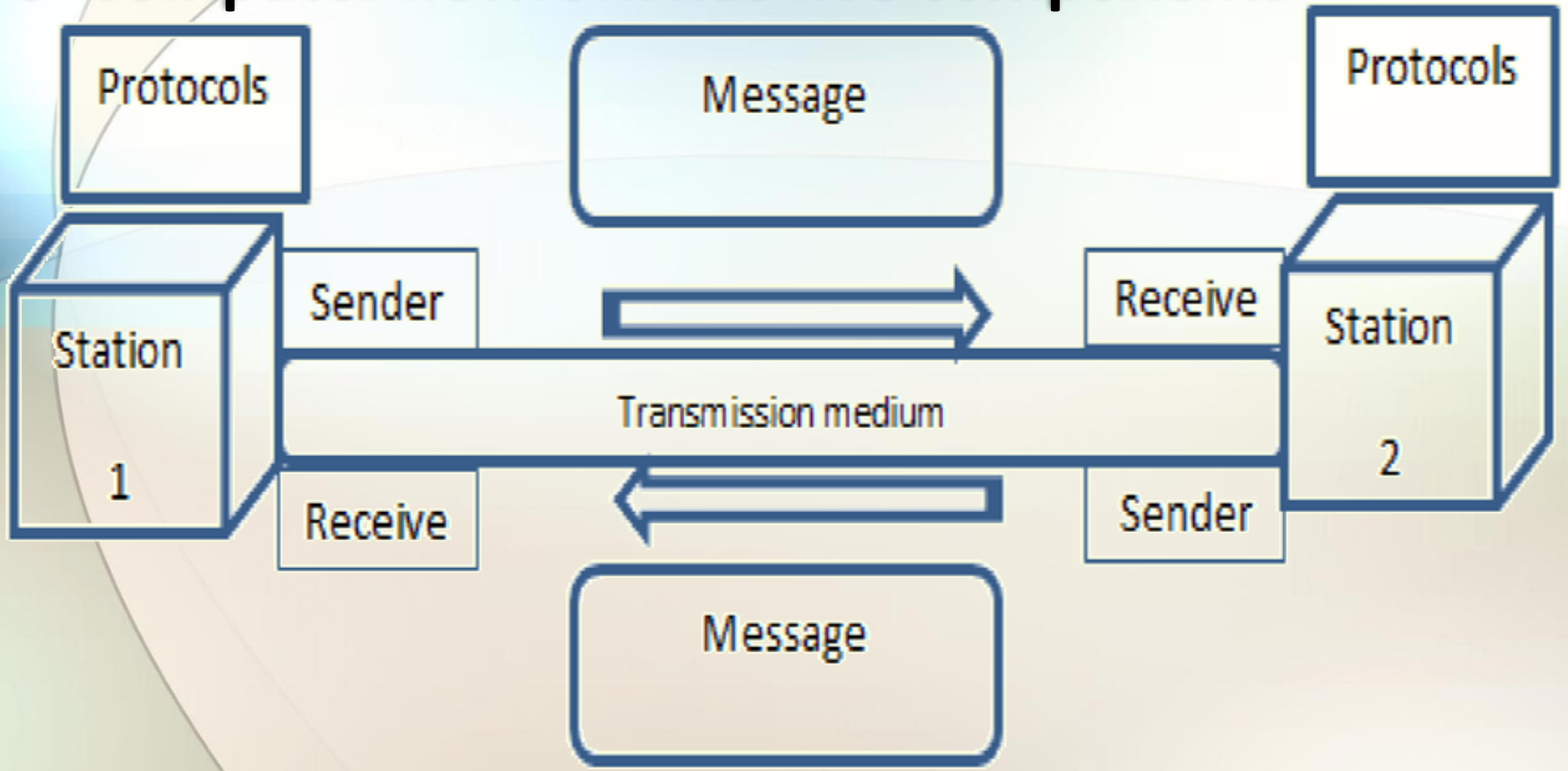
Computer networks

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**

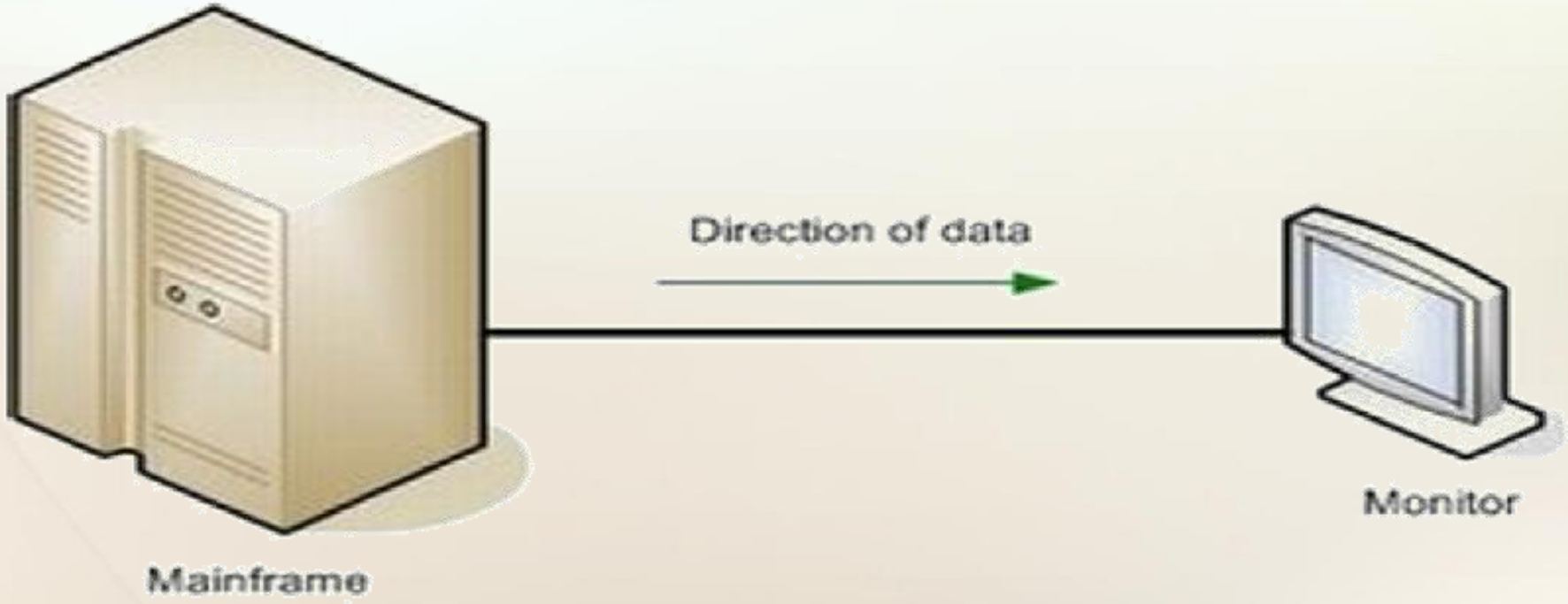


- **Data Representation**
  - ***Text***
    - Bit pattern (0s or 1s)
    - Code , coding
    - Unicode(32 bits) & ASCII (127 char)
  - ***Numbers***
    - Binary
  - **Images**
    - Pixel
    - White & black , RGB , YCM

