CSMC 417

Computer Networks

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Set 2b

Spring 2003

A sliding window is used to make transmission more efficient as well as to control the flow of data so that the destination does not become overwhelmed with data. TCP's sliding windows are byte oriented.

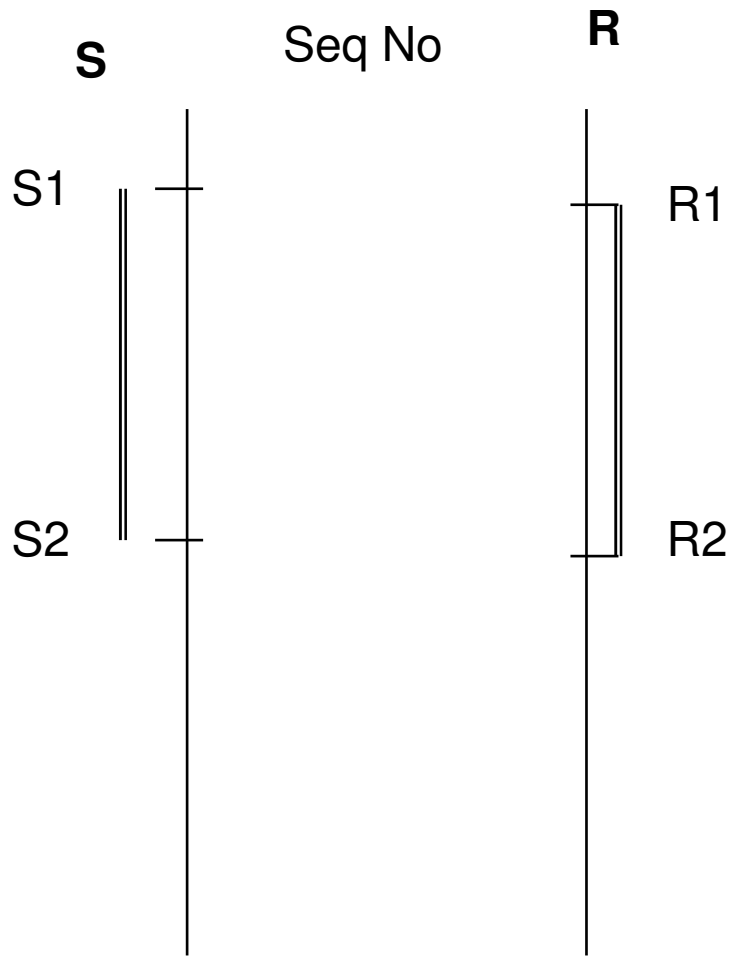
Sliding Window Protocols

- When transit time is large Stop and Wait gives very low line utilization

- Should be able to have more frames in transit

Sliding Windows

- S1 – Sender Base No
- S2 – Sender High No
- R1 – Receiver Base No
- R2 – Receiver High No



Sliding Window

- Sender is authorized to send any packet with sequence number between S1 and S2
- Receiver receives any packet in the range R1 – R2.
- If a packet outside this range is received – discard
- Acknowledge any correct packet received in this range.
  - What information to send as acknowledgement

