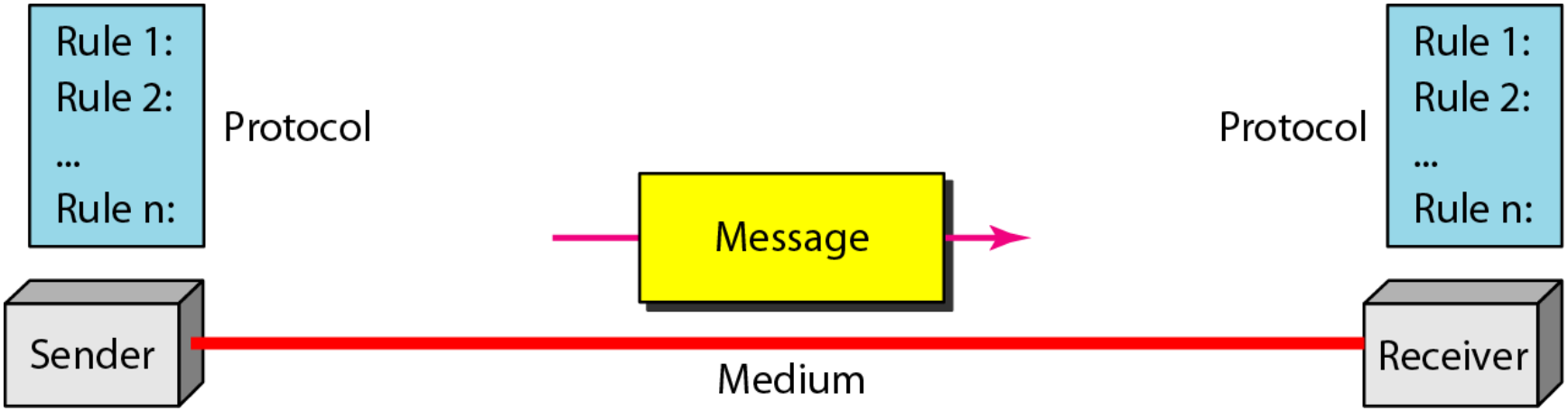
History, Goals and Applications of Networks

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.*

Components of a data communication system



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.*

Computer network

- A computer network is a set of computers connected together for the purpose of sharing resources.
- The most common resource shared today is information over Internet.
- Other shared resources can include a printer or a file server etc.
- In computer networks, networked computing devices pass data to each other along with data connections Data is transferred in the form of packets.
- The connections between nodes are established using either cable media or wireless media.
- The best-known computer network is the Internet.

Goals of computer network

Goals of computer network are as follow :

- To provide sharing of resources such as information, devices or processors
- To provide inter-process communication among user and processors.
- It provides the network user with maximum performance at minimum cost
- It provides centralized control for a geographically distributed system.
- It provides compatibility of dissimilar equipment and software.
- It provides centralized management and allocation of network resources.
- It provides distributed processing functions.

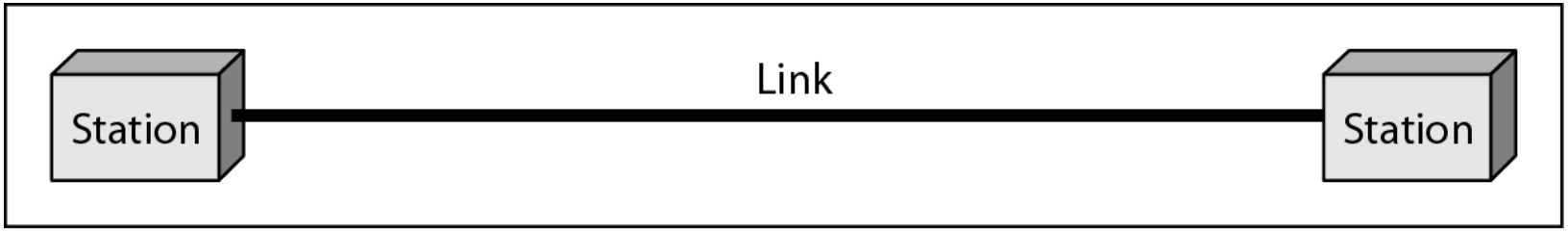
Network Criteria

- **Performance**
  - **Depends on Network Elements**
  - **Measured in terms of Delay and Throughput**
- **Reliability**
  - **Failure rate of network components**
  - **Measured in terms of availability/robustness**
- **Security**
  - **Data protection against corruption/loss of data due to:**
    - **Errors**
    - **Malicious users**

