

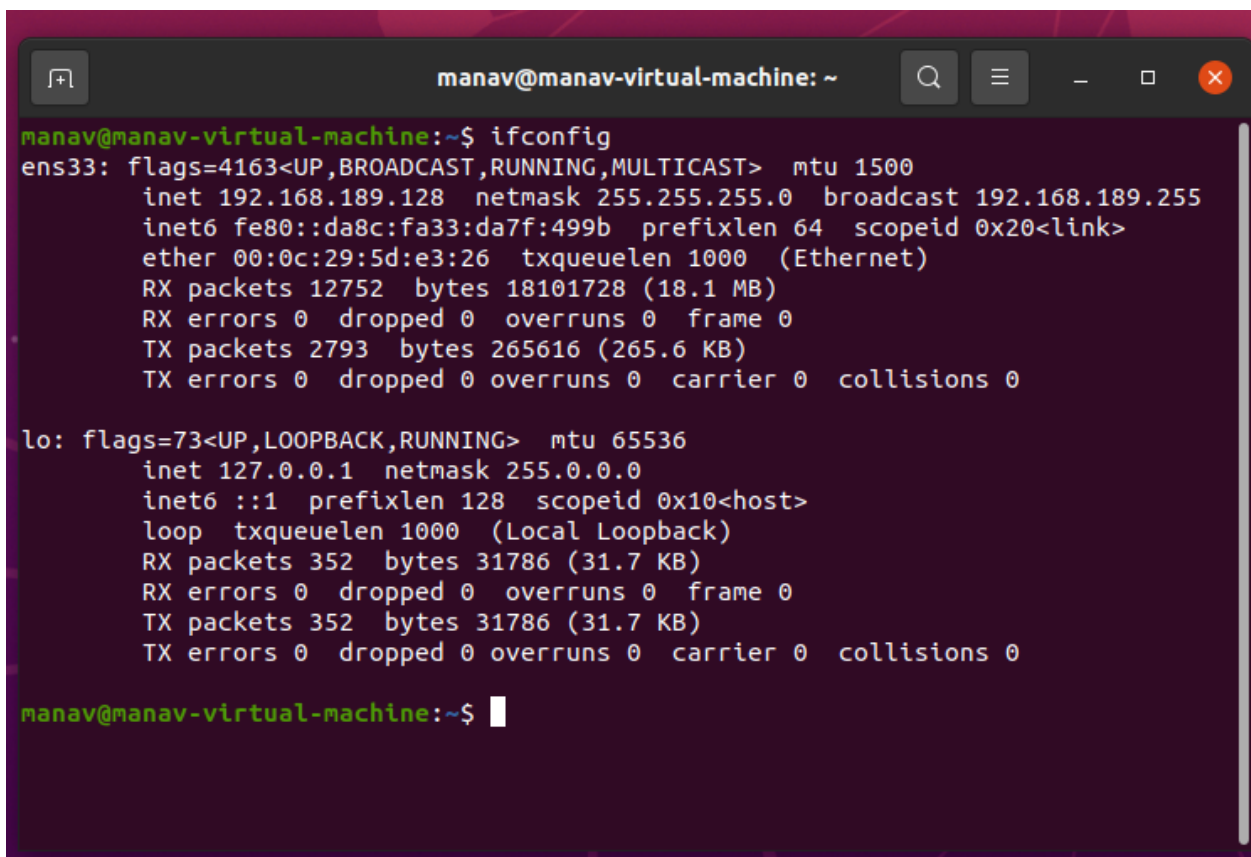
Aim: To execute Network Commands

Introduction:

Networking commands are used at the command prompt to get network information like the IP address of the system, MAC address, network route traversed by a packet and the IP address of the server in which a website or URL is hosted.

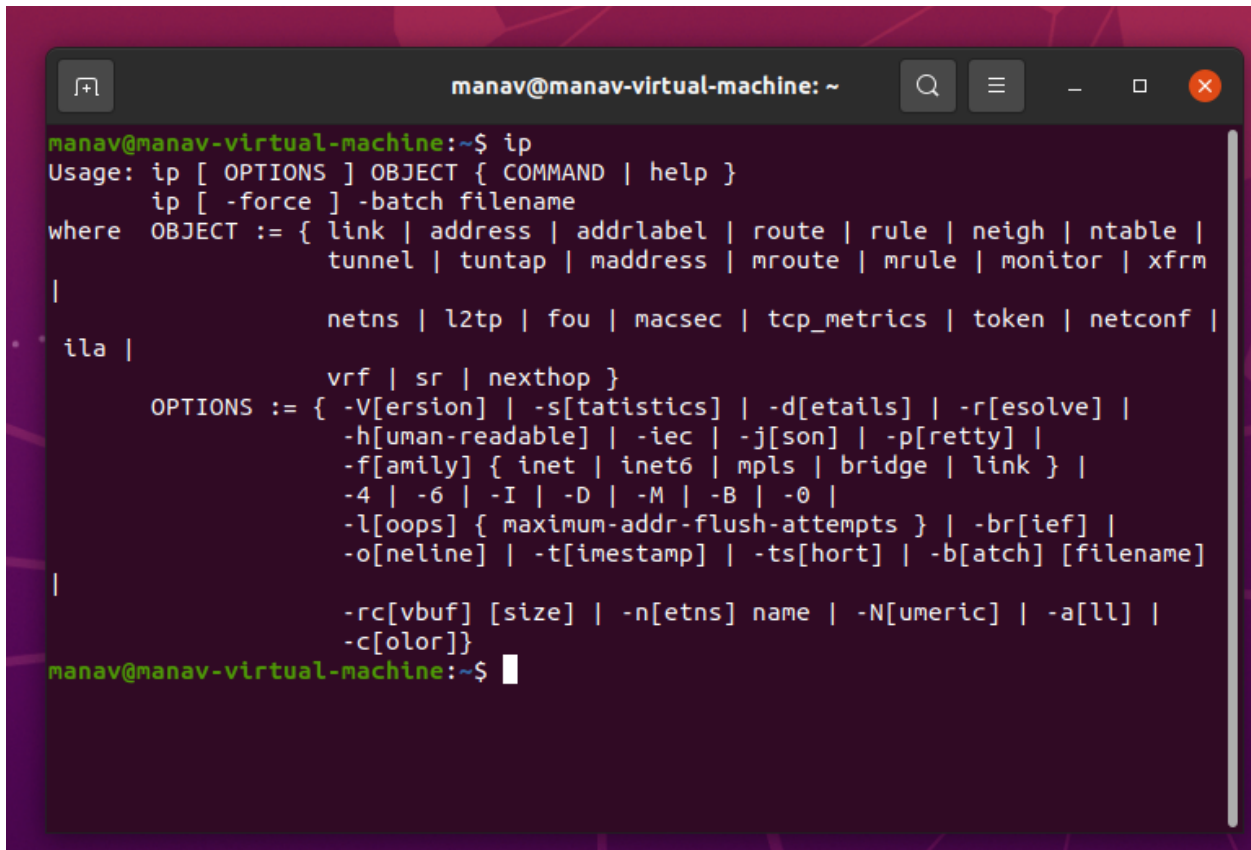
Theory:

1. **ifconfig** - **ifconfig** (interface configuration) is a network management tool. It is used to configure and view the status of the network interfaces in Ubuntu operating systems. With **ifconfig**, you can assign IP addresses, enable or disable interfaces, manage ARP cache, routes, and more.



