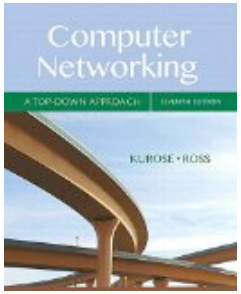
COMP 375: Lecture 17



- **News & Notes:**
  - Project #2 demos scheduling soon
  - Project #3 due Fri, March 16
- **Reading (Fri, Feb. 9)**
  - Review Sections 3.4.{2-4}

Section 3.4

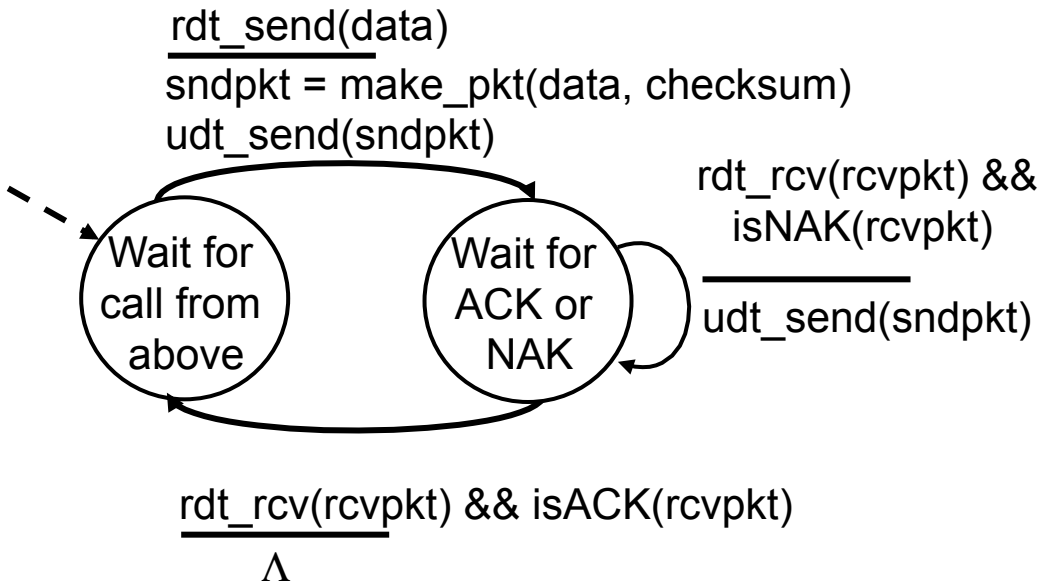
RELIABLE DATA TRANSFER

Automatic **R**epeat Re**Q**uest (ARQ) protocols are similar to the protocol you use for cell phones.

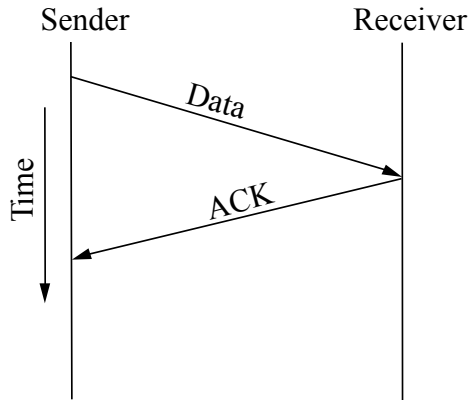
PHOTO: CARL PENDLE/GETTY IMAGES

We'll focus on two ways to view ARQ protocols: FSMs and timelines.

Finite State Machine (FSM)

