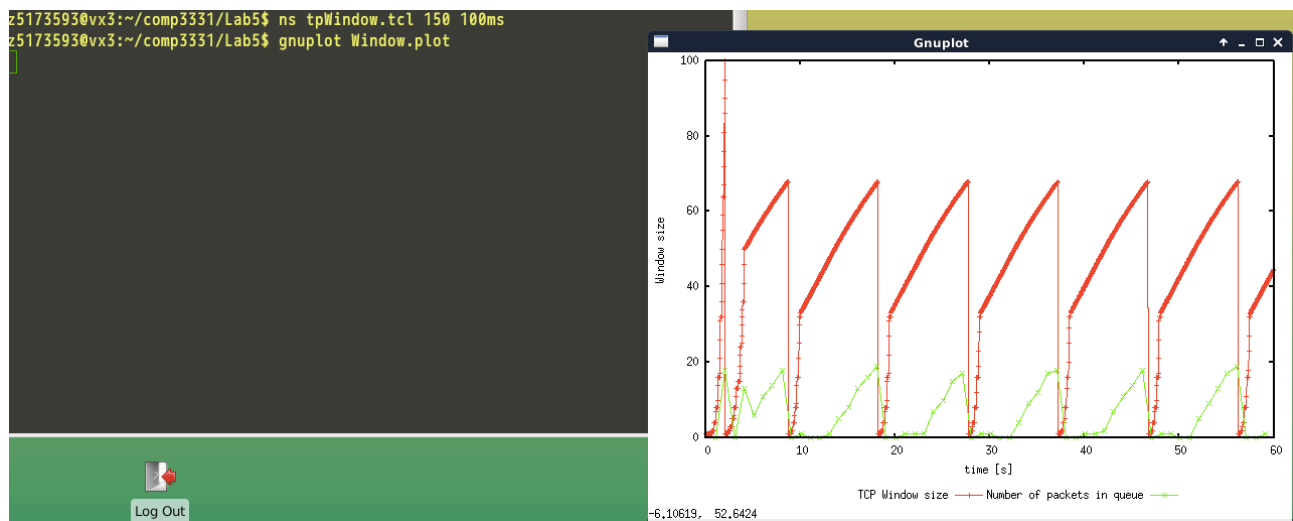# Lab Exercise 5: TCP Congestion Control and Fairness

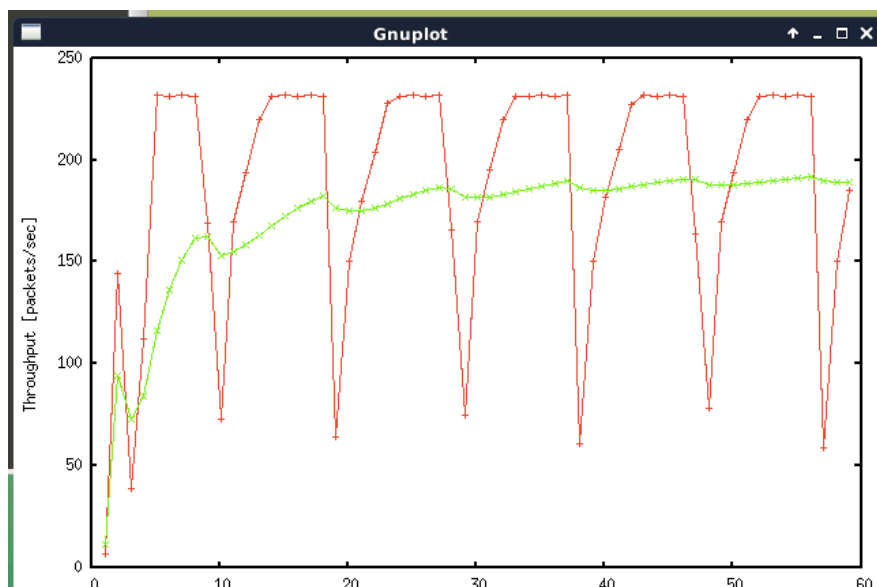## Exercise 1:

Question1.