Sliding Windows

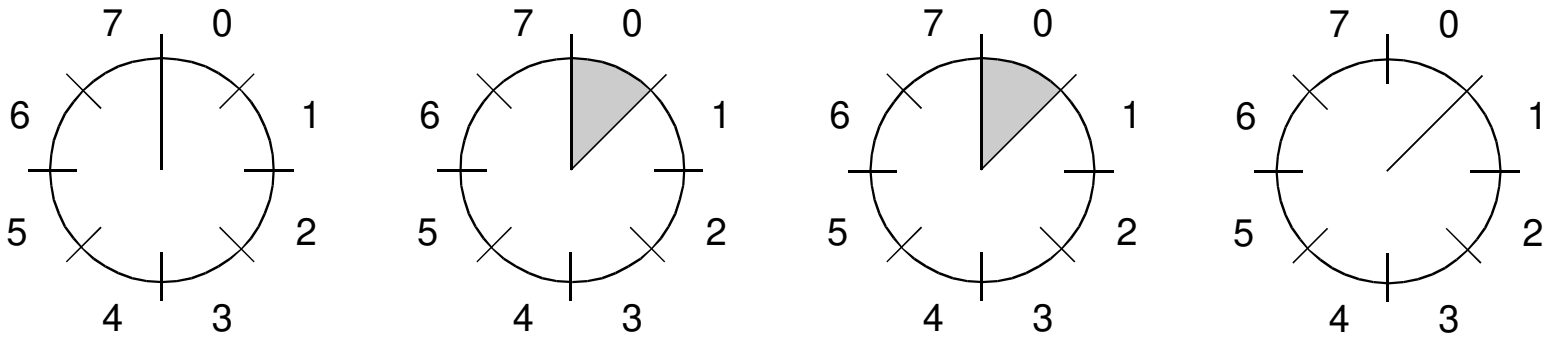
- Acknowledgement – Seq No. N
  - Packet N received correctly
  - All packets numbered N or lower received correctly
  - Receive sequence
  - 1 2 3 5 6 7 4 8 9
  - 1 2 3 3 3 3 7 8 9
  - 1 2 3 5 6 7 4 8 9
- Packet received in error
  - Discard packet – treat as if never received
  - Header received correctly
    - Send NAK with seq no of packet

Sliding Window

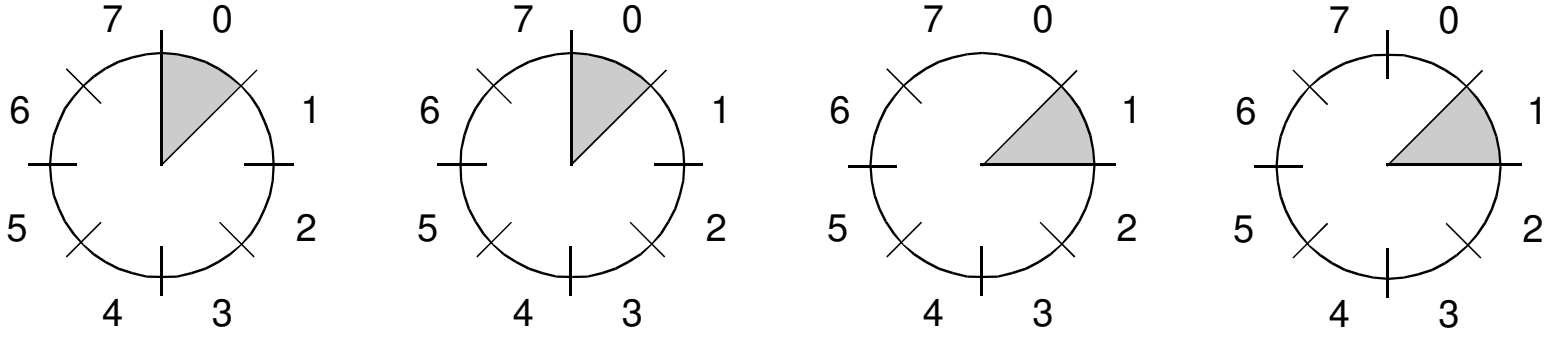
- Sender
  - Advance S1 and S2
    - Reflecting packets received correctly
  - Lost packets
    - Time out
      - By each packet sent
- What should be the window size?
- Should sender adjust window size? (S2-S1)
- Effect of Packet
  - lost
  - received in error
  - Out of sequence
  - With long delay

