COMP 535 Computer Networks 1

Assignment 1

Guidelines:

Please remember that the assignment must be solved individually. A pdf file with your solutions to the different exercises needs to be uploaded in the "Assignment 1" folder. This .pdf must be named A1_IDi.pdf, where IDi is your McGill id number. Inside the pdf file indicate your name and student id also in the header. **Due date: Feb 3, 11:59 PM**.

Exercise 1: (6 pts)

This exercise explores propagation delay and transmission delay, two central concepts in data networking. Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters, and suppose the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to Host B.

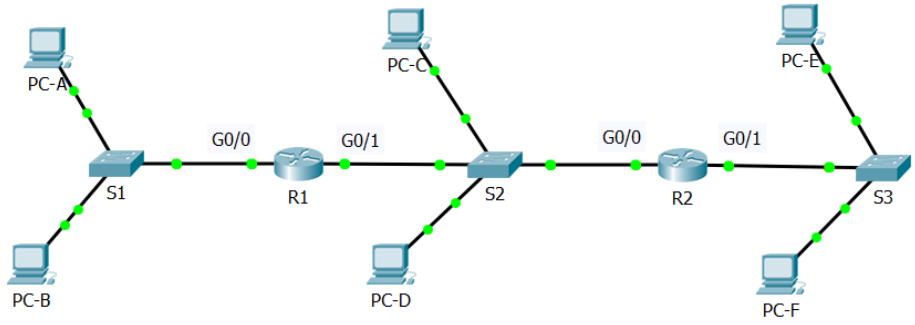
a. Express the propagation delay, d_{prop}, in terms of m and s.
b. Determine the transmission time of the packet, d_{trans}, in terms of L and R.
c. Ignoring processing and queuing delays, obtain an expression for the end-to-end delay, in terms of m, s, L and R.
d. Suppose Host A begins to transmit the packet at time $t = 0$. At time $t = d_{trans}$, where is the last bit of the packet? Justify.
e. Suppose d_{prop} is greater than d_{trans}. At time $t = d_{trans}$, where is the first bit of the packet? Justify.
f. Suppose d_{prop} is less than d_{trans}. At time $t = d_{trans}$, where is the first bit of the packet? Justify.
g. Find the expression of the distance m so that d_{prop} equals d_{trans}.
h. Suppose $s = 2.5 \cdot 10^8$ m/s, $L = 100$ bits, and $R = 250$ kbps. What is the value of m so that d_{prop} equals d_{trans}.

Exercise 2: (6 pts)

a. Which layer of the OSI model is concerned with MAC addresses?
b. How big is the MAC address space?
c. Which layer of the OSI model assigns IP addresses?
d. How big is the IP address space?
e. Why do need both MAC and IP addresses in networks? How are these two types of addresses different?
f) To which IPv4 class belongs each one of these IP addresses:
i) 5.100.6.4
ii) 235.40.14.12
iii) 2.375.8.3
iv) 190.0.0.0

Exercise 3: (6 pts)

Consider the figure below.



1. Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific destination MAC address?
2. Suppose PC-E wants to send an IP packet to PC-F. Assume that E's ARP table does not contain PC-F's Ethernet interface MAC address. Will PC-E perform an ARP query to find PC-F's Ethernet interface MAC address? Why?
3. Consider the following IP and MAC addresses:

	PC-A Ethernet	R1 G0/0	R1 G0/1	R2 G0/0	R2 G0/1	PC-F Ethernet
MAC	0060.2F38.AC0D	000E.18D3.CD41	0040.CD43.342C	0065.1323.EC34	0070.1453.AB04	0061.45F8.BB0C
IP	192.168.0.100/24	192.168.0.1/24	192.168.1.2/24	192.168.1.1/24	192.168.2.1/24	192.168.2.100/24

Suppose PC-A sends a packet to PC-F. Provide in the table below the source and destination MAC and IP addresses for the corresponding frame in each case:

	OUT OF PC-A	OUT OF R1 G0/1	OUT OF R2 G0/1
MAC DEST			
IP DEST			
MAC SRC			
IP SRC			

Exercise 4: (3 pts)

Perform a `traceroute` on a terminal between your machine and any other host on the Internet, preferably overseas. Provide snapshots of what was returned and analyze the returned information. Comment on any behavior that looks un-usual. Indicate the number of routers between your machine and the targeted host/server.

Command examples on terminal:
Windows: tracert orange.fr
MAC OS: traceroute orange.fr
Unix: traceroute orange.fr