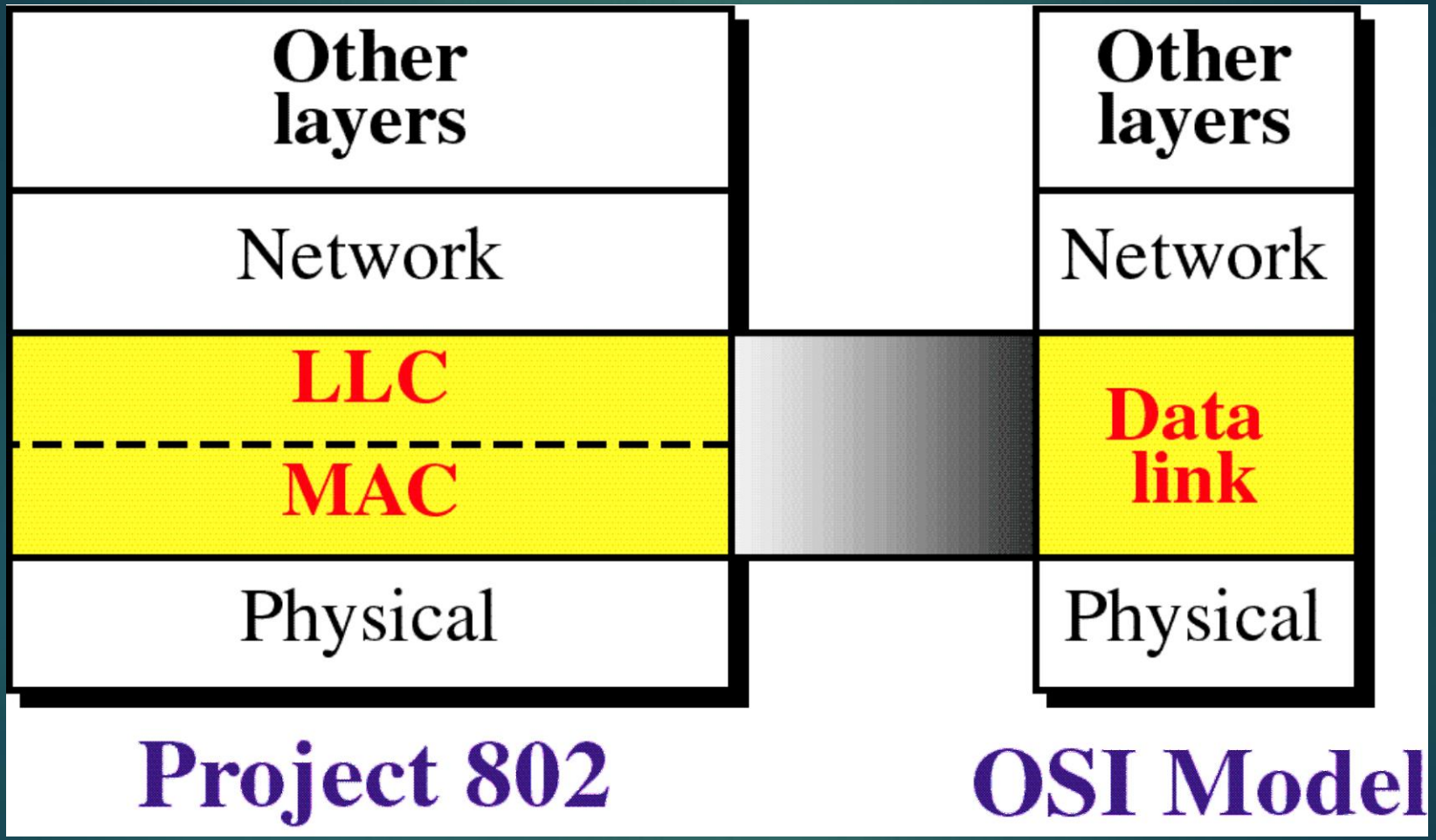
UNIT II

LAN NETWORK AND MEDIUM ACCES S LAYER

BY SUCHETA RAUT

OSI Model and Project 802

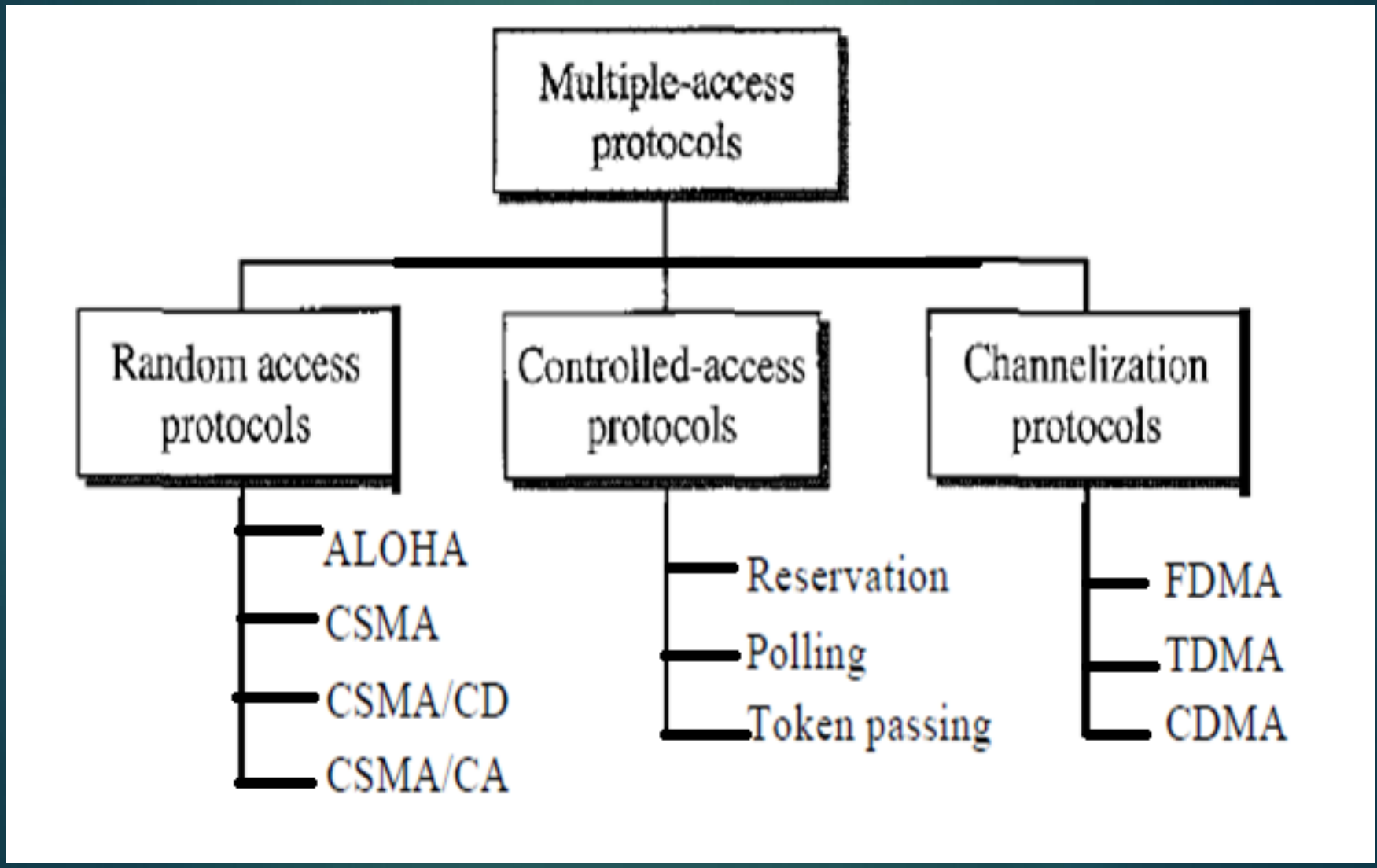


The Channel Allocation Problem

- Static Channel Allocation in LANs and MANs
- Dynamic Channel Allocation in LANs and MANs (Five key assumption are as follows)

1) Station Model.
2) Single Channel Assumption
3) Collision Assumption.
4) Continuous Time.
5) Slotted Time.
6) Carrier Sense.

Taxonomy ofmultiple-access protocols

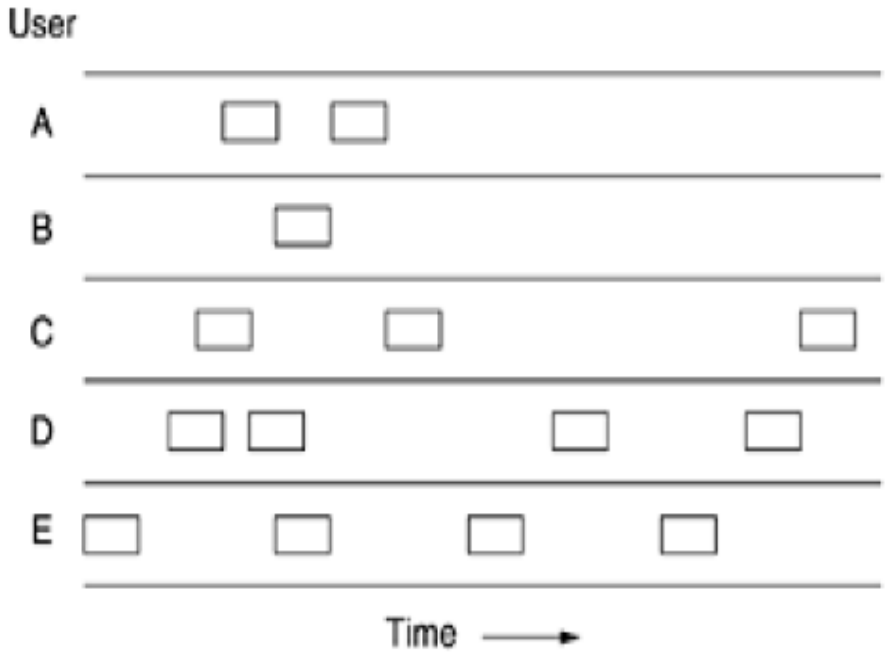


Multiple Access Protocols

- ALOHA
  - *Pure ALOHA*
  - *Slotted ALOHA*

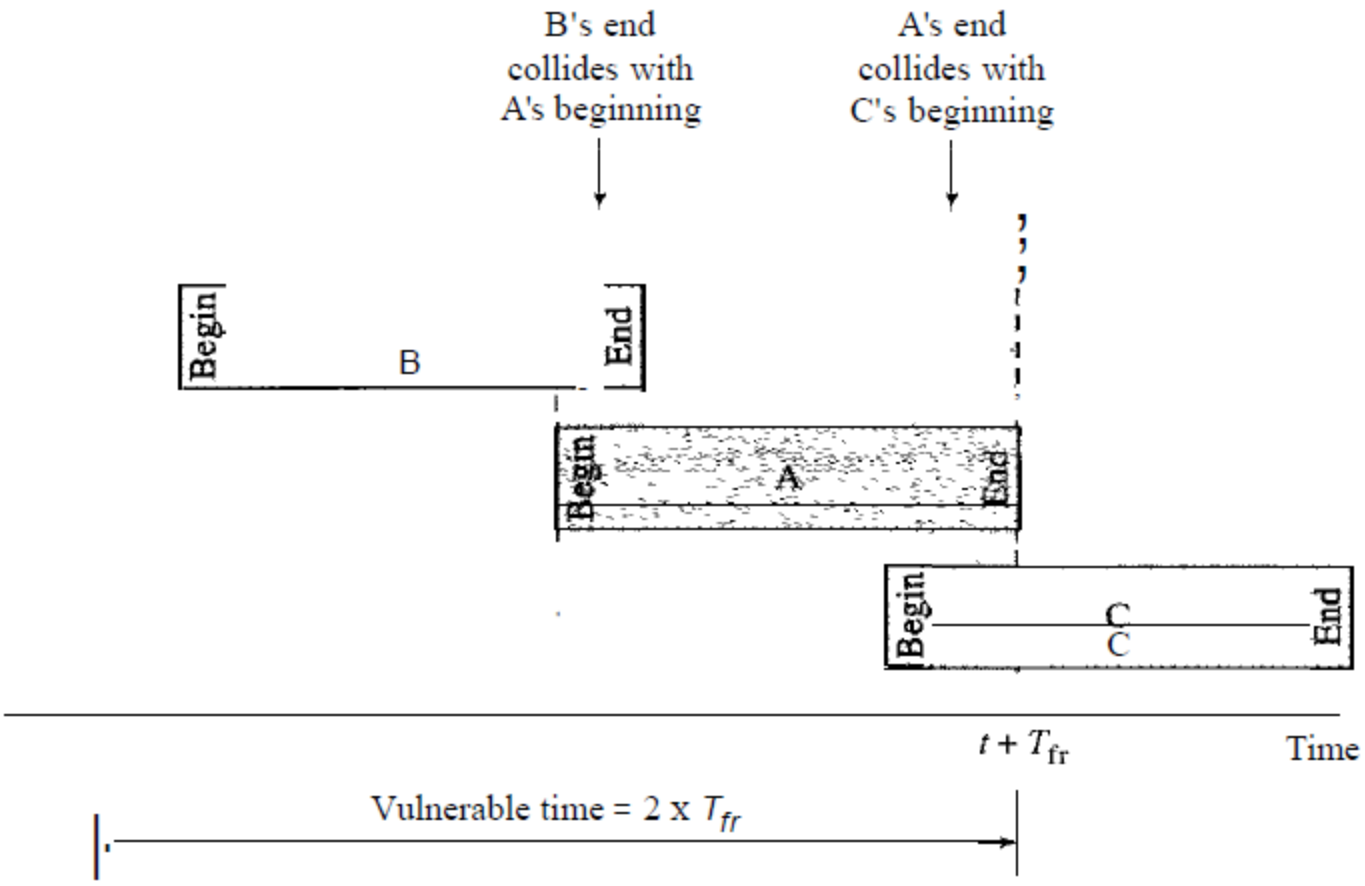
•Pure ALOHA

Figure 4-1. In pure ALOHA, frames are transmitted at completely arbitrary times.



