Computer Networks COL334: Assignment 1

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1 Question 1

1.1 Part a

1. The IP address of my machine when connected to reliance jio fiber is 192.168.29.116
2. The IP address of my machine when connected to mobile hotspot is 192.168.43.116
3. The IP addresses change as we change the ISPs.
4. Disconnecting and then reconnecting to the interface also changes the IP address.

1.2 Part b

1. The IP address associated with www.google.com is 142.251.42.68. Changing the name server to ns1.google.com gives IP address as 172.217.167.4
2. The IP address associated with www.facebook.com is 157.240.198.35 which comes as non-authorative answer Changing the nameserver **d.ns.facebook.com** yeilds the IP address of the site as 157.240.239.35

1.3 Part c

The maximum packet size that is successful when i ping is 1472 on www.iitd.ac.in and 1452 on www.facebook.com, google.com, though occasionally they accept 1472 byte packets too
On my system, I am able to send ping packets of maxsize 1472 to most of the sites.
However, I had the opportunity to check on other system also, where I was able to send packets of maximum size 1472 to iitd.ac.in and rest as 1452.

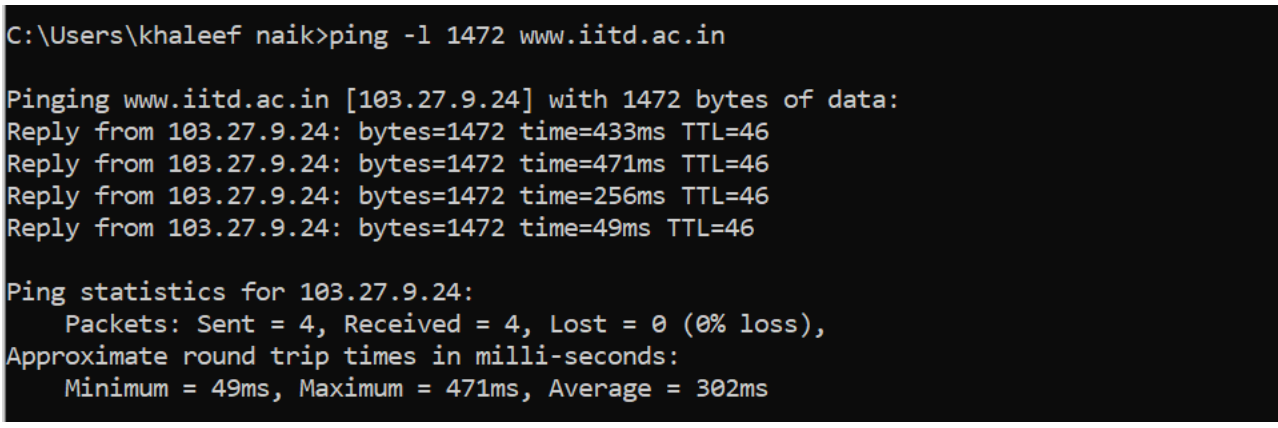

Figure 1: Packet size 1472- Successful ping

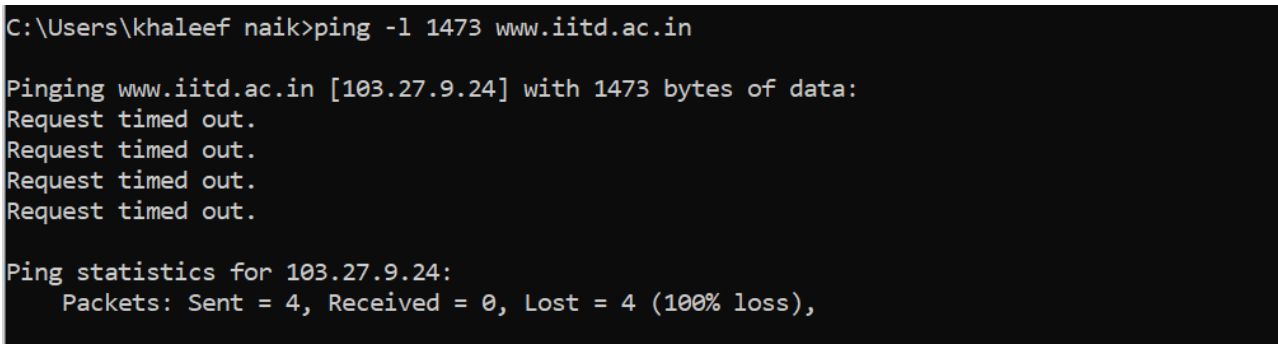

Figure 2: Packet size 1473- Failed ping

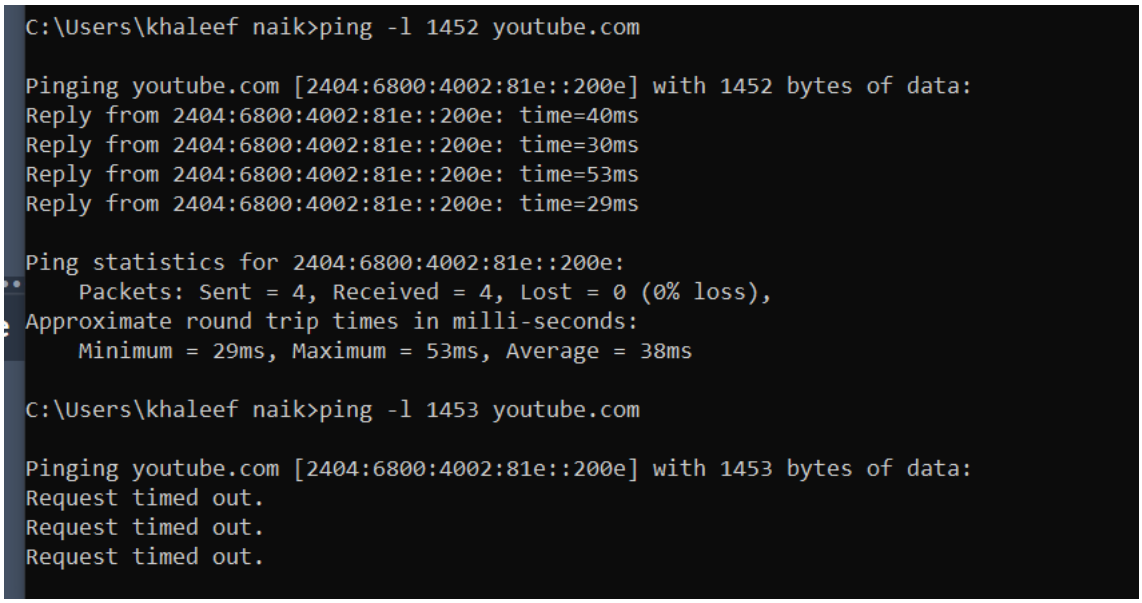

Figure 3: Youtube Pings

1.4 Part d

