Data Communication

A Vital Process of Computerization

What is data communication?

- Not to be confused with telecommunication—
  - Any process that permits the passage from a sender to one or more receivers of information of any nature, delivered in any easy to use form by any electromagnetic system.
- Data communication-
  - Defined as a subset of telecommunication involving the transmission of data to and from computers and components of computer systems.
    - More specifically data communication is transmitted via mediums such as wires, coaxial cables, fiber optics, or radiated electromagnetic waves such as broadcast radio, infrared light, microwaves, and satellites.

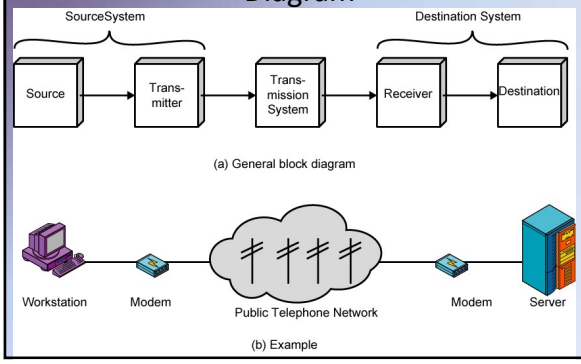
Features of Communication

- Four things required
  - Sender, receiver, medium, and message
- Types of messages
  - File
  - Request
  - Response
  - Status
  - Control
  - Correspondence
- Understandability
- Error Detection

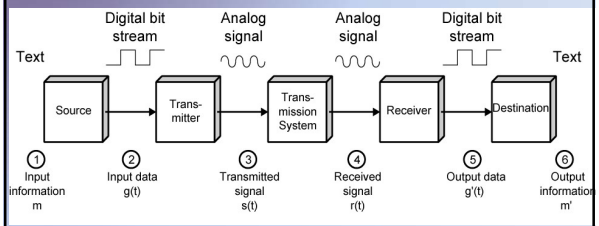
A Communications Model

- Source
  - generates data to be transmitted
- Transmitter
  - Converts data into transmittable signals
- Transmission System
  - Carries data
- Receiver
  - Converts received signal into data
- Destination
  - Takes incoming data

Simplified Communications Model - Diagram

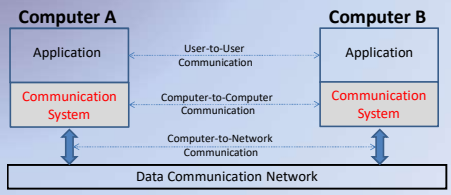


Simplified Data Communications Model



Communication Level

- User-to-User Communication
- Computer-to-Computer Communication
- Computer-to-Network Communication



Computer Network

A Process of Connecting Devices

NETWORKS

- A network is a set of devices (often referred to as nodes) connected by communication links. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.

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Network Criteria

- Performance
  - Mostly measured by throughput and delay
- Reliability
  - The frequency of failure
  - Recovery time from a failure
- Security
  - Protecting data from
    - unauthorized access
    - Damage

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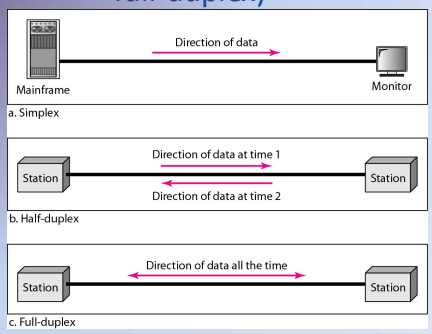
Uses of Network

- Personal communication
  - Email
    - Instantaneous communication
  - Conferencing
    - Tele conferencing
    - Videoconferencing
    - Audio-conferencing
    - Data-conferencing
  - Voice over IP
    - Phone communication over network wires

Data flow (simplex, half-duplex, and full-duplex)



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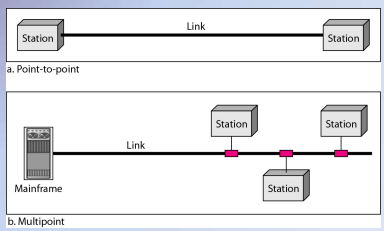
Type of Connection

