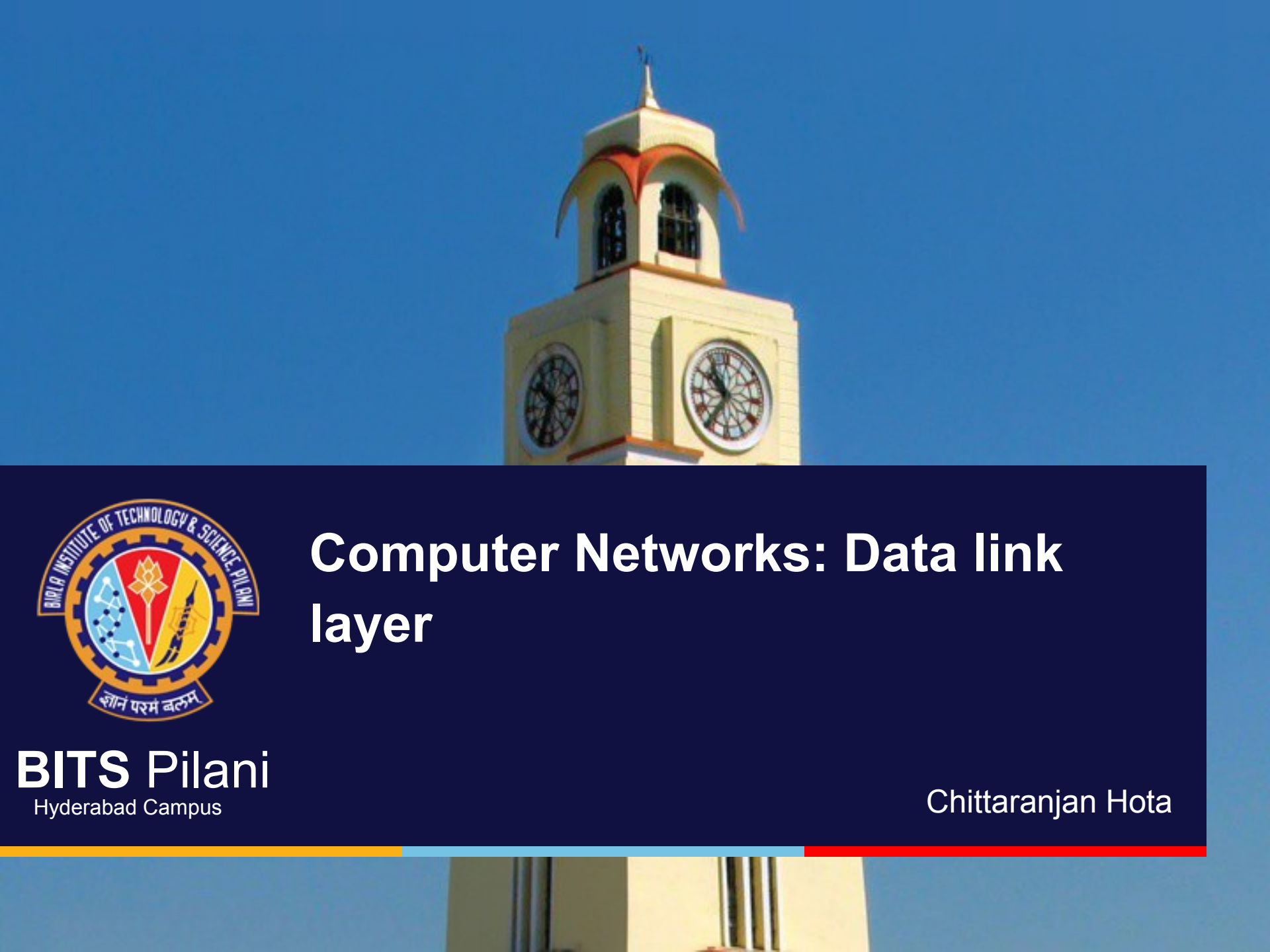
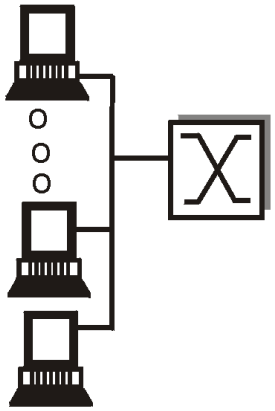


Computer Networks: Data link layer

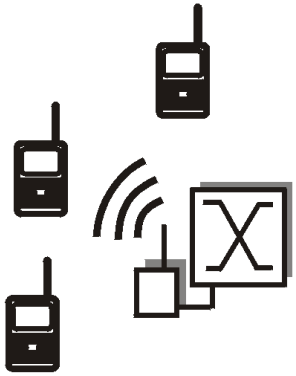
BITS Pilani
Hyderabad Campus

Chittaranjan Hota

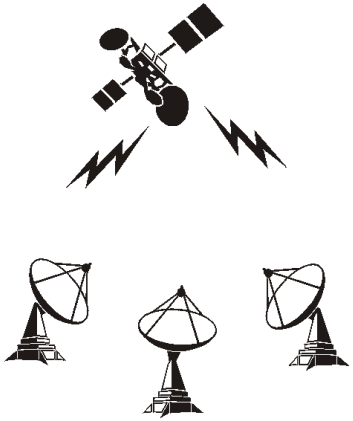
Multiple Access



shared wire
(e.g. Ethernet)



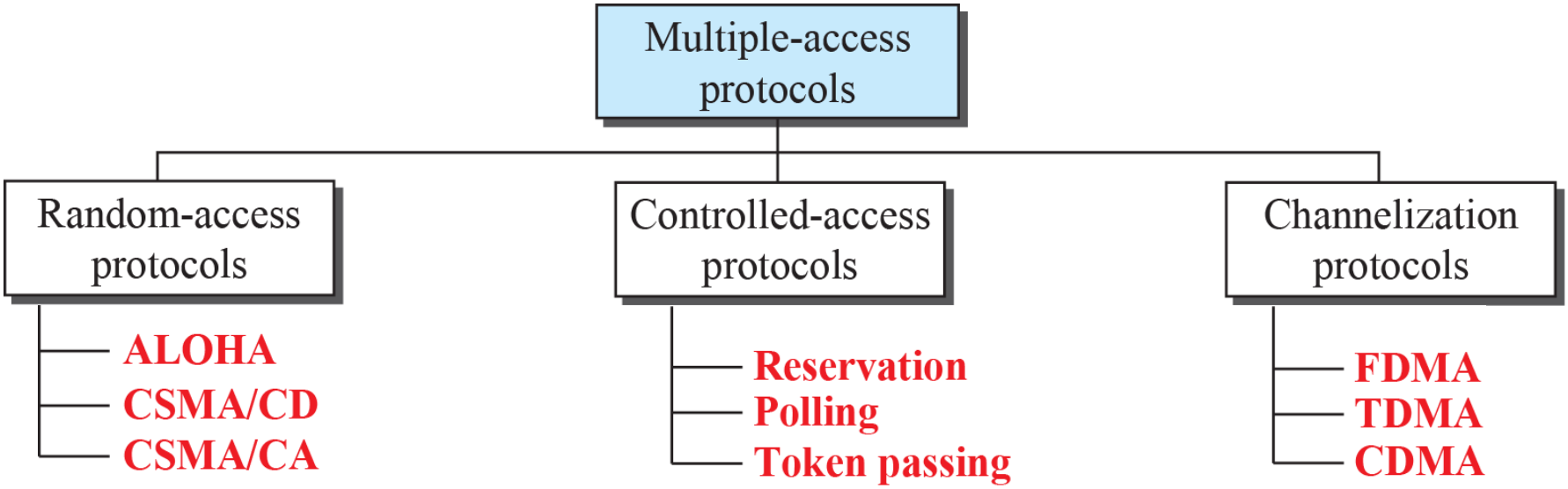
shared wireless
(e.g. Wavelan)



