



# Data Communications and Networking

Fourth Edition

**aminotes**  
Forouzan

## Chapter 1

# Introduction

## 1-1 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.*

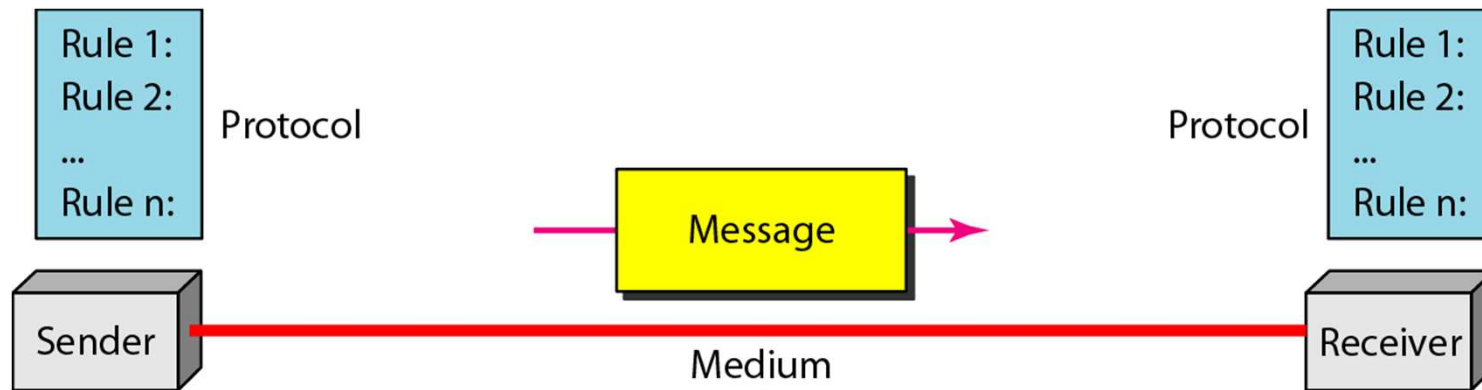
### *Topics discussed in this section:*

**Components**

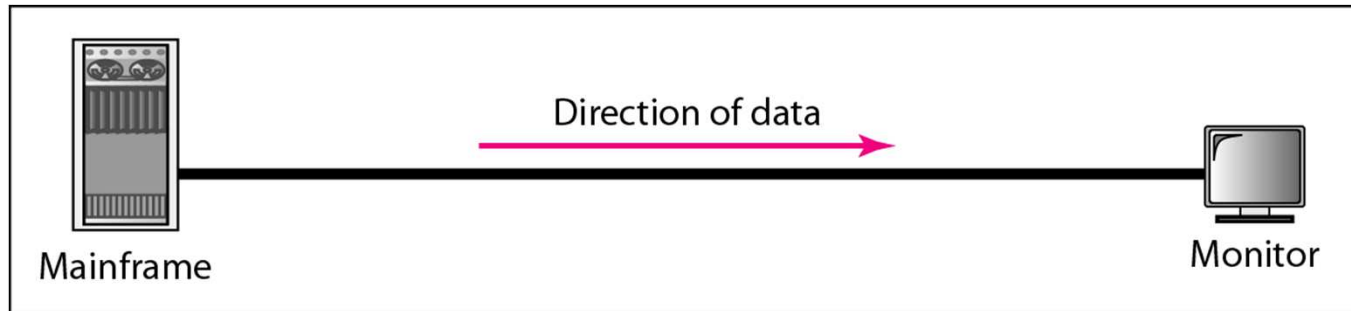
**Data Representation**

**Data Flow**

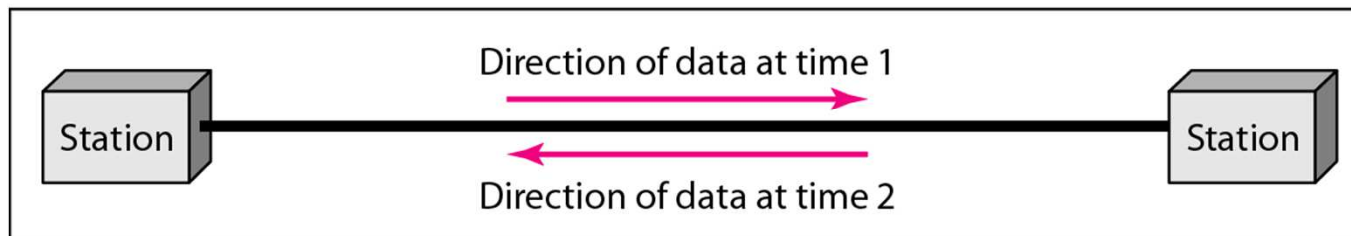
**Figure 1.1** *Five components of data communication*



