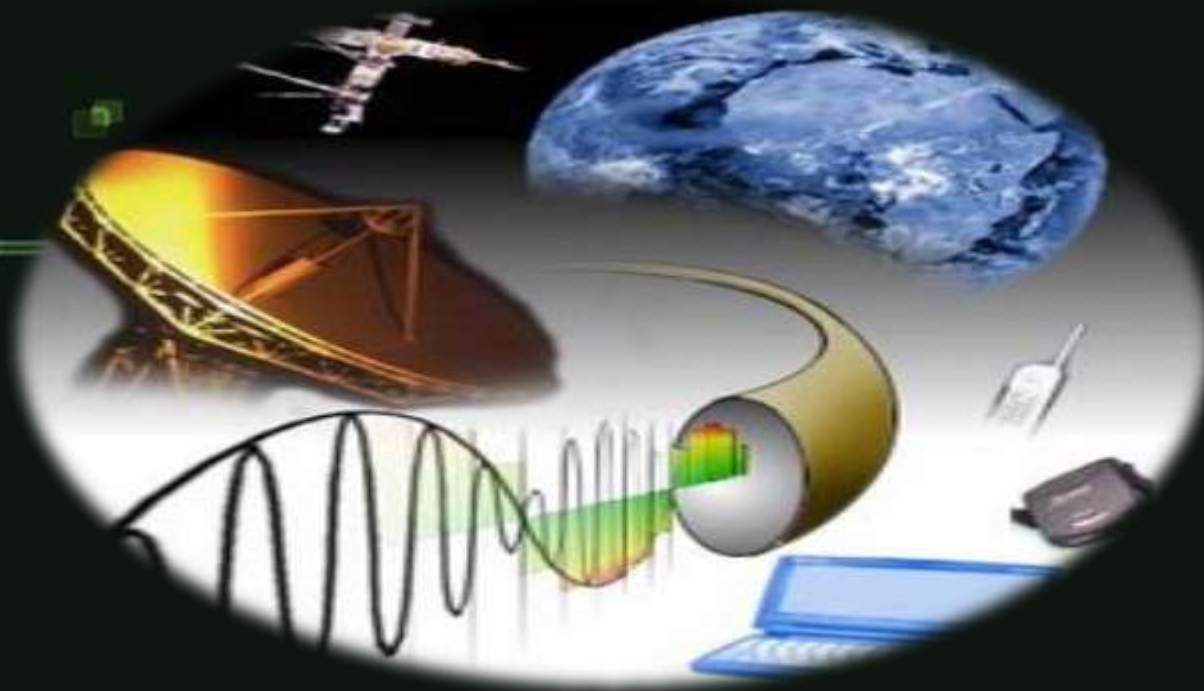


PRESENTATION **ON** **CSMA/CD** **IN** **COMPUTER NETWORKS**



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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

Do not transmit

No

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?