1. Tracert to iid.ac.in gives the IP addresses of the intermediate routers in IPv4, i.e. it defaults to IPv4.link.
2. Using tracert on google.com, facebook.com etc usually defaults to IPv6.link
3. We can force the tracert to use IPv4 by using the option -4, e.g.tracert -4 www.google.com.link

2 Question 2

2.1 Part a

The DNS request response time for http://apache.org is 6.3905ms

2.2 Part b

The approximate number of http requests that were generated on visiting http://apache.org is **26**. The requests can be found in the given link.
Webpages contain many files(images, videos) etc. When loading a webpage, first the structure and design(text, etc) of the webpage is loaded and then the corresponding images and videos are loaded through various GET requests and these are then rendered by the browser.

2.3 Part c

The total time taken to load the website is $(11.708413 - 6.660363) = 5.04805$s
The whole **apache packet trace** can be found in the link link

2.4 Part d

http://www.cse.iitd.ac.in/ has less number(two packets) of http requests compared to http://apache.org, because most of the files that http://www.cse.iitd.ac.in/ loads follow https(secure protocol) and can be seen by using TLS filter. On contrary to that apache.org loads follow http protocol and hence can be seen using http filter.

No.	Time	Source	Destination	Protocol	Length	DNS Time	Info
332	50.842712	192.168.29.72	103.27.9.152	HTTP	492		GET / HTTP/1.1
336	50.872561	103.27.9.152	192.168.29.72	HTTP	793		HTTP/1.1 301 Moved Permanently