satellite

cocktail party

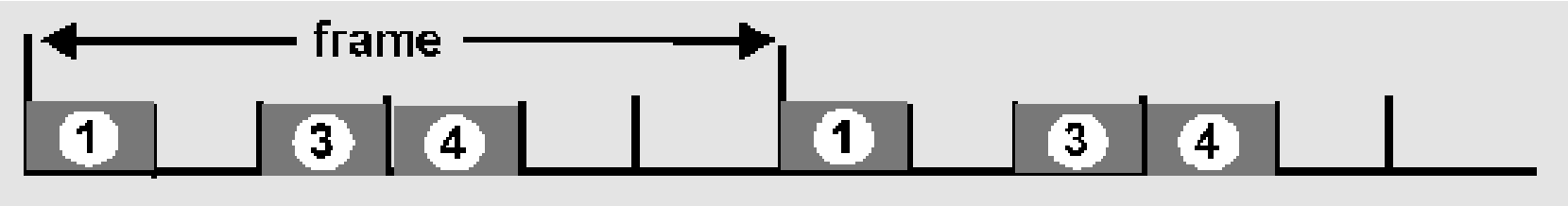
Multiple Access

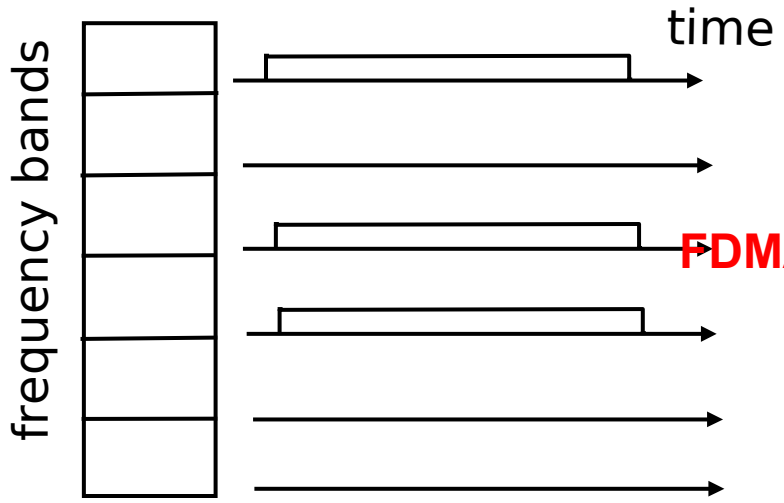


Channel partitioning

TDMA: time division multiple access

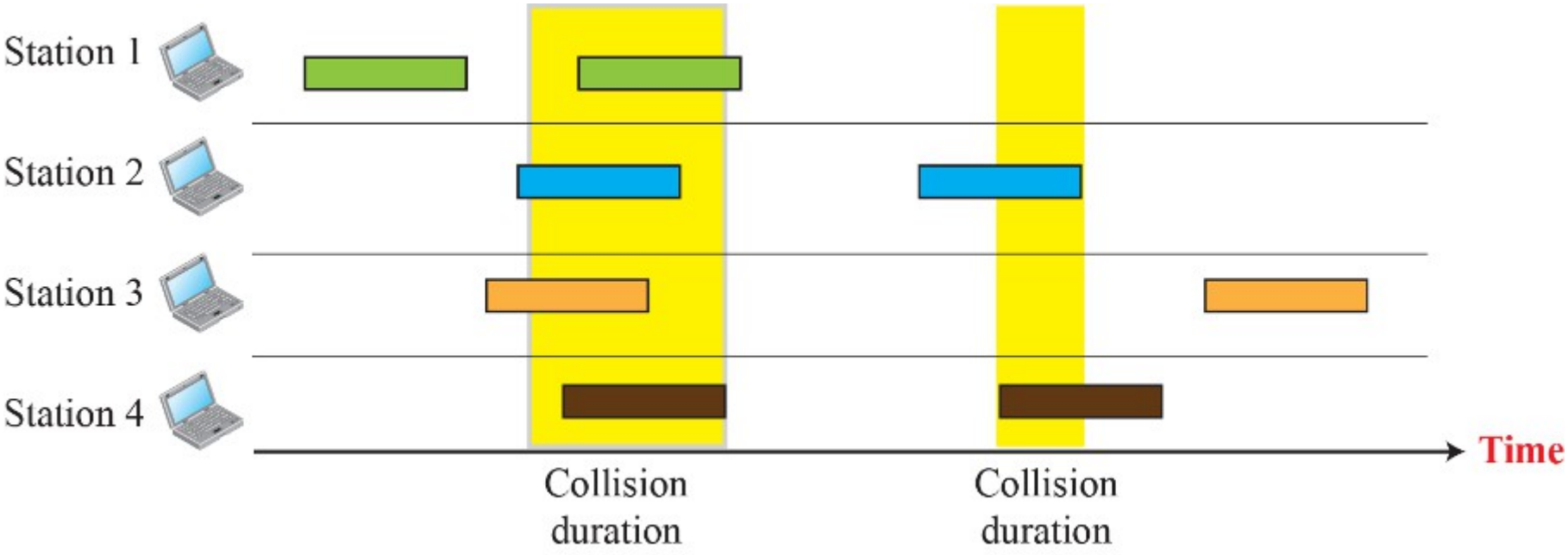
- example: 6-station LAN, 1,3,4 have pkt, slots 2,5,6 idle



