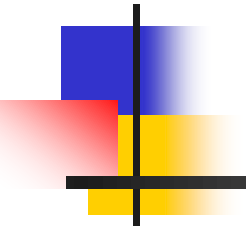
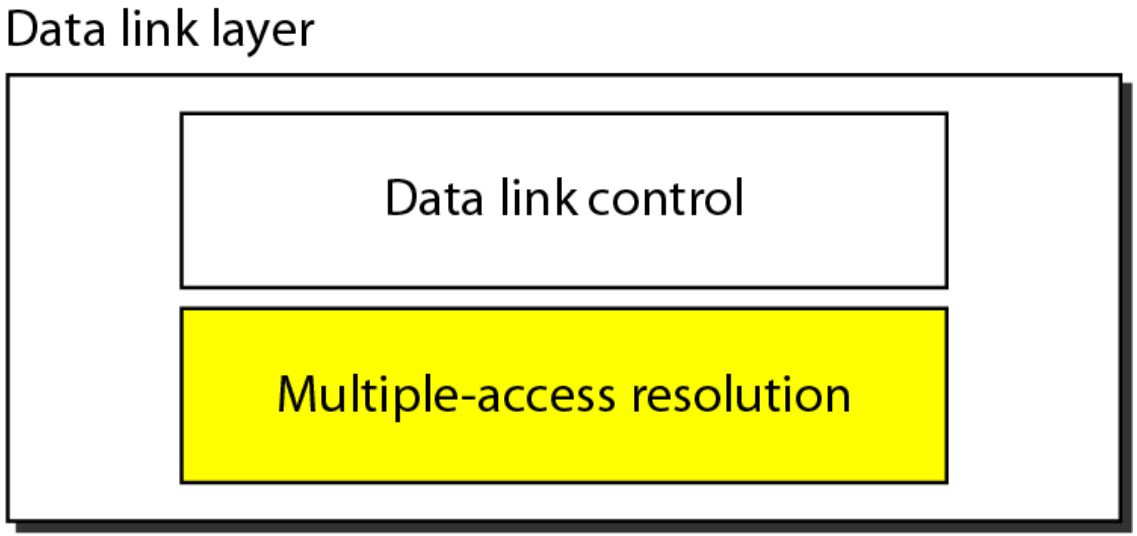
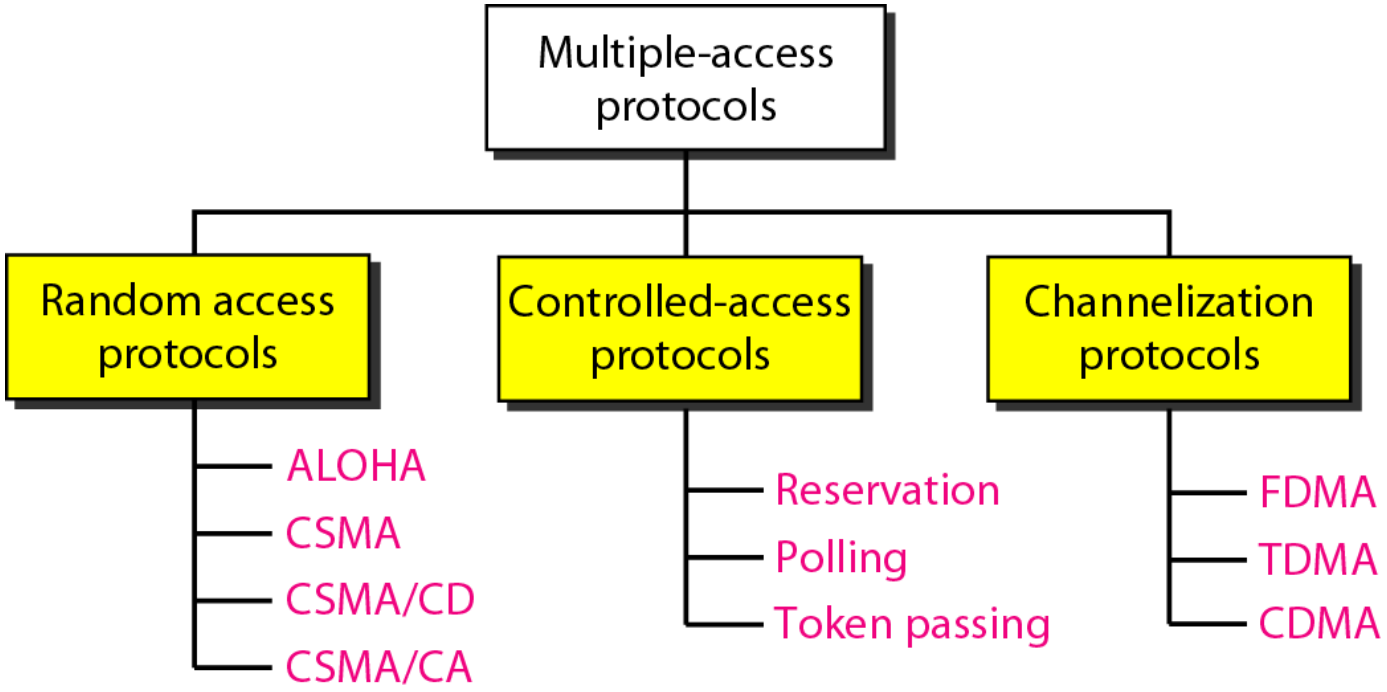


