Chapter 12
Multiple Access

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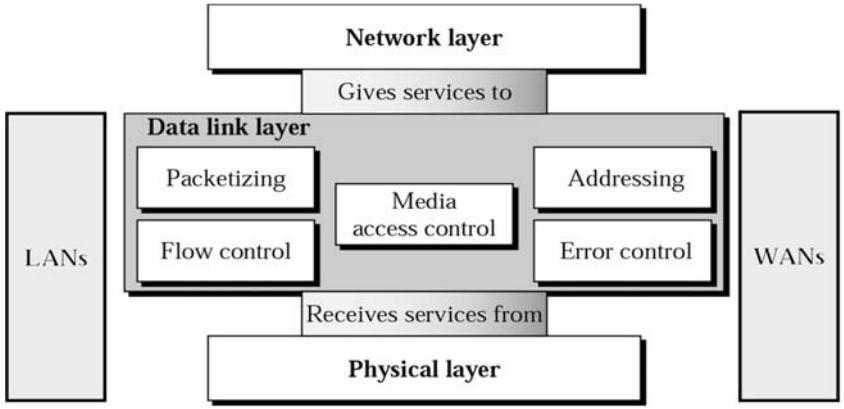
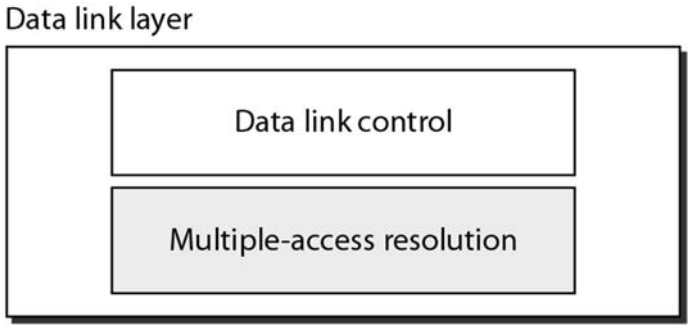
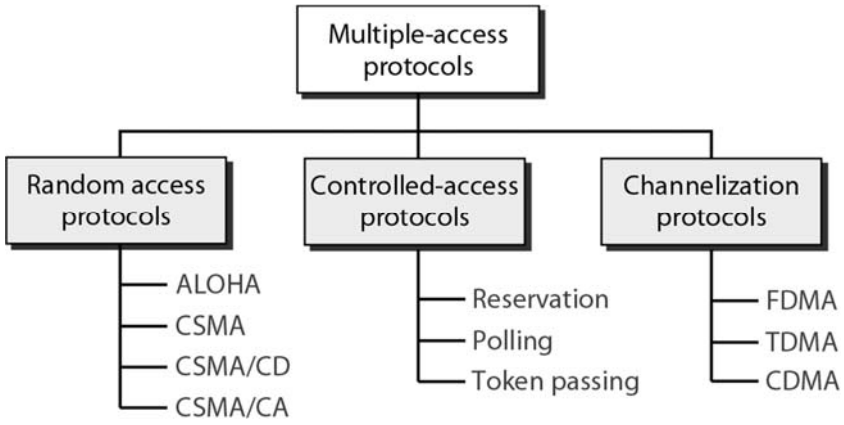
Data-link layer



