ECEn 426: Networking Homework

1. (10 points) Did you do spend at least 30 minutes on the Getting Started Wireshark lab (http://www-net.cs.umass.edu/wireshark-labs/Wireshark_Intro_v8.0.pdf)?

   ◯ Yes

   ◯ No

2. (2 points) What are the benefits and drawbacks of using packet-switching vs circuit switching?

3. (2 points) Describe a human analogy for a protocol. What happens when someone does not follow the protocol?
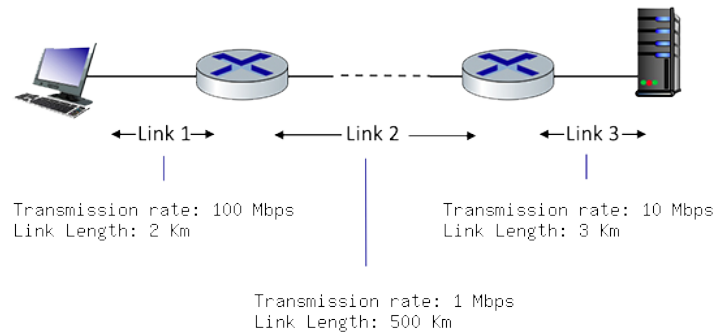
4. (3 points) What should a networking protocol define?

5. (2 points) What problems are introduced by using a store-and-forward transmission technique for routers and switches?

L: packet length (in bits)
R: link transmission rates (Mbps)

Queue of packets
waiting for output link
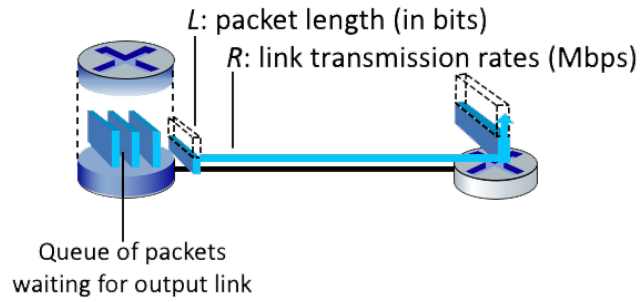
6. (1 point) Suppose that the packet length is **L = 16000 bits**, and that the link transmission rate along the link to router on the right is **R = 100 Mbps**.

(a) What is the transmission delay?

(b) What is the maximum number of packets per second that can be transmitted by this link?
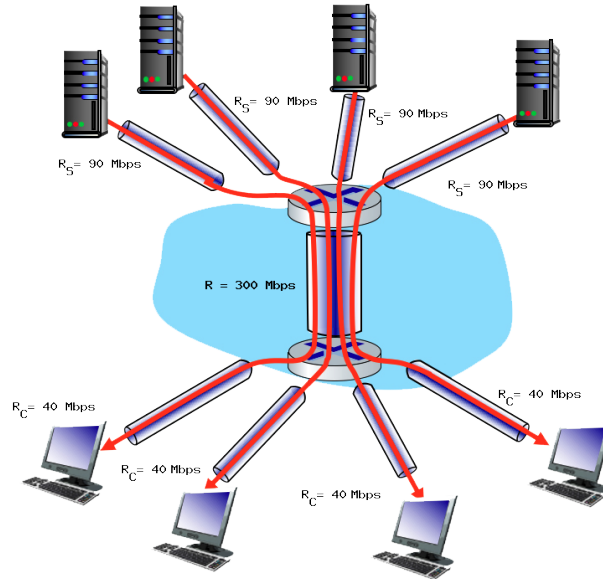
Transmission rate: 100 Mbps
Link Length: 2 Km

Transmission rate: 10 Mbps
Link Length: 3 Km

Transmission rate: 1 Mbps
Link Length: 500 Km

7. (2 points) Assume the length of a packet is 4000 bits. The speed of light propagation delay on each link is 3×10^8 m/sec.

   (a) What is the transmission delay and propagation delay for link 1?

   (b) What is the transmission delay and propagation delay for link 2?

   (c) What is the transmission delay and propagation delay for link 3?

   (d) What is the total end-to-end delay?

8. (2½ points) (a) What is the maximum achievable end-to-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fairly shared (divides its transmission rate equally)?

(b) Which link is the bottleneck link?

(c) Assuming that the servers are sending at the maximum rate possible, what are the link utilizations for the server links (R_S)?

(d) Assuming that the servers are sending at the maximum rate possible, what are the link utilizations for the client links (R_C)?

(e) Assuming that the servers are sending at the maximum rate possible, what is the link utilizations for the shared link (R)?