

Computer Networks:-

A computer network is a collection of various computing devices. The purpose of this network is that the devices can share data.

Means we have to connect various homogeneous, heterogeneous kind of devices.

Homogeneous
A computer network in which all computers ~~are~~ are identical.

(a) are identical.

(b) have a similar or same architecture.

such as all nodes have same model computers.

Heterogeneous

It is a network connecting computers with other devices with different operating systems and/or protocols.

Ex:- Local area networks (LANs) that connects Microsoft windows with Linux based personal computers.

The purpose of computer network is that they can share something, mainly sharing of data.

Now in a computer network we have:-



A sender (that sends the data) and receiver (which receives data). Sender and receiver can be machines so, we can say that the user transmits the data through the machines.

Suppose the sender wants to transmit/send a program so. it needs some connection. ~~be~~ This connection can be wired or wireless.

So, through the connection, the packets, the data will move from the sender's machine to the receiver's machine.



Let there is a message 'M'. The sender is sending this message 'M' to the receiver.

Now the next part is, the sender has sent the data and the receiver has received the data. But the next part is whatever message is received by "Receiver", whether it is able to read and understand it or not?

As per the concept the data sent by the sender must be understood by the receiver also. For this there must be some type of protocol that must be running on at the sender's machine as well as at the receiver's machine.

What is the advantage of protocol or what are protocols
It is a set of instructions, means the sender will send the data but it will have to follow certain instructions so that the receiver is able to understand the data.

Let's say I made a call. I know to speak Oxiya but I called a person from Udupi (Tulu) so, whatever I am speaking, that person is able to hear that, he can understand that I am saying something. But is he able to understand

The answer is No.

And whatever he is speaking I am not able to understand but I can recognize that he is sending some message.

The connection between sender and receiver ensures that the data has travelled from sender to receiver and vice-versa. But whether we are able to understand the data or not.

For that some kind of protocol must be running on both the sides and that's called the proper communication.

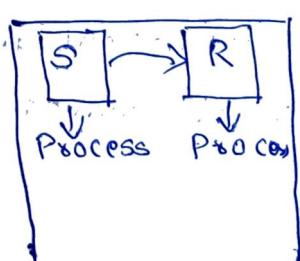
Now we are saying there is a sender and receiver, but in computer network terminology it is called as client and server.

Where these client and server are present?

→ one scenario can be sender and receiver are present on the same machine.

Let's say your Laptop.

Suppose we are typing, we press a button and the letter appears on the screen.



Machine.

So, there is some kind of process generated by the sender and the message is received by the receiver.

Process generated by sender and the receiver has also a process.

→ Sender is generating a process of pressing a button, and the receiver i.e. the screen of Laptop.

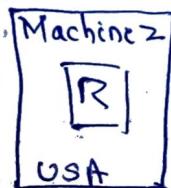
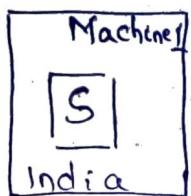
Here the sender is the keyboard.

But the user is a single person. The point here is there is a user process sending some kind of message, and message is printed on the screen.

N.B:- Here the entire process is running ~~on~~ within the same machine. So this is called as ~~inter~~process communication where the processes are taking place on the same machine.

Can this be called a computer network ?? No. This inter-process communication is done by the operating system.

Therefore if the ~~entire~~ sender and receiver are in different machines then the concept of computer network comes.



There should be smooth communication between the sender and receiver. It may be possible that the senders may be in India and the receiver be present in USA, Europe or any other location.

Taking about distance it can be 1 m or 1 km or ~~or more~~ 10,000 kms ~~also~~ or more.

Let machine 1 is present in India and Machine 2 is present in USA.

so my machine is sending some data to the server suppose I am opening a Facebook account. ~~and~~ what I do is I send a message from my machine to the server of Facebook.

We have to give an environment to both these machines i.e. they don't feel that they are two different machines.