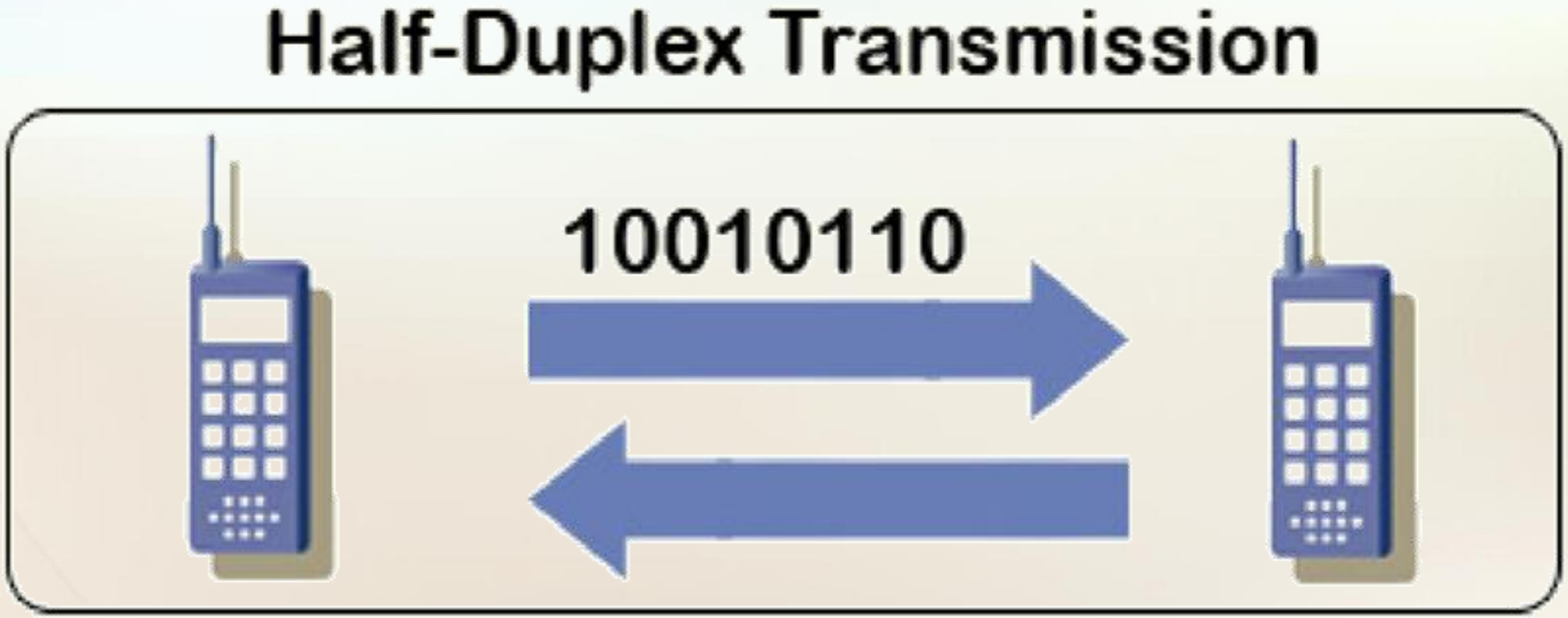
- ***Audio***
  - Digital
- ***Video***
  - Analog & digital

