Introduction to Internet, WWW and Web

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Computer Network

- **A network is a group of computers connected in some fashion in order to share**

Advantages of a computer network

- **Greater storage capacity**
- **Increased processing power**
- **Ease in exchanging data and information**
  - High speed
  - Low cost

Types of computer networks

- **Local Area Network (LAN)**
- **Metropolitan Area Network (MAN)**
- **Wide Area Network (WAN)**

- **Note : The category into which a network falls is determined by its size.**

Local Area Network

- **A group of computers located in the same room, on the same floor, or in the same building that are connected to form a single computer network.**
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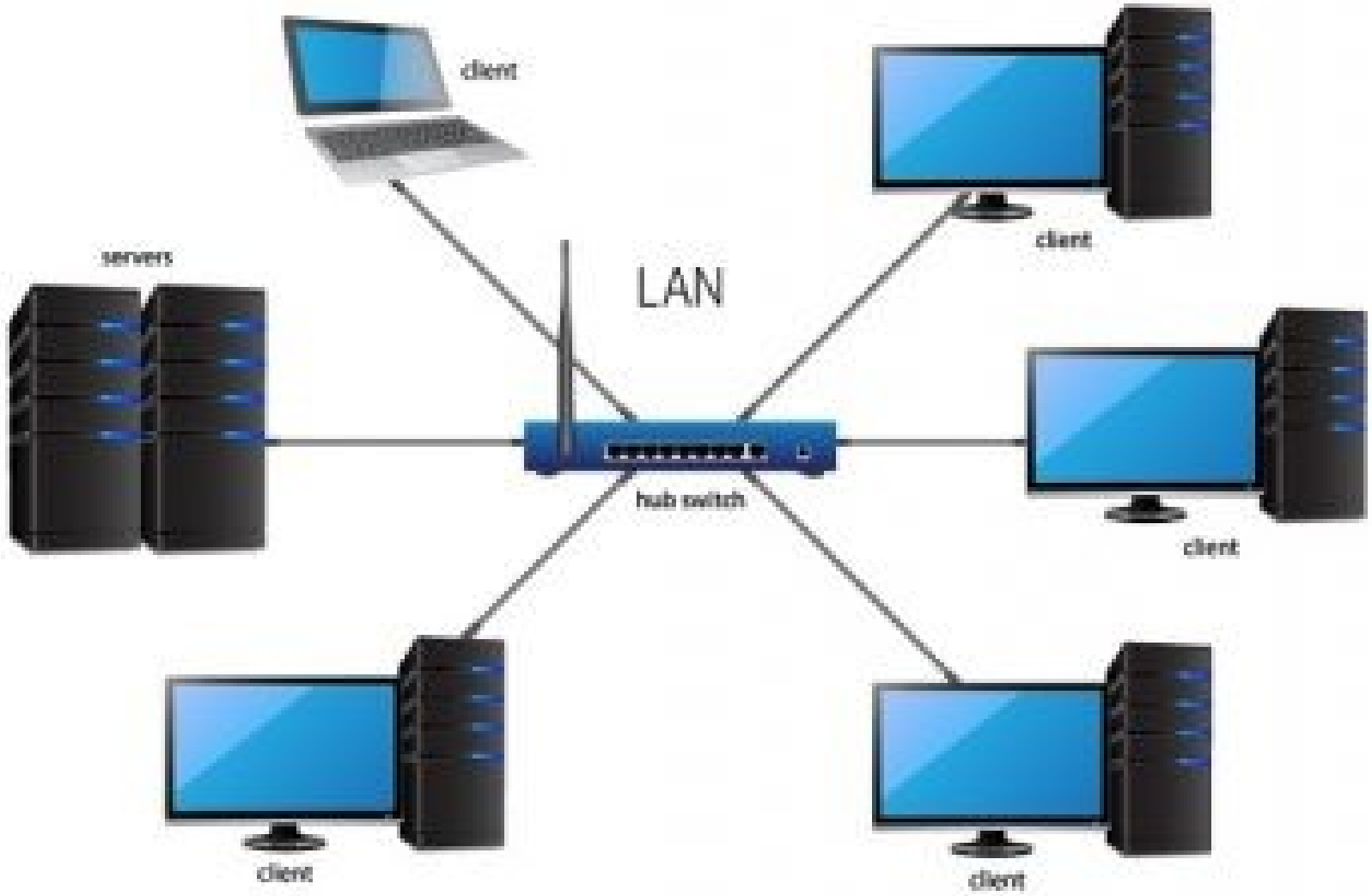
- **Distance : Less than a kilometer in diameter**
- **Topology used : Bus, ring or star topology**
- **Transmission medium : Ethernet, fiber and wireless**

