

A Study on Network Topology

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Abstract- A computer network may be demarcated as the mode of connecting computers to each other. A computer network embraces of nodes and links. An end point in a branch of a computer or workstation is called a node. A communication path between nodes is called as link or a circuit. For communication distribution of computers has become very important issue which deliver end to end performance at a low cost, hence distribution system performance is influenced by the technology adopted by network interconnection so distribution of computers is done according to communication network arranged in a geometrical manner known as network topology. Computer networks distributed in certain geometric shape is called a network topology. We will discuss about computer network and network topology, topologies such as bus, ring, mesh, star, tree, and hybrid. The paper will also talk about pros and cons of these topologies.

Keywords- Network Topology (Bus, star, ring, mesh and tree), advantage, disadvantages.

I. INTRODUCTION

In communication network, the term topology refers to the way in which the end points, or stations, attached to the network are interconnected. In computer networking, topology refers to the layout of connected devices. In simple way network topology refers to the way in which the network of computers is connected. Each topology is suited to specific tasks and has its own advantages and disadvantages. A most simple and good example of network topology is LAN. Where it LAN has one or more physical links to other devices in the network. In recent days there are basically two basic categories of network topologies: Physical topologies and logical topologies. Physical Network Topology emphasizes the hardware associated with the system including workstations, remote terminals, servers, and the associated wiring between assets. Conversely, Logical Network Topology emphasizes the representation of data flow between nodes.

II. BUS TOPOLOGY

In this topology a set of computers are connected via a single network cable known as bus which acts as a

backbone. It is the simplest way to connect multiple computers. Problems occur at that time when two clients want to transmit at the same time on the same bus. The cabling cost of bus systems is the least of all the different topologies. Each end of the cable is terminated using a special terminator.

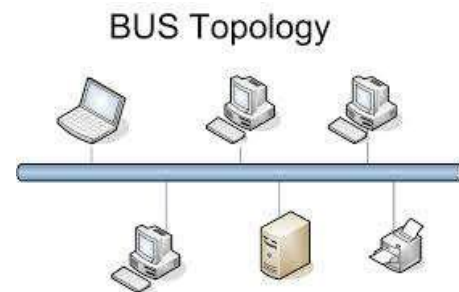


Figure 1. Bus Topology

ADVANTAGES:

1. Easy to implement and extend.
2. Less expensive because it require least amount of cable to connect the computers together.
3. Suitable and easy to use for small or temporary networks.
4. For extension a repeater can also be used.

DISADVANTAGES:

1. Heavy network traffic can slow a bus.
2. Proper termination is required.
3. Fault in the bus cable stops all transmission.
4. Difficult to administer.

III. STAR TOPOLOGY

Star topology uses a central hub through which, all components are connected. In a Star topology, the central hub is the host computer, and at the end of each connection is a node. Nodes communicate across the network by passing data through the hub. A star network uses a significant amount of cable as each node is wired back to the central hub, even if two nodes are side by side but several hundred meters away from the host. The central hub makes all routing decisions, and all other workstations can be simple.

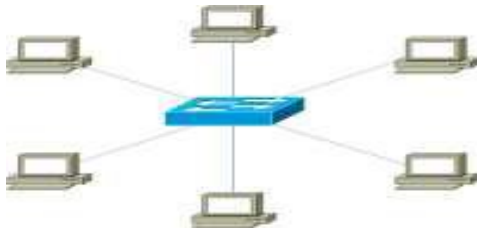


Figure 2. Star Topology

ADVANTAGES:

1. Easy to diagnose network fault.
2. Good performance.
3. Scalable, easy to set up and to extend.
4. Use of multiple cable types in the same network with a hub.

DISADVANTAGES:

1. Totally depend on a single hub.
2. Expensive to install.

IV. RING TOPOLOGY

In a ring topology, every device has exactly two neighbors for communication purposes. All messages travel through a ring in the same direction (either “clockwise” or “counter clock wise”). There is a direct point-to-point link between two neighboring nodes (the Next and the Previous). These links are unidirectional which ensures that transmission by a node traverses the whole ring and comes back to the node, which made the transmission as shown in figure.