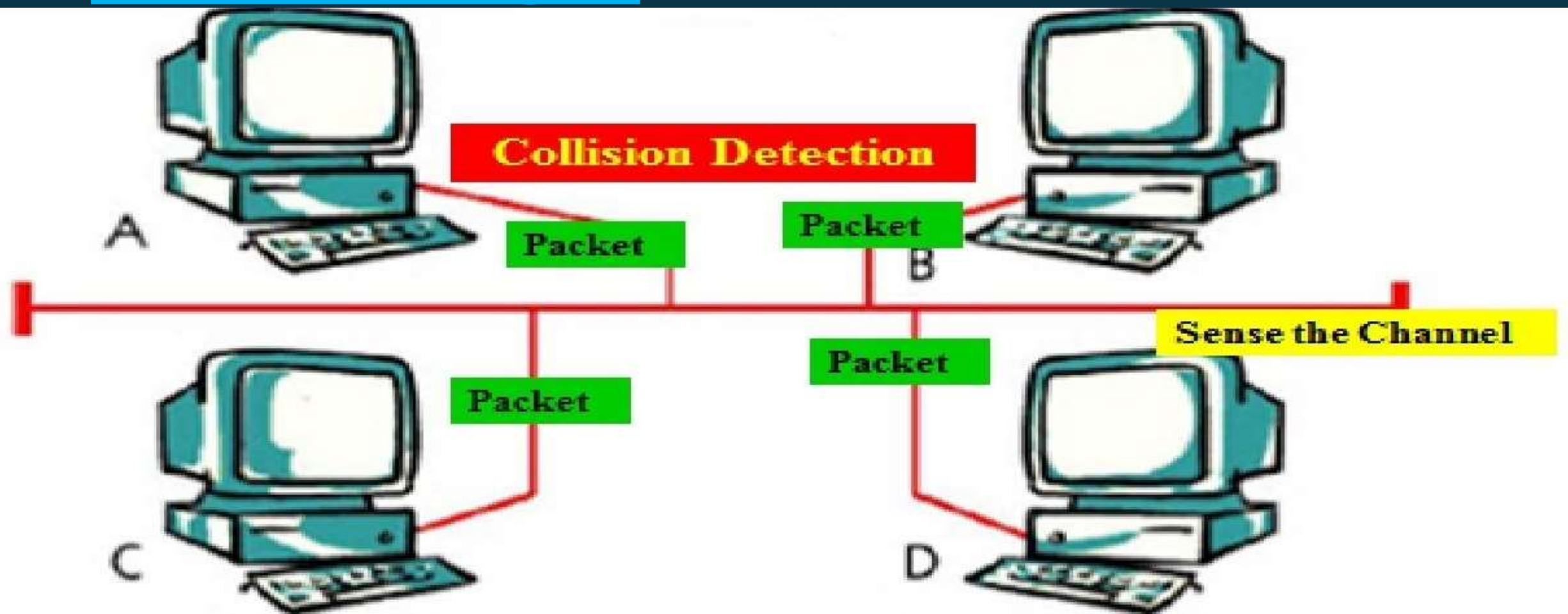
- CSMA/CD protocol can be considered as a refinement and modification of pure 'Carrier Sense Multiple Access' (CSMA).
- In a CSMA system, the chance of collision can be reduced if a station senses the medium before trying to use it, but it can not eliminate it.
- CSMA/CD is used to improve CSMA performance 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 $p=1$

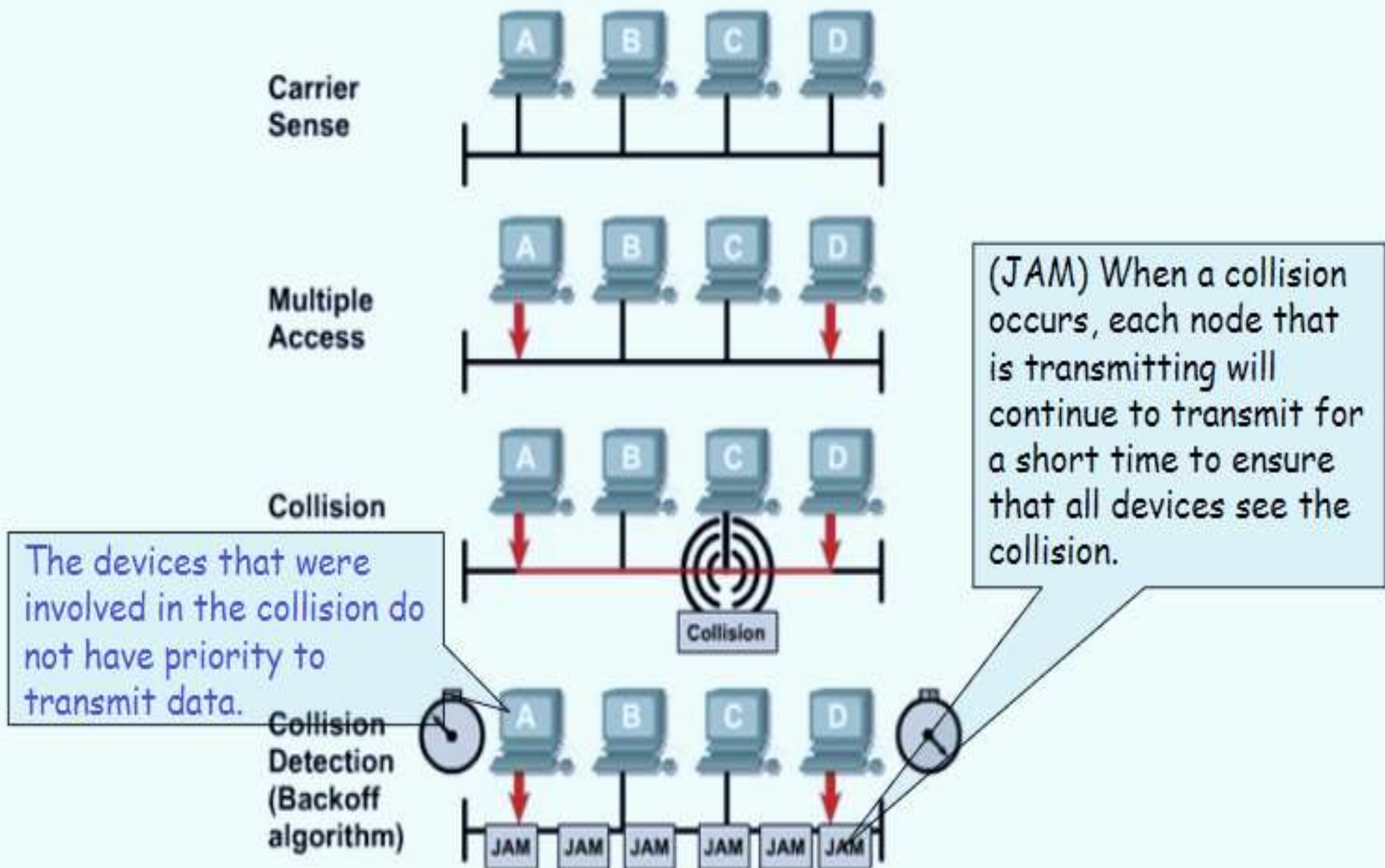
3.