Vulnerable time: **Let us find the length of time, the vulnerable time, in which there** is a possibility of collision. We assume that the stations send fixed-length frames with each frame taking *Tfr S to send. Figure 12.5 shows the vulnerable time for station A.*

Figure 12.5 *Vulnerable time for pure ALOHA protocol*



Slotted ALOHA

In slotted ALOHA we divide the time into slots of Tfr s and force the station to
send only at the beginning of the time slot. Figure 12.6 shows an example of frame

Figure 12.6 *Frames in a slotted ALOHA network*

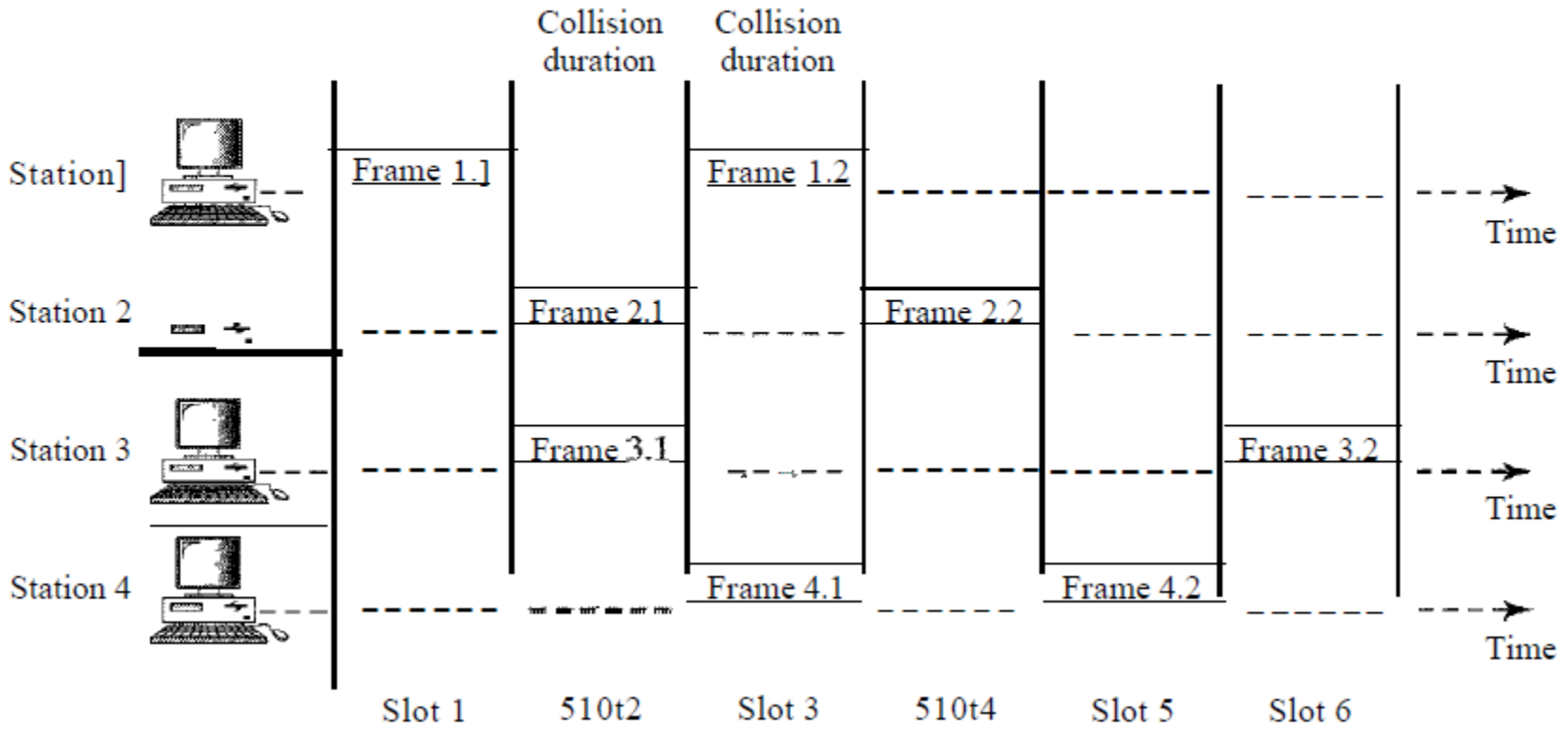
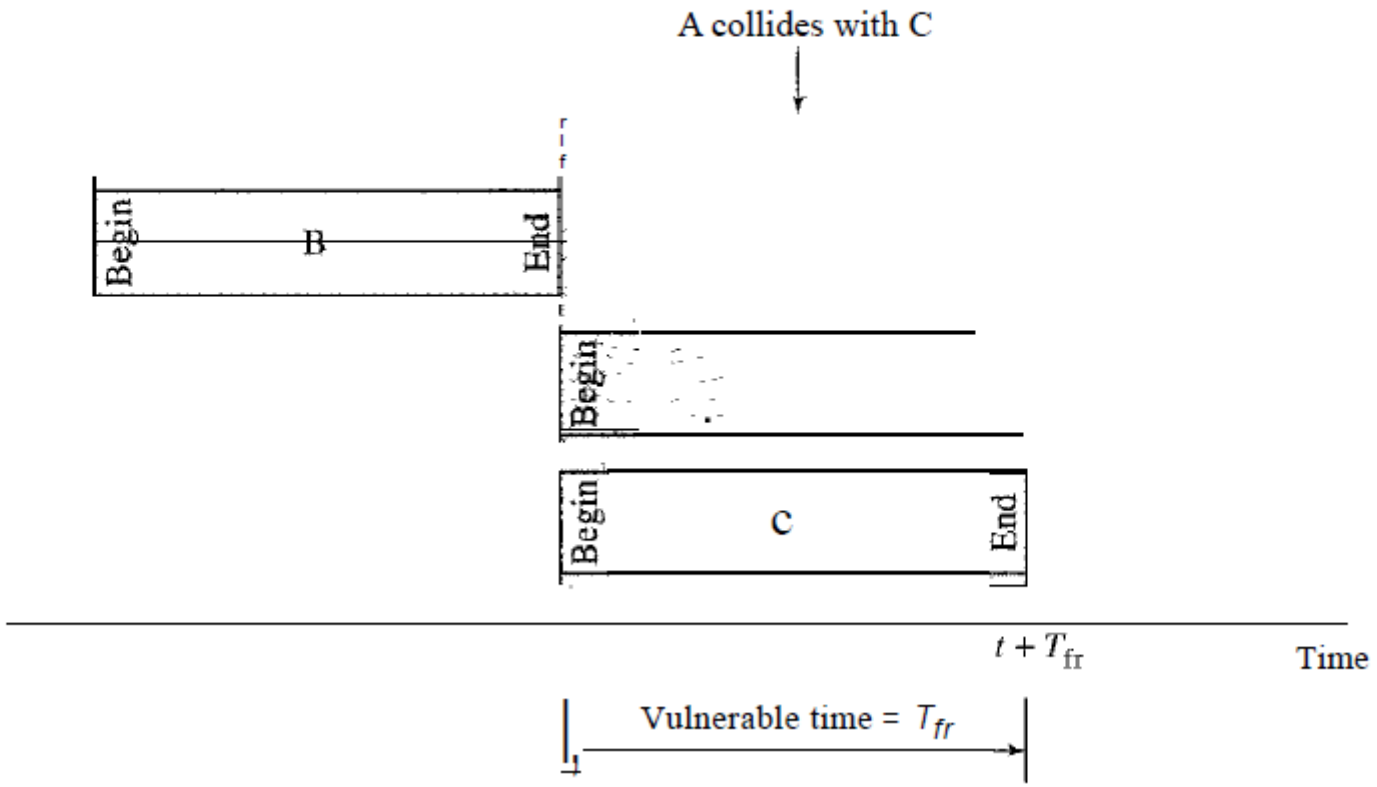


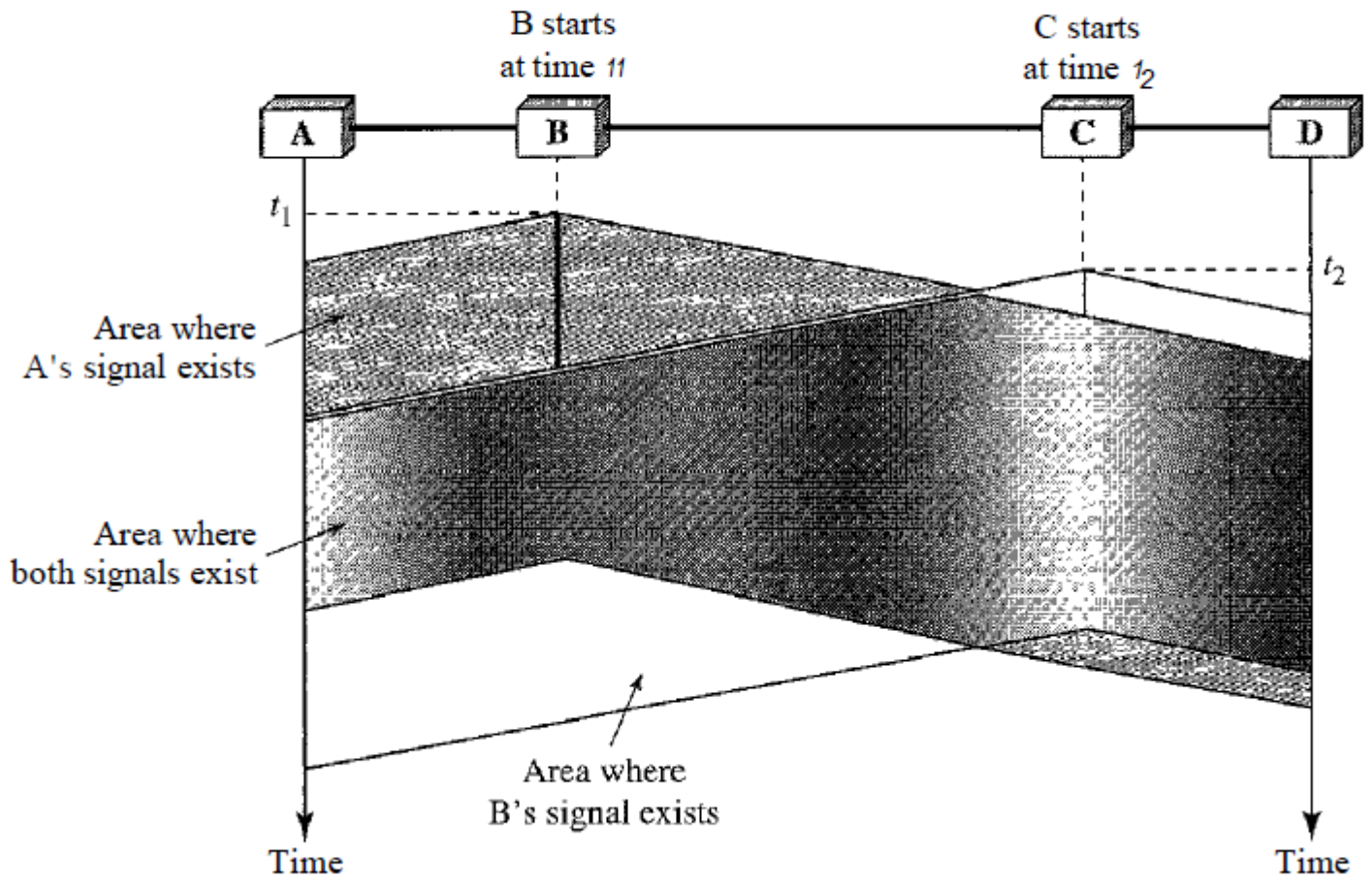
Figure 12.7 *Vulnerable time for slotted ALOHA protocol*



Slotted ALOHA vulnerable time = T_{fr}

Carrier Sense Multiple Access (CSMA)

Figure 12.8 *Space/time model of the collision in CSMA*

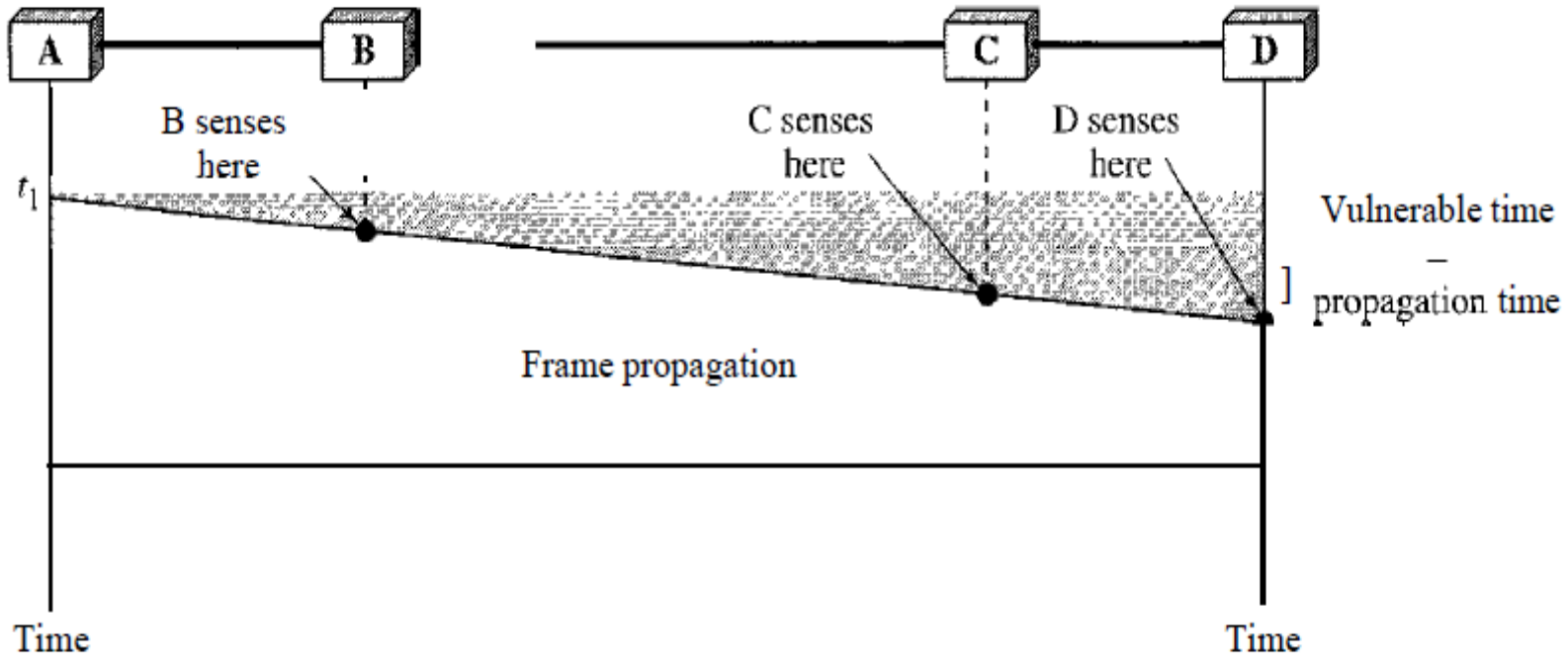


CSMA is based on the principle "sense before transmit" or "listen before talk."