Max size of window: 100

When congestion window reaches 100, the size dropped to 1.
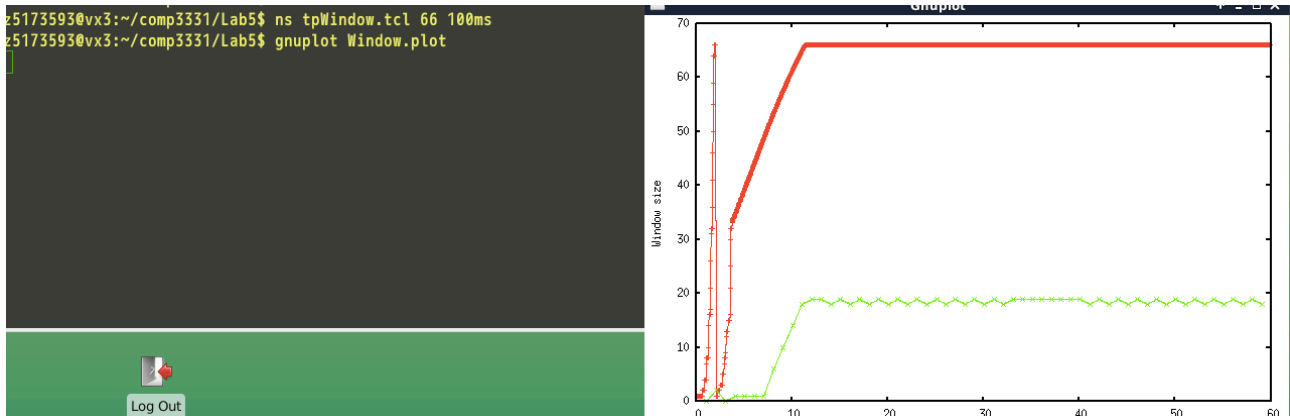
Slow start again with window size 1.

Question 2.

throughput 191 packet per sec

(500+20+20) * 191 * 8 = 825120 bps

Question 3.

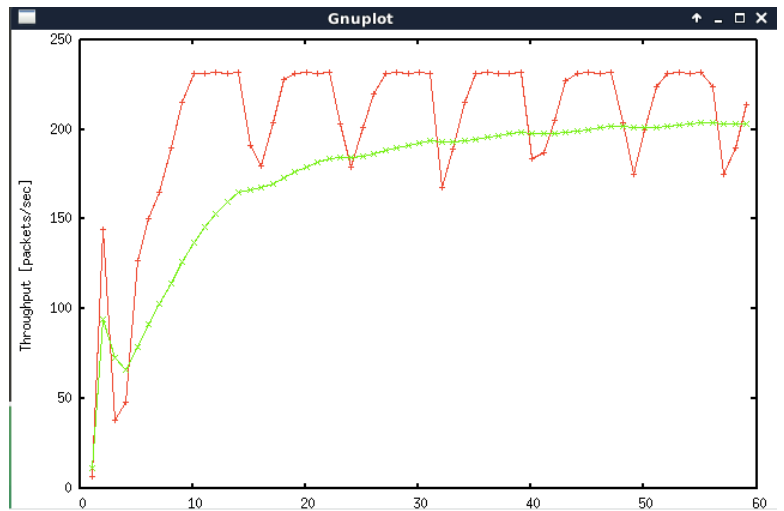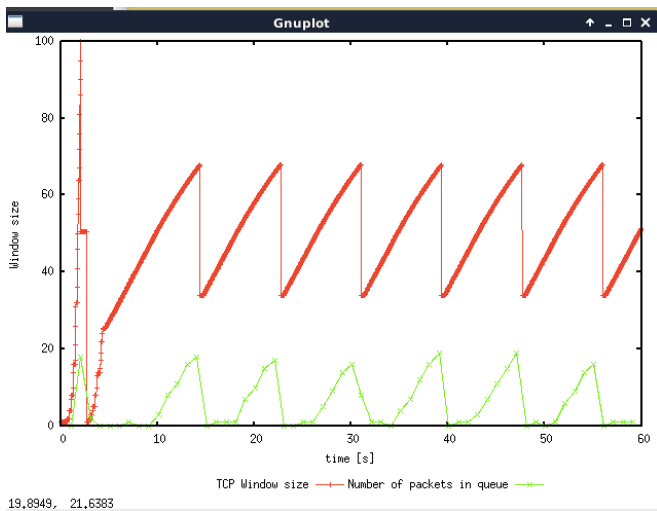While window size increase, number of oscillating increase.

Max window size 66.

Throughput 220.8 packets/sec

(500+20+20) * 220.8 * 8 = 953856 bps

utilisation: 100 - 100 *(1000000 - 953856)/100000 = 95.3856%

almost at link capacity.
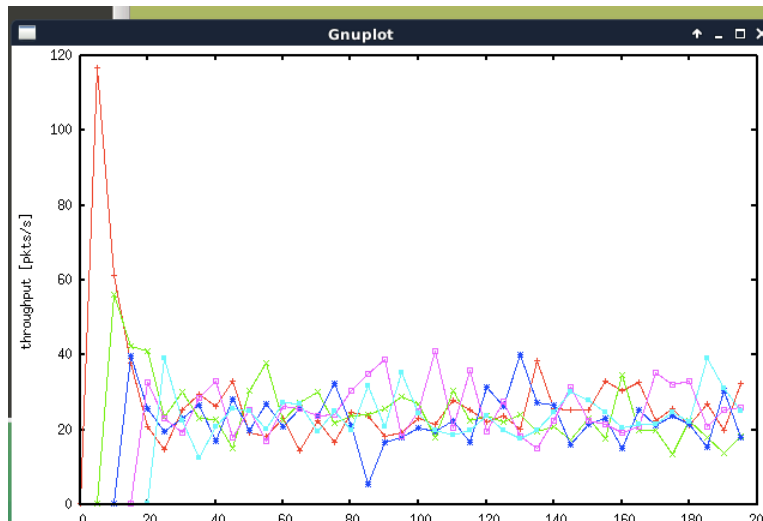
Question 4.

