

Computer Networks Assignment-1

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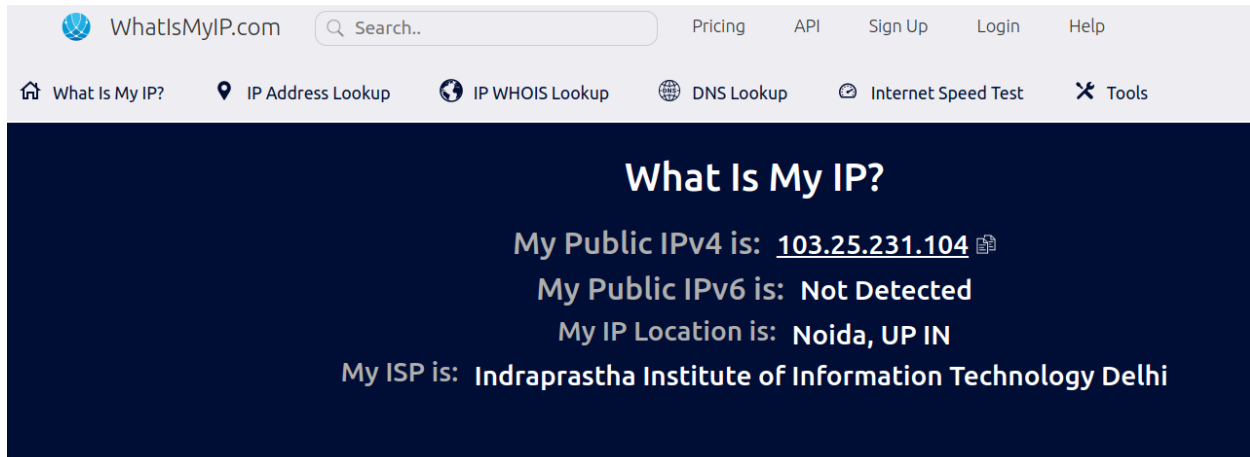
Q1 (a) IP address using ifconfig command:-

```
akash@akash-Modern-14-B11MOU:~$ 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 4320 bytes 389531 (389.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 4320 bytes 389531 (389.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.168.181 netmask 255.255.240.0 broadcast 192.168.175.255
    inet6 fe80::eccc:6f2f:a529:4439 prefixlen 64 scopeid 0x20<link>
    ether 60:dd:8e:fc:21:50 txqueuelen 1000 (Ethernet)
    RX packets 370376 bytes 252743219 (252.7 MB)
    RX errors 0 dropped 2 overruns 0 frame 0
    TX packets 45110 bytes 8934145 (8.9 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

IPv address of my network is : 192.168.168.181

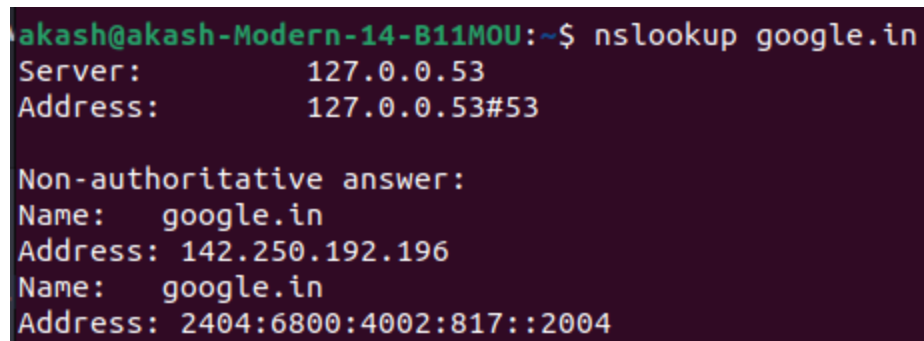
(b) My IP address on the webpage <https://www.whatismyip.com> is 103.25.231.104



The screenshot shows the homepage of WhatIsMyIP.com. The header includes the site logo, a search bar, and links for Pricing, API, Sign Up, Login, and Help. Below the header is a navigation bar with icons and labels for various tools: What Is My IP?, IP Address Lookup, IP WHOIS Lookup, DNS Lookup, Internet Speed Test, and Tools. The main content area has a dark blue background with white text. It displays the title 'What Is My IP?' followed by the following information: 'My Public IPv4 is: 103.25.231.104' (with a copy icon), 'My Public IPv6 is: Not Detected', 'My IP Location is: Noida, UP IN', and 'My ISP is: Indraprastha Institute of Information Technology Delhi'.

The two IP addresses are different. The one shown by the site is my Public IP address or the external IP address and the one shown by ifconfig on terminal is my internal or private IP address.

Q2 (a)