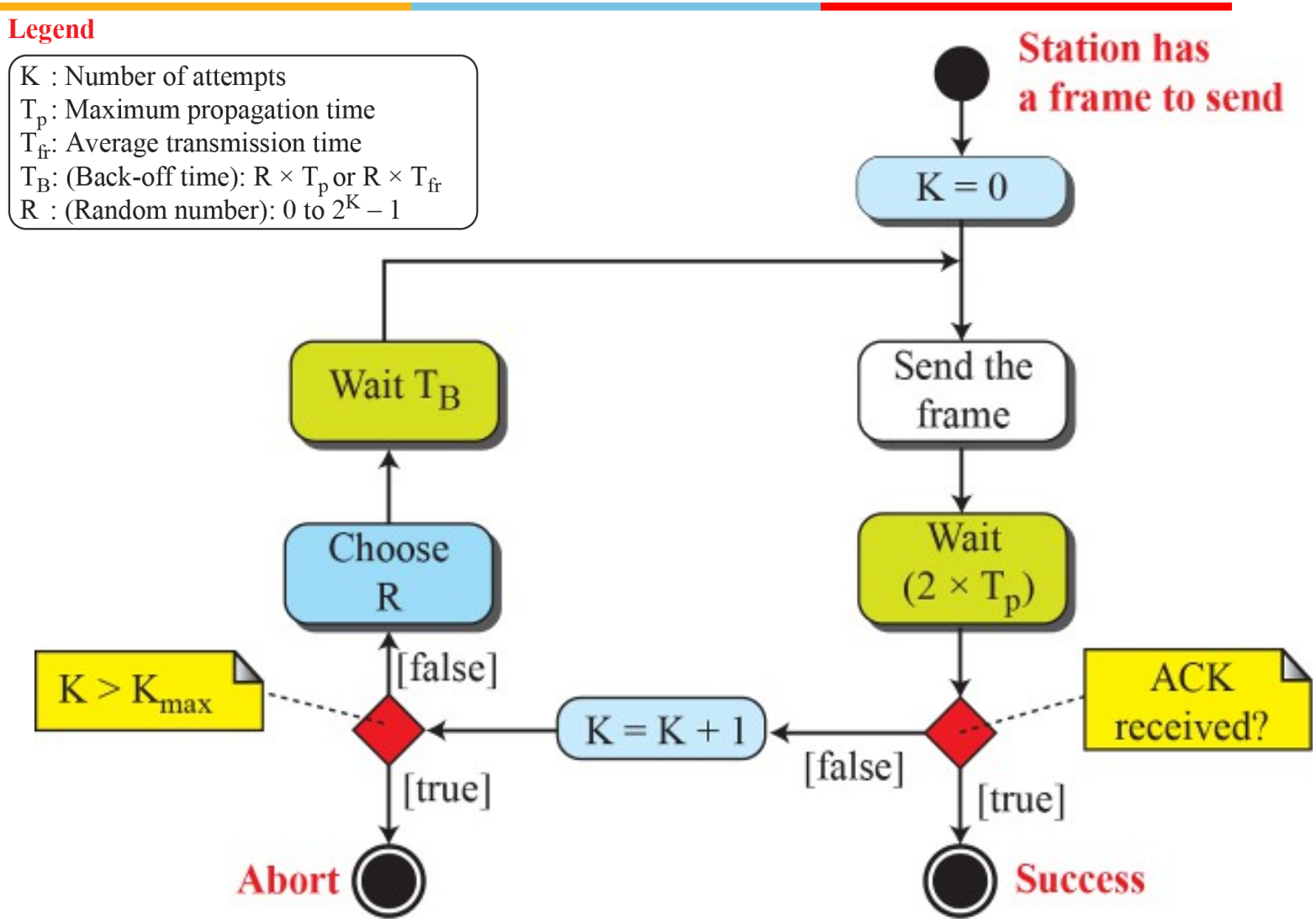


FDMA: frequency division multiple access

Random access: Pure ALOHA



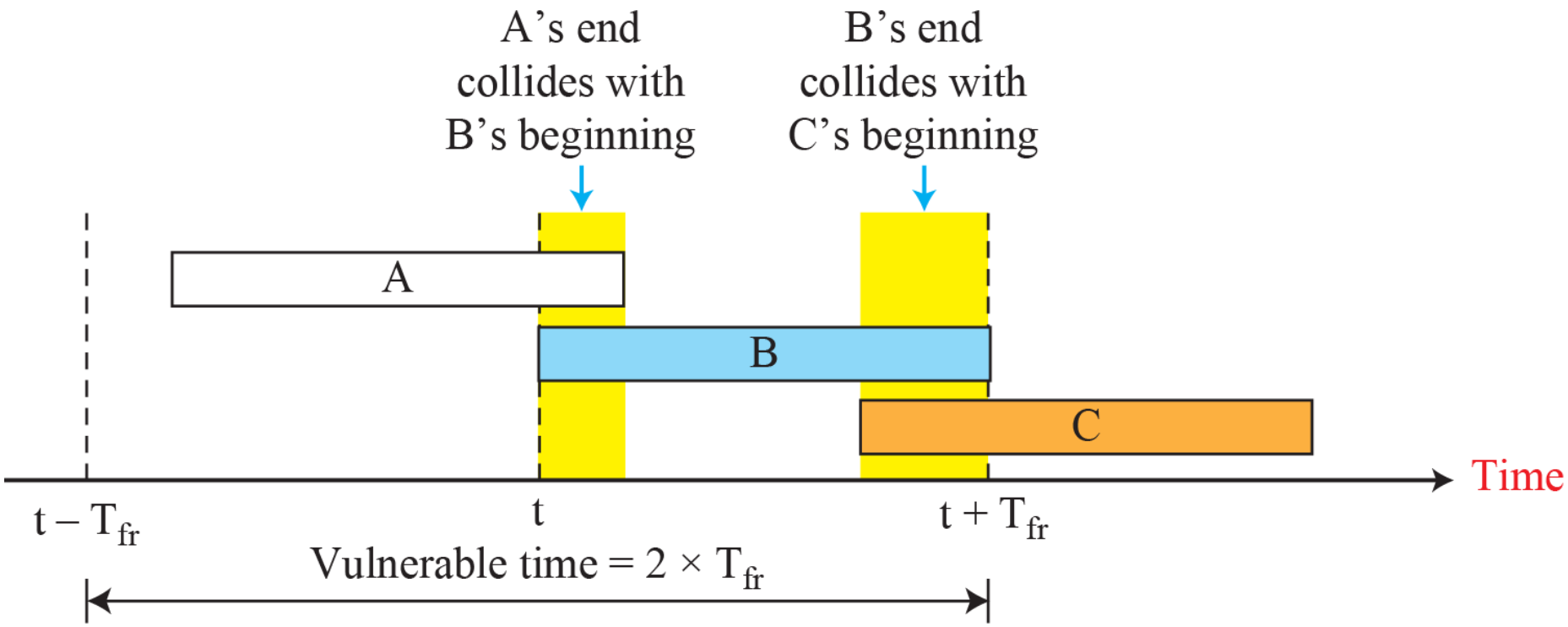
Procedure for Pure ALOHA



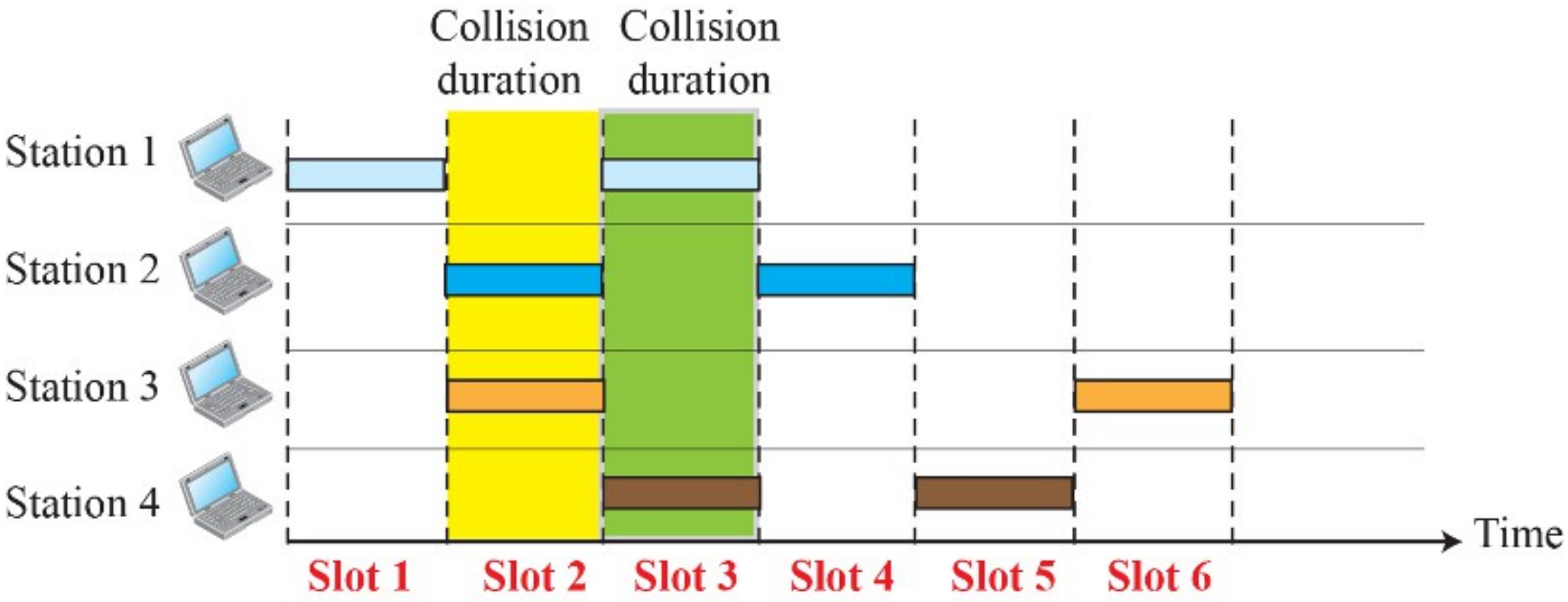
Example

The stations on a wireless ALOHA network are a maximum of 600 km apart. If we assume that signals propagate at 3×10^8 m/s, what is T_p , and T_B , for K=2?

