1 Congestion window sizes

The congestion window sizes are estimated at the sender since it makes more sense to do it there. This is because loss can be easily detected at the sender side based on triple dup acks or timeouts. The *initial congestion window size* is *11584* as per the analysis. Since TCP is byte addressed, the additive increase is not by one rather than some specific number of bytes. The percentage increase/decrease from the previous cwnd size is given in the second table.

Congestion window is the amount of data TCP can send into the network before receiving an ACK. Since seq numbers and ack numbers are byte indexed, we can find congestion window by simply subtracting the last received ack from the latest seq number sent. This gives us the size of the unacknowledged bytes which is the congestion window size.

	CONGESTION WINDOW SIZES		
CWND #	C1	C2	C3
1	11584	11584	11584
2	13032	13032	13032
3	14480	11584	11584
4	15928	15928	10136
5	17376	17376	8688
6	18824	15928	7240
7	20272	14480	5792
8	18824	17376	4344
9	17376	18824	2896
10	15928	17376	1448

	CWND SCALING FACTORS		
CWND	C1	C2	C3
1	11584	11584	11584
2	+12.0%	+12.0%	+12.0%
3	+11.0%	−11.0%	−11.0%
4	+10.0%	+38.0%	−12.0%
5	+9.0%	+9.0%	−14.0%
6	+8.0%	−8.0%	−17.0%
7	+8.0%	−9.0%	−20.0%
8	−7.0%	+20.0%	−25.0%
9	−8.0%	+8.0%	−33.0%
10	−8.0%	−8.0%	−50.0%

2 Computing retransmissions

The number of retransmissions based on triple dup acks, timeout and the total retransmissions are highlighted in the following table.

There are two types of retransmissions — timeout based and triple duplicate ack based.

Triple dup acks based retransmission: The triple dup ack based retransmissions are easy to figure out. You just have to find the number of packets with every ack number . If this count is greater than 3, then it's a triple duplicate ack induced retransmission.

Timeout based retransmissions: Timeout based retransmissions are difficult to figure out based on only the packet trace. However, we can find the number of timeout based retransmissions by simply subtracting the triple-dup-ack based retransmissions from the total number of retransmissions.

	RETRANSMISSIONS		
CONN #	TD ACKS	TIMEOUT	TOTAL
1	2	2	4
2	36	59	95
3	0	1	1