

Question 1)

a) IP Address -> IPV4 – 172.26.100.18

IPV6 - fe80::215::5dff:fe23:3d4

```
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.26.100.18 netmask 255.255.240.0 broadcast 172.26.111.255
    inet6 fe80::215:5dff:fe23:3d4c prefixlen 64 scopeid 0x20<link>
    ether 00:15:5d:23:3d:4c txqueuelen 1000 (Ethernet)
    RX packets 1130 bytes 489463 (489.4 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 586 bytes 152315 (152.3 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 22663 bytes 26724080 (26.7 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 22663 bytes 26724080 (26.7 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$
```

b) On the whatsimyip.com My Public IPv4: 27.123.242.77

My Public IPv6: Not Detected

IP Address are different because IP Address to my system is private and it is used for communication with LAN(Local Area Network) such as home or office network and the IP Address assign on whatismyip.com is assigned by Internet to Router or Gateway by service Provider(ISP).

IPV6 is NOT Detected could mean My ISP does not support IPV6 or my network configuration does not include IPV6.

Question-2)

Adding Custom IP Address

```

root@DESKTOP-LSU99UC: /CN/2022497-Assignment1
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1# sudo ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:23:3d:4c brd ff:ff:ff:ff:ff:ff
    inet 172.26.100.18/20 brd 172.26.111.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 172.26.100.18/24 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe23:3d4c/64 scope link
        valid_lft forever preferred_lft forever
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1# sudo ip addr add 192.168.0.0/24 dev eth0
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1# sudo ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:23:3d:4c brd ff:ff:ff:ff:ff:ff
    inet 172.26.100.18/20 brd 172.26.111.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 172.26.100.18/24 scope global eth0
        valid_lft forever preferred_lft forever
    inet 192.168.0.0/24 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe23:3d4c/64 scope link

```

Code on Terminal->

sudo ip addr show

sudo ip addr add 192.168.0.0/24 dev eth0

sudo ip addr show

Revert IP Address changes

```

root@DESKTOP-LSU99UC: /CN/2022497-Assignment1
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1# sudo ip addr del 192.168.0.0/24 dev eth0
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1# sudo ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:23:3d:4c brd ff:ff:ff:ff:ff:ff
    inet 172.26.100.18/20 brd 172.26.111.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 172.26.100.18/24 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe23:3d4c/64 scope link
        valid_lft forever preferred_lft forever
root@DESKTOP-LSU99UC:/CN/2022497-Assignment1#

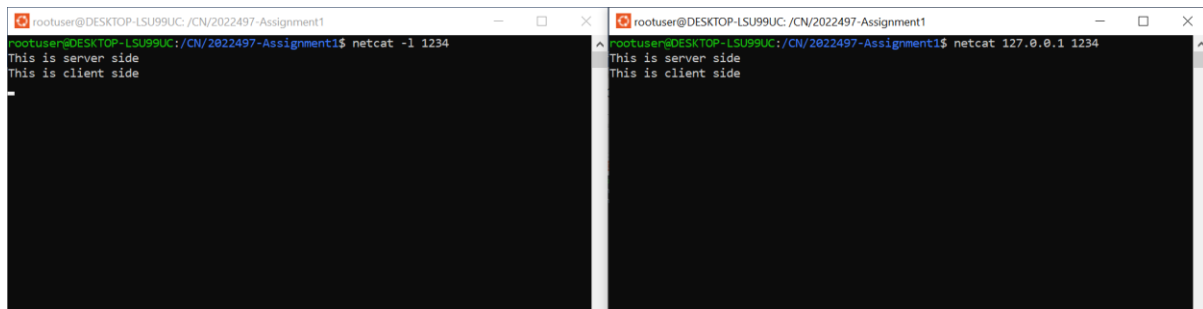
```

Code on Terminal->

sudo ip addr del 192.168.0.0/24 dev eth0

sudo ip addr show

Question-3)