Vulnerable Time

The vulnerable time for CSMA is the propagation time Tp . This is the time needed for a signal to propagate from one end of the medium to the other.

Figure 12.9 *Vulnerable time in CSMA*

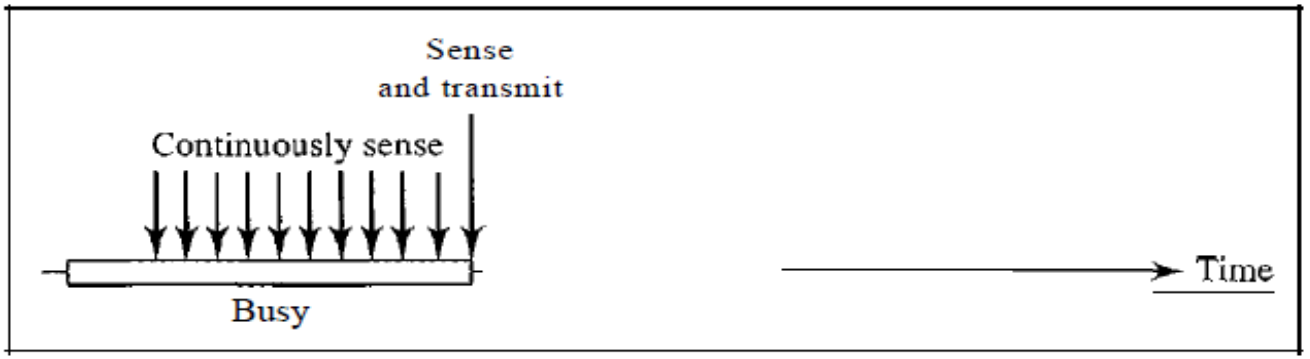


Persistence Methods

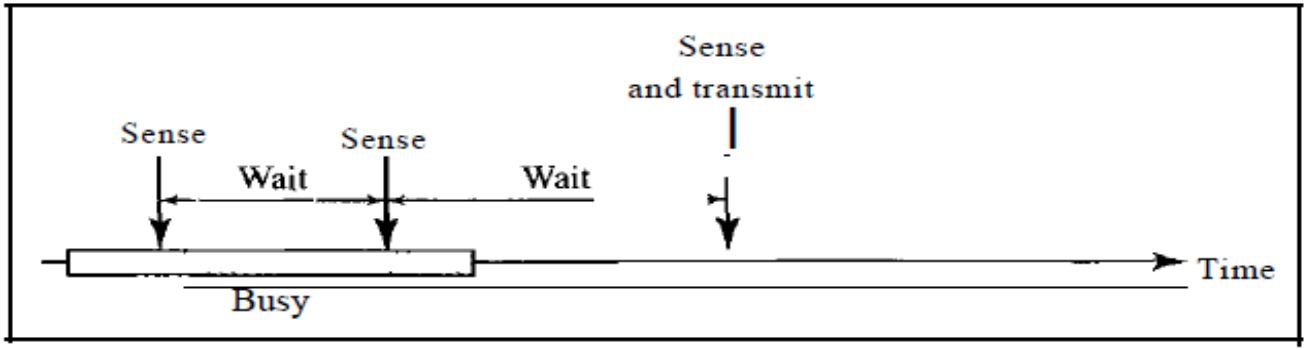
What should a station do if the channel is busy? What should a station do if the channel is idle? Three methods have been devised to answer these questions: the I-persistent method, the nonpersistent method, and the p-persistent method. Figure 12.10 shows the behavior of three persistence methods when a station finds a channel busy.

- **I-Persistent**
- **Nonpersistent**
- **p-Persistent**

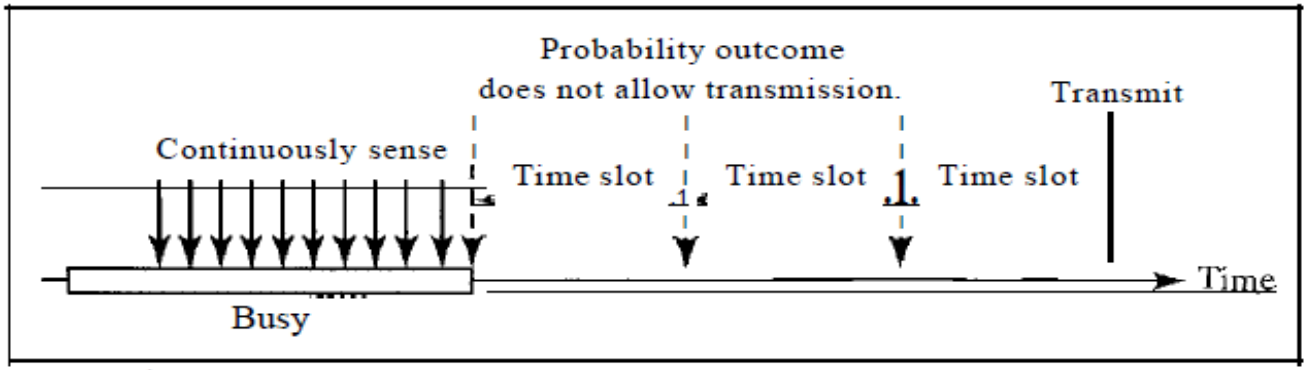
Figure 12.10 *Behavior of three persistence methods*



3. I-persistent



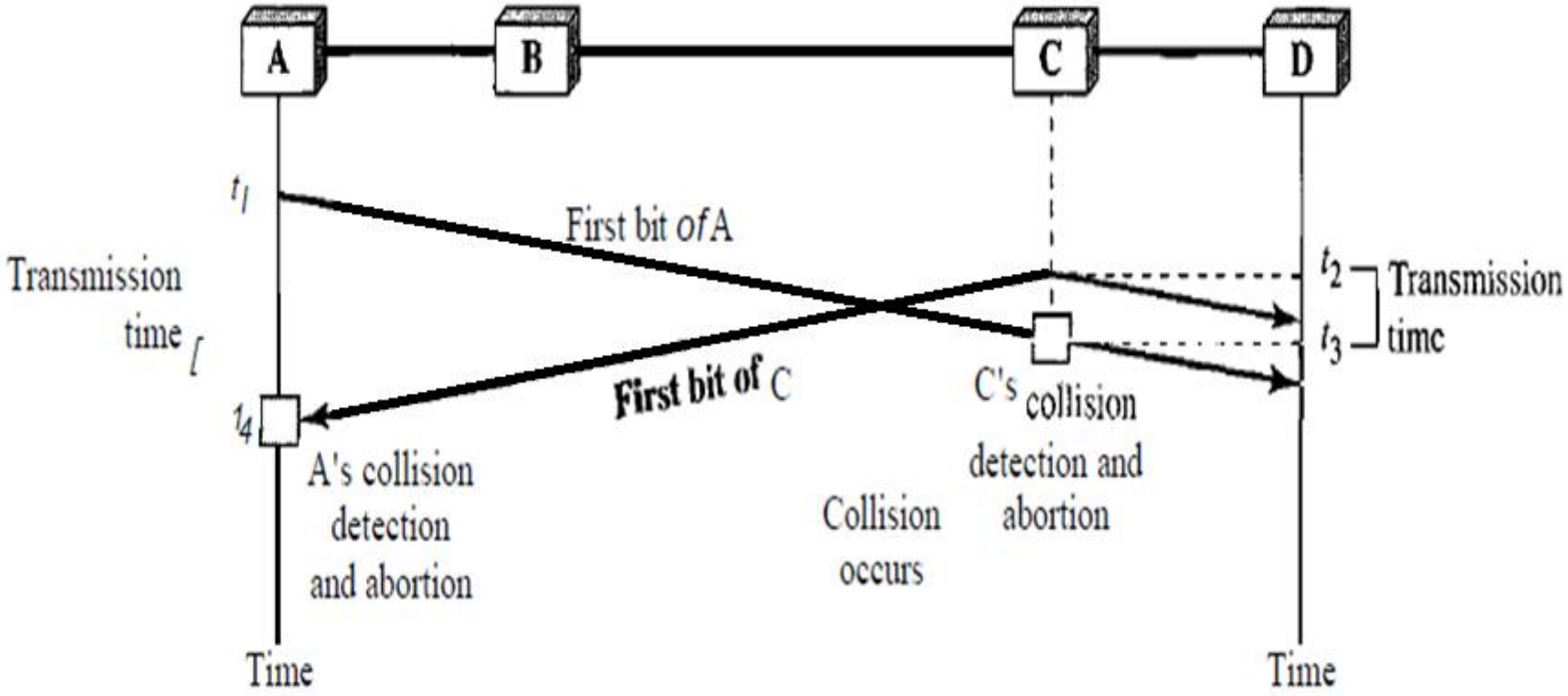
b. Nonpersistent



c. p-persistent

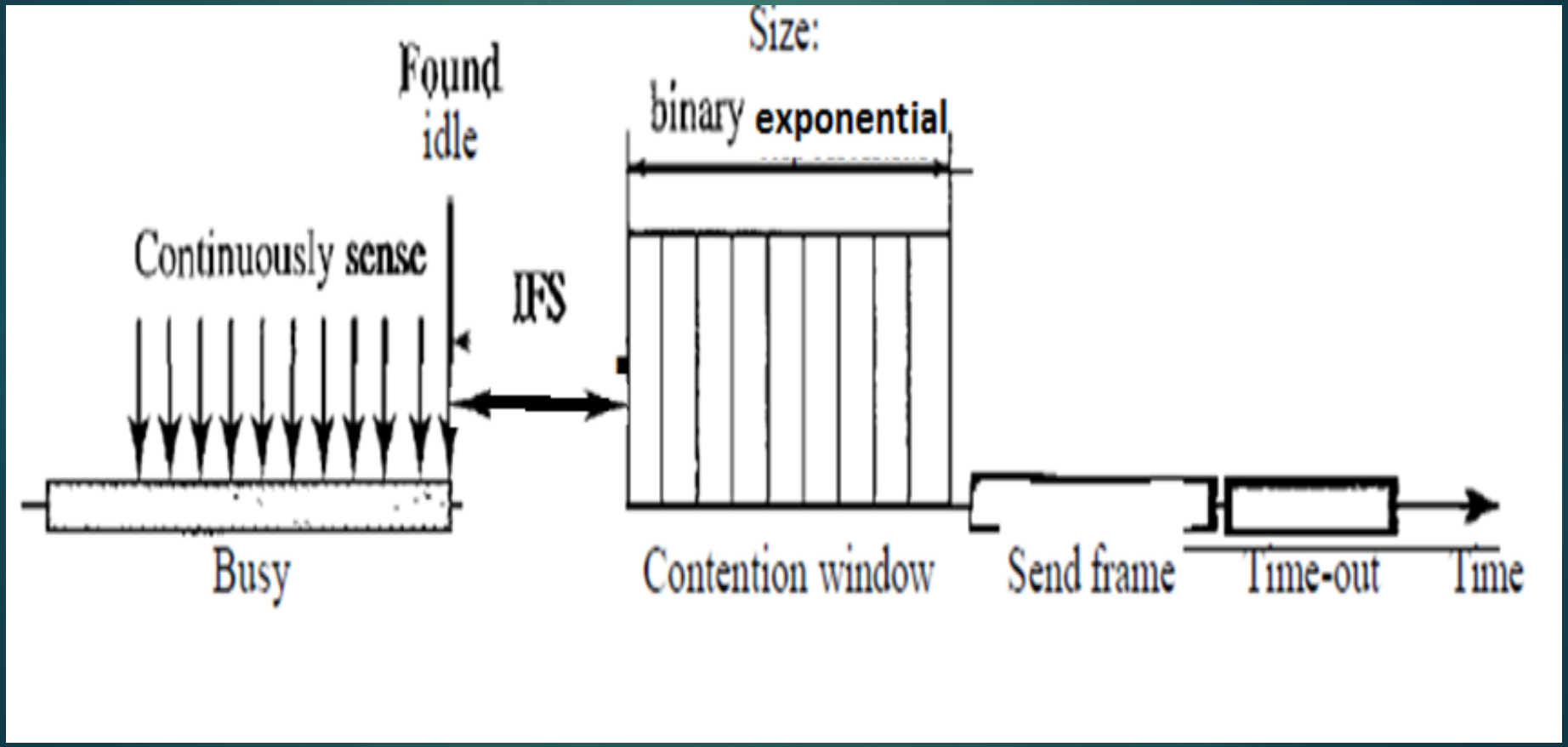
Carrier Sense Multiple Access with Collision

Figure 12.12 *Collision of the first bit in CSMA/CD*



Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)

Timing in CSMA/CA



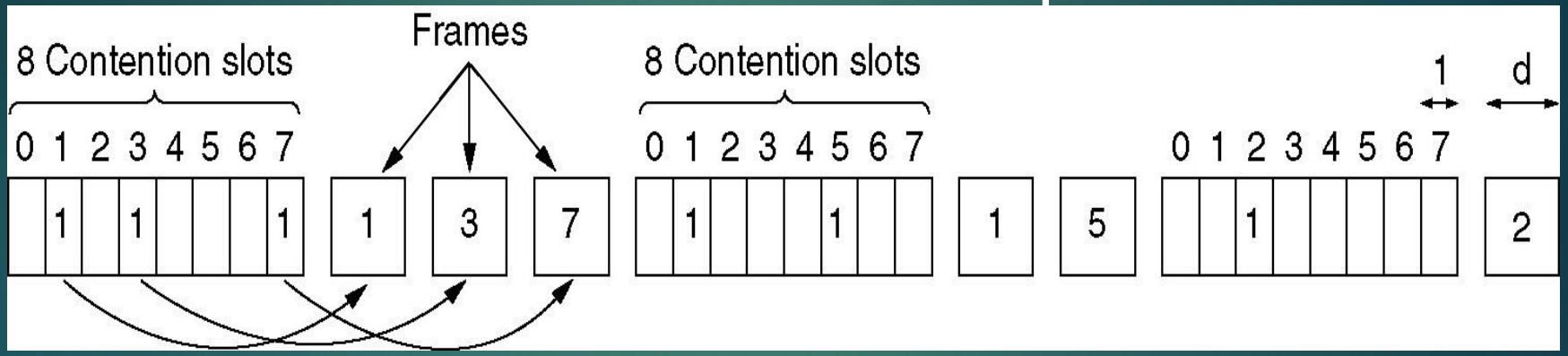
CSMA/CA Protocol is invented for wireless Network

