SNS COLLEGE OF ENGINEERING

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Department of Information Technology

Course Name – 19IT401 Computer Networks

II Year / IV Semester

Unit 2 – Link Layer

Topic 2- DLC Protocls

DLC Protocols

Traditionally four protocols have been defined for the data-link layer to deal with flow and error control:

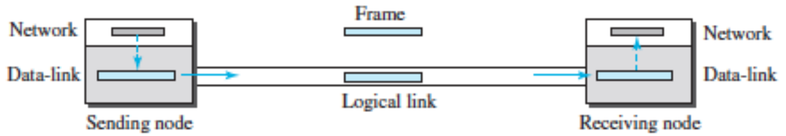
- Simple,
- Stop-and-Wait,
- Go-Back-N, and
- Selective-Repeat

Although the first two protocols still are used at the data-link layer, the last two have disappeared.

DLC Protocols

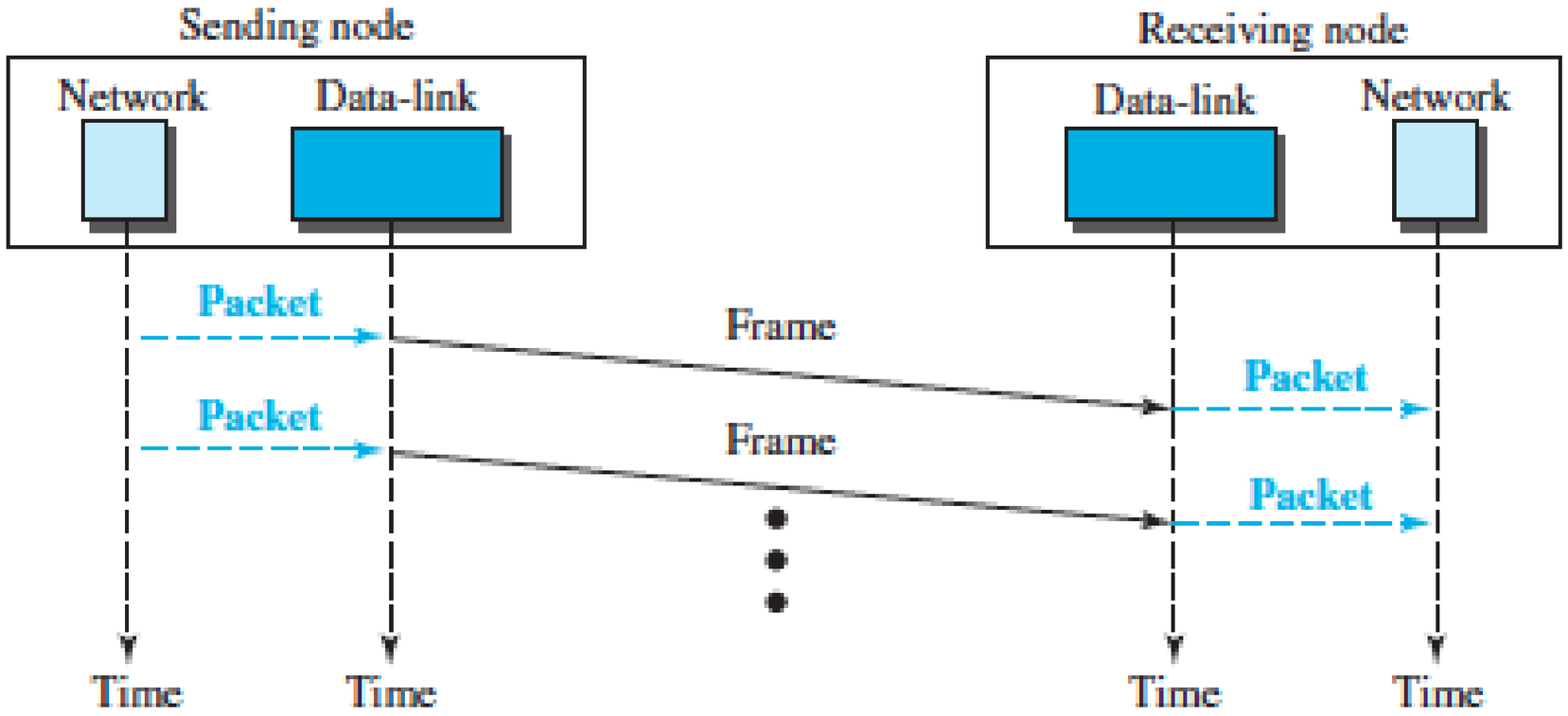
Simple Protocol

- Our first protocol is a simple protocol with neither flow nor error control.
- We assume that the receiver can immediately handle any frame it receives. In other words, the receiver can never be overwhelmed with incoming frames.
- The data-link layer at the sender gets a packet from its network layer, makes a frame out of it, and sends the frame.
- The data-link layer at the receiver receives a frame from the link, extracts the packet from the frame, and delivers the packet to its network layer.
- The data-link layers of the sender and receiver provide transmission services for their network layers.



