# LAYERS OF X.25

The protocol known as **X.25** was developed by the organization now known as the International Telecommunications Union (ITU) and involves in the first three layers of the **OSI 7-layered architecture** as defined by the International Organization for Standardization (ISO) as follows:

## X.25 Physical Layer

- **The Physical Layer** is concerned with electrical or signaling. It includes several electrical standards like **X.21**.
  It always specifies the physical, electrical and procedural interface between the host and the network. It is the first step to get connected where X.21 creates an environment and establish a connection between DTE.

## X.25 Data link Layer

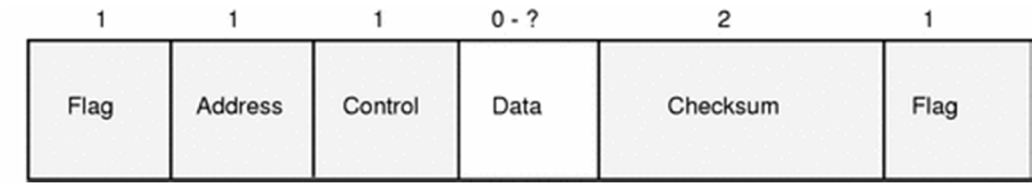
The **data link layer**'s role is to specify the link access procedure for the exchange of data across the physical link. This layer must ensure that all data transmitted at one end of a link reaches the other end intact.

This means for transmitting data, the data link layer must provide ways of telling whether data has reached its destination correctly, and retransmitting if it has not.

The X.25 Recommendation defines two possible data link layers: **LAP(**Link Access Procedure **) and LAPB(**Link Access Procedure Balanced**)**. In practice, LAP is rarely used. A Multilink Procedure (MLP) allows for multilink operations. It is used along with LAPB.

**Single Link Operations**
It shows the standard frame structure for a bit-oriented data link layer frame. The shaded parts are supplied by the data link layer. The Data field contains the data supplied by higher layer protocols. Sizes are given in octets

**Figure 2-4 Data link Layer Frame Structure**




Data link layer frames are structured as follows:

**Flag**

Frames are delimited at each end by a flag, with the value 01111110. This is necessary because X.25 is synchronous - in other words, data is transmitted as a continuous stream.

**Address**

This is one octet (8 bits). The value varies, depending on the direction of data flow, and on whether this is a single or multilink operation.

**Control**

The control octet define the type of frame this is: an **I (Information)**-frame containing data, a **S (Supervisory)**-frame, which is a response frame, or an **U(Unnumbered)**-frame, which performs control functions.

**Data**

The data field contains X.25 protocol information, as well as user data from higher layer protocols. A frame need not contain data.

**Checksum**

The two-octet checksum follows the data, and is derived from the contents of the data packet. It is usually generated automatically by the hardware.

## X.25 Network Layer

- **The Network Layer** that governs the end-to-end communications between the different DTE devices. Layer 3 is concerned with connection set-up and flow control between the DTE devices, as well as network routing functions and the multiplexing of simultaneous logical connections over a single physical connection.

X.25 permits a DTE user on an **X.25 network** to communicate with a number of remote DTE's simultaneously. Connections occur on logical channels of two types:

- **Switched virtual circuits** (**SVC**'s) – SVC's are very much like telephone calls; a connection is established, data are transferred and then the connection is released. Each DTE on the network is given a unique DTE address which can be used much like a telephone number.
- **Permanent virtual circuits** (**PVC**'s) – a PVC is similar to a leased line in that the connection is always present. The logical connection is established permanently by the Packet Switched Network administration. Therefore, data may always be sent, without any call setup.

To establish a connection on an SVC, the calling DTE sends a **Call Request** Packet, which includes the address of the remote DTE to be contacted.

The destination DTE decides whether or not to accept the call (the Call Request packet includes the sender's DTE address, as well as other information that the

called DTE can use to decide whether or not to accept the call). A call is accepted by issuing a **Call Accepted** packet, or cleared by issuing a **Clear Request** packet.

Once the originating DTE receives the Call Accepted packet, the virtual circuit is established and data transfer may take place. When either DTE wishes to terminate the call, a **Clear Request** packet is sent to the remote DTE, which responds with a **Clear Confirmation** packet.
The destination for each packet is identified by means of the **Logical Channel Identifier** (**LCI**) or **Logical Channel Number** (**LCN**). This allows the PSN to route the each packet to its intended DTE.