

# CSE232 Computer Networks

## Assignment 1

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**Github link-**[Pranav-Tanwar/Computer Networks Assignment 1 \(github.com\)](https://github.com/Pranav-Tanwar/Computer-Networks-Assignment-1)

Q1)

- a) The IP address of my system is 192.168.0.109

```
pranav-tanwar@PT:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      ether 48:9e:bd:f9:56:d8 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

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 72393 bytes 7276622 (7.2 MB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 72393 bytes 7276622 (7.2 MB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.0.109 netmask 255.255.255.0 broadcast 192.168.0.255
      inet6 fe80::7842:1f2c:93be:354c prefixlen 64 scopeid 0x20<link>
          ether 74:12:b3:8c:16:39 txqueuelen 1000 (Ethernet)
          RX packets 11586305 bytes 13725265294 (13.7 GB)
          RX errors 0 dropped 3971 overruns 0 frame 0
          TX packets 5149348 bytes 666381617 (666.3 MB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

pranav-tanwar@PT:~$
```

- b) The IP address shown on [whatismyip.com](https://whatismyip.com) was 103.112.17.231

It is different as ifconfig command shows us the private IP of our system on the local network, whereas the website shows us our public IP address.

# What Is My IP?

My Public IPv4: [103.112.17.231](http://103.112.17.231) 

My Public [IPv6](#): Not Detected

My IP Location: Delhi, DL IN 

My ISP: OMNET Broadband Services Pvt Ltd. 

Q2)

- Change the IP address of my network interface wlo1 from 192.168.0.109 to 192.168.0.149 using the sudo ifconfig command.

```
pranav-tanwar@PT:~$ sudo ifconfig wlo1 192.168.0.149
[sudo] password for pranav-tanwar:
pranav-tanwar@PT:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      ether 48:9e:bd:f9:56:d8 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

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 83555 bytes 8342966 (8.3 MB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 83555 bytes 8342966 (8.3 MB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.0.149 netmask 255.255.255.0 broadcast 192.168.0.255
      inet6 fe80::4d67:97ee:e274:d71a prefixlen 64 scopeid 0x20<link>
          ether 74:12:b3:8c:16:39 txqueuelen 1000 (Ethernet)
          RX packets 11823371 bytes 13822619087 (13.8 GB)
          RX errors 0 dropped 3971 overruns 0 frame 0
          TX packets 5431780 bytes 831306324 (831.3 MB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Reverted the change by using the same command with original IP address of 192.168.0.109

```
pranav-tanwar@PT:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      ether 48:9e:bd:f9:56:d8 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

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 85955 bytes 8531618 (8.5 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 85955 bytes 8531618 (8.5 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
      inet 192.168.0.109 netmask 255.255.255.0 broadcast 192.168.0.255
        inet6 fe80::4d67:97ee:e274:d71a prefixlen 64 scopeid 0x20<link>
          ether 74:12:b3:8c:16:39 txqueuelen 1000 (Ethernet)
            RX packets 11826040 bytes 13824413394 (13.8 GB)
            RX errors 0 dropped 3971 overruns 0 frame 0
            TX packets 5434771 bytes 832116919 (832.1 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

pranav-tanwar@PT:~$
```

Q3)

- Using the netcat command to set up a TCP client server connection between host machine and localhost.

```
pranav-tanwar@PT:~$ sudo netcat localhost 1002
[sudo] password for pranav-tanwar:
Sorry, try again.
[sudo] password for pranav-tanwar:
computer
network
assignment
```

-l here is used for listening

```
pranav-tanwar@PT:~$ sudo netcat -l 1002  
computer  
network  
assignment
```

- b) The TCP connection at client node was in ESTABLISHED state, This was checked using the netstat command over the port address 1002.

```
pranav-tanwar@PT:~$ netstat -an | grep 1002  
tcp        0      0 0.0.0.0:1002          0.0.0.0:*          LISTEN  
tcp        0      0 127.0.0.1:1002        127.0.0.1:41126    ESTABLISHED  
tcp        0      0 127.0.0.1:41126       127.0.0.1:1002      ESTABLISHED  
pranav-tanwar@PT:~$
```

Q4)

- a) Using the nslookup command with -type=SOA with the domain name google.in, the list of all the authoritative results was obtained. Reran the command with one of the authoritative answers (here, ns3.google.com) to get the final answer.

```
pranav-tanwar@PT:~$ nslookup -type=NS google.in
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
google.in      nameserver = ns4.google.com.
google.in      nameserver = ns2.google.com.
google.in      nameserver = ns1.google.com.
google.in      nameserver = ns3.google.com.

