



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT401 COMPUTER NETWORKS

II YEAR /IV SEMESTER

Unit 2-**LINK LAYER**

Topic 4 : HDLC



HDLC



- ✓ **High-level Data Link Control (HDLC) is a bit-oriented protocol for communication** over point-to-point and multipoint links.
- ✓ It implements the Stop-and-Wait protocol
- ✓ Most of the concept defined in this protocol is the basis for other practical protocols such as PPP, which we discuss next, or the Ethernet protocol, which we discuss in wired LANs , or in wireless LANs



HDLC



High-level Data Link Control – protocol supporting half-duplex and full-duplex communication over point-to-point and multipoint links

Relationship between two devices involved in an exchange

Defines who controls the link

Two modes:

- Normal response mode (NRM)

- Asynchronous balanced mode (ABM)



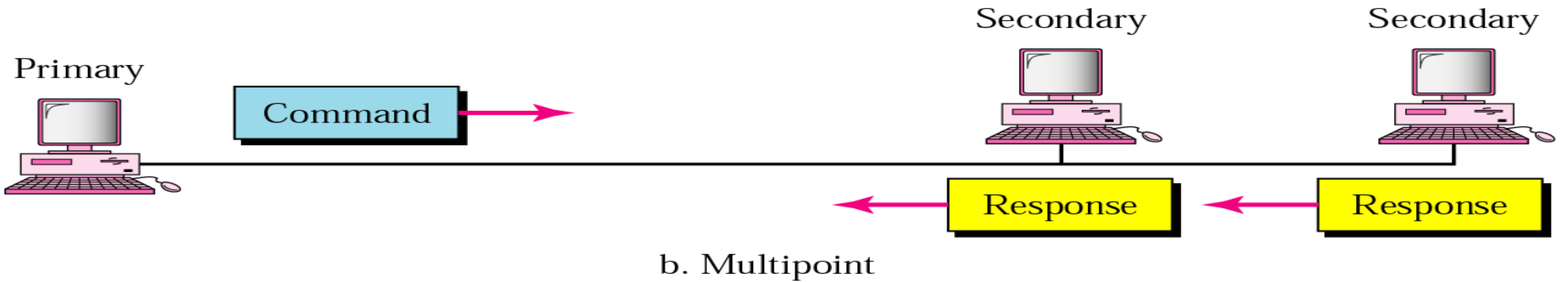
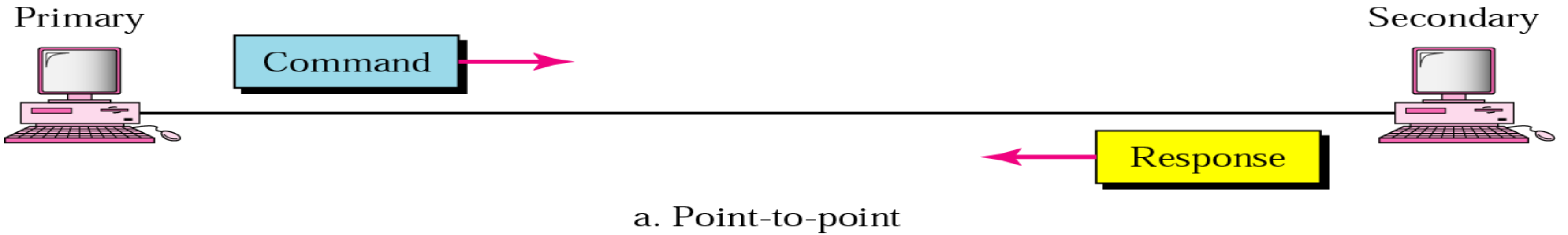
Normal Response Mode



- ✓ Refers to standard primary-secondary relationships
- ✓ Used for all exchanges in unbalanced configurations
- ✓ Primary can issue commands
- ✓ Secondary must have permission from primary before responding or sending data



