EE450 Introduction to Computer Networks

Homework #1, Fall 2019

Due Thursday, September 5th, 2019 in class

Reading Assignment:

Chapter 1

Problems to be solved:

1. Chapter 1, Page 67: R4
List six access technologies. Classify each one as home access, enterprise access, or wide-area wireless access.

2. Chapter 1, Page 68: R16
Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays or constant and which are variable?

3.
How long does it take a packet of length 1,500 bytes to propagate over a link of distance 35,200 km, propagation speed 3×10^8 m/s, and transmission rate 20 Mbps? More generally, how long does it take a packet of length L to propagate over a link of distance d, propagation speed s, and transmission rate R bps. Does this delay depend on packet length? Does this delay depend on transmission rate?

4. Chapter 1, Page 70: P3
Consider an application that transmits data at a steady rate (for example, the sender generates an N-bit unit of data every k time units, where k is small and fixed). Also, when such an application starts, it will continue running for a relatively long period of time. Answer the following questions, briefly justifying your answer:

a. Would a packet-switched network or a circuit-switched network be more appropriate for this application? Why?
b. Suppose that a packet-switched network is used and the only traffic in this network comes from such applications described above. Furthermore, assume that the sum of the application data rates is less than the capacities of each and every link. Is some form of congestion control needed? Why?

5. Chapter 1, Page 70: P4
Consider the circuit-switched network in Figure 1.13. Recall that there are 4 circuits on each link. Label the four switches A, B, C, and D, going in the clockwise direction.

a. What is the maximum number of simultaneous connections that can be in progress at any one time in this network?

b. Suppose that all connections are between switches A and C. What is the maximum number of simultaneous connections that can be in progress?
c. Suppose we want to make four connections between switches A and C, and another four connections between switches B and D. Can we route these calls through the four links to accommodate all eight connections?