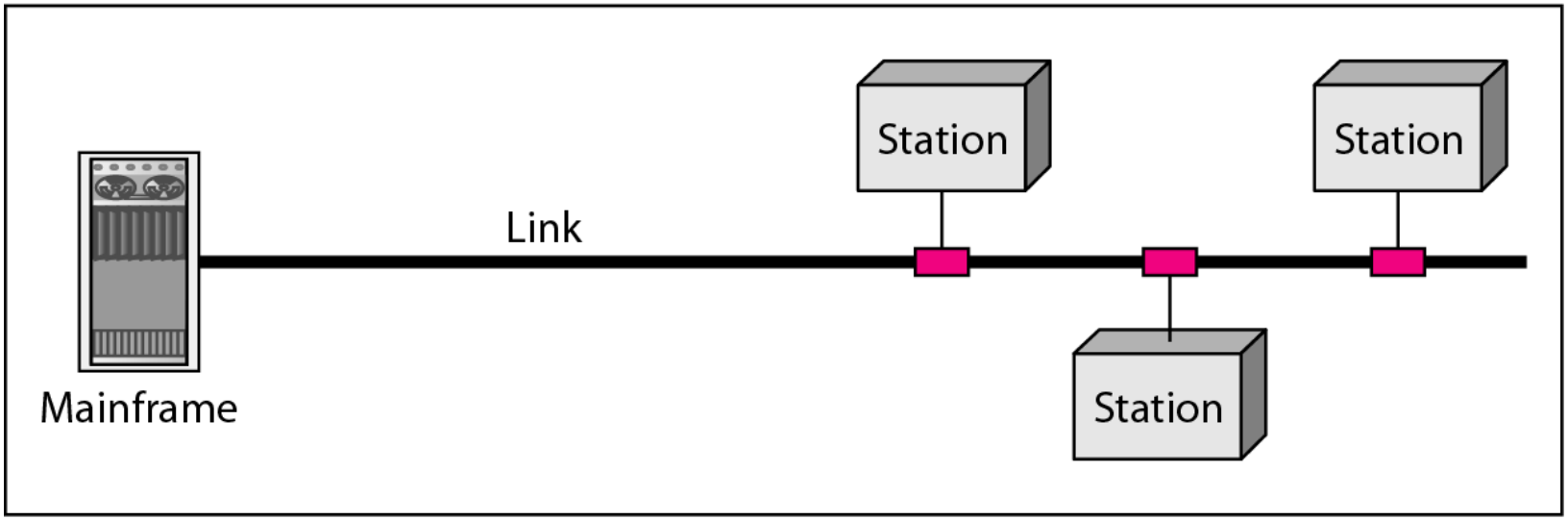
Physical Structures

- **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

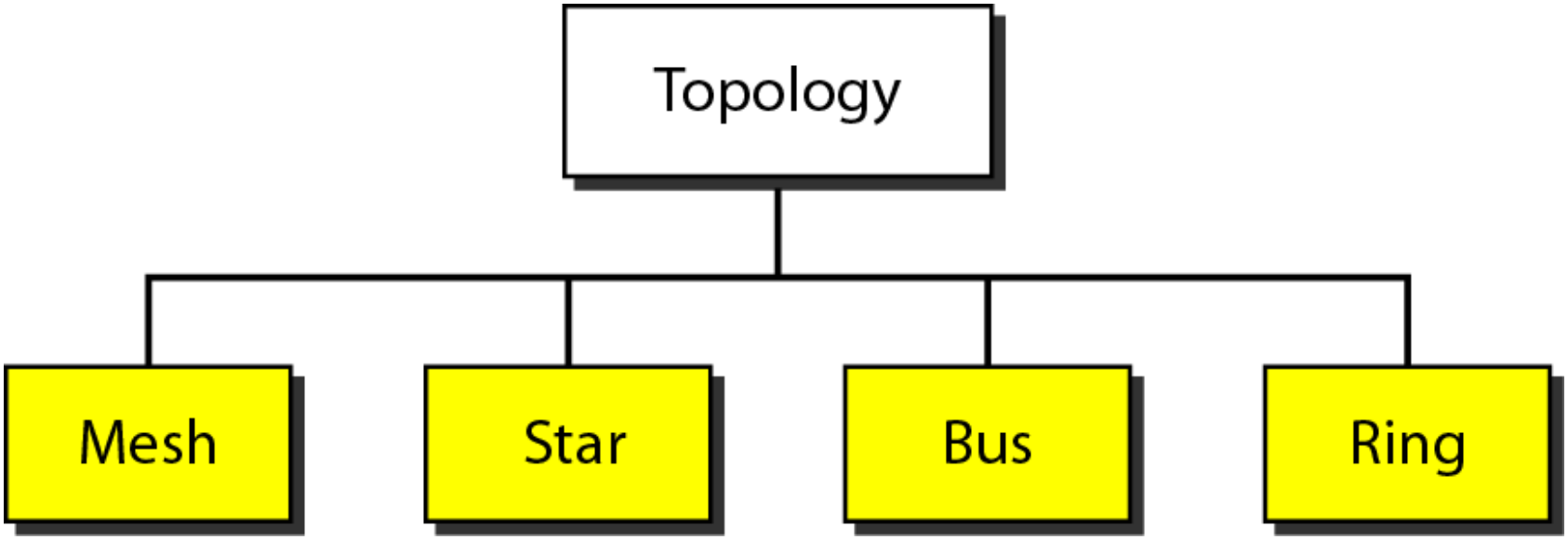


