UNIT 4

Data Transmission Networks I

Telephone networks:

- **Dial up Telephone networks**
- **Leased Line**
- **X.25**

The Integrated Services Digital Network (ISDN):

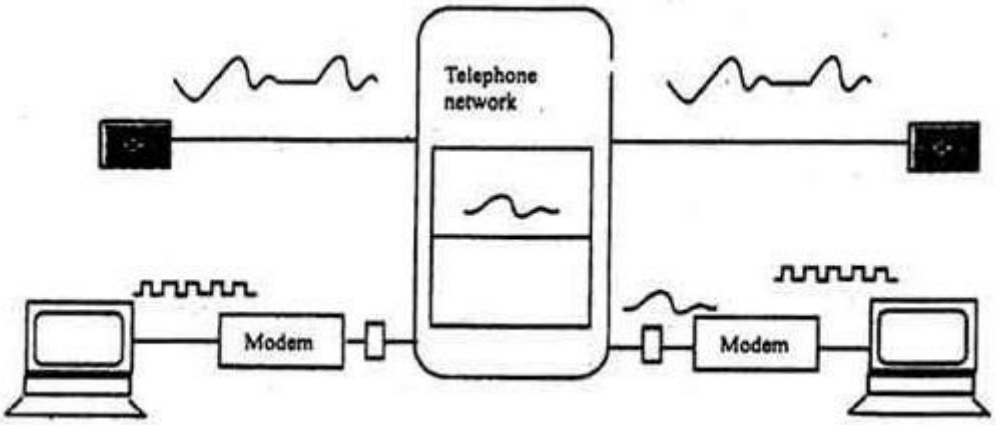
- **Narrow band ISDN**
- **Broadband ISDN Service**

Telephone networks

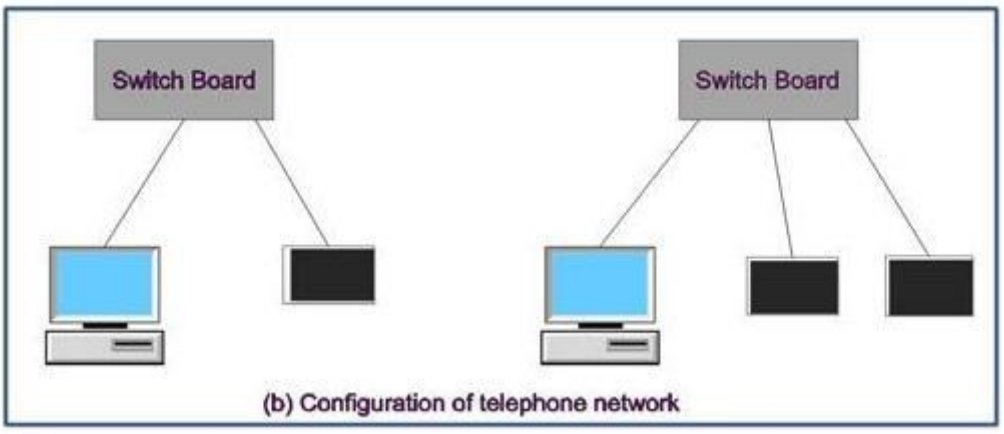
- The earliest electronic network is the telephone system.
- This telephone network commonly uses analog technology that was quite different from digital technology used in the computer-based networks.
- The advantages of digital technology over the analog technology in terms of economics and services forced the telephone industry to move rapidly to install fiber and digital networks.
- The telephone network transmits analog signals and hence a modem is required whenever a computer or terminal is connected to the telephone line.
- The modem then converts digital data from a computer to an analog signal that can be transmitted via a telecommunication line and converts the analog signal received to computer data

Dial up Telephone networks

- The telephone network consists of the subscriber's line, switchboards, and trunk lines.
- Each subscriber line has an address, i.e. telephone number.
- When a caller transmits a dial signal to the switchboard, the switchboard connects the caller's subscriber line to that of the receiver, enabling communication.
- The trunk line between the caller and the receiver is occupied until either discontinues the communication.
- When the telephone system is to connect with a network, it becomes necessary to dial the telephone number to select the target device on the network.
- A device called Network Control Unit (NCU) performs this, and most of the available modems, include this NCU.



