COMPUTER NETWORKS ASSIGNMENT-01

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Do analysis and understand the concepts of networking (basics).

1.Computer Networking:

Computer Network is basically a digital telecommunications network which permits the nodes to allocate resources. A computer network should be a set of two or more than two computers, printers & nodes that will transmit or receive data through wired media like copper cable or optic cable or wireless media like WiFi.
Best example is Internet.

It has three certain criteria as mentioned below

1. **Performance:** It basically depends upon transit time(time taken by data to travel from source to destination) and response time(time which has been passed between the query and response).
2. **Reliability:** It inversely proportional to failures. Higher the failures lower the reliability.
3. **Security:** Security is defined as how our data is protected from unwanted users.

A good network has all above mentioned qualities

Why is the need of computer networking?

1. Sharing of information over WAN.
2. Exchange of expensive software and database.
3. Communication between one PC to another PC
4. Exchange of data between various users of the same platform.
5. Used for sharing of hardware devices as well as software such as Printers, modems, hubs etc.

Different areas where we use computer networking:-

1. **Resource Sharing:** the sole aim is to make all software and hardware equipment especially, printers and switches accessible to anyone on the network regardless of the physical location of the sender or receiver.

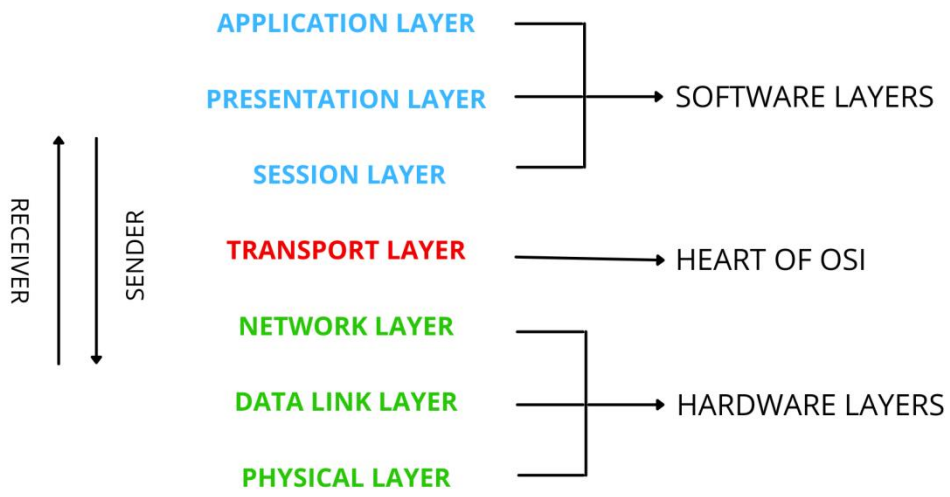
2. **Server-client Model:** Imagine a model in which a firm's data is stored on some smart computer which is highly secured with firewalls and is situated in the company office. Now, an employee of the firm needs to access data remotely with his simple desktop.

3. **Communication Medium:** A computer network provides a strong setup of communication medium among the employees in an office.

4. **E-commerce:** Nowadays, Shopping online by sitting at the comfort of our home is on-trend.

2. OSI layer

OSI stands for Open Systems Interconnection. It has been developed by ISO – 'International Organization of 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 individual bits from one node to the next. When receiving data, this layer will get the signal received and convert it into 0s and 1s and send them to the Data Link layer, which will put the frame back together.

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, over the physical layer. When a packet arrives in a network, it is the responsibility of DLL to transmit it to the Host using its MAC address.

3. Network Layer (Layer 3):

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 the shortest path to transmit the packet, from the number of routes available. The sender & receiver's IP address are placed in the header by the network layer.

4. Transport Layer (Layer 4):

Transport layer provides services to application layer and takes services from network layer. The data in the transport layer is referred to as Segments. It is responsible for the End to End Delivery of the complete message. The transport layer also provides the acknowledgement of the successful data transmission and re- transmits the data if an error is found

5. Session Layer (Layer 5) :
This layer is responsible for establishment of connection, maintenance of sessions, authentication and also ensures security.

6. Presentation Layer (Layer 6):
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.

7. Application Layer (Layer 7):
At the very top of the OSI Reference Model stack of layers, we find Application layer which is implemented by the network applications. These applications produce 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.

3. Different topologies

Topology is derived from two Greek words topo and logy, where topo means 'place' and logy means 'study'. In computer networks, a topology is used to explain how a network is physically connected and the logical flow of information in the network.

