

Computer Networks

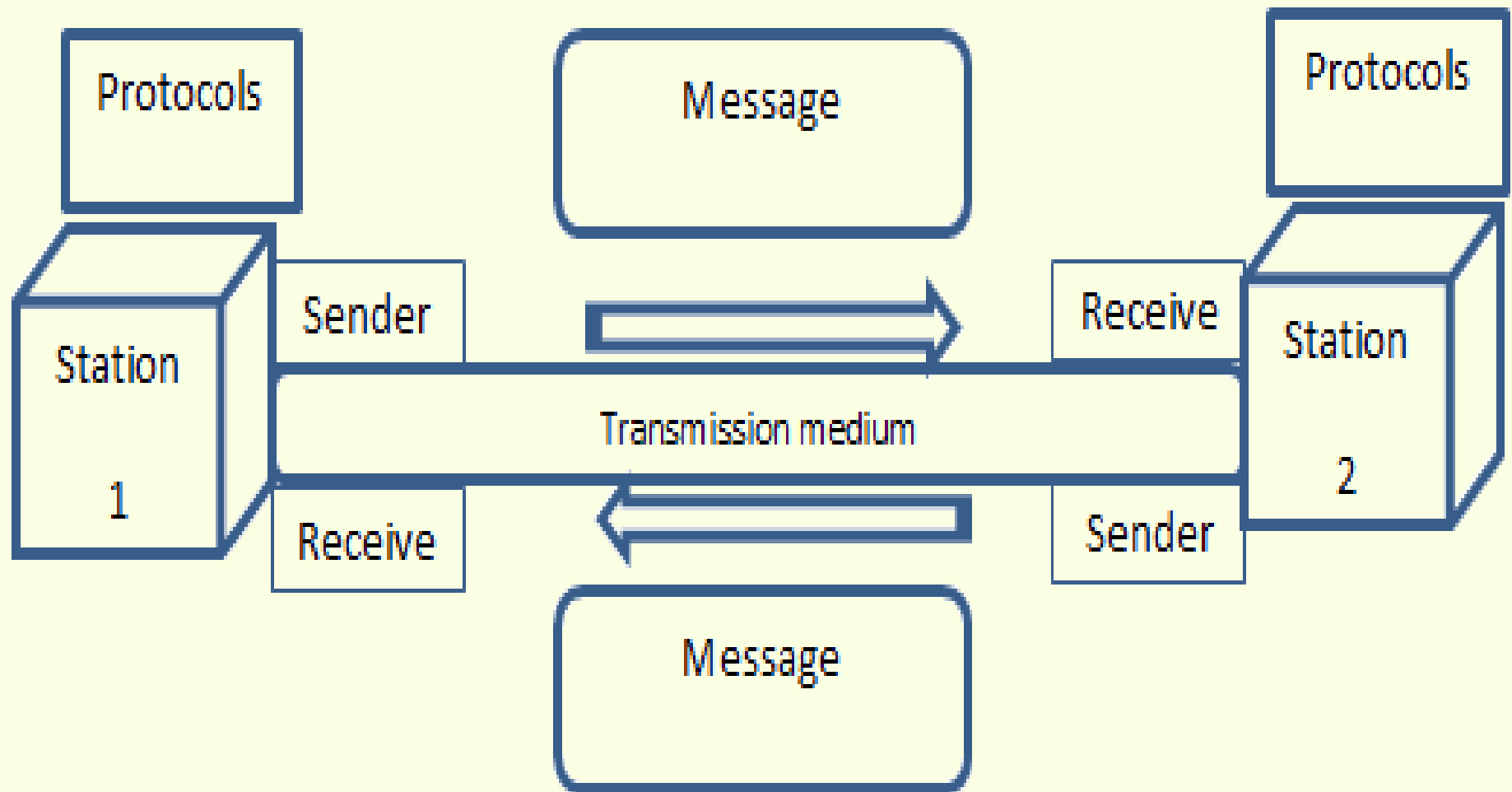


❖ Computer networks

- What is computer network ?
 - Set of **nodes** connected by physical path
 - Every node must be part of communication
 - Combination of hardware & software
- Computer networks change our life ?
- Where we can use computer networks?
- Communicate ,sharing & connect ?

- **When we communicate , we are sharing information**
 - ✓ **Local**
 - ✓ **Remote**
- **What is data communication?**
- **Effectiveness of a data communications :**
 - **Delivery**
 - **Accuracy**
 - **Timeliness**
 - **Jitter**

- **Computer network has five components**



○ **Data Representation**

■ ***Text***

- ✓ Bit pattern (0s or 1s)
- ✓ Code , coding
- ✓ Unicode(32 bits) & ASCII (127 char)