Multiple Access

Data link layer divided into two functionality-oriented sublayers



Taxonomy of multiple-access protocols discussed in this chapter



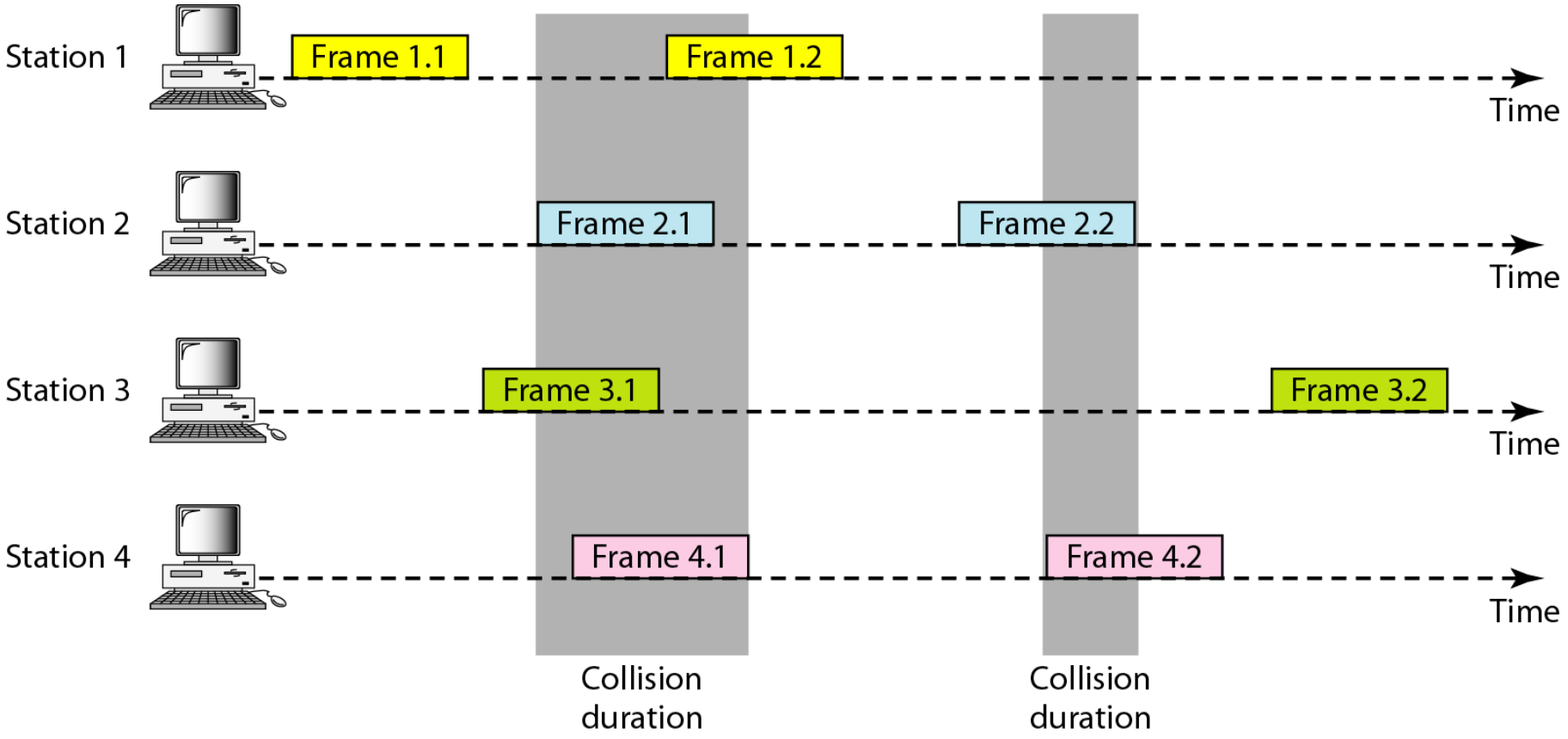
RANDOM ACCESS

In random access or contention methods, no station is superior to another station and none is assigned the control over another. No station permits, or does not permit, another station to send. At each instance, a station that has data to send uses a procedure defined by the protocol to make a decision on whether or not to send.

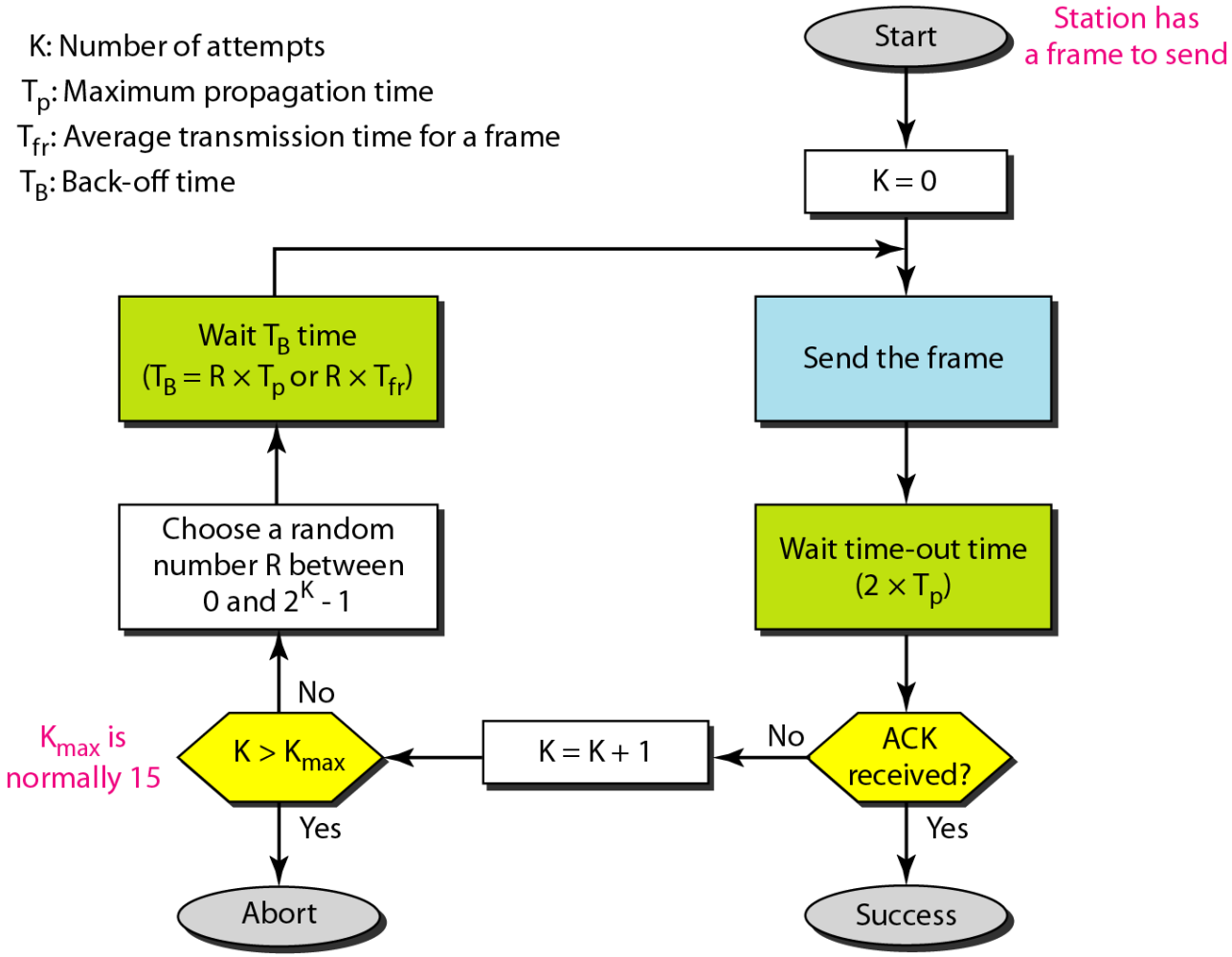
Topics discussed in this section:

ALOHA
Carrier Sense Multiple Access
Carrier Sense Multiple Access with Collision Detection
Carrier Sense Multiple Access with Collision Avoidance