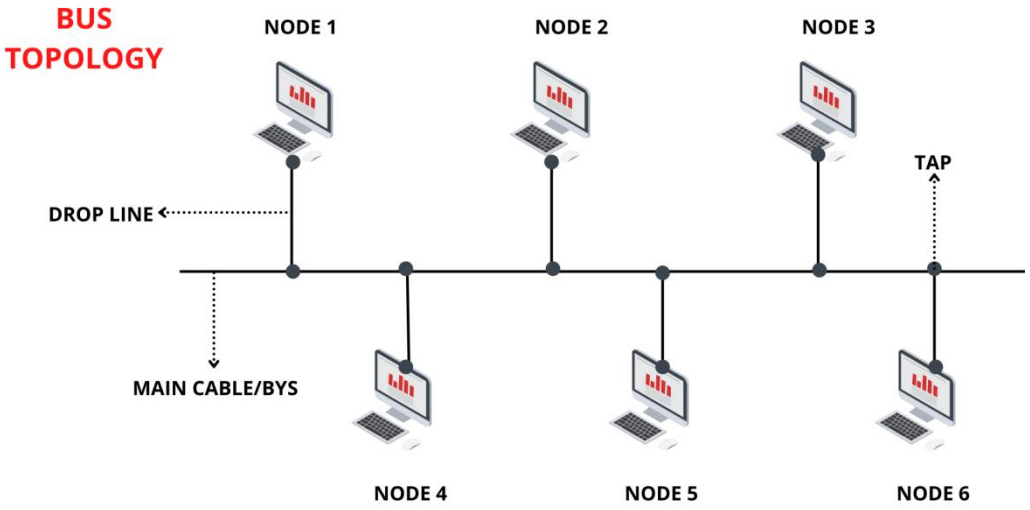
In computer networks, mainly two topologies are there:

Physical Topology: A physical topology describes the way in which the computers or nodes are connected with each other in a computer network.

Logical Topology: A logical topology describes the way, data flow from one computer to another.

Physical topology further divided in 6 different topologies:

1. Bus Topology: Bus topology is the simplest kind of topology in which a common bus or channel is used for communication in the network. The bus is connected to various taps and drop lines.



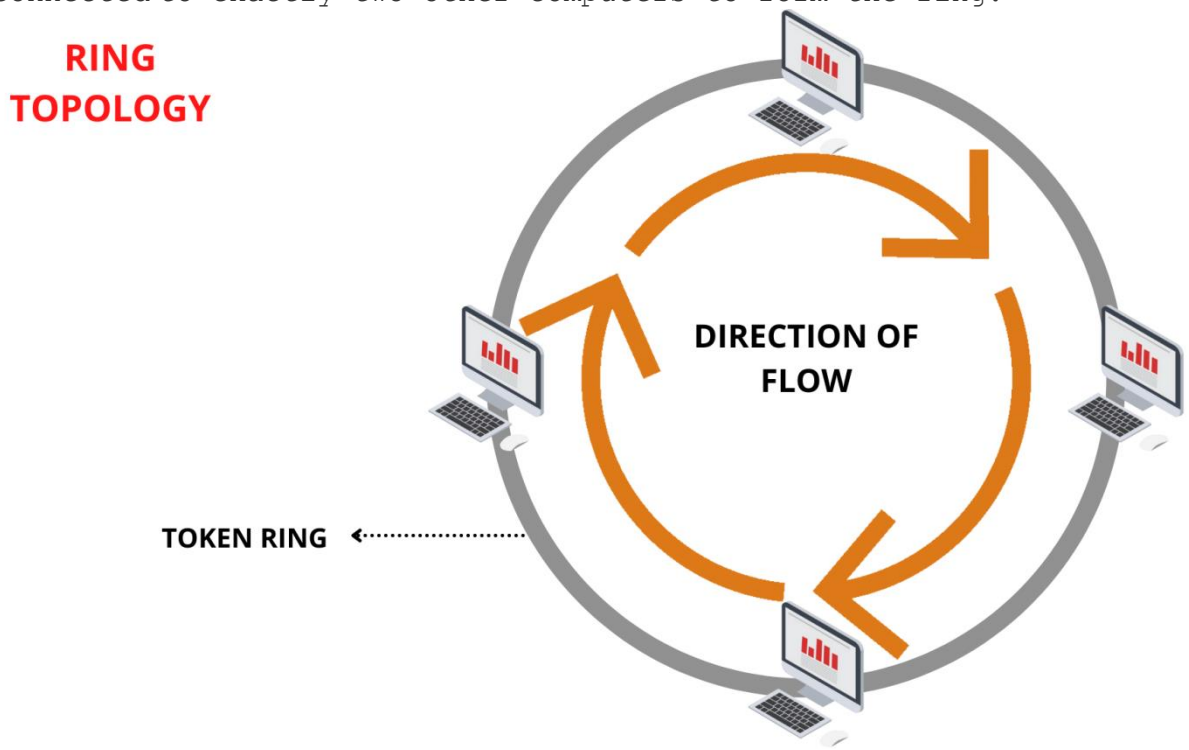
Advantages:

1. Simple to use and install.
2. If a node fails, it will not affect other nodes.
3. Less cabling is required.
4. Cost-efficient to implement.

