

Network Topologies & LAN ,MAN and WAN

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What is Topology

- NW Topology Defines how various computers or nodes they are connected to each other
- Or It refers the way a nw is laid out , either physically or logically.
- Two or more devices connect to a link;2 or more links form a topology. ● **Topology is physical arrangement of links in the network. Relationships**



2 Relationships are possible while choosing Topology.



Peer to peer : where the devices share link equally. like Ring and mesh



Primary–Secondary: Where one device control traffic and other must transmit through it. Like Star n tree. ● Bus topology is equally convenient.

Six Network Topologies



1 .Mesh Topology



2 .Star Topology



3 .Tree Topology



- **4 .Ring Topology**

- **5 .Bus Topology**

- **6 .Hybrid Topology**

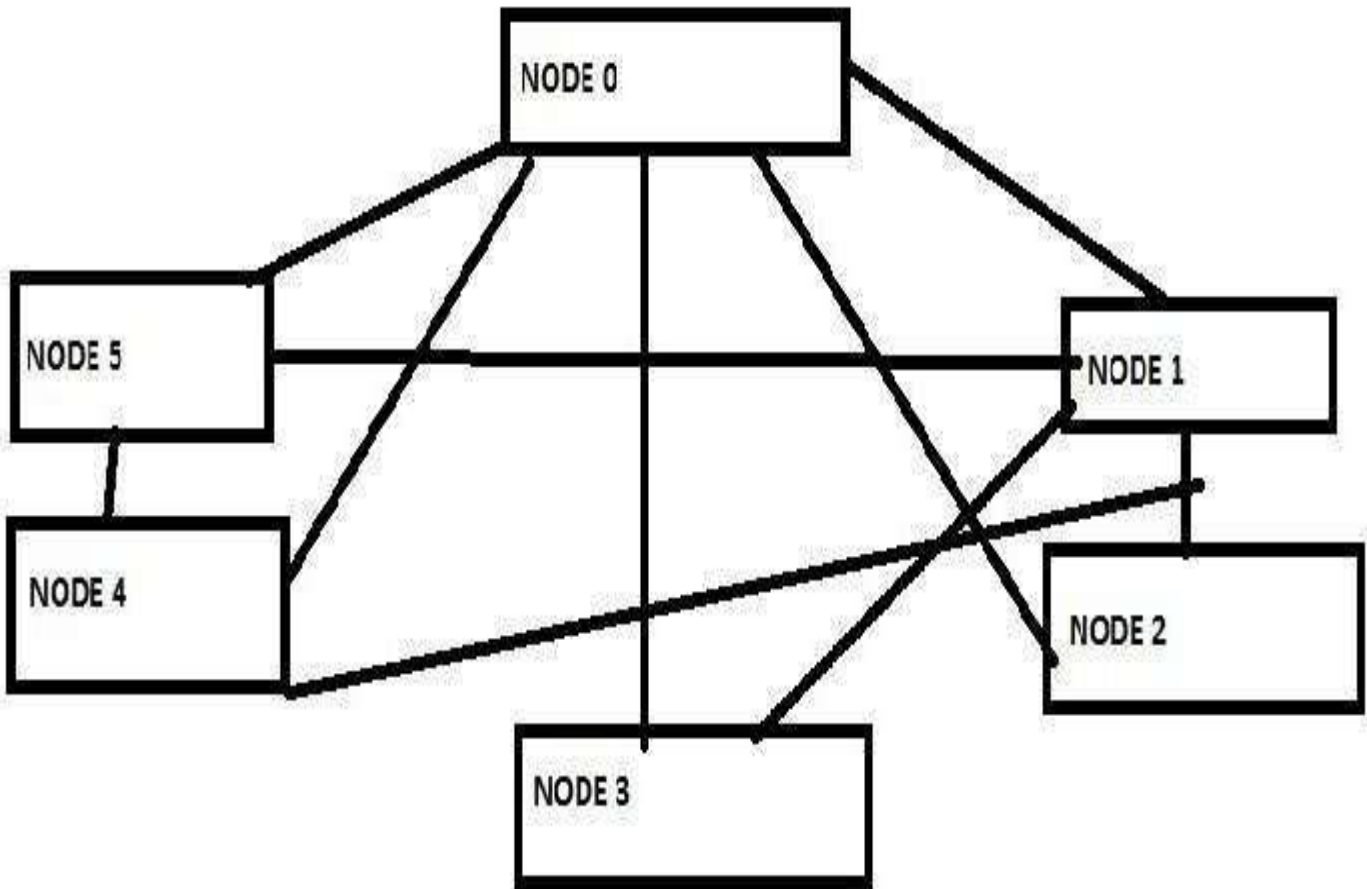
Mesh Topology ●

Complete Topology

Fully connected Mesh NW

- Each node is connected to every other node by direct links. ● Don't have traffic congestion problems

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- Special MAC Protocol is not needed here to who should communicate to whom & for how long



Mesh Topology Advantages



Carries own data.



