Use of Topologies in Network Architecture

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Abstract:-The geometrical arrangement of computer resources, remote devices and communication facilities is known as Network Architecture or Network topology. Topologies refers to the way in which network of computers is connected. A Topology defines the arrangement of nodes, cables and connectivity devices that make up the network. There are two categories: I Physical Topology ii. Logical Topology.

Keywords:- Topology, Ring, Bus, Star, Mesh, Tree ,Hybrid,Daisy.

1. INTRODUCTION

A Computer Network is a connection between two or more computers over a common transmission medium, which shares the resources such as printer, scanner etc, connected to such computers. Transmission medium is used to transmit the message across the individual computers.

The Goal of computer network is not only to exchange data, but also understand and the data received from other entities in a network.
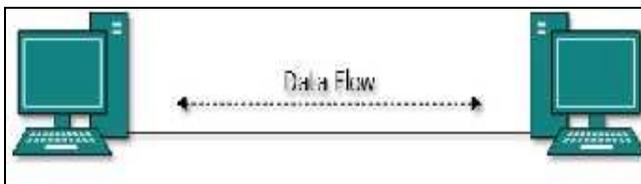

Figure 1   Data Flow

2. TYPES OF TOPOLOGIES

Two types of Toplogies. i. Physical   ii. Logical

Physical Topolgy:
Physical Topoogy describes the actual layout of the network transmission media. It defines the way the network looks.

Logical Topology:
It describe the logical pathway a signal follows as it passes among the network nodes. It defines the data passess among the nodes.Physical and logical topologies can take several forms.
 1. Bus 2. Ring 3.Star 4.Tree
 5. Mesh 6.Hybrid 7.Daisy Chain Topology

2.1 BUS TOPOLOGY

In this type several nodes are connected to common cable called as a **Bus or Trunk Line.**

The node connected to bus can send as well as receive data frombus in tow direction . However some buses are unidirectional. Each node listen the bus for their address and onece the address is recognized it accept data from the bus.

In a Bus topology all the devices are connedted to a common shared cable, it is availabe for each node to send its data to each and every computer node.The commonly used implementation for BUS topology ie ethernet at 10MBPS.
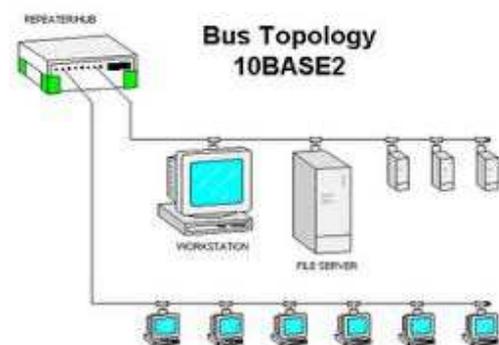
Advantages:
 1. The bus system is much faster.
 2. It can be extended with sub branches to form another topology
 3. Breakdown of any failure node does not affect other node's communication.

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Disadvantages:
1. It if difficult to detect cable fault
2. It is difficult to detect errors in hardware

2.2 RING TOPOLOGY

In Ring Topology,each Host machine connects to exactly two other machine,creating a circular network structure. When one Host tries to communicate or send message to a host which is not adjacent to it, the data travels trhough all intermediate host. To connect one more host in the existing structure administrator may need only one more extra cable.Each node works as transmitter and receiver and passes the data to its next node on a ring.
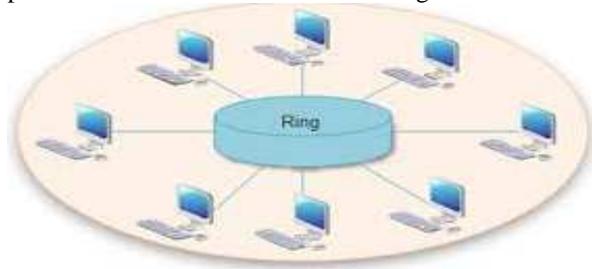

Figure 2 Ring Topology

The Commonly used implementation for RING topology is **"TOKEN RING"** at **4-16 MBPS Advantages:**
1. Cable failure affects limited users.
2. It is suitable for real time operation.

Dis-Advantages:
1. It is difficult to implement the network.
2. In case of node failure entire network fail.

2.3 STAR TOPOLOGY

In a STAR Topology all the workstations are connected to central HUB. The HUB receives signal from a workstation and routes it to the proper destination. Its Physical topology is often implemented to implement BUS or RING logical topology. In Star Topology central computer is called as SERVER or HUB , the HUB is attached to other workstation by direct cabling. Fir HUB receives the signal from network device and hen it routes the signal to proper destination. There is no need to take route decision as all messages are routed through central
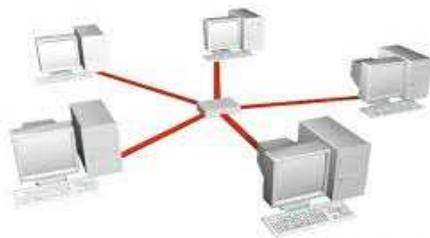
computer.

Figure 3 STAR Topology

Advantages:
1. Cabling layouts can be easily modified.
2. There is not possibility of data collision.

Dis-Advantages:
1. HUB failures affect all users.
2. HUBS are slightly expensive.
3. STAR topology requires more cabling then BUS and RING topology. Hence it cost more.