LAN



Advantages of LAN

- **Sharing of expensive resources**
- **High speed exchange of essential information.**
- **Users can access their files from any workstation.**
- **Data sharing by placing the file on a central computer.**

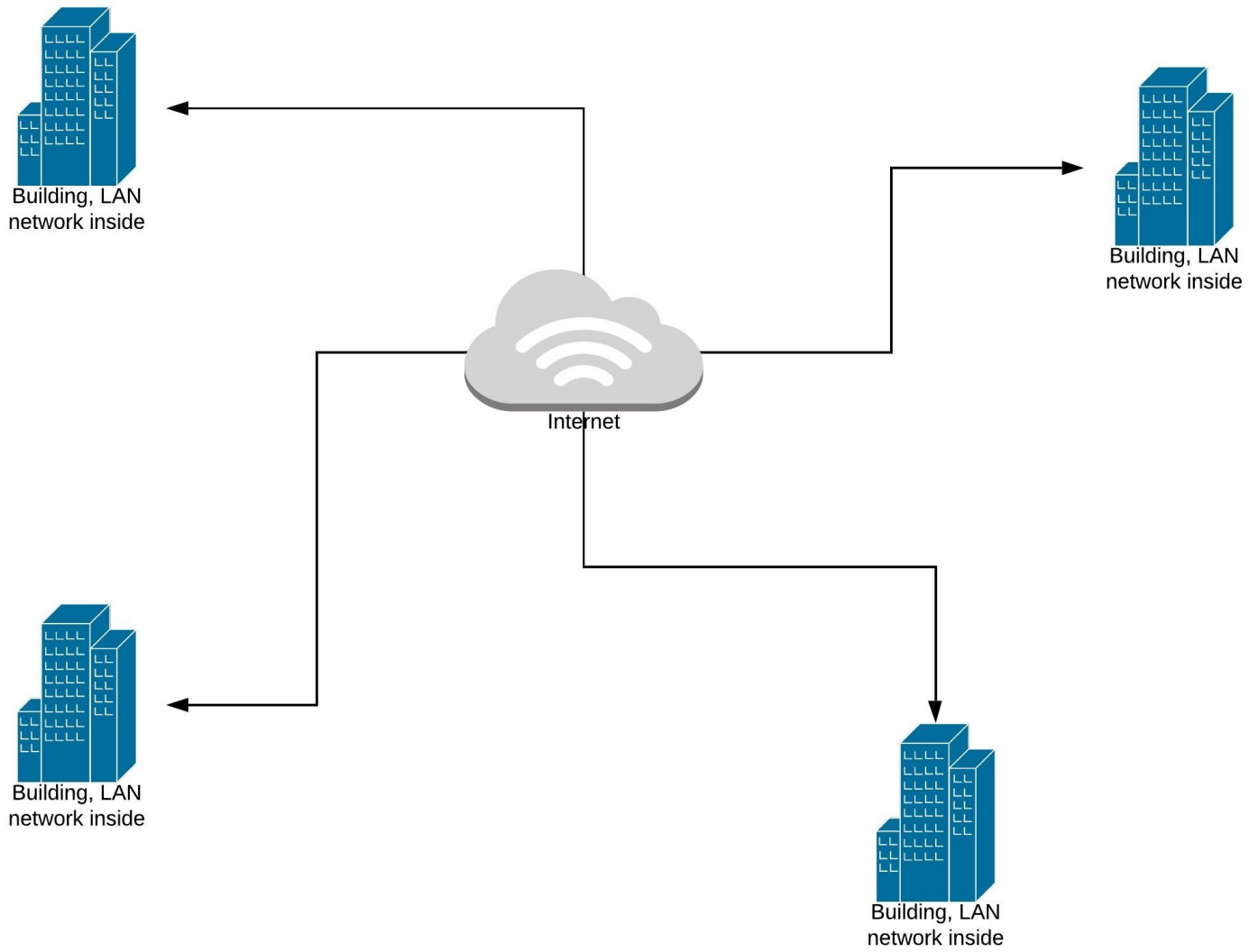
Disadvantages of LAN

- **The financial cost of LAN is still high.**
- **Local are networking software requires memory space in each of the computer in the network.**
- **Installation and management of LAN requires high technical and administrative skills.**
- **Sharing of vital data can be risky.**

