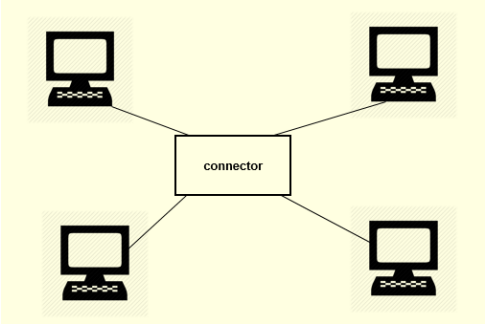
**Title:** In a computer lab all computers are connected to a central computer by twisted pair cables, resulting in lower transfer speeds. Analyze the type, medium and topology of the network used here.

**Computer network**

Two or more Computers/devices connected together called Computer Network. In a network the computer communicate each other by exchanging information and share resources.




Types of network can be defined based on:

**A) Geographical distance**

PAN, LAN, CAN, MAN, WAN

**B) Service providing and control structure**

Peer to Peer, Client Server, Hybrid

**C) Ownership of network**

Public network, Private network

The network mentioned in the assignment is a LAN (Local Area Network) in terms of geographical distance and a centralized network under Client Server network according to the service delivery and control structure.

**LAN (Local Area Network)**

All computers are located in same area

Highest network coverage 1 KM

All computers are in a same building or within few building in same area

**Advantage of LAN**

Resource sharing

Internal communication

Less expensive hardware

Any cable can be used

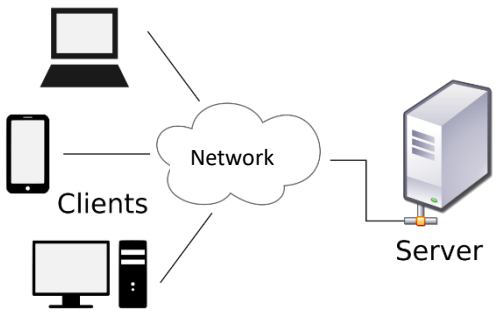
Available software

High speed communication

**Centralized network**

Only one server/host/main computer

Others are terminal/clients/workstations



**Transmission medium**

Transmission medium can be defined as a pathway that can transmit information from a sender to a receiver.

a) Wire or cable medium

Twisted pair, coaxial cable, optical fiber twisted pair

b) Wireless medium (Radio Wave, Microwave (Bluetooth, Wi-fi, Wi-max)

**Wireless communication system:**

Wireless technology currently in use:

Important state work

In government work

In law enforcement agencies

Educational Institutions,

Mills and industries

Office,

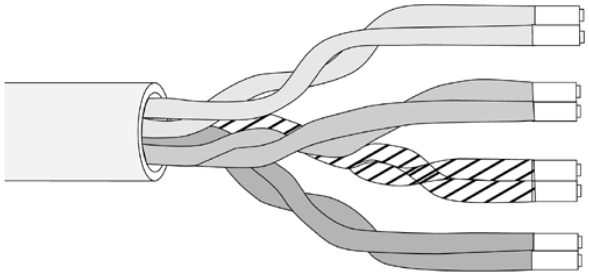
The court

Business organization

Treatment center

a) **Wire or cable medium:**

2 Copper wire arrange in regular spiral pattern. Insulator used for separating coppers wires from each other.



**Advantage of Twisted pair:**

Cheap

Suitable for short distance

Available at everywhere

**Disadvantage of Twisted pair**

Can’t carry signal to long distance(100 Meter)

Higher transmission loss

Low speed (10 Mbps to 1 Gbps)

EMI (Electro Magnetic Interference) problem

**Coaxial cable:**

It has a copper core (conductor) inside the cable

Copper core is surrounded by plastic insulator

Another outside conductor is present outside insulator (braided shield)

**Advantage/Characteristic of coaxial cable**

Can transmit both analog and digital signal

Faster data transmission(better then twisted pair)

Low transmission lose/attenuation

Easy to install

Moderate level of  EMI (electromagnetic interference)

Secured medium

Expandable to large

Suitable for long distance transmission

**Optical Fiber/Fiber Optics**

It is a transparent wire (cable) made of glass that can transmit light rays

**Advantages/characteristics of Optical fiber**

1) Can transmit data in the speed of light

2) high volume of data can be transmitted simulteninously

3) small in size

4) light weight

5) easy to carry

6) easy to process

7) not influenced by temperature of environment

8) no reaction with chemical

9) low tranmission loss

10) Repeaters are placed in long distance

11) safe and secret transmission

12) error free transmission

13) No EMI problem

**Disadvantage**

1) Can’t be bent like ‘U’

2) Costly

3) High Installation cost

4) Complex to maintenance

5) Not available in everywhere

**Network Topology**

*Network topology* means the design that shows how computer (electronic devices) connect each other and exchange data among those.