- Point-to-Point
- Multipoint (multi-drop)



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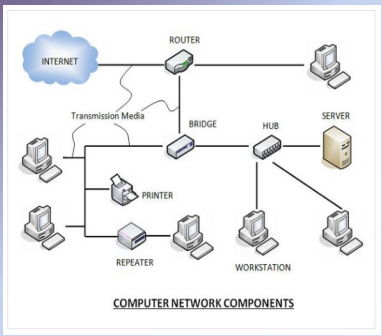
Network Components



Hardware Components and Software Components

Hardware Components

- **Servers** –Servers are high-configuration computers that manage the resources of the network. The network operating system is typically installed in the server and so they give user accesses to the network resources. Servers can be of various kinds: mail servers, file servers, database servers, print servers etc.
- **Clients** – Clients are computers that request and receive service from the servers to access and use the network resources.
- **Peers** – Peers are computers that provide as well as receive services from other peers in a workgroup network.
- **Transmission Media** – Transmission media are the channels through which data is transferred from one device to another in a network.
  - Transmission media may be guided media like coaxial cable, fiber optic cables etc; or maybe unguided media like microwaves, infra-red waves etc.

Hardware Components …

- **Connecting Devices** – Connecting devices act as middleware between networks or computers, by binding the network media together. Some of the common connecting devices are:
  - Routers
  - Bridges
  - Hubs
  - Repeaters
  - Gateways
  - Switches

Software Components

- **Networking Operating System** – Network Operating Systems is typically installed in the server and facilitate workstations in a network to share files, database, applications, printers etc.
- **Protocol Suite** – Protocol suite is a set of related protocols that are laid down for computer networks. The two popular protocol suites are –
  - a. OSI Model (Open System Interconnections)
  - b. TCP / IP Model

Network Topology

- Geometric representation of how the computers are connected to each other is known as **topology**. There are five **types** of **topology** – Mesh, Star, Bus, Ring and Hybrid.
- In networking, **topology** refers to the layout of a computer network. **Topology** can be described either physically or logically. Physical **topology** means the placement of the elements of the network, including the location of the devices or the layout of the cables.
- On the other hand, mapping the data flow between the components determines the logical **topology** of the network.

Physical Topology

- Star topology
- Bus topology
- Ring topology
- Hybrid topology
- Mesh topology

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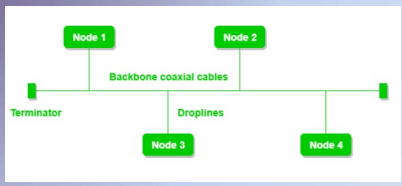
Bus Topology

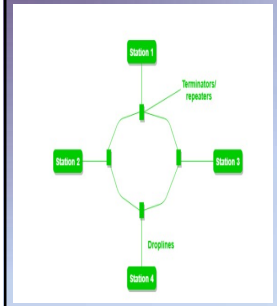


- Bus topology is a network type in which every computer and network device is connected to single cable. It transmits the data from one end to another in single direction. No bi-directional feature is in bus topology.

Advantages and Disadvantages

- If N devices are connected to each other in bus topology, then the number of cables required to connect them is 1 which is known as backbone cable and N drop lines are required.
- Cost of the cable is less as compared to other topology, but it is used to built small networks.
- If the common cable fails, then the whole system will crash down.
- If the network traffic is heavy, it increases collisions in the network. To avoid this, various protocols are used in MAC layer known as Pure Aloha, Slotted Aloha, CSMA/CD etc.

RING Topology

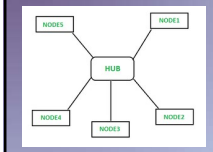


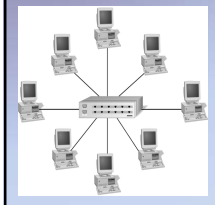
- In this topology, it forms a ring connecting devices with its exactly two neighboring devices.
- A number of repeaters are used for Ring topology with a large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.
- The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called Dual Ring Topology.