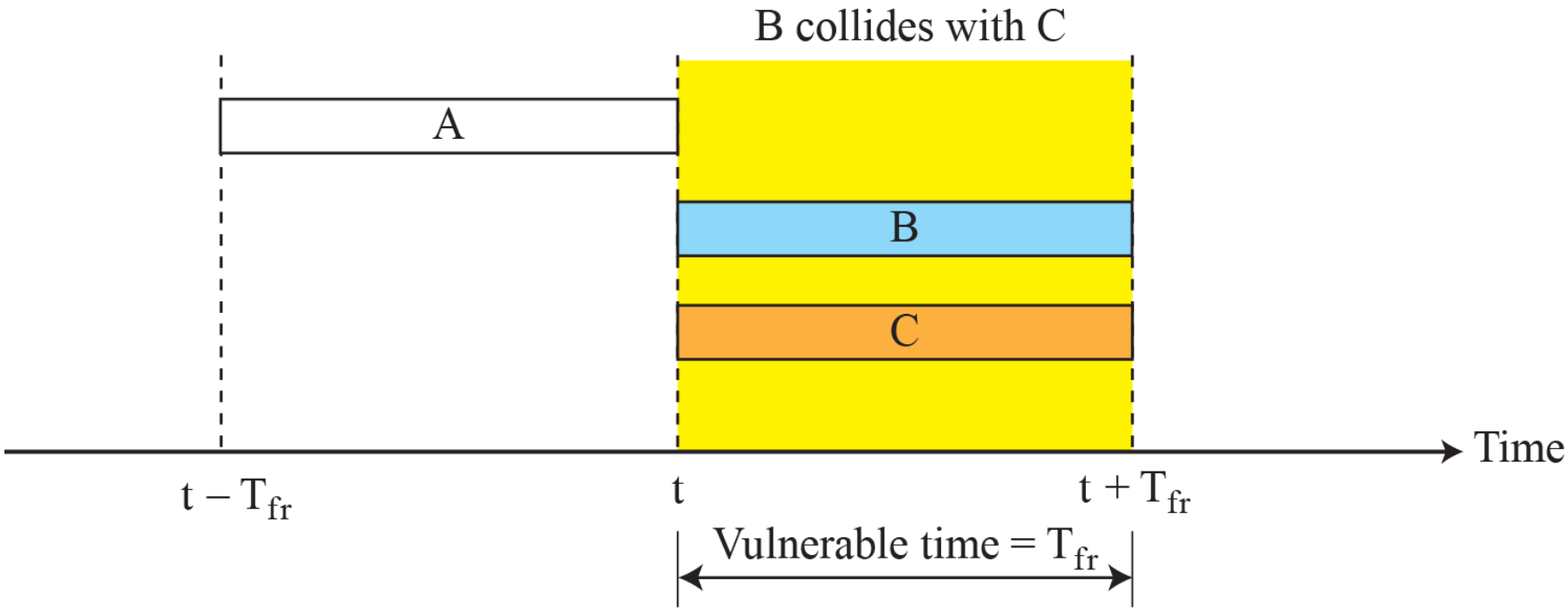
Vulnerable time for Pure ALOHA



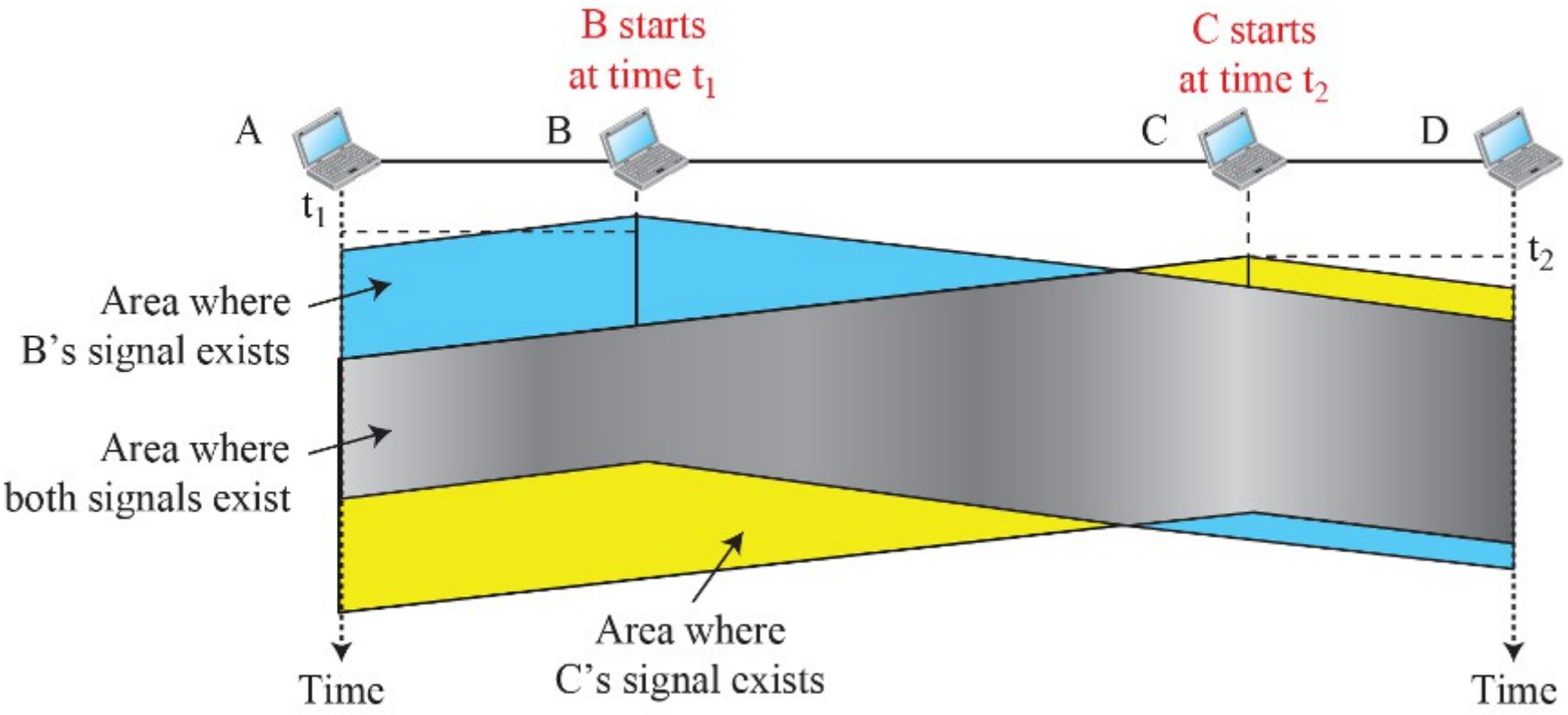
Frames in a slotted ALOHA



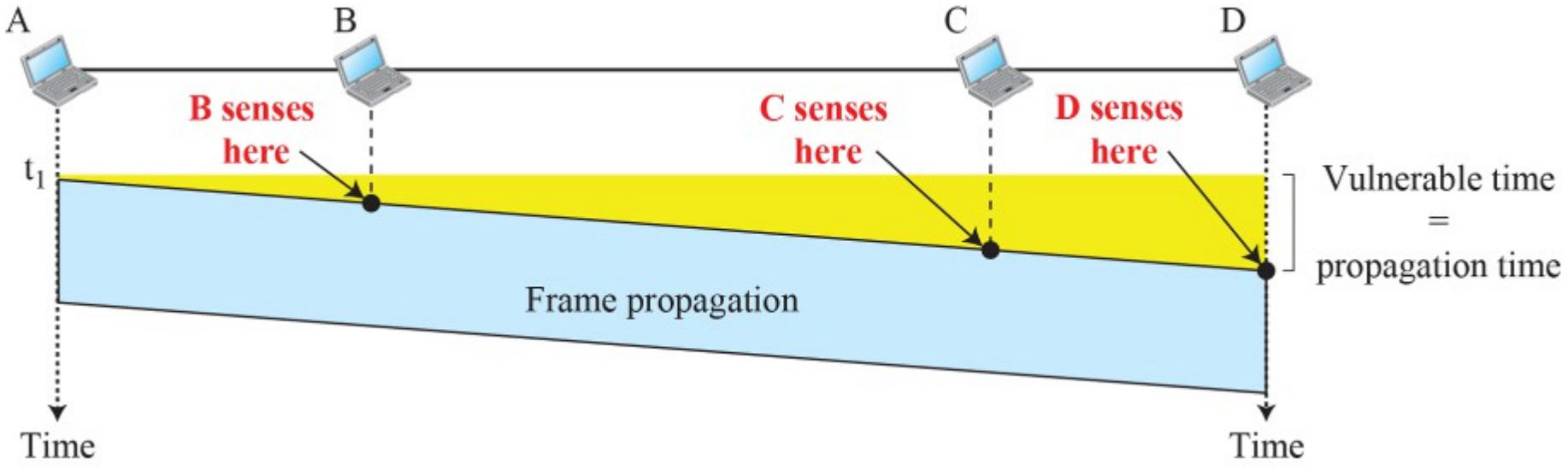
Vulnerable time for slotted ALOHA



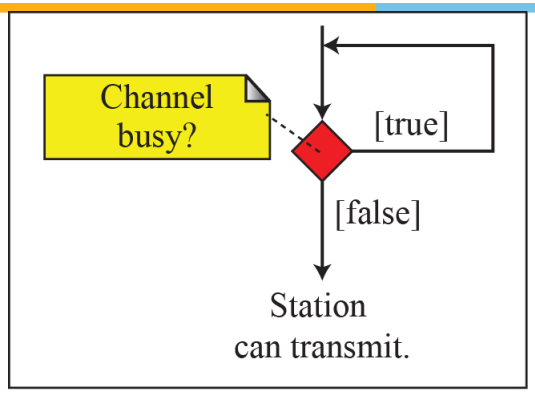