Data link sublayers



Multiple-access protocols



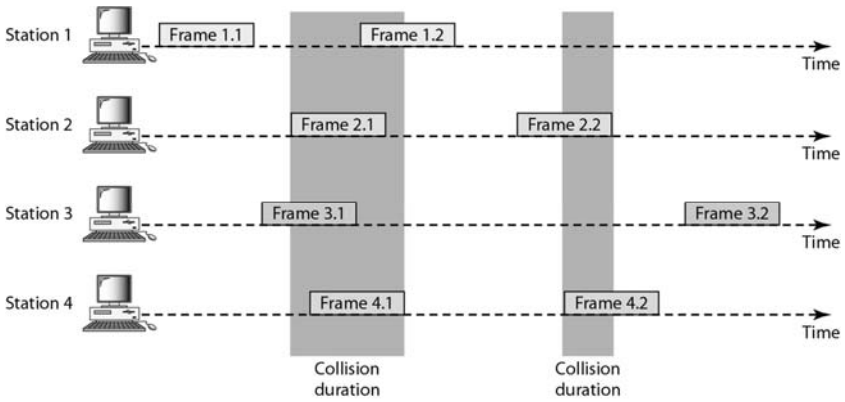
RANDOM ACCESS

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

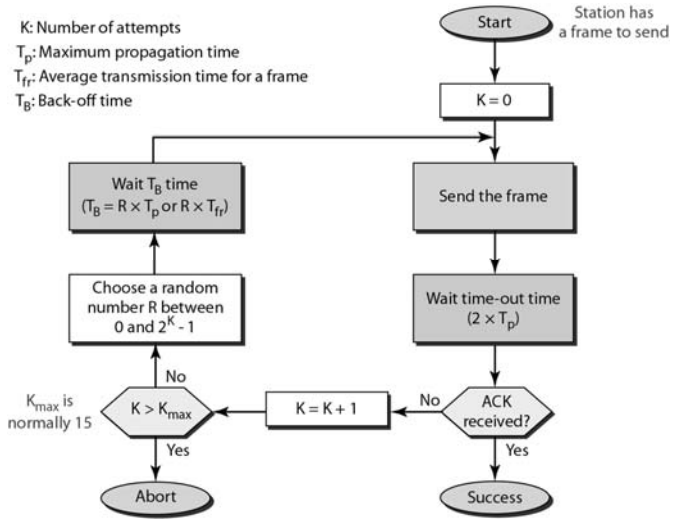
ALOHA

- Develop at University of Hawaii (1970) for radio LAN
  - Shared media
  - Collision free
- Type of ALOHA
  - pure ALOHA
  - Slotted ALOHA