Data flow

- Simplex
  - Unidirectional
  - Monitor & keyboard

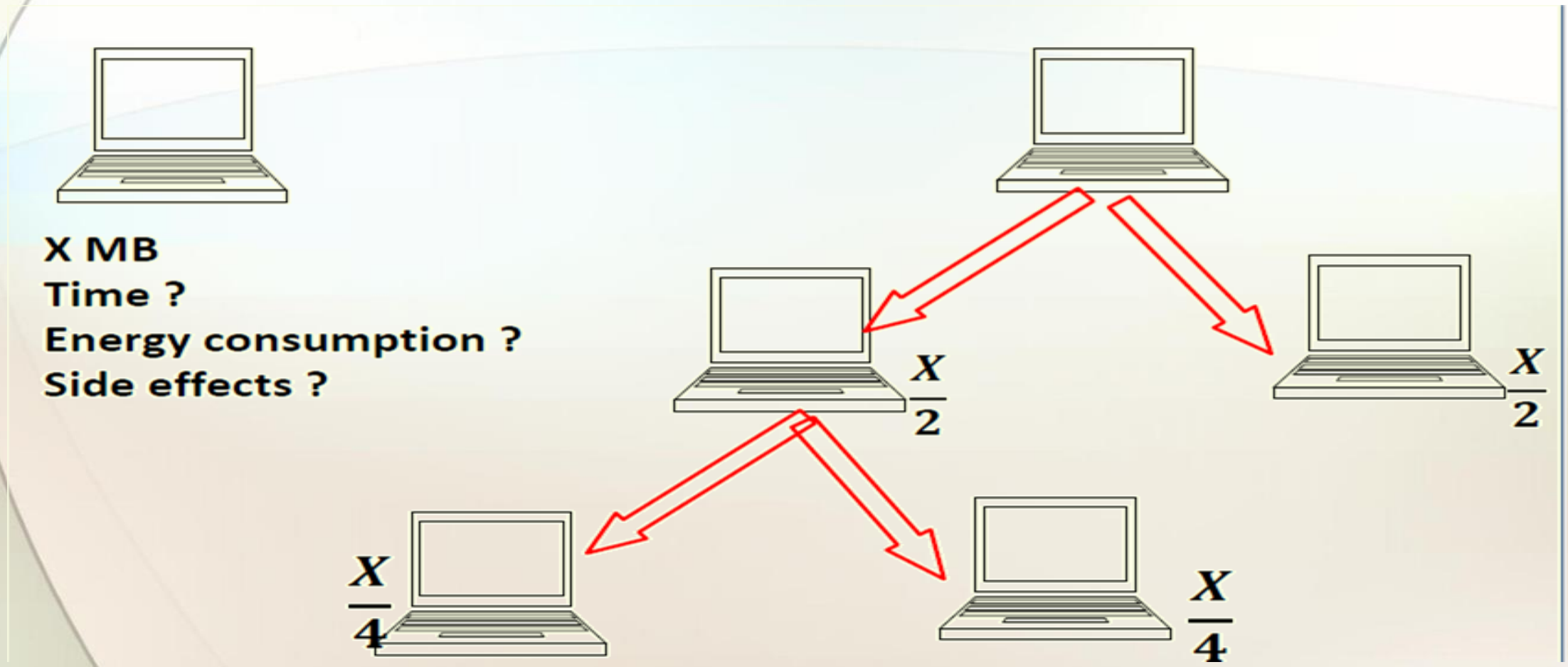


- Half duplex
  - Transmit OR receive
  - Path & capacity?
  - Citizens band



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

❖ Distributed processing



❖ 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

