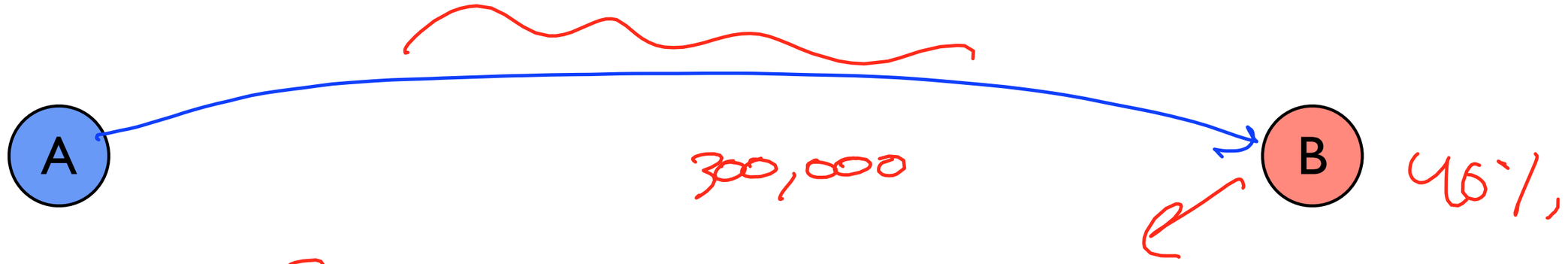
Flow Control

Stop-and-Wait

Problem



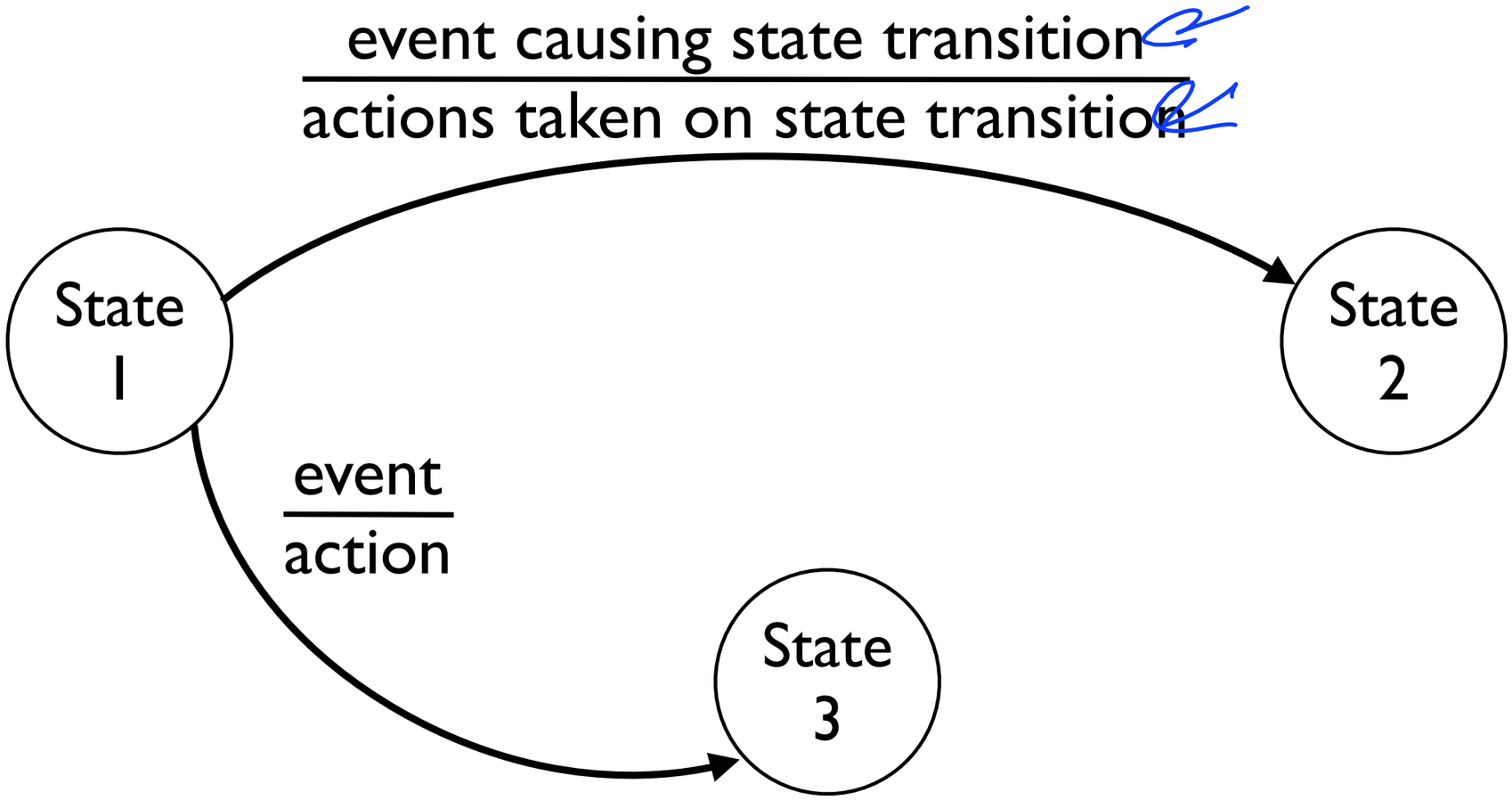
Can send 500,000 packets/second

Can receive 200,000 packets/second

Flow Control

- Don’t send more packets than receiver can process
- Receiver gives sender feedback
- Two basic approaches
  - Stop and wait (this video)
  - Sliding window (next video)