NRM



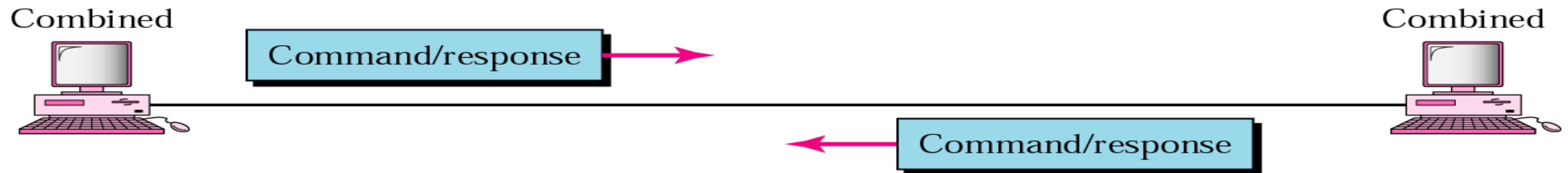


Asynchronous Balanced Mode



All stations are equal

Stations in point-to-point configurations act as both primary and secondary





HDLC Frames



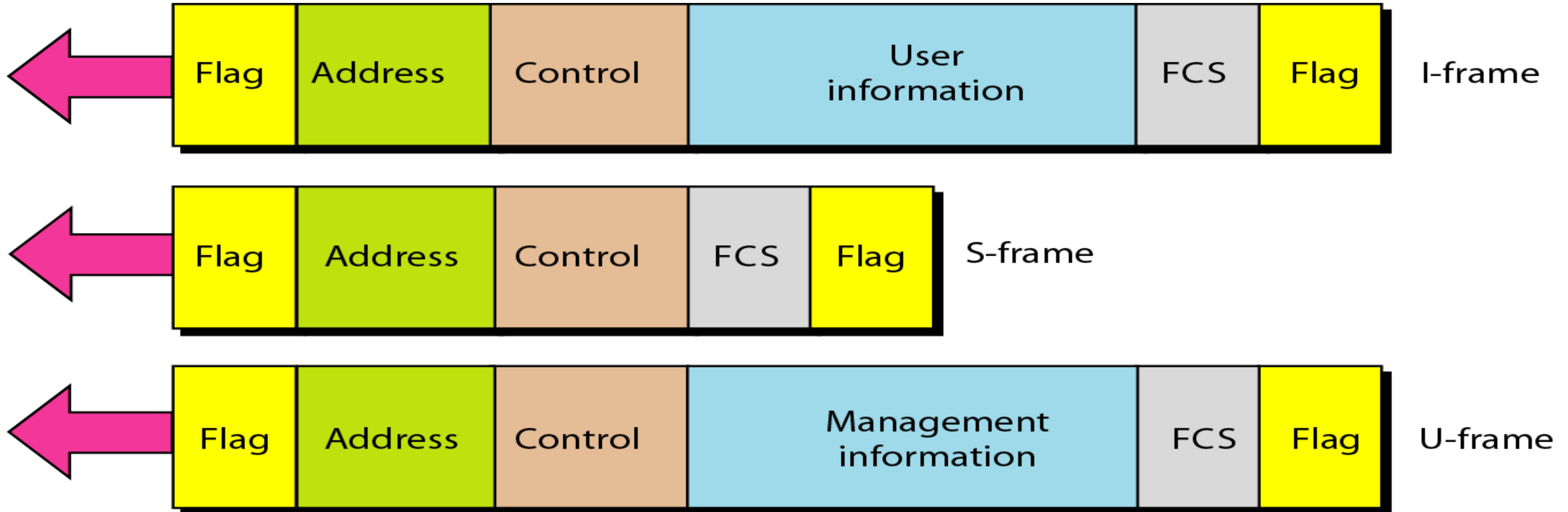
- ✓ Three types; each functions as an envelope to transmit a specific type of message
- ✓ Information frames (I-frames) – transports user data and control info relating to user data
- ✓ Supervisory frames (S-frames) – used to transport control info for data link layer flow and error controls
- ✓ Unnumbered frames (U-frames) – used for system mgmt and link mgmt



- ✓ Flag field. This field contains synchronization pattern 01111110, which identifies both the beginning and the end of a frame.
- ✓ Address field. This field contains the address of the secondary station. If a primary station created the frame, it contains a to address. If a secondary station creates the frame, it contains a from address.
- ✓ Control field. The control field is one or two bytes used for flow and error control.
- ✓ Information field. The information field contains the user's data from the network layer or management information.
- ✓ FCS field. The frame check sequence (FCS) is the HDLC error detection field. It can contain either a 2- or 4-byte CRC.