**Network Topology consists of:**

Physical connection of a LAN

Logical controlled path for data transmission

**Examples of Topology:**

Bus topology

Ring topology

Star topology

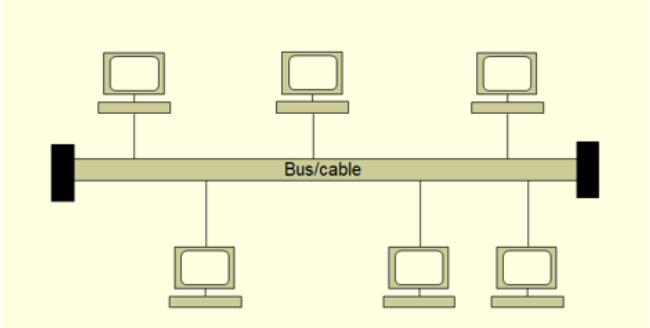
Tree topology

Mesh topology

Hybrid Topology

**Bus topology**

All computers are connected to the main backbone cable (example: optical fiber)



A data from the source travels in both directions to all machines until it finds the proper destination.

**Advantage of Bus topology**

Cheap and simple structure

Less cable needed

Cable can be extended so the network is also expanded

Connector or repeater can be needed

Easy to connect any new computer or device

Nothing will happen to entire network if a single computer is disconnected

No central device or server needed

**Disadvantage of Bus topology**

Slow data transmission

Entire network will fail if bus is damaged

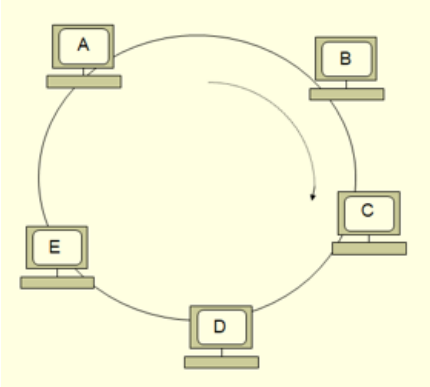
Network become more slower if number of device is increased

Heavy traffic created if number of device is increased

High chance of data collision

**Ring topology**

A circular path used to connect in which data travels around the ring.



**Advantage of ring topology**

No server needed

Cheap

All computers have equal importance

No collision

because of one way communication

Less cable needed

Save cost

**Disadvantages of ring topology**

Slow transmission

Not possible to send data directly to proper destination

If only node is disconnected/damaged than entire network will fail

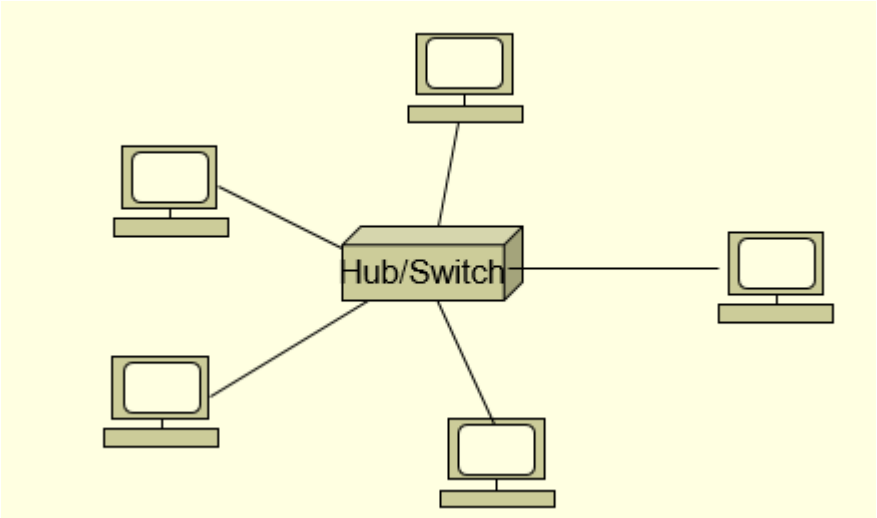
Damaging cable in anywhere leads to failure of entire network

Adding new computer is difficult and may leads to fail of entire network

Decrease speed if number of computers is increased.

