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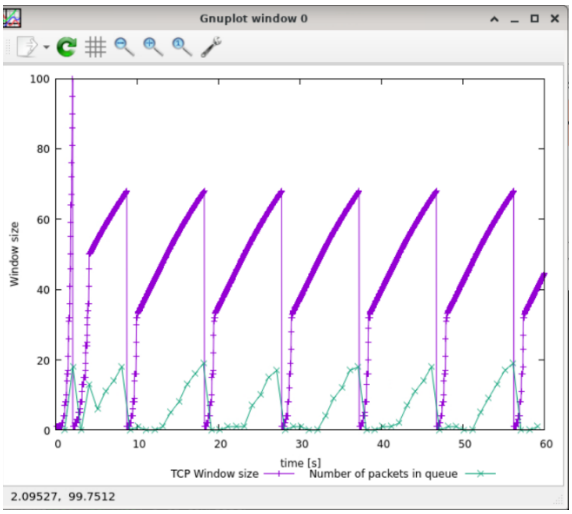
COMP3331 Lab5

Exercise 1: Understanding TCP Congestion Control using ns-2

Q1:

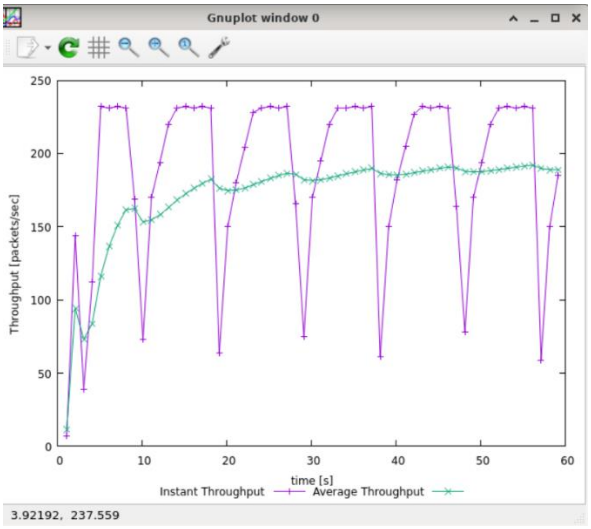


a) The maximum size of the TCP flow's congestion window is 100.

b) The window size is reduced to 1, and the threshold is set to 50; this could be due to timeout or triple duplicated ACK.

c) Then it would make a slow start until the threshold is reached, then make AMID until timeout or triple duplicated ACK occurs again, then reduce the window size to 1 and loop these actions, as you can see from the diagram.

Q2:

