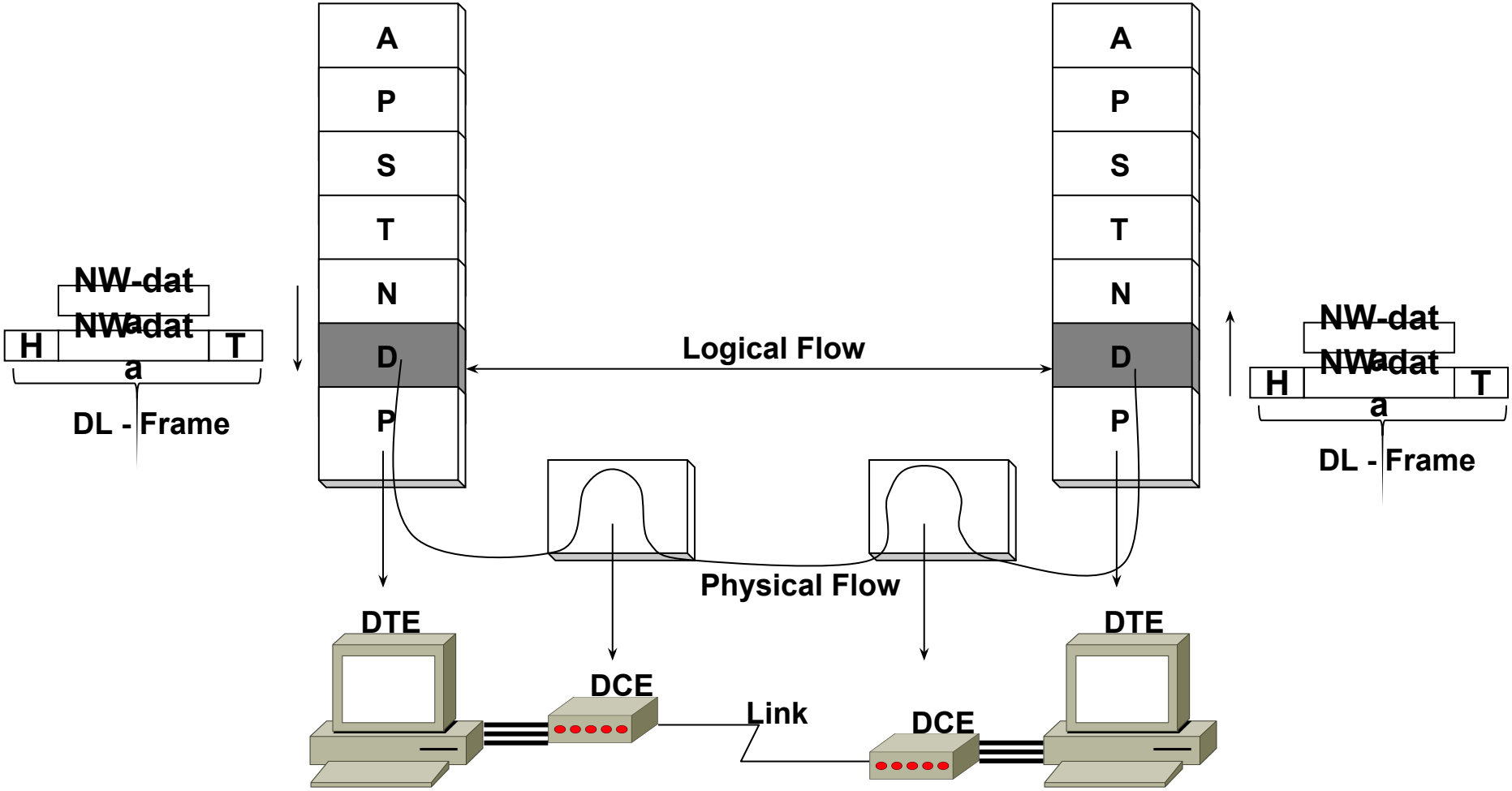
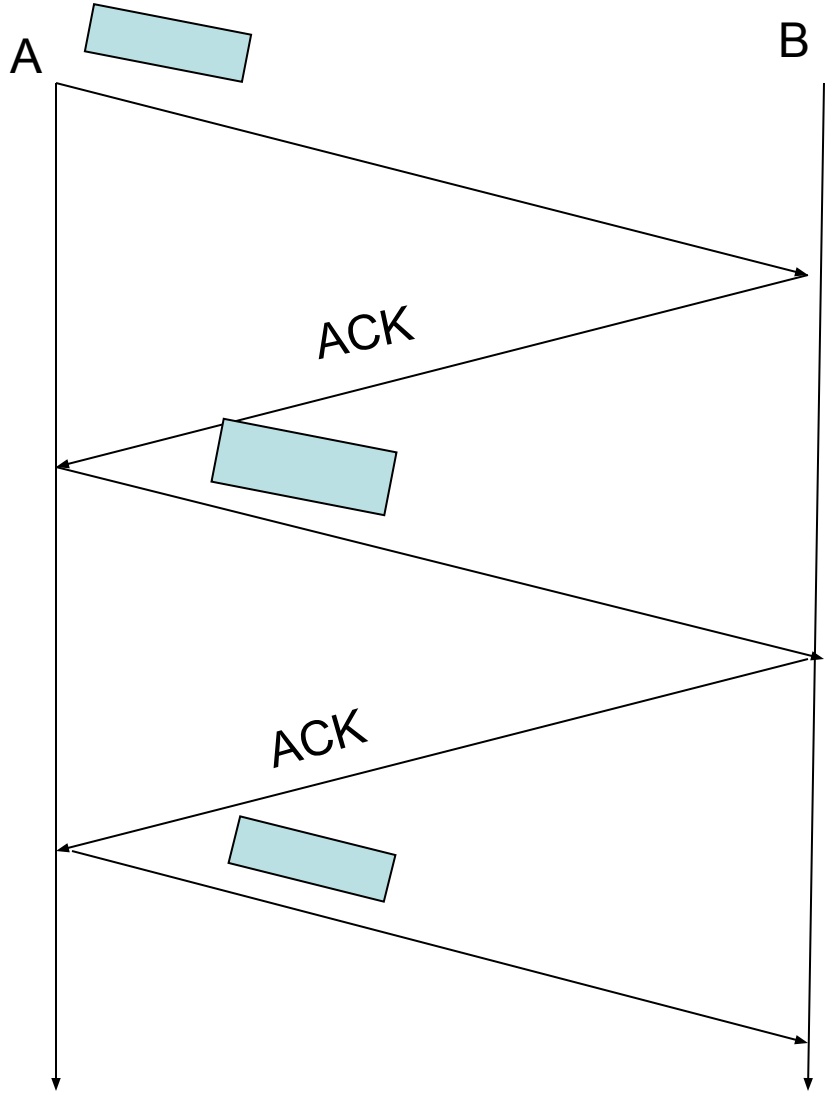
Data Link control
Layer 2

