

Computer Science & Engineering

Data Communication and Computer
Networks

(MTCSE-101-A)

Computer Network

Books

- **Data Communication & Networking, Behrouz A Forouzan**
- **Computer Networks, Tanenbaum Andrew S.**

Computer Network

A BRIEF HISTORY OF COMPUTER NETWORK

1960s (ARPANET)

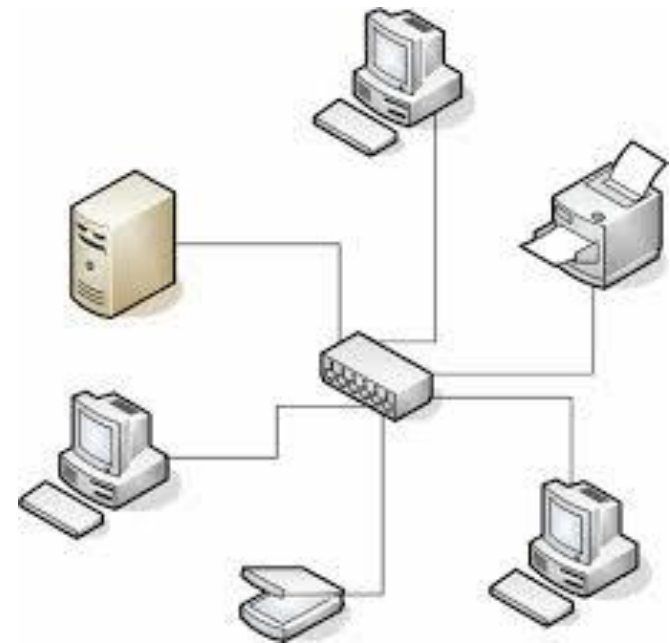
In the **1960s**, the **Advanced Research Projects Agency (ARPA)** started funding the design of the **Advanced Research Projects Agency Network (ARPANET)** for the **United States Department of Defense**

1969s

The **Advanced Research Projects Agency Network (ARPANET)**, was the world's first operational packet switching network and the core network of a set that came to compose the global Internet. The network was funded by the **Defense Advanced Research Projects Agency (DARPA)** of the **United States Department of Defense** for use by its projects at universities and research laboratories in the **US**

What is Computer Network

A **computer network** is a collection of hardware components and computers interconnected by communication channels that allow sharing of resources and information



Data Communication System Components

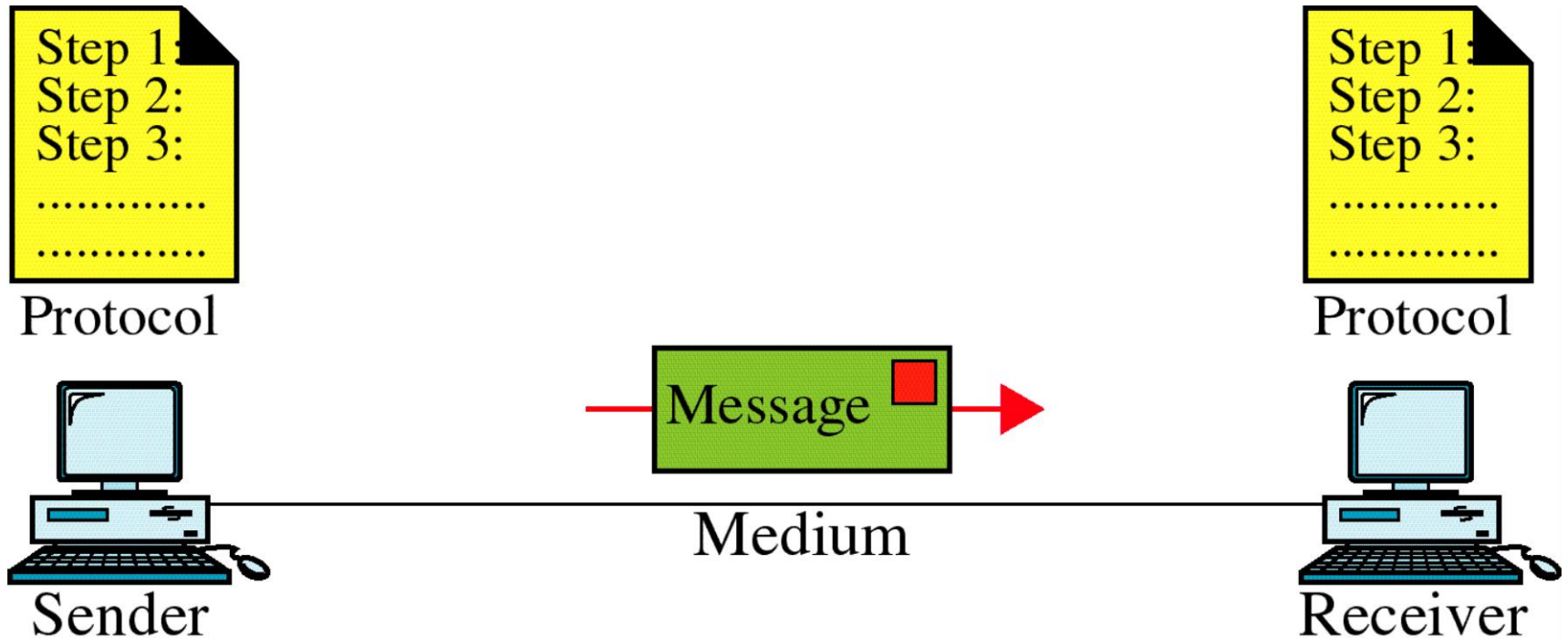
Data communication system depend on four fundamental characteristics

1. Delivery
2. Accuracy
3. Timeliness
4. Jitter

Data communication system has five component

1. Message
2. Sender
3. Receiver
4. Transmission Medium
5. Protocol

Data Communication System Components



Basic Concepts

- **Type of Connection**
- **Topology**
- **Transmission Mode**
- **Categories of Networks**
- **Internetworks**