WAN

- **Wide Area Network is a digital communication system which interconnects different sites, computer installations and user terminals.**
- **WAN is not restricted geographically.**
- **WAN is used to interconnect LANs which may be at opposite sides of a country or located around the earth’s globe.**
- **Transmission medium : Telephone lines, microwave communications or satellite data transmission**

WAN


Building, LAN
network inside
Building, LAN
network inside
Internet
Building, LAN
network inside
Building, LAN
network inside

Advantages of WAN

- **Computers at longer distance can easily communicate.**
- **It allows sharing of resources and application programs among distributed workstations.**

Disadvantages of WAN

- **Investment costs are higher.**
- **It is difficult to maintain network.**
- **There are more errors and issues due to wide coverage and use of different technologies.**
- **It has low security compared to LAN and MAN**

Functions of WAN

- Remote data and Job entry
- Centralizing information
- Facilitating Communications

Types of WAN

- **Hierarchial Network**
  - Many local minicomputers and microcomputers cluster around regional mainframe computers.
  - Most powerful computer is the large Mainframe computer.
- **Distributed Data-Processing Networks**
  - It places computers or terminals at local or regional sites, thereby providing computer power to these locations.

Types of WAN Connections

- **Host to terminal Connection**
- **LAN to LAN Connection**
  - A communication link that joins two or more LANs into a WAN is known as WAN link
    - Circuit-Switched Services
    - Leased Lines
    - Packed-Switched Services
- **Remote LAN Connection**

Metropolitan Area Network

- **A MAN is a network with size between LAN and WAN.**
- **Size : 1 to 10 Kms in diameter.**
- **An example of MAN is the part of the telephone company network that provides high speed DSL line to the customer.**

Network Topology

Network Topology

- **Network Topology refers to the way a network is laid out physically**
- **Two or more devices connect through a link**
- **Two or more links form a topology**
- **The topology of a network is the geometric representation of the relationship of all the links and linking devices (usually called nodes) to one another.**