Robust(if one link becomes unusable. it does not effect the whole system)

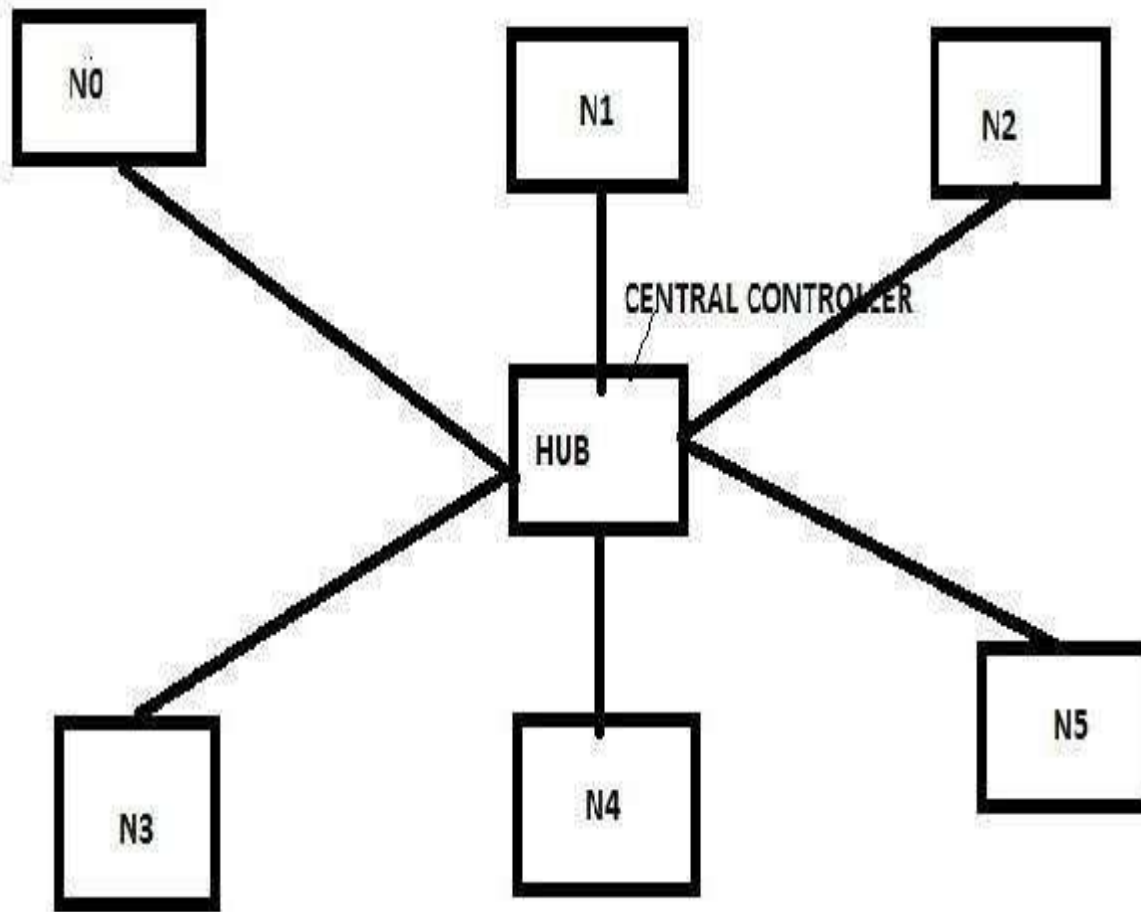


Security and Privacy



Point to point links make fault identification easy. **Disadvantages**

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- Cable length , cost n complexity
More number of Input ports required

Installation & reconfiguration are difficult. **Star Topology**

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- Direct point to point link only with central controller called **hub**.
- Controller acts like a exchange.
- **For example:** Telephone System ,if each telephone connected physically to all others we need sheer amount of wiring .That's why we have telephone exchange in which all phones are connected through which the connection is established using switching. Star Topology