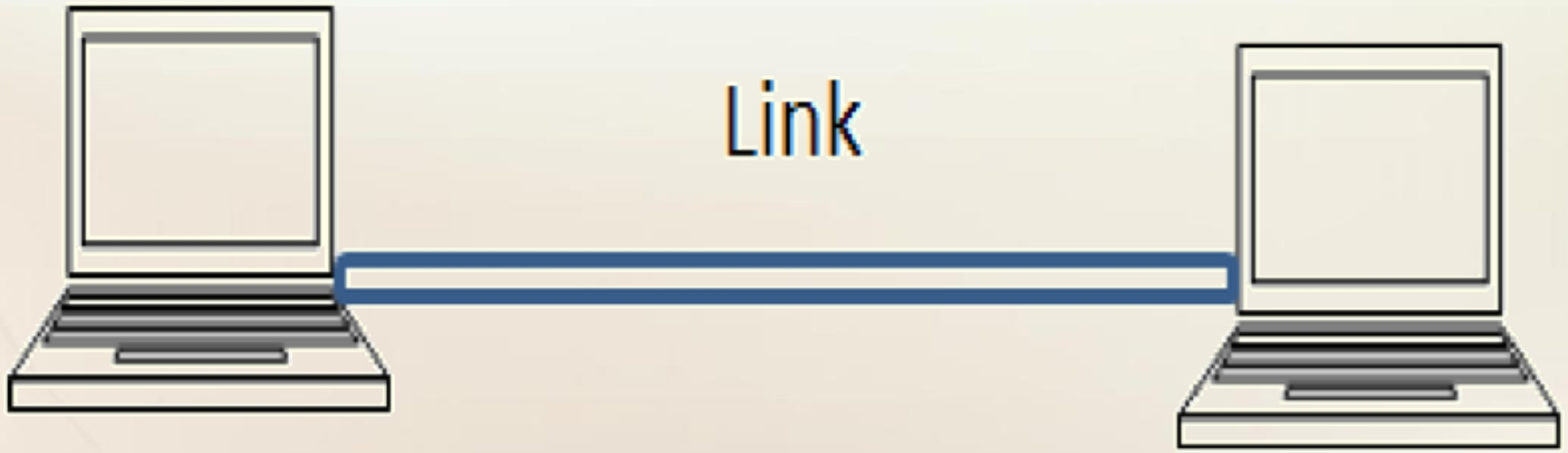
❖Physical structure

➢Types of Connection

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

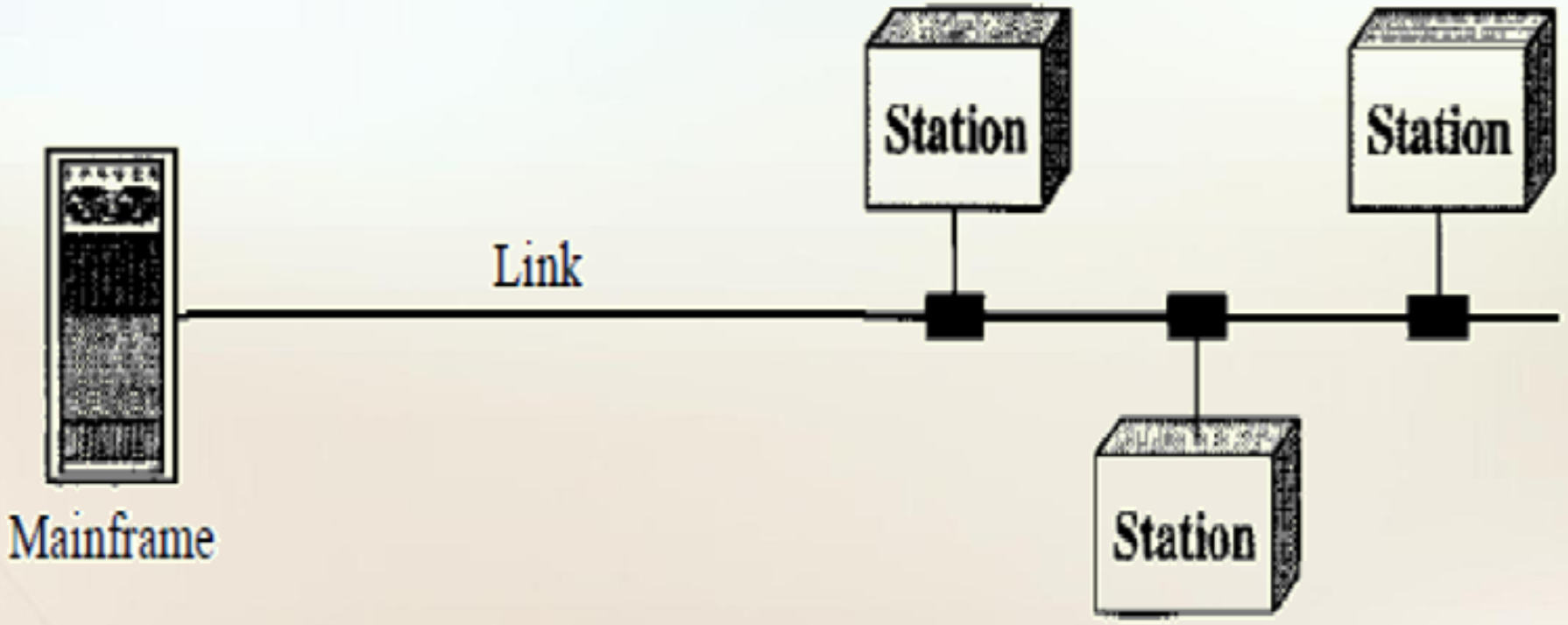
❑ Point - to – point

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



❑ Multiport (multidrop)

