

A Review on Computer Networking Types and Computer Networking Topologies

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Abstract:

This document gives us the detailed information about computer networking and its features in current time. In this paper we have shared the different types of networks that are mentioned as: LAN, MAN, WAN, PAN, SAN, CDN, WLAN and many more. This paper also tells us the concept of topology and various types of topologies in computer networks like Bus, Star, Mesh, Ring, Tree, Hybrid and Point to point topology in computer networking.

Keywords — Computer Network, Computer Networking Types, Computer Networking Topologies, LAN, MAN, WAN,

I. INTRODUCTION TO COMPUTER NETWORK

Definition:

A computer network is a combination of two or more computer systems or devices that are linked together to transmit data and resources from source to destination or from sender to receiver. It mainly includes personal computers, servers, laptops, hardware networking devices, and other hosts etc. These networks facilitate various applications and services, such as accessing the World Wide Web, sharing digital video and audio, using application and storage servers, and communicating via email and instant messaging applications. We can transfer large amounts of data in computer networking by using different methods like switching, routing, IP Addressing, and MAC Addressing. In computer networking we can transfer data by using different mediums which can be wired or wireless. HTTP, FTP, TCP/IP, and UDP are various kinds of protocols that are used for data transmission. By using the topology technique, we can arrange different computer systems with each other systematically and graphically.

II. TYPES OF COMPUTER NETWORK

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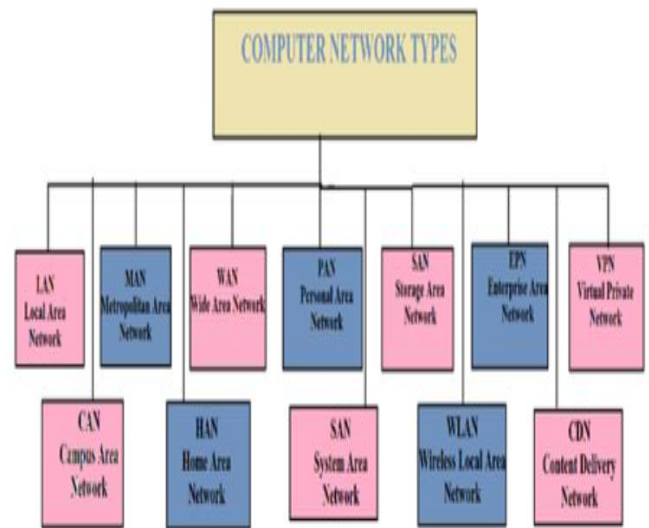


Fig 1: Types of Computer Networks

A. LAN (Local Area Network)

LAN stands for local area network. It is a collection of computer devices and network devices connected to one location, like a building, office, organization, or home. It can be small, or large ranging from a home network with one user to an enterprise network with several users and computer and network devices in an office or school. In LAN we can share data from one device to another. The devices can use a single Internet connection, share files, print to

shared printers, and be accessed and even controlled by one another. LAN is used for a limited range or area. The connection and communication is very strong in LAN. The resource-sharing possibility is more in LAN.

B. MAN (Metropolitan Area Network)

A metropolitan area network (MAN) is a computer network that connects computers in a metropolitan area, which could be a single large city, several cities, and towns, or any large area with lots of buildings. A MAN is larger than a local area network (LAN) but shorter than a wide area network (WAN). We can also say that MAN is a collection of two or more LANs.

C. WAN (Wide Area Network)

A wide-area network (WAN) is the technology that connects your offices, data centres, cloud applications, and cloud storage. It is called a wide-area network because it spreads beyond a single building or large campus to add multiple locations spread across a particular geographic area or in the world. For example, businesses with many international branch offices use a WAN to connect office networks. WAN is the collection of two or more MAN.

WAN used in different areas:

- Communicate using voice and video.
- Share resources between employees and customers.
- Access data storage and remotely back up data.
- Connect to applications running in the cloud.
- Run and host internal applications.

D. PAN (Personal Area Network)

It is the computer network that connects computers/devices within the range of a person. It is called a Personal Area Network. A Personal Area Network typically involves a computer, phone, tablet, printer, PDA (Personal Digital Assistant) and other and other entertainment devices like speakers, video game consoles, etc.