a. Point-to-point

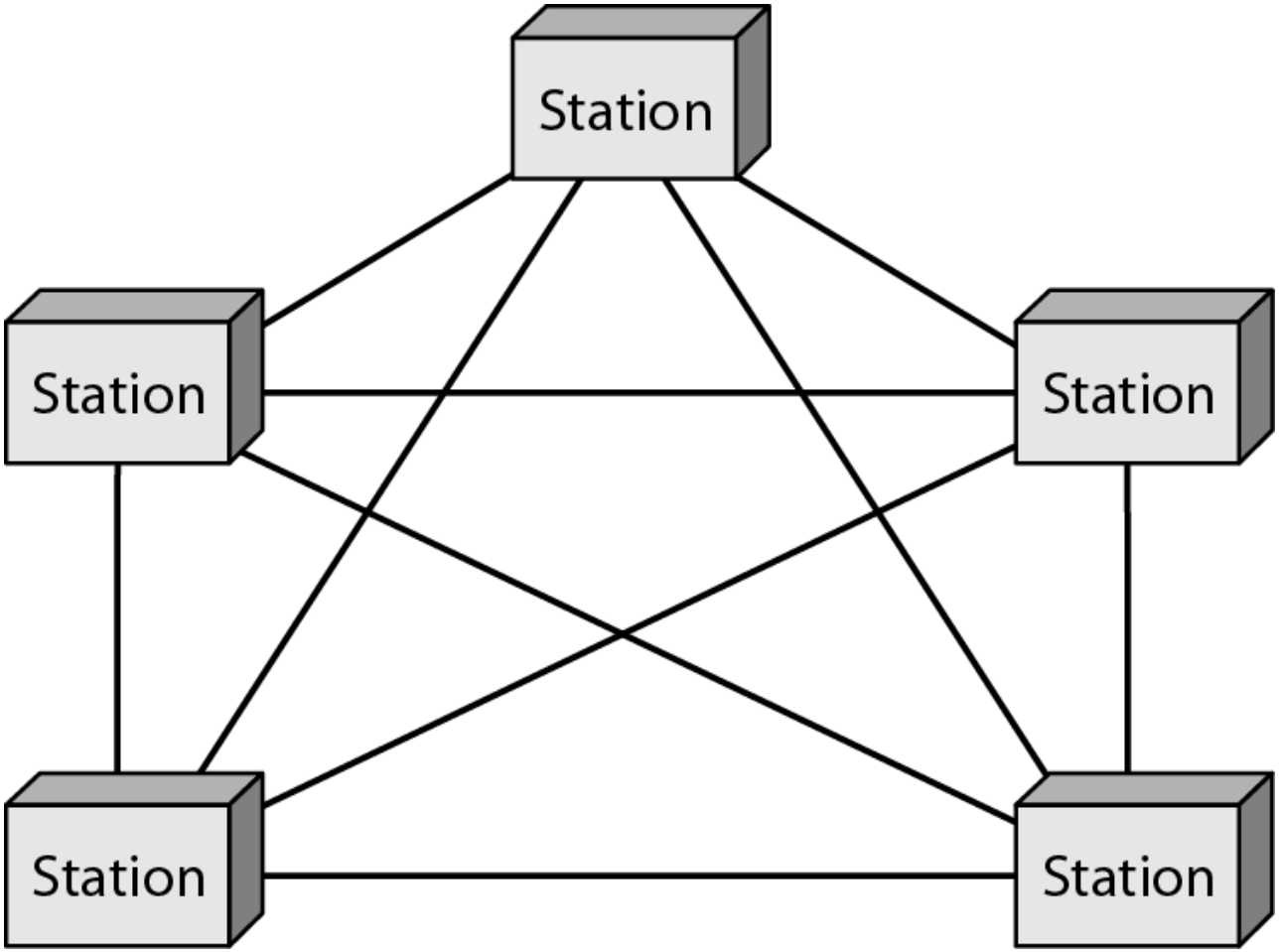


b. Multipoint

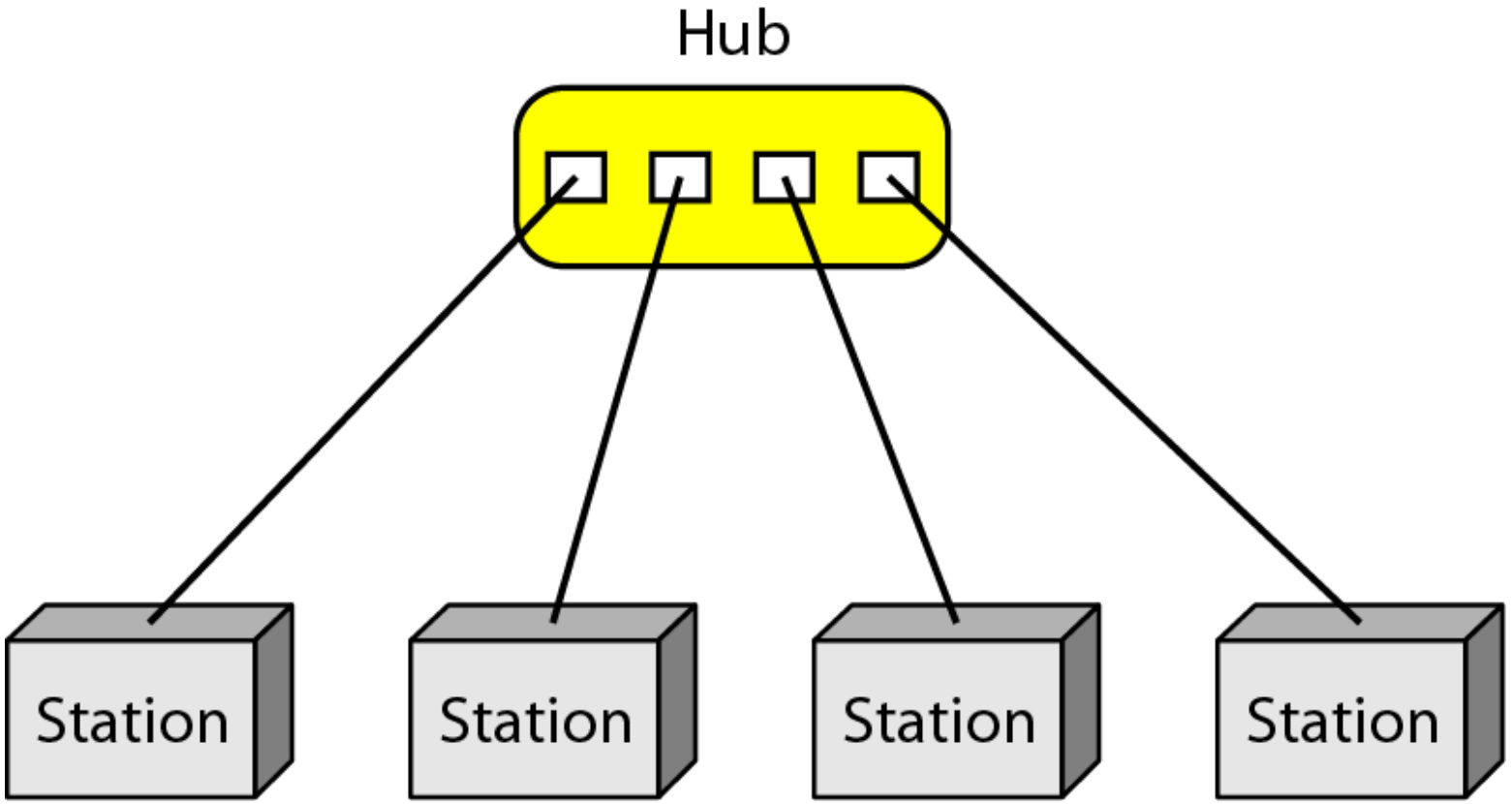
Categories of topology