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

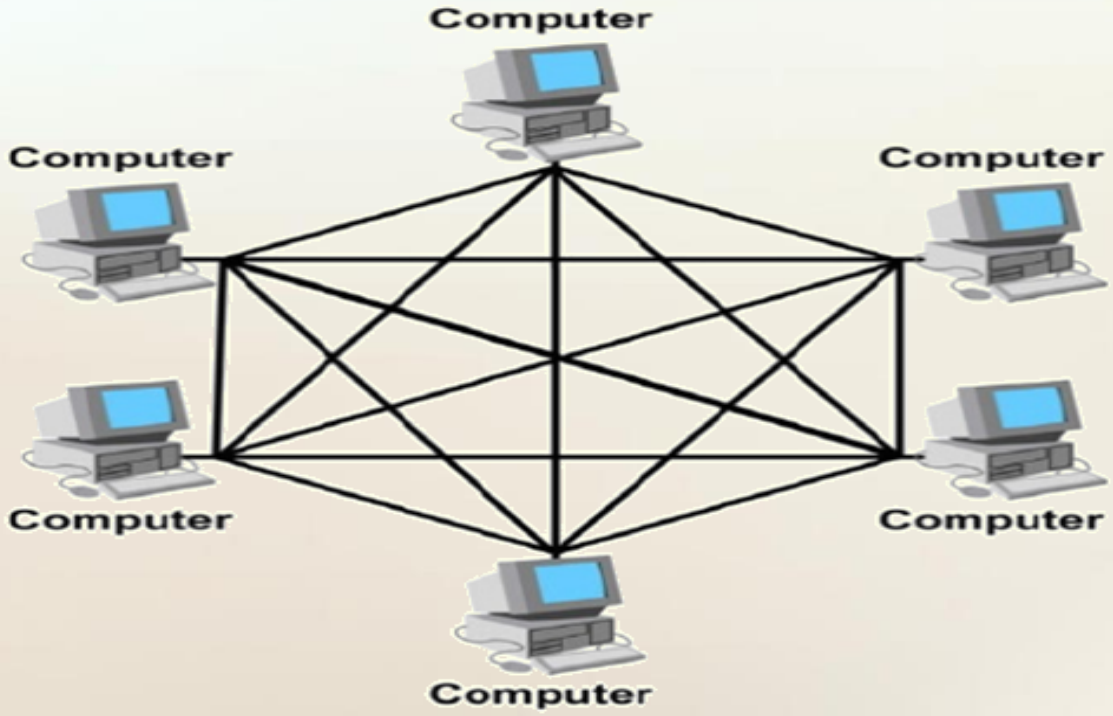


➢ Physical Topology

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

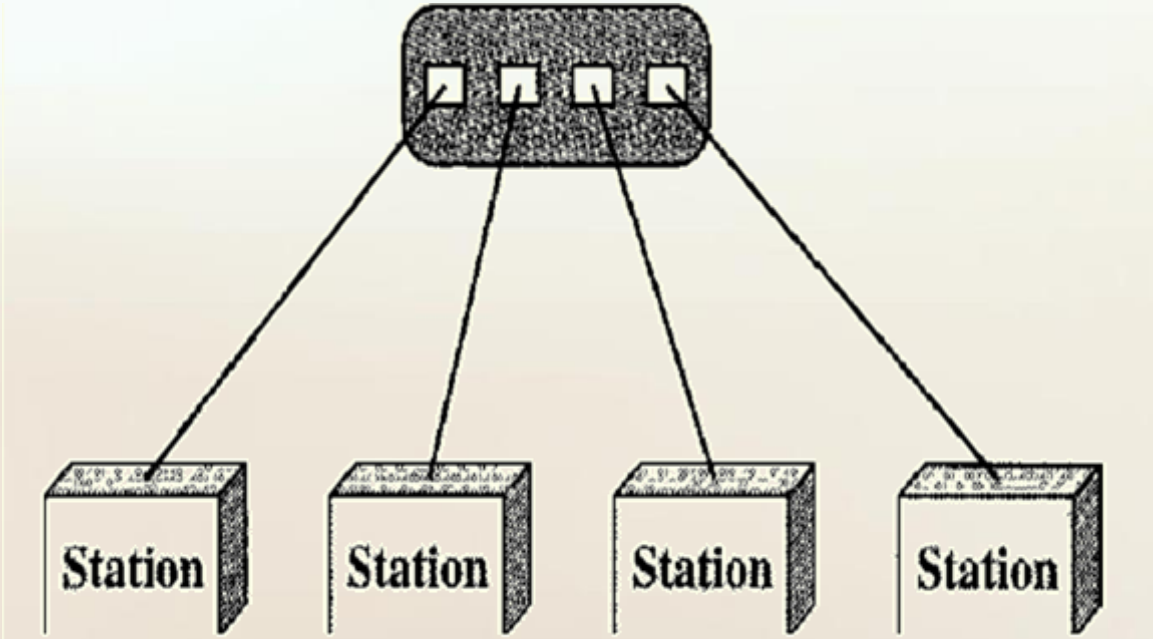