Finite State Machines

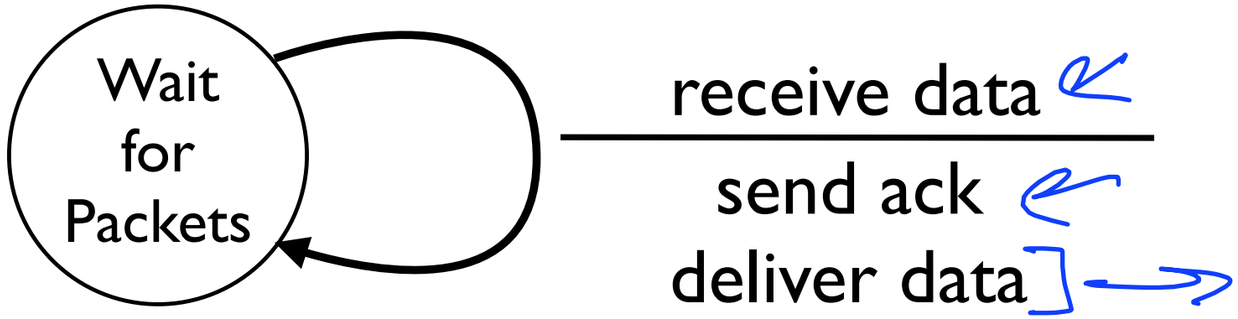


Stop and Wait

- At most one packet in flight at any time
- Sender sends one packet
- Receiver sends acknowledgment packet when it receives data
- On receiving acknowledgment, sender sends new data
- On timeout, sender resends current data