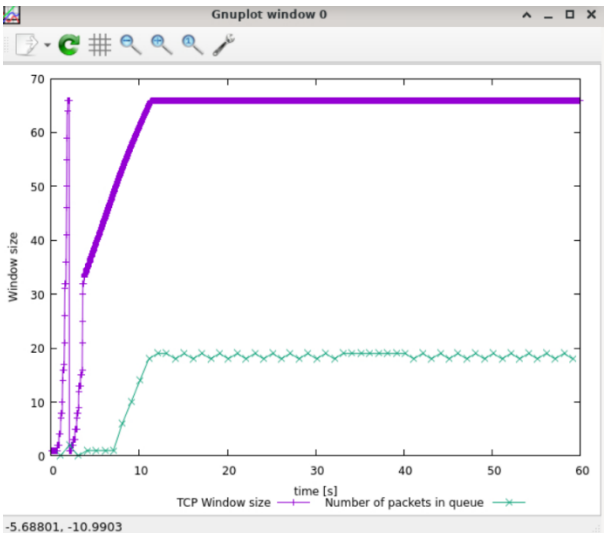


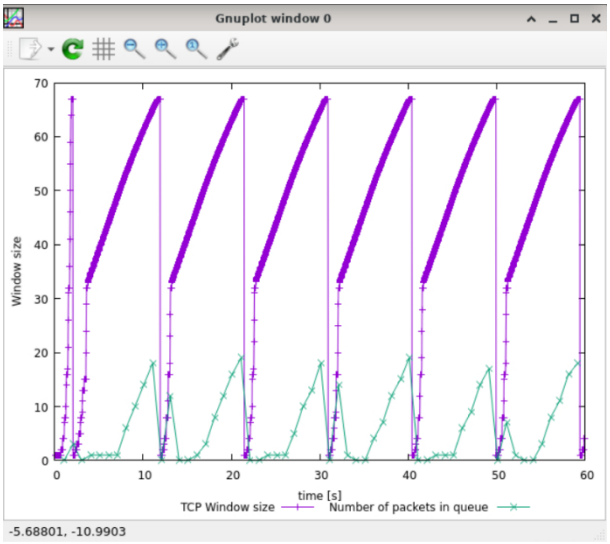
The average throughput is around 187 packets/sec (from the green line in the diagram).

187*(500+20+20) = 100980 Bytes per second. (packet's payload + IP + TCP)

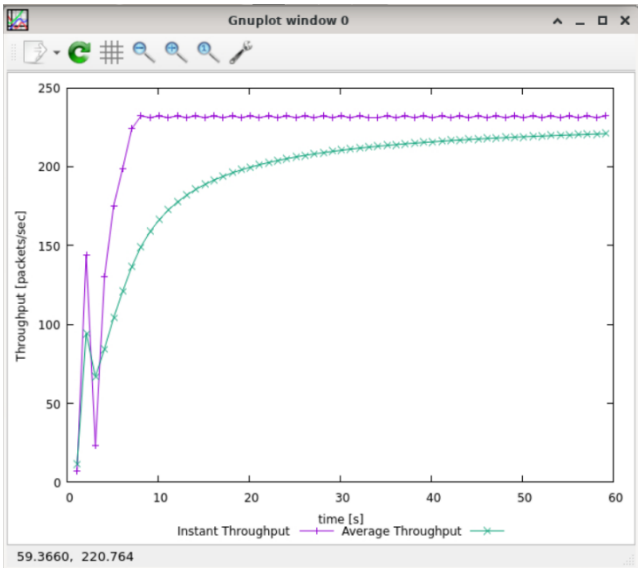
= 807840 bps.

Q3:





The maximum is at a window size of 66 before returning to normal at 67.



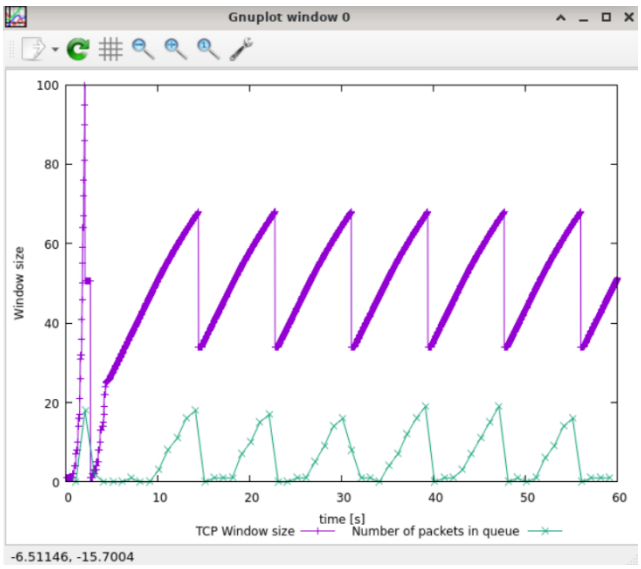
The average throughput is around 220 packets/sec.