DLC Protocols

Simple Protocol



DLC Protocols

Stop-and-Wait Protocol

- The sender keeps a copy of the frame and then transmits it.
- The sender waits for an acknowledgment before transmitting the next frame.
- If the acknowledgment does not arrive before the sender times out and retransmits the frame.

- In this protocol, the sender sends one frame at a time and waits for an acknowledgment before sending the next one.

- To detect corrupted frames, we need to add a CRC to each data frame.

- When a frame arrives at the receiver site, it is checked. If its CRC is incorrect, the frame is corrupted and silently discarded. The silence of the receiver is a signal for the sender that a frame was either corrupted or lost.

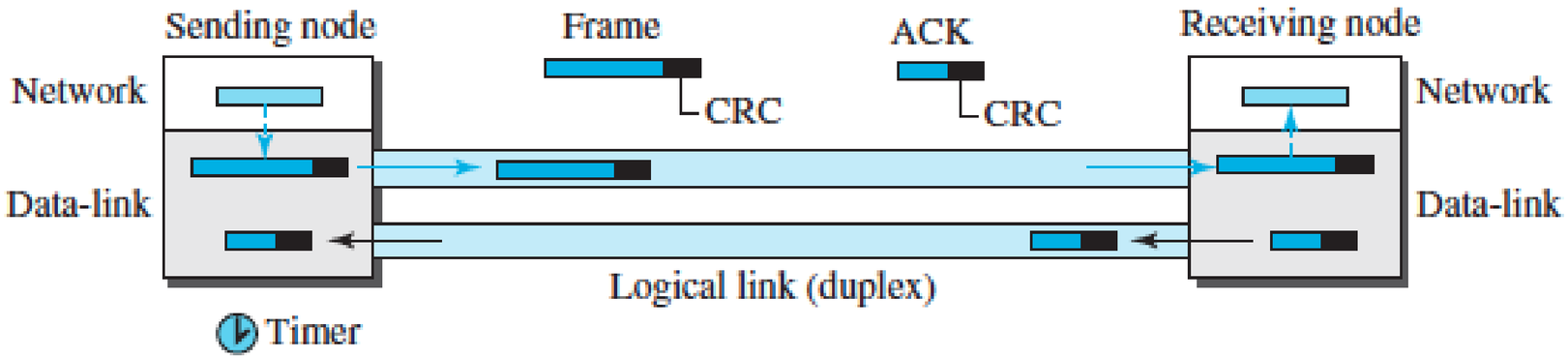
- Every time the sender sends a frame, it starts a timer. If an acknowledgment arrives before the timer expires, the timer is stopped and the sender sends the next frame.

- If the timer expires, the sender resends the previous frame, assuming that the frame was either lost or corrupted. This means that the sender needs to keep a copy of the frame until its acknowledgment arrives.

