CSE 232: Programming Assignment 1
Using command-line utilities for network debugging

Due date: Aug 30, 2024

Total: 30 points

Read the following instructions carefully

- For all the observations and explanations, create a single report.
- Attach screenshots in the report.
- Naming Convention: <Roll_No>-Assignment1.zip
  - Create a public git repository for the course, and add your report and code (if applicable).

Q1. [1 + 1]

a) Learn to use the ifconfig command, and figure out the IP address of your network interface. Put a screenshot.

```
sahil22427@LAPTOP-M1OBUFDV:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.240.0  broadcast 172.17.191.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 1417  bytes 468622 (468.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 122  bytes 8701 (8.7 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 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
```

b) Go to the webpage https://www.whatismyip.com and find out what IP is shown for your machine. Are they identical or different? Why?

Both are different because it uses pubic IP and my terminal is using private IP So, when you run the `ifconfig` command on your machine, the IP address you see is actually a **local or private IP address**. This is assigned by your router and is only used for communication within your home network. It's like your device's ID within your own Wi-Fi network.

But when you go to a site like WhatIsMyIP, the IP address it shows is your **public IP address**. This is the IP that your Internet Service Provider (ISP) assigns to your router, and it's the one that the entire internet sees. Your router then shares this public IP with all the devices connected to your network.

The key difference is that private IPs are only used inside your local network, while public IPs are unique and identify your network to the rest of the internet.

Q.2. [1+1+1]

a) Change the IP address of your network interface using the command line. Put a screenshot that shows the change. Revert to the original IP address.

```
sahil22427@LAPTOP-M1OBUFDV:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.240.0  broadcast 172.17.191.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 3732  bytes 859929 (859.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 136  bytes 9625 (9.6 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 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

sahil22427@LAPTOP-M1OBUFDV:~$ sudo ifconfig eth0 172.69.181.69
sahil22427@LAPTOP-M1OBUFDV:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.69.181.69  netmask 255.255.0.0  broadcast 172.69.255.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 3732  bytes 859929 (859.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 136  bytes 9625 (9.6 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>
```

```
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 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

sahil22427@LAPTOP-M1OBUFDV:~$ sudo ifconfig eth0 172.17.181.87
sahil22427@LAPTOP-M1OBUFDV:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.0.0  broadcast 172.17.255.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 3739  bytes 861073 (861.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 136  bytes 9625 (9.6 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 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

sahil22427@LAPTOP-M1OBUFDV:~$
```

Q.3. [4]

a) Use “netcat” to set up a TCP client/server connection between your VM and host machine. If you are not using a VM, you can set up the connection with *localhost*. Put a screenshot. [1+1]

```
sahil22427@LAPTOP-M1OBUFDV:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.0.0  broadcast 172.17.255.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 3756  bytes 863637 (863.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 136  bytes 9625 (9.6 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 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

sahil22427@LAPTOP-M1OBUFDV:~$ nc 127.0.0.1 1234
hello
i am server
```

```
sahil22427@LAPTOP-M1OBUI
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ nc -l -p 1234
hello
i am server
```

b) Determine the state of this TCP connection(s) at the client node. Put a screenshot. [1+1]

```
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:45800         localhost:1234          ESTABLISHED
tcp        0      0 localhost:1234          localhost:45800         ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$
```

NOTE : THE FOLLOWING QUESTION WAS NOT RUNNING ON MY TERMINAL HENCE I USED MY FRIEND'S LINUX.

Q.4. nslookup ([2+1] + [1+1])

a) Get an authoritative result for "google.in" using nslookup. Put a screenshot. Explain how you did it.

```
shashank-gadamsetty@shashank-gadamsetty:~$ nslookup google.in
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
Name:   google.in
Address: 142.250.193.4
Name:   google.in
Address: 2404:6800:4002:819::2004

shashank-gadamsetty@shashank-gadamsetty:~$ 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 = 668858537
        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
```

