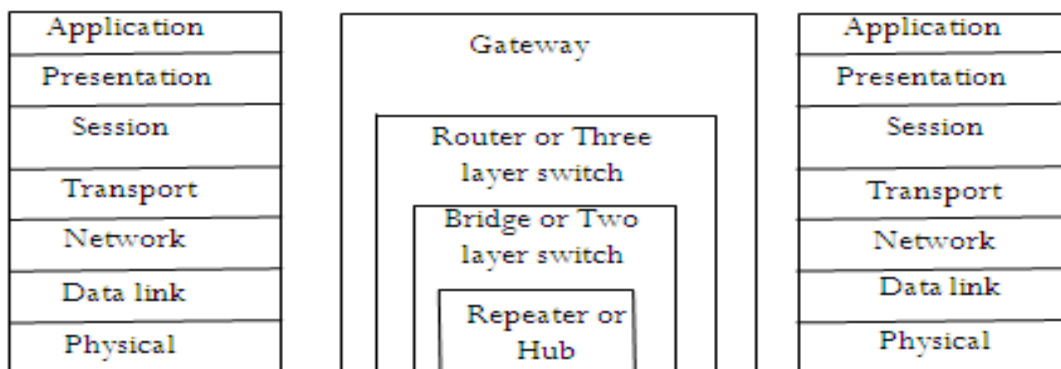


## UNIT - III

### **⌘ COMMON NETWORK CONNECTIVITY DEVICES:-**

- Two or more devices connected for the purpose of sharing data or resources can form a network.
- In the first case, a device called a repeater or re-generator is inserted into the network to increase the coverable distance.
- In the second, a device called a bridge is inserted for traffic management.
- An internet is an interconnection of individual networks. To create an internet, routers and gateways.
- Networking & Internetworking devices are divided into four categories: Routers, Bridges, Repeaters and Gateways.
- There are five kinds of connecting devices: Repeaters, Hubs, Bridges and two or three layer switches.
- Fig, Connecting devices and the OSI model



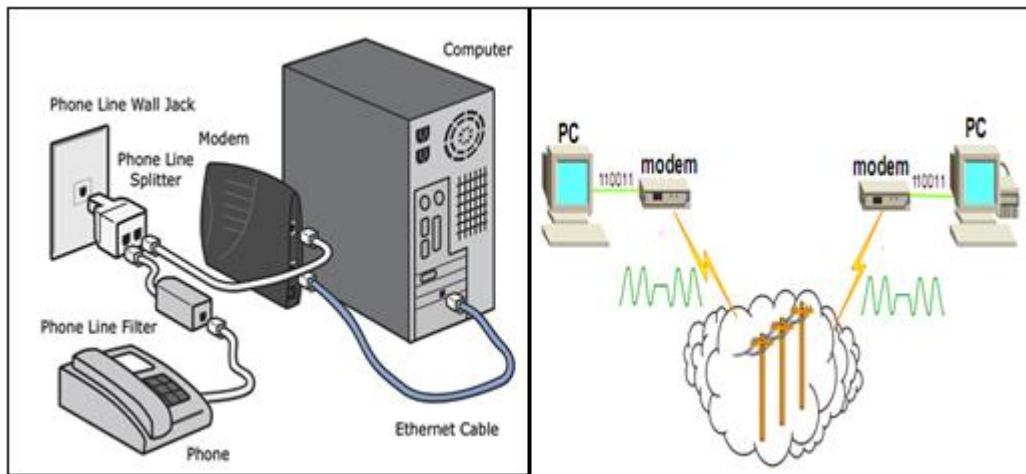
### **⌘ DATA COMMUNICATION COMPONENTS:-**

- |          |             |               |
|----------|-------------|---------------|
| 1) MODEM | 2) ROUTERS  | 3) BRIDGES    |
| 4) HUBS  | 5) SWITCHES | 6) REPEATERS. |

## 1) MODEM: (Modulator and Demodulator)

The telephone system is working on an analog signaling and our computer is working on a digital signal.

