

# HDLC

ပေါ်လောက်များရှိနေသူ  
စီမံမားပို့မှု HDLC ဖြစ်လေ

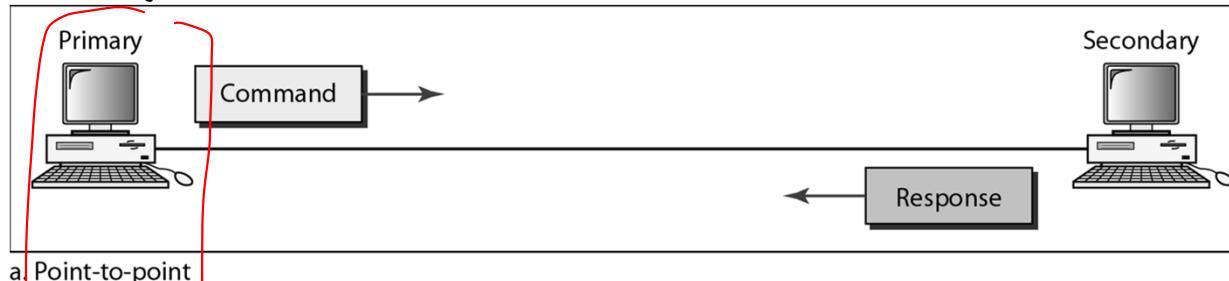
- High-level Data Link Control (HDLC) is a bit-oriented protocol for communication over point-to-point and multipoint links. It implements the ARQ mechanisms we discussed in this chapter.
  - Configurations and Transfer Modes
  - Frames
  - Control Field

mode မျမှော်ဝါယာ

# Transfer Modes

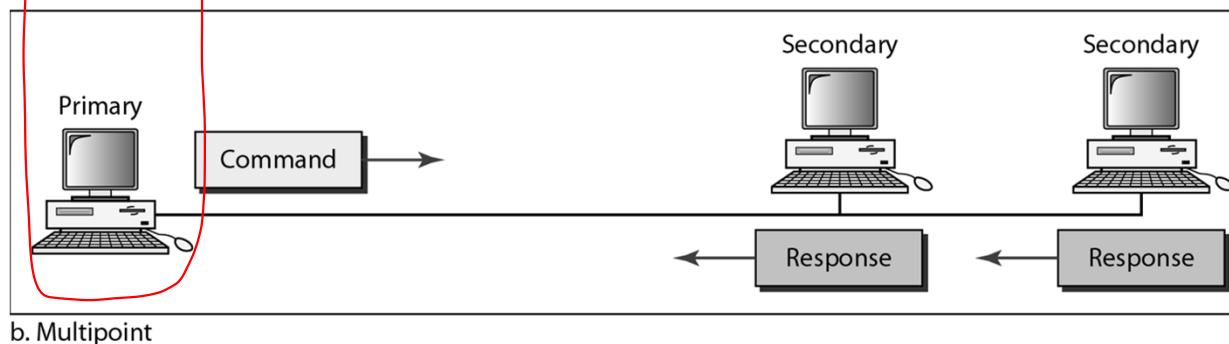
mode of operation

- Normal response mode (NRM)