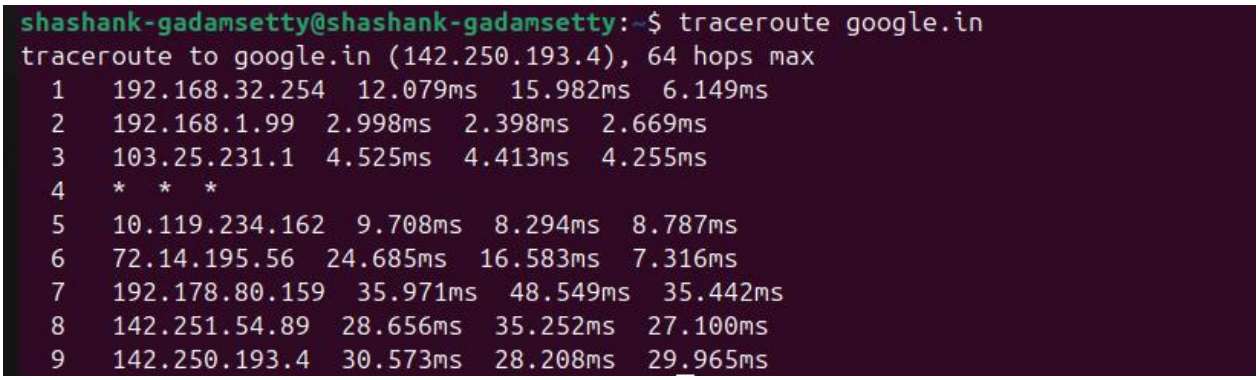
b) Find out the time to live for any website on the local DNS. Put a screenshot. Explain in words (with unit) after how much time this entry would expire from the local DNS server.

```
labex:project/ $ nslookup -debug google.in
Server:         127.0.0.11
Address:        127.0.0.11#53

------------
    QUESTIONS:
        google.in, type = A, class = IN
    ANSWERS:
    ->  google.in
        internet address = 142.250.191.68
        ttl = 10
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Non-authoritative answer:
Name:   google.in
Address: 142.250.191.68
------------
    QUESTIONS:
        google.in, type = AAAA, class = IN
    ANSWERS:
    ->  google.in
        has AAAA address 2607:f8b0:4005:811::2004
        ttl = 10
    AUTHORITY RECORDS:
    ADDITIONAL RECORDS:
------------
Name:   google.in
Address: 2607:f8b0:4005:811::2004
```

Q.5. [13]

a) Run the command, *traceroute google.in.* How many intermediate hosts do you see? What are the IP addresses? Compute the average latency to each intermediate host. Put a screenshot. [1+2+1]



HOSTS ARE 6

IP ADDRESS ARE ABOVE IN THE SCREENSHOT MENTIONED FROM 1 TO 9

Hop 1:

Average latency=33.752+59.078+26.2233=119.0533≈39.684 ms

Average latency=333.752+59.078+26.223=3119.053≈39.684 ms

Hop 2:

Average latency=14.624+2.529+15.2663=32.4193≈10.806 ms

Average latency=314.624+2.529+15.266=332.419≈10.806 ms

Hop 3:

Average latency=3.934+3.688+2.7273=10.3493≈3.450 ms

Average latency=33.934+3.688+2.727=310.349≈3.450 ms

Hop 4:

All values are missing (* * *), so no average can be calculated.

Hop 5:

Average latency=10.280+7.190+8.8193=26.2893≈8.763 ms

Average latency=310.280+7.190+8.819=326.289≈8.763 ms

Hop 6:

Average latency=7.239+60.486+8.8573=76.5823≈25.527 ms

Average latency=37.239+60.486+8.857=376.582≈25.527 ms

Hop 7:

Average latency=27.668+37.986+62.4603=128.1143≈42.705 ms

Average latency=327.668+37.986+62.460=3128.114≈42.705 ms

Hop 8:

Average latency=26.968+68.430+56.2423=151.6403≈50.547 ms
Average latency=326.968+68.430+56.242=3151.640≈50.547 ms

Hop 9:
Average latency=35.464+27.469+90.0173=152.9503≈50.983 ms
Average latency=335.464+27.469+90.017=3152.950≈50.983 ms

Here are the calculated average latencies for each hop:

Hop 1: 39.684 ms
Hop 2: 10.806 ms
Hop 3: 3.450 ms
Hop 4: N/A
Hop 5: 8.763 ms
Hop 6: 25.527 ms
Hop 7: 42.705 ms
Hop 8: 50.547 ms
Hop 9: 50.983 ms

