Computer Networks Assignment 1

This is my report for the first assignment of the Computer Networks course. The report is written in markdown and can be viewed in any markdown viewer. Each individual question has its own folder with a report and any images used in the report.

Problem 1

Part a

Using ifconfig:

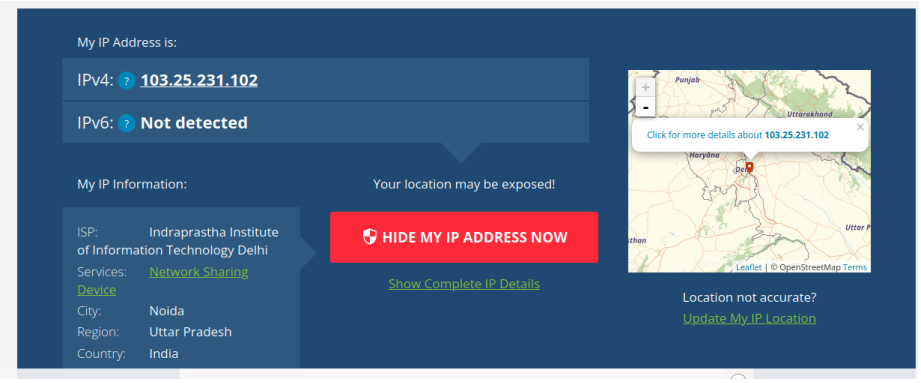
```
root@urmum-virtual-machine:/home/ur-mum/Documents/CN# ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.232.129  netmask 255.255.255.0  broadcast 192.168.232.255
        inet6 fe80::1eaf:8055:f765:2a0b  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:cd:f6:82  txqueuelen 1000  (Ethernet)
        RX packets 296954  bytes 327149471 (327.1 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 108355  bytes 23366001 (23.3 MB)
        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 97843  bytes 11792754 (11.7 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 97843  bytes 11792754 (11.7 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

local/private ip address

Part b

Using What is my ip address:



global/public ip address

Both the IP addresses are different.

The difference between the two is that the local ip address is the ip address of the device on the local network, while the global ip address is the ip address of the device on the internet. The local ip address is assigned by the router, while the

global ip address is assigned by the ISP company that provides internet service to the user. This is done to reduce the number of IP addresses and abstract the IP addresses for security.

Problem 2

Part a

An authoritative answer is a response we get directly from the primary DNS server holding the master copy of the zone file.

To recieve an authorative answer we first must find the primary DNS server for the domain we are looking for. We can do this by using the `nslookup` command. For example, if we want to find the primary DNS server for `google.com` we can run the command `nslookup -type=soa google.com` which will return the primary DNS server for `google.com` which is `ns1.google.com`.

Now that we have the primary DNS server for `google.com` we can run the command `nslookup google.com ns1.google.com` which will return an authorative answer for `google.com` which is in the image below:

```
root@urmum-virtual-machine:/home/ur-mum/Documents/CN/CSE232-ComputerNetworks-Assignments/Assignment-1/Q2# 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 = 556730683
        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

root@urmum-virtual-machine:/home/ur-mum/Documents/CN/CSE232-ComputerNetworks-Assignments/Assignment-1/Q2# nslookup google.in ns1.google.com
Server:         ns1.google.com
Address:        216.239.32.10#53

Name:   google.in
Address: 172.217.167.228
Name:   google.in
Address: 2404:6800:4002:80f::2004