Sliding Window Protocol

Sender

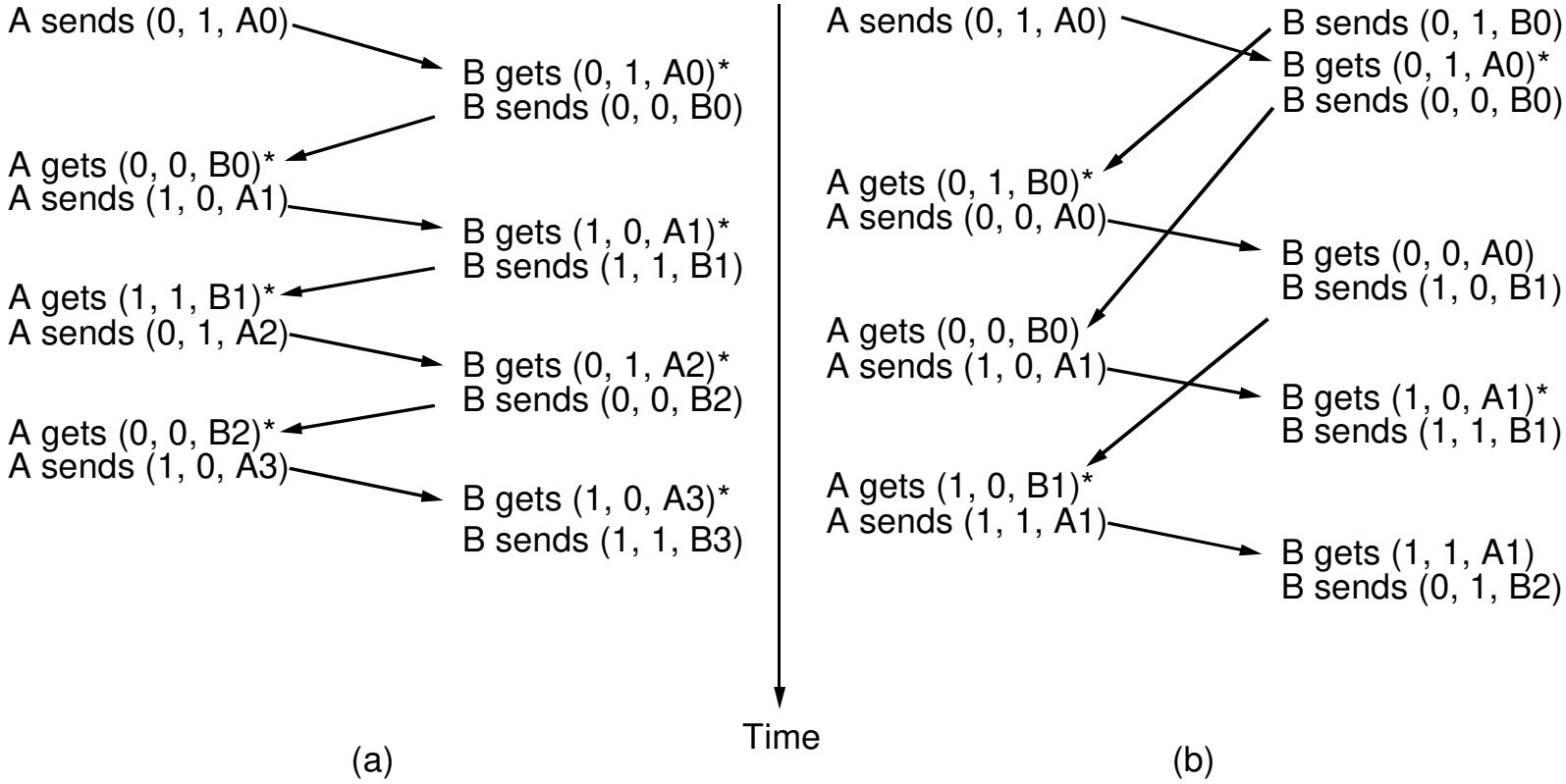


Receiver

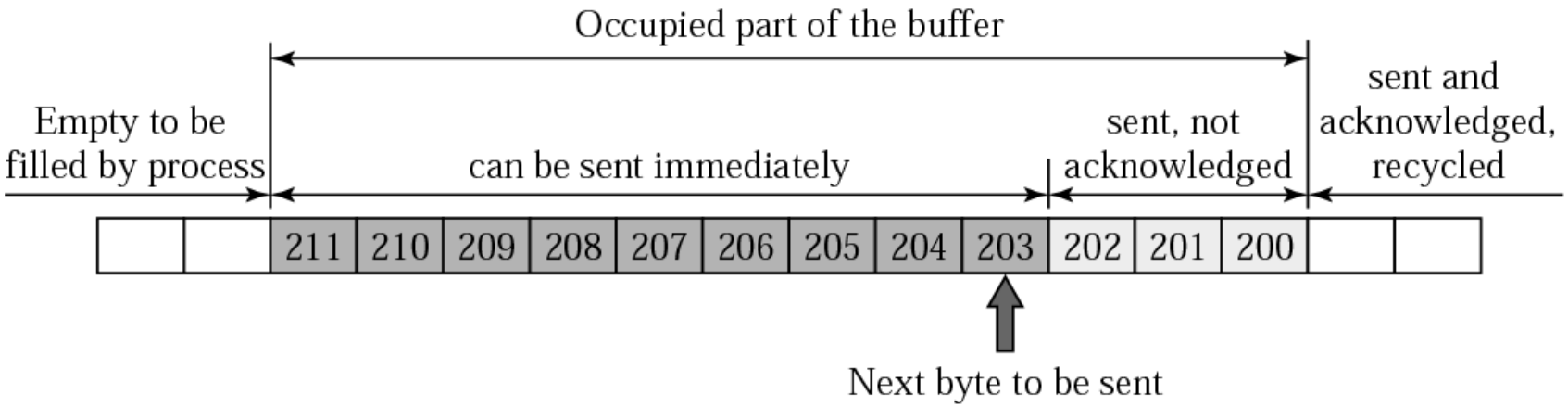


(a) (b) (c) (d)