a. Point-to-point

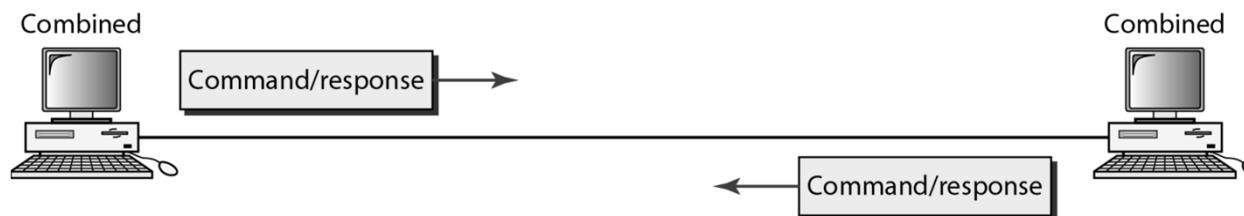
p2p



b. Multipoint

p2mp

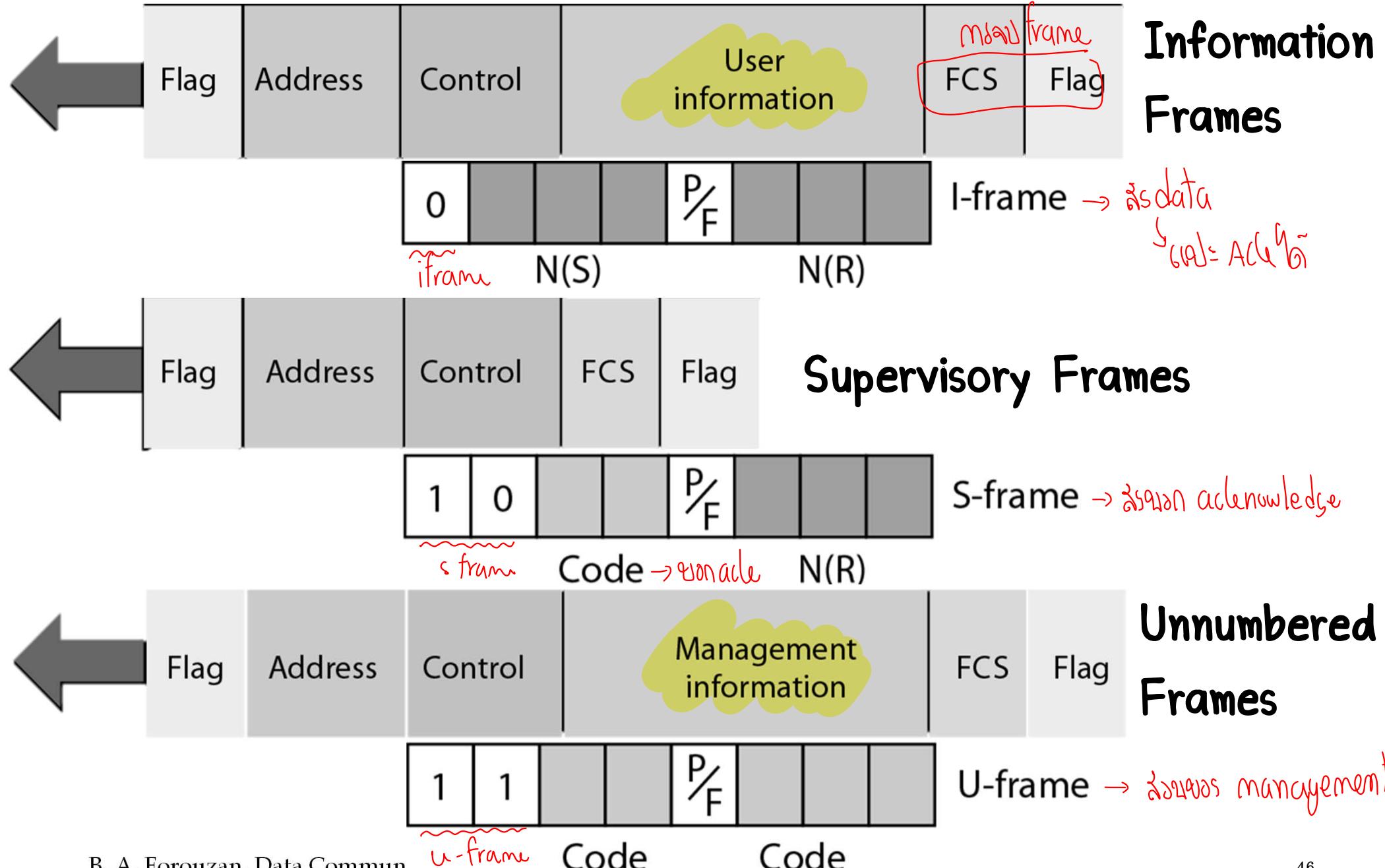
- Asynchronous balanced mode (ABM)



bit oriented prot

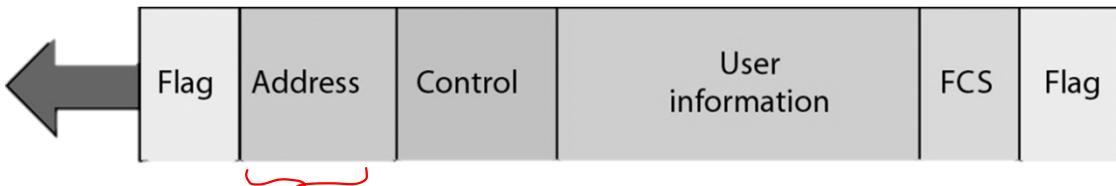
frames of HDLC

# HDLC frames & Control field format



# HDLC frames & Control field format

- Flag (8 bits) : "0111110"



- Address (>= 1 byte)

— Receiving address

— Length

- 1 byte

: last bit in address field = '1'

- > 1 byte

: last bit of each byte = '0'

except last bit of last address byte = '1'

եթե այլույթ է՝ address չի կը լինի byte



- FCS (Frame Check Sequence) (2 or 4 byte)

— Error detection

- CRC (16-bit CRC-CCITT : 0x1021 or CRC-32 : 0x04C11DB7)

- Error detection for all fields

— Except Flag

գրանցված frame ենք error կը հայտնաբերեն address - user information

եթե մասնակի կանոնավոր

\* Cyclic redundancy check. Retrieved January 19, 2017, from wikipedia Web site: [https://en.wikipedia.org/wiki/Cyclic\\_redundancy\\_check](https://en.wikipedia.org/wiki/Cyclic_redundancy_check)

# I-frame control field

សំណើស (control)

- 1<sup>st</sup> bit: '0' : defined type of frame (I-Frame)

- N(S) (3 bits): Transmitting Frame number (0-7)

— Can extend to 7 bits

- N(R) (3 bits): ACK or NAK Frame number (0-7)