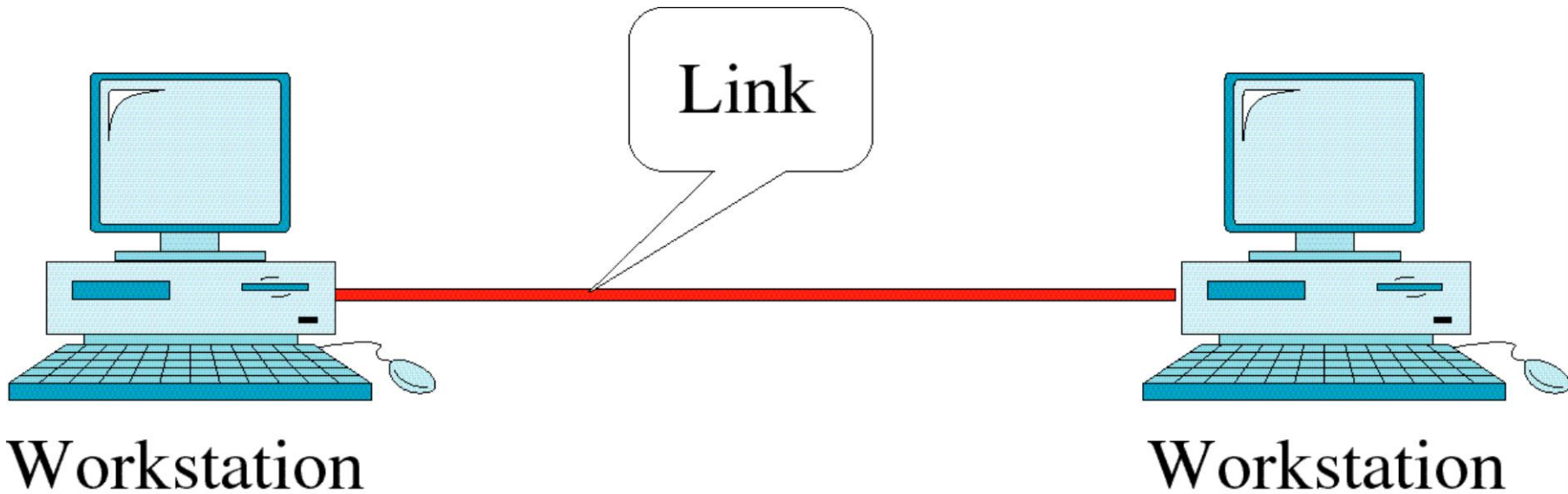
Type of Connection

```
graph TD; A[Type of Connection] --> B[Point-to-point]; A --> C[Multipoint];
```

