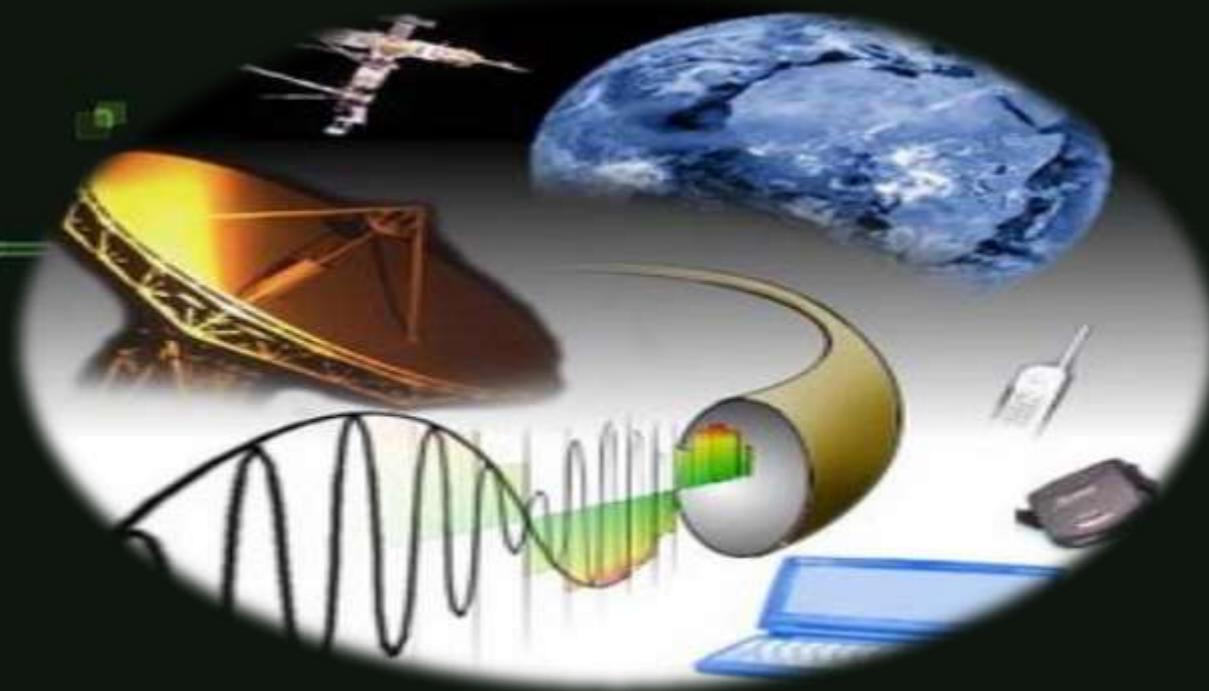


PRESENTATION
ON
CSMA/CD
IN
COMPUTER NETWORKS



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CSMA / CD

CARRIER SENSE MULTIPLE ACCESS WITH COLLISION DETECTION

CARRIER SENSE MULTIPLE ACCESS WITH COLLISION DETECTION

CSMA \ CD

Carrier Sense



Is anyone transmitting data?

Yes

No

Do not transmit

Transmit Data

Multiple Access



Multiple devices are connected...

The Perfect environment for collisions!

Collision Detect



Backoff Algorithm

Computer A has transmission priority

WHAT IS CSMA/CD?