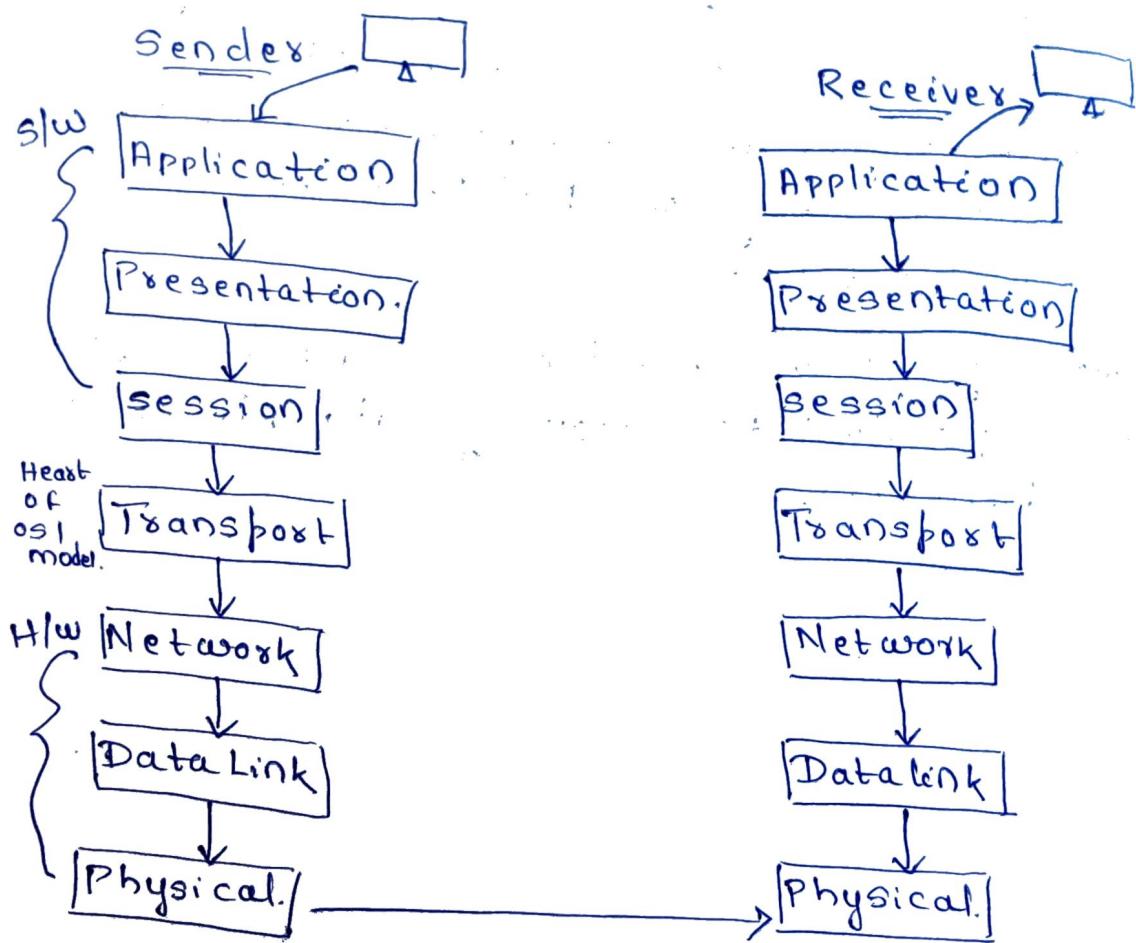
Generally the communication is so fast, that it is equivalent to accessing data present in the hard disk.

What is OSI model?

Ans - OSI stands for "open system interconnection" model. It has been developed by standard organization ISO (International organization for standardization) in the year 1984.

N.B:- It is a 7 layers architecture where each layer having specific functionality.