Collision in CSMA



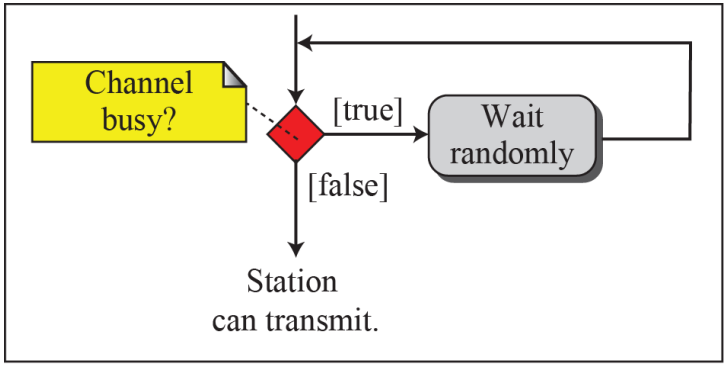
Vulnerable time in CSMA



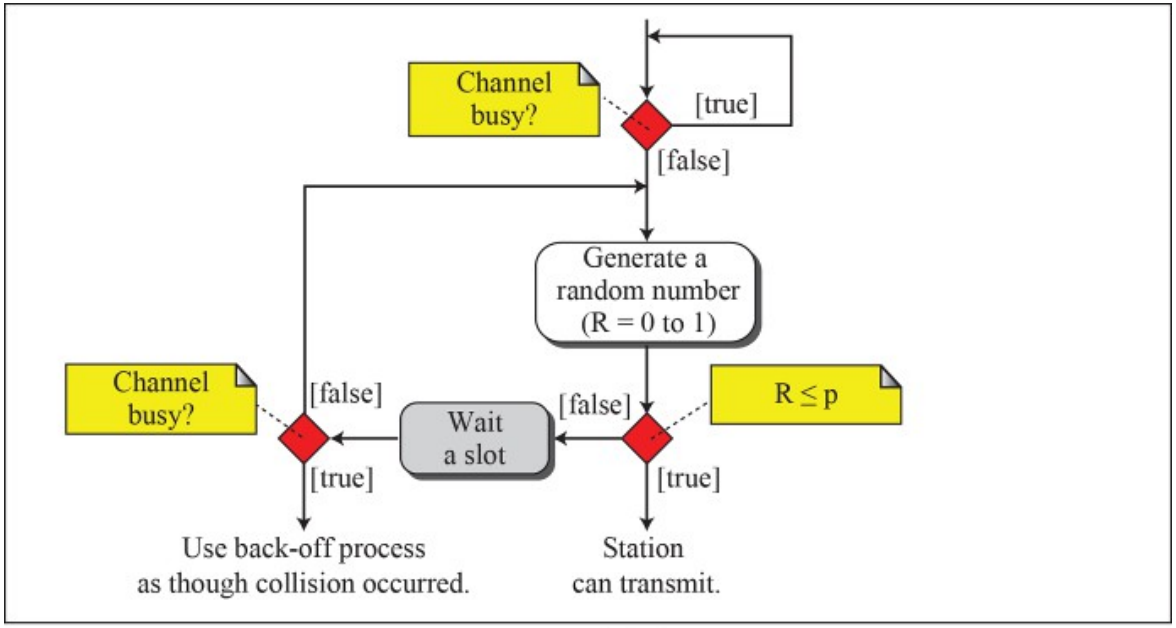
Persistence methods



a. 1-persistent

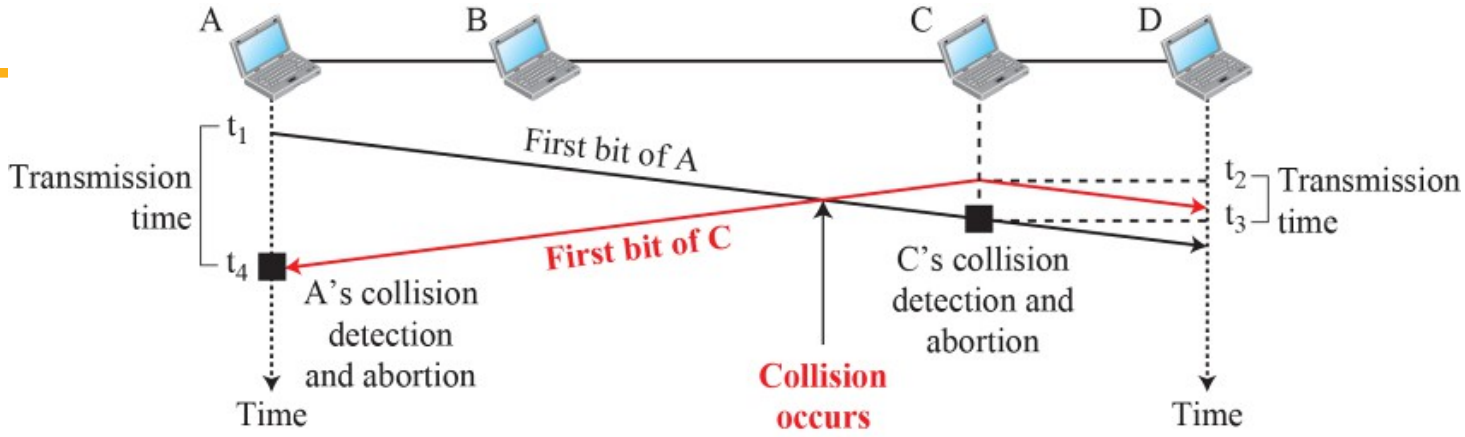


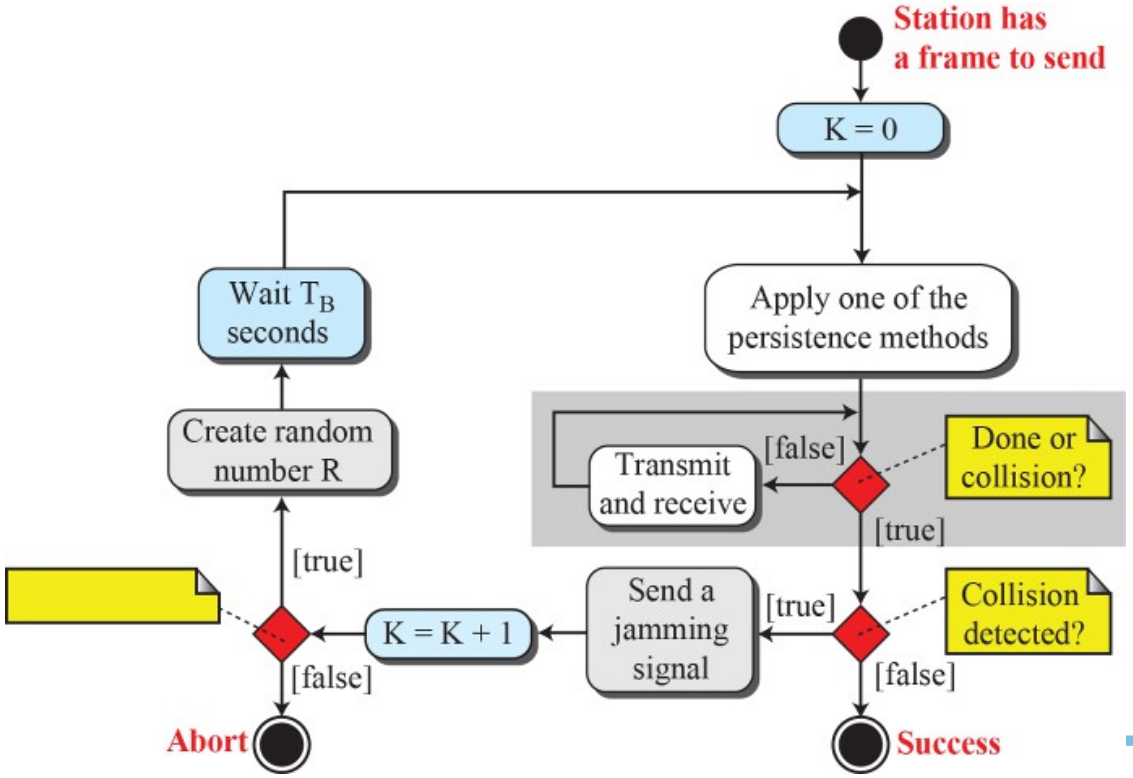
b. Nonpersistent