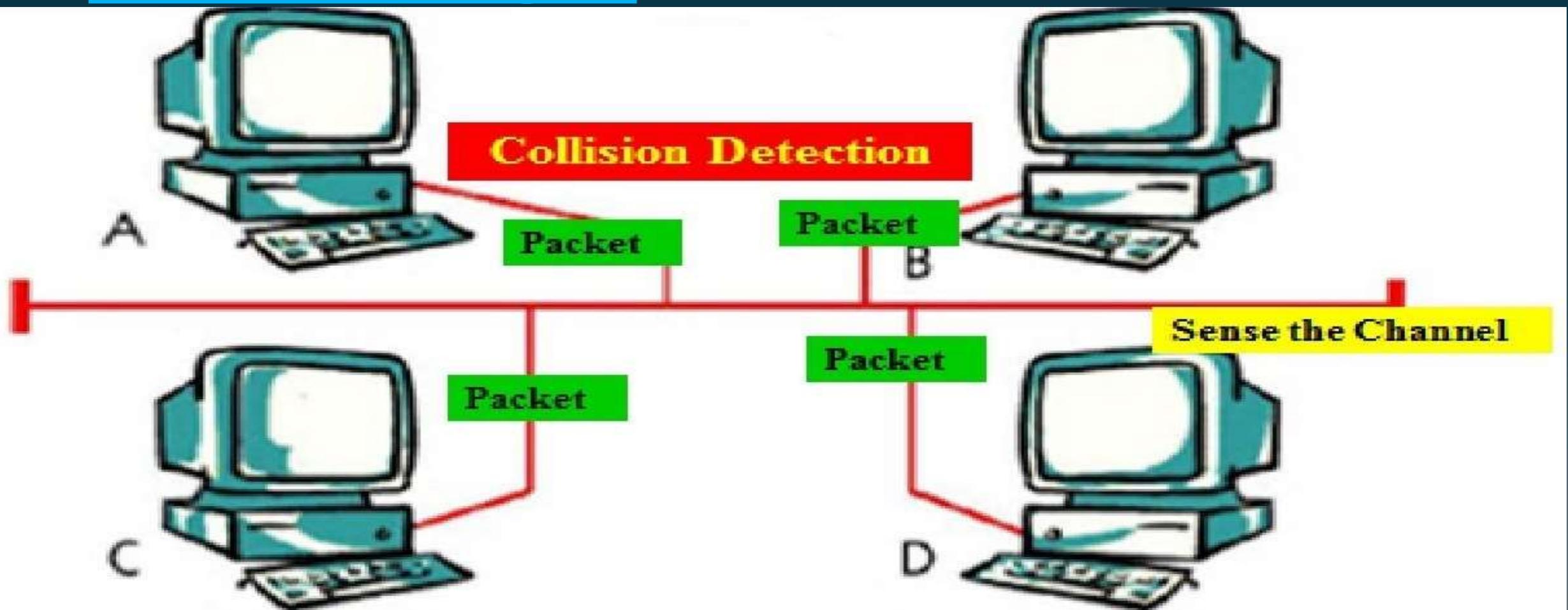
- CSMA/CD protocol can be considered as a refinement and modification of pure "Carrier Sense Multiple Access" (CSMA).
- In a CSMA system, the chance of collision can be reduced if a station senses the medium before trying to use it, but it can not eliminate it.
- CSMA/CD is used to improve CSMA performance and it augments the algorithm to handle the collision.

CSMA/CD - INTRODUCTION

- CARRIER SENSE MULTIPLE ACCESS with COLLISION DETECTION (CSMA/CD) is a MEDIA ACCESS CONTROL method used most notably in early ETHERNET technology for LOCAL AREA NETWORKING.
- This is used in combination with COLLISION DETECTION in which a transmitting station detects collisions by sensing transmissions from other stations while it is transmitting a frame.
- When this collision condition is detected, the station stops transmitting that frame, transmits a jam signal, and then waits for a random time interval before trying to resend the frame.

CSMA/CD – CONCEPT

- In CSMA/CD method, a station MONITORS the MEDIUM after it sends a frame to see if the transmission was successful. If so, the station is finished. If however, there is a Collision, the frame is sent again.



How to CSMA/CD Protocol works?

