COMPUTER NETWORK

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What is Networking ?

Definition:

- A computer network is defined as the interconnection of two or more computers. It is done to enable the computers to communicate and share available resources.

- The computers that provides the resources to other computers on a network is known as server.

- The individual computers in the network which access shared network resource are known as client or node.

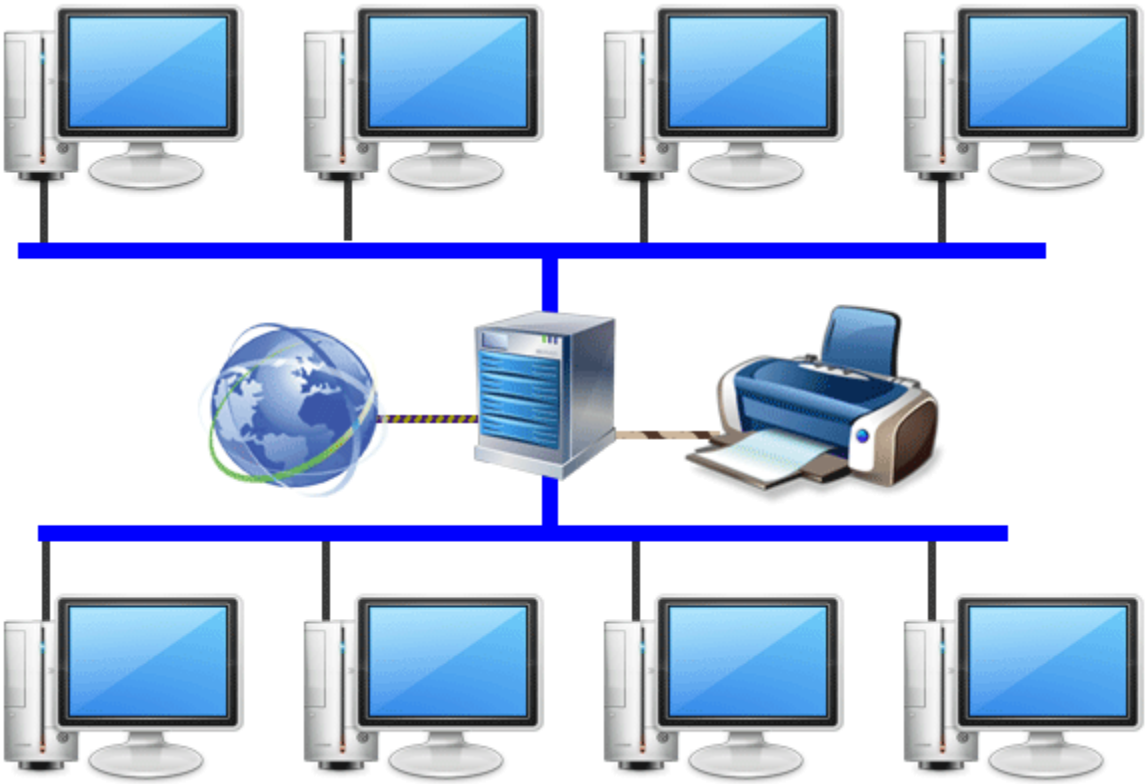


Figure: Computer Network

- Computer network range from small private network to the internet and are widely used by individuals and business today.

Importance of computer Network

1. Sharing of resources such as printers
2. Sharing of software's and database
3. Exchange of data and information among users via network
4. It allows for the electronic transfer of text.
5. It allows for decentralized of various data processing functions
6. It allows for communication between organization
7. It allows for easier backup process

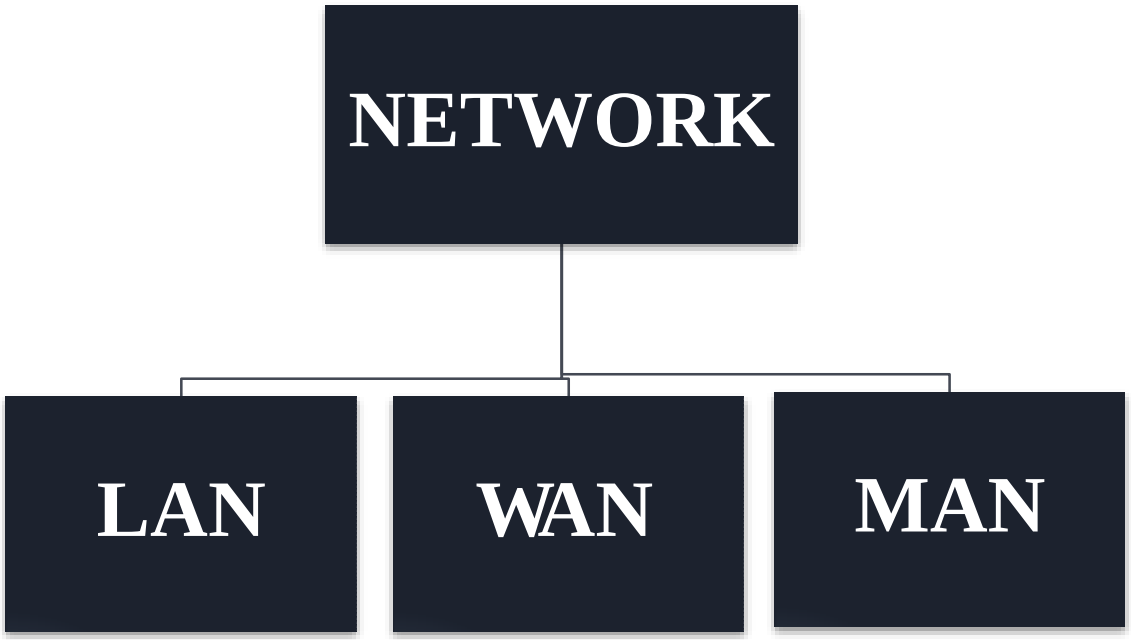
ADVANTAGES OF COMPUTER NETWORK

- Increased speed
- Reduced cost
- Improved security
- Electronic mail
- Flexible access

DISADVATAGES OF COMPUTER NETWORKS

- ✓High cost of installation
- ✓Requires time for administration
- ✓Failure of server
- ✓Cable faults

CLASSIFICATION OF AREA BY THEIR GEOGRAPHY



LOCAL AREANETWORK(LAN)

- LAN is a network which is designed to operate over a small physical area such as an office, factory or a group of buildings.