■ ***Numbers***

- ✓ Binary

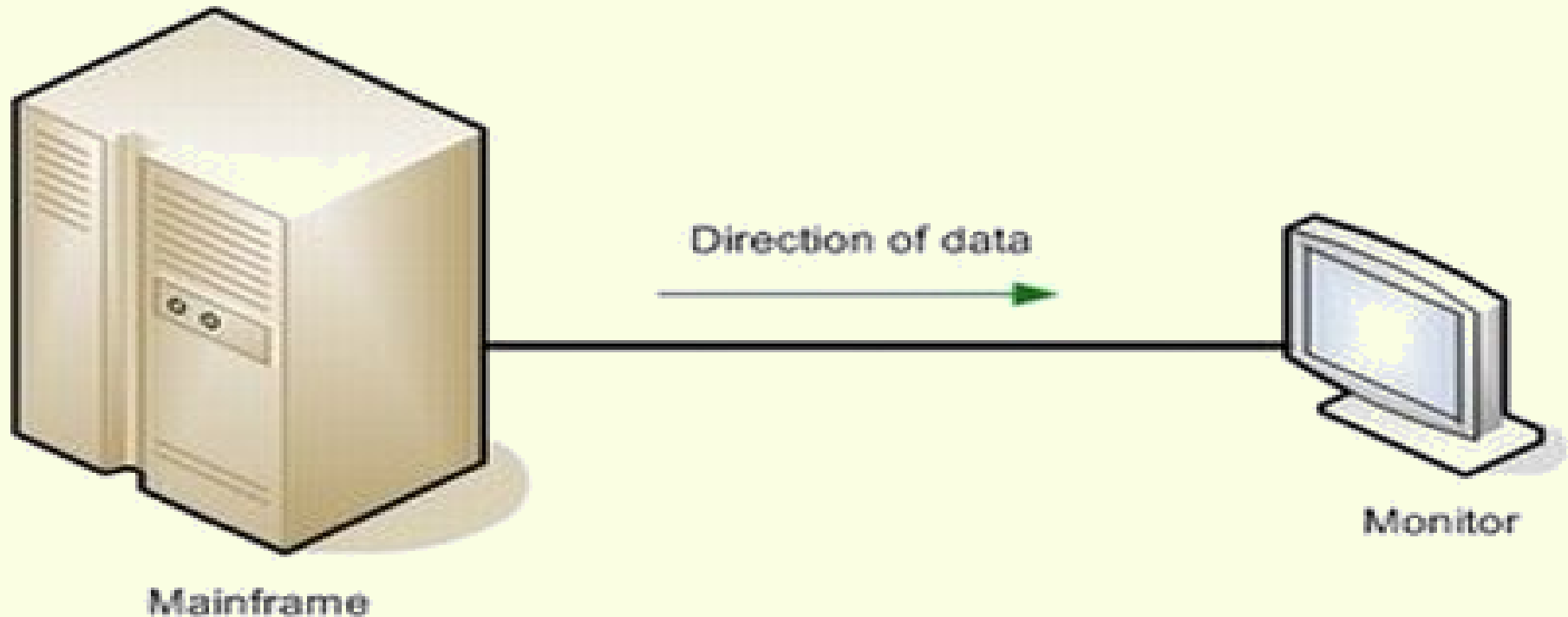
■ **Images**

- ✓ Pixel
- ✓ White & black , RGB , YCM

- ***Audio***
 - ✓ Digital
- ***Video***
 - ✓ Analog & digital

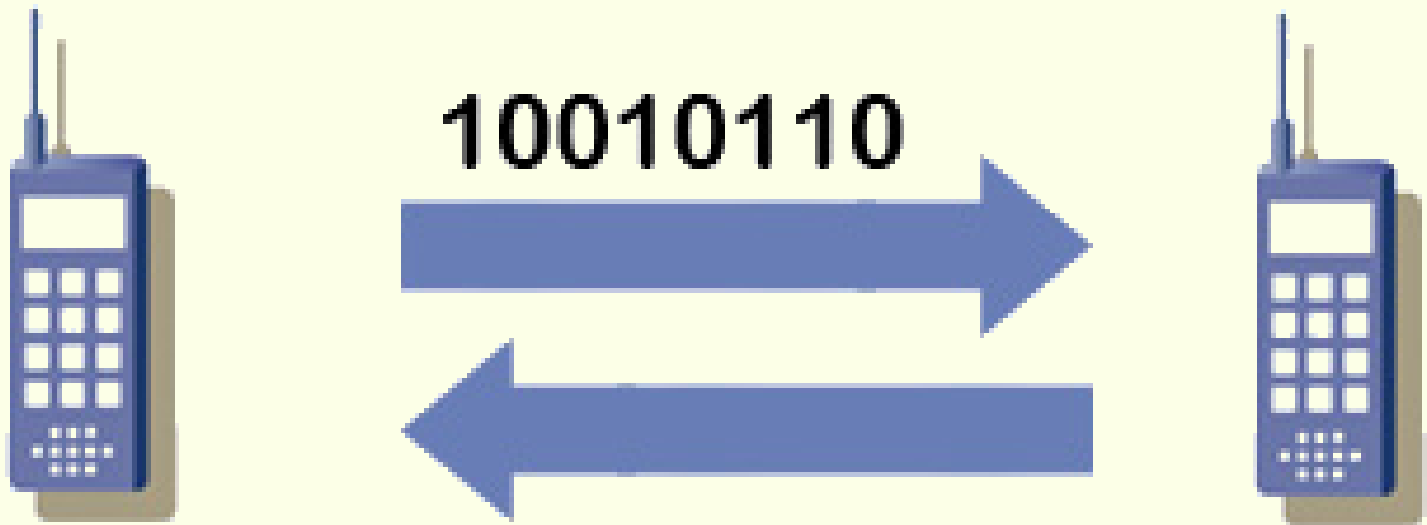
