SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
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Department of Information Technology

Course Name – 19IT401 Computer Networks

II Year / IV Semester

Unit 2 – Link Layer

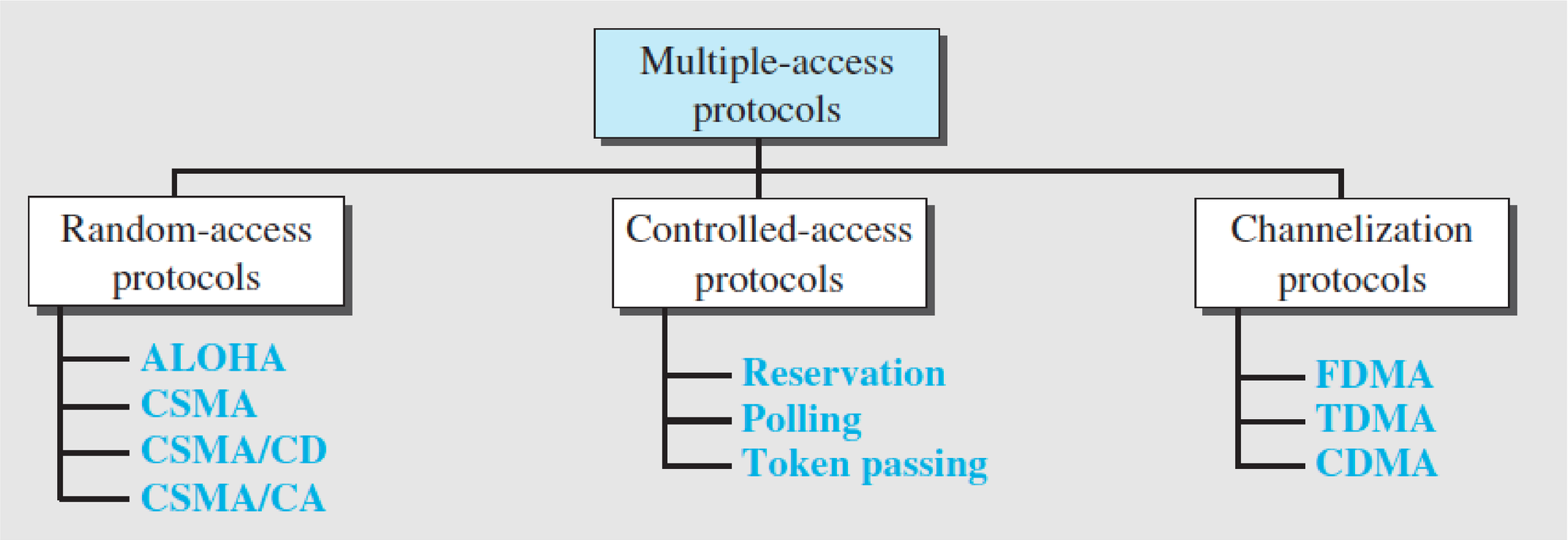
Topic 5- Media Access

Media Access Control

- When nodes or stations are connected and use a common link, called a multipoint or broadcast link, we need a multiple-access protocol to coordinate access to the link.
- Many protocols have been devised to handle access to a shared link.
- At any one time, there may be a number of devices attempting to send and receive data using the network media.
- When two or more nodes are sending data at the same time, data may be unusable due to collision. There are rules that govern how these devices share the media to solve the collision problem.

Media Access Control

Taxonomy of multiple-access protocols



Random Access

RANDOM ACCESS

- In random-access or contention methods, no station is superior to another station and none is assigned control over another.

- At each instance, a station that has data to send uses a procedure defined by the protocol to make a decision on whether or not to send.

- This decision depends on the state of the medium (idle or busy)

Protocols

- ALOHA
- Carrier Sense Multiple Access (CSMA)
- Carrier Sense Multiple Access with Collision Detection(CSMA/CD)
- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)

Random Access - ALOHA

ALOHA,

- This is the earliest random access method, was developed at the University of Hawaii in early 1970. It was designed for a radio (wireless) LAN, but it can be used on any shared medium.

- The medium is shared between the stations. When a station sends data, another station may attempt to do so at the same time. The data from the two stations collide and become garbled.

Types

- Pure ALOHA
- Slotted ALOHA

Pure ALOHA

- The original ALOHA protocol is called pure ALOHA. The idea is that each station sends a frame whenever it has a frame to send (multiple access).

- However, since there is only one channel to share, there is the possibility of collision between frames from different stations.

Random Access - ALOHA

- A collision involves two or more stations. If all these stations try to resend their frames after the time-out, the frames will collide again.

