

Lecture 2

In this lecture we will discuss about the fabrication of LLC and MAC, and discuss in detail the operation of LLC. Prerequisite for studying LLC is HDLC.

The physical layer of the OSI model performs the following functions

- Encoding/Decoding of signals
- Preamble generation/removal for synchronization
- Bit transmission/reception
- Considers specification of the underlying transmission medium and topology

After the physical layer, we have data link layer. Functionality of data link layer is divided into two parts. One is **LLC** (Logical Link Control) and other is **MAC** (Medium Access Control).

Features of MAC

- On transmission, assemble data into frame with address and error-detection fields.
- On reception, disassemble frame, and perform address recognition and error-detection.
- Govern access to LAN configuration medium in case of multipoint configuration. This property is also called as 'Access Control'.

Features of LLC

- LLC provide an interface to higher layers and perform flow and error control.
- LLC specifies the mechanisms for addressing stations across the medium and for controlling the exchange of data between two users.

So after network layer, comes the LLC, which appends control information as a header, creating LLC protocol data unit (PDU). The entire LLC PDU is then passed down to the MAC layer, which appends control information at the front and back end of the packet, forming a MAC frame.

So we have to follow this terminology. From Transport layer to Network layer, data unit is passed, which is called as message or segment. From Network layer takes the segment and form the packets, and pass these packets to the data link layer, where these packets are made as frames, these frames are finally given to physical layer for transmission.

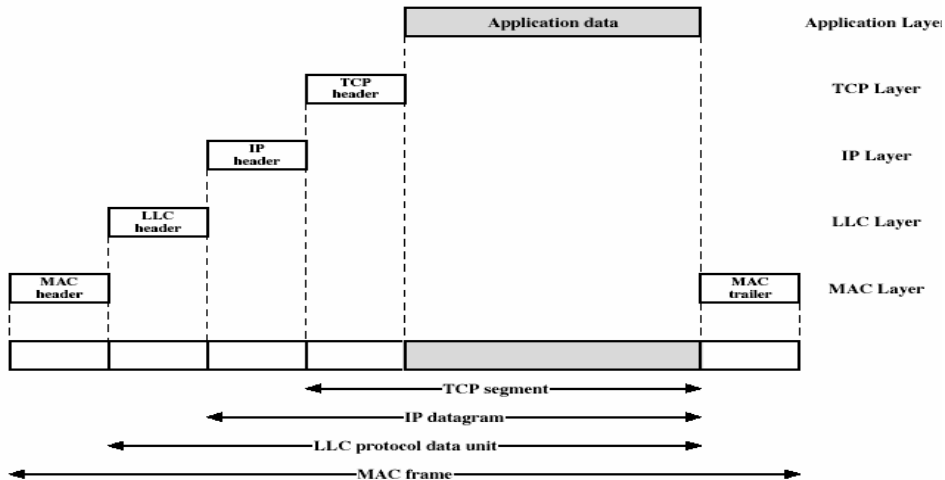
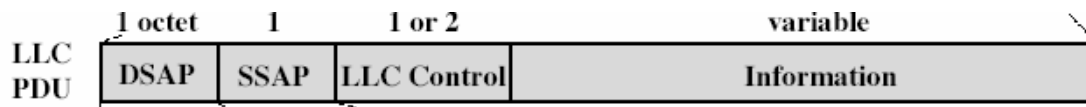


Figure 15.6 LAN Protocols in Context

LLC (Logical Link Control)

The operation and format of this standard is based on HDLC. For operation of HDLC refer to next lecture.

We will discuss about the LLC PDU, which consist of four fields



DSAP and SSAP: The DSAP and SSAP are addresses used by the LLC to identify the receiving and sending machines on the LAN. The first bit of the DSAP indicates whether the frame is intended for an individual or group. The first bit of SSAP indicates whether the communication is a command or response.

LLC Control: The control field of the PDU is identical to the control field in HDLC. As in HDLC, PDU frames can be I-frames, S-frames or U-frames and carry all of the codes and information that the corresponding HDLC frames can carry.

LLC Services

LLC specifies the mechanism for addressing stations across the medium and for controlling the exchange of data between the users. Three services are provided as alternatives for attached devices using LLC:

1. Unacknowledged connectionless service: This service is a datagram-style service. It doesn't involve any of the flow and error control mechanism. So delivery of data is not guaranteed. LLC uses the Unnumbered frame in PDU for unacknowledged connectionless service. Example: monitoring applications.
2. Connection-oriented service: This service is similar to that offered by HDLC. A logical connection is setup between two users exchanging data, and flow control, error control is provided. This is reliable service. An acknowledgment is expected after every transmission of data frame. LLC makes use of ABM operation of HDLC, to support connection-mode LLC service.

- (i) The LLC entity uses a Set Asynchronous Balanced Mode (SABM) PDU to request a logical connection with the other LLC entity.
 - (ii) If the connection is accepted is accepted by the user designated by the LLC user designated by the DSA, then the destination LLC user returns an UA frame.
 - (iii) The connection is henceforth uniquely identified by the pair of user SAP. In case the destination LLC user rejects the connection request, a DM (Disconnect Mode) PDU is sent.
 - (iv) Once the connection is established, data is exchanged using information PDU, as in HDLC.
 - (v) Either of the LLC user can disconnect the connection by issuing disconnect (DISC) PDU.
3. Acknowledged connectionless service: This is a hybrid form of above two services. It provides that datagrams are to be acknowledged but no prior logical connection is setup. LLC uses the Unnumbered frame in PDU for acknowledged connectionless service. Example: process control systems. For communication Acknowledged Connectionless (AC) I-frame PDU is defined. User data is sent in AC command PDU and must be acknowledged using an AC response PDU. To guard against lost PDU, a 1-bit sequence number is used. The sender alternates the use of 0 and 1 in its AC command PDU, and the receiver responds with an AC PDU with the opposite number of the corresponding command. Only one PDU in each direction may be outstanding at any time.

The frame format of LLC control field is as follows

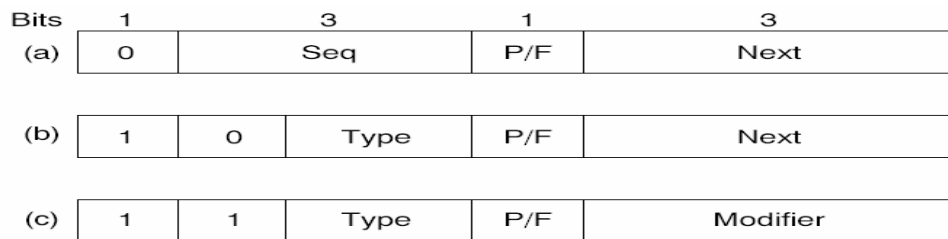


Fig. 3-25. Control field of (a) an information frame, (b) a supervisory frame, (c) an unnumbered frame.

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