BVM Engineering College, VV Nagar

Gujarat Technological University

WIRELESS COMMUNICATION

SEM 7
PRESENTATION

Packet Radio Access Techniques

Electronics & Communication Dept.

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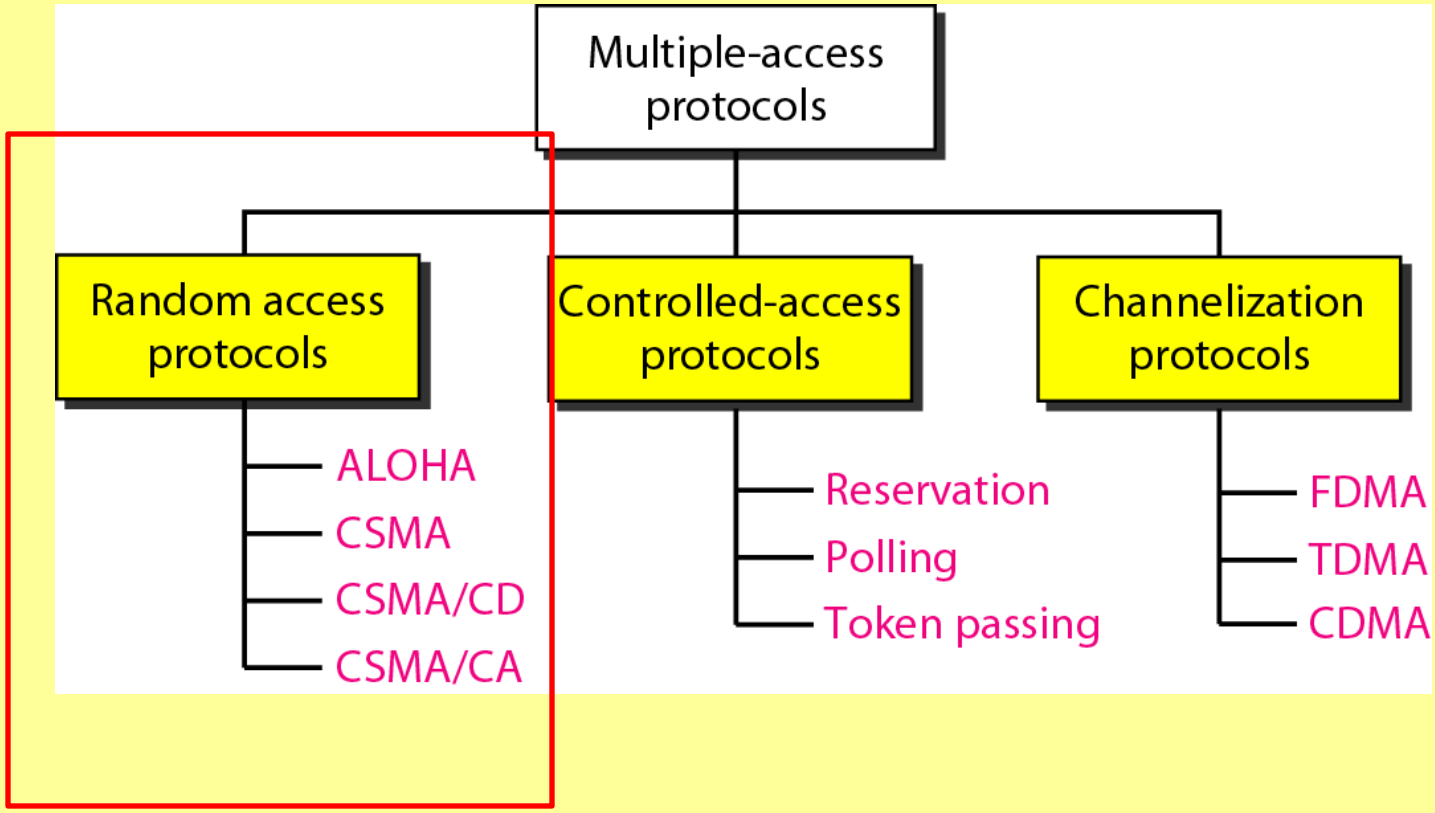
In this presentation, we'll discuss about …

- Random Access Techniques
- Parameters
- ALOHA
- CSMA
  - Persistent Models
- CSMA/CD
- CSMA/CA

Random Access Protocols aka Packet Radio Access Techniques



Parameters

$$\boldsymbol{T = Throughput}$$

$$= Average\ number\ of\ messages\ successfully\ transmitted\ per\ unit\ time$$

$$\boldsymbol{D = Average\ Delay}$$

$$\boldsymbol{R = Network\ Throughput}$$

$$\boldsymbol{V_P = Vulnerable\ Period}$$

$$= Time\ interval\ during\ which\ packets\ are\ susceptible\ to\ collisions\ with\ transmission\ from\ other\ users$$

$$P_r(n) = Probability\ that\ 'n'\ packets\ are\ generated\ by\ user\ population\ during\ a\ given\ packet\ duration$$