```
akash@akash-Modern-14-B11MOU:~$ nslookup google.in
Server:          127.0.0.53
Address:         127.0.0.53#53

Non-authoritative answer:
Name:   google.in
Address: 142.250.192.196
Name:   google.in
Address: 2404:6800:4002:817::2004
```

If we run a simple `nslookup google.in` command we get Non-authoritative answers which means the answer is not coming directly from the name server of the server we are querying.

To find the authoritative name-server for a domain name, we first need to access the corresponding SOA (State of authority) record which is shown in below image

```

akash@akash-Modern-14-B11MOU:~$ nslookup -type=soa google.in
Server:          127.0.0.53
Address:         127.0.0.53#53

Non-authoritative answer:
google.in
    origin = ns1.google.com
    mail addr = dns-admin.google.com
    serial = 554750970
    refresh = 900
    retry = 900
    expire = 1800
    minimum = 60

Authoritative answers can be found from:
ns1.google.com  internet address = 216.239.32.10
ns1.google.com  has AAAA address 2001:4860:4802:32::a

```

To find the authoritative answer for google.in, we execute a new nslookup query in which we specify the primary name server as ns1.google.com

```

akash@akash-Modern-14-B11MOU:~$ nslookup google.in ns1.google.com
Server:          ns1.google.com
Address:         216.239.32.10#53

Name:   google.in
Address: 142.250.77.228
Name:   google.in
Address: 2404:6800:4002:814::2004

```

(b) Finding out the TTL(time to live) for www.google.com

```

akash@akash-Modern-14-B11M0U:~$ nslookup -debug www.google.com
Server:          127.0.0.53
Address:         127.0.0.53#53

-----
QUESTIONS:
    www.google.com, type = A, class = IN
ANSWERS:
-> www.google.com
    internet address = 142.250.77.196
    ttl = 12
AUTHORITY RECORDS:
ADDITIONAL RECORDS:
-----
Non-authoritative answer:
Name:   www.google.com
Address: 142.250.77.196
-----
QUESTIONS:
    www.google.com, type = AAAA, class = IN
ANSWERS:
-> www.google.com
    has AAAA address 2404:6800:4002:813::2004
    ttl = 193
AUTHORITY RECORDS:
ADDITIONAL RECORDS:
-----
Name:   www.google.com
Address: 2404:6800:4002:813::2004

```

Time to live for www.google.com is 12 seconds on local DNS for type=A and 193 seconds for type=AAAA which means that entry would expire after 12/193 (depends on type) seconds after that we need to request for a fresh value of the record.

Q3 (a) All intermediate hosts with their respective IP addresses are shown in below image for google.in :-

```

akash@akash-Modern-14-B11MOU:~$ traceroute google.in
traceroute to google.in (142.250.192.228), 64 hops max
 1  192.168.160.254  22.485ms  16.750ms  13.156ms
 2  192.168.1.99    1.195ms  1.204ms  1.095ms
 3  103.25.231.1    2.455ms  1.240ms  1.427ms
 4  * * *
 5  10.119.234.162  6.747ms  4.584ms  6.269ms
 6  72.14.195.56   27.979ms 28.255ms 22.374ms
 7  74.125.244.193  5.556ms  5.112ms  6.419ms
 8  142.251.54.65   5.036ms  8.130ms  5.704ms
 9  142.250.192.228 5.339ms  5.075ms  6.427ms

```

There are 8 intermediate hosts and the 9th host is the destination host itself.

Average latencies for all hosts:-

192.168.160.254 - 17.463ms

192.168.1.99 - 1.164ms

103.25.231.1 - 1.707ms

10.119.234.162 - 5.866ms

72.14.195.56 - 26.202ms

74.125.244.193 - 5.695ms

142.251.54.65 - 6.29ms

(Destination host) 142.250.192.228 - 5.613ms

(b)