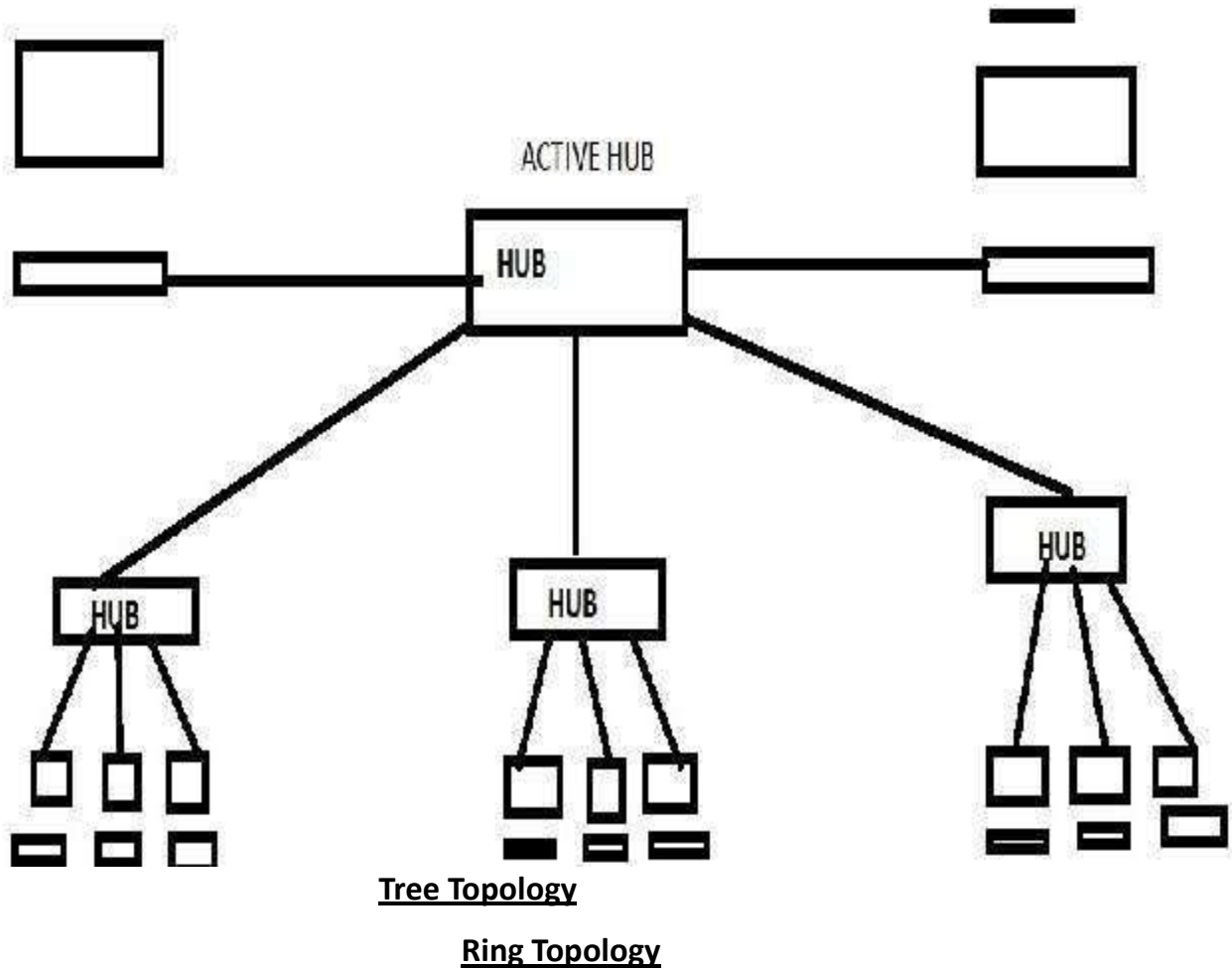
Advantages

- Cheaper then mesh
- Easier to Install ,maintain and reconfigure
- Robust
Requires less cable

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- Easy fault identification
- **Disadvantage** : if hub goes down ,the entire NW becomes defunction. **Tree Topology**
- Tree has Hierarchy of various hubs like have branches in tree.
- Here, Not every device plugs directly to Central hub. Majority of devices connected to Secondary hub that in turn connected to Central hub.
- **Active n passive Hub: Central hub is called active hub .It contains repeater that regenerates the received bit patterns before sending them out CONT...**
- **Passive hub provides simple physical connection between attached devices.**
- **Advantage** : It allows more devices to be attached to single hub and can there fore increase the signal can travel Between devices.