- We want to transmit a digital data of the computer on telephone system then, it is necessary to convert the digital data into analog form.
- A modem is communication device that convert your binary signal into analog signal and analog signal to binary signal for transmission over the telephone lines.
- MODEM stands for Modulation and Demodulation.
- A conversion from binary to analog signal is known as **Modulation**.
- The reverse conversion i.e. from analog signal to binary signal is known as **Demodulation**.
- When you connect your telephone to computer that time you must require a modem for internet.
- You can use an internal as well as external modem to connect computer to telephone for internet.
- **Fig. MODEM**



- A modem permits your computer to connect to and communicate with the rest of the world.

### 1) ***Internal Modem:***

- The internal one is installed inside of your PC (you must remove screws, etc. to install it).

### 2) ***External Modem:***

- An external one just plugs in to a cable: USB cable (USB modem) or to the serial port (RS-232 serial modem).

## 2) ROUTER

- An internetworking device operating at the first three (Physical, Data link & Network layer) OSI model.
- A router is attached to two or more networks and forwards packets from one network to another network.
- Routers are devices that connect to more networks they consist of a combination of hardware (h/w) and software (s/w).
- The main function of routers, it should follow the shortest, fastest route.
- The hardware includes the physical interfaces.
- Routers relay packets among multiple interconnected networks.
- **Fig :- Routers**

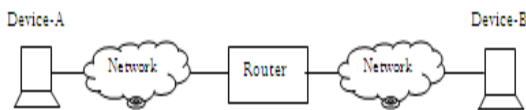
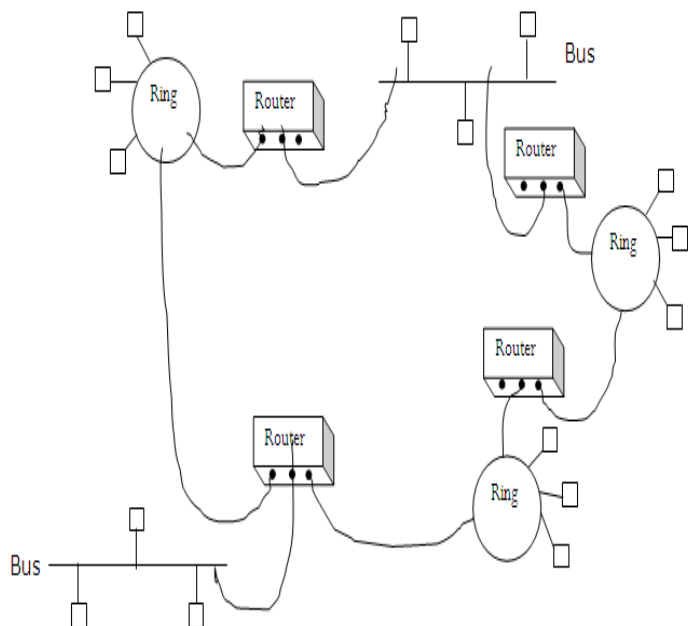


Fig: shows a possible internet work of five networks.

- A packet sent from a station on one network to a station on a neighboring networks goes first to the jointly held router, it over to the destination.
- If there is no one router connected to both the sending and receiving networks, the sending router transfer the packet across one of its connected networks to the next router in the direction of the ultimate destination.



