Tutorial 2

Question 1

Consider two hosts A and B, connected by a single link of rate R bps. A and B are separated by d meters. The propagation speed along the link is s m/s. Host A is to send a packet of size L bits to host B.

(a)   Suppose host A begins to transmit the packet at time $t = 0$. At time $t = d_{trans}$ (transmission delay), where is the last bit of the packet?

(b)   Suppose d_{prop} (propagation delay) is greater than d_{trans}. At time $t = d_{trans}$, where is the first bit of the packet?

(c)   Suppose d_{prop} is less than d_{trans}. At time $t = d_{trans}$, where is the first bit of the packet?

(d)   Suppose $s = 2.5$ x 10^8 m/s, $L = 120$ bits, and $R = 56$ Kbps. Find d so that $d_{prop} = d_{trans}$.

Question 2

Consider two hosts A and B, connected by links of rate 1.5 Mbps. Each link is 309 Km long. The propagation speed along the link is 2 x 10^8 m/s. There are 3 routers between hosts A and B. Each router spends 1.5 ms to perform error detection. Assume there is no congestion in the network. Host A is to send a 1,200-byte packet to host B.

(a)   At what time the last bit of the packet leaves host A? L/R   6.4ms

(b)   At what time the last bit of the packet reaches the first router?   7.945ms
6.4ms+309000/2x10^8

(c)   What is the total end-to-end delay for the packet to reach host B? 0.03628, 36.28ms

Question 3

Suppose there are 120 client-server pairs. Each server link has the rate of 10 Mbps. Each client link has the rate of 100 Mbps. The network link has the rate of 1 Gbps. What is the maximum end-to-end throughput between the server and client?   =10^9

10^9/120