If Collision
DETECTED

- Transmit brief “**JAMMING SIGNAL**”
- ABORT Transmission

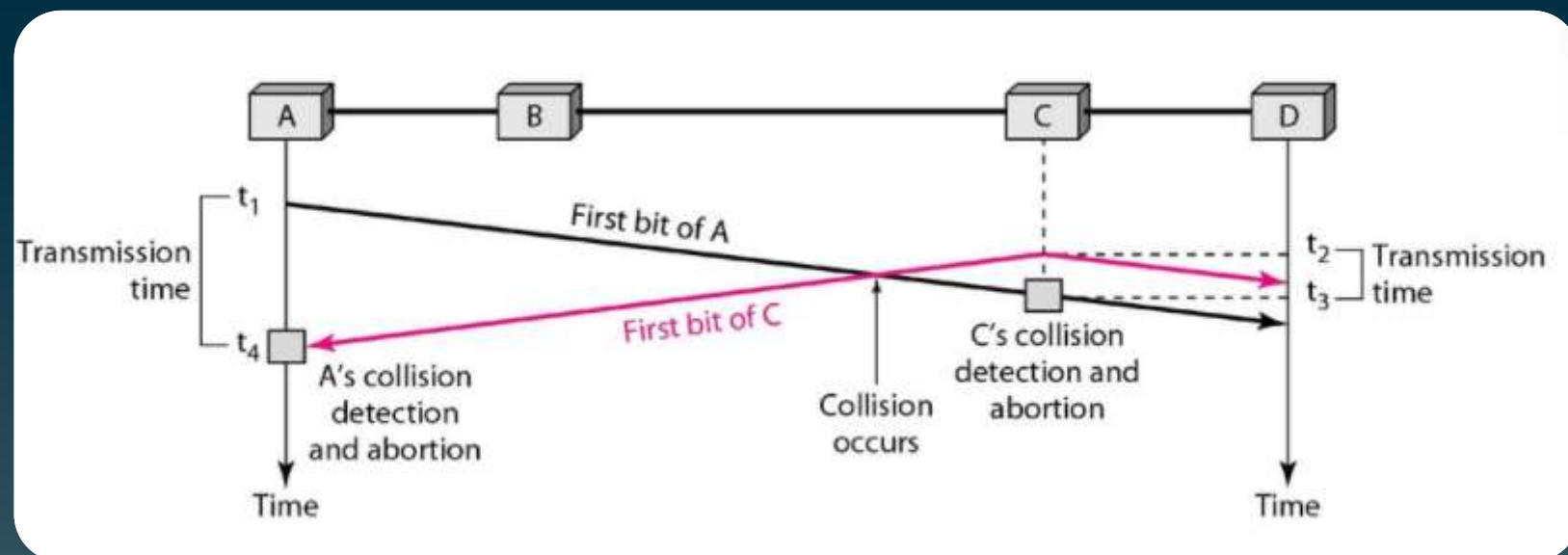
After Aborting- WAIT RANDOM Time, Try again

COLLISION DETECTION PROCEDURE



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:



