CHAPTER 6

Computer Networks and Internet

(Solutions to Review Questions and Problems)

Review Questions

Q6-1. To make the communication bidirectional, each layer needs to be able to provide two opposite tasks, one in each direction.

Q6-3.

a. At the application layer, the unit of data is a message.

b. At the network layer, the unit of data is a datagram.

c. At the data-link layer, the unit of data is a frame.

Q6-5. A user datagram is a transport-layer data unit. It decapsulates a data unit going to the application layer. In this case, the data unit is a message.

Q6-7.

a. At the application layer, we normally use a name to define the destination computer name and the name of the file we need to access. An example is *something@somewhere.com.*

b. At the network layer, we use two logical addresses (source and destination) to define the source and destination computers. These addresses are unique universally.

c. At the data-link layer, we use two link-layer addresses (source and destination) to define the source and destination connections to the link.

Q6-9. A personal computer, such as a desktop or a laptop, is normally used as a client. If a business needs to use a computer as a server, it should be more powerful to allow several connections from clients at the same time.

Q6-11. Routing cannot be done at the transport layer, because the communication at the transport layer is one single logical path between the source port and the destination port. Routing cannot be done at the data-link layer because the communication at the data-link layer is between two nodes (one single path); there is no need for routing. On the other hand, there are several possible paths for a packet between the source host and destination host at the network layer. Routing is the job of selecting one of these paths for the packet.

Q6-13. Dial-up modems use part of the bandwidth of the local loop to transfer data. The latest dial-up modems use the V-series standards such as V.90 (56 kbps

for downloading and 33.6 kbps for uploading), and V.92 (56 kbps for downloading and 48 kbps for uploading).

Q6-15. The period of a signal is the inverse of its frequency: T = 1/*f*.

Q6-17. Normally, analog transmission refers to the transmission of analog signals using a band-pass channel. Baseband digital or analog signals are converted to a complex analog signal with a range of frequencies suitable for the channel.

Q6-19. The two major categories are guided and unguided media.

Problems

P6-1. The services provided in part a and part b are the opposite of each other.

a. Layer 1 takes the ciphertext from layer 2, inserts (encapsulates) it in an envelope and sends it.

b. Layer 1 receives the mail, removes (decapsulates) the ciphertext from the envelope and delivers it to layer 2.

P6-3. In 10 years, the number of hosts becomes about six times (1.2010 ? 6.19) the-number in 2010. This means the number of hosts connected to the Internet is more than three billion.

P6-5.

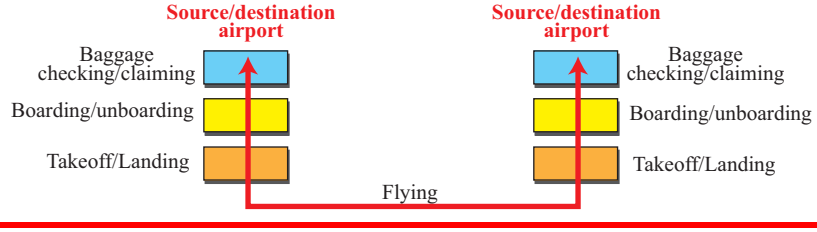
a. The network layer is responsible for route determination.

b. The physical layer is the only layer that is connected to the transmission media.

c. The application layer provides services for the end users.

P6-7. Figure 6.1 shows the layers. Note that we have not shown the security checking that you need to pass through because it does not have the counterpart when you arrive. It must be included in baggage/checking layer.

Figure 6.1 *Solution to P6-7*



P6-9. The domain of IP addresses is universal. A device directly connected to the Internet needs a unique IP address. The domain of port numbers is local; they can be repeated. Two computers running the HTTP server process use the same well-known port number (80); two computers running the HTTP client process can use the same ephemeral port number.

P6-11. We change each 8-bit section to the corresponding decimal value and insert dots between the bytes.

a. 94.176.117.21

b. 137.142.208.49

c. 87.132.55.15

P6-13.

a. (10 / 1000) s = **0.01 s**

b. (8 / 1000) s = 0. 008 s = **8 ms**

c. ((100,000 · 8) / 1000) s = **800 s**