Need complex software to control network

Star topology: All nodes in star topology are connected by a central device (Hub or Switch). It is controlled by central device (hub/switch) or server



**Advantages of star topology:**

It’s a faster communication technique

Less chance of collision

Easy to find a problem if needed

Easy to connect a new node even if network is running

Network will continue to run even after failure of a node

Use of switch increase security of data

Increasing number of nodes does no leads to slow transmission

**Disadvantage of star topology**

If the central device (hub/switch) is damaged the entire network will fail

Extra cost of central device (hub/switch)

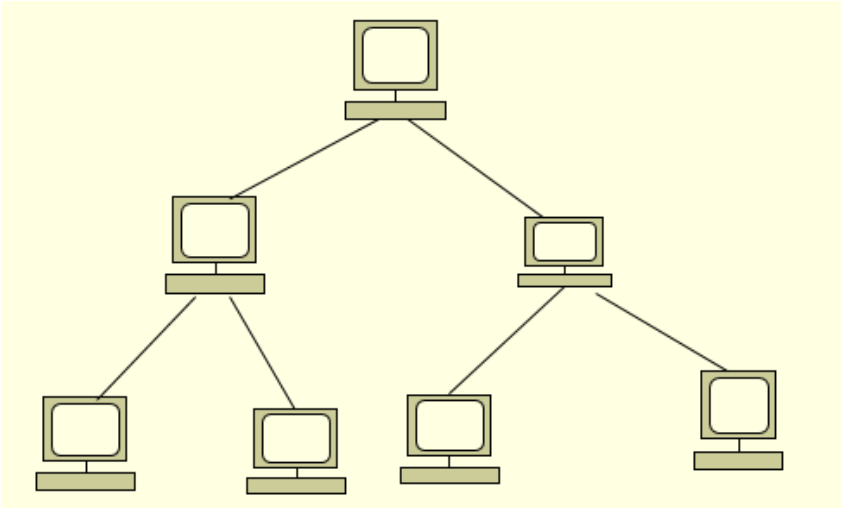
Extra cost for cable

Each node need separate cable for connecting central devices

Nodes cannot communicate each other directly

**Tree topology**

In tree topology all nodes are arranged in a tree like structure.



**Advantages of Tree topology**

New branch is easy to create and expand the network

Easy add a new node

If a branch node is disconnected entire network will not fail

**Disadvantages of tree topology**

if the main computer is damaged than full network will fail

Complex structure

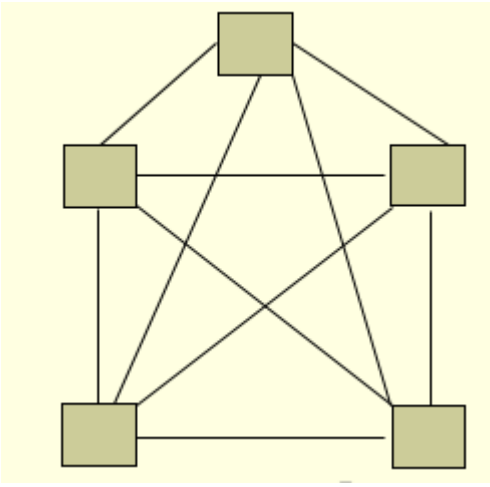
Costly implementation

Server, Hub, cable

If any node is disconnected then subordinate nodes are disconnected

**Mesh topology**

Each node is connected every other nodes of the network



**Advantages of mesh topology**

Because of direct connation data transmission rate is fast.

Increasing number of nodes does not leads to slow transmission

If one computer (or cable) is disconnected or damaged no hamper occurs to network

Reliability is high because of many alternate paths

Because reliability its popular in defense and banking sector

No server is needed. So all nodes have equal importance.

**Disadvantages of Mesh topology**

Huge cable leads to complexity

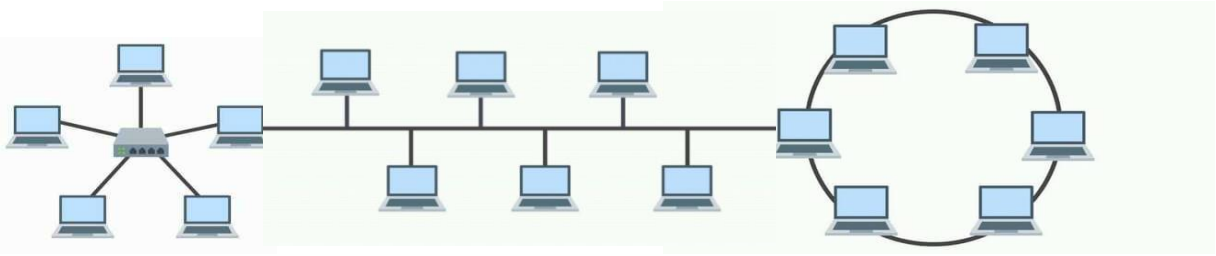
Huge cable leads to high cost

Hard to add new computer in network

Increasing number of devices leads to more complexity

**Hybrid topology**

Combination of two or more topologies is called Hybrid topology



**Advantages of Hybrid topology**

Necessary expansion is possible by adding hub/switch

Easy trouble shooting(solving problem)

If a single topology is damaged other do work as usual

Since it is created by various topology, different types of advantages are existed in hybrid topology

**Disadvantages of Hybrid topology**

Because many numbers of topologies maintenance become come complex

Because many numbers of topologies maintenance become come costly

Installation and configuration is complex

Since it is created by various topology, different types of disadvantages are existed in hybrid topology