Assumed to be a **Poisson distribution**

If

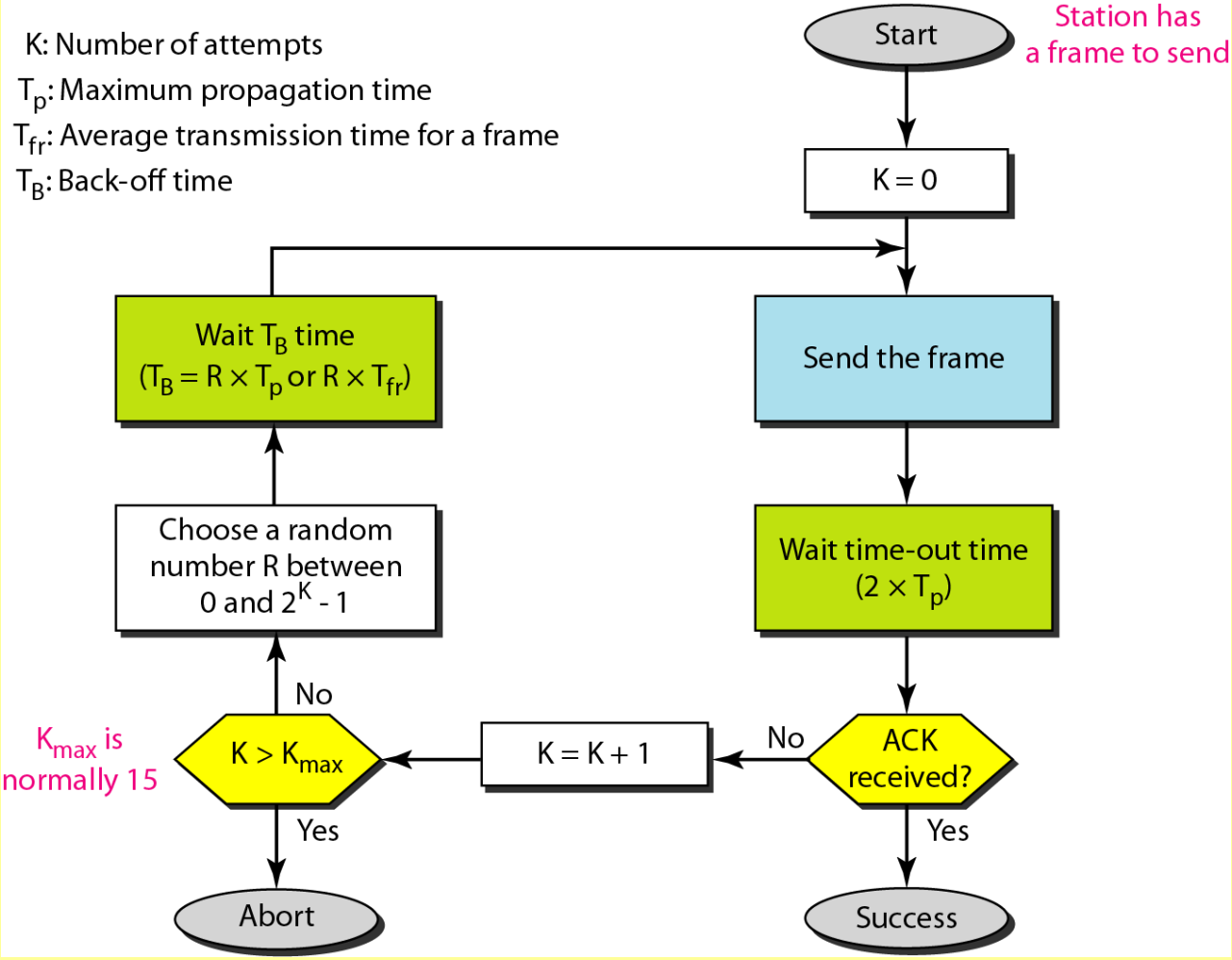
$$\boldsymbol{\tau = Packet\ duration\ in\ seconds}$$