To find the total time, sum the average latencies for each hop where the data is available:
Total time=39.684+10.806+3.450+8.763+25.527+42.705+50.547+50.983
Total time=39.684+10.806+3.450+8.763+25.527+42.705+50.547+50.983

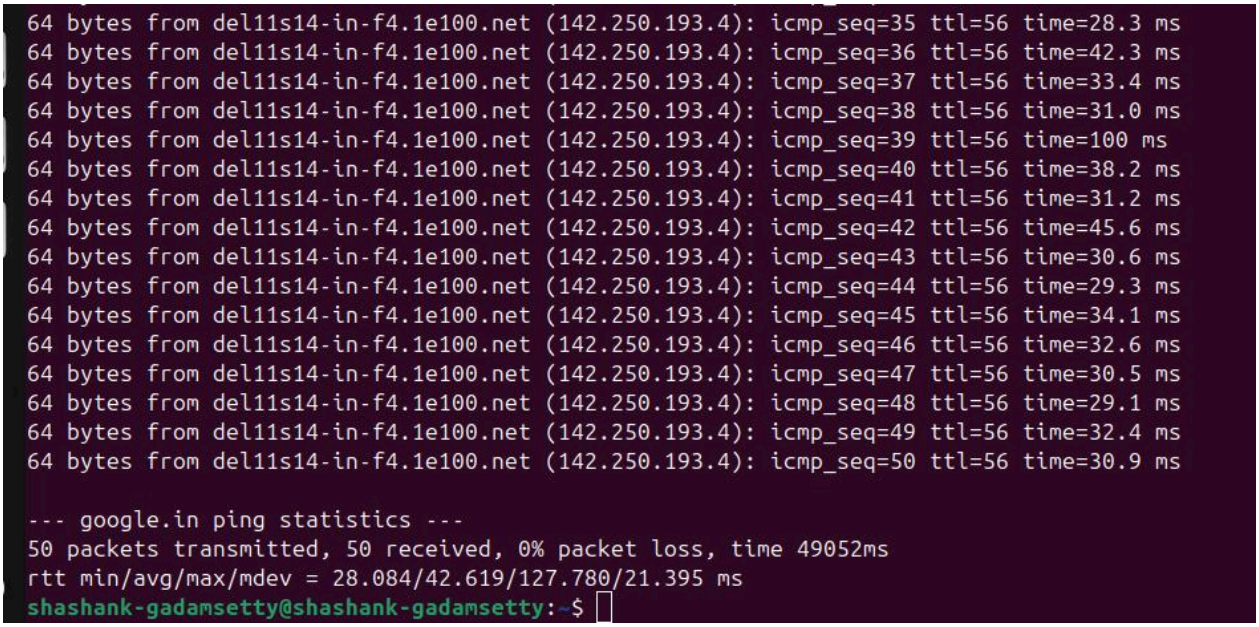
Calculating this:
Total time=232.465 ms
Total time=232.465 ms

So, the total time after summing all the average latencies is 232.465 ms.
TOTAL INTERMEDIATE HOPS = 6

Note that some of the intermediate hosts might not be visible; their IP addresses will come as "", ignore those hosts for this assignment.***

b) Send 50 ping messages to google.in, Determine the average latency. Put a screenshot. [1]

```
shashank-gadamsetty@shashank-gadamsetty:~$ ping -c 50 google.in
PING google.in (142.250.193.4) 56(84) bytes of data.
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=1 ttl=56 time=30.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=2 ttl=56 time=55.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=3 ttl=56 time=31.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=4 ttl=56 time=29.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=5 ttl=56 time=42.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=6 ttl=56 time=36.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=7 ttl=56 time=40.1 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=8 ttl=56 time=31.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=9 ttl=56 time=32.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=10 ttl=56 time=29.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=11 ttl=56 time=30.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=12 ttl=56 time=31.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=13 ttl=56 time=56.9 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=14 ttl=56 time=69.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=15 ttl=56 time=33.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=16 ttl=56 time=30.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=17 ttl=56 time=29.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=18 ttl=56 time=34.5 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=19 ttl=56 time=112 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=20 ttl=56 time=128 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=21 ttl=56 time=30.1 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=22 ttl=56 time=48.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=23 ttl=56 time=34.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=24 ttl=56 time=50.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=25 ttl=56 time=45.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=26 ttl=56 time=50.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=27 ttl=56 time=29.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=28 ttl=56 time=35.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=29 ttl=56 time=66.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=30 ttl=56 time=29.9 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=31 ttl=56 time=28.1 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=32 ttl=56 time=64.8 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=33 ttl=56 time=73.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=34 ttl=56 time=29.7 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=35 ttl=56 time=28.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=36 ttl=56 time=42.3 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=37 ttl=56 time=33.4 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=38 ttl=56 time=31.0 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=39 ttl=56 time=100 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=40 ttl=56 time=38.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=41 ttl=56 time=31.2 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=42 ttl=56 time=45.6 ms
64 bytes from del11s14-in-f4.1e100.net (142.250.193.4): icmp_seq=43 ttl=56 time=30.6 ms
```