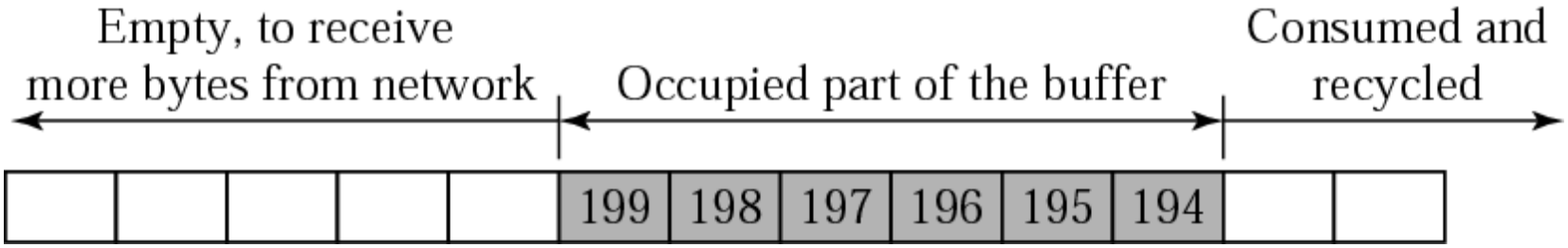
Two Scenarios
One bit window



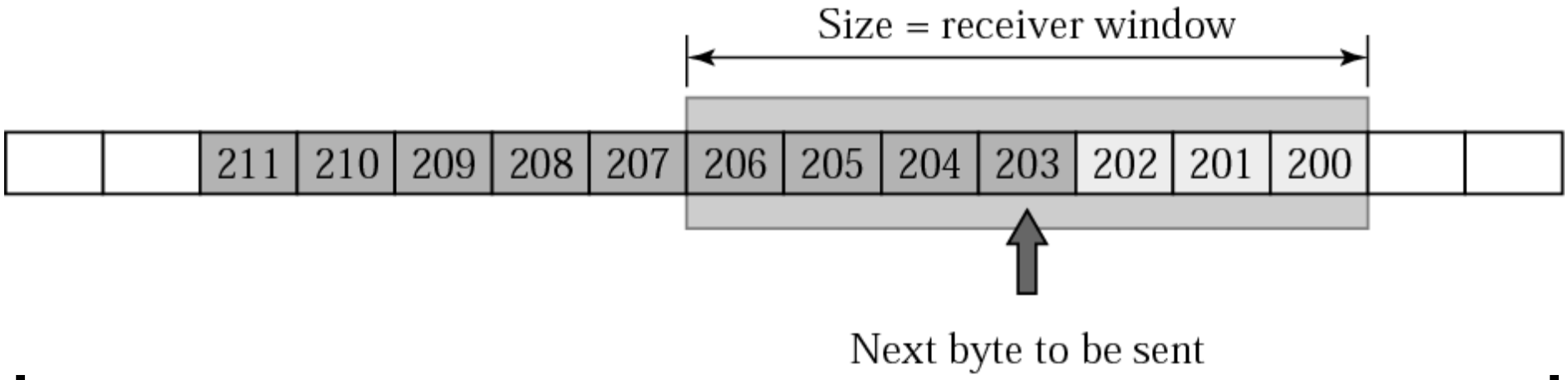
Sender buffer



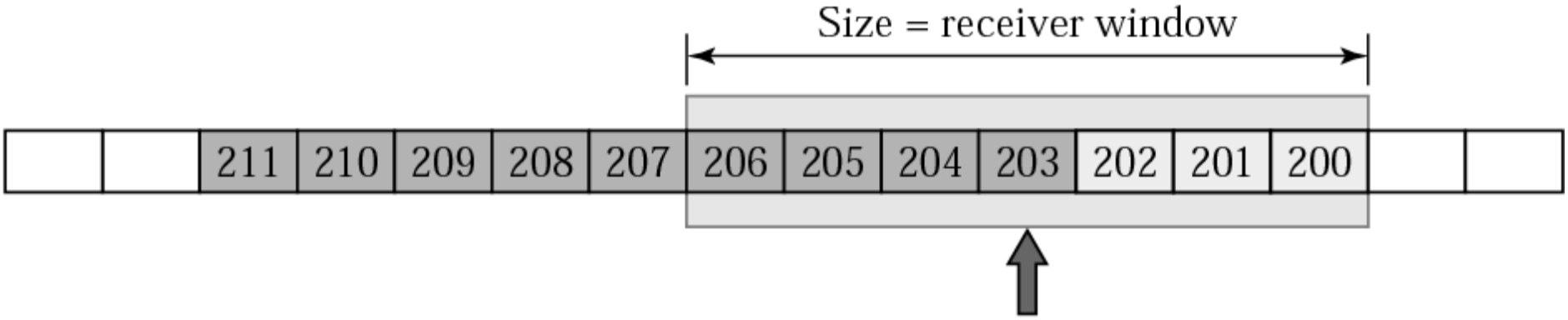
Receiver window



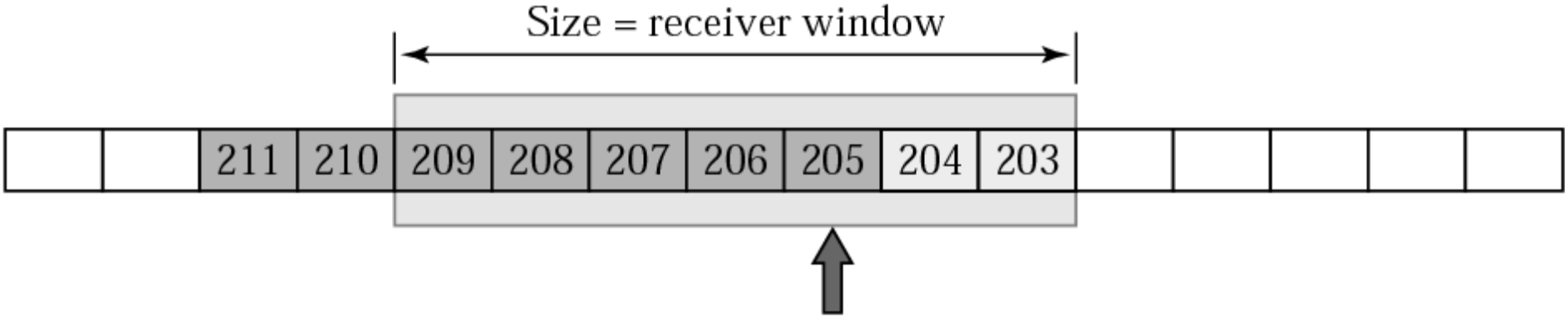
Sender buffer and sender window