c. *p*-persistent

CSMA/CD

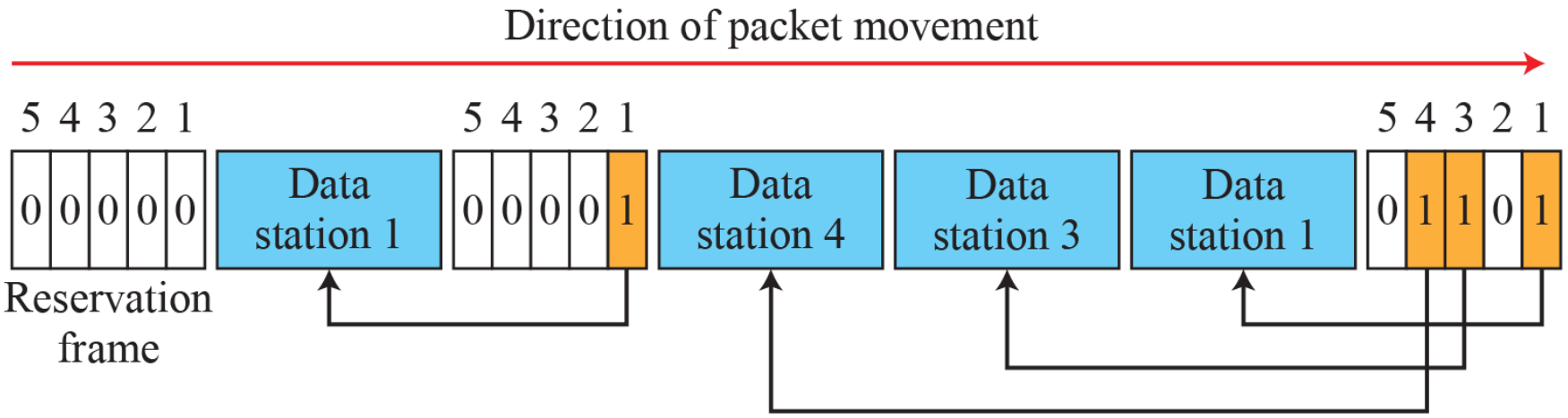




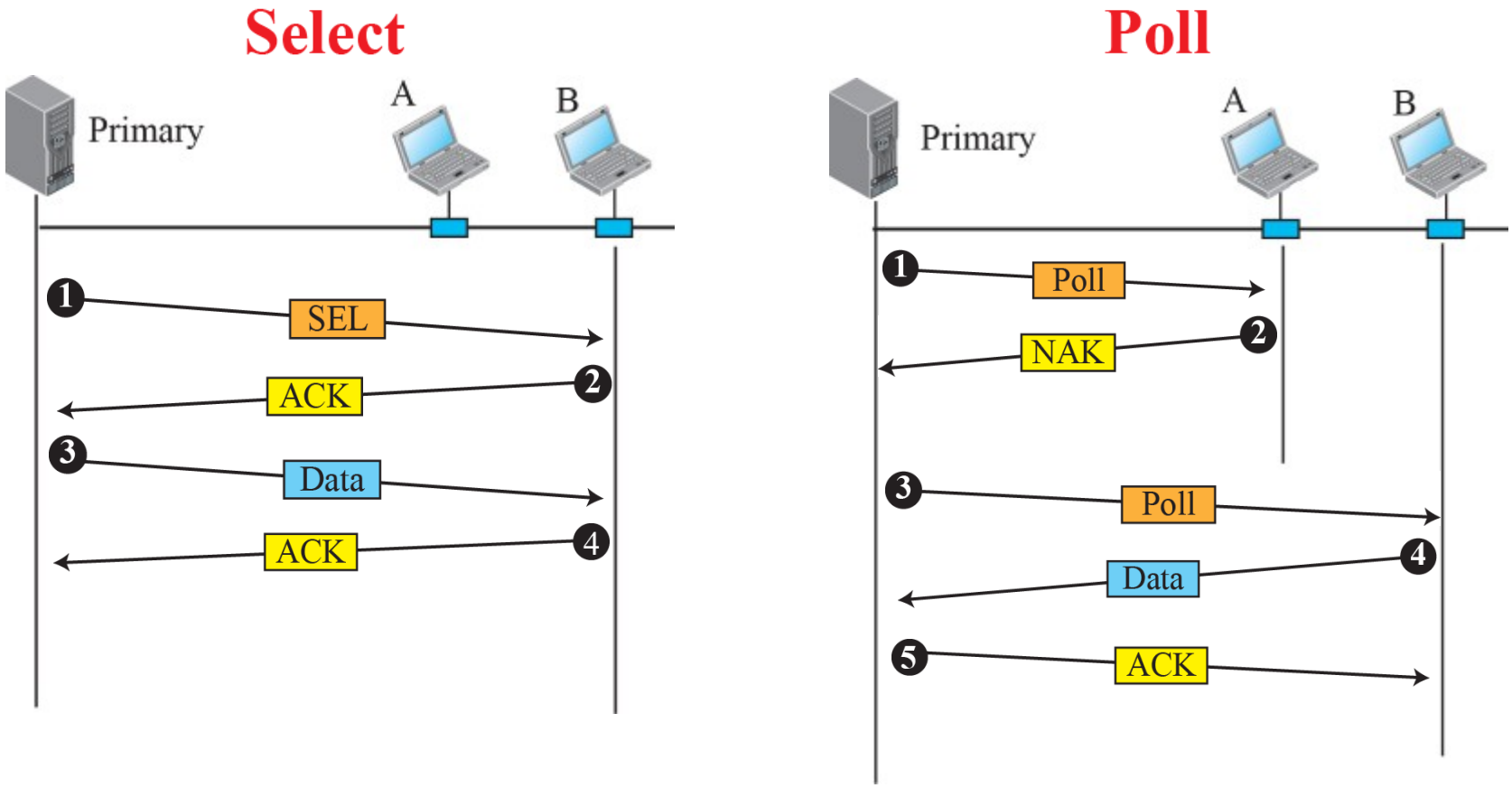
Legend

T_{fr}: Frame average transmission time
K : Number of attempts
R : (random number): 0 to $2^K - 1$
T_B: (Back-off time) = R × T_{fr}