❑ Mesh

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



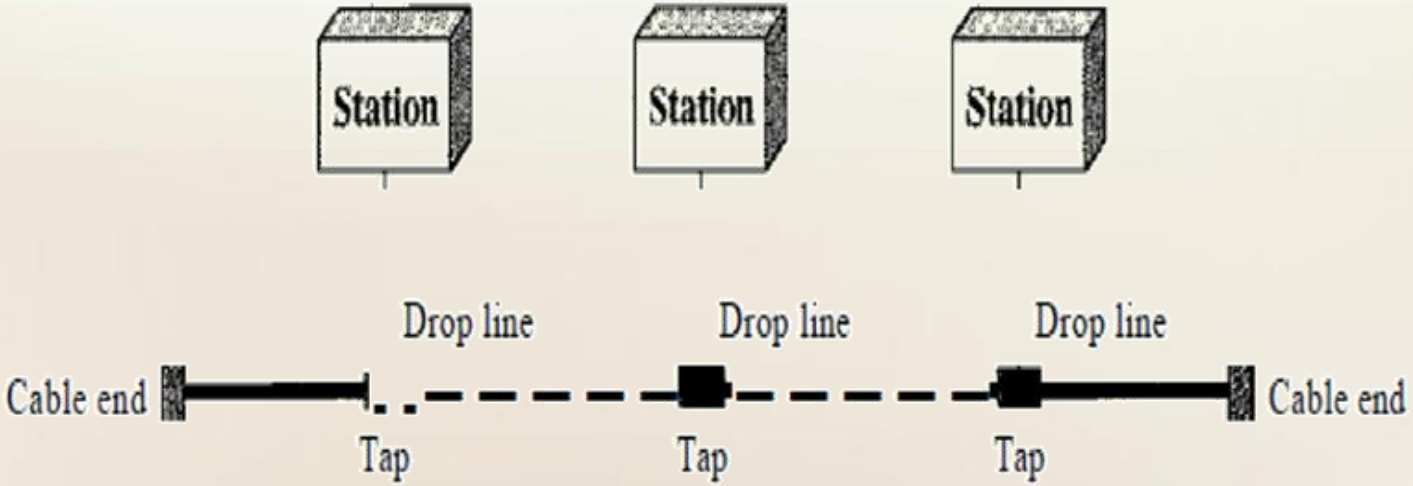
❑ Star

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



