

Assignment – 1

Name – Sayak Sen

Enrollment No – 2023CSB047

Subject – Computer Networks Lab

1. Read the man pages of ifconfig, ping, traceroute, arp, dig, nslookup, and netstat and write their utilities in brief.

ifconfig

- Displays network interface details (IP, MAC, MTU, RX/TX stats).
- Used to enable/disable interfaces (up/down).
- Helps diagnose interface/link issues.

ping

- Checks whether a host is reachable using ICMP.
- Measures round-trip time (latency).
- Detects packet loss and unstable links.
- Helps separate DNS issue vs network issue (ping domain vs IP).

traceroute

- Shows route (hops) taken to reach destination.
- Identifies delay at each hop to find slow networks.
- Helps locate routing failures or packet drops.

arp

- Displays ARP cache (IP ↔ MAC address mapping).
- Adds or deletes ARP table entries.
- Useful for LAN troubleshooting and spoof detection.

dig

- Performs DNS queries for records (A, AAAA, MX, NS, TXT, etc.).
- Gives detailed output (authority section, response, time).
- Useful for debugging DNS resolution/propagation.
- Can query specific DNS server (dig @server).

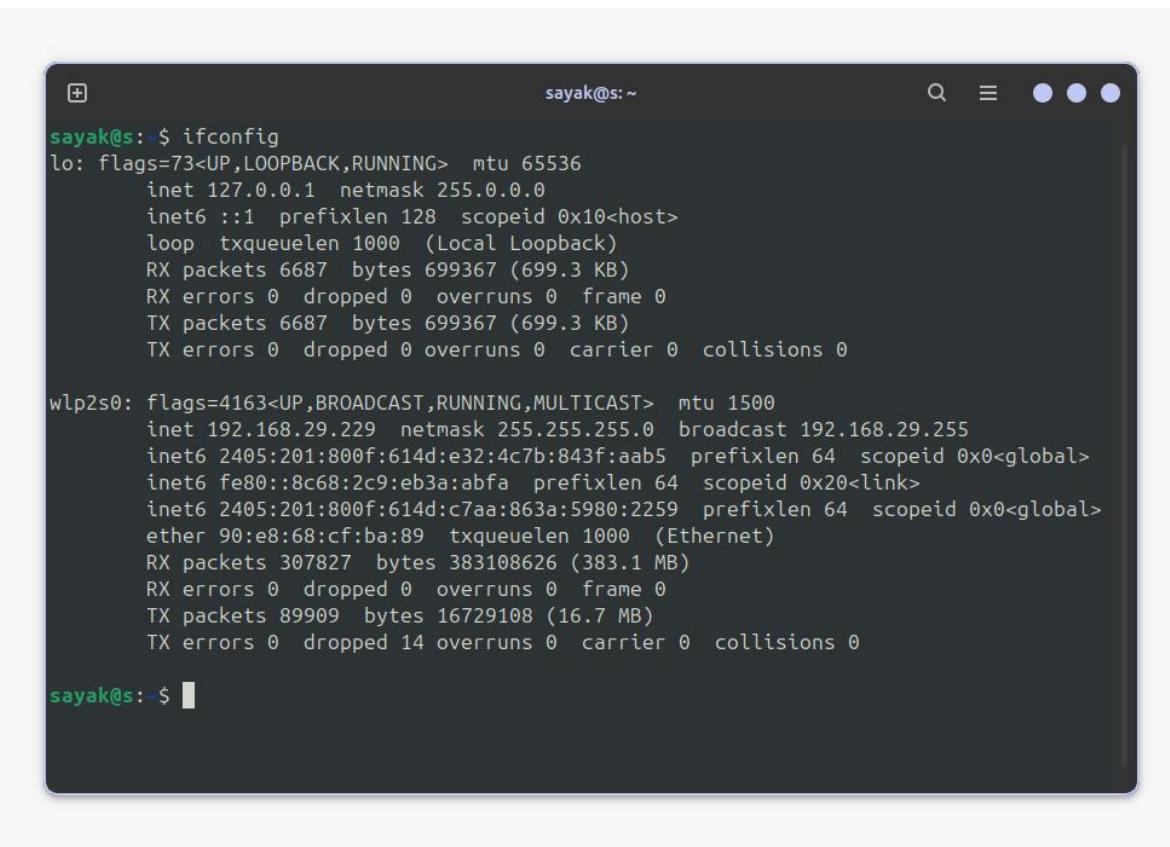
nslookup

- Resolves domain name to IP and reverse lookup.
- Can query a specific DNS server.
- Useful for quick DNS troubleshooting.

netstat

- Shows active network connections (TCP/UDP) with states.
- Lists listening ports and services.
- Displays routing table information.
- Useful for troubleshooting and checking suspicious connections.

