Lab 5

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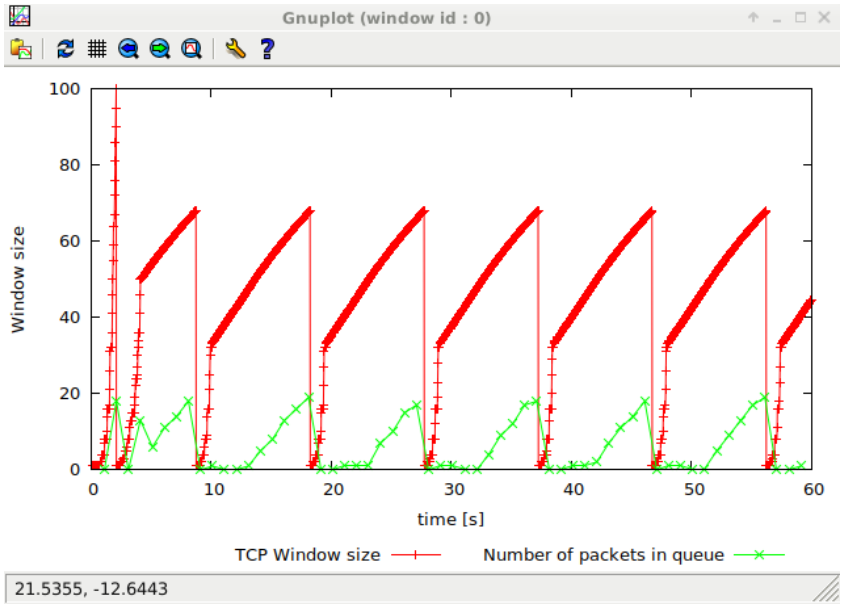
Exercise 1

Question 1:

Maximum size of the congestion window: 100

The size of congestion window dropped to 1 when the congestion window reaches this value, because the flow cannot deal so many packages at one time.

Then TCP flow back to slow start.

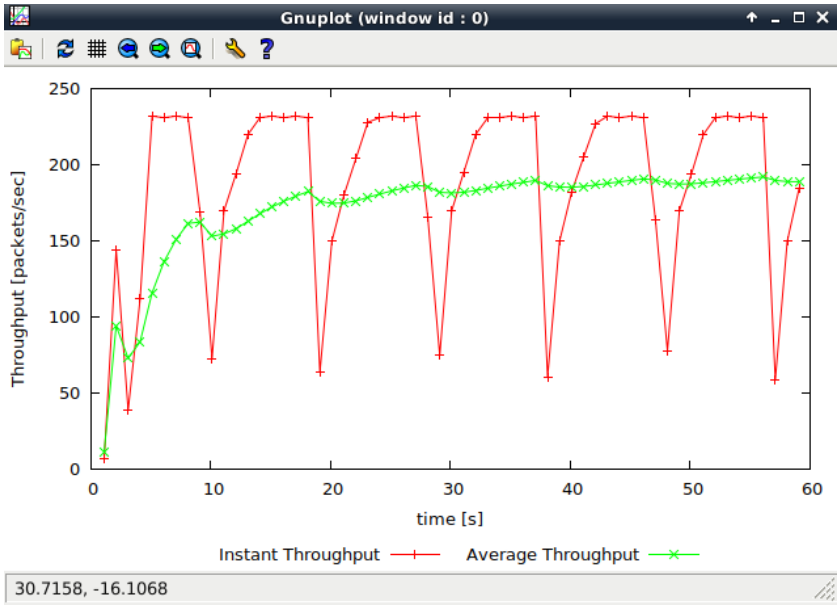


Question 2:

Average throughput is 189 packets/s

Total size of each packet = 500 + 20*2 = 540 bytes

Average throughput = 189 * 540 * 8 = 816480 bps



Question 3:

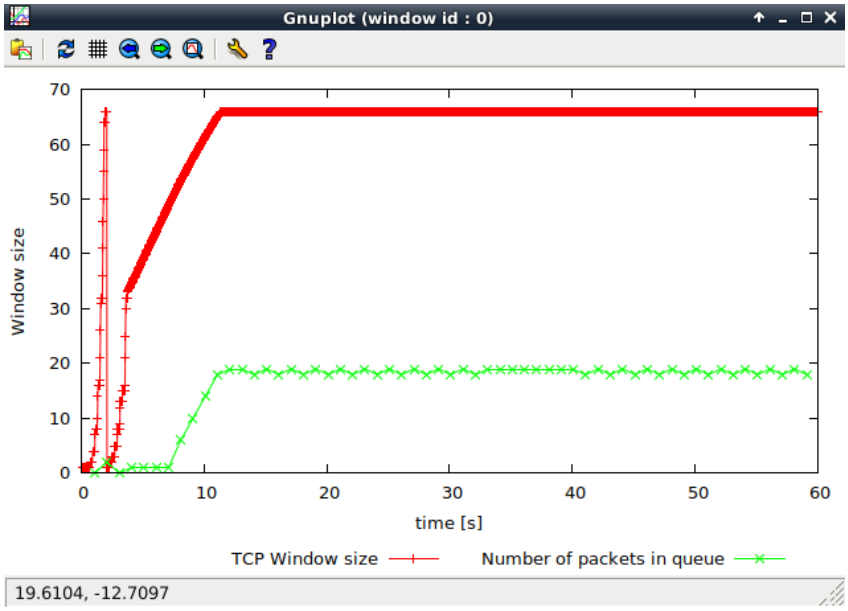
The maximum window size is 66 (or 50)

Average throughput: 220 packets/s

Average throughout = 220 * 540 * 8 = 950400 bps

Actual average throughput is smaller than the link capacity (1Mbps)

Photo when maximum window size is 66: no oscillating from 3s



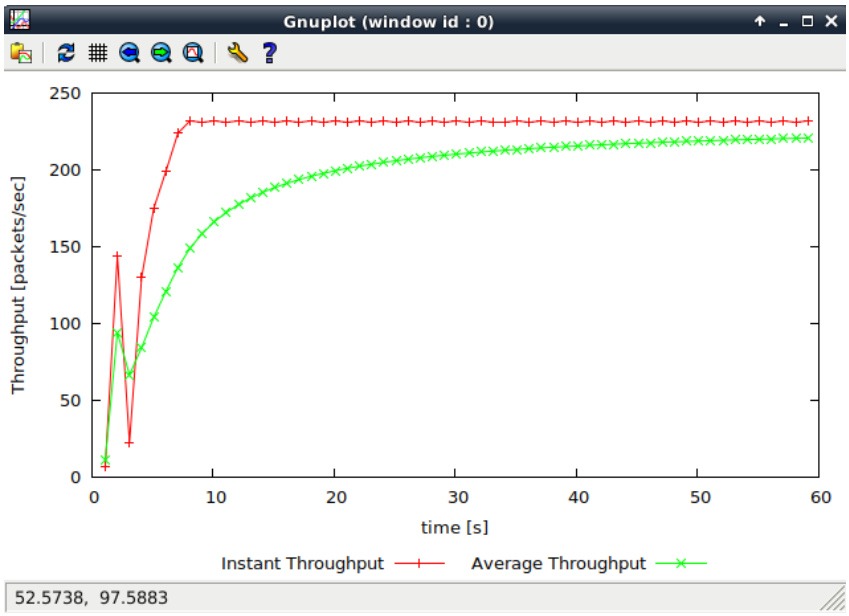
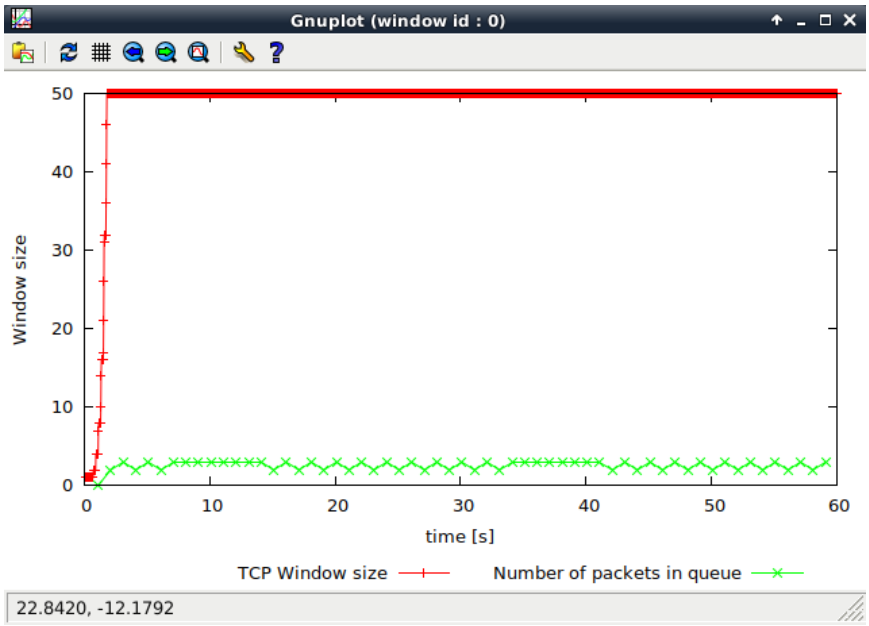
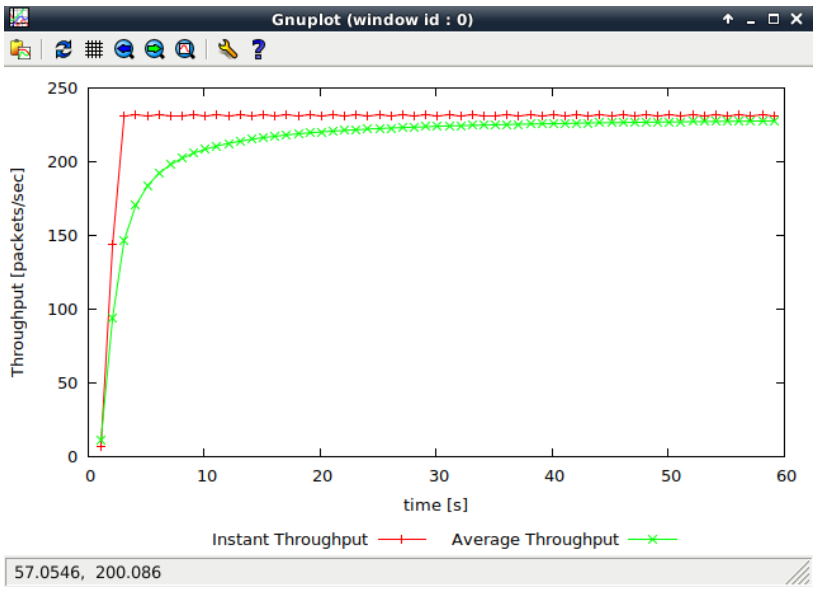


