Quiz #1 of introduction to networking

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1 Review questions

1. What is the difference between a host and an end system? List different types of end systems. Is a mail server an end system?

2. What is a client program? What is a server program?

3. What are the two kinds of services that the Internet provides to the applications? Describe some typical features of each.

4. Are the objectives of flow control and congestion control the same?

5. Give a very short description of how the connection-oriented service of the Internet provides reliable transport. What is the name of this service, by the way?

6. Suppose there is exactly one packet switch between a sending host and a receiving host. The transmission rates between the sending host and the switch and between the switch and the receiving host are R_1 and R_2, respectively. Assuming that the switch uses store-and-forward packet switching, what is the total end-to-end delay to send a packet of length L? (Ignore queuing, propagation delay and processing delay.)

2 Problems

1. Design and describe an application-level protocol to be used between an automatic teller machine (ATM) and a bank's centralised computer. Your protocol should allow a user's card and password to be verified, the account balance (which is maintained at the bank's centralised computer) to be queried, and an account withdrawal to be made (money is given to the customer).

   Specify your protocol by listing the messages exchanged and the action taken by the ATM or the bank's centralised computer on transmission or receipt of each message.

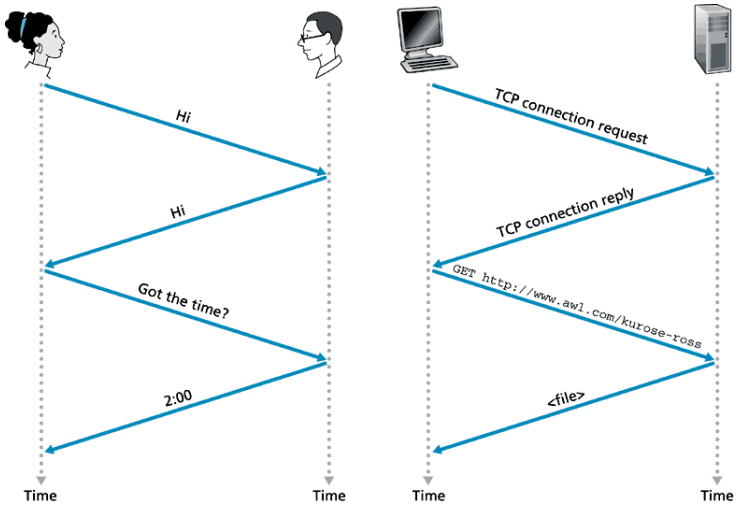

Figure 1: Sketch of protocols

Sketch the operation of your protocol for the case of a simple withdrawal with no errors, using a diagram similar to Figure 1. Explicitly state the assumptions made by your protocol about the underlying end-to-end transport service.

2. Consider an application that transmits data at a steady rate: it generates an N-bit unit of data every k time units, where k is small and fixed. Also, when such an application starts, it will continue running for a long period of time. Answer the following questions, briefly justifying your answer.

   (a) Would a packet-switched network or a circuit-switched network be more appropriate for this application? Why?

   (b) Suppose that a packet-switched network is used and the only traffic in this network comes from such applications as described above. Furthermore, assume that the sum of the application data rates is less than the capacities of each and every link. Is some form of congestion control needed? Why?