2. Find the IP and hardware addresses of your machine using ifconfig command.



The screenshot shows a terminal window with a dark background. At the top, it displays the user's session: sayak@s: ~. The window title bar also shows "sayak@s: ~". On the right side of the title bar are icons for search, minimize, maximize, and close. The main area of the terminal contains the output of the "ifconfig" command. It lists two interfaces: "lo" (loopback) and "wlp2s0" (wireless). For each interface, it shows flags (e.g., UP, BROADCAST, RUNNING), MTU, queueing discipline, and various statistics for received and transmitted packets, bytes, errors, dropped, overruns, frame, and collisions. The "lo" interface has an IP address of 127.0.0.1 and a netmask of 255.0.0.0. The "wlp2s0" interface has an IP address of 192.168.29.229 and a broadcast address of 192.168.29.255. The terminal prompt at the bottom is "sayak@s:~\$".

```
sayak@s:~$ ifconfig
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 6687 bytes 699367 (699.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 6687 bytes 699367 (699.3 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.29.229 netmask 255.255.255.0 broadcast 192.168.29.255
        inet6 2405:201:800f:614d:e32:4c7b:843f:aab5 prefixlen 64 scopeid 0x0<global>
        inet6 fe80::8c68:2c9:eb3a:abfa prefixlen 64 scopeid 0x20<link>
        inet6 2405:201:800f:614d:c7aa:863a:5980:2259 prefixlen 64 scopeid 0x0<global>
        ether 90:e8:68:cf:ba:89 txqueuelen 1000 (Ethernet)
        RX packets 307827 bytes 383108626 (383.1 MB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 89909 bytes 16729108 (16.7 MB)
        TX errors 0 dropped 14 overruns 0 carrier 0 collisions 0

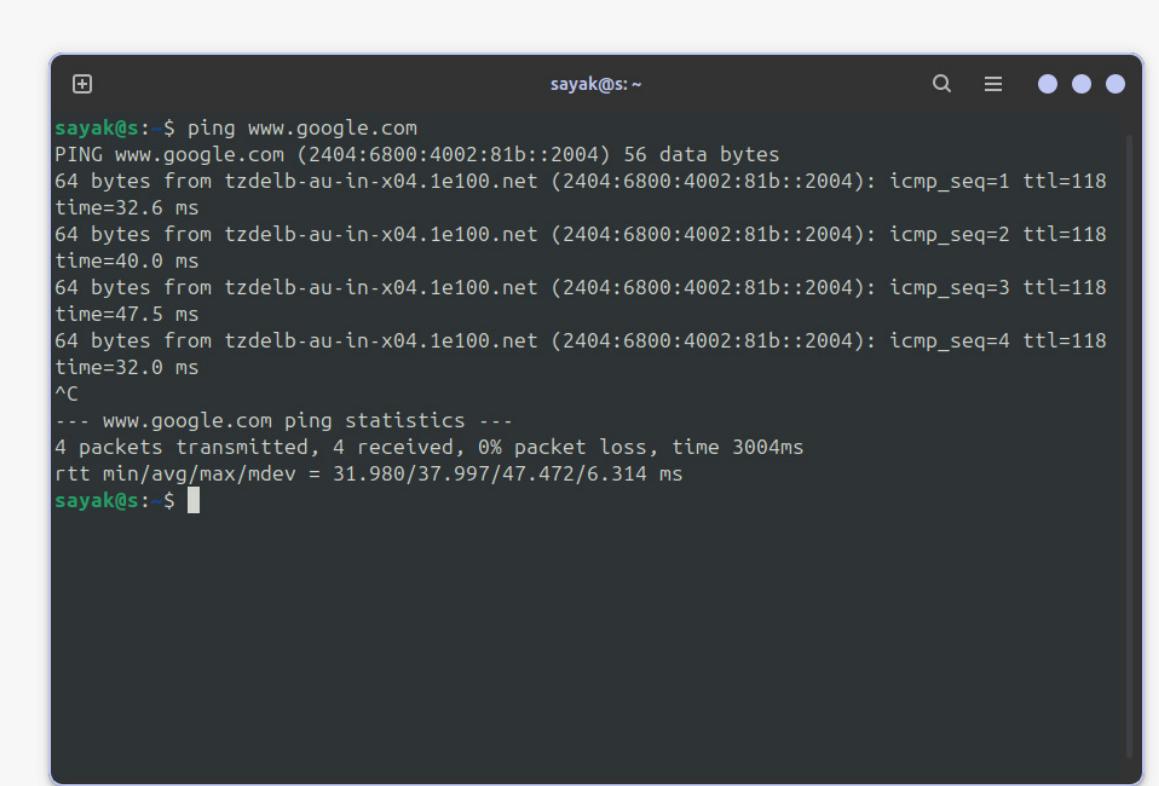
sayak@s:~$
```

