NETWORK SIMULATOR ASSIGNMENT

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Designed & Developed in NS-3

March 27, 2016

1 Question

Application 8: Compare the effect of CBR traffic over UDP agent and FTP traffic over TCP agent. Consider a Dumbbell topology with two routers R1 and R2 connected by a (30 Mbps, 100 ms) wired link and use drop-tail queues with queue size set according to bandwidth-delay product of the link. Each of the routers is connected to 2 hosts i.e., H1 and H2 are connected to R1 and H3 and H4 are connected to R2. The hosts are attached to the routers with (80 Mbps, 20ms) links. Choose appropriate packet size for your experiments and perform the following:
1. Compare the delay (in ms) and throughput (in Kbps) of CBR and FTP traffic streams, when only one of them is present in the network.
2. Start both the flows at the same time and on different time. Also, compare the delay (in ms) and throughput (in Kbps) of CBR and FTP traffic streams.
Make appropriate assumptions wherever necessary.

2 Introduction

We created the Dumbbell topology with two routers and two host on each of those routers. According to Figure 1, there is UDP protocol with CBR traffic between H2(host-2) on router 1 and H3(host-3) on router 2 and similarly there is TCP protocol with FTP traffic between H1(host-1) on router 1 and H4(host-4) on router 2. There are not much assumptions used during design of topology. While analyzing, as the data rate for CBR traffic was not provided so, we used it to be 100Kbps

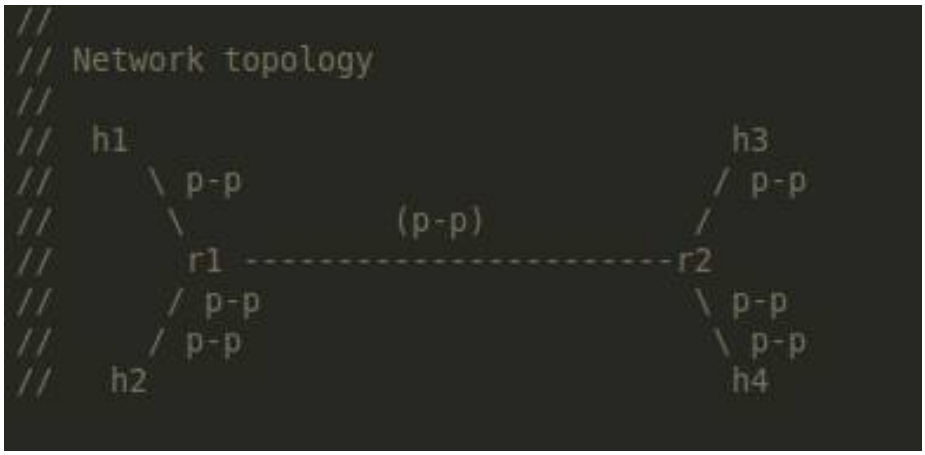

Figure 1: Network Topology.

similarly as packet sizes were not provided so we assumed it to be 80 bytes for UDP and 590 bytes for TCP protocol.

For the first part we have generated four graphs for comparison of delay and throughput in both type of traffic and for the second part we have generated six graphs showing effect of CBR and FTP traffic when applications are started at same time and when they are started at different time.

3 CBR vs FTP delay

For calculating the Delay in CBR traffic and FTP traffic, we have taken a sample of more than 1000 data packets and plotted the graph. For calculating the delay we have taken into account following delays:-

1. Propagation delay (140 ms)
2. Transmission delay (varies).
3. Queuing delay (varies).

$$Delay = P_d + T_d + Q_d$$

We see a constant delay in case of CBR because the data travels with a constant bit rate and it doesn't wait for any acknowledgement while in the case of FTP(TCP) it waits for acknowledgement to come and so we see fluctuation in delay. In both the case transmission delay varies due to difference in packet size for FTP(TCP) packet size and