Потоки данных по соединениям физического и канального уровней

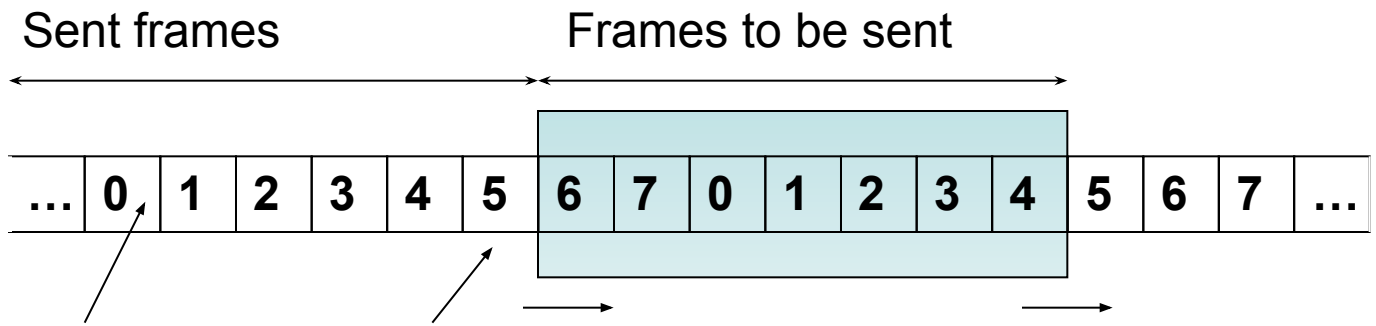


Flow control – Stop-and-Wait

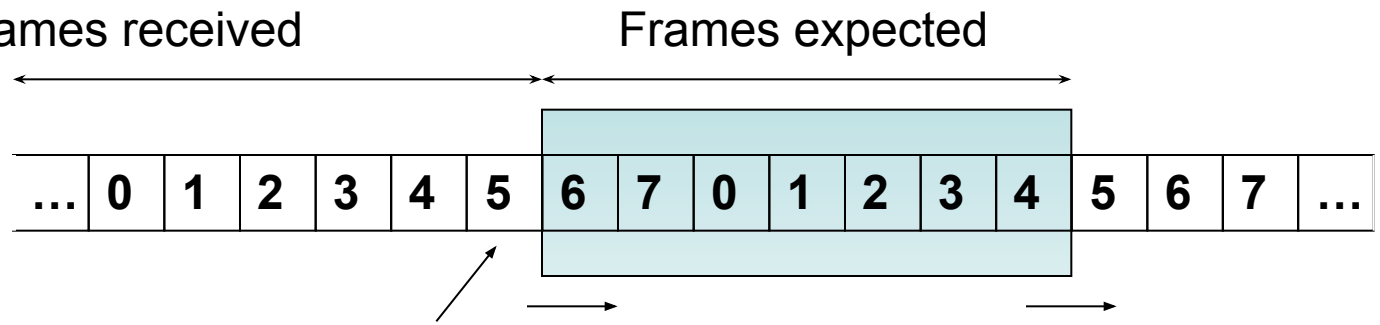


Низкая эффективность использования канала – особенно, если канал длинный, а скорость передачи - высокая

