

# Computer Networks

[ 2020, 2019, 2018, 2017, 2016, 2014 ] K.U.D

Q1.

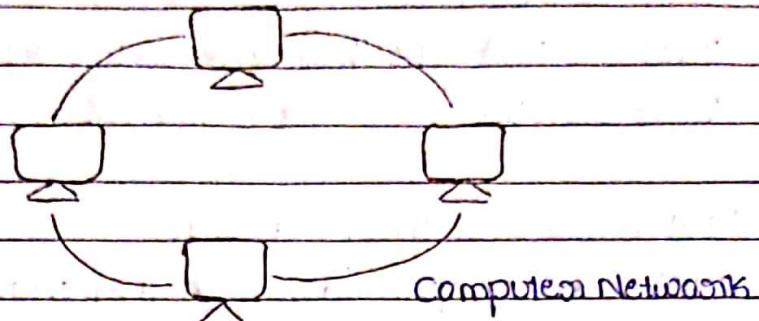
1. a) Describe TCP/IP reference model. [2020, 2018]  
b) What is computer network? Explain different types of computer network. [2020]
2. a) What is computer network? Explain applications of computer network. [2019]  
b) Explain OSI reference model with a neat diagram [2019]
3. a) Explain TCP/IP reference model with diagram [2018]  
b) What is Topology? with diagram explain different types of Topologies. [2018]
4. a) What do you mean by computer Network? Explain the terms LAN, MAN, WAN. [2017]  
b) Explain OSI reference model in detail. [2017]
5. a) Define computer network. Distinguish computer network with distributed System. [2016]  
b) Explain ISO-OSI model in detail. [2016]
6. a) Define computer network. classify the networks in detail. [2014]  
b) Compare OSI model with TCPIP model. [2014]  
c) Write a note on ARPANET. [2014]



## Computer Network.

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A Group of computers which are connected to each other for the purpose of sharing their resource is called Computer Network.



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First Computer Network → ARPANET [2014]

ARPANET → Advanced Research Projects Agency Network

### Characteristics of Computer Network.

- \* Resource Sharing
- \* Communication speed
- \* Backup
- \* Scalability
- \* Reliability
- \* Slow and fast sharing
- \* Security.

### Network Devices :

- \* HUB
- \* Switch
- \* Gateway
- \* Router etc..



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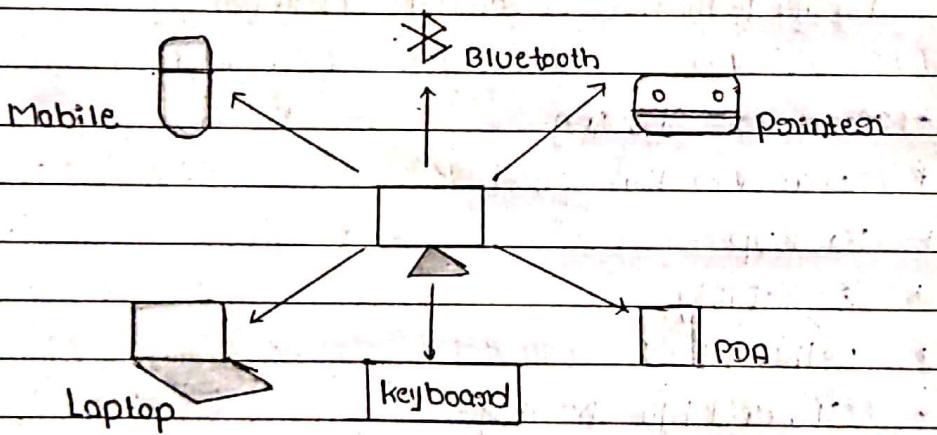
## Types of Networks :

[2020, 2014] [2017]

- \* PAN [Personal Area Network]
- \* LAN [Local Area Network]
- \* MAN [Metropolitan Area Network]
- \* WAN [Wide Area Network]