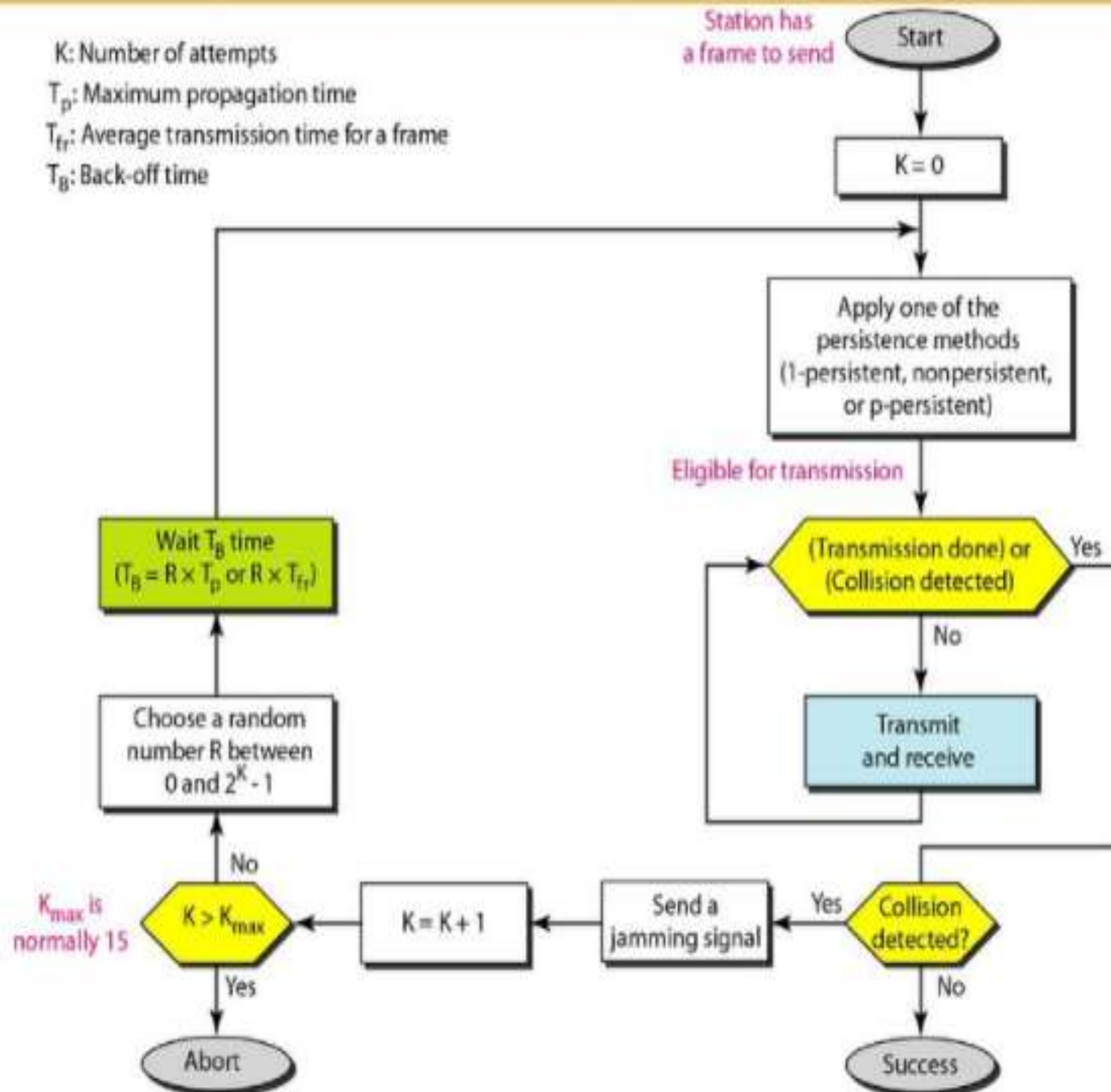
Proceed according to the conditions.

