EE3009 Tutorial 2

(Internet Structure, Delay)

Review Question

- What are the three components of the Internet structure?
- What are the four most important types of delay in a computer network?

Problem

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 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) Determine the propagation delay, d_{prop}.
   b) Determine the transmission time of the packet, d_{trans}.
   c) Ignoring processing and queuing 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 $s = 2.5 \times 108$ m/sec, $L = 100$ bits, and $R = 28$ kbps. Find the distance m so that d_{prop} equals d_{trans}.

2. Consider sending a file of 10,000 bits from Host A to Host B. There are three links (and two routers) between A and B. The transmission speed of each link is 10 Mbps. The routers are store-and-forward devices. Assume that propagation delay is negligible. Calculate the total time required to transmit the file from A to B
   a) as a single packet.
   b) as two 5000-bit packets sent one right after the other.
   (*Do you know how to calculate the total delay if propagation delay cannot be neglected?*)

Computer Exercise (Marks will be given to you if you successfully completed the following exercise.)

3. In this exercise, you will make use of the `ping` service provided by the following web site:
   http://lookingglass.pccwglobal.com/
   First, choose Hong Kong as the source. Then choose (i) Taipei (ii) New York City as the destination. In each case, what is the approximate round trip time (RTT) from Hong Kong to the selected destination? Which case has a longer RTT? Why? Explain it to your tutor.