Photo when Maximum window size is 50: no oscillating from beginning





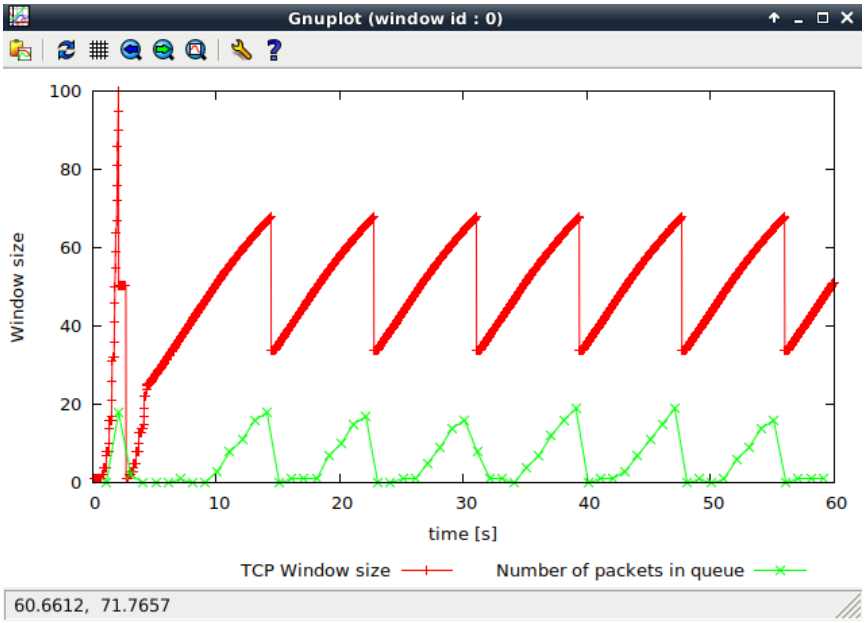
Question 4:

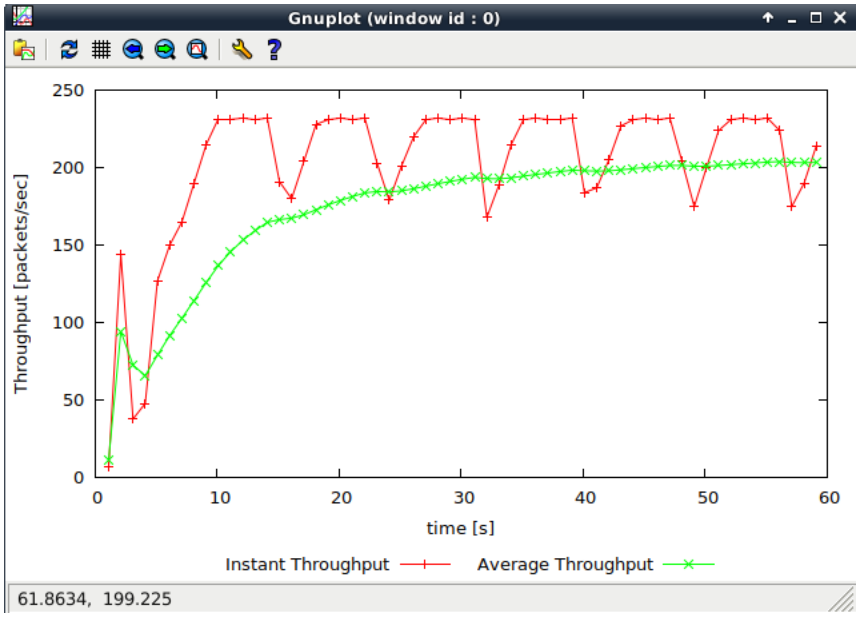
There is no slow start when packets lost

Average throughput: 203 packets/s

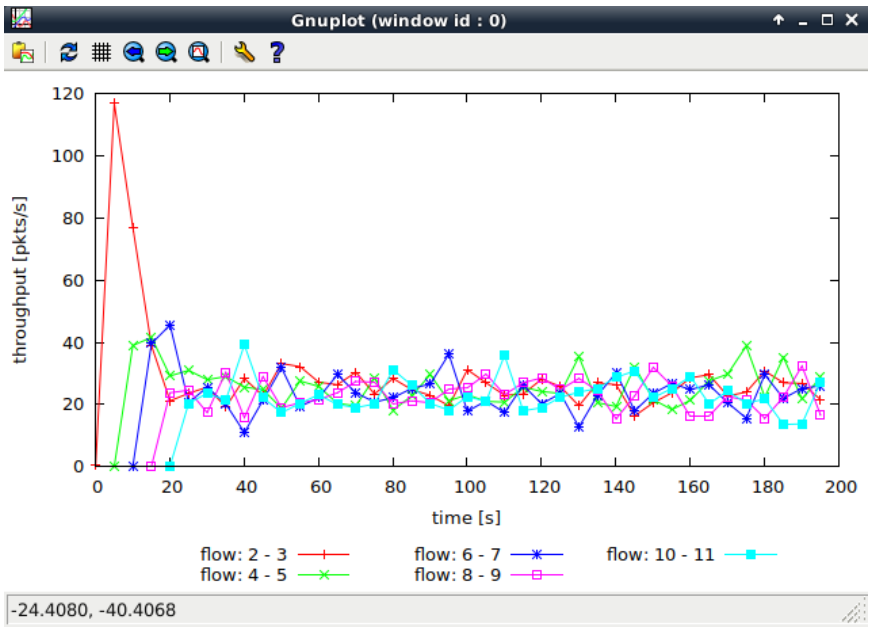
Average throughput: 203 * 540 * 8 = 876960 bps > 816480 bps (Tahoe)

Reno works better than Tahoe





Exercise 2



Question 1:

Yes, though at the beginning, flow 2-3 goes very high, but after 5s, throughput of flow 2-3 goes down and all flows nearly get similar throughput

Question 2:

When new flow is created, the throughput of the first flow decrease significantly until the throughput of every flow gets nearly equal throughput.

AIMD mechanism.