1.
If Medium
IDLE

- TRANSMIT,
- Otherwise step 2

2.
If Medium
BUSY

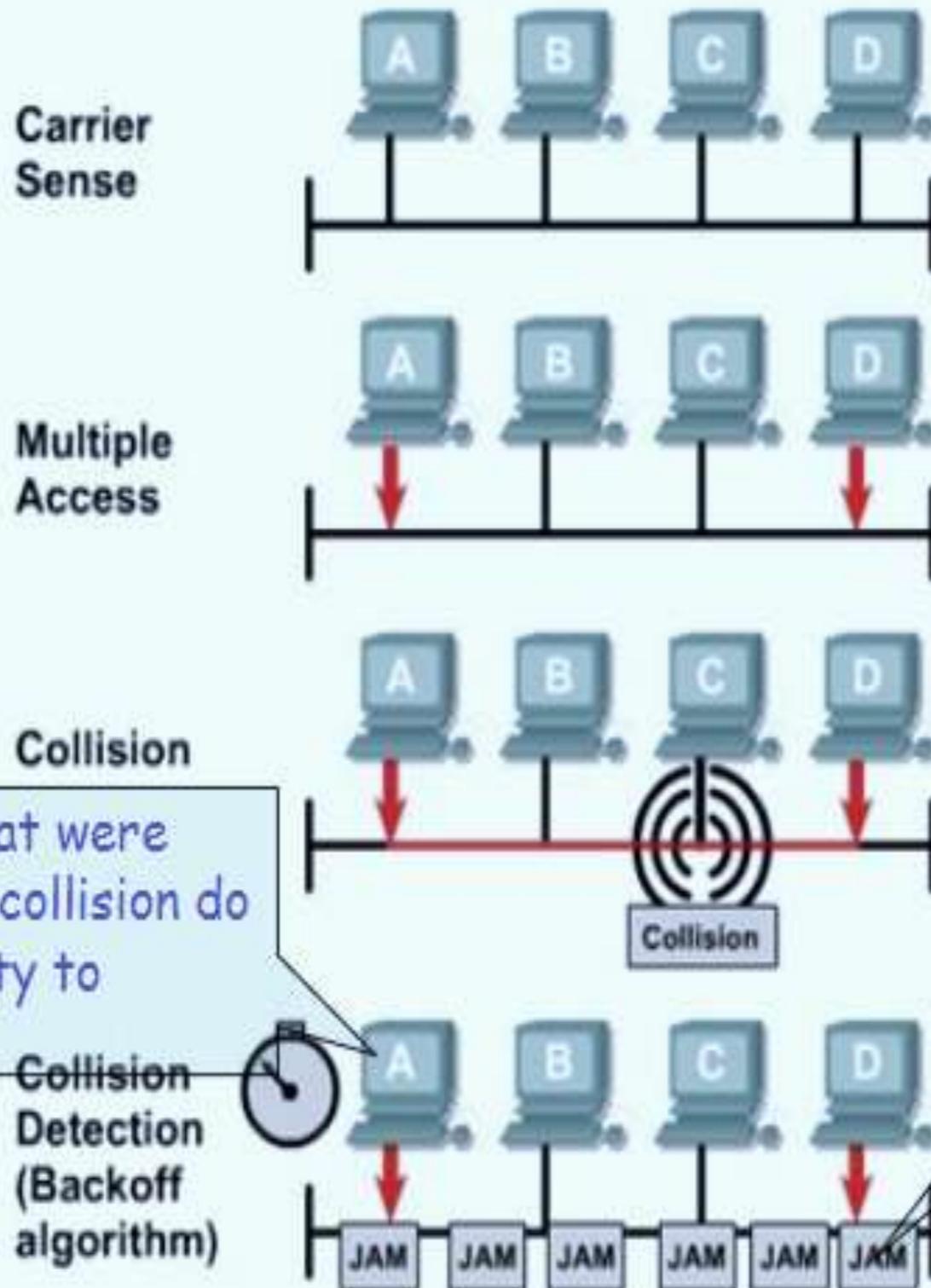
- WAIT until idle,
- Then, TRANSMISSION with $p=1$

3.
If Collision
DETECTED

- Transmit brief "**JAMMING SIGNAL**"
- ABORT Transmission

After Aborting- WAIT RANDOM Time, Try again

COLLISION DETECTION PROCEDURE



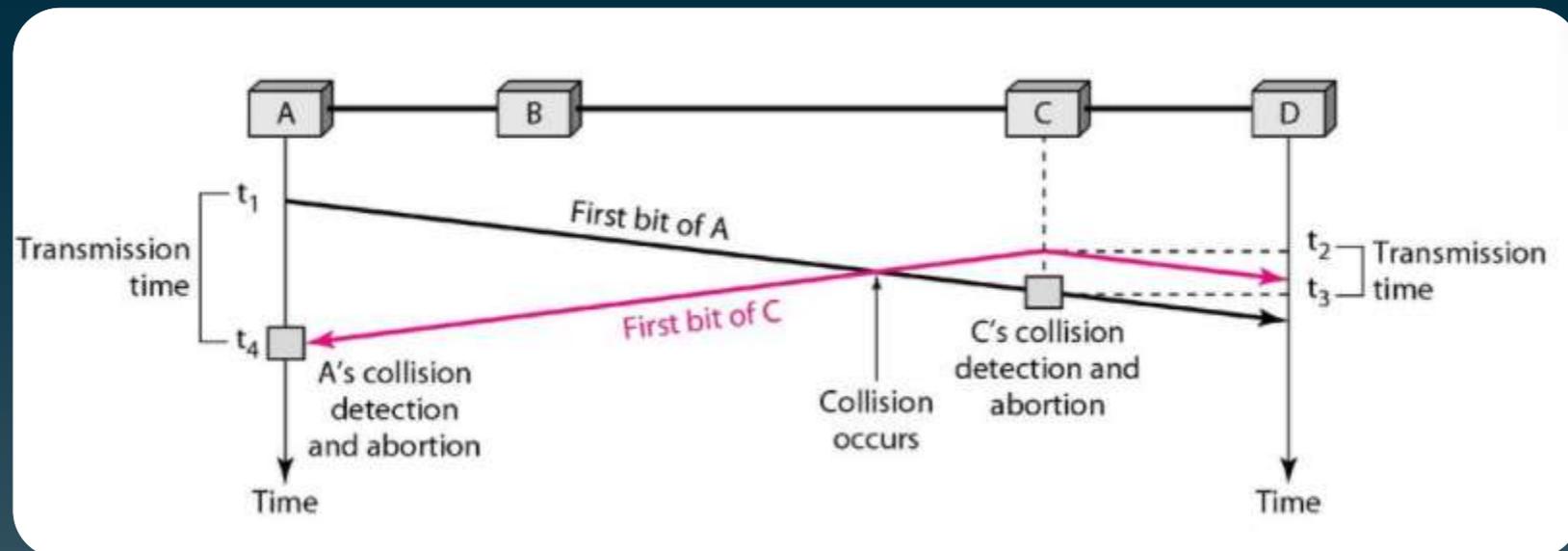
(JAM) When a collision occurs, each node that is transmitting will continue to transmit for a short time to ensure that all devices see the collision.