❖ *Data Flow*

- Simplex
 - ✓ Unidirectional
 - ✓ Monitor & keyboard



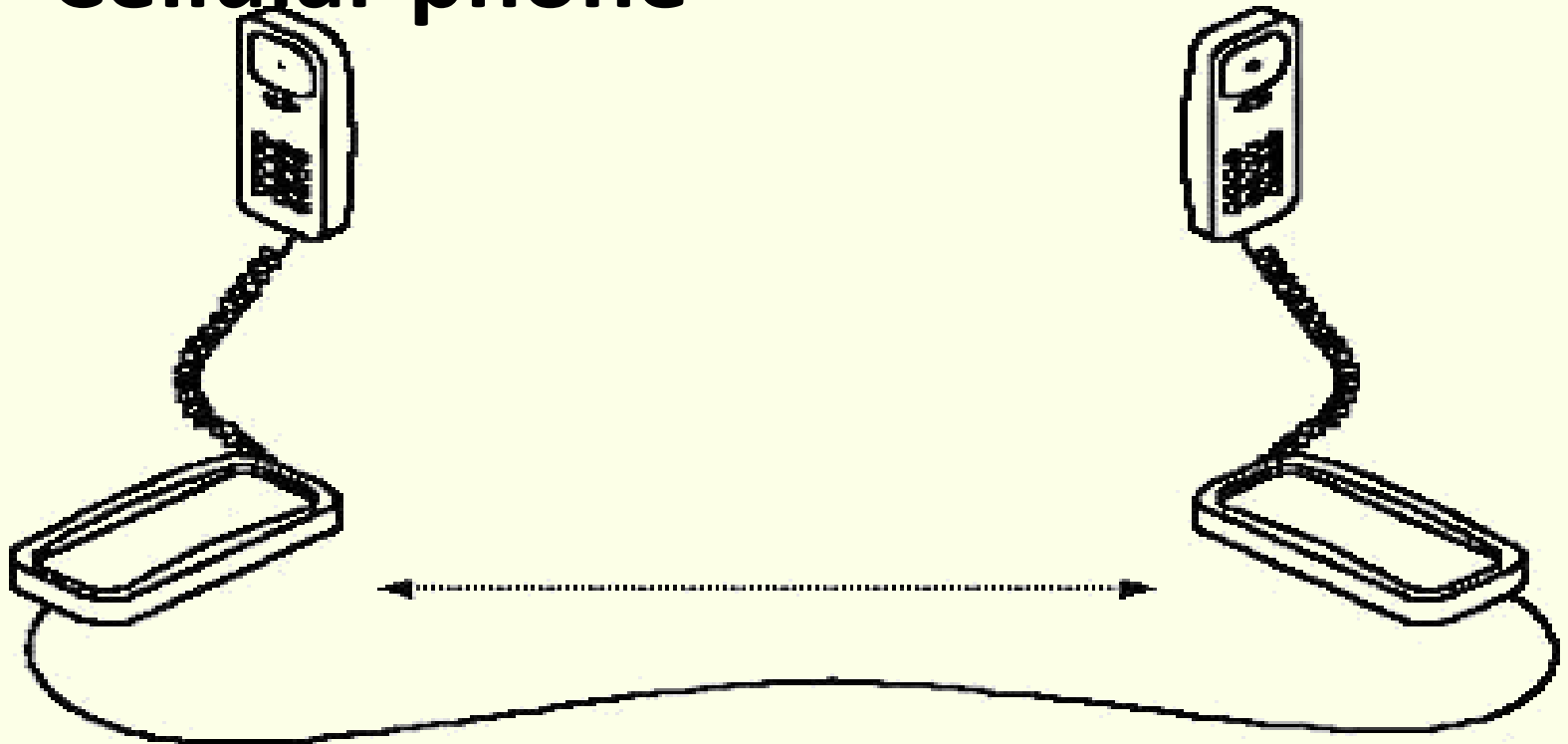
- **Half-Duplex**
 - ✓ **Transmit OR receive**
 - ✓ **Path & capacity?**
 - ✓ **Citizens band**

