

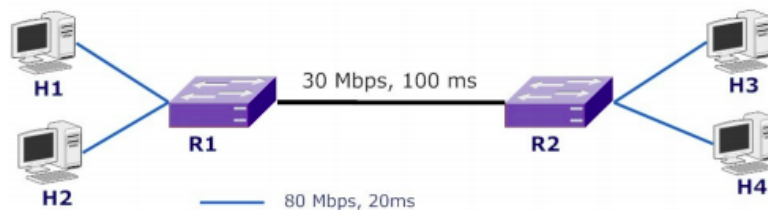
CS349 Networks Lab - Assignment 4

Group 42 (Application 6)

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PROBLEM STATEMENT

The objective of the assignment was to **compare the effect of CBR traffic over UDP agent and FTP traffic over TCP agent**. We had to create a **Dumbbell topology** with two routers R1 and R2 connected by a wired link (30 Mbps, 100 ms), Each of the routers is connected to 2 hosts, i.e. H1, H2 are connected to R1, and H3, H4 are connected to R2. The hosts are attached to the routers with (80 Mbps, 20ms) links. The CBR traffic over UDP agent and FTP traffic over TCP agent are attached to H1 and H2 respectively.



We were supposed to:

- Compare the delay (in sec) and throughput (in Kbps) of CBR and FTP traffic streams when only one of them is present in the network.
- Start both the flows at the same time and also at different times and compare the delay (in sec) and throughput (in Kbps) of CBR and FTP traffic streams.
- Plot the graphs for the delay (in sec) and throughput (in Kbps) observed with different packet sizes.

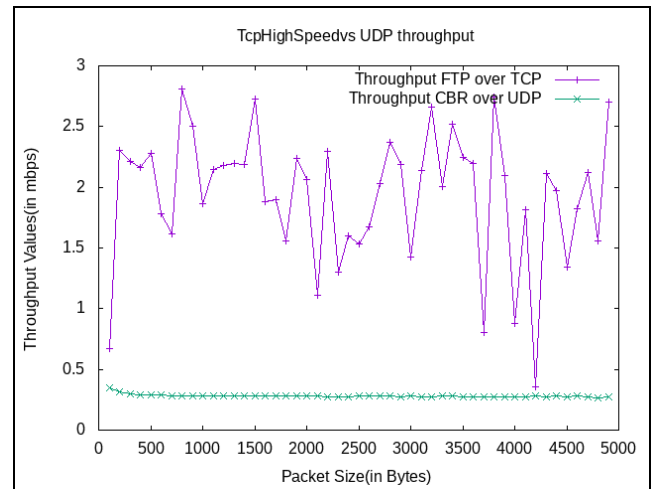
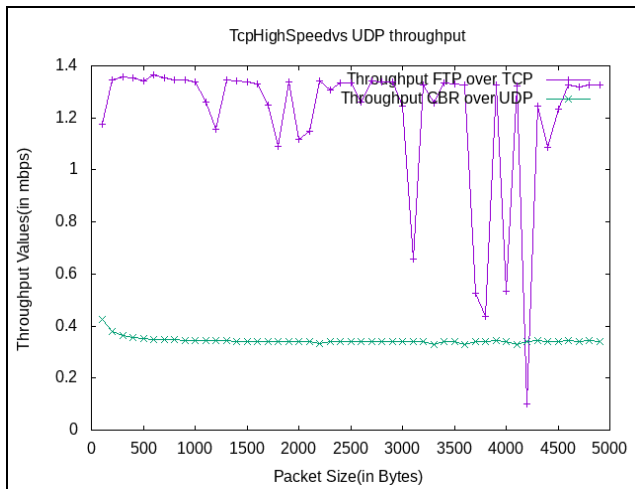
COMMANDS TO USE

- The sample.cc file must be copied to the **scratch** folder located inside the ns-3.xx.x folder, (name of the folder depends on the version of software used).
- Following command can be used to run the network simulation:
./waf --run scratch/sample
- Following command can be used to plot throughput and delay comparison graphs:
**./waf --run "scratch/sample --maxBytes=4000000 --packetsize=100
--prot="TcpScalable" --for_loop=49 run_time=10 --simultaneously=false"**
(the maximum number of bytes, packet size, protocol etc can be altered to get different graphs)

TCP HighSpeed is a TCP model designed for high-capacity channels (connections with large congestion windows). It makes the congestion window grow faster during the probing phases and accelerates the congestion window recovery from losses, when the window grows beyond a certain threshold.

