

# Introduction



# DATA COMMUNICATIONS

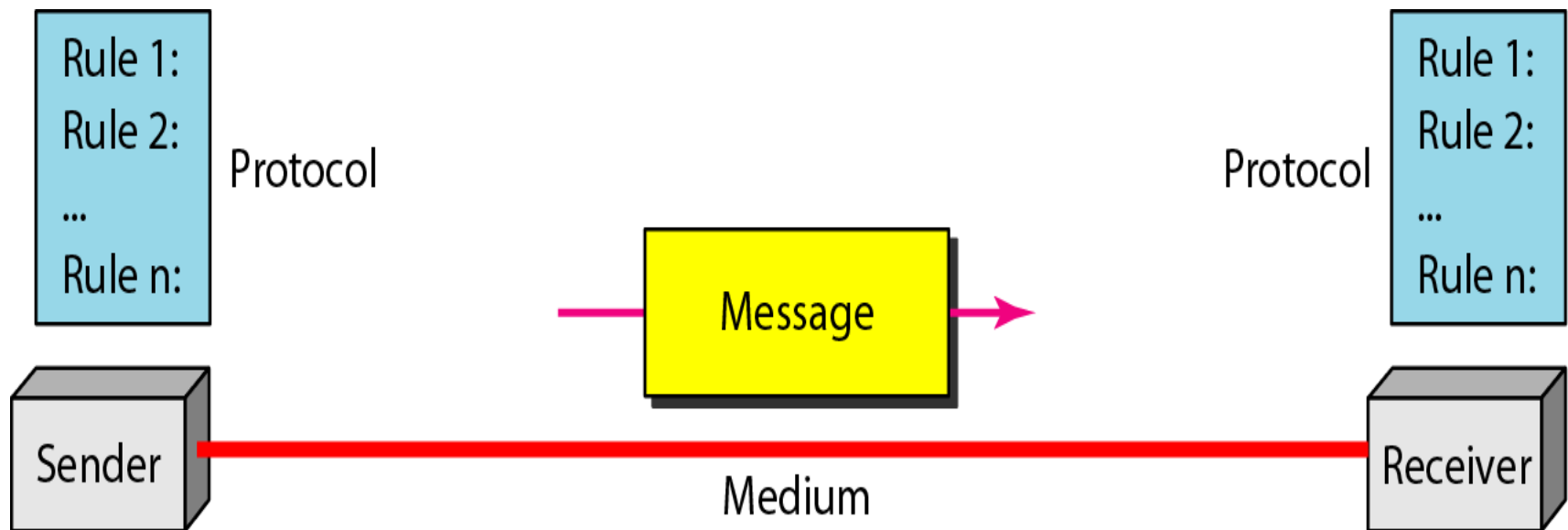
- The term telecommunication means communication at a distance. The word data refers to information presented in whatever form is agreed upon by the parties creating and using the data.
- Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable or may be wireless.

