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Computer Networks and Distributed Systems
Exercise Sheet 6

Exercise 6.1

Consider two TCP connections that share a common channel. Both connections only transmit data in the same direction. At time $t = 1$ the `CongWin` of connection A is 10, the `CongWin` of connection B is 1. Both thresholds are 8 initially.

For simplification we consider time units of the size 1 RTT and ignore the transmission time $\frac{S}{R}$ of the segments. All data segments have the length $S = MSS$. Other segments are ignored.

At most 16 data segments can be transmitted per time unit. If more than 16 data segments are sent, segments get lost according to the following rules:

- Connection A sends 13 segments, connection B sends 8 segments $\rightsquigarrow$ 8 segments of connection A and 8 segments of connection B reach their destination.
- Connection A sends 7 segments, connection B sends 12 segments $\rightsquigarrow$ 7 segments of connection A and 9 segments of connection B reach their destination.
- Connection A sends 11 segments, connection B sends 7 segments $\rightsquigarrow$ 9 segments of connection A and 7 segments of connection B reach their destination.

a) Complete the following table according to the TCP algorithm for congestion control.
(Hint: Write a JAVA program to compute the table.)

t	1	2	...	15	Σ^*
$\texttt{CongWin}_A$	10	11			
$\texttt{CongWin}_B$	1	2			
$\Sigma^\dagger$	11	13			
Threshold_A	8	8			/
Threshold_B	8	8			/

b) Is the TCP congestion control fair?

c) Compute the utilization of the channel.

*Number of overall transmitted segments
†Number of transmitted segments in time unit t

Exercise 6.2

An object of size $O = 3000\,Bytes$ has to be transferred from a server to a client via an ISDN connection, We assume that the (static) window size of the transport protocol is $W = 3$, that $RTT = 100\,ms$ and that the segment size is $S = 500\,Byte$. Draw the time sequence diagrams.

a) A single B channel with $R = 64\,kbit/s$ *(= 64000 bit/s)* is used.

b) Two B channels are combined for $R = 128\,kbit/s$ *(= 128000 bit/s)*.

c) What cases for a static window size known from the lecture are we dealing with here?

Hint for a) and b) : Assume that each packet is acknowledged separately (no cumulative acknowledgments).