Figure 4: cse.iitd.ac.in http request response

3 Question 3

Code submitted:

```
import subprocess
import re
import time
import matplotlib
import matplotlib.pyplot as plt
class Traceroute:
    def __init__(self, destination, count):
        self.destination = destination
        self.version = "-4"
        self.data =[]
        self.RTT = []
        self.count = count
    def run(self):
        for ttl in range(1, 31):
            bashCmd = ["ping", self.version, "-i", str(ttl), self.
    destination]
            process = subprocess.Popen(bashCmd, stdout = subprocess
    .PIPE)
            output, error =  process.communicate()
            process.kill()
            output = output.split(b"\n")
            output = [i.decode('utf-8') for i in output]
            print("TTL = ", ttl)
            s = None
            for i in range(2, 5):
```

```
                if (output[i].find('expired') == -1 and output[i].find('timed out') == -1):
                    print(output[i])
                    print(output[i].split()[4].split("=")[1][:-2])
                    self.RTT.append(int(output[i].split()[4].split("=")[1][:-2]))
                    self.data.append(ttl)
                    plt.plot(self.data, self.RTT)
                    plt.xlabel("Number of Hops")
                    plt.ylabel("Round Trip Time")
                    plt.savefig("TTL vs RTT.png")
                    plt.show()
                    return
                elif (output[i].find('timed out') == -1):
                    s = output[i]
            if(s==None):
                self.RTT.append(0.0)
                self.data.append(ttl)
                print("*    *    *  RTTT = 0 due to timeout")

            else:
                s = s.split()
                bashCmd = ["ping", self.version, s[2][:-1]]
                print(s[2][:-1])
                process = subprocess.Popen(bashCmd, stdout = subprocess.PIPE)
                output, error =  process.communicate()
                process.kill()
                output = output.split(b"\n")
                output = [i.decode('utf-8') for i in output]
                cnt = 0
                time = 0
                for i in range(2, 5):
                    if(output[i].find('expired')==-1 and output[i].find('timed out') == -1):
                        st = output[i].split()[4].split("=")[1][:-2]
                        print(st, "ms",end = ' ')
                        time+=int(st)
                        cnt+=1
                    else:
                        print("*",end = ' ')
                if(cnt == 0):
                    self.data.append(ttl)
                    self.RTT.append(0)
                    print("RTT = 0 due to ping failure")
                else:
                    self.data.append(ttl)
                    self.RTT.append(time/cnt)
                    print("RTT = ", time/cnt)
print("Enter the destination to Traceroute: ")
url = input().split()[0]
print("Tracing route to ", url)
tracker = Traceroute(url, 0)
tracker.run()
```

The way the above code works is by sending ICMP requests and listening to

ICMP failed responses to get the IP address of the router at which TTL expired, then pinging the same IP address to get the corresponding RTT. The code assumes that the path followed by the ping requests remains the same during the entire run of the traceroute.
The link to the image of self implemeted traceroute on iitd.ac.in is IITD TRACEROUTE

3.1 Observations

1. There seem to exist some **taboo values** for TTL in the sense that most of them give time out no matter the site I ping. These values are **7, 8 and 9**, with ISP as airtel.

2. With ISP as reliance no such taboo values exist. However, most of the intermediate routers returned by tracert or ping are private IP addresses in this case.

3. Pinging using IPv6 as IP address always replies with IPv6 address of destination and does not reveal the intermediate IP addresses.

4. IITD sites mostly choose default as IPv4 when pinging.

5. There is a general increase of RTT values with number of hops (excluding time outs and private IPs). This is more clear from the Youtube traceroute.