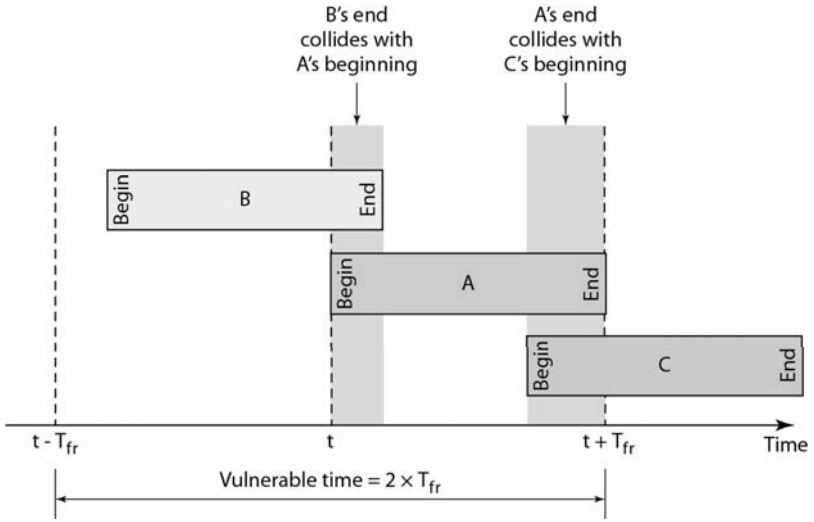
Frames in a pure ALOHA network



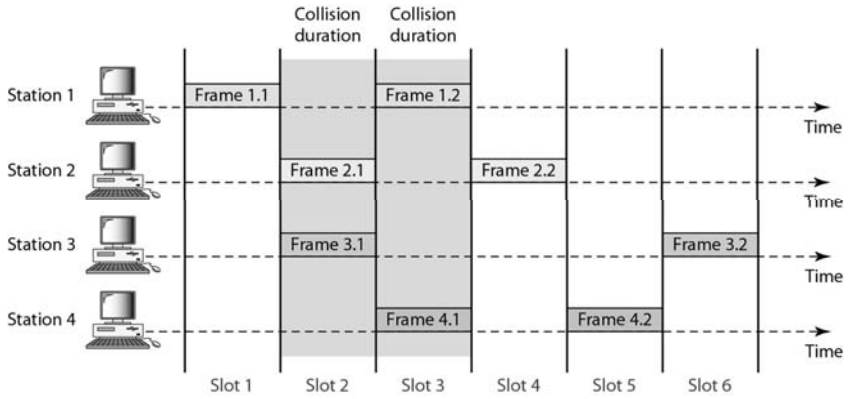
Procedure for pure ALOHA protocol



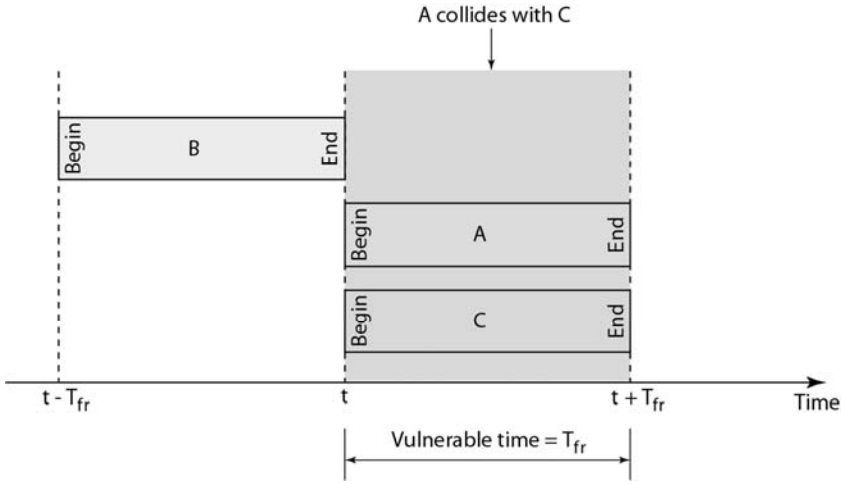
Vulnerable time for pure ALOHA protocol



Frames in a slotted ALOHA network



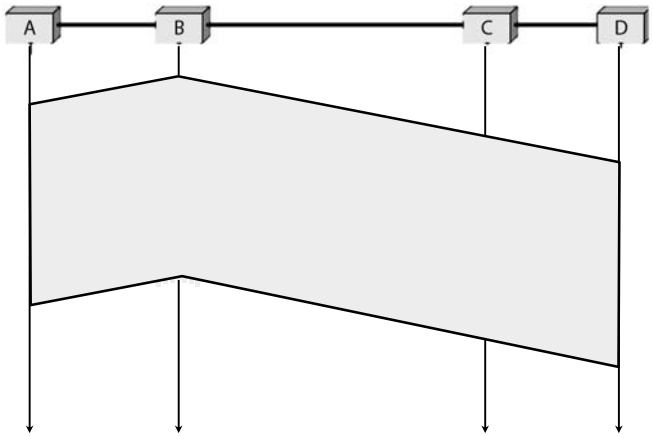
Vulnerable time for slotted ALOHA protocol



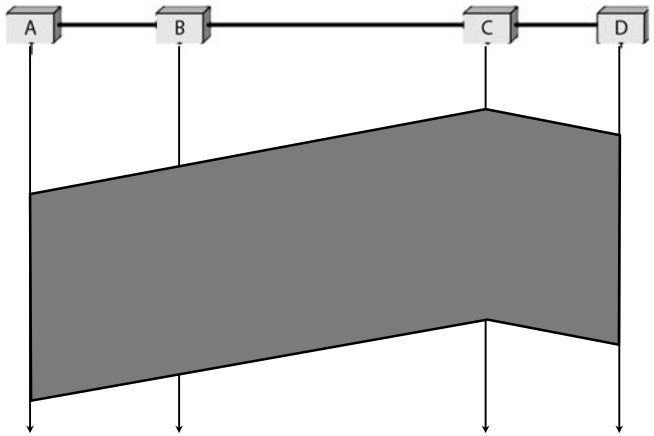
Carrier Sense Multiple Access

- Carrier sense multiple access (CSMA) requires that each station first listen to the medium (or check the state of the medium) before sending
  - "sense before transmit"
  - "listen before talk"