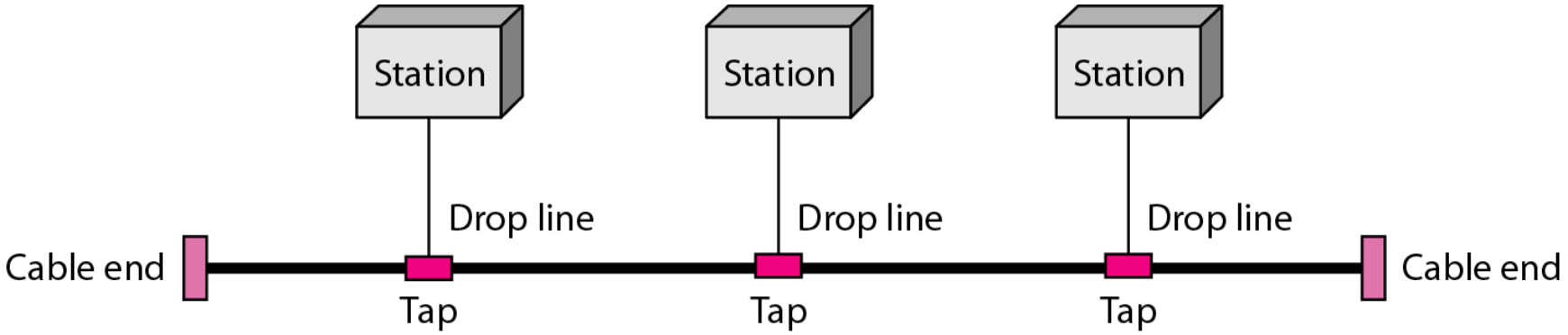
A fully connected mesh topology (five devices)



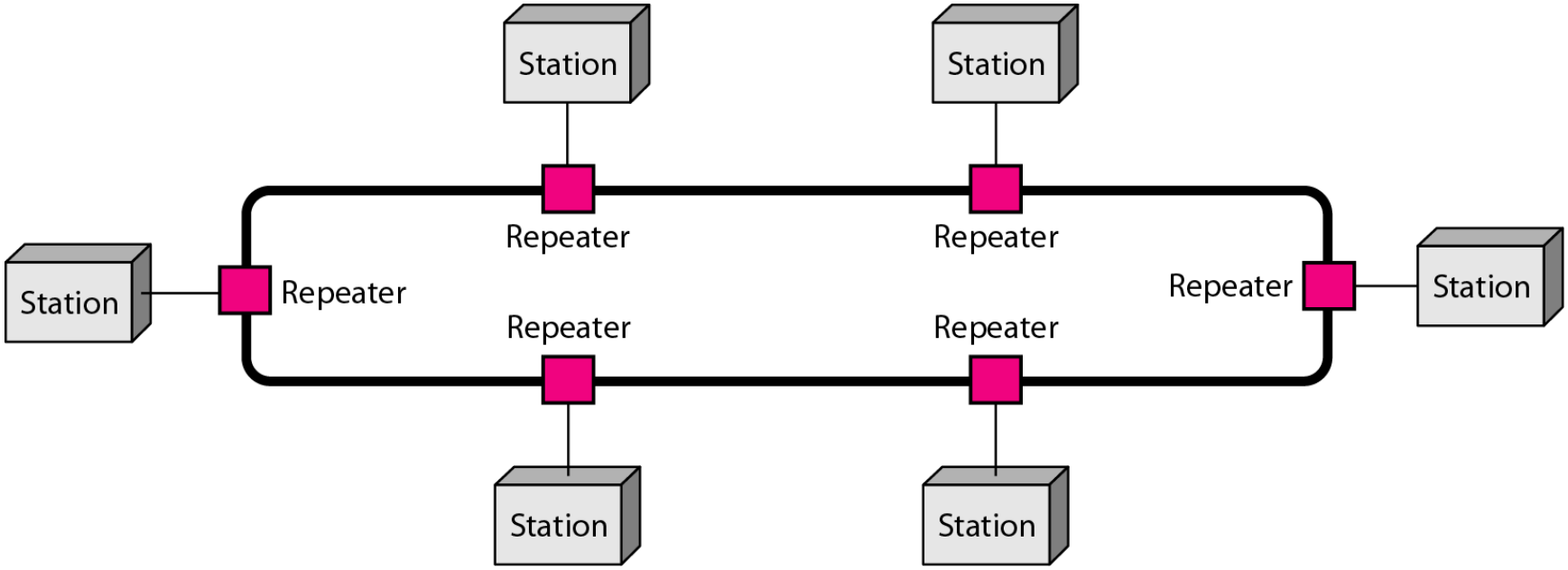
A star topology connecting four stations