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

FLOWCHART

OF CSMA/CD

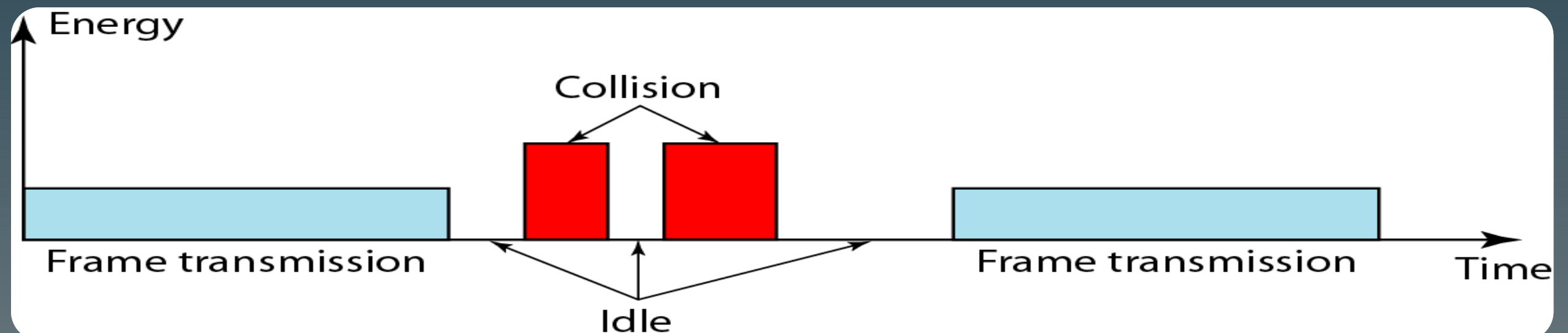
K: Number of attempts
 T_p : Maximum propagation time
 T_{fr} : Average transmission time for a frame
 T_B : Back-off time



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

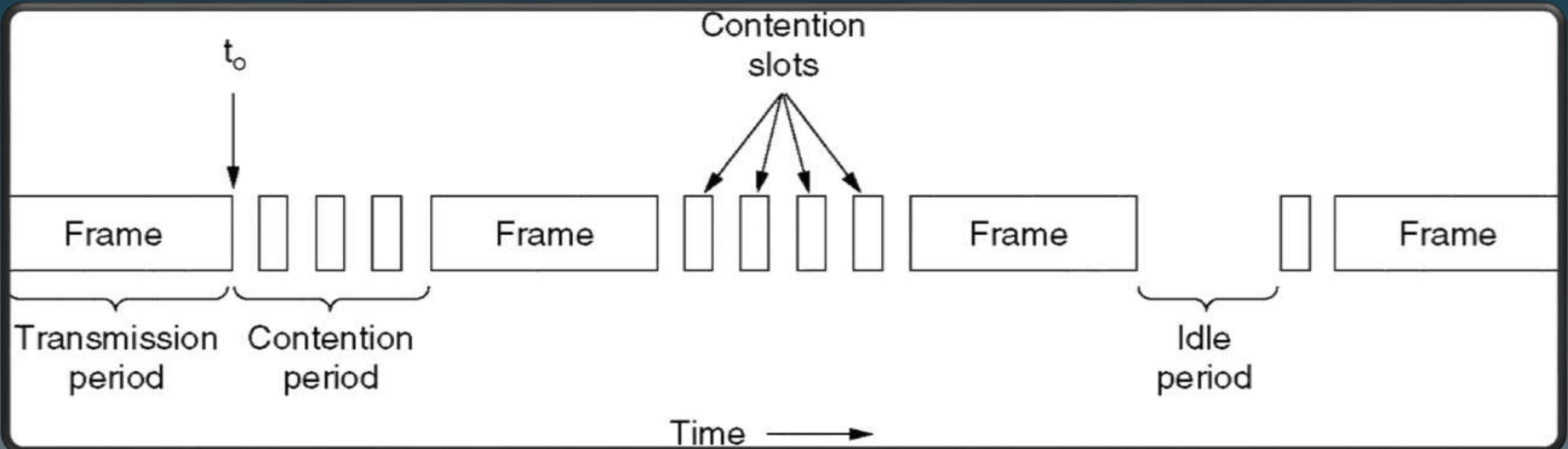
- CSMA/CD can be in one of Three States :

Contention

Transmission

Idle

States are
observed during
the transmission
of frames.

