# TP - A closer look at TCP

https://beta.computer-networking.info/syllabus/default/exercises/tcp-2.html#open-questions

Assumptions (unless specified otherwise)

- RTT is fixed to 100 ms (=propagation delay * 2)

- RTO is 2*RTT = 200 ms

- The transmission delay for a single TCP segment is set to 1 ms, independently of its size

- The transmission delay for a TCP acknowledgment is negligible

- The initial value of the congestion window is one MSS-sized segment

- The value of the duplicate acknowledgment threshold is set to 3

- TCP always acknowledges each received segment

Open question 1
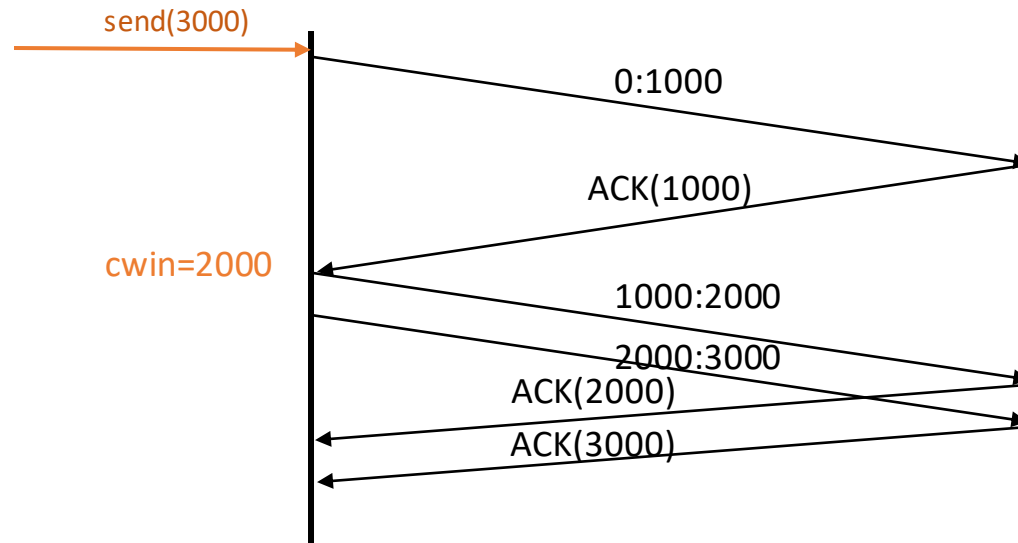
MSS = 1000
rwin=2000
cwin=1000
swin=min(rwin, cwin)
sbuffer=swin $-$ bytes_in_flight
ssthresh=64000

a. Can you explain why the sender only sends one segment first and then two successive segments ? (The delay between the two segments on the figure is due to graphical reasons)
b. Can you explain why the congestion window is increased after the reception of the first acknowledgment ?
c. How long does it take for the sender to deliver 3 KBytes to the receiver ?

Open question 2

send(3000)