— When piggybacking is used

— Can extend to 7 bits

- P/F bit

— P bit (Poll bit) : Poll Frame from Primary

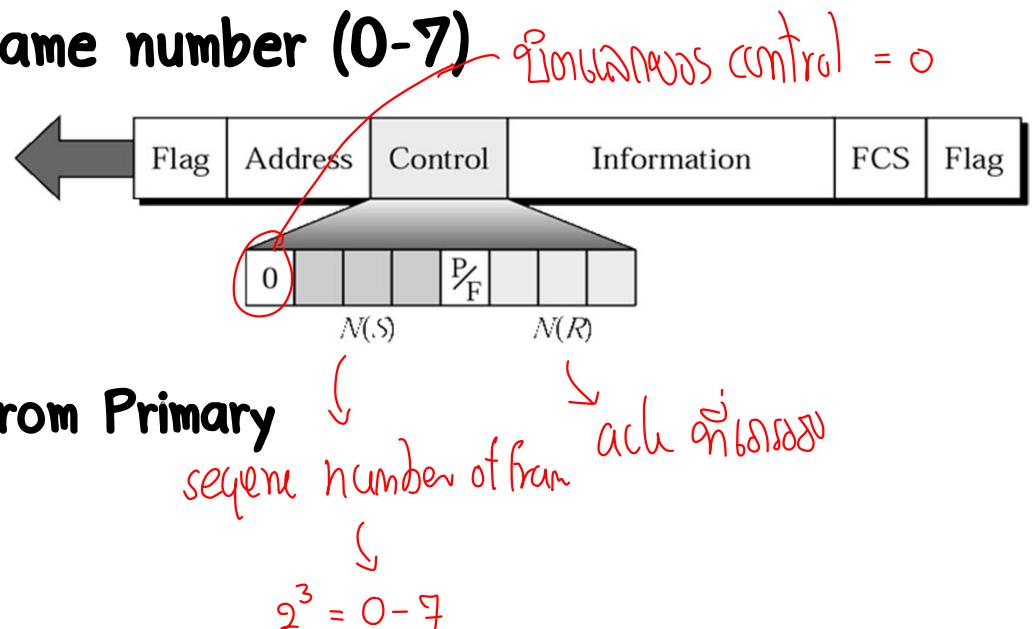
- '1': Poll Frame from Primary

- '0': otherwise

— F bit (Final bit) : Frame from Secondary

- '1': Last I-frame from Secondary

- '0': otherwise



# S-frame control field

- Code

(ack)

- 00: RR (Receive Ready)

- N(R) = ACK no.

- 01: REJ (REject)

- N(R) = NAK no.

- 10: RNR (Receive Not Ready) : receiver announces that receiver is busy and cannot receive more frame (acts as kind of congestion control mechanism by asking sender to slow down)

- N(R) = ACK no.

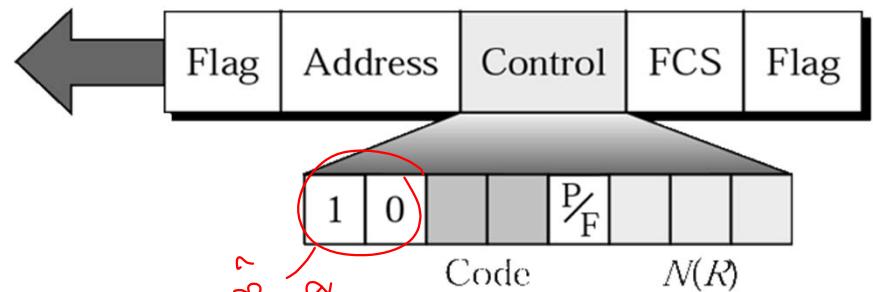
(nack)