Computer IP Address – 127.0.0.1

Machine Address – 90 : e8 : 68 : cf : ba : 89

3. Use “ping <AnyURL>” command and find out

- 1. the average RTT(round trip time).**
- 2. the %packet loss.**
- 3. size of packet that is sent to <AnyURL> server.**
- 4. size of packet that is received by your machine.**



A screenshot of a terminal window titled "sayak@s: ~". The window shows the output of a "ping www.google.com" command. The output includes several ICMP echo requests being sent to the IP 2404:6800:4002:81b::2004, with details like sequence number, TTL, and round-trip time. It ends with a summary of 4 packets transmitted, 4 received, 0% packet loss, and an average round-trip time of 37.997ms.

```
sayak@s:~$ ping www.google.com
PING www.google.com (2404:6800:4002:81b::2004) 56 data bytes
64 bytes from tzdelb-au-in-x04.1e100.net (2404:6800:4002:81b::2004): icmp_seq=1 ttl=118
time=32.6 ms
64 bytes from tzdelb-au-in-x04.1e100.net (2404:6800:4002:81b::2004): icmp_seq=2 ttl=118
time=40.0 ms
64 bytes from tzdelb-au-in-x04.1e100.net (2404:6800:4002:81b::2004): icmp_seq=3 ttl=118
time=47.5 ms
64 bytes from tzdelb-au-in-x04.1e100.net (2404:6800:4002:81b::2004): icmp_seq=4 ttl=118
time=32.0 ms
^C
--- www.google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 31.980/37.997/47.472/6.314 ms
sayak@s:~$
```

1. Average RTT - 37.997
2. %Packet Loss – 0%
3. Size of packet sent – 56 bytes data + 8 bytes header
4. Size of packet received – 64 bytes

4. Use “dig <AnyURL>” command and find out

- 1. The IP address of <AnyURL>.**
- 2. The IP addresses of local DNS servers of IEST.**

```
sayak@s:~$ dig www.google.com

; <>> DiG 9.18.39-0ubuntu0.24.04.2-Ubuntu <>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 9374
;; 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.      30      IN      A      142.251.223.4

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Fri Jan 09 22:08:47 IST 2026
;; MSG SIZE  rcvd: 59

sayak@s:~$
```

