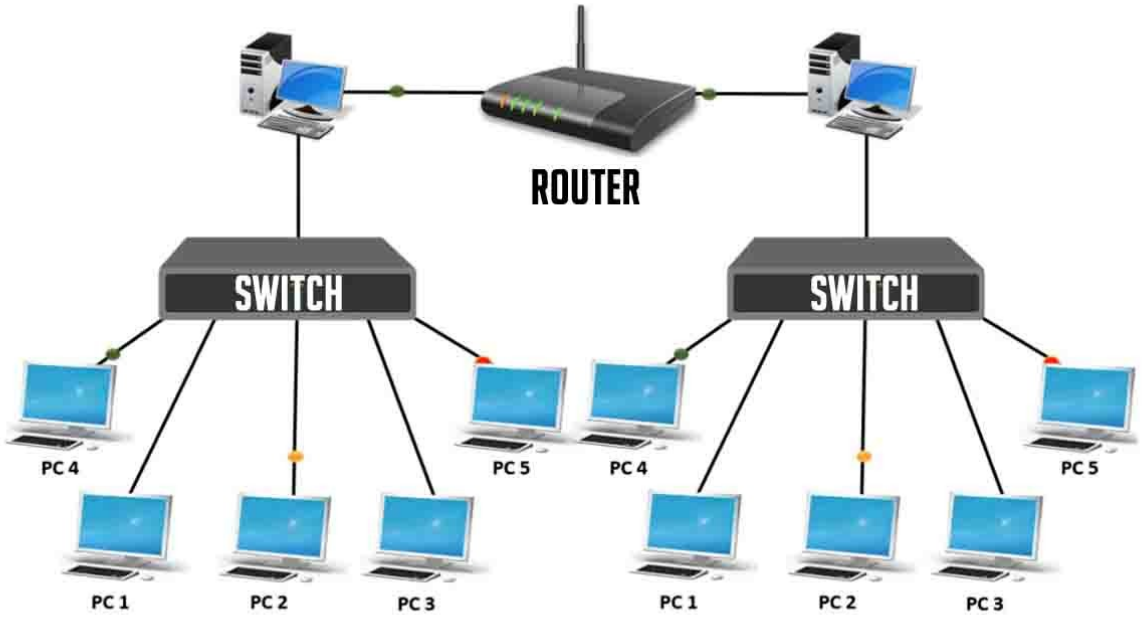
LAN

1)Local area network is a group of computers connected with each other in a small places such as school, hospital, apartment etc.

2)LAN due to their small size are considerably faster, their speed can range anywhere from 100 to 100Mbps. It uses HDLC(High Level Data Link Control) Prtocol.

3)Works on IEEE-802.11.

Layer 1 (Network Access): Also called the Link or Network Interface layer.



4)A LAN comprises cables, access points, switches, routers

routers: (1) the creation and maintenance of a local area network (2) the management of data that enters and leaves a network along with the data that moves inside of the network.

It has a speed limit of about 1-10 Mbps (Megabytes per second) for wireless connection and 100 Mbps in case of a wired connection.

A router stores IP addresses

A typical router can easily operate at the third layer (Network) in an OSI model.

It is a networking device with 2/4/8 ports.

A port is a physical docking point using which an external device can be connected to the computer.

Switches: A network switch is basically a computer networking device that helps in connecting multiple devices on one computer network.

It has a speed limit of about 10/100 Mbps.

A switch stores MAC addresses

The switches in a network operate at the second layer (Data Link Layer) in an OSI model.

It is a type of multi-port bridge with 24/48 ports.

Access Points: An Access point in networking, receive and transmit the data packets between different end devices.

5) Ethernet,Token ring,Token Bus are different types of LANs.

Ethernet Cable: An ethernet cable allows the user to connect their devices such as computers, mobile phones, routers, etc.; to a network that will allow a user to have internet access

Types of Ethernet Cables:

Mainly there are three types of ethernet cables used in LANs i.e., Coaxial cables, Twisted Pair cables, and Fiber optic cables.

1)Coaxial Cables :

A coaxial cable is used to carry high-frequency electrical signals with low losses.
It uses 10Base2 and 10Base5 Ethernet variants.
Its maximum transmission speed is 10 Mbps. It is usually used in telephone systems, cable TV, etc.