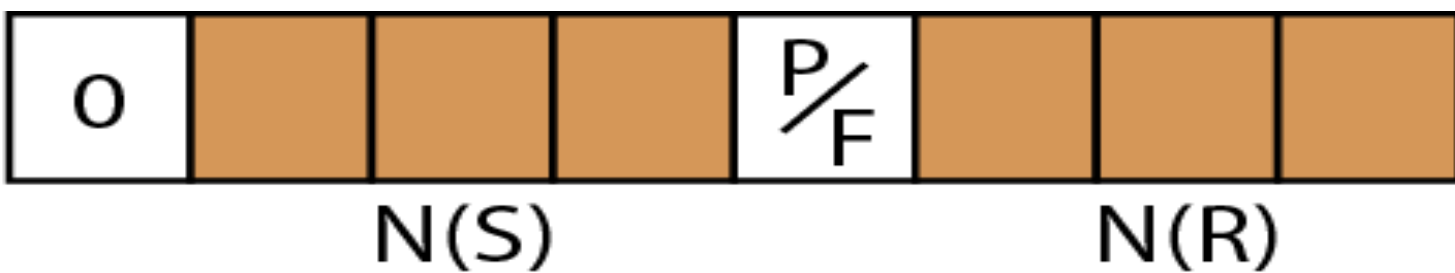


HDLC frames

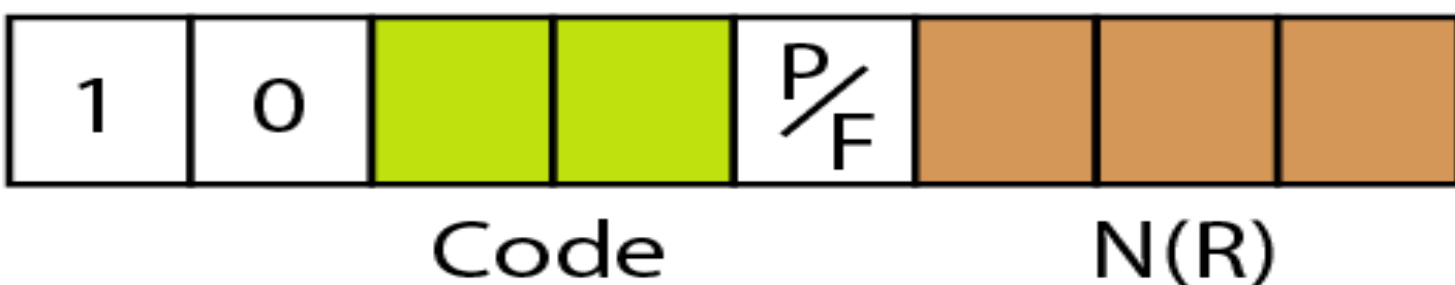




Control field format for the different frame types



I-frame



S-frame



U-frame address field contains the address of the receiver).

- ✓ $N(S)$, define the sequence number of the frame
- ✓ $N(R)$, correspond to the acknowledgment number
- ✓ The P/F field is a single bit with a dual purpose. It has meaning only when it is set (bit = 1) and can mean poll or final. It means *poll* when the frame is sent by a primary station to a secondary (when the address field contains the address of the receiver).
- ✓ *final* - when the frame is sent by a secondary to a primary (when the address field contains the address of the sender).