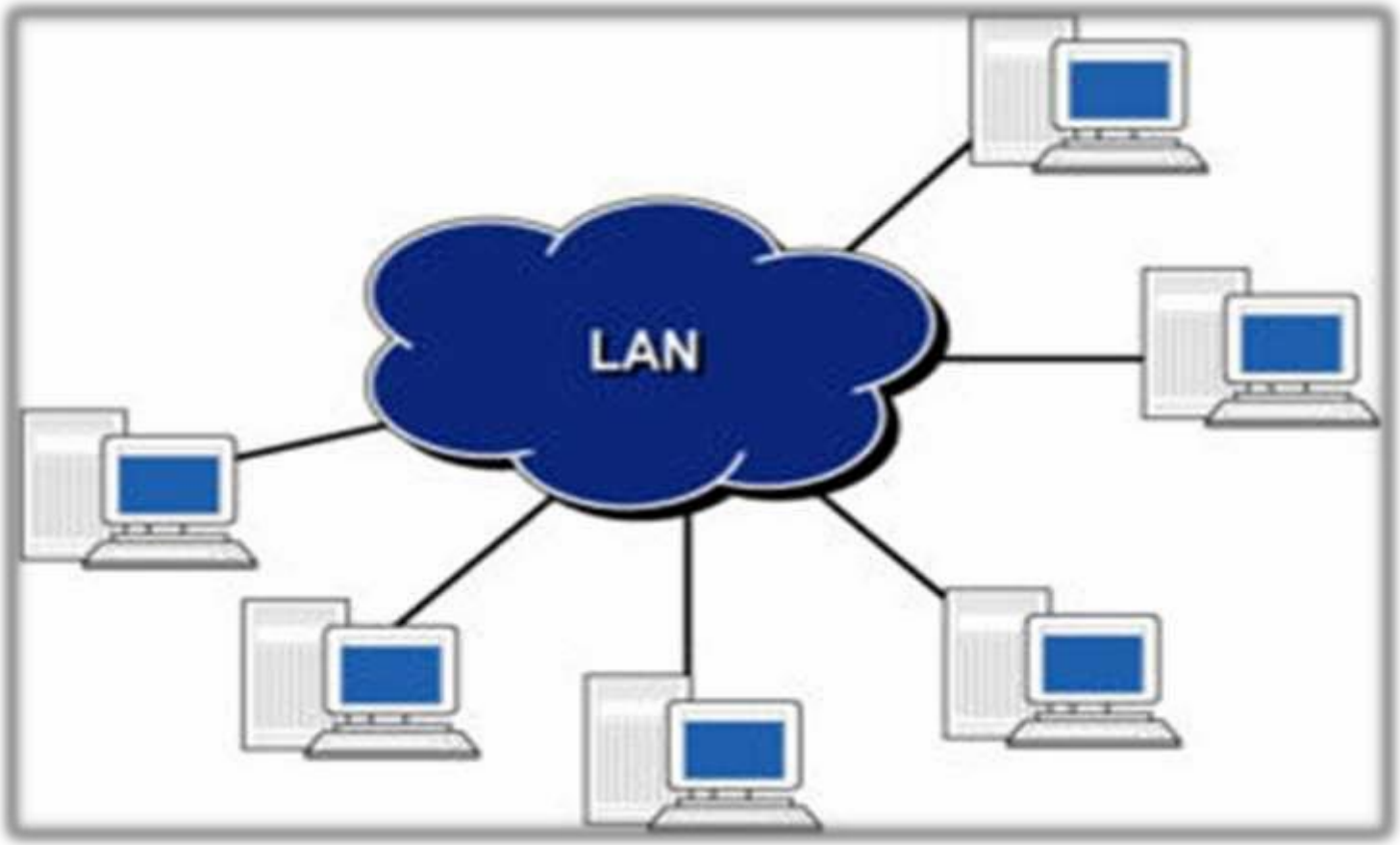
- LAN's are easy to design and troubleshoot.
- Exchange of information and sharing of resources becomes easy because of LAN.

- In LAN all machines are connected to a single cable.

- Different types of topologies such as star ,tree, bus, ring, etc Can be used.

LOCAL AREANETWORK(LAN)

- It is usually a privately owned network.

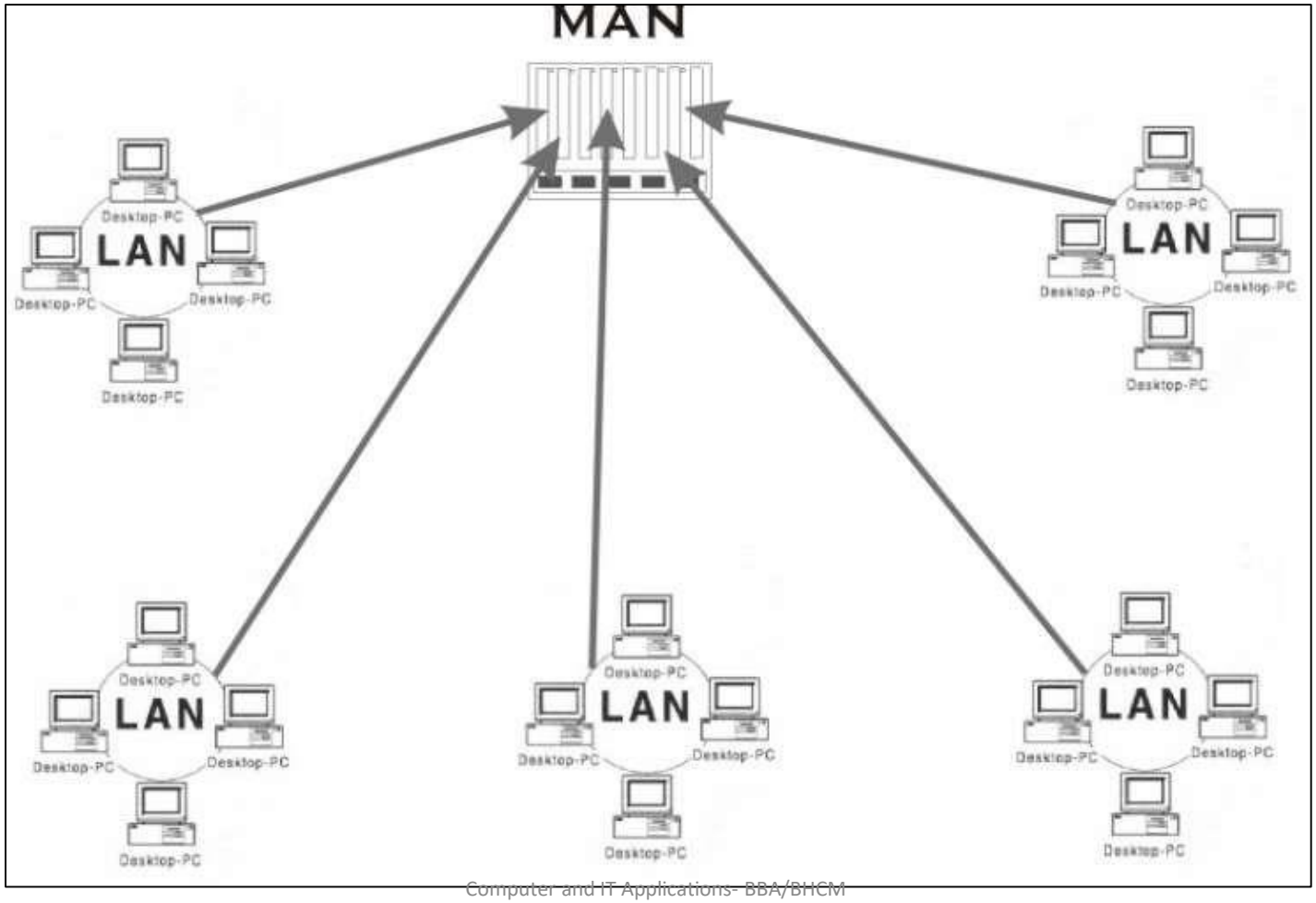


Advantages	Disadvantages
The reliability of network is high because the failure of one computer in the network does not affect the functioning for other computers	Cover a small geographical region
Addition of new computers to network is easy	Limitation in exchanging information
High rate of data transmission is possible	Special security measure are need to stop users from using programs and data they should not have access to
Peripheral device like printer can be shared by other computers	In LAN all machines are connected to a single cable so that if cable failed; it affect entire system.

METROPOLITAN AREA NETWORK (MAN)

- ✓It is in between LAN & WAN technology that covers the entire city.
- ✓It uses similar technology as LAN.
- ✓It can be a single network such as cable TV network, or a measure of connecting a number of LAN's or a large network so that resources can be shared LAN to LAN as well as device to device.