Flow control –sliding window

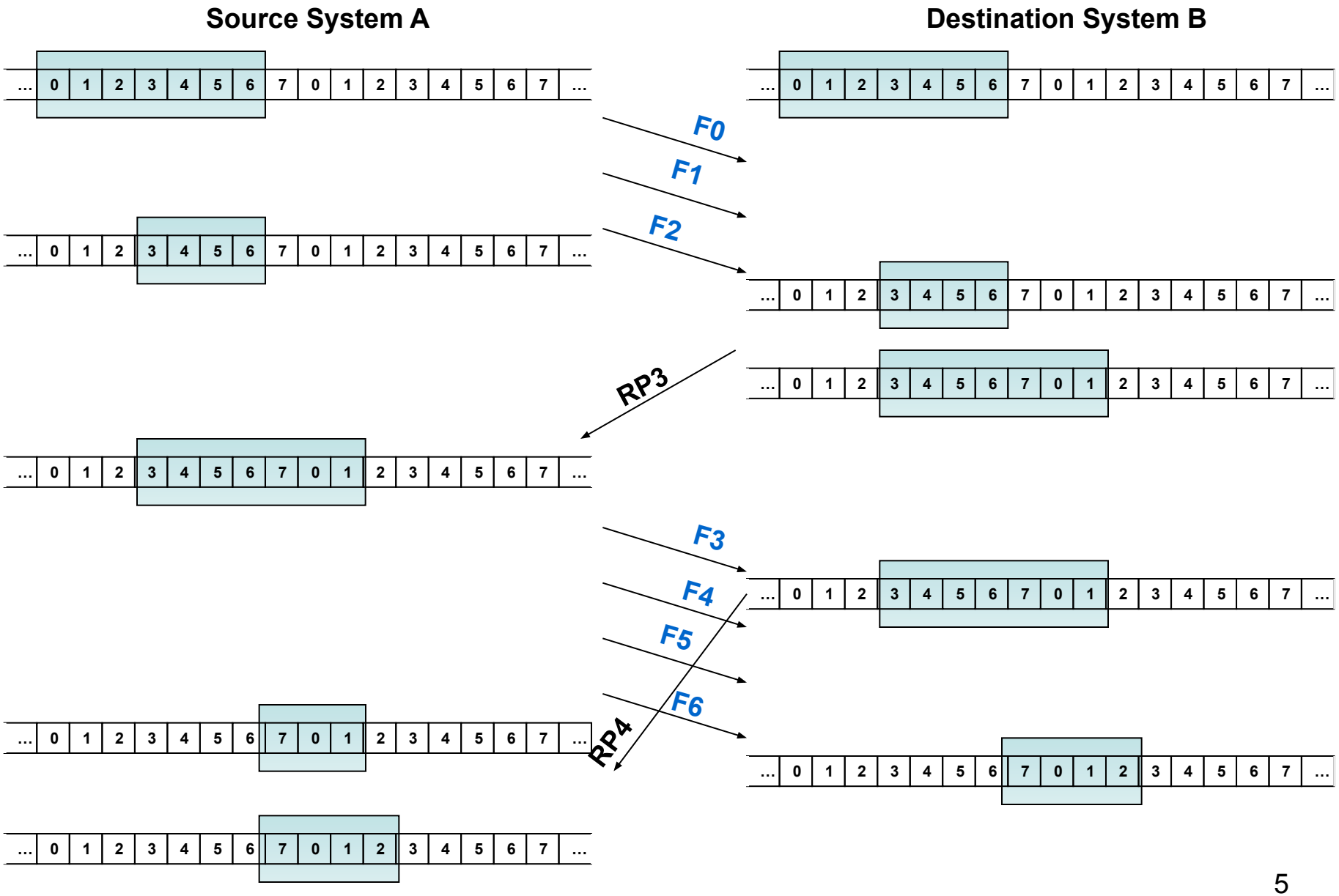


From sender perspective



From receiver perspective

