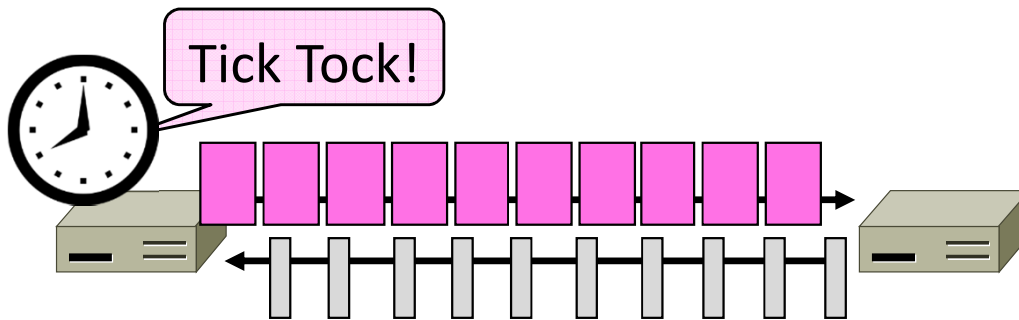# Computer Networks

## TCP Ack Clocking (§6.5.10)

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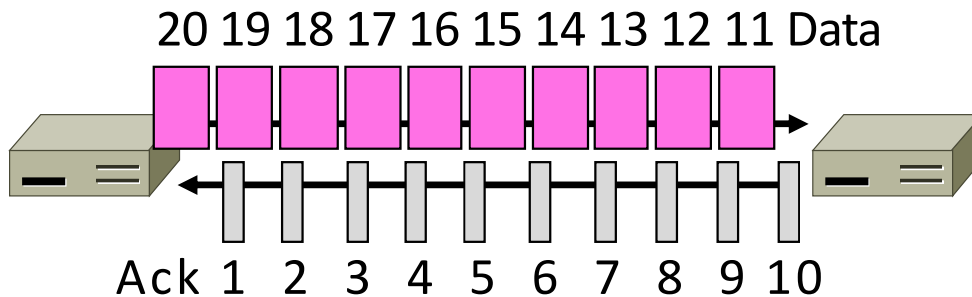
# Topic

- The self-clocking behavior of sliding windows, and how it is used by TCP
  - The "ACK clock"

# Sliding Window ACK Clock

- Each in-order ACK advances the sliding window and lets a new segment enter the network
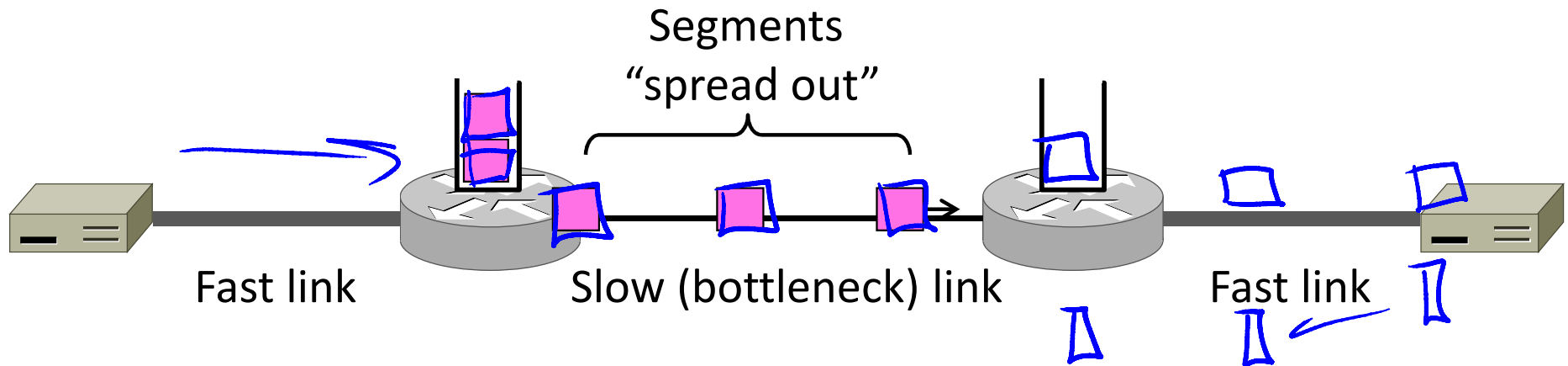  - ACKs "clock" data segments