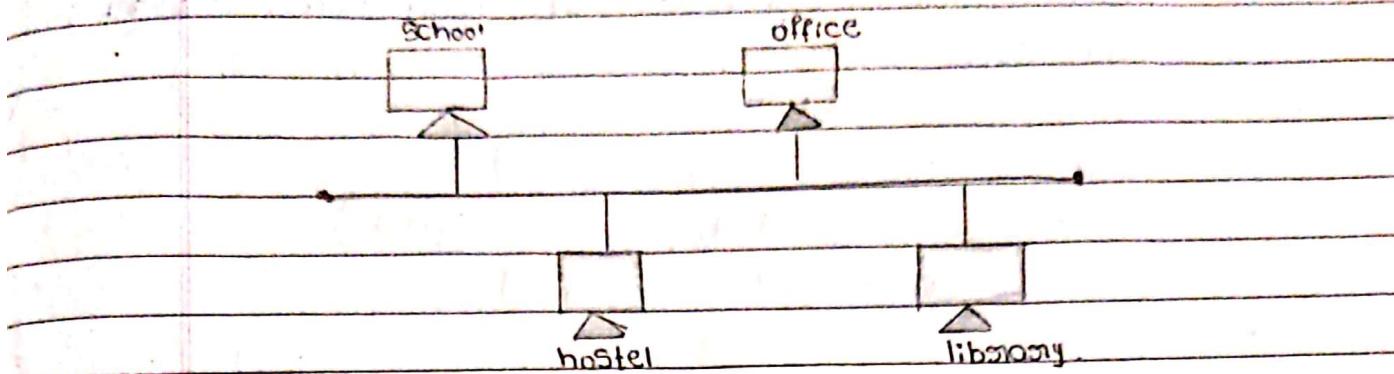
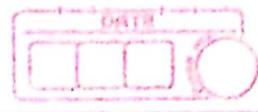
### → PAN : Personal Area Networks

- \* PAN is the computer network that connects computers/devices within the range of an individual person.
- \* PAN provides a network range of 10 meters.
- \* PAN involves a computer, Phone, Printer, Speaker etc..
- \* PAN can be of 2 types depending upon its connections wireless PAN, and wired PAN.



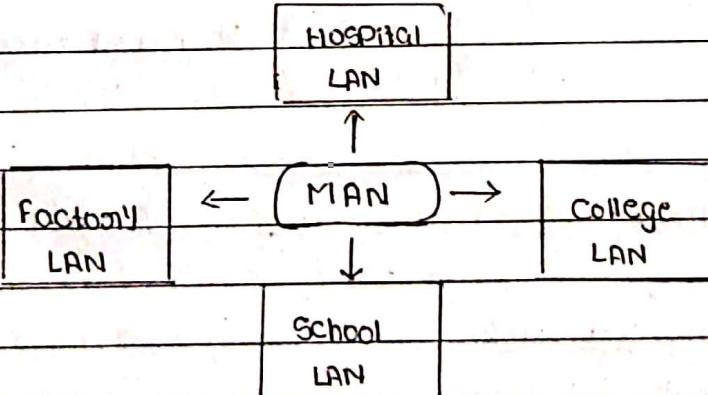
### → LAN : Local Area Network

- \* LAN is a group of computers connected to each other in a small area such as building, office.
- \* LAN is used for connecting two or more personal computers through a communication medium.
- \* LAN provides higher security.
- \* LAN provides a network range < 150 meters.



→ MAN : Metropolitan Area Network

- \* MAN area network is a network that covers a larger geographic area by interconnecting different LAN to form a large network.
- \* In MAN, various LAN's are connected to each other.
- \* It has a higher range than Local Area Network.
- \* MAN provides a network range 50 km.
- \* MAN Area Network used within city.