```

akash@akash-Modern-14-B11MOU:~$ ping -c 50 google.in
PING google.in (142.250.192.196) 56(84) bytes of data:
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=1 ttl=118 time=15.9 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=2 ttl=118 time=19.7 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=3 ttl=118 time=11.5 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=4 ttl=118 time=9.60 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=5 ttl=118 time=10.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=6 ttl=118 time=9.80 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=7 ttl=118 time=9.07 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=8 ttl=118 time=12.6 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=9 ttl=118 time=9.98 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=10 ttl=118 time=16.9 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=11 ttl=118 time=7.24 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=12 ttl=118 time=8.89 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=13 ttl=118 time=27.4 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=14 ttl=118 time=12.5 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=15 ttl=118 time=10.7 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=16 ttl=118 time=15.5 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=17 ttl=118 time=10.2 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=18 ttl=118 time=23.4 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=19 ttl=118 time=20.9 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=20 ttl=118 time=10.6 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=21 ttl=118 time=13.1 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=22 ttl=118 time=17.7 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=23 ttl=118 time=9.84 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=24 ttl=118 time=8.03 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=25 ttl=118 time=18.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=26 ttl=118 time=22.3 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=27 ttl=118 time=23.3 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=28 ttl=118 time=13.3 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=29 ttl=118 time=19.7 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=30 ttl=118 time=18.5 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=31 ttl=118 time=35.8 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=32 ttl=118 time=16.8 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=33 ttl=118 time=21.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=34 ttl=118 time=19.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=35 ttl=118 time=49.2 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=36 ttl=118 time=45.2 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=37 ttl=118 time=17.1 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=38 ttl=118 time=58.2 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=39 ttl=118 time=132 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=40 ttl=118 time=138 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=41 ttl=118 time=50.2 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=42 ttl=118 time=66.4 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=43 ttl=118 time=31.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=44 ttl=118 time=51.1 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=45 ttl=118 time=27.0 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=46 ttl=118 time=48.6 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=47 ttl=118 time=41.9 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=48 ttl=118 time=239 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=49 ttl=118 time=40.3 ms
64 bytes from del11s12-in-f4.1e100.net (142.250.192.196): icmp_seq=50 ttl=118 time=55.5 ms

--- google.in ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49080ms
rtt min/avg/max/mdev = 7.238/32.380/238.804/39.701 ms

```

Average latency time is 32.380ms as mentioned in above image

(c) Adding up latencies of all hosts in part (a)

$17.463 + 1.164 + 1.707 + 5.866 + 26.202 + 5.695 + 6.29 = 64.387\text{ms}$

Ping latency for google.in is 32.380ms

They do not match exactly due to differences in the way traceroute and ping work. Traceroute measures the time it takes to reach each intermediate hop, while ping measures the round-trip time to the target server.

(d) Maximum of ping latency amongst the intermediate hosts in (a) is 26.202ms and Ping latency for google.in is 32.380ms

This is comparable with the max latency amongst intermediate hosts and this is because of the packet switching technique, which is a store and forward network. So the bottleneck latency(max latency amongst intermediate hosts) would be quite close to the overall latency which we can see in this case.

(e) Multiple entries for a single hop in traceroute indicate that the packets are taking multiple paths to reach the same destination. This can happen due to load balancing, network congestion, or other routing decisions.

(f)


```

akash@akash-Modern-14-B11MOU:~$ 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=229 time=352 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=2 ttl=229 time=322 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=3 ttl=229 time=321 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=4 ttl=229 time=348 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=5 ttl=229 time=391 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=6 ttl=229 time=329 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=7 ttl=229 time=371 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=8 ttl=229 time=414 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=9 ttl=229 time=354 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=10 ttl=229 time=322 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=11 ttl=229 time=335 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=12 ttl=229 time=380 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=13 ttl=229 time=422 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=14 ttl=229 time=361 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=15 ttl=229 time=329 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=16 ttl=229 time=446 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=17 ttl=229 time=387 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=18 ttl=229 time=431 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=19 ttl=229 time=371 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=20 ttl=229 time=414 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=21 ttl=229 time=352 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=22 ttl=229 time=395 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=23 ttl=229 time=334 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=24 ttl=229 time=377 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=25 ttl=229 time=421 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=26 ttl=229 time=336 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=27 ttl=229 time=402 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=28 ttl=229 time=342 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=29 ttl=229 time=385 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=30 ttl=229 time=428 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=31 ttl=229 time=322 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=32 ttl=229 time=408 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=33 ttl=229 time=352 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=34 ttl=229 time=394 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=35 ttl=229 time=333 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=36 ttl=229 time=376 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=37 ttl=229 time=323 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=38 ttl=229 time=358 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=39 ttl=229 time=401 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=40 ttl=229 time=340 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=41 ttl=229 time=384 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=42 ttl=229 time=322 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=43 ttl=229 time=365 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=44 ttl=229 time=409 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=45 ttl=229 time=347 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=46 ttl=229 time=391 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=47 ttl=229 time=330 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=48 ttl=229 time=372 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=49 ttl=229 time=413 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=50 ttl=229 time=356 ms

--- stanford.edu ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49057ms
rtt min/avg/max/mdev = 321.086/369.252/446.261/34.750 ms

```


Average latency for stanford.edu is 369.252ms

(g)