Half-Duplex Transmission

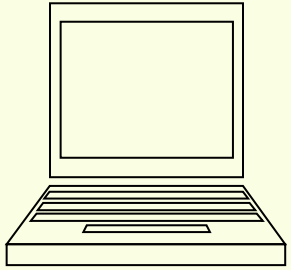


➤ Full-Duplex

- ✓ Transmit & receive at the same time
- ✓ Path & capacity ?
- ✓ Cellular phone



○ Distributed Processing

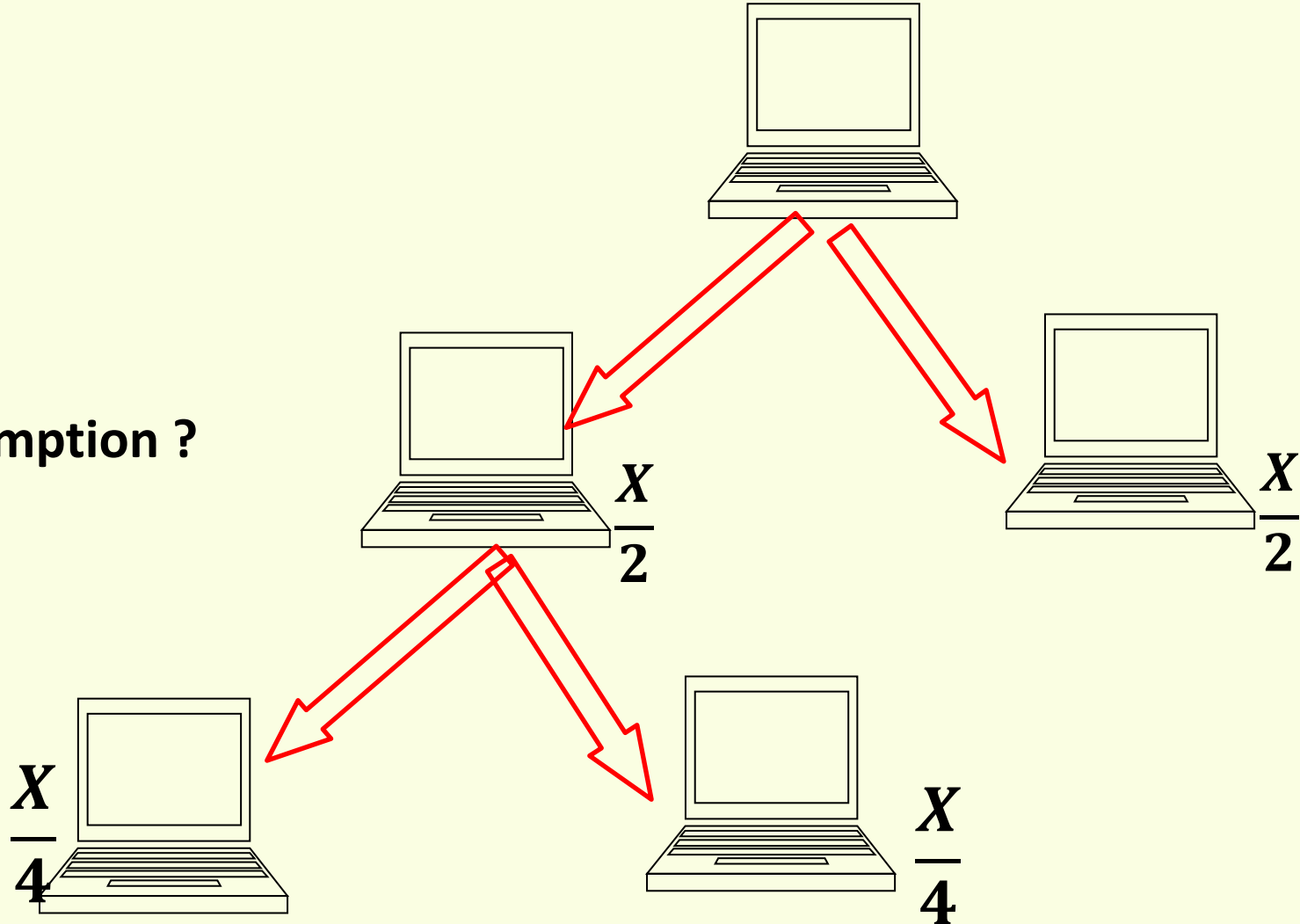


X MB

Time ?

Energy consumption ?

Side effects ?



❖ Network Criteria

○ *Performance*

- ✓ Measured by transit time and response time.
- ✓ Depends on number of users ,transmission medium , Hardware & software
- ✓ Evaluated by throughput and delay

○ *Reliability*

- ✓ *Frequency of failure ?*
- ✓ *Time to recover failure ?*
- ✓ Network's robustness in a catastrophe

○ *Security*

- ✓ *Protecting data from unauthorized access*
- ✓ *Policies*
- ✓ Procedures for recovery from breaches and data losses

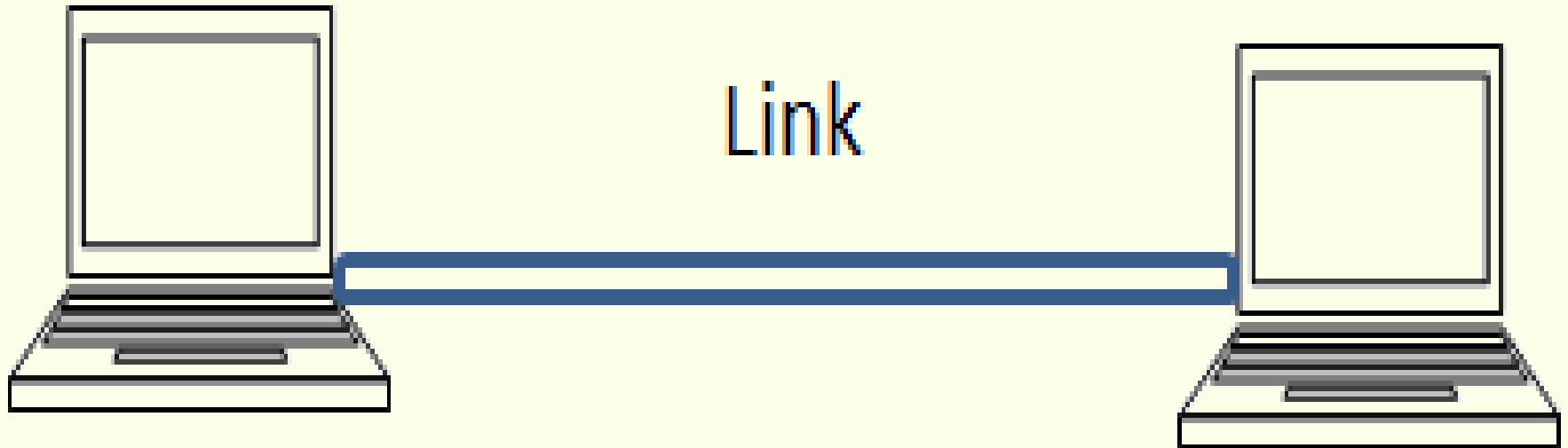
❖ Physical Structures

➤ Types of Connection

- link is physical pathway
- Link used to connected devices
- point-to- point or multipoint