# Effectiveness of Data Communication

## Four Fundamental Characteristics

- Delivery
- Accuracy
- Timeliness - *-real time*
- Jitter

# Components of a Data Communication System

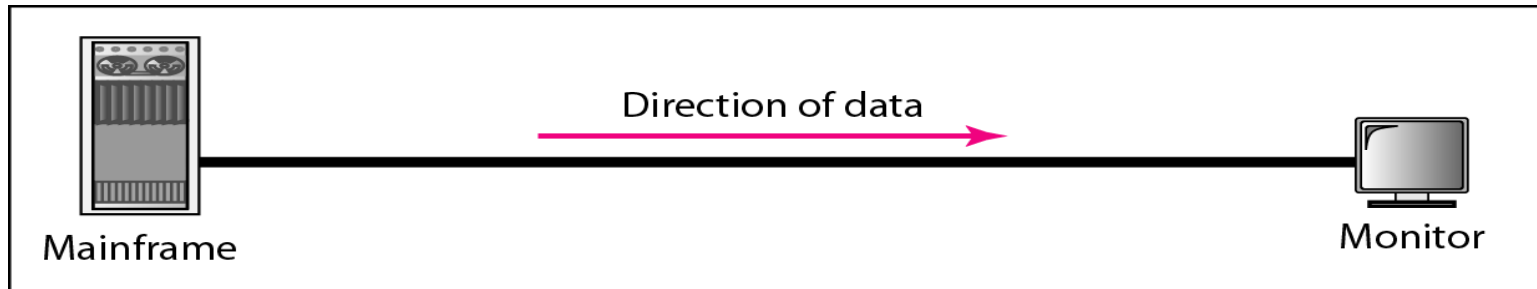


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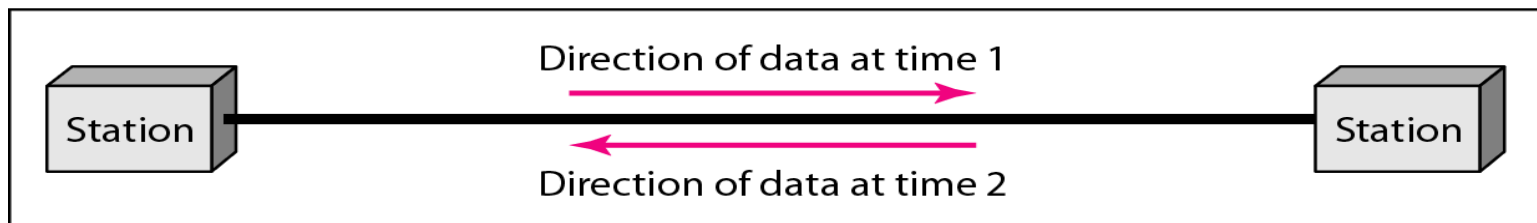
## **Five Components:**

- Message- *Text, Number, Image, Audio, Video*
- Sender
- Receiver
- Transmission Medium
- Protocol

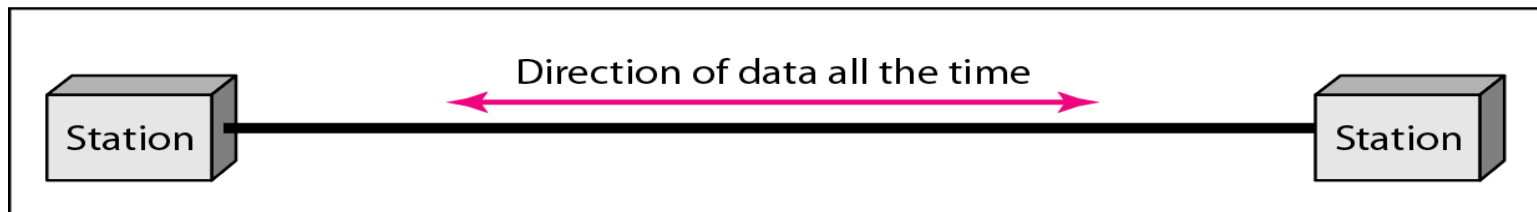
# Data flow (Simplex, Half-duplex, and Full-duplex)



a. Simplex



b. Half-duplex



c. Full-duplex

# NETWORKS

- A network is a set of devices (often referred to as nodes) connected by communication links. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.
- A link can be a cable, air, optical fiber, or any medium which can transport a signal carrying information.