It uses three strategy to avoid collision

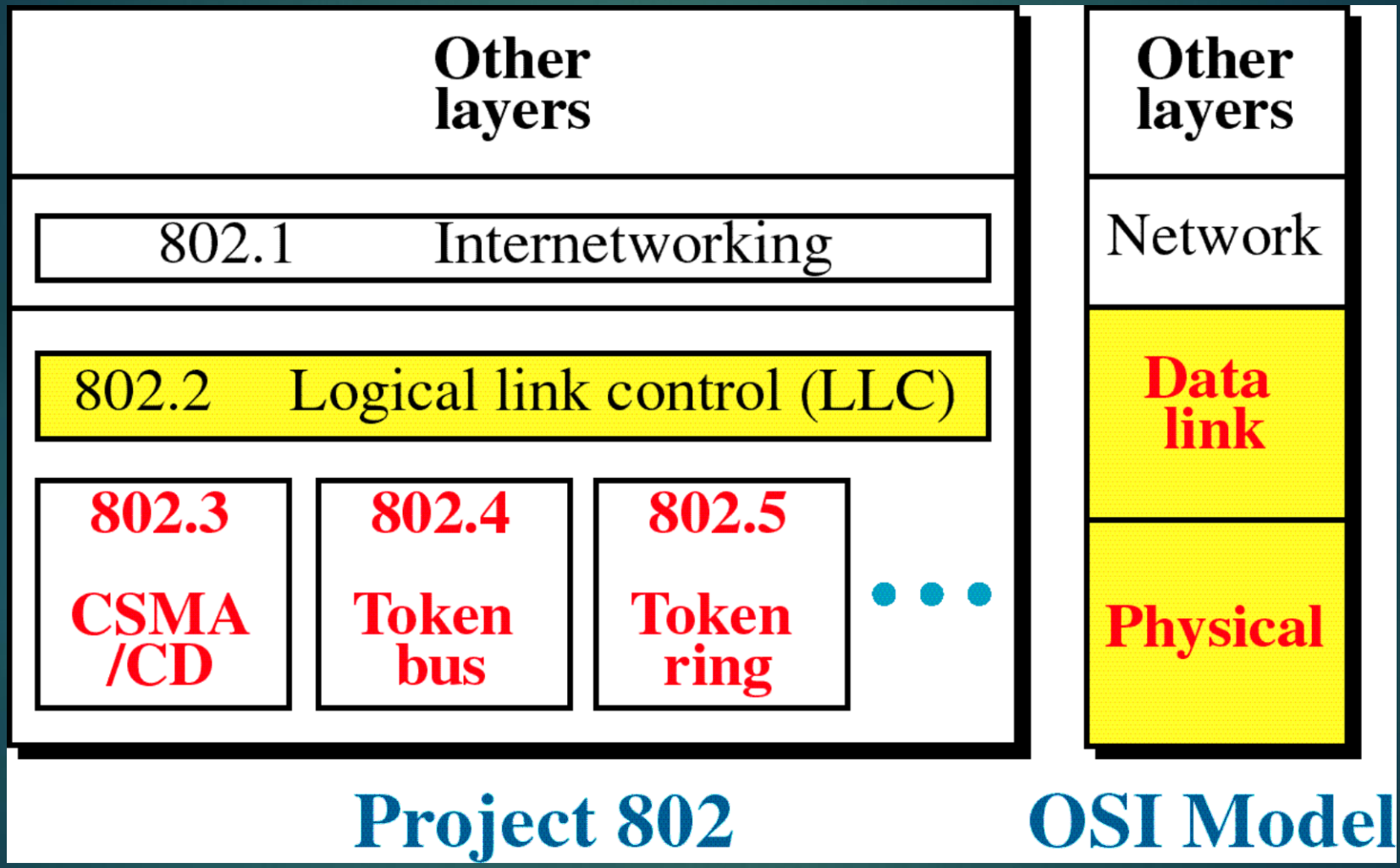
1)Interframe Space
2) The Contention Window
3) Acknowledgments

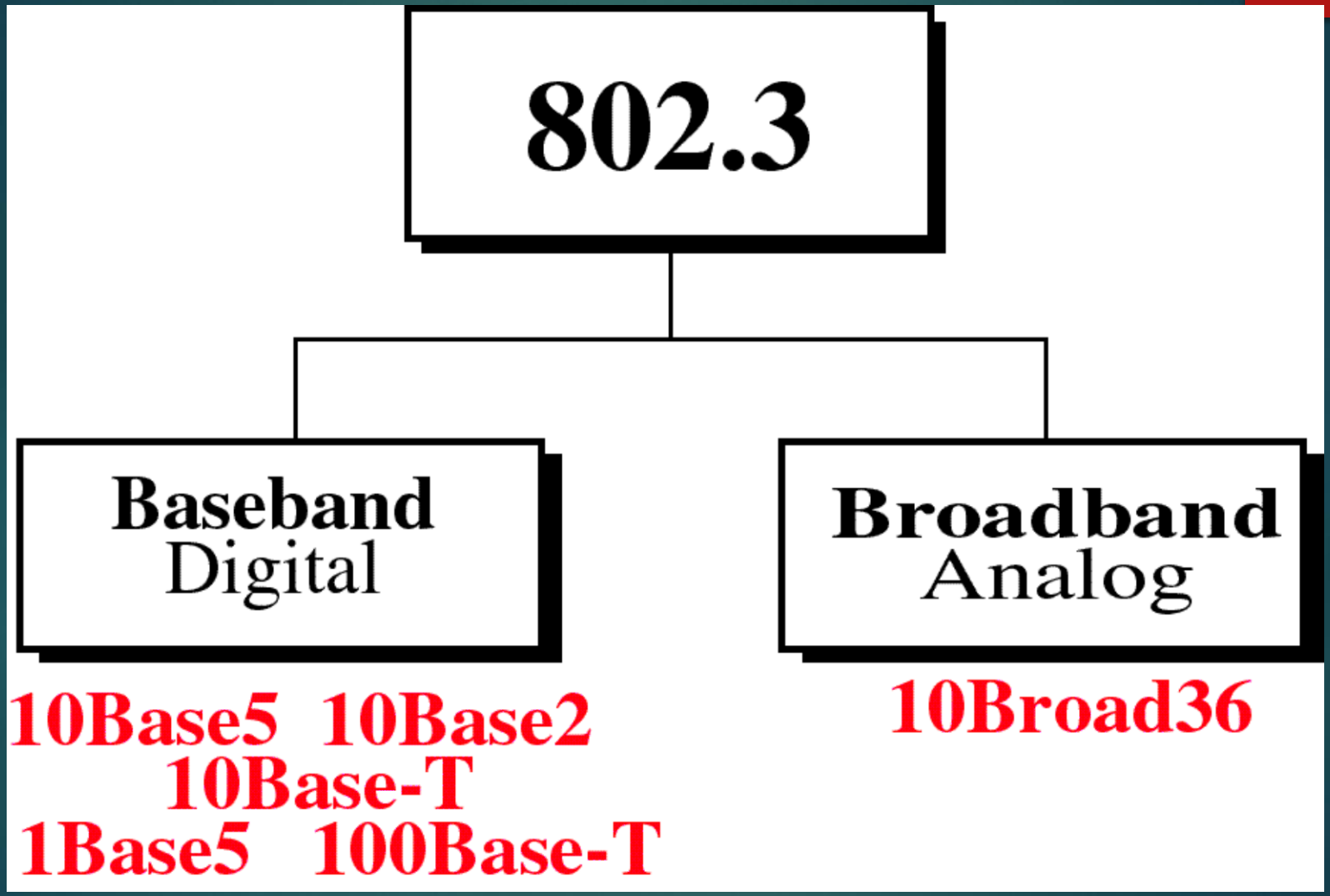
Collision-Free Protocols

The basic bit-map



IEEE 802 Standards



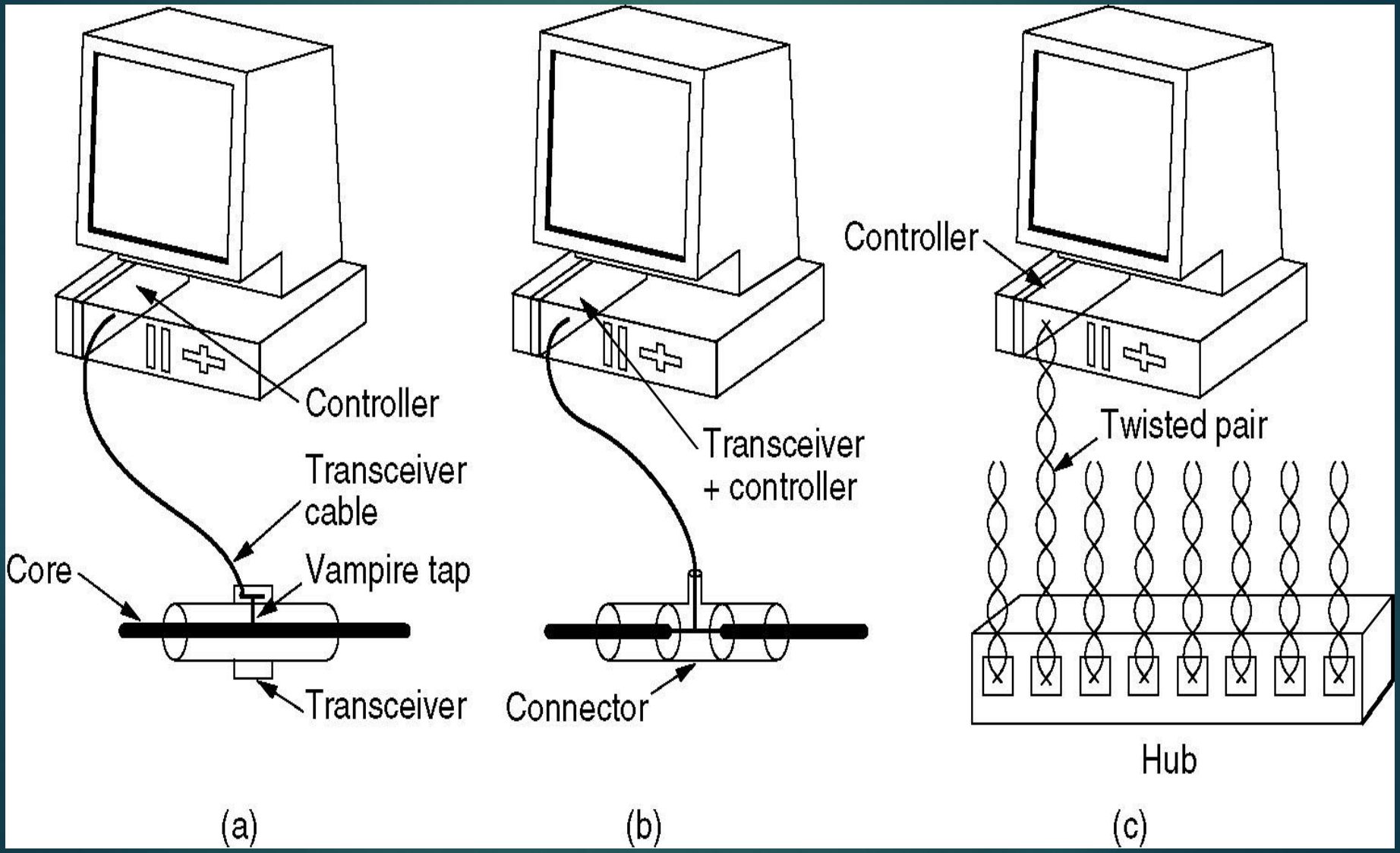

802.3
Baseband
Digital
Broadband
Analog
10Base5 10Base2
10Base-T
1Base5 100Base-T
10Broad36

Ethernet/802.3 Cabling

The most common kinds of Ethernet cabling.

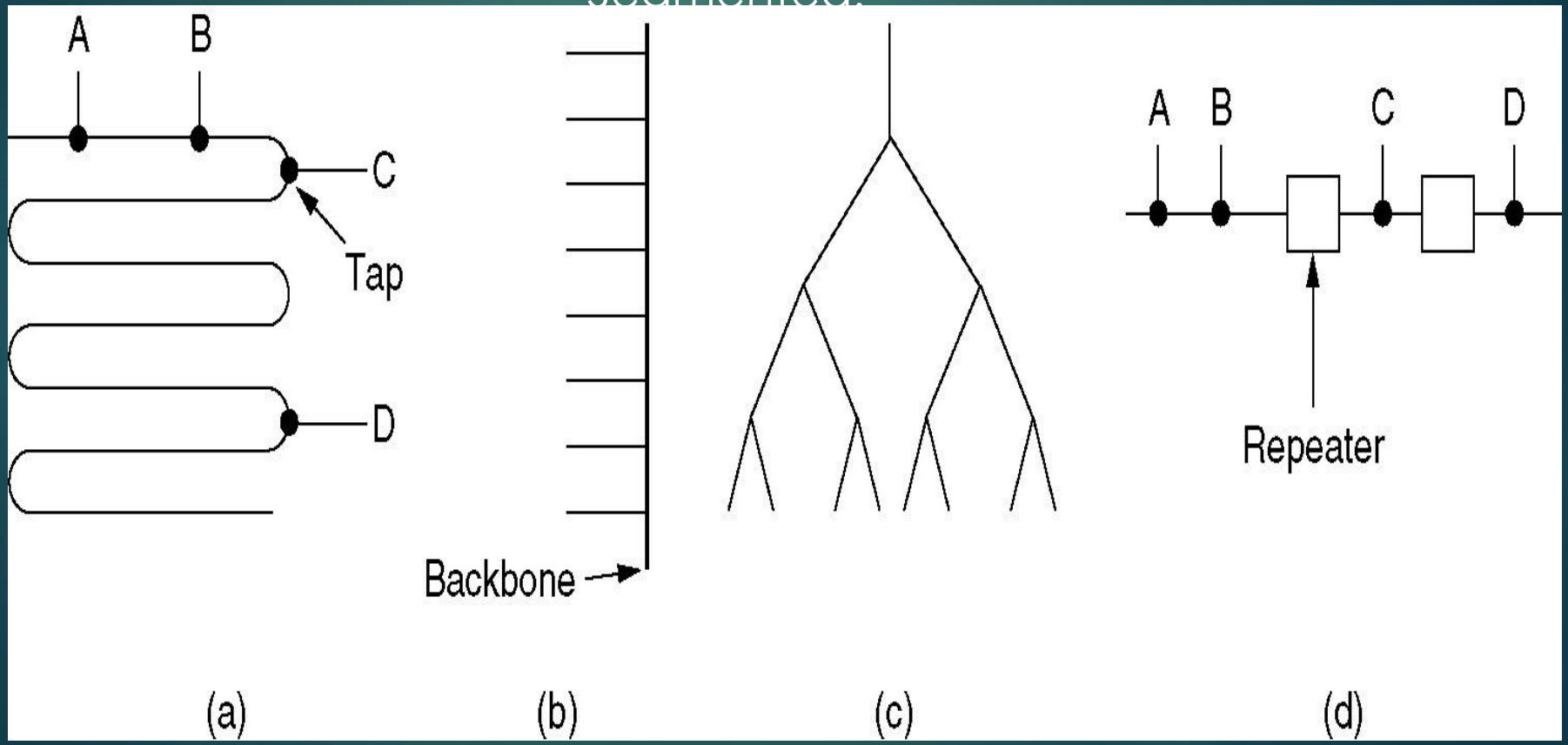
Name	Cable	Max. seg.	Nodes/seg.	Advantages
10Base5	Thick coax	500 m	100	Original cable; now obsolete
10Base2	Thin coax	185 m	30	No hub needed
10Base-T	Twisted pair	100 m	1024	Cheapest system
10Base-F	Fiber optics	2000 m	1024	Best between buildings