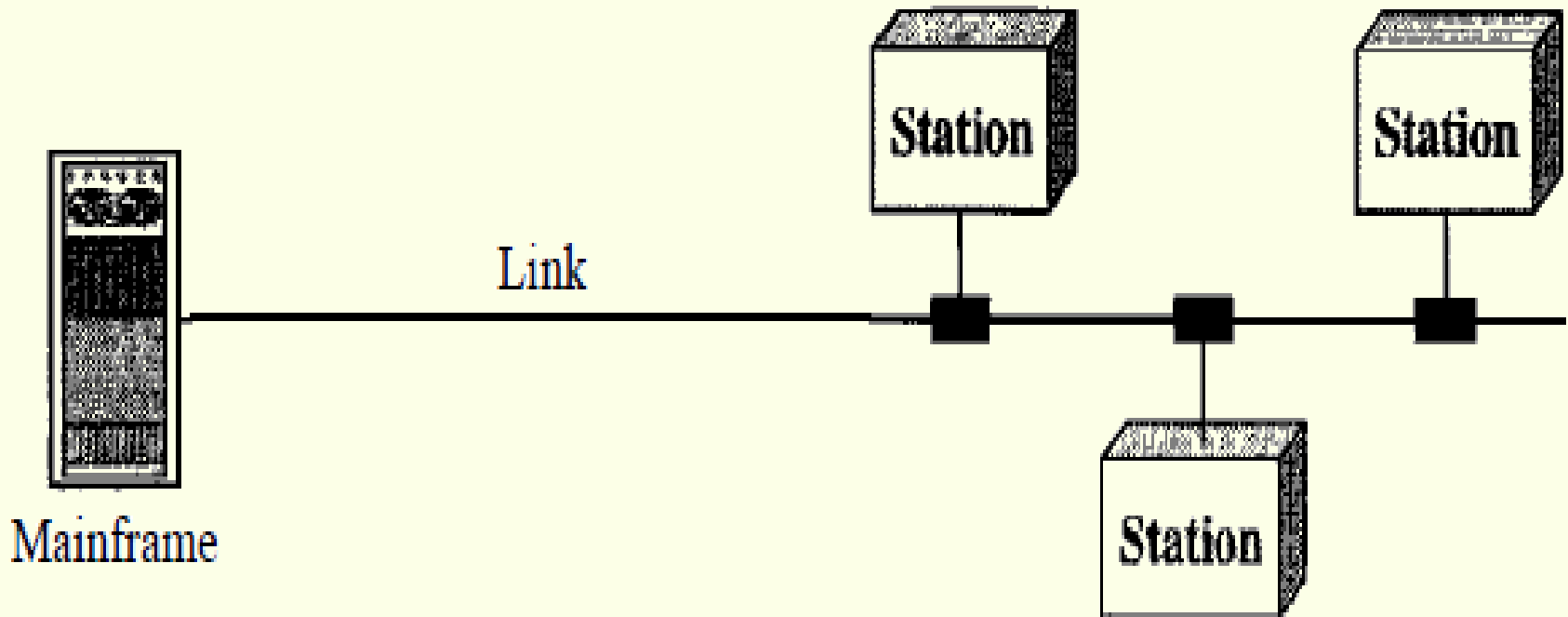
❑ Point – to – point

- Dedicated link between two devices
- Capacity of the link is reserved
- Example : remote control



❑ Multipoint (multidrop)