# Network Criteria

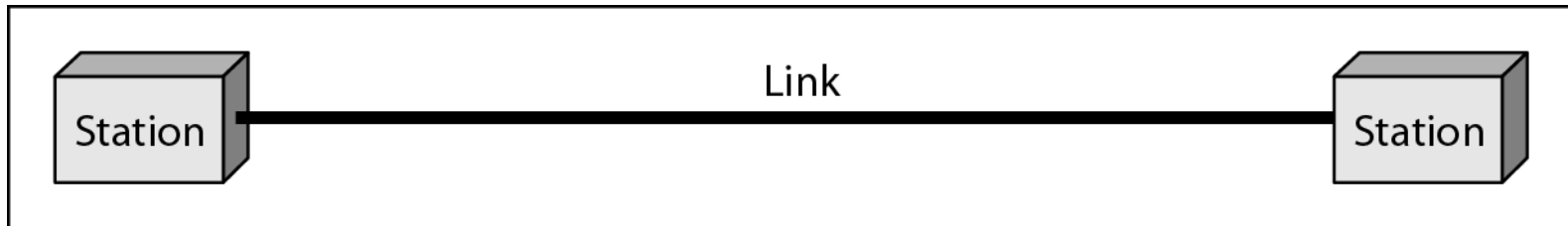
- Performance
  - Depends on Network Elements- Transmit time, Response Time, Number of users, type of transmission medium, hardware, software.
  - Measured in terms of Delay and Throughput
- Reliability
  - Failure rate of network components.
  - Time to recover from a failure.
  - Measured in terms of availability/robustness
- Security
  - Data protection against corruption/loss of data due to:
    - Errors
    - Malicious users/ Unauthorized access.



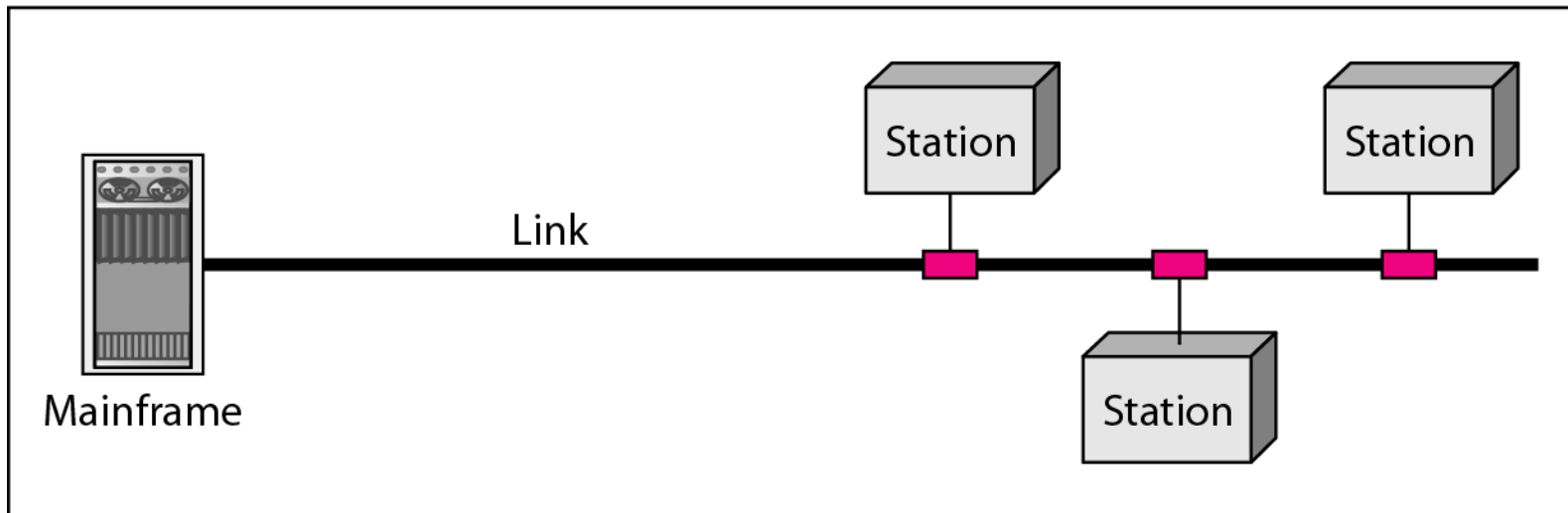
# Physical Structures

- Type of Connection
  - Point to Point - single transmitter and receiver
  - Multipoint - multiple recipients of single transmission
- Physical Topology
  - Connection of devices
  - Type of transmission - unicast, mulitcast, broadcast

