Computer Network

Lecture-25

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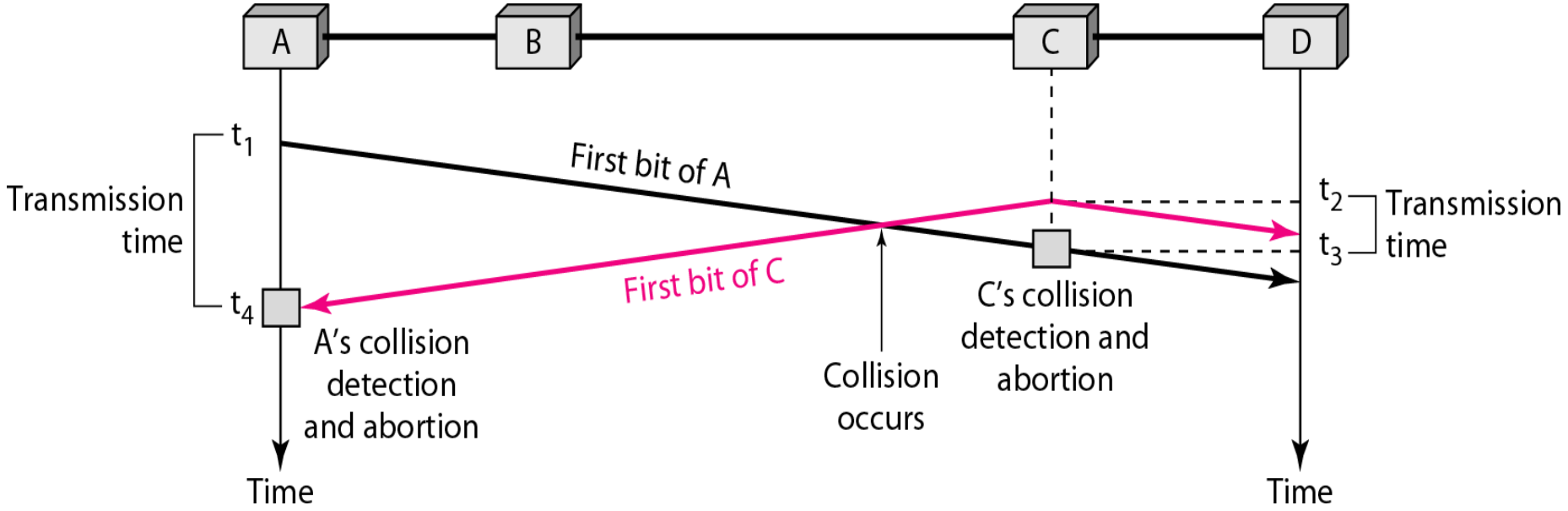
Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- The CSMA method does not specify the procedure following a collision.
- CSMA/CD augments the algorithm to handle the collision.
- In this 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.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)



- In this figure, stations A and C are involved in the collision.
- At time t_1, station A has executed its persistence procedure and starts sending the bits of its frame. At time t_2, station C has not yet sensed the first bit sent by A. Station C executes its persistence procedure and starts sending the bits in its frame, which propagate both to the left and to the right. The collision occurs sometime after time t_2. Station C detects a collision at time t_3 when it receives the first bit of A's frame. Station C immediately aborts transmission. Station A detects collision at time t_4 when it receives the first bit of C's frame; it also immediately aborts transmission.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Minimum Frame Size

- For CSMA/CD to work, we need a restriction on the frame size.
- Before sending the last bit of the frame, the sending station must detect a collision, if any, and abort the transmission.
- This is so because the station, once the entire frame is sent, does not keep a copy of the frame and does not monitor the line for collision detection.
- Therefore, the frame transmission time T_{fr} must be at least two times the maximum propagation time T_p i.e.