### **Routing is classified as Non-adaptive or Adaptive routing:-**

#### **1. Non-adaptive Routing:-**

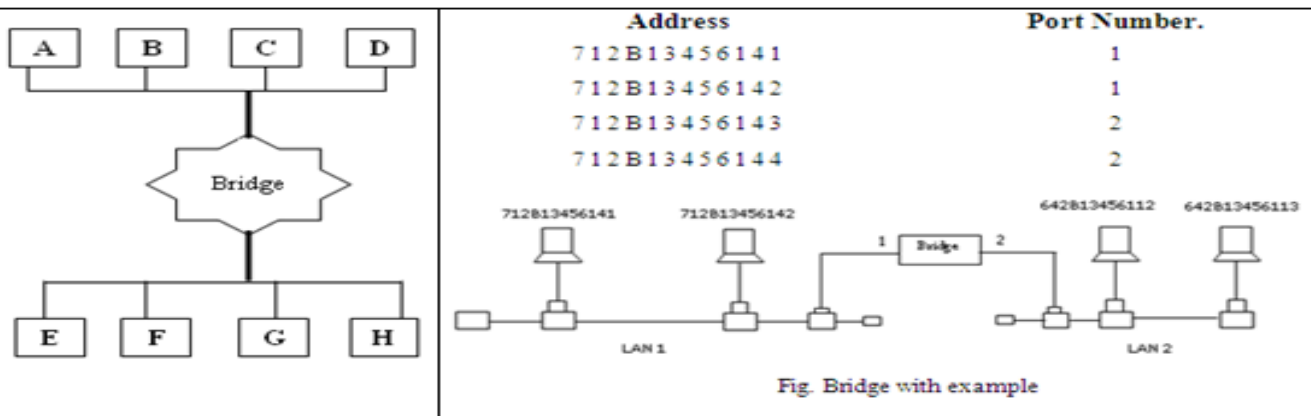
- In some routing protocols, once a pathway to a destination has been selected, the router sends all packets for that destination along that one route.
- In short, the routing decisions are not made based on the condition or topology of the networks.

#### **2. Adaptive Routing:-**

- Other routing protocols employ a technique called adaptive routing by which a router may select a new route for each packet in response to changes in condition & topology of the networks.
- The routing table contains the all network addresses and passive paths.

### 3) BRIDGES

- Bridge is a data communication devices it s used for to communication between more the one networks.
- Bridge is a network device operating at the first two layers (Physical and Data Link Layer) of the OSI model with filtering and forwarding capabilities.
- As a Data Link Layer device, the Bridge can check the physical (MAC) addresses (Source and destination) contained the frame.
- A Bridge operates at the Data Link layer giving it access to the physical address of all stations connected to it.
- Fig. Bridge.



#### TYPES OF BRIDGES:-

##### **TRANSPARENT BRIDGE:-**

- A transparent or learning, bridge its table of station addresses on its own as it performs its bridge functions.
- A transparent bridge can forward and filter frames, automatically build its forwarding table.

##### **SPANNING TREE BRIDGE:-**

- A spanning tree is a graph which there is no loop.
- So to avoid the loop problem in transparent bridges use the spanning tree algorithm through one path only (no loop).

##### **REMOTE BRIDGES:-**

- Another solution to prevent loops in LANs connected by bridge is source routing.
- In this method, the frame contains not only the source and destination address but also the addresses of all the bridges to be visited.

##### **MULTIPOINT BRIDGE:-**

- A Multiport bridge can be used to connect more than two LANs; the bridge has three tables, each one holding the physical address of stations reachable through the corresponding port.

## 4) HUB

- A Hub is a Central device in a star topology that provides a common connection among the nodes.
- Hub is a central point in a network.
- A Hub is actually a multi port repeater.
- Hubs can be used to connect multiple segments (nodes) of the same network and transfer data from one segment to another segment.
- In a network a Hub acts as a central point for various devices such as computer, printers and routers.
- Hubs can increase network traffic because they broadcast data to the device connected on all the ports.
- Fig. HUB.



### **TYPES OF HUB**

- 1. Passive HUB**
- 2. Active HUB**
- 3. Intelligent HUB (or Manageable HUB)**

#### **1. Passive HUB:-**

- A Passive Hub does not regenerate or amplify the signal. It only acts as an interface between two segments of a network or between different computers in a network.
- A passive hub is used when the network is divided into multiple segments but the segments are sufficient close to prevent signal attenuation.
- A passive hub generally does not require electrical power.