$$\boldsymbol{\lambda = Mean\ arrival\ rate\ (in\ packets/second)}$$

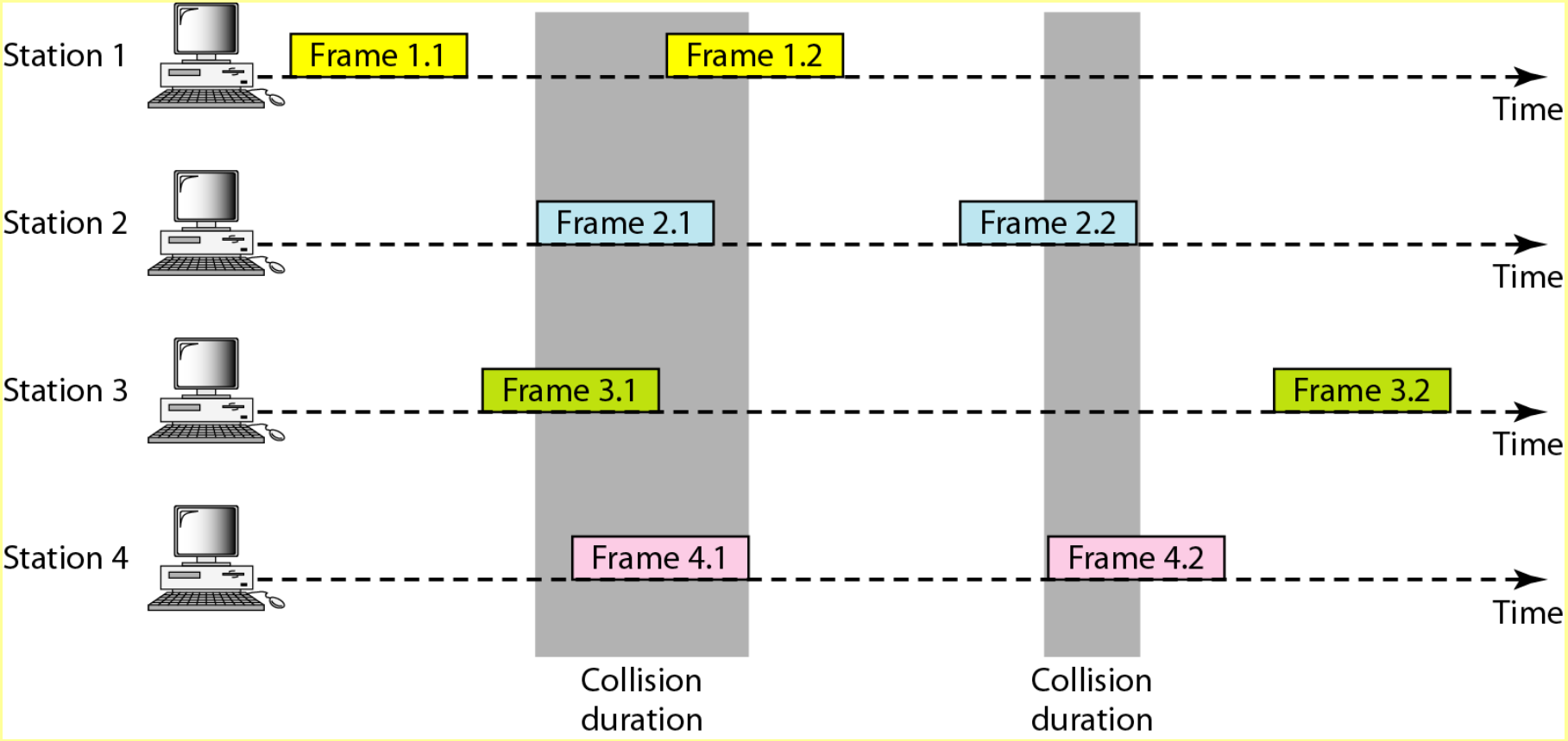
Then, $\boldsymbol{R = \lambda\tau}$ $(measured\ in\ Erlangs)$