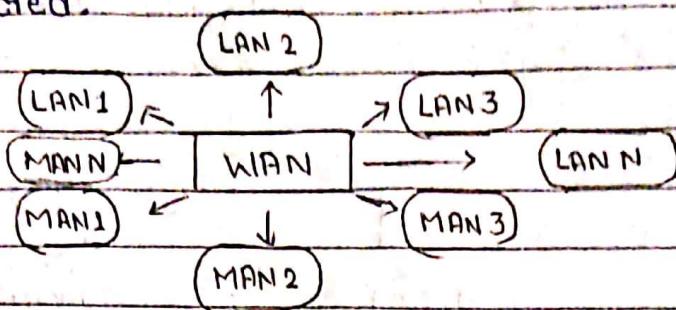


→ WAN : Wide Area Network

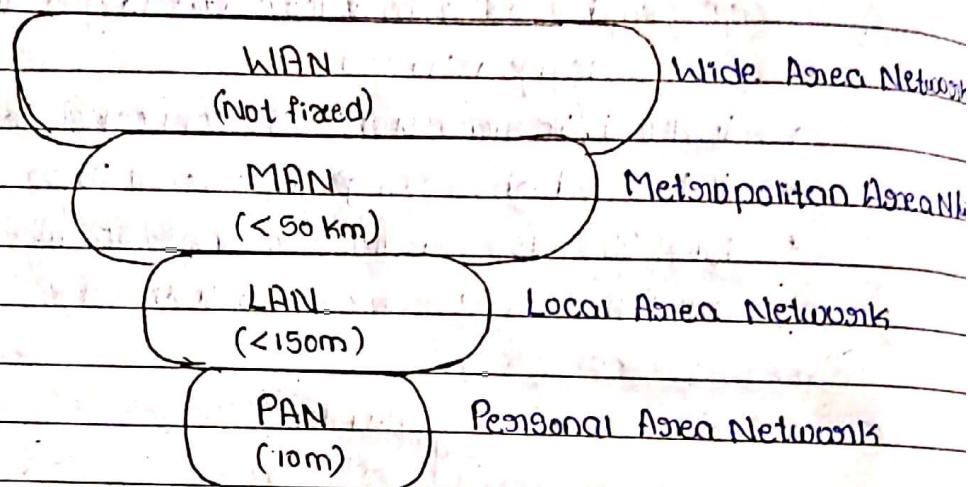
- \* A wide area network is network that extends over a large geographical area such as states or countries.
- \* WAN network range is not fixed.
- \* WAN is widely used in the field of business, government & education.



- \* In WAN various numbers of LAN's and 'n' numbers of MAN's connected.



PAN, LAN, MAN, WAN



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Application of computer Network : [2019]

- \* Marketing and Sales
- \* Financial Services
- \* Teleconferencing
- \* Cable Television
- \* Electronic Messaging
- \* Electronic Data Interchange (EDI)



#### → Marketing and Sales :

- \* Computer networks are widely used in both marketing and sales.
- \* These are used by marketing professionals to collect, exchange and analyzes data relating to customers.
- \* Teleshopping is also important part of sales applications that used modem-enter computers on telephones connected to an ordering processing network.

#### → Financial Services :

- \* In Present, Financial services are completely dependent on computer networks.
- \* Main applications are credit history searchs, electronic funds transfer (EFT).
- \* That permits a user to transfer money without going into bank.

#### → Teleconferencing :

- \* With the help of teleconferencing conferences are possible to occur without the participants being in the same place.
- \* Applications include simple text conferencing, voice conferencing & video conferencing.

#### → Cable Television :

- \* Future services provided by cable television network can include video on request, as well as the same information, financial & communications services.

#### → Electronic Messaging :

- \* Electronic mail is the most widely used network application.



## → Electronic Data Interchange (EDI) :

- \* EDI permits business information to be transferred without using paper.

## • Network Architecture

Computer Network Architecture is defined as the physical and logical design of the software, hardware, protocols, and media of the transmission of data.

Simply we can say that how computers are organized and how tasks are allocated to the computer.

