Homework 4

Due: Nov. 9

Chapter 3

Problem 1 (10 points) P27 in the 8th and 7th edition

Problem 2 (10 points) P31 in the 8th and 7th edition

Problem 3 (15 points) P40 in the 8th and 7th edition

Problem 4 (10 points) P41 in the 8th and 7th edition

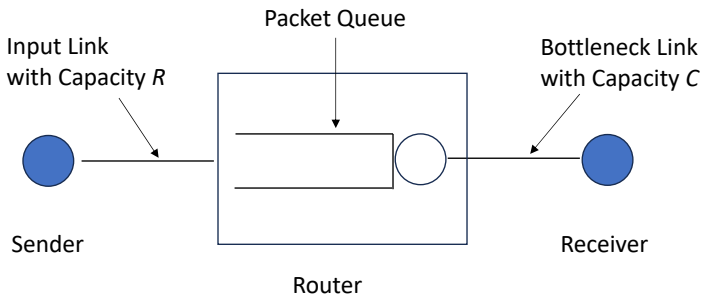
Problem 5 (5 points) P44 in the 8th and 7th edition

Problem 6 (10 points) P47 in the 8th (same as P45 in the 7th edition)

Problem 7 (10 points) P48 in the 8th (same as P46 in the 7th edition)

Hint: Think in terms of the simplest model, shown in the picture below. For this problem, the packet queue will be empty because there is no buffer. For Problem 8, there is buffer space and the packet queue can be non-empty. The following information may be useful to answer this problem and possibly many other problems related to TCP.

For this problem, the capacity of the bottleneck link is C=10 Mbps. The incoming link capacity $R>C$. It may appear that how much R is greater than C will matter. For instance, suppose R is nearly infinite. Then, even when the window size is W=2 segments, there will be packet losses because the sender can send two back-to-back segments at rate R, arriving at the router nearly at the same time. The router output link can only handle one segment, and the second segment will be dropped. This description is not wrong. However, it doesn't happen typically. Roughly speaking, when the window size is W segments, the sender will not send W segments back-to-back at rate R, but at rate C. This is because the ACKs coming back to the sender arrive at rate C, which in turn is because data packets arrive at the receiver at rate C, being limited by the bottleneck link. In short, the bottleneck link paces the ACK arrivals back at the sender, which then affects how fast new data segments are transmitted by the sender.



Problem 8 (10 points) P49 in the 8th (same as P47 in the 7th edition)

Wireshark Lab on TCP (20 points) The lab description is provided on Canvas.