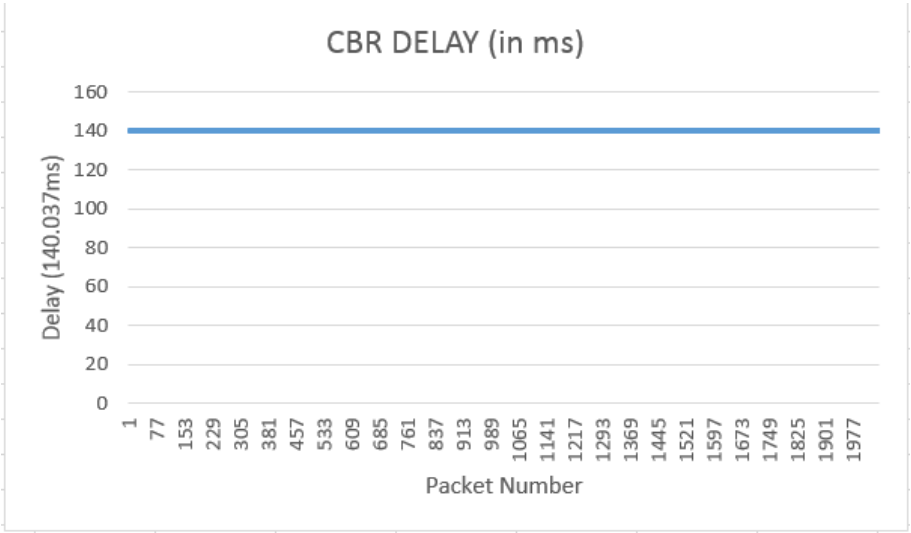

Figure 2: CBR delay.

overhead is greater than CBR(UDP). So we see a greater transmission delay. Figure 2 shows CBR delay and Figure 3 shows FTP delay.

4 CBR vs FTP Throughput

As there is a fixed very high propagation delay, the throughput changes only due to transmission delay and due to size of packet. As FTP(TCP) has high overhead due to its header, we see a better throughput.Figure 4 shows CBR throughput and Figure 5 shows FTP throughput.

$$Throughput = \frac{PacketSize}{TotalDelay}$$

5 CBR vs FTP (starting at same time)

We run the analysis for 10 seconds, we start both CBR and FTP application at 1s and stop it at 10s. On an average the Delay and throughput in both the case remains same but there is fluctuation in between the fluctuations may be due to the utilisation of the channel by two traffic at the same time which results in delay at times. Figure 6 shows the CBR Delay, Figure 7 shows the CBR throughput and similarly Figure8 and Figure9 shows the FTP delay and throughput.

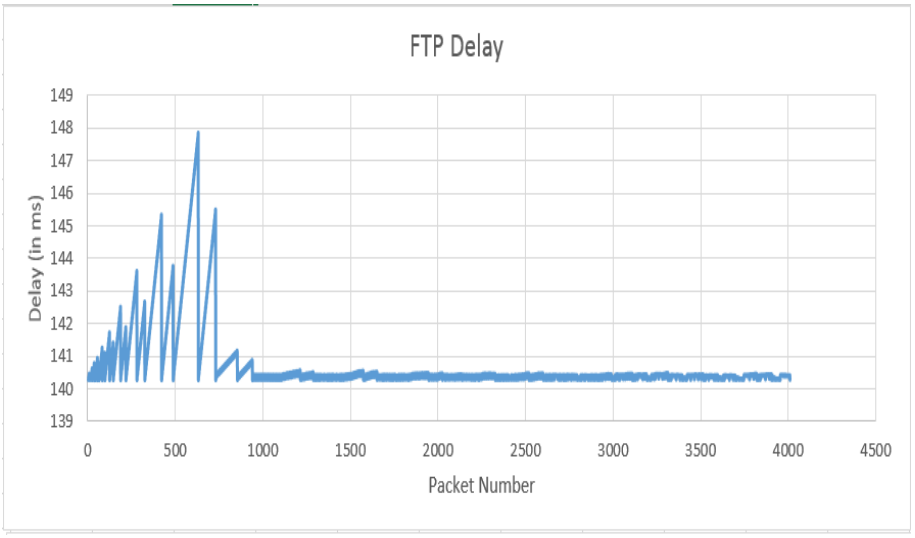

Figure 3: FTP delay.