# Types of connections: point-to-point and multipoint



a. Point-to-point



b. Multipoint

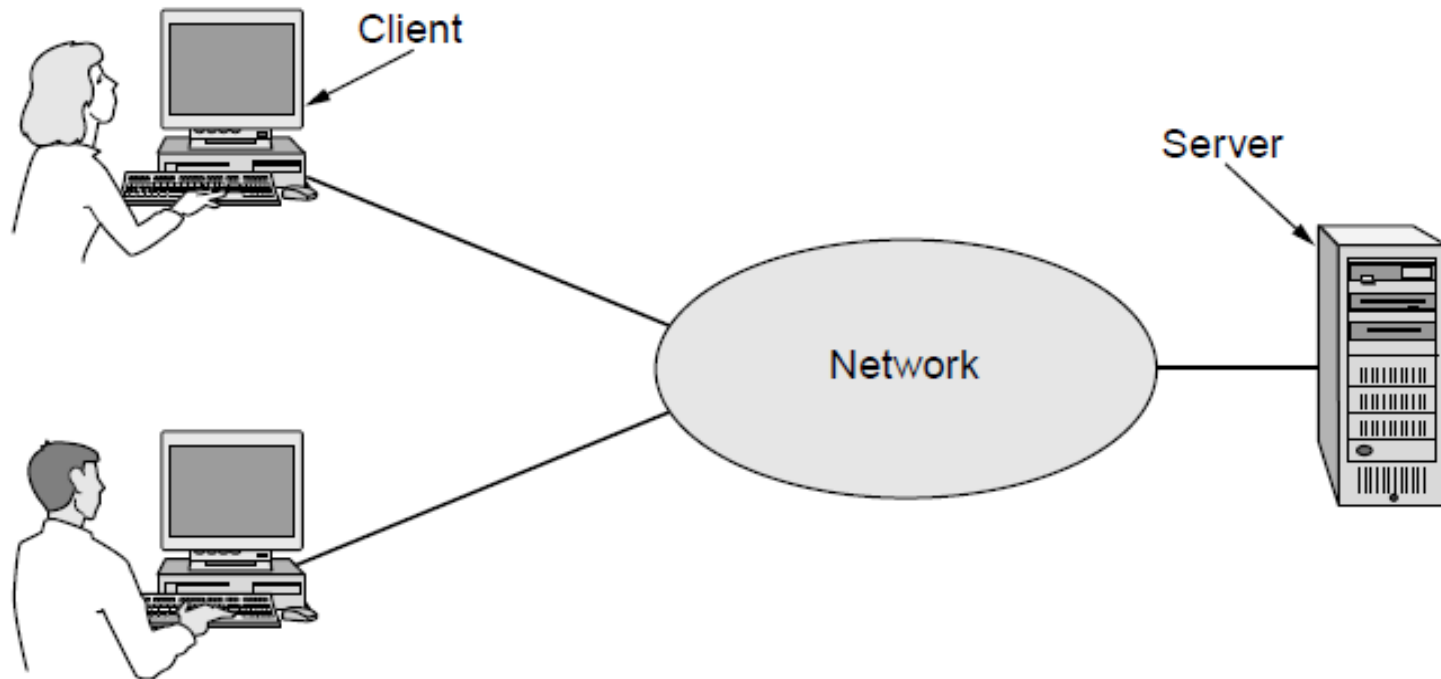
# Uses of Computer Network

- Business Applications
- Home Applications