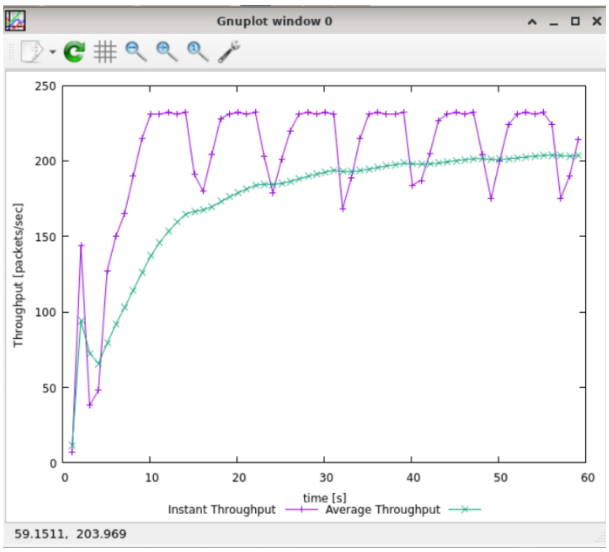
220*(500+20+20) = 118800 Bytes per second = 950400 bps, close to 1 Mbps (1000000 bps).

{|1000000-950400| / [(1000000+950400) / 2]} * 100

Only a 5% difference.

Q4:





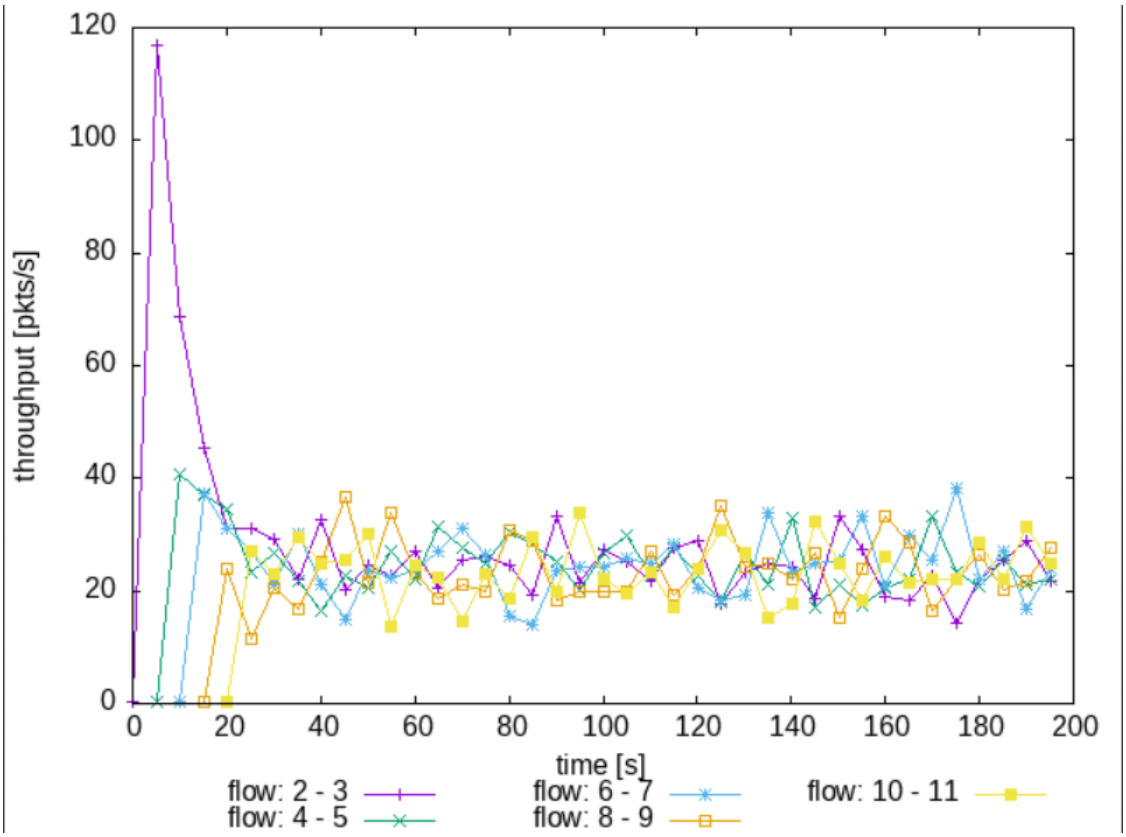
The TCP Reno's congestion window returns to zero only once after the first slow start, unlike Tahoe, which kept returning to zero for every timeout or triple duplicated ACK.