DLC Protocols

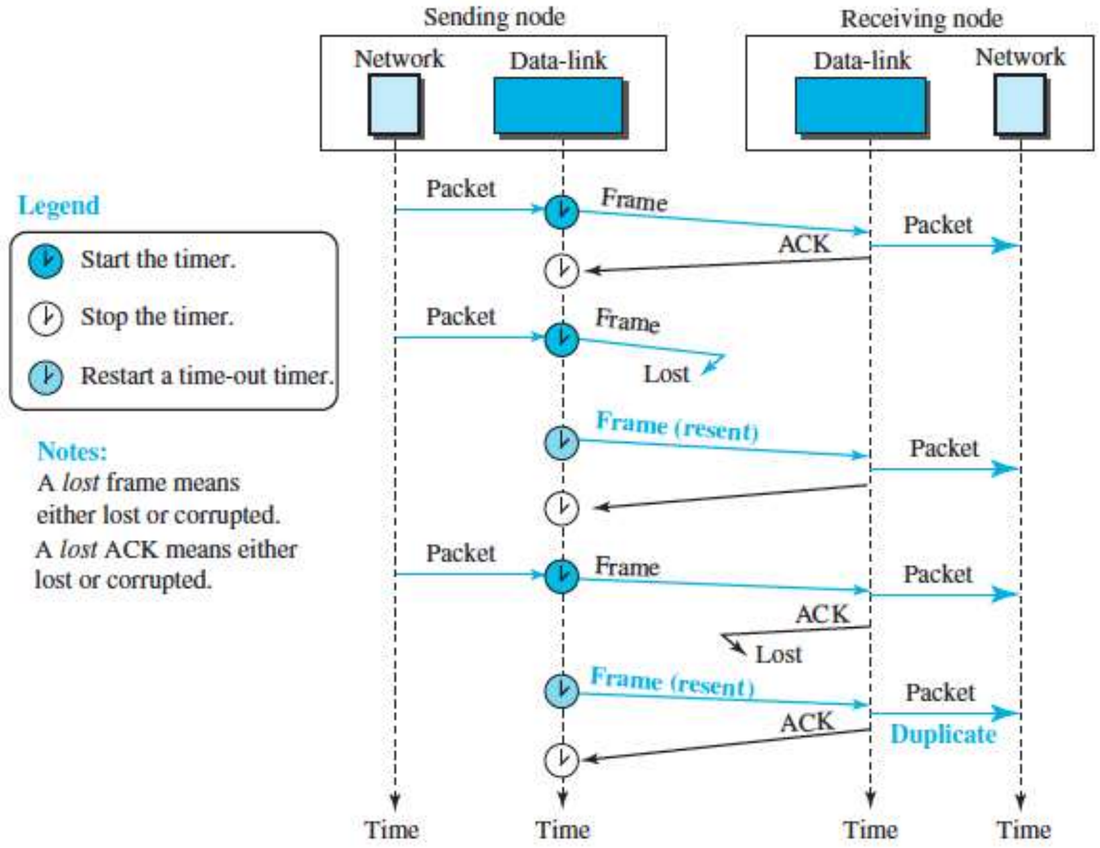
Stop-and-Wait Protocol

- When the corresponding acknowledgment arrives, the sender discards the copy and sends the next frame if it is ready.

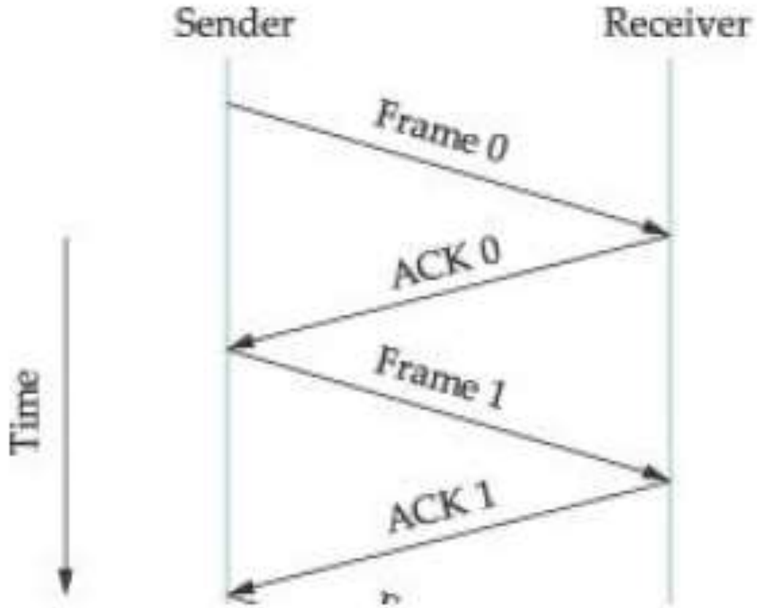


DLC Protocols

Stop-and-Wait Protocol



To address duplicate frames, the header for a stop-and-wait protocol includes a 1-bit sequence number (0 or 1)



DLC Protocols

Go Back N ARQ

- Several frames are sent before receiving acknowledgment. No. of frames that can be sent depends on the size of send window.

- Only one timer is used. When the timer for the first outstanding frame expires, all outstanding frames are resent.

- An acknowledgment number in this protocol is cumulative and defines the sequence number of the next packet expected. For example, if the acknowledgment number (ackNo) is 7, it means all packets with sequence number up to 6 have arrived, safe and sound, and the receiver is expecting the packet with sequence number 7.

Send Window

- The send window is an imaginary box covering the sequence numbers of the data packets that can be in transit or can be sent.

- In each window position, some of these sequence numbers define the packets that have been sent; others define those that can be sent. The maximum size of the window is 2m − 1,

DLC Protocols

Go Back N ARQ

Receive Window

- The receive window makes sure that the correct data packets are received and that the correct acknowledgments are sent. In Go-Back-N, the size of the receive window is always 1.

