

# COMP3203 Final Exam Notes

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## 1 Test 1 Stuff (Brief and Important Only)

- test 1 stuff here

## 2 ARQs

- (A)utomatic (R)epeat Re(Q)uests
- strategy to handle errors detected by the CRC
  - or whatever other detection method
- main types
  - **stop and wait**
  - sliding window
    - **go back N**
    - **selective reject**

### 2.1 Sliding Window

#### 2.1.1 Go Back $N$

- most commonly used sliding window
- sequential frames numbered  $n \bmod N$
- send up to  $N - 1$  frames **before an ACK is received**
- **unbounded sequence numbers** is a hurdle for sliding window in **non-FIFO** channels

#### ACKs and NAKs

- if no error
  - send RR (ACK) for frame[ $n$ ]
- if error
  - send REJ (NAK) for frame[ $n$ ]
- if frame lost, send a NAK
- if no ACK or NAK received before timeout, **assume lost**

#### When Sender Receives a NAK[ $n$ ]

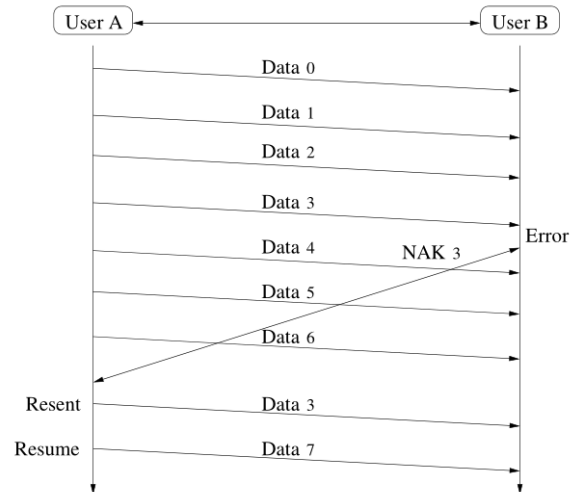
- resend frame[ $n$ ] and all frames sent since

#### When a Sender Receives No ACK or NAK

- go back to the previous ACK and resend all frames sent since

#### 2.1.2 Selective Reject

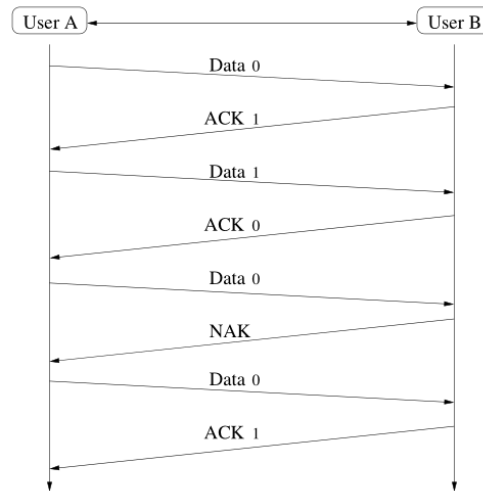
- similar to go back  $N$
- **BUT** we only resend the **lost frame**
  - out of order!
  - receiver needs sorting logic to store frames after a NAK
- in general, smaller window size



**Figure 1:** An example of the Selective Reject protocol.

## 2.2 Stop and Wait

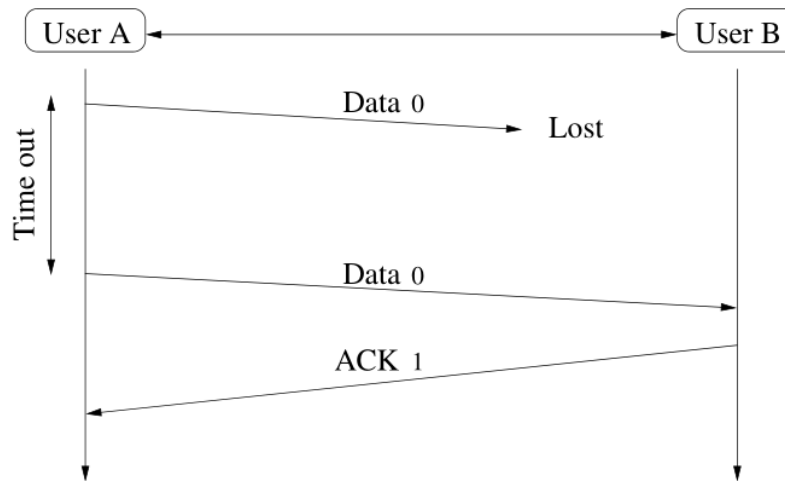
- also called an **ABP**
  - alternating bit protocol
  - because the label bits alternate between 0 and 1
- you can think of it as sliding “window” with a **window size of 1**
- works only in **FIFO queues**
  - suitable for **data link layer**



