connection is already made.

ss

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ss
Netid State  Recv-Q Send-Q                                Local Address:Port
                  Peer Address:Port                      Process
u_str ESTAB  0      0                                                  * 49573
                                 * 58377
u_str ESTAB  0      0                        /run/user/1000/pulse/native 64549
                                 * 61805
u_str ESTAB  0      0                        /run/systemd/journal/stdout 45002
                                 * 47085
u_str ESTAB  0      0                                                  * 37440
                                 * 41530
u_str ESTAB  0      0                        /run/dbus/system_bus_socket 31547
                                 * 36325
u_str ESTAB  0      0                                                  * 49480
                                 * 49085
u_str ESTAB  0      0                        /run/systemd/journal/stdout 35785
                                 * 49240
u_str ESTAB  0      0                        /run/systemd/journal/stdout 47438
                                 * 48365
```

ss -a

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ss -a
Netid              State              Recv-Q              Send-Q
                                                                Local Address:
Port                                Peer Address:Port          Process
nl                 UNCONN             0                   0
                                                                          rtnl:
avahi-daemon/852                                   *
nl                 UNCONN             0                   0
                                                                          rtnl:
winbindd/978                                       *
nl                 UNCONN             0                   0
                                                                          rtnl:
systemd-resolve/811                                *
nl                 UNCONN             0                   0
                                                                          rtnl:
xdg-desktop-por/3623                               *
nl                 UNCONN             0                   0
                                                                          rtnl:
evolution-sourc/3277                               *
```

ss -s

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ss -s
Total: 1144
TCP:   4 (estab 0, closed 1, orphaned 0, timewait 0)

Transport Total     IP        IPv6
RAW       1         0         1
UDP       7         5         2
TCP       3         2         1
INET      11        7         4
FRAG      0         0         0

Tom Saju_B191290CS:~$
```

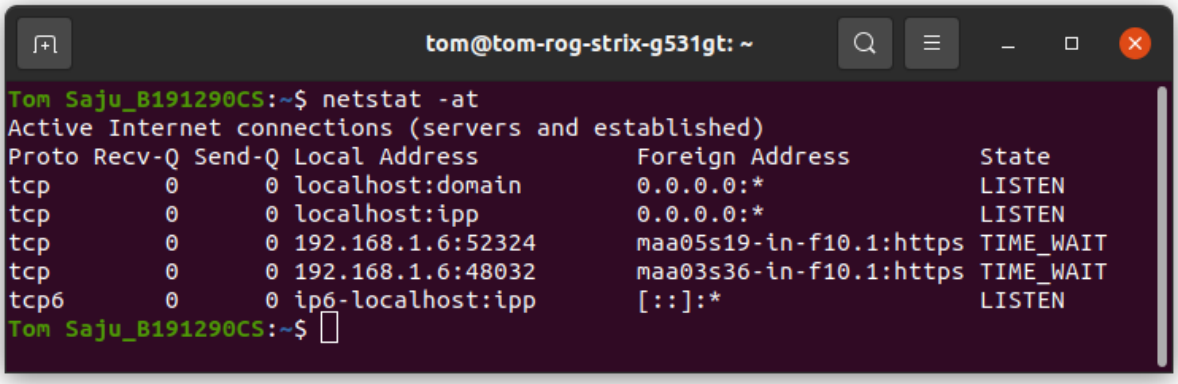
ss -u

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ss -u
Recv-Q   Send-Q        Local Address:Port       Peer Address:Port     Process
0        0          192.168.1.6%wlo1:bootpc      192.168.1.1:bootps
Tom Saju_B191290CS:~$
```