METROPOLITAN AREA NETWORK (MAN)



Advantages	Disadvantages
✓More cable required for a man connection from one place to another. ✓Increases the efficiency of handling data. ✓Increase the speed of transferring data. ✓Saves the cost attached to establish a wide area network. ✓Cost effective by Sharing of resources such as printers. ✓Offers centralized management of data. ✓Enables people to connect many fast LANs together. ✓Easy to implement links. ✓Flexibility of the proposed service.	✓The large the network becomes difficult to mange. ✓Difficult to make the system secure from hackers .

WIDE AREA NETWORK(WAN)

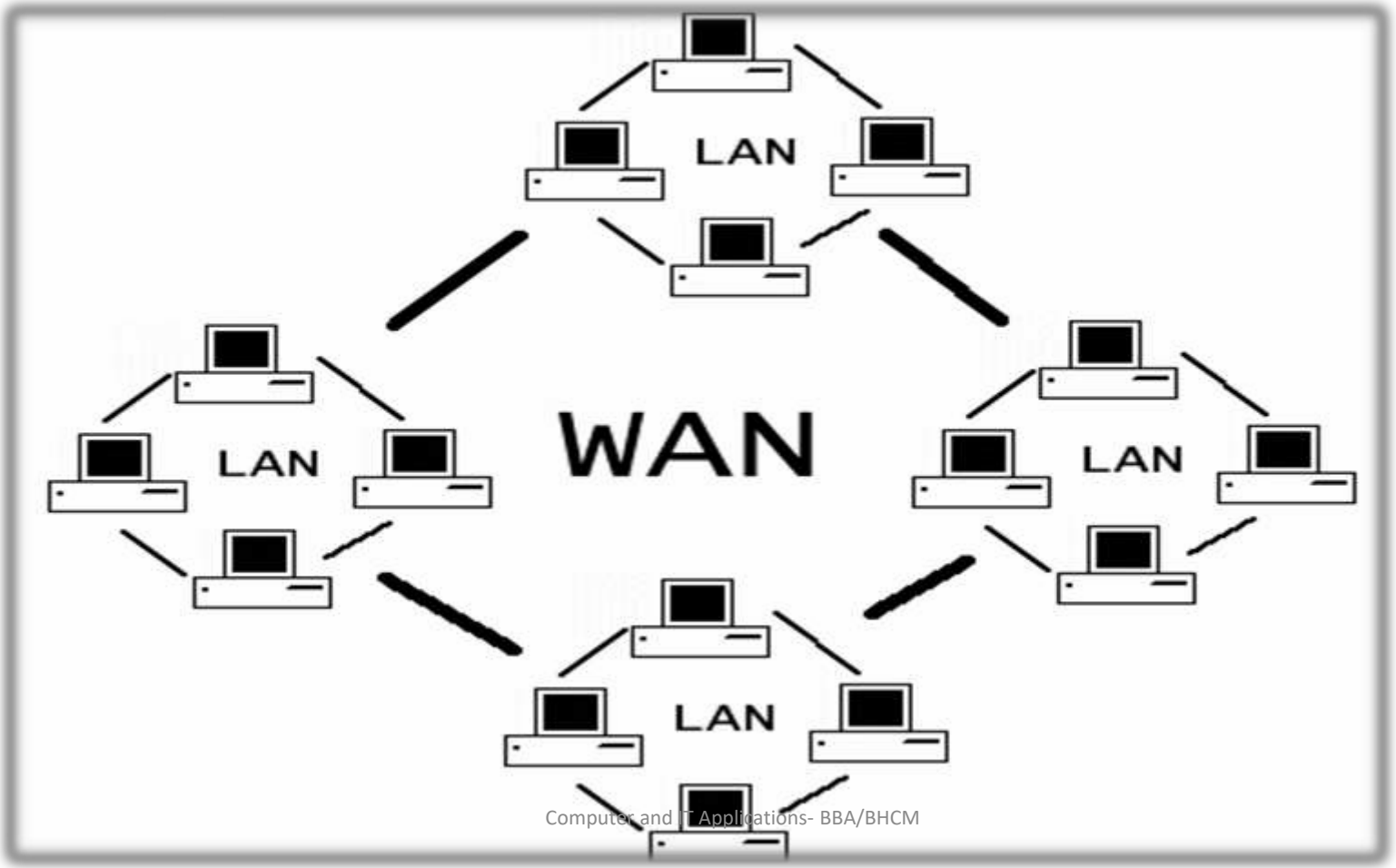
- When network spans over a large distance or when the computers to be connected to each other are at widely separated locations a local area network cannot be used. A wide area network(WAN) is installed.

- The communication between different users of WAN is established using leased telephone lines, satellite links and similar channels.

- It is cheaper and more efficient to use the phone network for the link.

WIDE AREA NETWORK(WAN)

- Most WAN networks are used to transfer large blocks of data between its users.



Advantages	Disadvantages
Covers a large geographical area so long distance business can connect on the network.	Network can be expensive and complicated.
Share software and resource with connecting working stations.	It is slow in speed
Everyone on the network can use same data. This avoids problems where some user may have older information than others.	Very much dependency on the third party because it is public network.

DISTINGUISH BETWEEN LAN,WAN,MAN

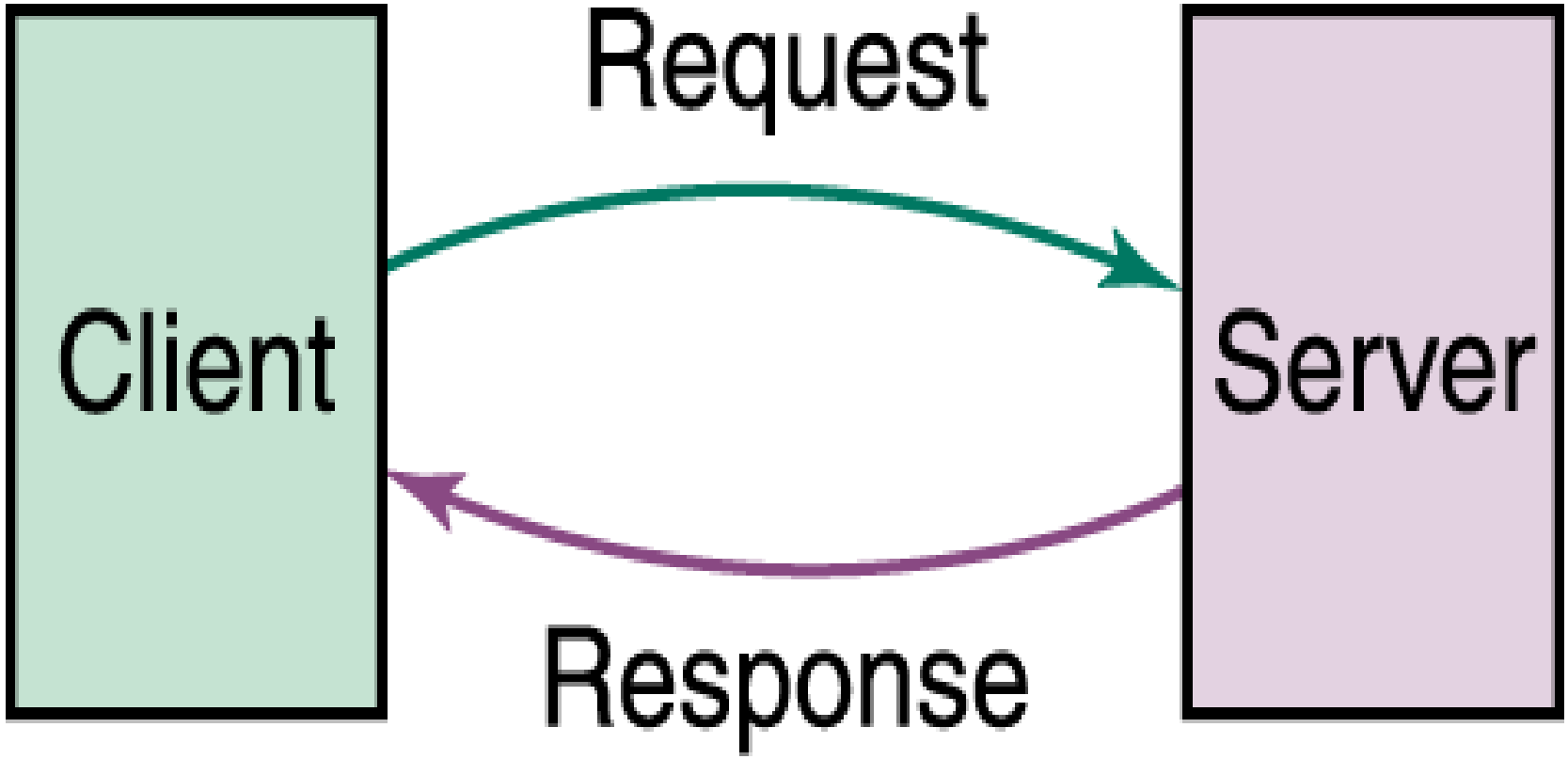
PARAMETERS	LAN	WAN	MAN
Ownership of network	Private	Private or public	Private or public
Geographical area covered	Small	Very large	Moderate
Design and maintenance	Easy	Not easy	Not easy
Communication medium	Coaxial cable	PSTN or satellite links	Coaxial cables, PSTN, optical fibre, cables, wireless
Bandwidth	Low	High	moderate
Data rates(speed)	High	Low	moderate