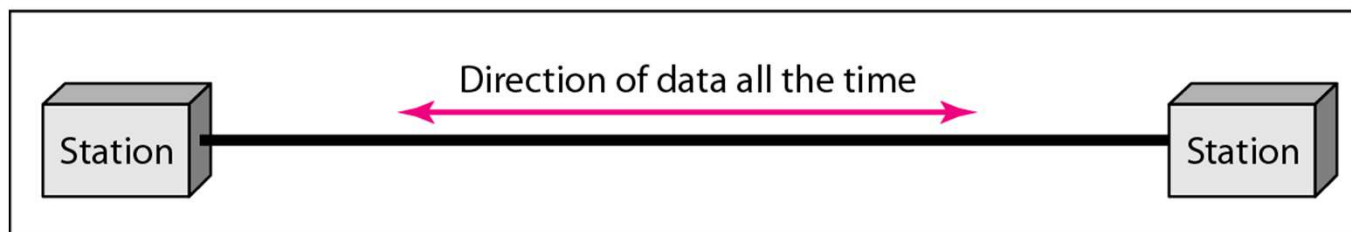
**Figure 1.2** *Data flow (simplex, half-duplex, and full-duplex)*



a. Simplex



b. Half-duplex



c. Full-duplex

## 1-2 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.*

### *Topics discussed in this section:*

**Distributed Processing**

**Network Criteria**

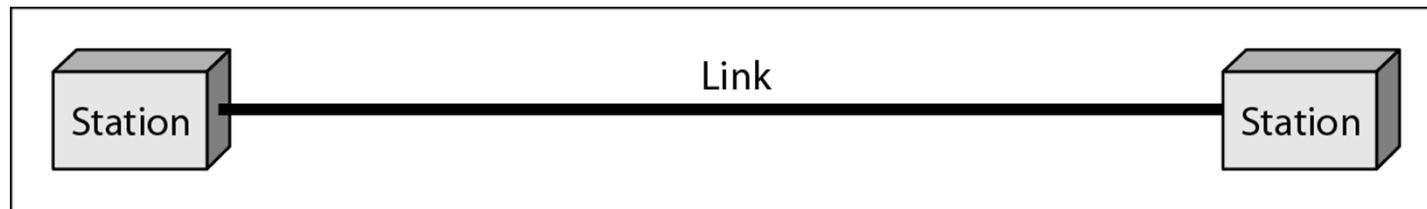
**Physical Structures**

**Network Models**

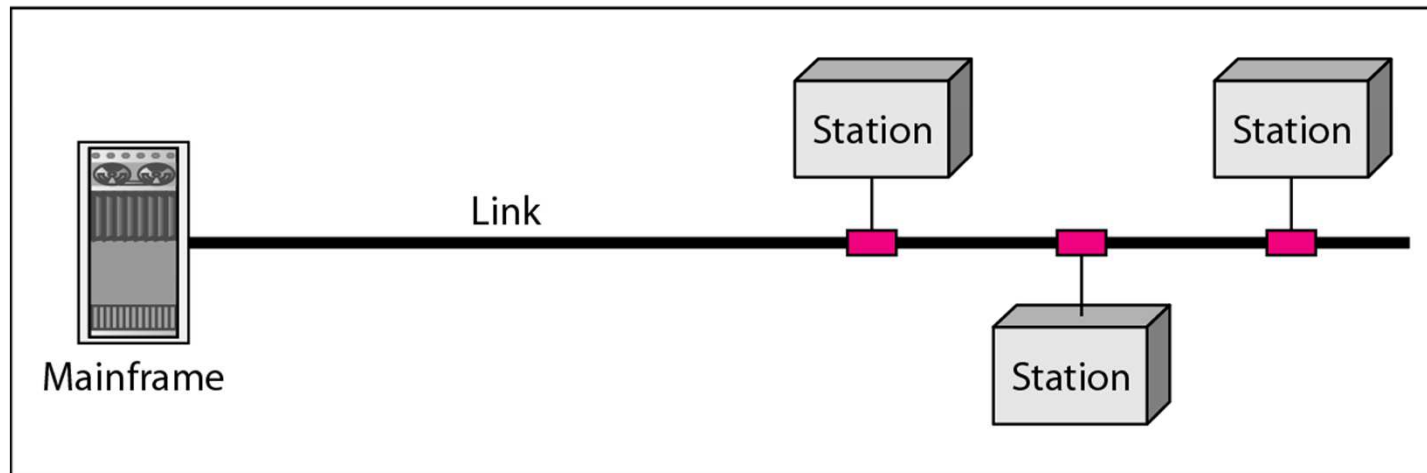
**Categories of Networks**

**Interconnection of Networks: Internetwork**

**Figure 1.3** *Types of connections: point-to-point and multipoint*

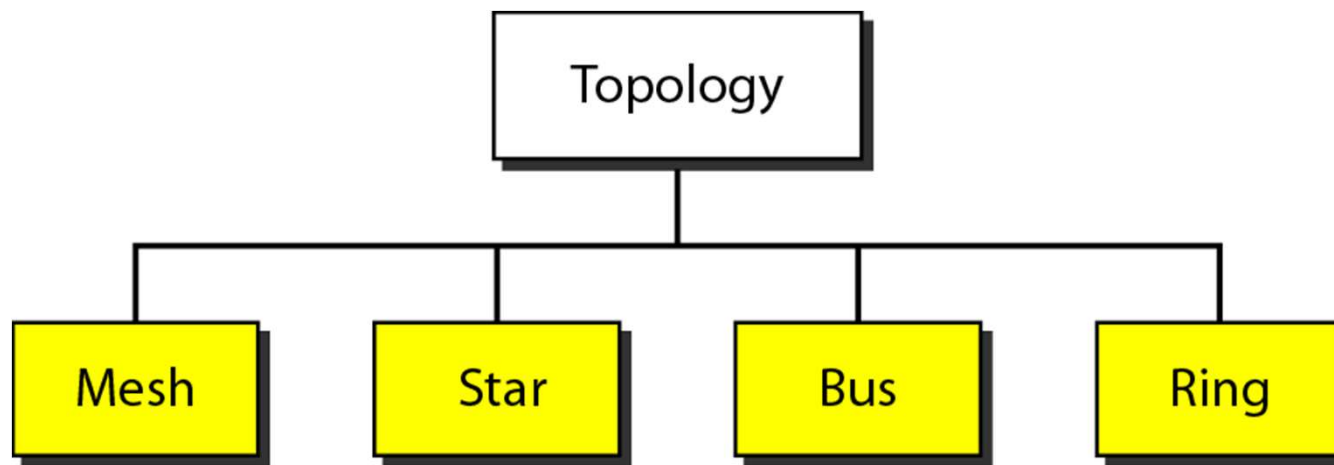


a. Point-to-point

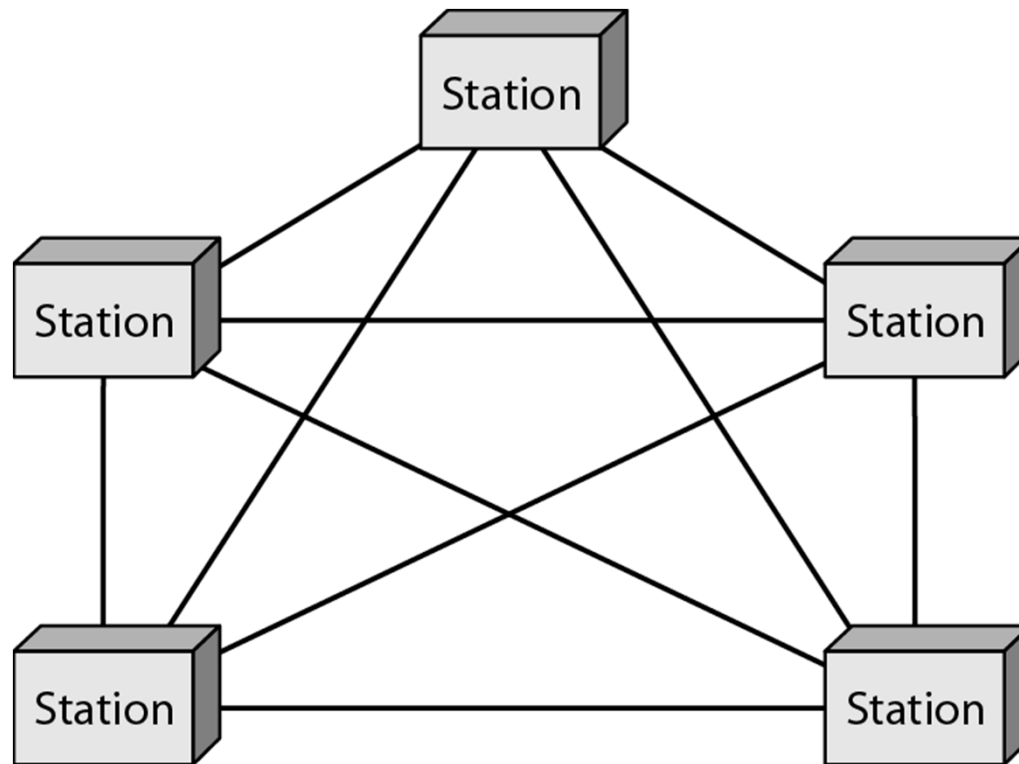


b. Multipoint

**Figure 1.4** *Categories of topology*

