ANALYTICAL STUDY OF DIFFERENT NETWORK TOPOLOGIES

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Abstract - *A network is the interconnection of two or more devices. The study of arrangement or mapping of elements (links, nodes) of a network is known as network topology. 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. This paper provides an analytical study of different types of basic network topologies on the basis of their advantages, disadvantages and different factors which differentiate them.*

Key Words: *Network Topology (Bus, star, ring, mesh and tree), advantage, disadvantage and hybrid topology.*

1. INTRODUCTION

In computer network two or more computers are linked together through a medium and data communication devices for the purpose of communicating data and sharing resources. The term topology in communication network refers to the way the computers or workstations are linked together in the network. The basic types of network topologies are: Bus Topology, Star Topology, Ring Topology, Mesh Topology and Tree Topology.

2. LITERATURE REVIEW OF TOPOLOGIES

2.1 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.
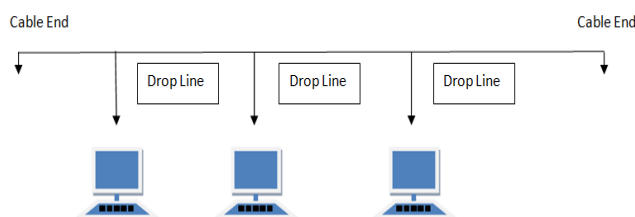

Fig-1: Bus Topology

ADVANTAGES:

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

DISADVANTAGES:

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

2.2 Star Topology

In this topology a central switch or hub is used to connect all the components. The devices or users are not linked to each other and it does allow direct traffic between devices. The active star network has an active central node that usually has the means to prevent echo –related problems.
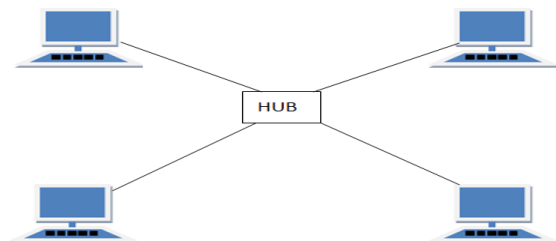

Fig-2: Star Topology

ADVANTAGES:

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

DISADVANTAGES:

- Totally depend on a single hub.
- Expensive to install.

2.3 Ring Topology

In this topology each node connects to exactly two other nodes that is a direct point- to- point link between two neighboring nodes forming a circular pathway for signal like a ring. Data is transferred in a sequential manner that is bit by bit.
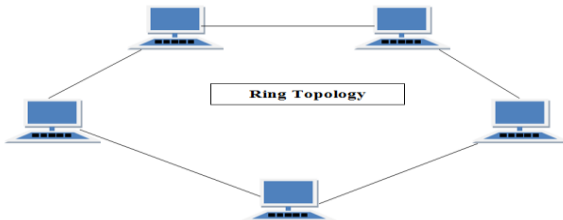

Fig-3: Ring Topology

ADVANTAGES:

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

DISADVANTAGE:

- Adding and removing disrupt the network.
- Troubleshooting is difficult.

2.4 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.
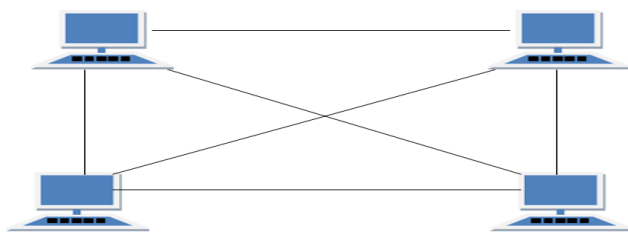

Fig-4: Mesh Topology

ADVANTAGE:

- Robust.
- Fault diagnosis is easy.
- Provide security and privacy.
- Each connection can carry its own load.

DISADVANTAGE:
- Cabling cost is more.
- Installation and configuration is difficult.

2.5 Tree Topology

In this topology only one route node exists between any two nodes on the network. It is also called hierarchical topology having at least three levels to the hierarchy.
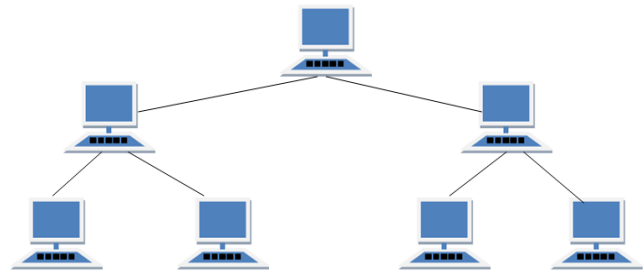

Fig-5: Tree Topology

ADVANTAGE:

- Easily managed and maintained.
- Error detection is easily done.
- Expansion of nodes is possible and easy.
- Extension of bus and star topologies.

DISADVANTAGE:

- Heavily cabled.
- Central hub fails network fails.

3. RESULT

Here study of different basic topologies is done for different parameters. The installation shows easy or difficult for different topologies. Cost is defined as the requirement of cable as expensive or not. Flexible represents the modification in the network either yes or no. Reliability is based on failure defined as high, low and moderate. Extension of the topologies based on the addition of computers and at last robust resembles to the ability of the connection between each nodes.

Table -1: ANALYSIS OF DIFFERENT TOPOLOGIES

Parameters	BUS	STAR	RING	MESH	TREE
Installation	easy	easy	difficult	difficult	easy
Cost	inexpensive	expensive	moderate	expensive	less
Flexible	yes	yes	no	no	yes
Reliability	moderate	high	high	high	moderate
Extension	easy	easy	easy	poor	easy
Robust	no	yes	no	yes	no

4. CONCLUSION

In this paper, we have done analytical study of different basic topologies which provide us a brief idea about each topology and their features. Each topology have some advantages and disadvantages as we discussed above so the solution is that we can integrate two or more different topologies to form a resultant topology having characteristic of combine topology known as Hybrid topology. This topology is reliable, scalable, flexible and effective. Only disadvantage is its complexity of design and costly infrastructure as we are combining two or more different topologies.

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