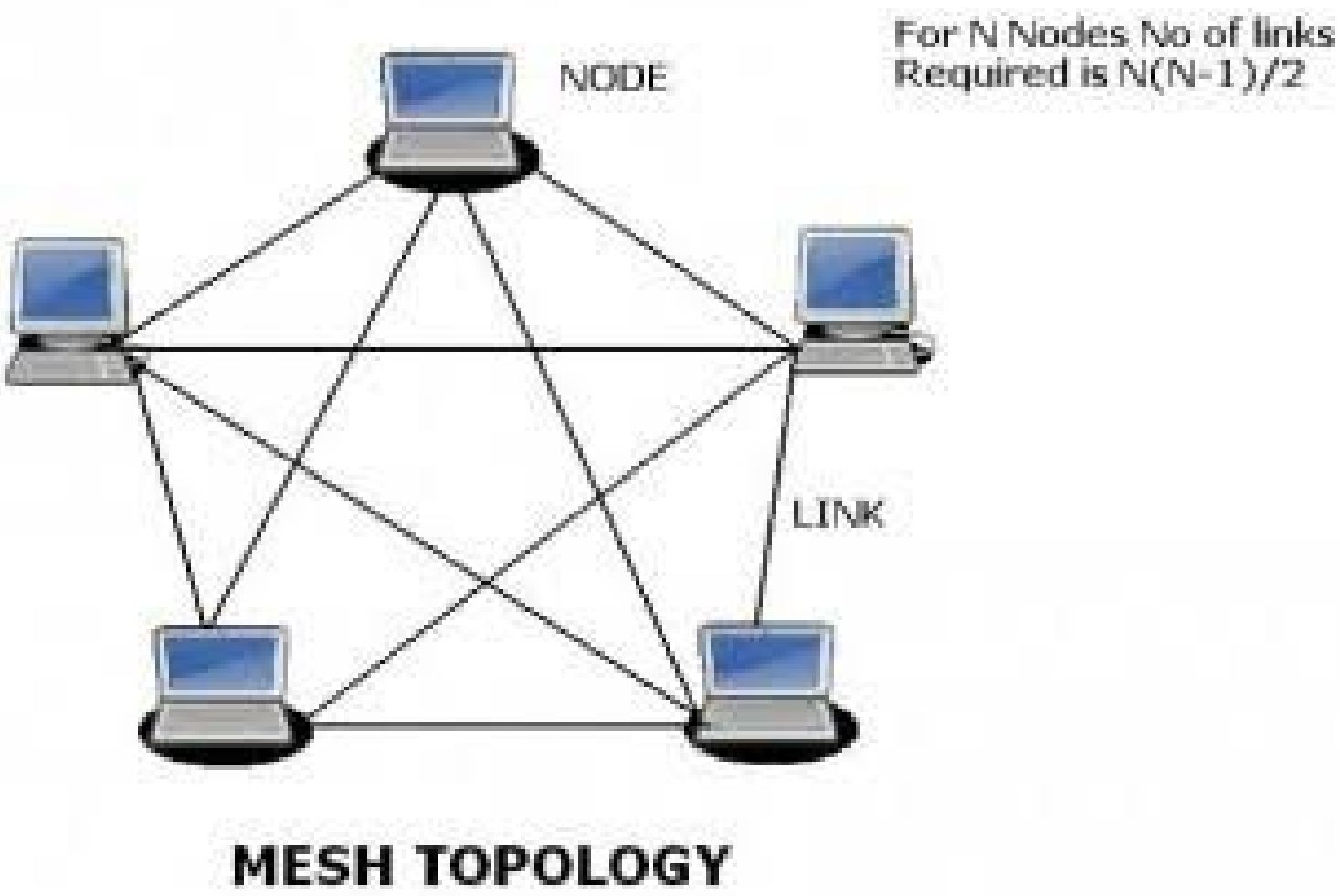
Types of network topologies

- Mesh
- Star
- Bus
- Ring
- Tree

Mesh Topology

- **Every device has a dedicated point-to-point link to every other device.**
- **To find the number of physical links in a fully connected mesh network with n nodes, consider the following points :**
  - Every node must be connected to every other node.
  - Node 1 must be connected to (n-1) nodes.
  - So, we need **n(n-1)** physical links.
  - However, if each physical link allows communication in both directions (duplex mode), We can divide the number of links by 2
  - So, in mesh topology with **n nodes**, we need **n(n-1)/2** duplex mode links

Mesh Topology



Advantages of Mesh Topology

- **Dedicated links eliminates traffic problems**
- **Robust. If one links becomes unusable, it does not incapacitate the entire network.**
- **Privacy and security is maintained when message travels along a dedicated link.**
- **Fault is diagnosed easily.**