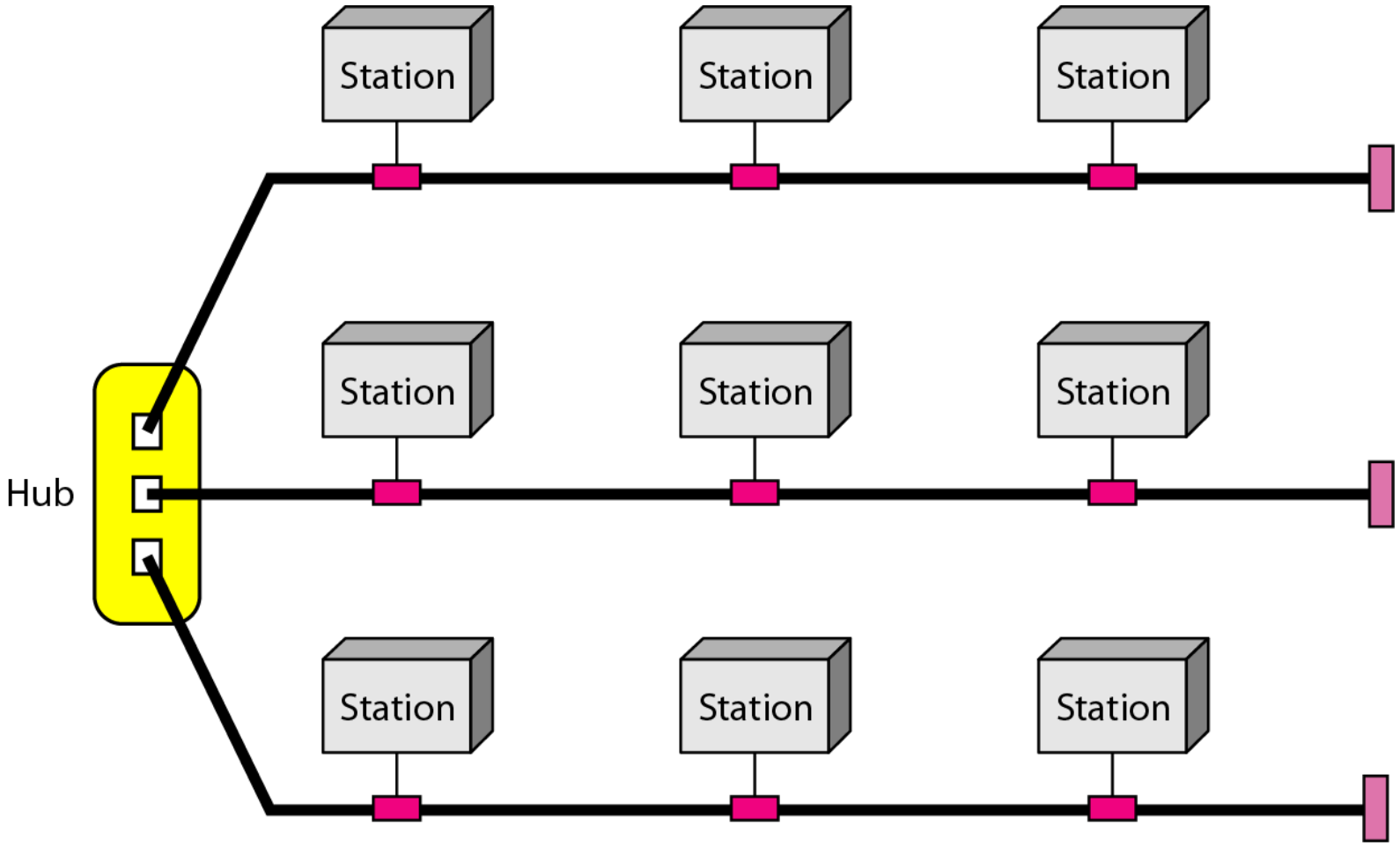
A bus topology connecting three stations