- 11: SREJ (Selective-REject) -> NAK for Selective-reject ( N(R) = NAK no.)

- P/F bit

- Depend on the condition of Code field

↙  
消息 acknowledge



-> NAK for Go-back-N

# U-frame control command and response

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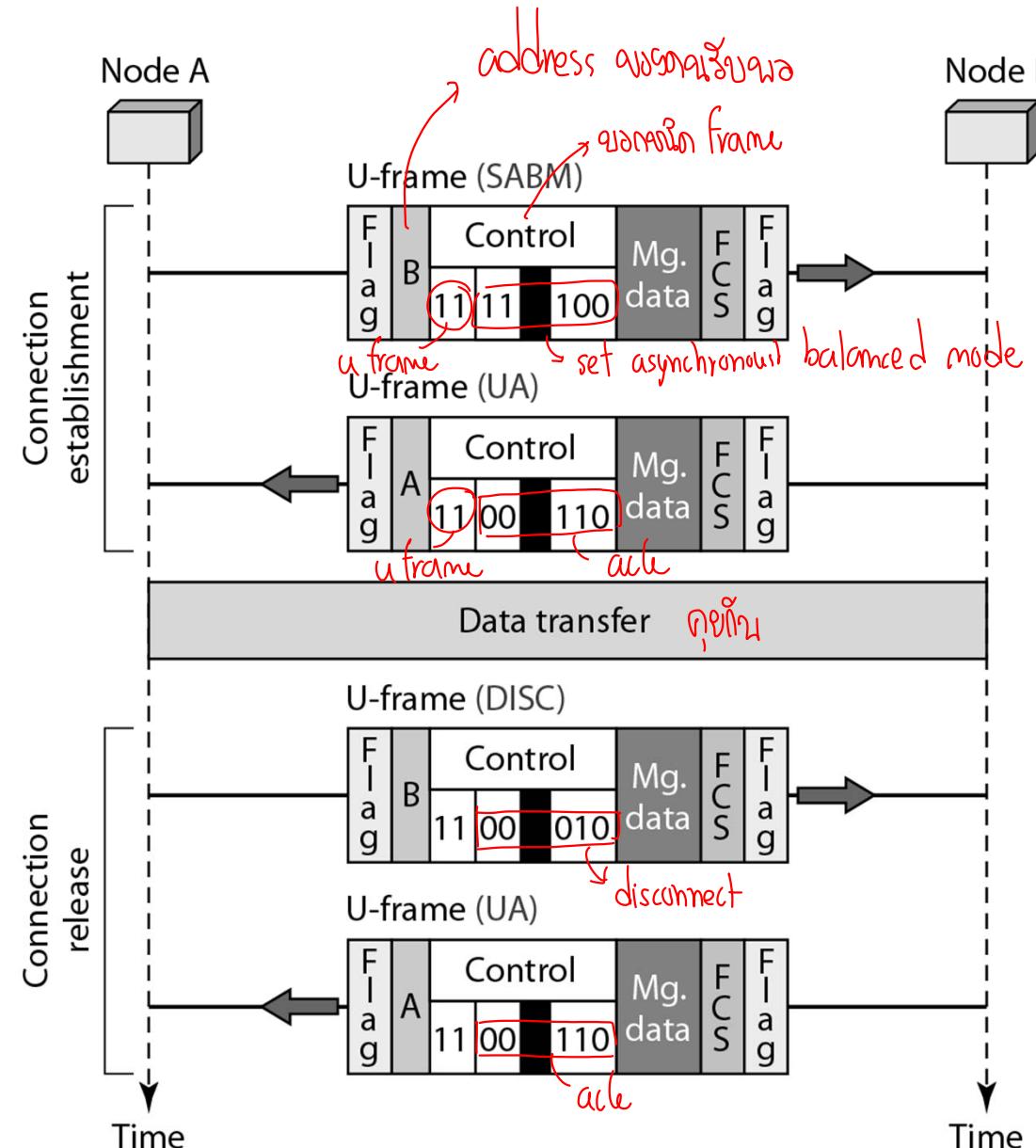
<i>Code</i>	<i>Command</i>	<i>Response</i>	<i>Meaning</i>
<b>00 001</b>	SNRM		Set normal response mode
<b>11 011</b>	SNRME		Set normal response mode, extended
<b>11 100</b>	SABM	<b>DM</b>	Set asynchronous balanced mode or <b>disconnect mode</b>
<b>11 110</b>	SABME		Set asynchronous balanced mode, extended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