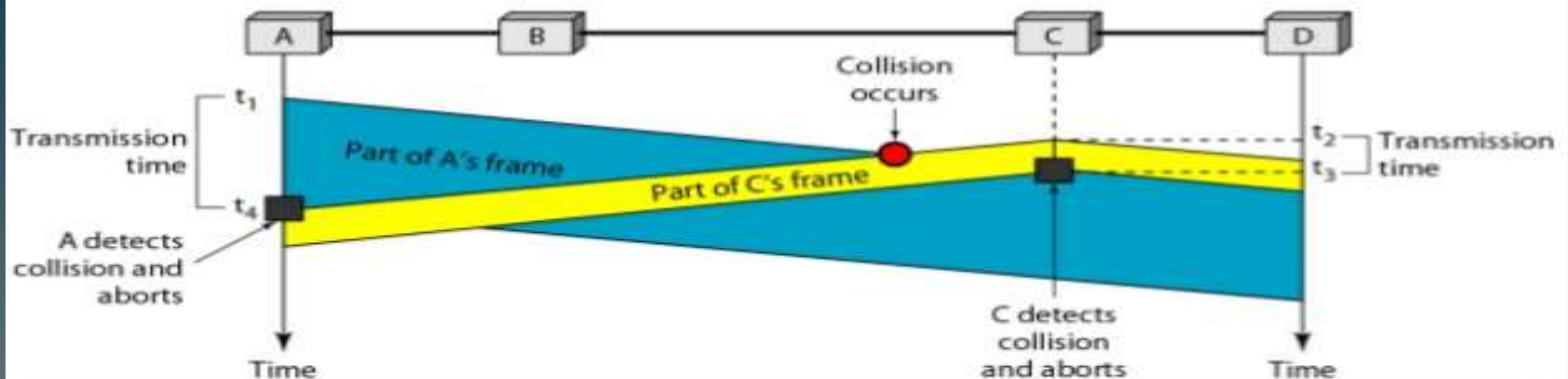


COLLISION & ABORTION IN CSMA/CD

- 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 .



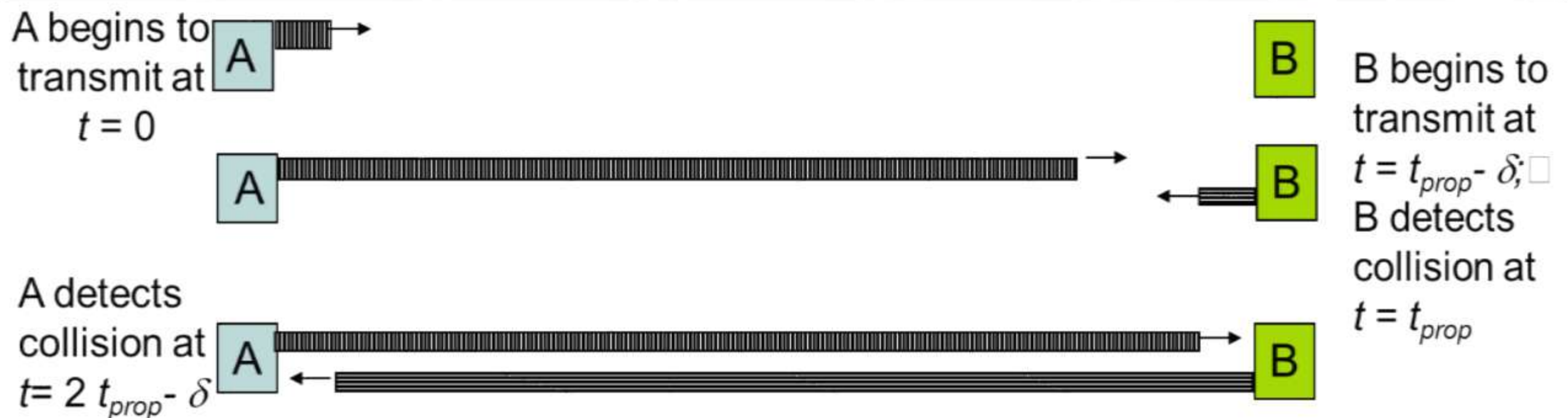
CSMA/CD PERFORMANCE

(Reaction Time)

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

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.