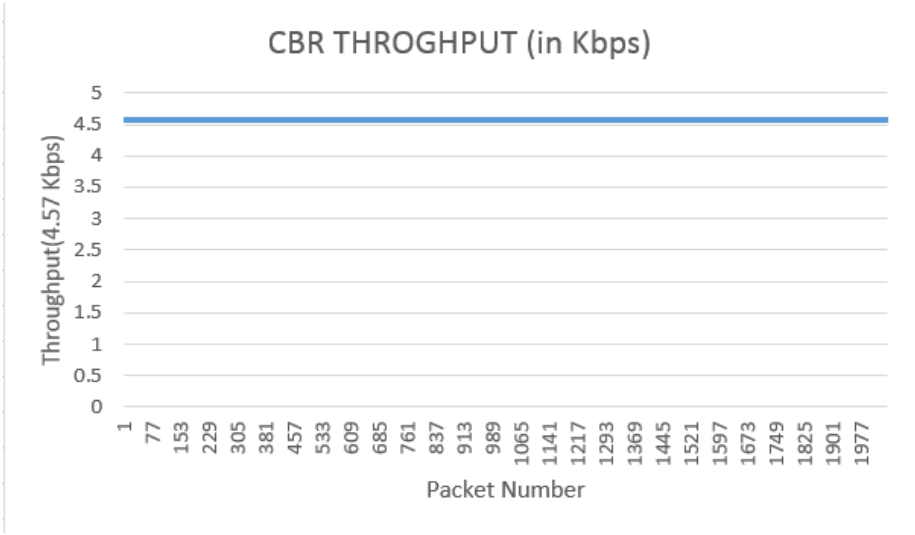

Figure 4: CBR Throughput.

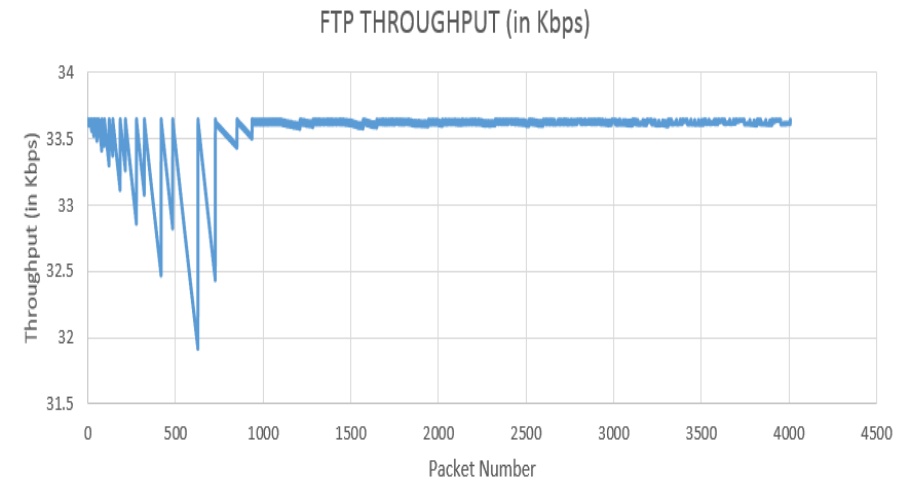

Figure 5: FTP throughput.

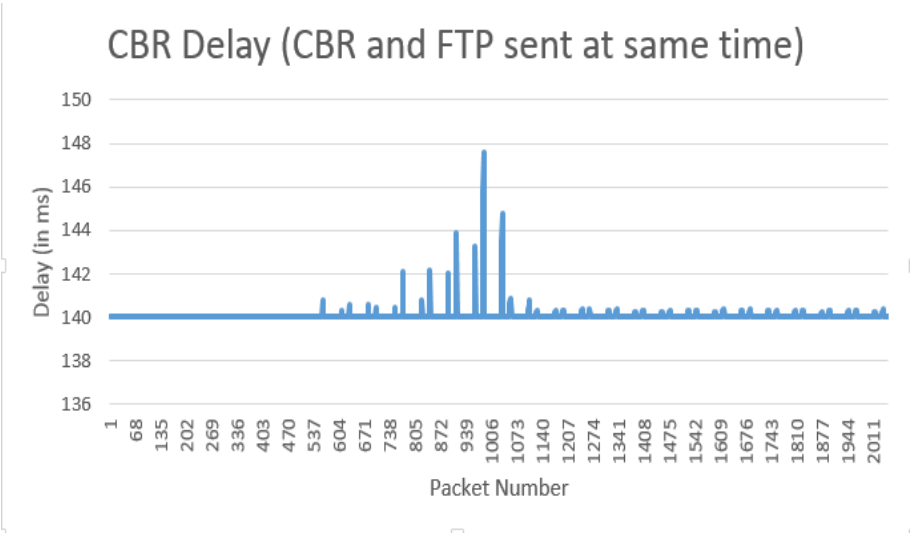

Figure 6: CBR Delay when combined.

