TRAFFIC MANAGEMENT AT FLOW LEVEL

FIFO and Priority Queues: The simplest approach to managing a multiplexer involves first-in, first-out (FIFO) queuing where all arriving packets are placed in a common queue and transmitted in order of arrival, as shown in Figure 1.42a. Packets are discarded when they arrive at a full buffer. The delay and loss experienced by packets in a FIFO system depend on the inter arrival times and on the packet lengths. As inter arrivals become more bursty or packet lengths more variable, performance will deteriorate. Because FIFO queuing treats all packets in the same manner, it is not possible to provide different information flows with different qualities of service. FIFO systems are also subject to hogging, which occurs when a user sends packets at a high rate and fills the buffers in the system, thus depriving other users of access to the multiplexer.

A FIFO queuing system can be modified to provide different packet-loss performance to different traffic types. Figure 1.42b shows an example with two classes of traffic. When the number of packets reaches a certain threshold, arrivals of lower access priority (Class 2) are not allowed into the system. Arrivals of higher access priority (Class 1) are allowed as long as the buffer is not full. As a result, packets of lower access priority will experience a higher packet-loss probability.

Head-of-line (HOL) priority queuing is a second approach that involves defining a number of priority classes. A separate queue is maintained for each priority class. As shown in Figure 1.43, each time the transmission line becomes available the next packet for transmission is selected from the head of the line of the highest priority queue that is not empty.

For example, it does not allow for providing some egree of guaranteed access to transmission bandwidth to the lower

priority classes. Another problem is that it does not discriminate between users of the same priority. Fairness problems can arise here when a certain user hogs the bandwidth by sending an excessive number of packets.

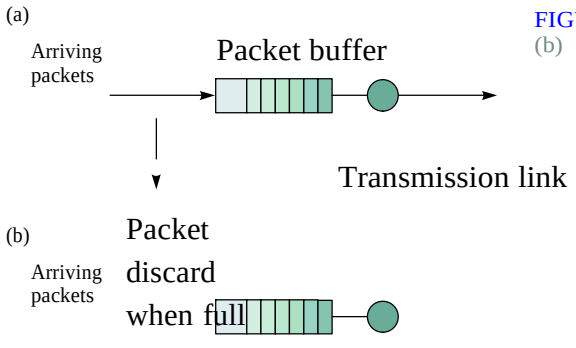
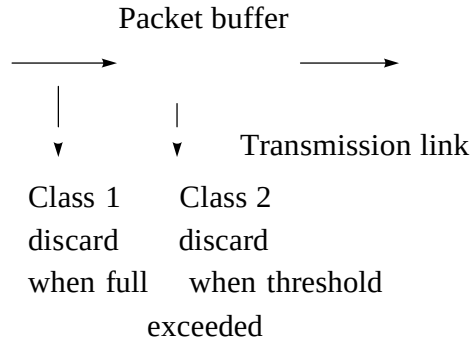


FIGURE 1.42 (a) FIFO queueing; (b)



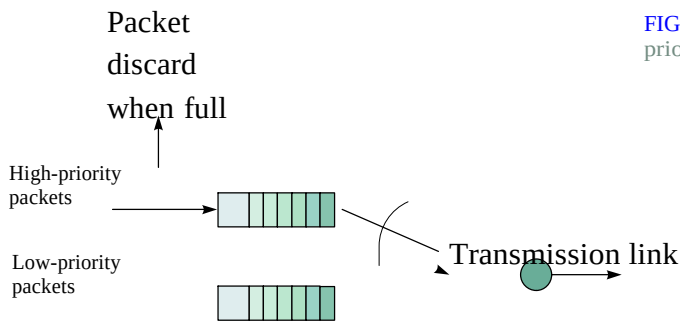
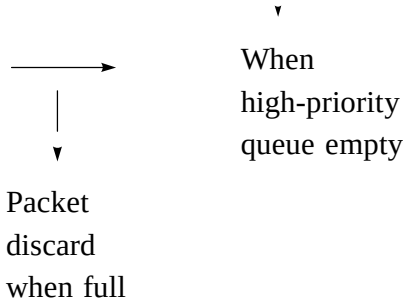


FIGURE 1.43 HOL priority



A third approach to managing a multiplexer, shown in Figure 1.44, involves sorting packets in the queue according to a priority tag that reflects the urgency with which each packet needs to be transmitted. This system is very flexible because the method for defining priority is open and can even be defined dynamically. For example, the priority tag could consist of a priority class followed by the arrival time of a packet to a multiplexer.

A third important example that can be implemented by the approach is fair queueing and weighted fair queueing, which are discussed next.

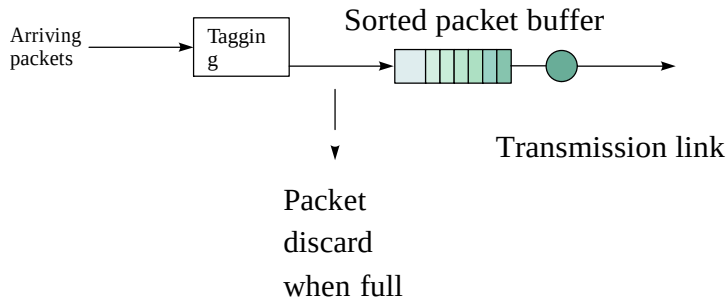


FIGURE 7.44 Sorting packets according to priority tag