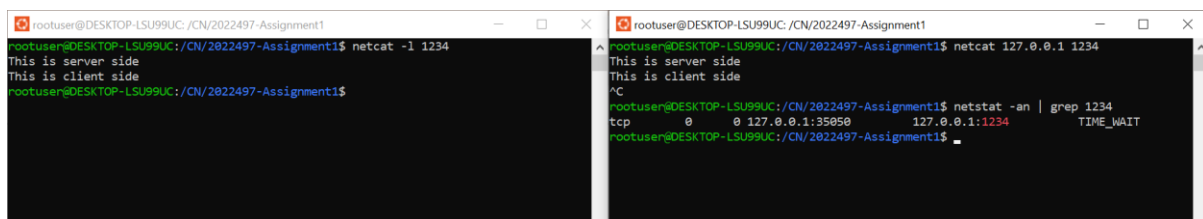


At Server Side

netcat -l 1234

At Client Side

netcat 127.0.0.1 1234

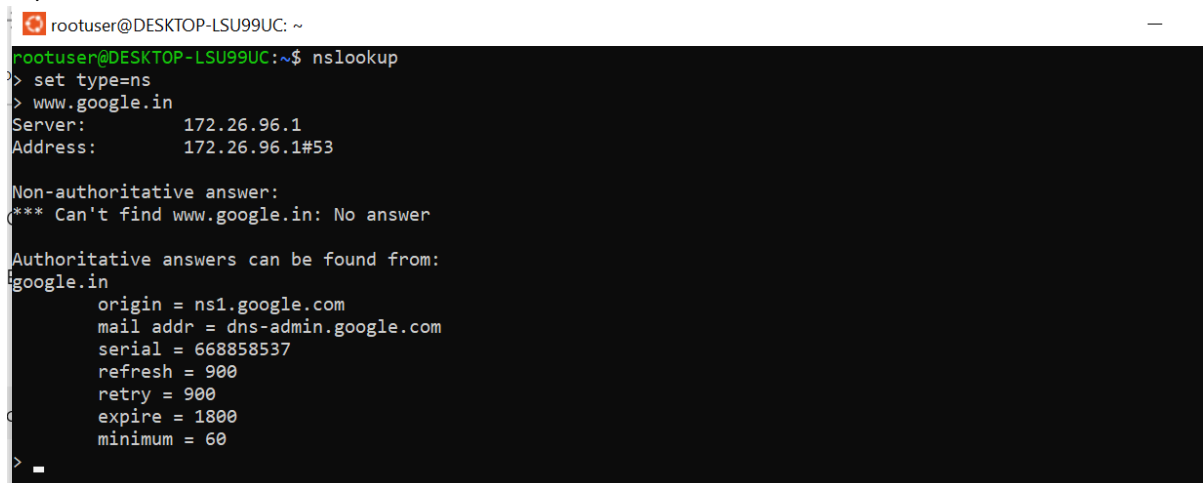


At Client Side

netstat -an | grep 1234

Question-4)

a)



command->

nslookup

set type=ns

www.google.in

b)

```
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1
rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1$ dig youtube.com

; <<>> DiG 9.18.28-0ubuntu0.22.04.1-Ubuntu <<>> youtube.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 43572
;; flags: qr rd ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;youtube.com.                IN      A

;; ANSWER SECTION:
youtube.com.                 0       IN      A      142.250.194.206

;; Query time: 0 msec
;; SERVER: 172.26.96.1#53(172.26.96.1) (UDP)
;; WHEN: Fri Aug 30 18:34:41 IST 2024
;; MSG SIZE rcvd: 56

rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1$
```

time to live for youtube.com is 0 second.

Since the time to live(TTL) is 0 the record is not meant to be cached and it considered as expired immediately.

Question-5)

a)

```
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1
rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1$ traceroute google.in
traceroute to google.in (142.250.182.228), 30 hops max, 60 byte packets
 1  DESKTOP-LSU99UC.mshome.net (172.26.96.1)  0.405 ms  0.522 ms  0.394 ms
 2  192.168.0.1 (192.168.0.1)  3.177 ms  3.083 ms  3.879 ms
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

There are 2 intermediate hosts.

IP addresses

host1-> 172.26.96.1 0.405 ms 0.522 ms 0.394 ms

host2-> 192.168.0.1 3.177 ms 3.083 ms 3.879 ms

Average latency of host1 = $0.405+0.522+0.394/3 = 0.440$ ms

Average latency of host2 = $3.177+3.083+3.879/3 = 3.376$ ms

b) command-> ping -c 50 google.in

