Homework 1, CSL374

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1 Properties of Transmission Medium

- Type of cable is Twisted-Pair
- Switched Ethernet technology is used
- Maximum speed allowed for this technology is 10Mbps

  On checking the speed at testmyspeed.com, the download and upload speed came about 3.36Mbps and 0.778Mbps respectively. The actual download and upload speed is slower than the maximum speed provided by the technology.

  - **TCP Congestion Control** - TCP protocol has a property that it tries to minimise congestion and thus data speed is slower and time varying.
  - In our institute, the Internet Service Providers($ISPs$) limits individual connection speed. ISPs use a technique called **"bandwidth throttling"** to limit each user's connection speed. This prevents individual connections from taking up excessive amounts of bandwidth. The system administrator employ bandwidth throttling to help limit network congestion and server crashes.
  - Our institute requires large number of individual connections, so bandwidth throttling also helps to spread the available bandwidth to a wider network.

2 Ping Command

- Ping is a networking utility used to test network connections. It is used to determine if a remote device can be reached across the network and also determines the network latency. Ping uses **Internet Control Message Protocol (ICMP)**. The ICMP has two fields, data(variable) and header(8 bytes). Ping sends very small packets to an IP host who will answer by sending packets back. The ICMP packets sent to the host are called echo-request(type 8 ICMP packets) and the packets sent back echo-response(type 0 ICMP packets). The host must respond to all echo requests with an echo reply containing the exact data received in the request message. Ping helps us to determine the following

  1. Host Reachability
  2. Network Latency
  3. Determination of length between server and client

  If the host is not active then the nearest router transmits back an error message to the sender. The network speed is shown by the RTT of the packet, which is the entire trip time from sender to receiver and back. The number of routers in path can be calculated by sutracting the received TTL from 255. If the TTL goes to zero in path, the last router that decremented its value generates an error and drops the packet.

- Ping is used to determine IP address of web servers along with RTT to them in seconds.

  1. **www.iitd.ac.in**
     - IP address : 10.7.174.111
     - RTT : approx. 7 msec
  2. **www.google.com**
     - IP address : 74.125.236.18
     - RTT : approx. 38 msec
  3. **www.rice.edu**
     - IP address : 128.42.206.11
     - RTT : approx. 321 msec

  From the data obtained, it is found that www.iitd.ac.in is closest and www.rice.edu is the farthest in terms of RTT. The reasons for getting the above trends are -

  - difference in the distance between the target and the host. With the increse in distance and the number of routers to cross to reach the target, the RTT value also increases.
  - Even though google has its headquarters in California, its RTT value is quite impressive when compared to www.rice.edu. The reason is that Google has servers all over the world and uses **Anycast** so that a server near you answers your request.

3 UDP Socket Assignment

Each Datagram generated by the client has -

- Packet ID
- Timestamp at which the packet is first transmitted
- Time to live, ttl

Keeping ttl constant and varying packet size, the following observations have been taken. The client sends 50 datagrams for each packet. For ttl=2, ttl=8, ttl=16, scatter plots are generated between Cumulative RTT vs. Packet Size.

3.1 When ttl = 2

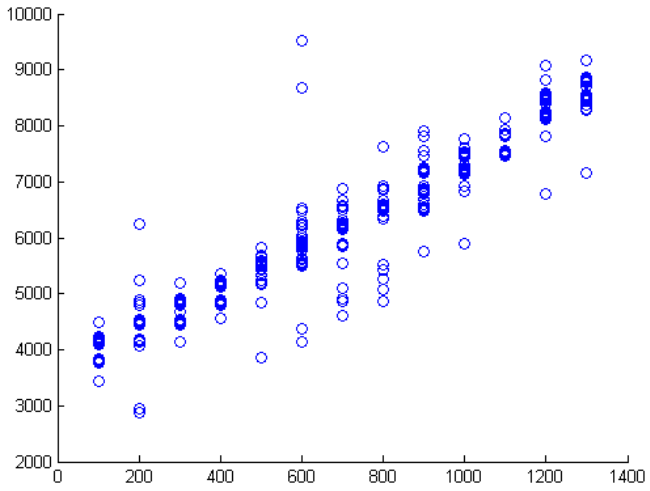

Figure 1: Cumulative RTT vs. Packet Size

The datapoints for the above plot can be found in **ttl2** folder.

3.2 When ttl = 8

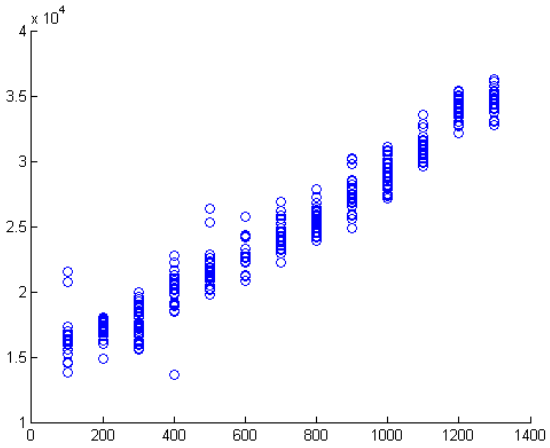

Figure 2: Cumulative RTT vs. Packet Size

The datapoints for the above plot can be found in **ttl8** folder.

3.3 When ttl = 16

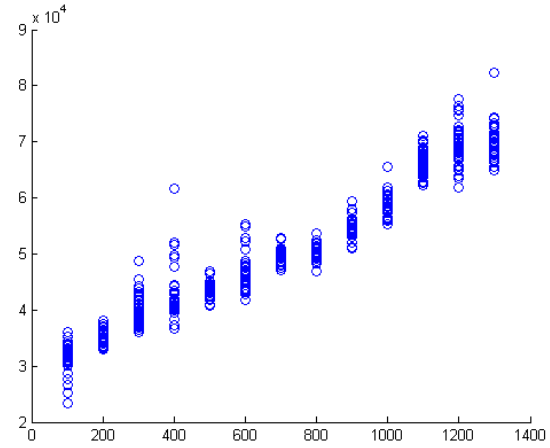

Figure 3: Cumulative RTT vs. Packet Size

The datapoints for the above plot can be found in **ttl16** folder.

3.4 Observations

- It can be observed from the above plots that the cumulative RTT clearly increases for different TTL values. This should be expected as the number of hops have doubled.
- When the value of TTL is kept constant and the size of the packet is increased, the cumulative RTT also increases.