MSS=1000
rwin=2000
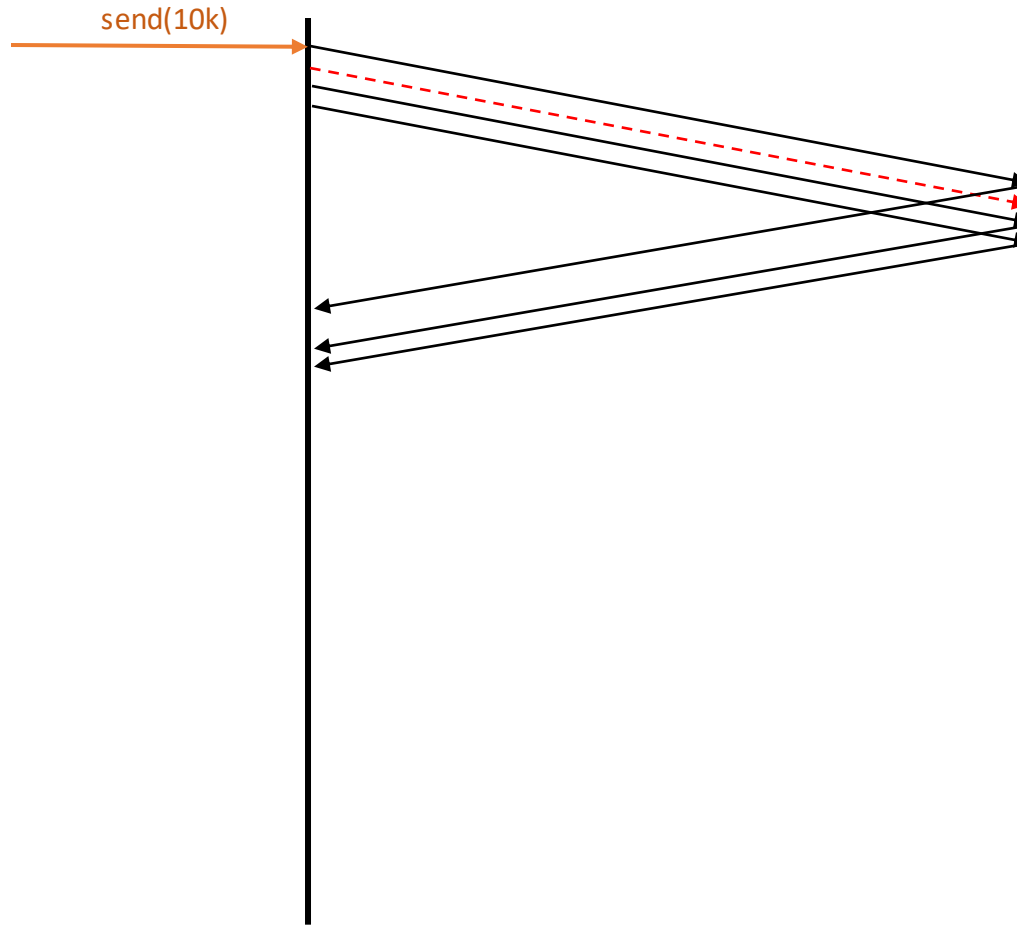cwin=10000
ssthresh=64000

Open question 3

send(5000)

MSS=500
rwin=2000
cwin=1000
ssthresh=64000

Open question 7

A TCP connection has been active for some time and has reached a congestion window of 4000 bytes. Four segments are sent, but the second (shown in red in the figure) is corrupted. Complete the time-sequence diagram.
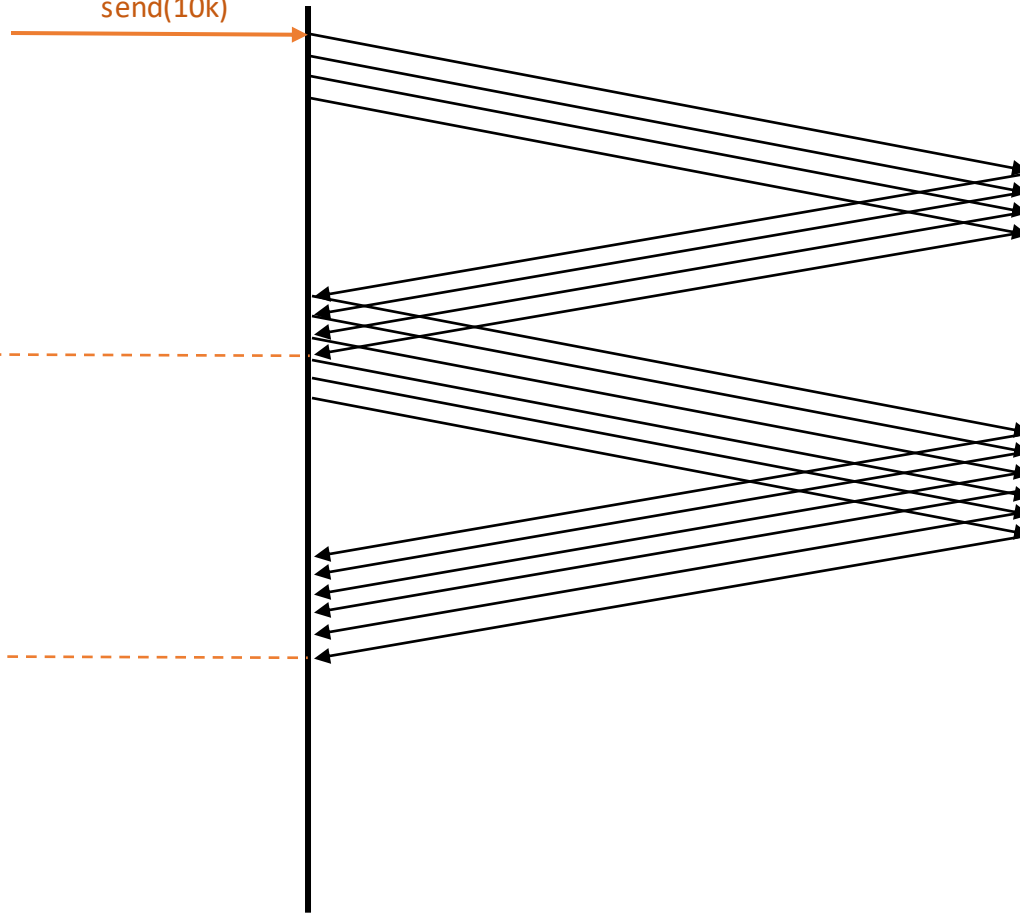
rwin=64000
cwin=4000
ssthresh=4000

send(10k)

