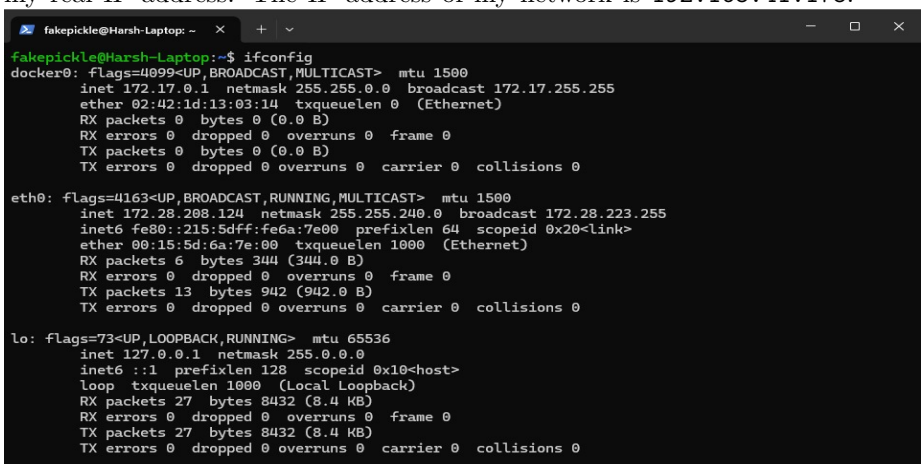
# Assignment 1

## Q1

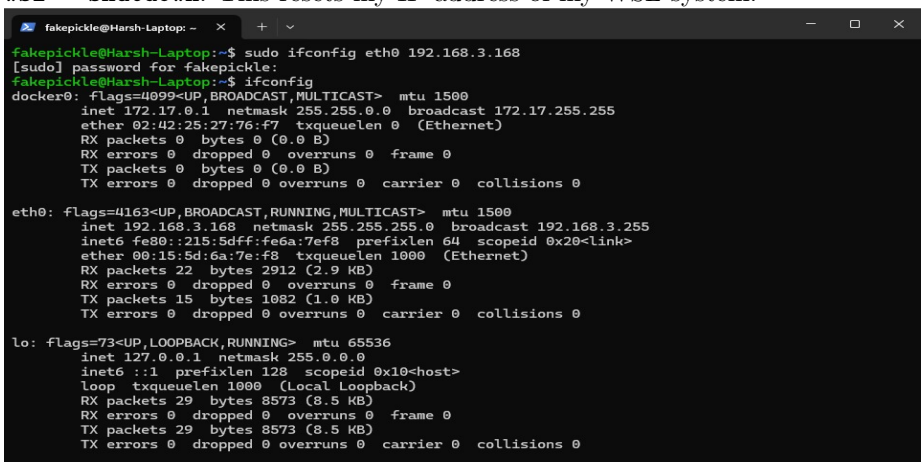
a) Since I am using WSL as of now, my IP address shown below is not my real IP address. The IP address of my network is `192.168.41.178`.




b) The IP address from the webpage https://www.whatismyip.com is different from the IP address above. This is because the IP address above is assigned by the college network and is used to identify my device within the college. The IP address shown on the website is my public IP address and is used to identify my device on the internet.