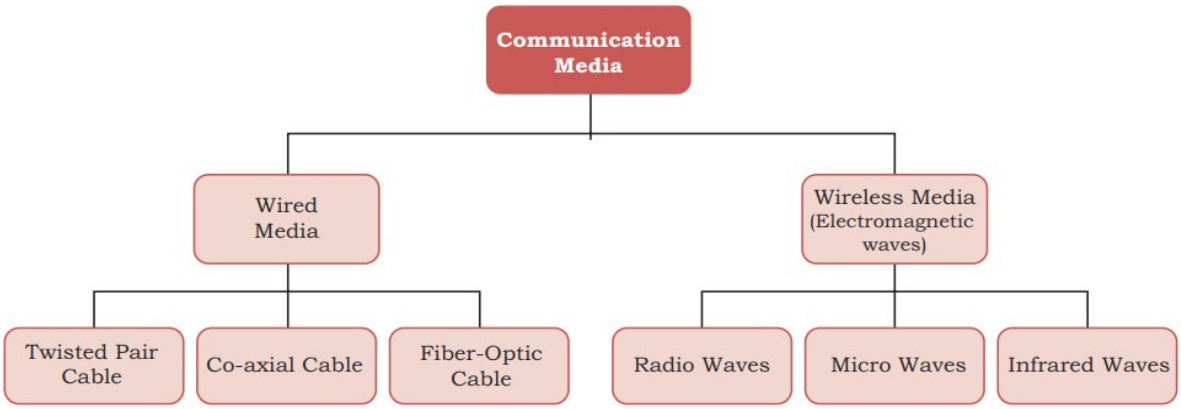
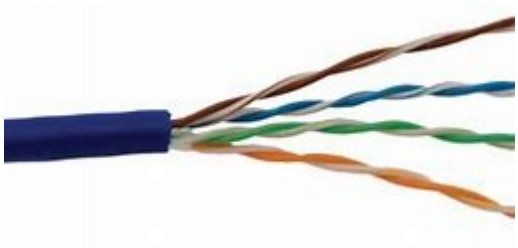


Figure 11.7: Classification of communication media

2)Twisted Pair:

Twisted pair is a copper wire cable in which two insulated copper wires are twisted around each other to reduce interference or crosstalk.
It uses 10BASE-T, 100BASE-T, and some other newer ethernet variants. It uses RJ-45 connectors.



Types of twisted pair cable:

- Shielded Twisted Pair (STP) Cable:they are used for longer distances and higher transmission rates.

- Unshielded Twisted Pair (UTP) Cable:UTP consists of two insulated copper wires twisted around one another, the twisting of wires helps in controlling interference.

3)Fiber Optic Cable:

Fiber optic cables use optical fibers which are made of glass cores surrounded by several layers of cladding material usually made of PVC or Teflon, it transmits data in the form of light signals due to which there are no interference issues in fiber optics

Fiber optics can transmit signals over a very long distance as compared to twisted pairs or coaxial cables

It uses 10BaseF, 100BaseFX, 100BaseBX, 100BaseSX, 1000BaseFx, 1000BaseSX, and 1000BaseBx ethernet variants. Hence, it is capable of carrying information at a great speed.

IP

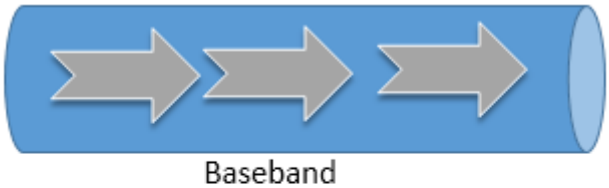
MAC vs IP address

MAC address	IP address
Functions at data link layer	Functions at network layer
It is a physical address	It is a logical address
It is fixed	It changes with the relocation of device from one network to another
It is a 48 bit address	It is a 32 bit address

address and Mac Address:

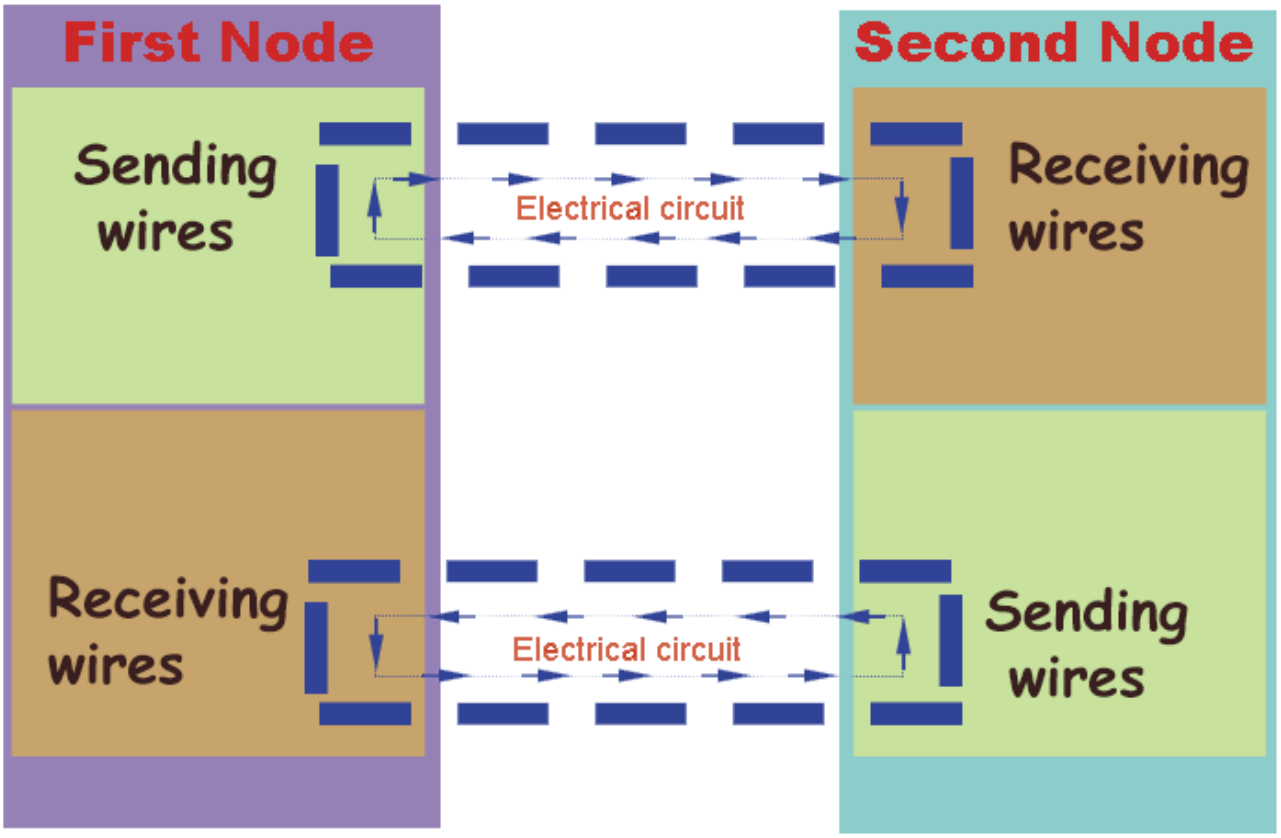
Baseband Vs Broad Band:

Baseband transmission	**Broadband transmission**
Transmit digital signals	Transmit analog signals
To boost signal strength, use repeaters	To boost signal strength, use amplifiers
Can transmit only a single data stream at a time	Can transmit multiple signal waves at a time
Support bidirectional communication simultaneously	Support unidirectional communication only
Support TDM based multiplexing	Support FDM based multiplexing
Use coaxial, twisted-pair, and fiber-optic cables	Use radio waves, coaxial cables, and fiber optic cables