2.4 TREE TOPOLOGY or HIERARCHICAL

Also known as Hierarchical Topology is the most common form of network topology in use present day. This topology imitates as extended Star Topology and inherits properties of Bus topology.

This topology divides the network in to multiple levels/layers of network. Mainly in LANs, a network is bifurcated into three types of network devices. The lowest most is access-layer where user's computer is attached. The middle layer is known as distribution layer, which works as mediator between upper layer and lower layer. The highest most layer is known as Core layer, and is central point of the network, i.e. root of the tree from which all nodes fork. All neighboring hosts have point-to-point connection between them. Like bus topology, if the root goes down, the entire network suffers. Though it is not the single point of failure. Every connection serves as point of failure, failing of which divides the network into unreachable segment and so on.
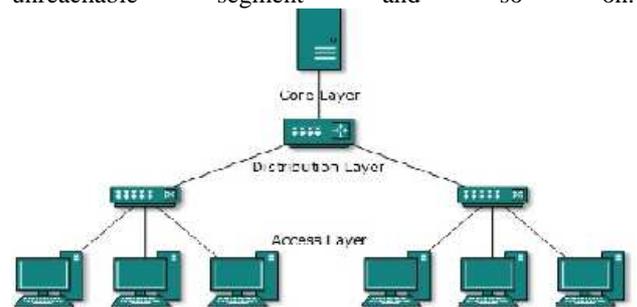
Advantages:
1. Expansion of Network is possible and easy.
2. Error detection and correction is easy.
**3.** If one segment is damaged, other segments are not affected.

Disadvantages:
1. As more and more nodes and segments are added, the maintenance becomes difficult.

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2. Scalability of the network depends on the type of cable used

2.5 MESH TOPOLOGY

In a mesh network topology, each of the network node, computer and other devices, are interconnected with one another. Every node not only sends its own signals but also relays data from other nodes. In fact a true mesh topology is the one where every node is connected to every other node in the network. This type of topology is very expensive as there are many redundant connections, thus it is not mostly used in computer networks. It is commonly used in wireless networks. Flooding or routing technique is used in mesh topology.
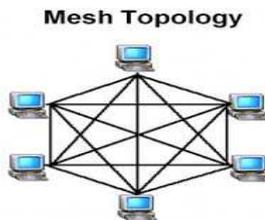
Mesh Topology

Types of Mesh Network topologies:-

1) Full Mesh Topology:-

In this, like a true mesh, each component is connected to every other component. Even after considering the redundancy factor and cost of this network, its main advantage is that the network traffic can be redirected to other nodes if one of the nodes goes down. Full mesh topology is used only for backbone networks.

2) 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 rests 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:

1. Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.

2. Expansion and modification in topology can be done without disrupting other nodes.

Disadvantage:
1. There are high chances of redundancy in many of the network connections.

2. Overall cost of this network is way too high as compared to other network topologies.

2.6 HYBRID TOPOLOGY

Hybrid, as the name suggests, is mixture of two different things. Similarly in this type of topology we integrate two or more different topologies to form a resultant topology which has good points(as well as weaknesses) of all the constituent basic topologies rather than having characteristics of one specific topology. This combination of topologies is done according to the requirements of the organization.
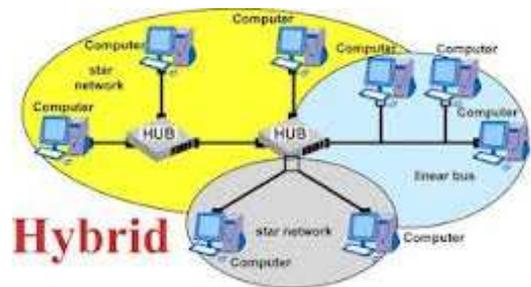
Advantages:
1. Reliable : Unlike other networks, fault detection and troubleshooting is easy in this type of topology. The part in which fault is detected can be isolated from the rest of network and required corrective measures can be taken, WITHOUT affecting the functioning rest of the network.
2. Scalable: Its 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.

Disadvantages:
1. Complexity of Design: One of the biggest drawback of hybrid topology is its design. Its not easy to design this type of architecture and its a tough job for designers.

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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 the network is down.

2.7 DAISY CHAIN TOPOLOGY

This topology connects all its hosts in a linear fashion. Similar to Ring topology, all hosts in this topology are connected to two hosts only, except the end hosts. That is if the end hosts in Daisy Chain are connected then it represents Ring topology. Each link in Daisy chain topology represents single point of failure. Every link failure splits the network into two segment. Every intermediate host works as relay for its immediate hosts.
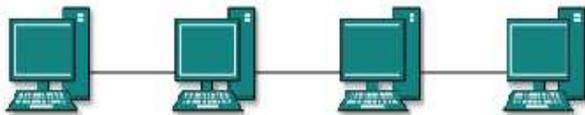
3. CONCLUSION

In this paper we have to study the different types of the topologies like Bus Topology, Ring Topology, Star Topology, Mesh Topology ,Tree Topology ,Daisy Toplogy

In this paper we have considered above Seven topology uses and its merits and demerits that will study will help to know that which structure or topology is best for which organization or business. We have to study the topology and finally we have to find the fact that all topologies are alternate options for business like that Bus Topology is use full for small network but its some demerits so its alternate option is Ring Topology. So finally, we can say that all topologies have some extra and different feature are available from other topology and that features are making it special from other topology.

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