1. Wireless PAN

2. Wired PAN

E. CAN (Campus Area Network)

A campus area network (CAN) is a large network that connects multiple buildings on a school or business campus. CANs may also be considered MANs since they connect multiple LANs but are not large enough to be considered a WAN.

Types of Personal Area Network (PAN):

Applications of PAN:

- Home and Offices
- Organizations and the Business sector
- Medical and Hospital
- School and College Education
- Military and Defence

It is very useful in the home, offices, and small network areas due to its high performance in terms of flexibility and efficiency

F. EPN Enterprise Area Network

EPN is a computer network that is controlled by a verified organization, and it is used to connect multiple devices that are in different locations.

G. VPN (Virtual Private Network)

A virtual private network (VPN) is a technology that creates a very secure and encrypted connection over a network where a large risk must be faced for data loss, such as the Internet. A Virtual Private Network is a method to maximize a private network using a public network such as the Internet. VPN is a type of virtual area network.

H. HAN Home Area Network

It is a network in a user's home where all the laptops, computers, smartphones, and other smart appliances and digital devices are connected to a network. This facilitates communication among the digital devices within a home that are connected to the home network. It may be wired or wireless in nature. Mostly HAN is used in wireless networks.

Examples:

1. computers,
2. printers,
3. game systems and tablets,
4. smartphones

I. SAN Storage Area Network

It is a network of storage devices that can be easily served by different servers or computers, providing a shared resource of storage space.

J. WLAN Wireless Local Area Network

WLAN stands for Wireless Local Area Network. It is a type of network that connects two or more devices using wireless communication within a limited area, such as a home, office, school, or campus.

Some benefits of WLAN are:

1. Strong connectivity
2. Easy to install
3. Easy maintenance
4. Less cost and complexity
5. Device support is good

Some drawbacks of WLAN are:

1. Less secure
2. Need of encryption and decryption
3. Less performance
4. Less reliability

K. SAN System Area Network

is a high-performance, connection-oriented network that can link a cluster of computers. A SAN delivers high bandwidth (1 Gbps or greater) with low latency. A SAN is switched by hubs that support eight or more nodes. The cable lengths between nodes on a SAN range from a few meters to a few kilometres.

L. CDN Content Delivery Network

It is a geographical distribution of a group of devices and servers that caches content close to end users. The popularity of Content delivery network services continues to expand, and today most of the web traffic is served with the help of CDNs, including traffic from major sites like Facebook, Netflix, Amazon, Flipkart, Amazon Prime Hot Star, etc.

III. TOPOLOGIES IN COMPUTER NETWORK

Topology defines the structure of the network of how all the computer devices are internally connected. There are two types of topologies: physical and logical topology. Topology is used for network sharing and data transmission from one source to another. The arrangement of computer systems in computer networking for sharing and transmission of data is known as topology. We can also elaborate topology by graphical representation of computer systems is known as topology.

Topology helps us to provide communication between two or more computer.

In computer networking there are mainly 7 types of topologies that are mentioned below:

1. Point-to-Point topology
2. Bus Topology
3. Star Topology
4. Mesh Topology
5. Ring Topology
6. Hybrid Topology
7. Tree Topology

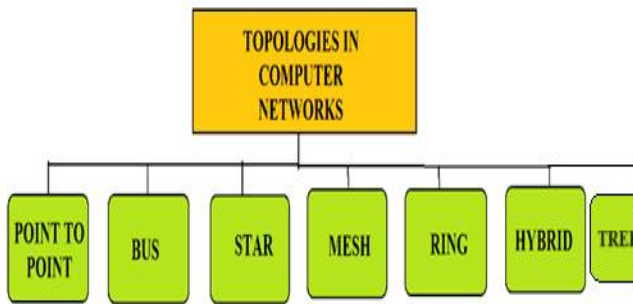


Fig 2: Types of network topologies

M. Point To Point Topology

Point to point topology is a graphical representation in which two or more systems relate to a cable or a wire. It is the simplest and most cost-effective way to create a computer network.