Baseband

Broadband



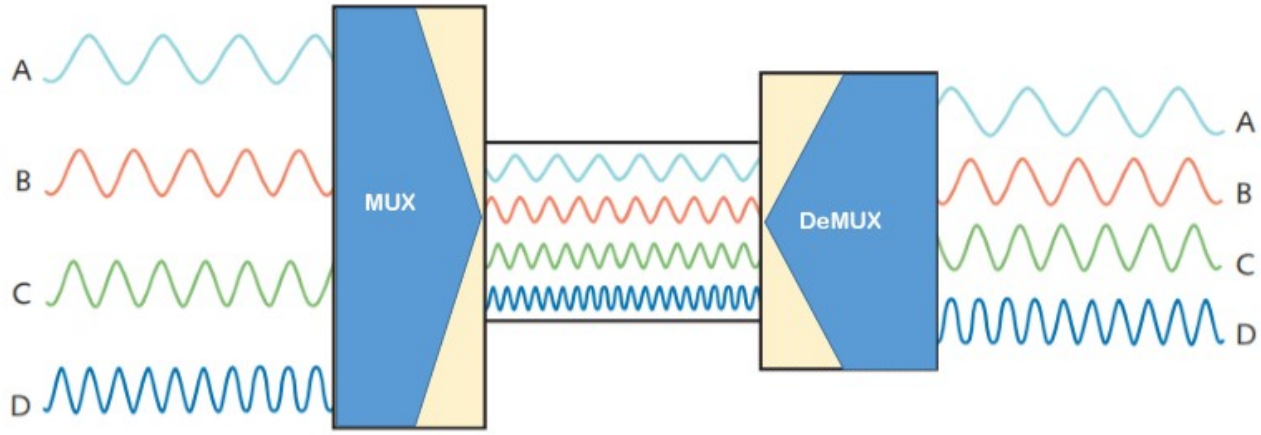
Baseband

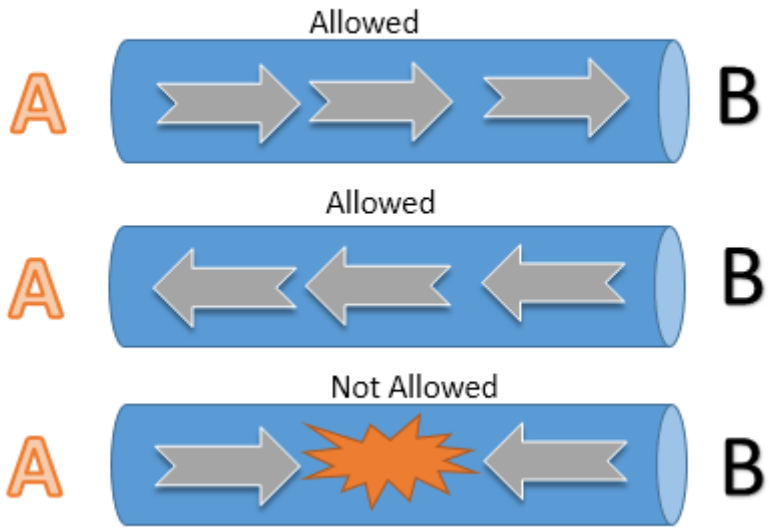
To combine the signals of multiple nodes, a technology known as multiplexing is used. Baseband supports the Time Division Multiplexing (TDM).

Broadband transmission

Broadband technology uses analog signals in data transmission. This technology uses a special analog wave known as the **carrier wave**.

To transmit data of multiple nodes simultaneously, this technology supports the Frequency Division Multiplexing**(FDM)**.





WAN

A metropolitan area network (MAN) is a network with a size greater than LAN but smaller than a WAN. It normally comprises networked interconnections within a city that also offers a connection to the Internet.

Network size generally ranges from 5 to 50 km. It may be as small as a group of buildings in a campus to as large as covering the whole city.

- Data rates are moderate to high.
- In general, a MAN is either owned by a user group or by a network provider who sells service to users, rather than a single organization as in LAN.
- It facilitates sharing of regional resources.
- They provide uplinks for connecting LANs to WANs and Internet.

Example of MAN

- Cable TV network
- Telephone networks providing high-speed DSL lines
- IEEE 802.16 or WiMAX, that provides high-speed broadband access with Internet connectivity to customer premises.

A MAN mostly works on the data link layer, which is Layer 2 of the Open Systems Interconnection (OSI) model.

WAN

A wide area network (WAN) is a computer network that covers a large geographical area comprising a region, a country, a continent or even the whole world. WAN includes the technologies to transmit data, image, audio and video information over long distances and among different LANs and MANs.

The distinguishing features of WAN are

- WANs have a large capacity, connecting a large number of computers over a large area, and are inherently scalable.
- They facilitate the sharing of regional resources.
- They provide uplinks for connecting LANs and MANs to the Internet.
- Communication links are provided by public carriers like telephone networks, network providers, cable systems, satellites etc.