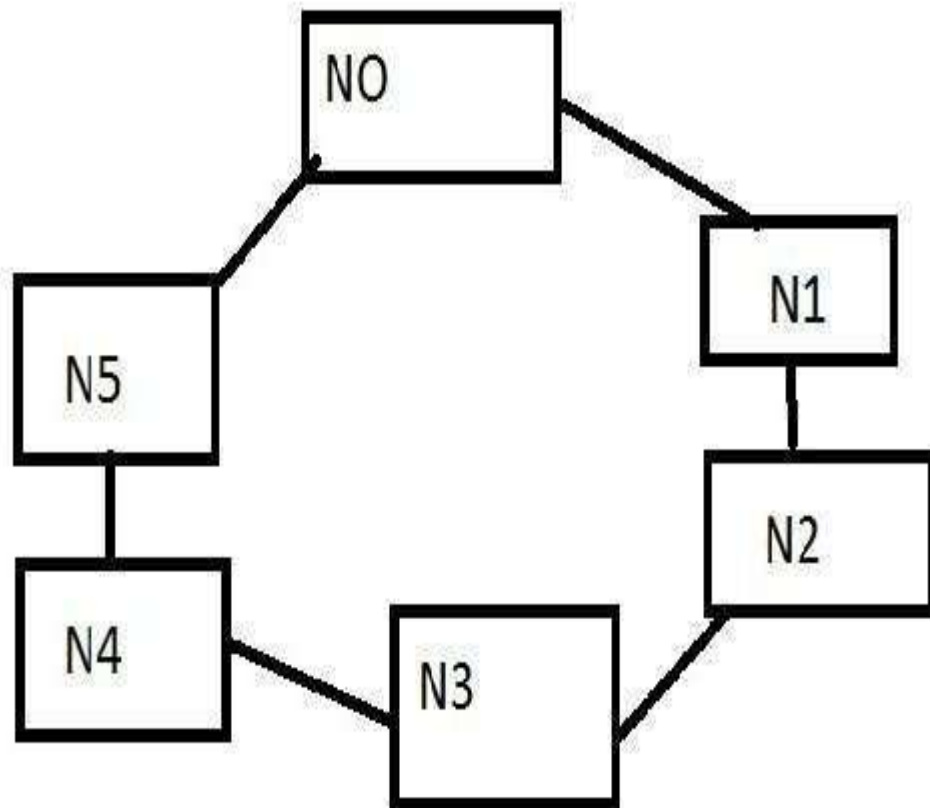
Example : Cable TV Tech main cable from main office , divided into branches.



- Each node is directly connected to its two adjacent neighbors.

- If a node wants to send something to distant node it has to go through many intermediate nodes . which acts like repeaters reproducing the incoming bit stream with full signals on outgoing line.