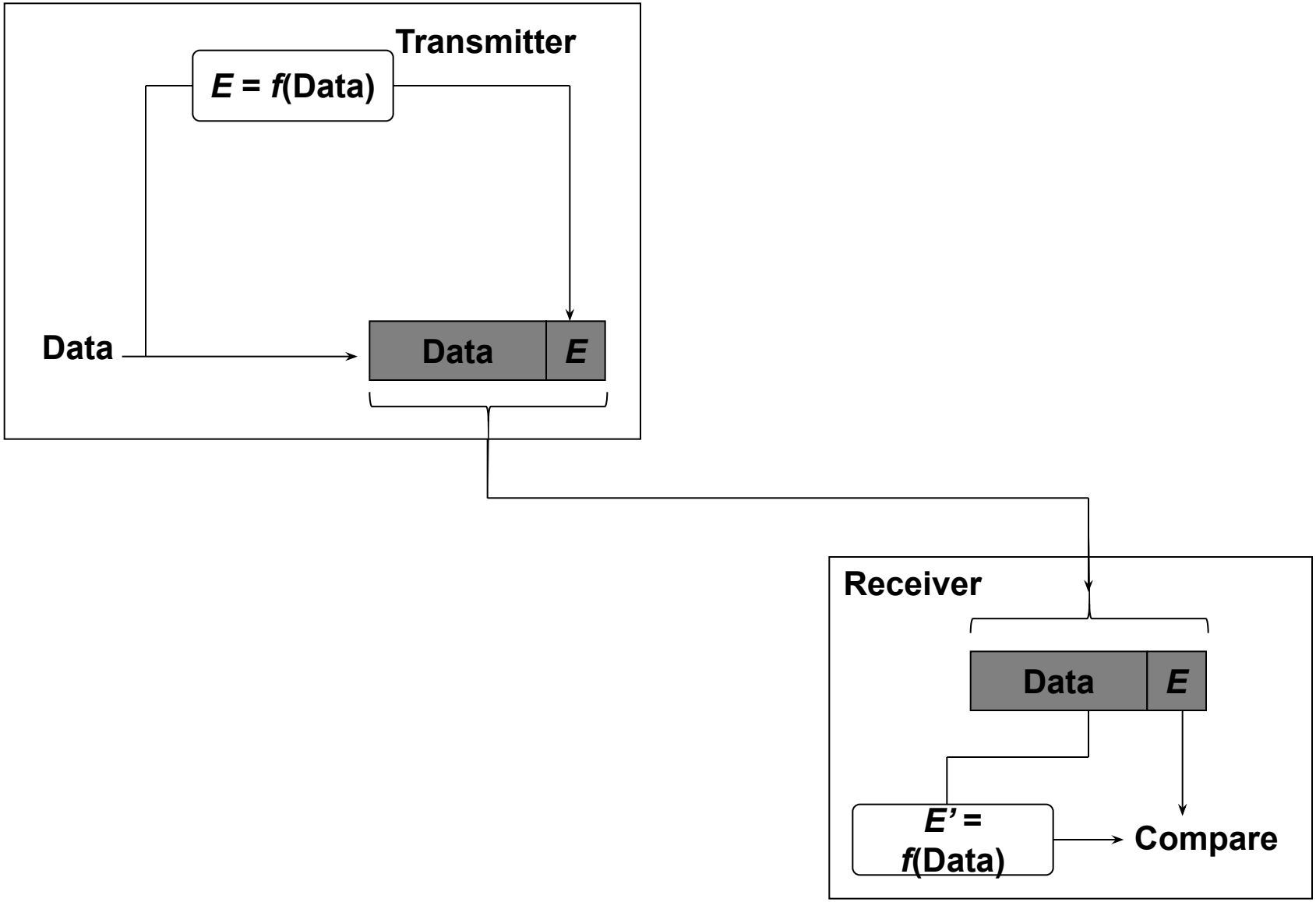
Example of a sliding-window protocol



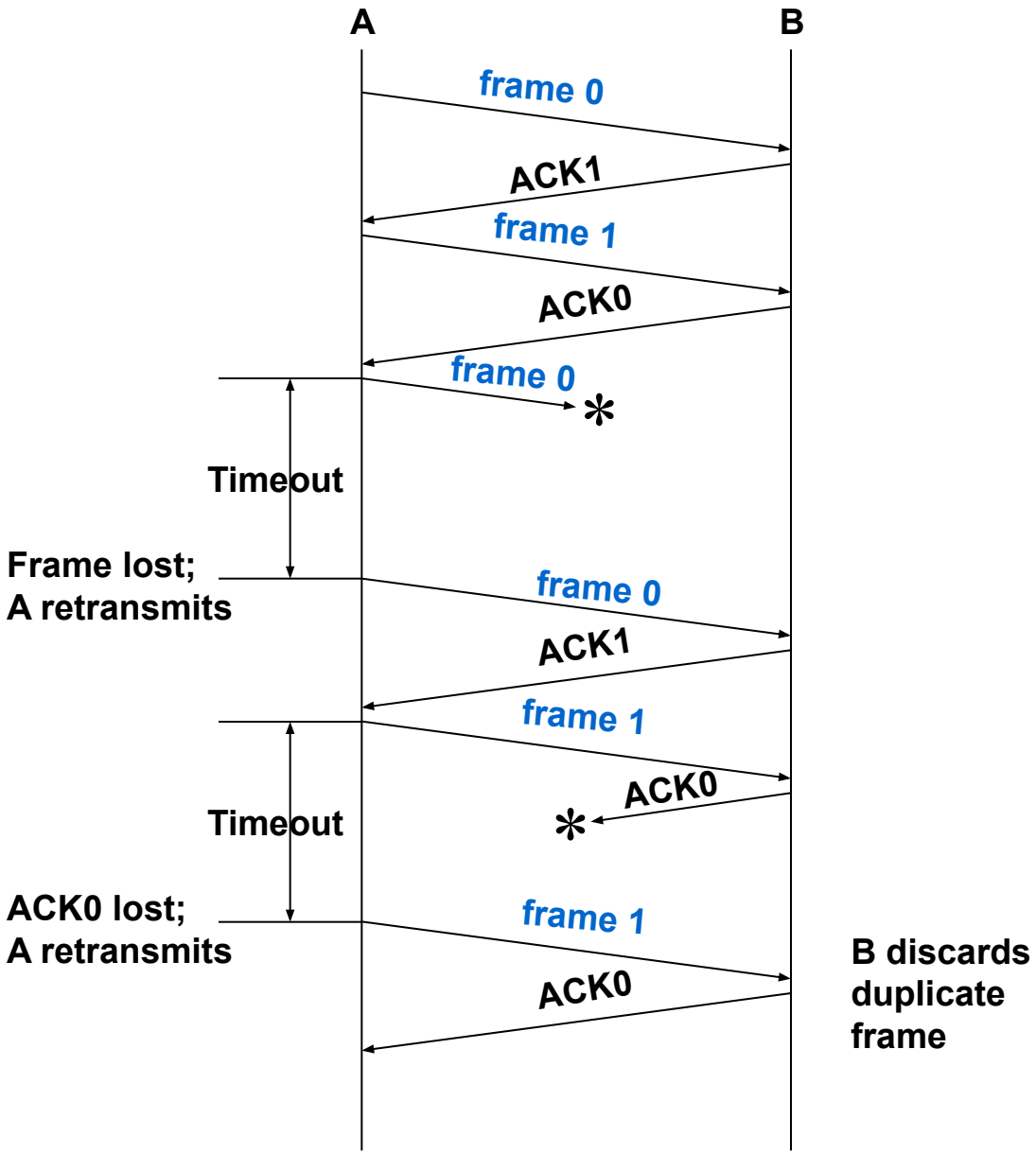
Error Control

- FEC- Forward Error Correction (using error correcting code)
- ARQ- Automatic Repeat reQuest