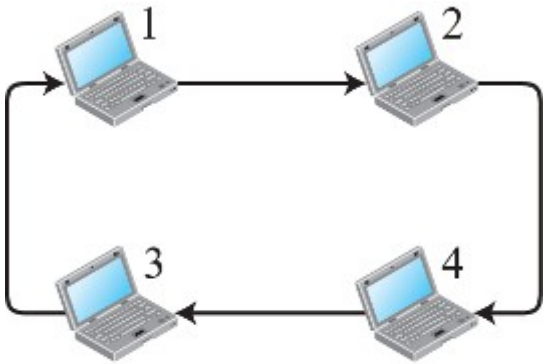
Controlled access: Reservation



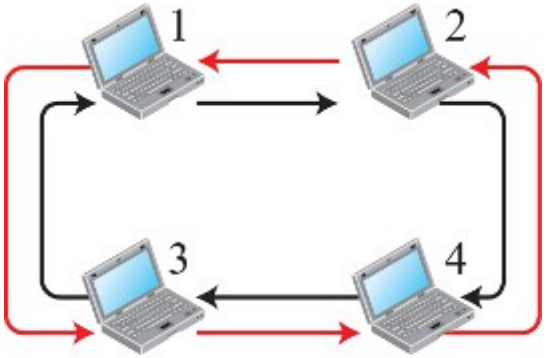
Select and poll in Polling access



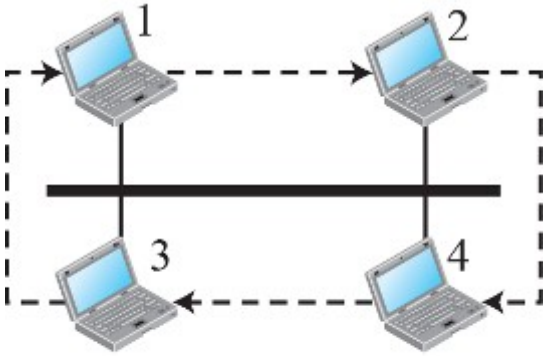
Token passing



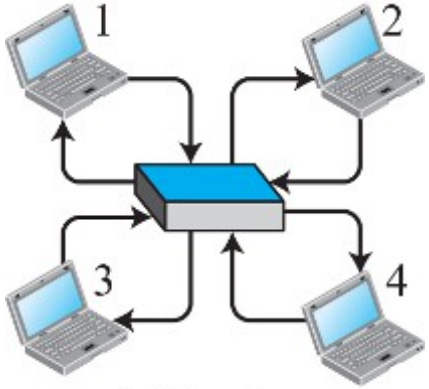
a. Physical ring



b. Dual ring

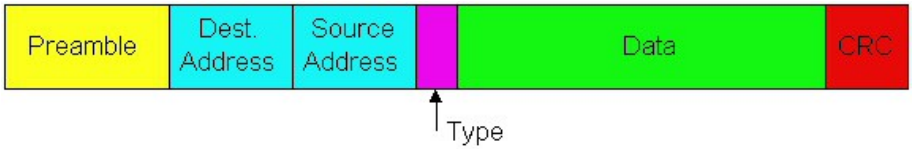


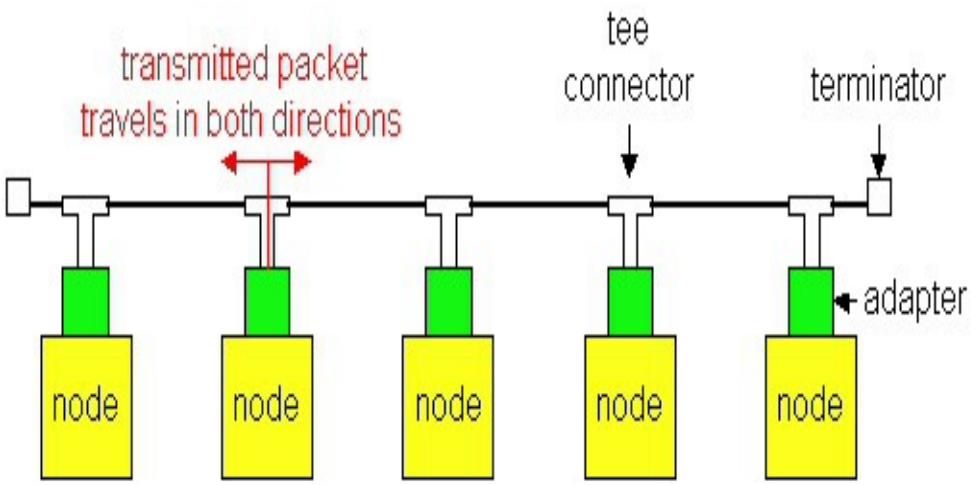
c. Bus ring



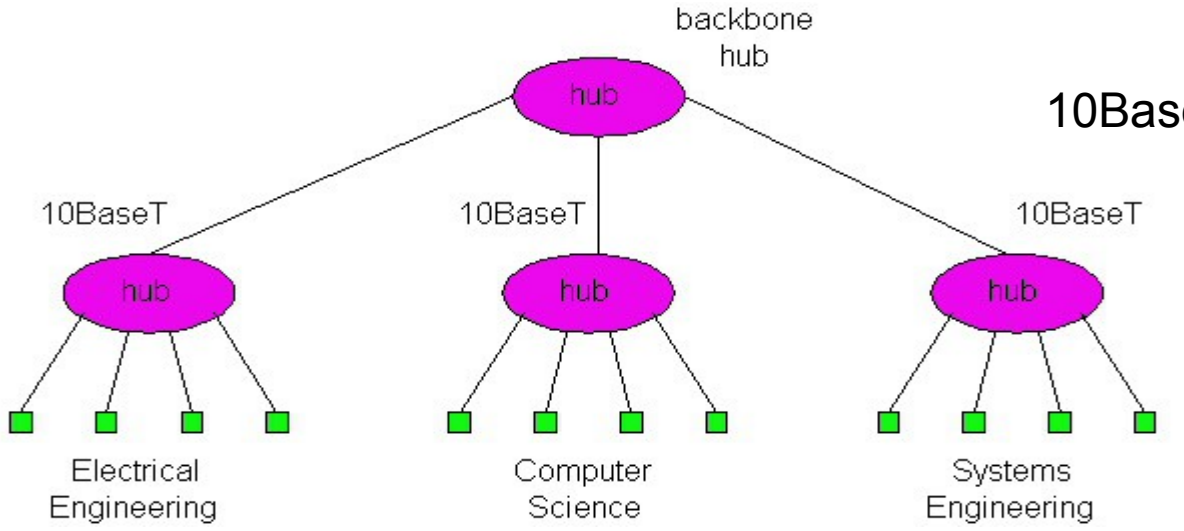
d. Star ring

Ethernet Technologies



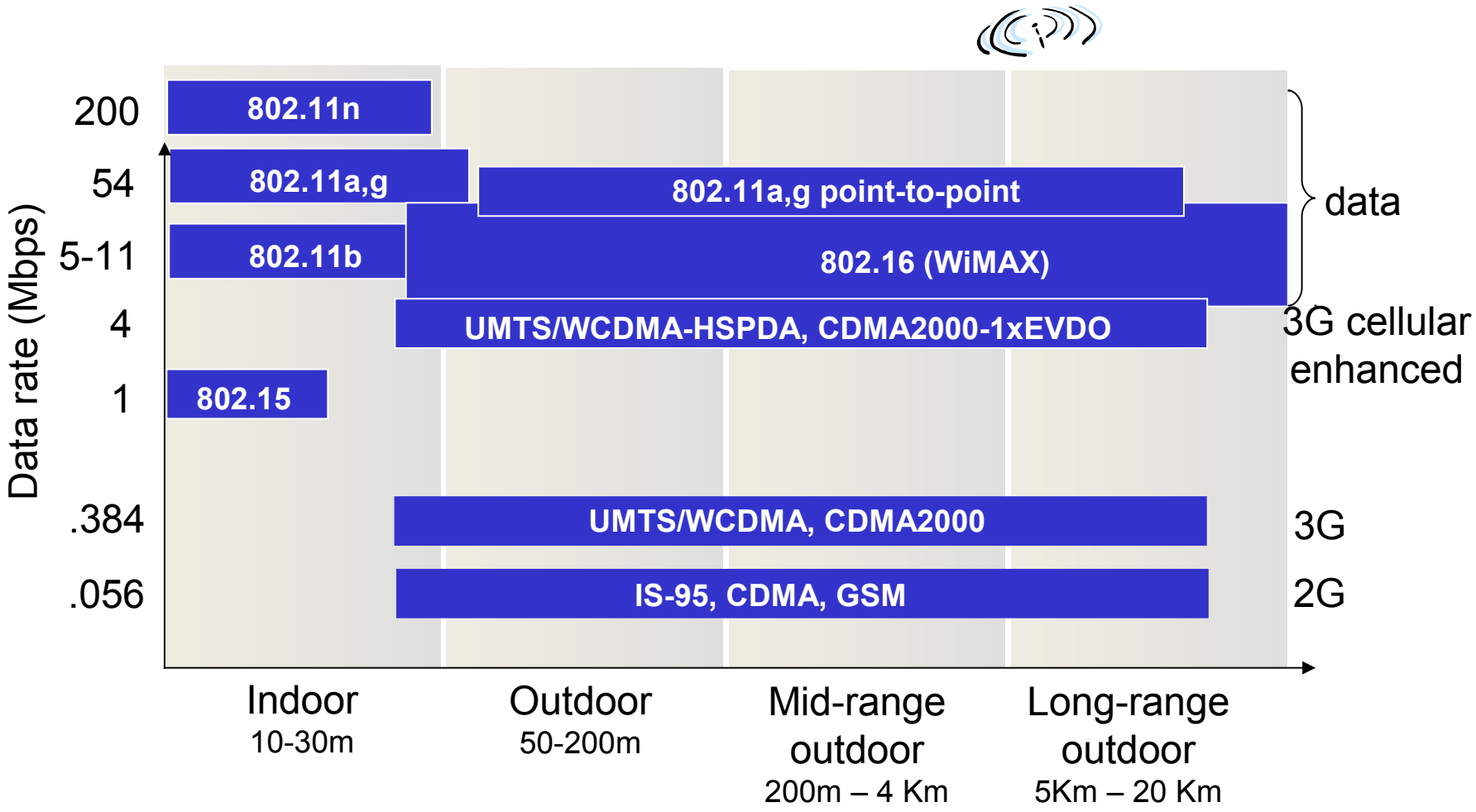


10Base2

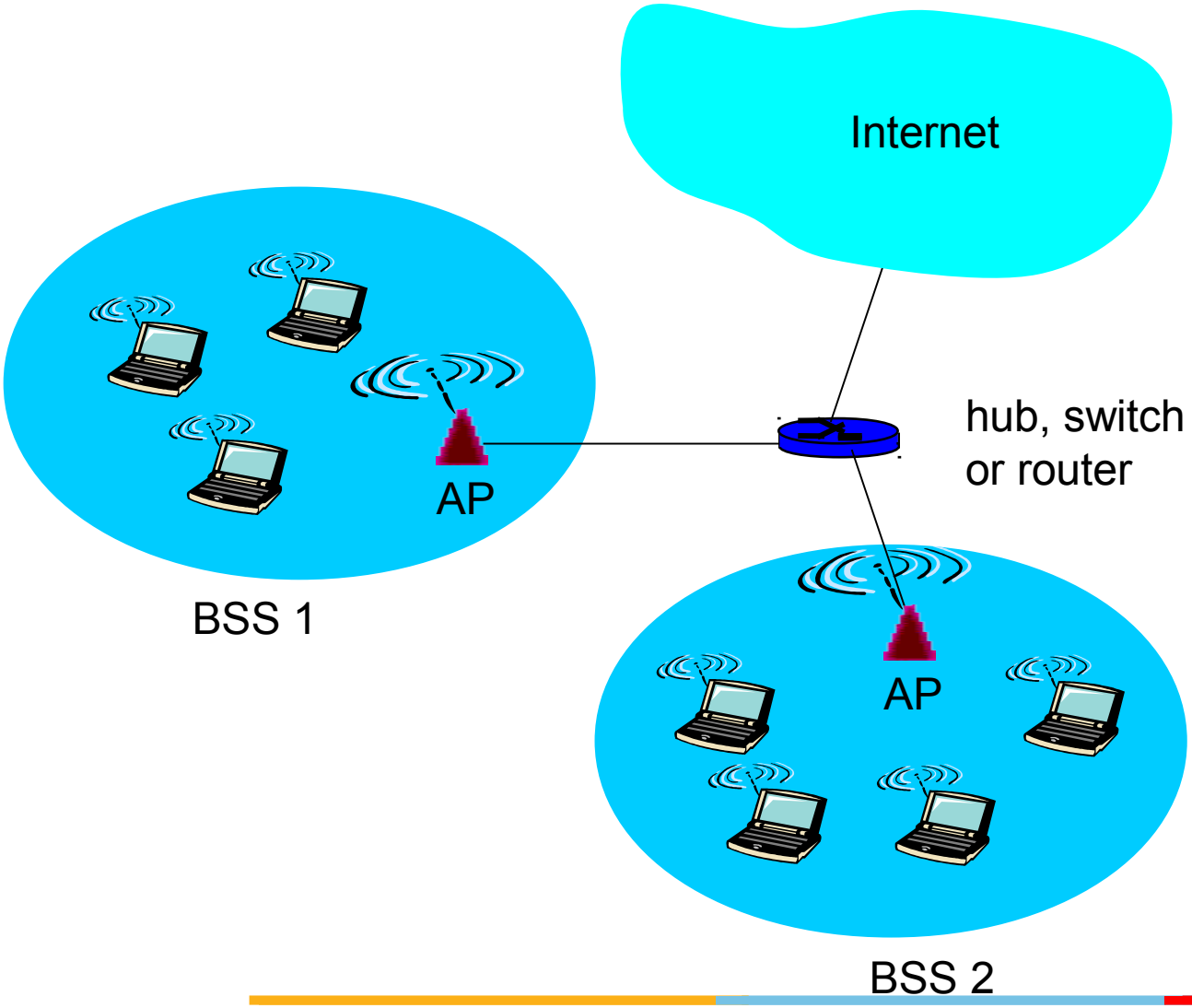


10BaseT

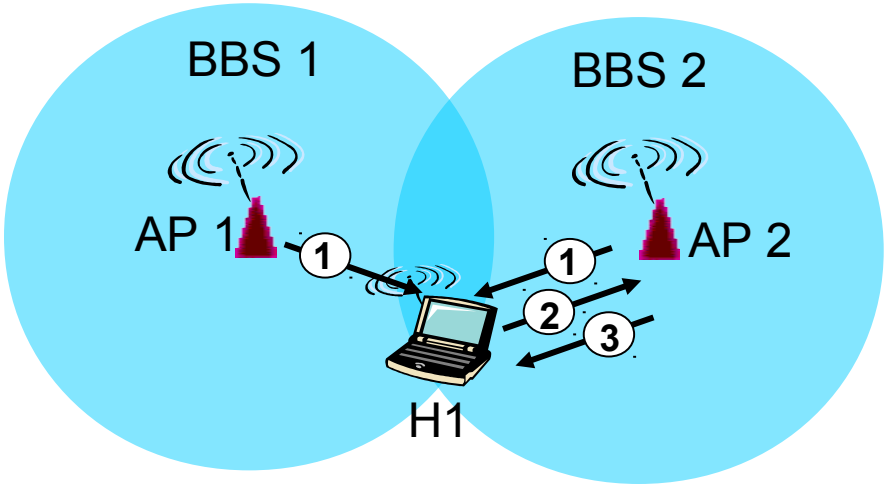
Wireless Links

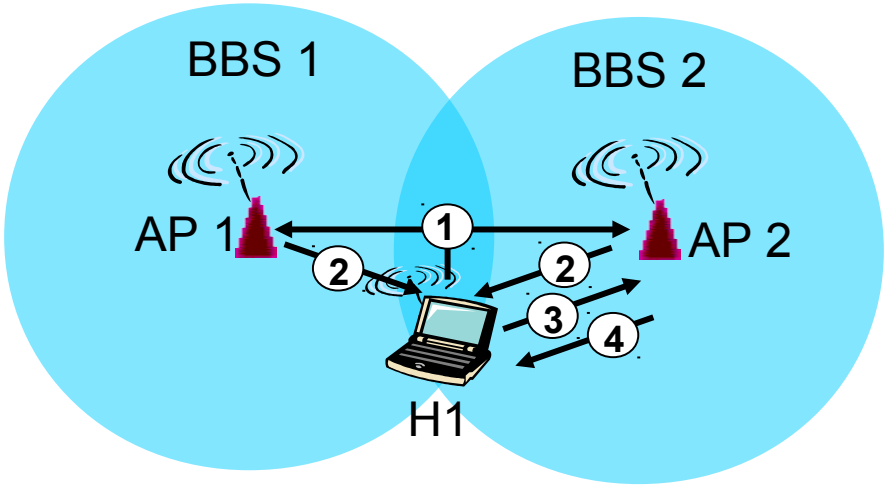