Ring Topology



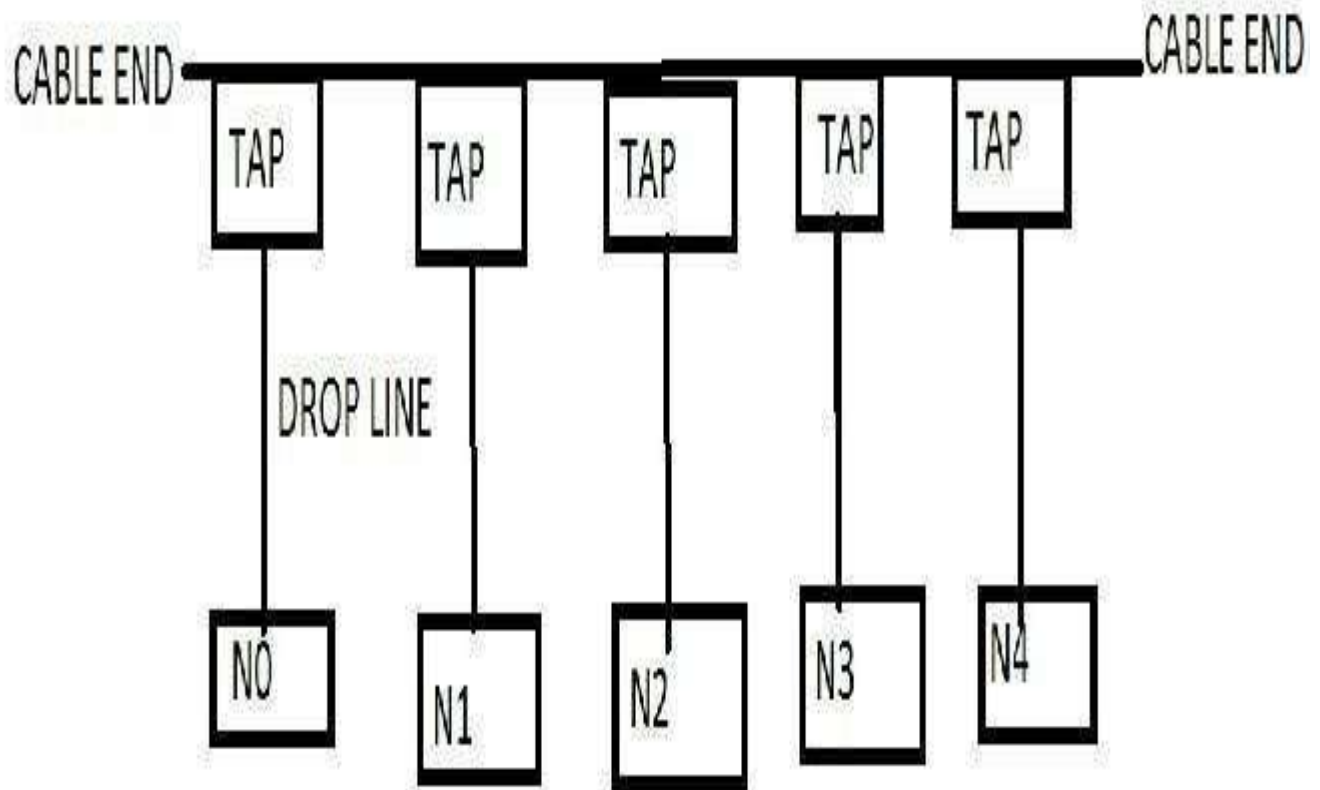
Advantages

- Easy to reconfigure & install

- Signal circulate all the time
- If a node not receiving signal for a long time it can issue a alarm
- Fault isolation is easy
- **Demerit** : Traffic Is only in one direction
- If a node in ring fail, the whole ring cannot function **Bus Topology**
- A bus topology uses multipoint philosophy.
- A long cable called bus acts as backbone to all nodes
- Nodes are connected to bus cable by drop lines & taps

- **Drop line:** connection running between device & main cable
- **Tap:** it is a connector that connects node with metallic core of bus via drop line **Cont...** ●
As signal transverse across the bus , some of the energy converted into heat energy , thus weakening of signals Therefore this topology cannot be used **for very large no of computers**
- If a node want to send some data to other node it pushes the data on bus which carries it to other node where it is received in the same way that passengers get in bus & get out of it at dest .
Hence this topology is called bus.

Bus Topology



Advantages

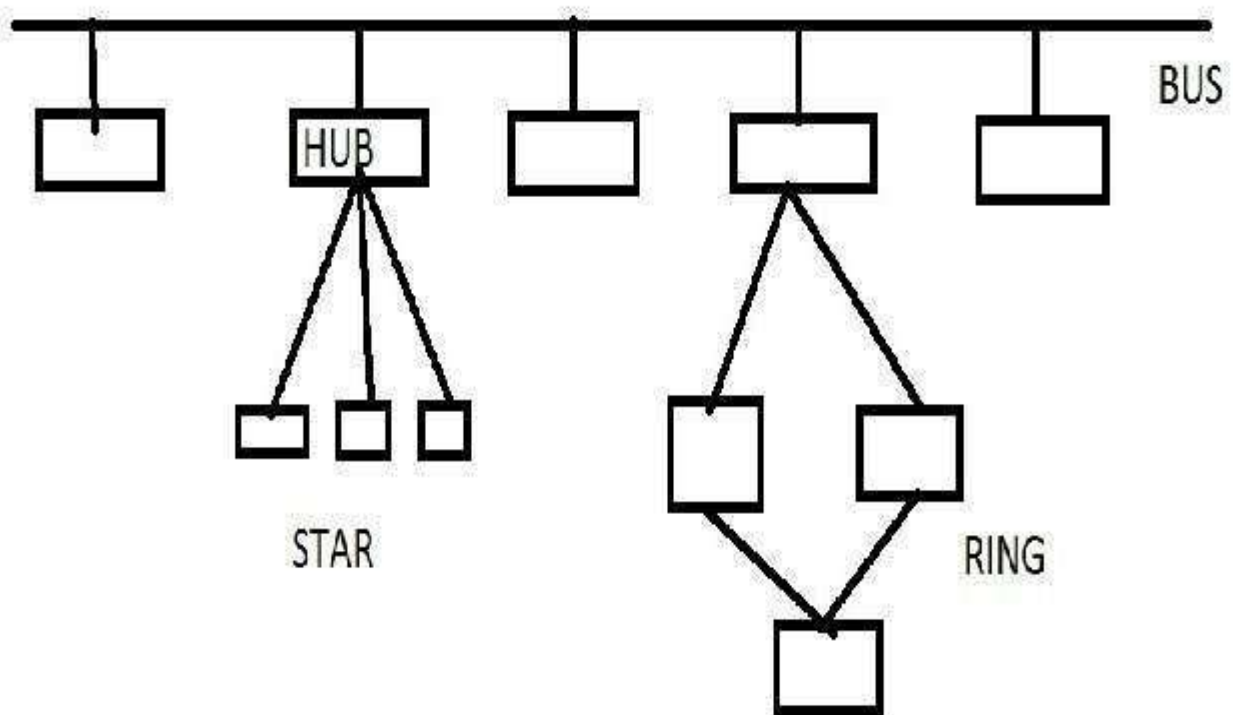
- Easy to install
- Uses less cable than mesh and star.