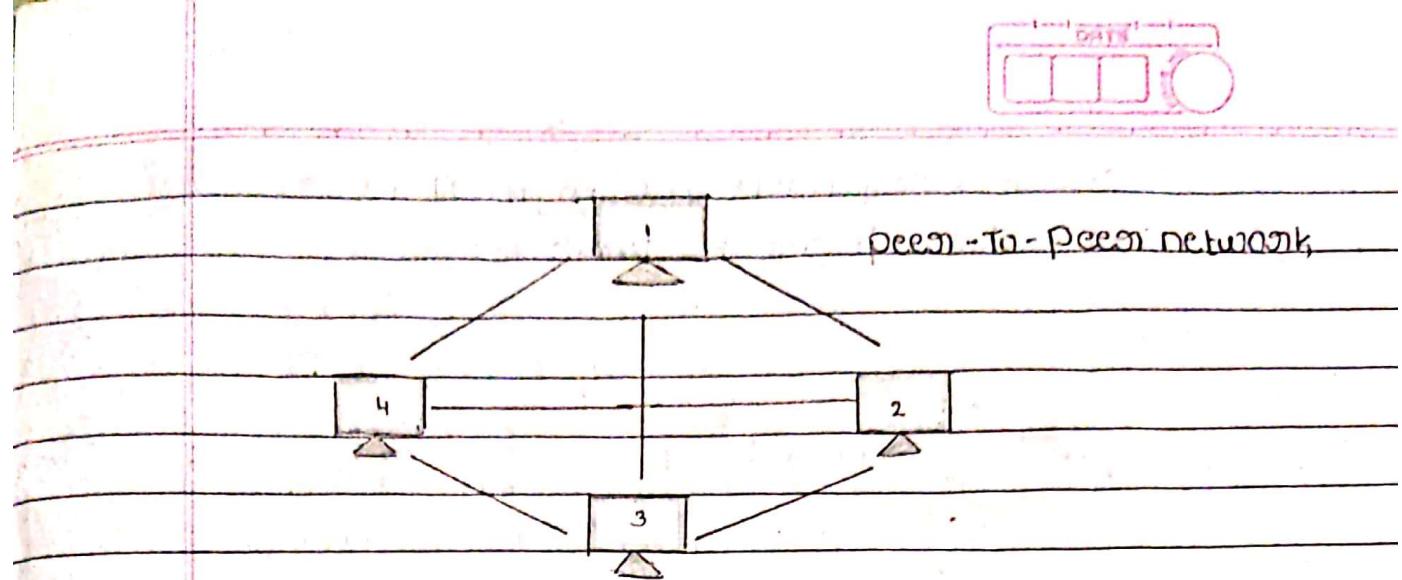
## Types of network architecture.

→ Peer - To - Peer network

→ Client / Server network

## Peer - To - Peer network

- \* Peer - To - Peer network is a network in which all the computers are linked together with equal privilege and responsibilities for processing the data.
- \* Peer - To - Peer network is useful for small environments, usually up to 10 computers.
- \* Peer - To - Peer network has no dedicated server.
- \* Special permissions are assigned to each computer for sharing the resources.



Peer - To - Peer network

### Advantages of Peer - To - Peer Network :

- \* It is less costly as it does not contain any dedicated server.
- \* If one computer stops working but, other computers will not stop working.
- \* It is easy to set up and maintain as each computer manages it self.

### Disadvantages of Peer - To - Peer Network :

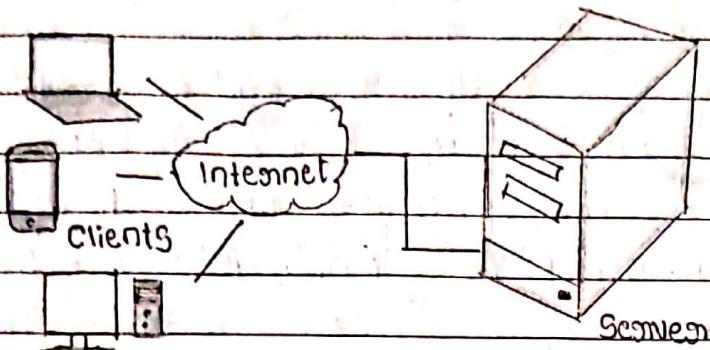
- \* In the case of Peer - To - Peer network, it doesn't contain the centralized system. Therefore, it cannot back up the data as the data different in different locations.
- \* It has a security issue as the device is managed itself.