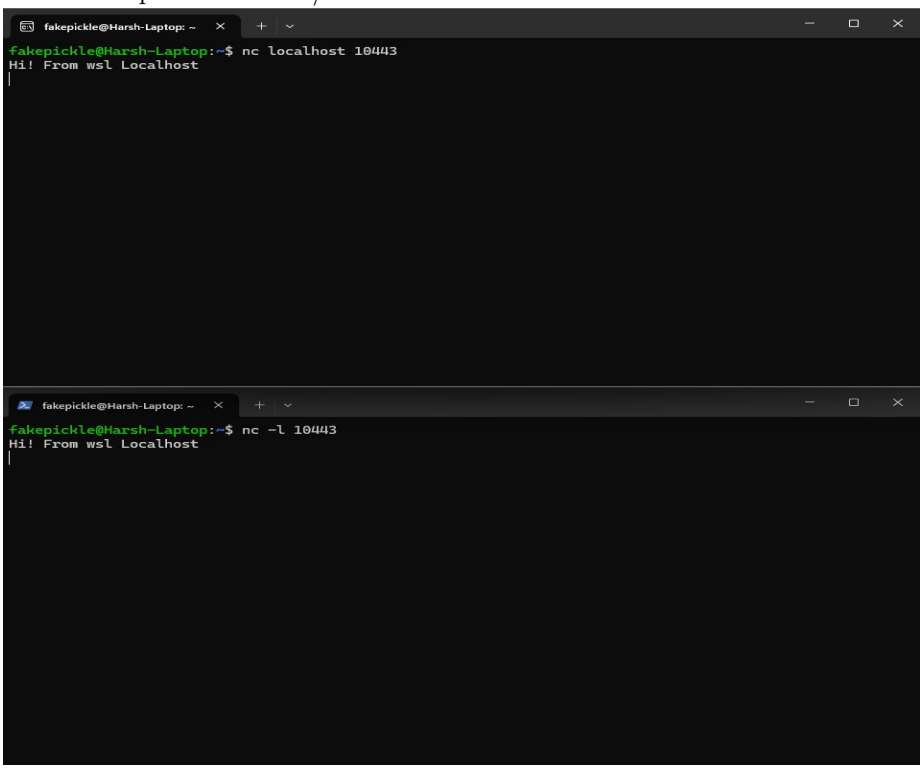
## Q2

a) In Q1 part A, my IP address is `172.28.208.124`. I changed it to `192.168.3.168`. To reset my IP address, I exit out of the WSL terminal and type in `wsl --shutdown`. This resets my IP address of my WSL system.

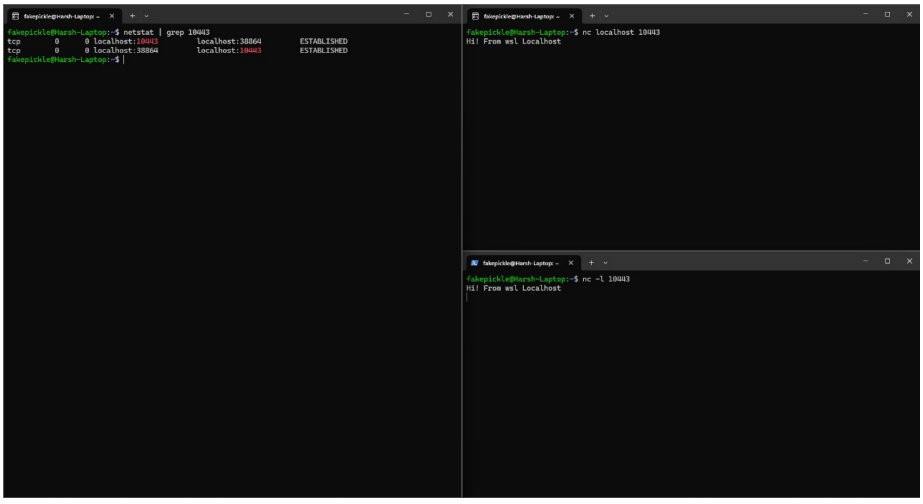


## Q3

a) I have set up a TCP client/server connection with localhost.

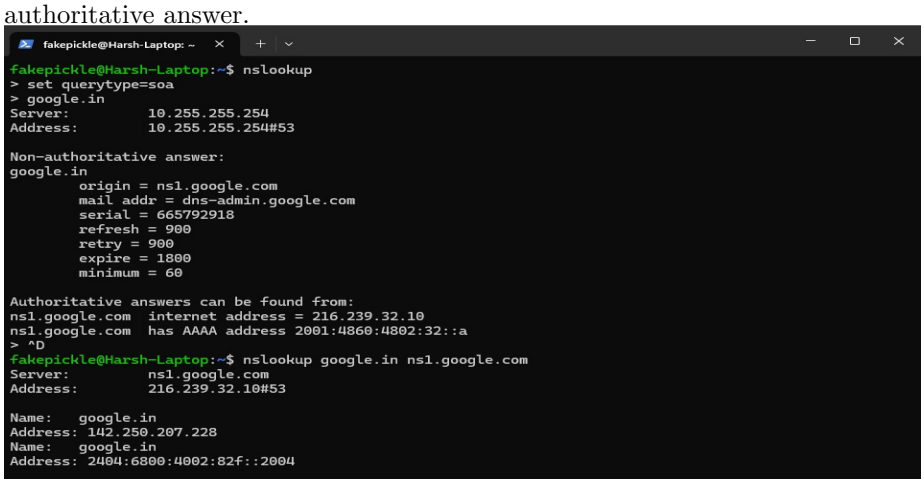



b) I used netstat to find the state of the client Node.