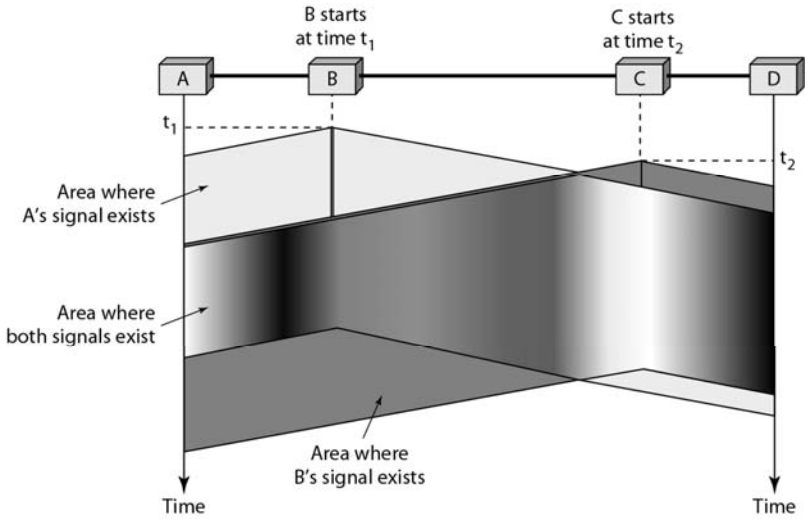
Space/time model of the collision in CSMA



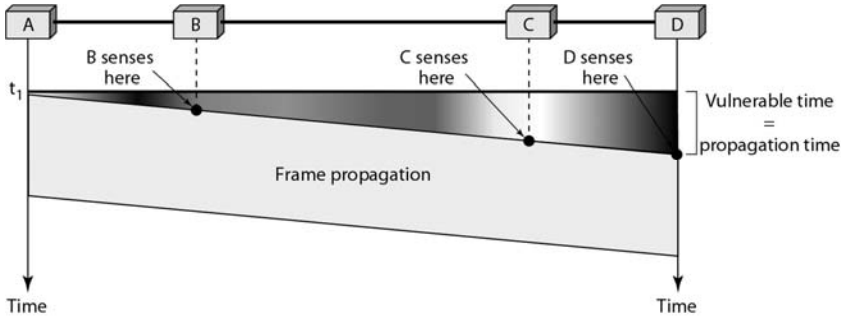
Space/time model of the collision in CSMA



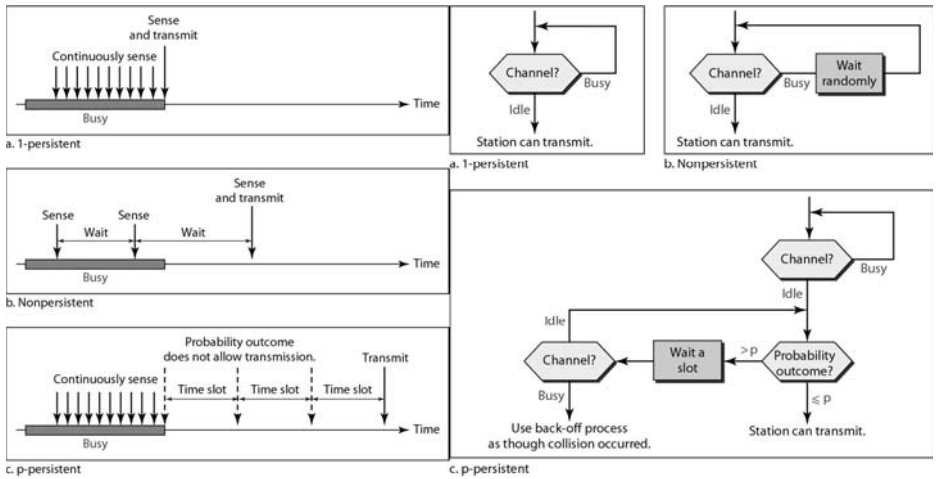
Space/time model of the collision in CSMA