netstat

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 192.168.1.6:bootpc      192.168.1.1:bootps      ESTABLISHED
udp        0      0 192.168.1.6:53421       multiplay.bsnl.i:domain ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  2      [ ]         DGRAM                    46849    /run/user/1000/system
d/notify
unix  2      [ ]         DGRAM                    44190    /run/user/125/systemd
/notify
unix  2      [ ]         DGRAM                    34640    /var/run/nvidia-xdriv
er-a2be6ad4
unix  4      [ ]         DGRAM                    34639    @var/run/nvidia-xdriv
er-a2be6ad4@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
unix  4      [ ]         DGRAM                    1664     /run/systemd/notify
unix  2      [ ]         DGRAM                    1678     /run/systemd/journal/
syslog
unix  22     [ ]         DGRAM                    1688     /run/systemd/journal/
dev-log
unix  9      [ ]         DGRAM                    1692     /run/systemd/journal/
socket
unix  2      [ ]         DGRAM                    63975    /run/wpa_supplicant/w
lo1
```

netstat -at: lists all TCP ports



9. dstat

dstat is a tool that is used to retrieve information or statistics from 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. It itself performs like vmsta, netstat, etc. By using this tool one can even see the throughput for block devices that make up a single file system or storage system.

Note: Install dstat by the command:

"**sudo apt install dstat**"

tom@tom-rog-strix-g531gt: ~

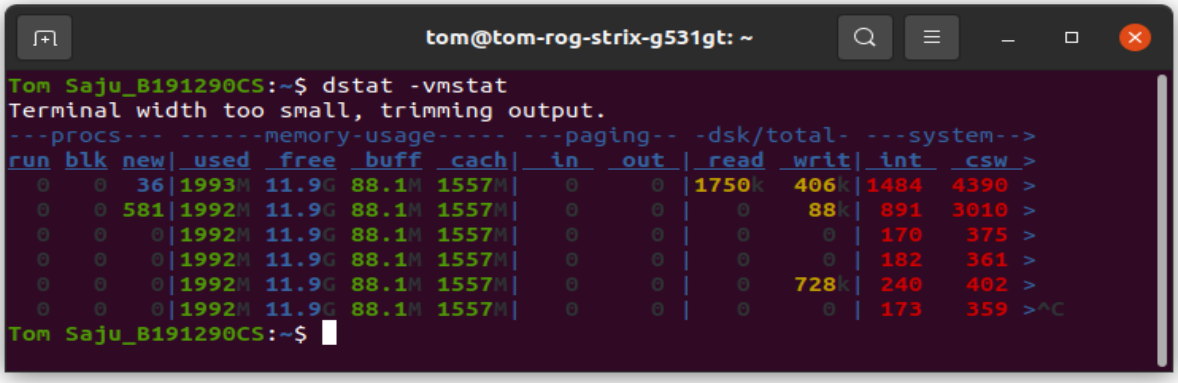
```
Tom Saju_B191290CS:~$ sudo apt install dstat
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libc6-i386 libc6-x32 libmessaging-menu0
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  dstat
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 55.6 kB of archives.
After this operation, 466 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 dstat all 0.7.4-6
 [55.6 kB]
Fetched 55.6 kB in 0s (154 kB/s)
Selecting previously unselected package dstat.
(Reading database ... 253804 files and directories currently installed.)
Preparing to unpack .../archives/dstat_0.7.4-6_all.deb ...
Unpacking dstat (0.7.4-6) ...
Setting up dstat (0.7.4-6) ...
/usr/share/dstat/dstat_mysql_keys.py:41: SyntaxWarning: 'str' object is not call
able; perhaps you missed a comma?
  if op.debug > 1: print('%s: exception' (self.filename, e))
/usr/share/dstat/dstat_squid.py:48: SyntaxWarning: 'str' object is not callable;
 perhaps you missed a comma?
  if op.debug > 1: print('%s: exception' (self.filename, e))
Processing triggers for man-db (2.9.1-1) ...
Tom Saju_B191290CS:~$
```

Example:

dstat

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ dstat
You did not select any stats, using -cdngy by default.
--total-cpu-usage-- -dsk/total- -net/total- ---paging-- ---system--
usr sys idl wai stl| read  writ| recv  send|  in   out | int   csw
  5   1  94   0   0|1828k 419k|   0     0 |   0     0 |1514  4475
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 248   689
  2   1  97   0   0|   0     0 |   0     0 |   0     0 | 902  3541
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 213   596
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 216   349
  0   0 100   0   0|   0     0 |  60B    0 |   0     0 | 198   353
  0   0  99   0   0|   0    88k|   0     0 |   0     0 | 187   361
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 162   289
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 201   389
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 203   381
  0   0  99   0   0|   0     0 |   0     0 |   0     0 | 190   405
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 181   421
  0   1  99   0   0|   0     0 |   0     0 |   0     0 | 429  2790
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 202   357
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 164   317
  3   2  95   0   0|   0     0 | 106B  192B|   0     0 |1298  4091
  6   1  92   0   0|   0     0 |  90B    0 |   0     0 |1506  4878
  5   1  94   0   0|   0     0 |   0     0 |   0     0 |1026  3814
  7   1  92   0   0|   0     0 |   0     0 |   0     0 |1301  4492
  0   0 100   0   0|   0     0 |   0     0 |   0     0 | 170   351
  4   1  95   0   0|   0   232k|  42B   70B|   0     0 |1197  4279
  6   1  94   0   0|   0     0 |   0     0 |   0     0 |1428  5527
  4   1  95   0   0|   0     0 |   0     0 |   0     0 |1100  3663 ^C
Tom Saju_B191290CS:~$
```

dstat –vmstat: To display information displayed by vmstat. It displays process and memory stats.