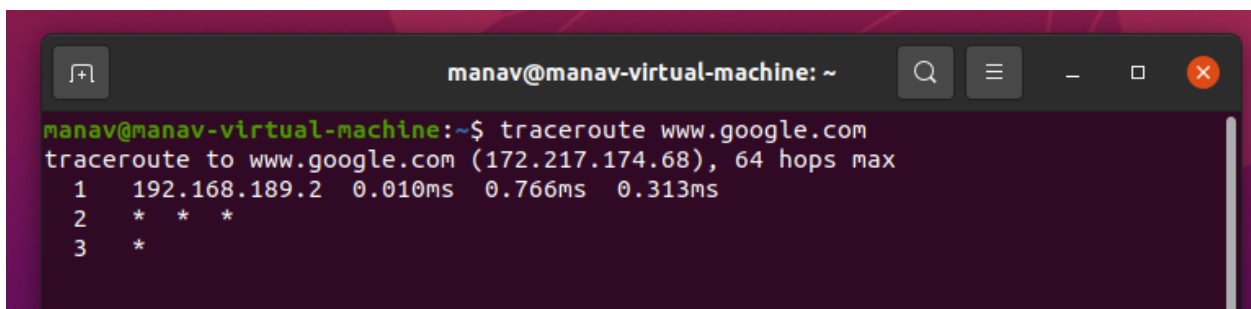
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ ifconfig  
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500  
    inet 192.168.189.128  netmask 255.255.255.0  broadcast 192.168.189.255  
    inet6 fe80::da8c:fa33:da7f:499b  prefixlen 64  scopeid 0x20<link>  
    ether 00:0c:29:5d:e3:26  txqueuelen 1000  (Ethernet)  
    RX packets 12752  bytes 18101728 (18.1 MB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 2793  bytes 265616 (265.6 KB)  
    TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536  
    inet 127.0.0.1  netmask 255.0.0.0  
    inet6 ::1  prefixlen 128  scopeid 0x10<host>  
    loop txqueuelen 1000  (Local Loopback)  
    RX packets 352  bytes 31786 (31.7 KB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 352  bytes 31786 (31.7 KB)  
    TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0  
  
manav@manav-virtual-machine:~$
```

2. ip - ip stands for Internet Protocol and as the name suggests, the tool is used for configuring network interfaces.



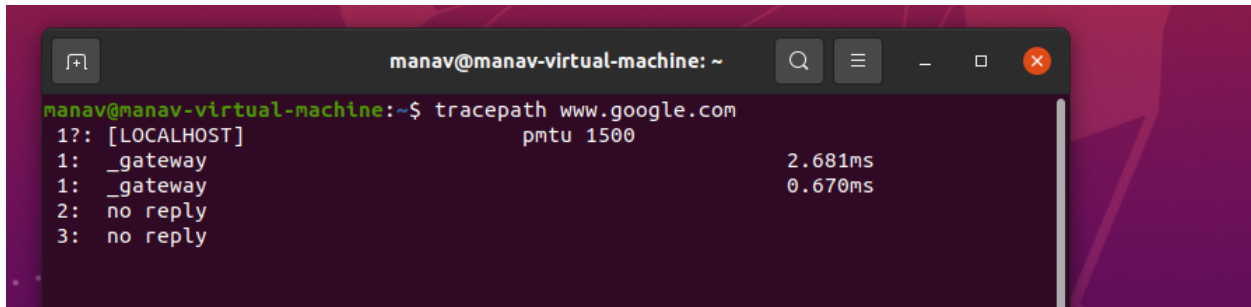
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ ip  
Usage: ip [ OPTIONS ] OBJECT { COMMAND | help }  
       ip [ -force ] -batch filename  
where  OBJECT := { link | address | addrlabel | route | rule | neigh | ntable |  
                  tunnel | tuntap | maddress | mroute | mrule | monitor | xfrm  
                  |  
                  netns | l2tp | fou | macsec | tcp_metrics | token | netconf |  
                  ila |  
                  vrf | sr | nexthop }  
OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |  
             -h[uman-readable] | -i[ec] | -j[son] | -p[retty] |  
             -f[amily] { inet | inet6 | mpls | bridge | link } |  
             -4 | -6 | -I | -D | -M | -B | -O |  
             -l[oops] { maximum-addr-flush-attempts } | -br[ief] |  
             -o[neline] | -t[imestamp] | -ts[hort] | -b[atch] [filename]  
             |  
             -rc[vbuf] [size] | -n[etns] name | -N[umeric] | -a[ll] |  
             -c[olor]}
```

3. traceroute - traceroute command in Ubuntu prints the route that a packet takes to reach the host. This command is useful when you want to know about the route and about all the hops that a packet takes.