Point-to-point

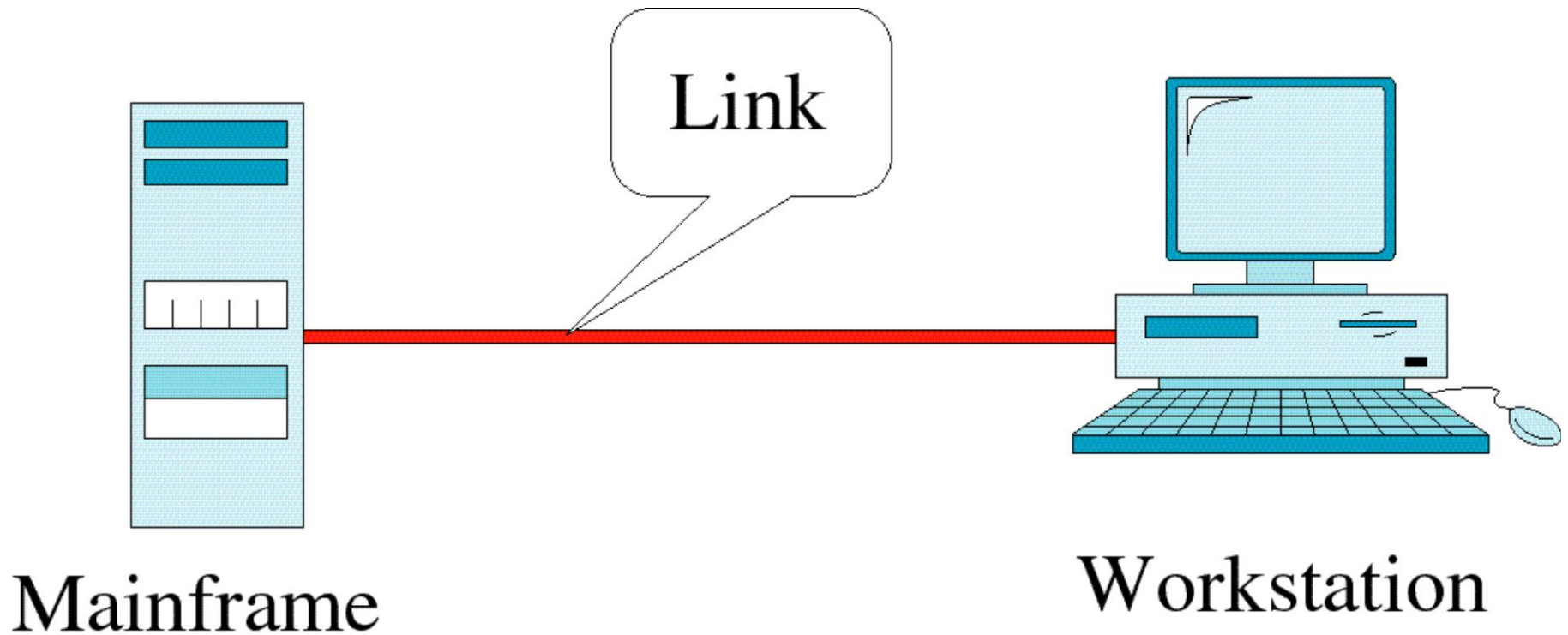
Multipoint

Point-to-Point Line Configuration



P2P provide a dedicated link
b/w two device

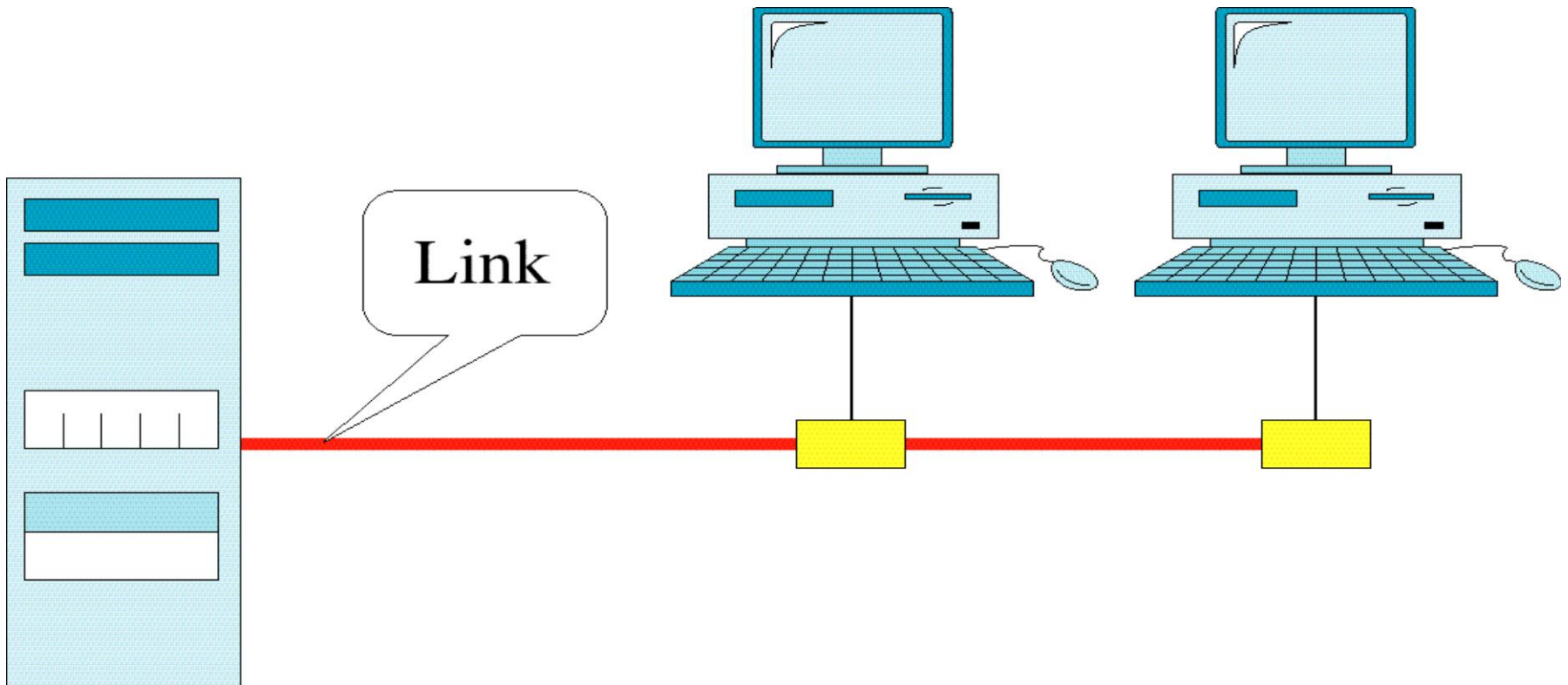
Point-to-Point Line Configuration



Point-to-Point Line Configuration



Multipoint Line Configuration



A **multipoint** (also called **Multidrop**) connection is one in which more than two specific devices share a single link.

Topology

- The term topology refers to the way in which a n/w is laid out physically.
- Two or more devices connect to a link.
- The topology of a n/w is the geometric representation of the relationship of all the link.

There are following basic topologies possible:

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

Topology

```
graph TD; Topology[Topology] --- HorizontalLine[ ]; HorizontalLine --- Mesh[Mesh]; HorizontalLine --- Star[Star]; HorizontalLine --- Tree[Tree]; HorizontalLine --- Bus[Bus]; HorizontalLine --- Ring[Ring];
```

Mesh

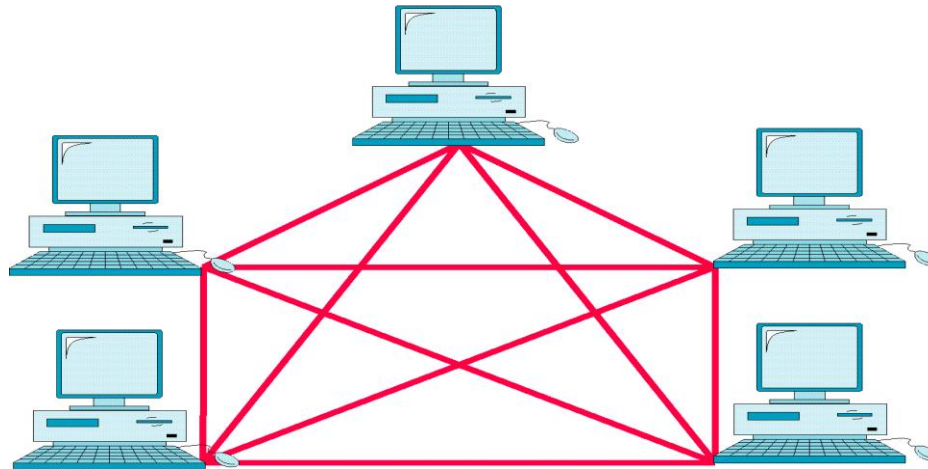
Star

Tree

Bus

Ring

Mesh Topology



In a mesh topology, every device has a dedicated point-to-point link to every other device.

Find the number of physical link in a fully connected mesh n/w with n nodes.

We first consider that each node must be connected to every other nodes.

Then node **1** must be connected with **n-1** nodes

node **2** must be connected with **n-1** nodes

node **n** must be connected with **n-1** nodes so we need $n(n-1)$ physical link.

Now we can say that in mesh topology, we need $\mathbf{n(n-1)/2}$ duplex-mode links.

