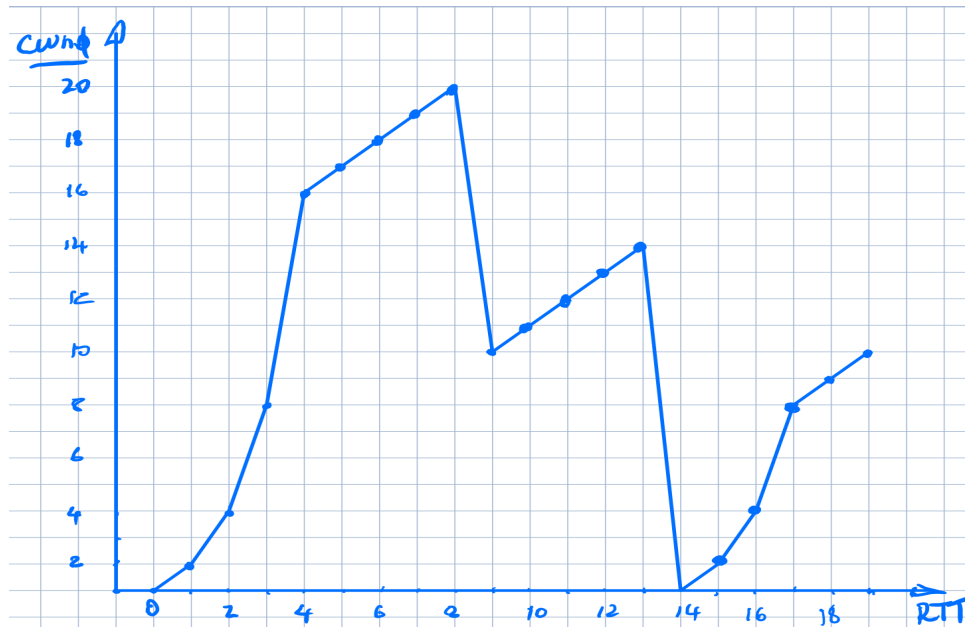


# CSIT5610 Computer Networks: An Internet Perspective

## Fall Semester 2019 -- Homework 2

### Problems:

- (30pts) Consider the following figure showing TCP congestion window size as a function of the transmission-round (or the RTT). Assuming each time there is a loss only one segment is lost and retransmitted. Answer the following, briefly justifying each answer.



- Which version of TCP is this and why? (3pts)
  - Per this figure, what is the initial value of ssthresh at round 0? (4pts)
  - In which rounds is Congestion avoidance active? (4pts)
  - In which rounds is slow start active? (4pts)
  - At time 8 was loss detected by 3-dup Acks or by timeout? (4pts)
  - At time 13 was loss detected by 3-dup Acks or by timeout? (3pts)
  - This figure has a flaw. Explain it and draw the correct version. (4pts)
  - At what round is segment 34 transmitted? (4pts)
- (30pts) Consider the TCP connections between an http client and an http server, using http 1.1. The transaction consists of an http request that consists of 100 bytes of data to which the server replies with an object of 3000 bytes. We consider a MSS of 1460 bytes and assume that the initial sequence number from the client to be 0 and from the server to be 100. Draw the exchange of TCP segments between the client and server from the connection establishment until the end, assuming the client closes the connection first. Label each segment with the sequence number, the number of bytes in the segment and the Ack number and the S,F,A flags if needed. We will use the following convention: S# for the sequence number, A# for the ack number, L# for the number of bytes in the segment, S, for the Sync bit, A for the Ack bit and F for the Fin bit. For example, the first segment to open the connection would be labelled with S, S#:0 (because it has the sync bit set and the initial sequence number is 0. Ignore transmission delay and propagation delay.

3. (10pts) Starting from the definition of TCP smooth RTT estimator studied in class, give an expression of the SRTT as a function of all the RTT samples measured from the beginning of the TCP connection.
4. (10pts) TCP recommends that when the estimated retransmission timeout is smaller than 1 second then it is set to 1 second. Most TCP implementations choose a value of RTO\_Min around 200 to 300 ms. Explain how this value affects the TCP delayed ACK mechanism.

**Practical Exercises (*compulsory Must be done*): (20pts)**

Wireshark TCP Lab: Check the course website under canvas in the Labs to find instructions for Wireshark TCP Lab. Follow the instructions given there. Do the questions using the Internet (not the traces) and submit your own answers with cropped screen captures in PDF for questions 3,4,5,6 only (5points each)