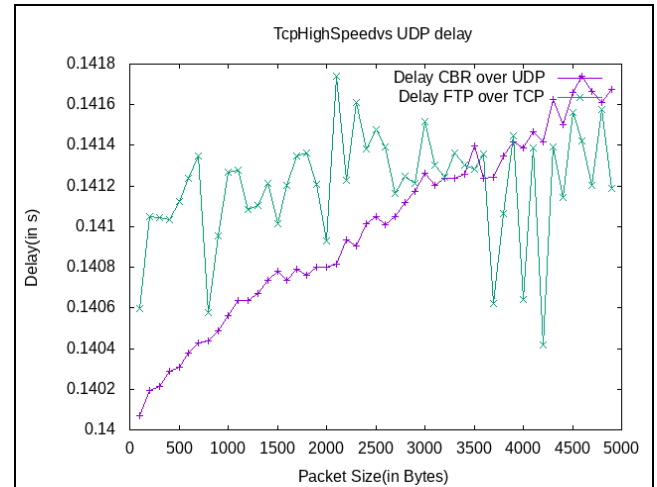
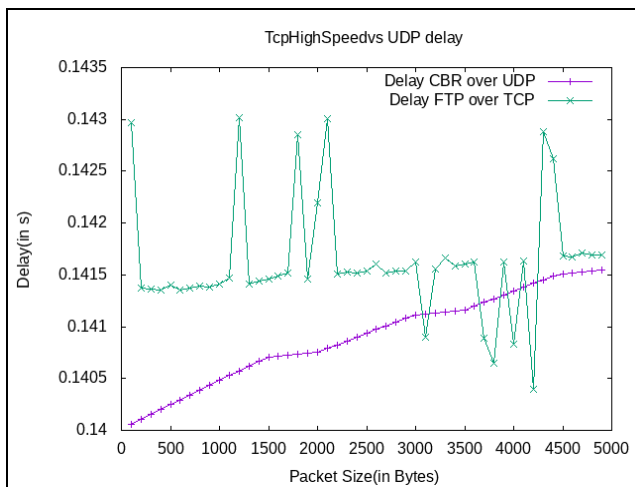
Throughput Comparison

The graph below shows a comparison between the throughput of TCP Highspeed agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.



Delay Comparison

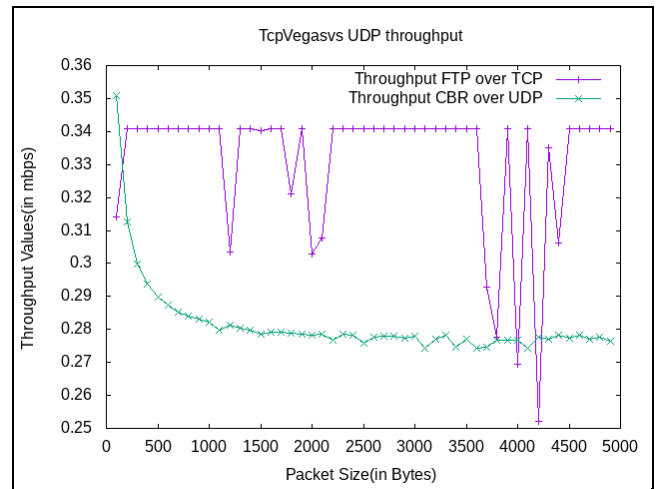
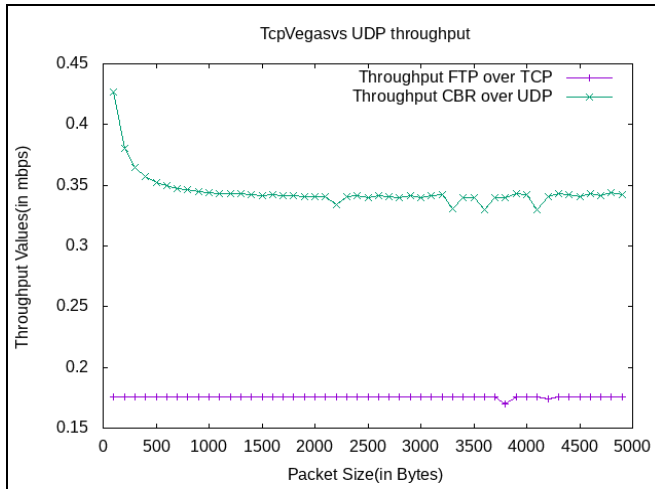
The graph below shows a comparison between the delay of TCP Highspeed agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.



TCP Vegas is a TCP model that uses a congestion avoidance algorithm that emphasizes packet delay, rather than packet loss. It controls the window size by observing RTTs (round-trip times) of packets that the sender host has sent before. If observed RTTs become large, it throttles the window size and if the RTTs become small, it increases the window size again.