The devices that were involved in the collision do not have priority to transmit data.

Collision Detection (Backoff algorithm)

Collision of the First Bit in CSMA/CD

Each Station continues to send bits in the frame until it detects the Collision.



COLLISION DETECTION METHOD

Use one of the **“PERSISTENT METHOD”** as-

- Non-Persistent
- 1-Persistent
- P-Persistent

What should a station do if the channel is busy or idle?

Constantly monitor in order to detect one of two conditions:



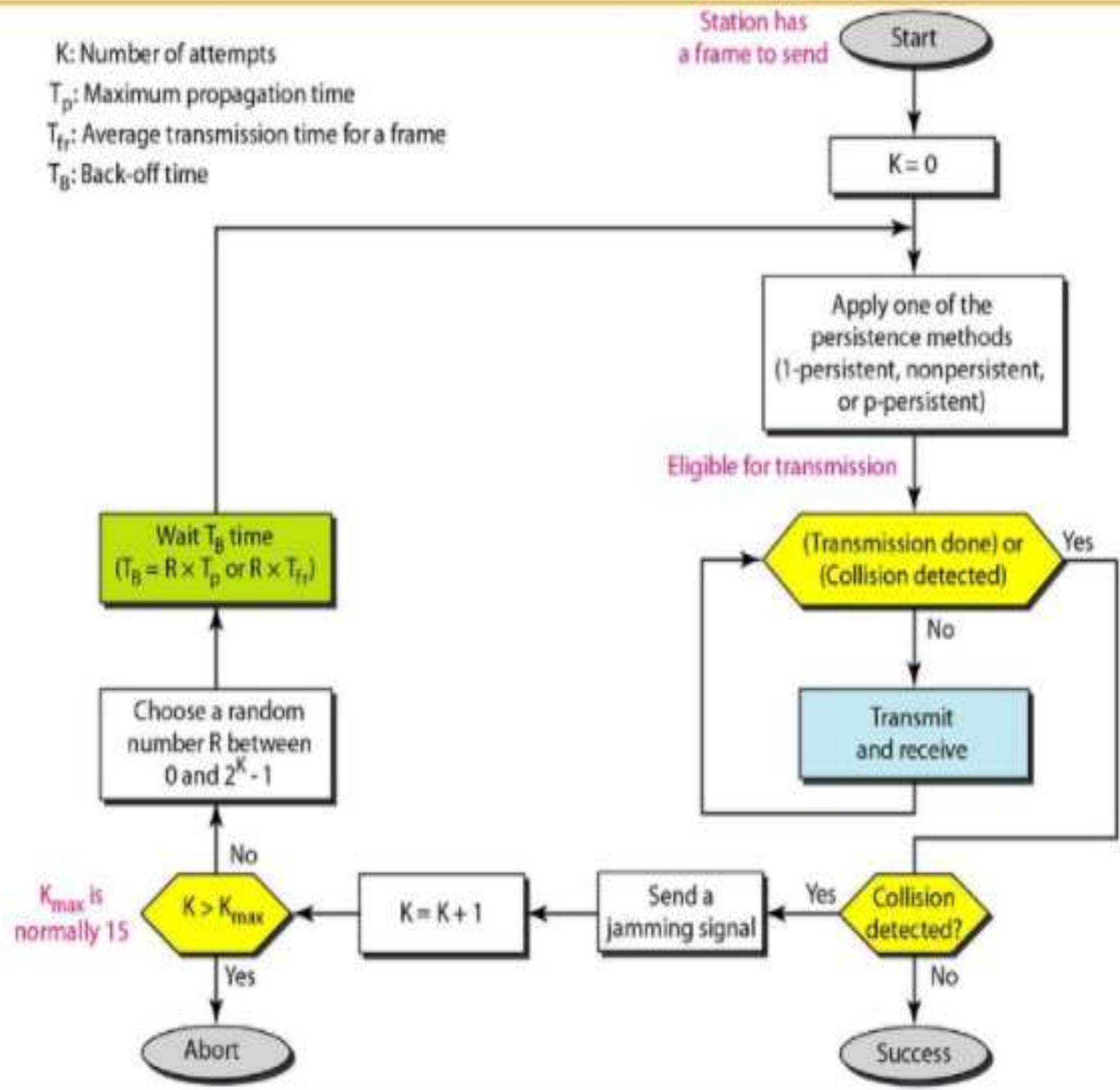
Proceed according to the conditions.