AVG : 42.619

c) Add up the ping latency of all the intermediate hosts obtained in (a) and compare with (b). Are they matching, explain? [1+1]

Ans : The two average latency are different because trace root work by sending request to each hop and recording the time against this ping calculates the round trip time That is time taken for request to be catered or the time for the entire trip

d) Take the maximum ping latency amongst the intermediate hosts (in (a)) and compare it with (b). Are they matching, explain? [1+1]

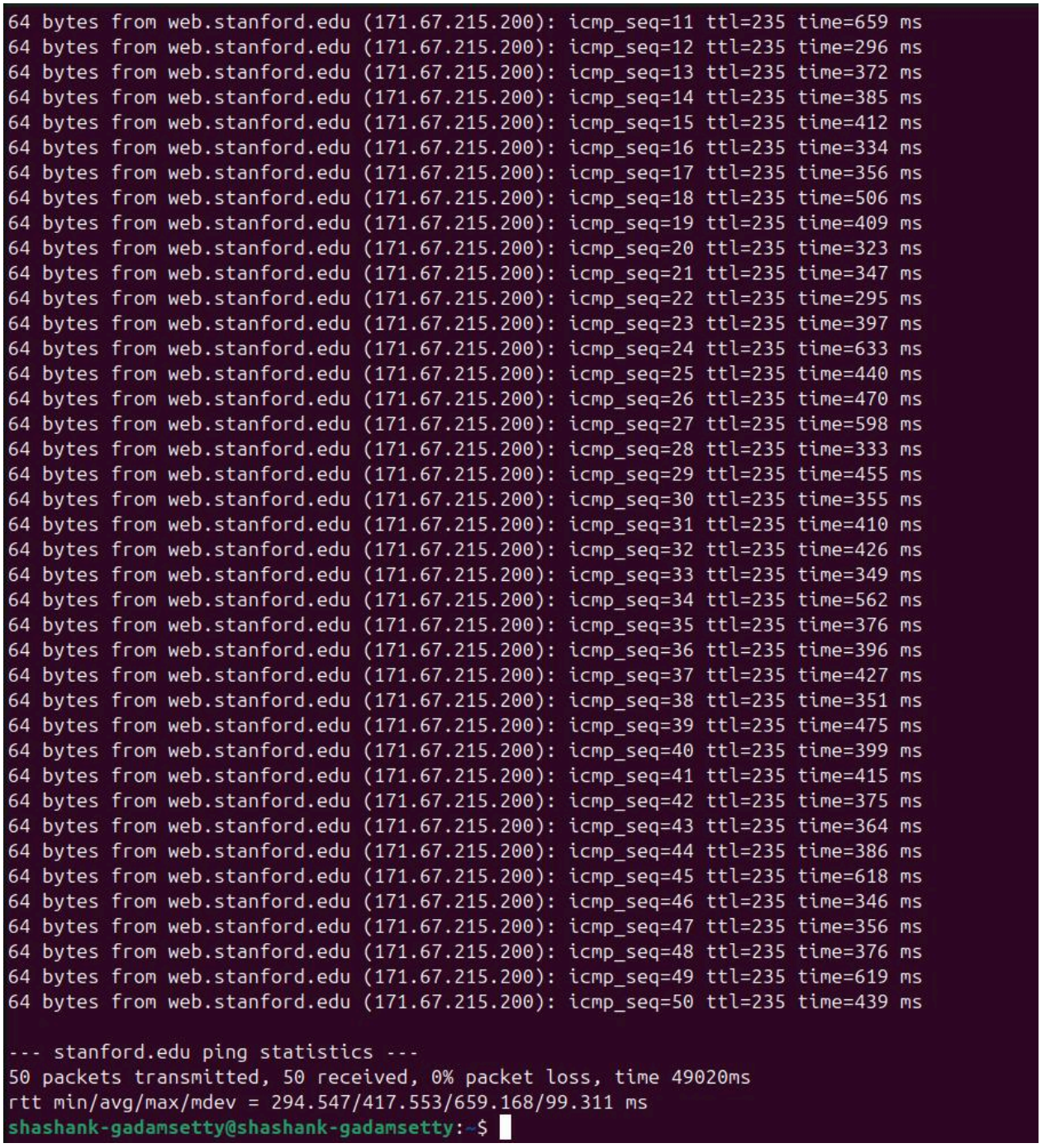
ANS :MAX DIFFERENCE : 48.549 for trace root and 127.780 is for ping commands respectively, They are different because of the same reason “The two average latency are different because trace root work by sending request to each hop and recording the time against this ping calculates the round trip time
That is time taken for request to be catered or the time for the entire trip”