Pure ALOHA

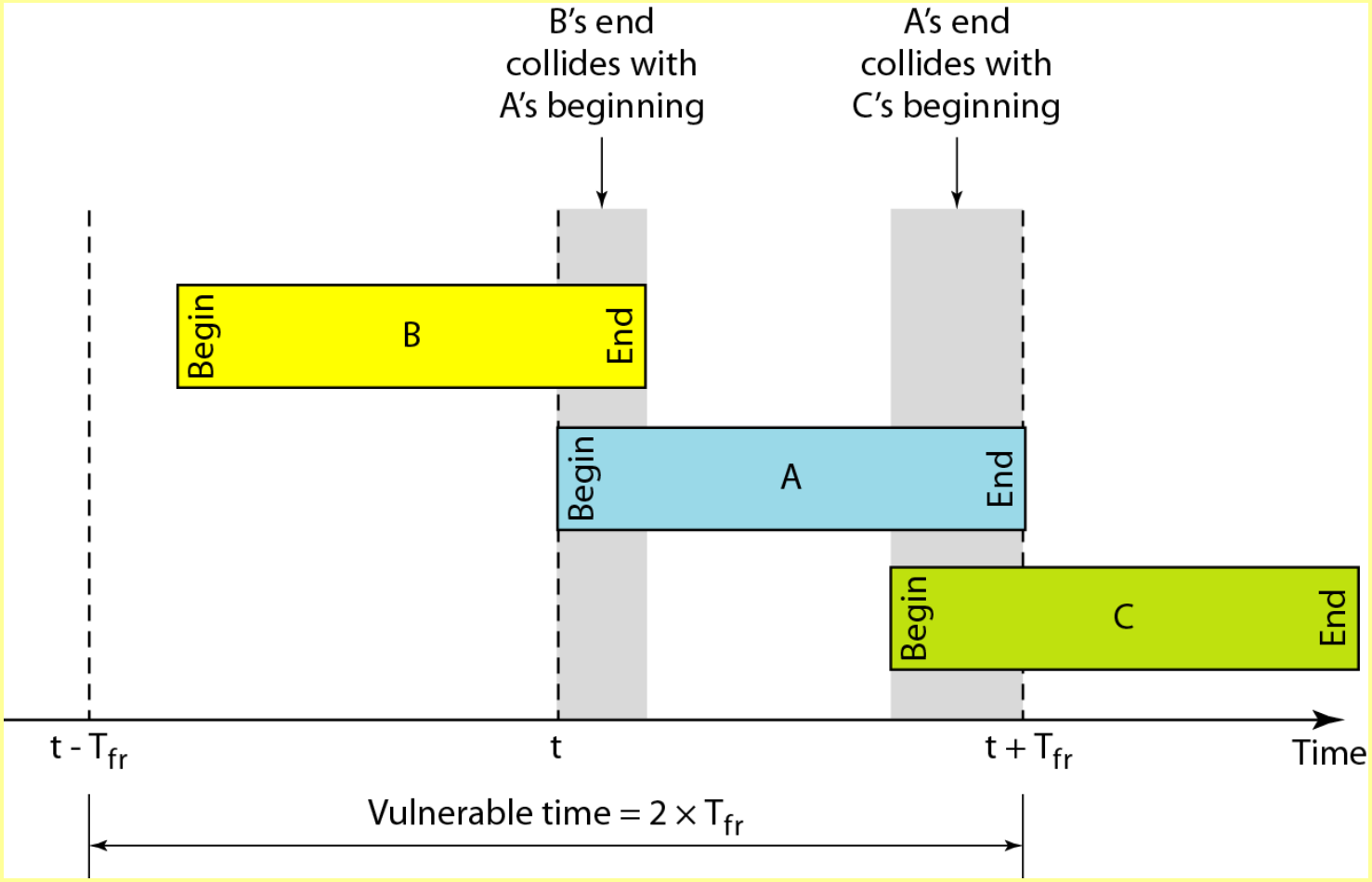
Procedure



Frame Movement



Vulnerable Period



Results

The throughput for pure ALOHA is $T = Re^{-2R}$.