- Pure ALOHA dictates that when the time-out period passes, each station waits a random amount of time before resending its frame.

- The randomness will help avoid more collisions. We call this time the backoff time T_B .

Slotted ALOHA

- In slotted ALOHA we divide the time into slots of seconds and force the station to send only at the beginning of the time slot.

- Because a station is allowed to send only at the beginning of the synchronized time slot, if a station misses this moment, it must wait until the beginning of the next time slot.

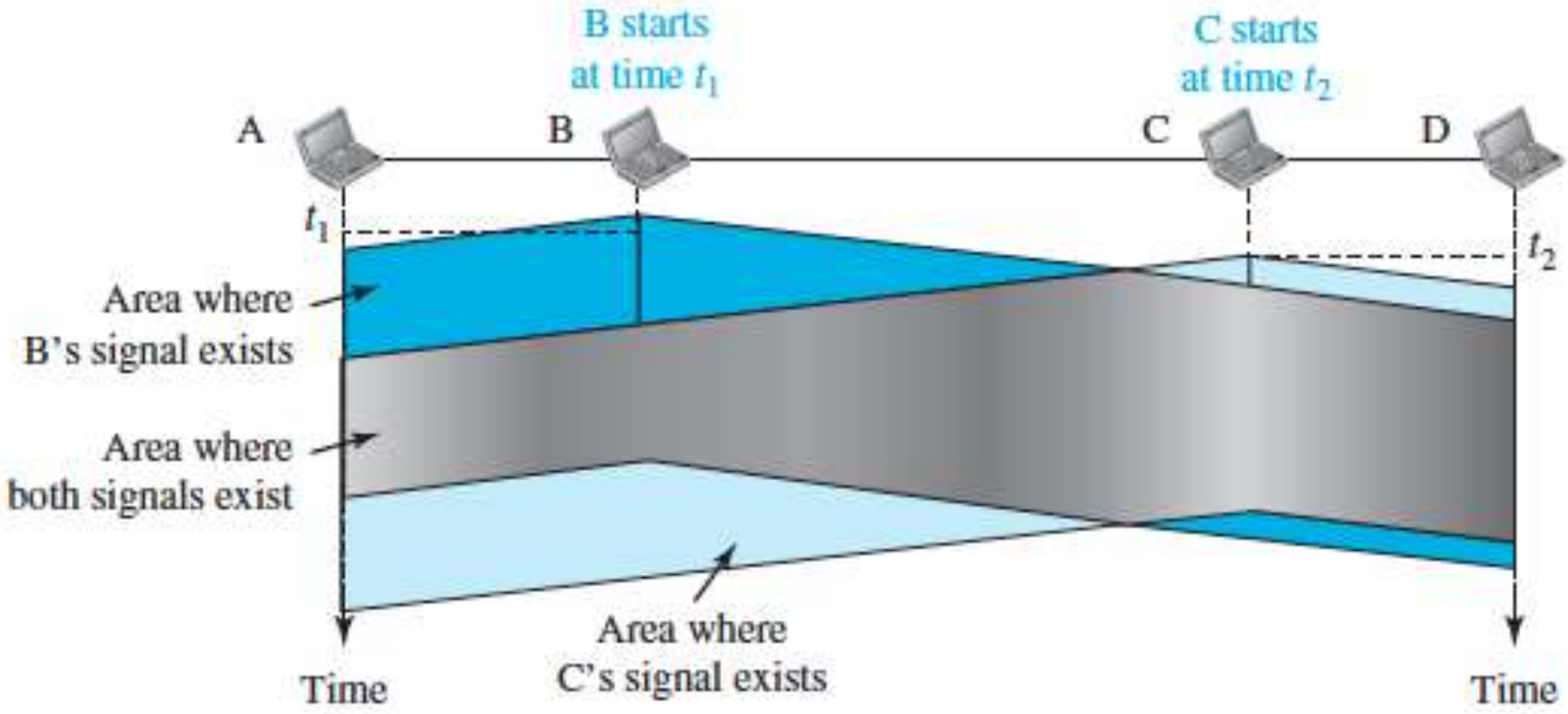
- This means that the station which started at the beginning of this slot has already finished sending its frame

Random Access - CSMA

Carrier sense multiple access (CSMA)

- To minimize the chance of collision and, therefore, increase the performance, the CSMA method was developed.
- CSMA requires that each station first listen to the medium (or check the state of the medium) before sending.
- In other words, CSMA is based on the principle “sense before transmit” or “listen before talk.”
- CSMA can reduce the possibility of collision, but it cannot eliminate.
- The possibility of collision still exists because of propagation delay; when a station sends a frame, it still takes time (although very short) for the first bit to reach every station and for every station to sense it.
- In other words, a station may sense the medium and find it idle, only because the first bit sent by another station has not yet been received.