Advantages and Disadvantages

- The possibility of collision is minimum in this type of topology.
- Cheap to install and expand.
- Troubleshooting is difficult in this topology.
- Addition of stations in between or removal of stations can disturb the whole topology.

Star Topology





- A star may be a topology for a Local Area Network (LAN) during which all nodes are individually connected to a central connection point, sort of a hub or a switch.
- Each device within the network is connected to a central device called hub. If one device wants to send data to another device, it's to first send the info to hub then the hub transmits that data to the designated device.
- A star takes more cable than e.g. a bus, but the benefit is that if a cable fails, just one node is going to be brought down.

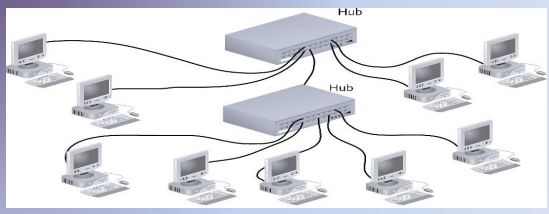
Advantages

- It is very reliable – if one cable or device fails then all the others will still work
- It is high-performing as no data collisions can occur
- Less expensive because each device only need one I/O port and wishes to be connected with hub with one link.
- Easier to put in
- Robust in nature
- Easy fault detection because the link are often easily identified.
- No disruptions to the network when connecting or removing devices.
- Each device requires just one port i.e. to attach to the hub.
- If N devices are connected to every other in star, then the amount of cables required to attach them is N. So, it's easy to line up.

Disadvantages

- Requires more cable than a linear bus .
- If the connecting network device (network switch) fails, nodes attached are disabled and can't participate in network communication.
- More expensive than linear bus topology due to the value of the connecting devices (network switches)
- If hub goes down everything goes down, none of the devices can work without hub.
- Hub requires more resources and regular maintenance because it's the central system of star .
- Extra hardware is required (hubs or switches) which adds to cost
- Performance is predicated on the one concentrator i.e. hub.

Some more Topologies



- Tree Topology → Star + Bus
- Graph Topology → Star + Ring
- Mash Topology → Star + Ring + Bus (Optional)
- Daisy-Chain Topology → Ring + Bus
- Hybrid Topology → Combination of Any 2 or More

Logical Topologies

- Logical topology: how data is transmitted between nodes
  - May not match physical topology
- Bus logical topology: signals travel from one network device to all other devices on network
  - Required by bus, star, star-wired physical topologies
- Ring logical topology: signals follow circular path between sender and receiver
  - Required by ring, star-wired ring topologies

Categories of Networks – Geographical

- Personal Area Network (PAN)
- Home Area Network (HAN)
- Local Area Network (LAN)
- Campus Area Network (CAN)
- Metropolitan Area Network (MAN)
- Wide Area Network (WAN)

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Network Categories (Continue…)

- Personal Area Network (PAN)
  - Very small scale network
  - Range is less than 2 meters
  - Cell phones, PDAs, MP3 players
- Home Area Network (HAN)
  - Small scale network
  - Connects computers and entertainment appliances
  - Found mainly in the home

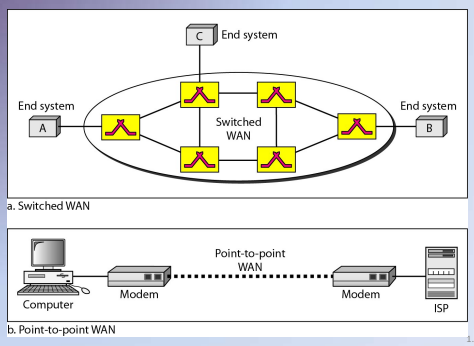
Network Categories (Continue…)

- Local Area Network (LAN)
  - Contains printers, servers and computers
  - Systems are close to each other
  - Contained in one office or building
  - Organizations often have several LANS
- Campus Area Networks (CAN)
  - A LAN in one large geographic area
  - Resources related to the same organization
  - Each department shares the LAN

Network Categories (Continue…)