Example of WAN

- The Internet
- 4G Mobile Broadband Systems

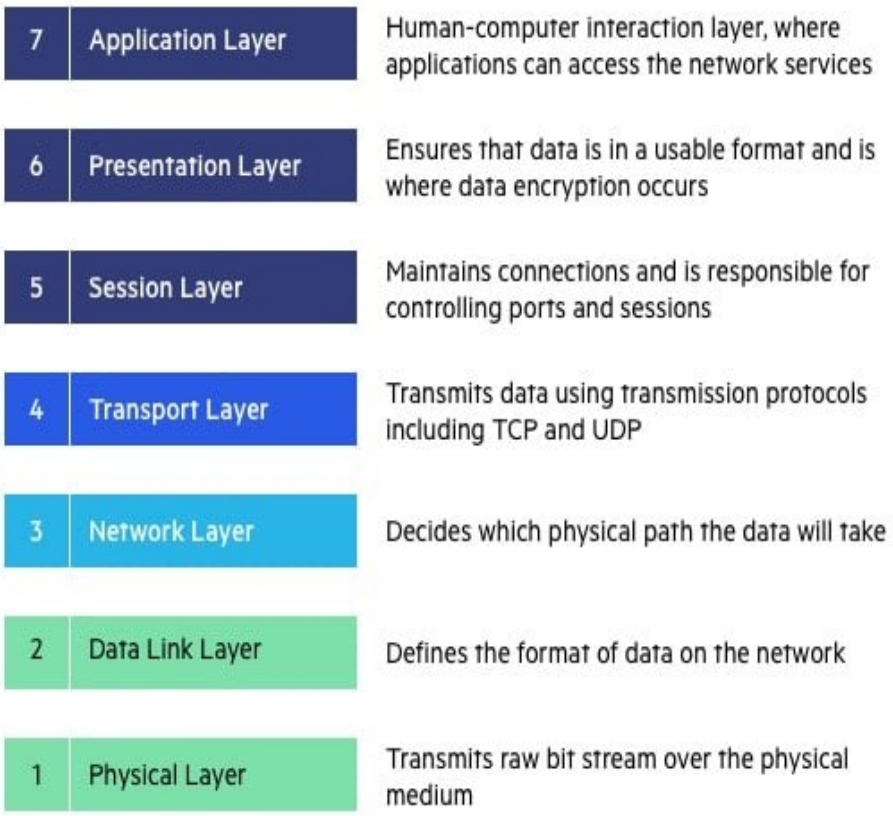
OSI MODEL:

The OSI Model or the Open Systems Interconnection Model is a conceptual framework which describes the functions of a networking system. It is used for the transfer of data over a network which moves through different layers.

In the 1970s the OSI Model was proposed and in the year 1984, it was published by the International Organisation of Standardization (ISO)

- Using this model, troubleshooting has become easier as the error can be detected at different levels
- This also helps in understanding the relationship and function of the software and hardware of a computer network
- The concept that the OSI Model should be a seven-layer structure, was proposed by Charles Bachman at Honeywell Information Systems

7.



Application Layer

The application layer is used by end-user software such as web browsers and email clients. It provides protocols that allow software to send and receive information and present meaningful data to users. A few examples of application layer protocols are the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol (POP), Simple Mail Transfer

Protocol (SMTP), and Domain Name System (DNS).

6. Presentation Layer

The presentation layer prepares data for the application layer. It defines how two devices should encode, encrypt, and compress data so it is received correctly on the other end. The presentation layer takes any data transmitted by the application layer and prepares it for transmission over the session layer.

5. Session Layer

The session layer creates communication channels, called sessions, between devices. It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when

communication ends. The session layer can also set checkpoints during a data transfer—if the session is interrupted, devices can resume data transfer from the last checkpoint.

4. Transport Layer

The transport layer takes data transferred in the session layer and breaks it into “segments” on the transmitting end. It is responsible for reassembling the segments on the receiving end, turning it back into data that can be used by the session layer. The transport layer carries out flow control, sending data at a rate that matches the connection speed of the receiving device, and error control, checking if data was received incorrectly and if not, requesting it again.

3. Network Layer

The network layer has two main functions. One is breaking up segments into network packets, and reassembling the packets on the receiving end. The other is routing packets by discovering the best path across a physical network. The network layer uses network addresses (typically Internet Protocol addresses) to route packets to a destination node.