Mesh Topology

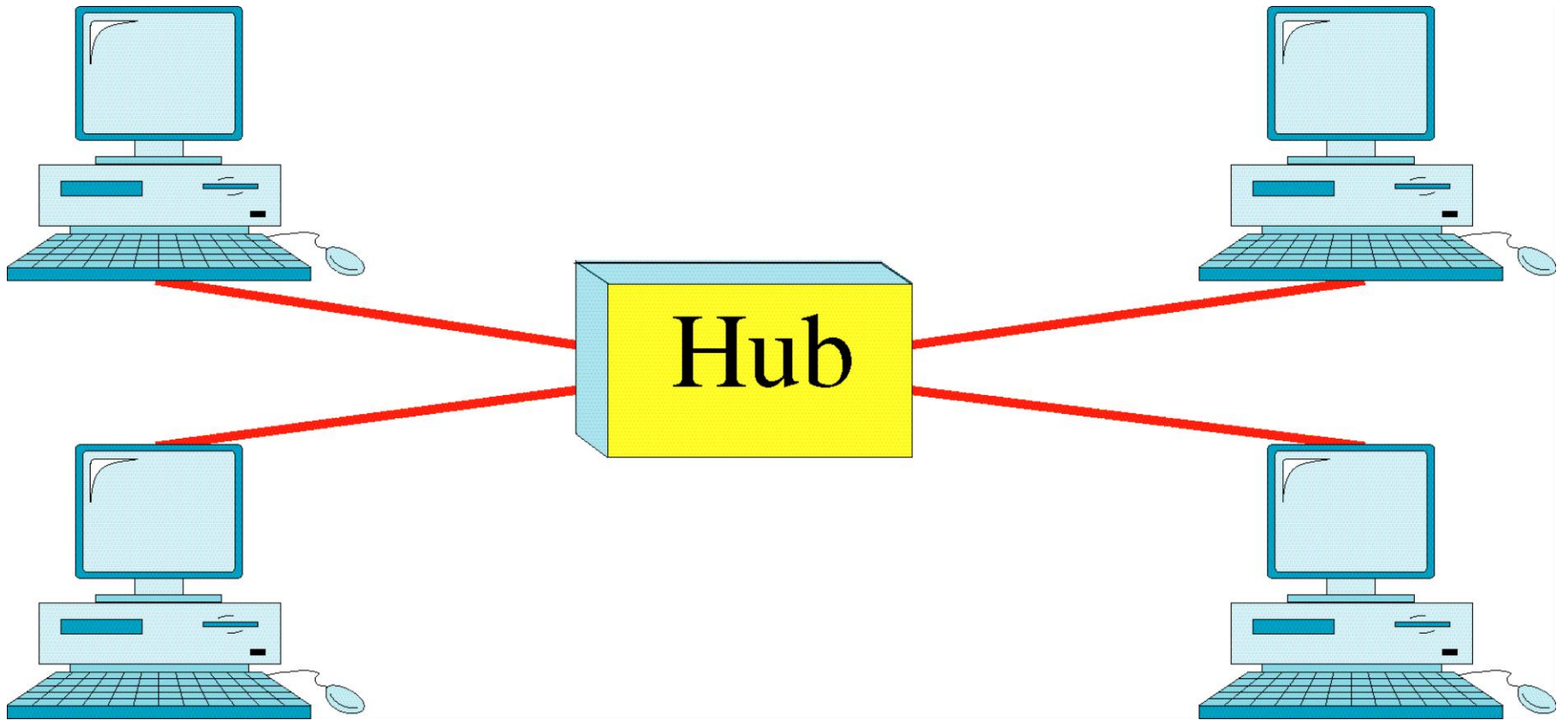
Advantages of Mesh Topology

1. Eliminating the traffic problem.
2. A Mesh topology is strong(robust).
3. There is the advantage of privacy and security.
4. P2P links make fault identification and fault isolation easy

Disadvantages of Mesh Topology

1. Amount of cabling and no. of I/O port required.
2. Installation and reconnection are difficult .

Star Topology



Star Topology

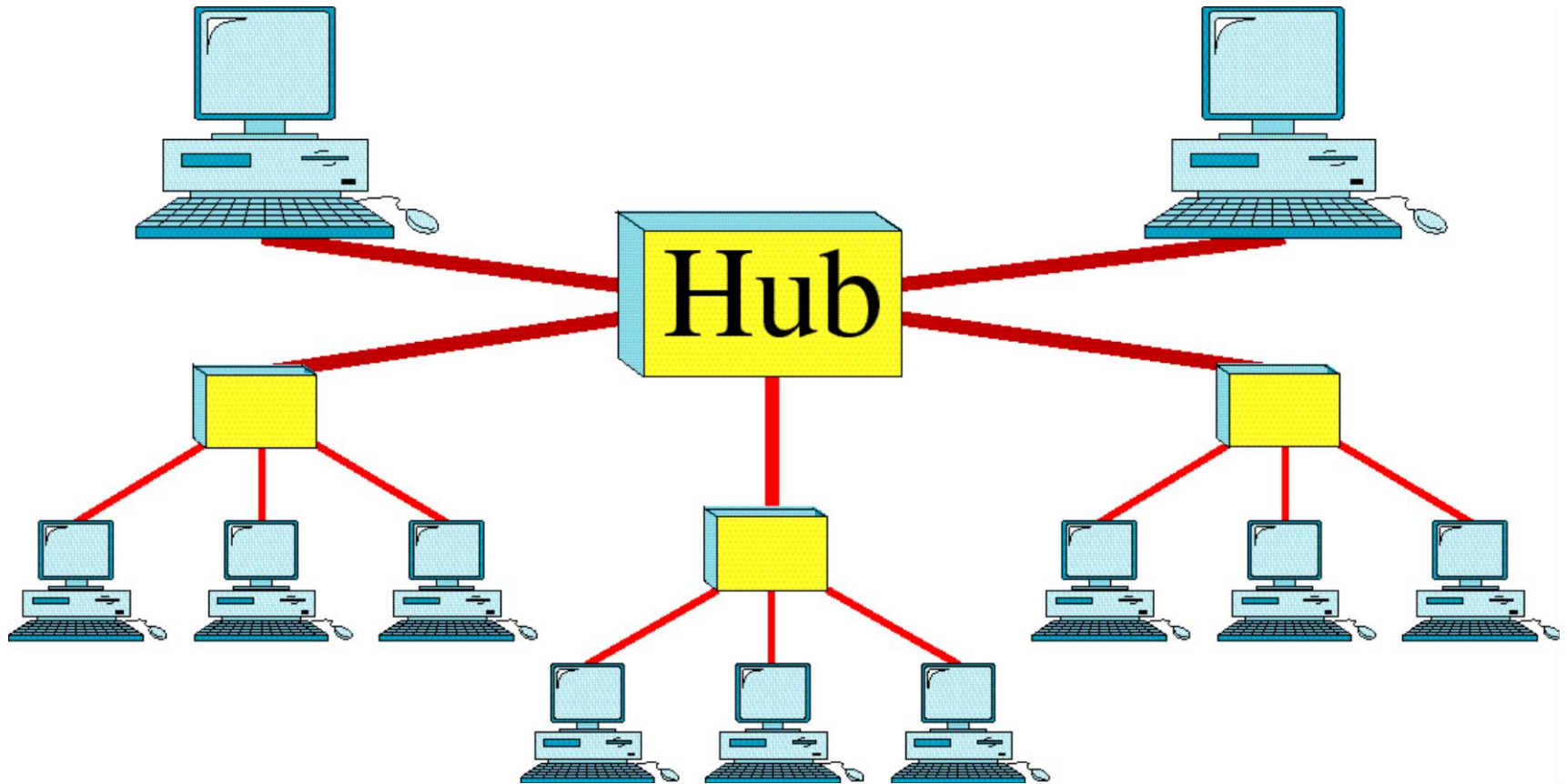
Advantages of Star Topology

1. A **Star** topology less expensive than a **Mesh** topology.
2. Robustness.
(If one link fail, only that link affected. All other link remain active)
3. P2P links make fault identification and fault isolation easy.