- Capacity of the channel is shared
- Reduce cost & energy consume

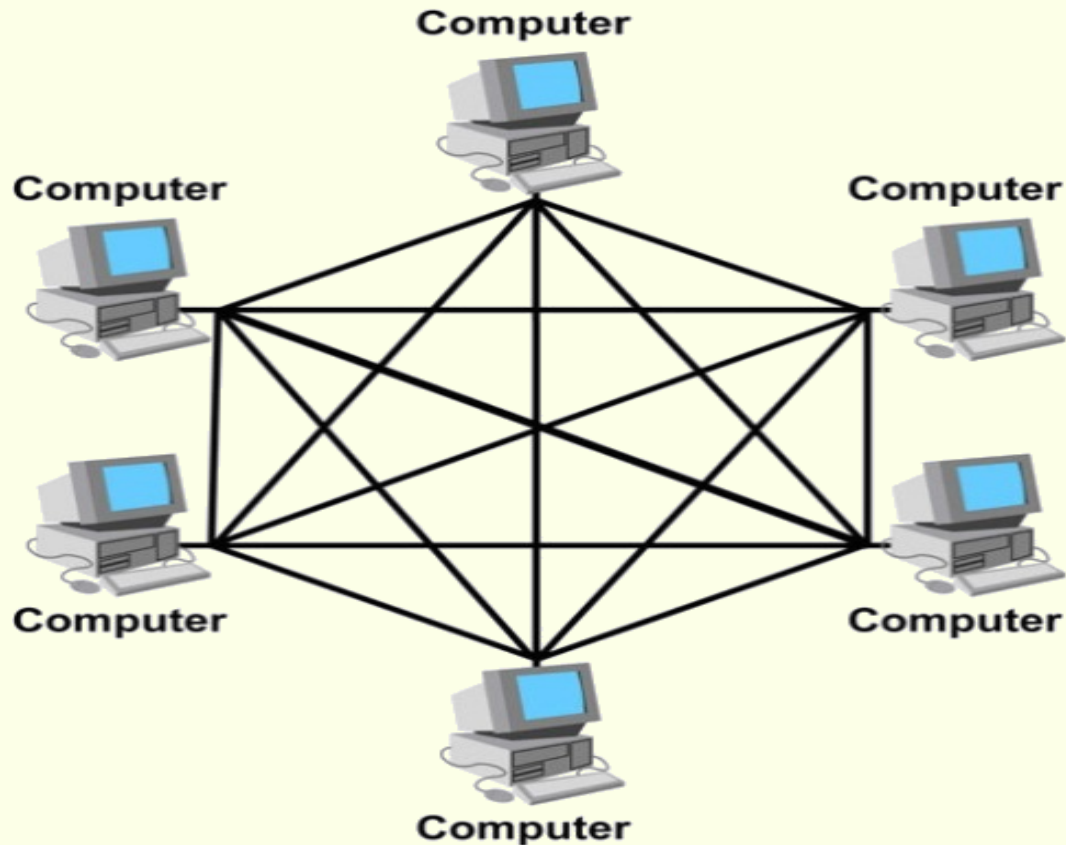


➤ **Physical Topology**

- **Geometric representation**
- **The shape of our network**
- **Why ?**
- **Mesh , Star , Bus & Ring**

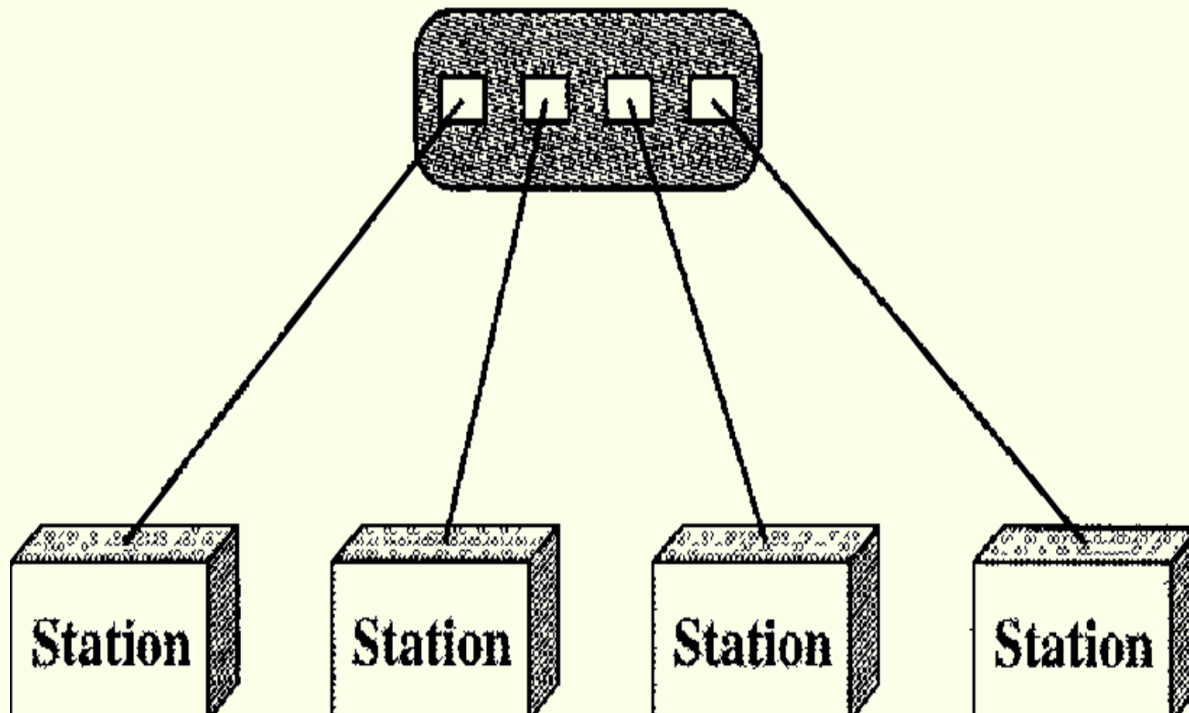
□ Mesh

- dedicated point-to-point link
- Security , robust & guarantee
- Expensive & amount of input/output
- $n - 1$, $n(n - 1)$ & $n(n - 1) / 2$