- Metropolitan Area Network (MAN)
  - Large network that connects different organizations
  - Shares regional resources
  - A network provider sells time
- Wide Area Networks (WAN)
  - Two or more LANs connected
  - Over a large geographic area
  - Typically use public or leased lines
    - Phone lines
    - Satellite
  - The Internet is a WAN

Switched WAN v/s Point-to-Point WAN



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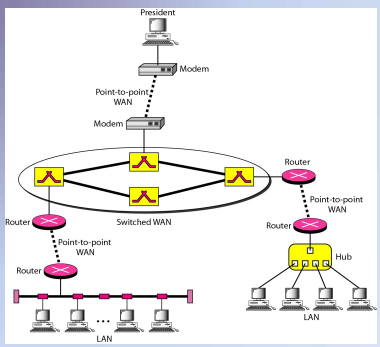
Heterogeneous Network



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Network Structure

- Server based network
  - Node is any network device
  - Servers control what the node accesses
  - Users gain access by logging in
  - Server is the most important computer
- Client/Server network
  - Nodes and servers share data roles
  - Nodes are called clients
  - Servers are used to control access
  - Database software
    - Access to data controlled by server
  - Server is the most important computer
- Peer to Peer Network

Client – Server Network

- Client/Server network is a network model designed for the end users called clients, 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 and network management.
- A server is responsible for managing all the resources such as files, directories, printer, etc.
- All the clients communicate with each other through a server. For example, if client1 wants to send some data to client 2, then it first sends the request to the server for the permission. The server sends the response to the client 1 to initiate its communication with the client 2.

Advantages v/s Disadvantages

- Advantages Of Client/Server network:
  - A Client/Server network contains the centralized system. Therefore we can back up the data easily.
  - A Client/Server network has a dedicated server that improves the overall performance of the whole system.
  - Security is better in Client/Server network as a single server administers the shared resources.
  - 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 clients, but the cost of NOS is very high.
  - It requires a dedicated network administrator to manage all the resources.

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, but this can lead to a problem if the computer with the resource is down.

Advantages v/s Disadvantages

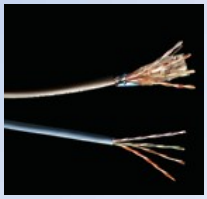
- Advantages Of Peer-To-Peer Network:
  - It is less costly as it does not contain any dedicated server.
  - If one computer stops working but, other computers will not stop working.
  - It is easy to set up and maintain as each computer manages itself.
- Disadvantages Of Peer-To-Peer Network:
  - In the case of Peer-To-Peer network, it does not contain the centralized system . Therefore, it cannot back up the data as the data is different in different locations.
  - It has a security issue as the device is managed itself.

Transmission Media

- In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver i.e. it is the channel through which data is sent from one place to another.
- Choice Factors for Transmission media
  - Speed
  - Security
  - Size
- Transmission Media is broadly classified into the following types:
  - Guided Media/Wired Media/Bounded Media
  - Unguided Media/Wireless Media/Unbounded Media

Wired or Guided Media

- **Twisted Pair Cable**
  - It consists of 2 separately insulated conductor wires wound about each other.
  - They are the most widely used Transmission Media.
  - Twisted Pair is of two types:
    - Shielded Twisted Pair (STP)
    - Unshielded Twisted Pair (UTP)

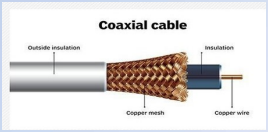


STP v/s UTP

- **Unshielded Twisted Pair (UTP):** To block interference and does not depend on a physical shield for this purpose. It is used for telephonic applications.
- Advantages:
  - Least expensive
  - Easy to install
  - High-speed capacity
  - Susceptible to external interference
  - Lower capacity and performance in comparison to STP
  - Short distance transmission due to attenuation
- **Shielded Twisted Pair (STP):** A special jacket to block external interference. It is used in fast-data-rate Ethernet and in voice & data channels of phone lines.
- Advantages:
  - Better performance at a higher data rate in comparison to UTP
  - Eliminates crosstalk
  - Comparatively faster
  - Comparatively difficult to install and manufacture
  - More expensive
  - Bulky