A ring topology connecting six stations



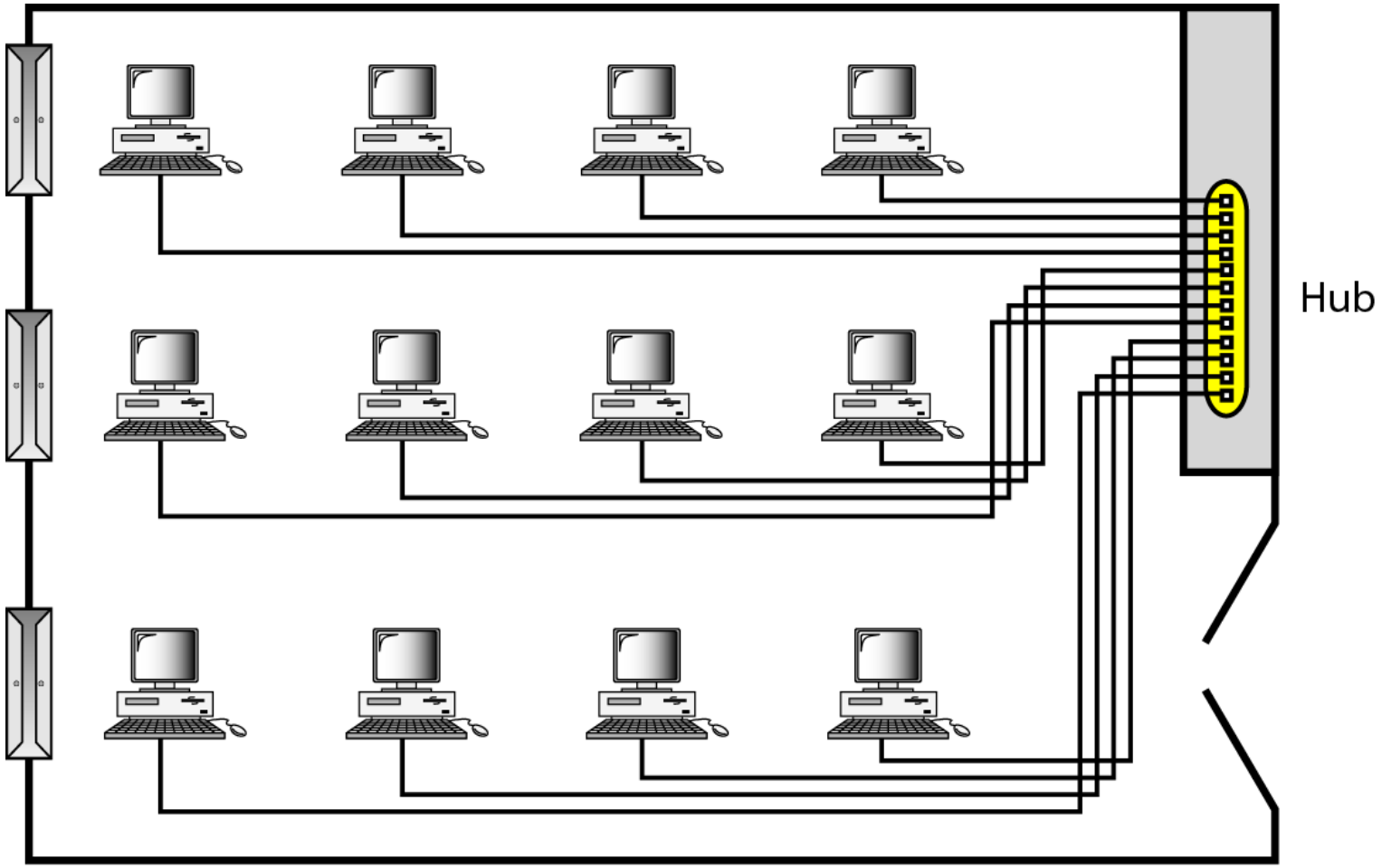
A hybrid topology: a star backbone with three bus networks