### Client / Server Network

- \* Client / Server network is a network model designed for the end users called client, to access the resources such as songs, video etc. from a central computer known as Server.
- \* The central controller is known as a Server while all other computers in the network are called clients.
- \* A Server performs all the major operations such as security & network management.



- \* A Server is responsible for managing all the resources such as files, directories, printers etc..



#### Advantages of client / server network :

- \* A client / server network contains the centralized system.
- \* A client / server network has a dedicated server that improves the overall performance of the whole system.
- \* Security is better in client / server network.
- \* It also increases the speed of the sharing resources.

#### Disadvantages of client / server network :

- \* Client / server network is expensive as it requires the server with large memory.
- \* A server has a Network Operating System (NOS) to provide the resources to the client, but the cost of NOS is very high.

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#### Network Topology [2018]

The physical arrangement of the computer system node, which is connected to each other via communication medium is called topology.

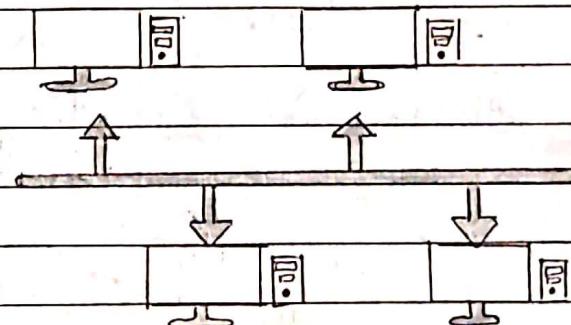


## Types of Topology

- \* BUS Topology
- \* RING Topology
- \* STAR Topology
- + MESH Topology
- + Hybrid Topology
- + TREE Topology.

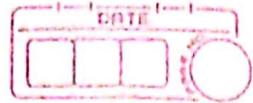
→ BUS Topology :

In BUS Topology, one long single cable acts as a single communication channel & all the devices are connected to this cable.



### Advantages of Bus Topology :

- \* Easy to add or remove nodes in a network.
- \* Required only cable.
- \* It is less expensive.
- \* It broadcast the message to each device which are connected through the cable.
- \* It is easy to maintain.
- \* In case of any computer failure, there will be no effect on other devices.

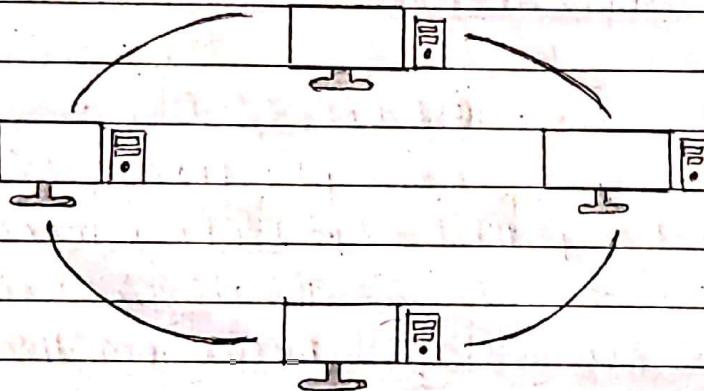


### Disadvantages of Bus Topology :

- \* If cable is fail then the entire network will be failed.
- \* The messages are broadcast so, we can't send private msg.
- \* It takes more time to pass the messages from one place to another place.
- \* The length of cable is limited.
- \* In this topology data is transmitted only one direction.

### → RING Topology :

It is called ring topology because it forms a ring. In this topology each node is strongly connected with its adjacent node.



### Advantages of RING Topology :

- \* It forms a strong network.
- \* Each an every node can share data with another node connected through a ring topology.
- \* Transmission rate of data is very speed.
- \* The data send through ring topology will be broadcast.