203.4 * (500+20+20) * 8 = 878688 bps

compare to 825120bps in question 2.
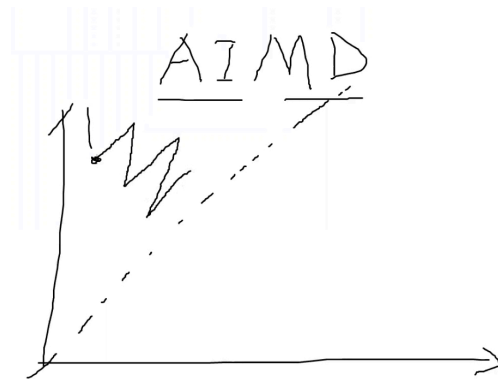
Exercise 2.
Question 1.

Equal share, because after stable, all 5 almost have the same throughput.
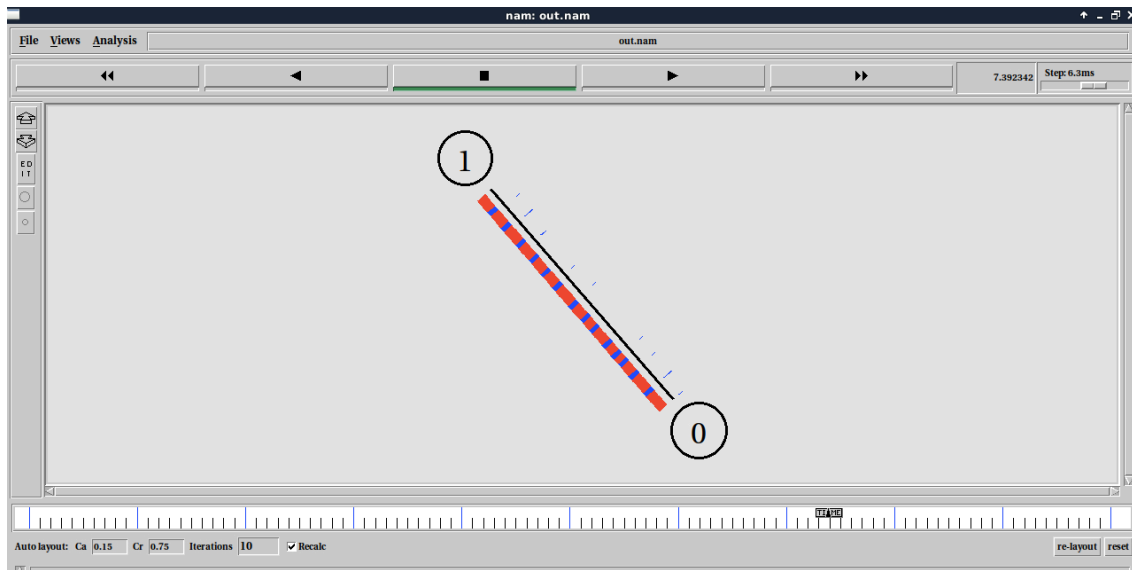
Question 2.

After the second flow join, the window size of first decrease sharply because they share capacity o of the common link.

It is fair, because multiple flows will converge to receive an equal share of the link.
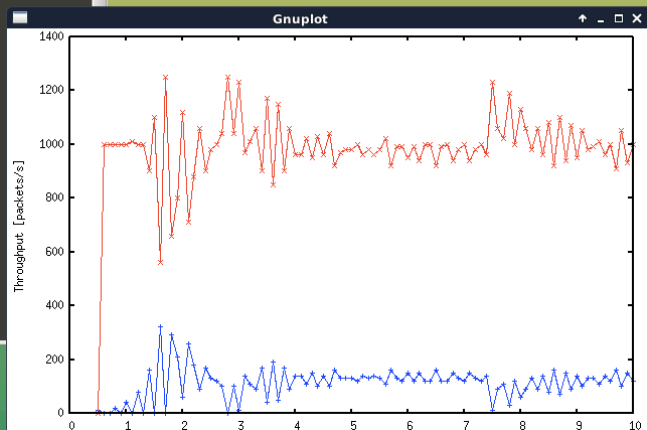
Exercise 3:
Question 1.

I expect the throughput will increase for both TCP and the UDP flow.

I think the red one is UDP flow, while the lower one is TCP flow.

Question 2.

There's no congestion control in UDP protocol, so UDP will try to send all the packets, but if there's any lost in TCP, TCP will show down, decrease its window size.

Question 3.

UDP Advantages: faster than TCP, higher overall throughput.

UDP disadvantages: might lost packets. The order when receive might have changed.