Disadvantages:

1. Efficiency is less when nodes are more(strength of signal decreases).
2. If the bus fails, the network will fail.
3. A limited number of nodes can connect to the bus due to limited bus length.

2. Ring Topology: Ring topology is a topology in which each computer is connected to exactly two other computers to form the ring.



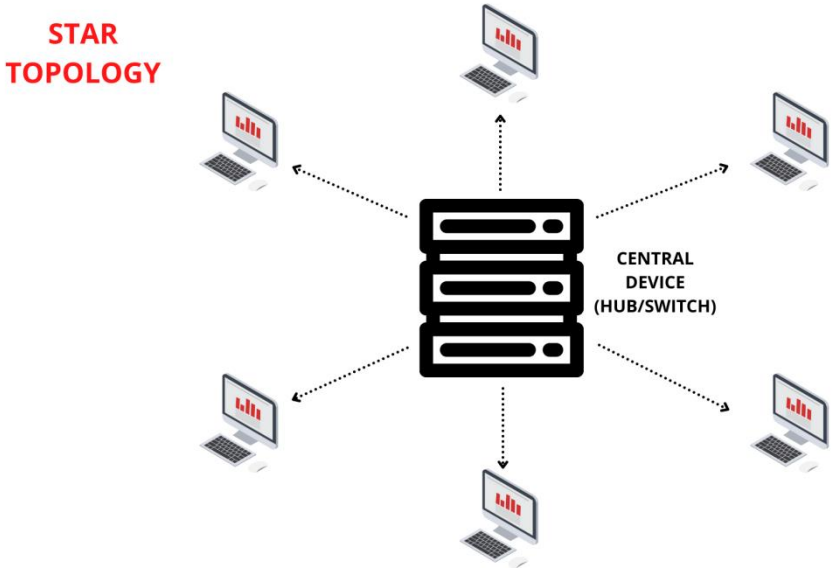
Advantages:

1. Easy Installation.
2. Less Cabling Required.
3. Reduces chances of data collision(unidirectional).
4. Each node gets the same access time.

Disadvantages:

1. If a node fails, the whole network will fail.
2. Slow data transmission speed(each message has to go through the ring path).
3. Difficult to reconfigure(we have to break the ring)

3. Star Topology: Star topology is a computer network topology in which all the nodes are connected to a centralized hub.



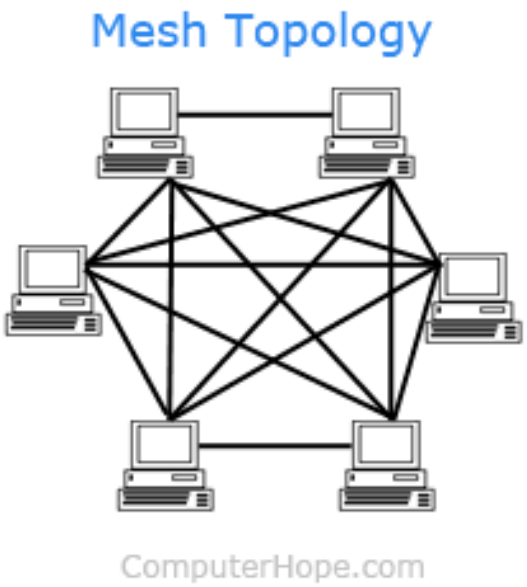
Advantages:

1. Centralized control.
2. Less Expensive.
3. Easy to troubleshoot(the faulty node does not give response).
4. Good fault tolerance due to centralized control on nodes.

Disadvantages:

1. If the central device fails, the network will fail.
2. The number of devices in the network is limited(due to limited input-output port in a central device).