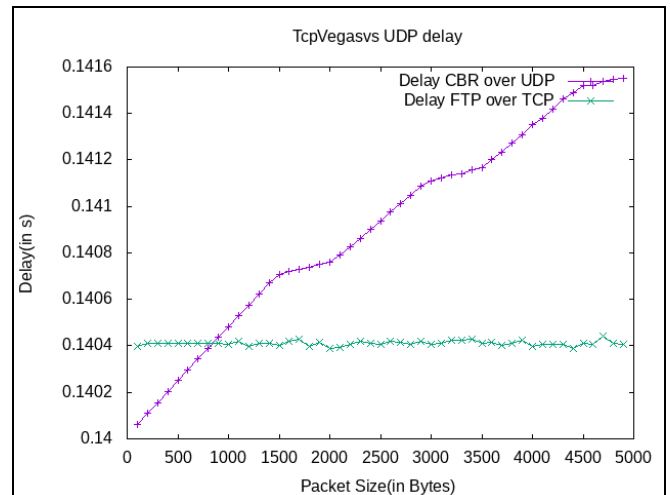
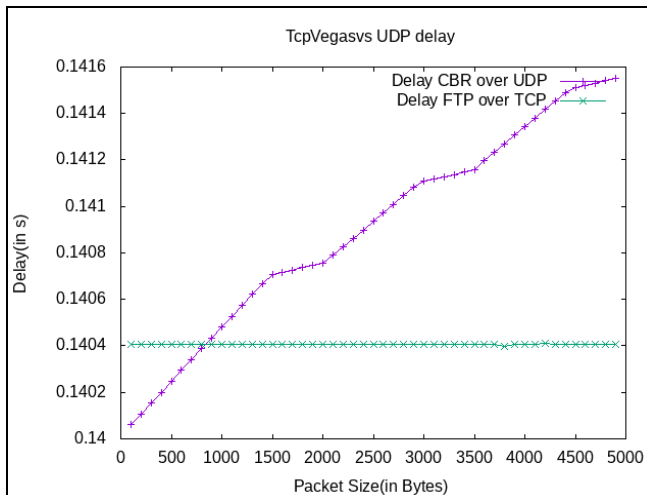
Throughput Comparison

The graph below shows a comparison between the throughput of TCP Vegas agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.



Delay Comparison

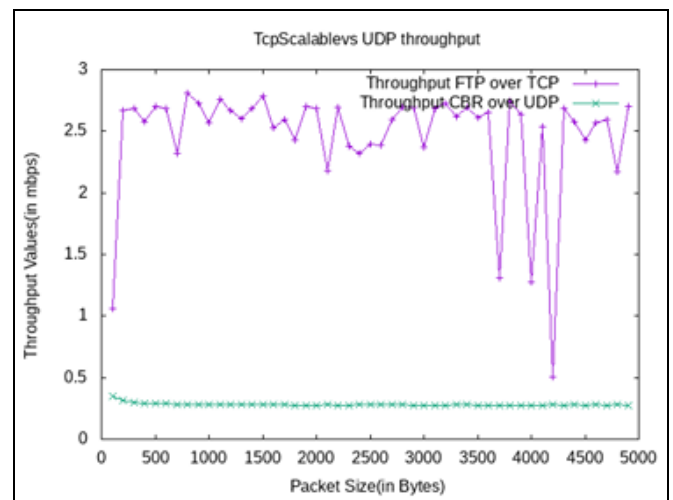
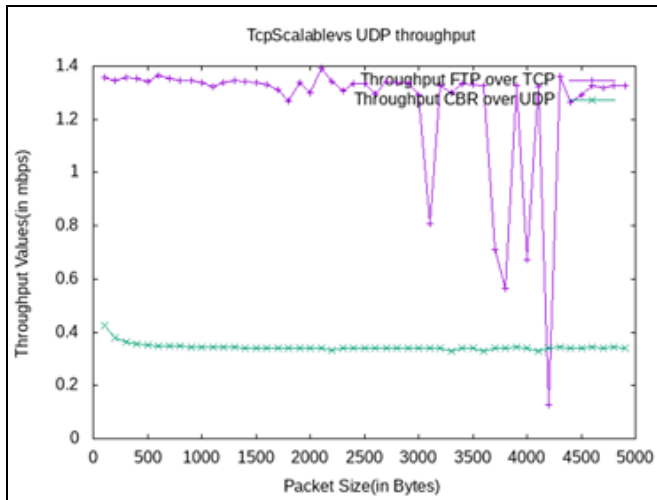
The graph below shows a comparison between the delay of TCP Vegas agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.



TCP Scalable is a TCP model that does better utilization of the available bandwidth of a high speed wide area network by altering the congestion window adjustment algorithm. In scalable, when the congestion has not been detected, for each ACK received in an RTT, the congestion window is increased by 0.01.

Throughput Comparison

The graph below shows a comparison between the throughput of TCP Scalable agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.



Delay Comparison

The graph below shows a comparison between the delay of TCP Scalable agent and UDP agent. The first graph refers to the case when only one of them is transmitting at a time, while the second graph gives the comparison when both transmit simultaneously.