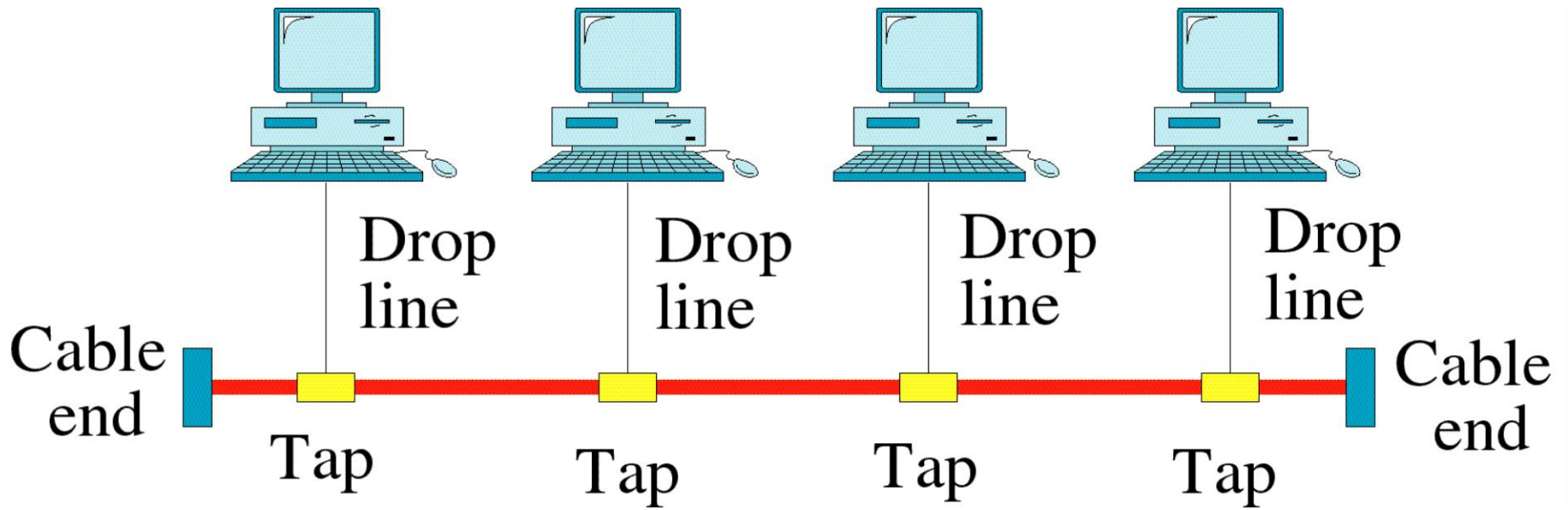
Disadvantages of Star Topology

1. If the HUB goes down , the whole system is down.

Tree Topology



Bus Topology



Bus Topology

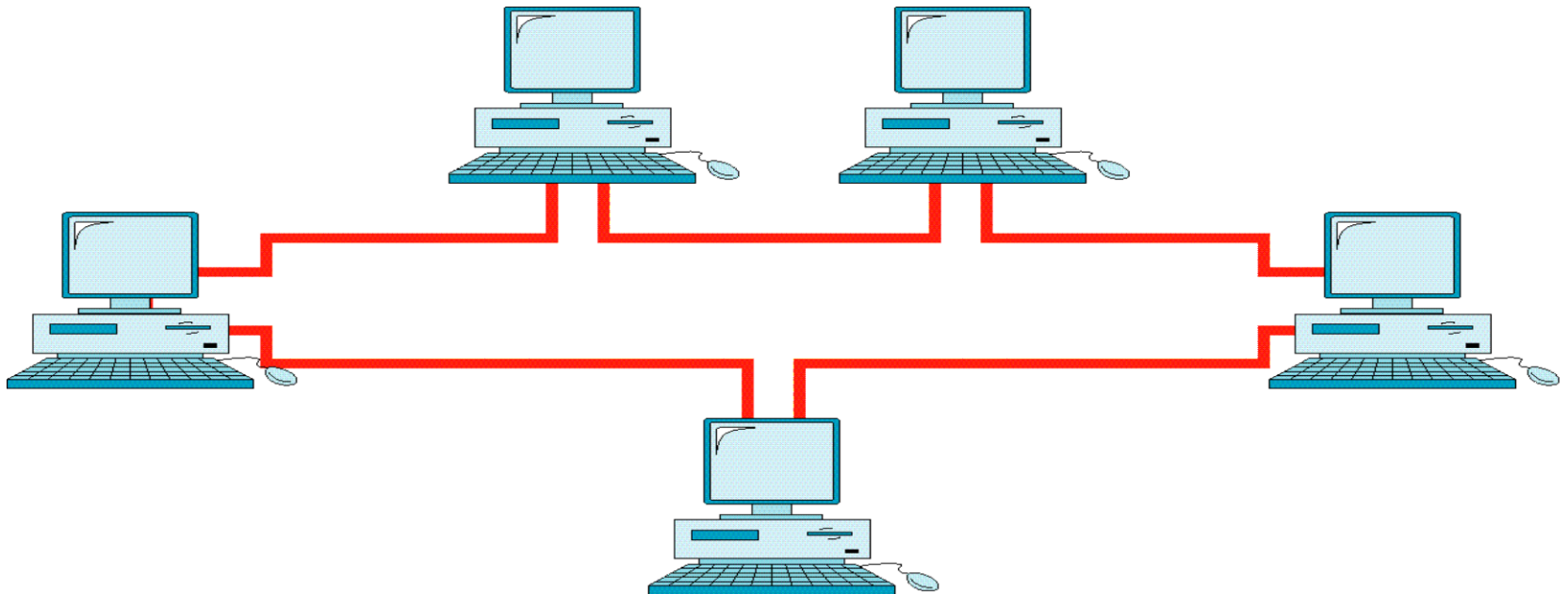
Advantages of Bus Topology

1. Easy installation.
2. A bus topology use less cabling than mesh and star topology.

Disadvantages of Bus Topology

1. Difficult reconnection and fault isolation.
2. A fault or break in the bus cable than stop all transmission.

Ring Topology



In a ring topology each device has a dedicated P2P connection with only the two devices on either side of it.