The output indicates:

CPU Stats: CPU usage by user, system processes and number of idle processes, and number of waiting processes, hardware and software interrupts.

Disk Stats: Total number of read and write operations on the disk.

Network Stats:Total amount of Bytes received and sent on network interfaces.

Paging Stats: Number of times information is copied into and moved out of memory.

System Stats: Number of interrupts and context switches.

Example:

dstat -c --top-cpu: To display stats of the process which is consuming most of the CPU.

dstat -c --top-mem: To display stats of the process which is consuming most of the memory.

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ dstat -c --top-cpu
/usr/bin/dstat:2619: DeprecationWarning: the imp module is deprecated in favour
of importlib; see the module's documentation for alternative uses
  import imp
--total-cpu-usage-- -most-expensive-
usr sys idl wai stl|  cpu process   
  5   1  94   0   0|Xorg         0.9
  0   0 100   0   0|gnome-shell  0.2
  0   0 100   0   0|Xorg         0.1
  0   0  99   1   0|gnome-shell  0.1
  1   2  97   0   0|preload      0.9
  0   0 100   0   0|Xorg         0.1
  0   0 100   0   0|Xorg         0.1^C
Tom Saju_B191290CS:~$ dstat -c --top-mem
/usr/bin/dstat:2619: DeprecationWarning: the imp module is deprecated in favour
of importlib; see the module's documentation for alternative uses
  import imp
--total-cpu-usage-- --most-expensive-
usr sys idl wai stl|  memory process  
  5   1  94   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M
  0   0 100   0   0|gnome-shell  503M^C
Tom Saju_B191290CS:~$
```

dstat --list: We can display stats of a few plugins. This command will display those plugins.

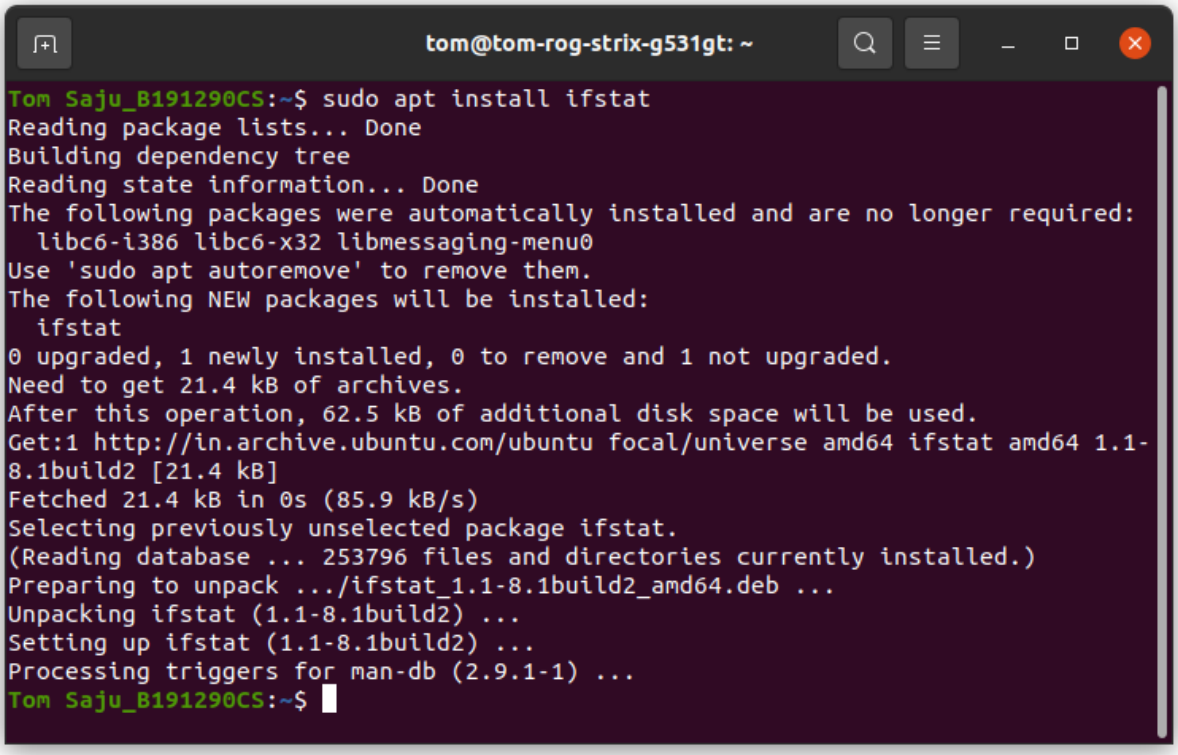
```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ dstat --list
internal:
        aio,cpu,cpu-adv,cpu-use,cpu24,disk,disk24,disk24-old,epoch,
        fs,int,int24,io,ipc,load,lock,mem,mem-adv,net,page,page24,
        proc,raw,socket,swap,swap-old,sys,tcp,time,udp,unix,vm,
        vm-adv,zones
/usr/share/dstat:
        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,ib,innodb-buffer,innodb-io,innodb-ops,
        jvm-full,jvm-vm,lustre,md-status,memcache-hits,mongodb-conn,
        mongodb-mem,mongodb-opcount,mongodb-queue,mongodb-stats,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
Tom Saju_B191290CS:~$
```

10. ifstat

As dstat, iostat, vmstat displays stats regarding the components of System. ifstat displays network interface statistics. This tool keeps records of the previous data files and displays differences between last and current calls.

Note: Install ifstat by command:

"**sudo apt install ifstat**"



Example:

ifstat

