



## Network topology

There are seven basic topologies in the study of network topology:

1. Point-to-point topology,
2. Bus (point-to-multipoint) topology,
3. Ring topology,
4. Star topology,
5. Hybrid topology,
6. Mesh topology and
7. Tree topology.

The interconnections between computers whether logical or physical are the foundation of this classification. **Logical topology** is the way a computer in a given network transmits information, not the way it looks or connected, along with the varying speeds of cables used from one network to another. On the other hand the **physical topology** is affected by a number of factors:

- Troubleshooting technique,
- Installation cost,
- Office layout and
- Cables' types.

The physical topology is figured out on the basis of a network's capability to access media and devices, the fault tolerance desired and the cost of telecommunications circuits. The classification of networks by the virtue of their physical span is as follows: Local Area Networks (LAN), Wide Area Internetworks (WAN) and Metropolitan Area Networks or campus or building internetworks. **11.6.3 How Is the Physical Topology Classified?**

### **Point-to-Point Network Topology**

It is the basic model of typical telephony. The simplest topology is a permanent connection between two points. The value

127  
of a demanding point-to-point network is proportionate to the number of subscribers' potential pairs. It is possible to establish a permanent circuit within many switched telecommunication systems: the telephone present in a lobby would always connect to the same port, no matter what number is being dialed. A switch connection would save the cost between two points where the resources could be released when no longer required.

### **Bus Network Topology**



LANs that make use of bus topology connects each node to a single cable. Some connector connects each computer or server to the bus cable. For avoiding the bouncing of signal a terminator is used at each end of the bus cable. The source transmits a signal that travels in both directions and passes all machines unless it finds the system with IP address, the intended recipient. The data is ignored in case the address is unmatched. The installation of one cable makes bus topology an inexpensive solution as compared to other topologies; however the maintenance cost is high. If the cable is broken all systems would collapse.

- **Linear Bus:** If all network nodes are connected to a combine transmission medium that has two endpoints the Bus is Linear. The data transmitted between these nodes is transmitted over the combine medium and received by all nodes simultaneously.

- **Distributed Bus:** If all network nodes are connected to a combine transmission medium that has more than two endpoints created by branching the main section of the transmitting medium.

A linear bus topology consists of a main run of cable with a terminator at each end (See fig. 1). All nodes (file server, workstations, and peripherals) are connected to the linear cable. A *bus topology* uses one long cable (backbone) to which network

128

devices are either directly attached or are attached by using short drop cables. Because all workstations share this bus, a workstation checks for any information that might be coming down the backbone before sending their messages. All messages pass the other workstations on the way to their destinations. Each workstation then checks the address of each message to see if it matches its own. Note that bus network topologies, the backbone must be terminated at both ends to remove the signal from the wire after it has passed all devices on the network. *Fig. 1. Linear Bus topology*

#### **Advantages of a Linear Bus Topology**

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

#### **Disadvantages of a Linear Bus Topology**

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

129

#### **Star Network Topology**

The topology when each network host is connected to a central hub in LAN is called Star. Each node is connected to the hub with a point-to-point connection. All traffic passes through the hub that serves as a repeater or signal booster. The easiest topology to install is hailed for its simplicity to add more nodes but criticized for making hub the single point of failure. The network could be BMA (broadcast multi-access) or NBMA (non-broadcast multi-access) depending on



whether the signal is automatically propagated at the hub to all spokes or individually spokes with those who are addressed.

- **Extended Star:** A network that keeps one or more than one repeaters between the central node or hub and the peripheral or the spoke node, supported by the transmitter power of the hub and beyond that supported by the standard of the physical layer of the network.

- **Distributed Star:** The topology is based on the linear connectivity that is Daisy Chained with no top or centre level connection points.

### **Advantages of a Star Topology**

- Easy to install and wire.

- No disruptions to the network when connecting or removing devices.

- Easy to detect faults and to remove parts.

130

### **Disadvantages of a Star Topology**

- Requires more cable length than a linear topology.

- If the hub, switch, or concentrator fails, nodes attached are disabled.

- More expensive than linear bus topologies because of the cost of the hubs, etc.

**Ring Network Topology** Ring topology is one of the old ways of building computer network design and it is pretty much obsolete. FDDI, SONET or Token Ring technologies are used to build ring technology. It is not widely popular in terms of usability but in case if you find it anywhere it will mostly be in schools or office buildings. Such physical setting sets up nodes in a circular manner where the data could travel in one direction where each device on the ring serves as a repeater to strengthen the signal as it moves ahead.

### **Mesh Network Topology**

The exponent of the number of subscribers is proportionate to the value of the fully meshed networks.

- **Fully Connected:** For practical networks such topology is too complex and costly but highly recommended for small number of interconnected nodes.

131

- **Partially Connected:** This set up involves the connection of some nodes to more than one nodes in the network via point-to-point link. In such connection it is possible to take advantage of the redundancy without any complexity or expense of establishing a connection between each node.

### **Hybrid Topology**



Hybrid topologies are a combination of two or more different topologies. WANs sometimes have hybrid topologies because they connect a variety of LAN topologies. The big advantage of hybrid topologies is that they connect disparate topologies. However, the disadvantage of hybrid topologies is that they are potentially complex to establish and manage.

### **Tree Network Topology**

The top level of the hierarchy, the central root node is connected to some nodes that are a level low in the hierarchy by a point-to-point link where the second level nodes that are already connected to central root would be connected to the nodes in the third level by a point-to-point link. The central root would be the only node having no higher node in the hierarchy. The tree hierarchy is symmetrical. The BRANCHING FACTOR is the fixed number of nodes connected to the next level in the hierarchy. Such network must have at least three levels. Physical Linear Tree Topology would be of a network whose Branching Factor is one.



132

### **Advantages of a Tree Topology**

Point-to-point wiring for individual segments.  
Supported by several hardware and software vendors.

### **Disadvantages of a Tree Topology**

Overall length of each segment is limited by the type of cabling used.  
If the backbone line breaks, the entire segment goes down.  
More difficult to configure and wire than other topologies.

### **Considerations When Choosing a Topology**

**Money.** A linear bus network may be the least expensive way to install a network; you do not have to purchase concentrators.

**Length of cable needed.** The linear bus network uses shorter lengths of cable.

**Future growth.** With a star topology, expanding a network is easily done by adding another concentrator.