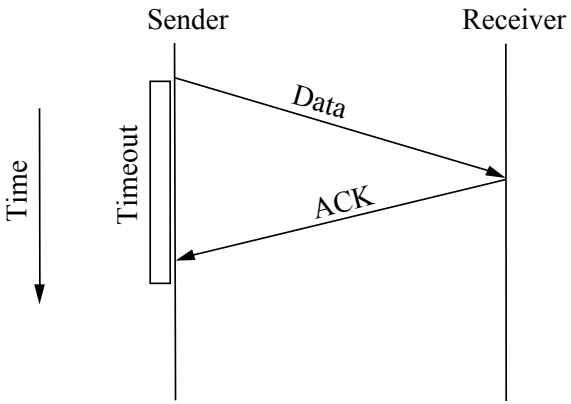


Timeline

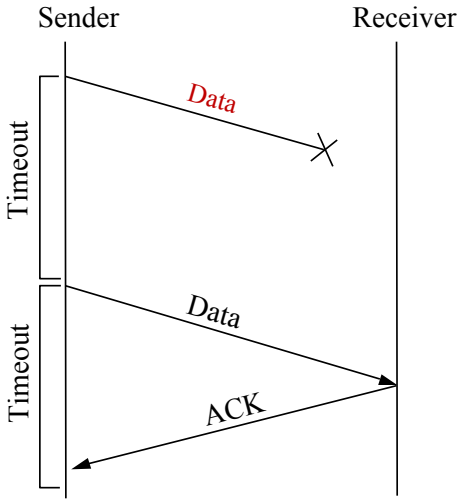


In ARQ, receiver sends ACKs when it receives data.

Scenario 1: No Data Loss

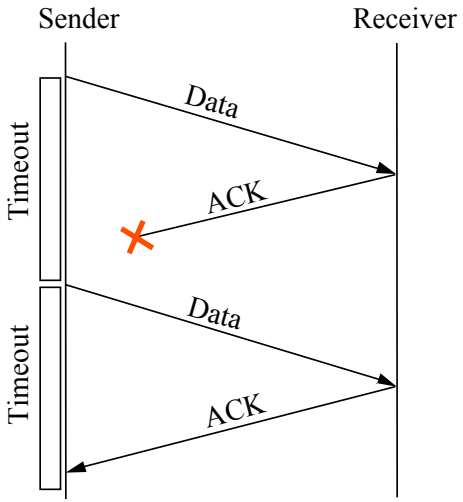


Scenario 2: Data Loss

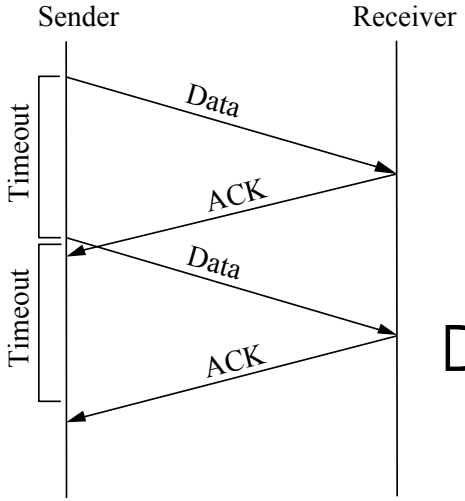


ACKs can get lost/corrupted too, which leads to duplication.

Scenario 3: ACK Loss



Scenario 4: Slow ACK

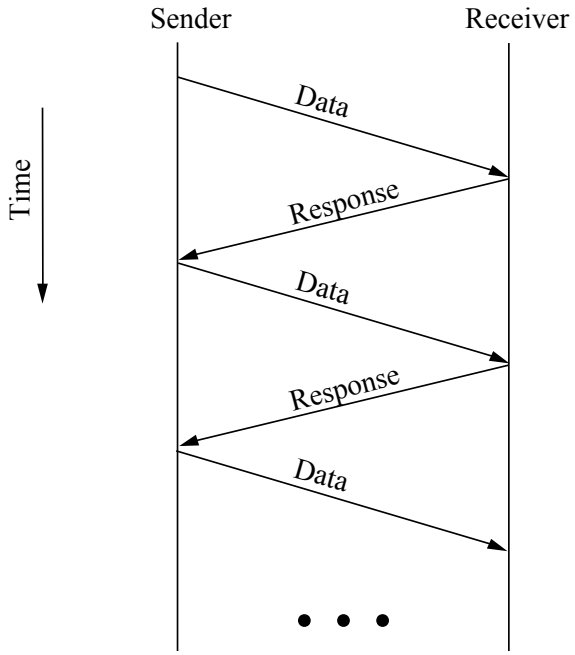


Duplicate!

ARQ protocols differ on when they send new messages and what they do after data loss.