Ethernet Cabling (2)

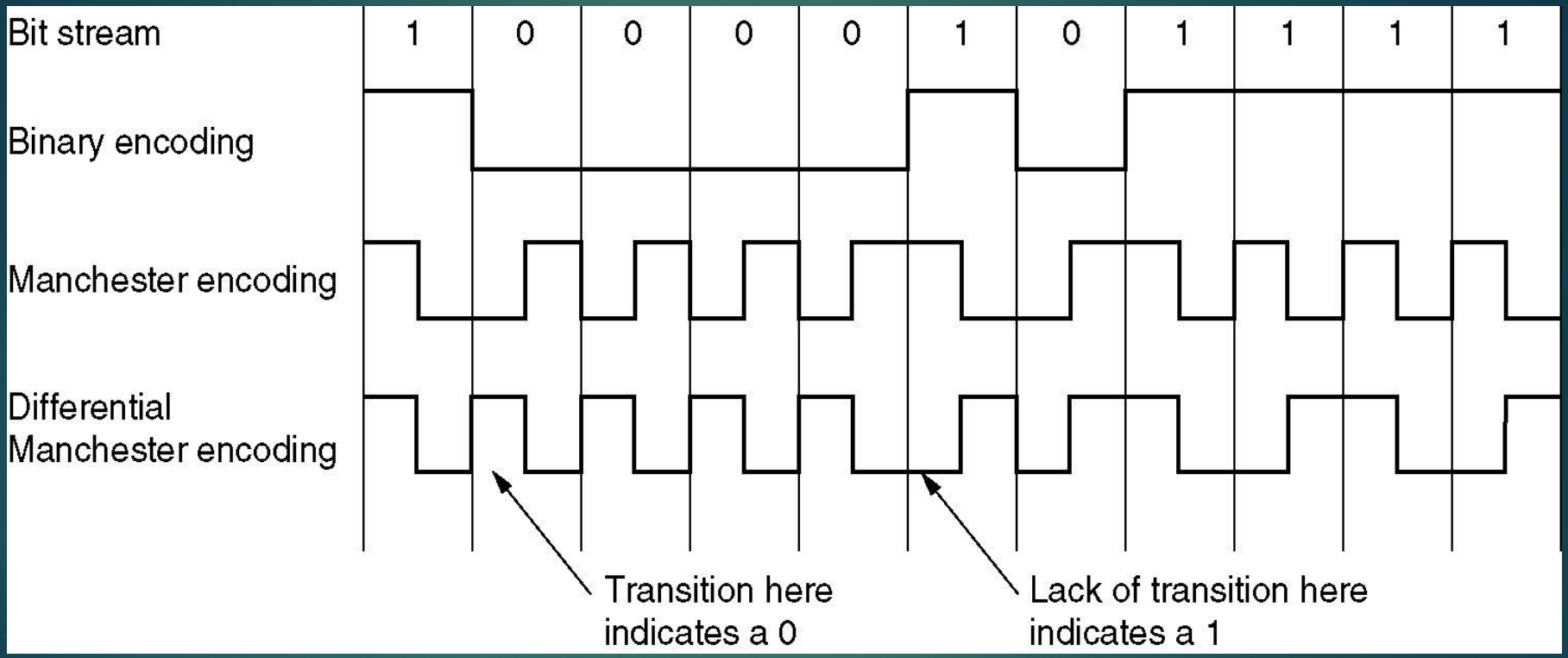


Ethernet Cabling (3)

Cable topologies. (a) Linear, (b) Spine, (c) Tree, (d) Segmented.



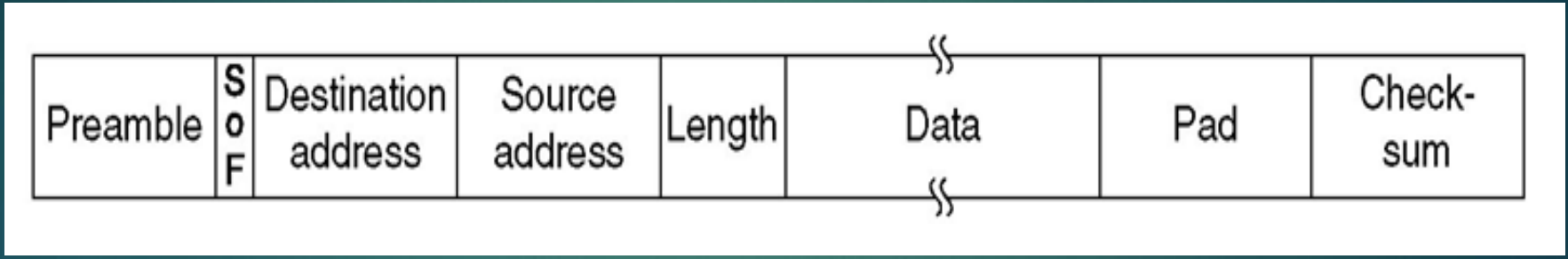
Ethernet Cabling (4)



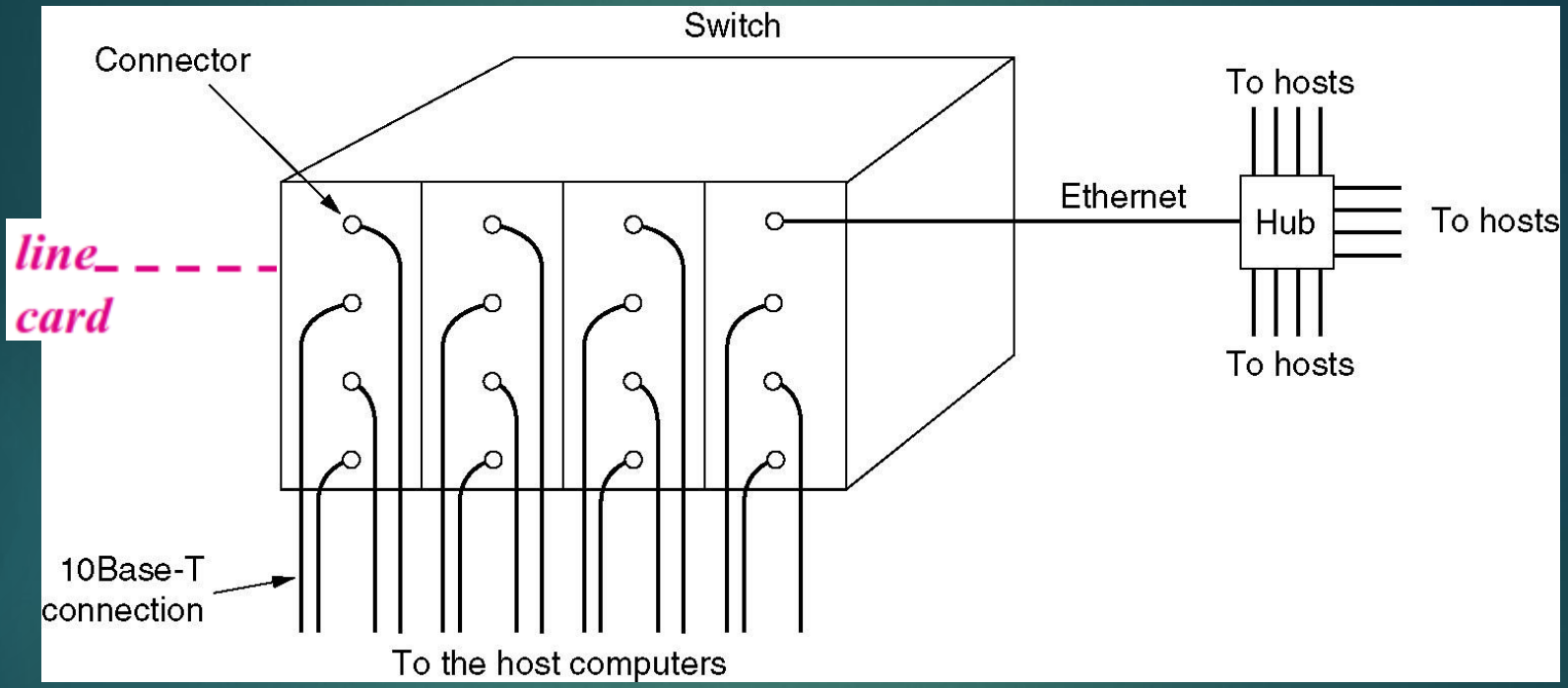
(a) Binary encoding, (b) Manchester encoding, (c) Differential Manchester encoding.