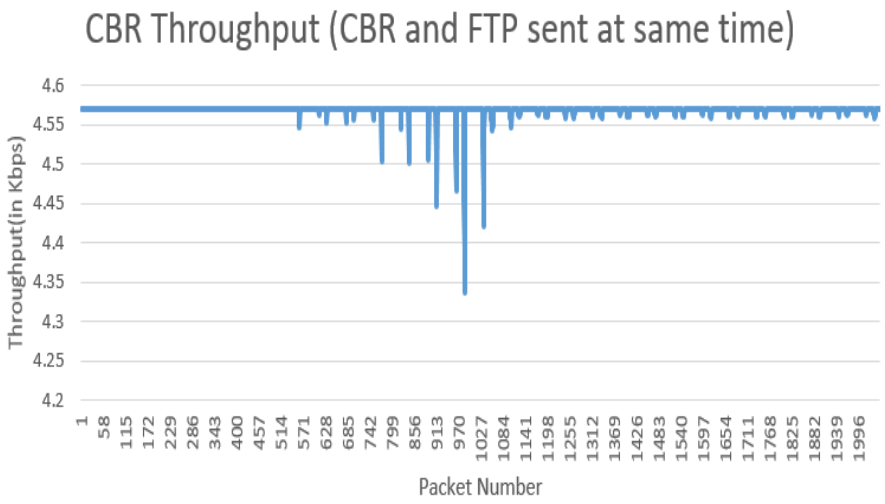

Figure 7: CBR throughput when combined.

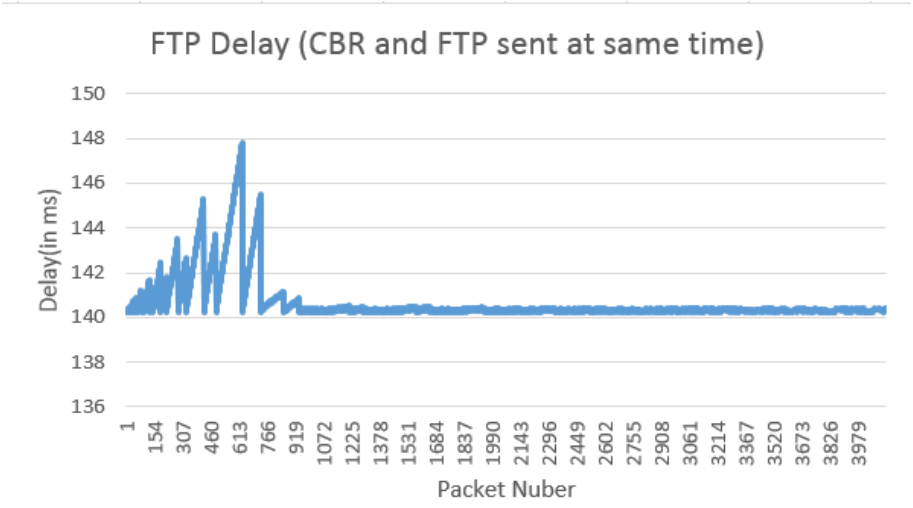

Figure 8: FTP Delay when combined.

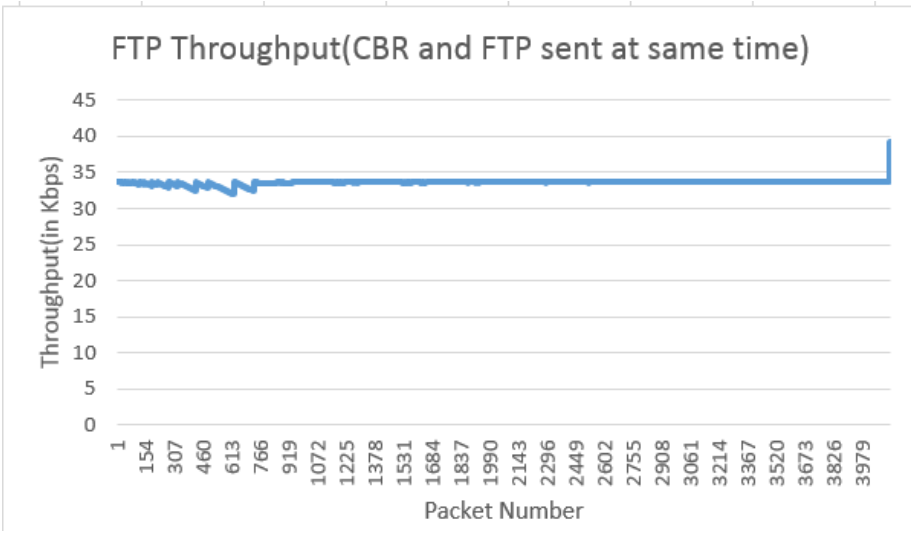

Figure 9: FTP throughput when combined.