- The receiver is always looking for the arrival of a specific packet. Any packet arriving out of order is discarded and needs to be resent.

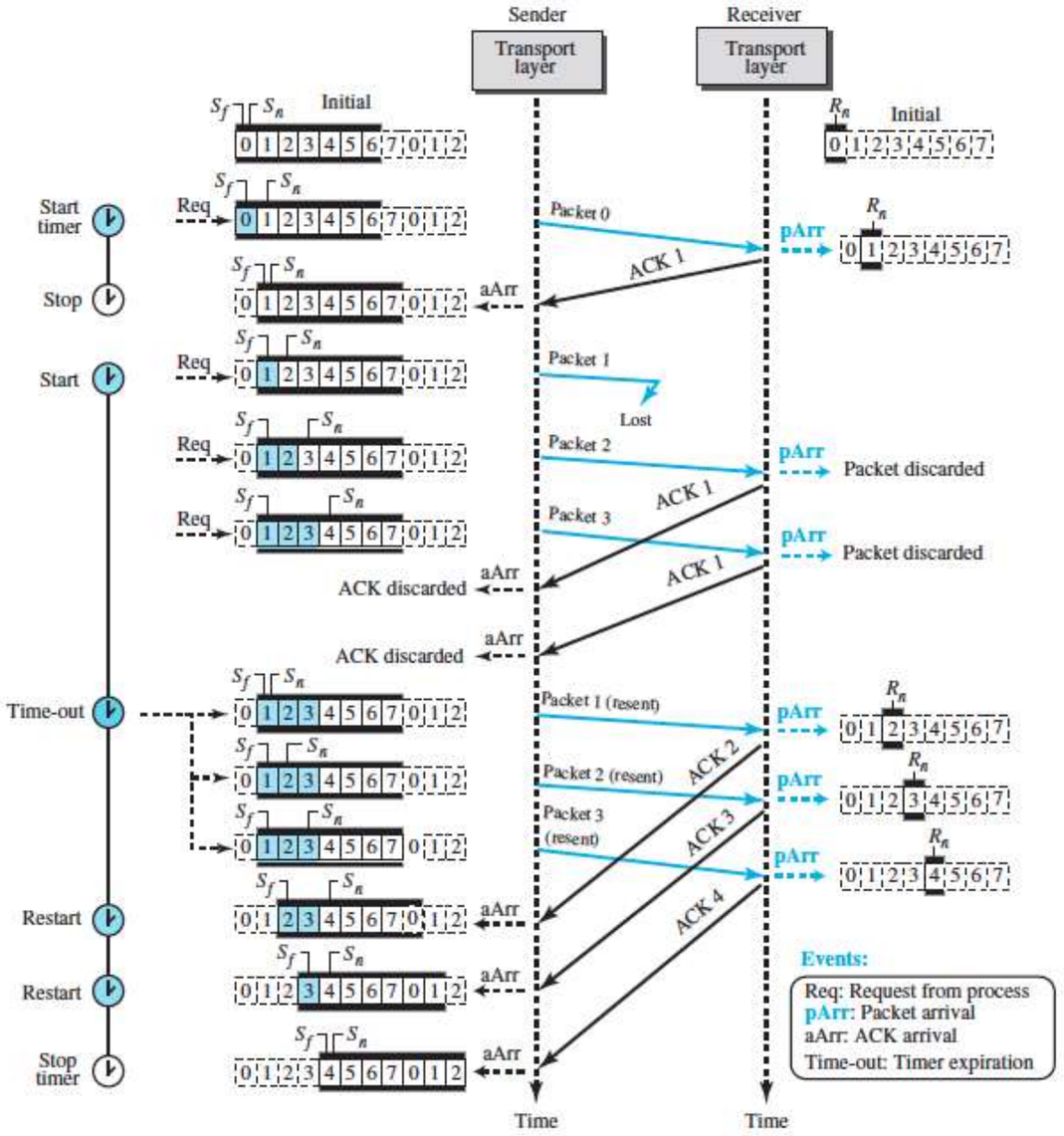
Disadvantage

- Each time a single packet is lost or corrupted, the sender resends all outstanding packets, even though some of these packets may have been received safe and sound but out of order.

- If the network layer is losing many packets because of congestion in the network, the resending of all of these outstanding packets makes the congestion worse, and eventually more packets are lost. This has an avalanche effect that may result in the total collapse of the network.