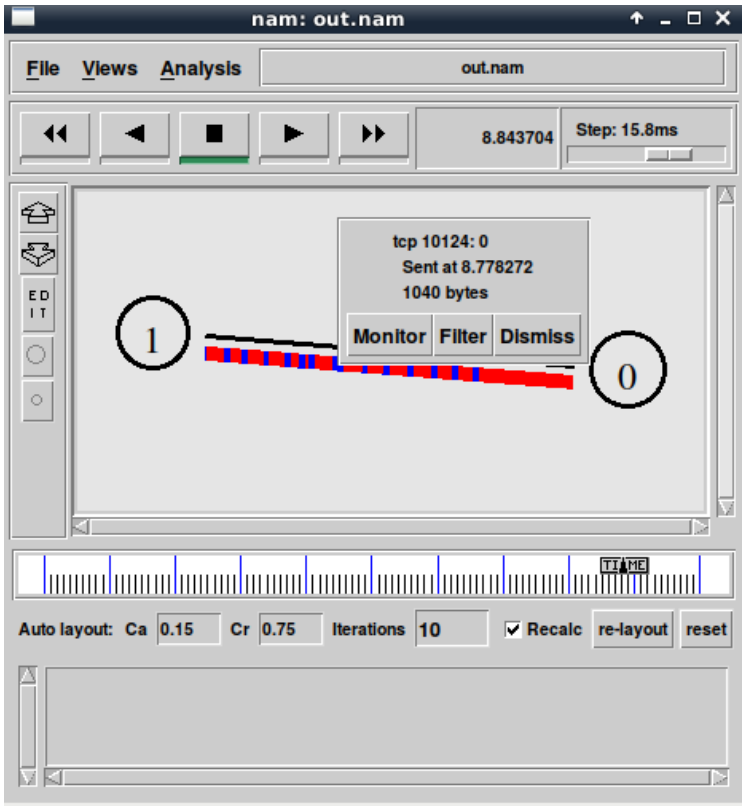
This is fair as when new connection comes in, the size of window of each flow will be changed to make the average throughput of each flow balanced.

Exercise 3

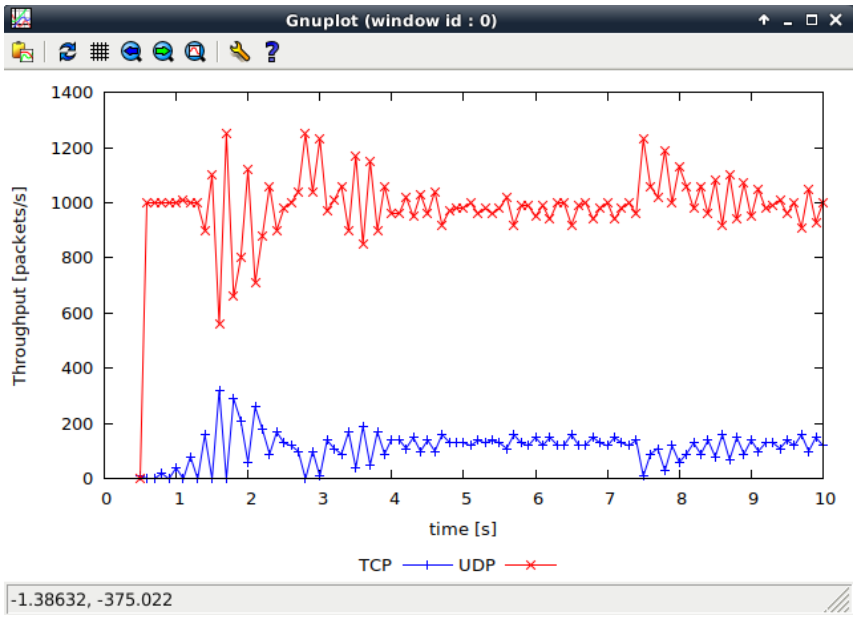
Question 1:

Red is UDP, blue is TCP

The reason is that UDP constantly send packets, but TCP applies congestion control and slow start, so UDP should occupy more region. During the transmission, we see most of region is red so red is UDP.



Question 2:



Because TCP has congestion control, so if packets lost occur when use TCP, the number of packets sent from TCP flow will restart from 0, but UDP doesn't has this functionality, that means its throughput is higher.

The mechanism is TCP has congestion control but UDP doesn't have.

Question 3:

Advantages of UDP:

Does not need to maintain connection between client and server, therefore it is fast

Disadvantages of UDP:

No congestion control and won't retransmit the packets which lost during transmission

If everyone started using UDP, everyone can only get few data, and the worst case is that every packet may be dropped.