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Review Questions CH 1

1.1 What is the difference between a host and an end system? List several different types of end systems. Is a Web server an end system? (2 marks)

Host is a network that is accessed from a remote location.

End systems are computer on the network that a request ends at.

Section 1.2R7. What are the different transmission rates of Ethernet LANs? (4 marks)

100Mbps, 1Gbps, 10Gbps

Section 1.3R12. What advantage does a circuit-switched network have over a packet-switched network? What advantages does TDM have over FDM in a circuit-switched network? (2 marks)

Dedicated resources, guaranteed performance. TDM has more frequency available than FDM.

Section 1.4R16. Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays are constant and which are variable? (5 marks)

Nodal is constant while queueing/transmission/propagation are variable.

Section 1.5R23. What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers? (10 marks)

Application – supports network applications. Transport – process-process data transfer. Network – routing of datagrams from source to destination. Link – data transfer between neighboring network elements. Physical – bits on wire.

Section 1.6R26. What is the difference between a virus and a worm? (2 marks)

Viruses require activation by their hosts and require a host to replicate. Worms monitor without activation and self-replicate.

Problems

P3. Consider an application that transmits data at a steady rate (for example, the sender 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 relatively 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? (2 marks)
    a. Circuit switching is more appropriate because of the length of time the application will run. Since packet switching can delay the transmission due to other applications using the same switcher circuit switching is better for more consistent performance.
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? (2 marks)
    a. If the packet buffer doesn't overflow then congestion control isn't required.

P24. Suppose you would like to urgently deliver 40 terabytes data from Boston to Los Angeles. You have available a 100 Mbps dedicated link for data transfer. Would you prefer to transmit the data via this link or instead use FedEx overnight delivery? Explain. (2 marks)

FedEx overnight delivery, the time it would take to transfer this much data would be almost 5 days thus it would be better to do overnight delivery to conserve time.

P31. In modern packet-switched networks, including the Internet, the source host segments long, application-layer messages (for example, an image or a music file) into smaller packets and sends the packets into the network. The receiver then reassembles the packets back into the original message. We refer to this process as message segmentation. Figure 1.27 illustrates the end-to-end transport of a message with and without message segmentation. Consider a message that is $8 \cdot 10^6$ bits long that is to be sent from source to destination in Figure 1.27. Suppose each link in the figure is 2 Mbps. Ignore propagation, queuing, and processing delays.

a) Consider sending the message from source to destination without message segmentation. How long does it take to move the message from the source host to the first packet switch? Keeping in mind that each switch uses store-and-forward packet switching, what is the total time to move the message from source host to destination host? (2 marks)
    a. 12 seconds. 8Mb / 2Mbps = 4 seconds each link is 2Mbps, 3 links, no change in data size, thus: 4 * 3 = 12 seconds.
b) Now suppose that the message is segmented into 800 packets, with each packet being 10,000 bits long. How long does it take to move the first packet from source host to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. At what time will the second packet be fully received at the first switch? (2 marks)
    a. 0.005 seconds to first switch.
    b. 0.005 seconds for first packet, second takes the same amount of time thus 0.01 seconds for the second packet.
c) How long does it take to move the file from source host to destination host when message segmentation is used? Compare this result with your answer in part (a) and comment. (3 marks)
    a. each packet takes 0.015 seconds from source to destination. 800 packets x 0.015 = 12 seconds. This is the same as the previous result, however this method is better to prevent data loss since the packet buffer will not be filled up with a large data file.
d) In addition to reducing delay, what are reasons to use message segmentation? (2 marks)
    a. Prevent data loss due to buffer overflow.
    b. Better congestion control.
e) Discuss the drawbacks of message segmentation. (2 marks)
    a. Congestion control could make data transfer take longer than expected.
    b. Possible data loss due to other applications.