4. Mesh Topology: Mesh topology is a computer network topology in which nodes are interconnected with each other.



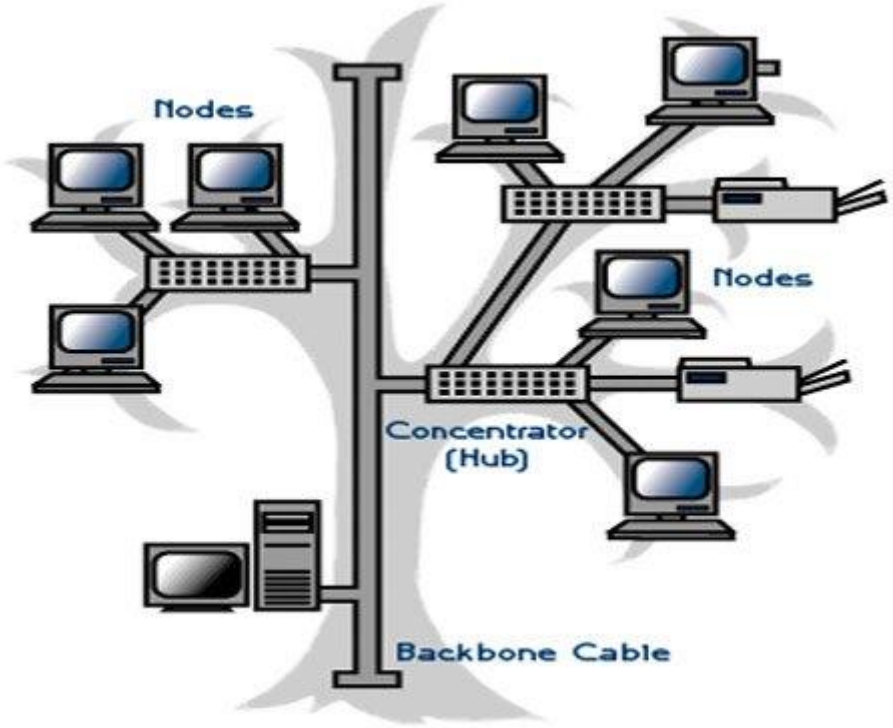
Advantages:

1. Dedicated links facilitate direct communication.
2. No congestion or traffic problems on the channels.
3. Good Fault tolerance due to the dedicated path for each node.
4. Very fast communication.

Disadvantages:

1. Very high cabling required.
2. Cost inefficient to implement.
3. Installation and maintenance are very difficult.

5. Tree Topology: Tree topology is a computer network topology in which all the nodes are directly or indirectly connected to the main bus cable.



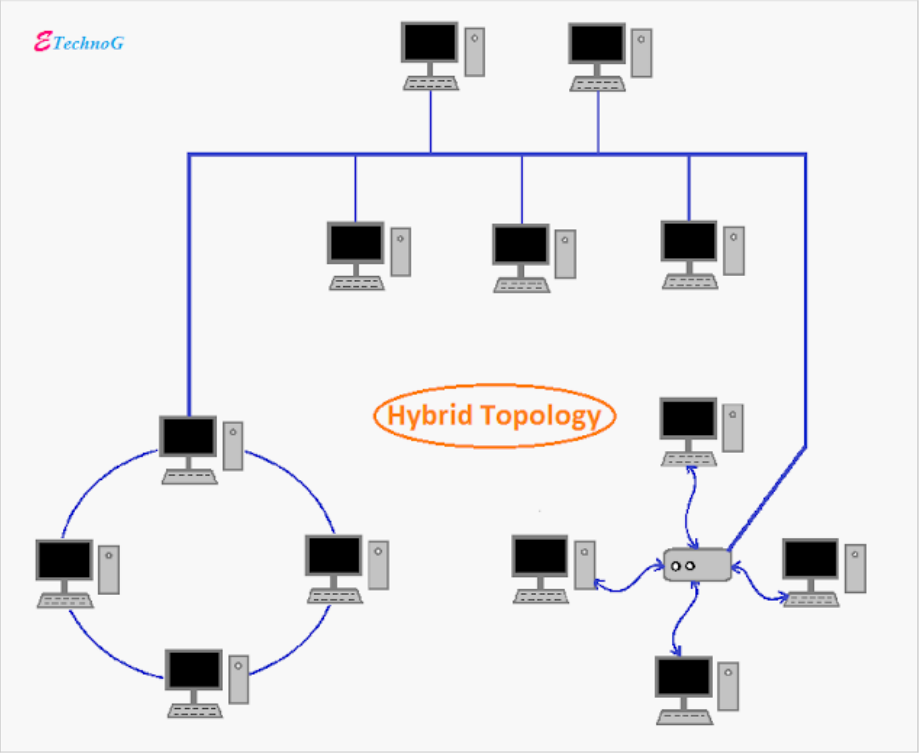
Advantages:

1. Large distance network coverage.
2. Fault finding is easy by checking each hierarchy.
3. Least or no data loss.
4. A Large number of nodes can be connected directly or indirectly.

Disadvantages:

1. Cabling and hardware cost is high.
2. Complex to implement.
3. Hub cabling is also required.

6. Hybrid Topology: A Hybrid topology is a computer topology which is a combination of two or more topologies.



Advantages:

1. It can handle a large volume of nodes
2. It provides flexibility to modify the network according to our needs.

Disadvantages:

1. Complex design.
2. Expensive to implement.
3. Multi-Station Access Unit(MSAL) required.

4. What is the significance of computer network?

1. Provides best way of business communication.
2. Streamline communication.
3. Cost-effective resource sharing.
4. Improving storage efficiency and volume.
5. Cut costs on software.
6. Cut costs on hardware.
7. Utilizes Centralized Database.
8. Increase in efficiency.