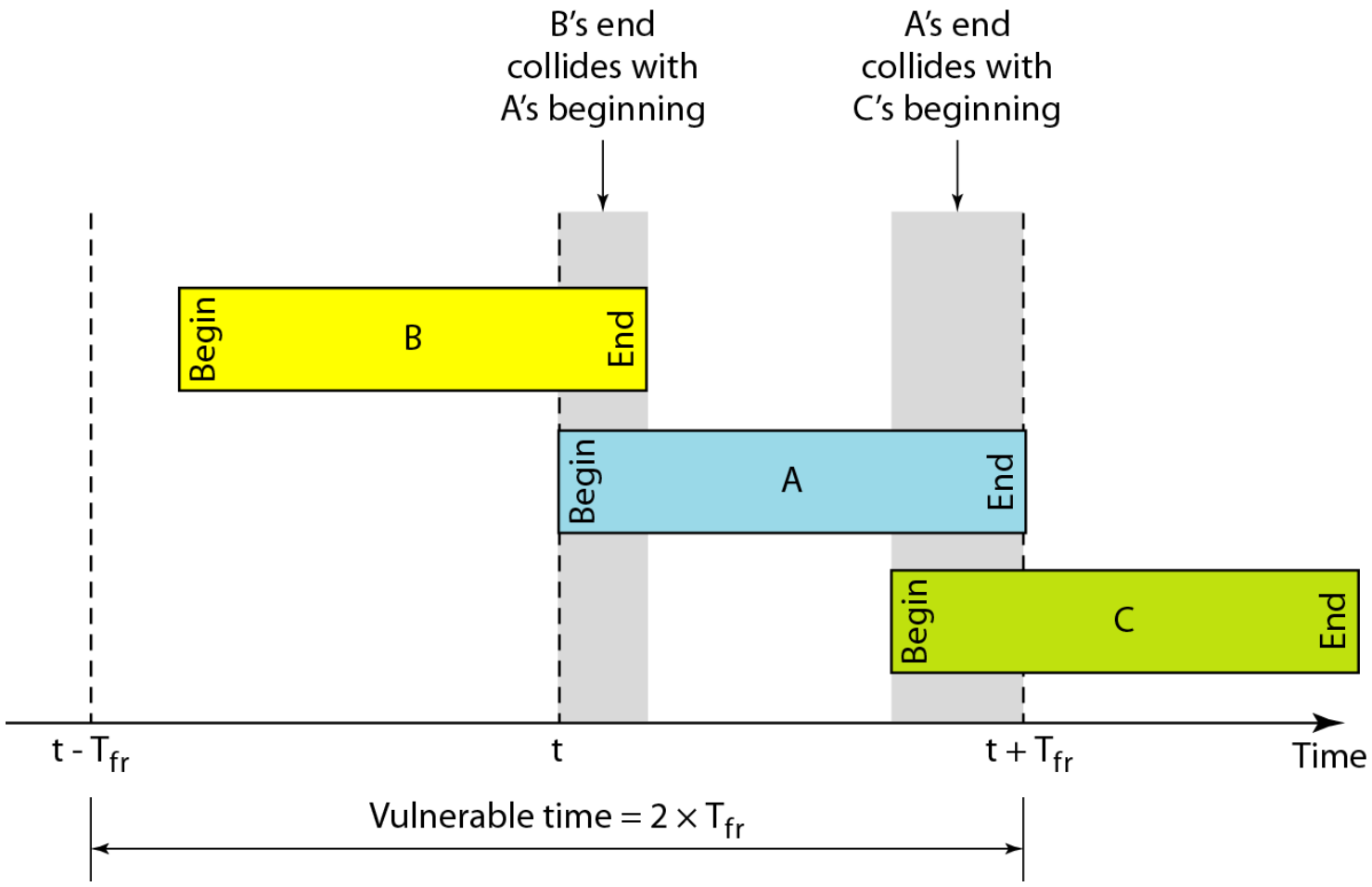
Frames in a pure ALOHA network



Procedure for pure ALOHA protocol



Vulnerable time for pure ALOHA protocol



Note

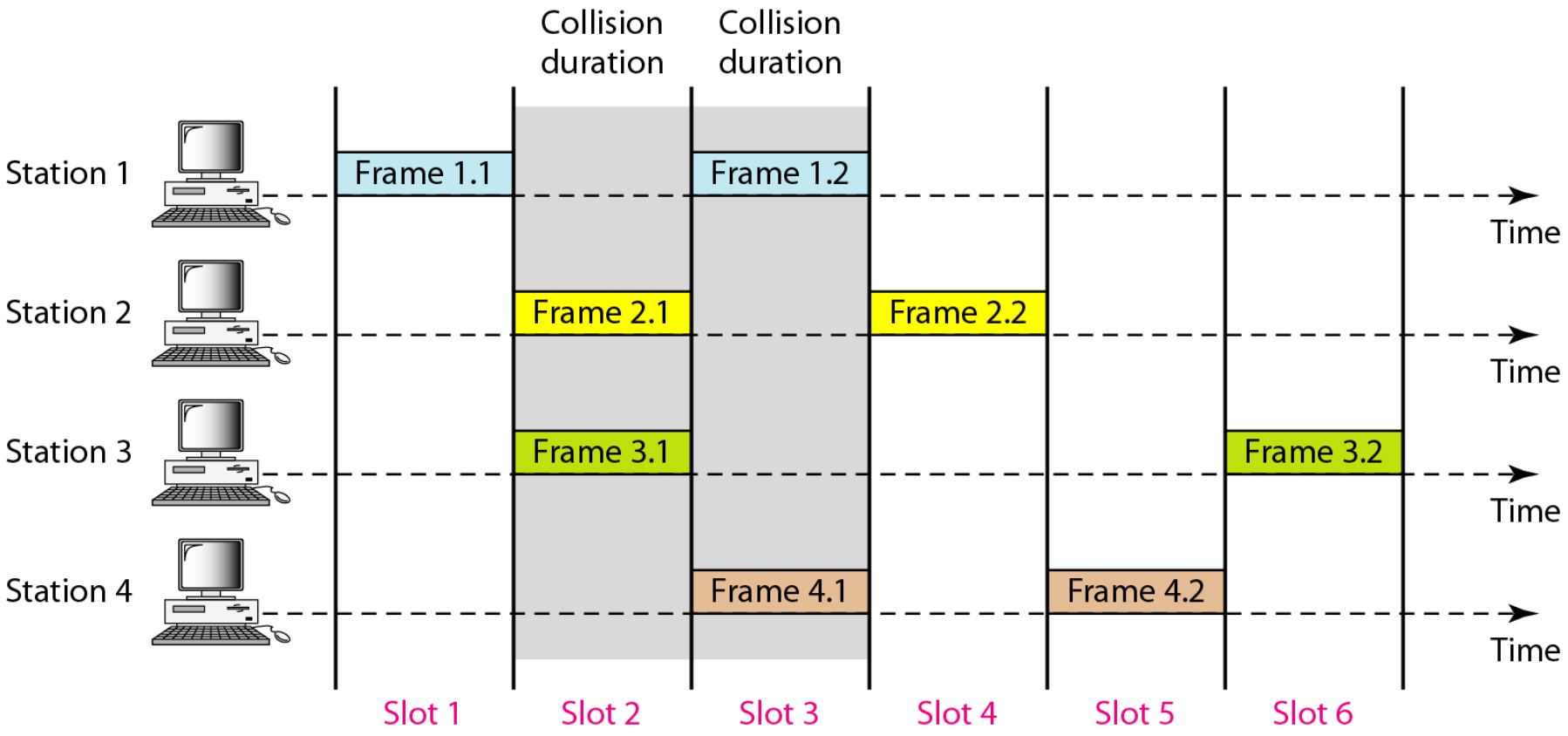
The throughput for pure ALOHA is

$$S = G \times e^{-2G} .$$

The maximum throughput

$$S_{max} = 0.184 \text{ when } G = (1/2).$$

