COL 334
ASSIGNMENT 3

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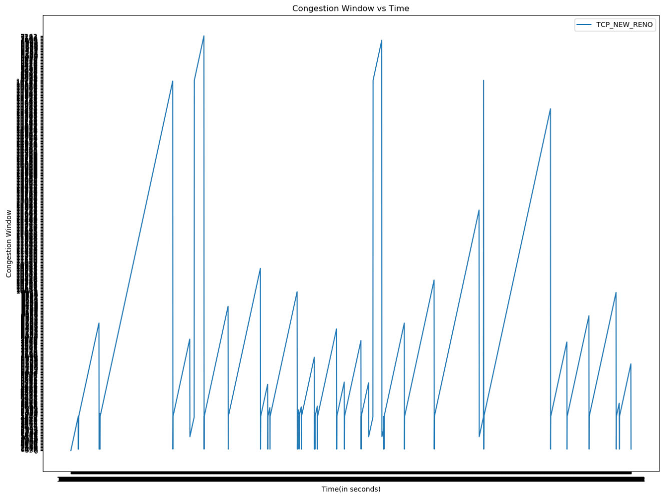
2019CS50422

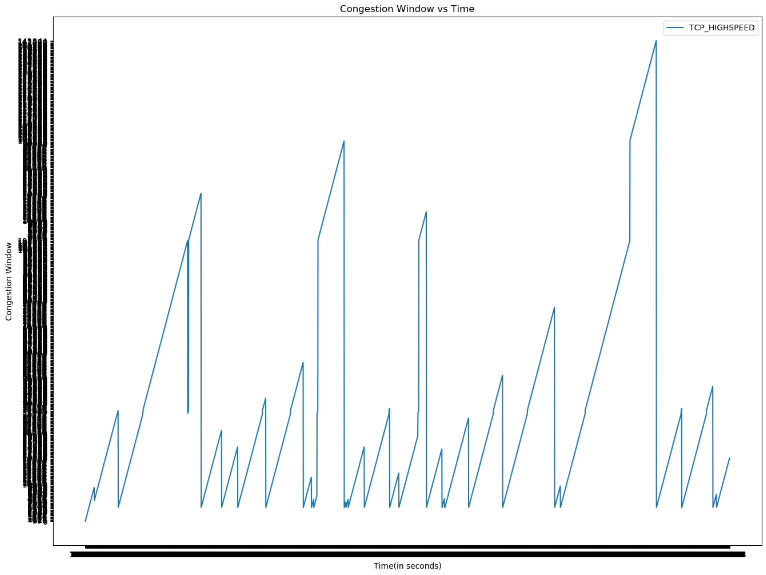
PART 1

1.

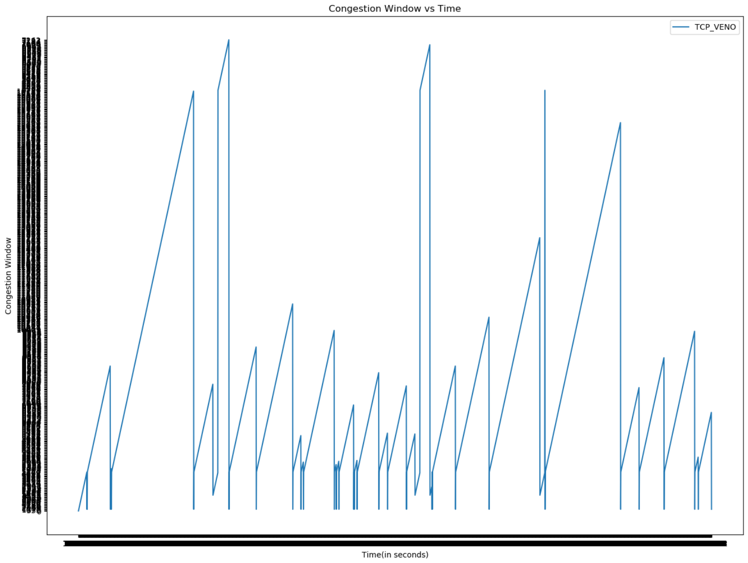
TcpNewReno



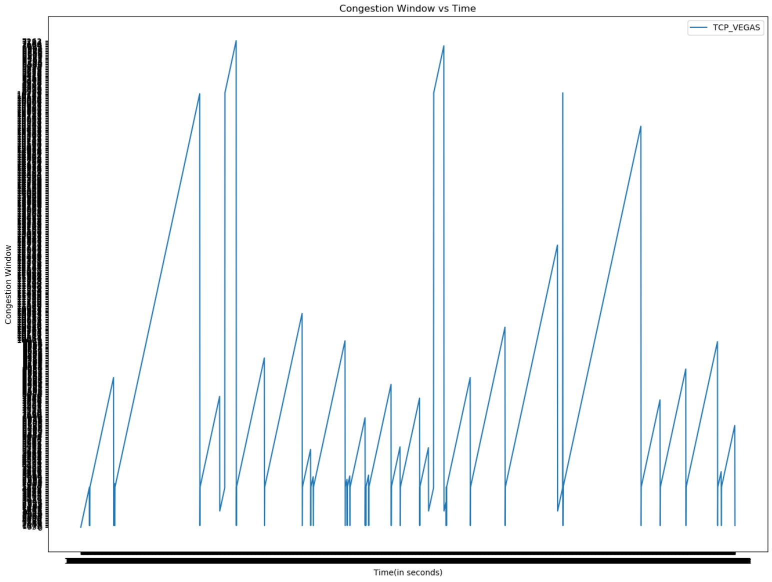
For tcp highspeed



For tcp veno



For Tcp Vegas



2. Number of dropped packets

Protocol	Number of Packets Dropped
TCP NEW RENO	38
TCP HIGH SPEED	36
TCP VENO	38
TCP VEGAS	38