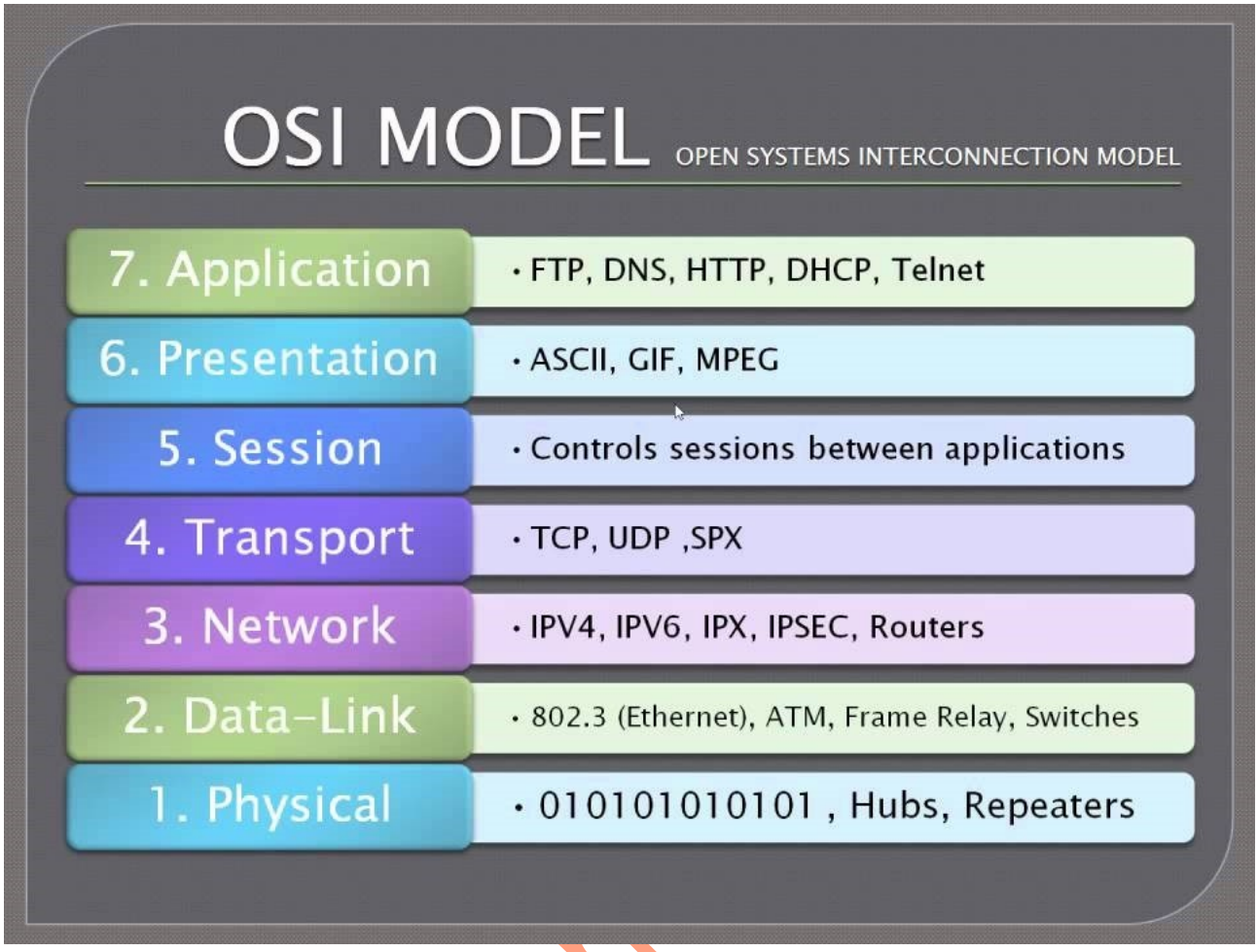
2. Data Link Layer

The data link layer establishes and terminates a connection between two physically-connected nodes on a network. It breaks up packets into frames and sends them from source to destination. This layer is composed of two parts—Logical Link Control (LLC),

which identifies network protocols, performs error checking and synchronizes frames, and Media Access Control (MAC) which uses MAC addresses to connect devices and define permissions to transmit and receive data.

1. Physical Layer

The physical layer is responsible for the physical cable or wireless connection between network nodes. It defines the connector, the electrical cable or wireless technology connecting the devices, and is responsible for transmission of the raw data, which is simply a series of 0s and 1s, while taking care of bit rate control.



Pyare Dost Naveen Tumhari Shaadi Pr Aunga

Data transmission modes:

Basis for Comparison	Simplex	Half Duplex	Full Duplex
Direction	Unidirection	Two-	Two-

of Communication	al	directional, one at a time	directional, simultaneously
Send / Receive	The sender can only send data	The sender can send and receive data, but one a time	The sender can send and receive data simultaneously
Performance	Worst performing mode of transmission	Better than Simplex	Best performing mode of transmission
Example	Keyboard and monitor	Walkie-talkie	Telephone