```
rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1$ ping -c 50 google.in
PING google.in (142.250.193.36) 56(84) bytes of data:
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=1 ttl=117 time=9.77 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=2 ttl=117 time=10.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=3 ttl=117 time=8.89 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=4 ttl=117 time=12.4 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=5 ttl=117 time=11.4 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=6 ttl=117 time=10.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=7 ttl=117 time=11.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=8 ttl=117 time=9.21 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=9 ttl=117 time=17.2 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=10 ttl=117 time=12.2 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=11 ttl=117 time=11.7 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=12 ttl=117 time=31.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=13 ttl=117 time=15.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=14 ttl=117 time=11.2 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=15 ttl=117 time=13.3 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=16 ttl=117 time=8.27 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=17 ttl=117 time=11.2 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=18 ttl=117 time=15.4 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=19 ttl=117 time=44.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=20 ttl=117 time=7.14 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=21 ttl=117 time=9.49 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=22 ttl=117 time=9.08 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=23 ttl=117 time=20.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=24 ttl=117 time=11.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=25 ttl=117 time=16.7 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=26 ttl=117 time=17.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=27 ttl=117 time=9.43 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=28 ttl=117 time=14.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=29 ttl=117 time=8.63 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=30 ttl=117 time=41.3 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=31 ttl=117 time=11.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=32 ttl=117 time=16.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=33 ttl=117 time=8.76 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=34 ttl=117 time=20.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=35 ttl=117 time=15.5 ms
```

```

rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=21 ttl=117 time=9.49 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=22 ttl=117 time=9.08 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=23 ttl=117 time=20.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=24 ttl=117 time=11.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=25 ttl=117 time=16.7 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=26 ttl=117 time=17.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=27 ttl=117 time=9.43 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=28 ttl=117 time=14.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=29 ttl=117 time=8.63 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=30 ttl=117 time=41.3 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=31 ttl=117 time=11.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=32 ttl=117 time=16.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=33 ttl=117 time=8.76 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=34 ttl=117 time=20.8 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=35 ttl=117 time=15.5 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=36 ttl=117 time=10.5 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=37 ttl=117 time=11.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=38 ttl=117 time=6.48 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=39 ttl=117 time=10.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=40 ttl=117 time=11.1 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=41 ttl=117 time=11.0 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=42 ttl=117 time=50.6 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=43 ttl=117 time=6.68 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=44 ttl=117 time=8.21 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=45 ttl=117 time=11.9 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=46 ttl=117 time=17.4 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=47 ttl=117 time=9.33 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=48 ttl=117 time=7.78 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=49 ttl=117 time=10.9 ms
64 bytes from dell1s15-in-f4.1e100.net (142.250.193.36): icmp_seq=50 ttl=117 time=9.23 ms

--- google.in ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49089ms
rtt min/avg/max/mdev = 6.476/14.179/50.577/9.065 ms
rootuser@DESKTOP-LSU99UC:/CN/2022497-Assignment1$

```

Average latency -> 14.179ms

c) a) Average total latency of traceroute command -> 3.816 ms

b) Average latency of ping command -> 14.179 ms

There are not matching.

Latency of ping is higher than ping command because of the following reason.

1) Many intermediate hops did not receive a response("****") meaning their latency is not added in the overall traceroute latency sum.

2) Ping command measures the round-trip time from client(my computer) to destination(google.in) and back, covering the entire path, including all intermediate hops,

Whereas traceroute only measures the time to each hop independently and does not get a response from every hop.

d) a) Max latency of traceroute command -> 3.879 ms

b) Max latency of ping command -> 50.577 ms

There are not matching.

Latency of ping is higher than ping command because of the following reason.

1) Many intermediate hops did not receive a response("****") meaning their latency is not added in the overall traceroute latency sum in traceroute command.

2) Ping command measures the round-trip time from client(my computer) to destination(google.in) and back, covering the entire path, including all intermediate hops,

Whereas traceroute only measures the time to each hop independently and does not get a response from every hop.

e) There is no multiple entry for any single hop in traceroute google.in (ignoring "***").

If multiple entries were present for a single hop, it would following indicate:

- 1) Load Balancing: Traffic is distributed across multiple paths.
- 2) Different Interfaces: Device at that hop has multiple network interfaces.
- 3) Multiple Routers: Responses from closely located routers.
- 4) Network Changes: Dynamic updates in network routing.

f) command-> ping -c 50 stanford.edu