Number of dropped packets are almost equal for each of the used protocols,thus even if we change the protocols it does not affect the rate of dropped packets

3. TcpNewReno

We have two possible congestion window increment strategies: slow start and congestion avoidance.
During slow start, a TCP increment cwnd by at most SMSS bytes for each ACK received that cumulatively acknowledges new data. Slow start ends when cwnd exceeds ssthresh (or, optionally, when it reaches it, as noted above) or when congestion is observed.

$$cwnd+ = min(N, SMSS)$$

Tcp High Speed

for TCP connections with large congestion windows
The following formula are used in this

$$cWnd = cWnd + \frac{a(cWnd)}{cWnd}$$

$$cWnd = (1 - b(cWnd)) \cdot cWnd$$

Tcp Vegas

It is a delay based congestion control algorithm. It linearly increases/decreases its congestion window to ensure the diff value falls between the two predefined thresholds, alpha and beta

Diff =expected-actual

$$actual = \frac{cWnd}{RTT}$$

$$expected = \frac{cWnd}{BaseRTT}$$

Tcp Veno

It enhances Reno algorithm for more effectively dealing with random packet loss in wireless access networks

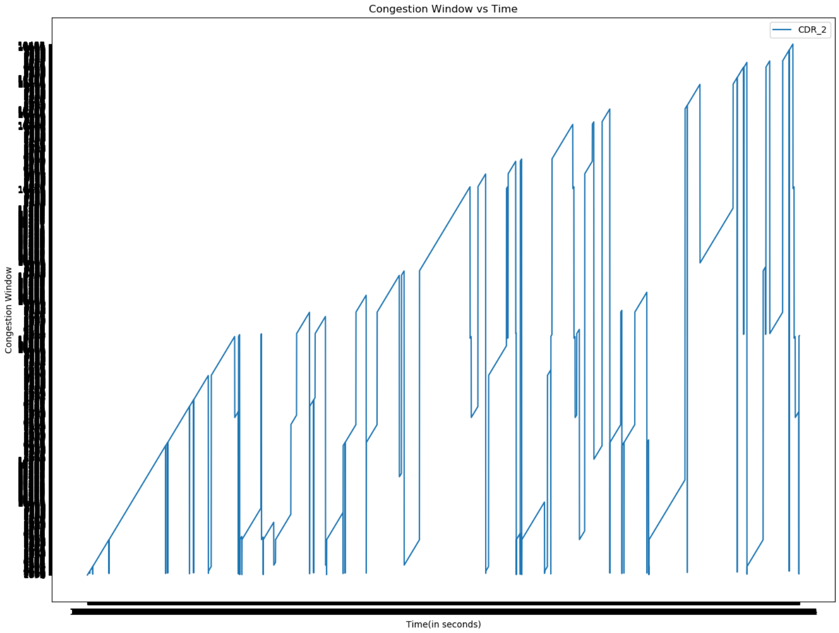
$$\begin{aligned} N &= Actual \cdot (RTT - BaseRTT) \\ &= Diff \cdot BaseRTT \end{aligned}$$

The trend for each protocol is different as even though the congestion values are almost similar the number of packets changed.
Also the peak for highspeed is higher than the other protocols whereas veno,vegas and newreno have a very similar graph