DLC Protocols

Go Back N ARQ



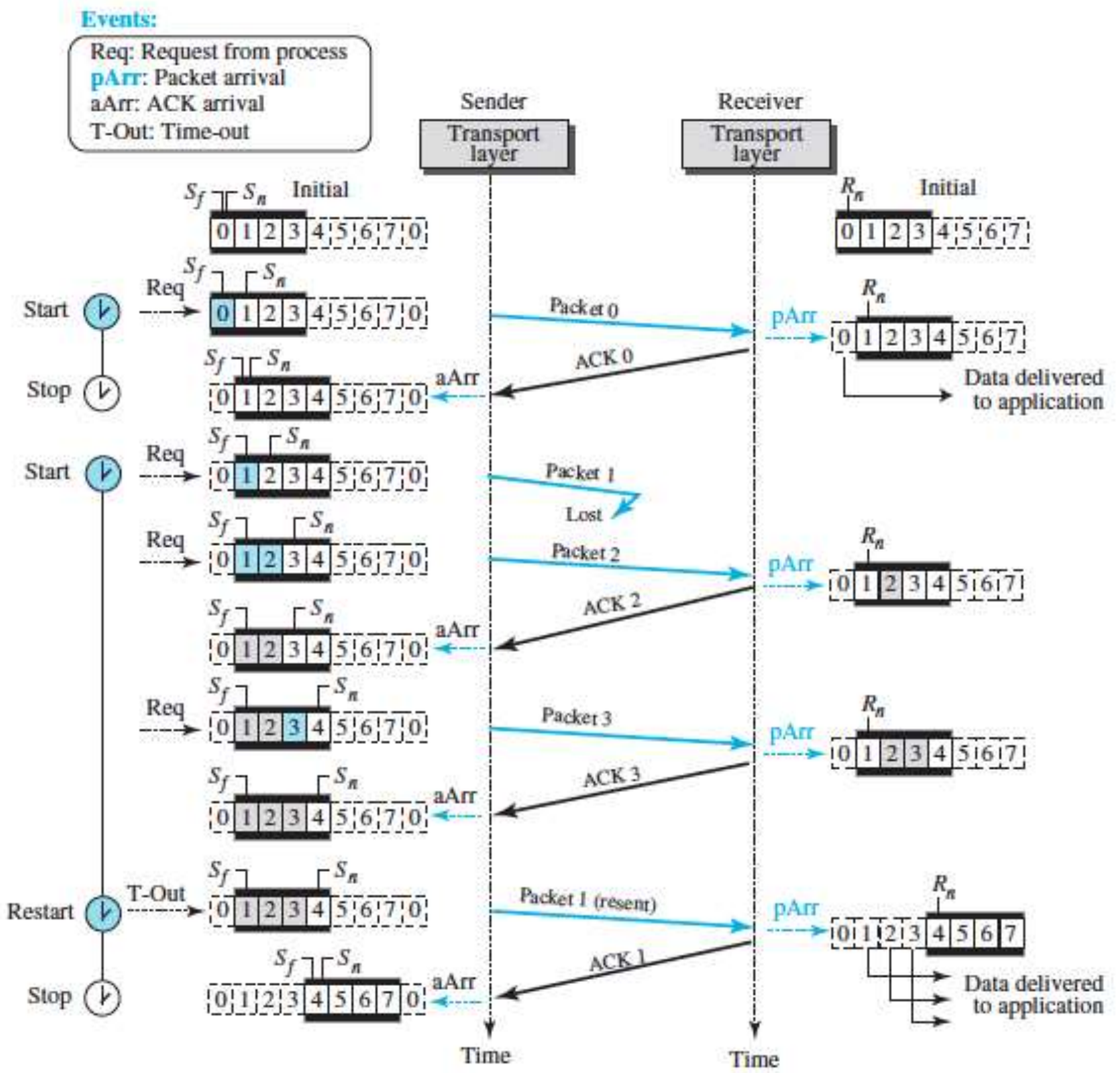
DLC Protocols

Selective Repeat ARQ

- Only the damaged/lost frame is resent. This is done by increasing the complexity at the receivers end.
- The Selective-Repeat protocol also uses two windows: a send window and a receive window. However, there are differences between the windows in this protocol and the ones in Go-Back-N .
- First, the maximum size of the send window is much smaller; it is $2^m - 1$. Second, the receive window is the same size as the send window.
- The Selective-Repeat protocol allows as many packets as the size of the receive window to arrive out of order and be kept until there is a set of consecutive packets to be delivered to the application layer.
- Theoretically, Selective-Repeat uses one timer for each outstanding packet. When a timer expires, only the corresponding packet is resent
- In SR, an ackNo defines the sequence number of a single packet that is received safe and sound; there is no feedback for any other

DLC Protocols

Selective Repeat ARQ



THANK YOU