Frames in a slotted ALOHA network



Note

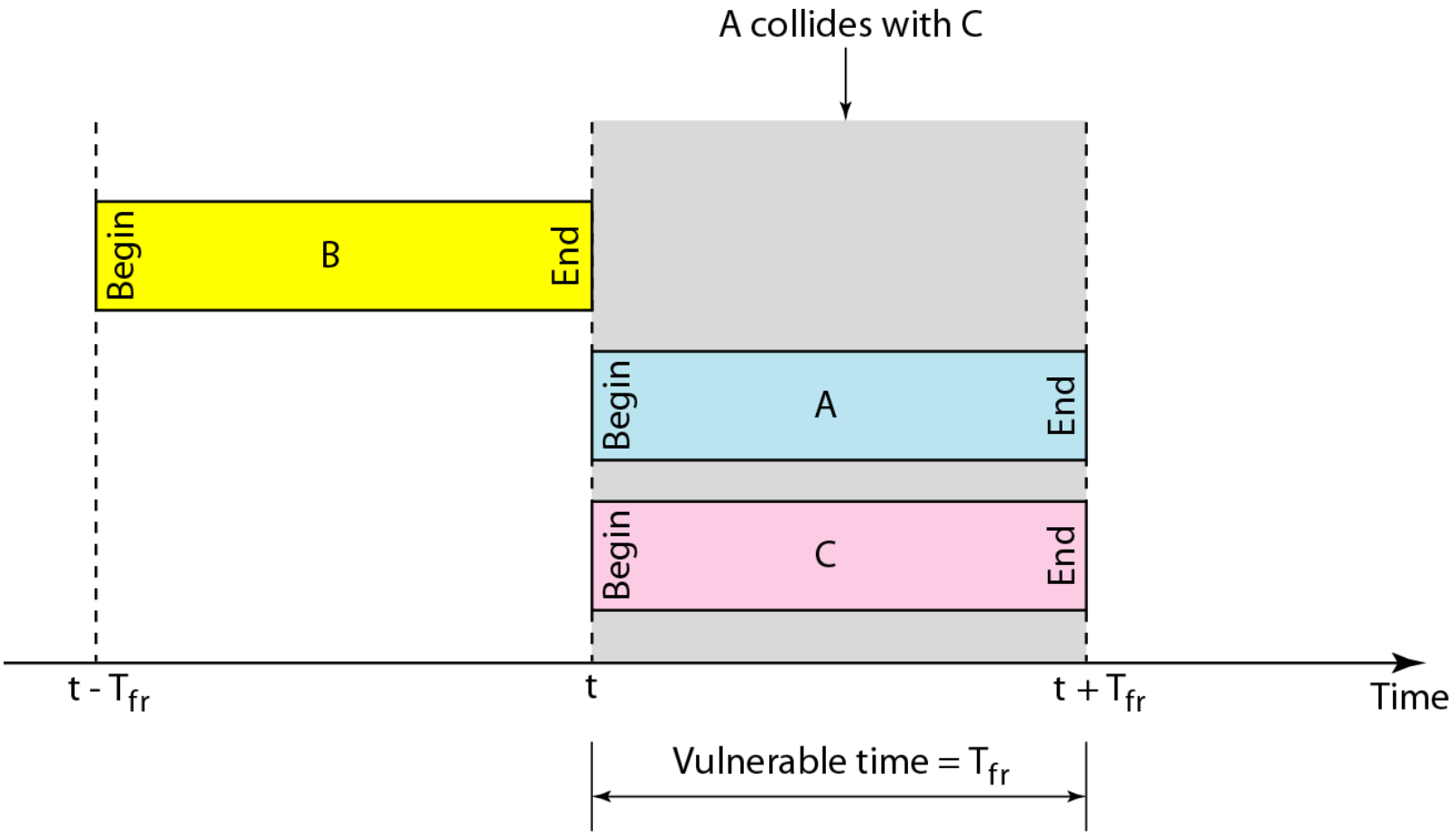
The throughput for slotted ALOHA is

$$S = G \times e^{-G} .$$

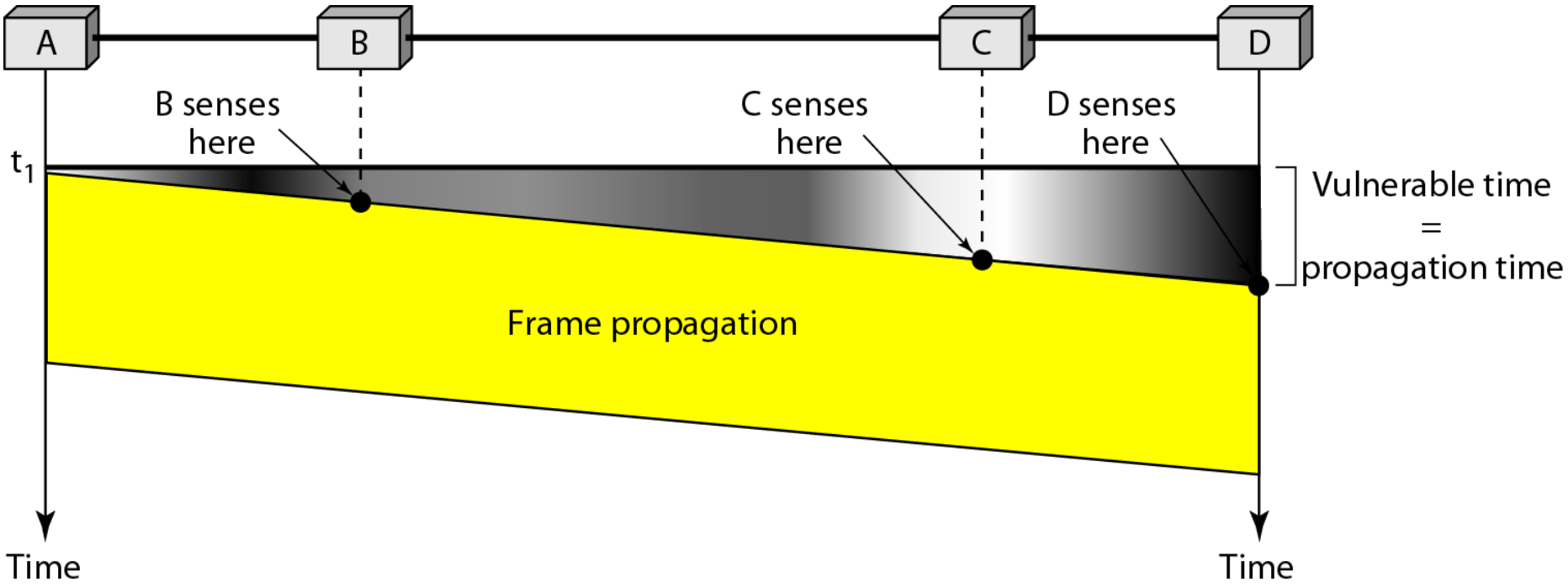
The maximum throughput

$$S_{max} = 0.368 \text{ when } G = 1.$$

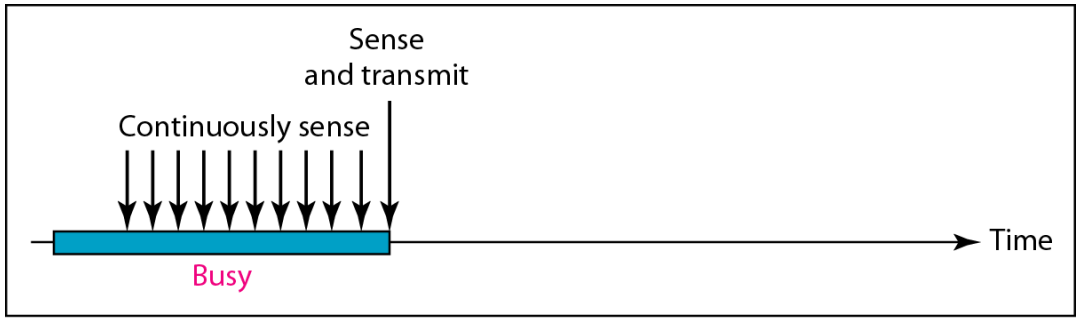
Vulnerable time for slotted ALOHA protocol