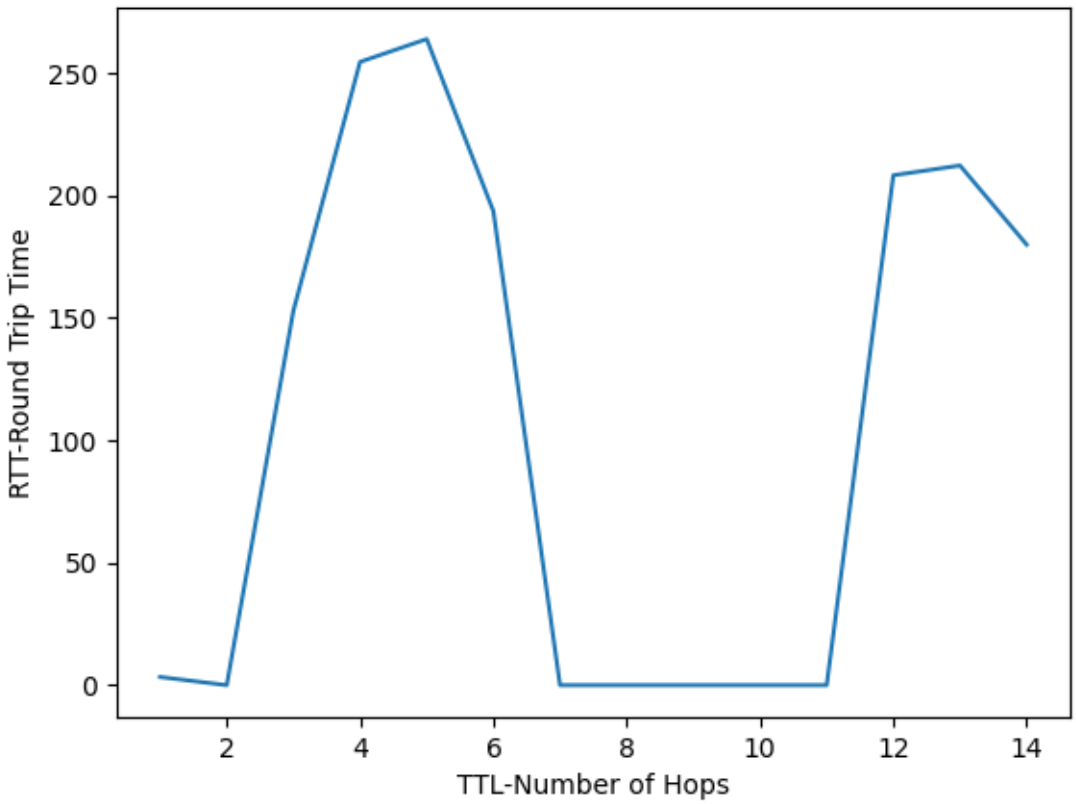

Figure 5: Plot of Number of hops vs RTT for iitd

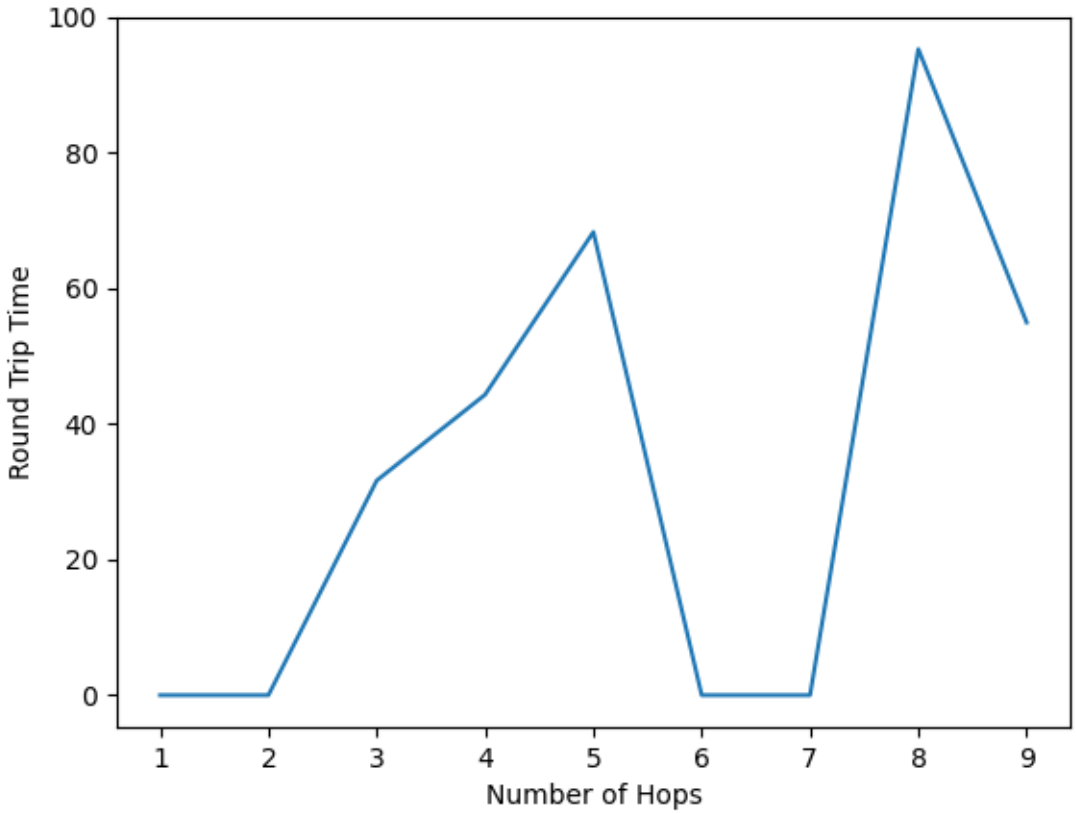