Co-Axial Cable

- It has an outer plastic covering containing 2 parallel conductors each having a separate insulated protection cover.
- The coaxial cable transmits information in two modes:
  - Baseband mode(dedicated cable bandwidth) and
  - Broadband mode(cable bandwidth is split into separate ranges).
- Advantages:
  - High Bandwidth
  - Better noise Immunity
  - Easy to install and expand
  - Inexpensive
- Disadvantages:
  - Single cable failure can disrupt the entire network



Optical Fiber Cable (OFC)

- It uses the concept of reflection of light through a core made up of glass or plastic. The core is surrounded by a less dense glass or plastic covering called the cladding. It is used for the transmission of large volumes of data.
- The cable can be unidirectional or bidirectional. The WDM (Wavelength Division Multiplexer) supports two modes, namely unidirectional and bidirectional mode.

Advantages v/s Disadvantages

- Advantages:
  - Increased capacity and bandwidth
  - Lightweight
  - Less signal attenuation
  - Immunity to electromagnetic interference
  - Resistance to corrosive materials
- Disadvantages:
  - Difficult to install and maintain
  - High cost
  - Fragile

Strip-line

- Strip-line is a transverse electromagnetic (TEM) transmission line medium invented by Robert M. Barrett of the Air Force Cambridge Research Centre in the 1950s.
- Strip-line is the earliest form of the planar transmission line. It uses a conducting material to transmit high-frequency waves it is also called a waveguide.
- This conducting material is sandwiched between two layers of the ground plane which are usually shorted to provide EMI immunity.

Wireless or Unguided Media

- It is also referred to as Wireless or Unbounded transmission media. No physical medium is required for the transmission of electromagnetic signals.
- Features:
  - The signal is broadcasted through air
  - Less Secure
  - Used for larger distances

Reference URL (Video)
https://www.youtube.com/watch?app=desktop&v=X2infMqOoEA

Types of Wireless Media

- **RADIOWAVES**
  - These are easy to generate and can penetrate through buildings.
  - The sending and receiving antennas need not be aligned.
  - Frequency Range:3KHz – 1GHz.
  - AM and FM radios and cordless phones use Radio waves for transmission.
  - Further Categorized as (i) Terrestrial and (ii) Satellite.
- **MICROWAVES**
  - It is a line of sight transmission i.e. the sending and receiving antennas need to be properly aligned with each other.
  - The distance covered by the signal is directly proportional to the height of the antenna.
  - Frequency Range:1GHz – 300GHz.
  - These are majorly used for mobile phone communication and television distribution.
- **INFRARED**
  - Infrared waves are used for very short distance communication.
  - They cannot penetrate through obstacles.
  - This prevents interference between systems.
  - Frequency Range:300GHz – 400THz.
  - It is used in TV remotes, wireless mouse, keyboard, printer, etc.

Computer Network Components

- NIC
  - NIC stands for network interface card.
  - NIC is a hardware component used to connect a computer with another computer onto a network
  - It can support a transfer rate of 10,100 to 1000 Mb/s.
  - The MAC address or physical address is encoded on the network card chip which is assigned by the IEEE to identify a network card uniquely. The MAC address is stored in the PROM (Programmable read-only memory).
  - There are two types of NIC:
    - Wired NIC
      - The Wired NIC is present inside the motherboard. Cables and connectors are used with wired NIC to transfer data.
    - Wireless NIC
      - The wireless NIC contains the antenna to obtain the connection over the wireless network.

Computer Network Components

- HUB
  - A Hub is a hardware device that divides the network connection among multiple devices.
  - Hub will broadcast this request to the entire network.
  - All the devices will check whether the request belongs to them or not. If not, the request will be dropped.
  - The process used by the Hub consumes more bandwidth and limits the amount of communication.
  - Nowadays, the use of hub is obsolete, and it is replaced by more advanced computer network components such as Switches, Routers.