IEEE 802.3/Ethernet Frame format

Bytes 7 1 2 or 6 2 or 6 2 0 – 1500 0 – 46 4



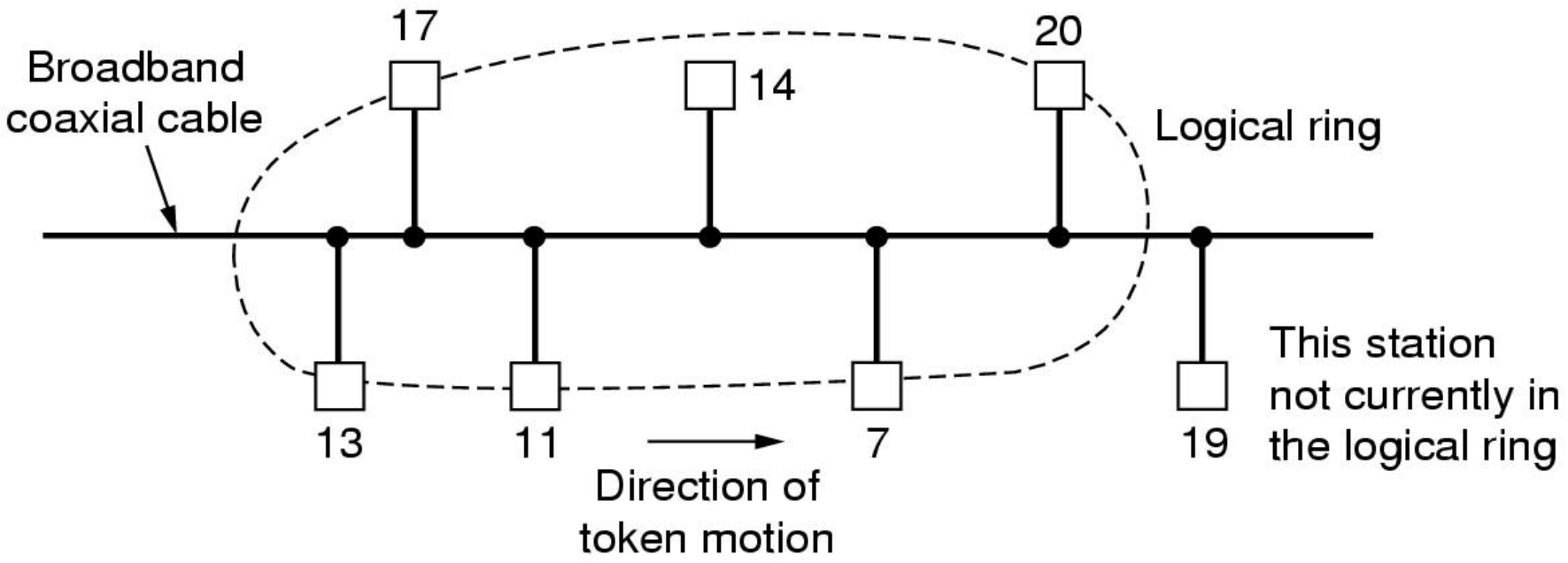
Switched Ethernet



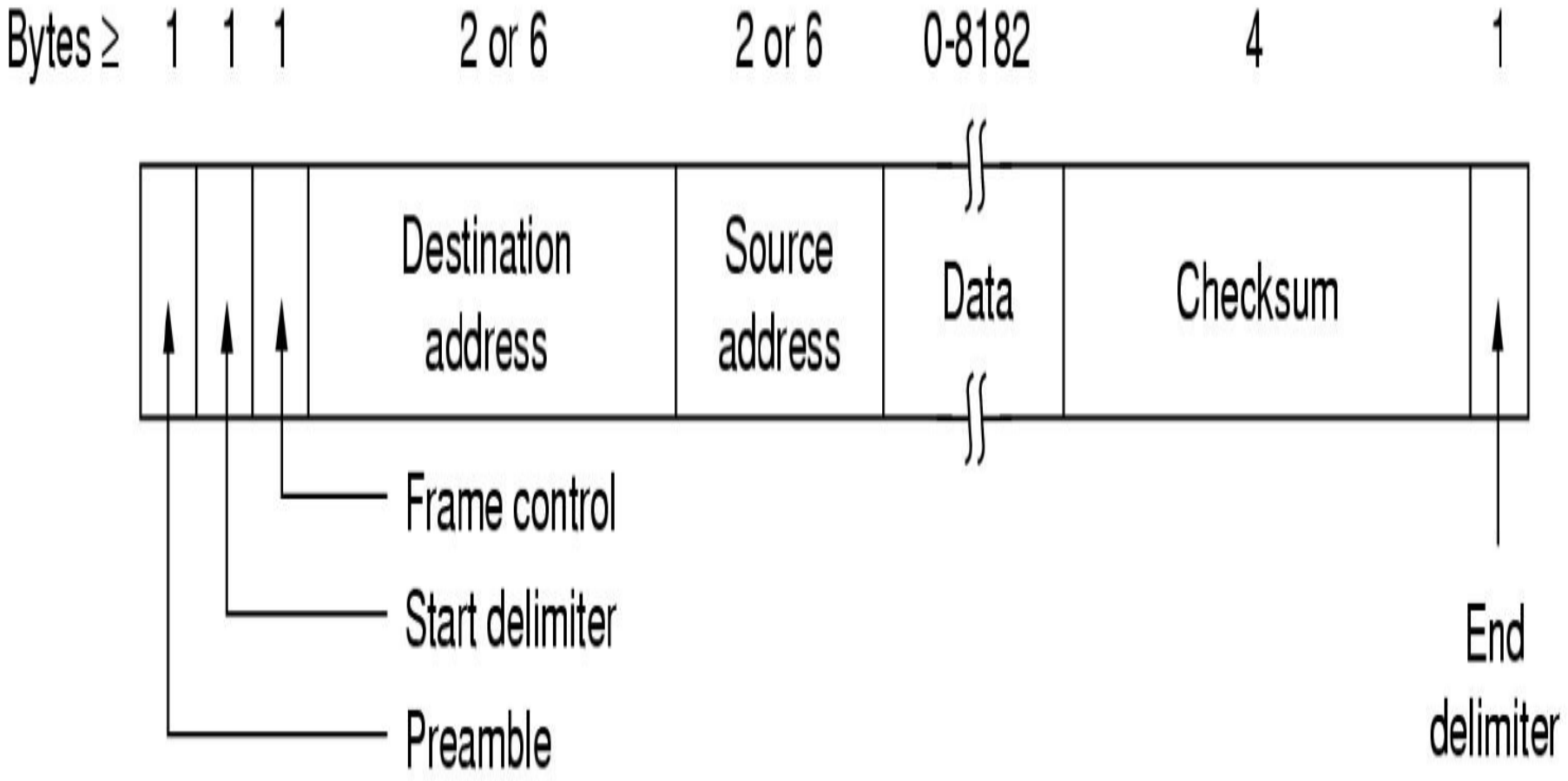
typically: 4-32 line cards connected by a high-speed (e.g. 1 Gbps) backplane inside the switch

Datalinklayer: Token Bus networks (802.4)

- physically a bus, but logically a token-passing ring
- each node in the logical ring knows physical address of its successor and its predecessor
- each node connected to the bus (whether it is in the logical ring or not) receives each Frame –but discards Frames not addressed to it

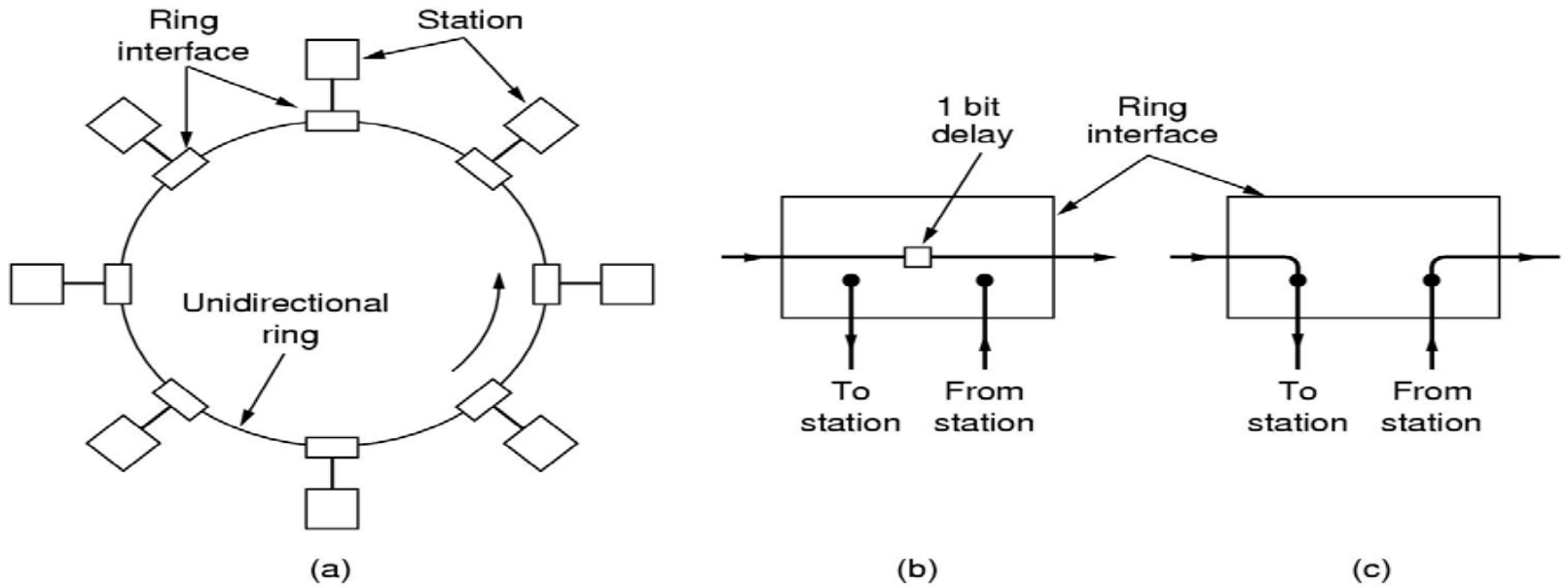


802.4/Token Bus Frame Format

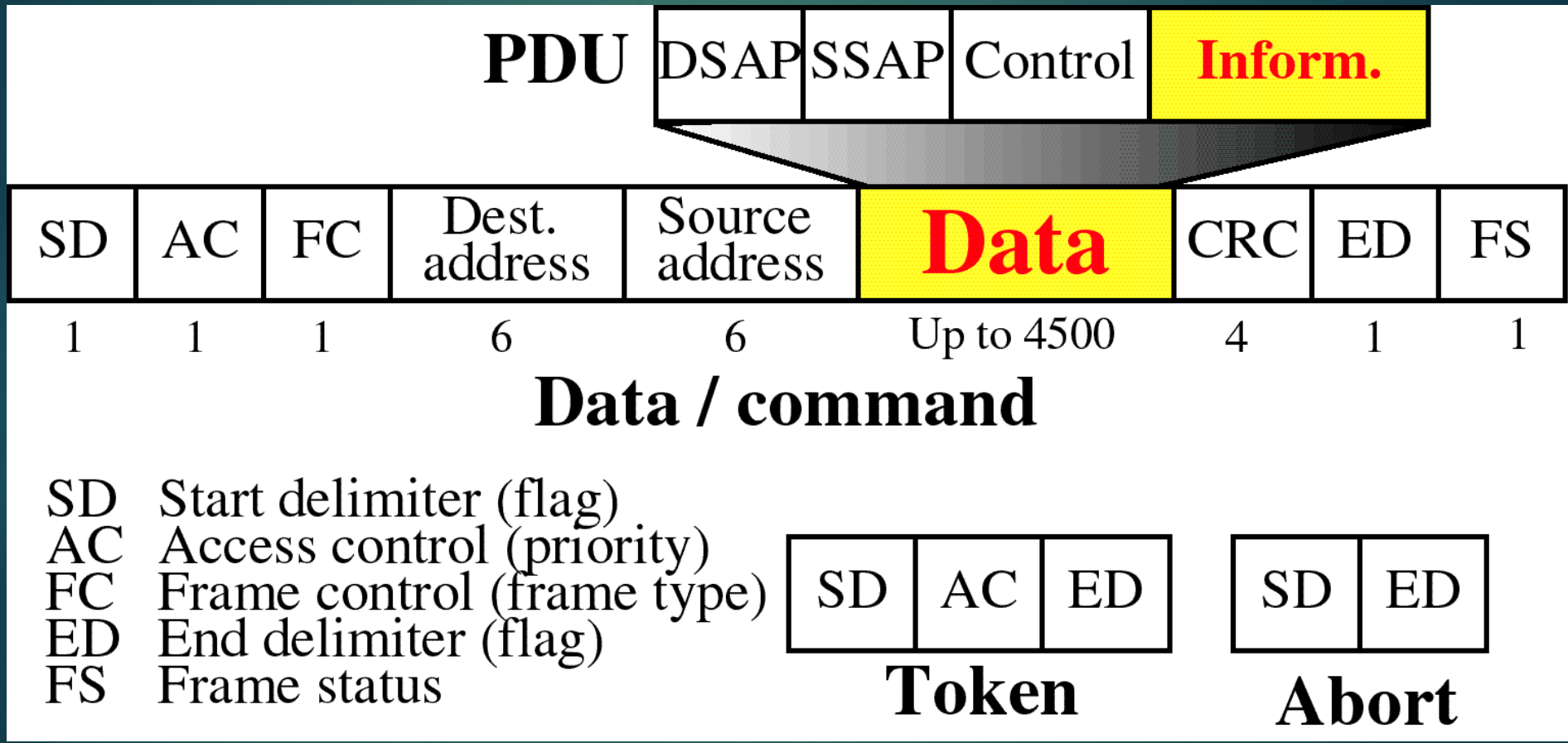


Datalinklayer: Token Ring networks (802.5)

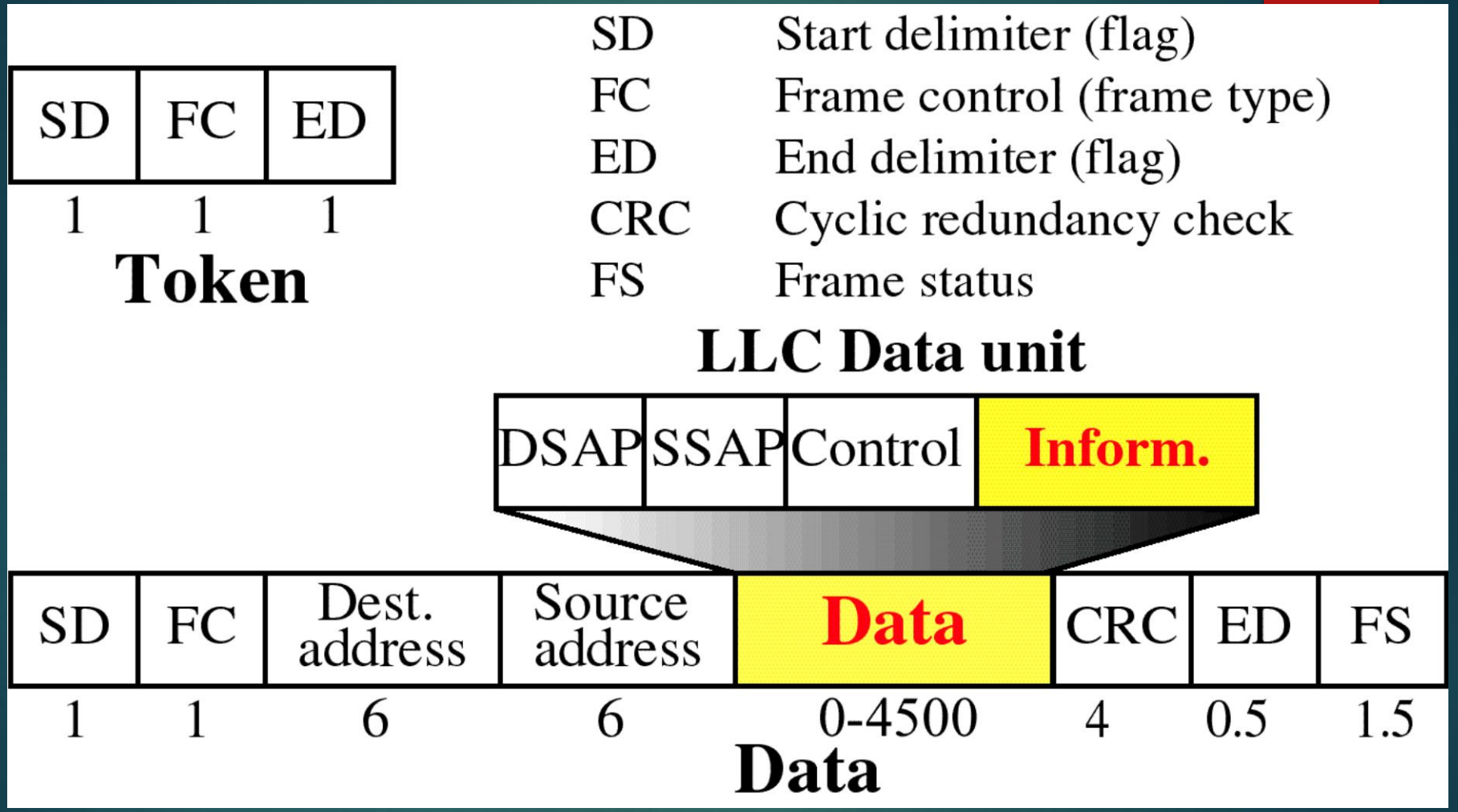
- **"ring" is actually a set of point-to-point links that form a circle**
- ring is (logically) unidirectional
- **token= special frame that is passed from one node to the next**
- a node may only transmit Frame(s) when it has the token
- when a node receives the token, it removes it from the ring and transmits one Frame, then puts the token back on the ring (i.e. transmits it to next node)
- "removing the token" means changing it into the start of a data Frame…



