MINISTRY OF EDUCATION

ST. EDMUND'S SECONDARY SCHOOL

COMPUTER STUDIES

TYPES OF COMPUTER NETWORKS

GRADE 9

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WHAT IS A OF COMPUTER NETWORK?

- A computer network is a system that connects multiple devices to share resources, exchange data, and communicate efficiently. Networks can vary in size, purpose, and structure. They enable connectivity between computers, servers, and other network devices using wired or wireless technologies.

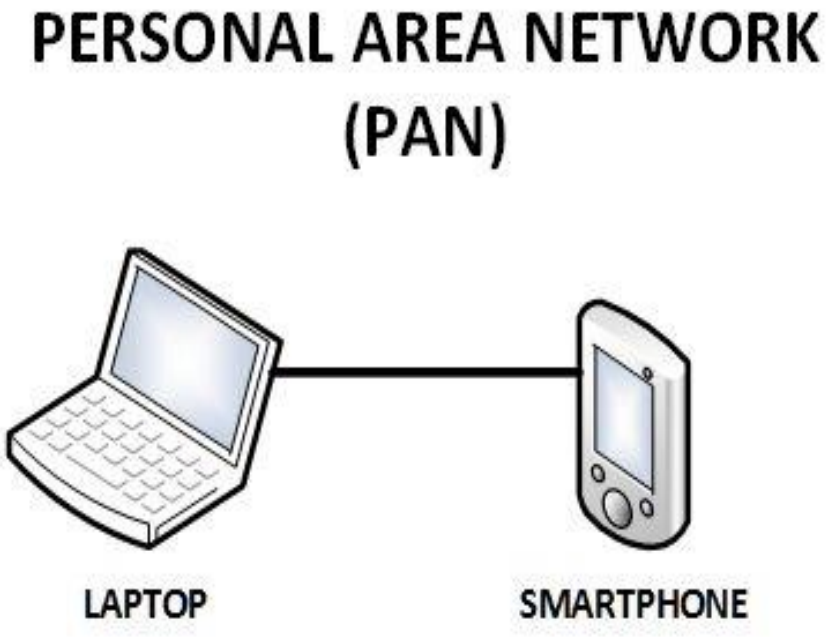
TYPES OF COMPUTER NETWORKS

1. Personal Area Network (PAN)
2. Home Area Network (HAN)
3. Local Area Network (LAN)
4. Campus Area Network (CAN)
5. Wide Area Network (WAN)
6. Metropolitan Area Network (MAN)
7. Global Area Network (GAN)
8. Storage Area Network (SAN)
9. Virtual Private Network (VPN)

Personal Area Network (PAN)

What is personal area network?

A personal area network (PAN) **connects electronic devices within a user's immediate area**. The size of a PAN ranges from a few centimeters to a few meters. One of the most common real-world examples of a PAN is the connection between a Bluetooth earpiece and a smartphone.

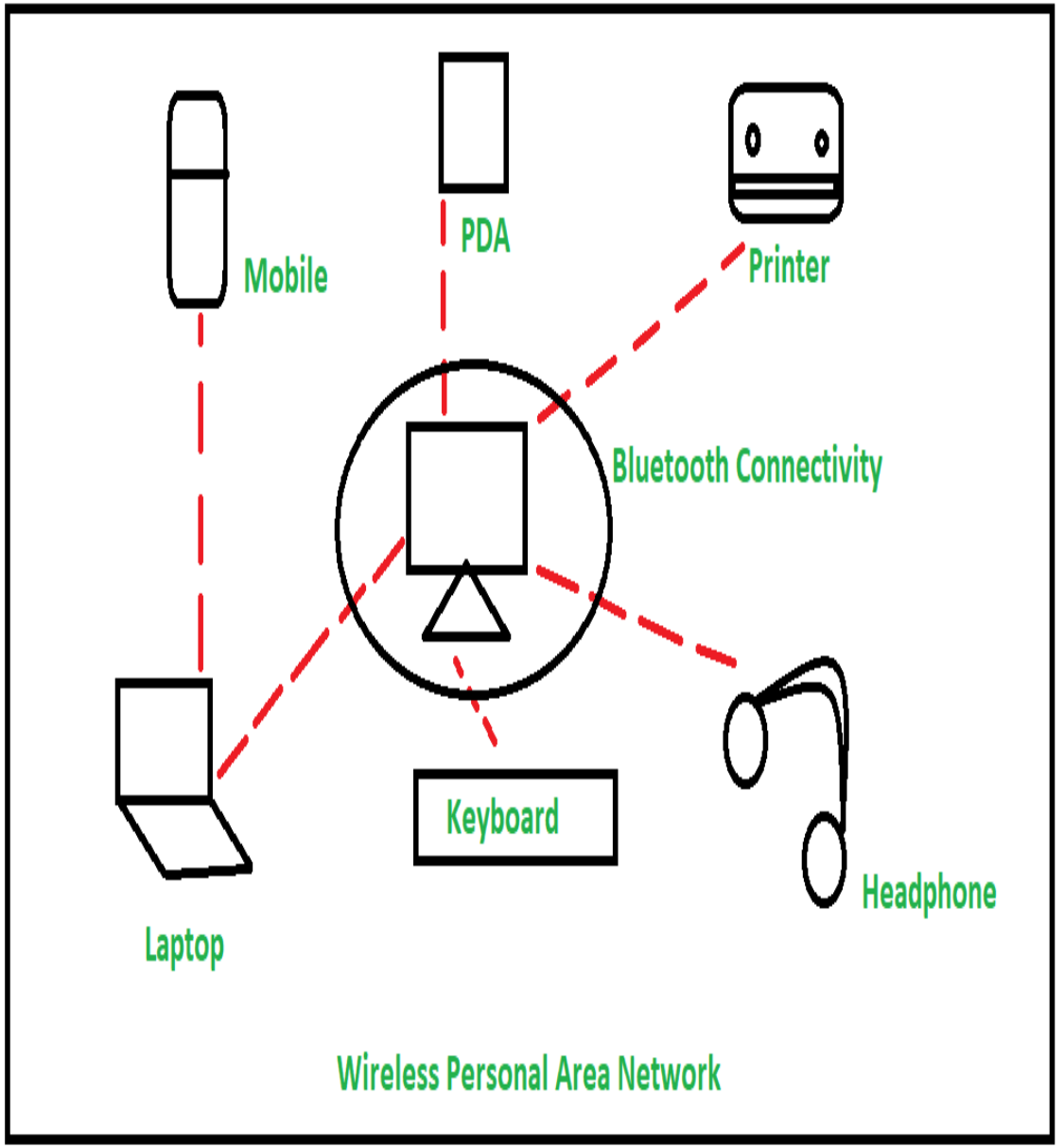


PAN doesn't use wires or cables often, **a *personal area network (PAN)* , or *wireless personal area network (WPAN),* uses short-range wireless technology to connect**

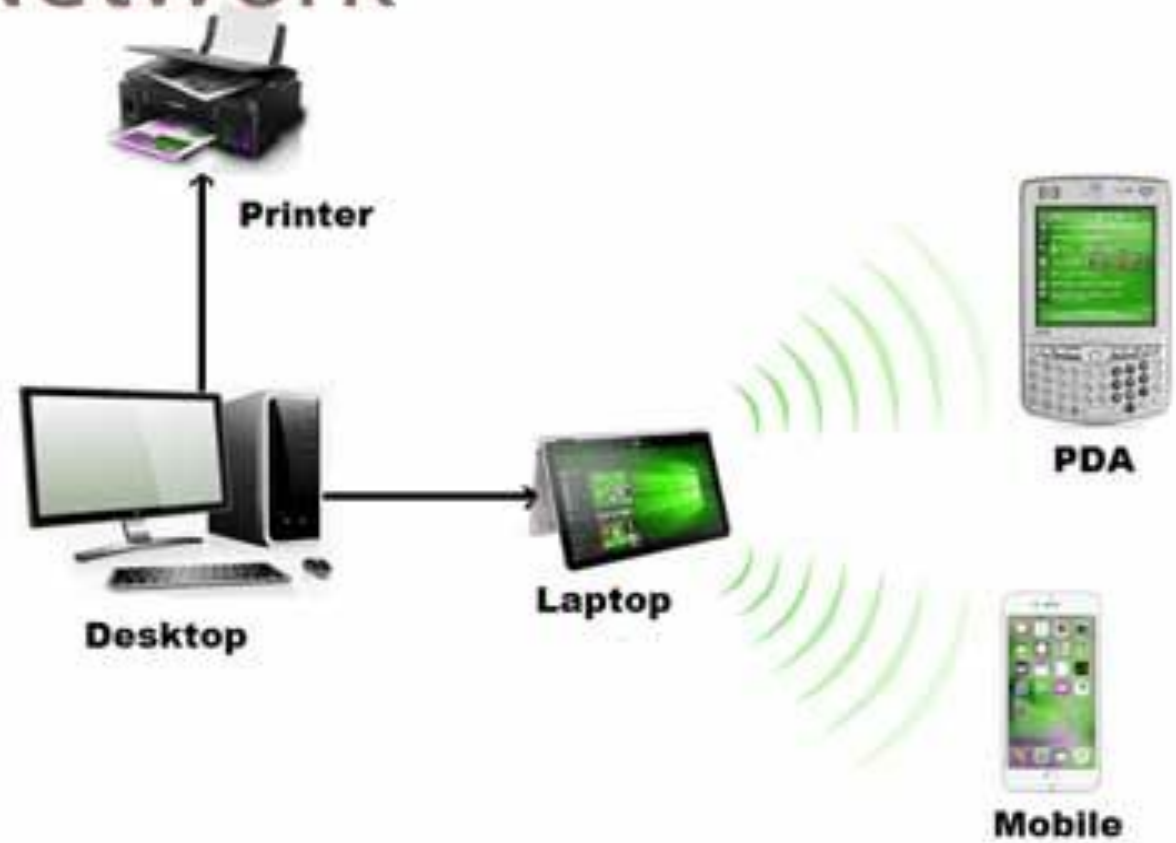
an individual's personal electronics, such as cellphone, PDA, MP3 player,

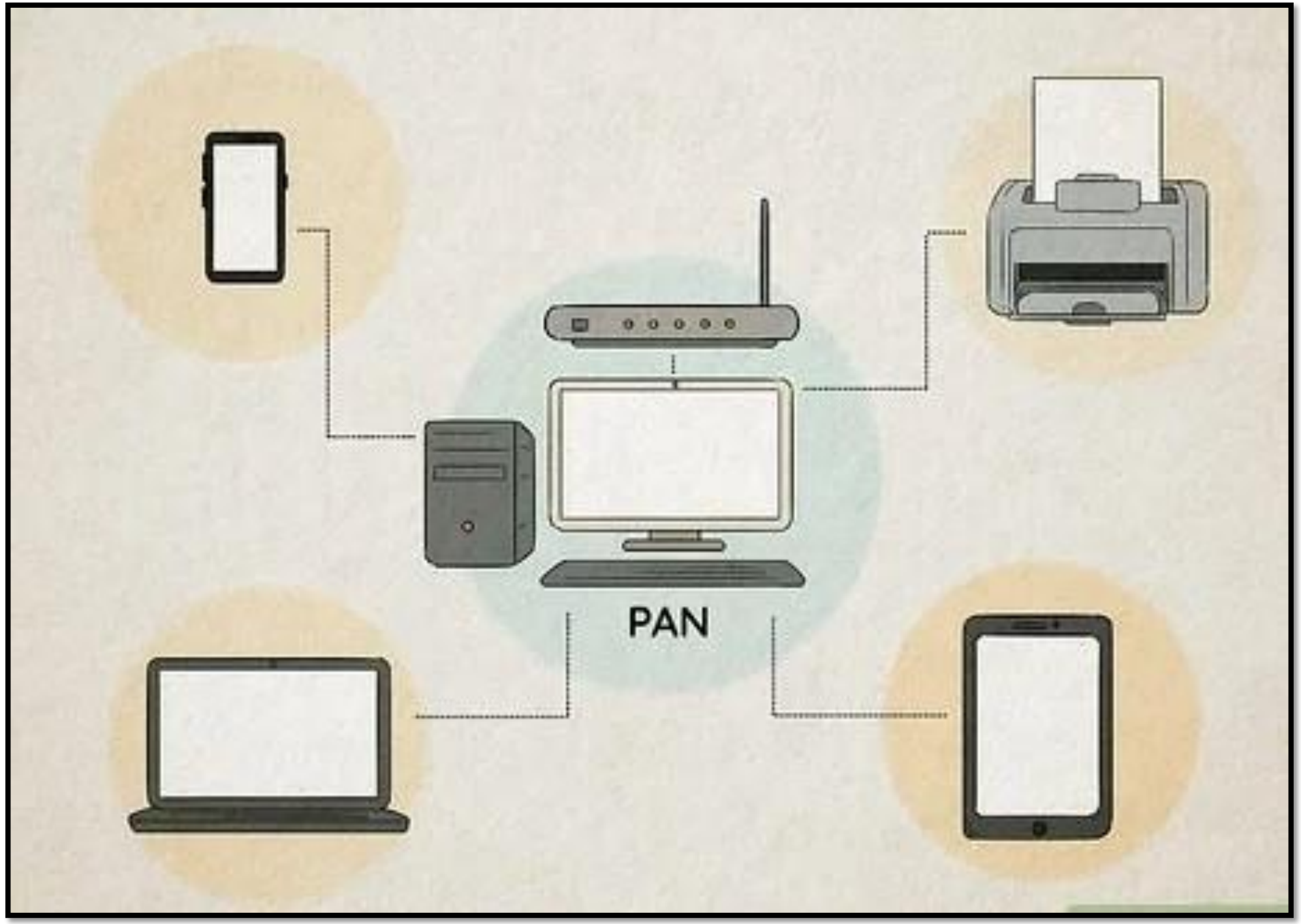
notebook PC, and printer. PANs are made possible with such inexpensive,

short-range wireless technologies as Bluetooth, ultra wideband, and wireless.