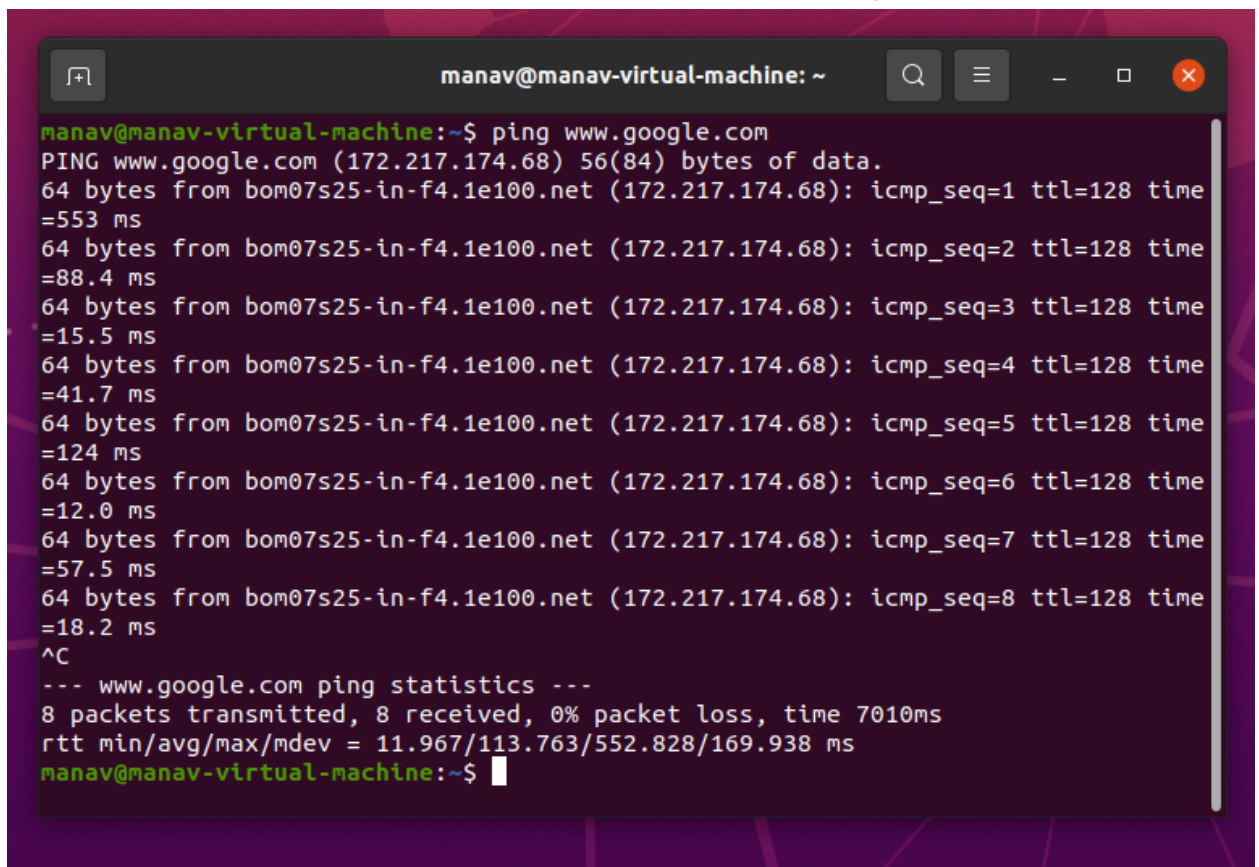
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ traceroute www.google.com  
traceroute to www.google.com (172.217.174.68), 64 hops max  
 1  192.168.189.2  0.010ms  0.766ms  0.313ms  
 2  * * *  
 3  *
```

4. `tracert` - The `tracert` command in Ubuntu allows to trace the path to the destination path determining MTU. `tracert` and `tracert` are similar to each other.



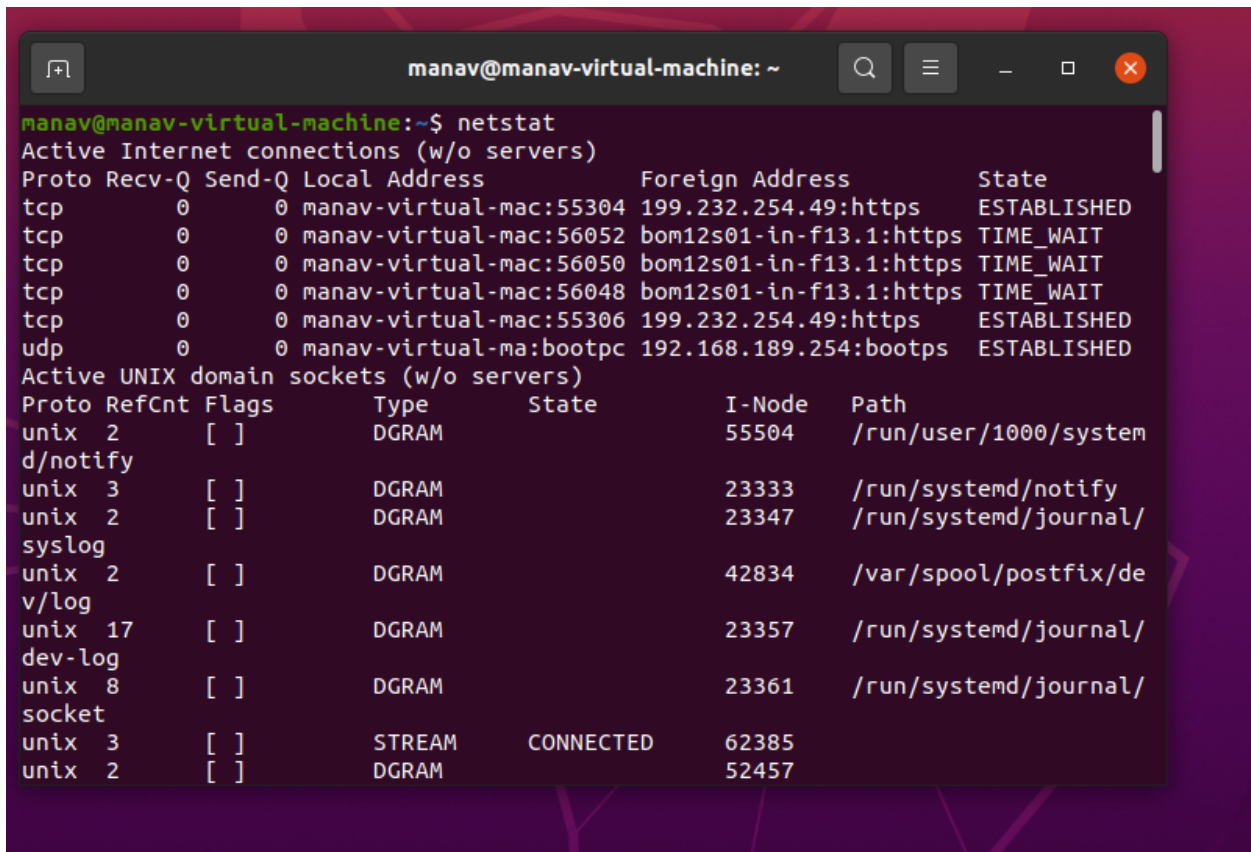
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ tracert www.google.com  
1?: [LOCALHOST] pmtu 1500  
1: _gateway 2.681ms  
1: _gateway 0.670ms  
2: no reply  
3: no reply
```

5. `ping` - PING (Packet Internet Groper) command is used to check the network connectivity between host and server/host. To stop pinging we should use `ctrl+c` otherwise it will keep on sending packets.



```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ ping www.google.com  
PING www.google.com (172.217.174.68) 56(84) bytes of data.  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=1 ttl=128 time  
=553 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=2 ttl=128 time  
=88.4 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=3 ttl=128 time  
=15.5 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=4 ttl=128 time  
=41.7 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=5 ttl=128 time  
=124 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=6 ttl=128 time  
=12.0 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=7 ttl=128 time  
=57.5 ms  
64 bytes from bom07s25-in-f4.1e100.net (172.217.174.68): icmp_seq=8 ttl=128 time  
=18.2 ms  
^C  
--- www.google.com ping statistics ---  
8 packets transmitted, 8 received, 0% packet loss, time 7010ms  
rtt min/avg/max/mdev = 11.967/113.763/552.828/169.938 ms  
manav@manav-virtual-machine:~$
```