Sending of a short **“JAMMING SIGNAL”** that enforces the collision in case **other stations have not yet sensed the collision.**

FLOWCHART

OF CSMA/CD

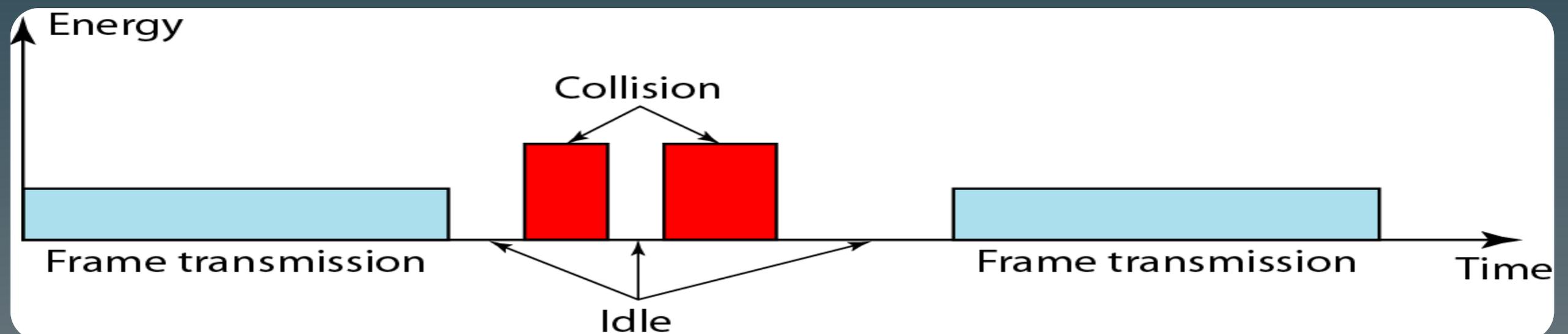
K : Number of attempts
 T_p : Maximum propagation time
 T_{fr} : Average transmission time for a frame
 T_B : Back-off time



ENERGY LEVEL during transmission, idleness or collision in CSMA/CD

➤ Level of Energy in a Channel can have three values :

- ZERO : Channel is Idle.
- NORMAL: A station has successfully captured the channel & is sending its frame.
- ABNORMAL : There is a collision & the level of energy is twice the normal level.



STATES IN CSMA/CD

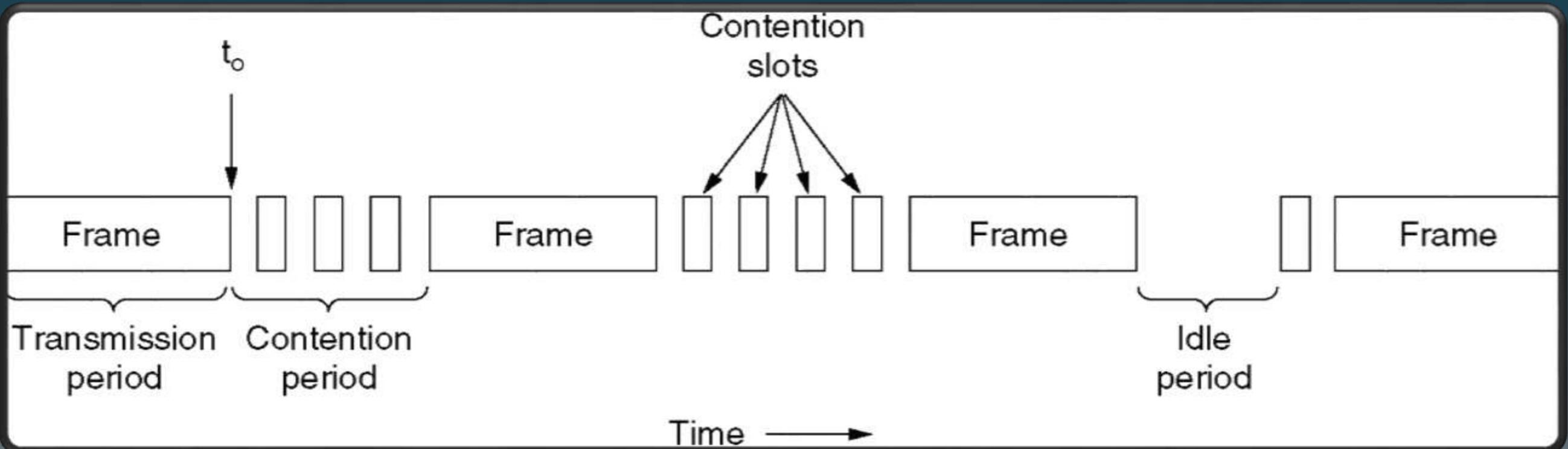
- CSMA/CD can be in one of Three States :

Contention

Transmission

Idle

States are observed during the transmission of frames.