Examples of Personal Area Network



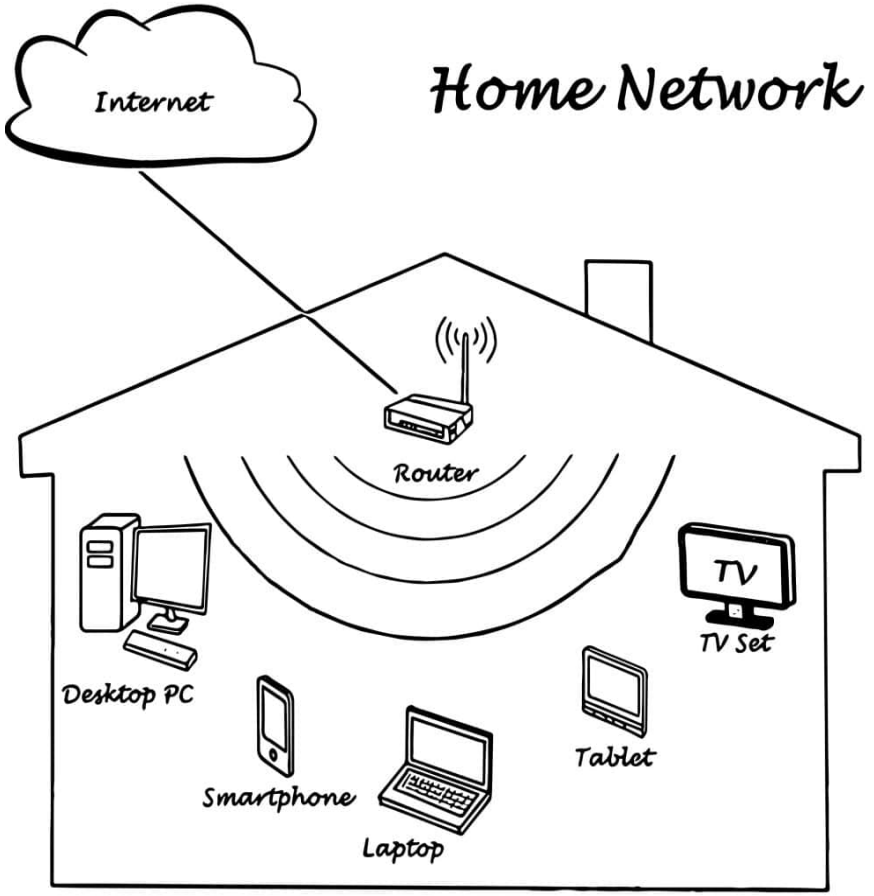

PAN

Home Area Network (HAN)

What is the meaning of home network?

A home network is a group of devices — such as computers, game systems, printers, and mobile devices — that connect to the internet and each other. Home networks connect in two ways:

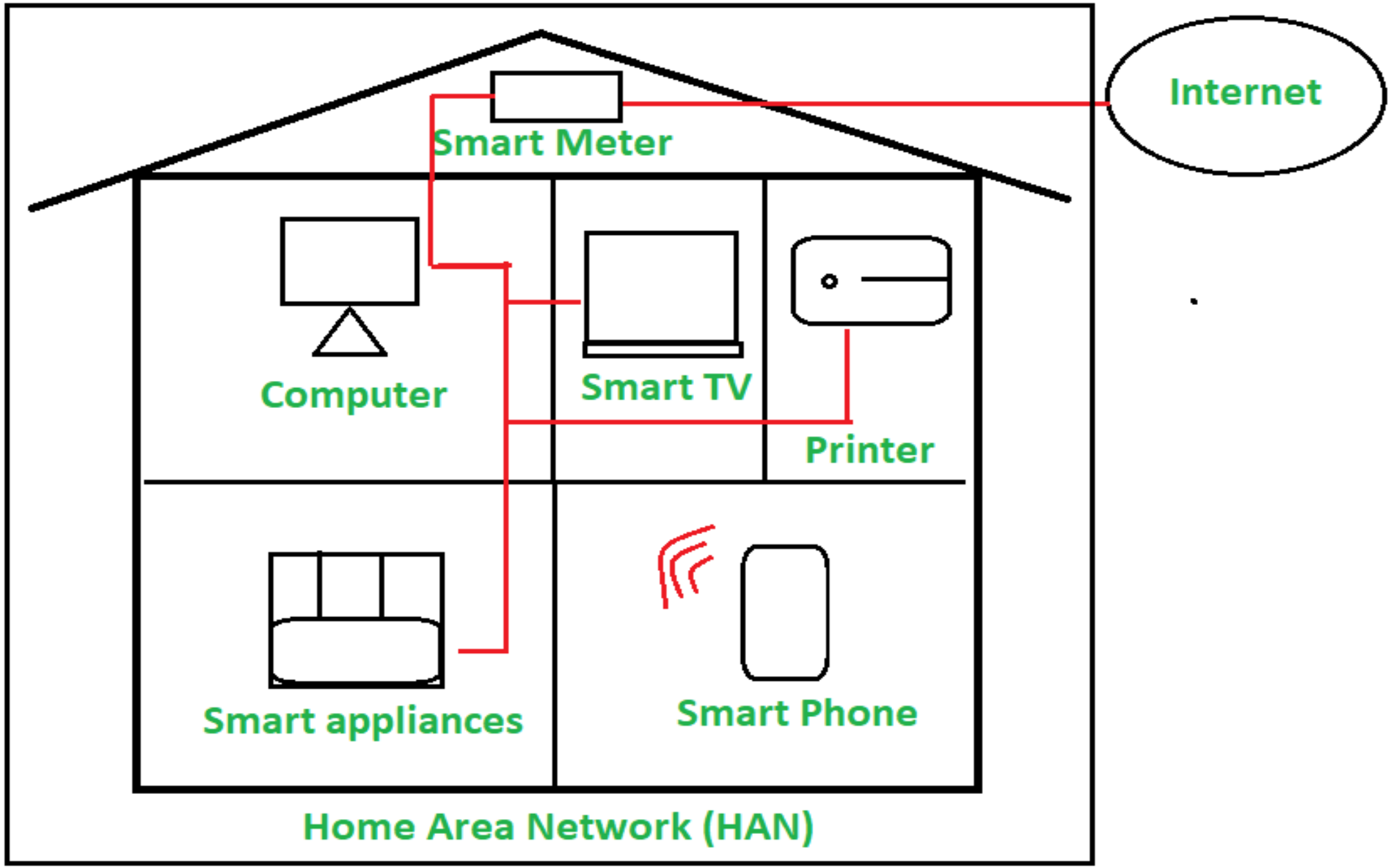
A wired network, which connects devices like printers and scanners with cables.



- A home area network (HAN) is a network inside the home used to provide monitoring and control over energy usage. It connects to the utility's electric meter and monitors energy usage so the home owner can see what energy is being used and where.

Example

Think about a home where computers, printers, game systems and tablets, smartphones, other smart appliances are connected to each other through wired or wireless over a network is an example of Home Area Network.

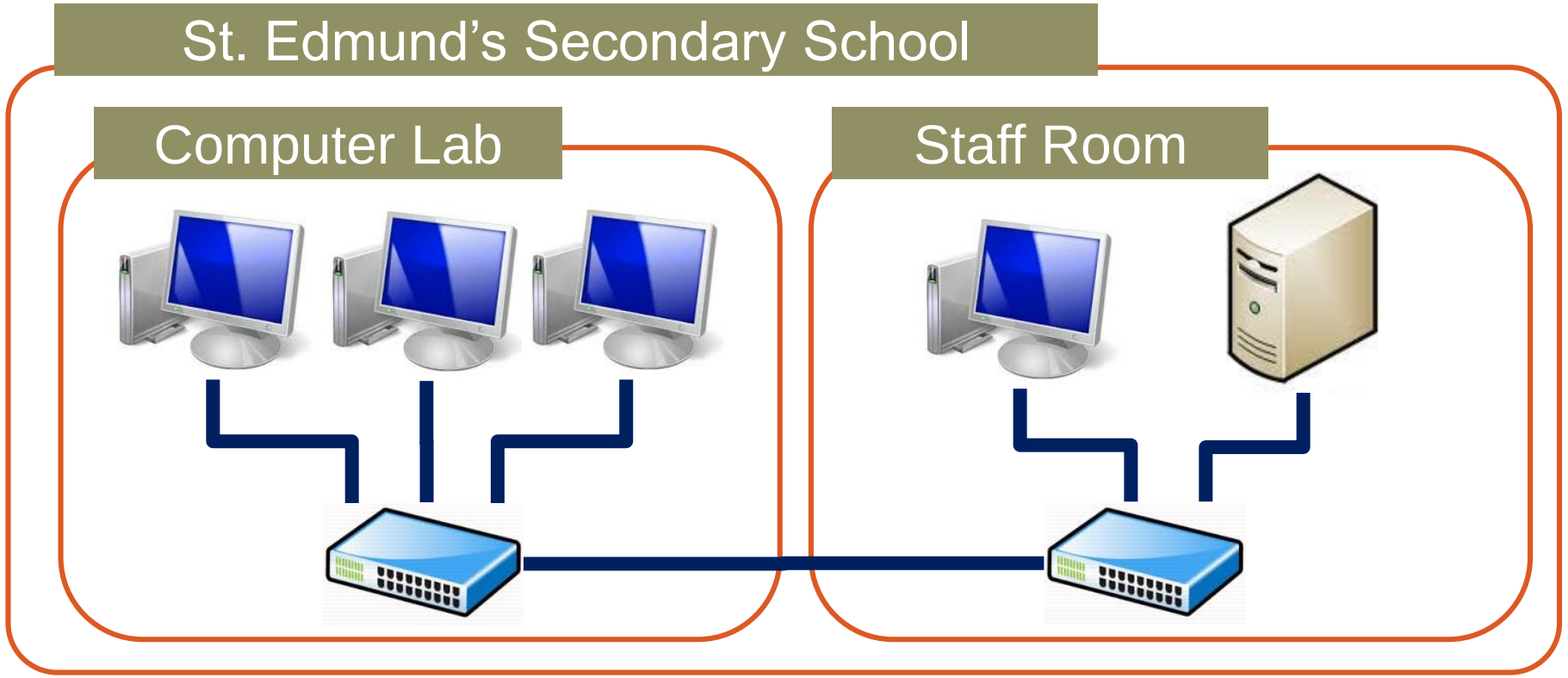

Internet
Smart Meter
Computer
Smart TV
Printer
Smart appliances
Smart Phone
Home Area Network (HAN)

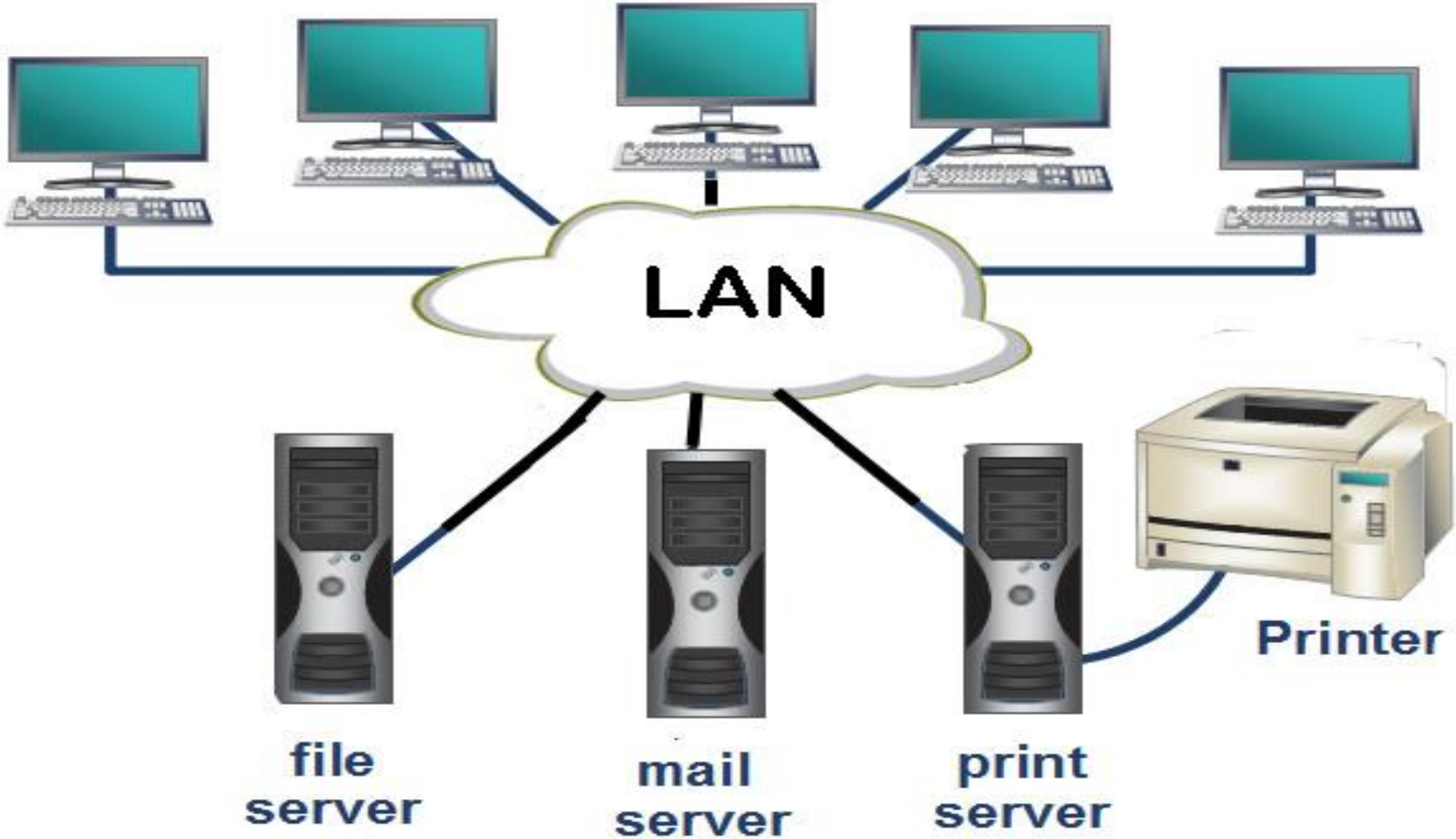
Local Area Network (LAN)

What is local area network?

