Network Assignment 1

-Shashwat Shivam (2016CS10328)

PART-A

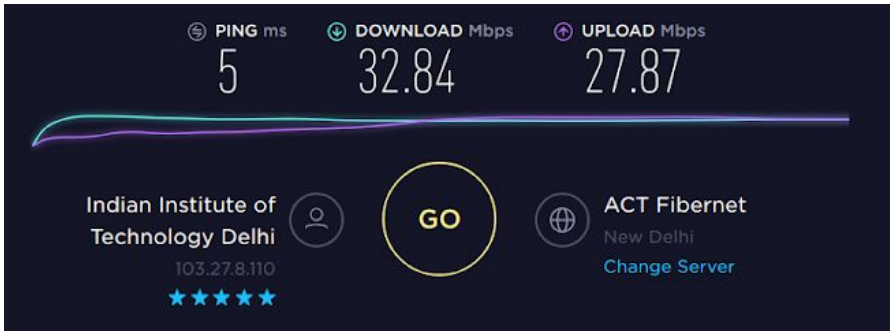
Q1. Net speeds

1. Test on different speed testing websites:-
    a. http://www.testmyspeed.com/

Results :-

- Download Speed :- 16.15Mb/s
- Upload Speed :- 8.47Mb/s
- Ping :- 228ms

    b. http://www.speedtest.net/



Results :-

- Download Speed :- 32.84Mb/s
- Upload Speed :- 27.87Mb/s
- Ping:- 5ms

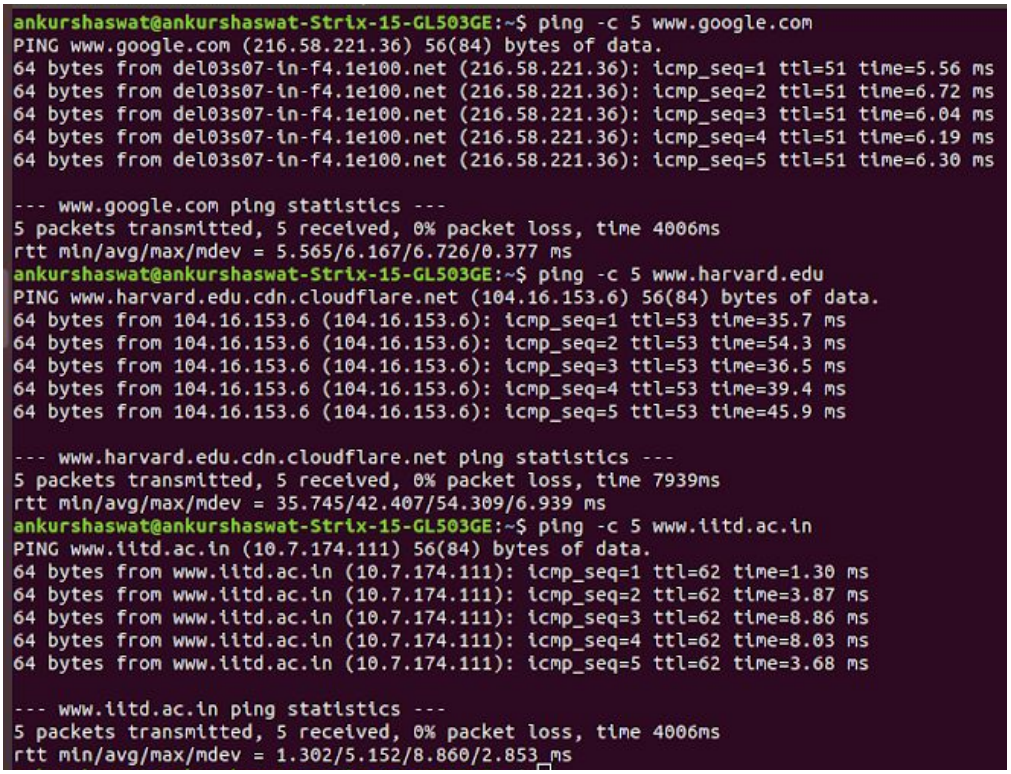
2. Comments on Results:- The ping depends on the distance of the website hosting server from the user. This can vary from site to site, thus resulting in

different pings. The difference in the speeds can occur due to the following reasons:-

a. Different website request rates for different websites at the end of the ISP which results in queuing of requests.
b. The number of servers available at the end of the website to serve requests.

