

# Computer Networks And It's Topologies

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**Abstract:** Computer networks deals with a connection of networks which are joined together to form a link of computers for communication and purpose of sharing information as well as resources. This paper deals with the no. of technologies which computer the network. The most popular web technology which forms the computer network is Internet. The other technologies include Topologies which form the computer networks.

## I. LITERATURE SURVEY

**History of Networking:** In early period, there was no such efficient of new techniques for communicating as it is in modern era. Earlier there was the use of telephony and telegraph for communicating services. Then with growing aeon, the new communication was established known as packet switching protocol for no. of applications. For example, secure voice transmission. This technology worked for the rest of 20<sup>th</sup> century. This development led to the ARPANET which was the ancestor of the modern internet. With the growing span, there was the establishment of new protocols like LAN in 1997 which lead to the development of MAN and WAN.

### History of computer network

- In 1969,a network called ARPANET (advanced research project agency) was created. For transmission lines of 56kb dedicated line.
- In 1970, DECNET (digital electronic corporation network) was created . For proper trait design.
- In 1977-83, ETHERNET was created . Network capacity 10Mhz. Support token ring topology.
- In 1981, a network called TCP/IP (transmission control protocol/internet protocol) was created. To support LAN and WAN. Which lead to the beginning of INTERNET.
- In 1980's , GIGA BYTE network was created. To support applications such as FTP, SMTP, HTTP, POP3, IMAP4.

## II. INTRODUCTION

Computer network is divided into connections called topologies, which is a source of connecting computers. Topologies are connected with the help of local area network (LAN) called the Ethernet. Ethernet is a protocol which supports the Internet, Local Area Network and Wide Area Network.

The protocol Ethernet helps the topologies to establish the connection between the computers.

**Topologies** is collection of nodes which are connected together form a structure of network whether in a physical form or logically connected to form a computer network. Distance between nodes and physical interconnections as well as transmission rates or signal types may differ between two networks yet their topologies may be identical.

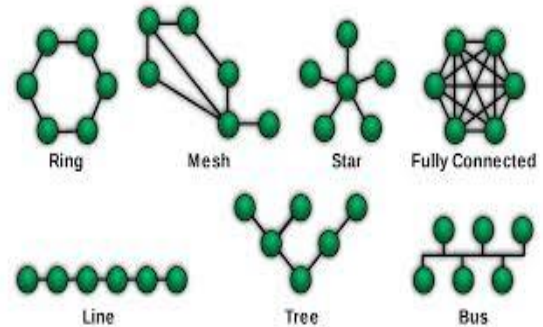


Fig.1: Different types of topologies (Reference: [en.wikipedia.org](http://en.wikipedia.org) )

Network Topologies are of two types:

1. Physical Topologies
2. Logical Topologies

**Physical Topologies:** Physical Topologies are those kinds of topologies in which all the networks of connections are connected together with cables. Data is passed through from one device to another through physical interconnection of devices.

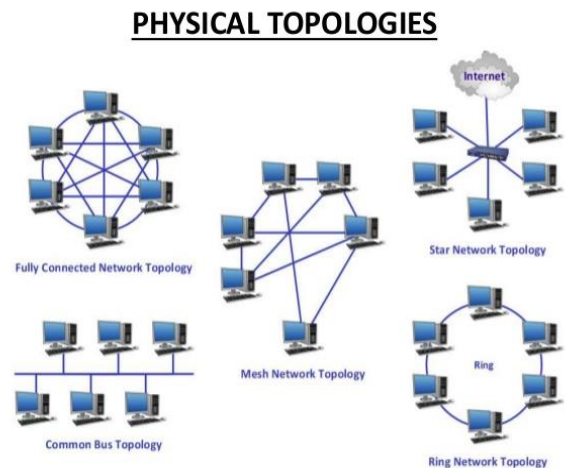


Fig.2: Examples of physical topologies (Reference: [www.slideshare.net](http://www.slideshare.net) )

**Logical Topologies:** Logical Topologies are the topologies in which connections is established between two devices on the basis of signals that act on the network without the help of physical interconnection of the devices.