Open question 6

rwin=64000
cwin=4000
ssthresh=64000

send(10k)

rwin=64000
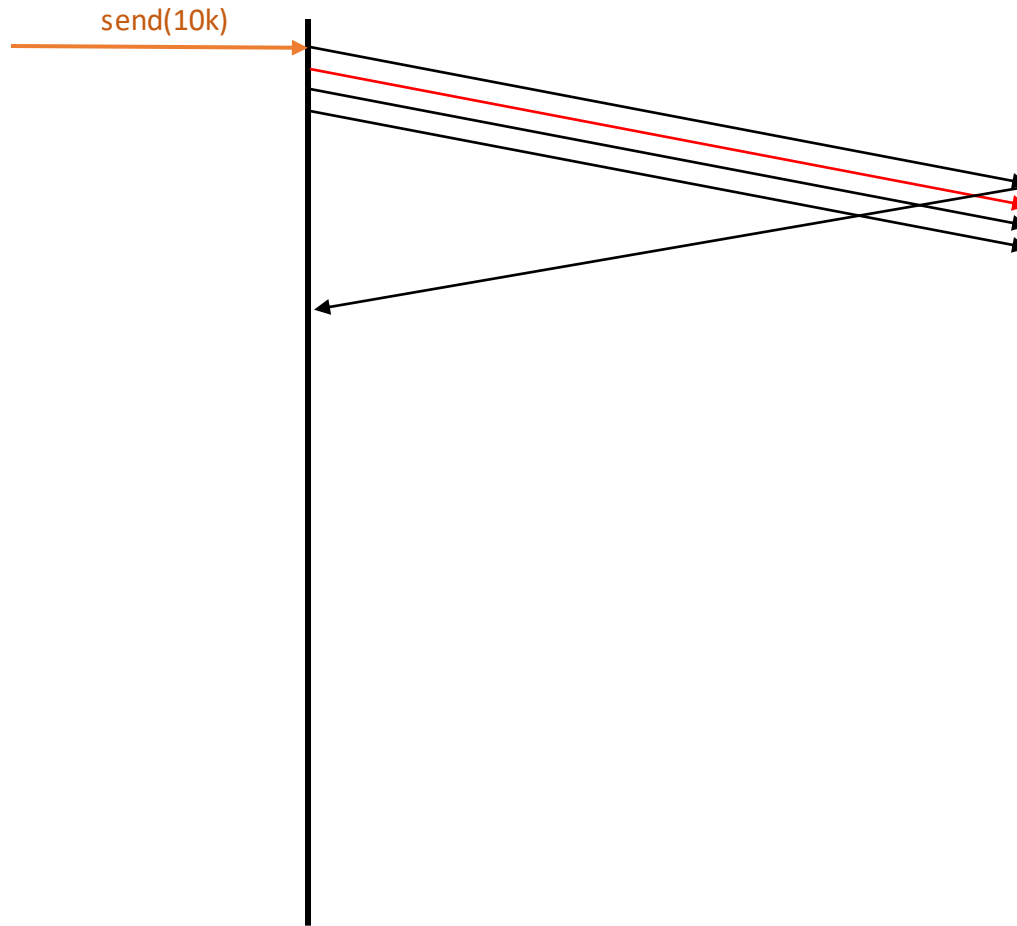cwin=8000
ssthresh=64000

rwin=64000
cwin=16000
ssthresh=64000

Open question 6.a

Redraw the same figure assuming that the second segment that was delivered by the sender in the figure experienced congestion. In a network that uses Explicit Congestion Notification, this segment would be marked by routers and the receiver would return the congestion mark in the corresponding acknowledgment.

rwin=64000
cwin=4000
ssthresh=64000

send(10k)

Open question 6.b

Redraw the same figure assuming that the fourth segment that was delivered by the sender in the figure experienced congestion. In a network that uses Explicit Congestion Notification, this segment would be marked by routers and the receiver would return the congestion mark in the corresponding acknowledgment.

rwin=64000
cwin=4000
ssthresh=64000

send(10k)