```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ifstat
       eno2                wlo1
 KB/s in  KB/s out   KB/s in  KB/s out
    0.00      0.00      0.06      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
    0.00      0.00      0.04      0.07
    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      0.00      0.06      0.00
^C
Tom Saju_B191290CS:~$
```

ifstat -t : To add timestamp to each entry

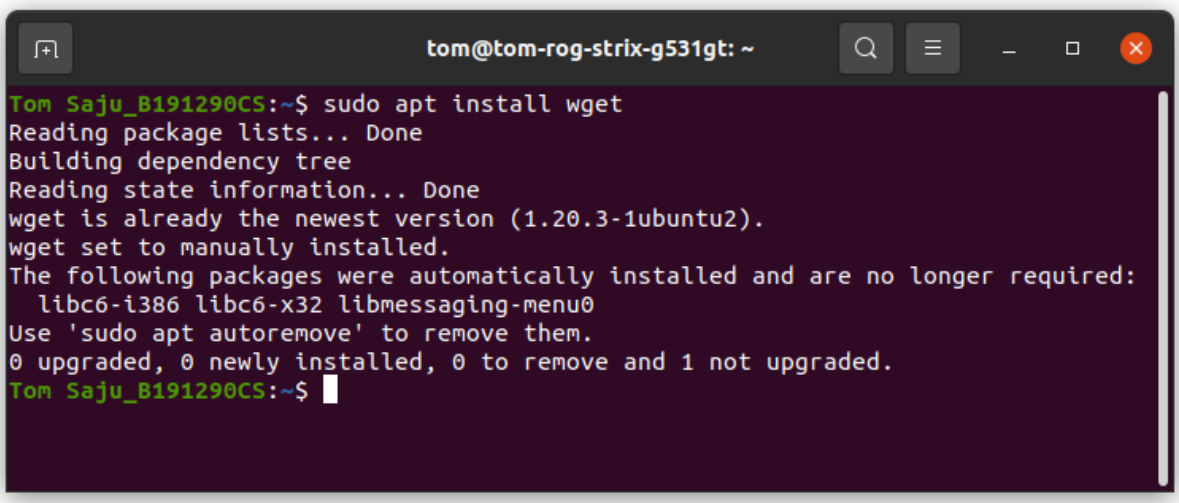
```
tom@tom-rog-strix-g531gt: ~
Tom Saju_B191290CS:~$ ifstat -t
  Time            eno2                wlo1
HH:MM:SS   KB/s in  KB/s out   KB/s in  KB/s out
20:19:33      0.00      0.00      0.00      0.00
20:19:34      0.00      0.00      0.00      0.00
20:19:35      0.00      0.00      0.00      0.00
20:19:36      0.00      0.00      0.00      0.00
20:19:37      0.00      0.00      0.00      0.00
20:19:38      0.00      0.00      0.06      0.00
20:19:39      0.00      0.00      0.00      0.00
20:19:40      0.00      0.00      0.00      0.00
20:19:41      0.00      0.00      0.00      0.00
^C
Tom Saju_B191290CS:~$
```