The maximum throughput $T_{max} = 0.184$ when $R = \frac{1}{2}$

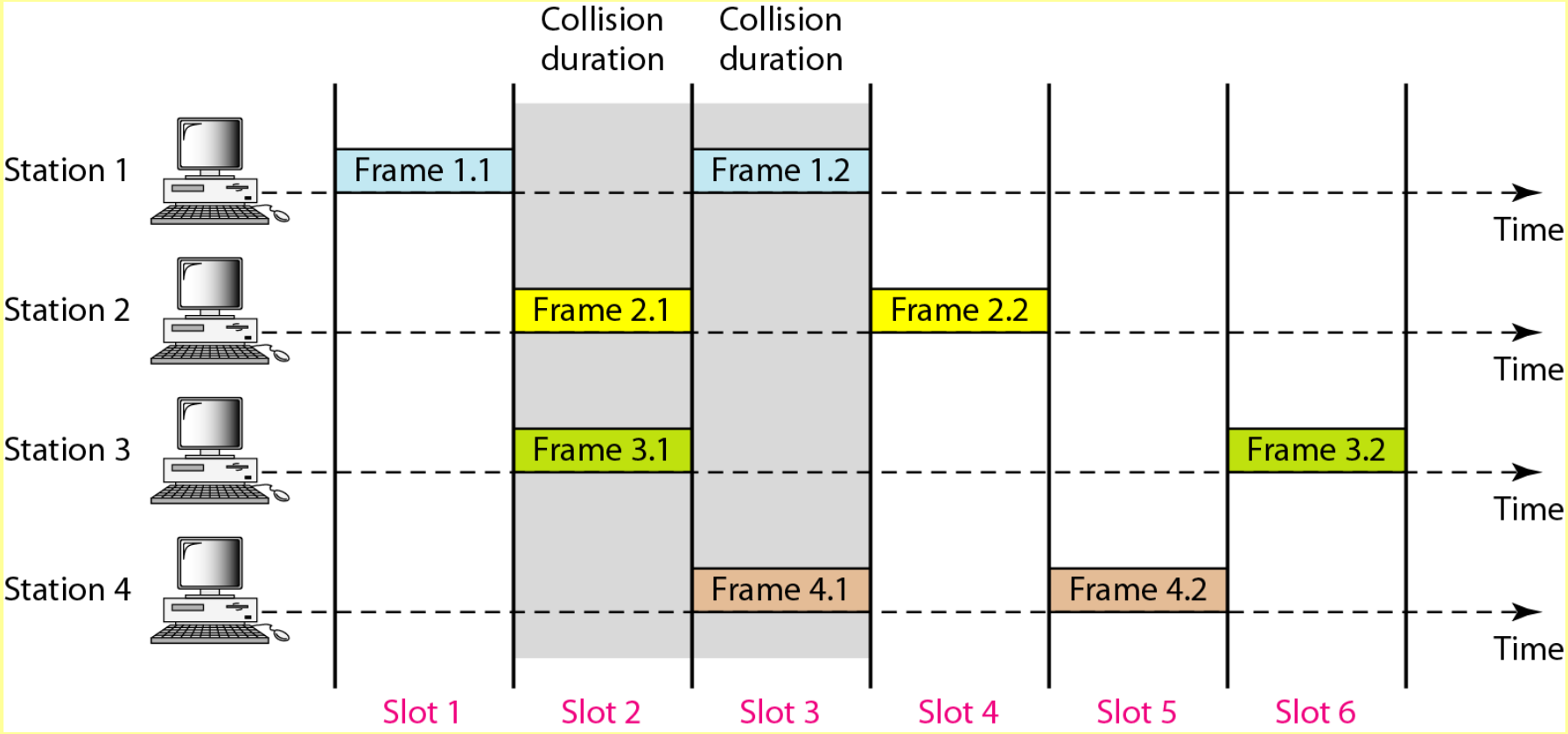
Using

Probability for no collision, which is

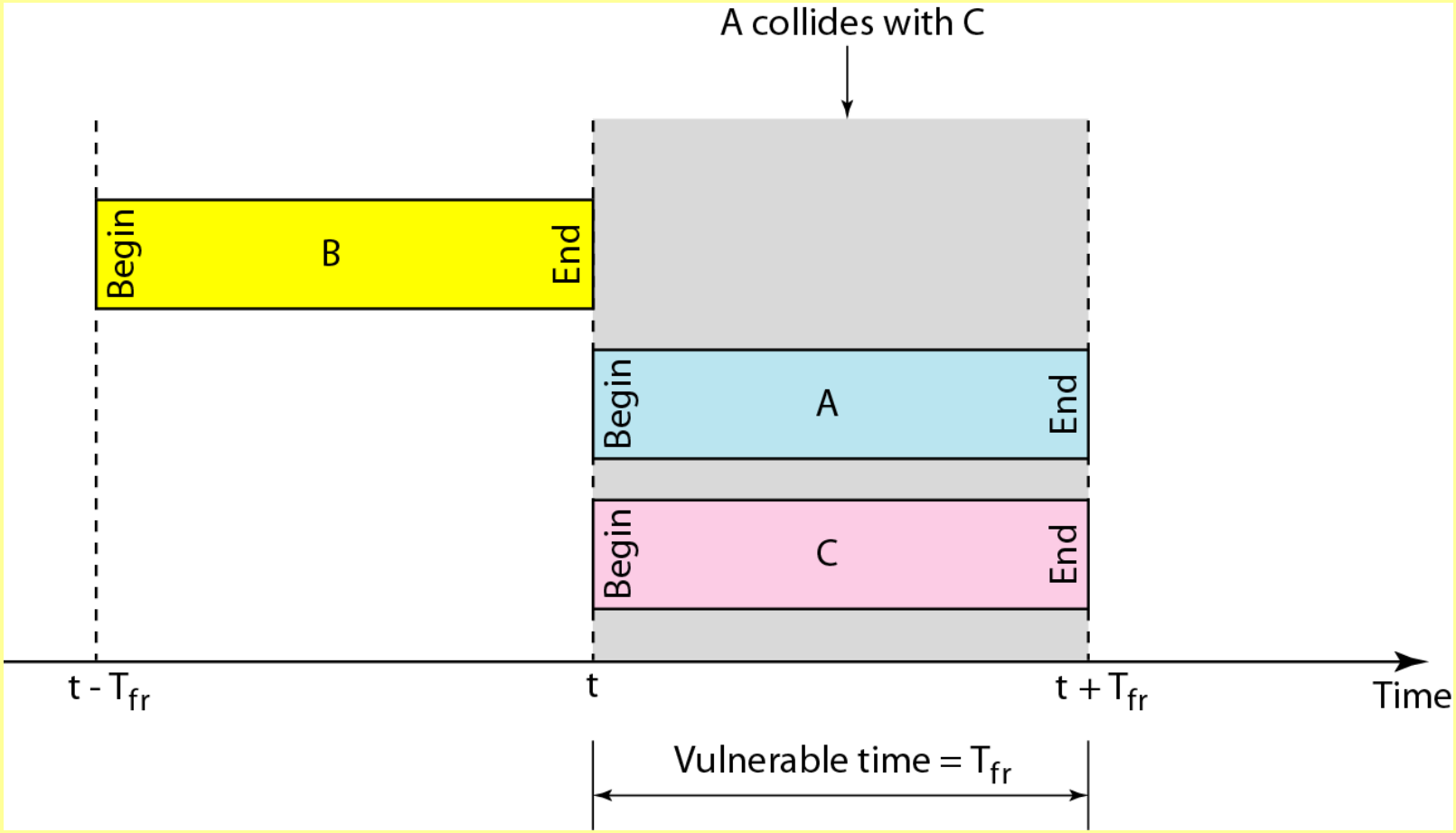
$P_r(n) = \frac{(2R)^n e^{-2R}}{n!}$ at $n = 0$

Slotted ALOHA

Frame Movement



Vulnerable Period



Results

The throughput for slotted ALOHA is $T = Re^{-R}$.