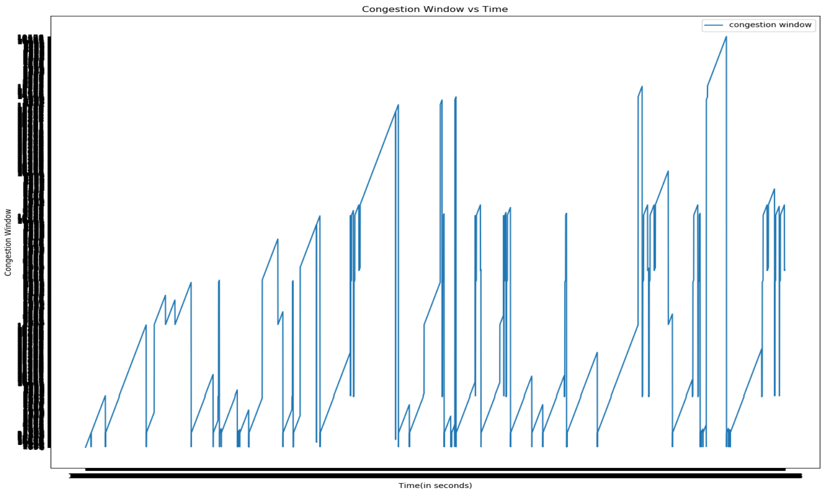
PART 2

a. Here we varied the channel data rate

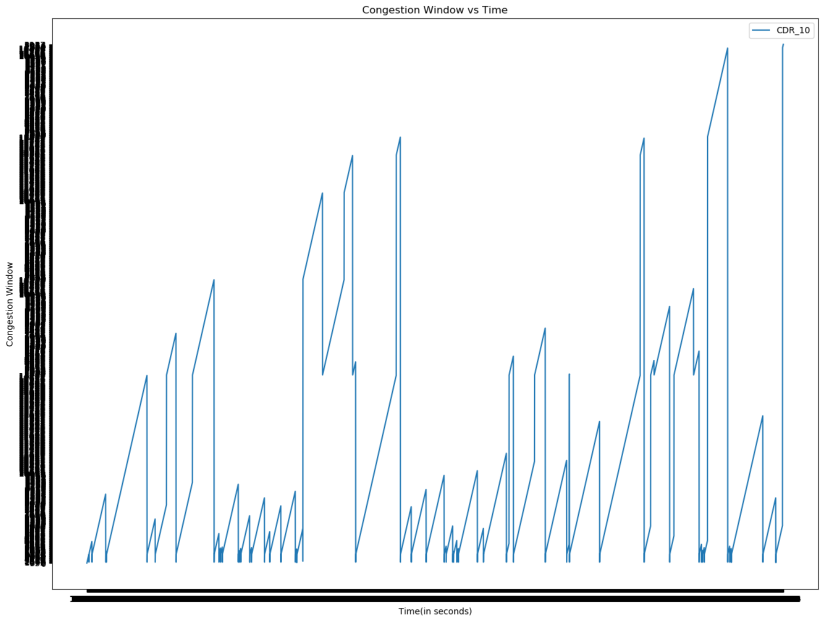
Channel Data Rate =2



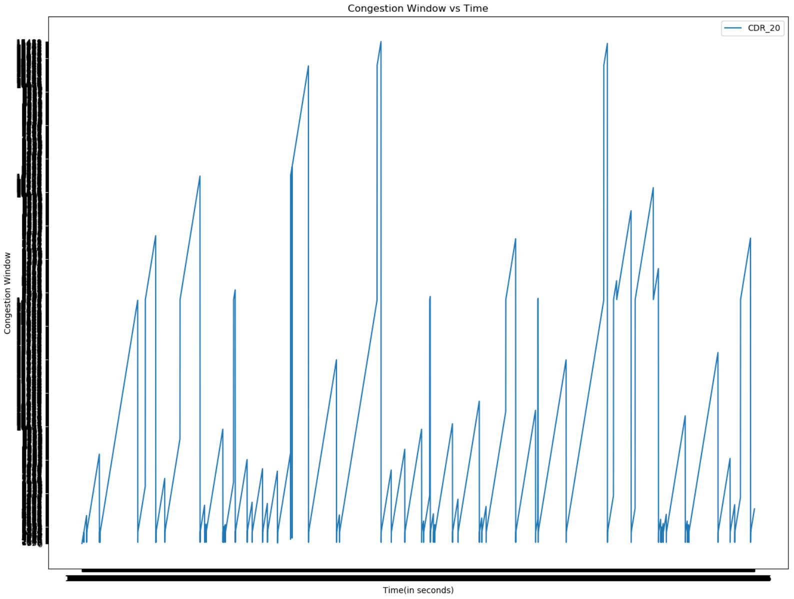
Channel Data Rate=4



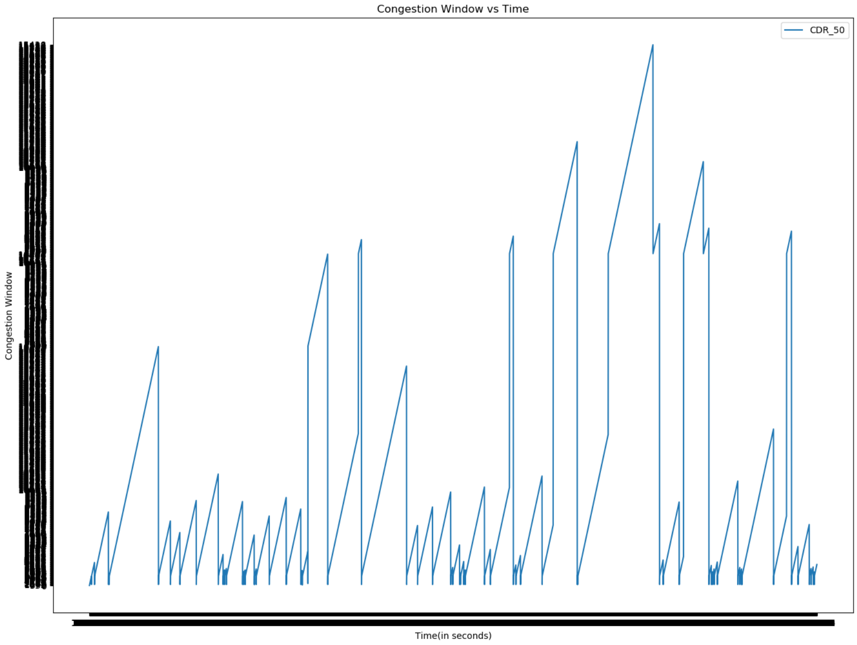
Channel Data Rate = 10



Channel Data Rate=20



Channel Data Rate=50



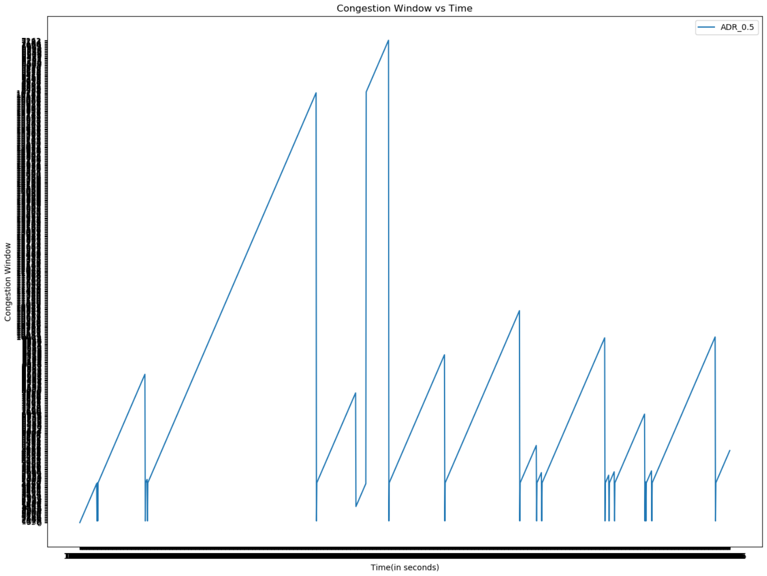
We observe that as we increase Channel data rate the number of packets also increase and thus the graphs are getting closer lines,more number of points.