The average throughput is around 203 packets/sec.

203*(500+20+20) = 109620 Bytes per second.

= 876960 bps, higher than the first one.

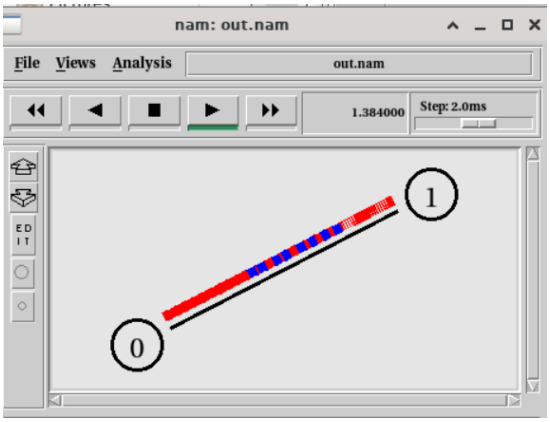
Exercise 2: Flow Fairness with TCP

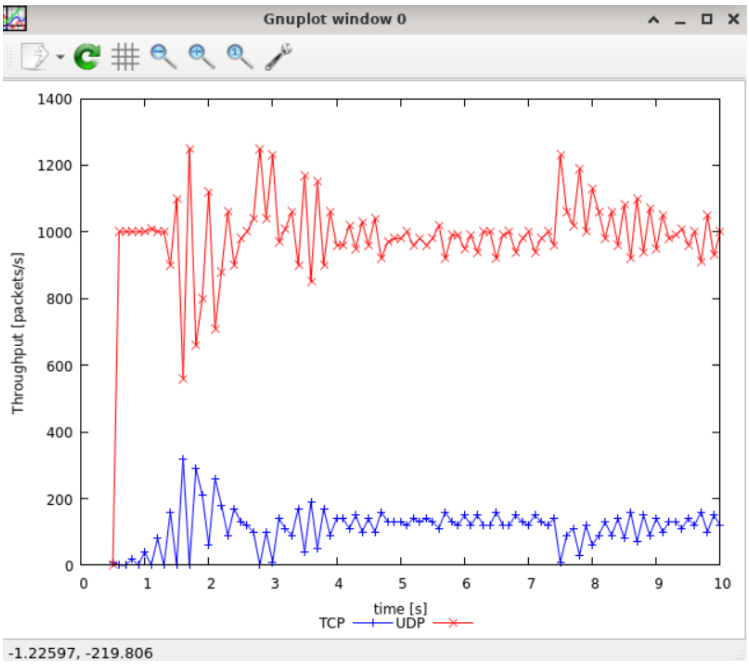


Q1. Yes, even with a different start, each flow has been adjusted until each shares almost the same average, around 15-35.

Q2. The throughput of the pre-existing TCP flows would be decreased when introducing a new flow due to congestion from the first slow start forcing the pre-existing ones to decrease window sizes. This is fair since all flows adjust to share them.

Exercise 3: TCP competing with UDP





Q1) UDP should have a higher throughput since TCP needs to control congestion meaning UDP should be in red and TCP should be in blue.

Q2) As mentioned in Q1, we learned that UDP is faster when TCP needs to care about packet loss and congestion control. Even though TCP is slower but it is more stable.

Q3) UDP is faster and has better throughput but has no congestion controls; packets could be lost and not in order. The network would suffer from congestion if everyone used UDP due to having no congestion controls and many corrupted files.