20 19 18 17 16 15 14 13 12 11 Data

Ack 1 2 3 4 5 6 7 8 9 10

# Benefit of ACK Clocking

- Consider what happens when sender injects a burst of segments into the network



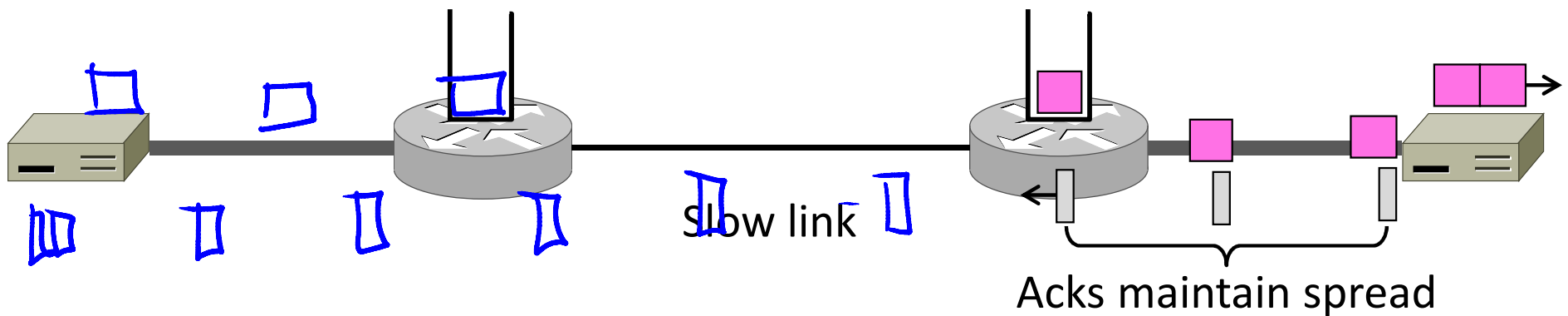Fast link        Slow (bottleneck) link        Fast link

Queue
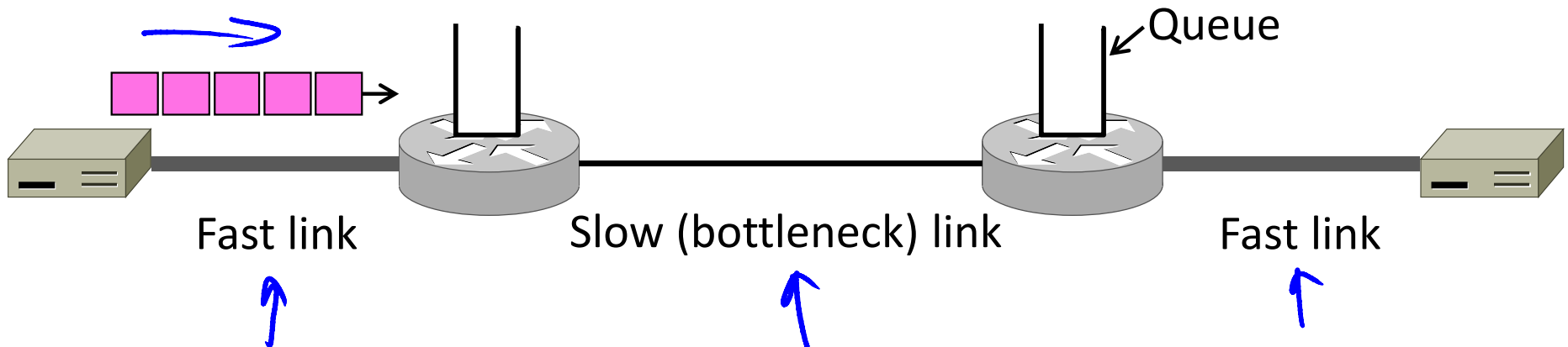
# Benefit of ACK Clocking (2)

- Segments are buffered and spread out on slow link

# Benefit of ACK Clocking (3)

- ACKs maintain the spread back to the original sender

Slow link

Acks maintain spread

# Benefit of ACK Clocking (4)

- Sender clocks new segments with the spread
  - Now sending at the bottleneck link without queuing!

Segments spread

Queue no longer builds

Slow link
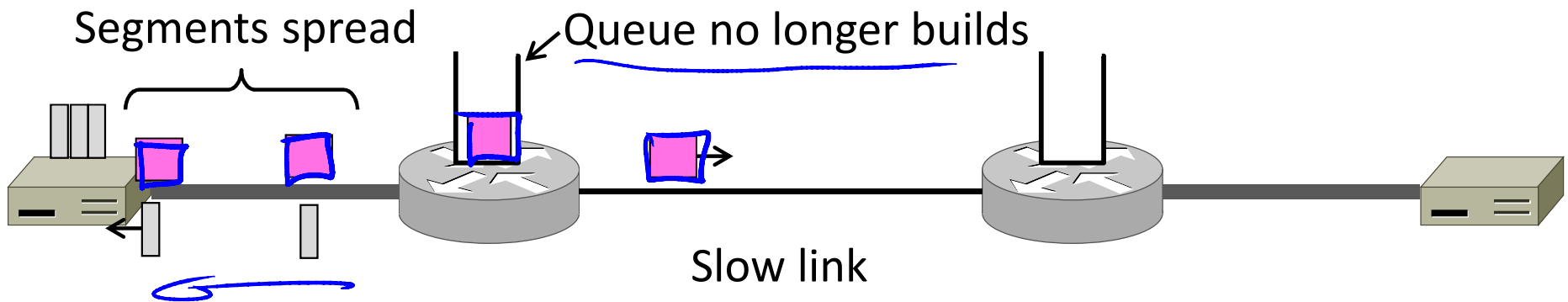
# Benefit of ACK Clocking (4)

- Helps the network run with low levels of loss and delay!

- The network has smoothed out the burst of data segments

- ACK clock transfers this smooth timing back to the sender

- Subsequent data segments are not sent in bursts so do not queue up in the network

# TCP Uses ACK Clocking

- TCP uses a sliding window because of the value of ACK clocking

- Sliding window controls how many segments are inside the network
  - Called the congestion window, or cwnd
  - Rate is roughly cwnd/RTT

- TCP only sends small bursts of segments to let the network keep the traffic smooth

# END