

Assignment #1  
Csci4211 Spring 2019  
Due on Feb. 18th, 2019

Notes: There are five questions in this assignment. Each question has 10 points.

1. (10 pt.) Describe the following access networks connected to your home: DSL, HFC, and FTTH. What are the advantages and dis-advantages of each?
2. (10 pt.) There are 100 computers to be connected to each other. How many connections required if they are connected to each other with a direct link? Given a set of 5X5 switches (5 ports and each port has both input and output connections), what is the configuration that has any computer connected to any other computer with the minimum maximum distance? The distance is measured by the number of hops (switches) to be traversed.
3. (10 pt.) Compute the time required for circuit switching and packet switching with the following conditions:
  - The destination is 4 hops away from the source: three intermediate switches between the source and the destination, with 4 links.
  - The distance between source (and destination) computer to its connected switch is 1 Km. The distance between any two adjacent switches is 10 Km.
  - The signal propagation speed is  $5 \times 10^5$  m per second.
  - The message size is 5 Mega bits (1 Mega =  $10^6$ )
  - The maximum packet size is 200k bits ( $1k = 10^3$ . You can ignore the size of the header.).
  - The transmission speed of source (or end) computer to its connected switch is 100 Mbps (Mega bits per second). The link speed between adjacent switches is 10 Giga bits per second
  - The circuit setup time is  $2 \times 10^{-1}$  second for the case of circuit switching.
  - The processing time for routing decision including queuing delay at each switch is  $10^{-3}$  second.

In this case, which switching method has a shorter completion time? If the message size can be enlarged, is there a chance the other switching method can be better?

Note: Please show your computation steps.

4. (10 pt.) Consider the queuing delay in a router buffer (preceding an outbound link). Suppose all packets are  $L$  bits, the transmission rate is  $R$  bps, and the  $N$  packets simultaneously arrive at the buffer every  $LN/R$  seconds. Find the average queuing delay of a packet. (Hint: The queuing delay for the first packet is zero; for the second packet  $L/R$ ; for the third packet  $2L/R$ . The  $N$ th packet has already been transmitted when the second batch of packets arrives.)
5. (10 pt.) Describe today's Internet? Please pay attention to a) How is the Internet organized and managed? b) What is the design principles of Internet? c) How are

layering and protocols used? and d) How applications are supported? Your answer should be no more than two pages.