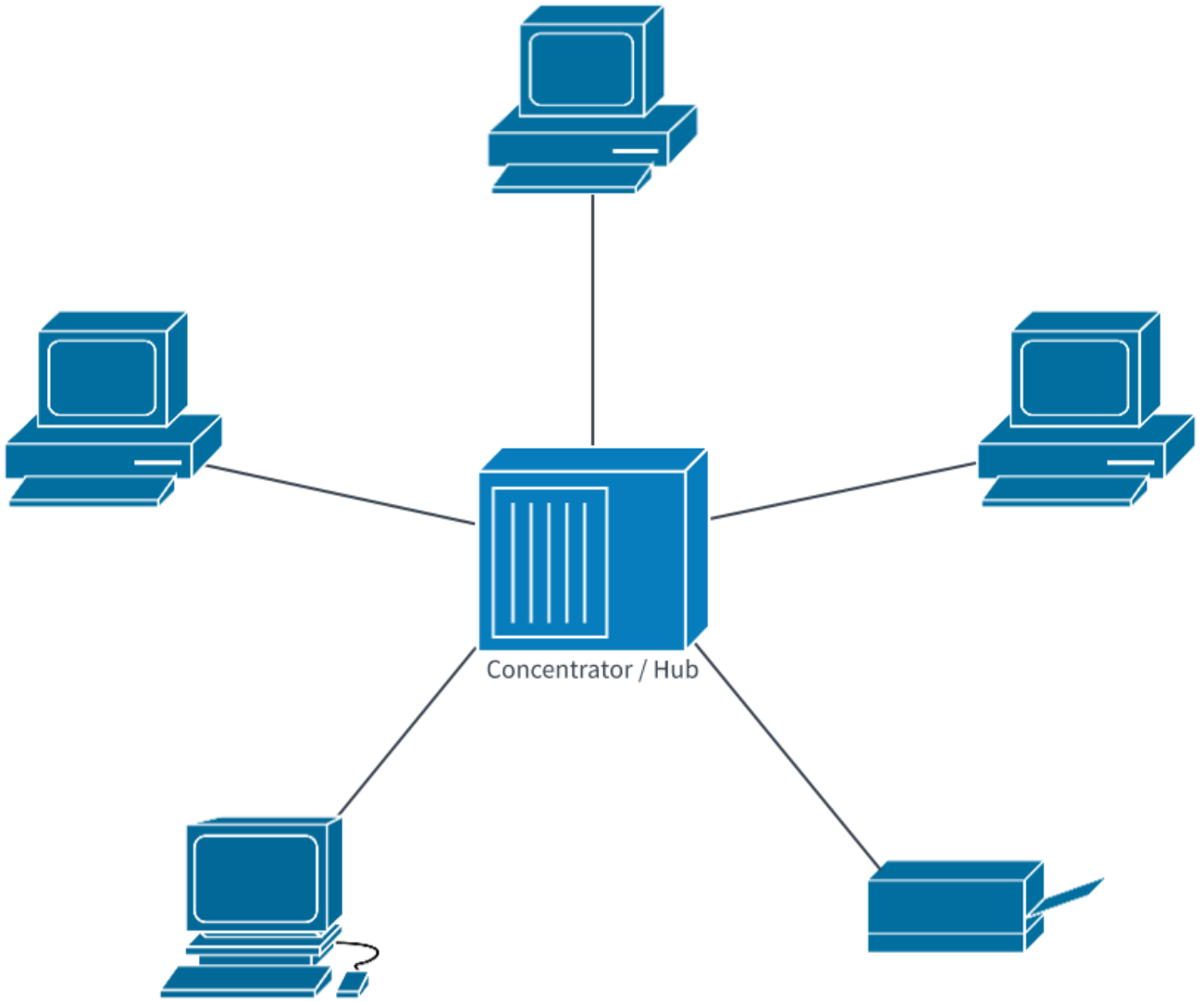
Disadvantages of Mesh Topology

- **Installation and configuration is difficult.**
- **Cabling cost is more.**
- **Bulk wiring is required.**

Star Topology

- **Each device has a dedicated point-to-point link only to a central controller, usually called a hub.**
- **The devices are not directly linked to one another.**
- **Star topology does not allow direct traffic between devices.**
- **The controller acts as an exchange.**
  - If one device wants to send data to another, it sends the data to the controller, which then relays the data to the other connected device.
- **Hub acts as a repeater for data flow**
- **Protocols commonly used : Ethernet, Token Ring, LocalTalk**
- **Transmission media can be twisted pair, optical fiber or coaxial cable**

Star Topology



Advantages of Star topology

- **Fast performance with fewer nodes.**
- **Hub can be easily upgraded.**
- **Easy to setup and modify.**
- **Easy to troubleshoot.**
- **Robust.**