Vulnerable time in CSMA

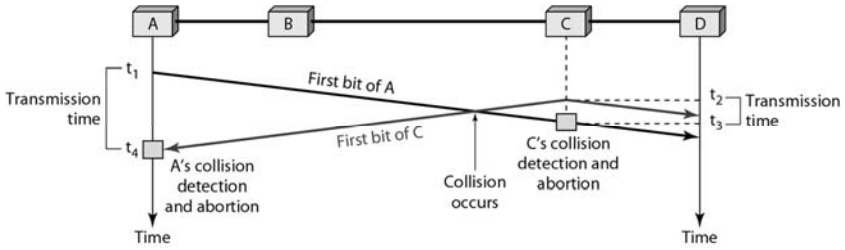


Persistence methods

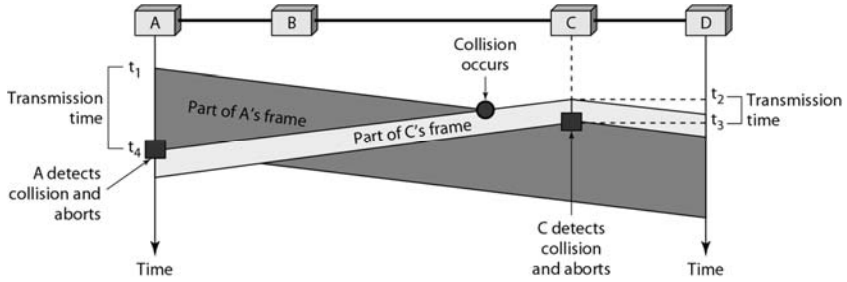


Carrier Sense Multiple Access with Collision Detection

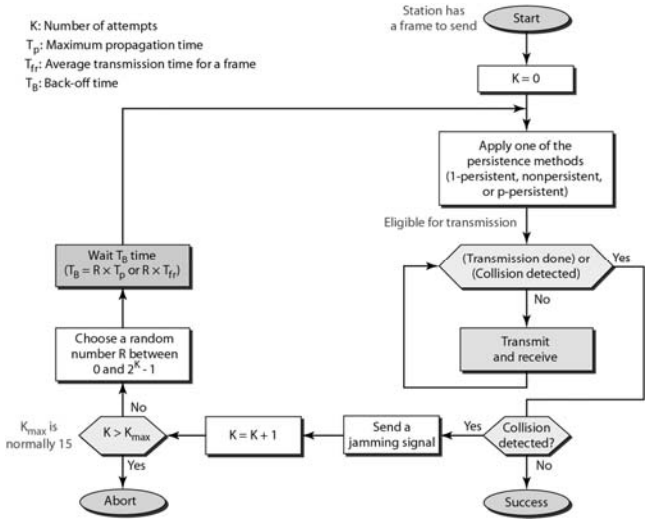
- Augments the algorithm to handle the collision



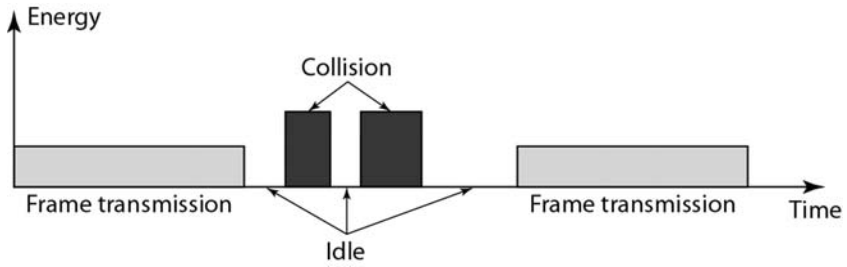
Collision and abortion in CSMA/CD



Flow diagram for the CSMA/CD

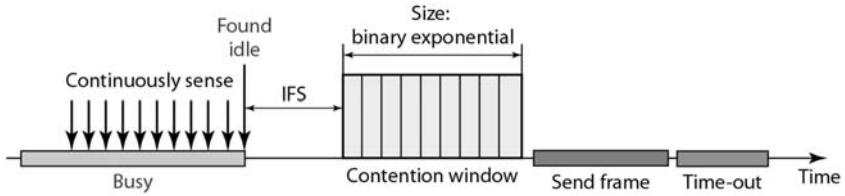


Energy level during transmission, idleness, or collision



Carrier Sense Multiple Access with Collision Avoidance

- CSMA/CD : detect a collision
  - wired network => same energy => detected energy almost doubles
  - wireless network => energy is lost in transmission
- CSMA/CA three strategies
  - the interframe space, the contention window, and acknowledgments



Interframe Space (IFS)

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