Also for each graph the trend of congestion window values is similar i.e. increases as time increase(decreases a lot when packet drop happens)

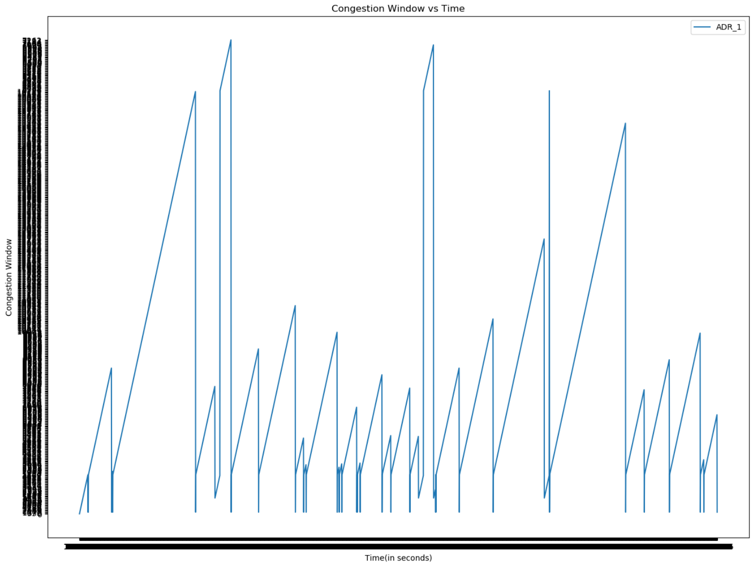
We also observe that through the graphs peaks are coming earlier as we increase data rate

Also it seems as overall the congestion window increase as the peaks are getting scattered over the graph rather than at the end.