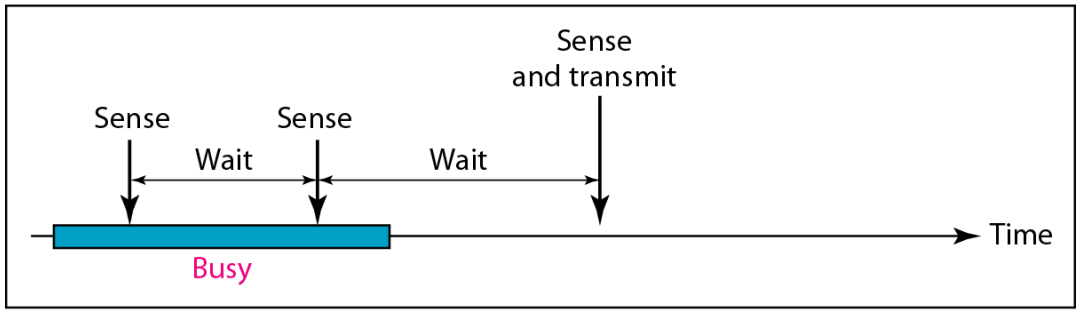
Vulnerable time in CSMA



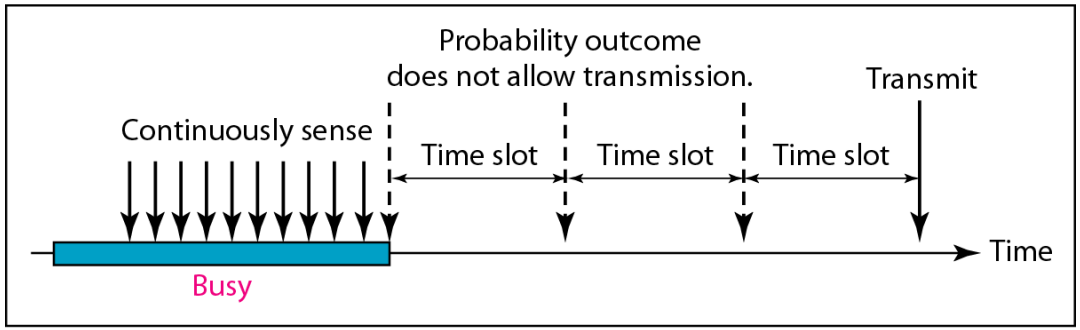
Behavior of three persistence methods



a. 1-persistent

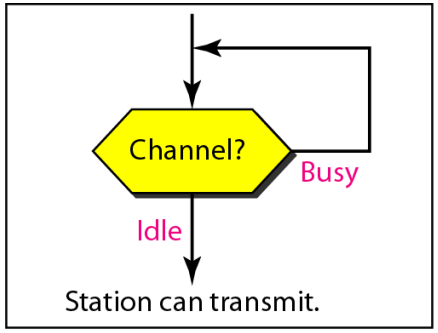


b. Nonpersistent

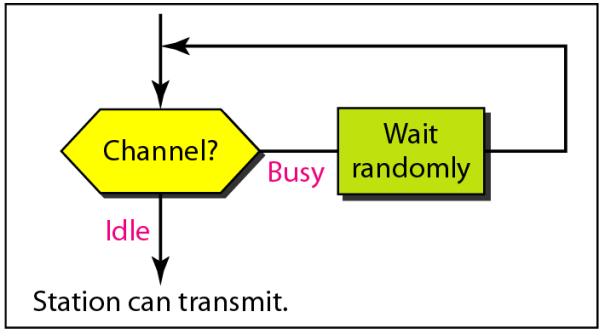


c. p-persistent

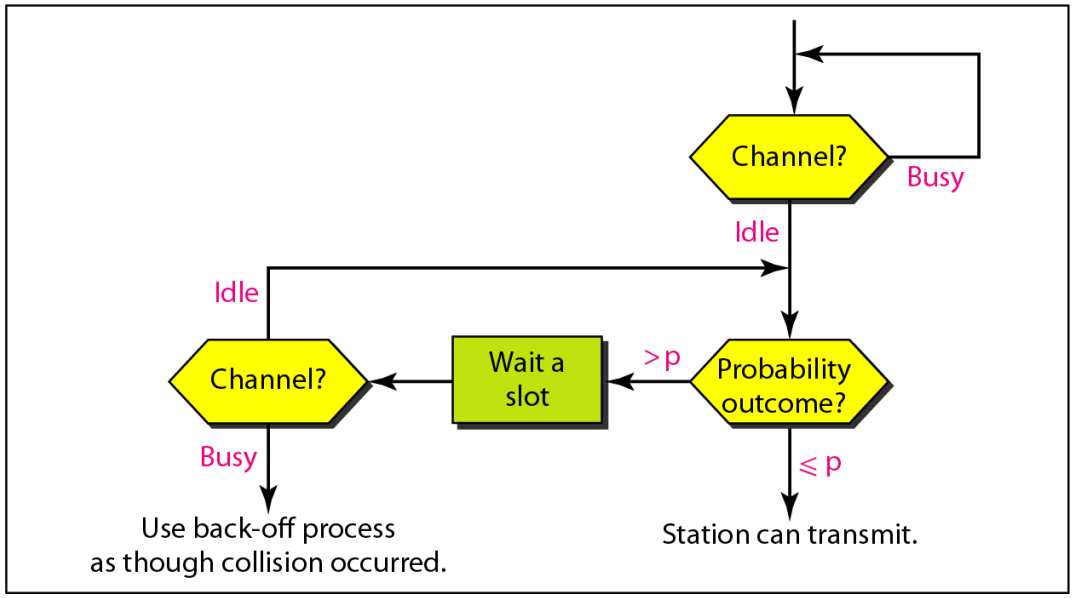
Flow diagram for three persistence methods



