
PRACTICE SET

Questions

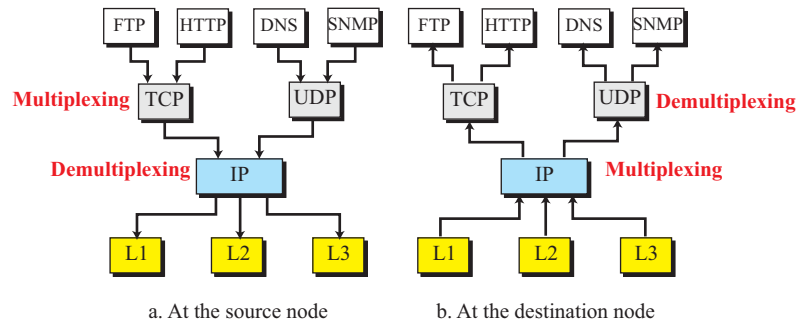
- Q2-1.** To make the communication bidirectional, each layer needs to be able to provide two opposite tasks, one in each direction.
- Q2-3.** The router is involved in:
- three physical layers,
 - three data-link layers,
 - and only one network layer.
- Q2-5.**
- At the application layer, the unit of data is a *message*.
 - At the network layer, the unit of data is a *datagram*.
 - At the data-link layer, the unit of data is a *frame*.
- Q2-7.** 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.
- Q2-9.** We mentioned HTTP, FTP, SMTP, SNMP, TELNET, SSH, and DNS.
- Q2-11.**
- 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*.
 - At the network layer, we use two logical addresses (source and destination) to define the source and destination computers. These addresses are unique universally.
 - At the data-link layer, we use two link-layer addresses (source and destination) to define the source and destination connections to the link.

- Q2-13.** The application layer is the top layer in the suite; it does not provide services to any layer, which means multiplexing/demultiplexing does not exist for this layer.
- Q2-15.** We do not need a router in this case because a router is needed when there is more than one path between the two hosts; the router is responsible for choosing the best path at each moment.

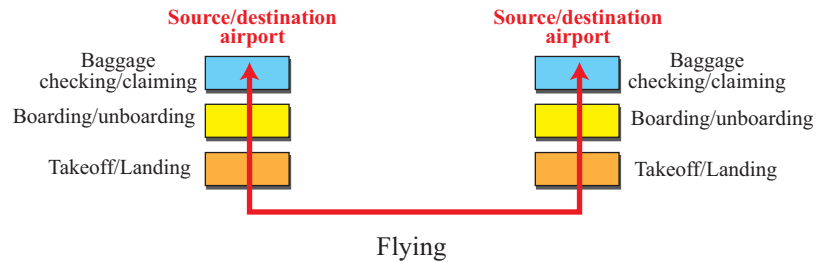
Problems

- P2-1.** The services provided in part a and part b are the opposite of each other.
- Layer 1 takes the ciphertext from layer 2, inserts (encapsulates) it in an envelope and sends it.
 - Layer 1 receives the mail, removes (decapsulates) the ciphertext from the envelope and delivers it to layer 2.
- P2-3.** In 10 years, the number of hosts becomes about six times ($1.20^{10} \approx 6.19$) the number in 2010. This means the number of hosts connected to the Internet is more than three billion.
- P2-5.** The advantage of using large packets is less overhead. When using large packets, the number of packets to be sent for a huge file becomes small. Since we are adding three headers to each packet, we are sending fewer extra bytes than in the case in which the number of packets is large. The disadvantage manifests itself when a packet is lost or corrupted during the transmission; we need to resend a large amount of data.
- P2-7.**
- User datagrams are created at the *transport layer*.
 - The *data-link layer* is responsible for handling frames between adjacent nodes.
 - The *physical layer* is responsible for transforming bits to electromagnetic signals.
- P2-9.** The following shows the situation. If we think about multiplexing as *many-to-one* and demultiplexing as *one-to-many*, we have demultiplexing at the source

node and multiplexing at the destination node in the data-link layer. However, some purists call these two *inverse multiplexing* and *inverse demultiplexing*.



- P2-11.** The following 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.



- P2-13.** The only two layers that need to be changed are the data-link layer and the physical layer. The new hardware and software need to be installed in all host, routers, and link-layer switches. As long as the new data-link layer can encapsulate and decapsulate datagrams from the network layer, there is no need to change any protocol in the upper three layers. This is one of the characteristics of the protocol layering.

P2-15. The following shows the layers and the flow of data. Note that each host is involved in five layers, each switch in two layers, and each router in three layers.