- **Drawback:**
- If a portion of bus break down whole bus cannot function.
- Inflexible because we cannot add new nodes to bus , addition of nodes changes the no of taps and average distance between them

Hybrid Topology

- Which uses two or more topologies
- In this case bus ,star and ring are used to create hybrid topology.
- A network combine several topologies as subnetwork linked together in large topology.
- **For example: One dept may have decided to use bus topology while other dept has ring . Two can be connected to each other via central controller in star topology**

Hybrid Topology



Local Area Network- LAN

- A **local area network (LAN)** is a computer network that connects computers and devices in a limited geographical area such as home, school, computer laboratory or office building. Or
- It is a data communication system that allows a number of independent devices to communicate directly with each other in a limited geographic area.
Cont...

- **The defining characteristics of LANs, in contrast to wide area networks (WANs) are :**
- higher data-transfer rates
- smaller geographic area and ● lack of a need for leased telecommunication lines.

Cont... ● Token Ring and other technology standards have been used in the past, but Ethernet over twisted pair cabling and Wi-Fi are the two most common technologies currently in use.

- The most **common topology** types are bus, ring, star and mesh.
- Traditionally ,Lans have data rates in the 4 to 16 Mbps range.Today,however,speeds are increasing and can reach 100 Mbps with gigabit system **Metropolitan Area Network (MAN)**
- A **metropolitan area network (MAN)** is a computer network that usually spans a city or a large campus.

- A MAN usually interconnects a number of local area networks (LANs) using a highcapacity backbone technology, such as fiberoptical links, and provides up-link services to wide area networks (or WAN) and the Internet. **Cont...**
- MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities.
- MANs can also depend on communications channels of moderate-to-high data rates.
- A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations.
- MANs might also be owned and operated as public utilities. They will often provide means for internetworking of local networks.

CONT...



MAN occupies a middle ground between LAN and WAN. MANs provide Internet connectivity for LANs in a metropolitan region, and connect them to wider area networks like the Internet. ”



The primary market for MANs is the customer that has high capacity needs in a metropolitan area. A MAN is intended to provide the required capacity at lower cost and greater efficiency. ● It can also be used in cable television. **Wide Area Network (WAN)**



wide area network (WAN) is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries).



This is in contrast with personal area networks (**PANs**), **local area networks (LANs)** or **metropolitan area networks (MANs)** which are usually limited to a room, building, campus or specific metropolitan area (e.g., a city) respectively **Cont...**



Typically , a WAN consists of a number of a interconnected **switching nodes**.



A transmission from any one device is routed through these internal nodes to the specified destination device. These nodes are not concerned with the content of the data; rather their purpose is to provide a switching facility that will move the data from node to node until they reach their destination .



Cont.... Traditionally ,WANs have been implemented using one of two technologies: circuit and packet switching. More recently ,frame relay and ATM networks have assumed major roles.



WAN Provides long distance transmission of data , voice ,image and video information over large geographical areas that may comprise a country even whole world. **Cont...**



WAN may utilize public ,leased or private communication devices ,usually in combinations devices and can therefore span an unlimited number of miles.



WAN is wholly owned and used by single company is often referred to as enterprise network.

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