```
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ 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=240 time=265 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=2 ttl=240 time=282 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=3 ttl=240 time=285 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=4 ttl=240 time=263 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=5 ttl=240 time=268 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=6 ttl=240 time=270 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=7 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=8 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=9 ttl=240 time=265 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=10 ttl=240 time=274 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=11 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=12 ttl=240 time=267 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=13 ttl=240 time=262 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=14 ttl=240 time=273 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=15 ttl=240 time=311 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=16 ttl=240 time=334 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=17 ttl=240 time=357 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=18 ttl=240 time=279 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=19 ttl=240 time=266 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=20 ttl=240 time=266 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=21 ttl=240 time=268 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=22 ttl=240 time=262 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=23 ttl=240 time=266 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=24 ttl=240 time=262 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=25 ttl=240 time=273 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=26 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=27 ttl=240 time=268 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=28 ttl=240 time=260 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=29 ttl=240 time=275 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=30 ttl=240 time=264 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=31 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=32 ttl=240 time=271 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=33 ttl=240 time=270 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=34 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=35 ttl=240 time=267 ms
```

```

rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=21 ttl=240 time=268 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=22 ttl=240 time=262 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=23 ttl=240 time=266 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=24 ttl=240 time=262 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=25 ttl=240 time=273 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=26 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=27 ttl=240 time=268 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=28 ttl=240 time=260 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=29 ttl=240 time=275 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=30 ttl=240 time=264 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=31 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=32 ttl=240 time=271 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=33 ttl=240 time=270 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=34 ttl=240 time=261 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=35 ttl=240 time=267 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=36 ttl=240 time=282 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=37 ttl=240 time=278 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=38 ttl=240 time=289 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=39 ttl=240 time=272 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=40 ttl=240 time=259 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=41 ttl=240 time=267 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=42 ttl=240 time=260 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=43 ttl=240 time=258 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=44 ttl=240 time=264 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=45 ttl=240 time=272 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=46 ttl=240 time=264 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=47 ttl=240 time=271 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=48 ttl=240 time=275 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=49 ttl=240 time=266 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=50 ttl=240 time=266 ms

--- stanford.edu ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49058ms
rtt min/avg/max/mdev = 257.526/271.998/357.394/17.736 ms
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$

```

Average latency-> 271.998 ms

g)

traceroute stanford.edu

traceroute google.in

```

rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ traceroute stanford.edu
traceroute to stanford.edu (171.67.215.200), 30 hops max, 60 byte packets
 1 DESKTOP-LSU99UC.mshome.net (172.26.96.1) 0.611 ms 0.562 ms 0.542 ms
 2 192.168.0.1 (192.168.0.1) 2.729 ms 4.227 ms 4.213 ms
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$

```

```

rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ traceroute google.in
traceroute to google.in (142.250.182.228), 30 hops max, 60 byte packets
 1 DESKTOP-LSU99UC.mshome.net (172.26.96.1) 0.485 ms 0.522 ms 0.394 ms
 2 192.168.0.1 (192.168.0.1) 3.177 ms 3.083 ms 3.879 ms
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$

```

Both have same number of hops It suggest the number of intermediate devices in the route are similar for both direction.

h)

ping -c 50 google.in

rrt min/avg/max/mdev = 6.476 / 14.179 / 50.577 / 9.065 ms

ping -c 50 stanford.edu

rrt min/avg/max/mdev = 257.526 / 271.998 / 357.394 / 17.736 ms

Differences due to the following reason->

1)Geographic location: google.in servers are more nearly than stanford.edu in which are located outside the India causing the latency of stanford.edu > google.in

2)Network Infrastructure: Google has a globally distributed infrastructure and extensive use of CDN network causing the fastest network and lower latency.

3)Optimization : Google's infrastructure is highly optimized for speed, which helps them keeps the latency low . whereas Stanford being a academic institution may not have the same level of optimization.

Question-6)

```
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ sudo iptables -A INPUT -p icmp --icmp-type echo-request -j DROP
rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$ ping 127.0.0.1
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.
^C
--- 127.0.0.1 ping statistics ---
24 packets transmitted, 0 received, 100% packet loss, time 23952ms

rootuser@DESKTOP-LSU99UC: /CN/2022497-Assignment1$
```

To block ICMP Requests->

sudo iptables -A INPUT -p icmp --icmp-type echo-request -j DROP

-A INPUT: Adds rule to the incoming packets

-p icmp: Specifies ICMP protocol

--icmp-type echo-request : target echo requests packets that is used by ping.

-j DROP: Drops the packet make the ping command fails.

```
ping 127.0.0.1
```

To restore ICMP Requests->

```
sudo iptables -D INPUT -p icmp -icmp-type echo-request -j DROP
```

To achieve 100% packets loss we can do this by blocking ICMP(Internet Control Message Protocol) requests which ping uses to send and receive packets. 'ping' command relies on ICMP echo requests and replies. After blocking with ICMP Requests, machine will never replies, and 'ping' command fails completely.