

City University of Hong Kong  
Department of Electronic Engineering

**EE3009 Data Communications and Networking**

**Tutorial 1**

1. 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 that 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. 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 the processing delay and queueing delays, obtain an expression for the end-to-end delay.
  - 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?
  - e. Suppose  $d_{prop}$  is greater than  $d_{trans}$ . At time  $t=d_{trans}$ , where is the first bit of the packet?
  - f. Suppose  $d_{prop}$  is less than  $d_{trans}$ . At time  $t=d_{trans}$ , where is the first bit of the packet?
  - g. Suppose  $s=2.5 \times 10^8$ ,  $L=120$  bits, and  $R=56$  kbps. Find the distance  $m$  so that  $d_{prop}$  equals  $d_{trans}$ .
2. Consider a TCP connection between Host A and Host B. Suppose that the TCP segments travelling from Host A to Host B have source port number 37 and destination port number 61. What are the source and destination port numbers for the segments travelling from Host B to Host A?
3. For IP telephony and IP video calls, which one of TCP and UDP would be preferable? Justify your answer.
4. Compare the size of overheads between TCP and UDP.
5. Suppose a process in Host C has a UDP socket with port number 6789. Suppose both Host A and Host B each send a UDP segment to Host C with destination port number 6789. Will both of these segments be directed to the same socket at Host C? If so, how will the process at Host C know that these two segments originated from two different hosts?