

Computer Network – Review Questions

Chapter 1

1. What are the two types of services that the Internet provides to its applications? What are some of characteristics of each of these services?
2. It has been said that flow control and congestion control are equivalent. Is this true for the Internet's connection-oriented service? Are the objectives of flow control and congestion control the same?
3. What advantage does a circuit-switched network have over a packet-switched network?
4. Suppose that between a sending host and a receiving host there is exactly one packet switch. 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 router uses store-and-forward packet switching, what is the total end-to-end delay to send a packet of length L . (Ignore queuing and propagation delay)
5. Review the car-caravan analogy in Section 1.6. Again assume a propagation speed of 100km/hour.
 - (a) Suppose the caravan travels 200 km, beginning in front of one toll booth, passing through a second toll booth, and finishing just before a third toll booth. What is the end-to-end delay?
 - (b) Repeat (a), now assuming that there are 7 cars in the caravan instead of 10.
6. What are the five layers in the Internet protocol stack? What are the principle responsibilities for each of these layers?
7. Which layers in the Internet protocol stack does a router process?

Chapter 2

1. For a communication session between two hosts, which host is the client and which is the server?
2. What information is used by a process running on one host to identify a process running on another host? Why do HTTP, FTP, SMTP, POP3 and IMAP run on top of TCP rather than UDP?
3. Why is it said that FTP sends control information "out of band"?
4. Suppose Alice with a Web-based e-mail account (such as Yahoo! mail or Hotmail) sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.
5. From a user's perspective, what is the difference between the *download-and-delete* mode and the *download-and-keep* mode in POP3?
6. Each Internet host will have at least one local name server and one authoritative name server. What role does each of these servers have in DNS?

7. Is it possible that an organization's Web server and mail server have exactly the same alias for a hostname (e.g., foo.com)? What would be the "type" for the RR that contains the hostname of the mail server?
8. Suppose a user requests a Web page that consists of some text and two images. For this page the client will send one request message and receive three response messages? (true or false)

Chapter 3

1. Consider a TCP connection between host A and host B. Suppose that the TCP segments traveling from host A to host B have source port number x and destination port number y . What are the source and destination port numbers for the segments travelling from host B to host A?
2. Describe why an application developer may choose to run its application over UDP rather than TCP. Suppose host A is sending a large file to host B over a TCP connection. If the sequence number for a segment of this connection is m , then the sequence number for the subsequent segment will necessarily be $m+1$?
3. Suppose host A sends host B one segment with sequence number 38 and 4 bytes of data. Then in this same segment the acknowledgement number is necessarily 42?
4. Suppose A sends two TCP segments back-to-back to B. The first segment has sequence number 90; the second has sequence number 110. a) How much data is the first segment? b) Suppose that the first segment is lost, but the second segment arrives at B. In the acknowledgement that B sends to A, what will be the acknowledgment number?
5. Consider the Telnet example discussed in Section 3.5. A few seconds after the user types the letter 'C' the user types the letter 'R'. After typing the letter 'R' how many segments are sent and what is put in the sequence number and acknowledgement fields of the segments.
6. Consider transferring an enormous file of L bytes from host A to host B. Assume an MSS of 1460 bytes.
 - a) What is the maximum length of L such that TCP sequence numbers are not exhausted? Recall that the TCP number field has four bytes.
 - b) For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network and data-link header are added to each segment before the resulting packet is sent out over a 10 Mbps link. Ignore flow control and congestion control, so A can pump out the segments back-to-back and continuously.
7. UDP and TCP use 1's complement for their checksums. Suppose you have the following three 8-bit words: 01010101, 01110000, 11001100. What is the 1's complement of the sum of these words? Show all work.

Chapter 4

1. What are the two main functions of a datagram-based network layer? What additional functions does a VC-based network layer have?

2. Suppose there are three routers between source and destination hosts. Ignoring fragmentation, an IP segment sent from source host to destination host will travel over how many interfaces? How many routing tables will be indexed to move the datagram from source to destination?
3. Suppose an application generates chunks 40 bytes of data every 20 msec, and each chunk gets encapsulated in a TCP segment and then an IP datagram. What percentage of each datagram will be overhead and what percentage will be application data?
4. Consider sending a 3000 byte datagram into a link that has a MTU of 500 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are their characteristics?
5. Describe three different types of switching fabrics commonly used in packet switches.
6. Why are buffers needed at the output ports of switches? Why are buffers needed at the input port of switches?

Chapter 5

1. In section 5.2.1, we listed for desirable characteristics of a broadcast channel. Slotted ALOHA has which of these characteristics? Token passing has which of these characteristics?
2. Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific LAN address?