IP Address of www.google.com – 142.251.223.4

```
sayak@s:~$ dig cs.iiests.ac.in

; <>> DiG 9.18.39-0ubuntu0.24.04.2-Ubuntu <>> cs.iiests.ac.in
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50984
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;cs.iiests.ac.in.        IN      A

;; ANSWER SECTION:
cs.iiests.ac.in.    2496    IN      A      14.139.223.166

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Fri Jan 09 22:10:03 IST 2026
;; MSG SIZE  rcvd: 60

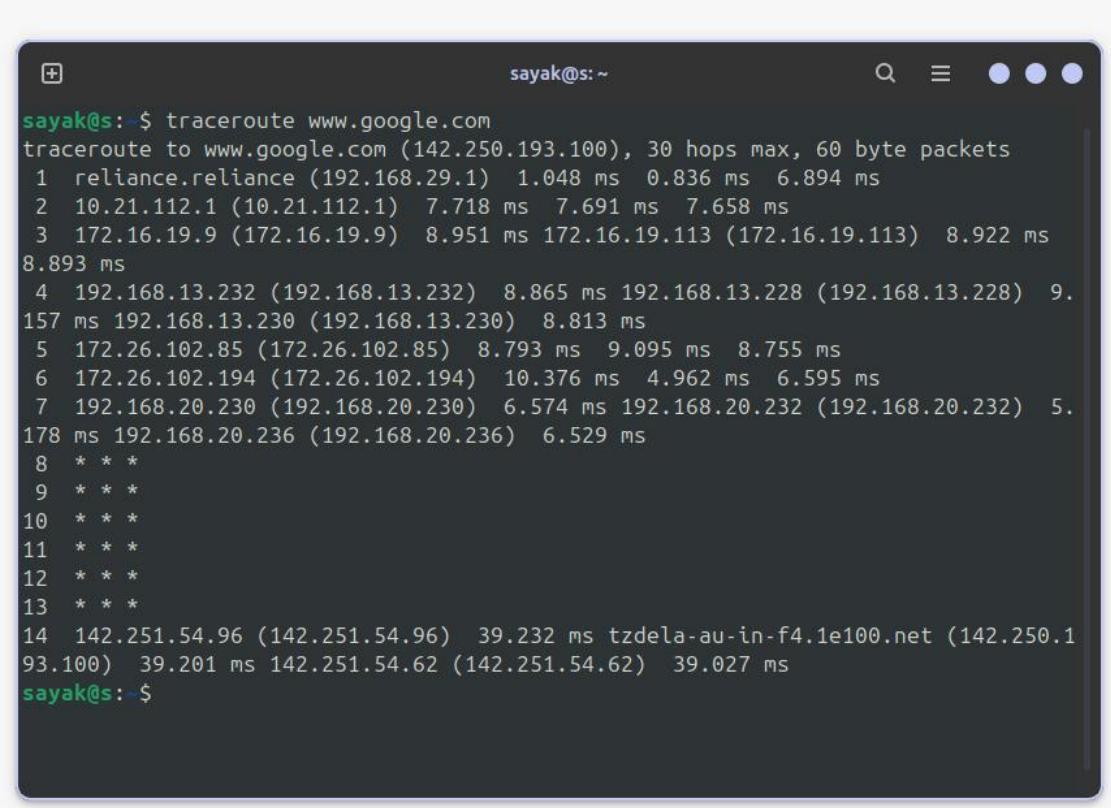
sayak@s:~$
```

IP Address of Local IIESTS Server – 14.139.223.166

5. Use “traceroute <AnyURL>” and find out

1. number of hops in between your machine and <AnyURL> server.

2. the IP address of your network gateway of your subnet.