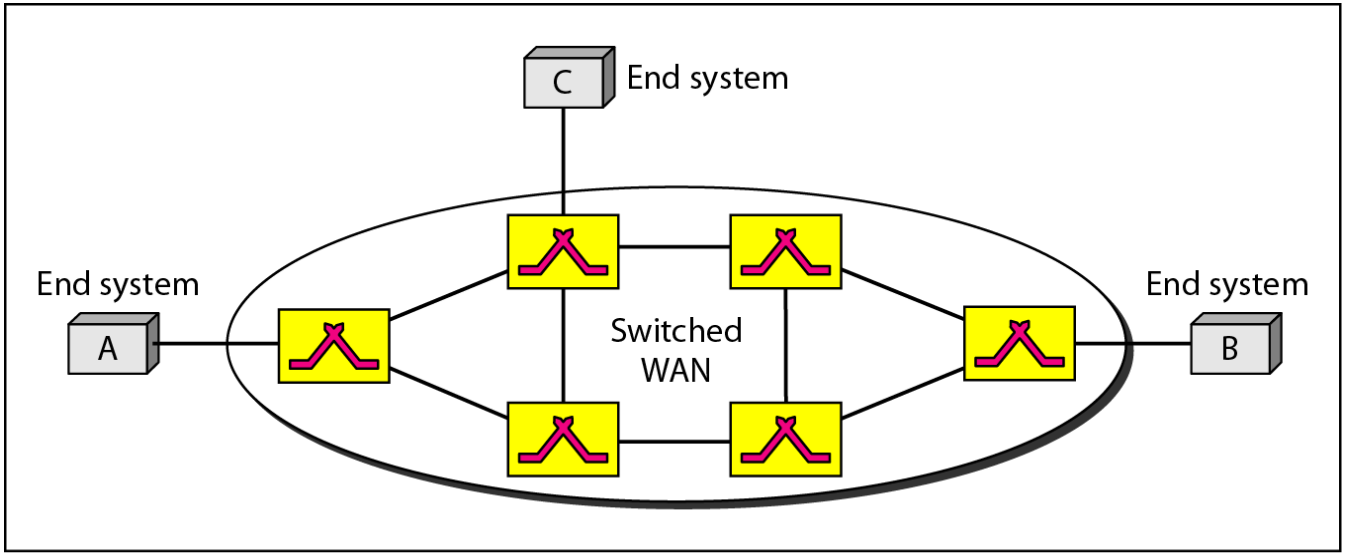
Categories of Networks

- **Local Area Networks (LANs)**
  - **Short distances**
  - **Designed to provide local interconnectivity**
- **Wide Area Networks (WANs)**
  - **Long distances**
  - **Provide connectivity over large areas**
- **Metropolitan Area Networks (MANs)**
  - **Provide connectivity over areas such as a city, a campus**

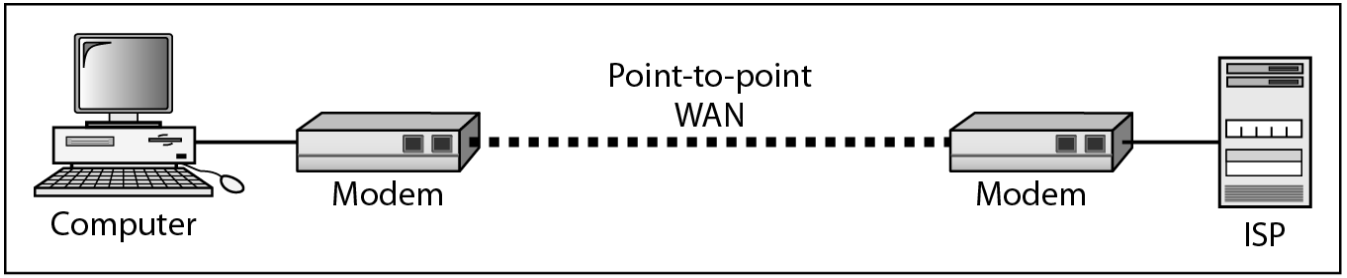
An isolated LAN connecting 12 computers to a hub in a closet