A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.

A collection of computers in a room, building, department or school that can share peripherals, share information and communication with each other on the network.

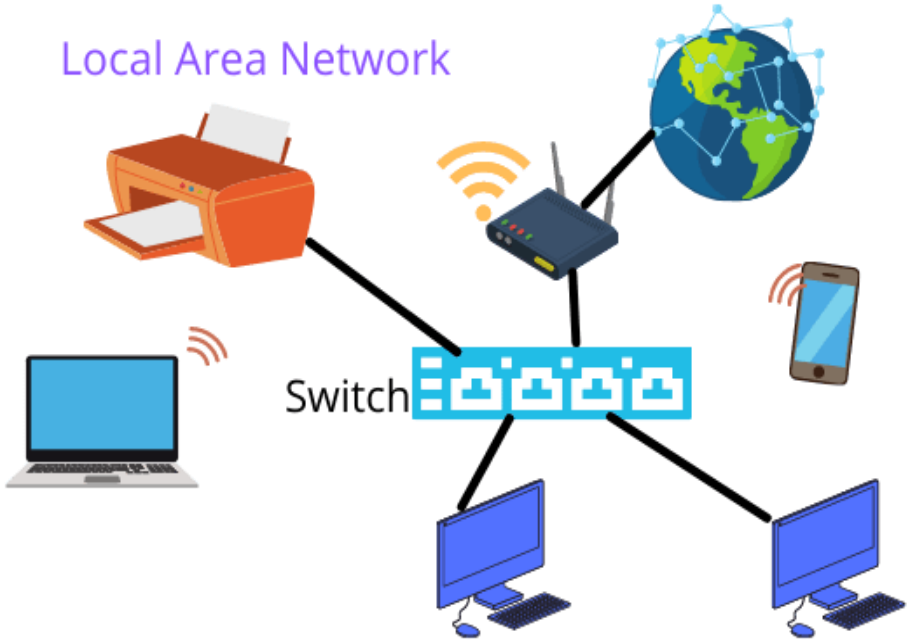



LAN
file server
mail server
print server
Printer

- A local area network (LAN) connects computers and devices in a limited geographic area, such as one office, one building, or a group of buildings close together. LANs are the basis for most office networks. The LANs of different offices on a university campus may also be linked together into a so-called campus-area network.
- The data transfer speed of Local Area Network is generally high i.e. large amount of data can be transferred from one computer to the other in a very short span of time.

Uses of LAN

- Sharing of one copy by all users.
- System resources can be shared like printer.
- Easy to manage data storage.
- Data is more secure from being copied or destroyed.
- It may be in form of Peer-to-peer Network or Client Server Network.

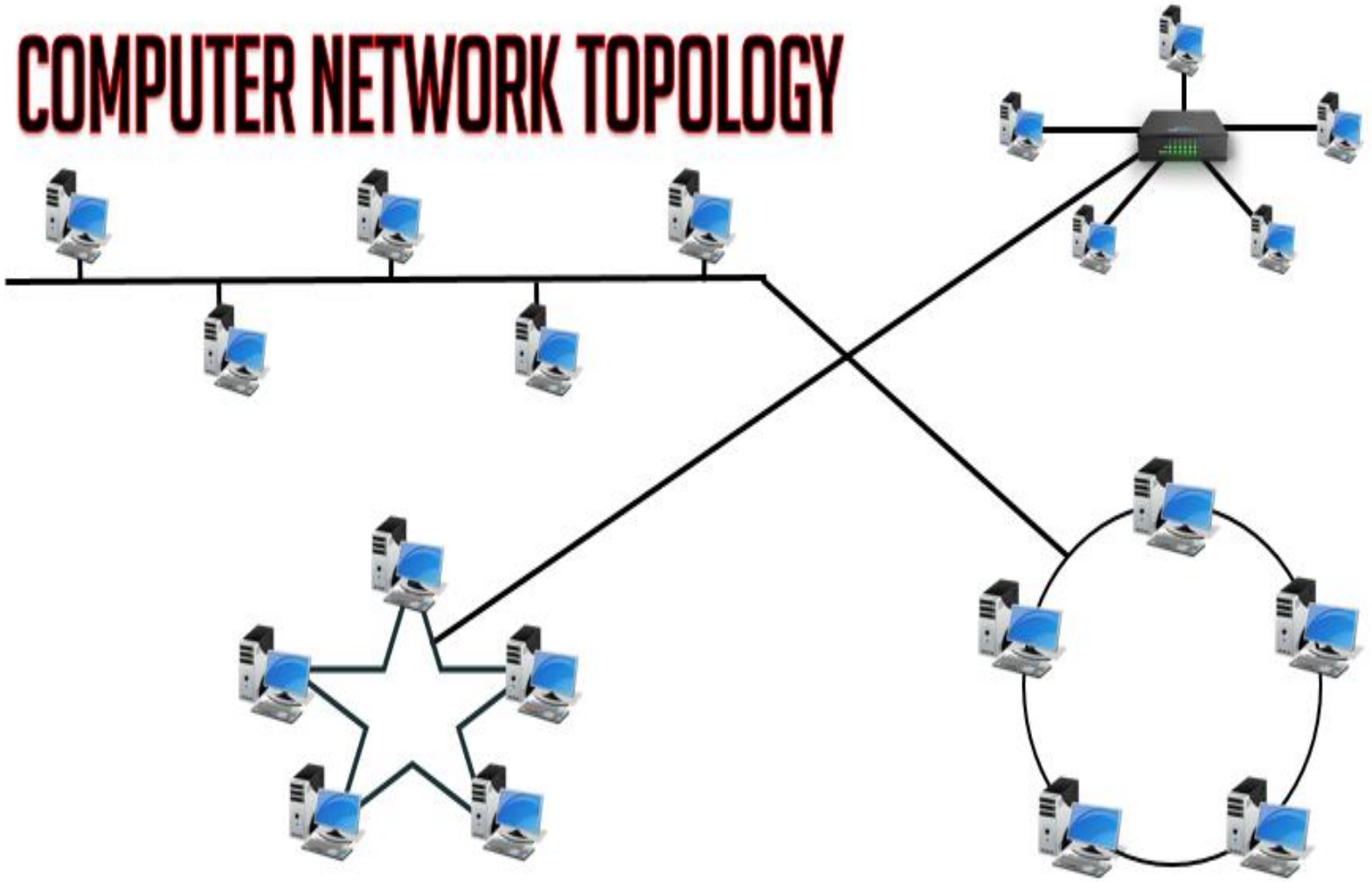


LAN Topologies

- Networks can be laid out in different ways. **The logical layout, or shape, of a network is called a *topology* .**
- The word topology means ‘arrangement’, so when we talk about the topology of a network, we mean how the different parts are arranged and connected together.
- The topology of a network defines how the nodes of a network are connected.
- The computers connected to the host are called terminals or workstations or slaves or clients.
- There are five common types of LAN network topologies