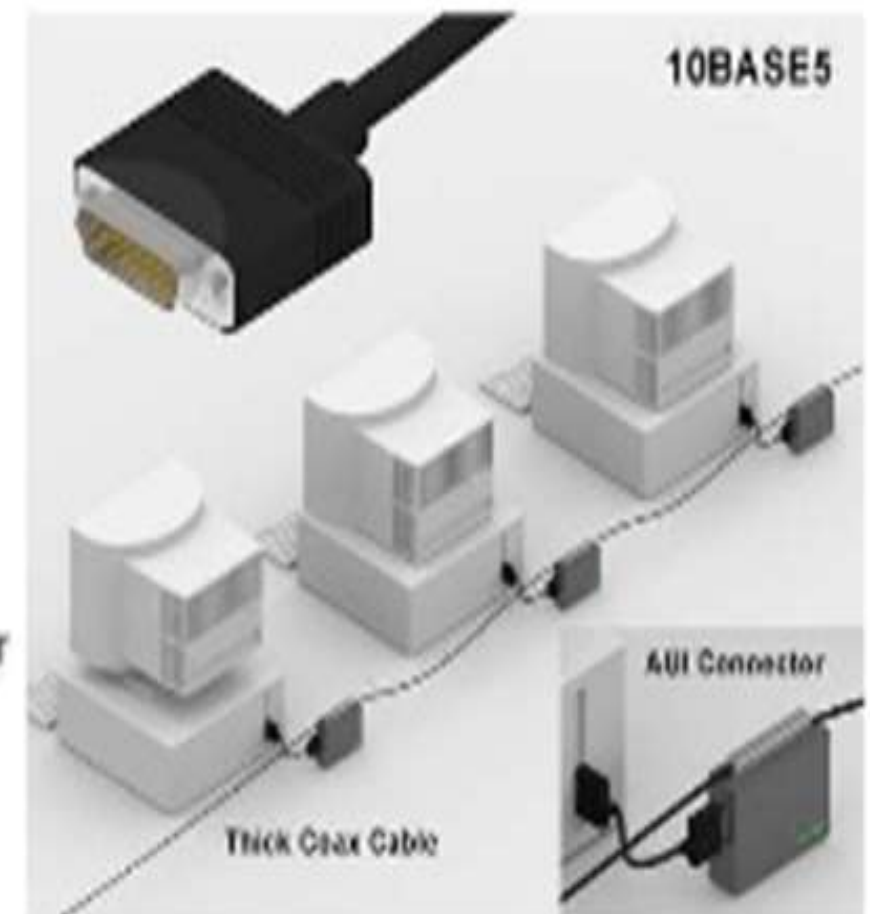
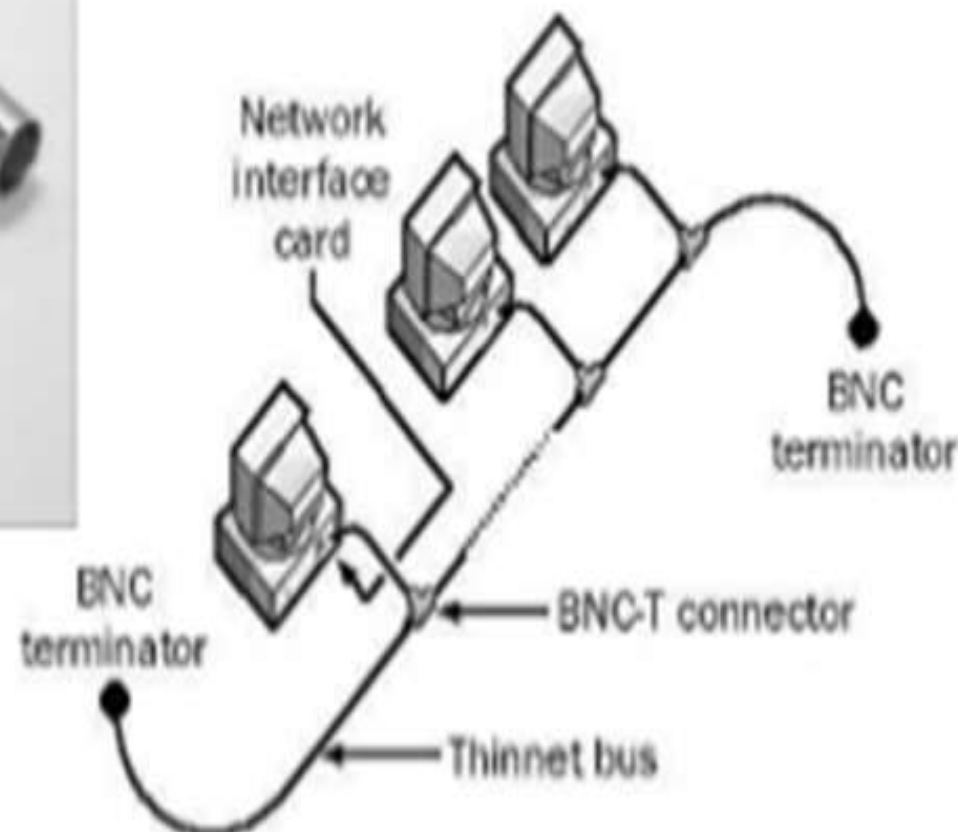
Inappropriate for LARGE/active networks; The slowdown increases, as the network grows larger.

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**.



