CS588 SYSTEM LAB ASSIGNMENT 3

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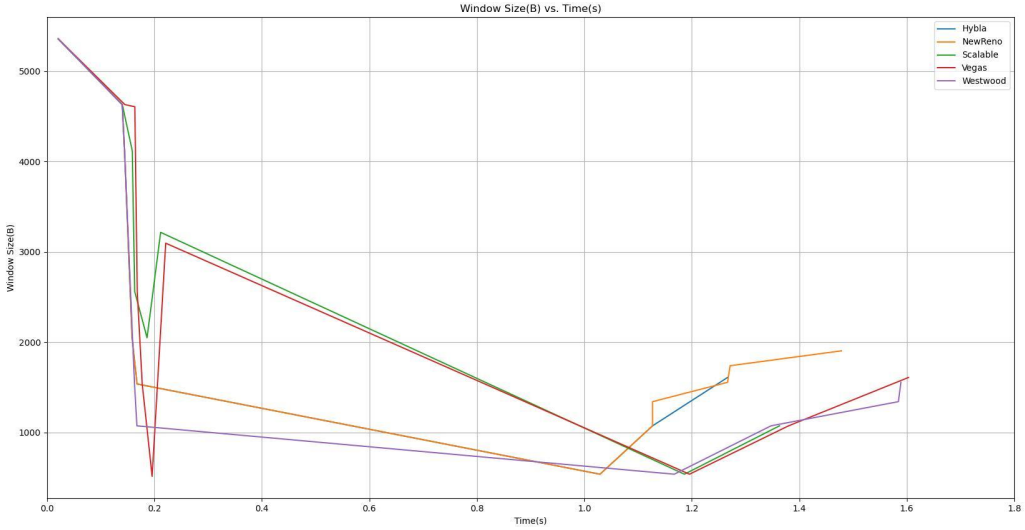
1.Plot graph(s) of TCP congestion window w.r.t. time for following 5 TCP congestion control algorithm
implementations, and describe the TCP congestion control algorithms' behaviour.

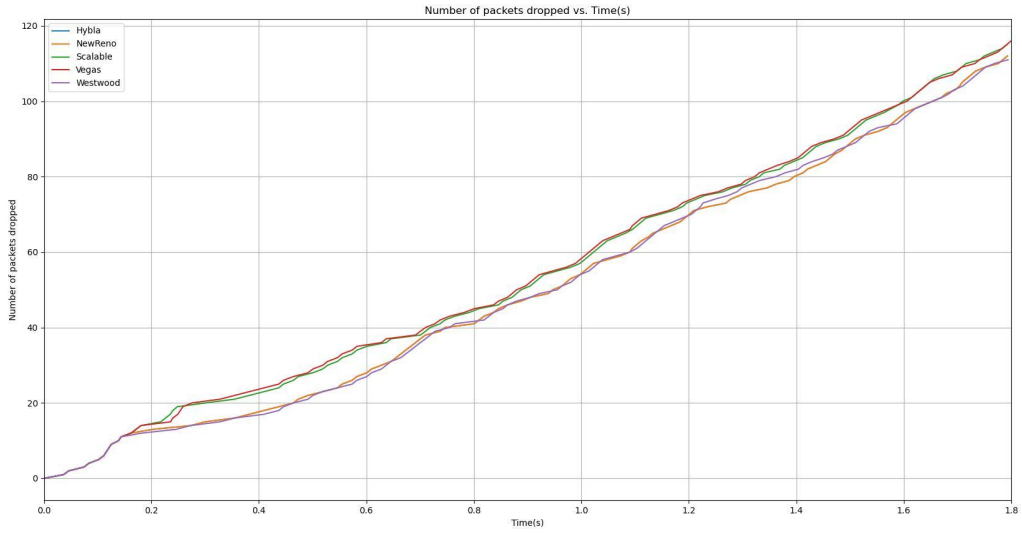
- Case 1: use TCP New Reno
- Case 2: use TCP Hybla
- Case 3: use TCP Westwood
- Case 4: use TCP Scalable
- Case 5: use TCP Vegas



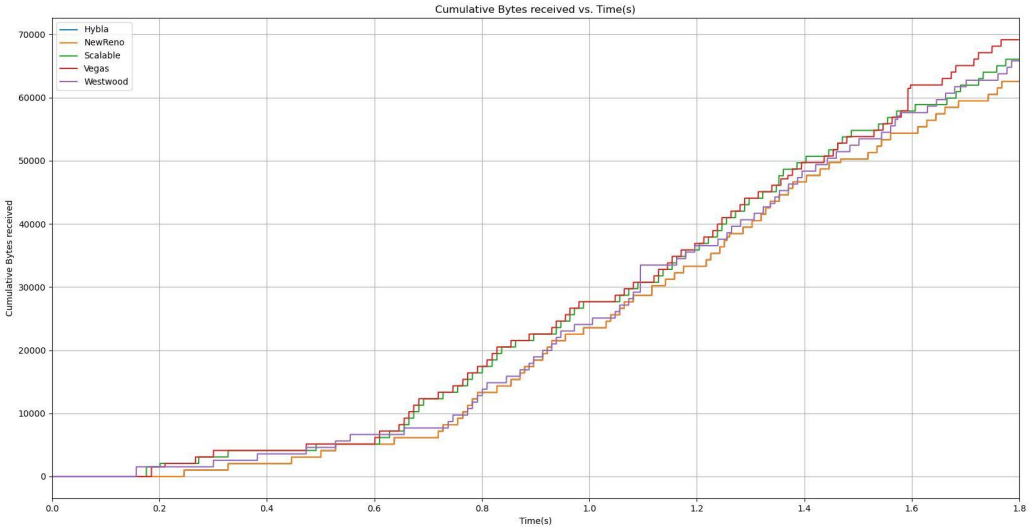
As we can see in the above diagram, TCP Scalable has the maximum congestion window size over time(till approx 1.1s) because in case of this protocol, it decreases congestion window by a small fraction(i.e. 1/8) when packet loss occurs and also it increases window size by a slow fixed rate hence takes little time to recover large window size.
TCP vegas is the most sensitive congestion control protocol. It reduces window size if the measured throughput is considerably lower than the estimated throughput. It gives up the bandwidth most easily so we can see at 0.199s(approx) TCP vegas window size is the least.
TCP hybla is very effective in high speed long distance networks.It changes window size based on estimated RTT and bottleneck bandwidth.

TCP westwood relies on rate of ack for controlling congestion window size. It controls window size by seeing available BW but in more conservative manner than TCP new reno or TCP vegas. Hence we can see window size is the least in case of TCP westwood(till approx 1.18 s).
TCP New reno uses fast recovery to recover quickly from packet losses when multiple packets are lost. It takes advantage of duplicate ack in case of multiple packet losses by resending the lost packet and continues to send new packets. It also uses fast retransmit to quickly retransmit a lost packet without waiting for a timeout. After 1.099 s(approx) we can see window size in case of TCP new reno is maximum.

2. Draw a graph showing cumulative TCP packets dropped w.r.t. time comparing above 5 TCP congestion control algorithm implementations.



3. Draw a graph showing cumulative bytes transferred w.r.t. time comparing above 5 TCP congestion
control algorithm implementations


Cumulative Bytes received vs. Time(s)
Hybla
NewReno
Scalable
Vegas
Westwood
Cumulative Bytes received
Time(s)
0
10000
20000
30000
40000
50000
60000
70000
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8