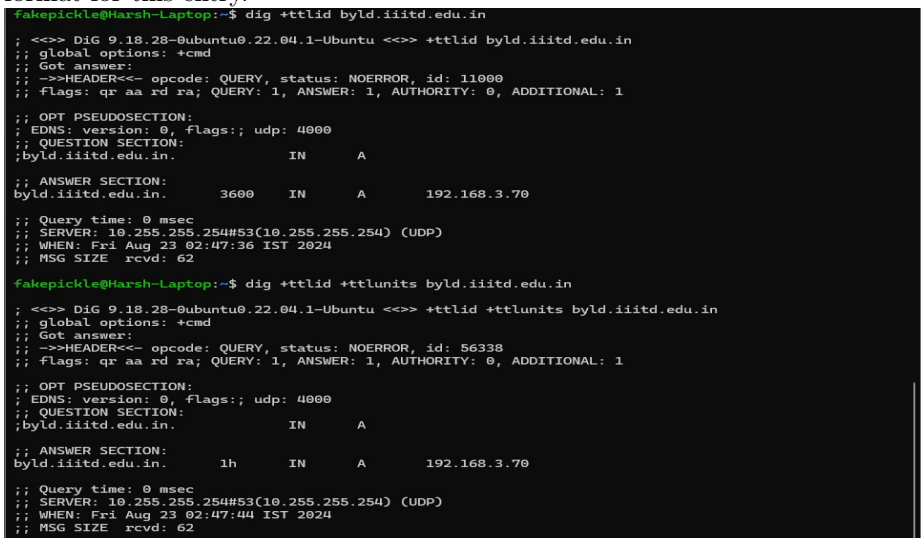


## Q4

a) The way to get authoritative answer for "google.in" using nslookup is by getting the start-of-authority for a DNS. We can do that by first going in command line mode for nslookup and then typing `set querytype=soa` and then type in google.in. There will be a section which says that authoritative answers can be found from ns1.google.com. Then we run the command `nslookup google.in ns1.google.com`. It will provide me with authoritative answer.



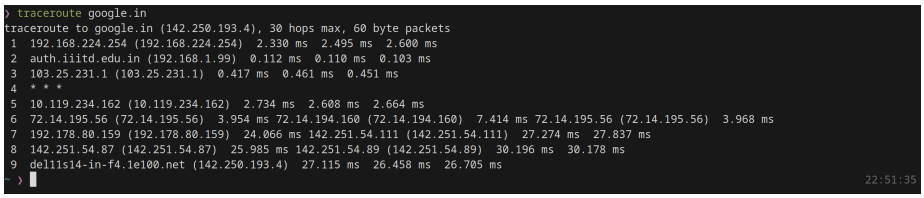

b) The local DNS `byld.iiitd.edu.in` will expire after 3600 seconds or 1 hour. So the cache will get cleared after every 1 hour in the server. I have passed one more parameter ttlunits to give me the time to live in hour format for this entry.



