RIZVI COLLEGE OF ENGINEERING

Department Of Computer Engineering

Subject : Computer Network (CSC503)

Semester V (R-2019)

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Module No : 3	Data Link Layer	8 Hrs
3.1	DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum) , Elementary Data Link protocols , Stop and Wait, Sliding Window(Go Back N, Selective Repeat)	
3.2	Medium Access Control sublayer Channel Allocation problem, Multiple access Protocol(Aloha, Carrier Sense Multiple Access (CSMA/CD)	

Course Outcome Covered : CO2 : Explore different design issues at data link layer.

- Books to be referred :
- B.A. Forouzan, Data Communications and Networking, 5th edition, TMH

- DLL Design Issues (Services, Framing, Error Control, Flow Control)
- **Design issues with data link layer are :**
1. **Services provided to the network layer:** The data link layer act as a service interface to the network layer. The principal service is transferring data from network layer on sending machine to the network layer on destination machine. This transfer also takes place via DLL (Data link-layer).
2. **Frame Synchronization :** The source machine sends data in the form of blocks called **frames** to the destination machine. The starting and ending of each frame **should be identified** so that the frame can be recognized by the destination machine

Flow control : Flow control is done to **prevent** the **flow** of data frame at the receiver end. The source machine **must not** send data frames at a rate faster than the capacity of destination machine to accept them.

Error control : Error control is done to **prevent duplication** of frames. The errors introduced during transmission from source to destination machines must be detected and corrected at the destination machine.

- **Data Link Layer Framing**
  - Data transmission associates' bits synchronized transmission through a source to a destination. This data link layer stores these bits into the frames.
  - **Frames Parts**
- A frame contains some parts which are mentioned as follows:
- **Flag:** It points to the starting and completion of the frame.
- **Trailer:** It includes the error correction and end detection bits.
- **Payload field:** It includes the messages to be rendered.
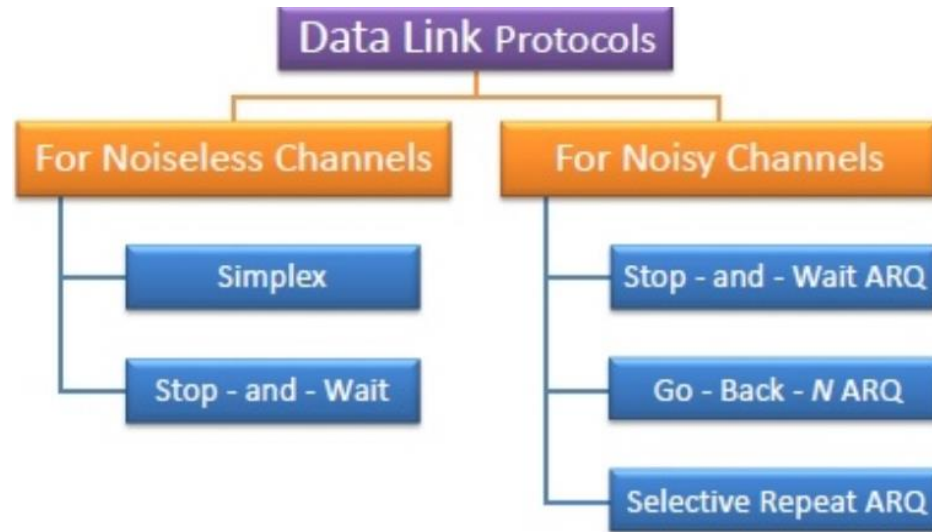- **Frame Header:** It includes the origin and the target addresses of a frame.

- **Frame Header**
- It includes the source address, destination address, and three of the main control fields such as **ack, seq,** and **kind**. These fields are discussed below:
- **ack:** It includes the acknowledgment number of a few frames when piggybacking is applied particularly.
- **seq:** It includes the sequence number of a frame for re-adjustment of various out-of-sequence frames. This field is also used for sending acknowledgments through the receiver.
- **kind:** It includes states whether a frame is any data frame or the frame is applied for many control functions such as link management or flow and error control etc.

- **Types of Data Link Protocols**
- Data link protocols can be broadly divided into two categories, depending on whether the transmission channel is noiseless or noisy.

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• Simplex Protocol

- The Simplex protocol is hypothetical protocol designed for unidirectional data transmission over an ideal channel, i.e., a channel through which transmission can never go wrong.

- It has distinct procedures for sender and receiver.

- The sender simply sends all its data available onto the channel as soon as they are available its buffer.

- The receiver is assumed to process all incoming data instantly. It is hypothetical since it does not handle flow control or error control

- **Stop – and – Wait Protocol**
- Stop – and – Wait protocol is for noiseless channel too.
- It provides unidirectional data transmission without any error control facilities.
- However, it provides for flow control so that a fast sender does not drown a slow receiver.
- The receiver has a finite buffer size with finite processing speed.
- The sender can send a frame only when it has received indication from the receiver that it is available for further data processing.

Stop – and – Wait ARQ

- Stop – and – wait Automatic Repeat Request (Stop – and – Wait ARQ) is a variation of the above protocol with added error control mechanisms, appropriate for noisy channels.

- The sender keeps a copy of the sent frame. It then waits for a finite time to receive a positive acknowledgement from receiver.

- If the timer expires or a negative acknowledgement is received, the frame is retransmitted. If a positive acknowledgement is received, then the next frame is sent.

Go – Back – N ARQ

- Go – Back – N ARQ provides for sending multiple frames before receiving the acknowledgement for the first frame.

- It uses the concept of sliding window, and so is also called sliding window protocol. The frames are sequentially numbered, and a finite number of frames are sent.

- If the acknowledgement of a frame is not received within the time period, all frames starting from that frame are retransmitted.