a. 1-persistent

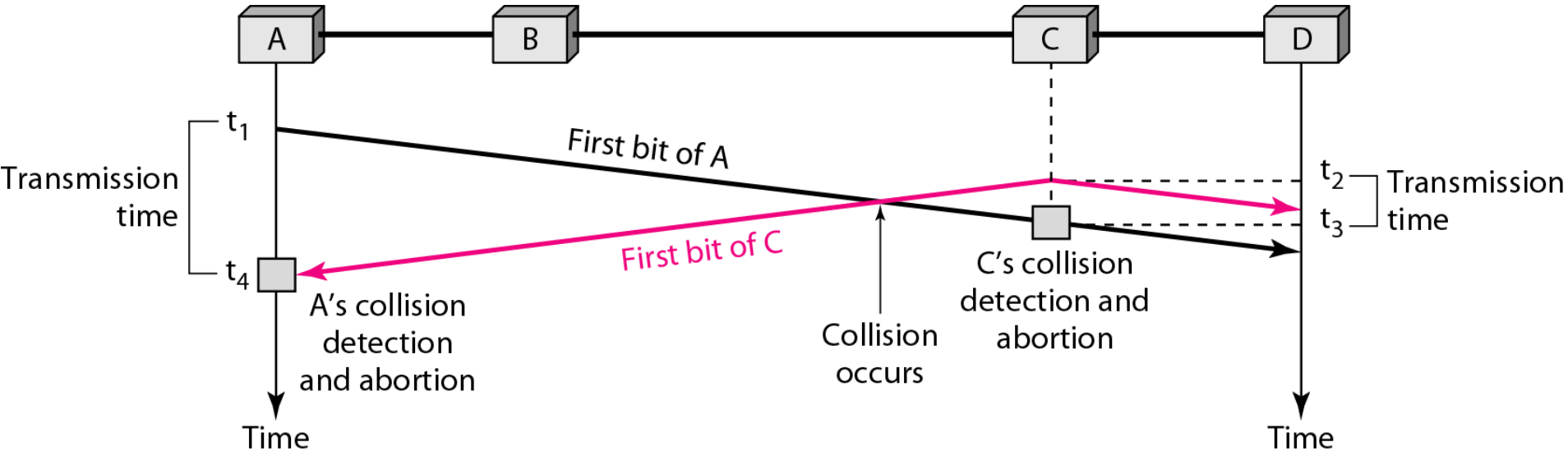


b. Nonpersistent

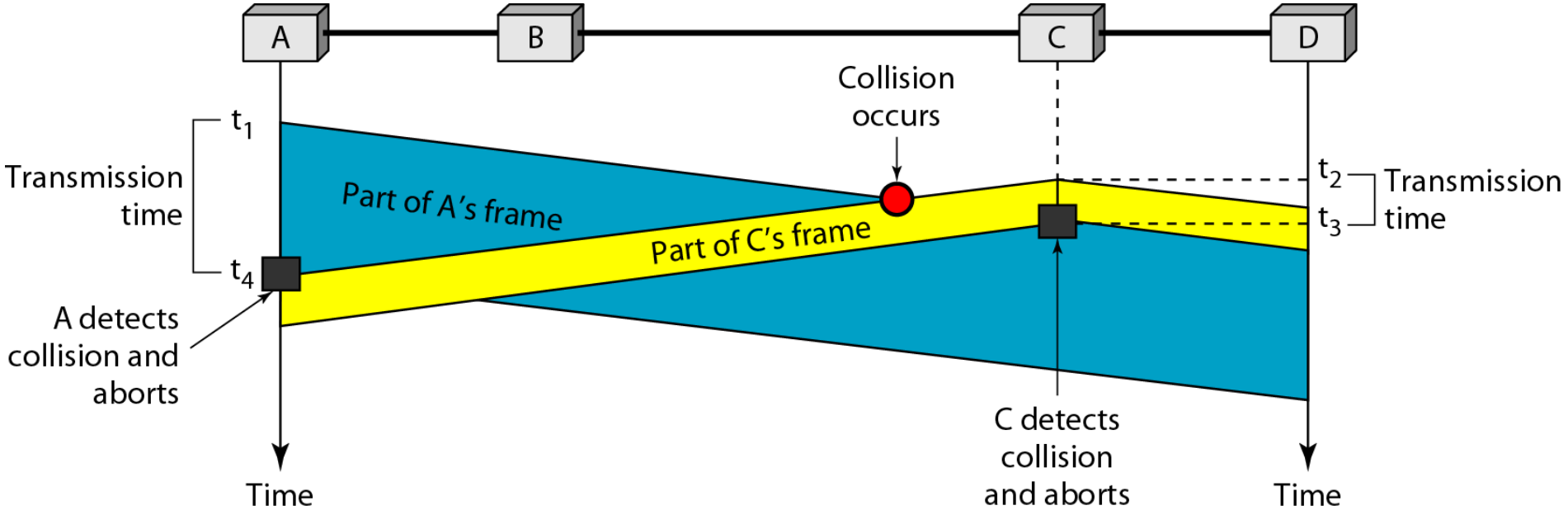


c. p-persistent

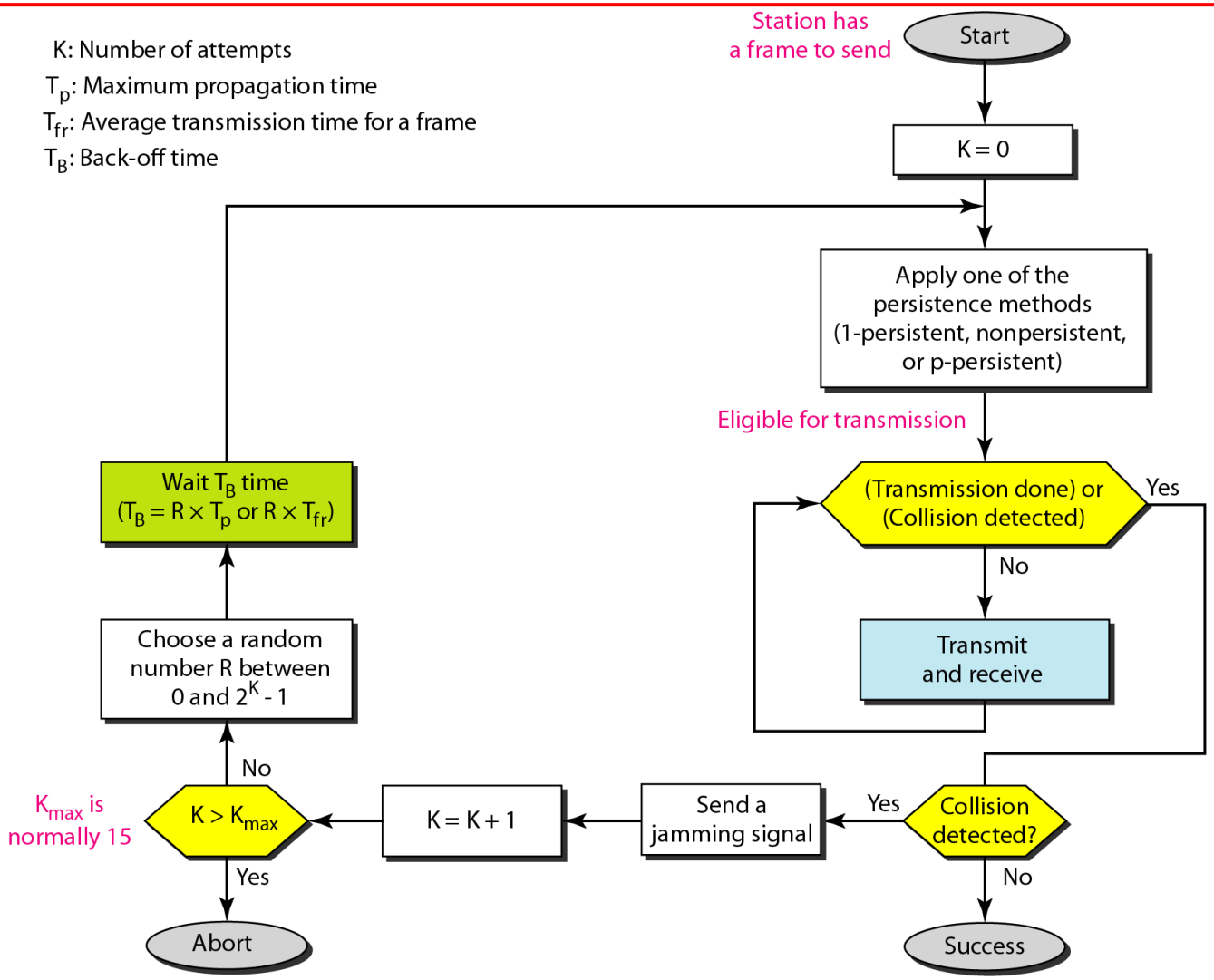
Collision of the first bit in CSMA/CD



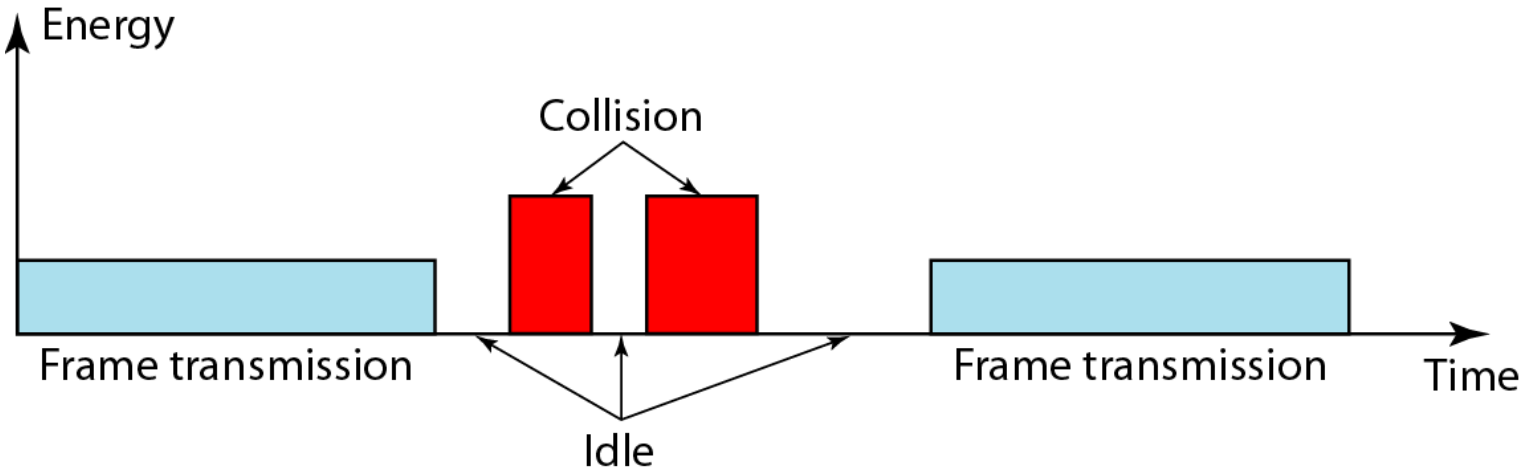
Collision and abortion in CSMA/CD



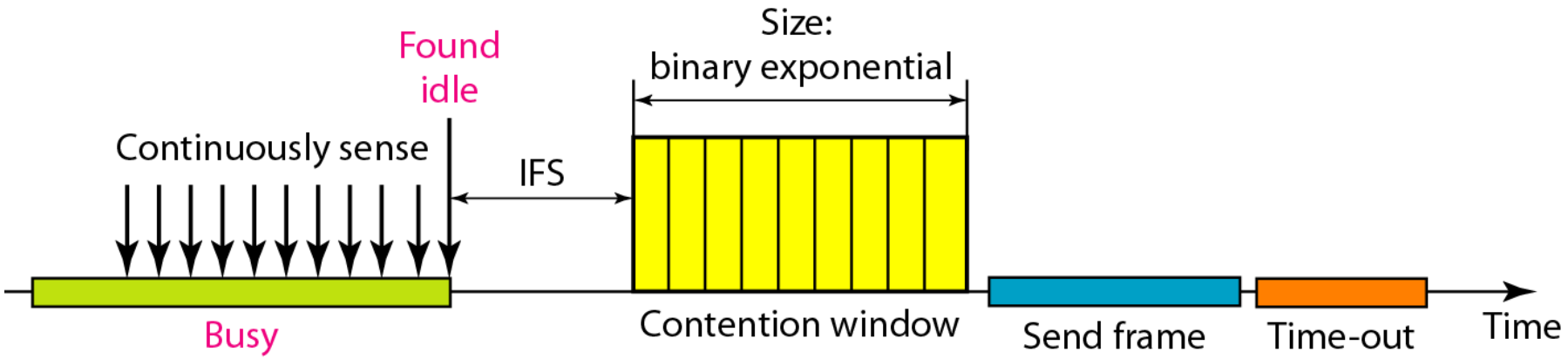
Flow diagram for the CSMA/CD



Energy level during transmission, idleness, or collision



Timing in CSMA/CA



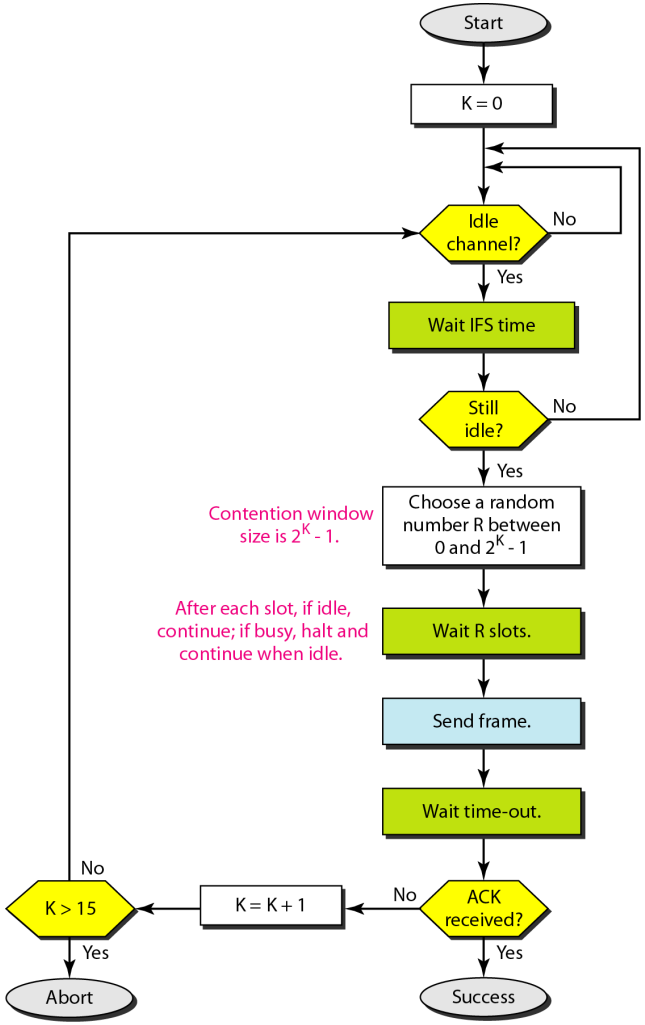
Note

