CSCI 379- Homework 2 Solution

Due Sep 20th 11:59 PM

Based on Week 1 and 2 material

Question 1 (3 points):

Consider the two scenarios below:

- A circuit-switching scenario in which N_{cs} users, each requiring a bandwidth of 25 Mbps, must share a link of capacity 200 Mbps.
- A packet-switching scenario with N_{ps} users sharing a 200 Mbps link, where each user again requires 25 Mbps when transmitting, but only needs to transmit 20 percent of the time.

Answer the following:

1. When circuit switching is used, what is the maximum number of circuit-switched users that can be supported? Explain your answer.

   #User = 200/25 = 8. In circuit switching, the users get dedicated bandwidth.

2. For the remainder of this problem, suppose packet switching is used. Suppose there are 35 packet-switching users (i.e., N_{ps} = 35). Can this many users be supported under circuit-switching? Explain.

   No. Since in circuit switching, the users get dedicated bandwidth, the maximum number of users are 8, as calculated in Q1.

Question 2 (4 points):

Find the end-to-end delay (including the transmission delays and propagation delays) for packet of 1,000 bytes. The source and destination are separated by a link of distance 2,500 km. The propagation speed 2.5*10^8m/s, and transmission rate 2 Mbps.

Transmission Delay = Packet Size/Transmission Rate (L/R). = (1,000 bytes)/(2Mbps)

*= (1000*8 bits)/(2*10^6bps) = 8000/2*10^6 =4/10^3 = 4*10^-3 = 4msec*

*Propagation Delay = Distance/Speed = (2,500 km)/(2.5*10^8m/s)*
*=(2,500*1000)/(2.5*10^8) = (2.5*10^6)/(2.5*10^8) = 1/100 = 10/1000 = 10msec*

End to End Delay = Transmission Delay + Propagation Delay = 4+10 = 14msec

Question 3 (3 points):

Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates R1=500 kbps, R2=2 Mbps, and R3=1 Mbps.

a. Assuming no other traffic in the network, what is the throughput for the file transfer?
   The lowest rate, which is 500kbps
   Or min{R1, R2, R3}

b. Which link is the bottleneck?
   The link with the lowest rate. R1