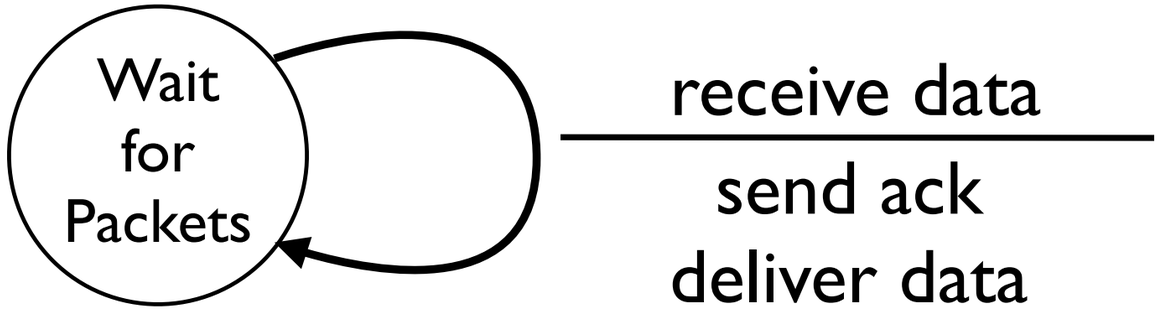
Stop and Wait FSM

Receiver FSM

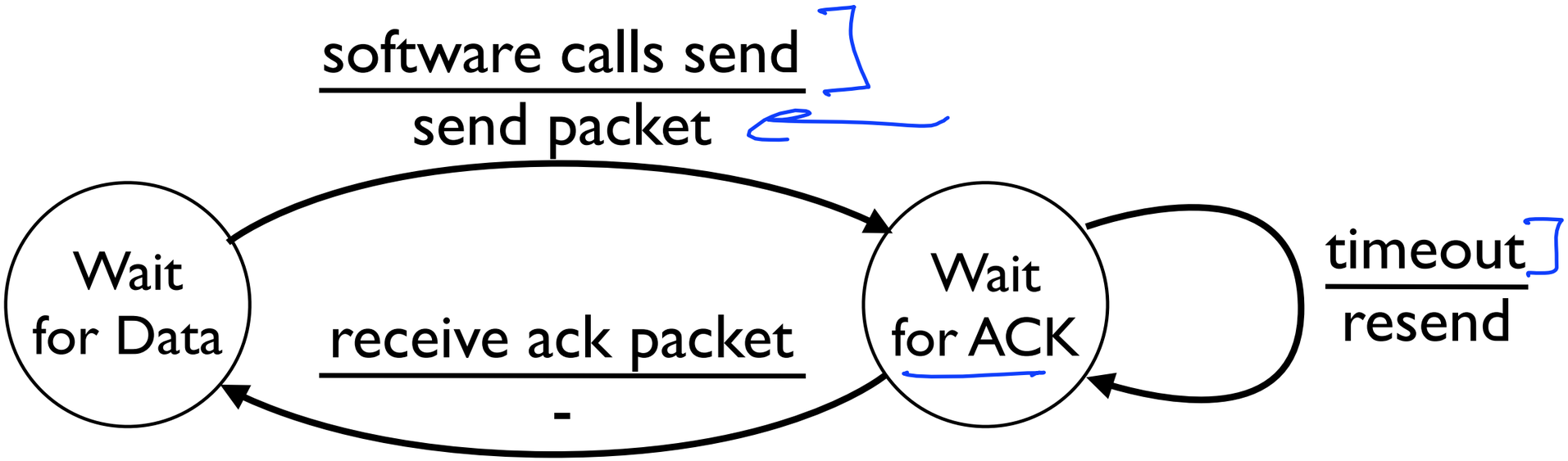


Stop and Wait FSM

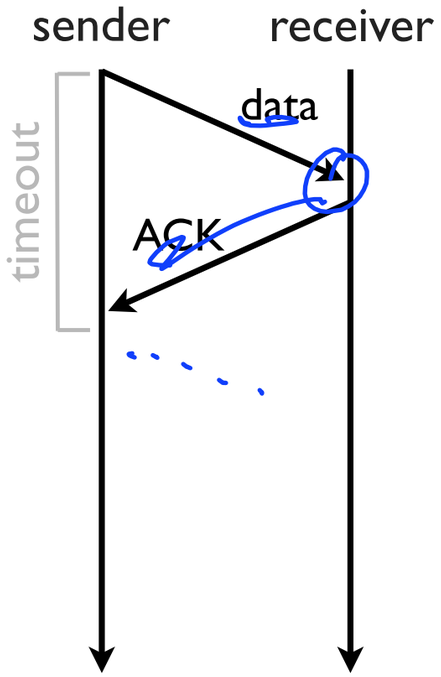
Receiver FSM



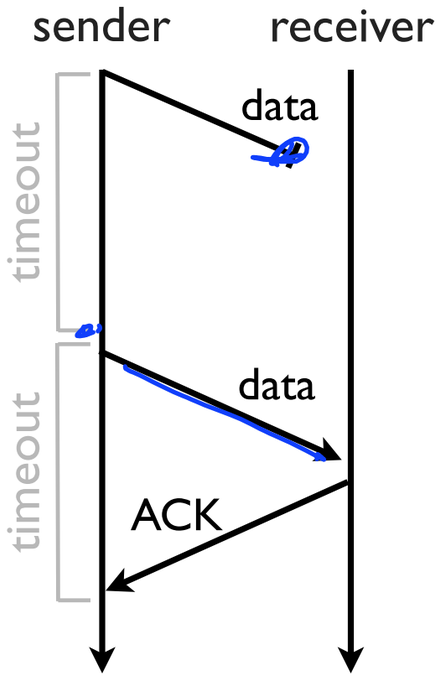
Sender FSM



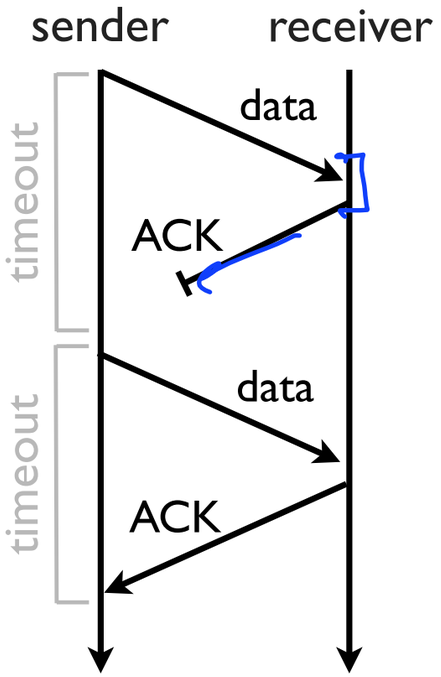
Example Executions



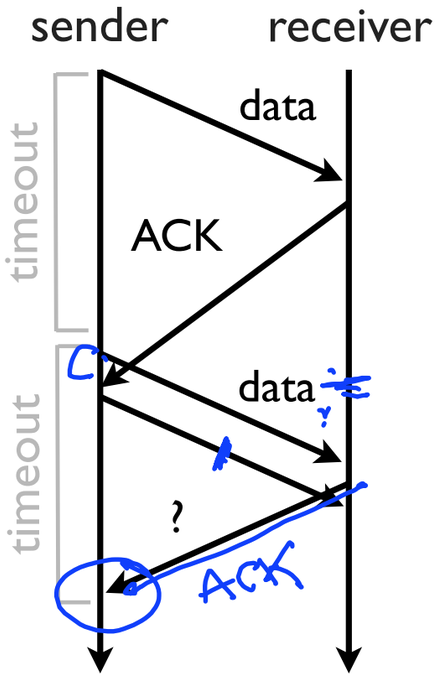
No Loss



Data Loss



ACK Loss



ACK Delay

Duplicates

- Use 1-bit counter in data and acknowledgments
  - Receiver can tell if new data or duplicate
- Some simplifying assumptions
  - Network does not duplicate packets
  - Packets not delayed multiple timeouts