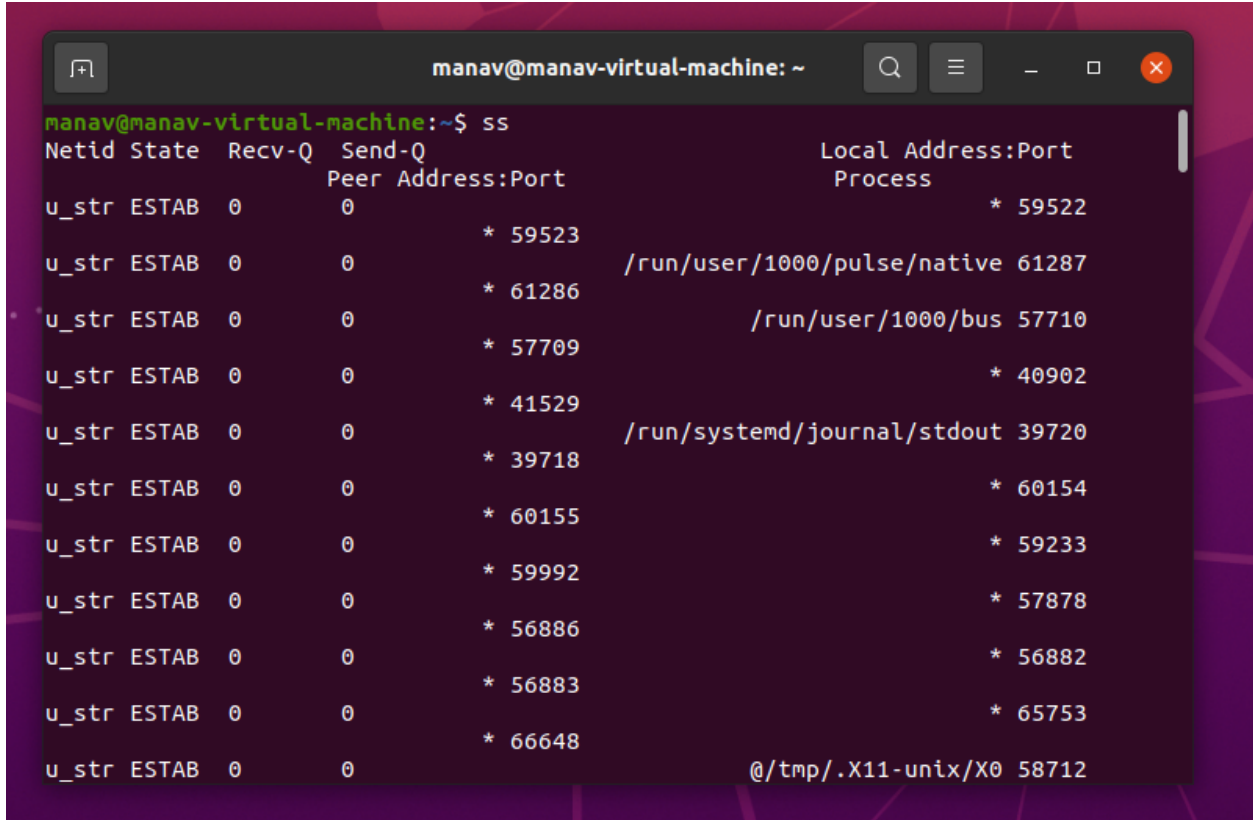
6. netstat - Netstat command displays various network related information such as network connections, routing tables, interface statistics, masquerade connections, multicast memberships etc.



```
manav@manav-virtual-machine: ~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp      0      0 manav-virtual-mac:55304 199.232.254.49:https    ESTABLISHED
tcp      0      0 manav-virtual-mac:56052 bom12s01-in-f13.1:https TIME_WAIT
tcp      0      0 manav-virtual-mac:56050 bom12s01-in-f13.1:https TIME_WAIT
tcp      0      0 manav-virtual-mac:56048 bom12s01-in-f13.1:https TIME_WAIT
tcp      0      0 manav-virtual-mac:55306 199.232.254.49:https    ESTABLISHED
udp      0      0 manav-virtual-ma:bootpc 192.168.189.254:bootps ESTABLISHED

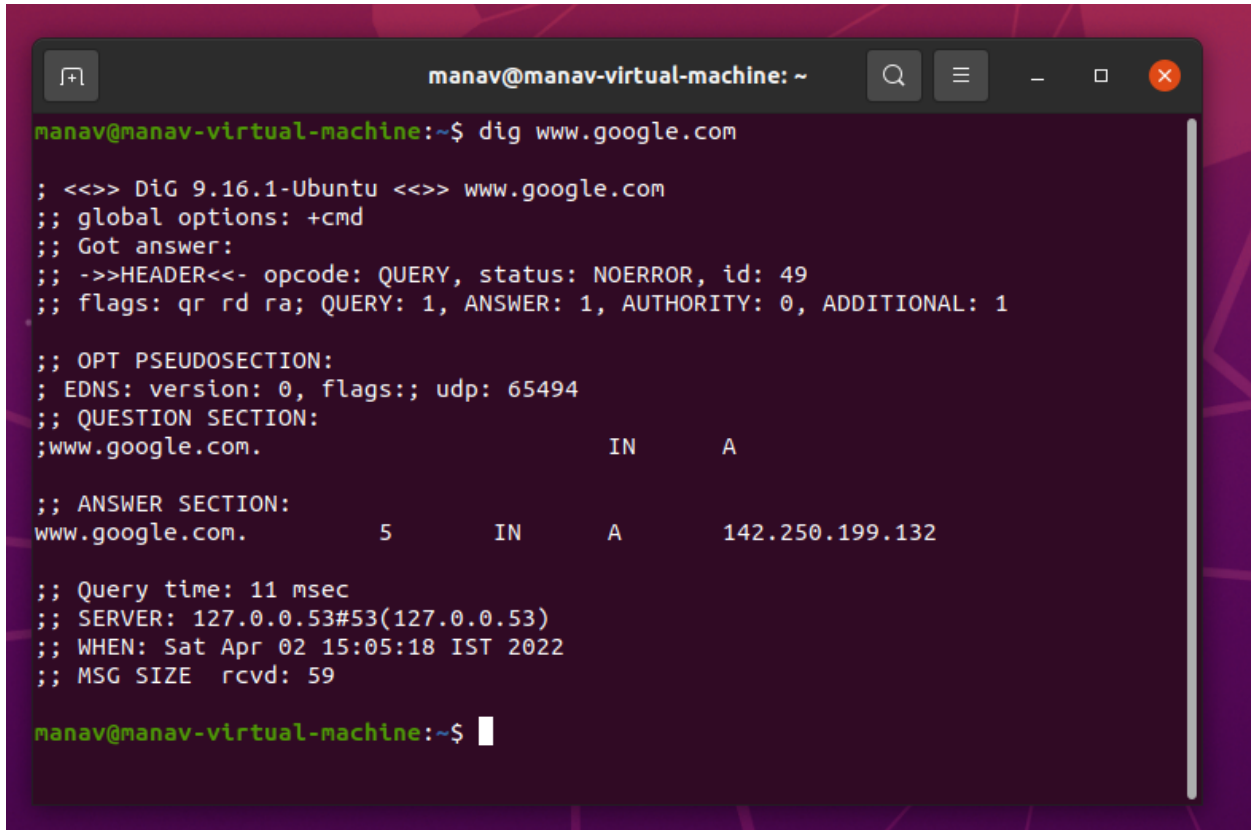
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags   Type       State      I-Node  Path
unix  2      [ ]      DGRAM                    55504    /run/user/1000/systemd/notify
unix  3      [ ]      DGRAM                    23333    /run/systemd/notify
unix  2      [ ]      DGRAM                    23347    /run/systemd/journal/dev-log
unix  2      [ ]      DGRAM                    42834    /var/spool/postfix/dev-log
unix 17      [ ]      DGRAM                    23357    /run/systemd/journal/dev-log
unix  8      [ ]      DGRAM                    23361    /run/systemd/journal/socket
unix  3      [ ]      STREAM  CONNECTED  62385
unix  2      [ ]      DGRAM                    52457
```

