NETWORK

By

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Network

A network is a group of devices (Nodes) connected by media links. A node can be a computer, printer or any other device capable of sending and receiving data generated by other nodes on the network.

In other words, a group of computer and associated peripherals connected by a communication channel capable of sharing files and other resources between several users is called network.
Types of Network

- **LAN** (Local Area Network): It is a campus, office or organization
- **MAN** (Metropolitan Area Network): Network extended over an entire city
- **WAN** (Wide Area Network): Network extended over the entire globe
A LAN can be as simple as two PCs and printer in one's home, office or it can be throughout a company and include voice, and video peripherals. At present LAN size is restricted to one kilometers.
LAN

A office
Features of LAN

- LAN uses NOS (Networking Operating System), which ties all the components together and makes operations transparent to user.

- LANs are wholly owned by an organization.

- LAN is a system of interlinked personal computers.

- A LAN works on the principle of load sharing because the program to be executed is downloaded into the personal computer memory.

- LAN has a very limited geographic range normally less than 1 km.
Advantage of LAN

- It permits sharing of expensive hardware's
- LAN improves the productivity, because information storage, processing and retrieval and other functionally can be improved.
- It provides cost-effective multi-user computer environment.
- It provides high transmission rate to accommodate the needs of both user and equipment.
- Error rate is very less because in-built method of detecting and compensating for systems error is implied.
- It allows file/record locking.
Disadvantage of LAN

- Installation and reconfiguration always requires technical & skilled man power.
- Due to sharing of resources, sometime operational speed may be slow down.
- Insufficient knowledge of network administrator creates improper authorization and security problem.
- Problem of password hacking.
A network is bigger than LAN but smaller than WAN, “Multiple LANs that are connected within the same city to form a citywide network for a specific government or industry using a high speed backbone” It is known as MAN.
MAN

Network operated By Public/Private company

Indore
Features of MAN

- MAN is a network designed to extend over an entire city.
- MAN includes different private LANs connected through cable and router or gateway.
- It is bigger than LAN but smaller than WAN.
- FDDI technology is the best suited for MAN.
Advantage of MAN

- Any company can connect all its branches existing in the same city.
- It is economical because sharing of costly resources for all branches of a company.
Disadvantage of MAN

- Network installation is difficult and required skilled persons.
- Installation cost is very much.
A WAN is a network that connect users across large distances, often crossing the geographical boundaries of cities, states or Nations.
Features of WAN

- In this network, computers and small networks are inter-connected without cables but with the help of telephone lines, microwave and satellite links.
- WAN can be implemented with the help of private networks as well as public networks.
- It is the very long-distance communication network.
Advantage of WAN

- WAN has no limit of area, so it is world wide network.
- Multi country’s organizations have facility to form their global integrated network through WAN.
- WAN support global markets and global business.
- For a network database, WAN allows users all over a network to access and update a single, consistent view of data.
Disadvantage of WAN

- WAN is very big and complex network.
- It is slow in speed.
- WAN is not very much secured means not reliable.
- It is very costly because we have to pay every time for transferring data.
- Very much dependency on the third party because it is public network.
## Difference between LAN, MAN & WAN

<table>
<thead>
<tr>
<th>Point of view</th>
<th>LAN</th>
<th>MAN</th>
<th>WAN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>1km</td>
<td>City</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Authority</strong></td>
<td>Personal</td>
<td>Company or Organizations</td>
<td>No authority</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>Normal</td>
<td>Medium</td>
<td>Very much</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>Cable media</td>
<td>Cable media and Telephone lines</td>
<td>Telephone lines, microwave and Satellite</td>
</tr>
<tr>
<td><strong>Device</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>0.1 to 100mbps</td>
<td>1 to 1mbps</td>
<td>1800 to 9600 bits per second</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>Very Good</td>
<td>Good</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Network Topology

- A topology defines the arrangement of nodes, cables and connectivity devices that make up the network.

- In other words we can say topology is the geometric arrangement of workstations and the links among them.
Parameters to analyses the Topology

There are certain parameters, to help us select the best topology for our situation and they are;

- Application
- Complexity
- Performance
- System overhead
- Vulnerability
- Expandability
Application

- It shows in what size installation is the topology most appropriate.

Complexity

- It shows, how technically complex is the topology?
Performance

- It shows, how much of a traffic load can the system support

System overhead

- It shows, what is the comparative price for excess capability.
Vulnerability

- It shows, how susceptible in the topology to failure and damage.

