Data-Link Layer Protocols

Synchronous Data Link Protocol (SDLC) − SDLC was developed by IBM in the 1970s as part of Systems Network Architecture. It was used to connect remote devices to mainframe computers. It ascertained that data units arrive correctly and with right flow from one network point to the next.

High Level Data Link Protocol (HDLC) − HDLC is based upon SDLC and provides both unreliable service and reliable service. It is a bit – oriented protocol that is applicable for both point – to – point and multipoint communications.

Serial Line Interface Protocol (SLIP) − This is a simple protocol for transmitting data units between an Internet service provider (ISP) and home user over a dial-up link. It does not provide error detection / correction facilities.

Point - to - Point Protocol (PPP) − This is used to transmit multiprotocol data between two directly connected (point-to-point) computers. It is a byte – oriented protocol that is widely used in broadband communications having heavy loads and high speeds.

Link Control Protocol (LCP) − It one of PPP protocols that is responsible for establishing, configuring, testing, maintaining and terminating links for transmission. It also imparts negotiation for set up of options and use of features by the two endpoints of the links.

Network Control Protocol (NCP) − These protocols are used for negotiating the parameters and facilities for the network layer. For every higher-layer protocol supported by PPP, one NCP is there.

Elementary Data Link protocols are classified into three categories.

Protocol 1 − Unrestricted simplex protocol
Protocol 2 − Simplex stop and wait protocol
Protocol 3 − Simplex protocol for noisy channels.

Unrestricted Simplex Protocol

Data transmitting is carried out in one direction only. The transmission (Tx) and receiving (Rx) are always ready and the processing time can be ignored. In this protocol, infinite buffer space is available, and no errors are occurring that is no damage frames and no lost frames.

Simplex Stop and Wait protocol

In this protocol we assume that data is transmitted in one direction only. No error occurs; the receiver can only process the received information at finite rate. These assumptions imply that the transmitter cannot send frames at rate faster than the receiver can process them.

Step1 − The receiver send the acknowledgement frame back to the sender telling the sender that the last received frame has been processed and passed to the host.
Step 2 − Permission to send the next frame is granted.
Step 3 − The sender after sending the sent frame has to wait for an acknowledge frame from the receiver before sending another frame.
This protocol is called Simplex Stop and wait protocol, the sender sends one frame and waits for feedback from the receiver. When the ACK arrives, the sender sends the next frame.

"stop-n-wait" is **the fundamental technique to provide reliable transfer under unreliable packet delivery system**. After transmitting one packet, the sender waits for an acknowledgment (ACK) from the receiver before transmitting the next one.

Simplex Protocol for Noisy Channel

Data transfer is only in one direction, consider separate sender and receiver, finite processing capacity and speed at the receiver, since it is a noisy channel, errors in data frames or acknowledgement frames are expected. Every frame has a unique sequence number.
After a frame has been transmitted, the timer is started for a finite time. Before the timer expires, if the acknowledgement is not received , the frame gets retransmitted, when the acknowledgement gets corrupted or sent data frames gets damaged, how long the sender should wait to transmit the next frame is infinite.

Piggybacking

In two-way communication, whenever a frame is received, the receiver waits and does not send the control frame back to the sender immediately. The receiver waits until its network layer passes in the next data packet. The delayed acknowledgment is then attached to this outgoing data frame.