U-frame control command and response

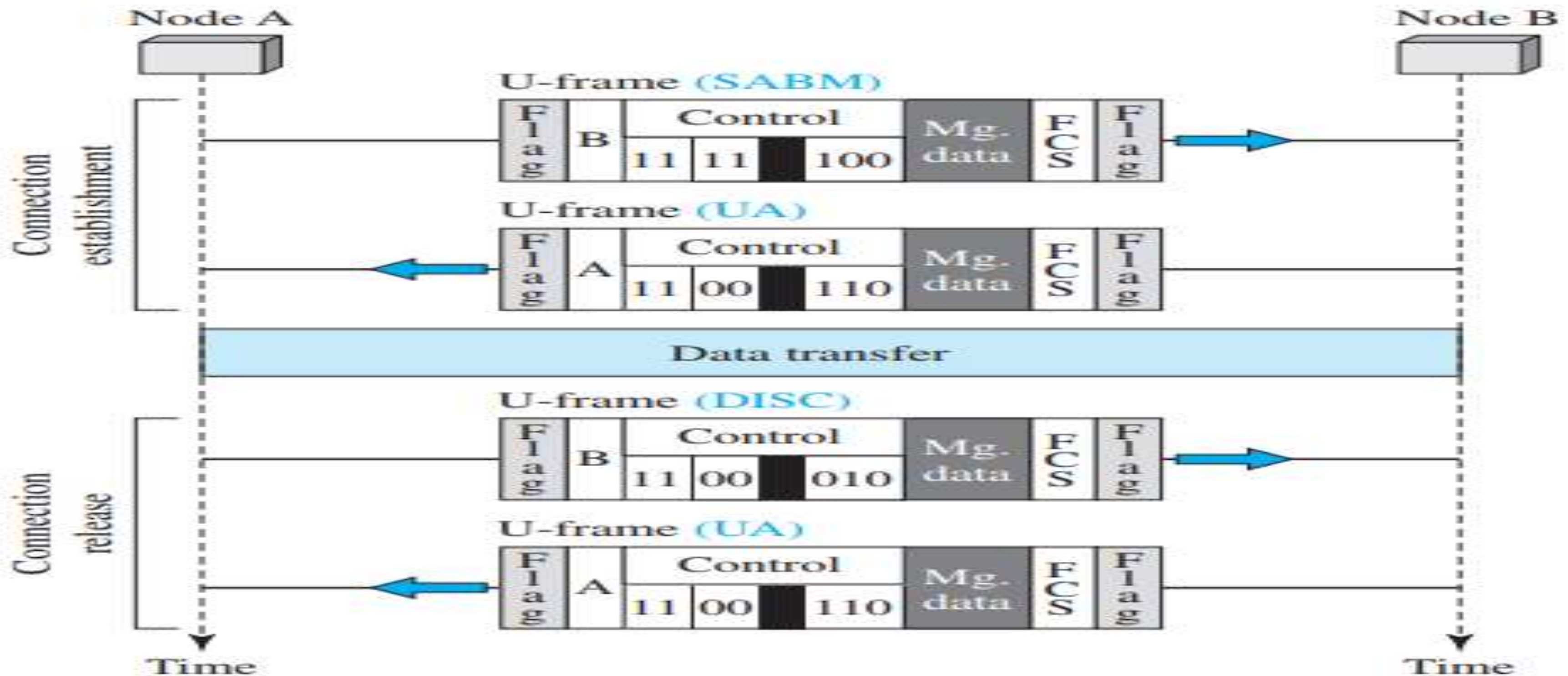


Code	Command	Response	Meaning
00 001	SNRM		Set normal response mode
11 011	SNRME		Set normal response mode, extended
11 100	SABM	DM	Set asynchronous balanced mode or disconnect mode
11 110	SABME		Set asynchronous balanced mode, extended
00 000	UI	UI	Unnumbered information
00 110		UA	Unnumbered acknowledgment
00 010	DISC	RD	Disconnect or request disconnect
10 000	SIM	RIM	Set initialization mode or request information mode
00 100	UP		Unnumbered poll
11 001	RSET		Reset
11 101	XID	XID	Exchange ID
10 001	FRMR	FRMR	Frame reject



- ✓ Figure shows how U-frames can be used for connection establishment and connection release.
- ✓ Node A asks for a connection with a set asynchronous balanced mode (SABM) frame;
- ✓ node B gives a positive response with an unnumbered acknowledgment (UA) frame.
- ✓ After these two exchanges, data can be transferred between the two nodes
- ✓ After data transfer, node A sends a DISC (disconnect) frame to release the connection; it is confirmed by node B responding with a UA (unnumbered acknowledgment).

Example of connection and disconnection





Assessment



- a).What is HDLC?
- b) What are the types of frame?
- c) What is I frame?
- d)What is S frame?
- e. What is U frame?





Reference



TEXT BOOKS

Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

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