Ring Topology

Advantages of Ring Topology

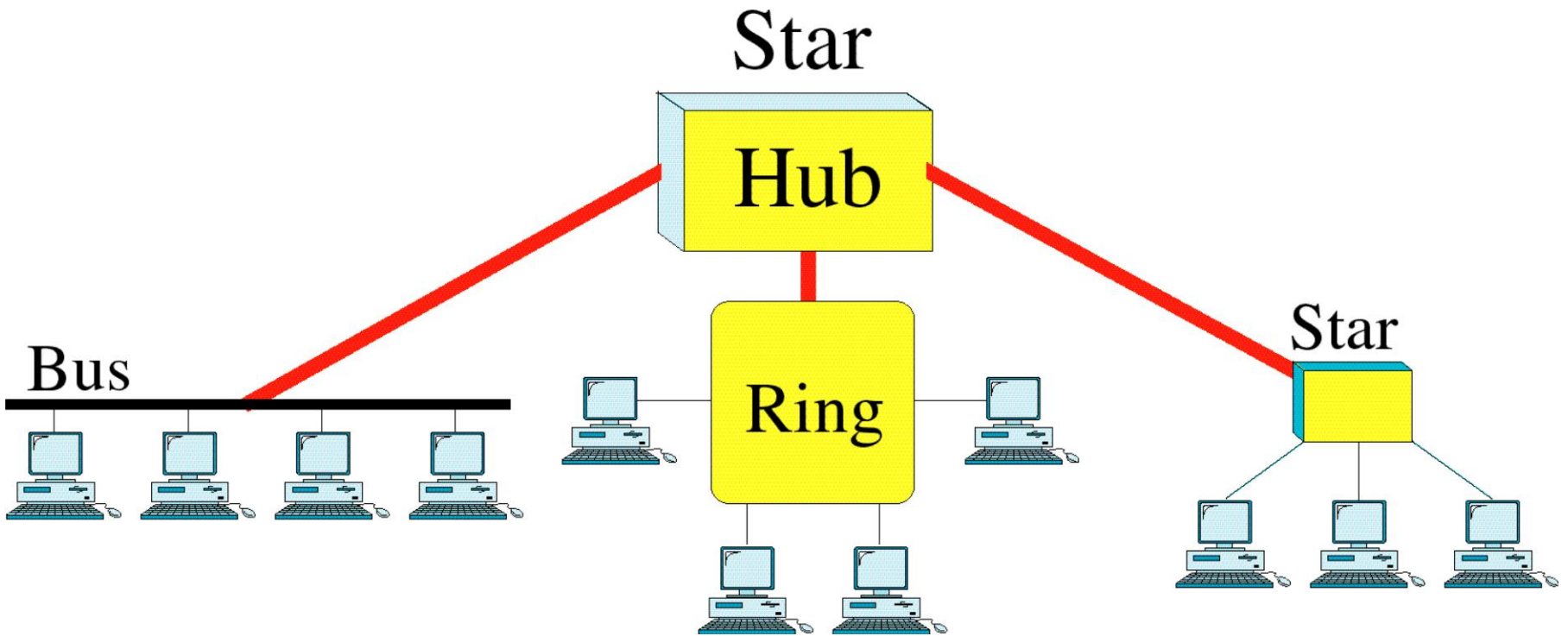
1. Easy to install and reconfigure.
2. Fault isolation is simplified.

(A signal is circulating at all time if one device does not receive a signal than alarm alert the n/w operator)

Disadvantages of Ring Topology

1. Unidirectional traffic.

Hybrid Topology



Transmission mode

```
graph TD; A[Transmission mode] --> B[Simplex]; A --> C[Half-duplex]; A --> D[Full-duplex];
```

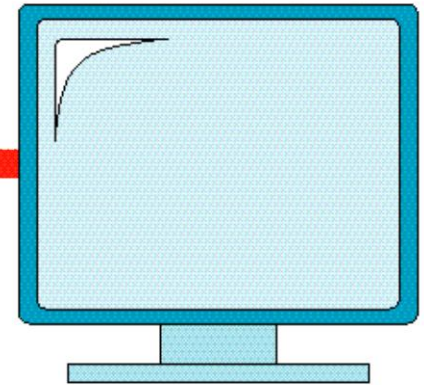
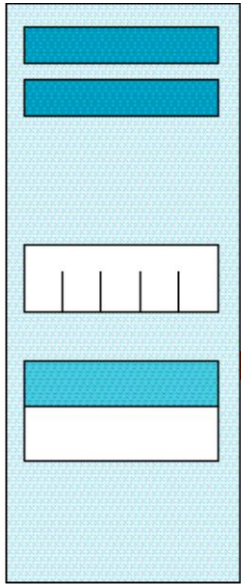
Simplex