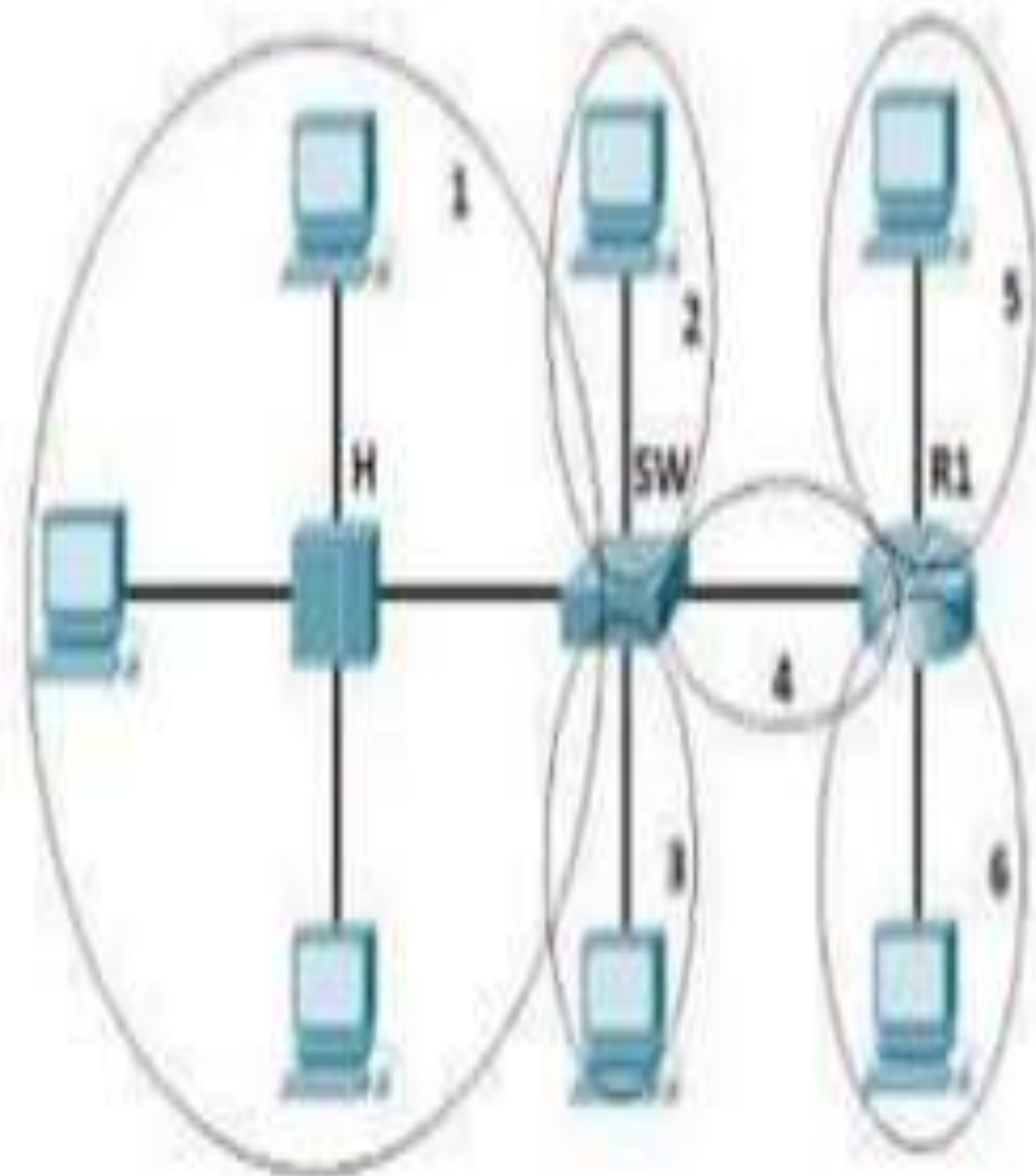
10BASE2

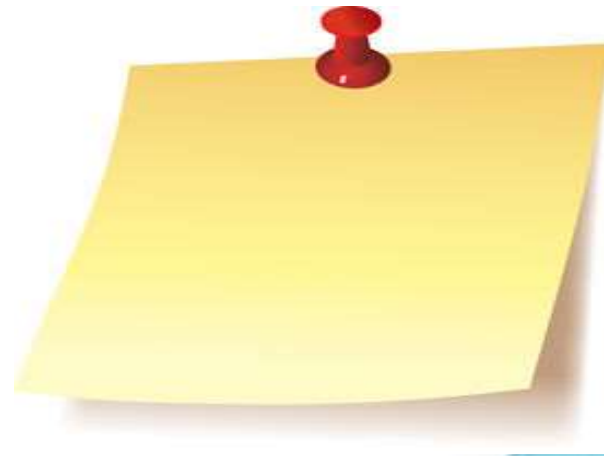


10BASE5

- 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...