# Example of connection and disconnection

ဤသိမ်းဆောင်ရေးမှုပါ၏

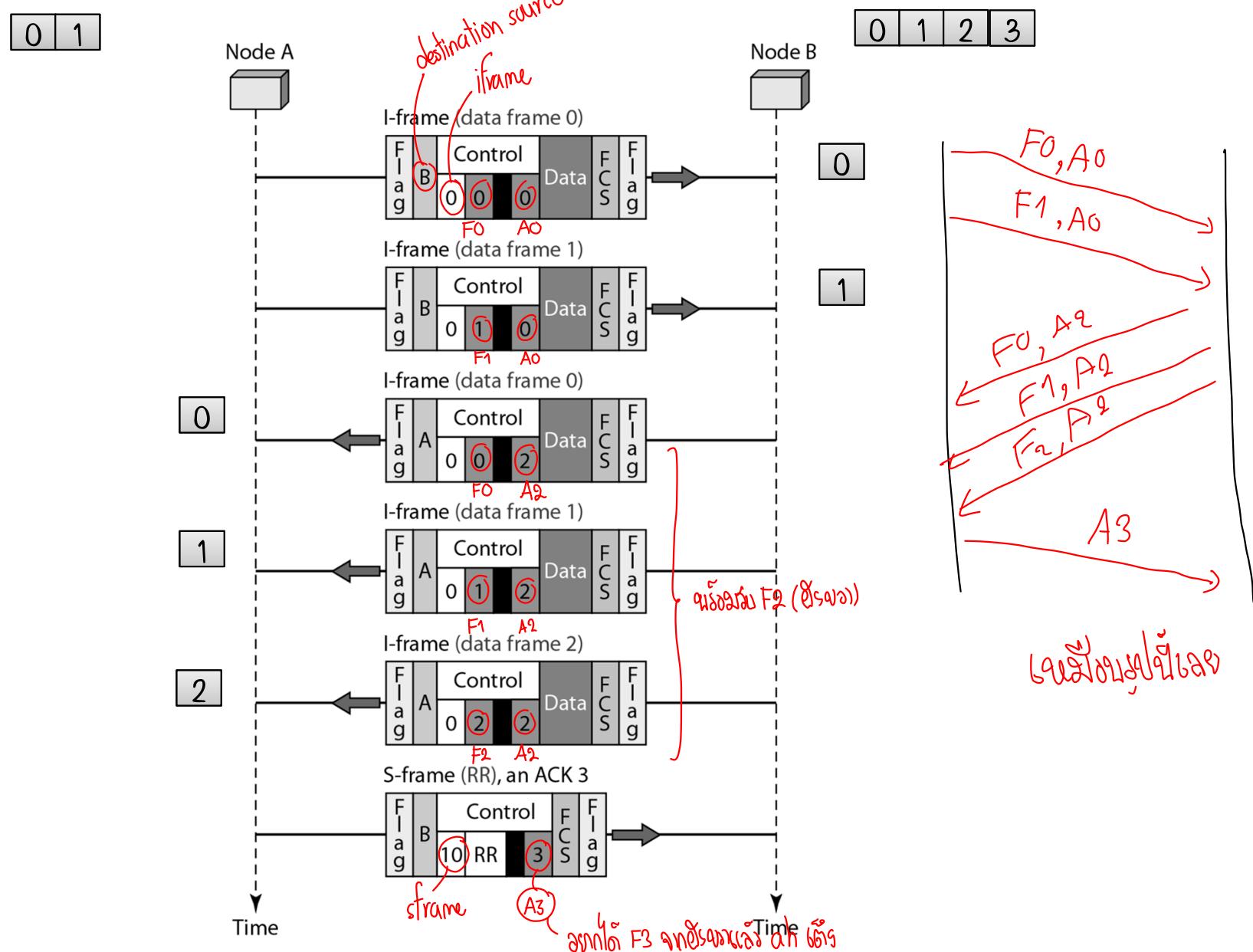
လုပ်ငန်းများ၏

လုပ်ငန်း u frame



လုပ်ငန်း concept

# Example of piggybacking without error



# Example