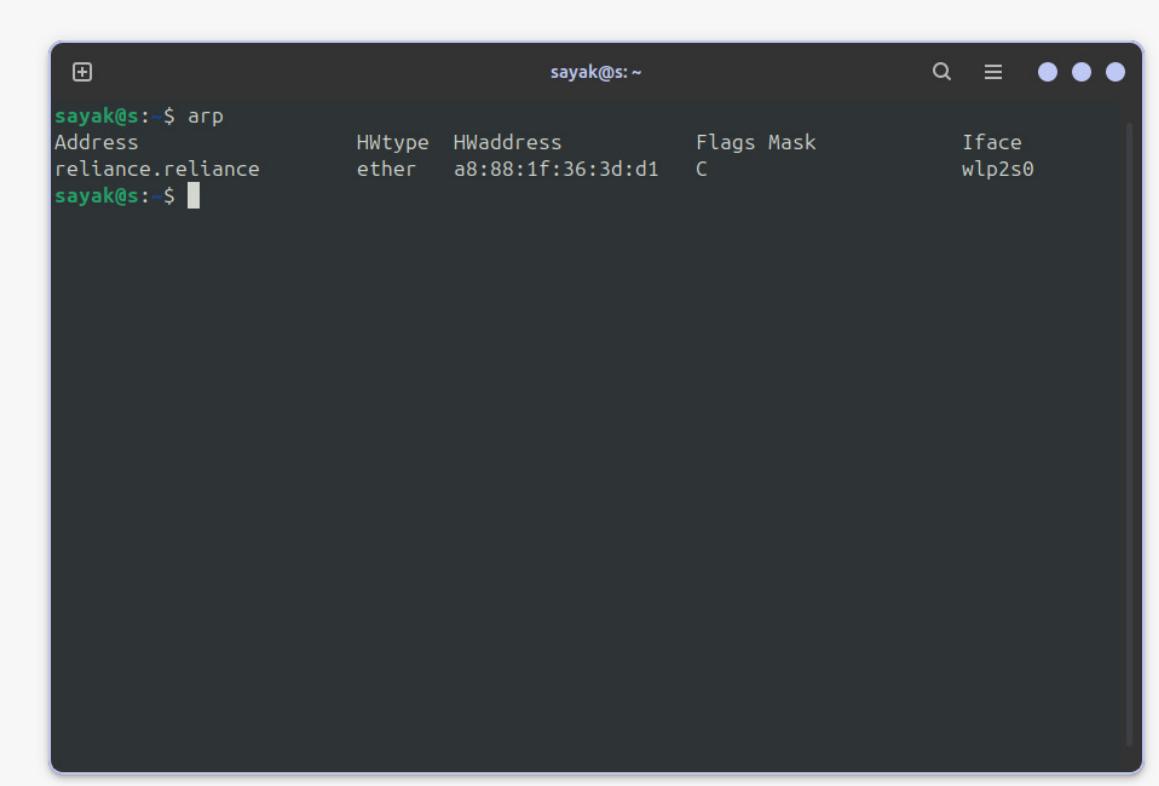
A screenshot of a terminal window titled "sayak@s:~". The window shows the command "traceroute www.google.com" being run. The output displays the path taken by packets from the user's machine to Google's website, listing 18 routers along the way. The routers are numbered 1 through 18, with some entries showing multiple IP addresses or names. The last router listed is "tzdela-au-in-f4.1e100.net" at IP 142.251.54.96. The terminal window has a dark background with light-colored text and a standard OS X-style title bar.

```
sayak@s:~$ traceroute www.google.com
traceroute to www.google.com (142.250.193.100), 30 hops max, 60 byte packets
 1  reliance.reliance (192.168.29.1)  1.048 ms  0.836 ms  6.894 ms
 2  10.21.112.1 (10.21.112.1)  7.718 ms  7.691 ms  7.658 ms
 3  172.16.19.9 (172.16.19.9)  8.951 ms  172.16.19.113 (172.16.19.113)  8.922 ms
 8.893 ms
 4  192.168.13.232 (192.168.13.232)  8.865 ms  192.168.13.228 (192.168.13.228)  9.
157 ms  192.168.13.230 (192.168.13.230)  8.813 ms
 5  172.26.102.85 (172.26.102.85)  8.793 ms  9.095 ms  8.755 ms
 6  172.26.102.194 (172.26.102.194)  10.376 ms  4.962 ms  6.595 ms
 7  192.168.20.230 (192.168.20.230)  6.574 ms  192.168.20.232 (192.168.20.232)  5.
178 ms  192.168.20.236 (192.168.20.236)  6.529 ms
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  142.251.54.96 (142.251.54.96)  39.232 ms  tzdela-au-in-f4.1e100.net (142.250.1
93.100)  39.201 ms  142.251.54.62 (142.251.54.62)  39.027 ms
sayak@s:~$
```