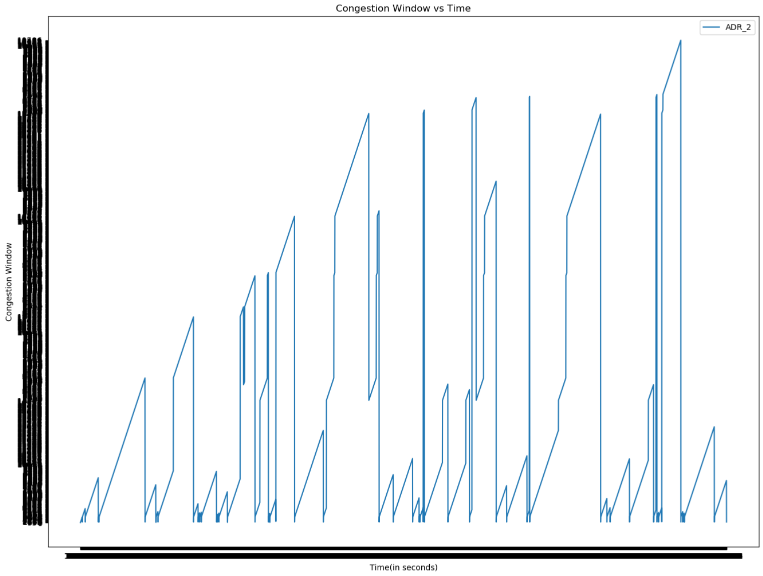
b. Application Data Rate=0.5



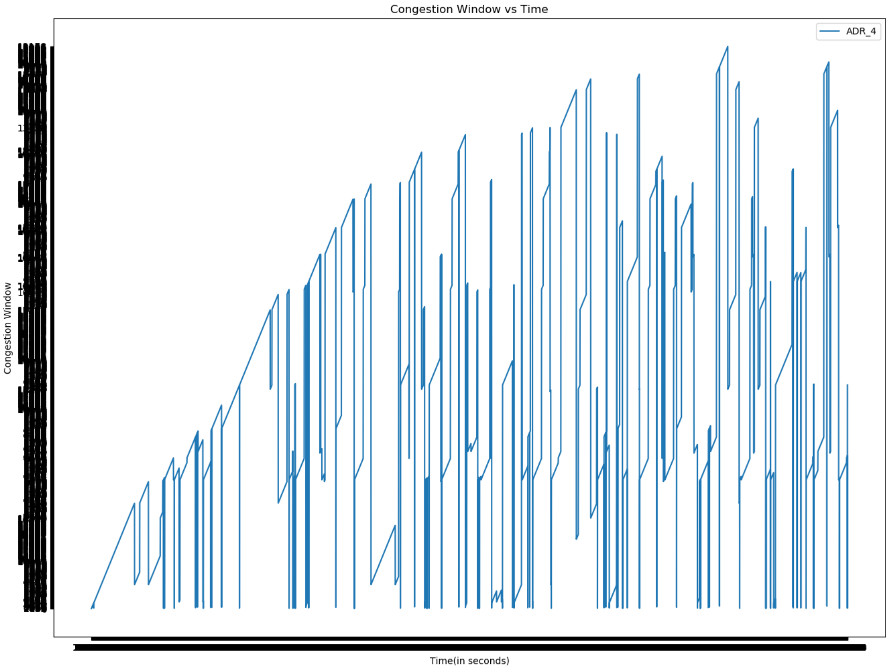
Application Data Rate = 1



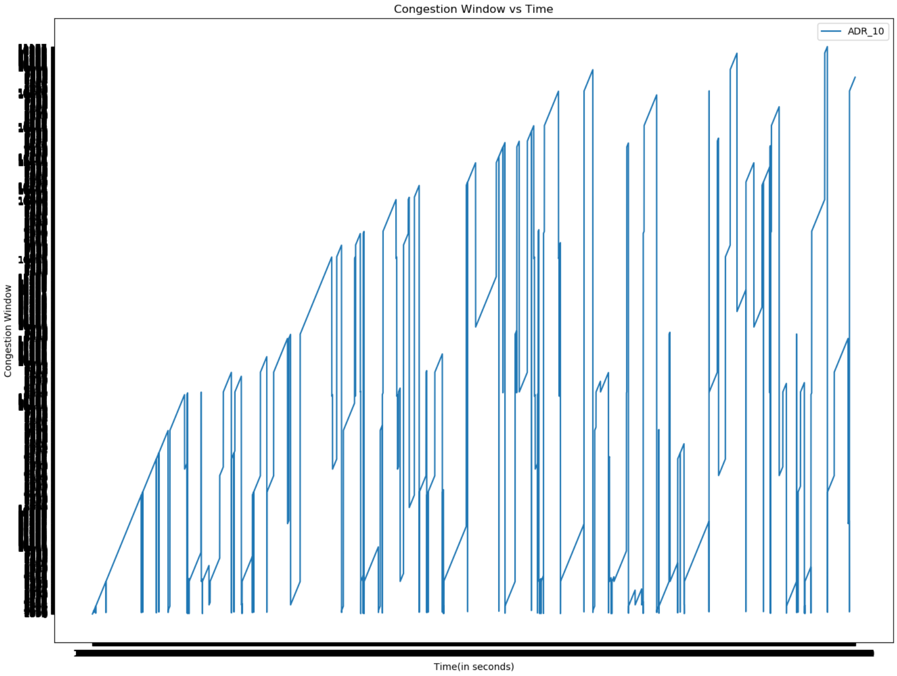
Application Data Rate=2



Application Data Rate = 4



Application Data Rate = 10

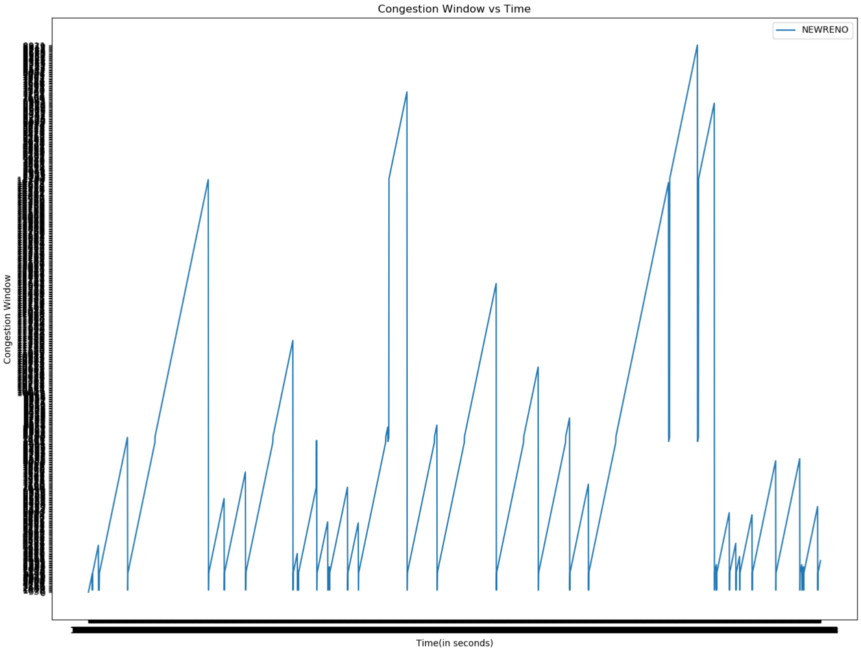


We observe that as we increase application data rate the number of packets increase substantially as the number of points in the graph increases.