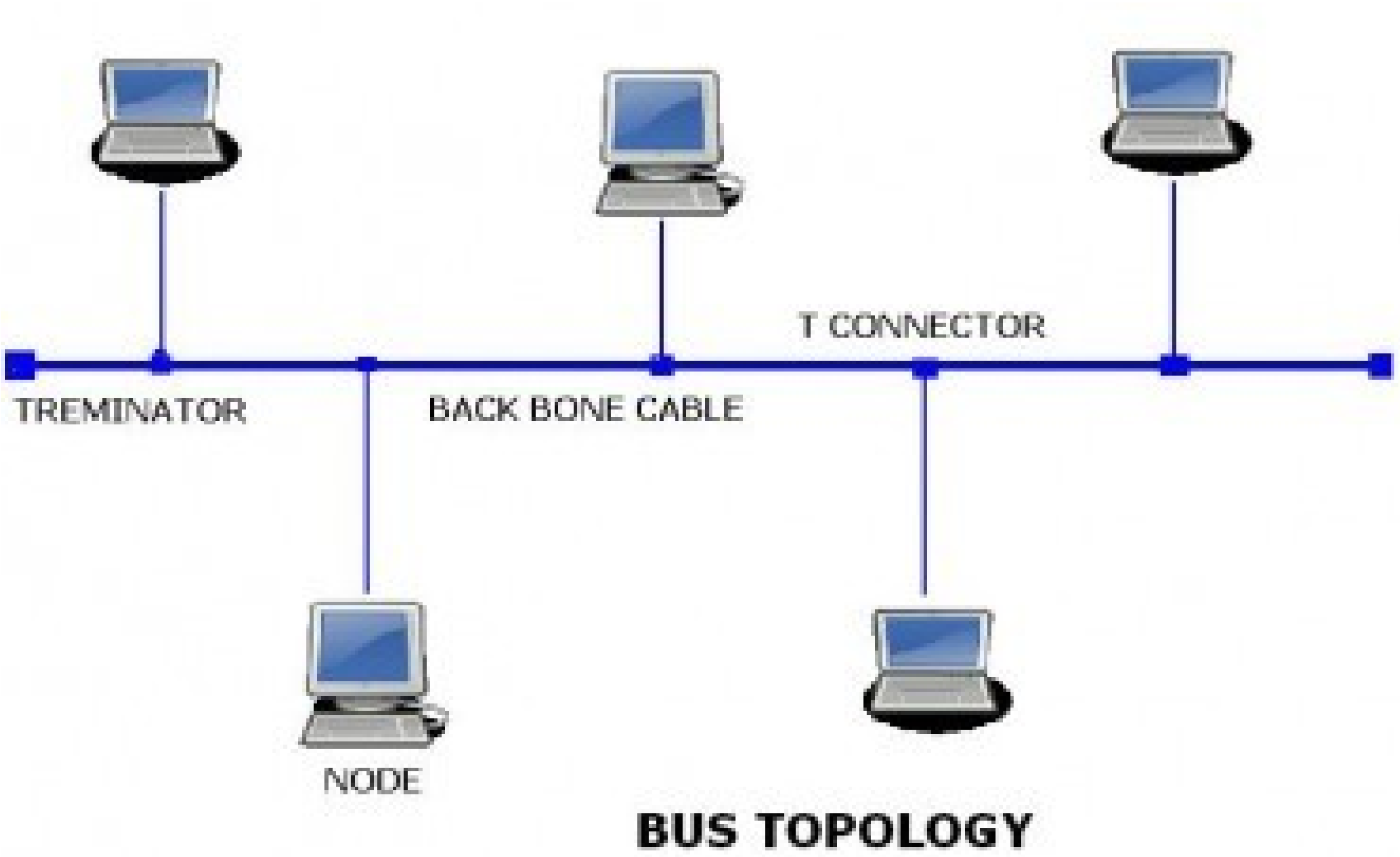
Disadvantages of Star Topology

- **If the hub fails, then the whole network is stopped because all the nodes depends on the hub.**
- **Performance is based on hub’s capacity.**
- **Cost of installation is high**

Bus topology

- **A bus topology is a multipoint one long cable that acts as a backbone link to all the devices of the network.**
- Nodes **are connected to the bus cable by drop lines and taps.**
- **A drop line is a connection running between the devices and the main cable.**
- **A tap is a connector that either splices into the main cable or punctures the shealthing of a cable to create a contact with the metallic core.**
- **As a signal travels along the backbone, some of its energy is transformed into heat.**
  - Therefore, it becomes weaker as it travels farther. For this reason, there is a limit on number of taps a bus can support and the distance between those taps.
  - Bus topology is good for connecting 15-20 computers.
- **It carries the address of the destination computer.**
- **Commonly used protocol : Ethernet**

Bus Topology



Advantages of Bus topology

- It is cost effective
- Cable required is least as compared to other topologies
- Easy to expand by joining two cables together.