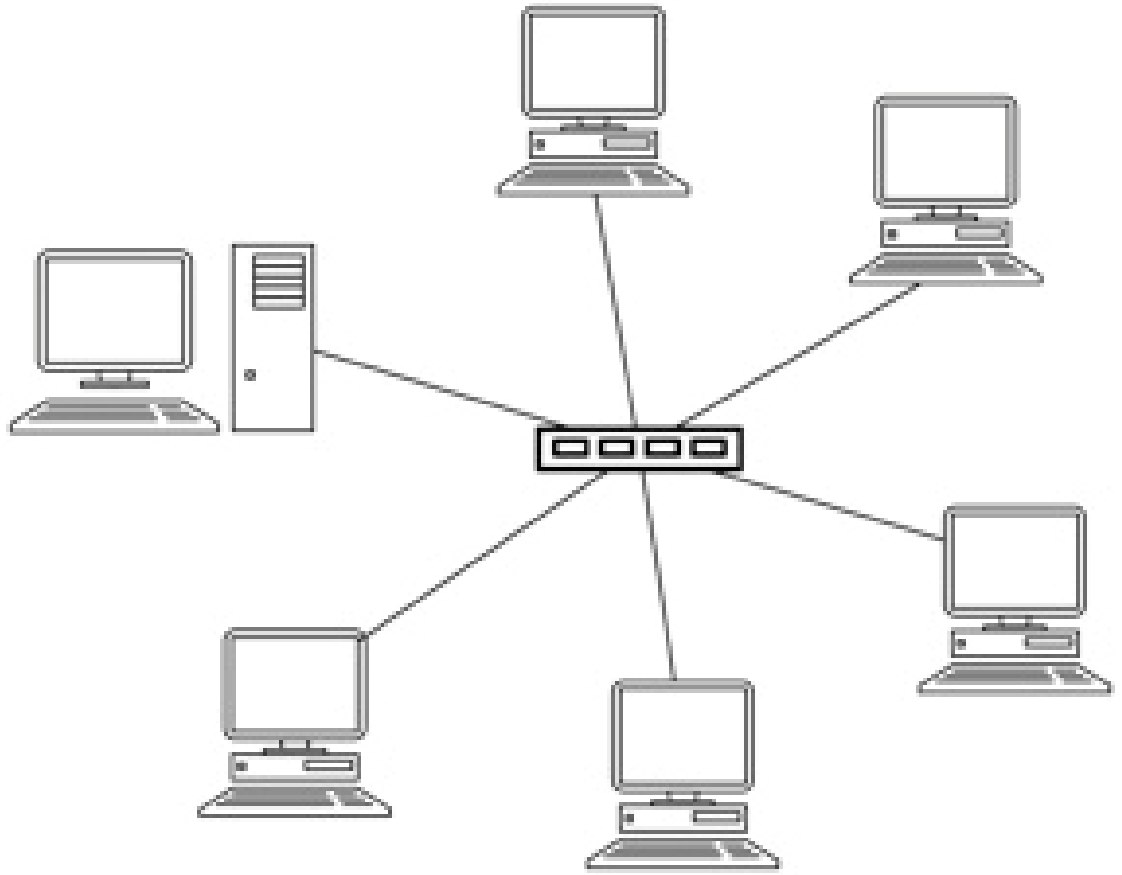
Types of LAN Topologies

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

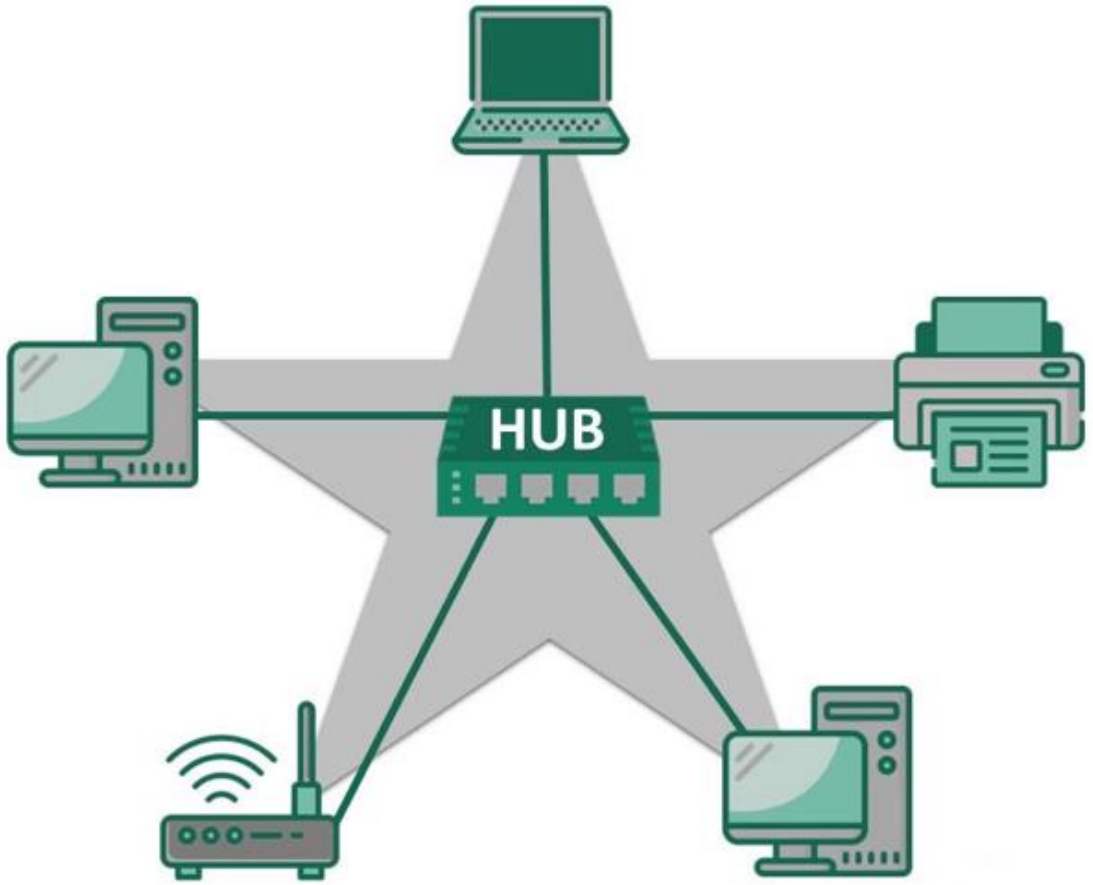


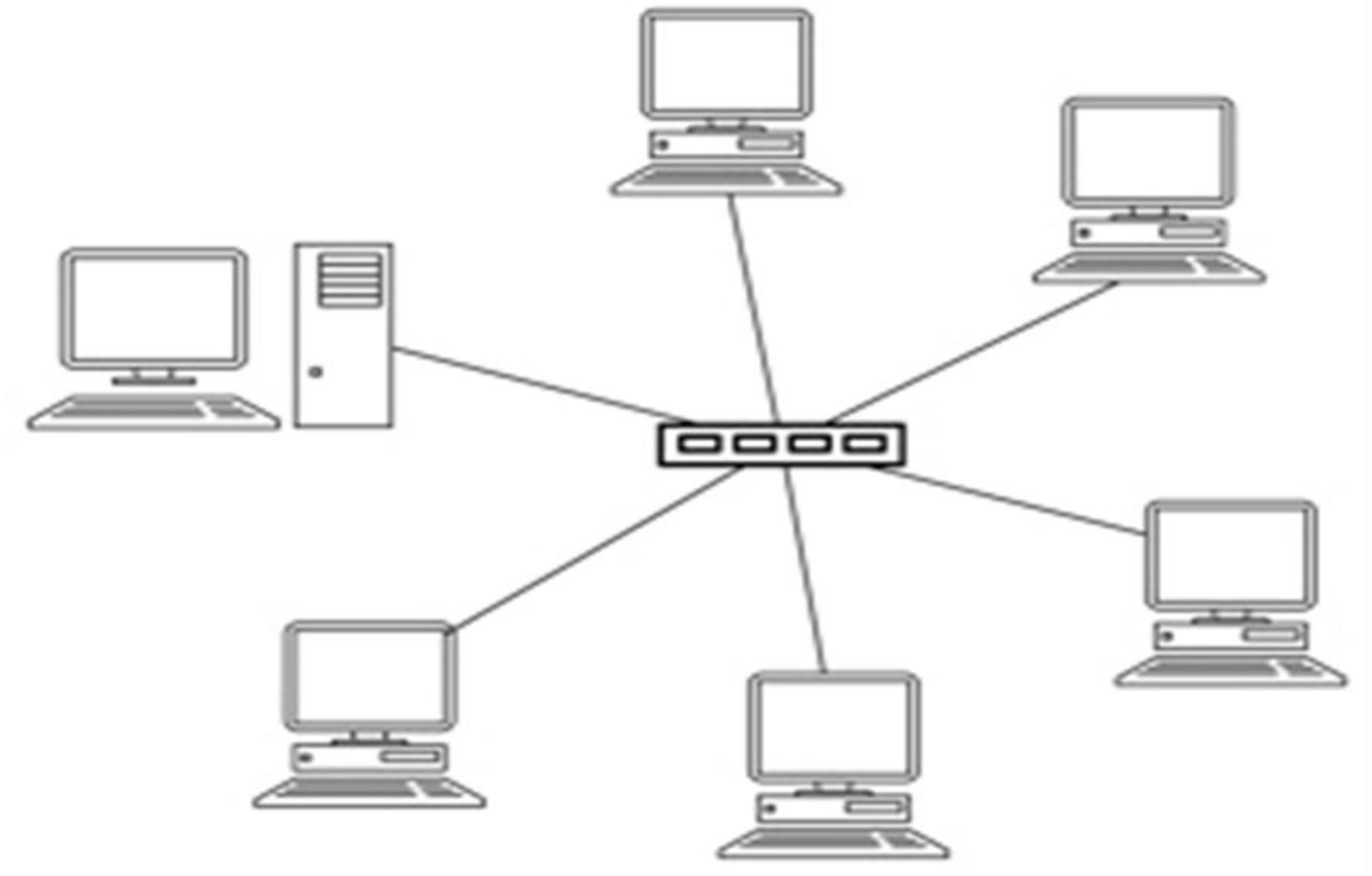
STAR TOPOLOGY

- In this type of network every computer is connected to a central device. The device passes messages between computers.
- Computers of the network are connected together through a special device called hub. Each computer is connected to the hub. Thus, the link of one computer is established with other computers via hub.
- A star network is also commonly known as a **client-server** network.



STAR TOPOLOGY





Advantages of Star Topology

1. Hub provides mechanism for connecting many computers to the network. So expansion of the network becomes very easy, if a slot is vacant in the hub. If all the hub slots are occupied then another hub can be added into the network, so as to make provision for many more new slots.
2. If the link between the hub and a computer is down then it doesn't effect the functioning of other computers of the network. Rest part of the network works fine.
3. There is better or improved security and control for data and other resources.
4. It is cheaper to install and easier to implement.
5. If one computer or device fails, then the rest of the network is unaffected.
6. Hub can accommodate multiple cable types

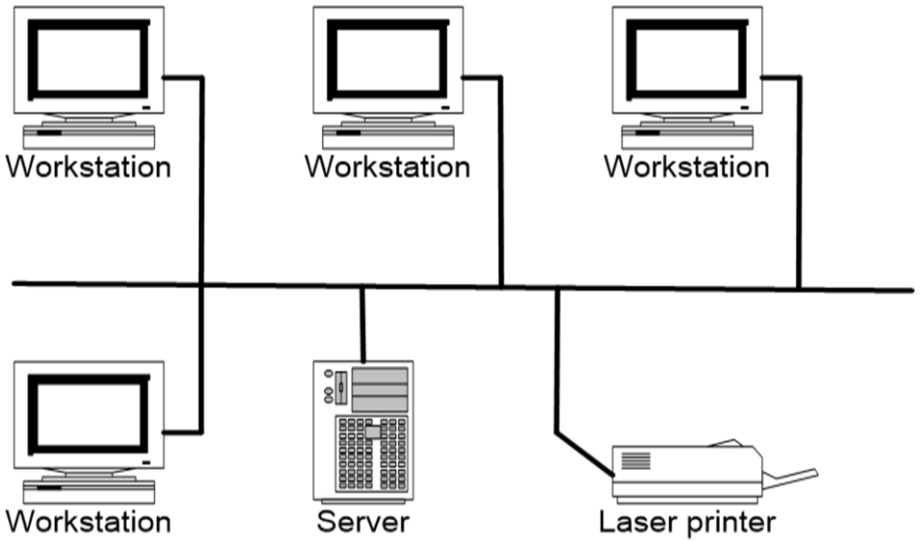
Disadvantages of Star Topology

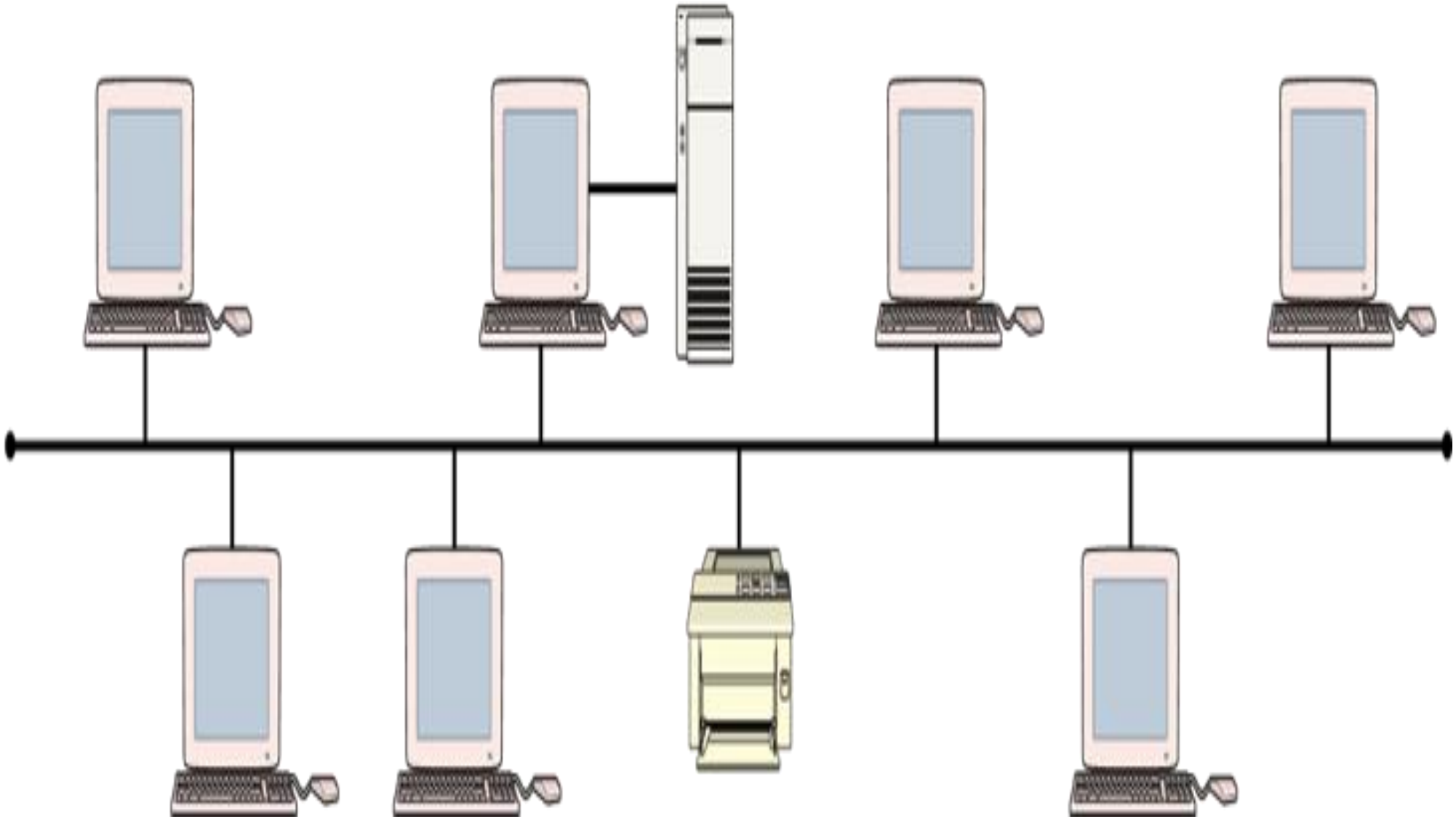
1. The whole network is affected when the server/hub is down or slow.
2. Extra hardware is required in order to extend the network beyond the limit of the star network.
3. Because there is no host computer to control communication, a special signal called a **token** is sent round the network.
4. The computer with the token is the one that is able to send while the other computers can receive only.
5. It is more expensive because all network cables must be pulled to a central point

Bus topology

In this topology, every host (workstation) is connected to a main cable called the **bus**.

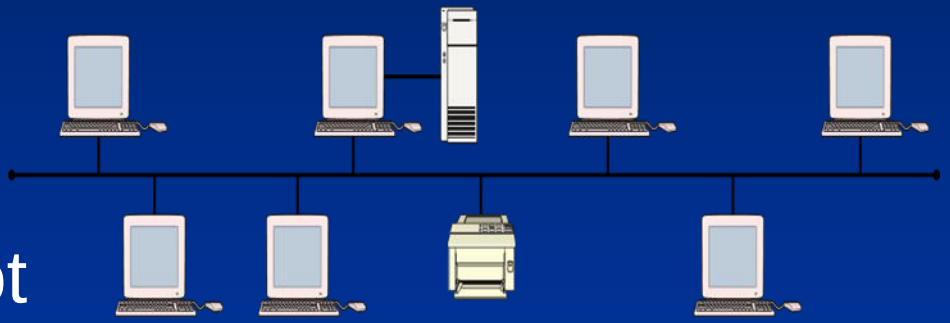
Each computer or device is connected to a common central line. Data travels along this central line until it reaches the computer or device that requires it.





