

# Answers to exercise #2 of Computer Networks

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## Questions.

1. Consider sending a file of  $M \times L$  bits over a path of  $Q$  links. Each link transmits at  $R$  bits per second. The network is lightly loaded so that there are no queuing delays. When a form of packet switching is used, the  $M \times L$  bits are broken up into  $M$  packets, each packet with  $L$  bits. Propagation delay is negligible.
  - (a) Suppose the network is a packet-switched virtual circuit network. Denote the VC set-up time by  $t_s$  seconds. Suppose the sending layers add a total of  $h$  bits of header to each packet. How long does it take to send the file from source to destination?
  - (b) Suppose the network is a packet-switched datagram network and a connectionless service is used. Now suppose each packet has  $2h$  bits of header. How long does it take to send the file?
  - (c) Repeat case 1b but assume message switching is used (that is,  $2h$  bits are added to the message, and the message is not segmented).
  - (d) Finally, suppose that the network is a circuit-switched network. Further suppose that the transmission rate of the circuit between source and destination is  $R$  bit/s. Assuming  $t_s$  seconds of set-up and  $h$  bits of header appended to the entire file, how long does it take to send the file?