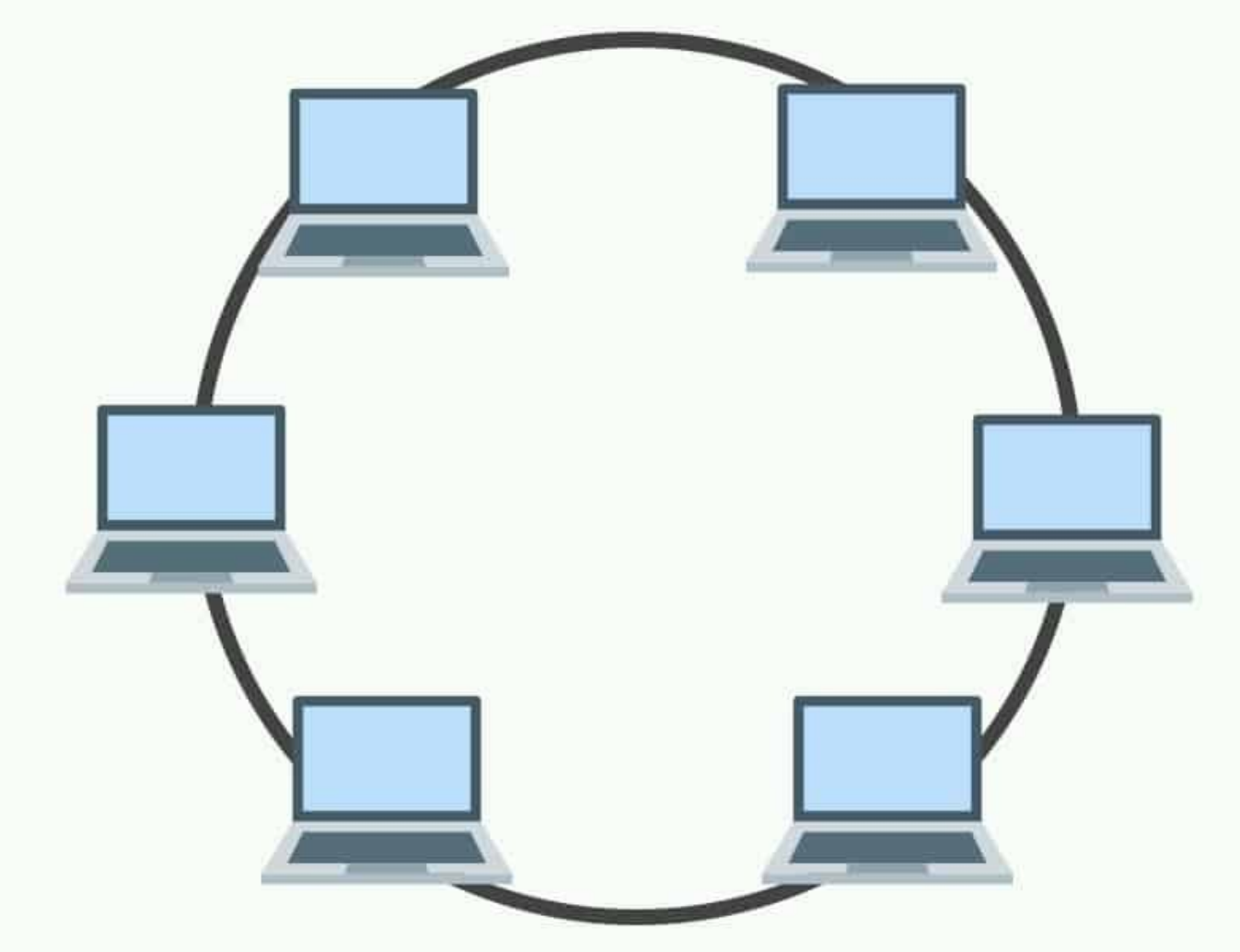
Disadvantages of Bus topology

- If the network cable breaks, the entire network will be down.
- If network traffic is heavy, nodes performance of the network decreases.
- Cable has a limited length.
- It is slower than the ring topology.

Ring Topology

- In ring topology, each device has a point-to-point connection with only the two devices on either side of it.
- Ring network does not have terminated ends; data signal travels in a circle.
- A signal is passed along a ring in one direction, from device to device, until it reaches its destination.
- It uses token passing method to provide access to the devices in the network.
- The computers or devices are connected in the ring using twisted pair cables, coaxial cables or optic fibers.