Number of hops between my machine and www.google.com – 18

The IP Address of network gateway – 192.168.29.1

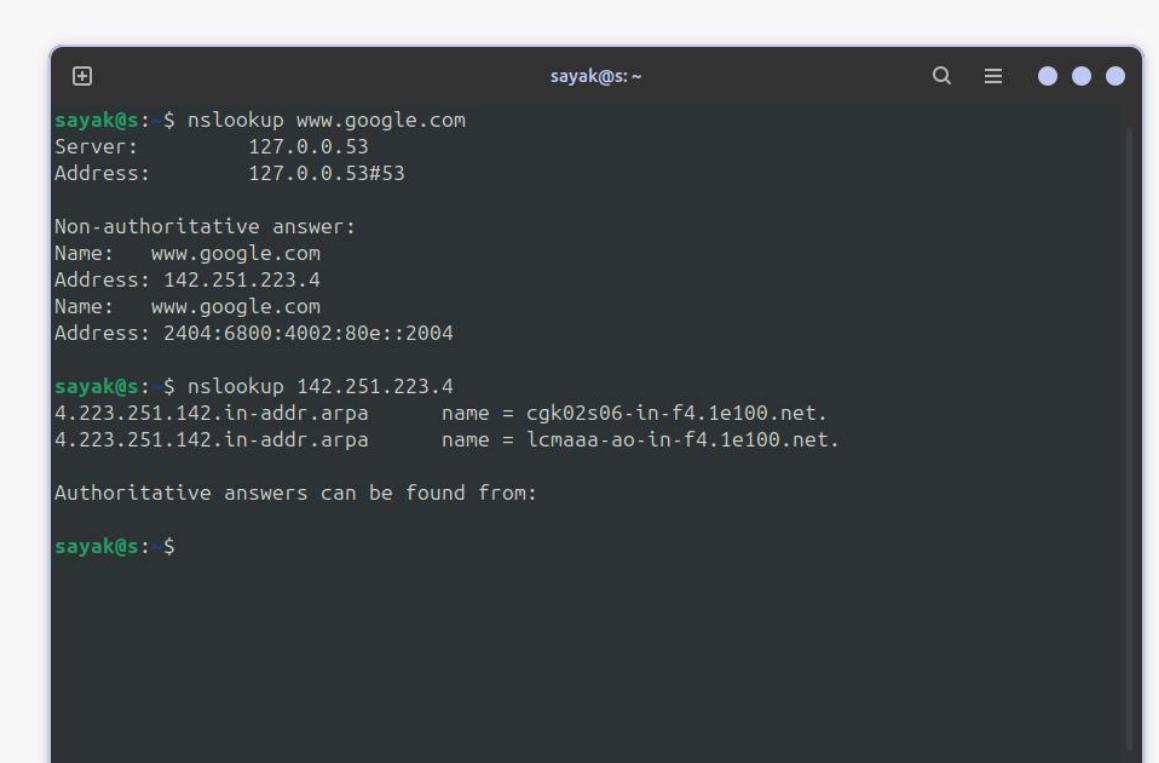
6. Use “arp” command to find out the MAC address of the device that is performing as your network gateway.

A screenshot of a terminal window titled "sayak@s: ~". The window shows the command "arp" being run, and its output. The output includes columns for Address, HWtype, HWaddress, Flags, Mask, and Iface. One entry is shown: "reliance.reliance" with HWtype "ether", HWaddress "a8:88:1f:36:3d:d1", Flags "C", Mask "", and Iface "wlp2s0".

```
sayak@s:~$ arp
Address          HWtype  HWaddress          Flags Mask   Iface
reliance.reliance  ether   a8:88:1f:36:3d:d1  C      wlp2s0
sayak@s:~$
```

MAC Address of the device that is performing as network gateway – a8 : 88 : 1f : 36 : 3d : d1