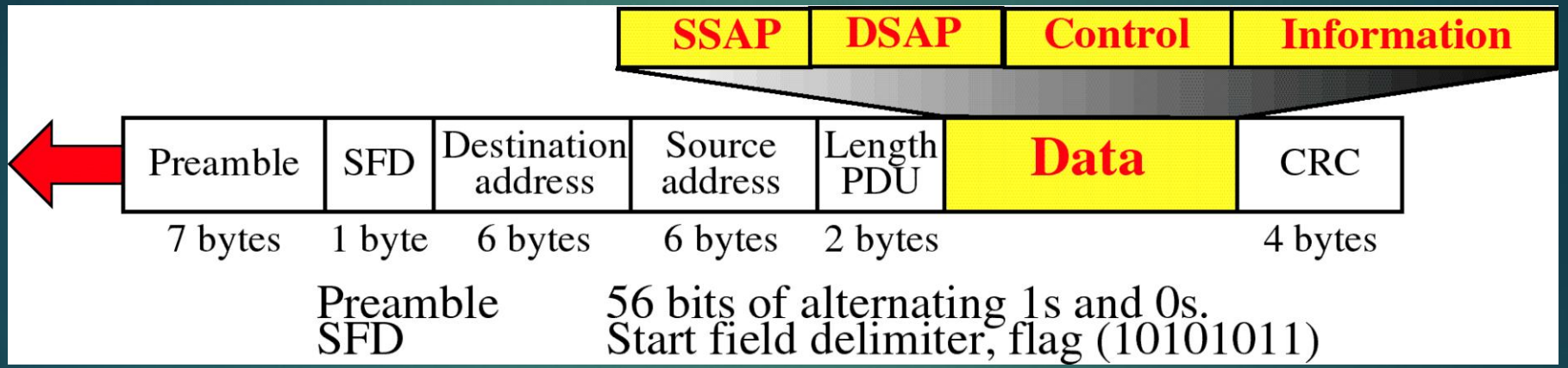
802.5/Token Ring Frame formats



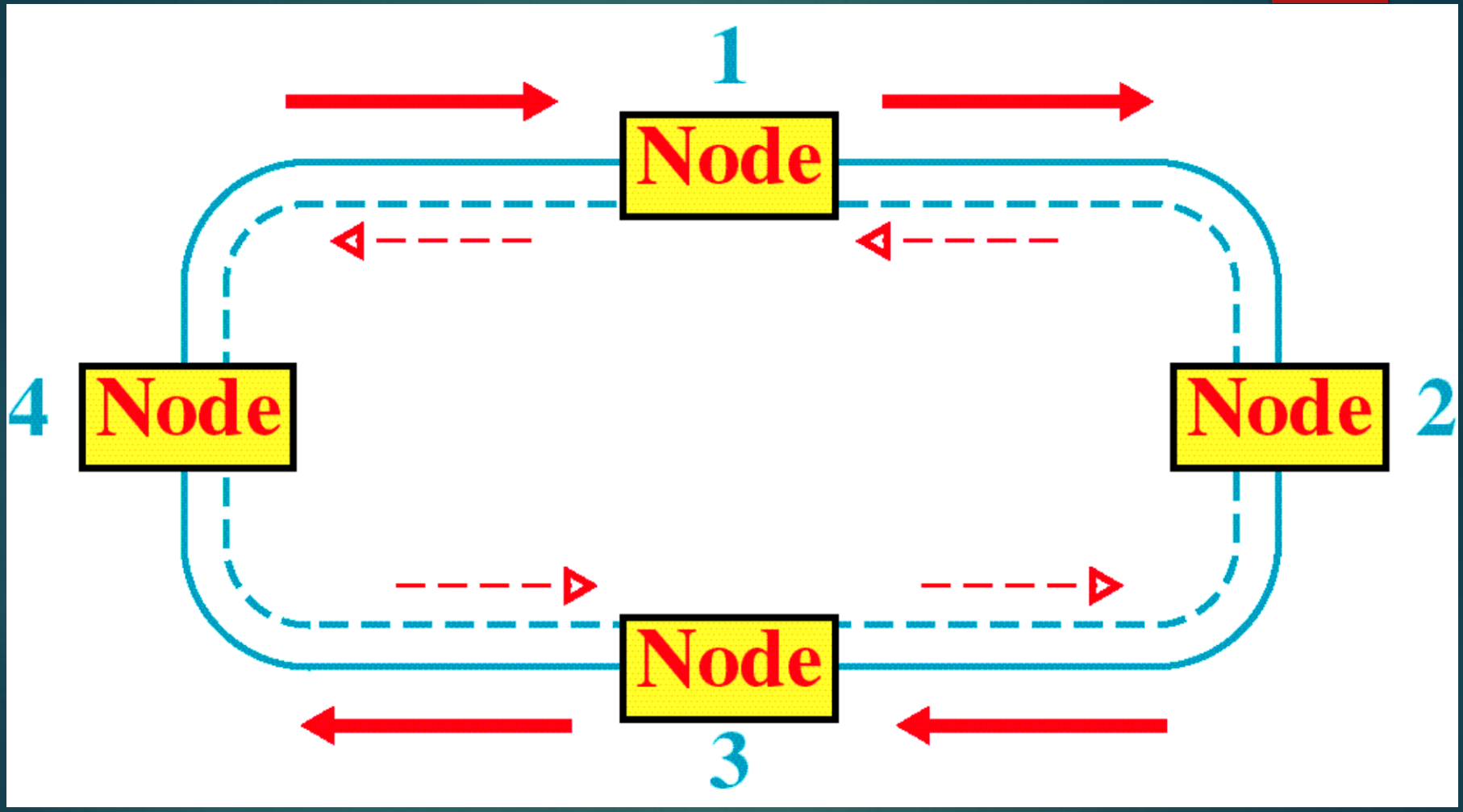
FDDI Frames


SD
FC
ED
1
1
1
Token
SD Start delimiter (flag)
FC Frame control (frame type)
ED End delimiter (flag)
CRC Cyclic redundancy check
FS Frame status
LLC Data unit
DSAP
SSAP
Control
Inform.
SD
FC
Dest. address
Source address
Data
CRC
ED
FS
1
1
6
6
0-4500
4
0.5
1.5
Data

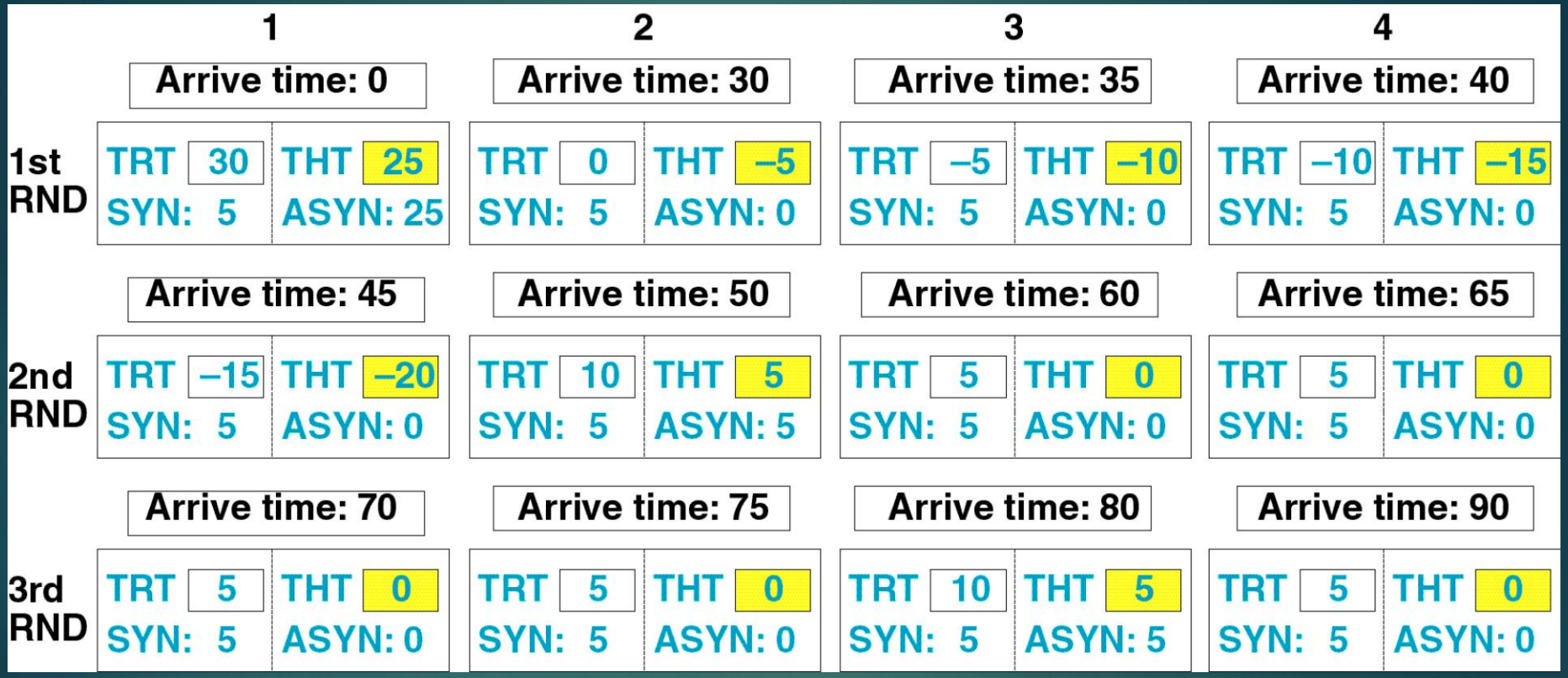
MAC Frame


SSAP
DSAP
Control
Information
Preamble
SFD
Destination address
Source address
Length PDU
Data
CRC
7 bytes
1 byte
6 bytes
6 bytes
2 bytes
4 bytes
Preamble
56 bits of alternating 1s and 0s.
SFD
Start field delimiter, flag (10101011)