WANs: a switched WAN and a point-to-point WAN

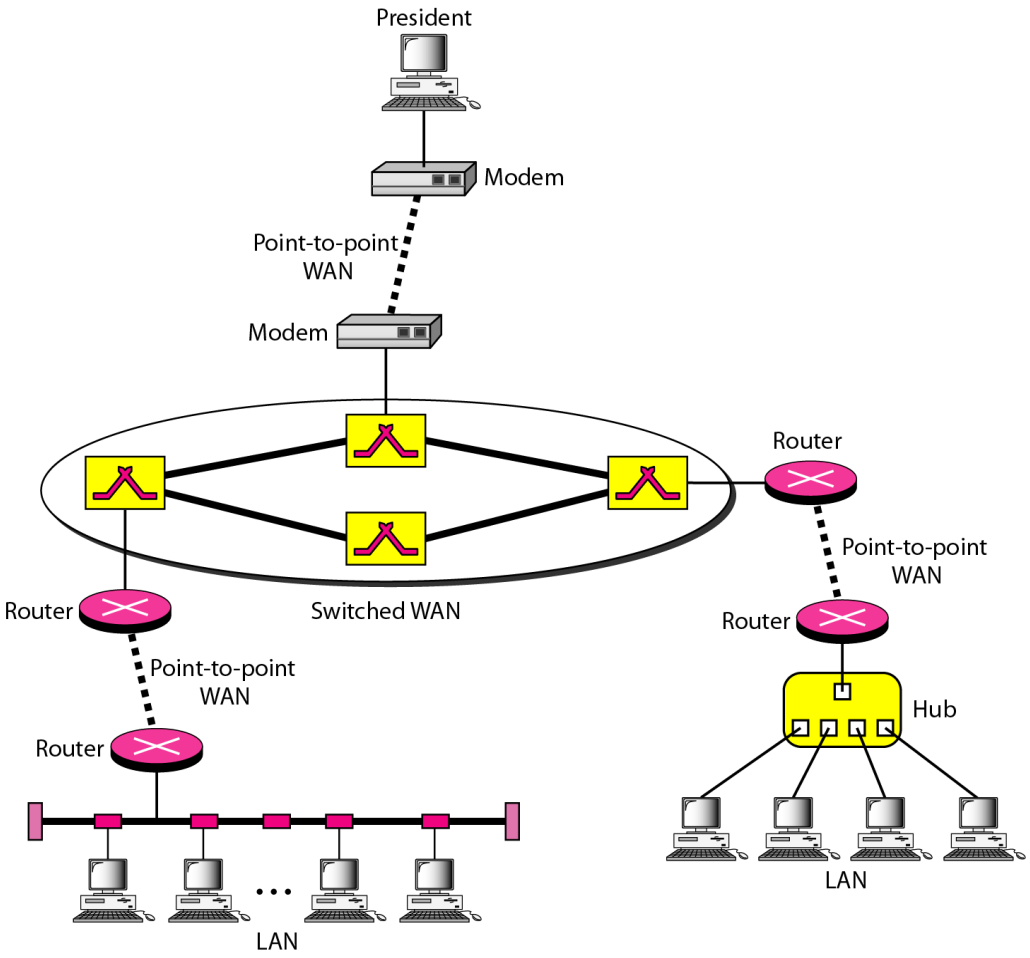


a. Switched WAN



b. Point-to-point WAN

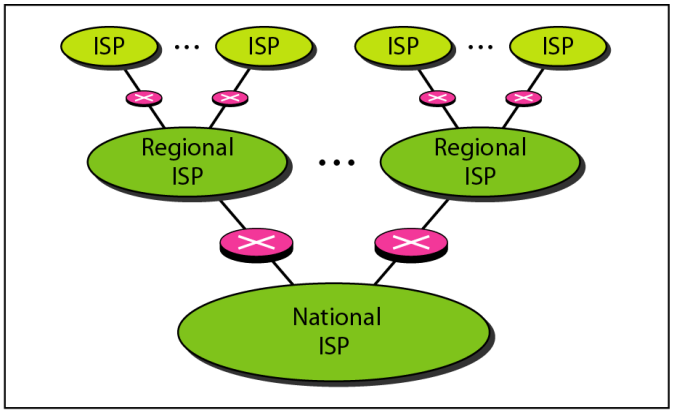
A heterogeneous network made of four WANs and two LANs



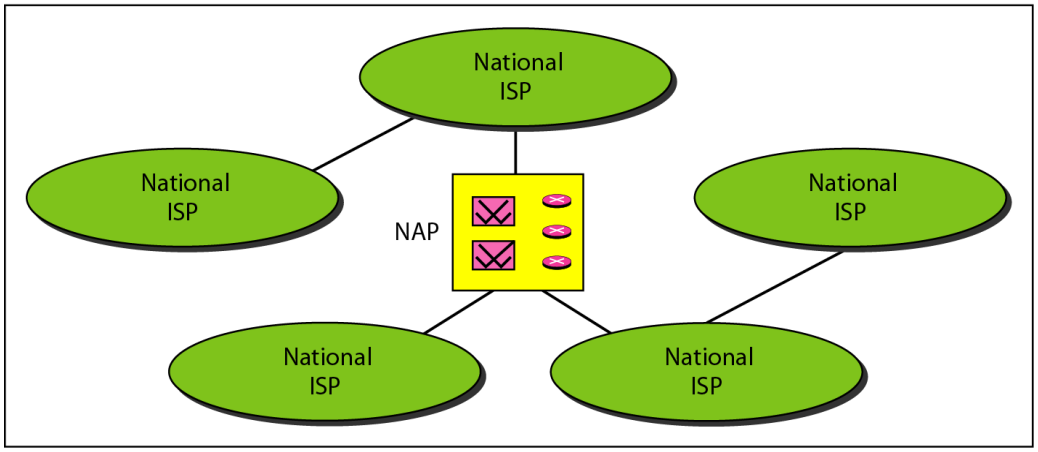
THE INTERNET

- *The Internet has revolutionized many aspects of our daily lives. It has affected the way we do business as well as the way we spend our leisure time. The Internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use.*

Hierarchical organization of the Internet



a. Structure of a national ISP



b. Interconnection of national ISPs

Applications of Networks

Major application areas of computer network are as follows :

1. Business application a)Database resources b)Communication media c)Electronic commerce d)Internet access provider
2. Home application a)Internet access b)Personal communication c)Entertainment d)Electronic commerce
3. Mobile applications : Many professionals use desktop computers at office and want to be connected to the office network while travelling and at home also. This is possible by wireless networks, hence use of lap- top, notebook computers and personal digital assistants has increased. Mobiles applications are used in:
   I. Taxis, delivery vehicles and other mobile vehicles for keeping contacts with their office.
   II. Geographical information system.
   III. Military application.
4. 4.Airports.
5. Banking.
6. 6.Weather reporting.

Applications of Networks

7. Business application : Now a days computers are being used in almost all business process. For example, use of computers to monitor production, inventories, to make payments. Resource sharing is the important purpose of using computer networks. Resources like programs, equipments and data are required to share amongst various users. a)Database resources b)Communication media c)Electronic commerce d)Internet access

8. Home application : a)Internet access b)Personal communication c)Entertainment d)Electronic commerce E-Mail, instant messaging, chatting, internet telephony, video phone provides personal communication by using internet and WWW.

9. Electronic commerce(E- Commerce)Application

I. Business –to – consumer on line ordering.

II. Business –to – Business Supply chain management (Suppliers to manufactures).

III. Government –to – consumer Different government forms on internet, e.g. income tax, state tax, electricity bills, application forms etc.

IV. Consumer –to – consumer Auctioning of second hand products.

Text and Reference Books:

- A. S Tanenbaum, “Computer Networks, PHI
- Forouzan, “Data Communication and Networking”, TMH