7. ss – ss stands for (Socket Statistics). With ss, you get very detailed information about how your Ubuntu machine is communicating with other machines, networks, and services; details about network connections, networking protocol statistics, and Ubuntu socket connections.

A terminal window titled 'manav@manav-virtual-machine: ~' showing the output of the 'ss' command. The output is a table of network connections. The columns are: Netid, State, Recv-Q, Send-Q, Peer Address:Port, Local Address:Port, and Process. The connections are all in the 'ESTAB' state. The processes listed include /run/user/1000/pulse/native, /run/user/1000/bus, /run/systemd/journal/stdout, and @/tmp/.X11-unix/X0.

```
manav@manav-virtual-machine:~$ ss
Netid State  Recv-Q  Send-Q   Peer Address:Port      Local Address:Port Process
u_str  ESTAB   0        0      * 59523                * 59522
u_str  ESTAB   0        0      * 59523 /run/user/1000/pulse/native 61287
u_str  ESTAB   0        0      * 61286                * 61286
u_str  ESTAB   0        0      * 61286 /run/user/1000/bus 57710
u_str  ESTAB   0        0      * 57709                * 57709
u_str  ESTAB   0        0      * 41529                * 40902
u_str  ESTAB   0        0      * 41529 /run/systemd/journal/stdout 39720
u_str  ESTAB   0        0      * 39718                * 39718
u_str  ESTAB   0        0      * 60155                * 60154
u_str  ESTAB   0        0      * 60155                * 60155
u_str  ESTAB   0        0      * 59992                * 59233
u_str  ESTAB   0        0      * 59992                * 59992
u_str  ESTAB   0        0      * 56886                * 57878
u_str  ESTAB   0        0      * 56886                * 56882
u_str  ESTAB   0        0      * 56883                * 56883
u_str  ESTAB   0        0      * 66648                * 65753
u_str  ESTAB   0        0      * 66648 @/tmp/.X11-unix/X0 58712
```

8. dig - The dig command in Ubuntu is used to gather DNS information. It stands for Domain Information Groper, and it collects data about Domain Name Servers. The dig command is helpful for troubleshooting DNS problems, but is also used to display DNS information.

A terminal window titled 'manav@manav-virtual-machine: ~' with standard window controls. The terminal shows the command 'dig www.google.com' and its output. The output includes DNS header information, question section, and answer section details for the domain 'www.google.com'.

```
manav@manav-virtual-machine:~$ dig www.google.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 49
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

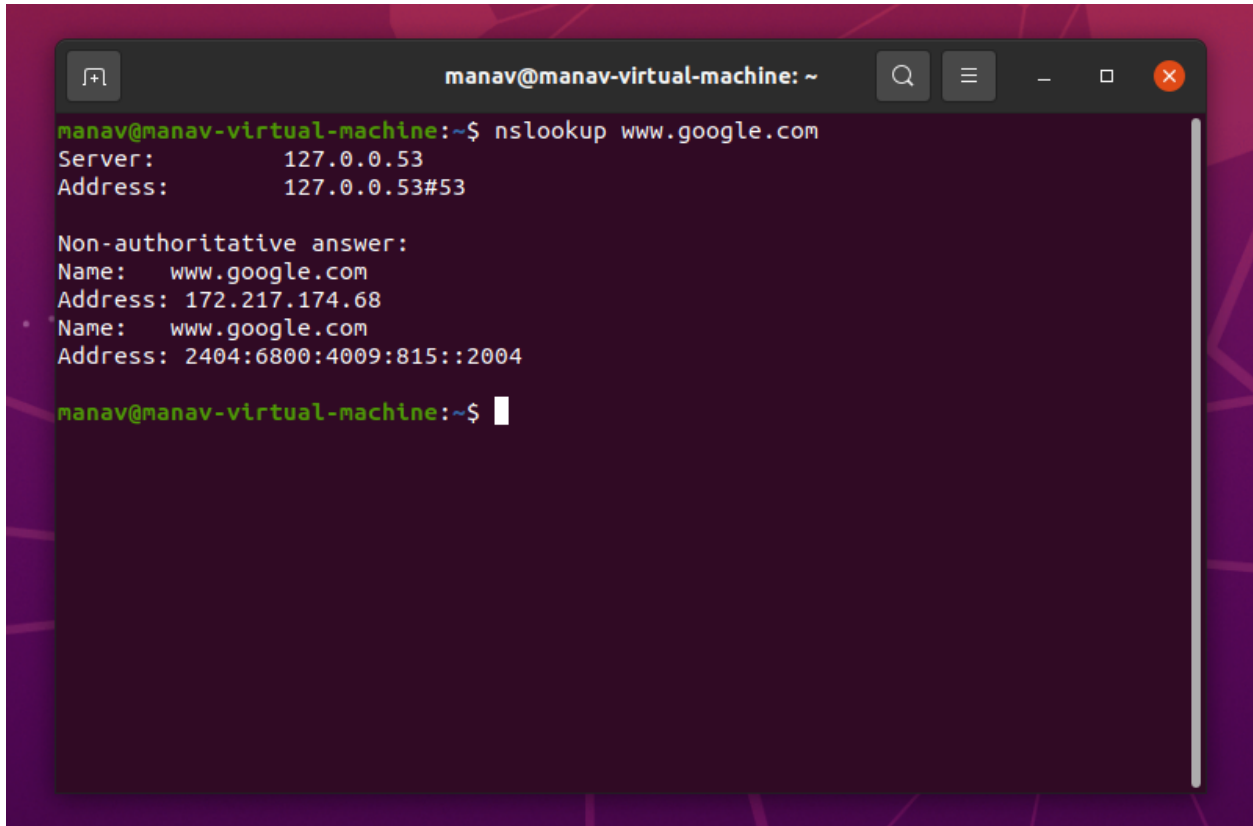
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.google.com.                IN      A

;; ANSWER SECTION:
www.google.com.                5       IN      A      142.250.199.132

;; Query time: 11 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sat Apr 02 15:05:18 IST 2022
;; MSG SIZE rcvd: 59

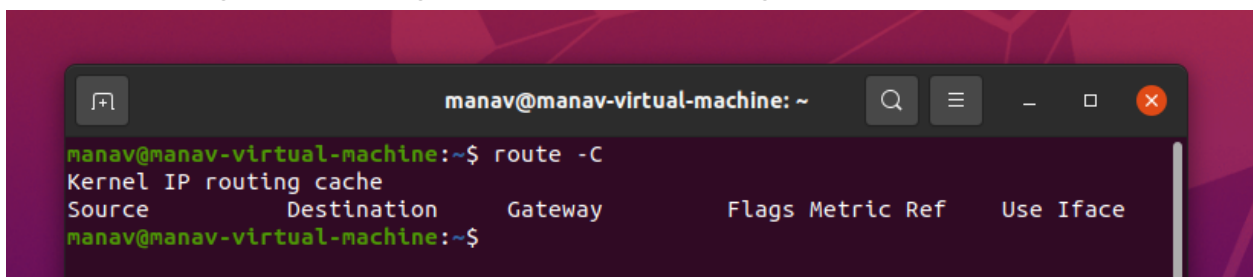
manav@manav-virtual-machine:~$
```