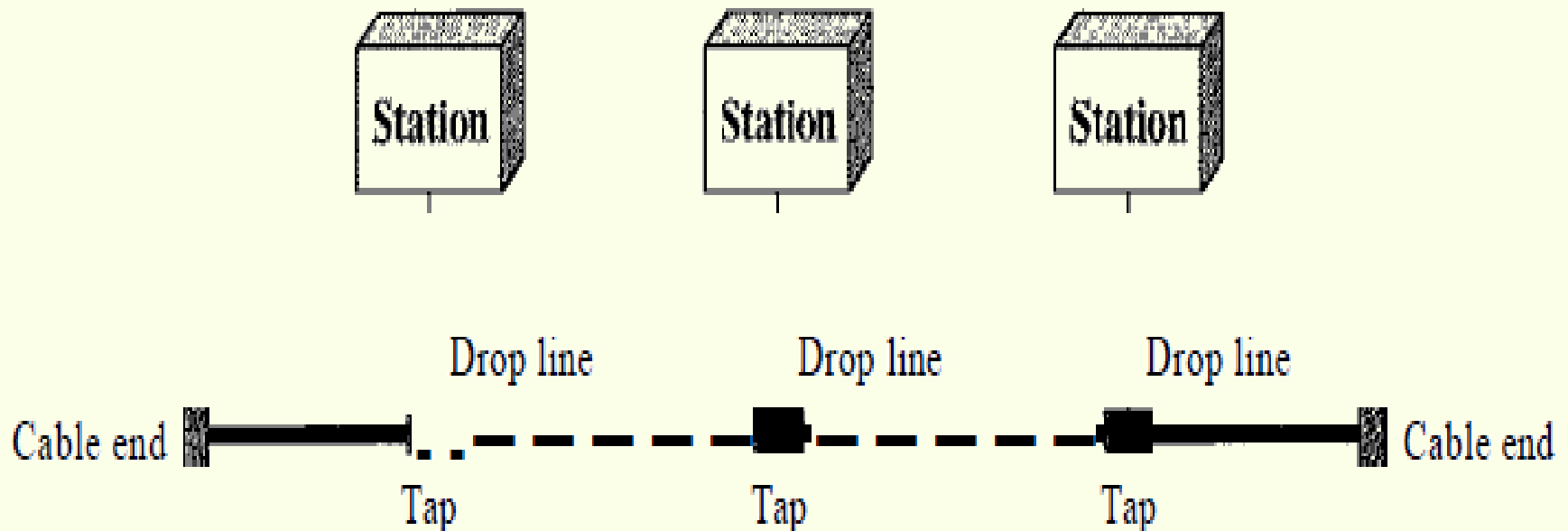
❑ Star Topology

- All device connected to central point
- Less expensive ,less links & robust
- What happened if central point goes down ?



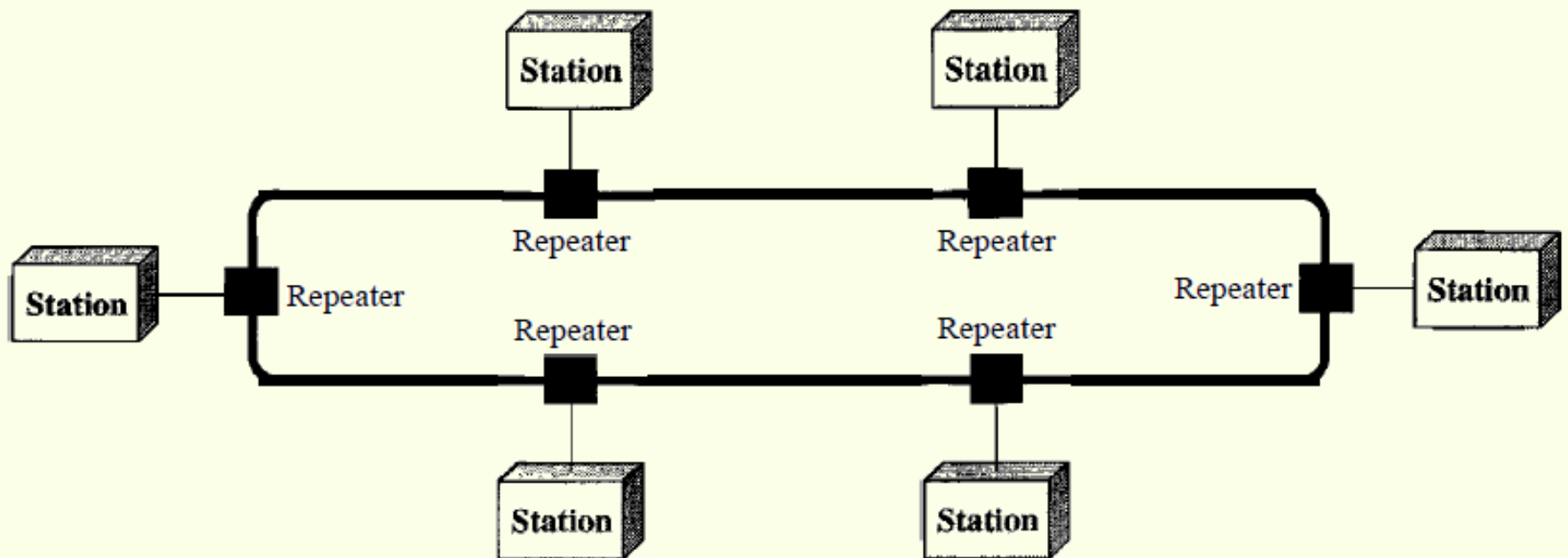
□ Bus Topology

- Nodes are connected to one long cable
- Drop line & taps
- Less cable & ease of installation
- Heat & cable problems