### Disadvantages of RING Topology :

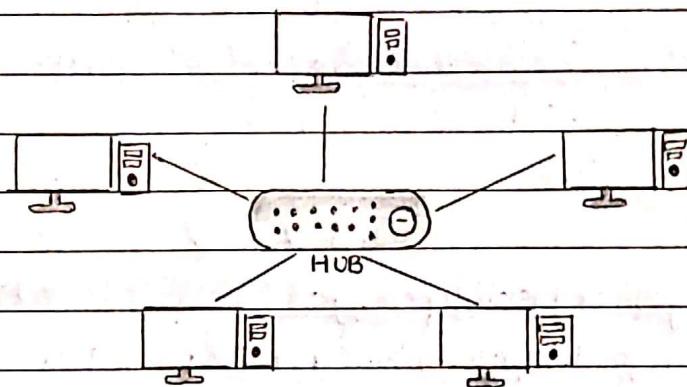
- \* It is very difficult task to add some new computer.
- \* If we want to send data from a source to destination machine then data will unnecessarily passed to all nodes.



- \* single point of failure, that means if a node goes down entire network goes down.
- \* It is very difficult to recover the ring topology if any particular machine is not working properly.
- \* We can't send private message.

→ STAR Topology :

In Star topology all nodes are connected with a central device called HUB. And the sharing of data is only possible through HUB.



Advantages of STAR Topology:

- \* It broadcast the message.
- \* It is less expensive due to less cable.
- \* Easy to connect new nodes without affecting rest of the net.
- \* If one node failed, then it would not be fail of entire network.

Disadvantages of STAR Topology:

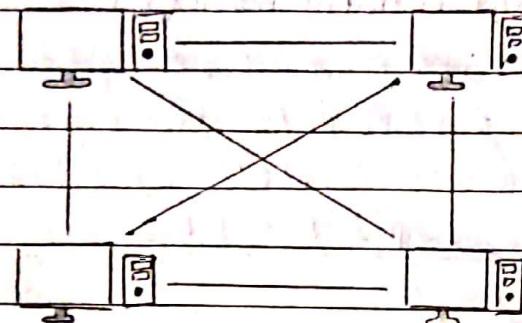
- \* In Star topology we must required a network device like HUB, Switch etc.
- \* If two nodes want to share the data, sharing is only possible through a HUB.



- \* If HUB is failed the entire network will be failed.
- \* We can't send private data.

### → MESH Topology:

In this topology each and every computer is directly connected with each other, so we can directly send the data to the destination machine without going to intermediate machine.



### Advantages of mesh topology:

- \* It is very good topology to send the private message.
- \* All nodes are directly associated with another node so, it provide point to point.
- \* Un-like ring topology, if a particular machine is failed then entire network will not fail.
- \* Multiple devices can send or receive data simultaneously.

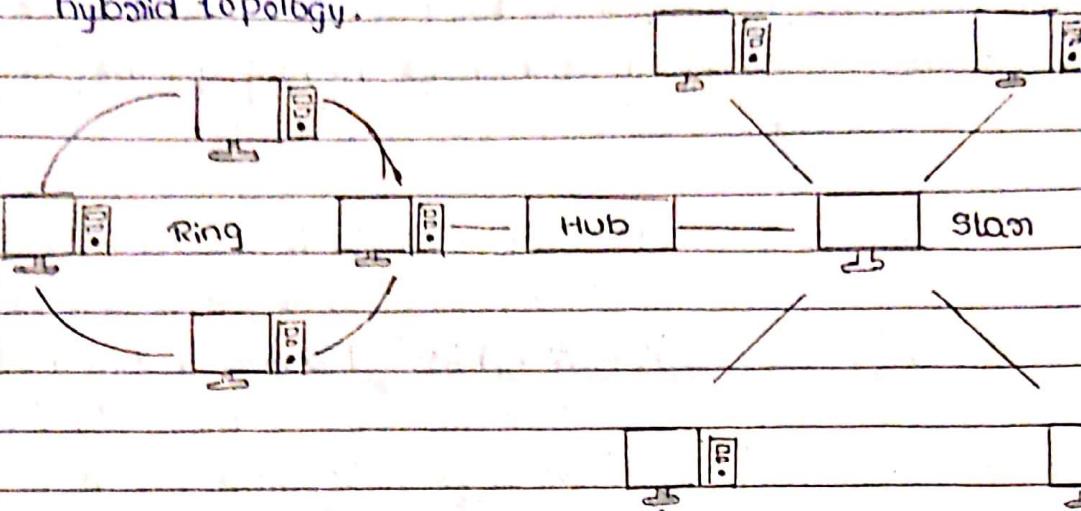
### Disadvantages of mesh topology:

- \* It is very difficult to add some new node because each and every computer directly connected with another one.
- \* If a particular machine not working then, we can't send or receive data from failure machine.