Advantages of bus topology

- This is the fastest network.
- It is easier to connect a computer to the bus.
- It requires less cable length than star network.
- If one device or computer fails, it does not affect the rest of the network.
- Easy to extend a bus



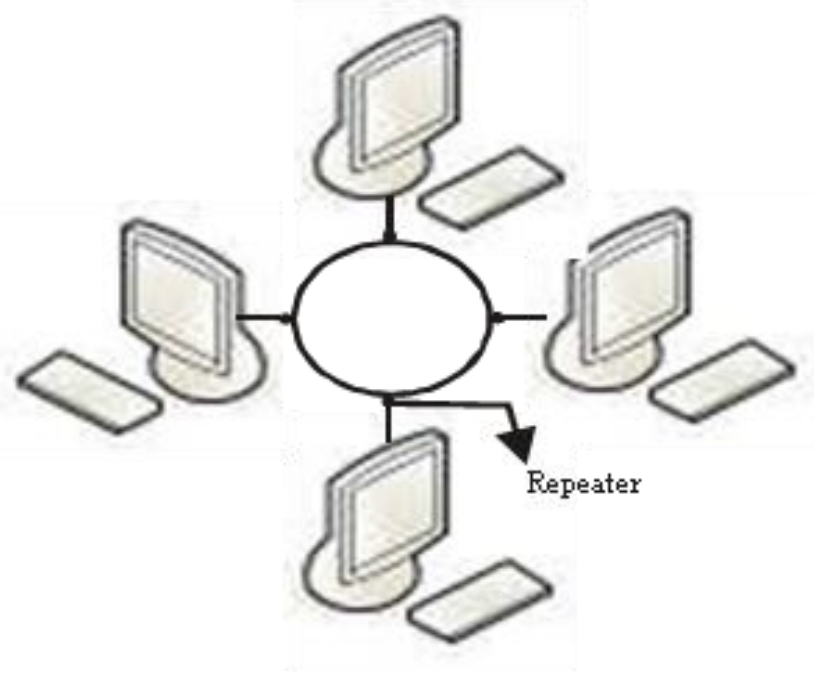
Disadvantages of bus topology

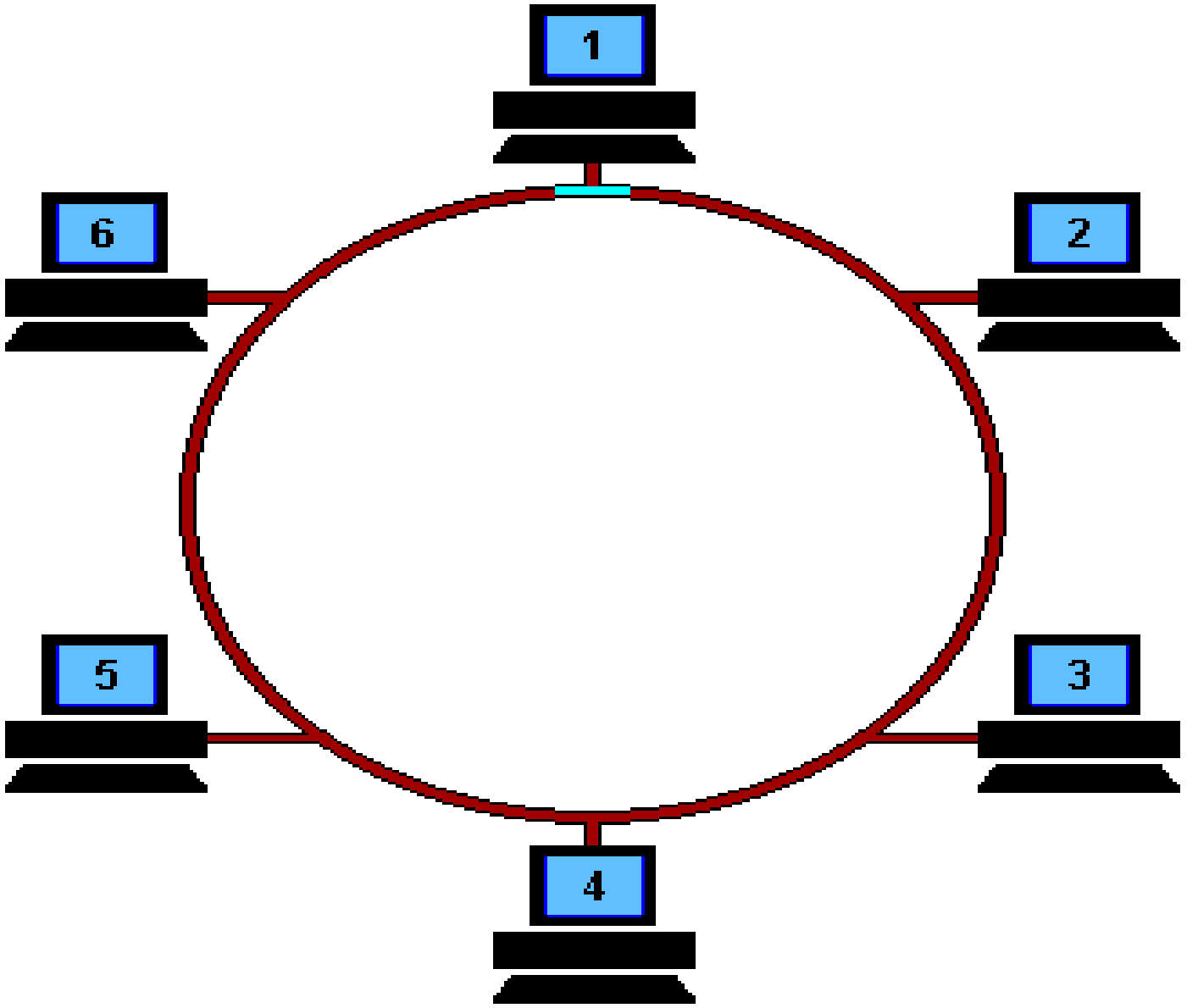
- The entire network shuts down if there is a break in the bus.
- Requires terminators at the end of the bus.
- It is difficulty to identify the problem if the network shuts down.
- Its performance worsens noticeably as more and more devices/ computers are added.
- Heavy network traffic can slow a network

Ring Topology

Every computer in the network is connected in a ring, including the server.

Data is transmitted around the ring and each computer only removes the data which is relevant to it. This allows each computer to send and receive data since they all have a unique identification/address.




1
2
3
4
5
6

Advantages of ring topology

1. This type of LAN is faster than the star network.
2. There are no signal collisions during transmission.
3. All stations have equal access.
4. Because each station on the ring acts as a repeater, ring networks can span longer distances.
5. There is no signal loss problem.

Disadvantages of ring topology

1. There is poor security for data.
2. It is the most expensive topology.
3. Failure of one node may affect others.
4. For these reasons, ring networks are no longer popular.
5. Difficult to troubleshoot.
6. Adding or removing computers disrupts the network

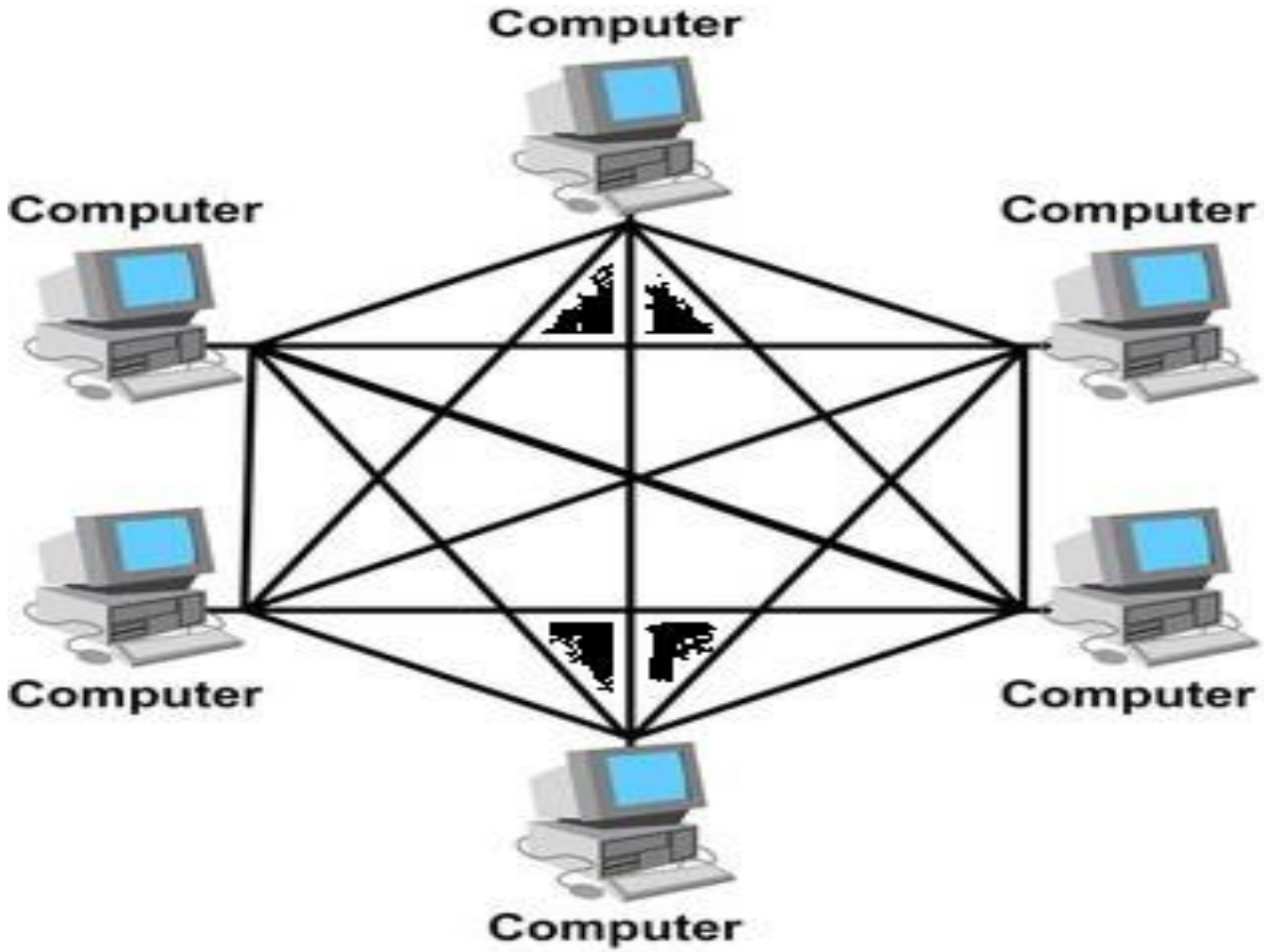
MESH TOPOLOGY

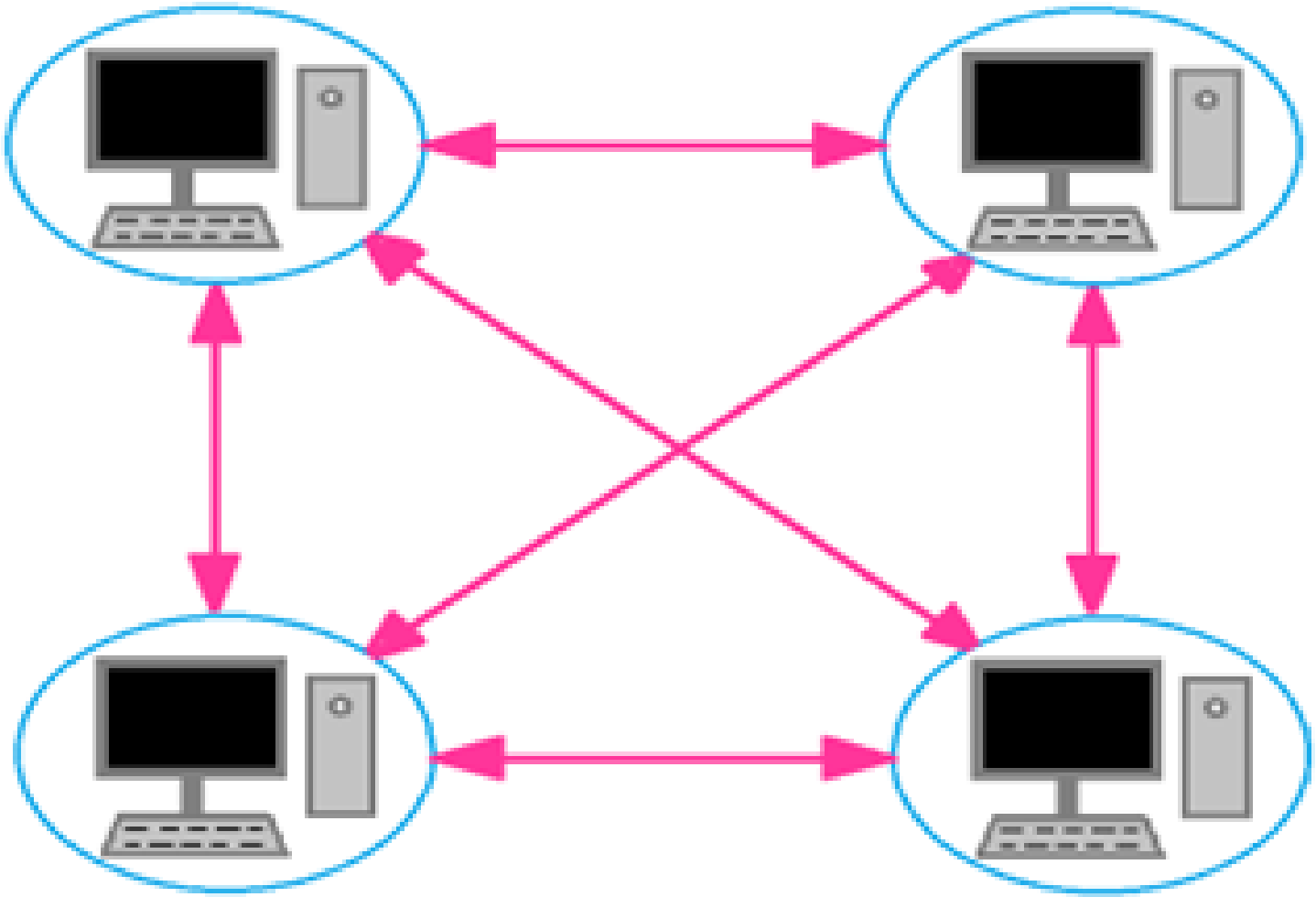
Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination.