#### **2. Active HUB:-**

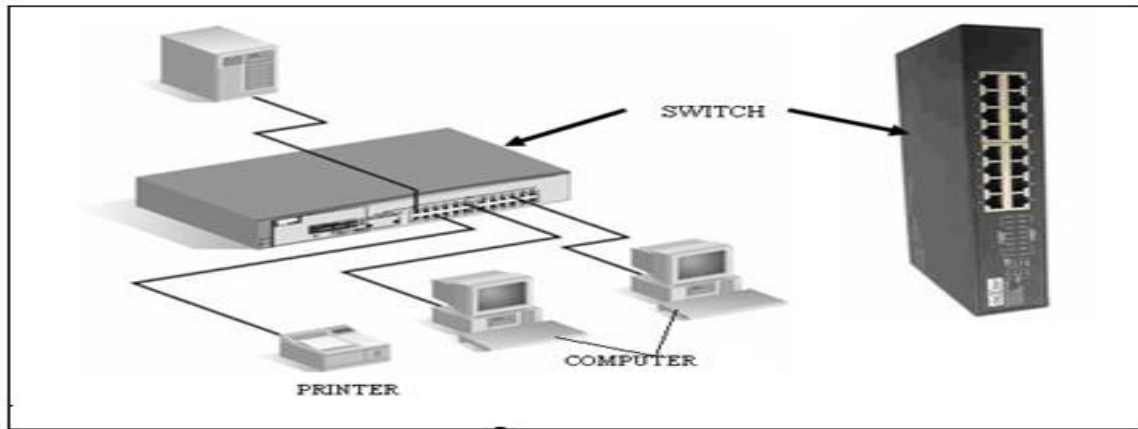
- Active hub can re-generate the signal to its original strength.
- Active hubs are the most common type of hubs used in the networks.
- Active hubs must require Electrical Power.
- Active hubs are useful when the segment of the network are not close to one another and the network are may require amplification.

#### **3. Intelligent Hub (or Manageable Hub):-**

- It does not require the whole instruction. Some instruction it take automatically.
- An Intelligent (Manageable hub) is an active hub with additional features such as network monitoring capabilities.
- An Intelligent (Manageable Hub) supporting SNMP (Simple Network Management Protocol) can provide information about such things as activity on each port or network error logs.

## 5) SWITCHES

- Switch acts as a central point for various devices such as computers, printers and routers.
- Switch also connects computers in a network or different segments of the same network like Hub.
- Fig. Switches.



- The two-layer switch performs at the physical and data link layer in OSI model.
- A three layer switch is used at the network layer; it is a kind of router.
- Switches treat data in the form of frames and the data frame contains the MAC address of Ethernet for the destination computer.
- Switches can maintain a list of MAC address and the port number associated with each MAC address.

### SWITCH TRANSMITTED METHODS: -

There are two methods used for data transmitted.

- 1) **Store and forward switching**
- 2) **Cut through switching**

#### 1) Store and forward switching:-

- A store and forward switching ensures that corrupt frames are dropped and only error-free data is forwarded.
- Disadvantage:-
- This switching is slower than cut through switching because each frame is checked for integrity and error-free data is forwarded only after the switch receive all the frames data.

#### 2) Cut-through switching:-

- In this method the switch reads the destination MAC address of data frame and immediately forwards the frame to the respective port.
- Advantage:- The switch forwards the frame as soon as it receive the frame and so the data transfer rate is not affected.

## **TYPES OF SWITCHES:-**

There are many types of switch used.

### **1. SIMPLE SWITCH:-**

- A simple switch is a device with  $n$  inputs and  $m$  outputs that creates a temporary connection between input link and output link.

