Where are we?
- Stop-and-Wait ARQ: “Safe” and “Live”

Next:
- Can we implement Stop-and-Wait ARQ
- Is Stop-and-Wait ARQ efficient?
Where are we?

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Where are we?

- Stop-and-Wait ARQ: “Safe” and “Live”

Next:

- Can we implement Stop-and-Wait ARQ
- Is Stop-and-Wait ARQ efficient?
Sequence Numbers/Request Numbers
Stop-and-Wait ARQ Using Modulus 2

0, 0

Even numbered packet received at B

Request for even packet received at A

1, 0

Odd numbered packet received at B

0, 1

Request for odd packet received at A

1, 1
Go-Back $n$ ARQ

![Diagram]

- **Already ACK’d**
- **Useable, not yet sent**
- **Sent, not yet ACK’d**
- **Not useable**

Window size $n$
Go-Back $n$ ARQ

```
<table>
<thead>
<tr>
<th>A</th>
<th>SN</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>RN</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
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<td></td>
</tr>
</tbody>
</table>
```

$[0,5] \quad [1,6][2,7][3,8][4,9]$
Go-Back $n$ ARQ

\[\begin{array}{cccccccc}
\text{SN} & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\text{RN} & 0 & 0 & 1 & 1 & 1 & 1 & 1 \\
\end{array}\]

[0,5] [1,6] [2,7]
Go-Back $n$ ARQ

A

B

SN

RN

[0,5]  [1,6]

0 1 2 3 4 5 6 1 2

0 0 1 2 3 4 5 6

$[0,5] \quad [1,6]$
Go-Back \( n \) ARQ

A

B

SN

RN

[0,5]

0 1 2 3 4 5
Selective-Repeat ARQ: Receiver

Window size \( n \)

- Out of Order (buffered) but already ACK’d
- Acceptable (within window)
- Expected, not yet received
- Not useable
Selective Repeat ARQ

A

B

SN 0 1 2 3 4 5 6 1 1 1

RN 0 0 1 1 3 4 5 6 7 7 2 2 2

[0,5] [1,6] [7,12]

CSC458/2209 - Computer Networks
Conditions for Modulus $m$

- Go-Back $n$ ARQ: $m > n$
- Selective Repeat ARQ: $m \geq 2n$