- **Based on computer nodes used , network can be classified into three types:**

1. Client server Network
2. Peer-to-peer Network
3. Value added Network

Client Server Network

- The Powerful computers that provides the resources to other computers on a network is known as server.
- The individual computers in the network which access shared network resource are known as client or node
- **In Client server communication :**
- Establish connection using protocol
- Client send request to server
- Server sends response to client request
- Close connection


Request
Client
Server
Response

- The server must be faster and more storage capacity to contain all the data, need to be shared to the clients. There are different type of servers:
- **File Servers**: managing files
- **Print server:** To handling printing request
- **Communication Server**: handle the communication between client and server
- **Mail server**: specially setup to handle client's email.

- **Advantages:**

1. Centralized Security
2. Easy accessibility

- **Disadvantages:**

1. Expensive server
2. If the server crashes , the computer network breaks down.

Peer-to Peer Network

- In peer-to-peer network computers are connected individually in pair(one to one connection).
- There is no dedicated server. All the computers are equal termed as peers.
- Each computer on the network has the capability to share data and resource with other computers.
- Each user has right to decide what he would or would not like to share. Each computer act as a both client and server.
- It is suitable in small office network.

- **Advantages:**

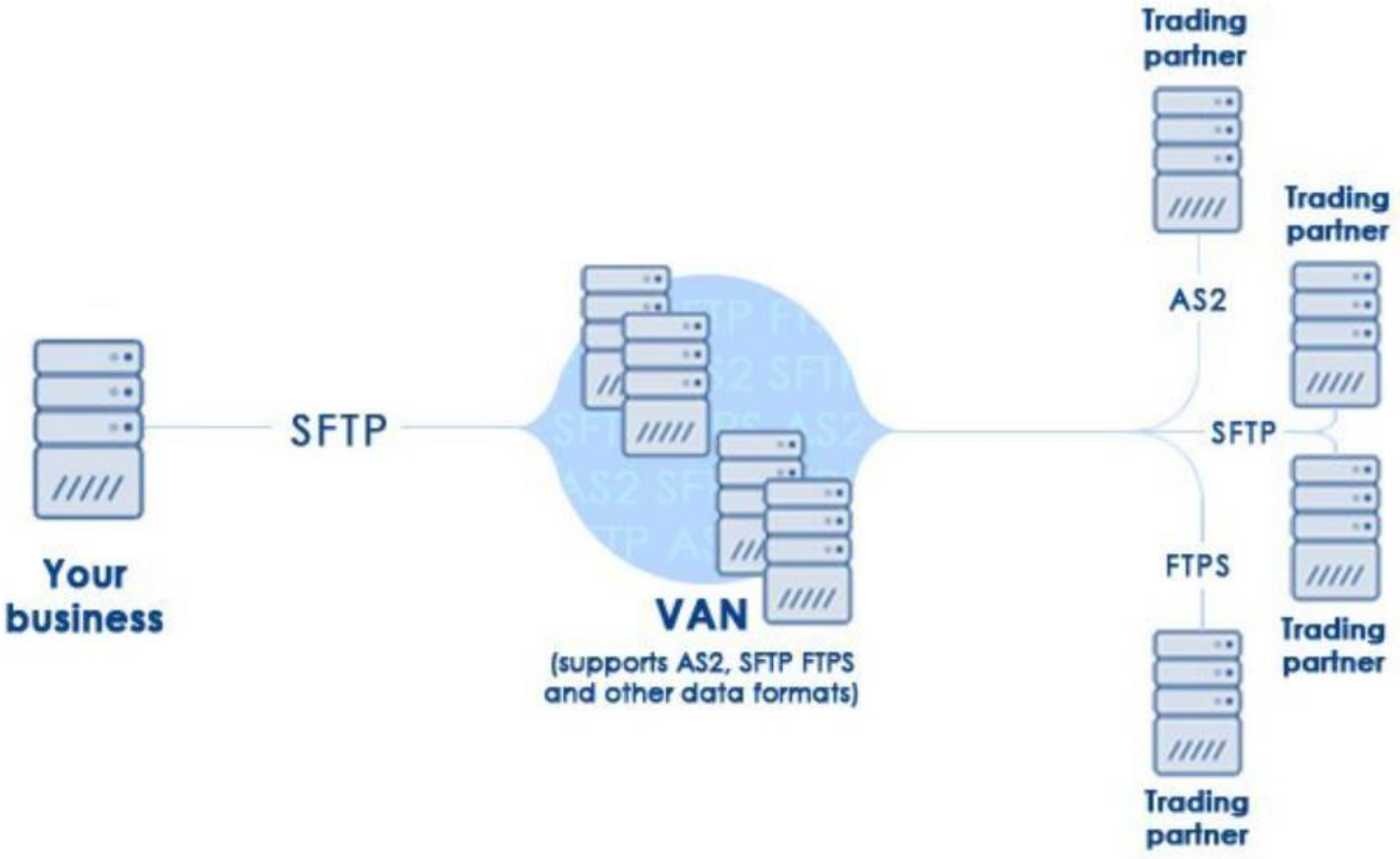
1. Inexpensive
2. Easy setup and maintenance

- **Disadvantages:**

1. Less secure because message flow freely between the computer.
2. It is decentralized as there is no space for the storage of files.

Value Added Network(VAN)

- A third part network performing services beyond the transmission of data. For example, VANs provide mailbox, data security. Many also offer email services.
- The connection between two VANs that allows message from one VAN's customer to be communicated to the customer on the other.
- VAN is generally used by the companies privately for Electronic data interchange (EDI), which is standard for interchanging the business data.