### → Hybrid Topology :

combination of various different topology is called hybrid topology.



### Advantages of Hybrid topology :

- \* This type of topology combines the benefits of different types of topologies in one topology.
- \* It is extremely flexible.
- \* Error detecting and trouble shooting is easy.
- \* It is used for create large network.

### Disadvantages of Hybrid topology :

- \* It is a type of network expensive.
- \* Design of hybrid networks expensive is very complex.
- \* Installation is a difficult process.

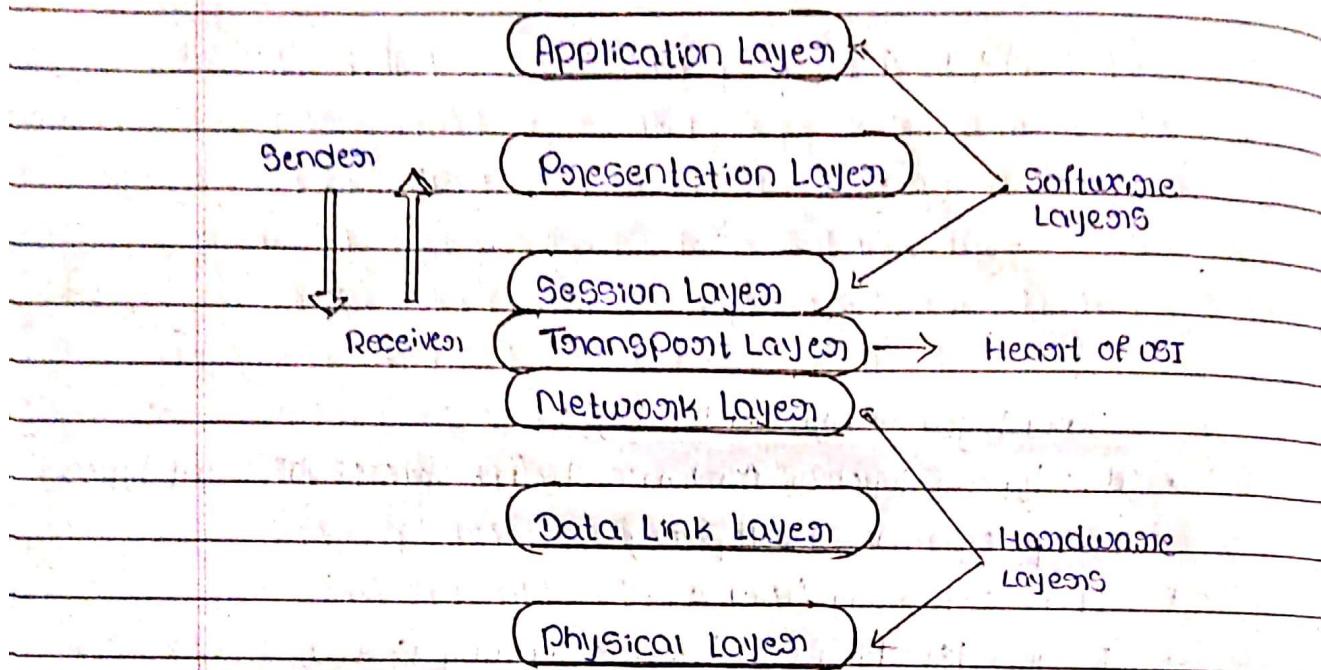
TOP

# OSI - Model.

[2019, 2014][2017]



OSI stands for Open Systems Interconnection. It has been developed by ISO - International Organization for Standardization. In the year 1984. It is a 7 layer architecture with each layer having specific functionality to perform.



