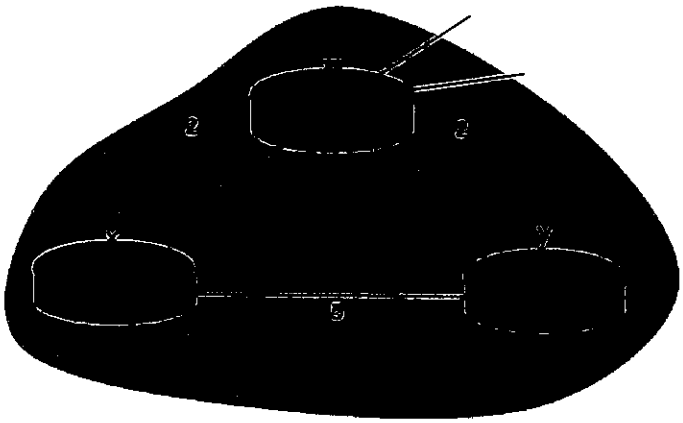
100-2學期電腦網路

1. Consider a packet of length $L$ which begins at end system A, travels over one link to a packet switch, and travels from the packet switch over a second link to a destination end system. Let $d_i$, $s_i$, and $R_i$ denote the length, propagation speed, and the transmission rate of link $i$ for $i = 1, 2$. The packet switch delays each packet by $d_{proc}$. Assuming no queueing delay, in terms of $d_i$, $s_i$, $R_i$, ($i = 1, 2$), and $L$, what is the total end-to-end delay for the packet?
   Suppose now the packet is 1000 bytes, the propagation speed on both links is 2.5 x $10^8$ m/s, the transmission rates of both links is 1 Mbps, the length of the first link is 4000 km, and the length of the last link is 1000 km. For these values, what is the end-to-end delay?
2. Explain briefly what is ISO/OSI 7-layer protocol reference model? What are the advantages of dividing the network protocol into layers? What are the possible problems behind it?
3. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose n DNS severs are visited before your host receives the IP address from DNS; the successive visits incur an RTT of $RTT_1$, ..., $RTT_n$. Further suppose that the Web page associated with the link contains exactly one object, containing of a small amount of HTML text. Let RTT0 denote the RTT between the local host and the server containing the object.
   (a) Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object?
   Suppose the HTML file references three very small objects on the same server. Neglecting transmission times, how much time elapses with
   (b) Non-persistent HTTP with parallel connections?
   (c) Non-persistent HTTP with no parallel connections?
   (d) Persistent HTTP? (10)
4. There are four types in DNS Resource Records (RRs), what are they and what are they used for? If you want to let your file server and your mail server to have the same aliased name to your customer, how can the DNS help you? Please use an example to explain it.
5. Write a simplified pseudo code for TCP sender. Then please add fast retransmit in your pseudo code.
6. Consider a network fragment shown below. x has only two attached neighbors, w and y. w has a minimum-cost path to destination u (not shown) of 5, and y has a minimum-cost path to u of 6. The complete paths from w and y to u (and between w and y) are not shown. All link costs in the network have strictly positive integer values.
   (a) Give x's distance vector for destinations w, y, and u.
   (b) Give a link-cost change for either c(x,w) or c(x,y) such that x will inform its neighbors of a new minimum-cost to u as a result of executing the distant-vector algorithm.
   (c) Give a link-cost change for either c(x,w) or c(x,y) such that x will not inform its neighbors of a new minimum-cost to u as a result of executing the distant-vector algorithm.



7. Suppose three active nodes-nodes A, B, and C-are competing for access to a channel using slotted ALOHA. Assume each node has an infinite number of packets to send. Each node attempts to transmit in each slot with probability p. The first slot is numbered slot 1, the second slot is numbered slot 2, and so on.
   (a) What is the probability that node A succeeds for the first in slot 4?
   (b) What is the probability that some node (either A, B, or C) succeeds in slot 2?
   (c) What is the probability that the first success occurs in slot 4?
   (d) What is the efficiency of this three-node system?
8. 1 1 1 -1 1 -1 -1 -1 and 1 -1 1 1 1 -1 1 1 are two orthogonal codes or chipping sequences for CDMA. Please use those two codes and draw a graph to show we can transmit two data bits (streams) within the same frequency range and retrieve two data bits (streams) correctly at receivers

9. Please use graphs and explanations to describe two types of loss anticipating schemes for recovering from packet loss.

10. Recall that the macroscopic description of TCP throughput. In the period of time from when the connection's rate varies from W/(2RTT) to W/RTT, only one packet is lost (at the very end of the period)
    (a) Show the loss rate (fraction of packets lost) L.
    (b) Use the result to show if a connection has loss rate L, then its average rate is approximately given by $L = \frac{1}{\frac{3}{8}W^2 + \frac{3}{4}W}$.