Half-duplex

Full-duplex

Simplex

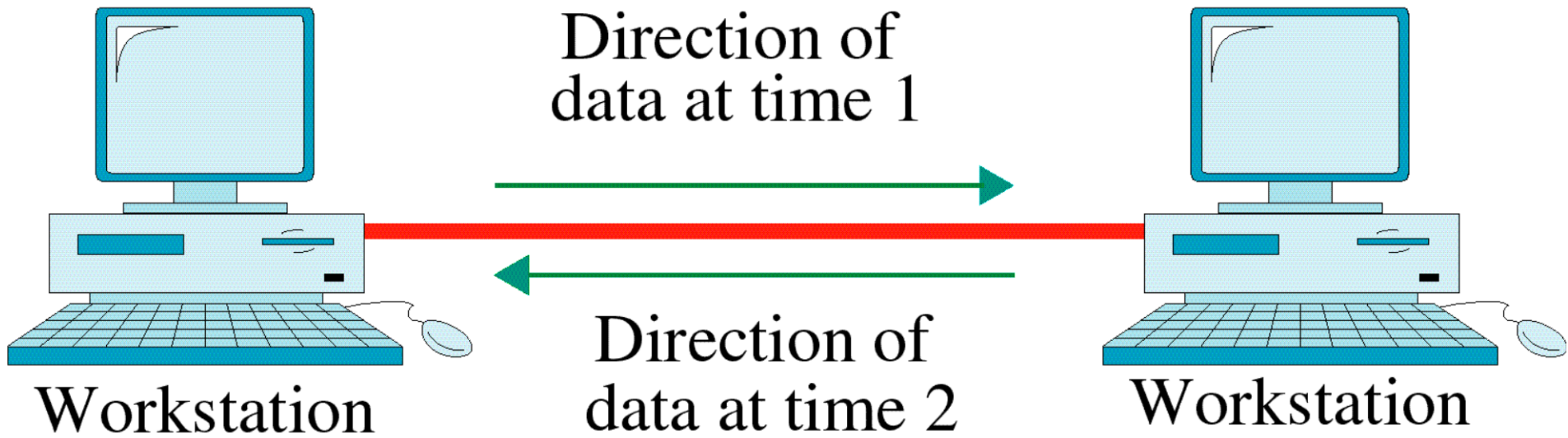
Direction
of data



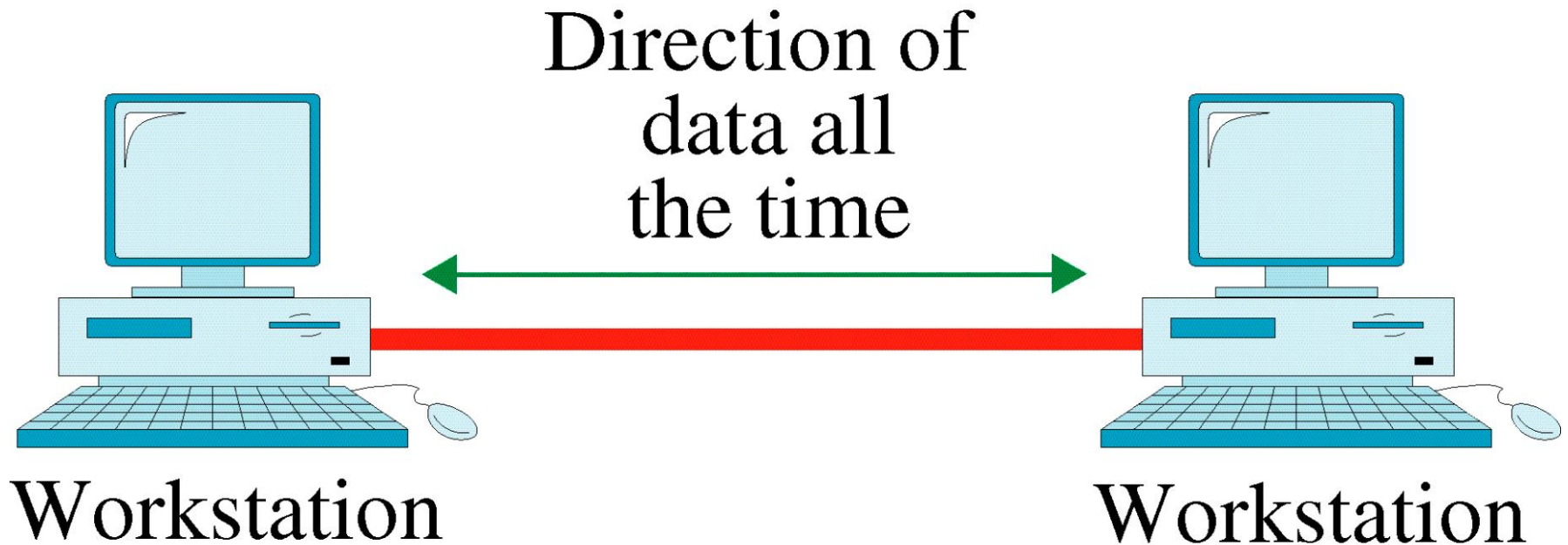
Mainframe

Monitor

Half-Duplex



Full-Duplex



```
graph TD; Network[Network] --- LAN[Local area network (LAN)]; Network --- MAN[Metropolitan area network (MAN)]; Network --- WAN[Wide area network (WAN)];
```

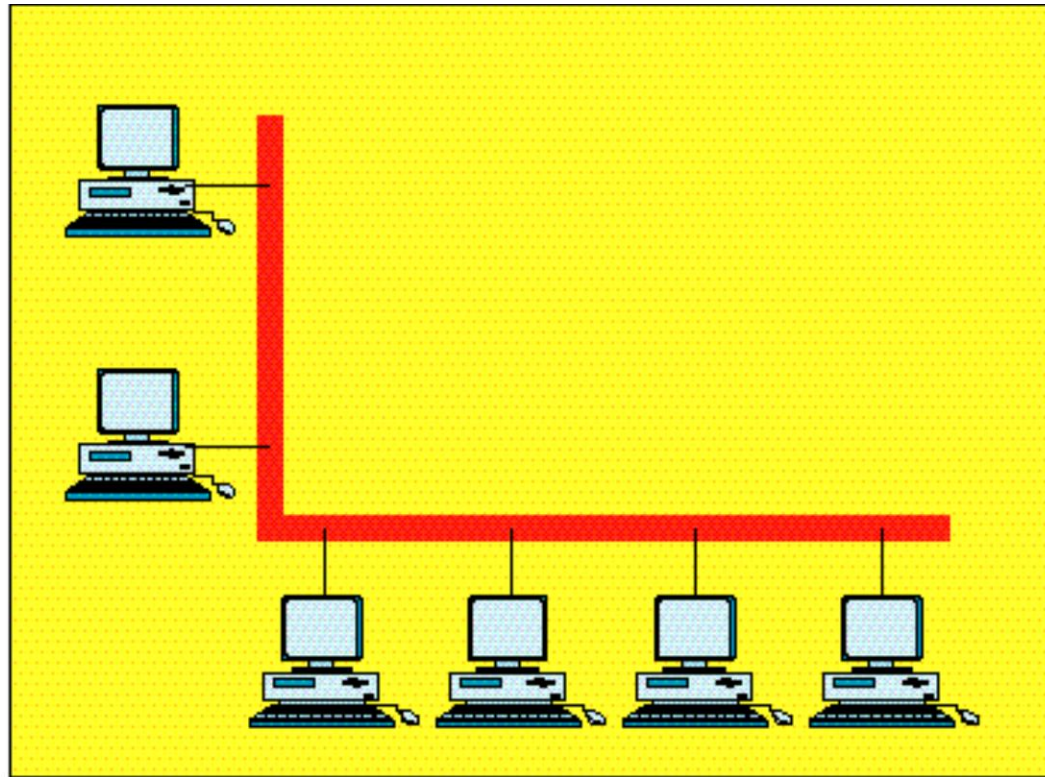
Network

Local area
network
(LAN)

Metropolitan area
network
(MAN)