- Mobile Users
- Social Issues

# Business Applications

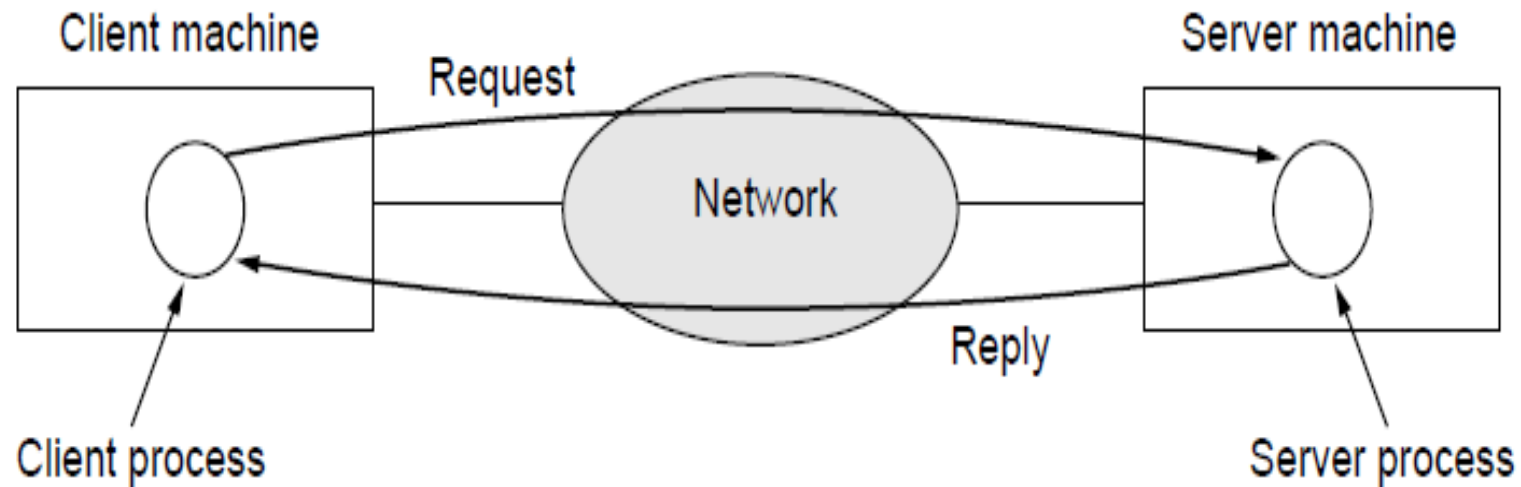
- Resource sharing such as printers and storage devices
- Exchange of information by means of e-Mails and FTP