In CSMA/CA, the IFS can also be used to define the priority of a station or a frame.

Note

In CSMA/CA, if the station finds the channel busy, it does not restart the timer of the contention window; it stops the timer and restarts it when the channel becomes idle.

Flow diagram for CSMA/CA



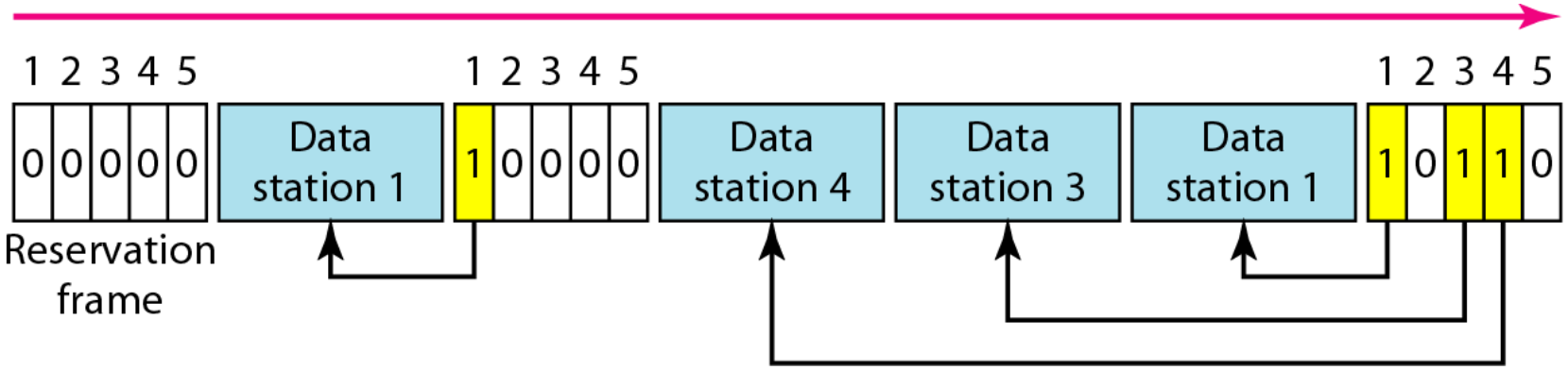
12-2 CONTROLLED ACCESS

In controlled access, the stations consult one another to find which station has the right to send. A station cannot send unless it has been authorized by other stations. We discuss three popular controlled-access methods.