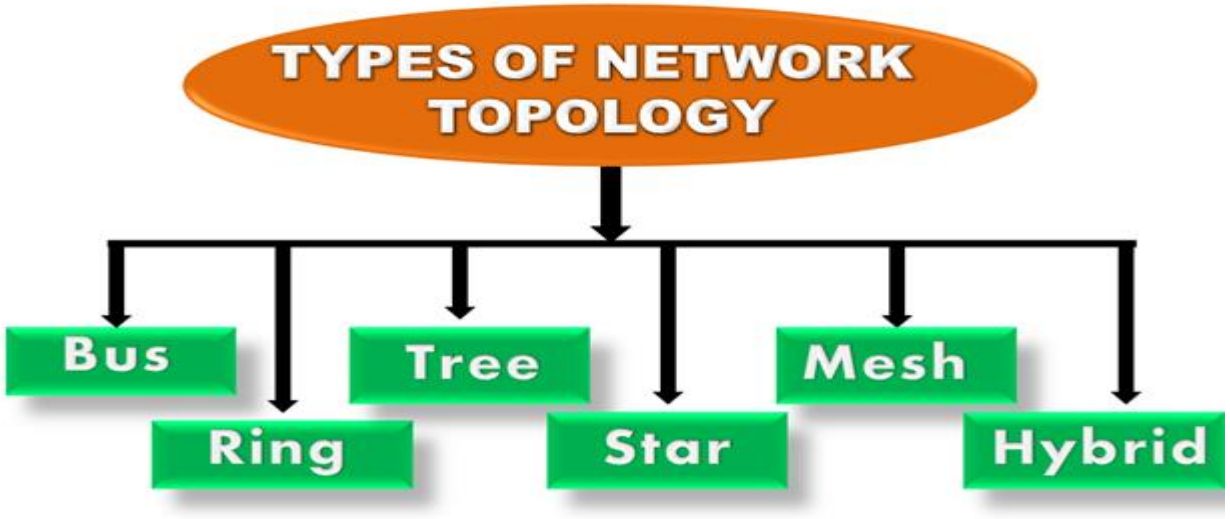

Trading partner
Trading partner
AS2
SFTP
SFTP
Your business
VAN
(supports AS2, SFTP FTPS and other data formats)
FTPS
Trading partner
Trading partner

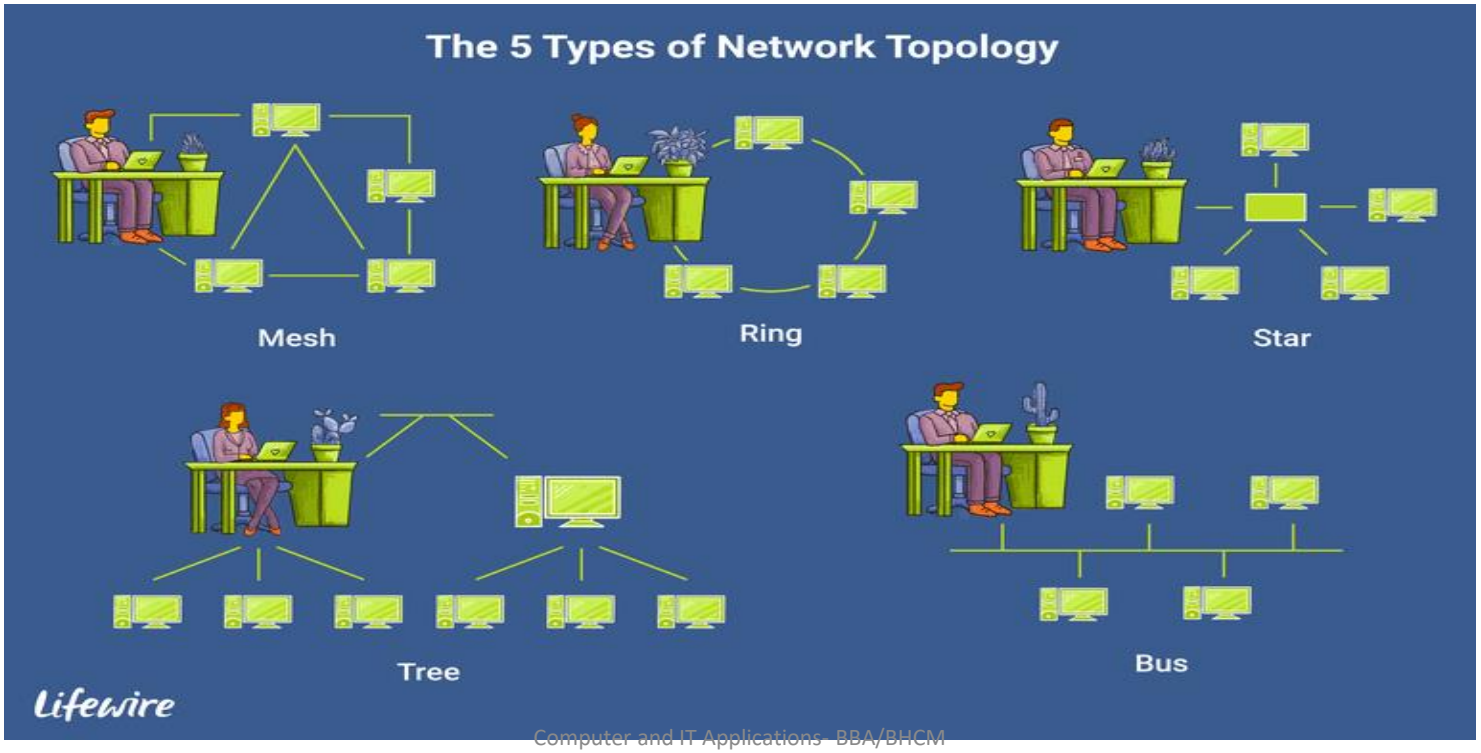
Network Topology and Application

- Network topology refers to the arrangement of the computer connected in the network through some physical medium such as cable, optical fibers etc.
- The major goal of topology is to find out the most economical and efficient way to all the users to the network resource .

Type of Network Topologies:

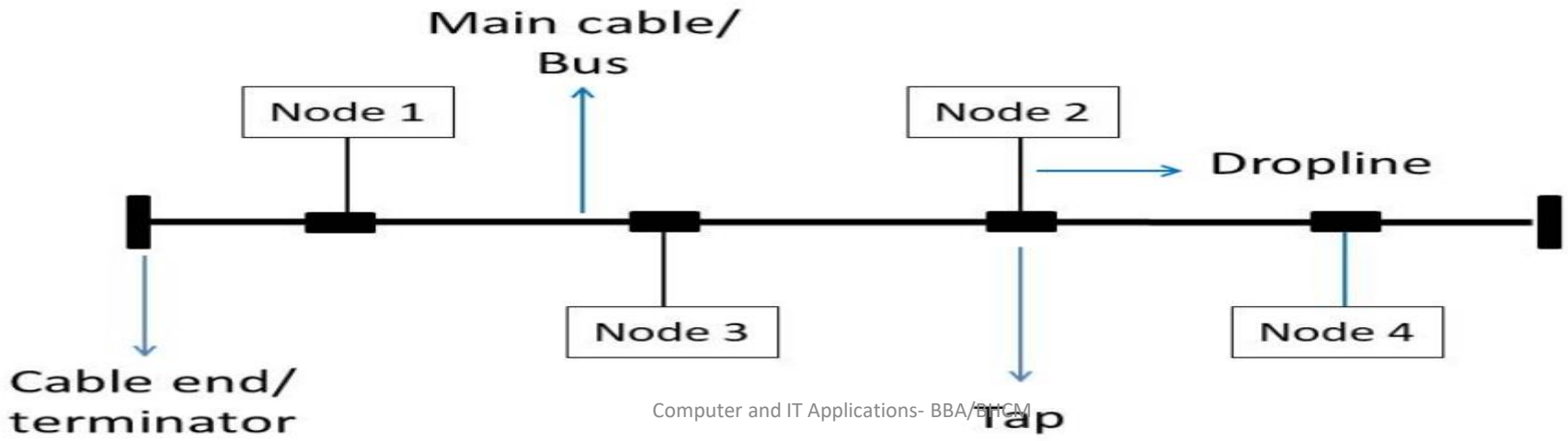
1. **Bus topology**
2. **Star topology**
3. **Ring topology**
4. **Tree topology**
5. **Mesh Topology**
6. **Hybrid Topology**


TYPES OF NETWORK TOPOLOGY
Bus
Ring
Tree
Star
Mesh
Hybrid


The 5 Types of Network Topology
Mesh
Ring
Star
Tree
Bus
Lifewire

1. Bus Topology

- A bus topology is also known as linear topology. It consist of several computers that are attached to a common cable called a bus , which is the backbone for the network.
- In Bus topology ,all the computers and servers are attached to the same communication channel.
- At the cable's start and end points a special device called a terminator is attached to indicate that the network is not available beyond the point.
- Coaxial cable is used for media and T-connector is used to terminate the data.
- Its maximum speed is 10 mbps.