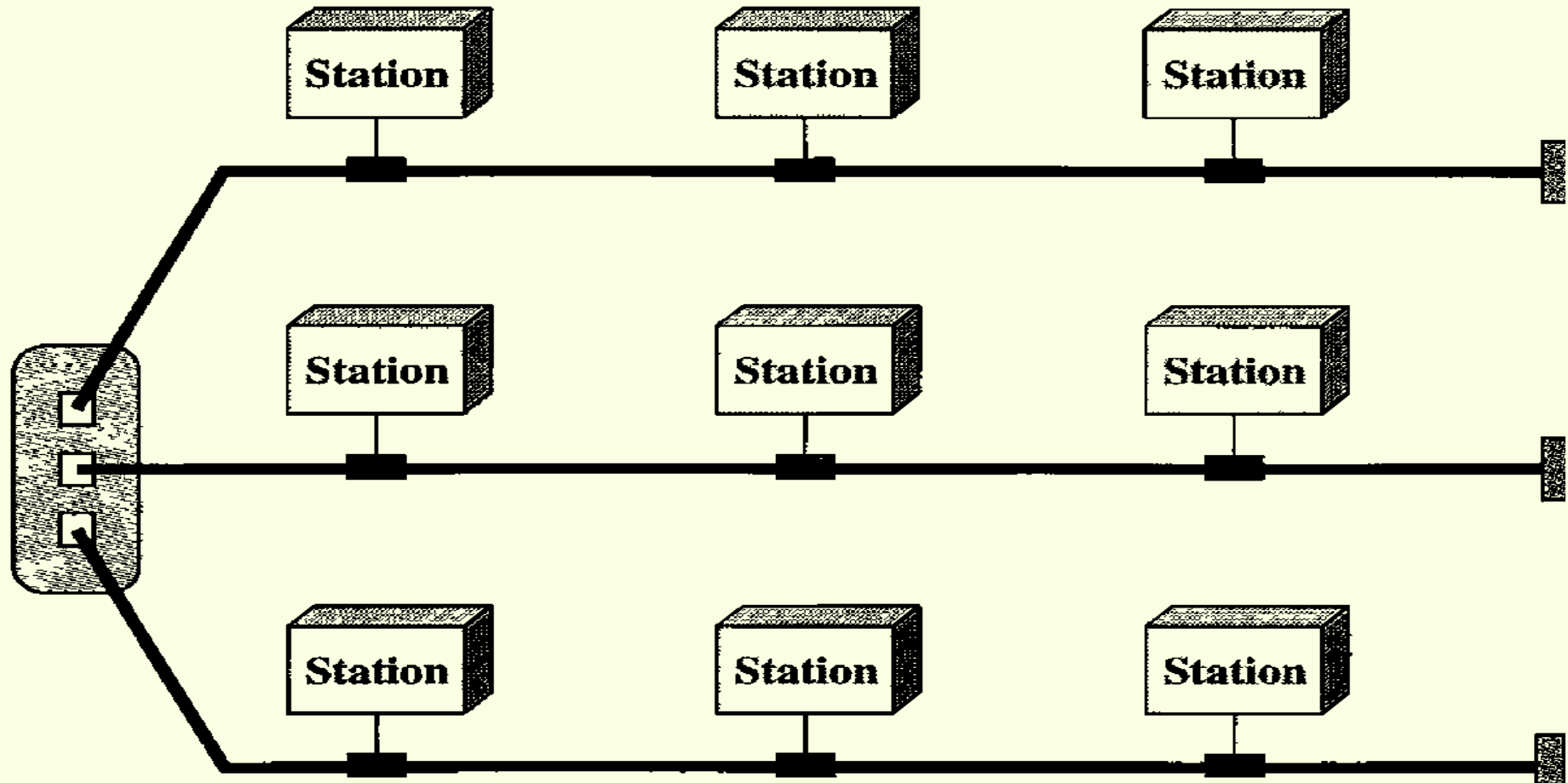


❑ Ring Topology

- Signal is passed along cable
- Update?
- Problems in cable?



❑ Hybrid Topology



Categories of Networks

1. Local Area Network

- Usually privately owned
- Single office, building, or campus
- Allow resources to be shared
- In general only one type of transmission medium

2. Wide Area Network

- Long distance
 - ✓ a country or world

3. Metropolitan Area Networks

- size between a LAN and a WAN
 - ✓ town or a city

❖ PROTOCOLS AND STANDARDS

□ Protocols

- Protocol is a set of rules that govern data Communications
- Define
 - ✓ What is communicated
 - ✓ How it is communicated
 - ✓ When it is communicated

- key elements of a protocol
 - Syntax
 - structure or format of the data
 - Semantics
 - meaning of each section of bits
 - Timing
 - when data should be sent
 - how fast they can be sent

❑ Standards

- Creating & maintaining an open and competitive market
- Provide guidelines to manufacturers, vendors, government agencies, and other service providers
- We have two categories
 - *de facto* , *by fact* , *by convention*
 - *de jure* , *by law*, *by regulation*

- International Organization for Standardization (ISO).
- International Telecommunication Union-Telecommunication Standards Sector (ITU-T)
- American National Standards Institute (ANSI).
- Institute of Electrical and Electronics Engineers (IEEE).
- Electronic Industries Association (EIA).

- *Forums*

- Telecommunications technology development is moving faster
- *Standards are slow move*

- **Regulatory Agencies**

- to protect the public interest

Best wishes