The maximum throughput $T_{max} = 0.368$ when $R = 1$

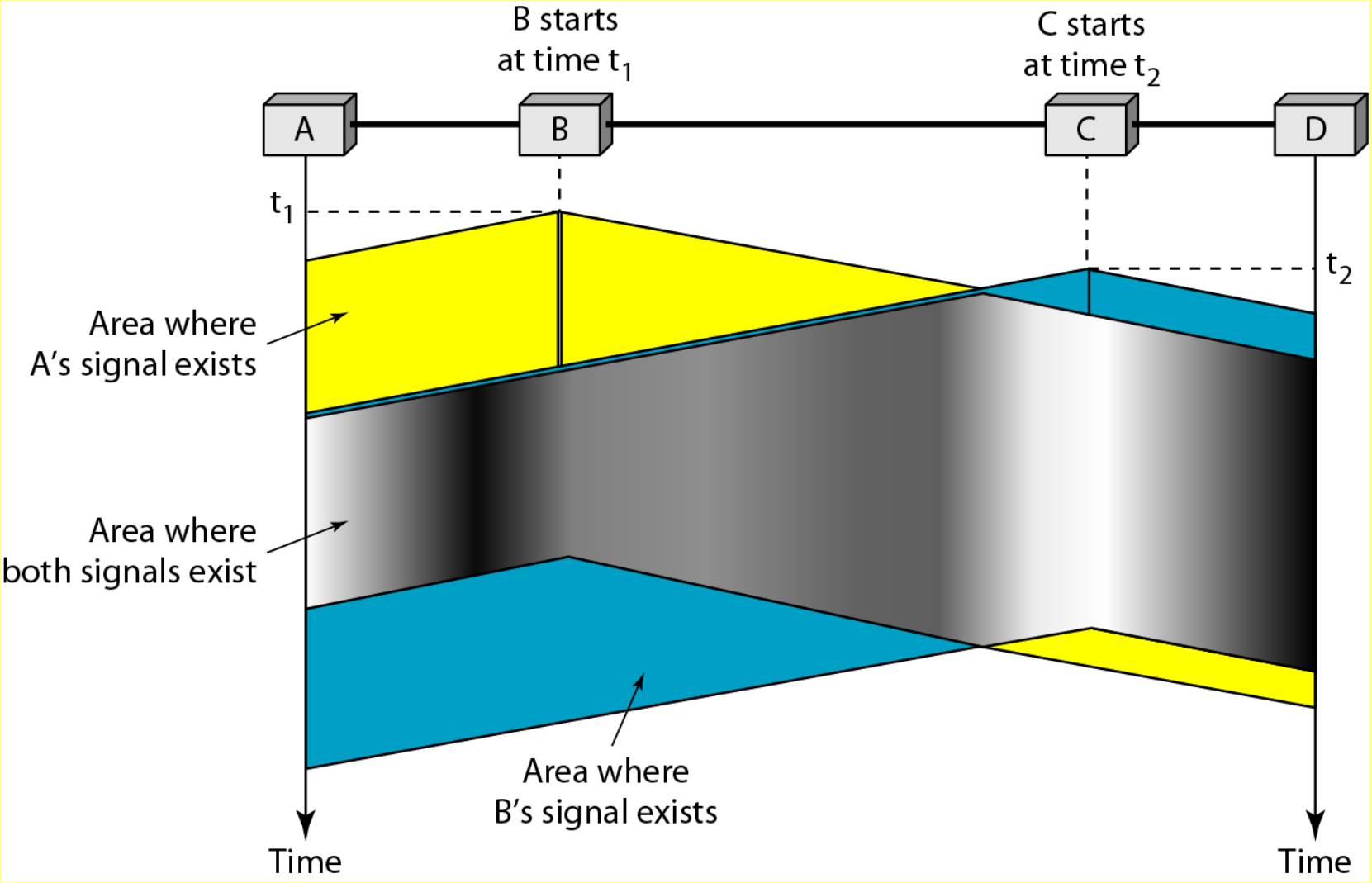
Using

Probability for no collision, which is

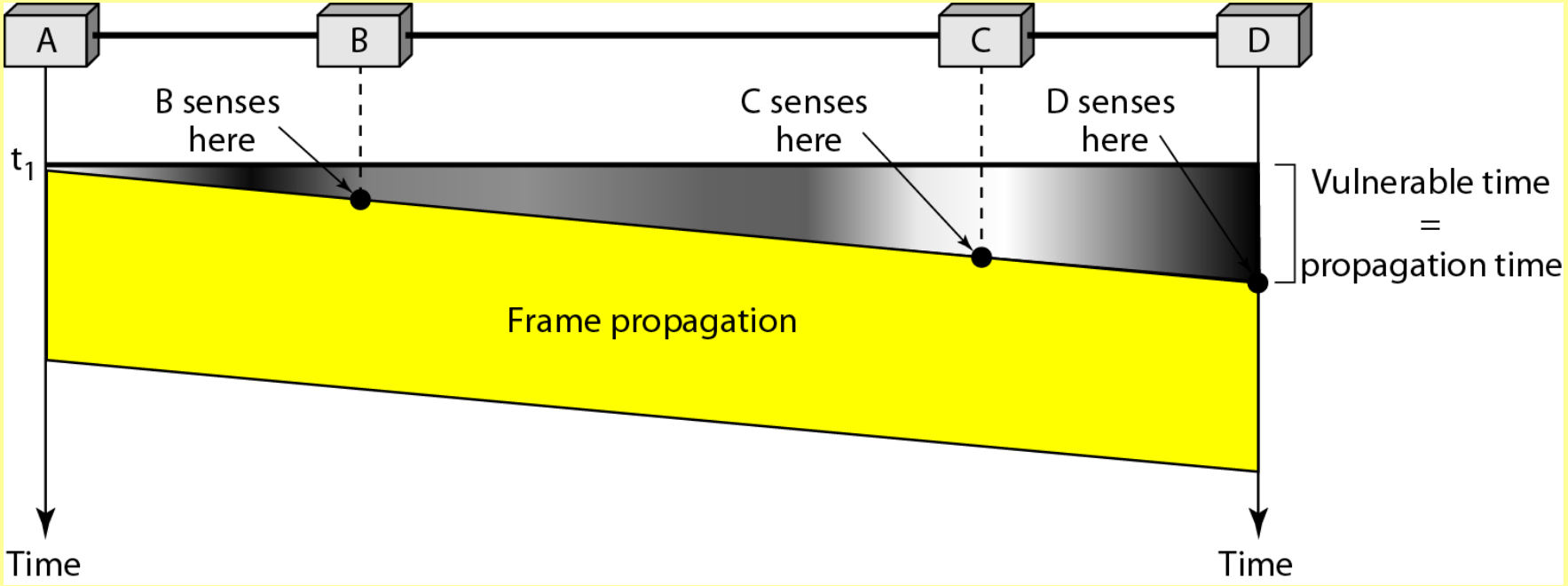
$P_r(n) = \frac{R^n e^{-R}}{n!}$ at $n = 0$

Carrier Sense Multiple Access (CSMA)