Advantages:

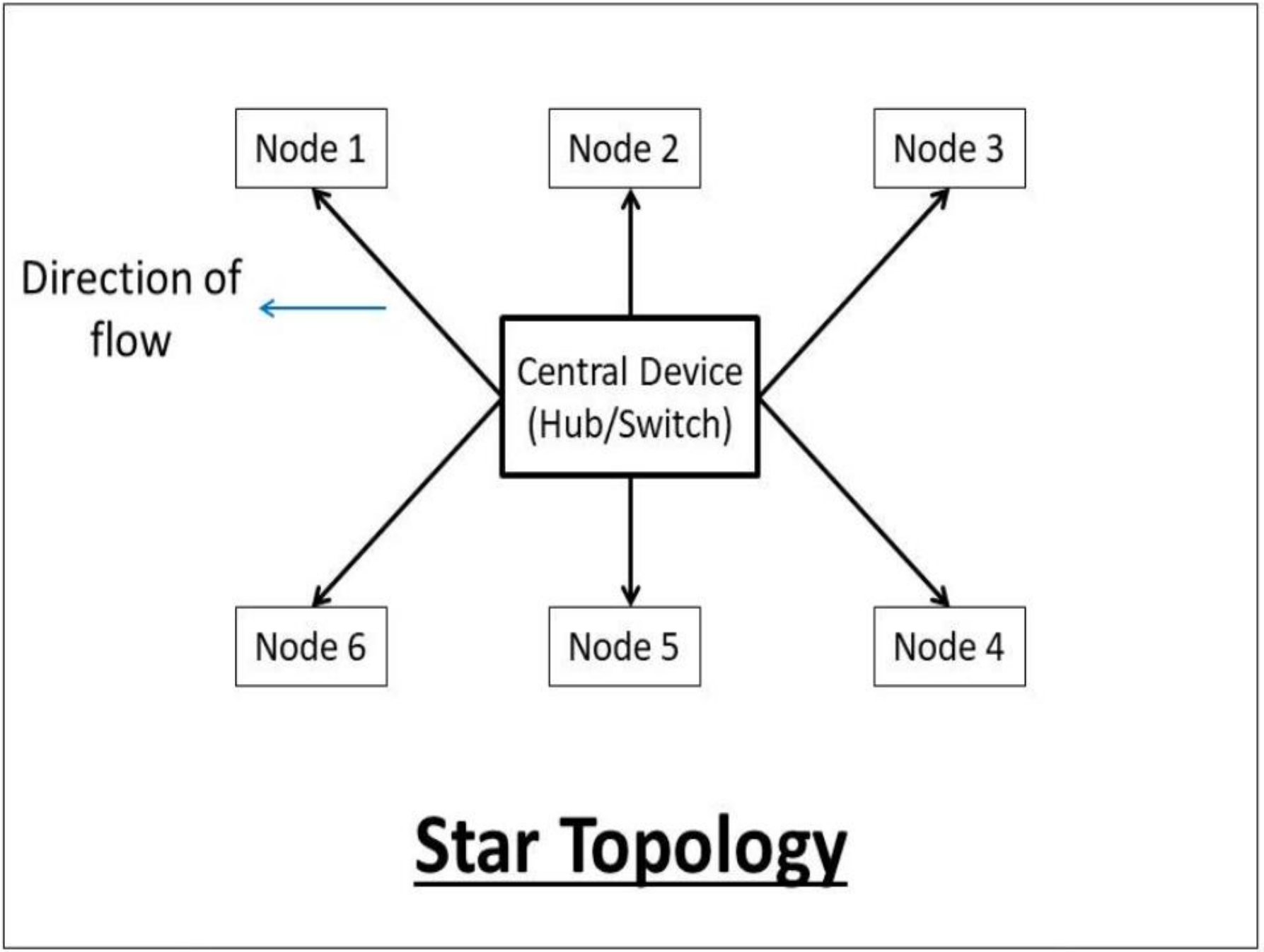
1. It is simple reliable and easy to install and use.
2. It is easy to extend (any numbers of computer can be connected by using a connector in the bus)
3. It is less expensive than other arrangement because it uses coaxial cable.

Disadvantages:

1. If the cable fails, then the entire system fails to respond to the user.
2. Fault finding and troubleshooting becomes very difficult due to single cable.
3. Data traffic is high.

2. Star Topology

- Star topology is most common topology in use today
- In star topology, all the computers are connected to a centrally located device called “hub”. The center node (hub) is connected to a powerful computer known as server.
- The computers are not directly linked to each other and communicate only through a host computer.
- The routing function is performed by host computer ,which centrally controls communication between any two other computers by establishing a logical path between them.


Node 1
Node 2
Node 3
Direction of flow
Central Device (Hub/Switch)
Node 6
Node 5
Node 4
Star Topology

Advantages:

1. If one node or its connection breaks it doesn't affect the other computers and their connections.
2. Devices can be added or removed without disturbing the network.

Disadvantages:

1. It is more expensive than bus topology as it requires extra cables and other controlling devices.
2. Failure of the hub or server makes the entire system disturbed.
3. Data transmission rates are low