**Figure 2:** A diagram of the Stop and Wait ARQ protocol.

### 2.2.1 Errors in Stop and Wait

- two main types
- **frame** errors
  - damaged frame
- **ACK** errors
  - damaged acknowledgement

Frame Errors

**Figure 3:** A lost frame error in the Stop and Wait ARQ protocol.

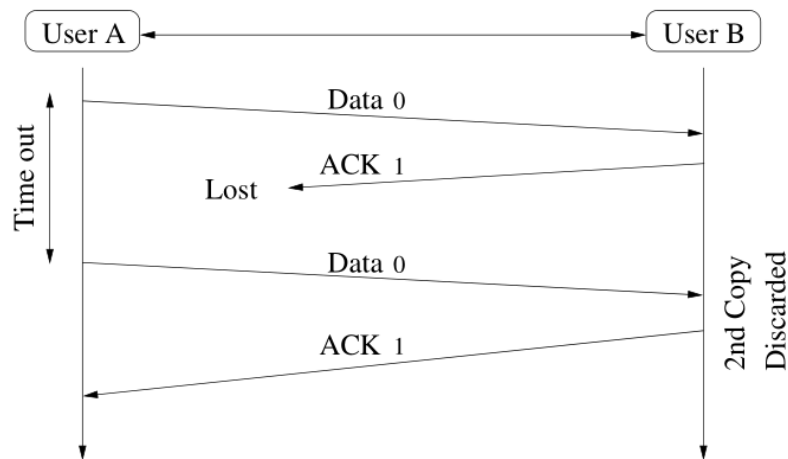
- frame is damaged
  - one or more bits have been altered
- discard the frame
- source waits for ACK
  - if it doesn't receive one, it will resend

ACK Errors

- frame is received but ACK is damaged
- sender will resend message
- receiver will accept the same message twice
  - so we need to label frames
  - and label ACKs
  - use a bit for this
    - $\text{ACK}[b]$  acknowledges  $\text{frame}[b + 1 \bmod 2]$
    - says receiver is ready for  $\text{frame}[b]$

**2.2.2 Correctness**

- satisfies:
  - safety
    - algorithm never gives an incorrect result
    - always results in a “corrected” error
  - liveness
    - never enters a deadlock condition



**Figure 4:** An ACK error in the Stop and Wait ARQ protocol.

### 3 Multiaccess

#### 3.1 Uncoordinated Access Control

COME BACK HERE

## 3.2 Ethernet

# 4 Coordinated Access

## 4.1 Tree Algorithm

## 4.2 Binary Countdown

## 4.3 Bitmap

# 5 Wireless

## 5.1 Cellular

## 5.2 Ad Hoc

### 5.2.1 UDG

### 5.2.2 Compass Routing

### 5.2.3 Face Routing

## 5.3 Bluetooth

# 6 GPS

## 6.1 Three Techniques

## 6.2 Satellites

# 7 Routing

## 7.1 Distance Vector (RIP)

## 7.2 Link State Protocol (LSP)

## 7.3 MSTs

## 7.4 Dijkstra

# 8 IP

## 8.1 IPv4

### 8.1.1 Classes of Address

### 8.1.2 Subnets

### 8.1.3 Subnet Masks

## 8.2 IPv6

## 8.3 DHCP

## 8.4 ARP

### 8.4.1 RARP

# 9 TCP

## 9.1 How it Works (Sliding Window)

## 9.2 How it Builds Statistics

## 9.3 Equilibrium Model