Computer Network Components

- SWITCH
  - A switch is a hardware device that connects multiple devices on a computer network.
  - A Switch contains more advanced features than Hub.
  - The Switch contains the updated table that decides where the data is transmitted or not.
  - Switch delivers the message to the correct destination based on the physical address present in the incoming message.
  - A Switch does not broadcast the message to the entire network like the Hub. It determines the device to whom the message is to be transmitted. It increases the speed of the network.

Computer Network Components

- ROUTER
  - A router is a hardware device which is used to connect a LAN with an internet connection. It is used to receive, analyze and forward the incoming packets to another network.
  - A router works in a **Layer 3 (Network layer)** of the OSI Reference model.
  - A router forwards the packet based on the information available in the routing table.
  - It determines the best path from the available paths for the transmission of the packet.
  - Security, Reliability, Performance, Network Range are some advantages of Router over other components

Computer Network Components

- MODEM
  - A modem is a hardware device that allows the computer to connect to the internet over the existing telephone line.
  - A modem is not integrated with the motherboard rather than it is installed on the PCI slot found on the motherboard.
  - It stands for Modulator/Demodulator. It converts the digital data into an analog signal over the telephone lines.
  - Based on the differences in speed and transmission rate, a modem can be classified in the following categories:
    - Standard PC modem or Dial-up modem
    - Cellular Modem
    - Cable modem

Internetwork

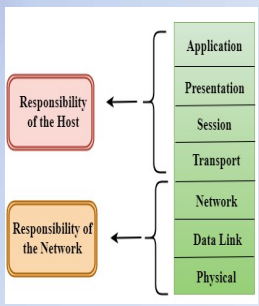
- An internetwork is defined as two or more computer network LANs or WAN or computer network segments are connected using devices, and they are configured by a local addressing scheme. This process is known as **internetworking**.
- An interconnection between public, private, commercial, industrial, or government computer networks can also be defined as **internetworking**.
- An internetworking uses the **internet protocol**.
- The reference model used for internetworking is **Open System Interconnection(OSI)**.

Types of Internetwork

- **Extranet:**
  - An extranet is a communication network based on the internet protocol such as **Transmission Control protocol (TCP)** and **internet protocol (IP)**.
  - The access to the extranet is restricted to only those users who have login credentials.
  - An extranet is the lowest level of internetworking. It can be categorized as **MAN**, **WAN** or other computer networks.
  - An extranet cannot have a single **LAN**, at least it must have one connection to the external network.
- **Intranet:**
  - An intranet is a private network based on TCP and IP.
  - An intranet belongs to an organization which is only accessible by the **organization's employee** or members.
  - The main aim of the intranet is to share the information and resources among the organization employees. An intranet provides the facility to work in groups and for teleconferences.

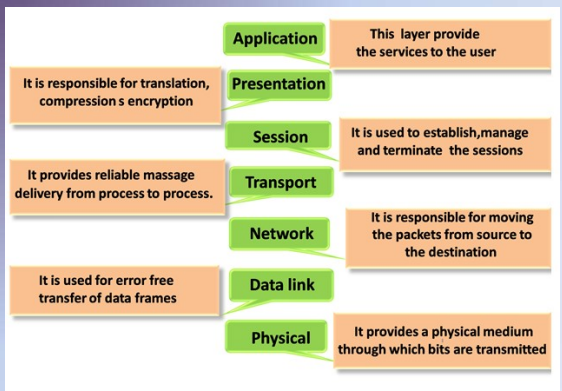
OSI Model

- OSI stands for **Open System Interconnection** is a reference model that describes how information from a software application in one computer moves through a physical medium to the software application in another computer.
- OSI consists of seven layers, and each layer performs a particular network function.
- OSI model was developed by the International Organization for Standardization (ISO) in 1984, and it is now considered as an architectural model for the inter-computer communications.
- OSI model divides the whole task into seven smaller and manageable tasks. Each layer is assigned a particular task.
- Each layer is self-contained, so that task assigned to each layer can be performed independently.



