

ECE 358: Computer Networks

- (a) Consider two nodes (computers or routers), A and B, that have been connected by means of a single optical fibre link of length 2500 kilometers. Assume that optical signal propagates over the link at the speed of 2.5×10^8 m/s (meter/sec), and the link speed is 2 Mbps. If computer A is sending a frame of length 1,000 bytes to B, how long does it take the frame to be completely copied from A to B?
- (b) Assume that a computer, A, is transmitting a frame to another computer, B, at a link speed (i.e., transmission rate) of 100 Mbps; the length of the CAT6 cable between A and B is 100 meters, and signal travels at the speed of 2×10^8 meters/sec in the cable. Compute the maximum number of bits of the frame that can simultaneously appear on the cable.
- (c) Suppose that host A wants to send a 1 Gigabit file to host B. The network between A and B has three links (See Fig. 1.) of rates $R_1 = 4$ Mbps, $R_2 = 2$ Mbps, and $R_3 = 1$ Mbps. “Giga” means 10^9 , “Mega” means 10^6 , and “Kilo” means 10^3 . Assume that the propagation delays on the three links are zero seconds. Make other assumptions as necessary and appropriate.
- If A sends the file as 1000-byte packets, how long does it take to move the file from A to B? Show the details of your calculation.
 - Also, give an approximate answer to part (I) by using the concept of bottleneck bandwidth.