3. Ring Topology

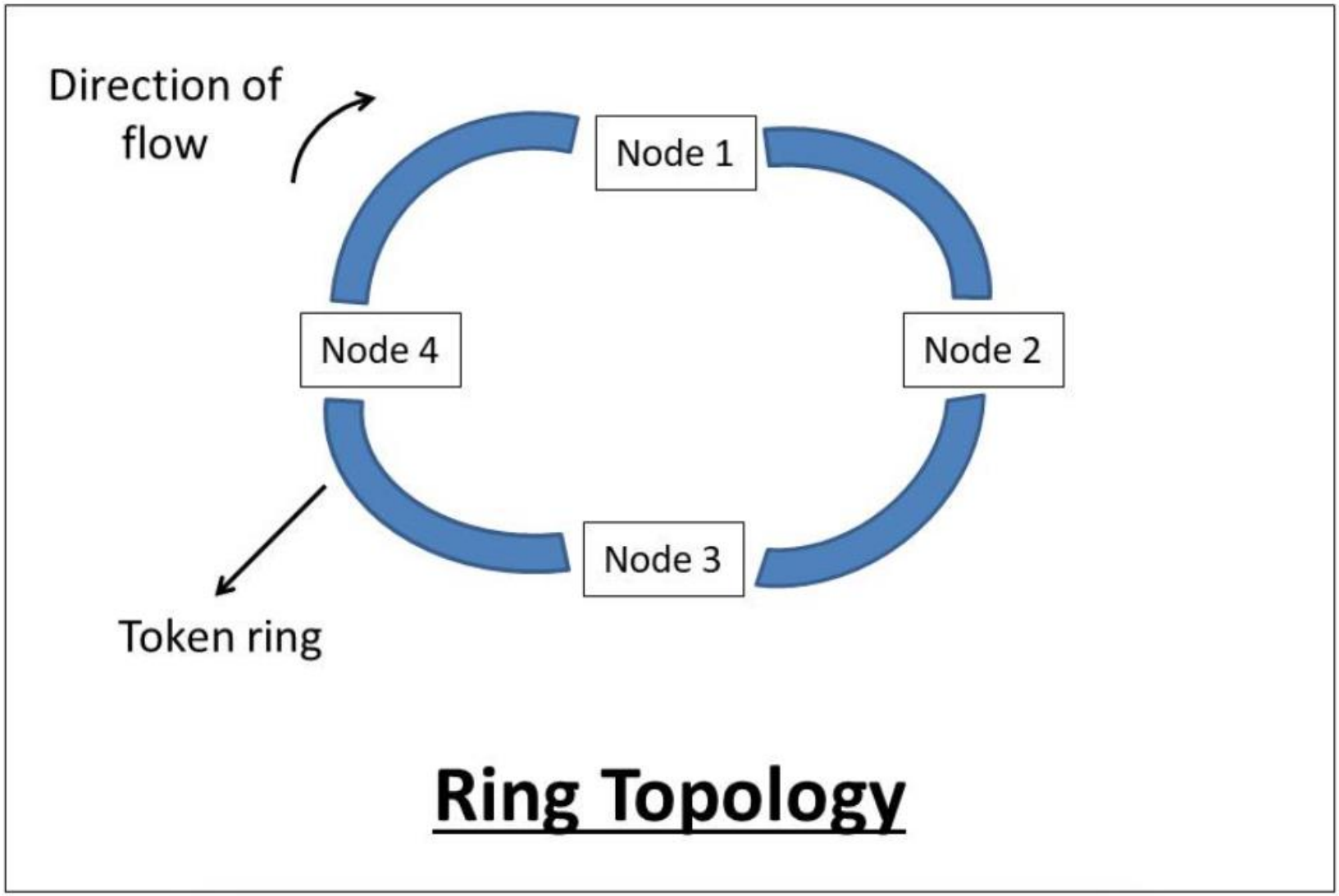
- In ring topology , all the computers/nodes are connected to each other in such a way that they make a closed loop.
- A ring topology passes data in only one direction. If the failure of one node can affect the entire network.

Advantages:

1. Easy to install
2. Short cable length then star topology
3. There is no dependency on central node.

Disadvantages:

1. Failure of any one computer on the network affect the entire system.
2. Adding and removing the computers are difficult.
3. Difficult to diagnose faults.



Ring Topology

4. Tree/Hierarchical topology

The tree topology arranges computers in a hierarchical structure in order to allow greater control and easier troubleshooting, so that it is also known as hierarchical topology.

The computer in upper level act as a server and at lower level act as client.

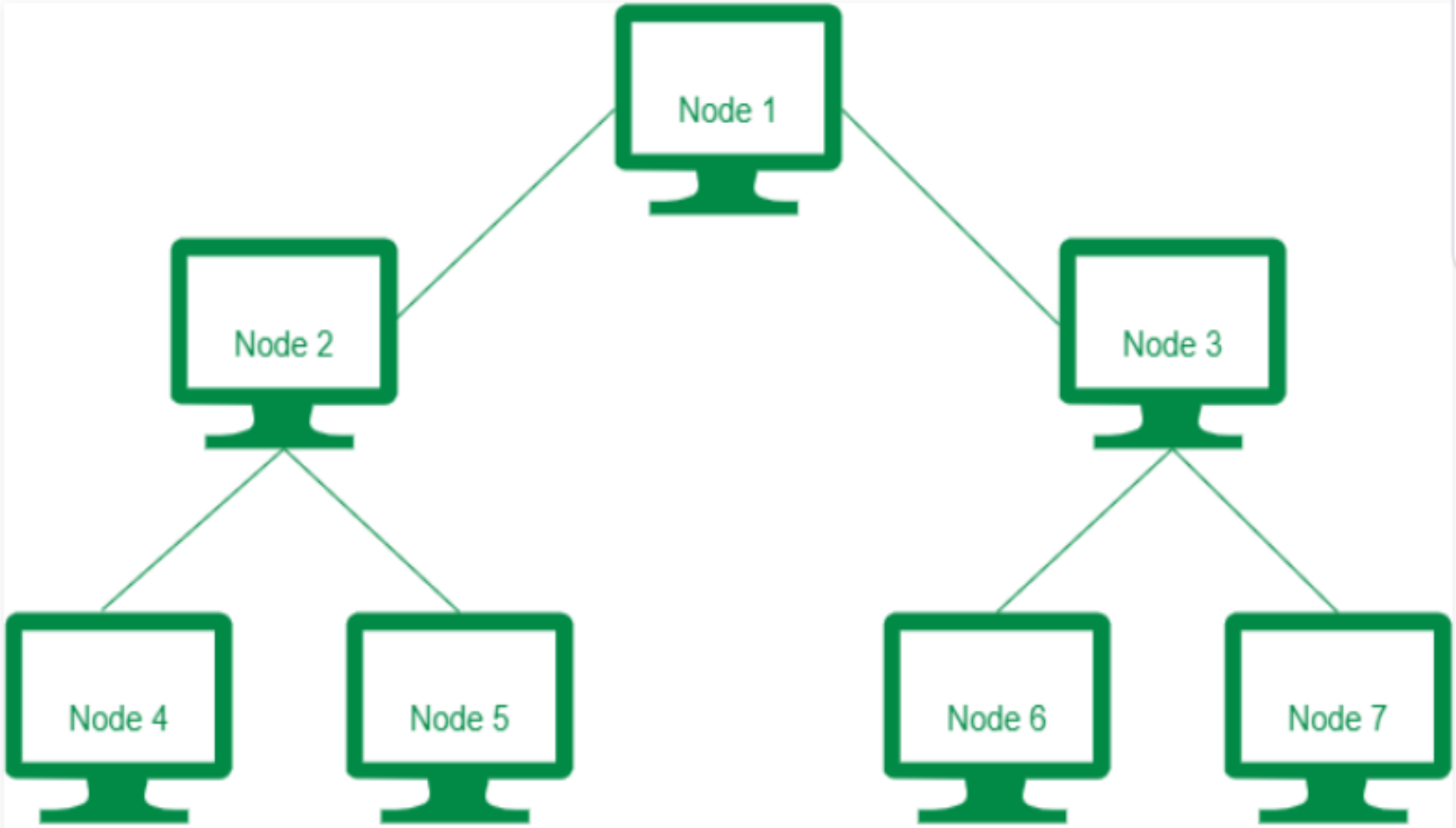
This type of network mostly used in organization where headquarters communicate with regional office and regional office communicate with district office.

Advantage:

Easy to extend

Disadvantage:

If main device fails to operate , the entire network is disturbed.



Tree Topology

5. Mesh Topology

In mesh topology, each computer is connected to every other computer in point-to-point mode. For example, if we have a four computers ,we must have six links.