root@urmum-virtual-machine:/home/ur-mum/Documents/CN/CSE232-ComputerNetworks-Assignments/Assignment-1/Q2#
```

Figure 1: plot

for part (b):

Time to live of google.com DNS is 5 seconds. It will then be

Problem 3

Part a

The total hops are 10. One intermediatery router is _gateway(192.168.232.2).
The average latency was is 0.506ms. The other is del11s22-in-f14.1e100.net(142.250.206.174).

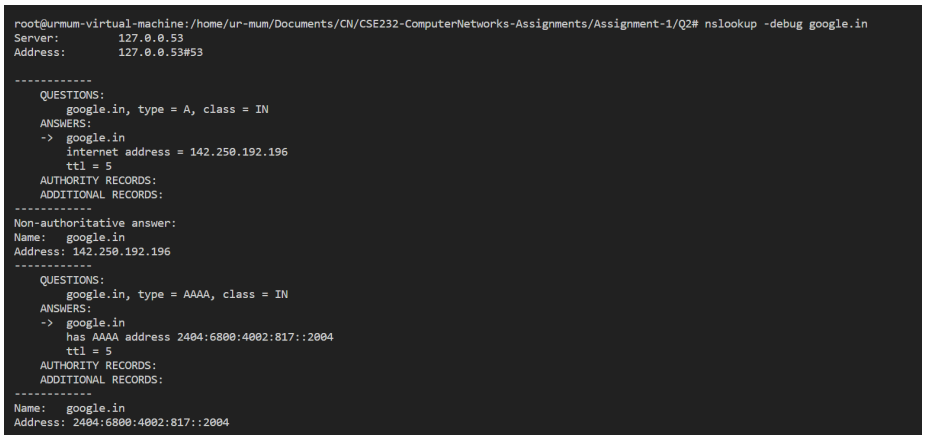


Figure 2: plot

The average latency was 5.802ms. Rest of the routers are not shown in the output of the command `traceroute www.google.com -I`.

The output of the command `traceroute www.google.com -I` is shown below:

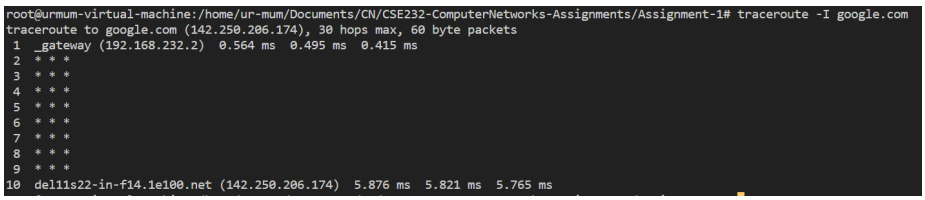


Figure 3: plot

Part b

After pinging the URL "www.google.com" 50 times, I got an average of 9.009 ms. The exact output is shown below:

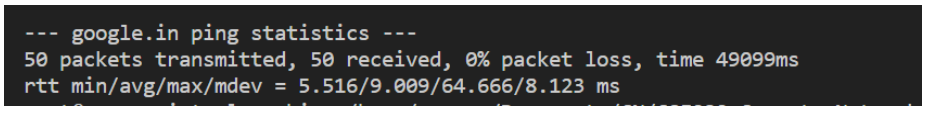


Figure 4: plot

Part c

Adding up all intermediate router latencies, we get 0.506ms + 5.802ms = 6.308ms. This is less than the average latency of pinging the URL "www.google.com" 50

times which is 9.009 ms. This are similar but dont exactly match due to a variety of network factors such as congestion. We also have a very small traceroute sample size of 1. This can be improved by increasing the sample size of the traceroute.

Part d

Maximum of all intermediate router latencies is 5.802ms. This is less than the average latency of pinging the URL "www.google.com" 50 times which is 9.009 ms. This is because the latency of any one intermediate router will be less than all the intermediate routers.

Part e

The multiple entries in the traceroute output are due to the fact that the packets are being routed through different paths. This is because the routers are using different routing algorithms to route the packets. The routers are using different routing algorithms because they are different routers and they are using different routing algorithms to route the packets.

Part f

The average latency is 329.266 ms. The output of the command `ping stanford.edu -c 50` is shown below:

```
--- stanford.edu ping statistics ---
50 packets transmitted, 50 received, 0% packet loss, time 49084ms
rtt min/avg/max/mdev = 326.331/329.266/344.812/2.648 ms
```

Figure 5: plot

Part g

The number of hops to stanford.edu is 27. This is much lower than google.com's 10 hops. The output of the command `traceroute stanford.edu -I` is shown below:

Part h

The latency difference between stanford.edu and google.com is 329.266 ms - 9.009 ms = 320.257 ms. This is due to stanford.edu being farther away from my location than google.com. This is because the packets have to travel a longer distance to reach stanford.edu than google.com. This is also leads to the higher number of hops to stanford.edu than google.com.

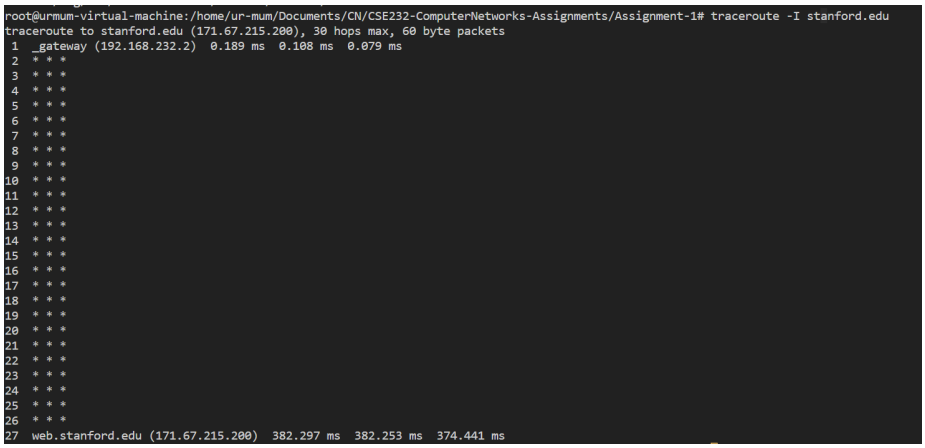


Figure 6: plot

Problem 4

To fail the localhost (127.0.0.1) with 100% packetloss, I made the firewal reject any input connection to the localhost. This can be done by running the command `sudo iptables -A INPUT -p icmp --icmp-type echo-request -s 127.0.0.1 -j DROP`. This will reject any input connection to the localhost. To test this I ran the command `ping 127.0.0.1` which returned the below image:

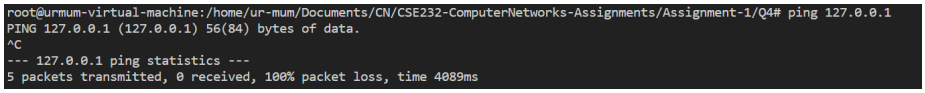


Figure 7: plot

To restore the localhost I ran the command `sudo iptables -D INPUT -p icmp --icmp-type echo-request -s 127.0.0.1 -j DROP` which will remove the rule that rejects any input connection to the localhost. To test this I ran the command `ping 127.0.0.1` which returned the below image:

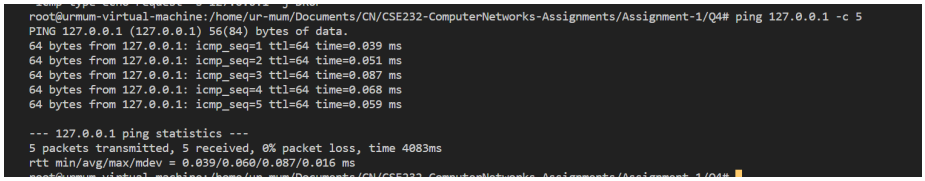


Figure 8: plot

Problem 5

```
root@urmum-virtual-machine:/home/ur-mum# telnet 192.168.24.12 9900
Trying 192.168.24.12...
Connected to 192.168.24.12.
Escape character is '^]'.
GET /secret
Host:192.168.24:9900

HTTP/1.1 200 OK
Content-Type: text/plain
ip: 192.168.1.99
X-secret: U2FsdGVkX1/FRtU+minEV2D1Ul25PKOCWrnuR16vSrB4bvMAkMgOXThQKNT+lP8Q
Date: Fri, 18 Aug 2023 15:09:05 GMT
Connection: close

Success
Connection closed by foreign host.
```

Figure 9: plot

Problem 6

```
root@urmum-virtual-machine:/home/ur-mum# 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: 21038@cse232.com
250 2.1.0 Ok
RCPT TO: 21038@cse232.com
250 2.1.5 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
testing.

.
250 2.0.0 Ok: queued as 344B76F6457B
```

Figure 10: plot

Sources:

https://www.linode.com/docs/guides/how-to-use-nslookup-command/

https://www.baeldung.com/cs/dns-authoritative-server-ip#:~:text=An%20authoritative%20answer%20is%20a,c

https://www.howtouselinux.com/post/dns-ttl#:~:text=The%20best%20way%20to%20check,is%20available%20c

https://superuser.com/questions/1137399/why-iptables-rules-are-impacting-ping-localhost

https://www.cloudservus.com/blog/using-telnet-to-send-mail

https://www.novell.com/documentation/extend5/Docs/help/Composer/books/TelnetAppendixB.html

https://www.wikihow.com/Send-Email-Using-Telnet

https://www.cloudservus.com/blog/using-telnet-to-send-mail