A mesh network in which every device connects to every other is called a full mesh.

In mesh topology each computer of the network remains connected with other computers through dedicated medium (wire).

In a fully connected network, all nodes are interconnected.


Computer
Computer
Computer
Computer
Computer
Computer
Computer



Mesh Topology

Advantages of mesh topology

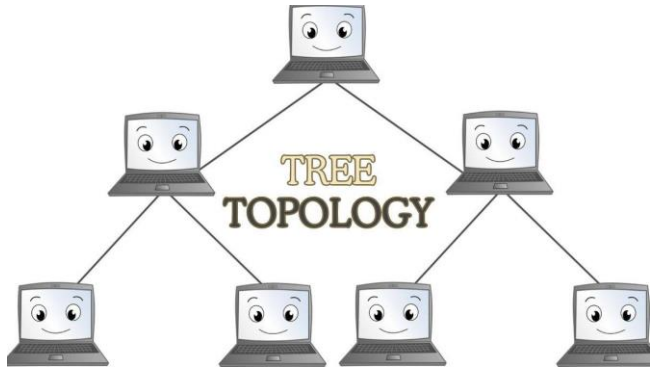
1. Due to direct connection between the computers, no switching is required. This makes the network very fast.
2. If one link gets broken, the data is routed through other links. Thus network seldom remains down.

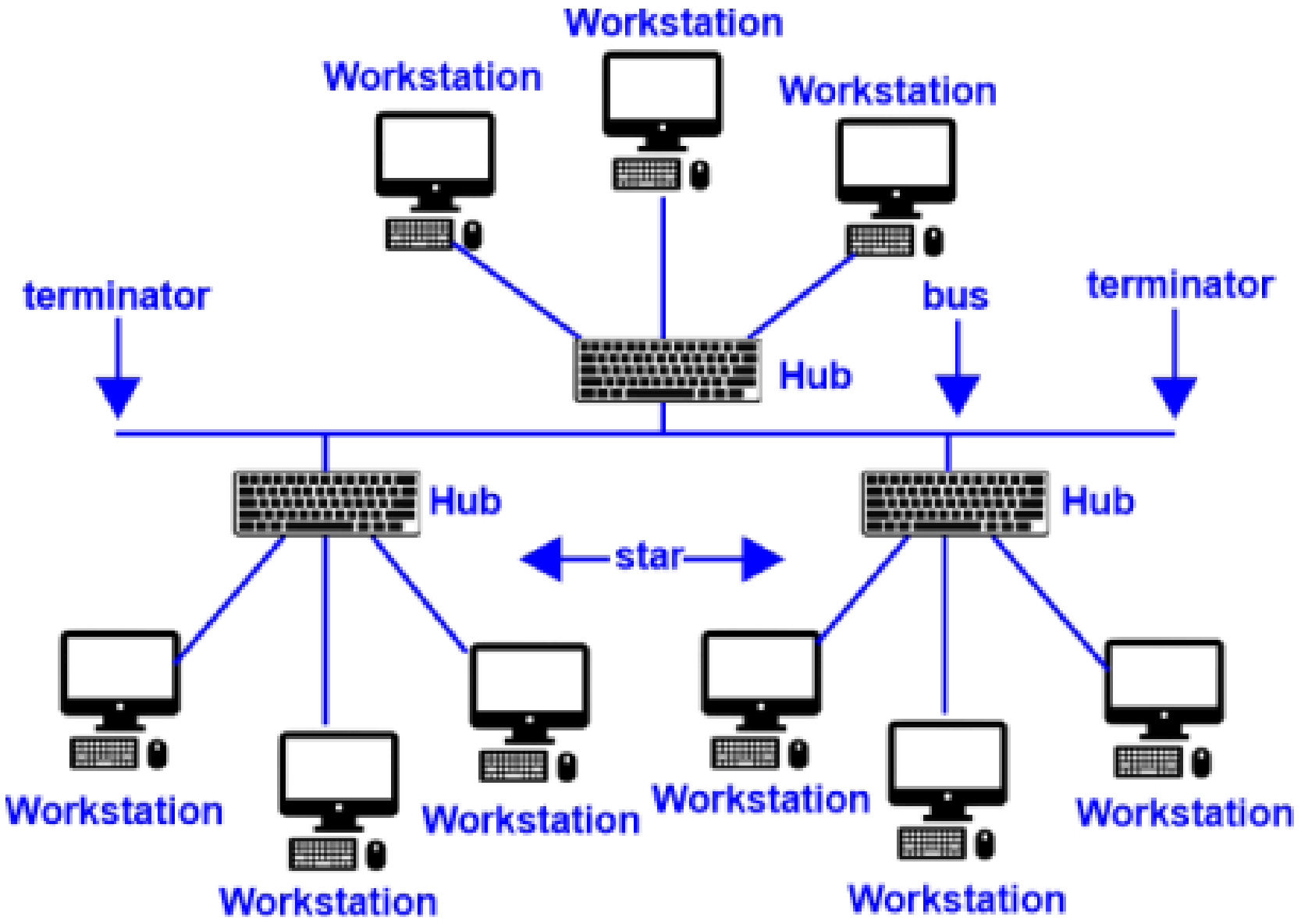
Disadvantages of Mesh topology

1. It doesn't suit well for large number of computers.
2. Very large length of cable is required to connect the computers, so the cost turns out to be very high.
3. This topology is almost obsolete now.

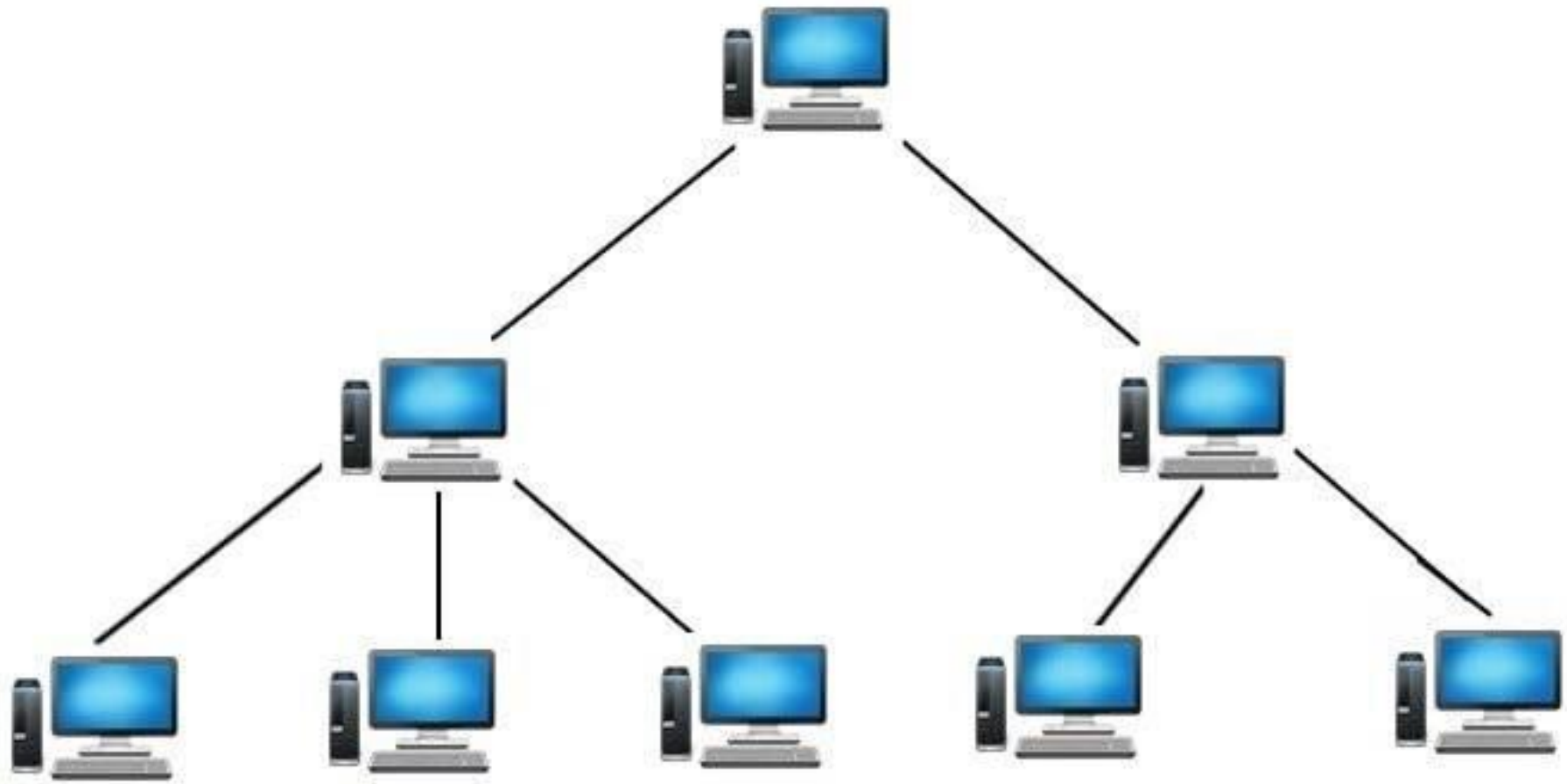
TREE TOPOLOGY

- A tree network has a central line connecting together a series of star networks.
- The server is also connected to this central line.
- Because of its flexibility, and the fact that it has the advantages of both bus and star networks





TREE TOPOLOGY



Advantages of tree topology

1. Point-to-point wiring for individual segments.
2. Supported by several hardware and software venders.
3. Extension of bus and star topologies.
4. Expansion of nodes is possible and easy.
5. Easily managed and maintained.
6. Error detection is easily done.

Disadvantages of tree topology

1. Overall length of each segment is limited by the type of cabling used.
2. If the backbone line breaks, the entire segment goes down.
3. More difficult to configure and wire than other topologies.
4. Heavily cabled.
5. Costly.
6. If more nodes are added maintenance is difficult.
7. Central hub fails, network fails.

Hybrid

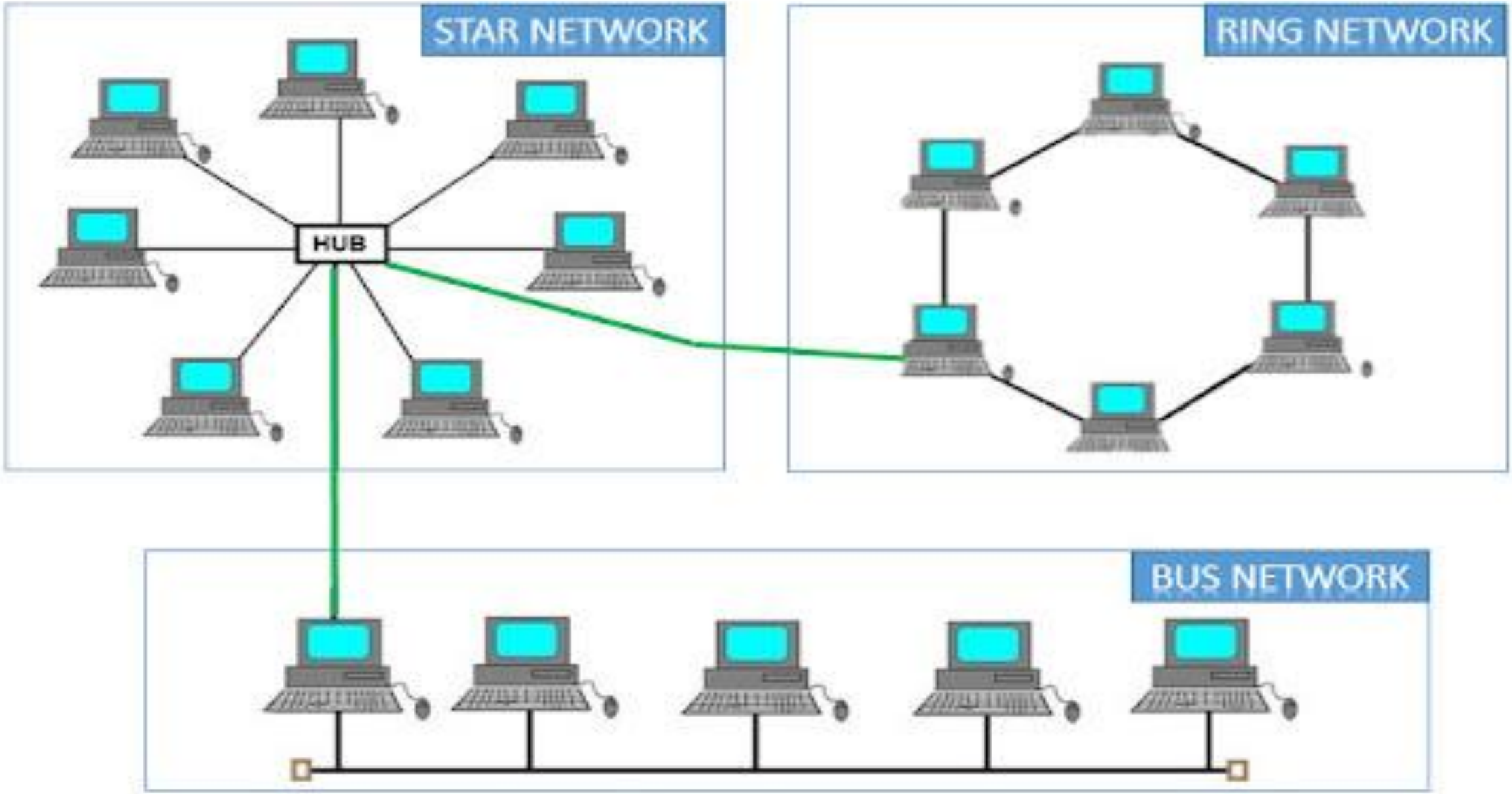
Hybrid networks combine two or more topologies in such a way that the resulting network does not exhibit one of the standard topologies (e.g., bus, star, ring, etc.).