9. nslookup - nslookup (stands for “Name Server Lookup”) is a useful command for getting information from the DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record. It is also used to troubleshoot DNS-related problems.



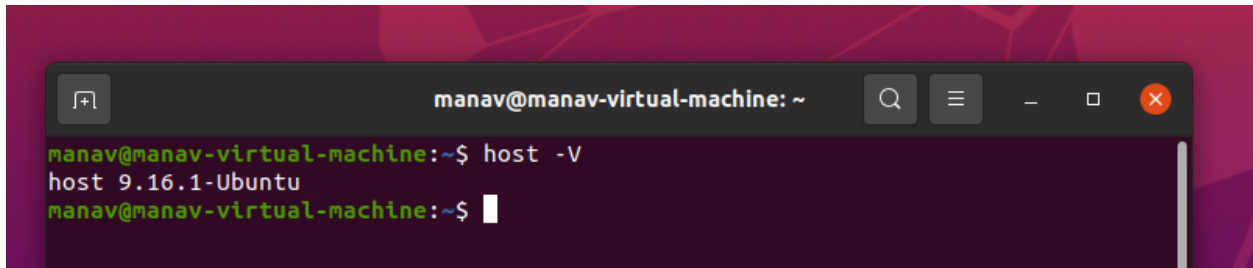
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ nslookup www.google.com  
Server:           127.0.0.53  
Address:          127.0.0.53#53  
  
Non-authoritative answer:  
Name:   www.google.com  
Address: 172.217.174.68  
Name:   www.google.com  
Address: 2404:6800:4009:815::2004  
  
manav@manav-virtual-machine:~$
```

10. `route` - `route` command in Ubuntu 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 updating the IP/kernel routing table.



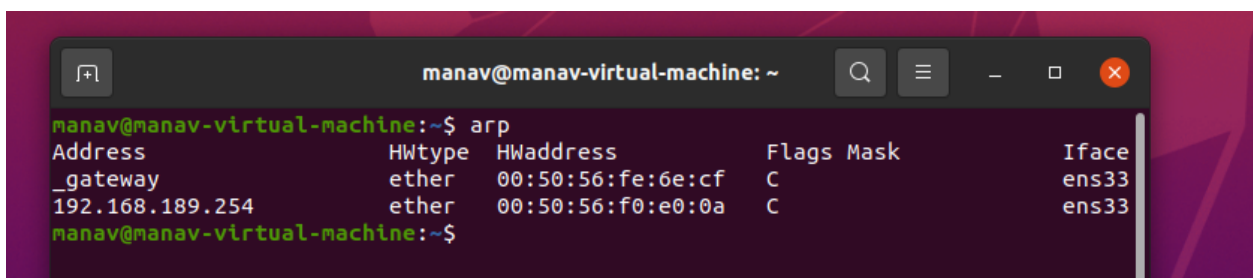
```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ route -C  
Kernel IP routing cache  
Source      Destination      Gateway          Flags Metric Ref    Use Iface  
manav@manav-virtual-machine:~$
```

11. `host` - `host` command in Ubuntu systems is used for DNS (Domain Name System) lookup operations. In simple words, this command is used to find the IP address of a particular domain name or if you want to find out the domain name of a particular IP address the `host` command becomes handy.



```
manav@manav-virtual-machine: ~  
manav@manav-virtual-machine:~$ host -V  
host 9.16.1-Ubuntu  
manav@manav-virtual-machine:~$
```

12. `arp` - ARP stands for "Address Resolution Protocol". ARP is a program used by a computer system to find another computer's MAC address based on its IP address.



```
manav@manav-virtual-machine:~$ arp  
Address          HWtype  HWaddress      Flags Mask    Iface  
_gateway          ether    00:50:56:fe:6e:cf  C           ens33  
192.168.189.254   ether    00:50:56:f0:e0:0a  C           ens33  
manav@manav-virtual-machine:~$
```

13. `curl` - `curl` (short for "Client URL") is a command line tool that enables data transfer over various network protocols. It communicates with a web or application server by specifying a relevant URL and the data that need to be sent or received.