of piggybacking with error

ເລືອດໃຫຍ່ ໂດຍບໍ່ໄດ້ຮັບແຈ້ງ ເພີ້ມ

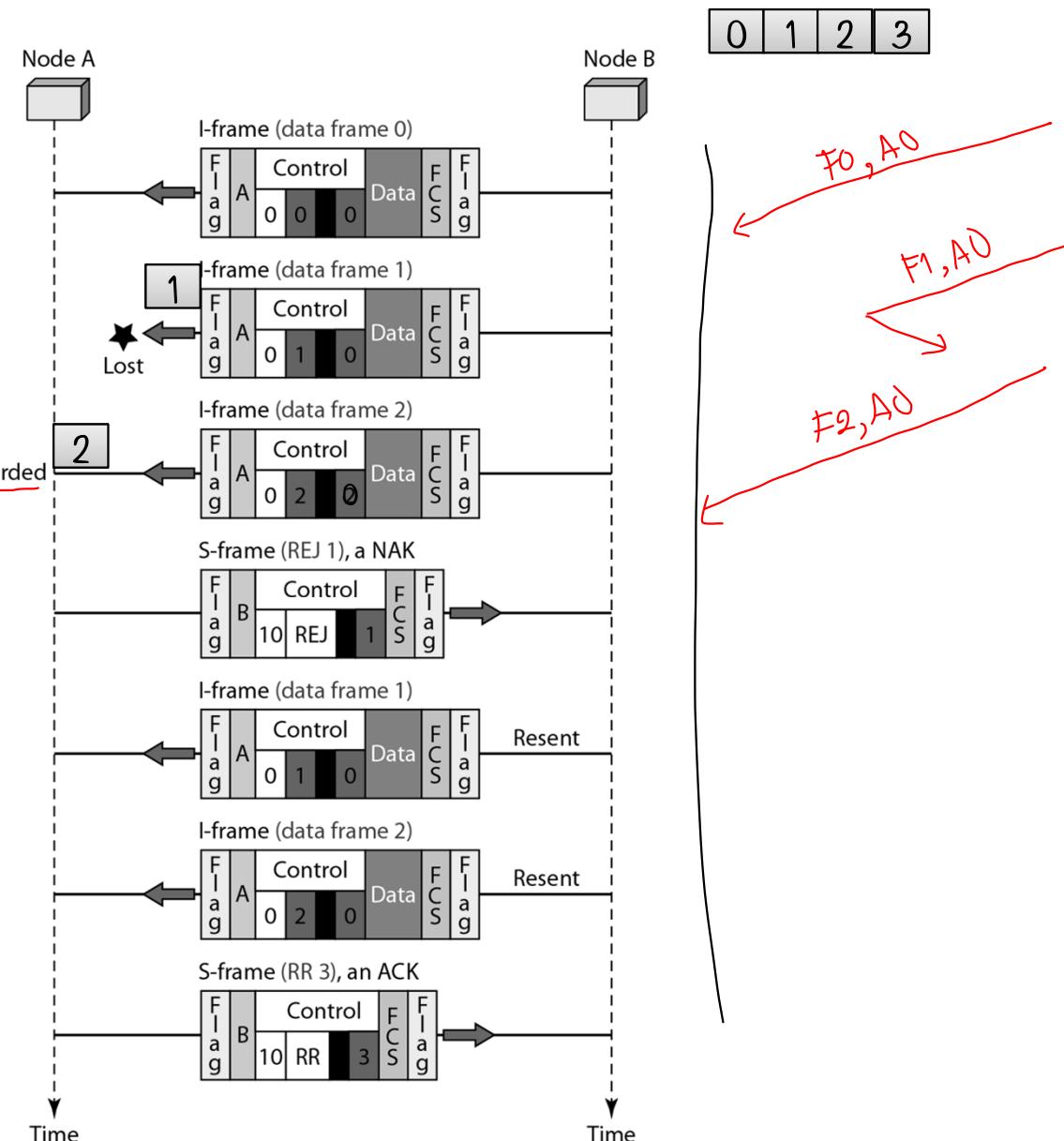
ມາຈະຢູ່ໄວ້

go back and  
discard

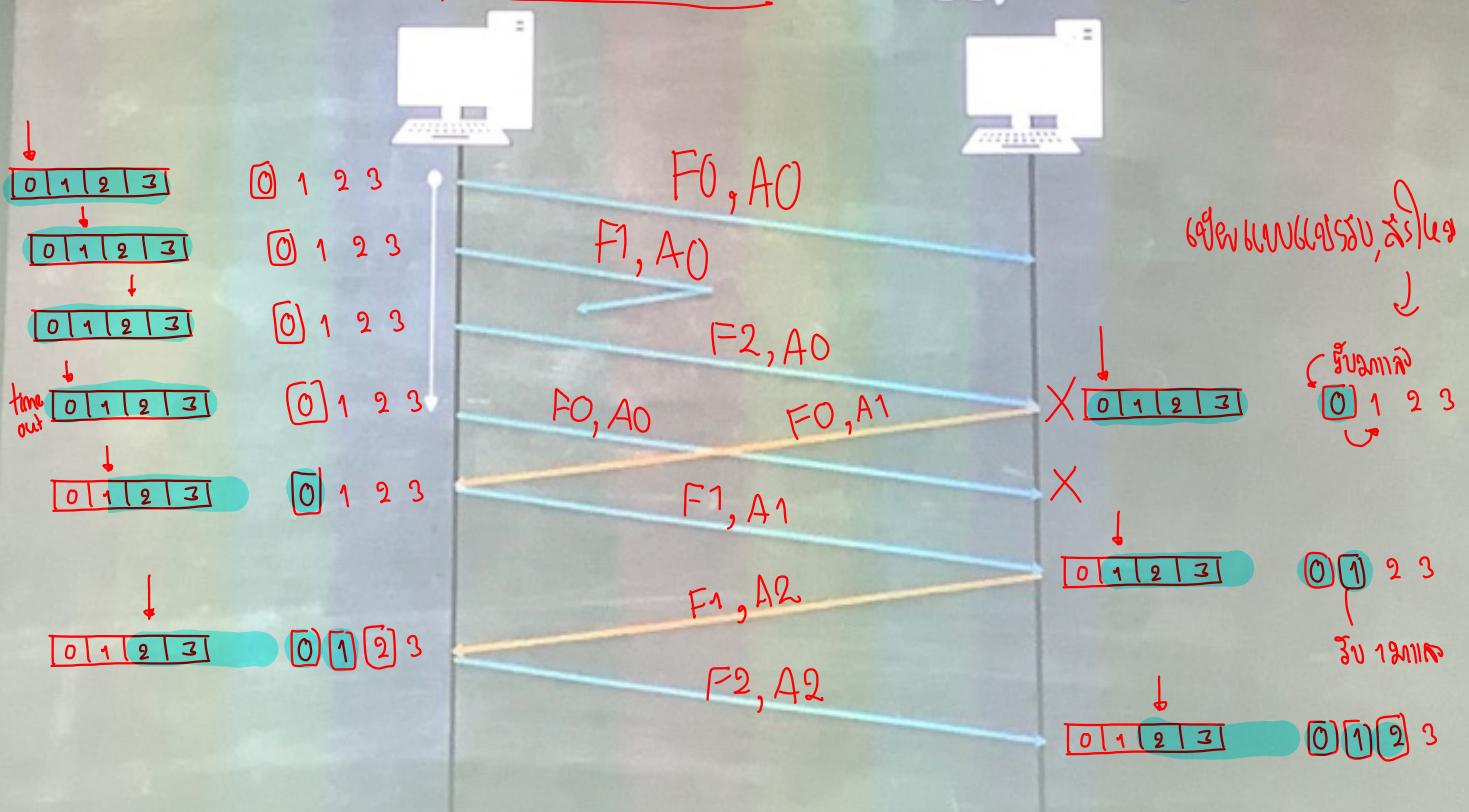
selective  
discard

[0 1 2 3]