Random Access - CSMA



Random Access - CSMA

Persistence Methods

What should a station do if the channel is busy?

What should a station do if the channel is idle?

Three methods have been devised to answer these questions: the

- 1-persistent method - If the station finds the line idle, it sends its frame immediately (with probability 1). Highest chance of collision because two or more stations may find the line idle and send their frames immediately

- the nonpersistent method - a station that has a frame to send senses the line. If the line is idle, it sends immediately. If the line is not idle, it waits a random amount of time and then senses the line again. It reduces the chance of collision because it is unlikely that two or more stations will wait the same amount of time and retry to send simultaneously.

- the p-persistent method - The p-persistent method is used if the channel has time slots with a slot duration equal to or greater than the maximum propagation time. After the station finds the line idle it follows these steps:
- 1. With probability p , the station sends its frame.
- 2. With probability q = 1 − p , the station waits for the beginning of the next time slot and checks the line again.

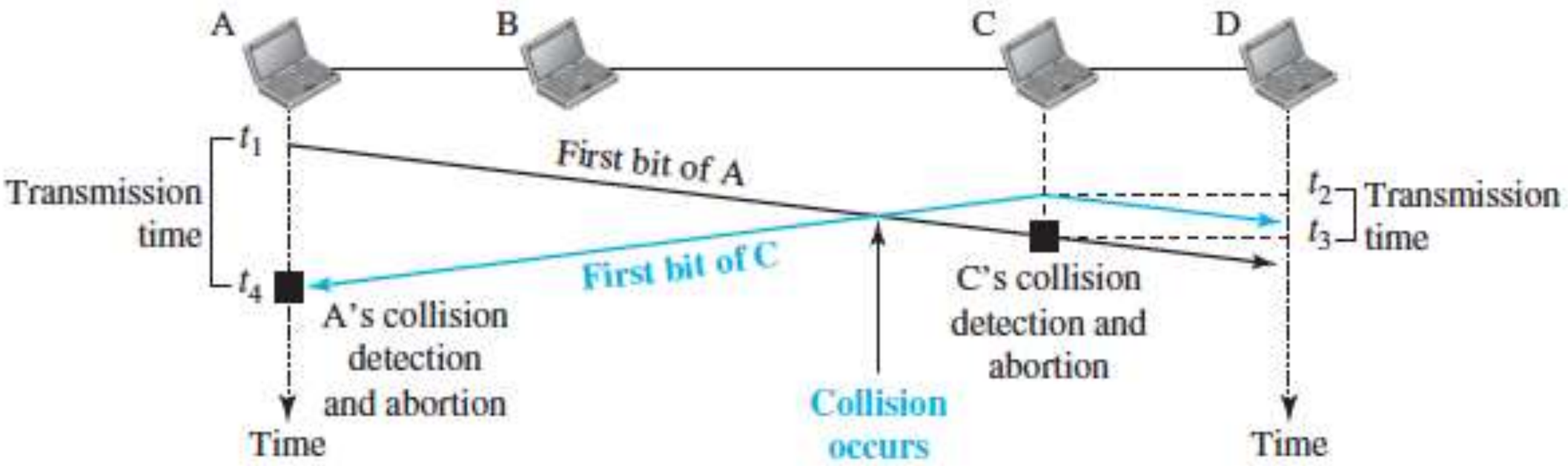
Random Access – CSMA/CD

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

Random Access – CSMA/CD

Carrier sense multiple access with collision detection (CSMA/CD)



Random Access – CSMA/CA

Carrier sense multiple access with collision Avoidance (CSMA/CA)

CSMA/CA was invented for wireless networks.

Collisions are avoided through the use of CSMA/CA's three strategies:

- the interframe space,
- the contention window, and
- Acknowledgments

Interframe Space (IFS) - First, collisions are avoided by deferring transmission even if the channel is found idle.

When an idle channel is found, the station does not send immediately. It waits for a period of time called the interframe space or IFS. After waiting an IFS time, if the channel is still idle, the station can send, but it still needs to wait a time equal to the contention window.

Random Access – CSMA/CA

Carrier sense multiple access with collision Avoidance (CSMA/CA)

Contention Window - The contention window is an amount of time divided into slots. A station that is ready to send chooses a random number of slots as its wait time.

Acknowledgment. With all these precautions, there still may be a collision resulting in destroyed data. In addition, the data may be corrupted during the transmission. The positive acknowledgment and the time-out timer can help guarantee that the receiver has received the frame

THANK YOU