Authoritative answers can be found from:
ns4.google.com  internet address = 216.239.38.10
ns4.google.com  has AAAA address 2001:4860:4802:38::a
ns2.google.com  internet address = 216.239.34.10
ns2.google.com  has AAAA address 2001:4860:4802:34::a
ns1.google.com  internet address = 216.239.32.10
ns1.google.com  has AAAA address 2001:4860:4802:32::a
ns3.google.com  internet address = 216.239.36.10
ns3.google.com  has AAAA address 2001:4860:4802:36::a

pranav-tanwar@PT:~$ nslookup google.in ns3.google.com
Server:      ns3.google.com
Address:     216.239.36.10#53

Name:   google.in
Address: 142.250.193.4
Name:   google.in
Address: 2404:6800:4002:819::2004
```

- b) Using the dig command on google.in, we can find the Time to Live (TTL) as dig gives us the DNS related information of any domain.

```

pranav-tanwar@PT:~$ dig google.in

; <>> DiG 9.18.28-0ubuntu0.24.04.1-Ubuntu <>> google.in
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 7382
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

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

;; ANSWER SECTION:
google.in.          300     IN      A      142.250.194.100

;; Query time: 87 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Fri Aug 30 22:50:09 IST 2024
;; MSG SIZE  rcvd: 54

```

Here, the TTL is 300 seconds.

Q5)

- a) We use the traceroute command on google.in to find the number of intermediate servers.

```

pranav-tanwar@PT:~$ traceroute google.in
traceroute to google.in (142.250.193.4), 64 hops max
 1  * * *
 2  103.25.231.1  5.278ms  4.748ms  4.599ms
 3  * * *
 4  10.119.234.162  10.229ms  174.420ms  7.155ms
 5  72.14.194.160  6.991ms  87.995ms  7.419ms
 6  142.251.54.111  94.795ms  102.280ms  103.682ms
 7  142.251.54.87  31.249ms  102.683ms  31.170ms
 8  142.250.193.4  115.086ms  127.583ms  101.830ms
pranav-tanwar@PT:~$

```

We observe a total of 6 intermediate hosts here are 7 if we exclude the IP for google.in (142.250.193.4)

Their IP addresses and average latencies are-

103.25.231.1 - 4.875ms  
10.119.234.162 - 63.935ms  
72.12.194.160 - 34.135ms  
142.251.54.111 - 100.253ms  
142.251.54.87 - 55.034ms  
142.250.193.4 - 114.833ms

- b) On running the ping command 50 times-

```
pranav-tanwar@PT:~$ ping -c 50 google.in
PING google.in (142.250.194.100) 56(84) bytes of data.
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=1 ttl=59 time=94.4 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=2 ttl=59 time=82.9 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=3 ttl=59 time=4.74 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=4 ttl=59 time=8.25 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=5 ttl=59 time=168 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=6 ttl=59 time=5.34 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=7 ttl=59 time=4.85 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=8 ttl=59 time=5.18 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=9 ttl=59 time=7.11 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=10 ttl=59 time=5.33 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=11 ttl=59 time=3.99 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=12 ttl=59 time=13.6 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=13 ttl=59 time=71.2 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=14 ttl=59 time=99.4 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=15 ttl=59 time=132 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=16 ttl=59 time=51.7 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=17 ttl=59 time=172 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=18 ttl=59 time=4.62 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=19 ttl=59 time=4.37 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=20 ttl=59 time=30.7 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=21 ttl=59 time=71.4 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=22 ttl=59 time=47.3 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=23 ttl=59 time=71.9 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=24 ttl=59 time=107 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=25 ttl=59 time=133 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=26 ttl=59 time=6.06 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=27 ttl=59 time=12.1 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=28 ttl=59 time=3.63 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=29 ttl=59 time=4.37 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=30 ttl=59 time=3.95 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=31 ttl=59 time=35.2 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=32 ttl=59 time=85.7 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=33 ttl=59 time=112 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=34 ttl=59 time=83.8 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=35 ttl=59 time=119 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=36 ttl=59 time=5.69 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=37 ttl=59 time=5.37 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=38 ttl=59 time=4.13 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=39 ttl=59 time=5.88 ms
64 bytes from del12s04.in-f4.1e100.net (142.250.194.100): icmp_seq=40 ttl=59 time=4.34 ms
```

```

64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=40 ttl=59 time=4.34 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=41 ttl=59 time=4.14 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=42 ttl=59 time=3.94 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=43 ttl=59 time=3.54 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=44 ttl=59 time=3.93 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=45 ttl=59 time=6.28 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=46 ttl=59 time=88.6 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=47 ttl=59 time=18.9 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=48 ttl=59 time=51.7 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=49 ttl=59 time=169 ms
64 bytes from del12s04-in-f4.1e100.net (142.250.194.100): icmp_seq=50 ttl=59 time=112 ms

--- google.in ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49036ms
rtt min/avg/max/mdev = 3.542/47.056/172.103/52.077 ms

```

-c 50 is added to limit the ping command to just 50 iterations. We observe that the average latency is 47.056ms.

- c) Total ping latency in a) was 403.065ms, whereas in b) we get 47.056ms. The values are not the same as traceroute measures the time to each intermediate server, whereas ping measures the roundtrip time between the source and the destination.
- d) Max latency in a) was taken by 142.250.193.4 (114.833ms), and the value in b) is 47.056ms. The values are not matching as the first is the max latency that it will take to reach an intermediate server, whereas the second is the average latency of a roundtrip ping request from the source to the destination.
- e) The multiple entries in a single hop with traceroute are caused due to the various packets being sent by traceroute taking different paths depending on the network conditions.
- f) Sending 50 ping requests to stanford.edu