e) You may see multiple entries for a single hop while using the traceroute command. What do these entries mean? [1]

Ans : This is because trace root works by sending 3 probs to the servers

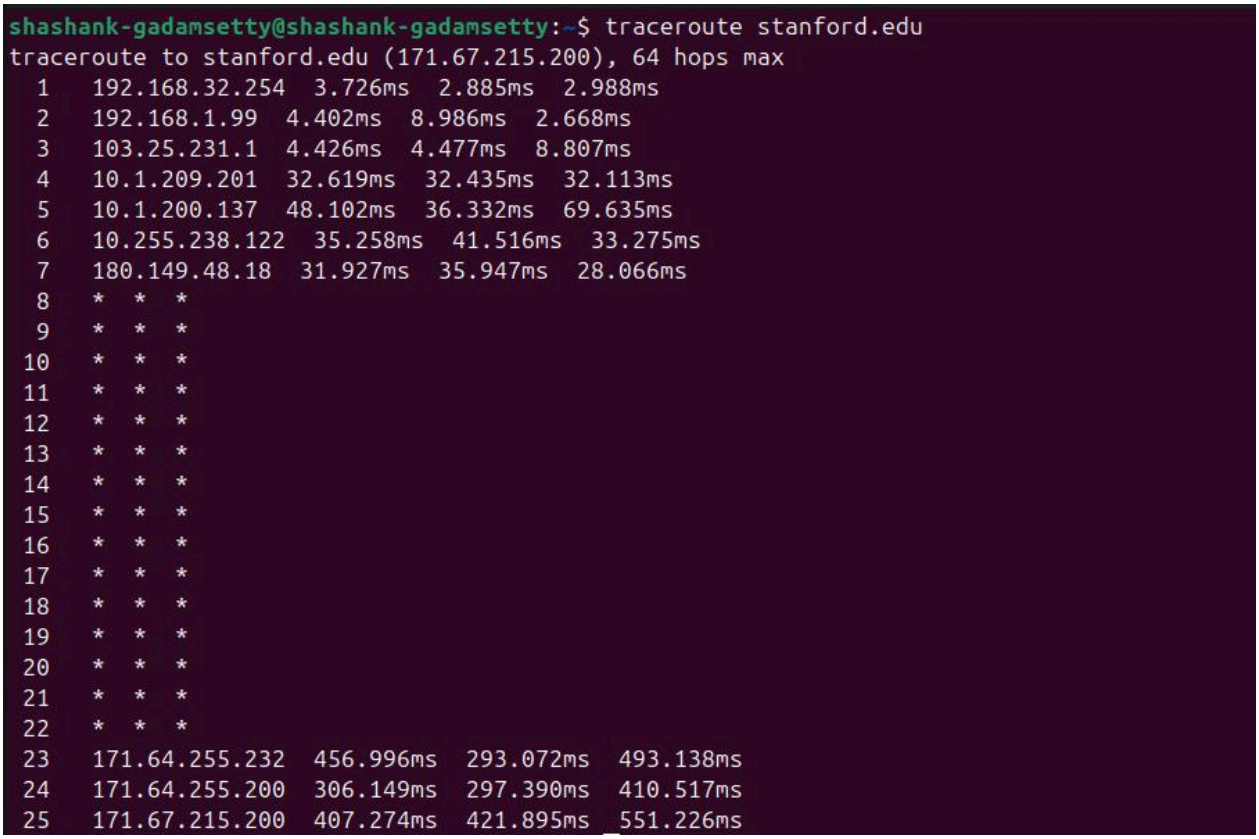
f) Send 50 ping messages to stanford.edu, Determine the average latency. Put a screenshot. [1]

```
shashank-gadamsetty@shashank-gadamsetty:~$ 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=235 time=404 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=2 ttl=235 time=313 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=3 ttl=235 time=298 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=4 ttl=235 time=296 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=5 ttl=235 time=411 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=6 ttl=235 time=612 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=7 ttl=235 time=341 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=8 ttl=235 time=300 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=9 ttl=235 time=622 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=10 ttl=235 time=441 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=11 ttl=235 time=659 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=12 ttl=235 time=296 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=13 ttl=235 time=372 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=14 ttl=235 time=385 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=15 ttl=235 time=412 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=16 ttl=235 time=334 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=17 ttl=235 time=356 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=18 ttl=235 time=506 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=19 ttl=235 time=409 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=20 ttl=235 time=323 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=21 ttl=235 time=347 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=22 ttl=235 time=295 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=23 ttl=235 time=397 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=24 ttl=235 time=633 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=25 ttl=235 time=440 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=26 ttl=235 time=470 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=27 ttl=235 time=598 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=28 ttl=235 time=333 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=29 ttl=235 time=455 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=30 ttl=235 time=355 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=31 ttl=235 time=410 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=32 ttl=235 time=426 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=33 ttl=235 time=349 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=34 ttl=235 time=562 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=35 ttl=235 time=376 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=36 ttl=235 time=396 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=37 ttl=235 time=427 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=38 ttl=235 time=351 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=39 ttl=235 time=475 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=40 ttl=235 time=399 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=41 ttl=235 time=415 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=42 ttl=235 time=375 ms
64 bytes from web.stanford.edu (171.67.215.200): icmp_seq=43 ttl=235 time=364 ms
```