Expandability

- When we are ready to extend the LAN, how easily can be topology accommodate additional workstations and cover larger distances?
Types of Topology

- Topology can be divide in two basic type;
  1. Physical topology
  2. Logical topology
Physical Topology

- It describes the actual layout of the network transmission media, means the way of networks looks.
Logical Topology

- It describes the logical pathway a signal follows as it passes among the network nodes, meaning the way the data passes among the nodes.
The most common types of Network Topology

- Bus Topology
- Ring Topology
- Star Topology
- Tree Topology
- Mesh Topology
- Token ring Topology
Bus Topology

Drop lines/Interface units

Terminator

Terminator
A bus topology is one in which all devices connect to a common shared cable (backbone) through interface units/drop lines and taps.

This topology is used in traditional data communication networks where the host at one end of the bus communicates with several terminals attached along its length.
Cont...

- Special connector called terminator must be placed at the end of the backbone cable to prevent signals from reflecting back on the cable and causing interference.

- Bus configuration is known as multi-drop line.
Advantage of Bus Topology

- Installation is very easy because it is a single cable network.
- It uses less cabling than any other topology.
- Additional nodes can be connected to an existing bus network at any point along its length.
- It is a resilient (flexible) architecture means simple and reliable.
- It is very economical.
Disadvantage of Bus Topology

- Difficult reconfiguration and fault isolation.
- All the nodes are directly connected to central cable and nodes have to decide which uses the network first.
- Entire network shutdown if there is a failure in the backbone.
- The damage area reflects signals back in the direction of origin, creating noise in both directions.
Ring Topology
Features of Ring Topology

- Ring topology are wired in a circle, each node is connected to its neighbors on either side.
- Data signals pass around the ring in one direction.
- Each device incorporates a receiver and a transmitter, and serves as a repeater that passes the signal on to the next device in the ring.
- Ring topologies are quite rare.
- No routing capability is required as messages automatically travel to the next workstation on the network.
Advantage of Ring Topology

- A ring relatively easy to install and reconfigure.
- Less cabling involved in a ring topology comparable to that of bus and is small relative to other.
- Each device is linked only to its immediate neighbors so to add or delete a device requires moving only two connections.
- It is good for small number of workstations operating at high speeds over short distances are to be connected.
Disadvantage of Ring Topology

- A node failure causes entire network failure.
- A ring requires relatively complex hardware to implement.
- The failure of one node will affect all others has serious problem for fault diagnosis.
- Topology affects the access protocol.
Star Topology
Features of Star Topology

- It requires that all devices connect to a central hub or wiring concentrator through a dedicated point to point.
- The hub receives signals from the other network devices and routes the signals to the proper destinations.
- Nodes do not have to make routing decisions, as all communications must pass through the central hub before going to their destinations.
- The size and capacity of the network depend on the central hub.
Advantage of Star Topology

- Each device needs only one link and one I/O port to connect it to any number of others.
- It is easy to install and reconfigure.
- Robustness of network means if one link fails, only that link is affected and all other links remain active.
- Due to the above fact, fault identification and fault isolation is very easy.
Disadvantage of Star Topology

- Cabling is required very much.
- Difficult to expand the network.
- If the central node in a star network fails the entire network is rendered inoperable.
- Maintenance and installation problems can increase costs considerably.
Tree Topology

Central/Primary node

Server

Secondary hub
Features of Tree Topology

- In tree, central hub is used to connect only secondary hubs, not with all nodes.
- So nodes & devices are connected through the secondary hubs.
- Normally the central hub of tree is an active hub so it is able to filter & regenerate the signals.
- Secondary hub may be active or passive.
Advantage of Tree Topology

- Tree network can be easily extended because central hub has so many hubs.
- Network (or sub-network) can be isolated and communication can be prioritized.
- Due to the above fact time sensitive data will not have to wait for access to the network.
Disadvantage of Tree Topology

- Tree topology has all the disadvantages of star topology.
- The subsection has dependence on the root section.
- Bigger branches slow down the speed of network.
Mesh Topology
Features of Mesh Topology

- Every device has a dedicated point to point link to every other device.
- Mesh is really a hybrid model representing an all channels topology.
- Every device on the network must have n-1 input/output ports.
Advantage of Mesh Topology

- It is very much fault tolerance capacity.
- Privacy or security is very high, every message sent travels along a dedicated line only the intended recipient sees it.
Disadvantage of Mesh Topology

- Installation & reconfiguration is very difficult.
- Extra workload to network administrator.
- It requires very much cabling & I/O ports.
- Extra wiring can be greater than the available space can accommodate.
- It is the most expansive network.
Token Ring Topology
Features of Token Ring Topology

- In this topology, wired in a circular format but all the node connected by the drop lines and T-shape tokens.

- In this topology all the nodes have only receiver and transmitter not a repeater.
Advantage of Token Ring Topology

- A node failure causes entire network are not failure.
- No problems in fault diagnosis.
- Privacy and accuracy in data transmission.
Disadvantage of Token Ring Topology

- A token ring is difficult to install and reconfigure.
- Cabling is required very much.
- It does not allow direct traffic between devices.