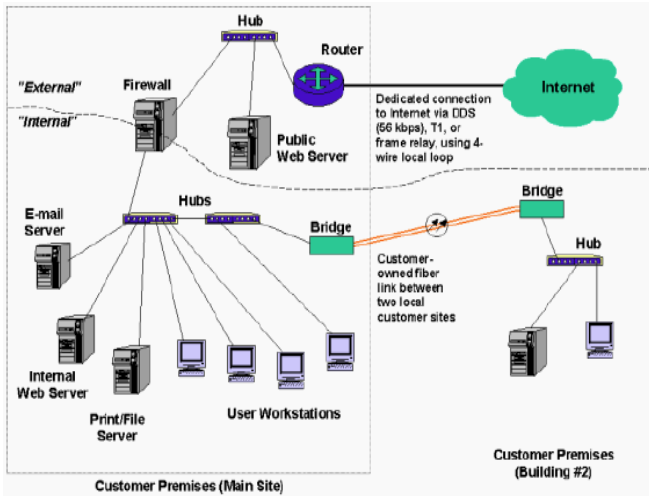


Fig.3: Image of Logical topologies (REF: [www.c-jump.com](http://www.c-jump.com))

**Different varieties of Topologies**

**Point to point topologies:** This is the topology in which node of the device is connected with the other node of the network device. In this topology, point to point connection takes place between two endpoints by switching. Point to Point topology communicates in a serial wise manner i.e. from one end point to the other endpoints of the device connecting network. This topology is very easier to understand. It is the basic model of conventional telephony which connects two endpoints.

**Examples of point to point topology:**

1. Connecting two computers with modems.
2. A substation or workstation communicating along a parallel cable to printer.
3. A main frame terminal communicating with front end processors.

**Star Topology:** The star topology is connecting of two or more device with a central device or node from where the entire device is connected through cables. Star topology makes use of more cables e.g. bus but the benefit is that if one cable fails down other nodes will keep on working and the failed cable will brought down. All the communication takes place from the hub of the star topology or the central node. The central hub is very efficient and is responsible for routing all traffic to all other nodes. The main advantage of the star topology is that one non-working node doesn't affect the other working nodes. However the main disadvantage of this topology is that it can prone to bottleneck and so does it can lead to failure in the problem of central site.

There are different architectures of star topology from where there several names used for central point which includes the following:

- ✓ Hub
- ✓ Multiple Repeater
- ✓ Concentrator
- ✓ Multi –Access Unit (MAU)

The star topology is often combined with a bus topology.

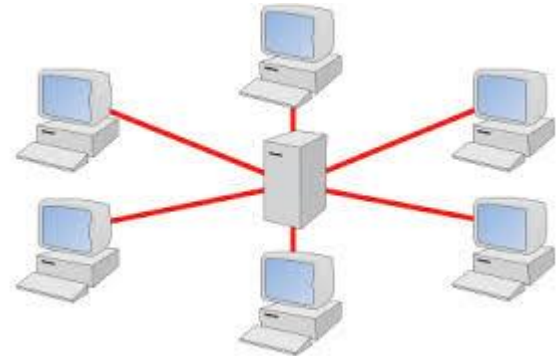


FIG.4: STAR TOPOLOGY

**Bus Topology:** The bus topology is a topology in which all the nodes are connected to a single cable. A bus topology is a topology which is used for Local Area Network (LAN). In Bus topology there is no requirement of many cables. The main single cable to which all the nodes are connected is called “backbone”. The advantage of this bus topology as compared to other topologies is that it doesn't requires a lot of cables lot network connection. On the other hand, the disadvantage of bus topology is that if the central cable to which all the nodes are connected gets fail then the entire system stops working.

Example of bus topology:

- ✓ Bus topology network is established in Ethernet of internet. The bus topology is emanated from the star topology.

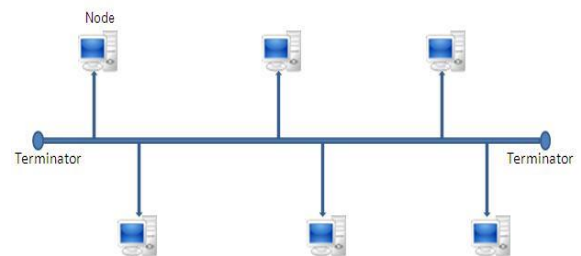


FIG.5: Bus topology

**Ring topology:** The ring topology again is used for other Local Area Network (LAN) in which every node has two devices for its communication of network. In this topology all the communication of network takes place as the shape of the ring i.e. all the network communication takes place in

the same direction. The main disadvantage of this system is that if in loop connection, one cable or device stops working then the whole system doesn't work. Another disadvantage of ring topology is that if any node is added or removed from the ring then the ring gets broken and the entire system fails. Ring Topology is also used in Wide Area Network (WAN) and Metropolitan Area Network (MAN), in which it is used as a city ring to connect the customers which are sitting at long distance.

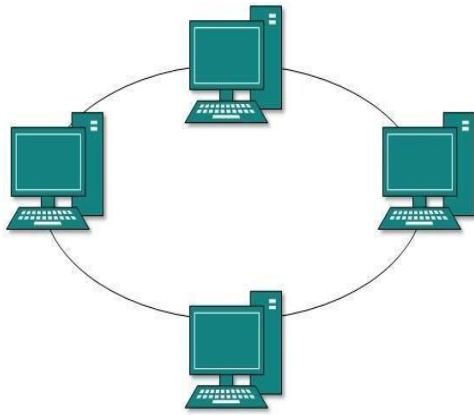


FIG.6: RING TOPOLOGY

**MESH Topology:** In mesh network topology, each of the nodes are interconnected with each other and sends signals and other data from the node. A true mesh topology is the one where one node is connected to every other node in the network. This topology is not mostly commonly used as it is very expensive and has redundant connections which are interconnected with each other. Routing and flooding is used in mesh topology.