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. With wget, you can download files using HTTP, HTTPS, and FTP protocols. wget provides a number of options allowing you to download multiple files, resume downloads, limit the bandwidth, recursive downloads, download in the background, mirror a website, and much more.

Note: Install wget by the command:

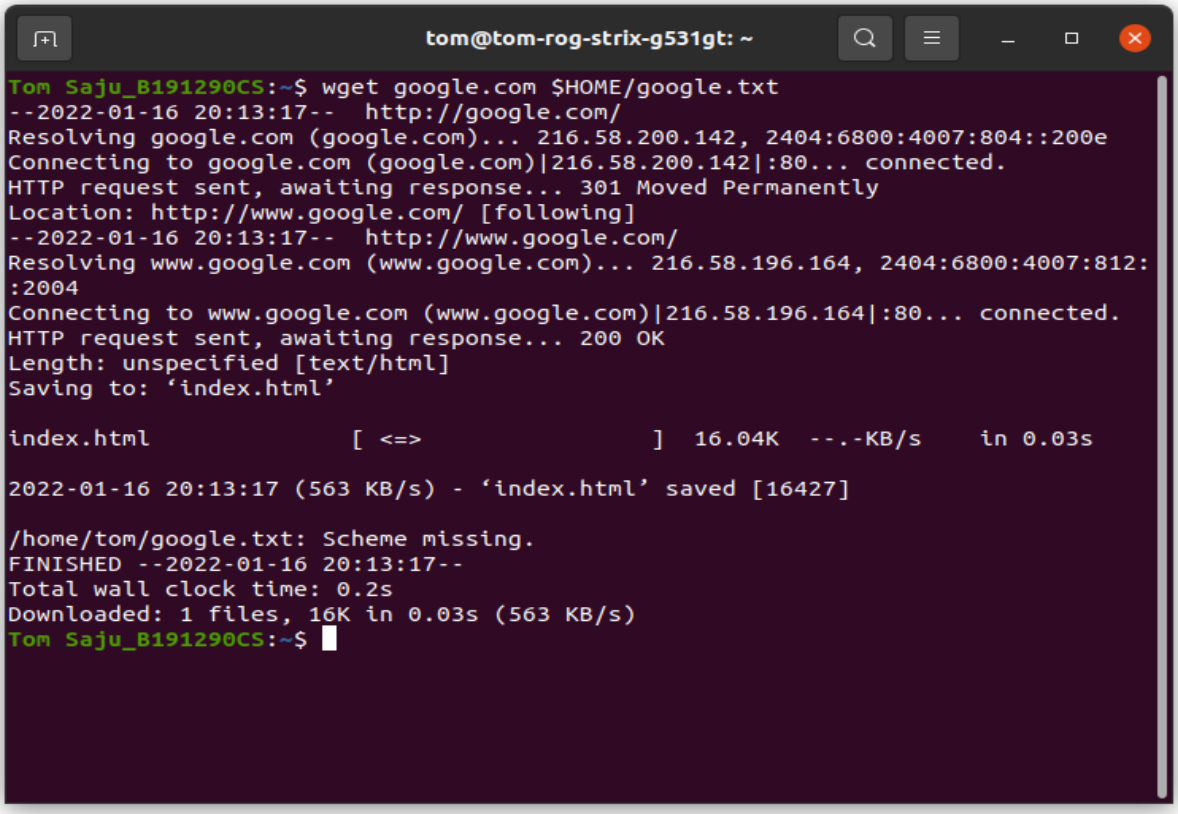
"**sudo apt install wget**"



Example:

wget [options] [url]	-
wget google.com	-

wget -b google.com	To download the file in background
wget google.com -o/path/filename.txt	To overwrite the log file of wget command.
wget -c google.com	To resume a partially downloaded file.



12. tracepath

tracepath command in Linux is used to traces path to destination discovering MTU along this path. It uses UDP port or some random port. It is similar to traceroute, but it does not require superuser privileges and has no fancy options. Tracepath *6* is a good replacement for traceroute *6* and classic example of the application of Linux error queues. The situation with IPv4 is worse because commercial IP routers do not return enough information in ICMP error messages.

Example:

tracepath www.google.com	-
tracepath -n google.com	Prints IP address numerically

tracepath -b google.com	Prints both host name ip addresses