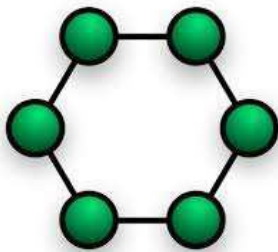


Figure 3. Ring Topology

ADVANTAGES:

- 1) It offers high performance for a small number of workstations or for large networks where each station has a similar workload.
- 2) Easy to extend.

DISADVANTAGES:

- 1) Adding and removing disrupt the network.
- 2) Troubleshooting is difficult.

V. MESH TOPOLOGY

In this topology is a point to point connection to other nodes or instruction. It allows for continuous connections and reconfiguration around broken and blocked paths by hopping from node to node until reached to destination.

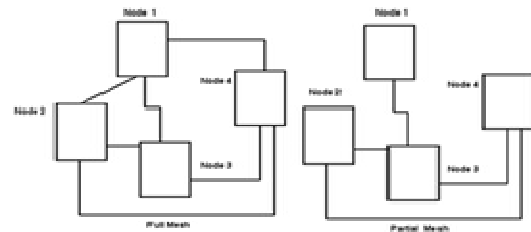


Fig 4:Mesh Topology

ADVANTAGES:

- 1) Robust.
- 2) Fault diagnosis is easy.
- 3) Provide security and privacy.
- 4) Each connection can carry its own load.

DISADVANTAGES:

- 1) Cabling cost is more.
- 2) Installation and configuration is difficult.

VI. TREE TOPOLOGY

The most common structure or topology known as Tree topology, Tree topology is a LAN topology in which only one route exists between any two nodes on the network. The pattern of connection resembles a tree in which all branches spring from one root. Tree topology is a hybrid topology, it is similar to the star topology, but the nodes are connected to the secondary hub, which in turn is connected to the central hub. In this topology group of star-configured networks are connected to a linear bus backbone

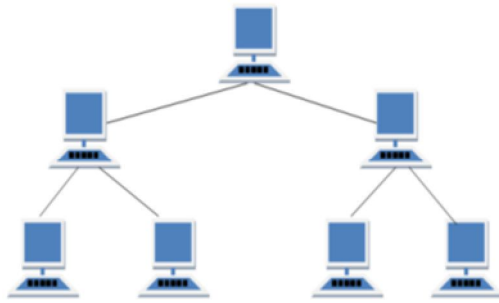


Figure 5. Tree Topology

ADVANTAGES:

- 1) Installation and configuration of network are easy.
- 2) The addition of the secondary hub allows more devices to be attached to the central hub.
- 3) Less expensive when compared to mesh topology.
- 4) Faults in the network can be detected traces.

DISADVANTAGES:

- 1) Failure in the central hub brings the entire network to a halt.
- 2) More cabling is required when compared to the bus topology because each node is connected to the central hub.

VII. LOGICAL TOPOLOGY

Logical Network Topology emphasizes the representation of data flow between nodes. It means logical topology is associated with the arrangement of devices on a computer network and how they communicate with one another. The main role of logical topology is to communicate across the physical topologies among different systems. Logical topologies are often closely associated with Media Access Control methods and protocols. Logical topologies are able to be dynamically reconfigured by special types of equipment such as routers and switches. There are two categories of logical topologies:

A. Shared Media Topology

In shared media topology the systems have unrestricted access to the physical media that is all the systems in a network have the ability to access the physical layout whenever they need it. Collision is the main disadvantage of this topology as more than one system send information out on the wire at the same time, the packets collide and as a result this collision kills the packets. Ethernet is an example of a shared media topology. As a remedy some huge networks are broken down into smaller networks. Some Ethernet uses

Carrier Sense Multiple Access protocol to reduce the number of collisions.

B. Token Based Topology

In token based topology a token is used which travels around the network to access the physical media. If any node wants to send a packet to another one it should wait for the token which is traverse within the network either clockwise or anti-clockwise direction.

VIII. CONCLUSION

In this paper we have to study the different types of the topologies like Bus Topology, Ring Topology, Star Topology, Mesh Topology and Tree Topology. Description of some inherent advantages and disadvantages computer network topologies to any system under study also has been described in this paper. 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 it's some demerits so its alternate option is Ring Topology. This paper has provided some knowledge of analysis approaches for dealing with network topology related problems. The techniques covered in this discussion can be adapted to related computer network applications. 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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