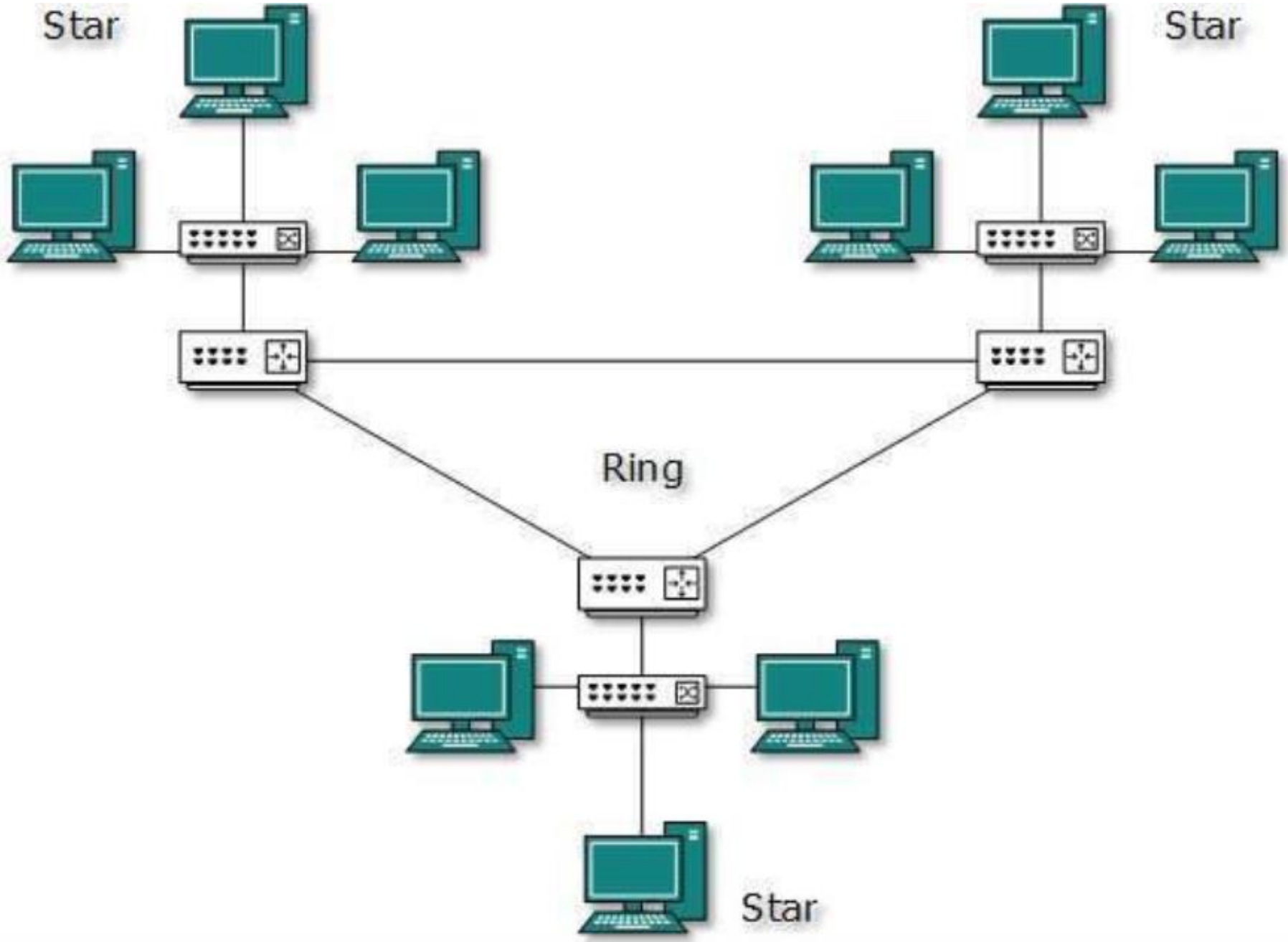
A network structure whose design contains more than one topology is said to be hybrid topology.

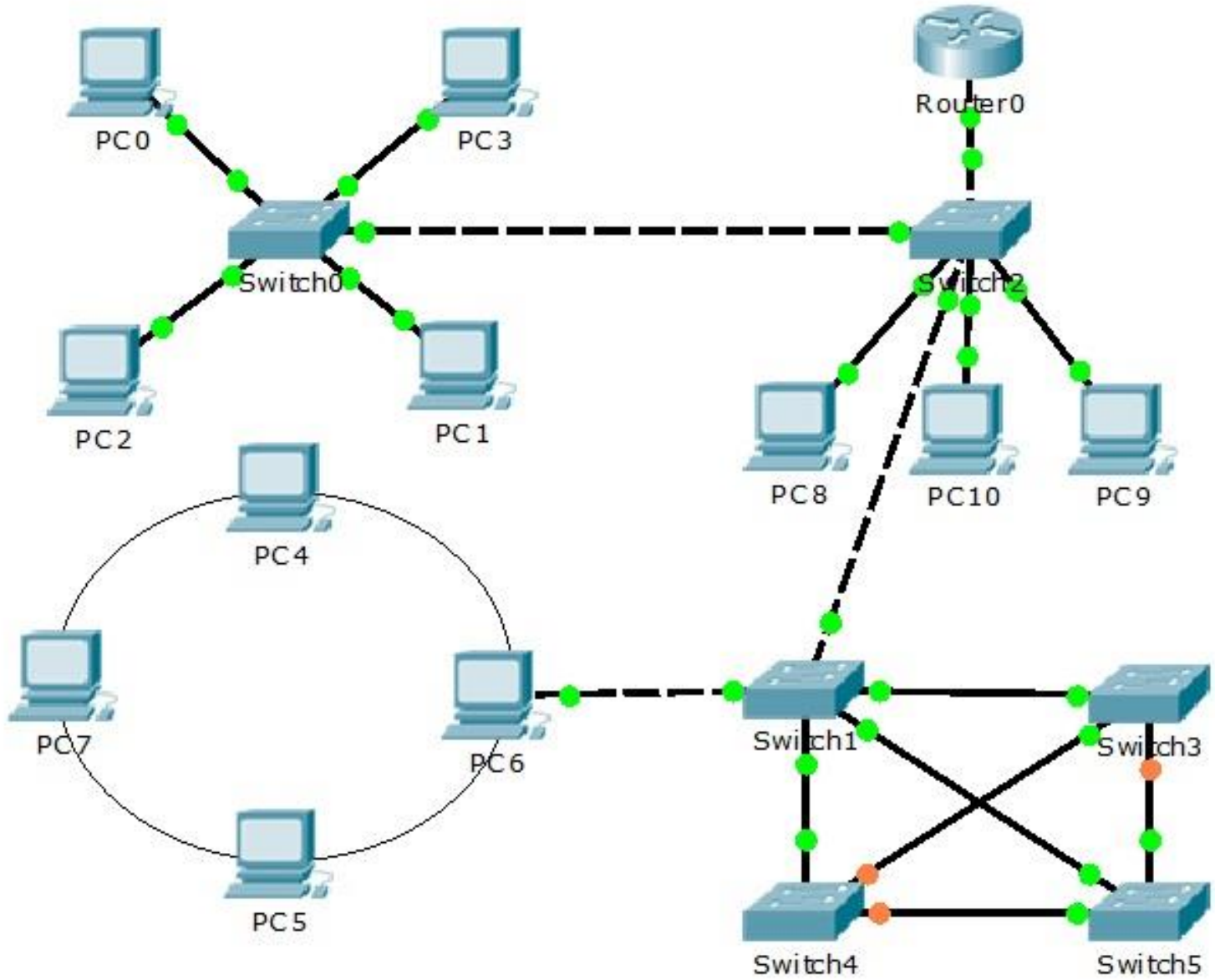
For example, a tree network (or star-bus network) is a hybrid topology in which star networks are interconnected via bus networks.

Internet is the best example of largest Hybrid topology.

HYBRID TOPOLOGY




Star
Star
Ring
Star


PC0
PC3
Router0
Switch0
Switch2
PC2
PC1
PC8
PC10
PC9
PC4
PC7
PC6
Switch1
Switch3
PC5
Switch4
Switch5

Advantages of hybrid topology

1. Reliable as Error detecting and troubleshooting is easy.
2. Effective.
3. Scalable as size can be increased easily.
4. Flexible.

Disadvantages of hybrid topology

1. Complex in design.
2. Costly.

Wide Area Network (WAN)

A wide area network (WAN) is a communications network that covers a wide geographic area, such as a country or the

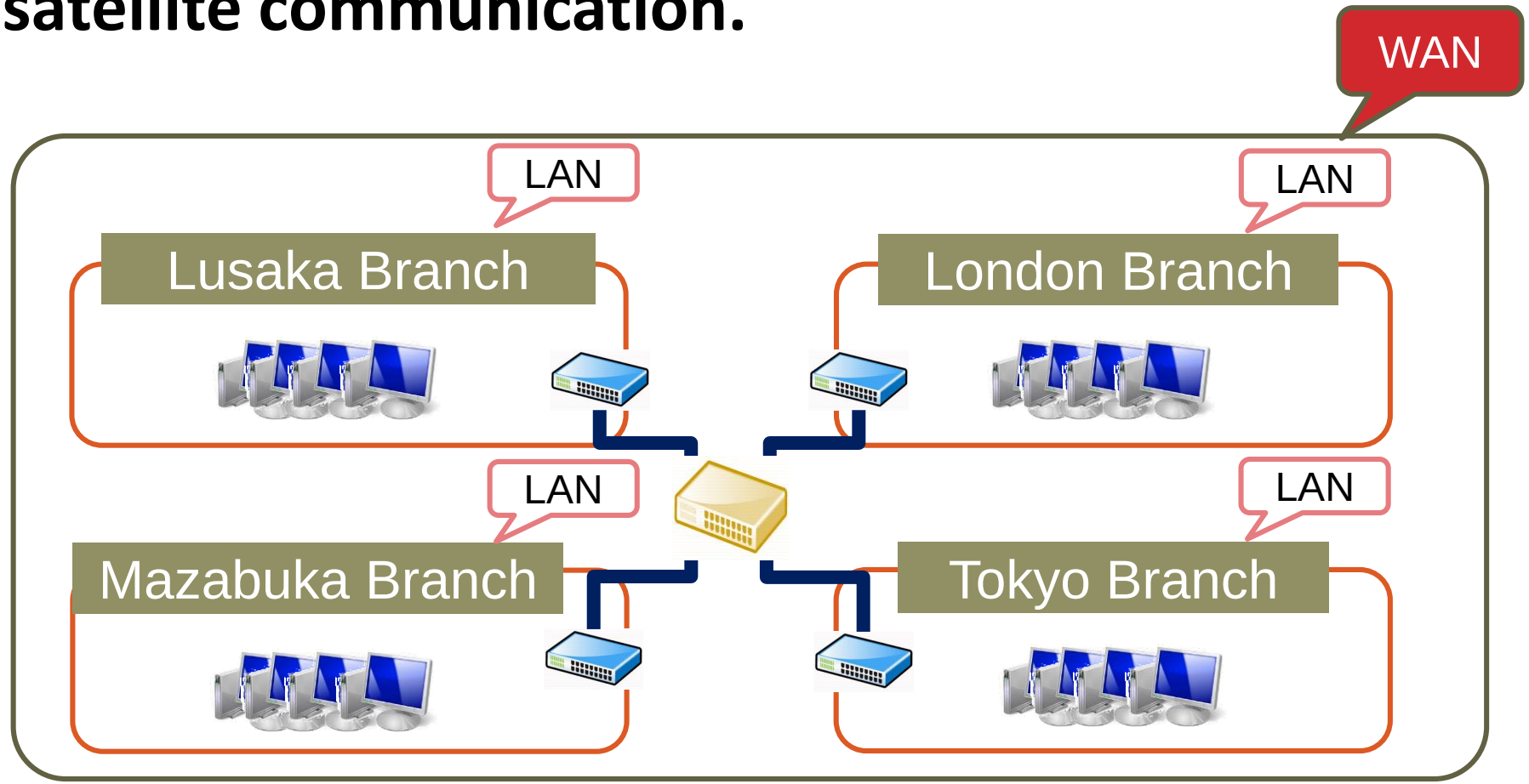
world. Most long-distance and regional telephone companies are WANs.