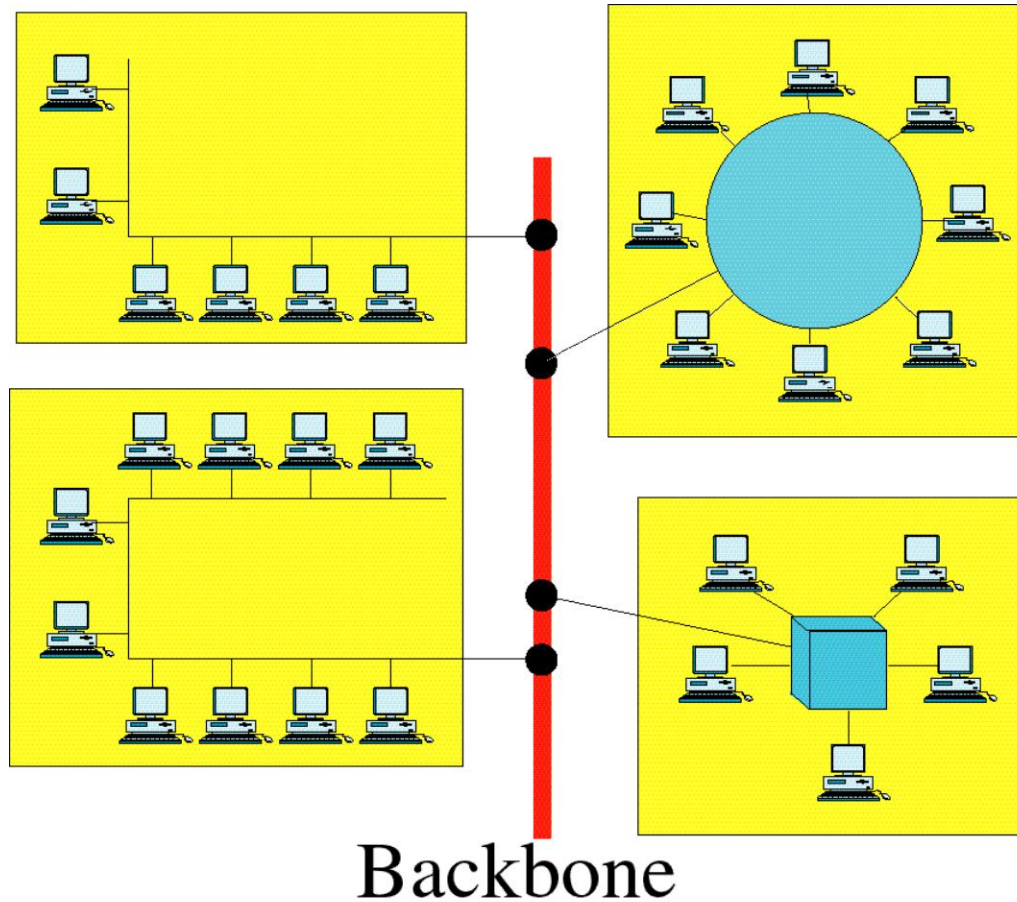
Wide area
network
(WAN)

Local Area Network



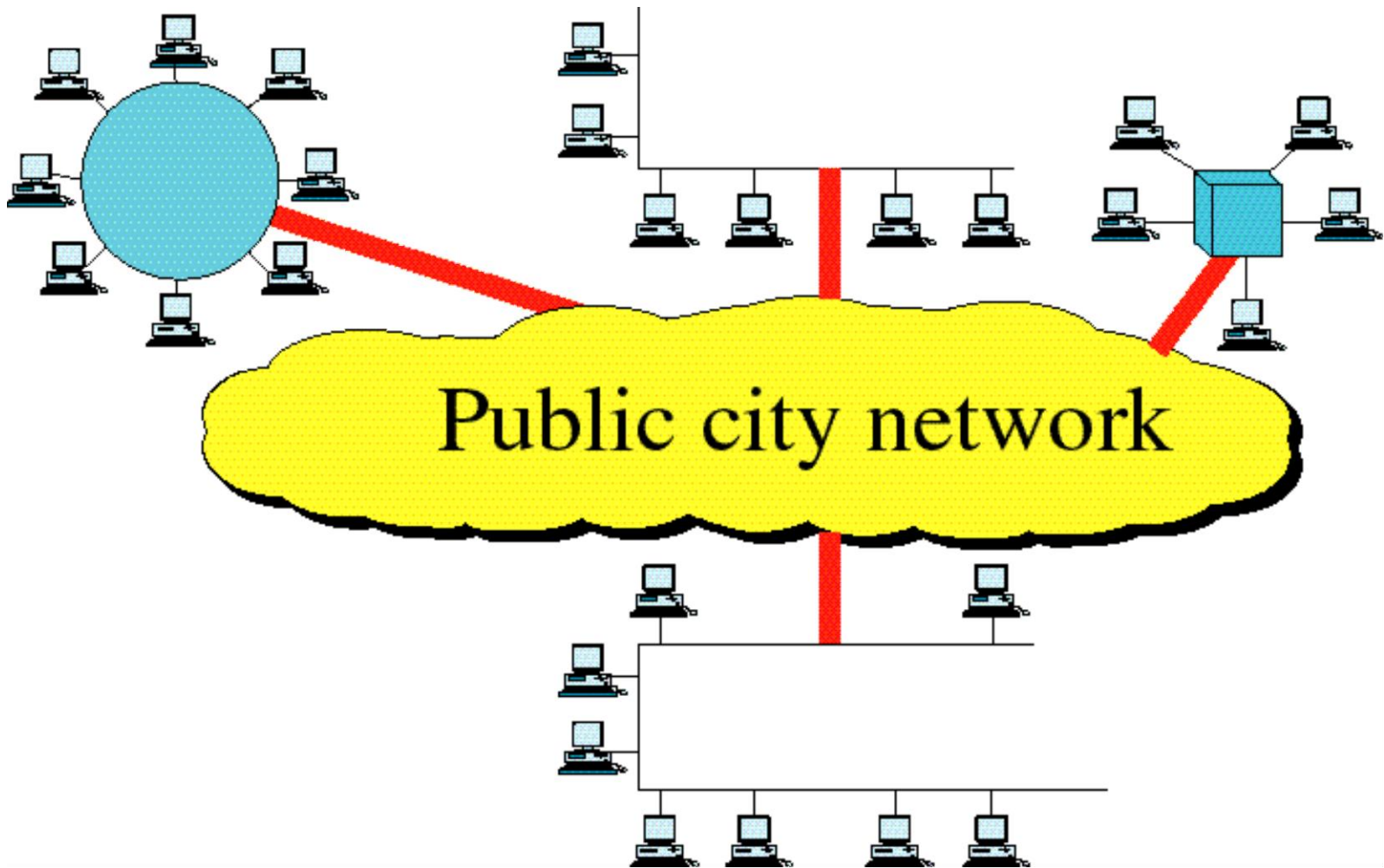
Single building LAN

Local Area Network



Multiple building LAN

Metropolitan Area Network



Wide Area Network