Figure 6: Plot of Number of hops vs RTT for Youtube

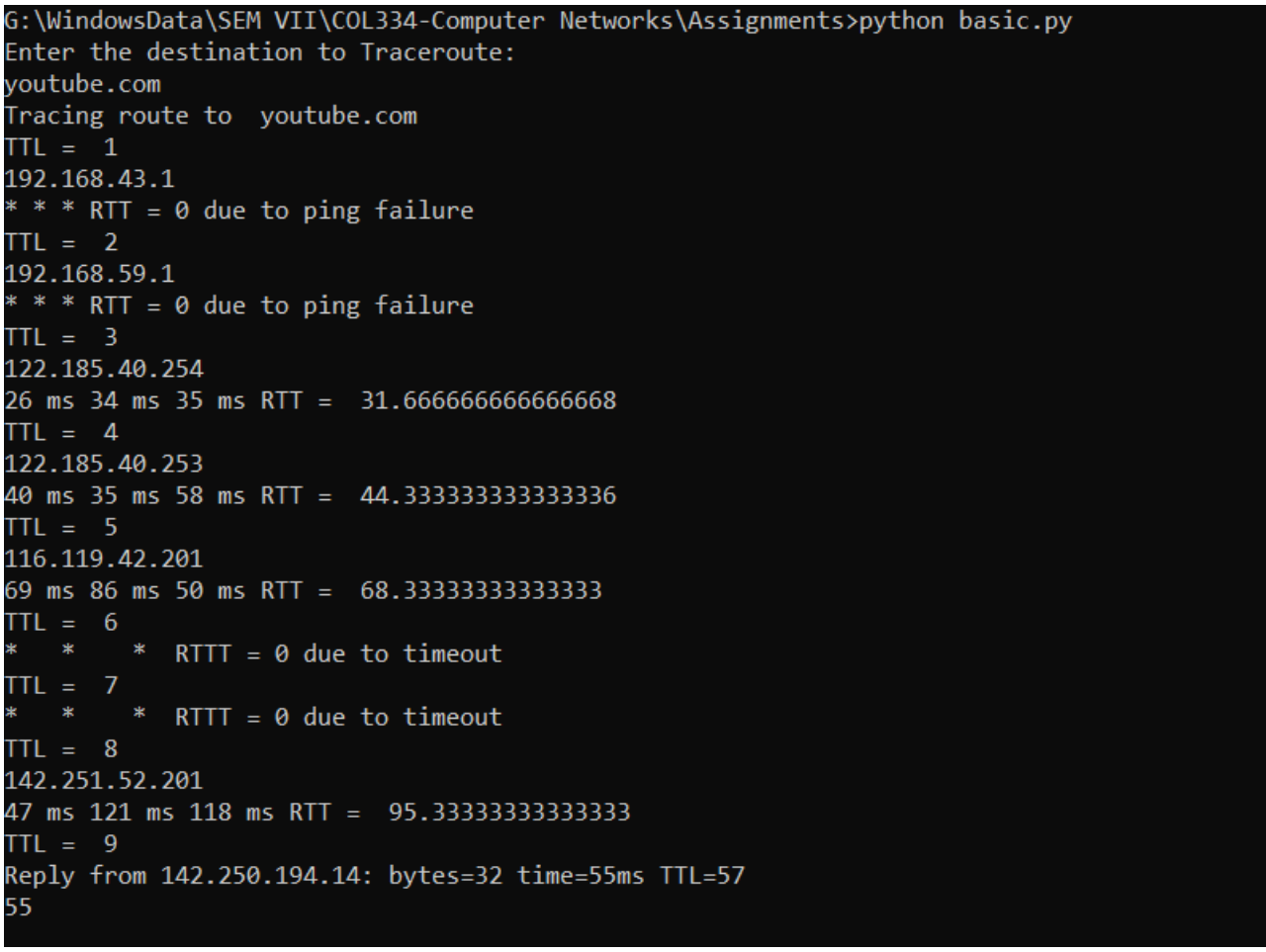

Figure 7: Youtube Traceroute