Some features of Point-to-point topology are mentioned below:

1. Maintained Easily
2. Bandwidth Utilization is easy
3. No delay in communication
4. Very cheap by cost

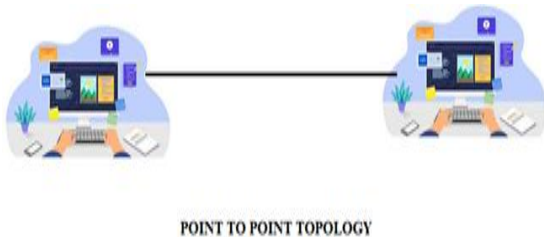


Fig 3: Point-to-Point Topology

N. Bus Topology

The bus topology is designed in such a way that all the stations are joined with a single cable known as a backbone cable. The bus topology is mainly used in 802.3 (ethernet) and 802.4 standard networks. The representation and arrangement of bus topology is very simple in nature. The bus topology is generally used in computer labs. The main drawback of bus topology is if any one system crashes or is disconnected then all other systems also stop working.

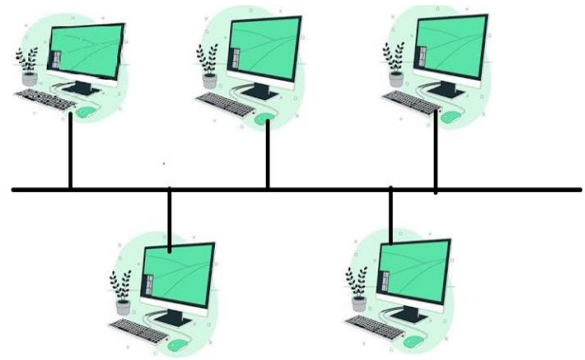


Fig 4: Bus Topology

Advantages of Bus topology:

1. Very Less Cost
2. High speed of data
3. Simple technology
4. Less Failure

Disadvantages of Bus topology:

1. Troubleshooting is very difficult
2. Only one interface is there
3. Difficulties in reconfiguration

O. Star Topology

It is the process and arrangement of the network where each system or device is connected and reported only to a central hub, switch, or central computer. In star topology, all devices and systems are controlled by central hub.

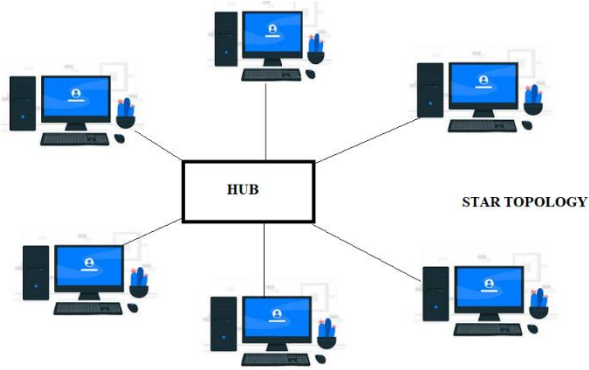


Fig 5: Star Topology

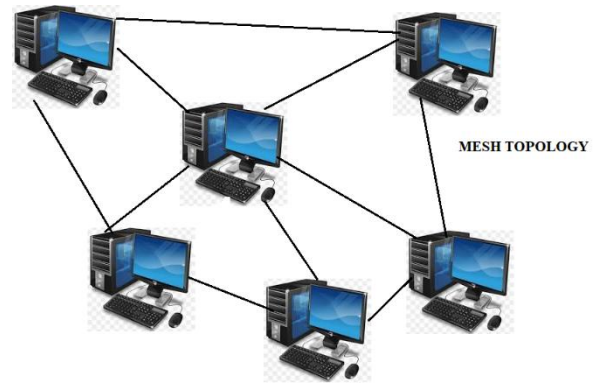


Fig 6: Mesh Topology

Advantages of Star Topology

1. Effective troubleshooting
2. Control on the network
3. Less Failure
4. Easy Technology.
5. Expandable in nature
6. Cost-effective in nature
7. Data speed is high