```

manav@manav-virtual-machine: ~
manav@manav-virtual-machine:~$ curl www.google.com
<!doctype html><html itemscope="" itemtype="http://schema.org/WebPage" lang="en-IN"><head><meta content="text/html; charset=UTF-8" http-equiv="Content-Type"><meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" itemprop="image"><title>Google</title><script nonce="WcFwGI/58pU5+vYW1JZPhQ==">(function(){window.google={kEI:'pCRIYpKhL4yF2roPmui40A8',kEXPI:'0,1302536,56873,6058,207,4804,2316,383,246,5,1353,4014,1237,1122516,1197773,617,380100,16115,17444,11240,17572,4858,1362,9290,3027,2817,14765,4020,978,13228,3847,4192,6430,7432,7331,7350,628,5081,1593,1279,2453,289,149,1103,842,6295,3514,606,2024,2298,14668,3227,2845,7,4811,12639,8101,8219,1851,15756,3,346,230,1014,1,5445,148,11323,2652,4,1528,2304,7039,22023,3050,2658,7356,31,11010,16413,7428,5830,2527,4094,4052,3,3541,1,11943,2319,2545,25347,2,14022,1931,784,255,4550,744,5852,9868,595,1160,5679,1020,2381,2719,8594,9666,2,2,5,7753,2124,2445,6258,3014,3,3706,16695,830,422,3369,2466,10300,1562,3105,1539,2794,8,2075,2594,1413,1394,445,2,2,1,3293,3102,4562,2127,4228,4135,2378,954,1406,10,1,8591,113,457,4554,5,1453,100,699,2,460,2,1985,593,5214,2215,421,880,1972,936,6187,363,791,4621,1450,2,1,2212,3702,142,1144,1411,913,321,326,139,770,1741,2,1388,869,936,501,1259,201,757,745,610,54,748,102,2151,13,1961,95,184,554,1814,71,30,205,107,59,316,1532,164,1923,332,3,230,2352,192,648,92,379,1329,1490,5449534,1197,118,8796696,882,444,3,1877,1,2562,1,748,141,795,563,1,4265,1,1,2,1331,4142,2609,155,17,13,72,139,4,2,20,2,169,13,19,46,5,39,96,548,29,2,2,1,2,1,2,2,7,4,1,2,2,2,2,2,353,513,186,1,1,158,3,2,2,2,2,4,2,3,3,269,1601,141,1002,71,241,14,3,13,94,2,2,5,10,7,7,1,8,23951500,2738465,1300110,3,3112,3,450,1964,2935,159,1358,4726,3,2173,5318,637,2010,864,10',kBL:'zIb2'};google.sn='webhp';google.kHL='en-IN';})();(function(){

```

14. **wget** - Wget is a utility command in Ubuntu that is used to download files from the web. We can use it to download files from HTTP, HTTPS, or FTP servers.

```

manav@manav-virtual-machine: ~
manav@manav-virtual-machine:~$ wget www.google.com
--2022-04-02 15:58:27-- http://www.google.com/
Resolving www.google.com (www.google.com)... 142.250.67.228, 2404:6800:4009:814:
:2004
Connecting to www.google.com (www.google.com)|142.250.67.228|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: 'index.html.1'

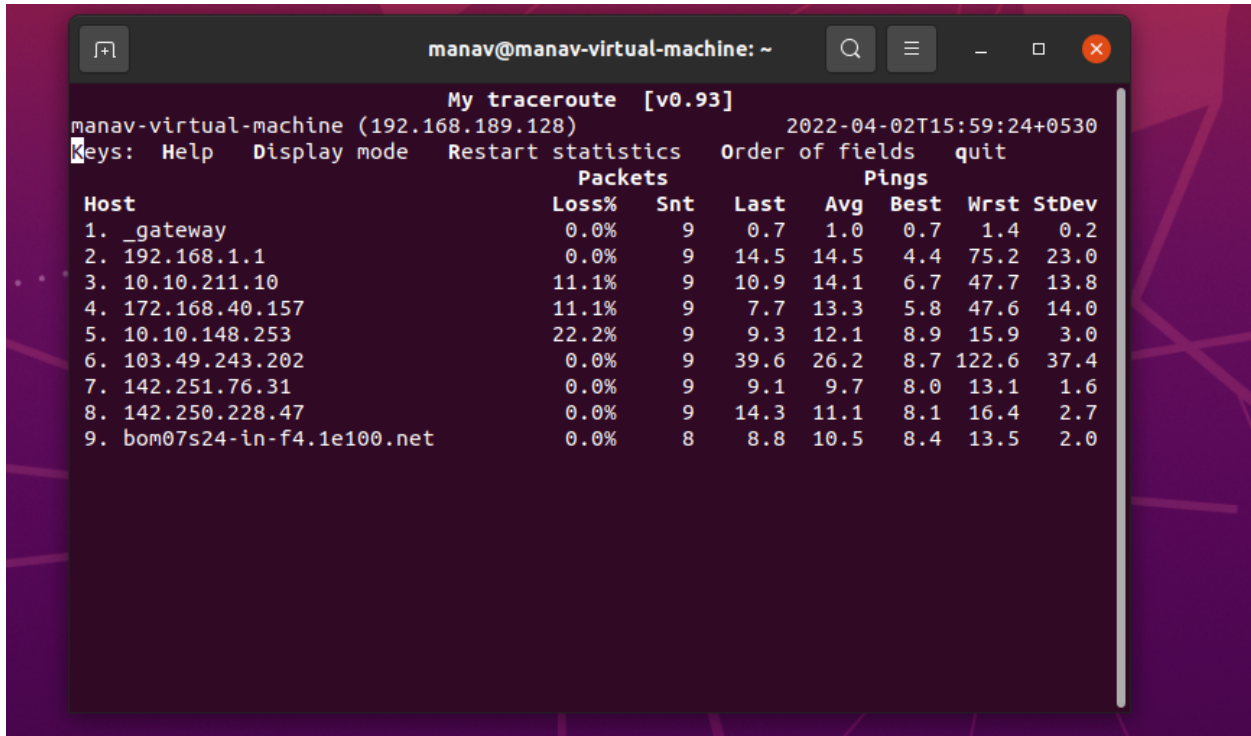
index.html.1          [ <=>          ] 15.94K  --.-KB/s   in 0.004s

2022-04-02 15:58:27 (3.99 MB/s) - 'index.html.1' saved [16326]