Ring Topology



Advantages of Ring topology

- **Transmitting network is not affected by heavy traffic or by adding more nodes, as only the nodes having token can transmit the data.**
- **To add or delete a device requires changing only two connections.**
- **Cheap and easy to expand.**

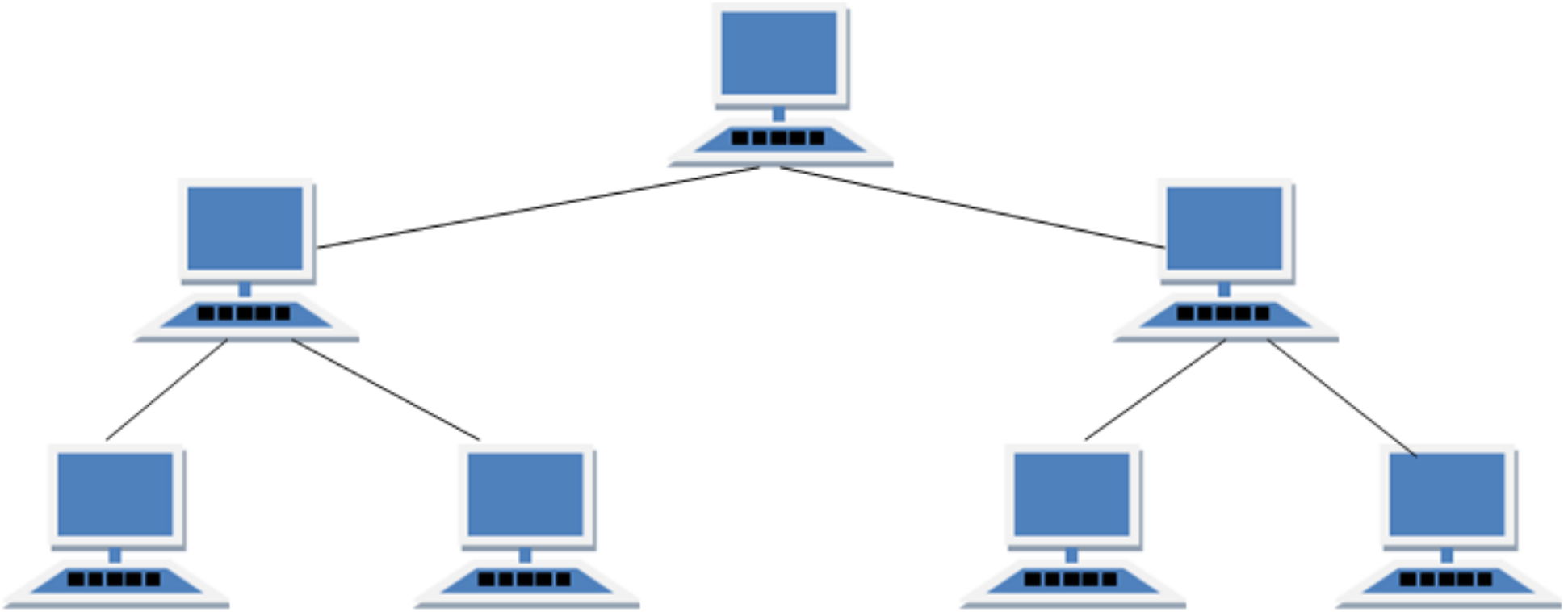
Disadvantages of Ring topology

- **Troubleshooting is difficult in ring topology.**
- **Failure of one computer disturbs the whole network.**

Tree Topology

- It has a root node, and all other nodes are connected to it forming a hierarchy.
- It is also called hierarchical topology.
- It should have atleast three levels to the hierarchy.
- It is used in Wide Area Networks.

Tree Topology



Advantages of tree topology

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

Disadvantages of tree topology

- **Heavily cabled**
- **If more nodes are added, maintainance is difficult.**
- **If central hub fails, network fails.**

Hybrid Topology

- **A network can be hybrid.**
- **Example : We can have a main star topology with each branch connecting several stations in bus topology.**

Thank You !!

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