Q2. Ping

1. Ping is used to measure the round trip time (RTT) from a host to another host on a network. Using ping command packets of specific sizes are generated and sent to another host/server. These packets are generated using the ICMP(Internet Control Message Protocol) protocol. If the target is not sleeping then it gives an instant reply message which is the same as the payload of the ping message sent to it. If the target is sleep, there may be a delay involved in the packet being retransmitted which is equal to the time required for the target to wake up. The target may also be running on low power mode just to reply to ping messages instantly.
2. Average RTT Values and IP addresses:-



a. www.google.com :- 6.167ms (216.58.221.36)
b. www.hardvard.edu :- 42.407ms (104.16.153.6)
c. www.iitd.ac.in :- 5.152ms (10.7.174.111)

Comment on these ping values:- There is a large amount of variation in these ping values as these are dependent on the nearest available server where the website is hosted. As iitd.ac.in is available on the

intranet, it has the lowest ping value. Google is a commercial website has servers all around the world to give its users a faster experience. Harvard being an educational institution, has the lowest number of servers and therefore they are located at a much farther distance from the user (laptop on IITD network).

Q3. ifconfig

1. IP(IPv4) addresses of the interfaces:-
    a. lo (loopback) :- 127.0.0.1
    b. wlo1 (Wireless LAN) :- 192.168.225.23

    IP Address of my system:- 192.168.225.23 (At the time of writing this document)

    MAC Address of my WLAN card :- b4:6b:fc:98:c1:91

    Subnet mask of my system:- 255.255.255.0 (At the time of writing this document)

    Gateway of my system:- 192.168.225.1 (At the time of writing this document)
2. Interfaces with ether:-
    a. enps30 :- 4c:ed:fb:d8:49:18 (mtu 1500)
    b. wlo1 :- b4:6b:fc:98:c1:91 (mtu 1500)

    MTU refers to Maximum Transmission Unit which refers to the maximum data size that can be communicated by a protocol in a single network layer transmission.
3. **IPv6 addresses** are of **64 bytes**. Interfaces with IPv6 addresses are:-
    a. lo (loopback):- ::1
    b. wlo1 (Wireless LAN):-
        i. 2405:204:3006:be6c:fcec:7fb2:44e9:113b
        ii. Fe80::5318:613e:9f9e:a44a
        iii. 2405:204:3006:be6c:7ed9:db0a:fadb:3f5

Q4. traceroute

1. The list of routers for traceroute on following websites:-
    a. www.iitd.ac.in :-
        i. 10.194.0.14 (2.204 ms)
        ii. 10.254.238.1 (2.533 ms)
        iii. 10.254.236.10 (2.477 ms)
        iv. 10.7.174.111 (www.iitd.ac.in) (1.93 ms)
    b. www.cse.iitd.ac.in :-
        i. 10.194.0.14 (2.513 ms)
        ii. 10.254.238.5 (3.117 ms)
        iii. 10.254.208.6 (2.308 ms)
        iv. 10.208.20.4 (2.209 ms)

In both the paths the number of routers are 4 and only the first router is common. The non-monotonic RTT(s) can be due to the fact that the router referred to by the previous router on the path may be closer (Eg:- DNS providers can be farther than the hosted server). This variation RTT(s) can also be due to different request handling limits of different routers and different traffic at different routers.

Q5. ARP

MAC address of default gateway:- c4:b3:01:aa:62:44

Q6. DNS

The Domain Name System (DNS) is like a registry of the internet. It stores the IP address of all the websites available on the internet. This is necessary as all the browsers need IP addresses to access websites.