Sliding the sender window

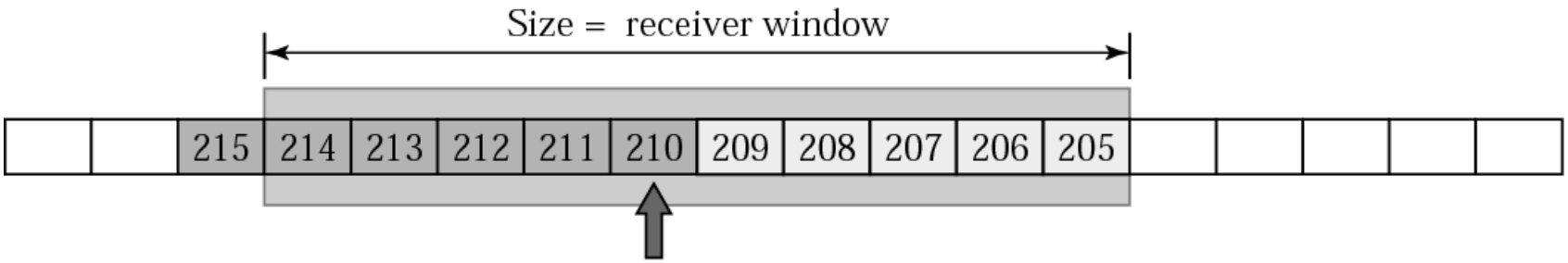


a. Before

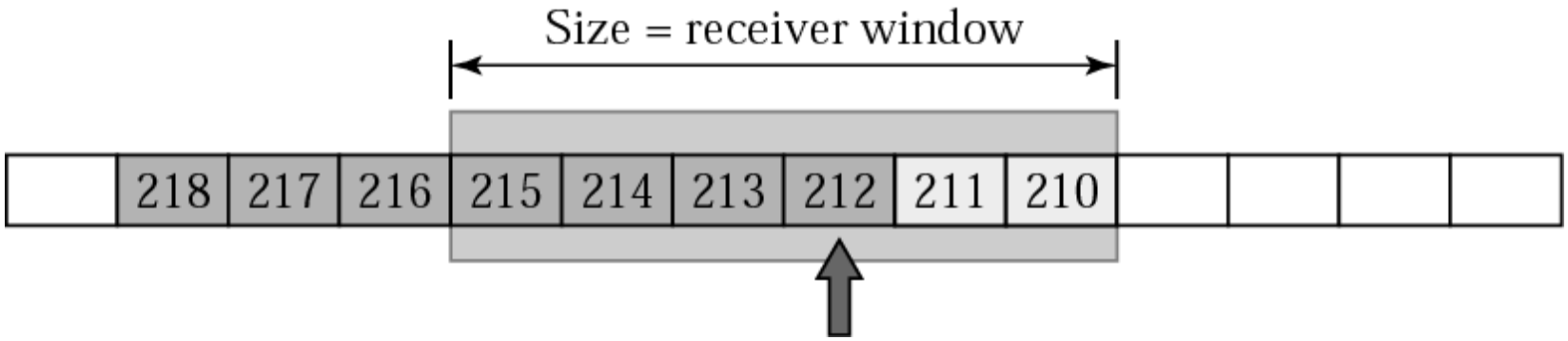


b. After

Expanding the sender window



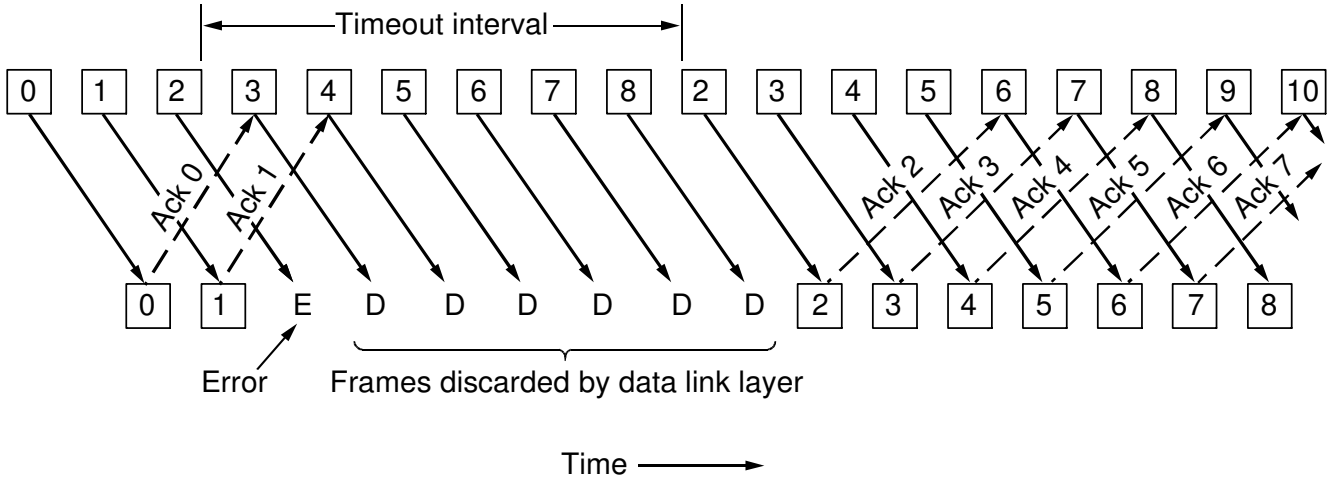
Shrinking the sender window



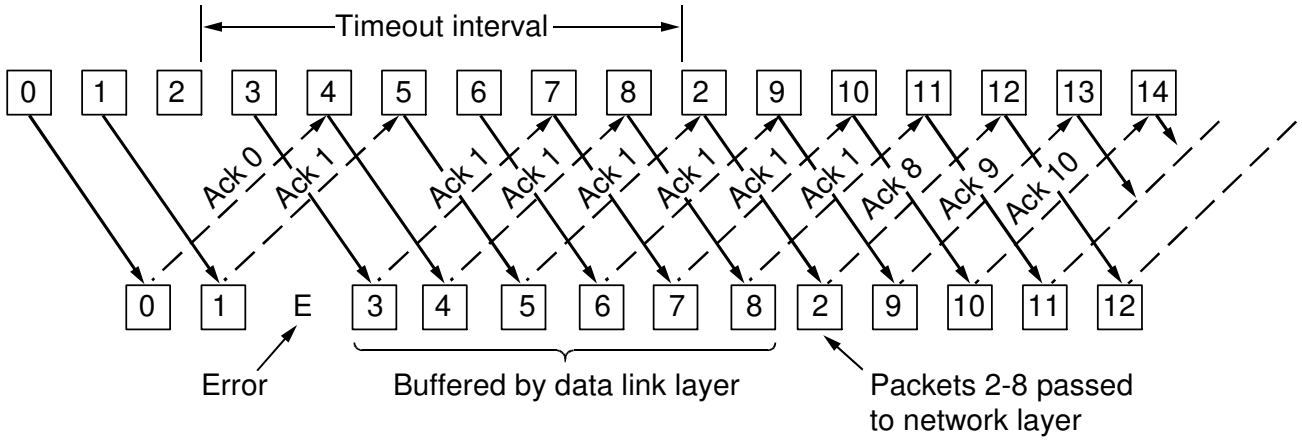
Error Recovery

- Go back N
- Selective Repeat

Go Back N



(a)



(b)

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In TCP, the sender window size is totally controlled by the receiver window value. However, the actual window size can be smaller if there is congestion in the network.

Some Points about TCP's Sliding Windows:

1. *The source does not have to send a full window's worth of data.*
2. *The size of the window can be increased or decreased by the destination.*
3. *The destination can send an acknowledgment at any time.*