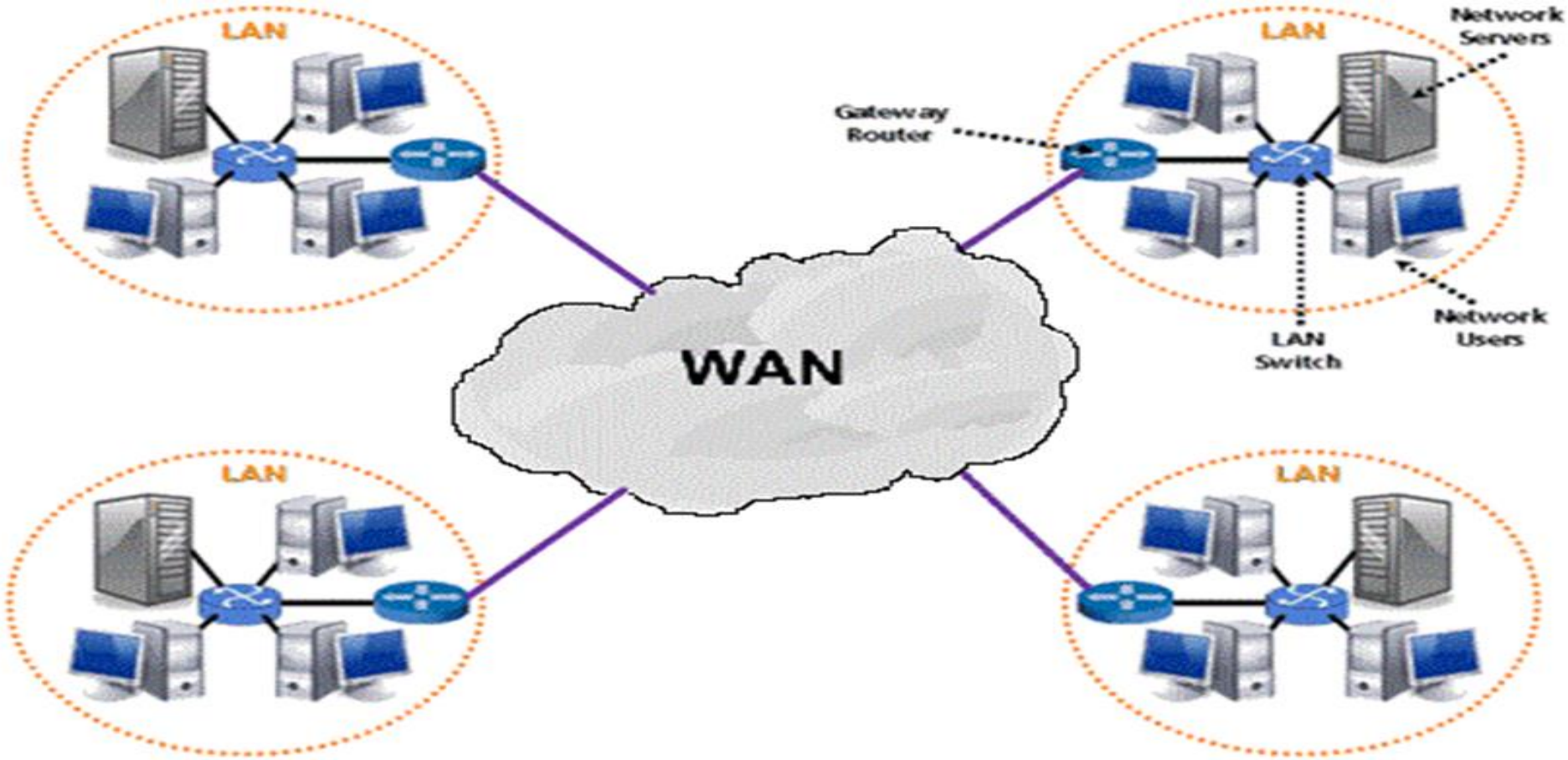
A WAN may use a combination of satellites, fiber-optic cable, microwave, and copper-wire connections and link a variety of computers, from mainframes to terminals.

WANs are used to connect local area networks together, so that users and computers in one location can communicate with users and computers in other locations.

The best example of a WAN is the internet.

A network spread over a wide area, possibly international, making use of, for example, permanent cable connections and satellite communication.





WAN - Wide Area Network

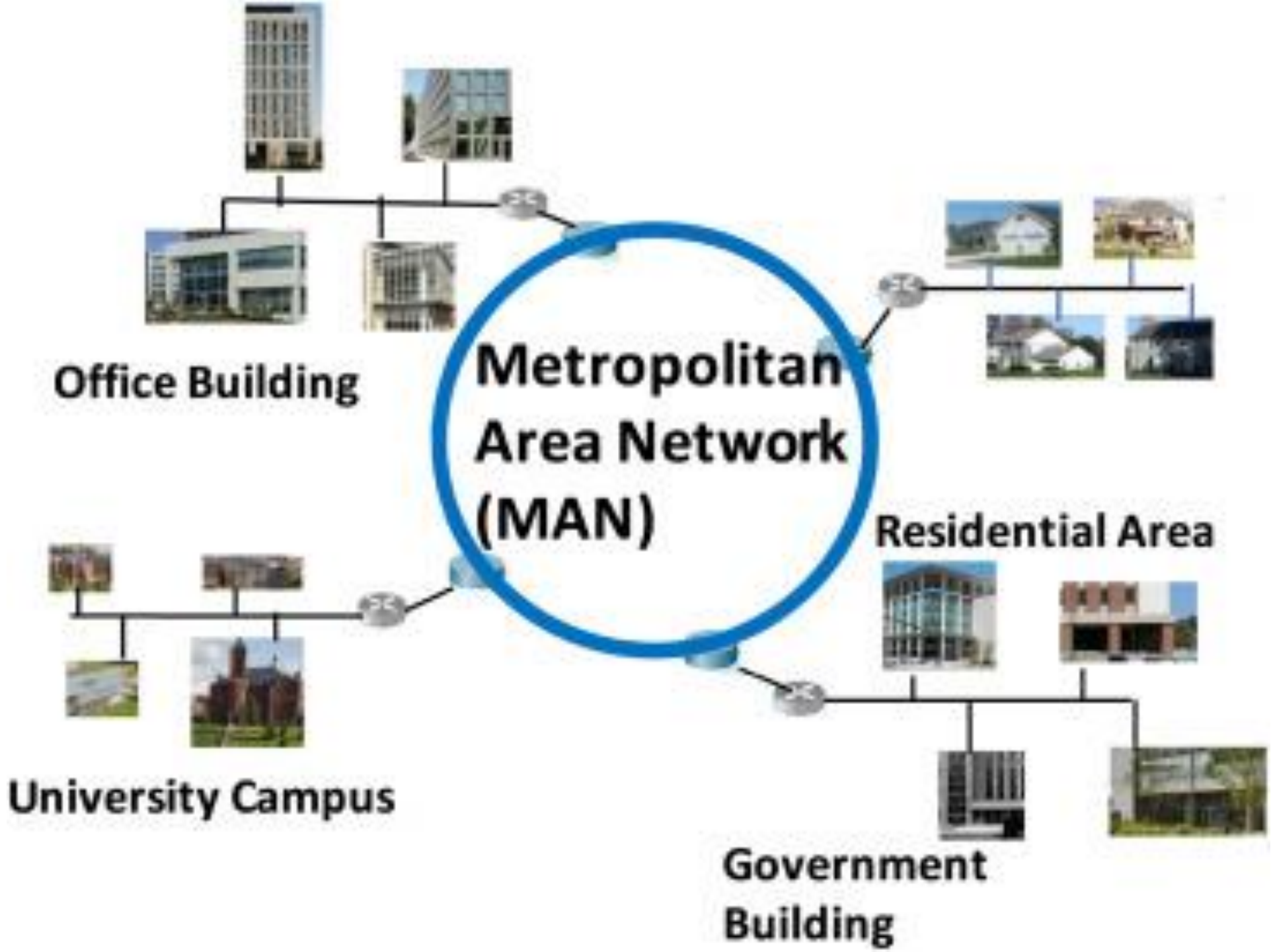
Metropolitan Area Network (MAN)

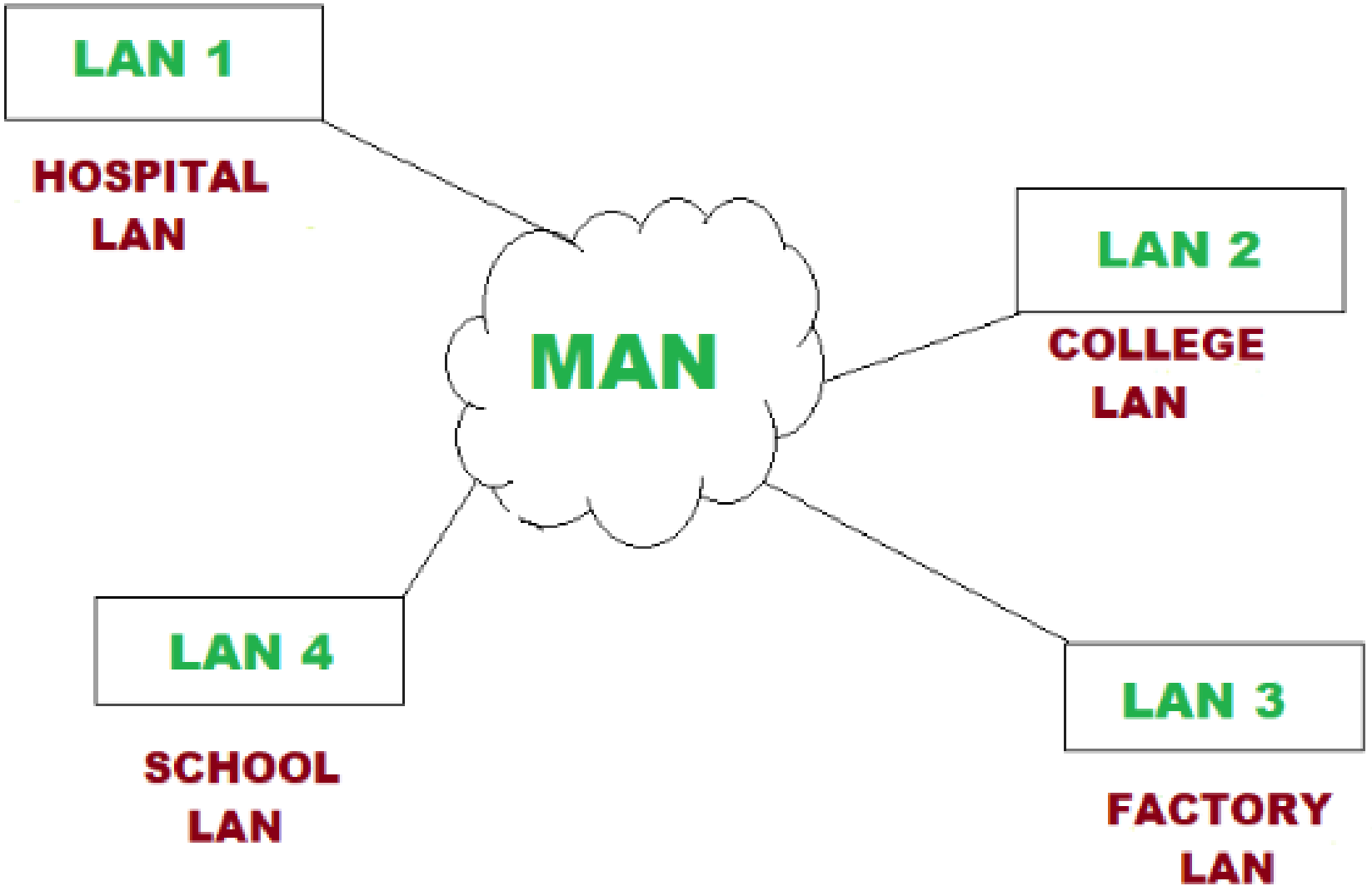
A metropolitan area network (MAN) is a communications network covering a city or a suburb. It is a computer network that connects computers within a metropolitan area, which could be a single large city, multiple cities and towns, or any given large area with multiple buildings.

The purpose of a MAN is often to bypass local telephone companies when accessing long distance services.

Many cellphone systems are MANs.

A MAN is larger than a local area network (LAN) but smaller than a wide area network (WAN).


Office Building
Metropolitan Area Network (MAN)
Residential Area
University Campus
Government Building


LAN 1
HOSPITAL LAN
MAN
LAN 2
COLLEGE LAN
LAN 4
SCHOOL LAN
LAN 3
FACTORY LAN

Global Area Network (GAN)

TO BE CONTINUED…