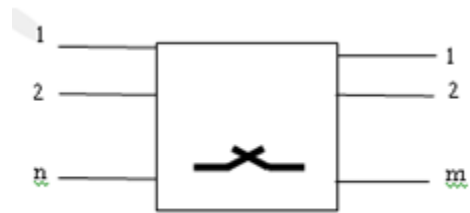


Fig. Simple Switch

### **2. A FOLDED SWITCH:-**

- An  $n$  by  $n$  folded switch can connect  $n$  lines in full-duplex mode.

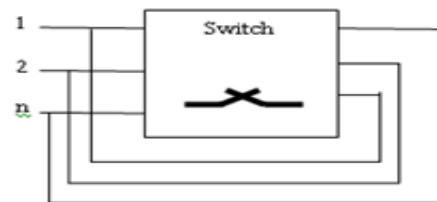


Fig. Folder Switch

### **3. CROSS BAR SWITCHES:-**

- A cross bar switch connects  $n$  inputs to  $m$  outputs in a grid using electronic micro switches (transistors) at each cross point.

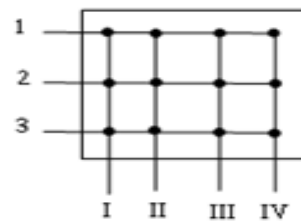
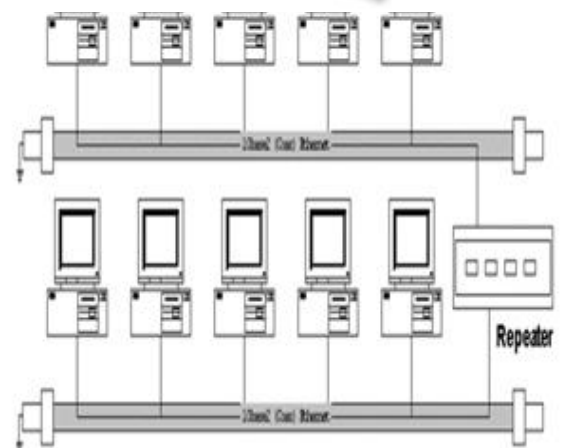


Fig. Cross Bar Switch

## **6) REPEATER**

- A repeater is a device that operates only in the physical layer.
- The function of the repeater is to regenerate the weak signal back to its original signal.
- A repeater installed on a link receives the signal before it becomes too weak or corrupted. So regenerates the original bit pattern and puts the re-freshed copy back onto the link.
- Repeater is one example of an active hub. Repeaters are devices that can receive signals, strengthen and sends the signal back to another place. So that the signal can reach more remote areas



## **Data Link Protocols:-**

Protocol refers to set rules or conventions for executing a particular task.

**- Asynchronous Protocol:** - Asynchronous transmission a data unit is transmitted with no timing coordination between the sender and receiver.

A number of Asynchronous Data Link protocols have been developed over the last several decades.

There is many types of protocols use asynchronous protocol.

**X modem, Y modem, Z modem, BLAST, Kermit**

### **XMODEM**

In 1979 Ward Christiansen designed a file transfer protocol for telephone-line communication between PCs.

### **YMODEM**

Y MODEM is a protocol similar to XMODEM,

### **ZMODEM**

Z MODEM is a newer protocol combining features of both XMODEM and YMODEM.

### **BLAST**

**Blocked Asynchronous transmission** (BLAST) is more powerful than XMODEM. It is full-duplex with sliding window flow control. It allows the transfer of data and binary files.

### **Kermit**

Kermit, designed at Columbia University, is currently the most widely used Asynchronous protocol.

**Synchronous Protocols:-** Character-Oriented(Byte Oriented) Protocol and Bit-Oriented protocol

### **Character-Oriented (Byte Oriented) Protocol:-**

Character oriented protocol is also called Byte oriented protocol.

Byte-oriented framing protocol is "a communications protocol in which full bytes are used as control codes. Also known as character-oriented protocol."

The character-oriented protocol is depends the binary code of a character set.