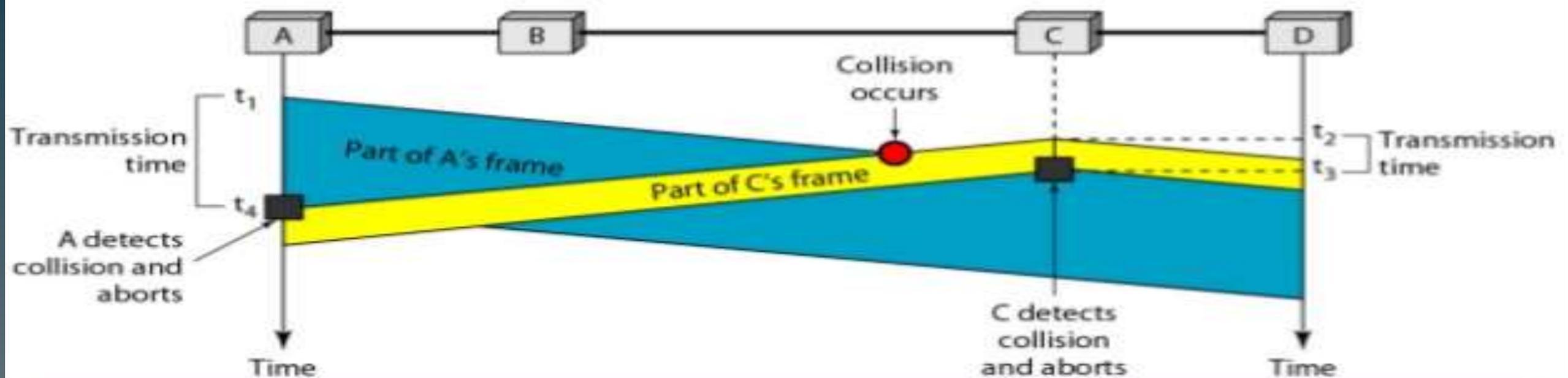


COLLISION & ABORTION IN CSMA/CD

- The CSMA method does not tell us what to do in case there is a collision.

Minimum Frame Size

For CSMA /CD to work, we need a restriction on the frame size...the frame transmission time T_{fr} must be at least two times the maximum propagation time T_p .

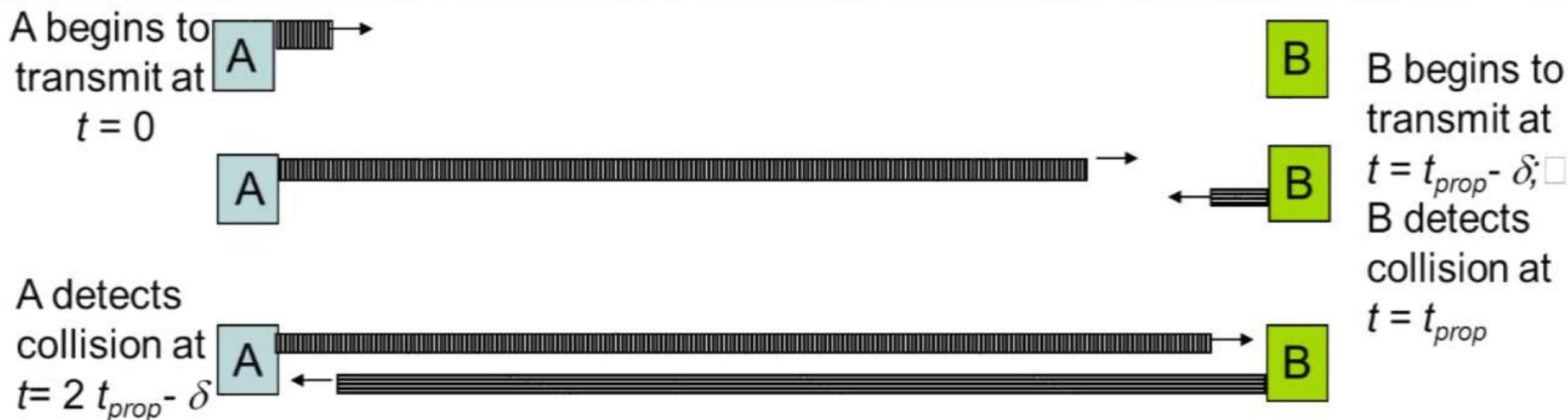


CSMA/CD PERFORMANCE (Reaction Time)

Time to detect collision $< 2 * \text{maximum propagation delay}$.