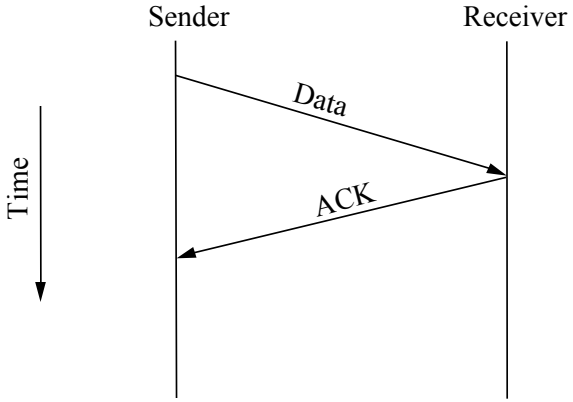
- Non-pipelined:
  - Stop-and-wait
- Pipelined
  - Go-back-N (GBN)
  - Selective Repeat (SR)

In **Stop-and-Wait**, sender only sends subsequent data after getting response.

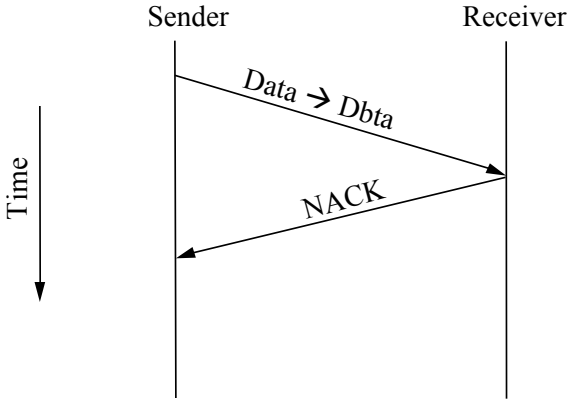


We can use checksums to detect errors, replying with ACK or NACK.

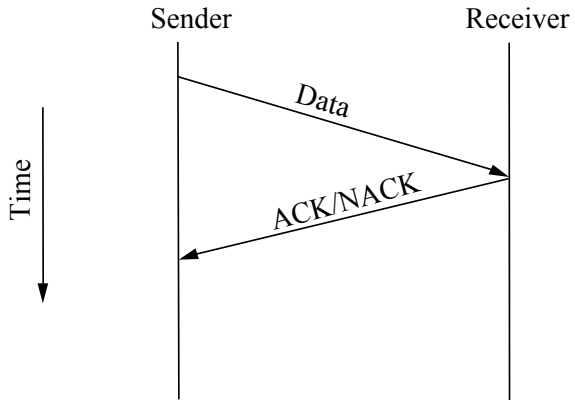
Scenario 5: Uncorrupted Data



Scenario 6: Corrupted Data

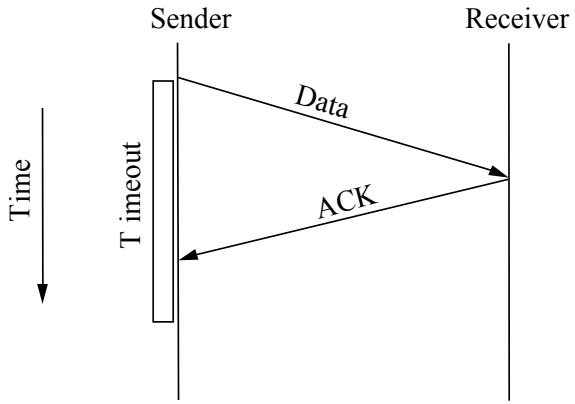


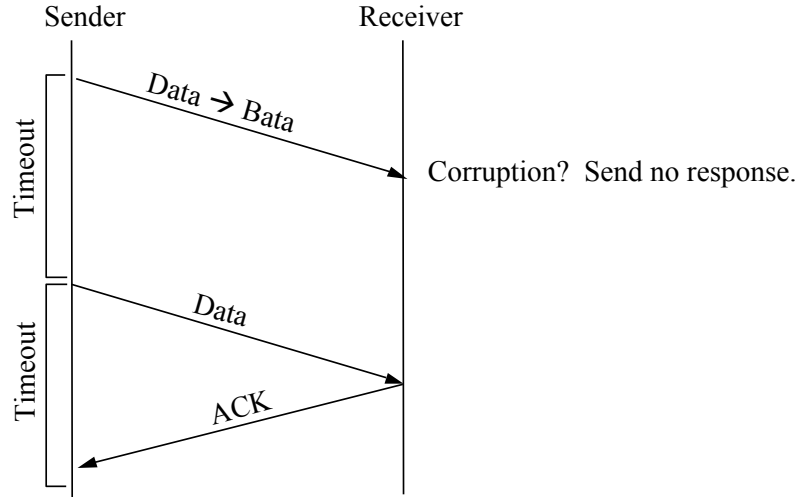
Could we do this with just ACKs or just NACKs?