All these layers work collaboratively to transmit the data from one network to another network across the globe.



Application layer

This application layer produces the data, which has to be transferred over the network. This layer also serves as a window for the application services to access the network and for displaying the received information to the user.

Functions:-

1. Network Virtual Terminal.
2. FTAM- File transfer access and management.
3. Mail Services.
4. Directory Services.

Presentation Layer-

This is also called as Translation layer. The data from the application layer is extracted here and is manipulated as per the required format over the network.

Functions:-

1. Translation: For example, ASCII to EBCDIC
2. Encryption/Decryption: Encryption translates the data into another form or code. The encrypted data is called ciphertext and decrypted data is known as plain text.
3. compression: Reduces the number of bits that needs to be transmitted on the network.

Session layer:-

This layer is responsible for the establishment of connection, maintenance of sessions, authentication, and also ensures security.

Functions:-

1. Session establishment, maintenance, and termination:
The layer allows the two processes to establish, maintain, and terminate a connection.
2. Synchronization: This layer allows a process to add check points which are considered synchronization points into the data. These synchronization points help to identify the errors so that the data is resynchronized properly, and ends of message are not cut prematurely and data loss is avoided.
3. Dialog controller: The session layer allows two systems to start communication in half-duplex or full-duplex.

Transport Layer:-

At sender's side, the transport layer receives the formatted data from the upper layers, performs segmentation, and also implements flow and error control to ensure proper data transmission. It also adds source and destination port addresses, number and in its headers and forwards it to the network layer. The destination port is configured by default or manually.

At receiver's side the transport layer reads the port numbers from its header and forwards the data which it has received to the respective application. It also performs the sequencing and reassembling of the segmented data.

The functions are:

1. Segmentation and Reassembly: Accepts message from the layer and breaks into smaller units. Each of the segments produced has a header associated with it. At destination station the transport layer reassembles the message.
2. Service Point addressing: In order to deliver the message to the correct process, the transport layer header includes a type of address called service point or port address. By specifying this the transport layer makes sure that message is delivered to the correct process.

Network Layer:

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 i.e. selection of shortest path to transmit the packet, from the number of routes available.

The sender and receiver's IP address are placed in the header by the network layer.

Functions:

1. Routing:- The network layer protocol determines which route is suitable from source to destination.

This function is called as routing.

2. Local Addressing:- In order to identify each device on internetwork uniquely, the network layer defines an addressing scheme. As sender and header addresses are placed in the header, distinguishes and distinguishes each device uniquely and universally.

Data link layer (DLL)

It is responsible for node to node delivery of the message. The main function of this layer is to make sure that the data transfer is error free from one node to another, over the physical layer. When the packet arrives in a network, the responsibility of DLL is to transmit it to the host using its IP address. Physical address.

Functions:

1. Framing: It provides a way for a sender to transmit a set of bits that are meaningful to the receiver. This is done by attaching special bit patterns to the beginning and end of the frame.
2. Physical addressing: After framing the DLL adds physical address of the sender/receiver in the header of each frame.
3. Error control: Detects and retransmits the damaged or lost frames.
4. Flow control: It coordinates the data rate on

both sides (constant rate).

5. Access control: when a single channel is shared by multiple devices, the MAC sublayer of the data link layer helps to determine which device has control over the given channel at a given time.

Physical layer:

It is responsible for actual connection between devices. It contains information in the form of bits. It is responsible for transmitting individual bits from one node to the next.

Functions:

1. Bit synchronization: synchronization of bits by using a clock. This clock controls both sender and receiver thus providing synchronization at bit level.
2. Bit rate control: Defines the transmission rate i.e. number of bits per second.
3. Physical topologies: specifies the way in which the nodes / devices are arranged in a network i.e. bus, star, or mesh topology.
4. Transmission mode: Physical layer also defines the way in which the data flows between two connected devices. The transmission modes are simplex, half-duplex, and full duplex.