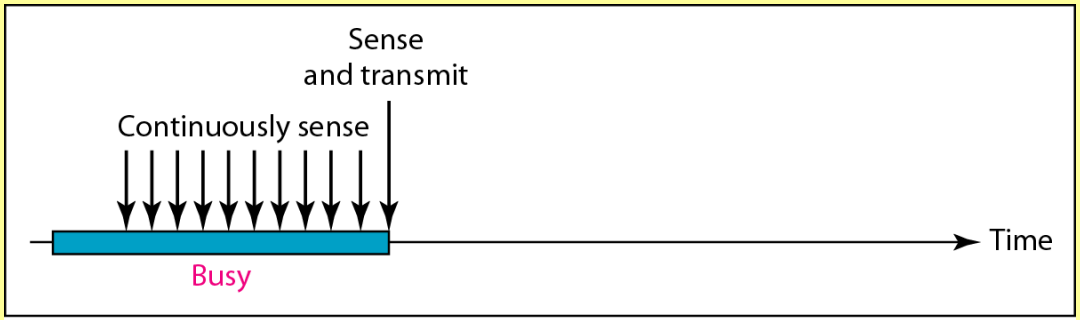
Space/Time model of the collision in CSMA



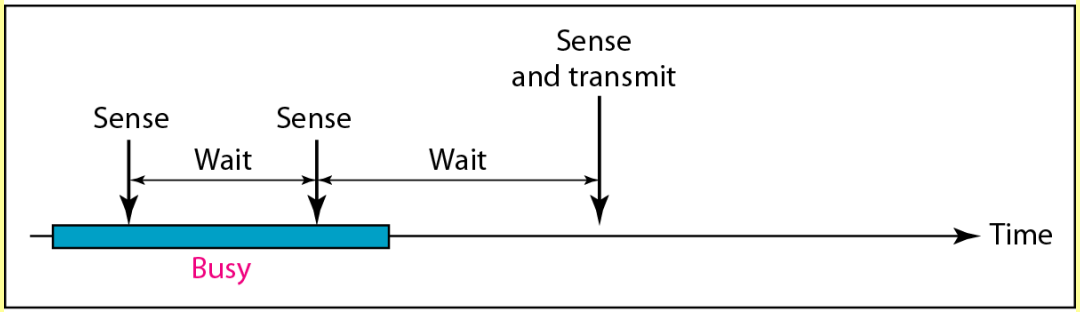
Vulnerable Time in CSMA



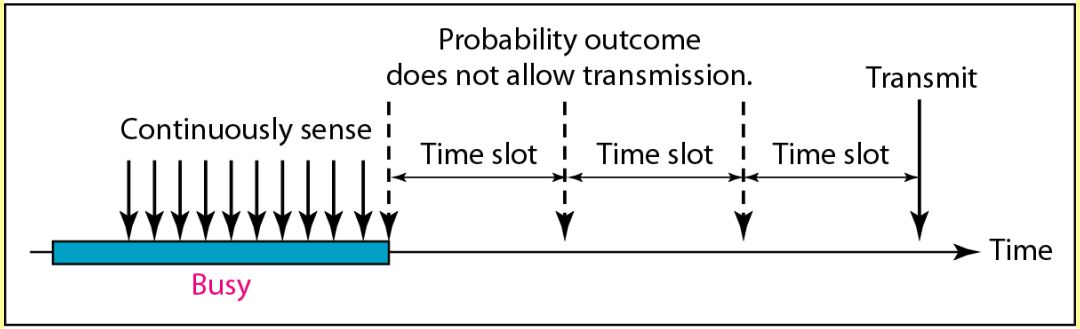
CSMA Persistence Models Behaviour



a. 1-persistent

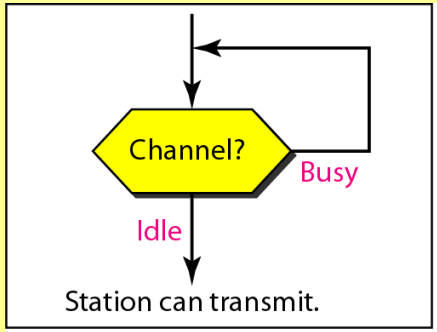


b. Nonpersistent