0 1 2 3

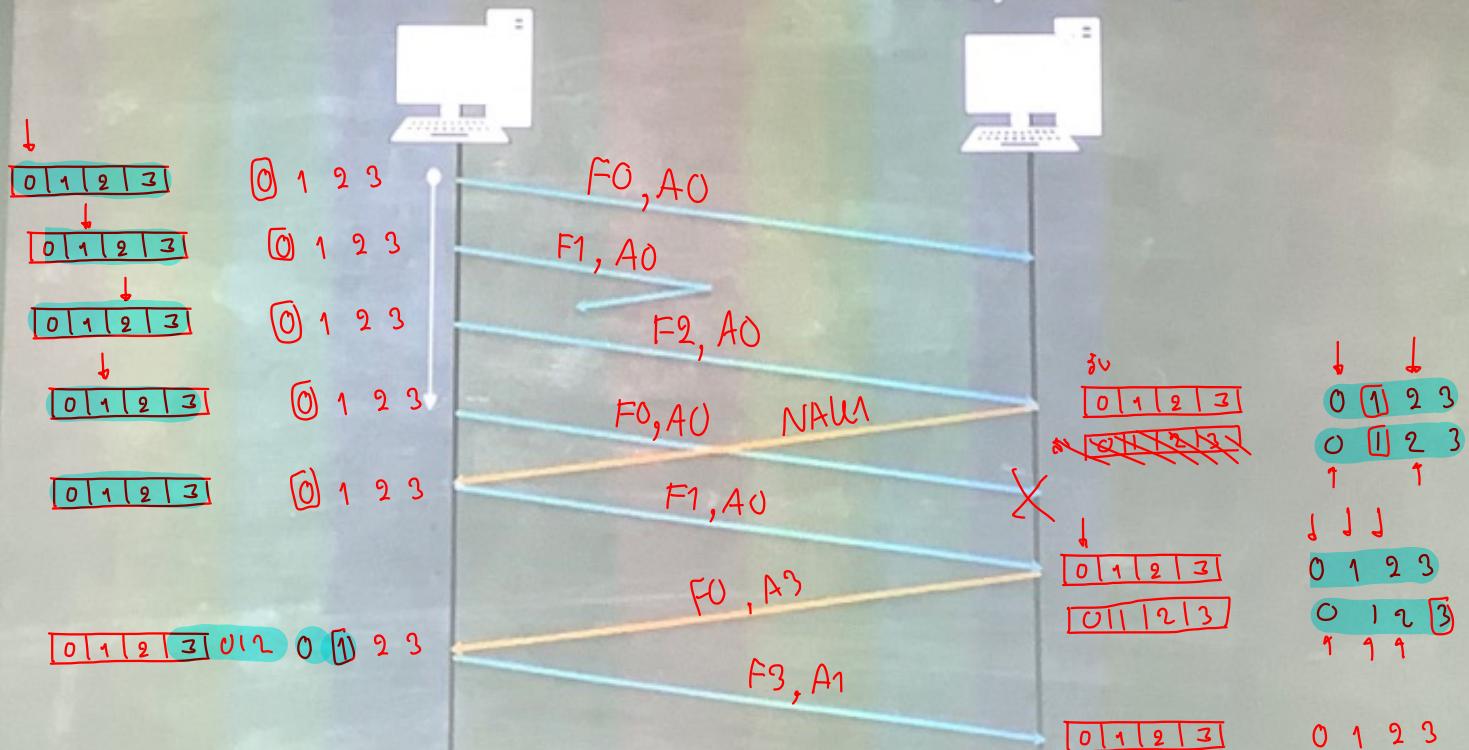


## • A : A<->B Go-Back-N ARQ & Piggybacking ( $m=3$ )



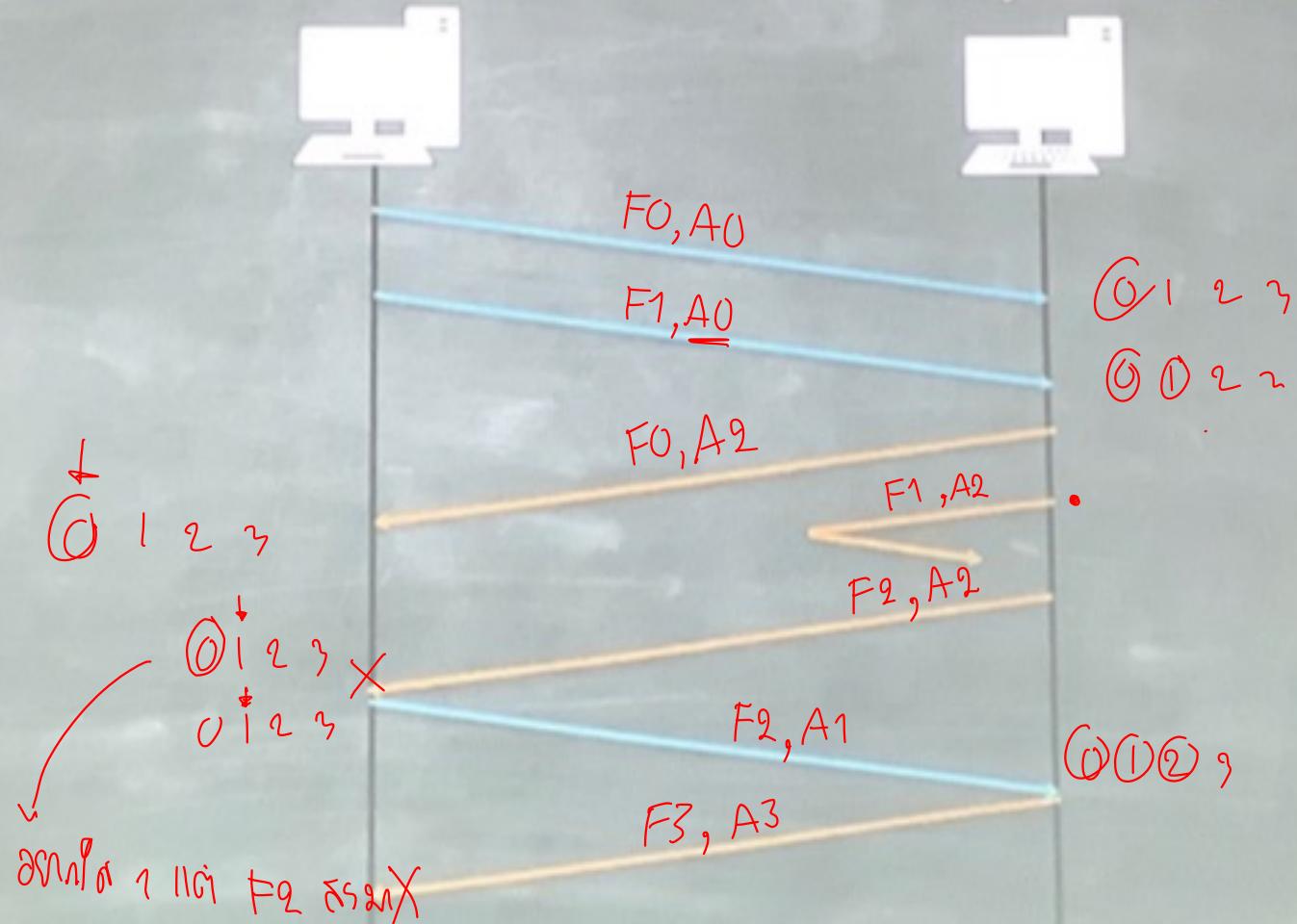
## HDLC (Activity)