Disadvantages of Star topology

1. Failure in central point

P. Mesh Topology

Mesh technology is an arrangement of the network in which computers are internally connected through various connections. In mesh topology, we have lots of paths for data transmission. Internet is the best example of mesh topology

Q. Tree Topology

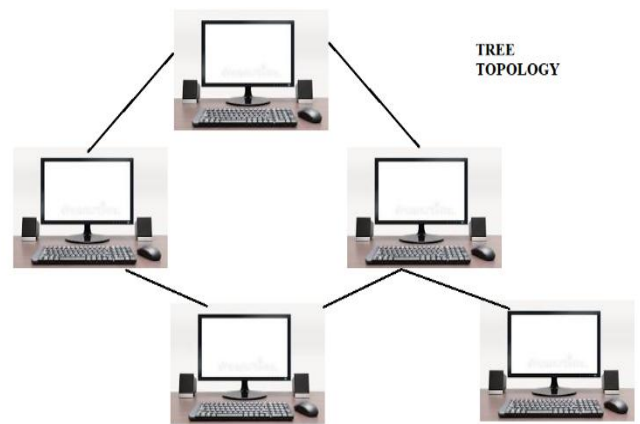


Fig 7: Tree Topology

R. Ring Topology

Ring topology is the same as bus topology but with connected ends. The different system that receives the message from the earlier computer will transfer the data to the next system. It is unidirectional in nature.

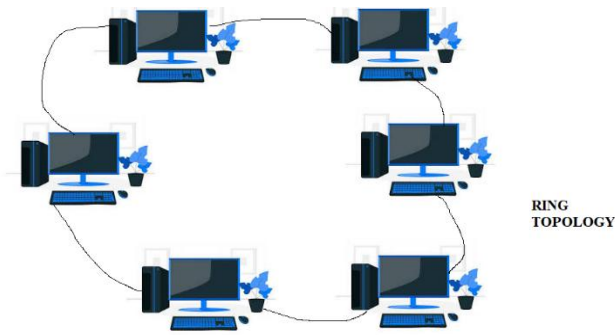


Fig 8: Ring Topology

1) Advantages of Ring topology:

1. Easy Network management
2. Availability of product
3. Cheap cost
4. Reliable in nature

2) Disadvantages of Ring topology:

1. Difficulty in troubleshooting
2. Failure
3. Difficulty in reconfiguration
4. Communication Delay

S. Hybrid Topology

The combination of various topologies is known as Hybrid topology. A Hybrid topology is a connection between different links and nodes to transfer the data. When two or more different topologies are combined is termed as Hybrid topology and if similar topologies are connected will not result in Hybrid topology.

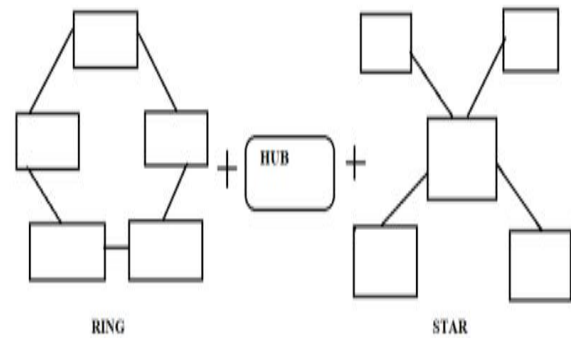


Fig 9: Hybrid Topology

Advantages of Hybrid Topology

1. Reliable in nature
2. Scalable in nature
3. Flexible in nature
4. Very effective in nature

Disadvantages of Hybrid Topology

1. Complexity in design
2. Hub is very costly
3. Infrastructure is very costly

IV. CONCLUSIONS

The conclusion of this paper is to find out and study the different computer network types like LAN, MAN, WAN, PAN, CAN, SAN, EPN, VPN, SAN, CDN, WLAN, etc. We have also studied the basic 7 types of Computer network topologies like Point-to-point, star, bus, mesh, tree, hybrid, and ring topologies in this paper. We have also found out the working and strategies of different network topologies and their types. With the help of topologies and Computer network types, we can easily transmit data from source to destination and arrange different computer systems in a particular manner. This paper concludes that we can share and transmit data from sender to receiver with the help of different computer networks.

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