$$T_{fr} \geq 2T_p$$

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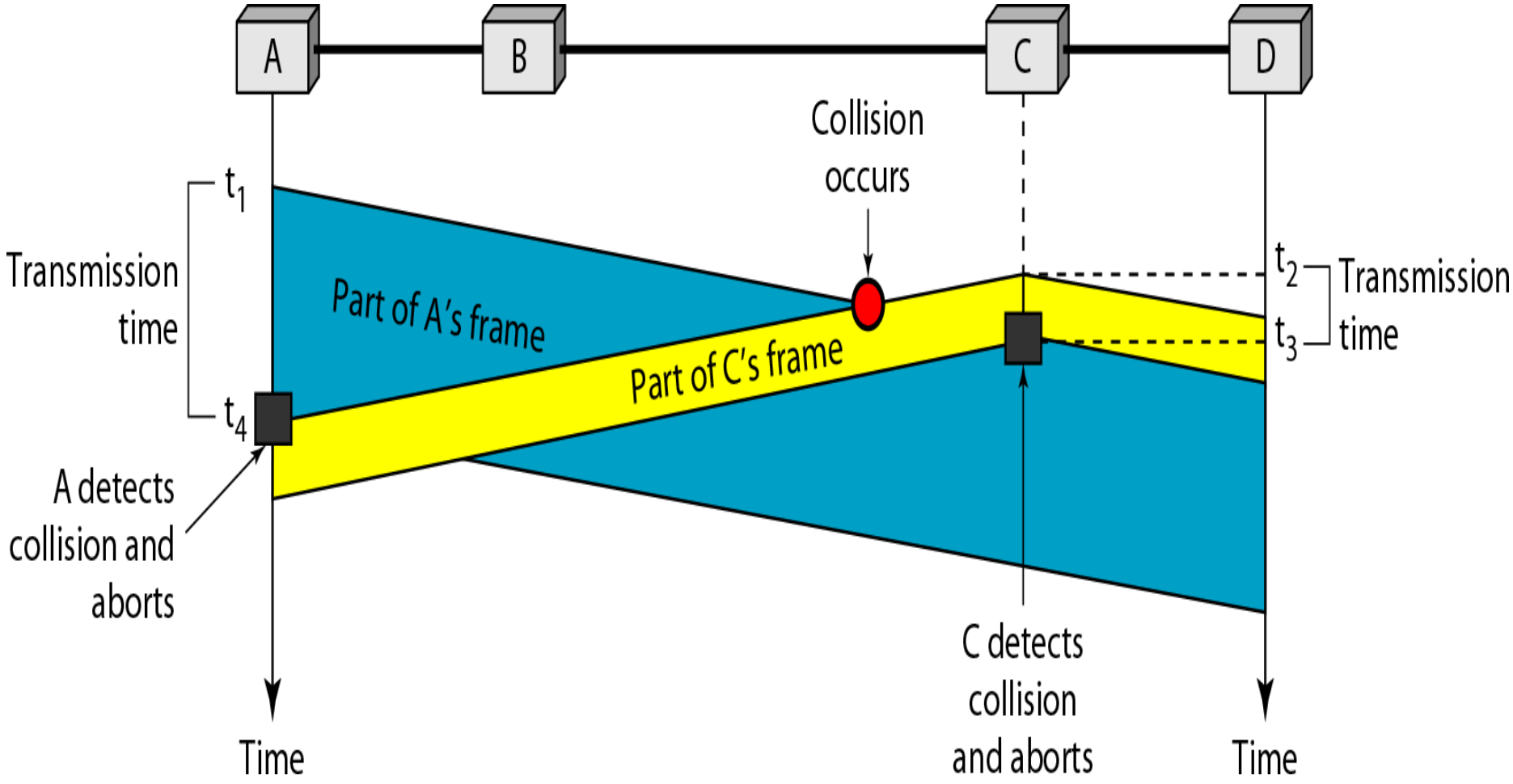
Minimum Frame Size



Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Example:

A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time is 25.6 μs, what is the minimum size of the frame?

Solution:

Let the frame size is x.

In CSMA/CD, we know that Tfr ≥ 2Tp,

Therefore, $x/(10*10^6) \geq 2*25.6*10^{-6}$

$x \geq 2*10*25.6*10^6 * 10^{-6} = 512$

Therefore, minimum size of the frame = 512 bits

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Throughput

- The throughput of CSMA/CD is greater than that of pure or slotted ALOHA.
- The maximum throughput occurs at a different value of G and is based on the persistence method and the value of p in the p-persistent approach.
- For 1-persistent method the maximum throughput is around 50 percent when G=1.
- For non-persistent method, the maximum throughput can go up to 90 percent when G is between 3 and 8.

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