### ~~Yellow~~ • A : A<->B Go-Back-N ARQ & Piggybacking ( $m=3$ )



# HDLC (Activity)

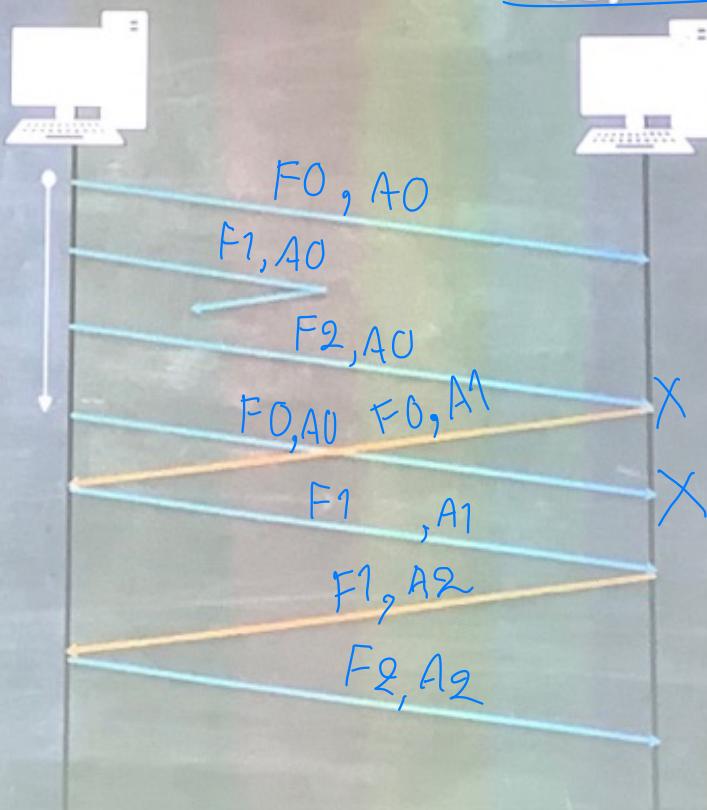
- C : A->B Go-Back-N ARQ & Piggybacking ( $m=3$ )



A. Forouzan, Data Communications and Networking, 4th edition, McGRAW-HILL

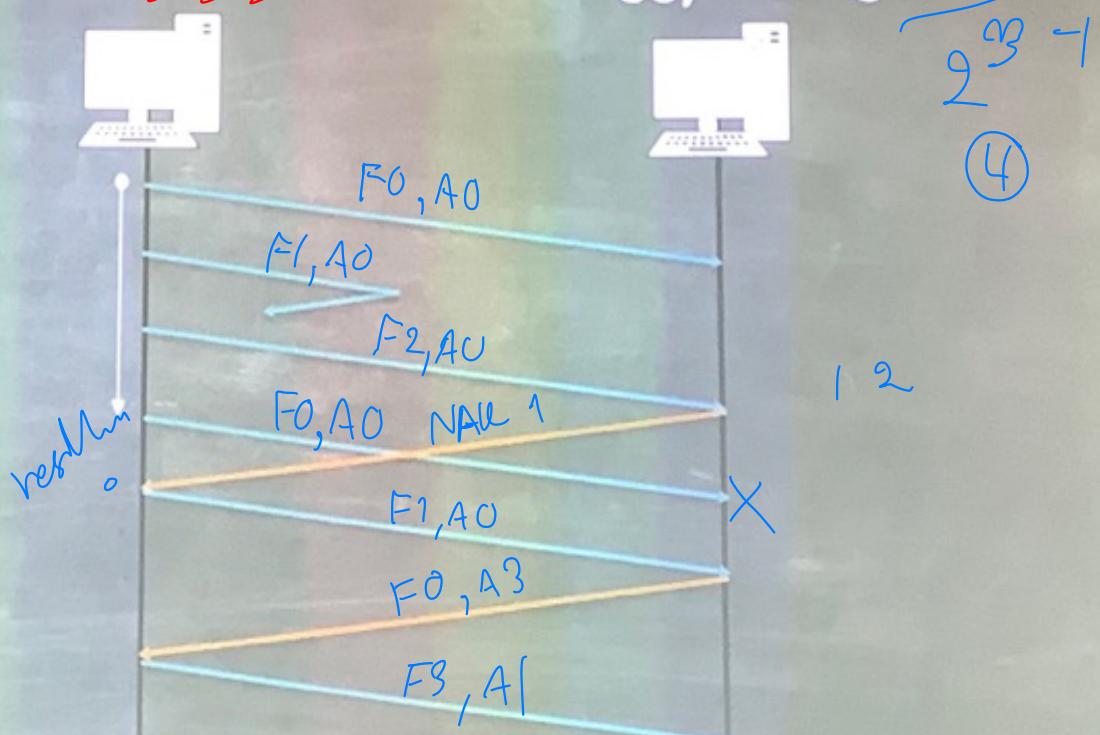
សំណងជាមួយនឹងការបញ្ចូលការពារ

- A : A<->B Go-Back-N ARQ & Piggybacking ( $m=3$ )



## HDLC (Activity)

- A : A<->B Go-Back-N ARQ & Piggybacking ( $m=3$ )



# HDLC (Activity)

- C : A->B Go-Back-N ARQ & Piggybacking (m=3)