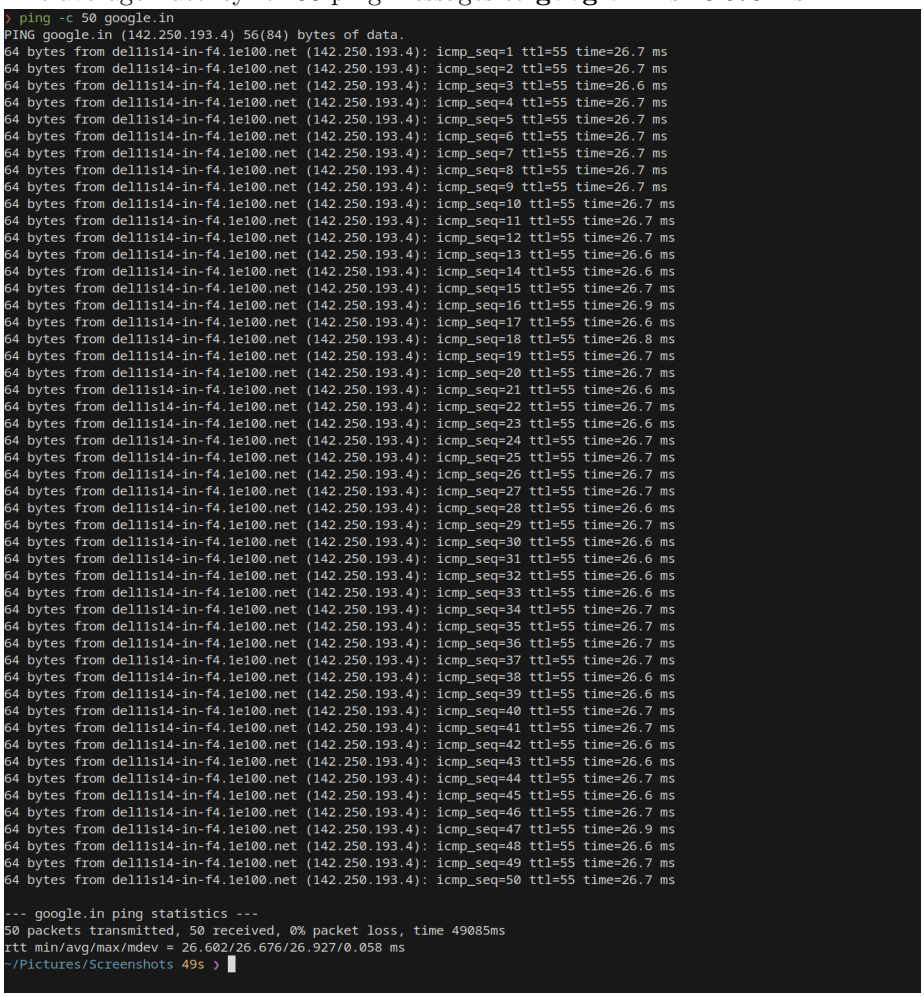
## Q5

a) There are in total 10 intermediate hosts visible. Their IP addresses are as follows:-

1) 192.168.224.254 Average Latency to communicate:- 2.475 ms
2) 192.168.1.99 Average Latency to communicate:- 0.1083 ms
3) 103.25.231.1 Average Latency to communicate:- 0.443 ms
4) *** Ignored
5) 10.119.234.162 Average Latency to communicate:- 2.6687 ms
6) 72.14.195.56 Average Latency to communicate:- 5.112 ms
7) 142.251.54.87 Average Latency to communicate:- 26.3923 ms
8) 142.251.54.87 Average Latency to communicate:- 28.7863 ms
9) Destination 142.250.192.228 Average Latency to communicate:- 26.7596 ms



