

## CCSI 3171 Assignment #1

**Due date:** May 21st, 11:59pm.

**Hand in:** Fill out the assignment cover sheet and attach to your assignment. Submit a hardcopy of your assignment in the 3171 assignment box. Any programming must **also** be submitted using the *submit* software that is described on the webpage.

**Notes:** Show your calculations for all questions.  
 Read the programming style guidelines on the course webpage.  
 Read the Dalhousie Policy on Plagiarism.

**Assignment Weight in Course = 5%**

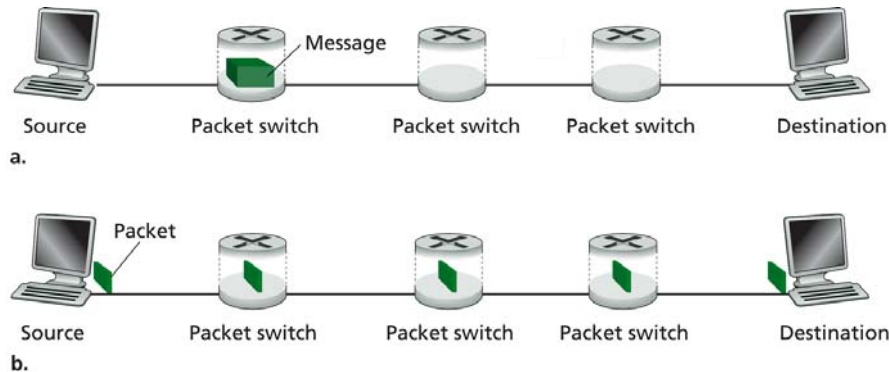
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(i) **[10 marks]:** John wants to send a picture of Napoleon Dynamite to Jane with his vintage Atari 520ST computer. The image is sent over a circuit switched network in 5 packets of 800 bits and one packet of 45 bits. All links are 100bps, but each link is divided into 7 FDM circuits. It takes 5.4 seconds to establish an end-to-end circuit. How long will it take for Jane to see the picture of Napoleon?



- (ii) **[50 marks]:** Suppose users share a 4.5Mb/s link. Each user is active 30% of the time. When a user is active, he or she uses 750 kb/s.
- a. If packet switching is used, what is the probability that a given user is not transmitting?
  - b. How many users will be able to use the network with circuit switching and why?
  - c. If packet switching is used and there are a total of 10 users, provide the formula for the probability that exactly  $x$  users are not transmitting at the same time.
  - d. If packet switching is used, find the probability that 7 or more users are transmitting at the same time. There are still a total of 10 users. Write a Java program to calculate this exactly (to the best precision of Java doubles). Include a printout of your code and the output of the program.
  - e. This network is going to be used by a classroom of 10 school children to surf the internet. Should the network use circuit switching or packet switching? Justify your answer.

- (iii) [15 marks]: In packet switched networks the source host segments long messages into smaller packets before sending them over the network. The following figure shows the end-to-end transport of a message without (a) and with (b) message segmentation:



Consider a message that is  $7.5 \times 10^6$  bits long that is to be sent from source to destination as in the figure. Suppose that each link is 1.5 Mbps. Ignore any propagation, queuing or processing delays.

- How long will it take to send the message as a single packet from source to destination and back again? Assume that the packet switches use store-and-forward transmission.
  - Now suppose that the message is segmented into 2,500 packets, with each packet being 3,000 bits. How long would it take to send all the packets from source to destination and back again? Assume that the destination system starts sending back packets as soon as it gets them and doesn't have to wait for the entire file.
  - Compare the results with and without using message segmentation and discuss.
- (iv) [25 marks]: First, read the document called “Ethereal: Getting Started”. Next, download the “busyNetwork.cap” file from the course webpage and use it to answer these questions based on your Ethereal experimentation. *Note that you can also use Wireshark instead of Ethereal.*
- List the different protocols that appear in the protocol column in the unfiltered packet-listing window. Which protocol was used the most? Which was used the least?
  - How long did it take from when the first HTTP GET message was sent until the first HTTP reply was received? By default, the value of the Time column in the packet-listing window is the amount of time, in seconds, since Ethereal tracing began. To display the Time field in time-of-day format, select the Ethereal View pull down menu, then select Time Display Format, then select Time-of-day.

- c. What are the Internet addresses of the source and destination for the 9<sup>th</sup> TCP packet?
- d. How many DNS packets arrived at 192.168.0.101?
- e. Print out the first packet of each protocol type that you listed for (a). To do so, select Print from the Ethereal File command menu, and select “Selected Packet Only” and “Print as displayed” and then click OK. Attach each of the packet printouts to your assignment.