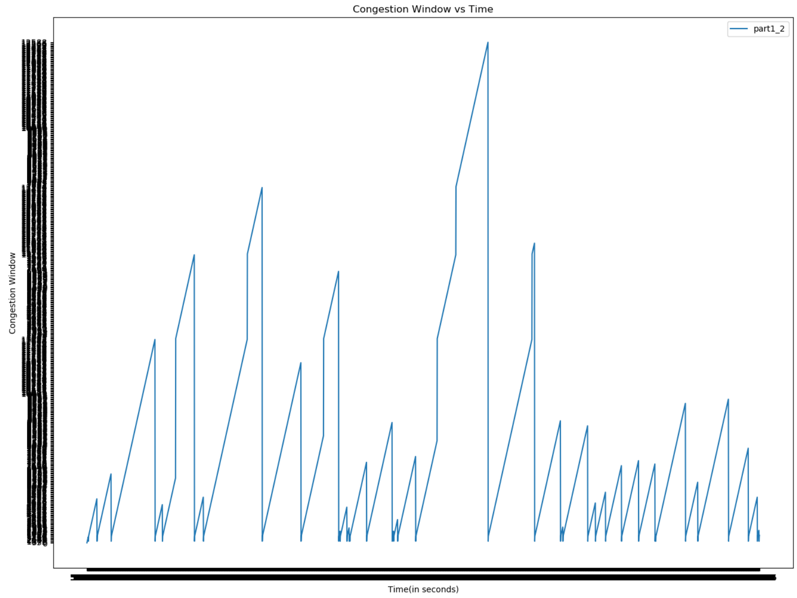
Also in each of the graphs the congestion windows shows an increasing behavior,more and more as we increase data rate.

PART 3

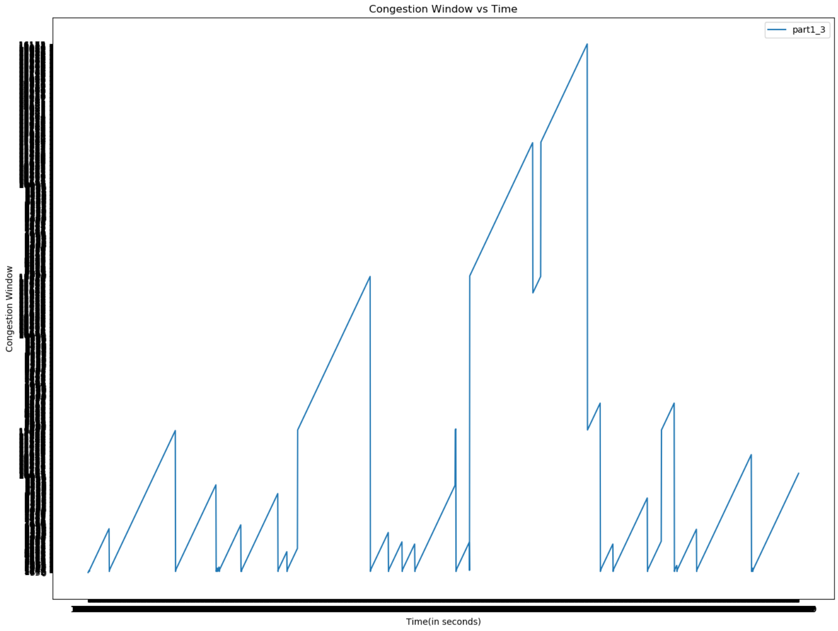
1. Graph for Part 1 For connection 1:



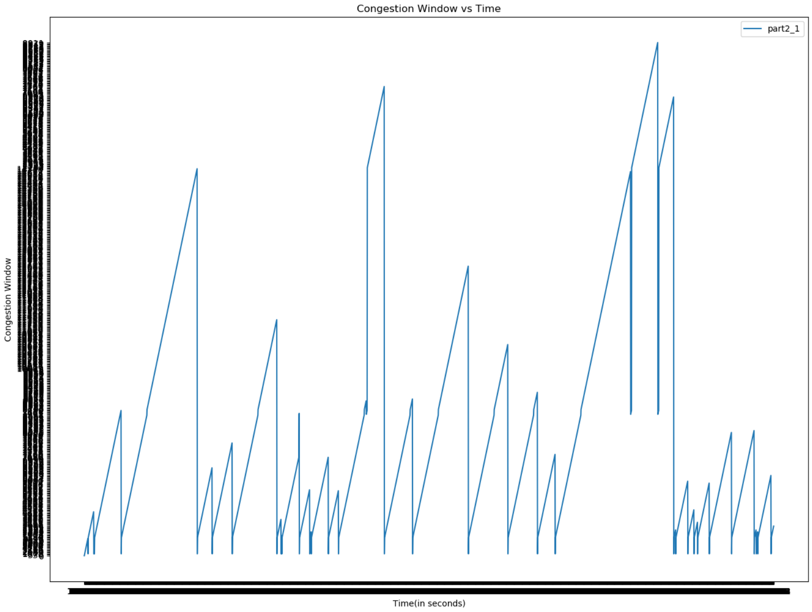
CONNECTION 2



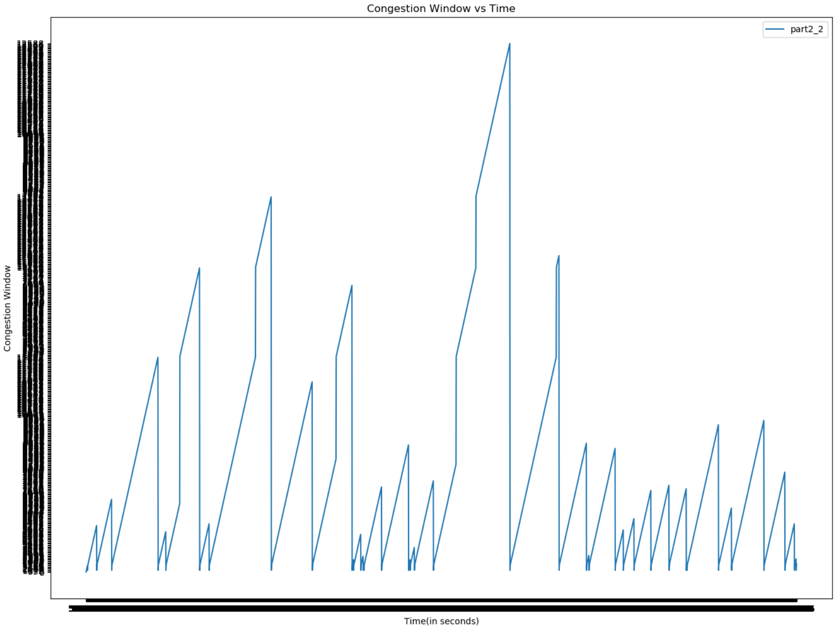
CONNECTION 3



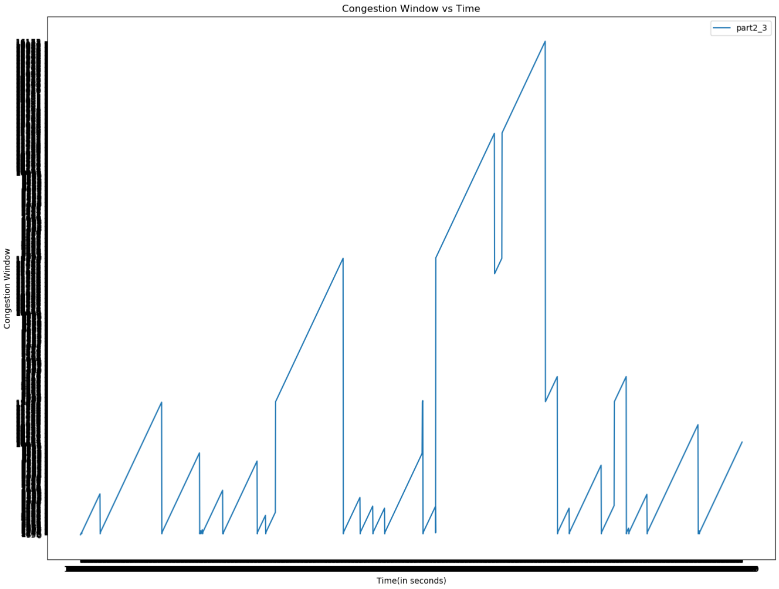
PART 2 CONNECTION 1



CONNECTION 2



CONNECTION 3



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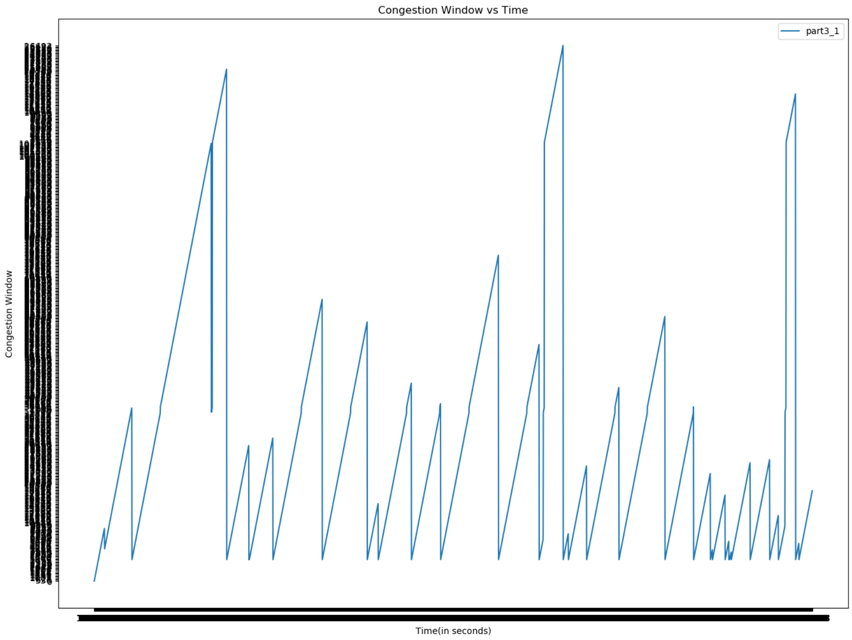
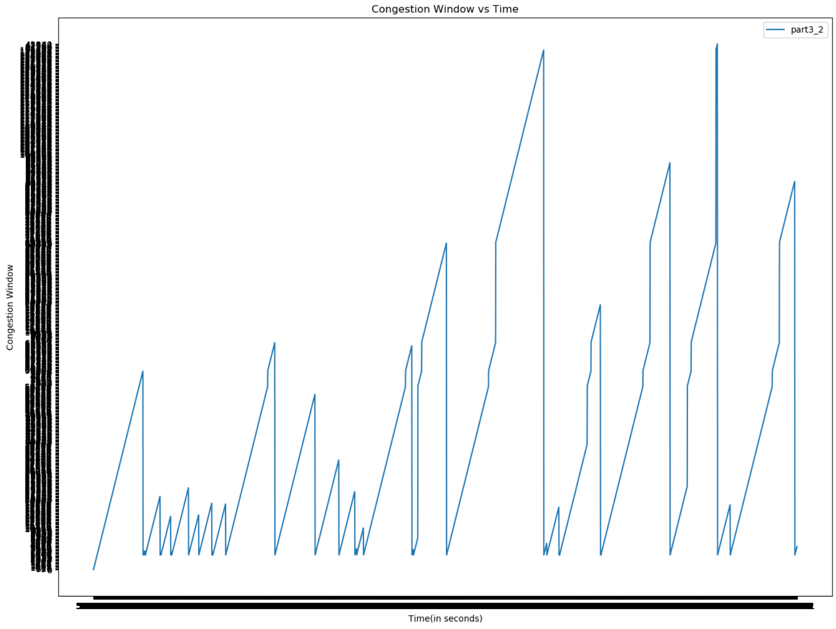
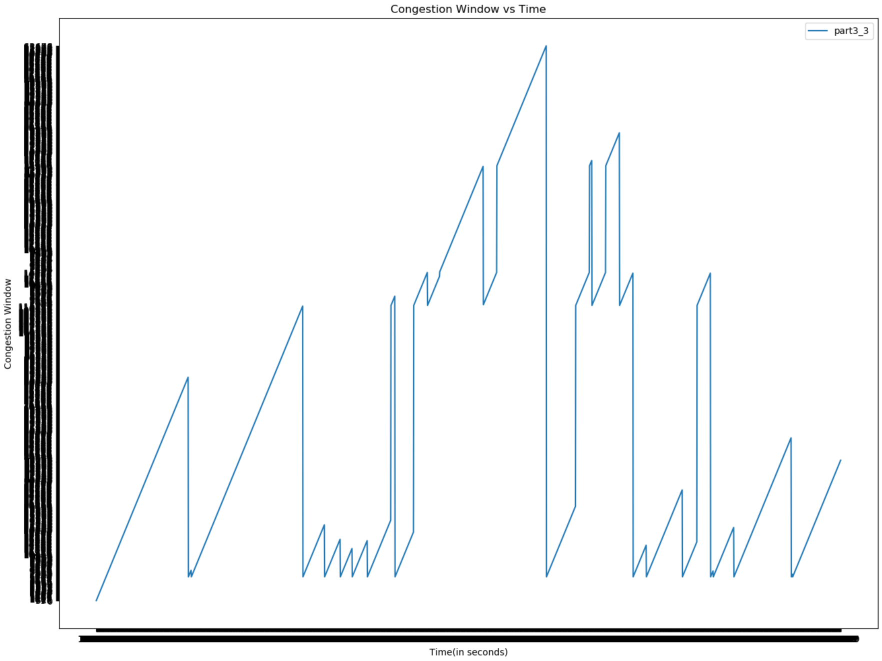


CONNECTION 2



CONNECTION 3



2.

Part	1	2	3
Total Dropped packets	108	108	107

We infer from this that the protocol used does not affect the packets dropped significantly as we saw in part1 for various tcp protocols

3. By comparing graphs of part 1 and part 3 where all connections have TcpNewReno and TcpNewRenoCSE respectively,we observe that the number of packets are increased also the congestion window values are higher overall in tcprenoCSE
AS tcpnewrenocse has exponential increase in Congestion avoidance it is evident in the graph/ Also for slow start also we can see that in tcpnewrenoCSE it is a linear increase. Furthermore there is a large difference in congestion window values and tcpnewrenoCSE values are higher

Extra libraries used is matplotlib only for the purpose of plotting the graph

The graphs have a black line in place of ticks and that was due to a large number of values which could not be properly spaced
This may have been a problem with just my device.