Characteristics of OSI Model

- The OSI model is divided into two layers:
  - upper layers and
  - lower layers.
- The upper layer of the OSI model mainly deals with the application related issues, and they are implemented only in the software. The application layer is closest to the end user. Both the end user and the application layer interact with the software applications. An upper layer refers to the layer just above another layer.
- The lower layer of the OSI model deals with the data transport issues. The data link layer and the physical layer are implemented in hardware and software. The physical layer is the lowest layer of the OSI model and is closest to the physical medium. The physical layer is mainly responsible for placing the information on the physical medium.



Functions of Layers

- Physical layer:
  - **Line Configuration:** It defines the way how two or more devices can be connected physically.
  - **Data Transmission:** It defines the transmission mode whether it is simplex, half-duplex or full-duplex mode between the two devices on the network.
  - **Topology:** It defines the way how network devices are arranged.
  - **Signals:** It determines the type of the signal used for transmitting the information.
- Data Link Layer
  - **Framing:** The data link layer translates the physical's raw bit stream into packets known as Frames. The Data link layer adds the header and trailer to the frame. The header which is added to the frame contains the hardware destination and source address.
  - **Physical Addressing:** The Data link layer adds a header to the frame that contains a destination address. The frame is transmitted to the destination address mentioned in the header.
  - **Flow Control:** Flow control is the main functionality of the Data-link layer. It is the technique through which the constant data rate is maintained on both the sides so that no data get corrupted. It ensures that the transmitting station such as a server with higher processing speed does not exceed the receiving station, with lower processing speed.
  - **Error Control:** Error control is achieved by adding a calculated value CRC (Cyclic Redundancy Check) that is placed to the Data link layer's trailer which is added to the message frame before it is sent to the physical layer. If any error seems to occurr, then the receiver sends the acknowledgment for the retransmission of the corrupted frames.
  - **Access Control:** When two or more devices are connected to the same communication channel, then the data link layer protocols are used to determine which device has control over the link at a given time.

Functions of Layers

- **Network Layer**
  - **Internetworking:** An internetworking is the main responsibility of the network layer. It provides a logical connection between different devices.
  - **Addressing:** A Network layer adds the source and destination address to the header of the frame. Addressing is used to identify the device on the internet.
  - **Routing:** Routing is the major component of the network layer, and it determines the best optimal path out of the multiple paths from source to the destination.
  - **Packetizing:** A Network Layer receives the packets from the upper layer and converts them into packets. This process is known as Packetizing. It is achieved by internet protocol (IP).

Functions of Layers

- **Transport Layer**
  - **Service-point addressing:** Computers run several programs simultaneously due to this reason, the transmission of data from source to the destination not only from one computer to another computer but also from one process to another process. The transport layer adds the header that contains the address known as a service-point address or port address. The responsibility of the network layer is to transmit the data from one computer to another computer and the responsibility of the transport layer is to transmit the message to the correct process.
  - **Segmentation and reassembly:** When the transport layer receives the message from the upper layer, it divides the message into multiple segments, and each segment is assigned with a sequence number that uniquely identifies each segment. When the message has arrived at the destination, then the transport layer reassembles the message based on their sequence numbers.
  - **Connection control:** Transport layer provides two services Connection-oriented service and connectionless service. A connectionless service treats each segment as an individual packet, and they all travel in different routes to reach the destination. A connection-oriented service makes a connection with the transport layer at the destination machine before delivering the packets. In connection-oriented service, all the packets travel in the single route.

Functions of Layers

  - **Flow control:** The transport layer also responsible for flow control but it is performed end-to-end rather than across a single link.
  - **Error control:** The transport layer is also responsible for Error control. Error control is performed end-to-end rather than across the single link. The sender transport layer ensures that message reach at the destination without any error.
- Session Layer
  - **Dialog control:** Session layer acts as a dialog controller that creates a dialog between two processes or we can say that it allows the communication between two processes which can be either half-duplex or full-duplex.
  - **Synchronization:** Session layer adds some checkpoints when transmitting the data in a sequence. If some error occurs in the middle of the transmission of data, then the transmission will take place again from the checkpoint. This process is known as Synchronization and recovery.