#### Types of mesh topology:

- **Full Mesh topology:** In this topology, each component is connected to every other component. Even after considering its expensive cost and other redundancy factors, the main advantage of this topology is that network traffic is redirected to other nodes.
- **Partial Mesh Topology:** This is far more practical as compared to full mesh topology. Here, some of the systems are connected in similar fashion as in mesh topology while the rest of the systems are only connected to 1 or 2 devices. It can be said that in partial mesh, the workstations are 'indirectly' connected to other devices. This one is less costly and also reduces redundancy.

#### Advantages of mesh topology:

- ✓ Data can be transmitted from one device to another device simultaneously.
- ✓ Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected.
- ✓ Changes can be made in one node while affecting the other interconnecting nodes.

#### Disadvantages of mesh topology:

- ✓ Redundancy occurs in mesh topology in their network connections.
- ✓ The cost of this topology is high as compared to other topology.
- ✓ Set up and maintenance in this mesh topology is very difficult.

#### Mesh Topology

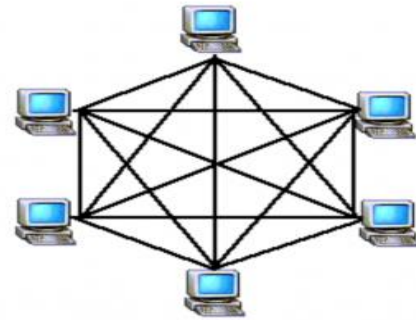


FIG.7: MESH TOPOLOGY

**Hybrid topology:** Hybrid Topology is a mixture of two or more topologies to form a new topology having characteristics of specific topology. The combination of two or more topologies is done on the basis of the organization. For example, if there exists a ring topology in one office department while a bus topology in another department, connecting these two will result in Hybrid topology. Remember connecting two similar topologies cannot be termed as Hybrid topology. Star-Ring and Star-Bus networks are most common examples of hybrid network.

#### Advantages of hybrid topology:

- 1) **Reliable:** Unlike other networks, fault detection and troubleshooting is easy in this type of topology. The part in which fault is detected can be isolated from the rest of the network and required corrective measures can be taken, WITHOUT affecting the functioning of the rest of the network.
- 2) **Scalable:** It's easy to increase the size of network by adding new components, without disturbing existing architecture.
- 3) **Flexible:** Hybrid Network can be designed according to the requirements of the organization and by optimizing the available resources. Special care can be given to nodes where traffic is high as well as where chances of fault are high.
- 4) **Effective:** Hybrid topology is the combination of two or more topologies, so we can design it in such a way that strengths of constituent topologies are maximized while their weaknesses are neutralized. For example, we saw Ring Topology has good data reliability (achieved by use of tokens) and Star topology has high tolerance capability (as each node is not directly connected to other but through central device), so these two can be

used effectively in hybrid star-ring topology.

### Disadvantages of Hybrid Topology

- 1) Complexity of Design: One of the biggest drawbacks of hybrid topology is its design. It's not easy to design this type of architecture and it's a tough job for designers. Configuration and installation process needs to be very efficient.
- 2) Costly Hub: The hubs used to connect two distinct networks, are very expensive. These hubs are different from usual hubs as they need to be intelligent enough to work with different architectures and should be function even if a part of network is down.
- 3) Costly Infrastructure: As hybrid architectures are usually larger in scale, they require a lot of cables; cooling systems, sophisticate network devices, etc.

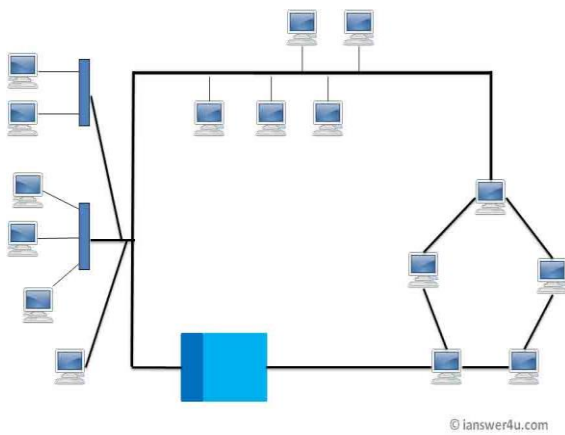


Fig.8: Hybrid Topology