AVG : 417.553

g) Run the command, *traceroute stanford.edu*. Compare the number of hops between google.in and stanford.edu (between the traceroute result of google.in and stanford.edu). [1]



GOOGLE : TOTAL 9 HOPS
STANFORD : TOTAL 25 HOPS

h) Can you explain the reason for the latency difference between google.in and stanford.edu (see (b) & (f))? [1]

ANS : THE TWO ARE DIFFERENT BECAUSE OF THE FOLLOWING REASON :

1) THE SERVER OF GOOGLE IS LIKELY TO LOCATED IN INDIA AND STANFORD IS LOCATED AT USA.
2) GREATER NUMBER OF HOPS

Q.6.. [2+1] Make your ping command fail for 127.0.0.1 (with 100% packet loss). Explain how you do it. Put a screenshot that it failed.

```
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.0.0  broadcast 172.17.255.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 4073  bytes 915324 (915.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 166  bytes 11763 (11.7 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 11  bytes 606 (606.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 11  bytes 606 (606.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ sudo ifconfig lo down
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.17.181.87  netmask 255.255.0.0  broadcast 172.17.255.255
        inet6 fe80::215:5dff:fefa:40ab  prefixlen 64  scopeid 0x20<link>
        ether 00:15:5d:fa:40:ab  txqueuelen 1000  (Ethernet)
        RX packets 4073  bytes 915324 (915.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 166  bytes 11763 (11.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$ 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 ---
4 packets transmitted, 0 received, 100% packet loss, time 3159ms

sahil22427@LAPTOP-M1OBUFDV:/mnt/c/windows/system32$
```

127.0.0.1 IS THE LOCAL HOST RESPONSIBLE FOR NETWORK CONNECTION THAT'S WHY WE BRING THE SERVICE DOWN BY THE COMMAND USING ABOVE;