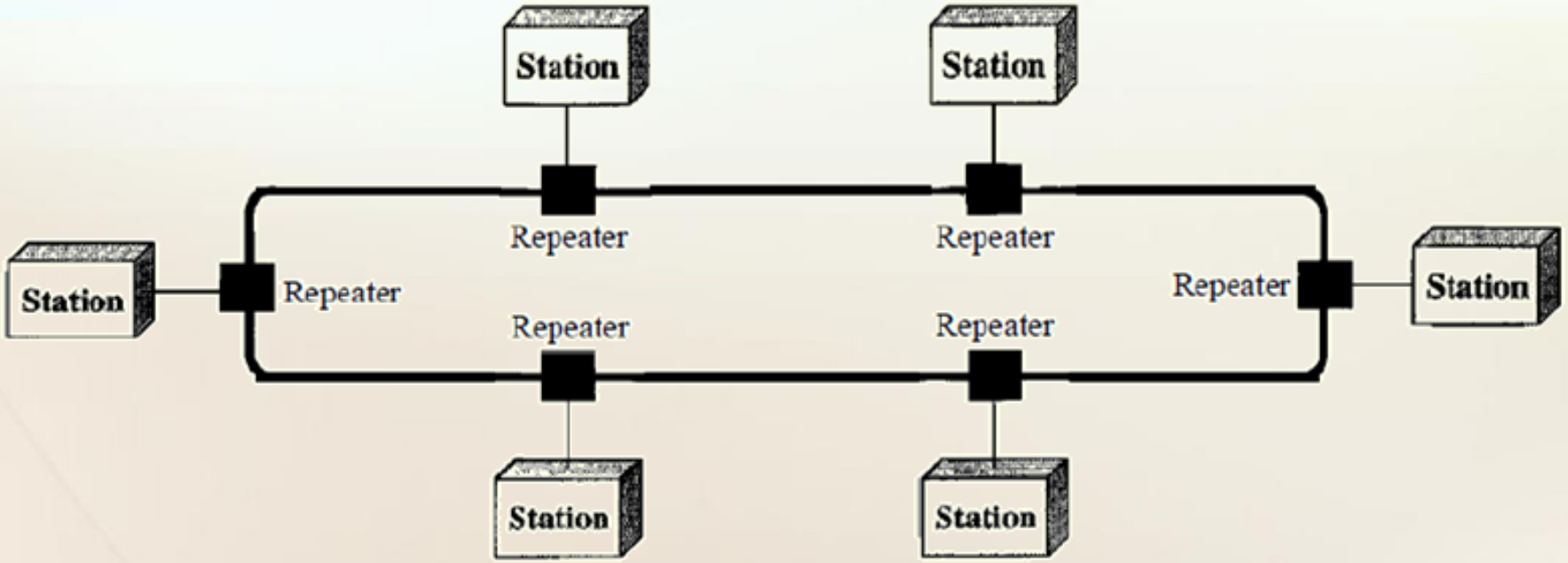
❑ Bus

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

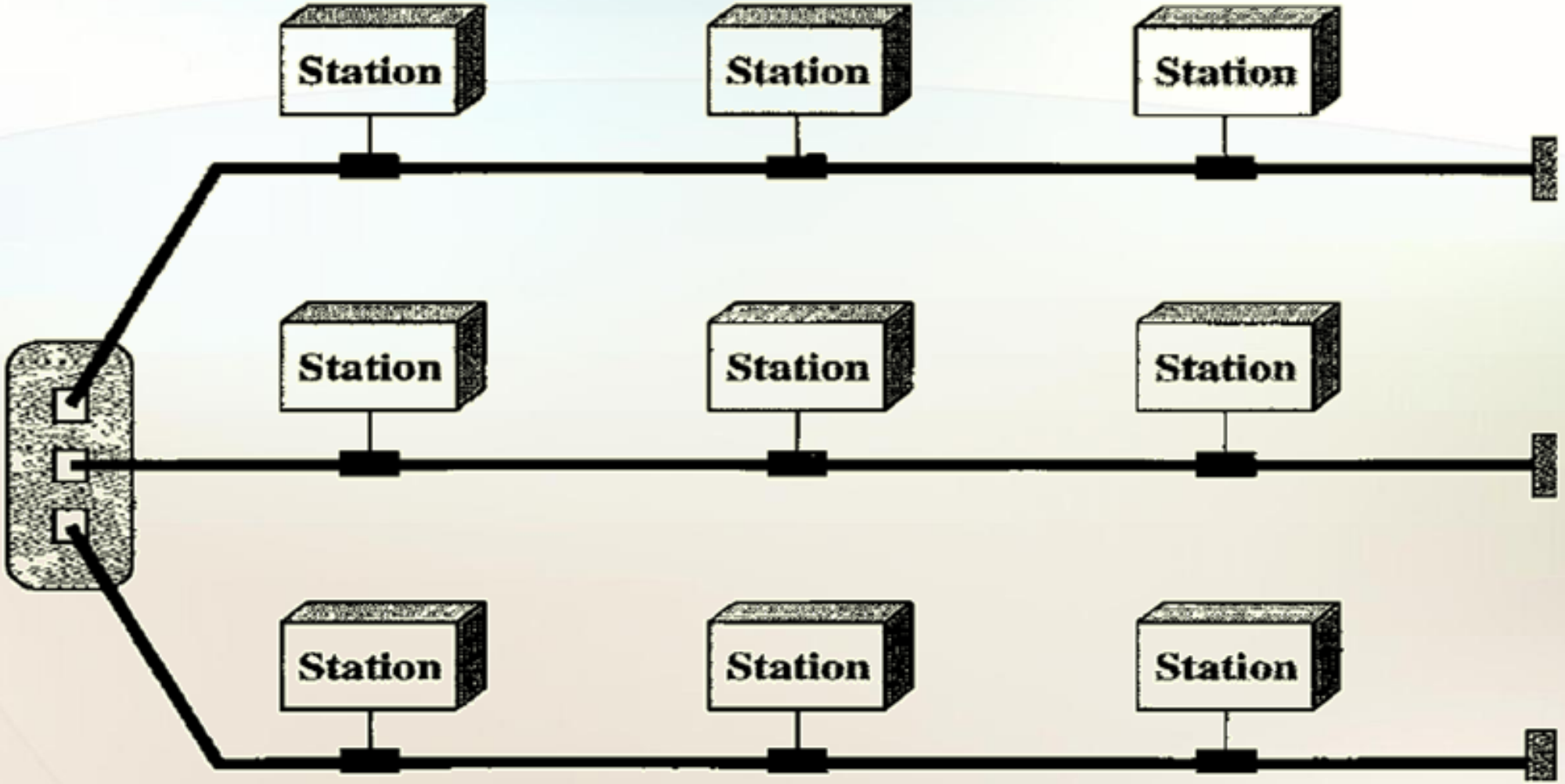


❑ Ring

- 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