```
akash@akash-Modern-14-B11MOU:~$ traceroute stanford.edu
traceroute to stanford.edu (171.67.215.200), 64 hops max
 1  192.168.32.254  13.766ms  3.259ms  11.397ms
 2  192.168.1.99   1.037ms  1.492ms  3.142ms
 3  103.25.231.1   1.613ms  1.387ms  1.392ms
 4  10.1.209.201   28.775ms 27.209ms 26.881ms
 5  10.1.200.137   31.111ms 30.564ms 30.725ms
 6  10.255.238.254 33.560ms 31.400ms 30.789ms
 7  180.149.48.18  30.196ms 29.757ms 30.601ms
 8  180.149.48.2   295.244ms 208.967ms 206.155ms
 9  180.149.48.13  315.481ms 314.662ms 246.995ms
10  163.253.1.116  378.522ms 420.424ms 415.016ms
11  163.253.1.123  417.963ms 342.174ms 389.655ms
12  163.253.1.123  316.789ms 412.850ms 320.934ms
13  163.253.2.145  411.232ms 417.389ms 416.468ms
14  163.253.2.17   417.731ms 417.597ms 418.834ms
15  163.253.1.206  416.521ms 420.005ms 415.634ms
16  163.253.1.206  417.674ms 418.538ms 416.739ms
17  163.253.1.250  320.776ms 411.149ms 417.702ms
18  163.253.1.250  417.059ms 417.262ms 419.105ms
19  163.253.1.169  416.455ms 417.599ms 417.487ms
20  163.253.1.36   418.846ms 417.613ms 416.536ms
21  163.253.1.36   377.712ms 353.271ms 418.771ms
22  137.164.26.126 335.405ms 394.779ms 417.365ms
23  137.164.25.95  418.067ms 418.572ms 420.713ms
24  137.164.25.95  414.134ms 316.136ms 351.365ms
25  171.66.255.132 325.684ms 363.564ms 417.684ms
26  171.66.255.132 417.652ms 418.793ms 417.267ms
27  * * *
28  171.67.215.200 394.432ms 418.339ms 417.429ms
```

Number of Intermediate hosts for google.in is 8 and number of intermediate hosts for stanford.edu is 27

(h) The reason for the latency gap between stanford.edu and google.in is the distance of the destination host from the host who sent the ping. The destination 27 hosts for stanford.edu is in the USA while the destination host for google.in is in India and the ping messages were sent from a host from India. So the ping messages to stanford.edu have a greater distance to travel.

Q4. 127.0.0.1 is the IP address for the loopback interface. we can use ifconfig to set lo down

Now if we send ping messages to 127.0.0.1 there is 100% packet loss because we have set lo to down.

```
akash@akash-Modern-14-B11MOU:~$ sudo ifconfig lo down
[sudo] password for akash:
akash@akash-Modern-14-B11MOU:~$ ping -c 50 127.0.0.1
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.

--- 127.0.0.1 ping statistics ---
50 packets transmitted, 0 received, 100% packet loss, time 50155ms
```

As we can see in the above image there is 100% packet loss.

Q5.

```
akash@akash-Modern-14-B11MOU:~$ telnet 192.168.24.12 9900
Trying 192.168.24.12...
Connected to 192.168.24.12.
Escape character is '^]'.
GET /secret HTTP/1.1
Host: 192.168.24.12

HTTP/1.1 200 OK
Content-Type: text/plain
ip: 192.168.43.117
X-secret: U2FsdGVkX1+BENcn72NA4H3DDbhbTHGFmuMoVjtLYY+Gwcq09yn2AT1c35EyFUE1
Date: Sat, 19 Aug 2023 10:50:54 GMT
Connection: keep-alive
Keep-Alive: timeout=5
Content-Length: 8

Success
Connection closed by foreign host.
```

Q6. Successfull steps to send mail:-

```

akash@akash-Modern-14-B11MOU:~$ telnet 192.168.24.12 smtp
Trying 192.168.24.12...
Connected to 192.168.24.12.
Escape character is '^]'.
220 Welcome to CSE232 Mail Server
helo cse232.com
250 xeon01-rs-iiitd.iiitd.edu.in
mail from:<21514@cse232.com>
250 2.1.0 Ok
rcpt to:<21060@cse232.com>
250 2.1.5 Ok
data
354 End data with <CR><LF>.<CR><LF>
trilogy ka oa kara de
.
250 2.0.0 Ok: queued as D89E16F643A5
quit
221 2.0.0 Bye
Connection closed by foreign host.
akash@akash-Modern-14-B11MOU:~$

```

Mail received by other student:-

```

From 21514@cse232.com Wed Aug 23 16:17:01 2023
Return-Path: <21514@cse232.com>
X-Original-To: 21060@cse232.com
Delivered-To: 21060@cse232.com
Received: from cse232.com (unknown [192.168.43.117])
        by xeon01-rs-iiitd.iiitd.edu.in (Postfix) with SMTP id D89E16F643A5
        for <21060@cse232.com>; Wed, 23 Aug 2023 16:16:16 +0530 (IST)

trilogy ka oa kara de

```