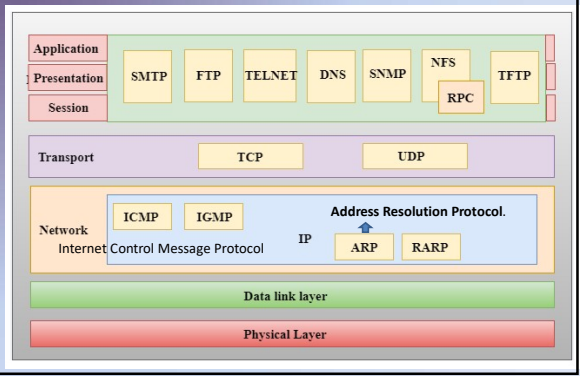
Functions of Layers

- Presentation Layer
  - **Translation:** The processes in two systems exchange the information in the form of character strings, numbers and so on. Different computers use different encoding methods, the presentation layer handles the interoperability between the different encoding methods. It converts the data from sender-dependent format into a common format and changes the common format into receiver-dependent format at the receiving end.
  - **Encryption:** Encryption is needed to maintain privacy. Encryption is a process of converting the sender-transmitted information into another form and sends the resulting message over the network.
  - **Compression:** Data compression is a process of compressing the data, i.e., it reduces the number of bits to be transmitted. Data compression is very important in multimedia such as text, audio, video.

Functions of Layers

- Application Layer
  - **File transfer, access, and management (FTAM):** An application layer allows a user to access the files in a remote computer, to retrieve the files from a computer and to manage the files in a remote computer.
  - **Mail services:** An application layer provides the facility for email forwarding and storage.
  - Directory services: An application provides the distributed database sources and is used to provide that global information about various objects.

TCP/IP Model



PROTOCOLS AND STANDARDS

- Protocols
  - A set of rules to define
    - What is communicated
    - How it is communicated
    - When it is communicated
- Standards
  - To guarantee national/international interoperatibility of data and telecommunication technology
  - Regardless of equipment manufacturers
  - ISO, ITU, ANSI, IEEE, …
  - Internet standards are maintained by IETF for publishing RFC (Request for Comments)
    - http://www.ietf.org/rfc.html

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Application Layer Protocols

- **HTTP:** HTTP stands for Hypertext transfer protocol. It transfers the data in the form of plain text, audio, video. It is known as a Hypertext transfer protocol as it has the efficiency to use in a hypertext environment where there are rapid jumps from one document to another.
- **SNMP:** SNMP stands for Simple Network Management Protocol. It is a framework used for managing the devices on the internet by using the TCP/IP protocol suite.
- **SMTP:** SMTP stands for Simple Mail Transfer Protocol. The TCP/IP protocol that supports the e-mail is known as a Simple mail transfer protocol. This protocol is used to send the data to another e-mail address.
- **DNS:** DNS stands for Domain Name System. An IP address is used to identify the connection of a host to the internet uniquely. But, people prefer to use the names instead of addresses. Therefore, the system that maps the name to the address is known as Domain Name System.
- **TELNET:** It is an abbreviation for Terminal Network. It establishes the connection between the local computer and remote computer in such a way that the local terminal appears to be a terminal at the remote system.
- **FTP:** FTP stands for File Transfer Protocol. FTP is a standard internet protocol used for transmitting the files from one computer to another computer.

The Internet

- The Internet has revolutionized many aspects of our daily lives. It has affected the way we do business as well as the way we spend our leisure time.
- The Internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use.
- The **Internet** is a global network of billions of computers and other electronic devices. With the **Internet**, it's possible to access almost any information, communicate with anyone else in the world, and do much more.
- You can do all of this by connecting a computer to the **Internet**, which is also called going online.

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What is a domain name

- Human friendly form of an Internet address
- Actual address is an Internet Protocol (IP) number
- System globally administered by ICANN
- Generic top level domains (gTLDs)
  - .com, .org, .net, .edu, .gov, .biz
- Country code top level domains (ccTLDs)

Domain name registration in India

- open and closed domains
- open - .com, .org, .net, .info, .biz
- closed - .gov, .edu, .mil, .museum
- India administers .co.in space
- to register in .in space must be a commercial entity registered and trading in India..

Query Session

Asking is another way of Learning