IEEE 802.11 Wireless LAN



Passive/Active Scanning





IEEE 802.11 MAC Protocol: CSMA/CA

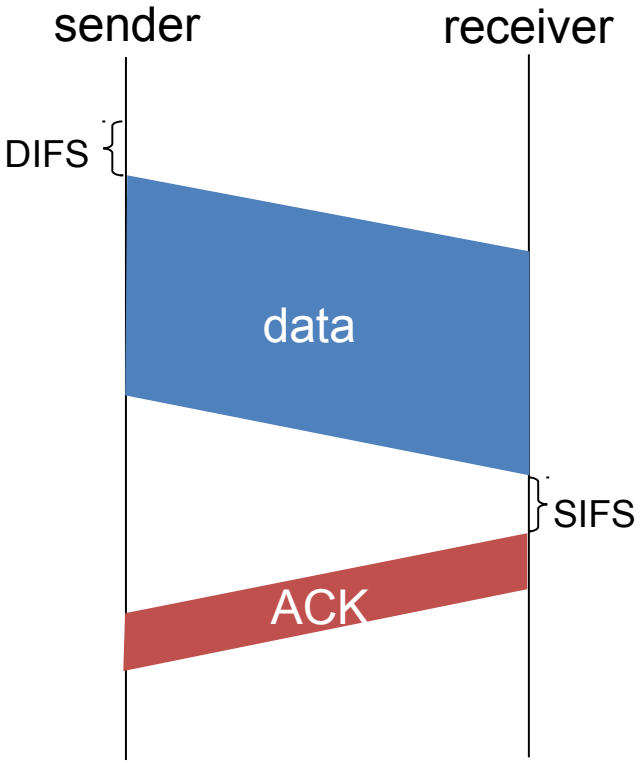
802.11 CSMA: sender

- if sense channel idle for **DIFS** sec.
  then transmit entire frame (no collision detection)
- if sense channel busy
  then binary backoff

802.11 CSMA receiver:

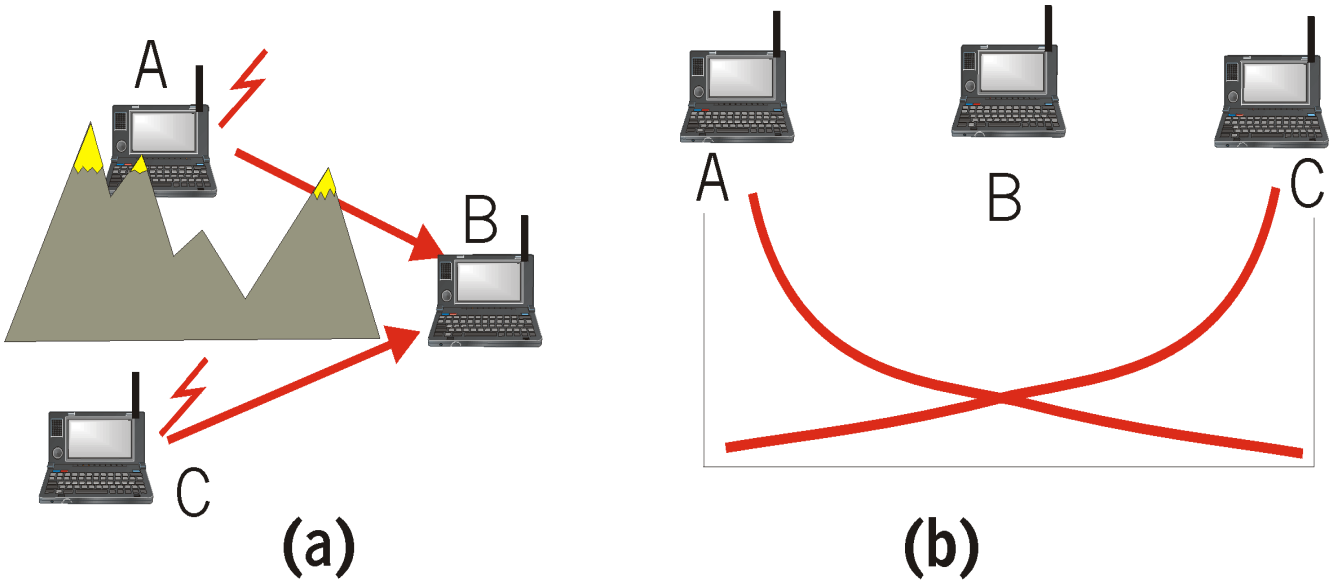
if received OK

return ACK after **SIFS**



Hidden Terminal effect

- hidden terminals: A, C cannot hear each other
  - obstacles, signal attenuation
  - collisions at B
- goal: avoid collisions at B
- **CSMA/CA: CSMA with C**ollision Avoidance



Collision Avoidance: RTS-CTS exchange