# Business Applications (1)



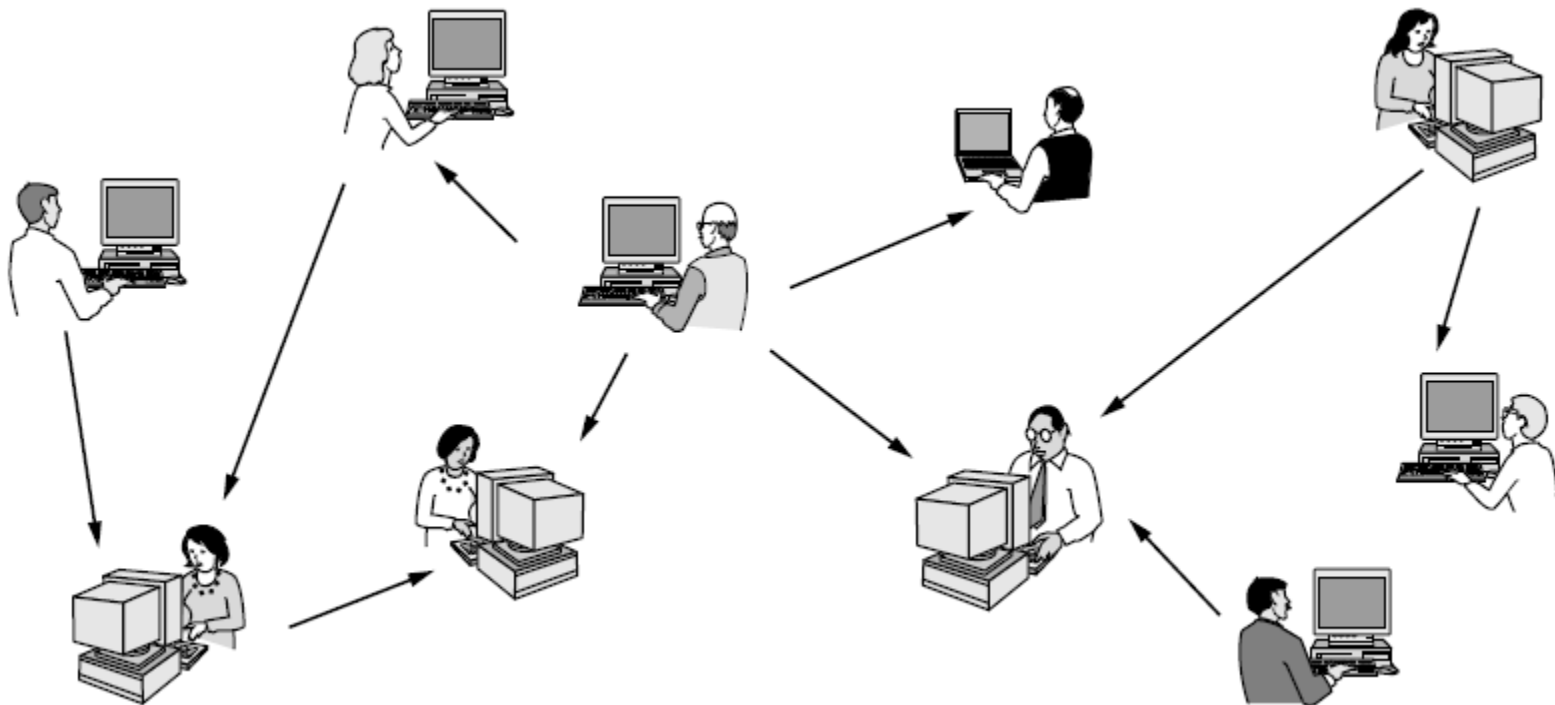
**A network with two clients and one server**

# Business Applications (2)



**The client-server model involves requests and replies**

# Home Applications (1)



**In a peer-to-peer system there are no fixed clients and servers.**

# Home Applications (2)

## Some forms of e-commerce

Tag	Full name	Example
B2C	Business-to-consumer	Ordering books online
B2B	Business-to-business	Car manufacturer ordering tires from supplier
G2C	Government-to-consumer	Government distributing tax forms electronically
C2C	Consumer-to-consumer	Auctioning second-hand products online
P2P	Peer-to-peer	Music sharing



# Mobile Users

## Combinations of wireless networks and mobile

Wireless	Mobile	Typical applications
No	No	Desktop computers in offices
No	Yes	A notebook computer used in a hotel room
Yes	No	Networks in unwired buildings
Yes	Yes	Store inventory with a handheld computer

# Social Issues

- Network neutrality
- Digital Millennium Copyright Act
- Profiling users
- Phishing

# PROTOCOLS

- A protocol is synonymous with rule. It consists of a set of rules that govern data communications. It determines what is communicated, how it is communicated and when it is communicated.
- The key elements of a protocol are
  - Syntax
  - Semantics
  - Timing



# Elements of a Protocol

- Syntax
  - Structure or format of the data
  - Indicates how to read the bits - field delineation
- Semantics
  - Interprets the meaning of the bits
  - Knows which fields define what action
- Timing
  - When data should be sent and what
  - Speed at which data should be sent or speed at which it is being received.

# Types of Network

- **Wired Networks**

- high bandwidth
- low bandwidth variability
- can listen on wire
- high power machines
- high resource machines
- low delay
- connected operation

-No Mobility.

- **Mobile Networks**

- low bandwidth
- high bandwidth variability
- hidden terminal problem
- low power machines
- low resource machines
- higher delay
- disconnected operation

Mobility.

# The End