Minimum frame size enough to allow collision detection prior to end of transmission.

The reaction time in CSMA-CD is $2t_{prop}$.



THROUGHPUT in CSMA/CD

* The Throughput of CSMA/CD is greater than that of Pure or Slotted ALOHA.

* For 1-persistent method the maximum throughput is around 50 % when $G=1$.

* For Non-persistent method, the maximum throughput can go up to 90 % when G is between 3 and 8.

ADVANTAGES OF CSMA/CD



RELIABLE; Collisions are detected and packets are re-sent, so no data is lost.



Relatively FAST; A computer does not have to wait its "turn" to transmit data.



EFFECTIVE; handle data collisions.

DISADVANTAGES OF CSMA/CD



LIMITED to 2500 meters/1 1/2 mile; The collision detection mechanism restricts the length of cable segment that can be used.



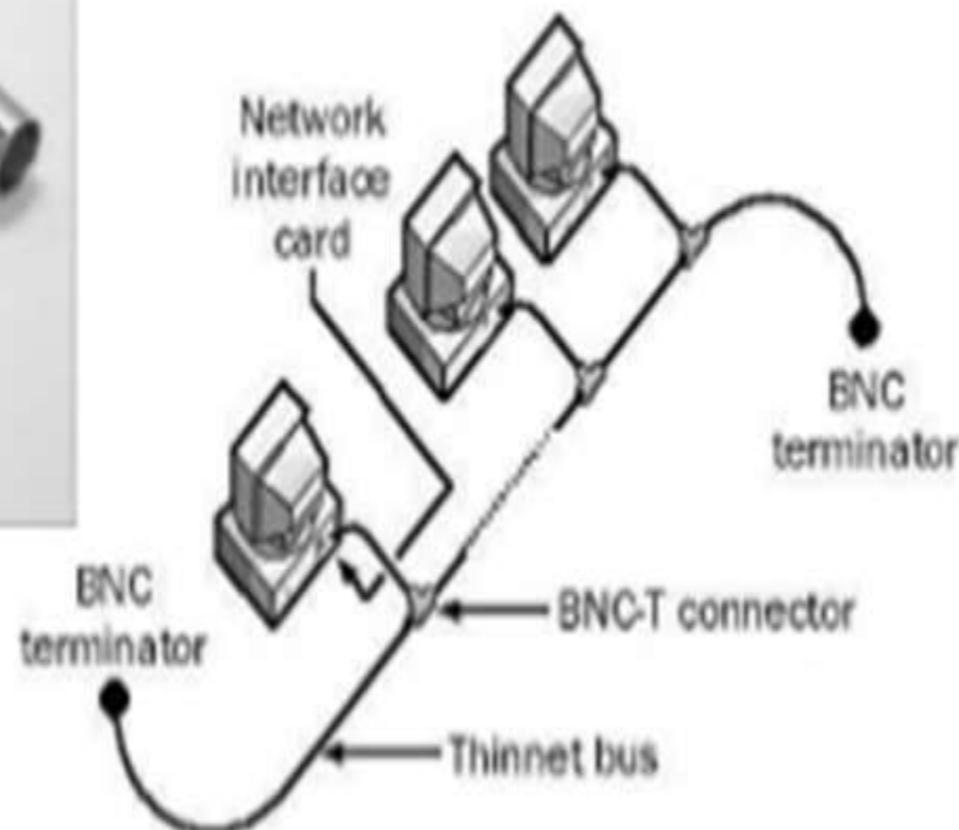
Inappropriate for LARGE/active networks; The slowdown increases, as the network grows larger.

APPLICATIONS OF CSMA/CD

- CSMA/CD was used in **now obsolete** shared media Ethernet variants (**10BASE5**, **10BASE2**) and in the **early versions** of twisted-pair Ethernet which used **repeater hubs**.