```
pranav-tanwar@PT:~$ ping -c 50 stanford.edu
PING stanford.edu (171.67.215.200) 56(84) bytes of data.
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=1 ttl=239 time=301 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=2 ttl=239 time=302 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=3 ttl=239 time=333 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=4 ttl=239 time=270 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=5 ttl=239 time=376 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=6 ttl=239 time=288 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=7 ttl=239 time=273 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=8 ttl=239 time=333 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=9 ttl=239 time=380 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=10 ttl=239 time=274 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=11 ttl=239 time=298 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=12 ttl=239 time=329 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=13 ttl=239 time=343 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=14 ttl=239 time=288 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=15 ttl=239 time=388 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=16 ttl=239 time=308 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=17 ttl=239 time=331 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=18 ttl=239 time=352 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=19 ttl=239 time=375 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=20 ttl=239 time=296 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=21 ttl=239 time=328 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=22 ttl=239 time=341 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=23 ttl=239 time=363 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=24 ttl=239 time=269 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=25 ttl=239 time=304 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=26 ttl=239 time=326 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=27 ttl=239 time=349 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=28 ttl=239 time=299 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=29 ttl=239 time=293 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=30 ttl=239 time=727 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=31 ttl=239 time=346 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=32 ttl=239 time=363 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=33 ttl=239 time=385 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=34 ttl=239 time=306 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=35 ttl=239 time=359 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=36 ttl=239 time=349 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=37 ttl=239 time=371 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=38 ttl=239 time=395 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=39 ttl=239 time=314 ms
```

```
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=40 ttl=239 time=336 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=41 ttl=239 time=359 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=42 ttl=239 time=381 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=43 ttl=239 time=301 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=44 ttl=239 time=324 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=45 ttl=239 time=345 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=46 ttl=239 time=368 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=47 ttl=239 time=305 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=48 ttl=239 time=311 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=49 ttl=239 time=332 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=50 ttl=239 time=353 ms

--- stanford.edu ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49172ms
rtt min/avg/max/mdev = 269.399/338.789/726.500/64.774 ms
```

The average latency is 338.789ms

- g) Running traceroute on stanford.edu

```
pranav-tanwar@PT:~$ traceroute stanford.edu
traceroute to stanford.edu (171.67.215.200), 64 hops max
 1  192.168.0.1  4.969ms  0.928ms  1.626ms
 2  172.16.144.1  2.434ms  11.707ms  55.400ms
 3  * * *
 4  43.248.155.141  91.078ms  266.224ms  4.260ms
 5  14.143.159.213  3.987ms  4.091ms  6.046ms
 6  * * *
 7  * * *
 8  195.219.174.16  238.316ms  *  *
 9  80.231.154.32  237.378ms  209.632ms  201.497ms
10  80.231.154.199  208.121ms  *  *
11  * 80.231.245.13  211.626ms  *
12  * * *
13  184.105.177.238  362.721ms  310.493ms  610.380ms
14  171.66.255.196  312.910ms  311.962ms  298.882ms
15  * * *
16  171.67.215.200  319.371ms  400.098ms  307.713ms
pranav-tanwar@PT:~$
```

There is a difference of 8 hops between google.in and stanford.edu, where google had 8 hops, and stanford had 16.

- h) The reason for the difference between the average latencies is the greater physical distance of the servers of stanford.edu, which are in US, to google.in which are in India. It could also be because of network congestion or server load.

Q6) We make the ping command fail for the localhost 127.0.0.1 by using the ifconfig command and turning it down, so no data transfer can be made to it.

```
pranav-tanwar@PT:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 48:9e:bd:f9:56:d8 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

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 238382 bytes 28723647 (28.7 MB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 238382 bytes 28723647 (28.7 MB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.0.109 netmask 255.255.255.0 broadcast 192.168.0.255
    inet6 fe80::4d67:97ee:e274:d71a prefixlen 64 scopeid 0x20<link>
        ether 74:12:b3:8c:16:39 txqueuelen 1000 (Ethernet)
        RX packets 12046546 bytes 13900439102 (13.9 GB)
        RX errors 0 dropped 3971 overruns 0 frame 0
        TX packets 5614759 bytes 888107399 (888.1 MB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

pranav-tanwar@PT:~$ ifconfig lo down
SIOCSIFFLAGS: Operation not permitted
pranav-tanwar@PT:~$ sudo ifconfig lo down
[sudo] password for pranav-tanwar:
pranav-tanwar@PT:~$ ping lo
ping: lo: Temporary failure in name resolution
pranav-tanwar@PT:~$ ping localhost
PING localhost (127.0.0.1) 56(84) bytes of data.
^C
--- localhost ping statistics ---
37 packets transmitted, 0 received, 100% packet loss, time 36821ms
```