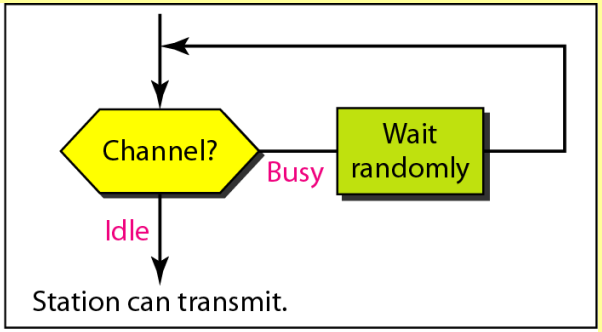


c. p-persistent

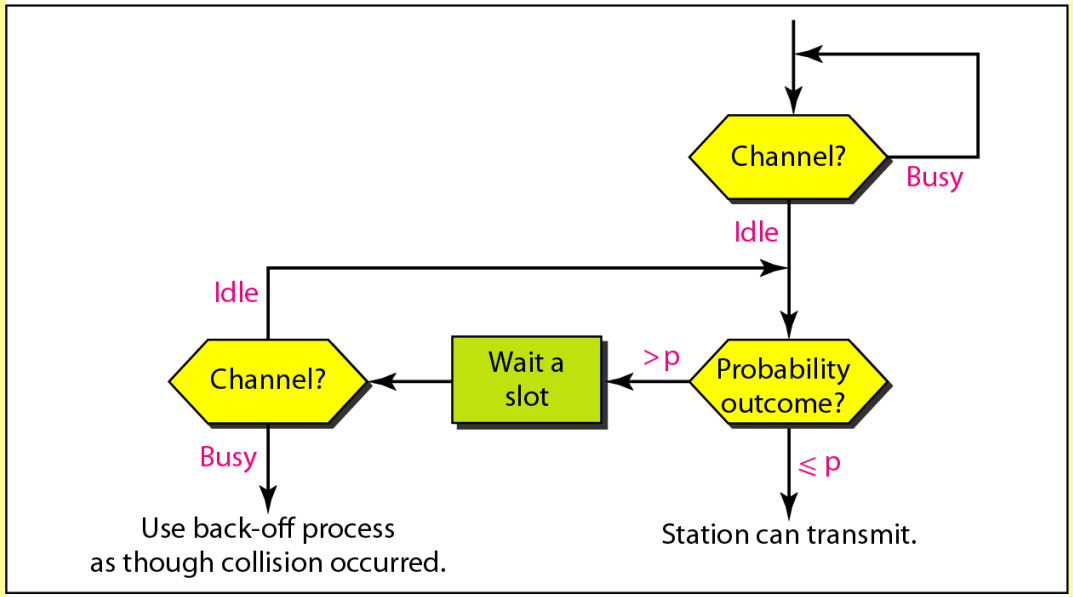
Flow Diagram



a. 1-persistent

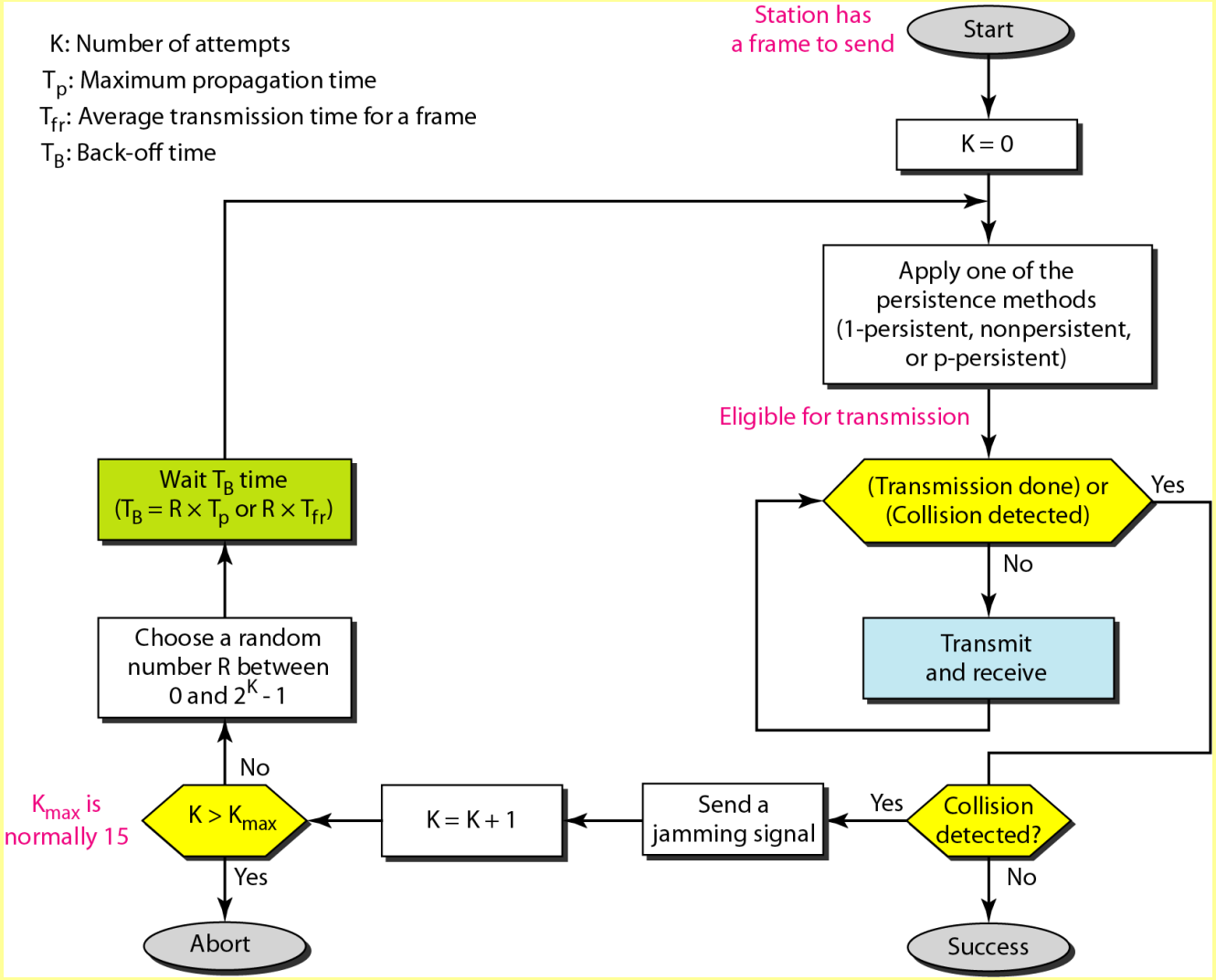


b. Nonpersistent



c. p-persistent

CSMA with Collision Detect (CSMA/CD)



CSMA with Collision Avoidance (CSMA/CA)