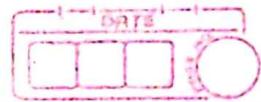
## 1. Physical Layer (Layer 1):

The lowest layer of the OSI reference model is the Physical layer. It is responsible for the actual physical connection between the devices.

The physical layer contains information in the form of bits. It is responsible for transmitting bits from one device to another.

### Functions of Physical layer are:

- \* Bit Synchronization
- \* Bit rate control
- \* Physical topologies
- \* Transmission mode



## 2. Data link layer (DLL) (Layer 2) :

The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error-free from one node to another.

Data link layer is divided into two sublayers.

1. Logical Link control (LLC)

2. Media Access control (MAC)

The packet received from the Network layer is further divided into frames depending on the frame size.

### Functions of the Data link layer :

- \* Framing
- \* Physical addressing
- \* Flow control
- \* Access control

## 3. Network Layer (Layer 3) :

The network layer works for the transmission of data from one host to the other located in different networks.

It also takes care of packet routing. The sender & receiver IP addresses are placed in the header by the network layer.

### Functions of Network layer are

- \* Routing
- \* Logical addressing



#### 4. Transport Layer (Layer 4):

The Transport layer provides services to the application layer and takes services from the network layer. The data in the transport layer is referred to as segments.

At sender's side : Transport layer receives the segmented data from the upper layers performing segmentation & also implements flow and error control.

At receiver's side : Transport layer reads the port number from its header and forwards the data.

##### functions of the transport layer

- \* Segmentation and Reassembly
- \* Service Point Addressing

#### 5. Session Layer (Layer 5):

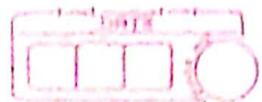
This layer is responsible for the establishment of connection, maintenance of session & also ensures security.

##### functions of the session layer

- \* session establishment, maintenance and Termination
- \* Synchronization
- \* Dialog controller

#### 6. Presentation Layer (Layer 6):

The presentation layer is also called the Translation layer. The data from the application layer is extracted here and manipulated as per the required.



format to transmit over the network.

### The functions of the presentation layer

- \* Translation
- \* Encryption / Decryption
- \* Compression

### 7. Application layer (Layer 7)

At the very top of the OSI reference model stack of layers, we find the application layer which is implemented by the network applications.

#### Functions of the application layer are:

- \* Network Virtual Terminal
- \* Mail Services
- \* Directory Services

TCP

### TCP / IP Reference Model : [2020, 2018]

TCP / IP Reference Model is a four-layered suite of communication protocols. It was developed by the DoD (Department of Defence) in 1960s.

It is named after the two main protocols that are used in the model, namely TCP and IP.

TCP stands for Transmission control Protocol and IP stands for Internet Protocol.

#### The Four layers in the TCP / IP protocol

- \* Host - to - Networks layer
- \* Internet layer
- \* Transport Layer
- \* Application Layer



## 1. Host - to - Network Layer :-

It is the lowest layer that is concerned with the physical transmission of data. TCP/IP does not specifically define any protocol here but supports all the standard protocols.

## 2. Internet Layer :-

It defines the protocols for logical transmission of data over the network. The main protocol in this layer is Internet protocol (IP) and it is supported by the protocols ICMP, IGMP, RARP, and ARP.

## 3. Transport Layer :-

It is responsible for ensuring free end-to-end delivery of data. The protocols defined here are Transmission control Protocol (TCP).

## 4. Application Layer :-

This is a topmost layer and defines the interface of host Programs with the transport layer Services.

This layer includes all high-level protocols like DNS, HTTP,

APPLICATION LAYER

TELNET DNS HTTP ...

TRANSPORT LAYER

TCP UDP SCTP

INTERNET LAYER

ICMP RARP  
IGMP ARP

HOST - TO - NETWORK

LAYER

Ethernet Token  
ring ATM