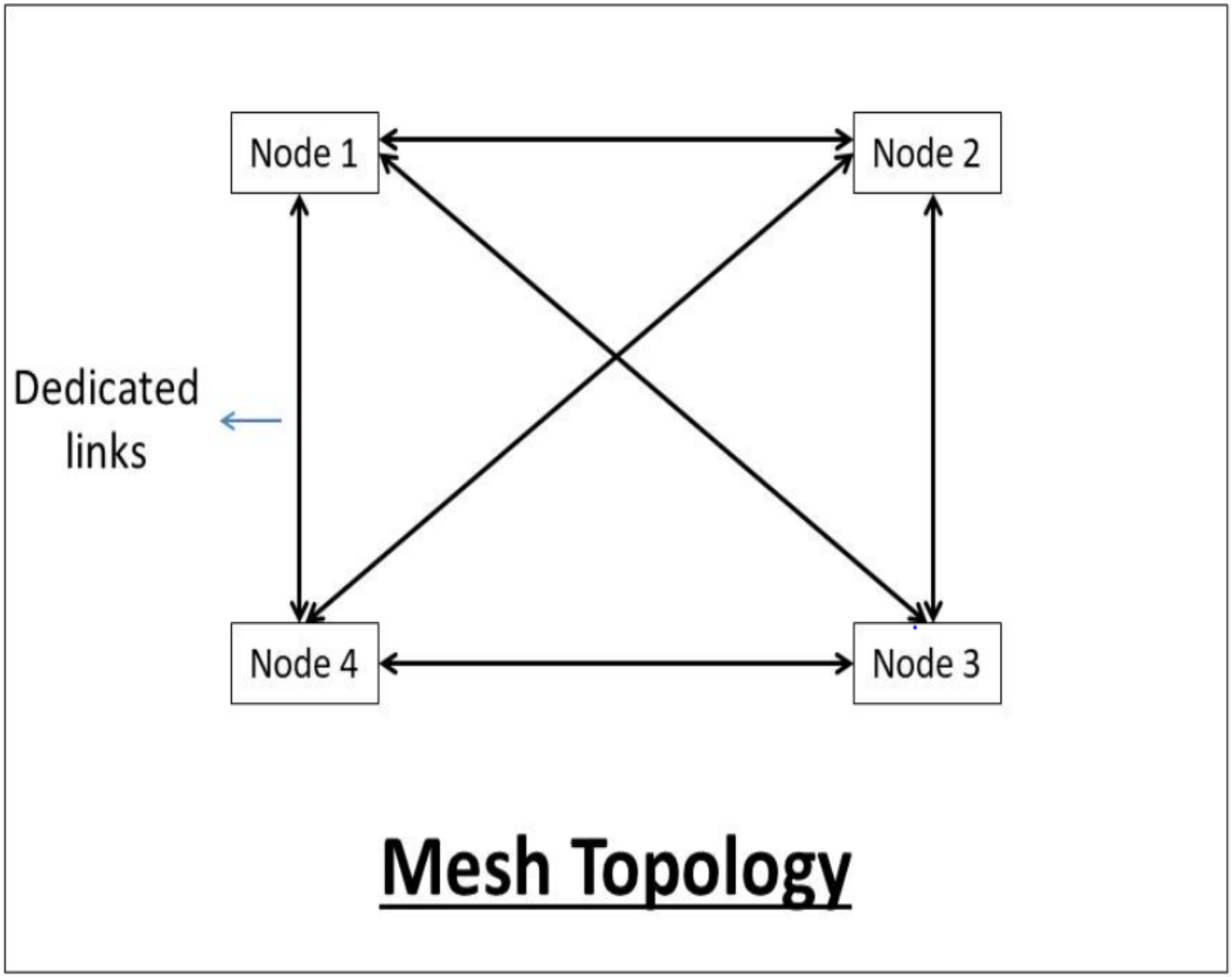
Advantage:

- If any one of the computer is down then the computers can still continue to work .
- Fast communication
- Directly communicate with each other.

Disadvantages:

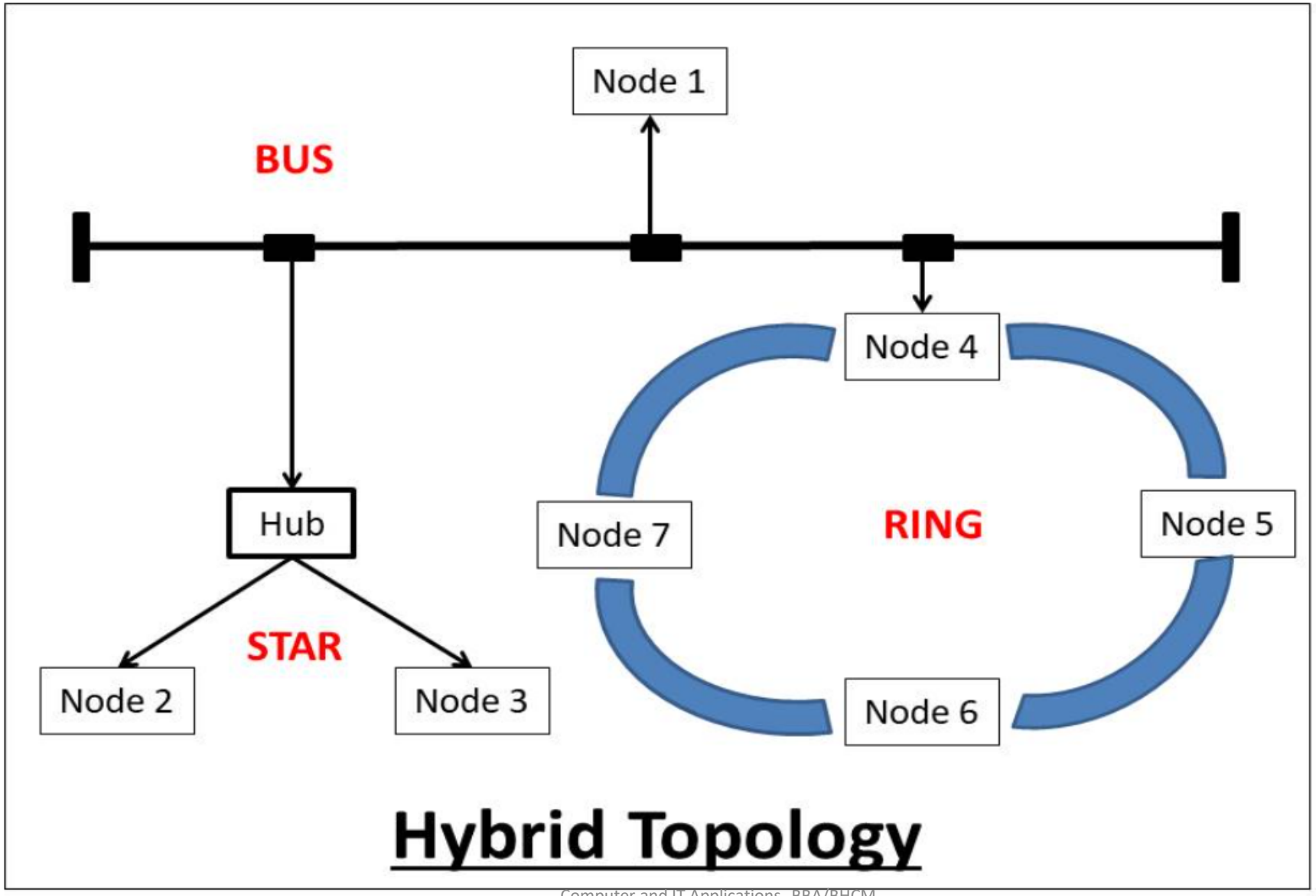
It is very complex to implement and hard to find out the fault.

It is expensive ,as it requires a lot of I/O ports and more cables.


Node 1
Node 2
Dedicated links
Node 4
Node 3
Mesh Topology

6. **Hybrid Topology**

Combination of two or more Topology



Advantage :

- Can be managed a large volume of nodes.
- flexibility to modify the network
- if one node fails it will not affect the whole network

Disadvantage:

- Complex design.
- Expensive to implement.