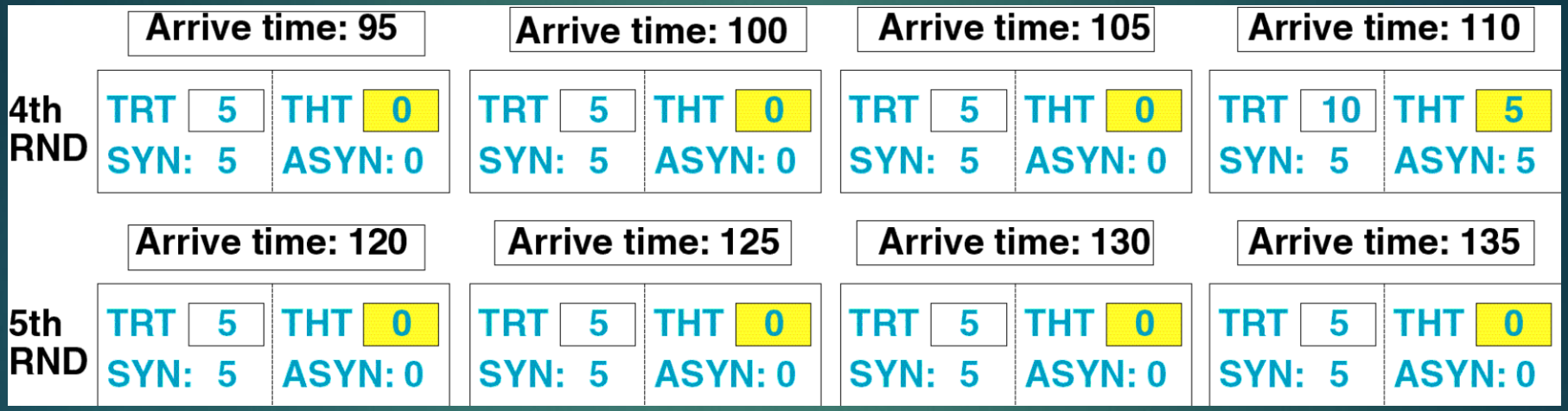
FDDI



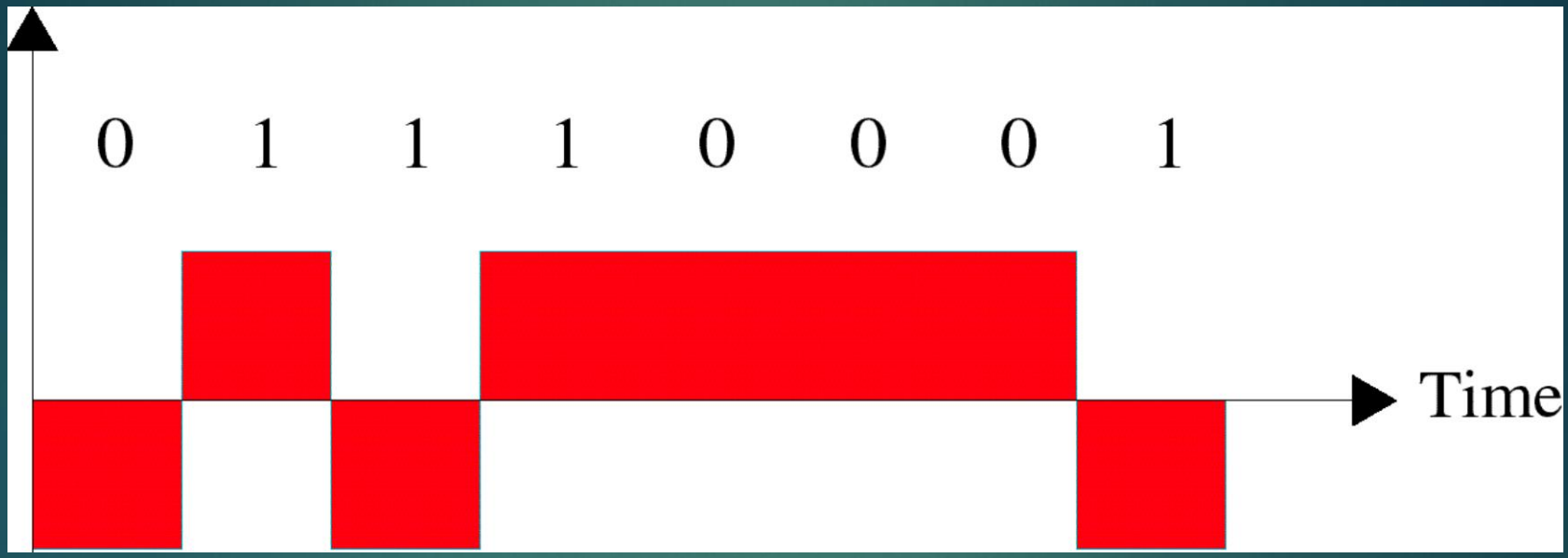
FDDI Example



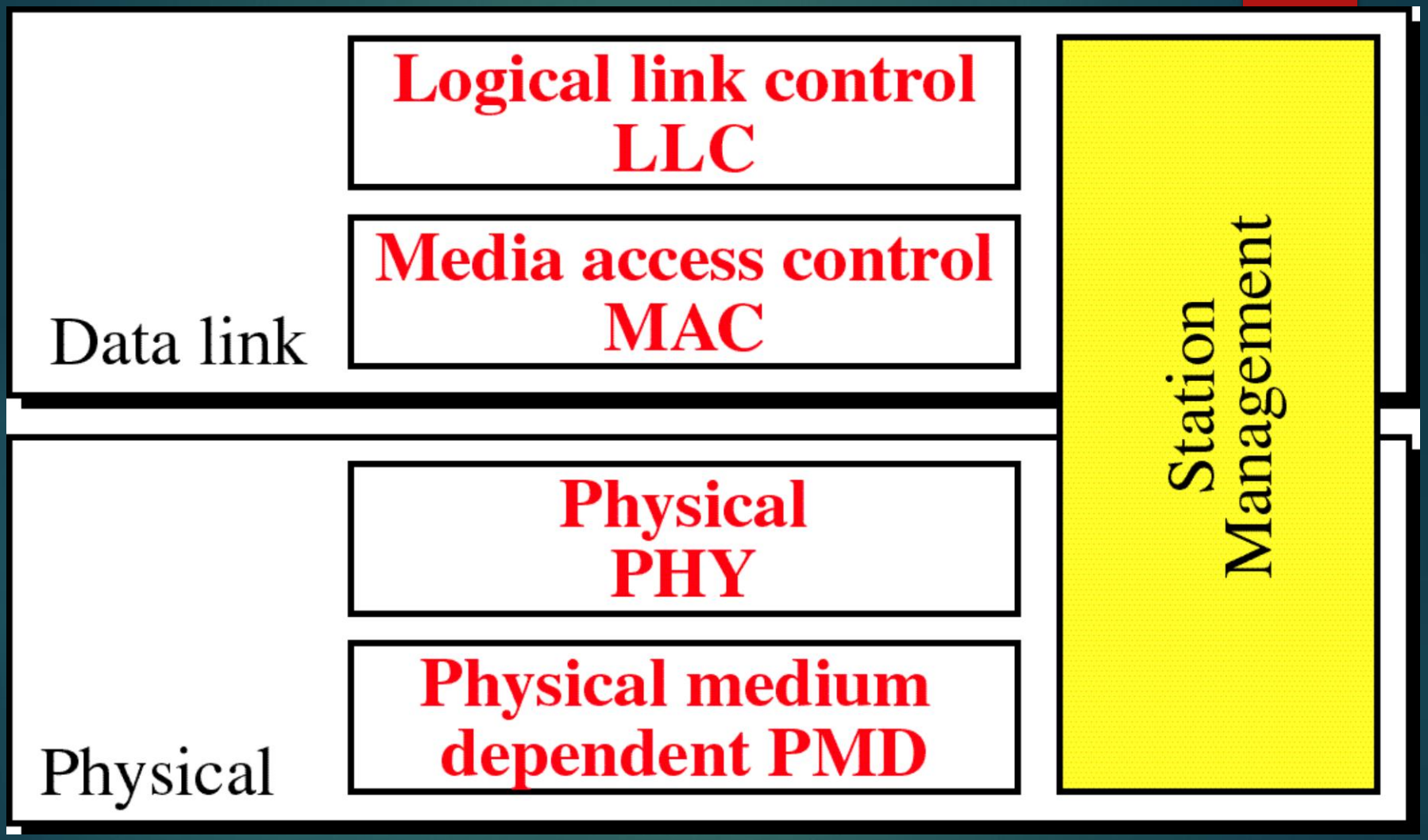
FDDI Example



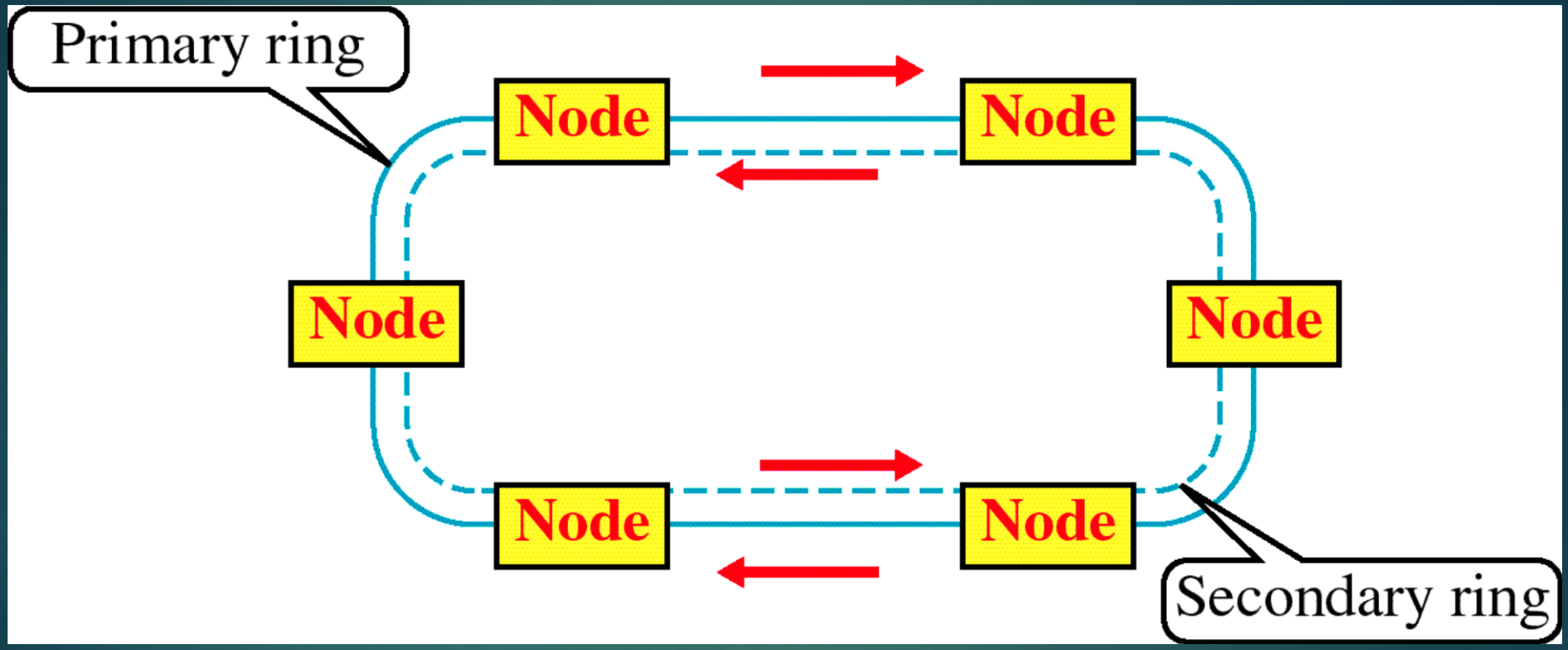
FDDI Encoding



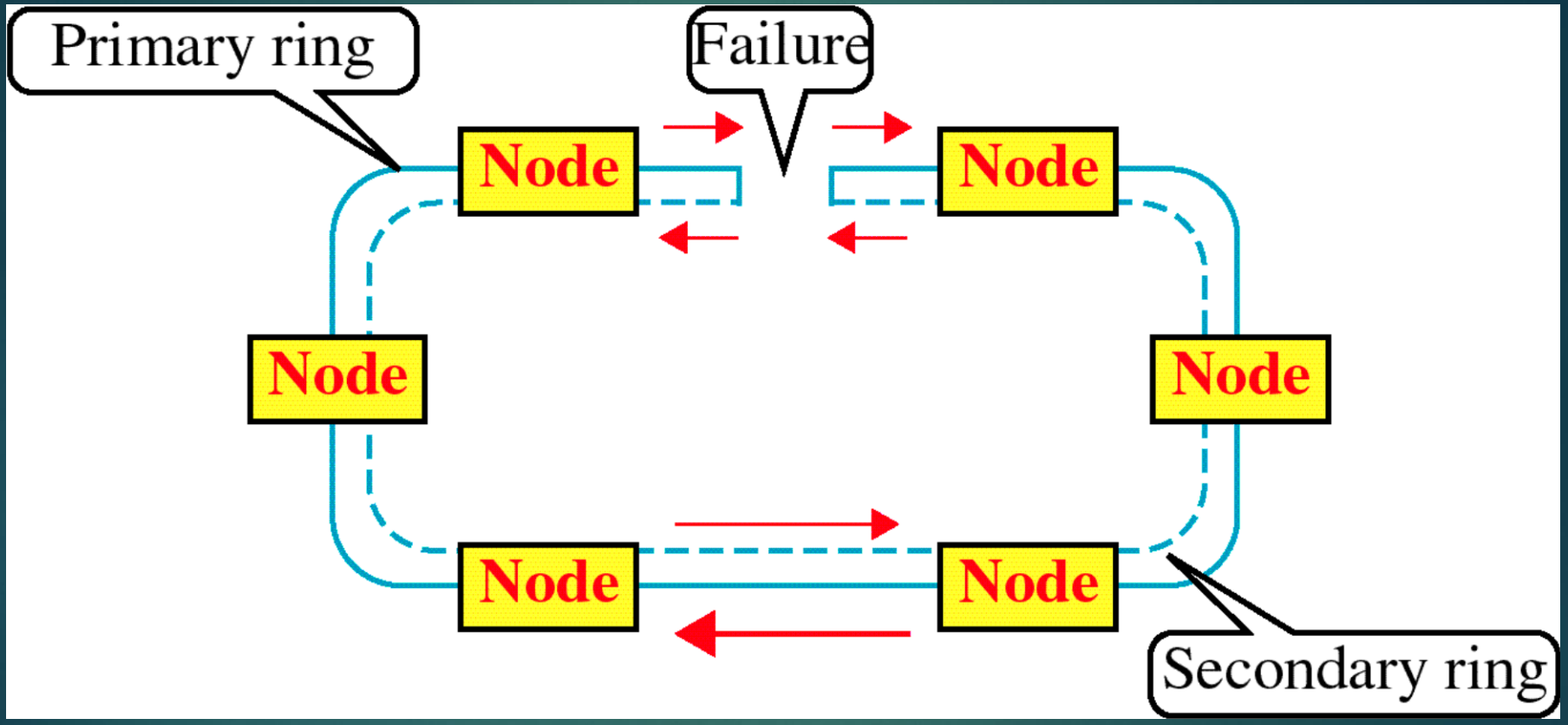
FDDI Layers


Logical link control
LLC
Media access control
MAC
Data link
Physical
PHY
Physical medium
dependent PMD
Physical
Station
Management

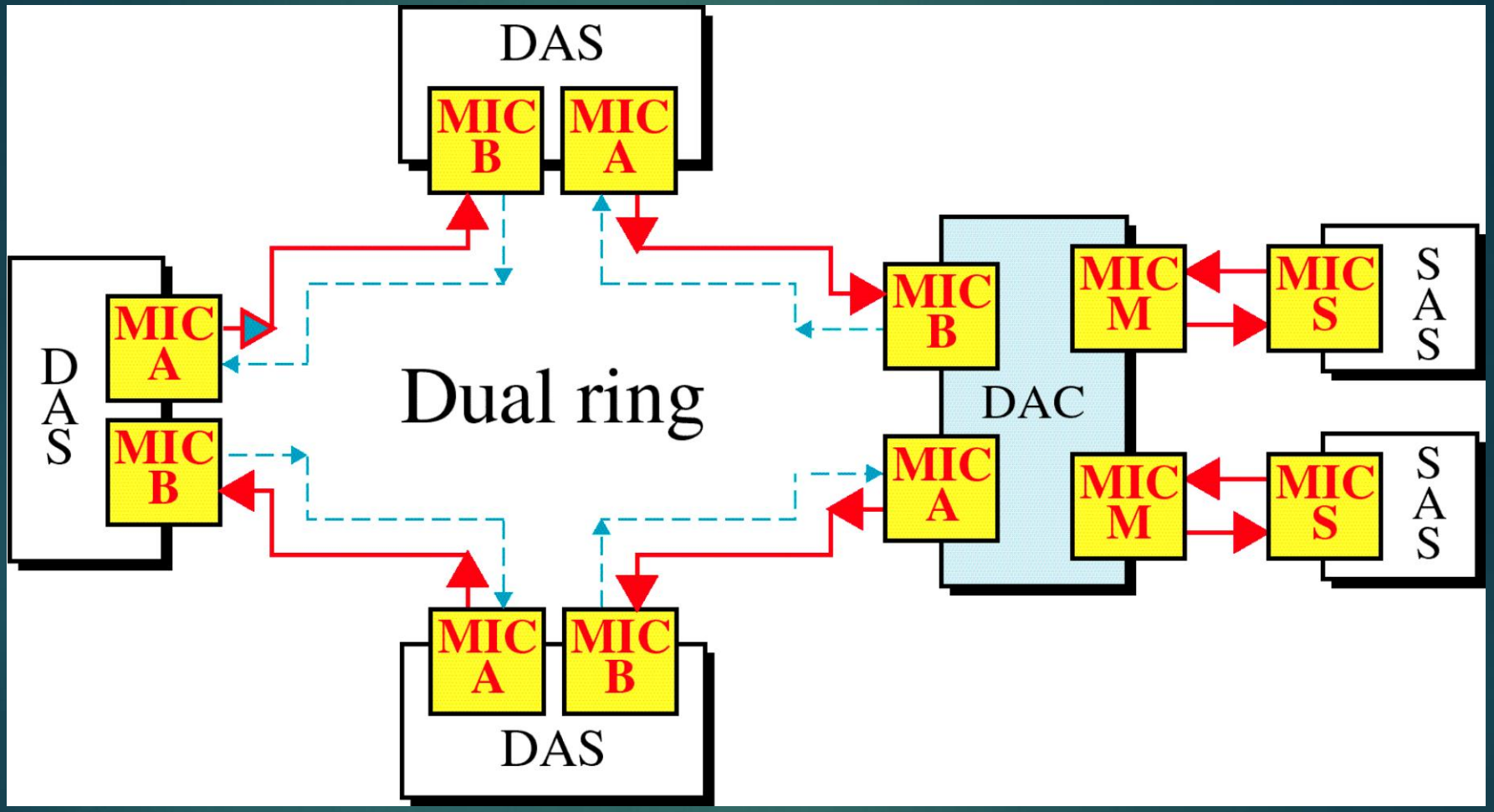
FDDI Rings



FDDI Ring Failure



FDDI Nodes


DAS
MIC B
MIC A
DAS
MIC A
MIC B
Dual ring
MIC B
MIC A
DAC
MIC M
MIC S
SAS
MIC M
MIC S
SAS
MIC A
MIC B
DAS