manav@manav-virtual-machine:~$

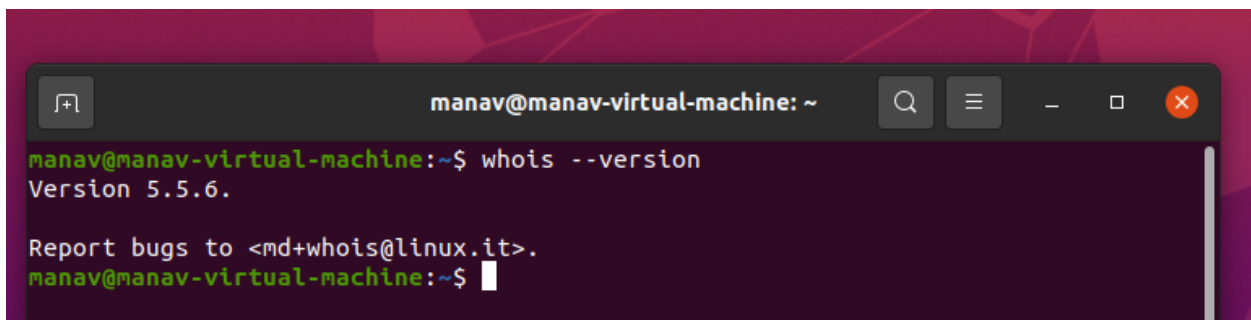
```

15. **mtr** - MTR is a simple, cross-platform command-line network diagnostic tool that combines the functionality of commonly used traceroute and ping programs into a single tool, that prints information about the entire route that the network packets take, right from the host system to the specified destination system.



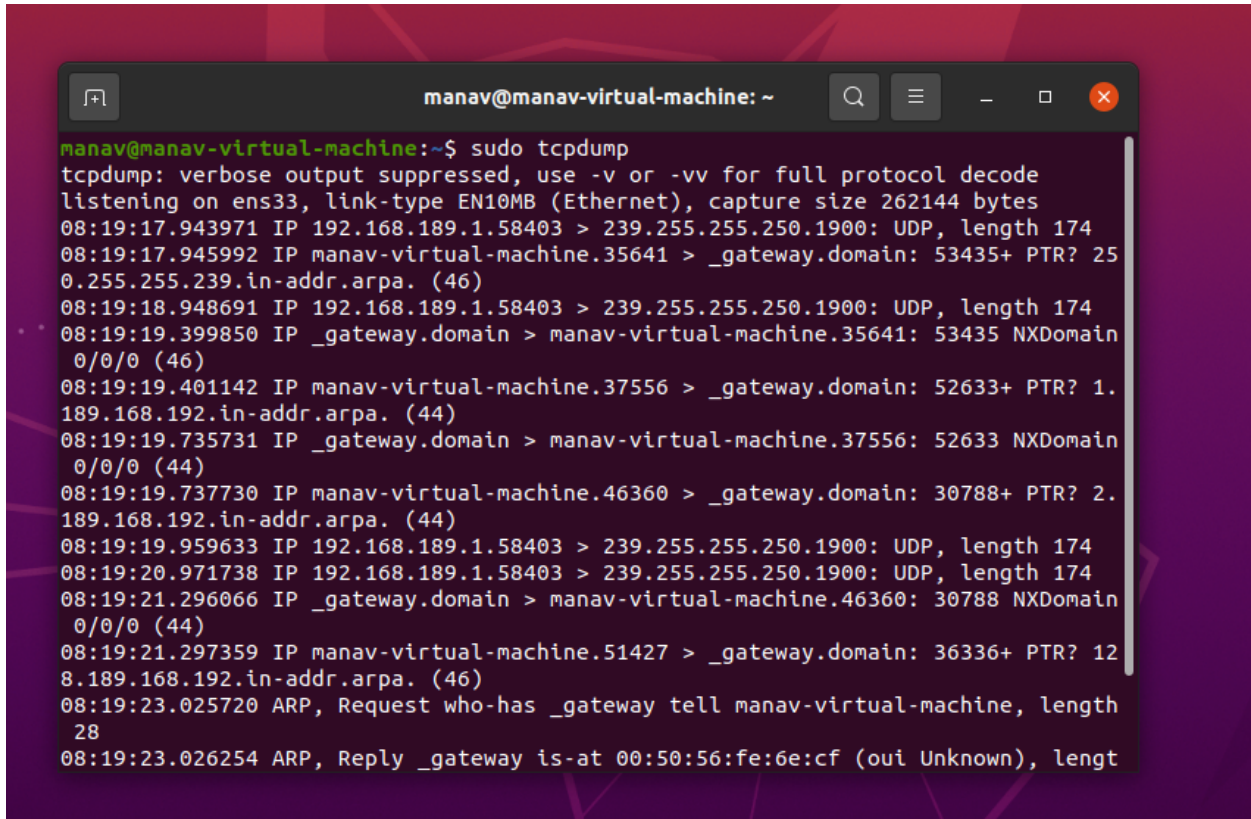
```
manav@manav-virtual-machine: ~  
My traceroute [v0.93]  
manav-virtual-machine (192.168.189.128) 2022-04-02T15:59:24+0530  
Keys: Help Display mode Restart statistics Order of fields quit  
Packets  
Host Loss% Snt Last Avg Best Wrst StDev  
1. _gateway 0.0% 9 0.7 1.0 0.7 1.4 0.2  
2. 192.168.1.1 0.0% 9 14.5 14.5 4.4 75.2 23.0  
3. 10.10.211.10 11.1% 9 10.9 14.1 6.7 47.7 13.8  
4. 172.168.40.157 11.1% 9 7.7 13.3 5.8 47.6 14.0  
5. 10.10.148.253 22.2% 9 9.3 12.1 8.9 15.9 3.0  
6. 103.49.243.202 0.0% 9 39.6 26.2 8.7 122.6 37.4  
7. 142.251.76.31 0.0% 9 9.1 9.7 8.0 13.1 1.6  
8. 142.250.228.47 0.0% 9 14.3 11.1 8.1 16.4 2.7  
9. bom07s24-in-f4.1e100.net 0.0% 8 8.8 10.5 8.4 13.5 2.0
```

16. **whois** - A whois search gives you a lot of information about who owns an internet domain.



```
manav@manav-virtual-machine:~$ whois --version  
Version 5.5.6.  
  
Report bugs to <md+whois@linux.it>.  
manav@manav-virtual-machine:~$
```

17. **tcpdump** - The tcpdump command can be used to capture network traffic on a Ubuntu system. It's a versatile command line utility that network administrators often rely on for troubleshooting.

A terminal window titled 'manav@manav-virtual-machine: ~' with standard Ubuntu window controls. The terminal shows the execution of 'sudo tcpdump' and a series of network packets captured on the 'ens33' interface. The output includes timestamps, IP addresses, and protocol details for UDP, ARP, and NXDomain requests and replies.

```
manav@manav-virtual-machine:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on ens33, link-type EN10MB (Ethernet), capture size 262144 bytes
08:19:17.943971 IP 192.168.189.1.58403 > 239.255.255.250.1900: UDP, length 174
08:19:17.945992 IP manav-virtual-machine.35641 > _gateway.domain: 53435+ PTR? 25
0.255.255.239.in-addr.arpa. (46)
08:19:18.948691 IP 192.168.189.1.58403 > 239.255.255.250.1900: UDP, length 174
08:19:19.399850 IP _gateway.domain > manav-virtual-machine.35641: 53435 NXDomain
0/0/0 (46)
08:19:19.401142 IP manav-virtual-machine.37556 > _gateway.domain: 52633+ PTR? 1.
189.168.192.in-addr.arpa. (44)
08:19:19.735731 IP _gateway.domain > manav-virtual-machine.37556: 52633 NXDomain
0/0/0 (44)
08:19:19.737730 IP manav-virtual-machine.46360 > _gateway.domain: 30788+ PTR? 2.
189.168.192.in-addr.arpa. (44)
08:19:19.959633 IP 192.168.189.1.58403 > 239.255.255.250.1900: UDP, length 174
08:19:20.971738 IP 192.168.189.1.58403 > 239.255.255.250.1900: UDP, length 174
08:19:21.296066 IP _gateway.domain > manav-virtual-machine.46360: 30788 NXDomain
0/0/0 (44)
08:19:21.297359 IP manav-virtual-machine.51427 > _gateway.domain: 36336+ PTR? 12
8.189.168.192.in-addr.arpa. (46)
08:19:23.025720 ARP, Request who-has _gateway tell manav-virtual-machine, length
28
08:19:23.026254 ARP, Reply _gateway is-at 00:50:56:fe:6e:cf (oui Unknown), lengt
```

Conclusion:

We have executed the network commands of Ubuntu.