7. Use nslookup <AnyURL> command and find out the IP address of <AnyURL>. Use nslookup <IP address> command and perform reverse domain lookup.



```
sayak@s:~$ nslookup www.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.251.223.4
Name:   www.google.com
Address: 2404:6800:4002:80e::2004

sayak@s:~$ nslookup 142.251.223.4
4.223.251.142.in-addr.arpa    name = cgk02s06-in-f4.1e100.net.
4.223.251.142.in-addr.arpa    name = lcmaaa-ao-in-f4.1e100.net.

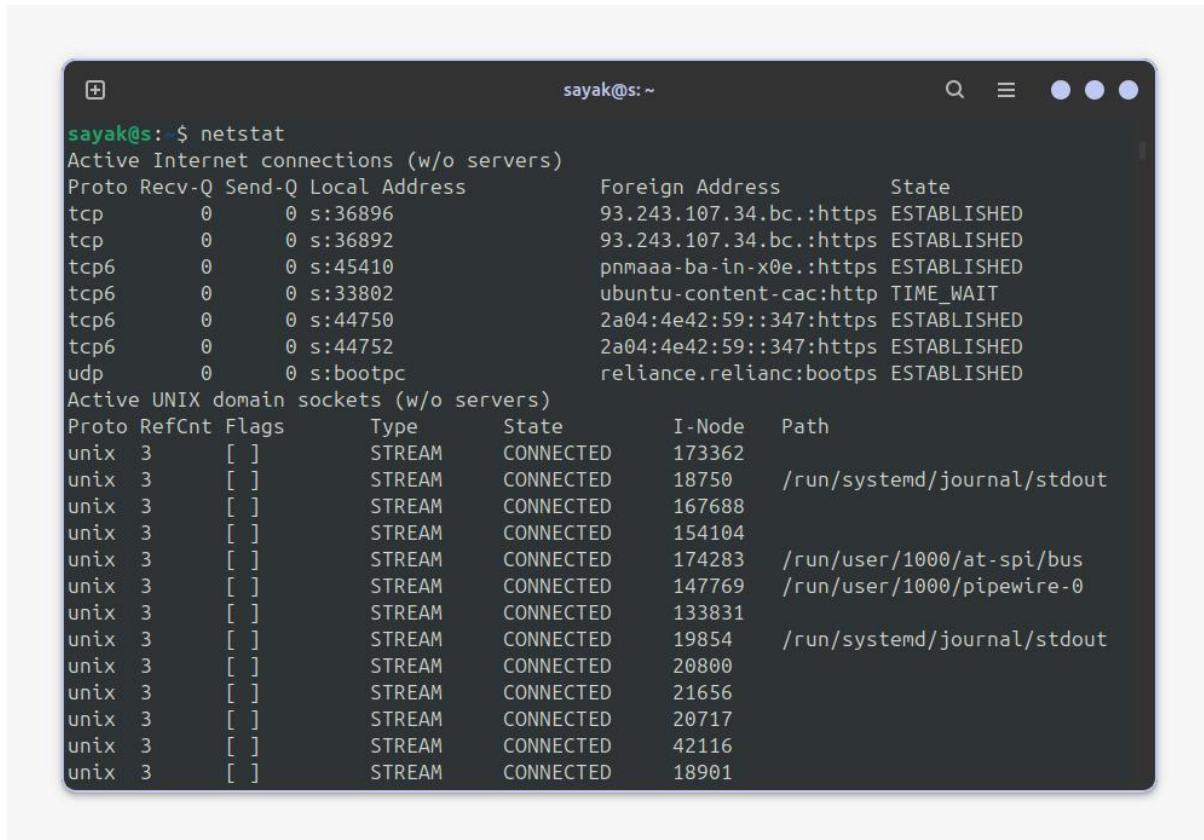
Authoritative answers can be found from:

sayak@s:~$
```

IP Address of www.google.com - 142.251.223.4

Name of server of server – cgk02s06-in-f4.1e100.net

8. Use netstat command and find out the active connections of your pc/laptop.



A terminal window titled "sayak@s: ~" displays the output of the "netstat" command. The output shows active Internet connections (w/o servers) and active UNIX domain sockets (w/o servers). The Internet connections table includes columns for Proto, Recv-Q, Send-Q, Local Address, Foreign Address, and State. The UNIX domain sockets table includes columns for Proto, RefCnt, Flags, Type, State, I-Node, and Path.

```
sayak@s:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 s:36896                  93.243.107.34.bc.:https ESTABLISHED
tcp      0      0 s:36892                  93.243.107.34.bc.:https ESTABLISHED
tcp6     0      0 s:45410                  pnmaaaa-ba-in-x0e.:https ESTABLISHED
tcp6     0      0 s:33802                  ubuntu-content-cac:http TIME_WAIT
tcp6     0      0 s:44750                  2a04:4e42:59::347:https ESTABLISHED
tcp6     0      0 s:44752                  2a04:4e42:59::347:https ESTABLISHED
udp      0      0 s:bootpc                reliance.relianc:bootps ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State      I-Node    Path
unix    3      [ ]      STREAM   CONNECTED  173362   /run/systemd/journal/stdout
unix    3      [ ]      STREAM   CONNECTED  18750    /run/systemd/journal/stdout
unix    3      [ ]      STREAM   CONNECTED  167688
unix    3      [ ]      STREAM   CONNECTED  154104
unix    3      [ ]      STREAM   CONNECTED  174283   /run/user/1000/at-spi/bus
unix    3      [ ]      STREAM   CONNECTED  147769   /run/user/1000/pipewire-0
unix    3      [ ]      STREAM   CONNECTED  133831
unix    3      [ ]      STREAM   CONNECTED  19854    /run/systemd/journal/stdout
unix    3      [ ]      STREAM   CONNECTED  20800
unix    3      [ ]      STREAM   CONNECTED  21656
unix    3      [ ]      STREAM   CONNECTED  20717
unix    3      [ ]      STREAM   CONNECTED  42116
unix    3      [ ]      STREAM   CONNECTED  18901
```