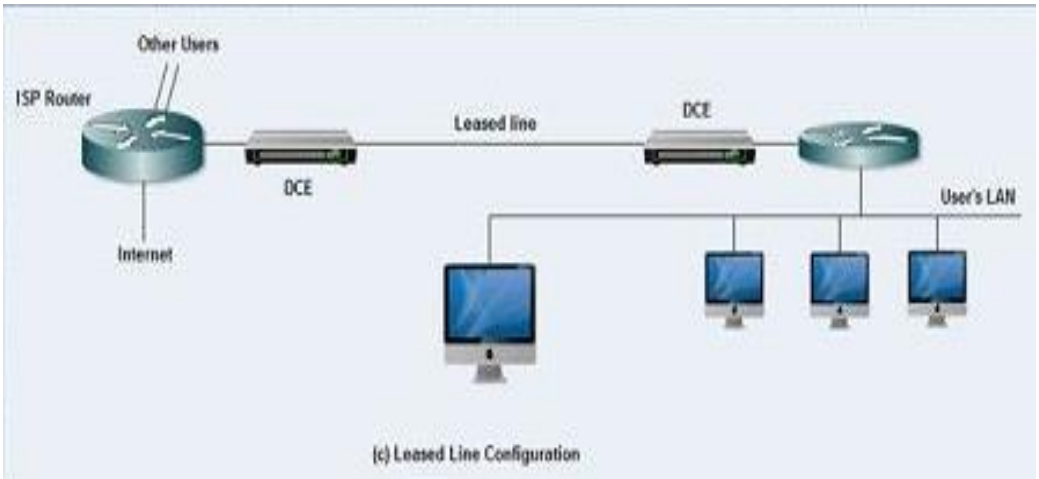
(a). Telephone network



(b) Configuration of telephone network

Leased Line

- A computer can be connected permanently to the Internet using leased lines in addition to a modem and router.
- These lines are based on speed of the connection, installation cost, and recurring monthly charges.
    - An example of usage of leased line is a system in which only one terminal is connected to the host computer.
    - Though multiple computers/terminals using multiplexing can be connected to one system via a single leased line.
    - It uses FDM for an analog leased line or TDM method for digital leased line.
    - DSU (Digital Service Unit) unit is used instead of modem for digital line.
    - Leased lines may also be used to Connect LANs.



X.25

- X.25 **is** a standard used by many older **public** networks especially outside the U.S.
- X.25 was developed **for** computer connections, used **for** terminal/timesharing connection
- It allows the user to establish virtual circuits and send packets on them. These packets are delivered to the destination reliably and in order
- • X.25 is a connection-oriented service. It supports switched virtual circuits as well as the permanent circuits
- X.25 provides the flow control, to avoid a fast sender overriding a slow or busy receiver.

Three Layers of X.25:

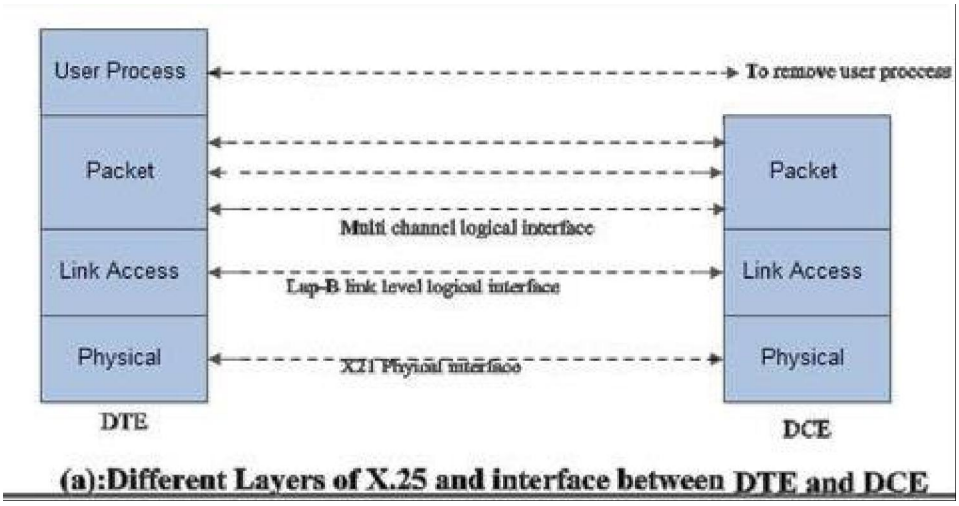
The X.25 interface is defined at three levels:

The three levels are:

(i) Physical layer (level 1)

(ii) Data link layer (level 2)

(iii) Packet layer (level 3).



(a):Different Layers of X.25 and interface between DTE and DCE

The Integrated Services Digital Network (ISDN)

- **Integrated Services Digital Network (ISDN)** is a set of ITU standards for digital transmission over ordinary telephone copper wire as well as over other media.
- This technology uses ISDN adapters in place of modems and provides very fast speed up.
- ISDN requires adapters at both ends of the transmission.
- ISDN is a network architecture in which digital technology is used to convey information from multiple networks to the end user. This information is end-to-end digital.

There are two forms of ISDN service:

- Narrow band ISDN
- Broadband ISDN Service

Narrow band ISDN

- Narrow band ISDN is digital service where the transport speeds are 1.544 Mbps (TI) or less.
- Narrow band ISDN provides for the following services:
    - Circuit Switched Voice
    - Circuit Switched Voice
    - High speed data
    - Low speed data

Broadband ISDN Service

- Broadband ISDN Service is a digital service in excess of 1.544 Mbps.