6 CBR vs FTP (starting at different time)

We run the analysis for 10 seconds, we start CBR at 1s and stop at 10s and FTP application at 6s and stop it at 10s. We see that the initially CBR has constant delay and constant throughput but as soon as the FTP data is sent, the throughput for CBR decreases slightly and delay gets increased (shown in peaks). There are many fluctuations in CBR and FTP traffic delay depending upon channel utilisation. Figure10 shows CBR vs FTP delay when applications are started at different time and Figure11 shows CBR vs FTP throughput when applications are started at different time

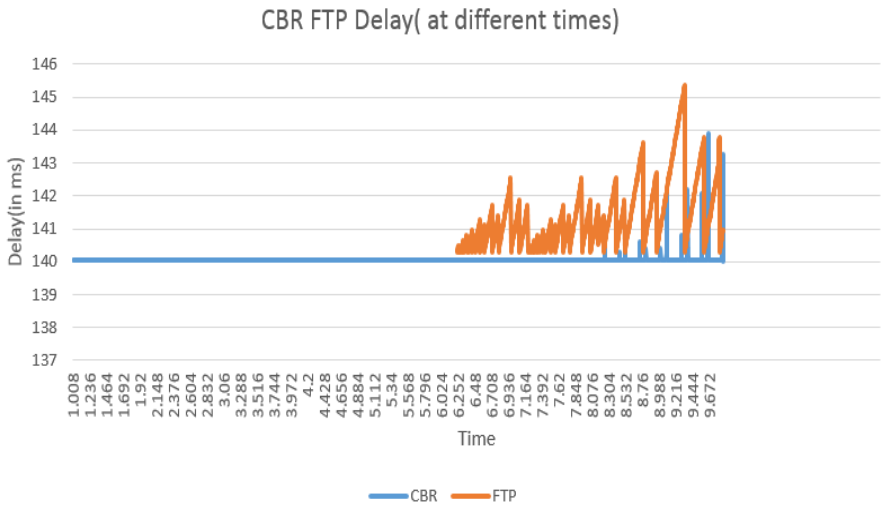

Figure 10: CBR FTP Delay (at different time).

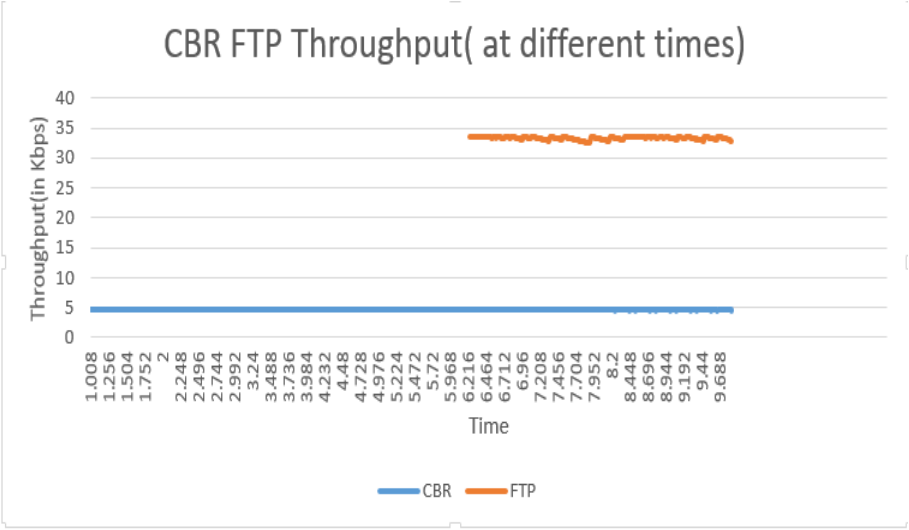

Figure 11: CBR FTP Throughput(at different time).