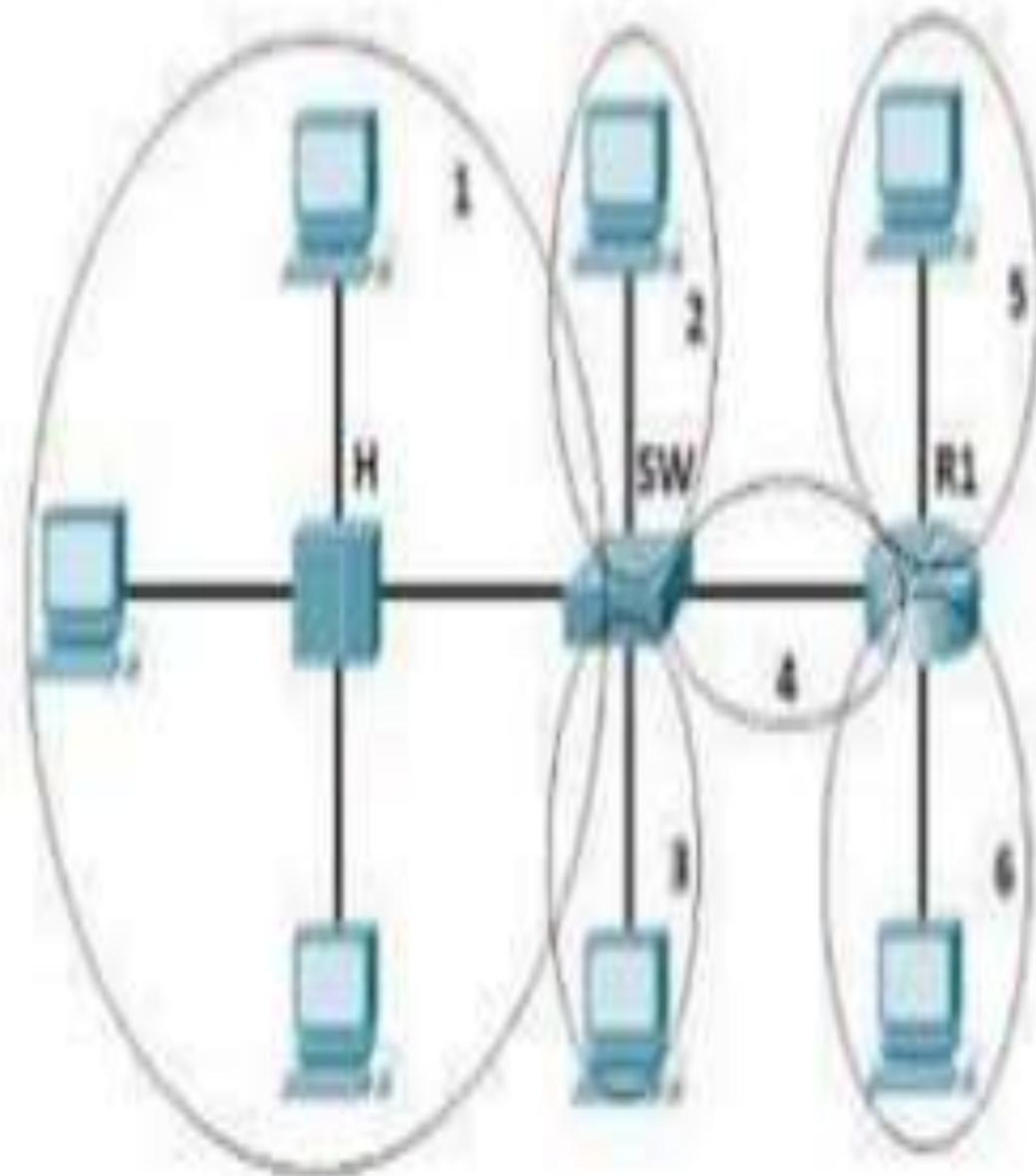
10BASE2

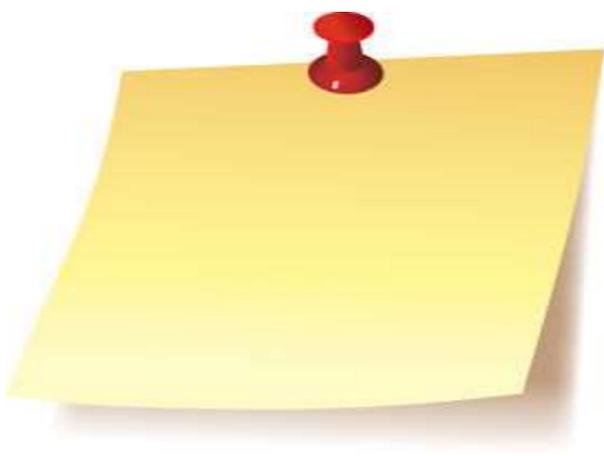


10BASE5

- Modern Ethernet networks, built with **switches** and **full-duplex connections**, **no longer need** to utilize CSMA/CD because each **collision domain** is now isolated.

- CSMA/CD is **still supported** for **backwards compatibility** and for **half-duplex connections**.





**THANK YOU
FOR
YOUR TIME & ATTENTION.**



Any Query?



Have a Great day...

