CS3200: Computer Networks

Lecture 11

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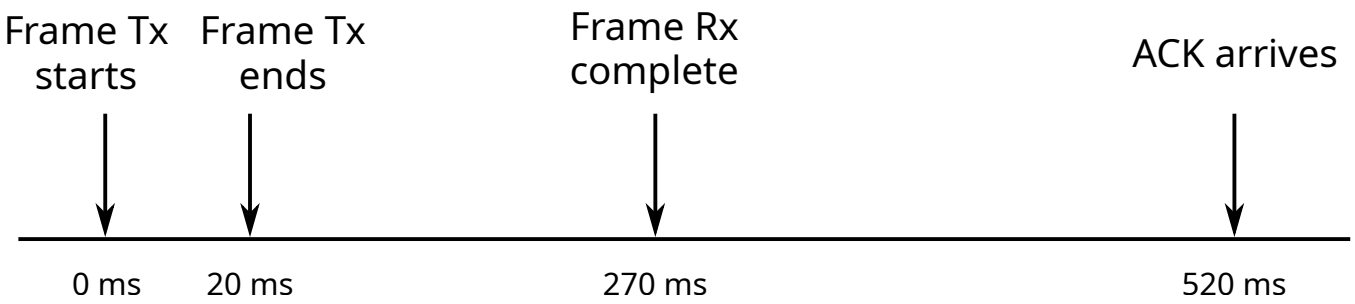
Why large window sizes?

Consider a 50-kbps satellite channel with a 500 msec round-trip propagation delay. Let us use the bi-directional sliding window (window size is 1) protocol to send 1000-bit frames via the satellite.



Sender blocked for $500/520 \approx 96\%$ of time. Or, in other words, only 4% of bandwidth was utilized.

How large should the window size be?

- Large values can cause backlog at the sender.
- Small values will lead to resource under-utilization.
- If link had bandwidth B and delay D, BD is known as the **bandwidth-delay** product. The window size should be about $2BD/L + 1$ where L is the number of bits in frame.
- Equivalently, we have

$$\text{link utilization} \leq \frac{w}{1 + 2BD/L}$$

where w is the window size.

Handling frame loss

This technique of keeping multiple frames in flight is an example of **pipelining**. Pipelining frames over an unreliable communication channel raises some serious issues.

- what happens if a frame in the middle of a long stream is damaged or lost?
- what should the receiver do with all the correct frames following a discarded frame?

Handling frame loss

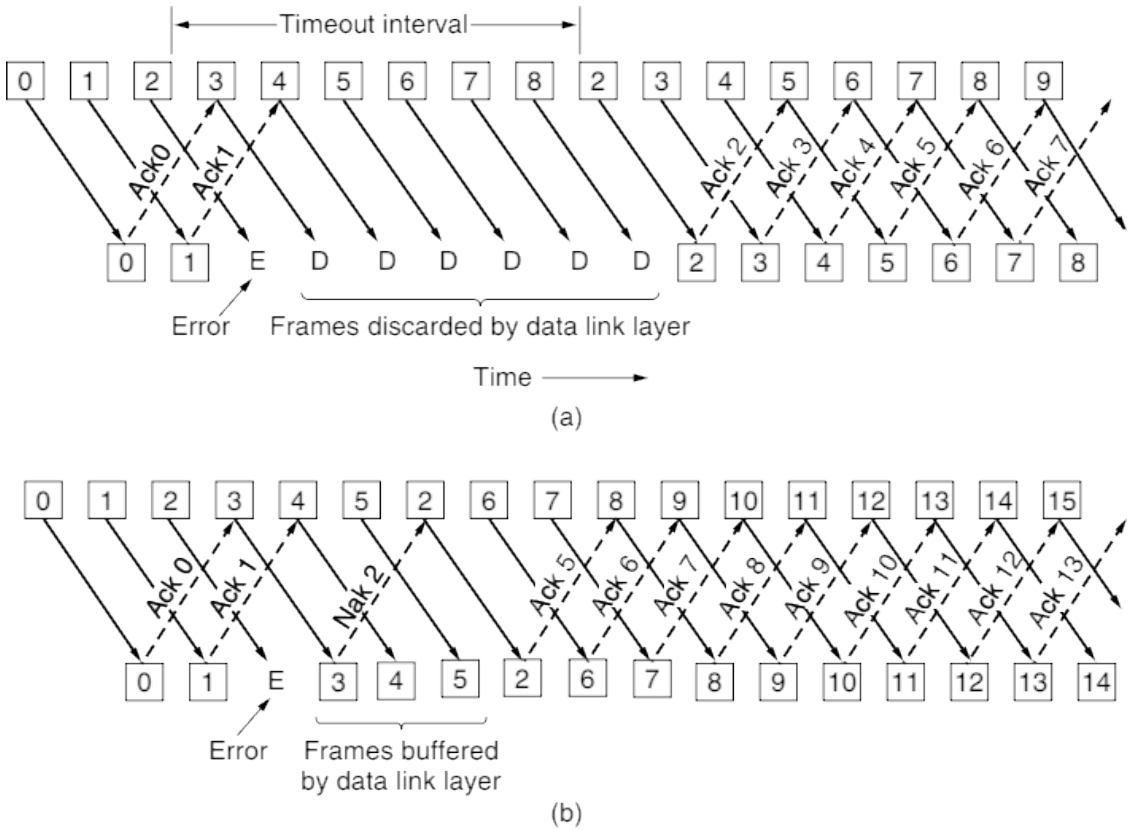


Figure: Pipelining and error recovery strategy for (a) receiver's window size is 1 (**Go-back-N**) (b) receiver's window size is large (**Selective Repeat**).