b) The average Latency for 50 ping messages to **google.in** is 26.676 ms



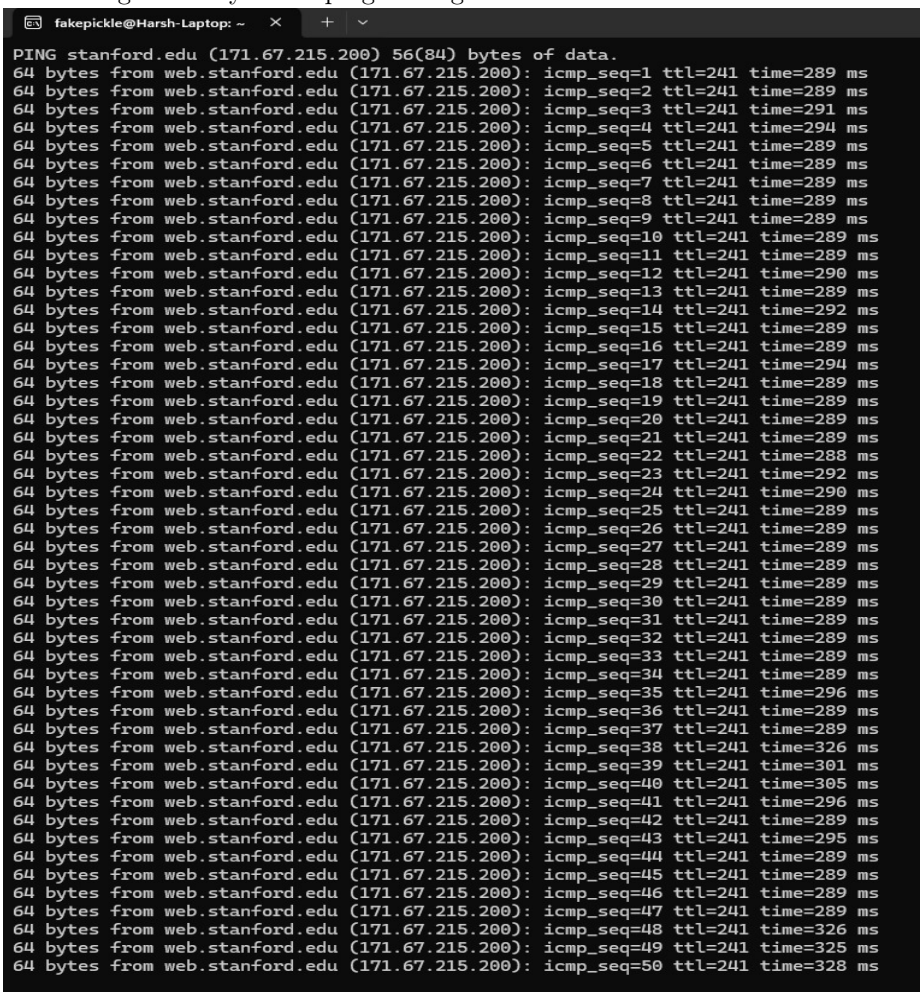

c) The total latency of ‘traceroute‘ is 92.7452, but it doesn’t match the latency from (b). This discrepancy occurs because ‘traceroute‘ sequentially pings each router along the route to the destination, showing the path packets take. Additionally, ‘traceroute‘ waits for a response from each router before moving to the next, which adds overhead that is not present in a simple ping measurement.

d) The maximum latency in traceroute (28.7863 ms) does not match the average ping latency (26.676 ms) because traceroute measures the time to each intermediate hop, while ping measures the total round-trip time to the final destination. As the distance to each hop increases, the latency typically increases as well, leading to this discrepancy.

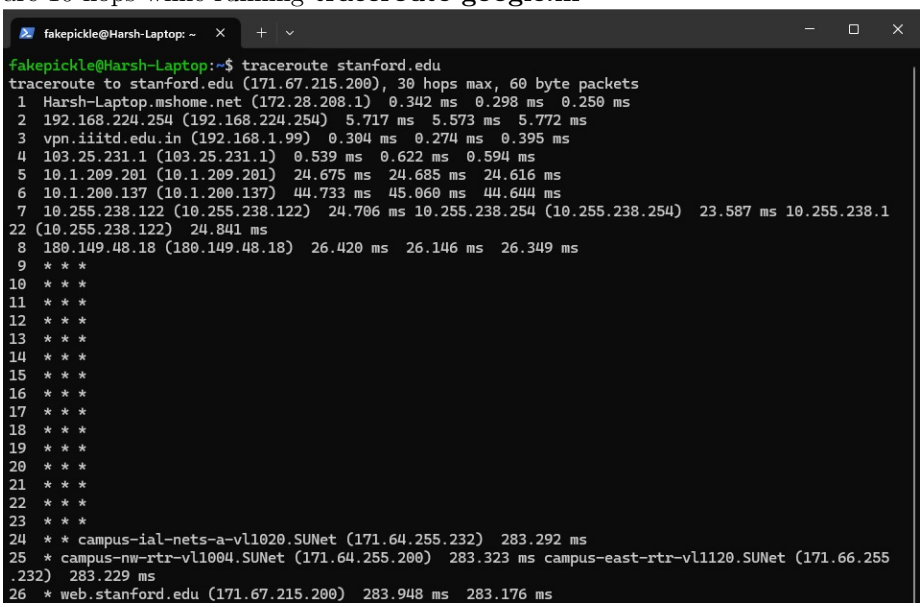
e) There are multiple reason for more than one entry in intermediate hosts. They are:-

1) Load Balancing:- It distributes traffic across multiple IP address.
2) Parallel Path:- The particular route may have parallel paths between two nodes. Traceroute can detect these paths and report the IP addresses of the interfaces along each path.
3) Routing changes:- If the routing changes during the traceroute, different IP addresses may be reported for the same hop.
4) Multipath routing:- Networks can use multipath routing protocol that allow equal cost paths between two nodes. Traceroute can detect and report the IP addresses across each path.

f) The average Latency for 50 ping messages to **stanford.edu** is 293.299 ms



g) There are 26 hops while running **traceroute stanford.edu** whereas there are 10 hops while running **traceroute google.in**




h) There are two major reasons for latency difference between google.in and stanford.edu. They could be:-

1) Due to the distance of the servers from my local machine. Since we are trying to ping the google servers located in India. Hence, the latency of google is lower than latency of Stanford as all the servers of Stanford are located in USA.
2) Also the google servers may be better optimized for lower latency and they would have better server equipment than Stanford server equiment.

## Q6

1. To make the localhost or 127.0.0.1 fail with 100% packet loss, we need to disable the loopback interface. To achieve this we can type the following command **'sudo ifconfig lo down'**. This disables the loopback interface. Hence, it prevents traffic to 127.0.0.1, which would result in the 'ping' command failing.