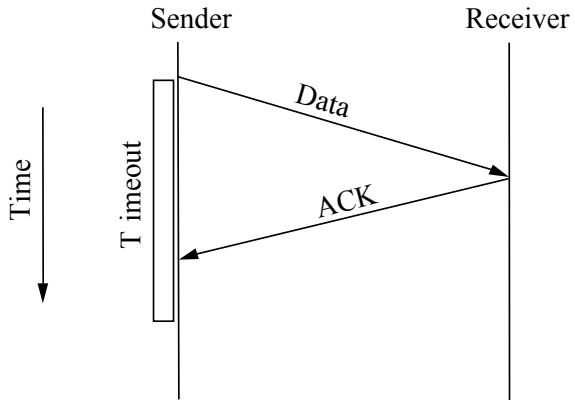
A.	**No**, we need them both.
B.	**Yes**, we could do without one of them, but we'd need some other mechanism.
C.	**Yes**, we could get by without one of them.

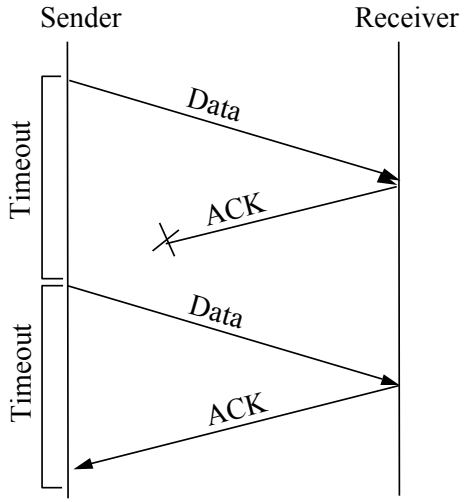
With timeouts, we don't need NACK, but we can't avoid ACKs.





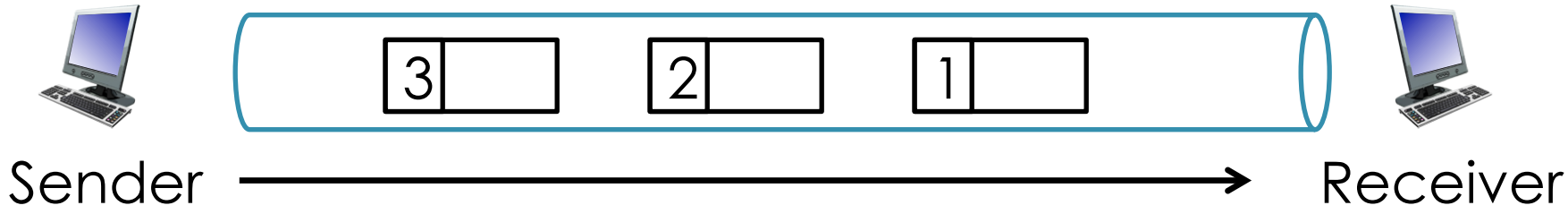
Adding timeouts might create new problems for us to worry about. How many? Examples?





A.	No new problems
B.	One new problem
C.	Two new problems
D.	More than two new problems

Adding **sequence numbers** helps us handle duplication.



When using stop-and-wait, we only need a 1-bit sequence number (i.e. 0 or 1).

Why is that the case?

A.	We only have two possible types of packets, original and duplicate.
B.	Since this is stop-and-wait, we only have one not-yet-ACKed packet in flight.
C.	Having more than two sequence numbers would blow up the number of states in our finite state machine to an unreasonable size.