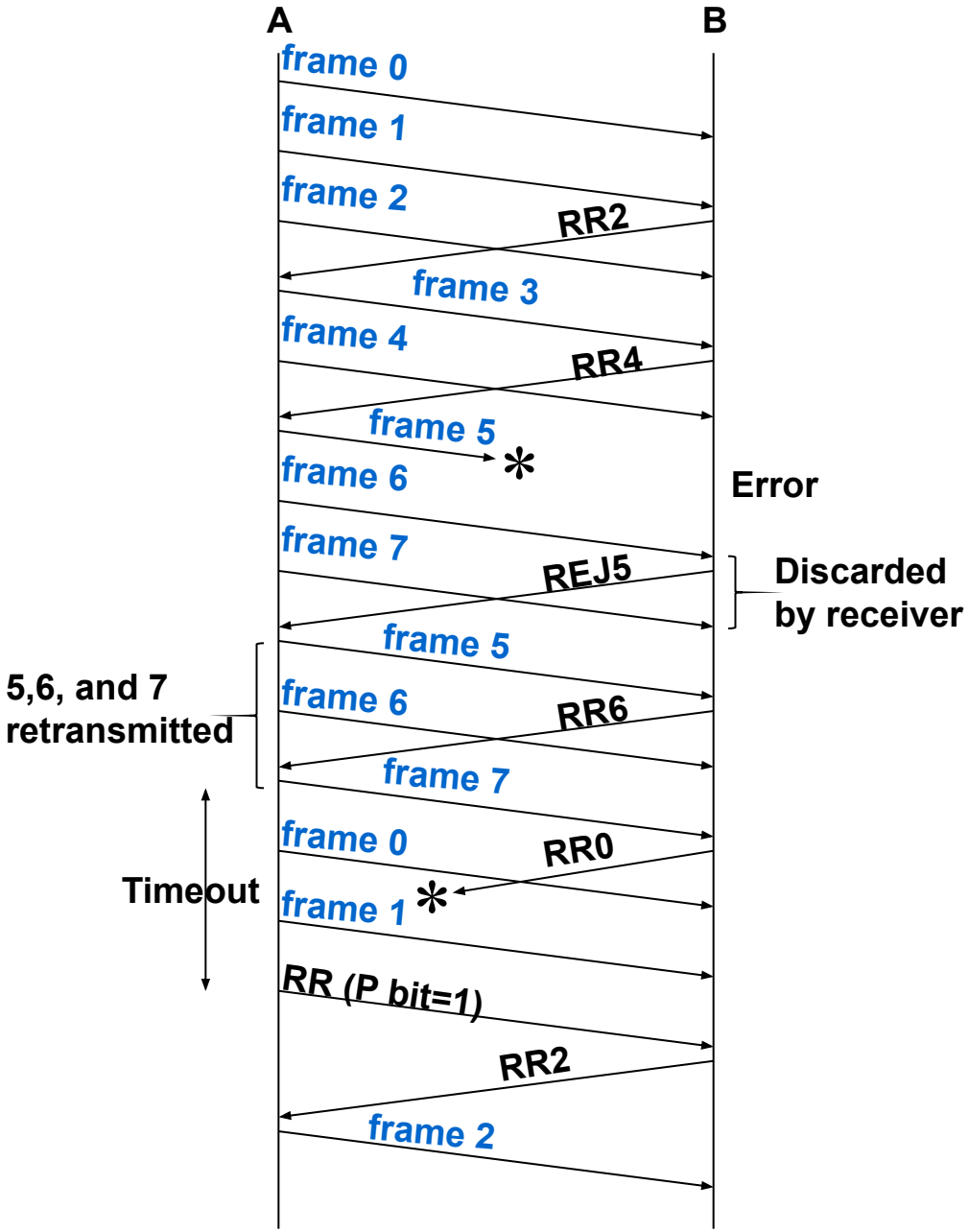
Error control principle



Stop-and-wait ARQ



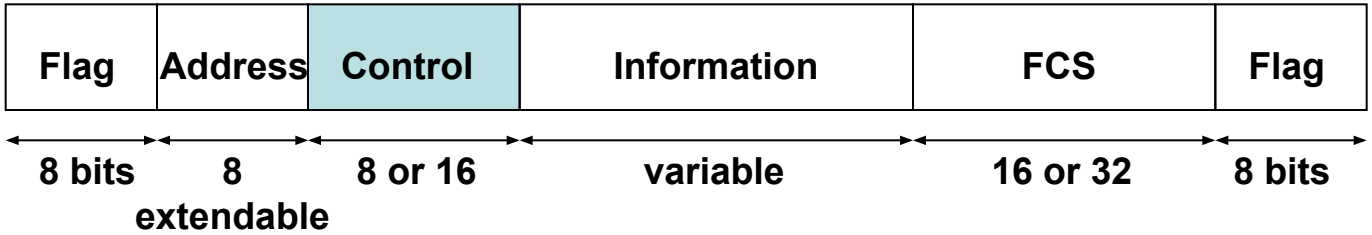
Go-back-N ARQ


A
B
frame 0
frame 1
frame 2
RR2
frame 3
frame 4
RR4
frame 5
*
frame 6
Error
frame 7
REJ5
Discarded
by receiver
frame 5
5,6, and 7
retransmitted
frame 6
RR6
frame 7
frame 0
RR0
Timeout
frame 1
*
RR (P bit=1)
RR2
frame 2

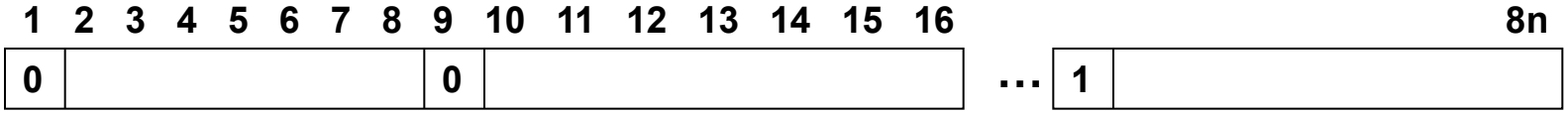
High Level Data Link Contriol

HDLC

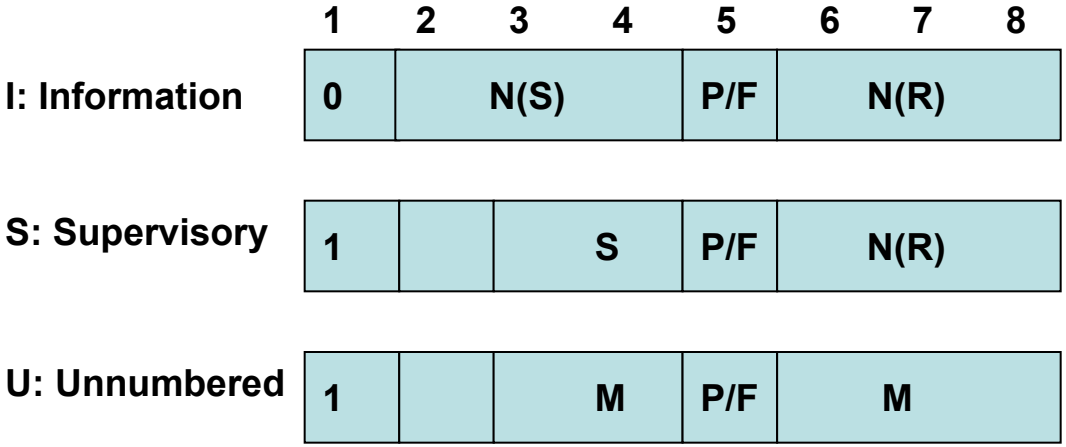
HDLC frame structure



(a) Frame format



(b) Extended address field



Legend

N(S) = Send sequence number

N(R) = Receive sequence number

S = Supervisory Function bits

M = Unnumbered function bits

P/F = Poll/final bit

(c) 8-bit control field format

HDLC (cont'd)

- Four supervisory frames

  RR (N(R))- Ready to Receive- ожидается кадр с номером R, все кадры с номерами 0…R-1 успешно приняты

  RNR (N(R) – Receive Not Ready – приемник приостанавливает передающую сторону, квитируя все кадры с номерами 0…R-1

  REJ (N (R)) –REJection – запрос на повторную передачу кадра с номером R и всех последующих, уже переданных

  SREJ (N(R) – Selective REJection- запрос на повторную передачу кадра с номером R
- Unnumbered Frames are used mostly for connection set-up

HDLC-family

- LAPB
- LAPD
- LLC
- PPP