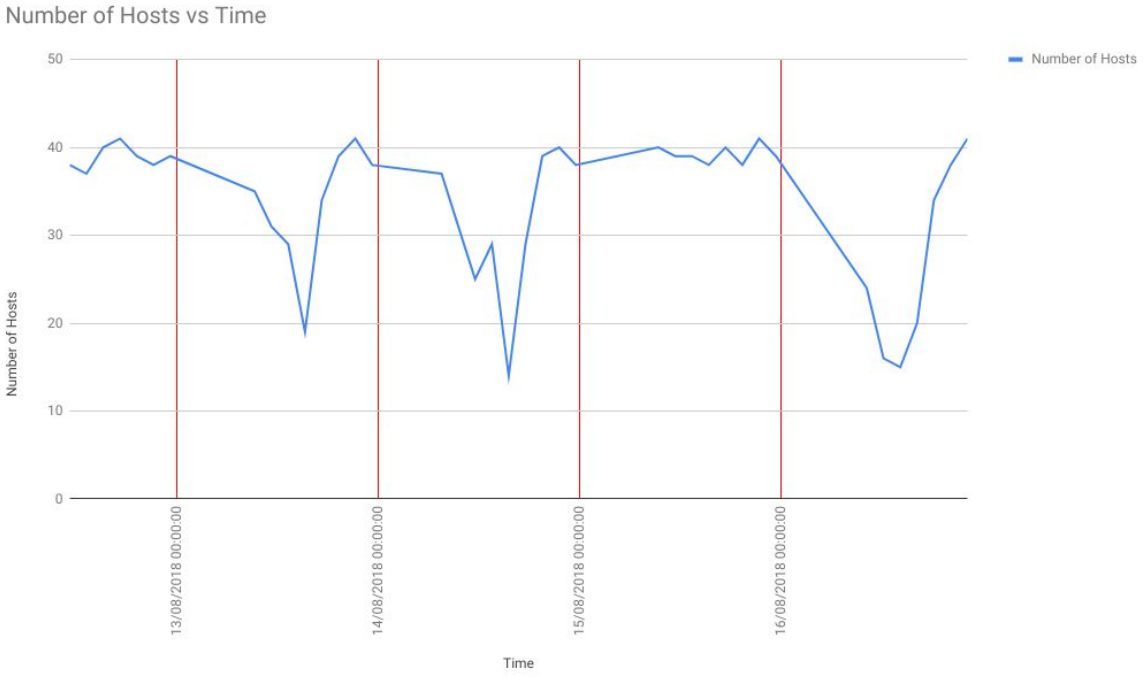
When we enter a URL inside any browser, it puts in a request to any of the public DNS providers which perform a lookup and return the IP address of the website which is then used by the browser to fetch the webpage.

1. 128.42.204.11 corresponds to the website www.netfu.rice.edu.
2. Some public DNS providers are :-
    a. Google :- 8.8.8.8.
    b. Quad9 :- 9.9.9.9.
    c. Cloudflare :- 1.1.1.1.

Q7. nmap

1. The observation on doing the above data collection was that the number of users remains constant throughout the day on holidays due to the installation of WiFi throughout hostels. The numbers vary only on working days as we can see on 13th, 14th and 16th of August. These numbers reach the lowest around 2 to 4 PM and are also less in the morning 10 AM to 12 Noon due to

students moving out of the hostel for work/ classes.



2. On querying the OS of different devices, it was found that most of the devices were of Linux kernel which suggests Android phones. Due to the installation of Wifi these devices are more common on hostel networks now than laptops.

PART-B

1. The output files of the different topologies are attached with this document along with the python codes. A floodlight Remote controller was used to resolve loops.
2. Effect of different parameters on the different topologies:-
    - Star:-
        i. Bandwidth:- On increasing bandwidth, packet loss is not affeccted much but throughput gets increased.
        ii. Delay:- On increasing delay, packet loss increases and throughput decreases.
        iii. Loss:- On increasing loss, packet loss increases and throughput decreases.
        iv. Queue Size:- On decreasing queue size, packet loss increases.
    - Linear:-
        i. Bandwidth:- On increasing bandwidth throughput increases. Packet loss decreases.
        ii. Delay:- Throughputs between hosts decreases on increasing delay. RTT also increases.

iii. Loss:- On increasing loss packet loss increases drastically. Throughput also decreseases.
iv. Queue Size:- On decreasing queue size, packet loss increases.

- Ring:-
  i. Bandwidth:- On increasing bandwidth by a factor of 10, the throughput only marginally increased (limited by the other factors) although the packet loss increased.
  ii. Delay:- On increasing delay, packet drops increased along with a high increase in RTT and some decrease in throughput.
  iii. Loss:- On increasing loss, packet drops drastically increased and throughput decreased drastically (higher drops for larger distances between hosts).
  iv. Queue Size:- Packet drops increased on decreasing queue size.
- Mesh:-
  i. Bandwidth:- On increasing bandwidth, the pingAll() function showed an increase in loss. The RTT remained constant while the throughputs between hosts increased.
  ii. Delay:- On increasing delay packet loss on ping increased with a decrease in throughput.
  iii. Loss:-On increasing loss packet loss on ping increased drastically along with a high decrease in throughput.
  iv. Queue Size:- On decreasing queue size packet loss increased between hosts.