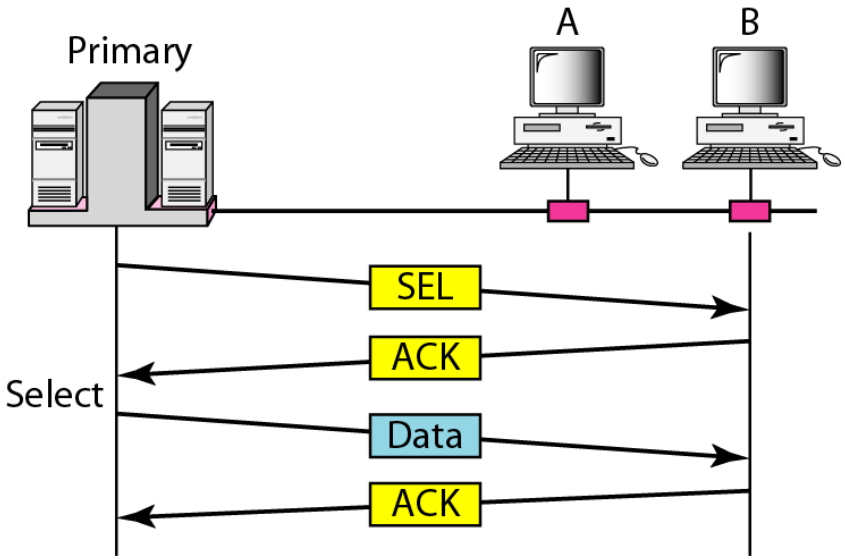
Topics discussed in this section:

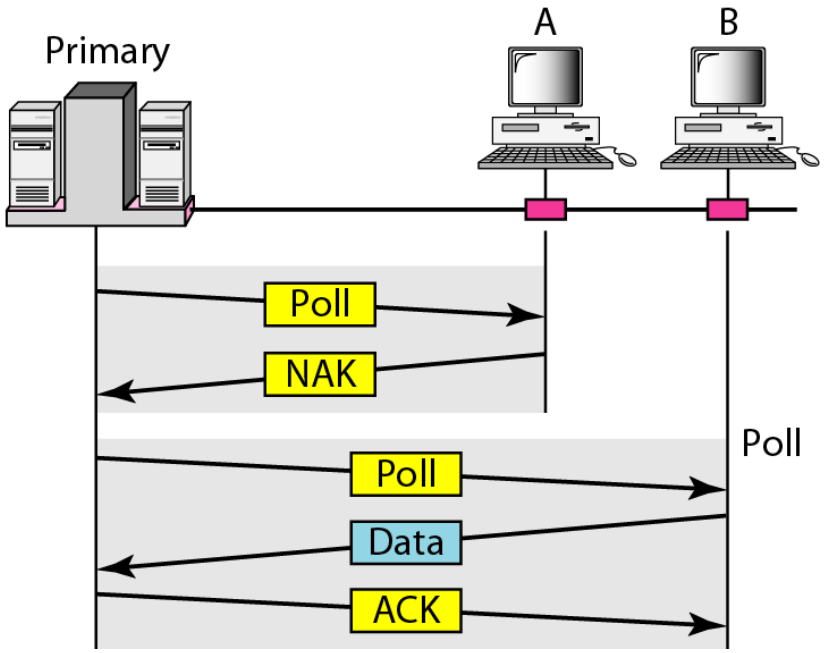
Reservation
Polling
Token Passing

Reservation access method

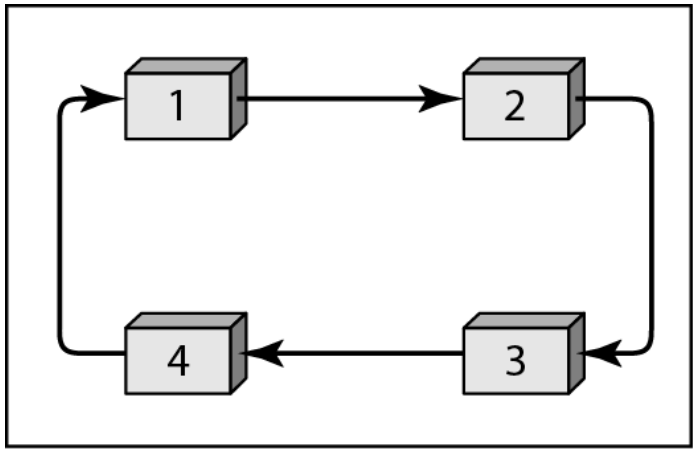


Select and poll functions in polling access method

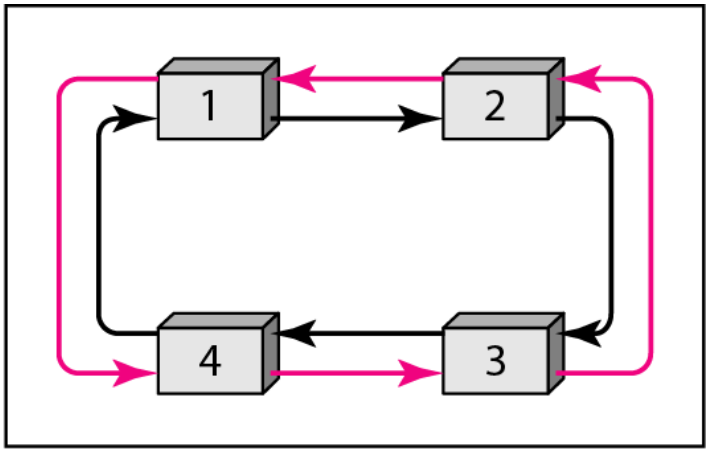




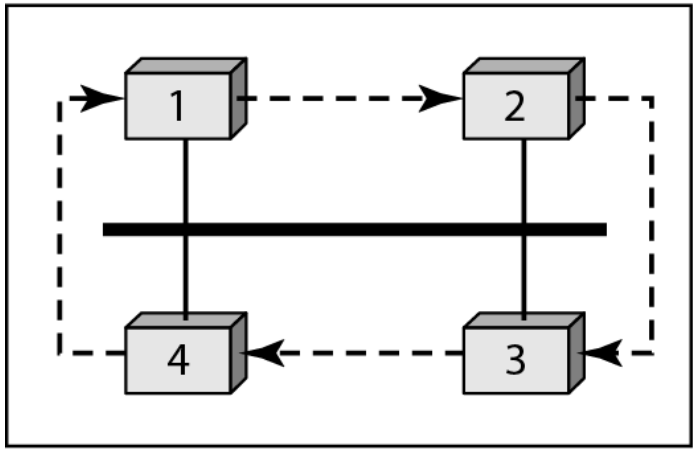
Logical ring and physical topology in token-passing access method



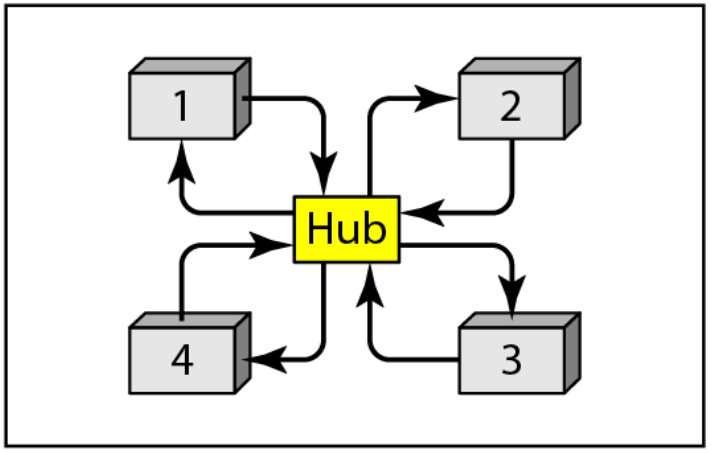
a. Physical ring



b. Dual ring



c. Bus ring



d. Star ring