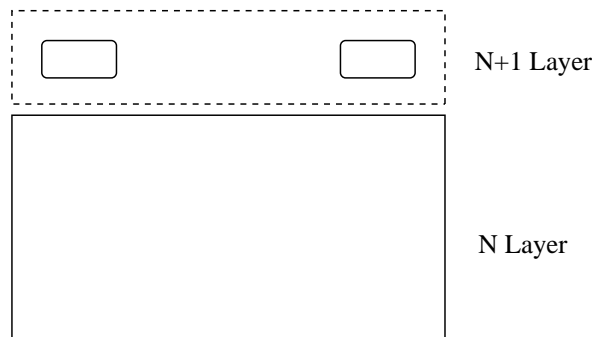


Layered Network Architecture



Question: How can we provide a reliable service on the top of a unreliable service?

1

ARQ: Automatic Repeat Request

- Can be used in every layer
- TCP uses ARQ

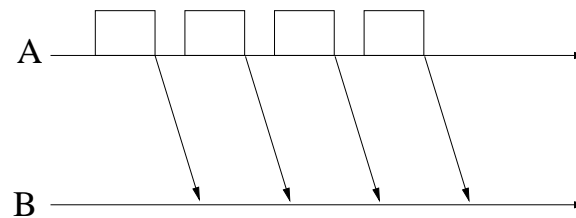
2

Goal

- Understand how ARQ works
- Understand approaches to improve the performance of ARQ

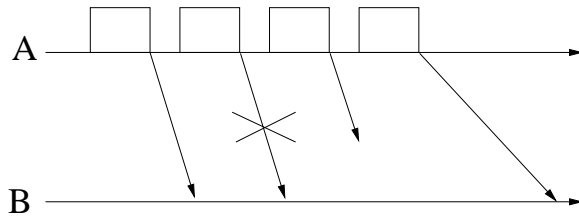
3

Ideally: Every Packet is Received without Errors



4

In Reality: Bad Things can Happen



5

ARQ: Retransmission Strategies

Objective:

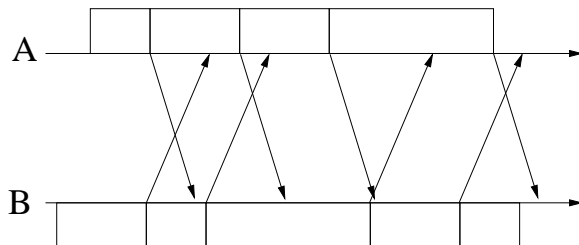
Design a protocol such that each packet is delivered once, and only once, and without errors.

Assumptions:

- All packets with error are detected
- Delay can be arbitrarily long
- Some packet maybe lost
- Packets that arrive are in the same order

6

Focus on Communication from A to B



7

Stop-and-Wait ARQ: Sender

The algorithm at node A for A-to-B transmission:

1. Set the integer variable SN to 0.
2. Accept a packet from the next higher layer at A; if no packet is available, wait until it is; assign number SN to the new packet.
3. Transmit the SNth in a frame containing SN in the sequence number field.
4. If an error-free frame is received from B containing a request number RN greater than SN, increase SN to RN and go to step 2. If no such frame is received within some finite delay, go to step 3.

8

Stop-and-Wait ARQ: Receiver

The algorithm at node B for A-to-B transmission:

1. Set the integer variable RN to 0 and the repeat steps 2 and 3 forever.
2. Whenever an error-free frame is received from A containing a sequence number SN equal to RN, release the received packet to the higher layer and increment RN.
3. At arbitrary times, but within bounded delay after receiving any error-free data frame from A, transmit a frame to A containing RN in the request number field.