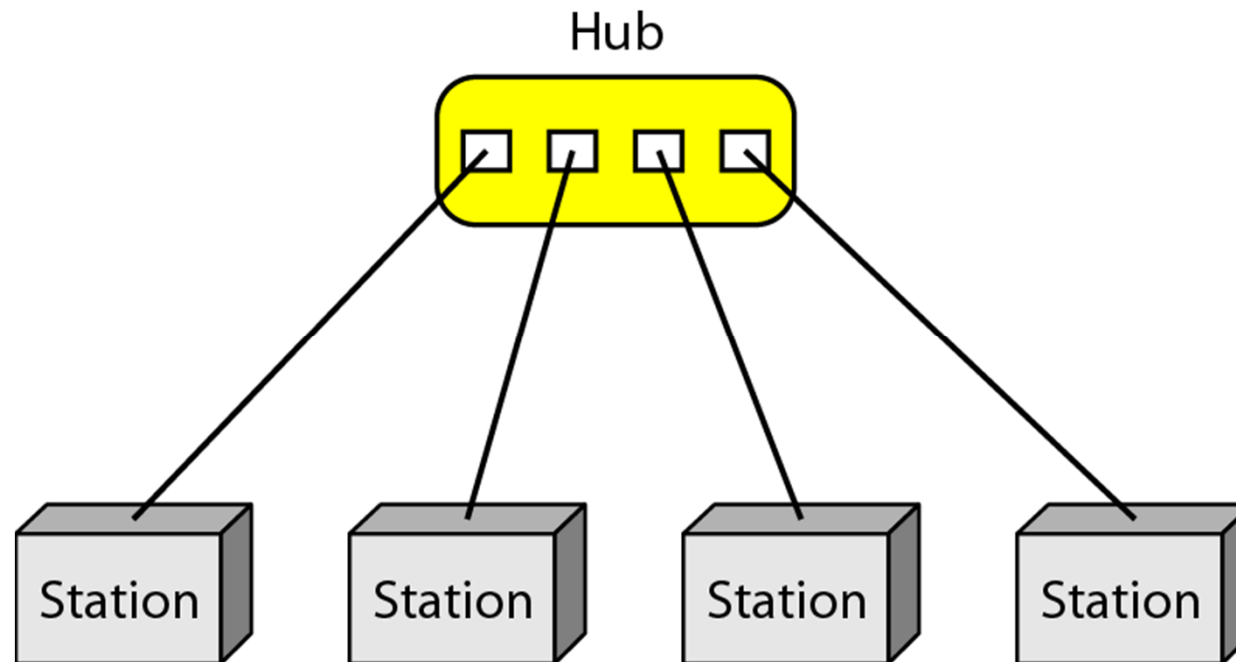


**Figure 1.5** *A fully connected mesh topology (five devices)*

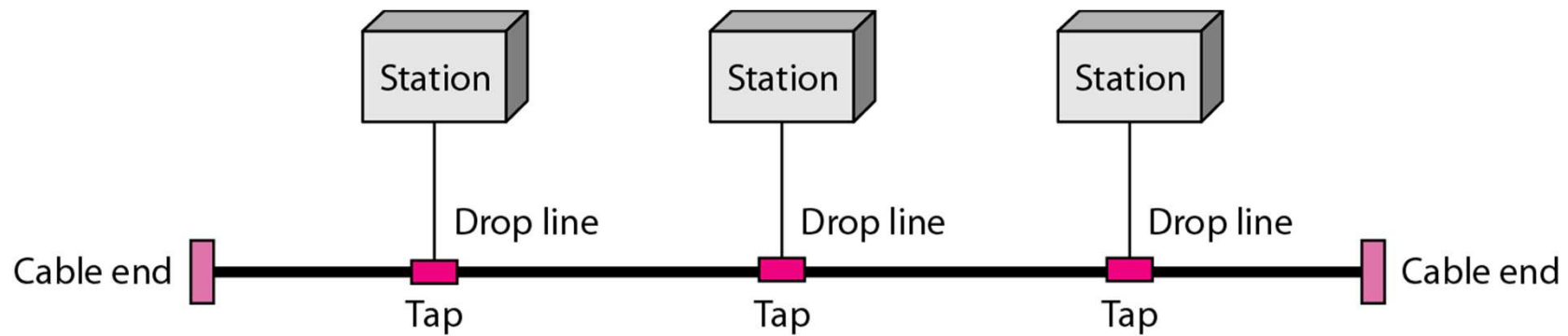




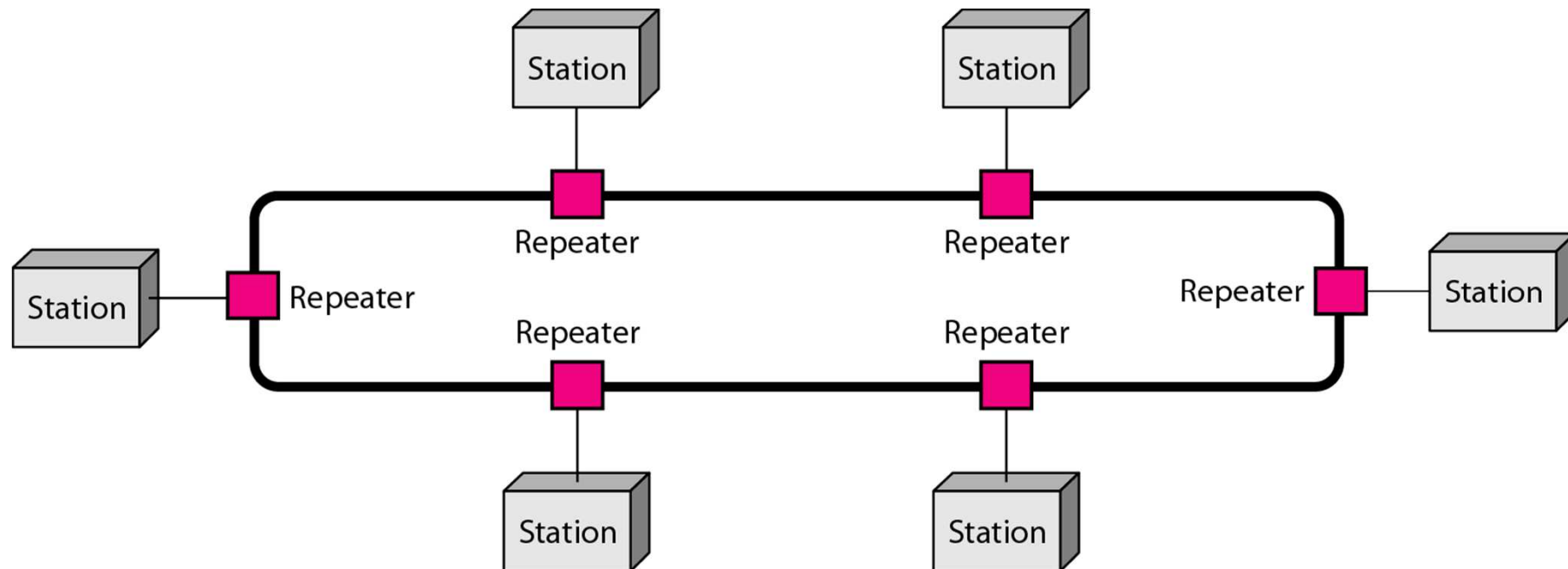
**Figure 1.6** *A star topology connecting four stations*



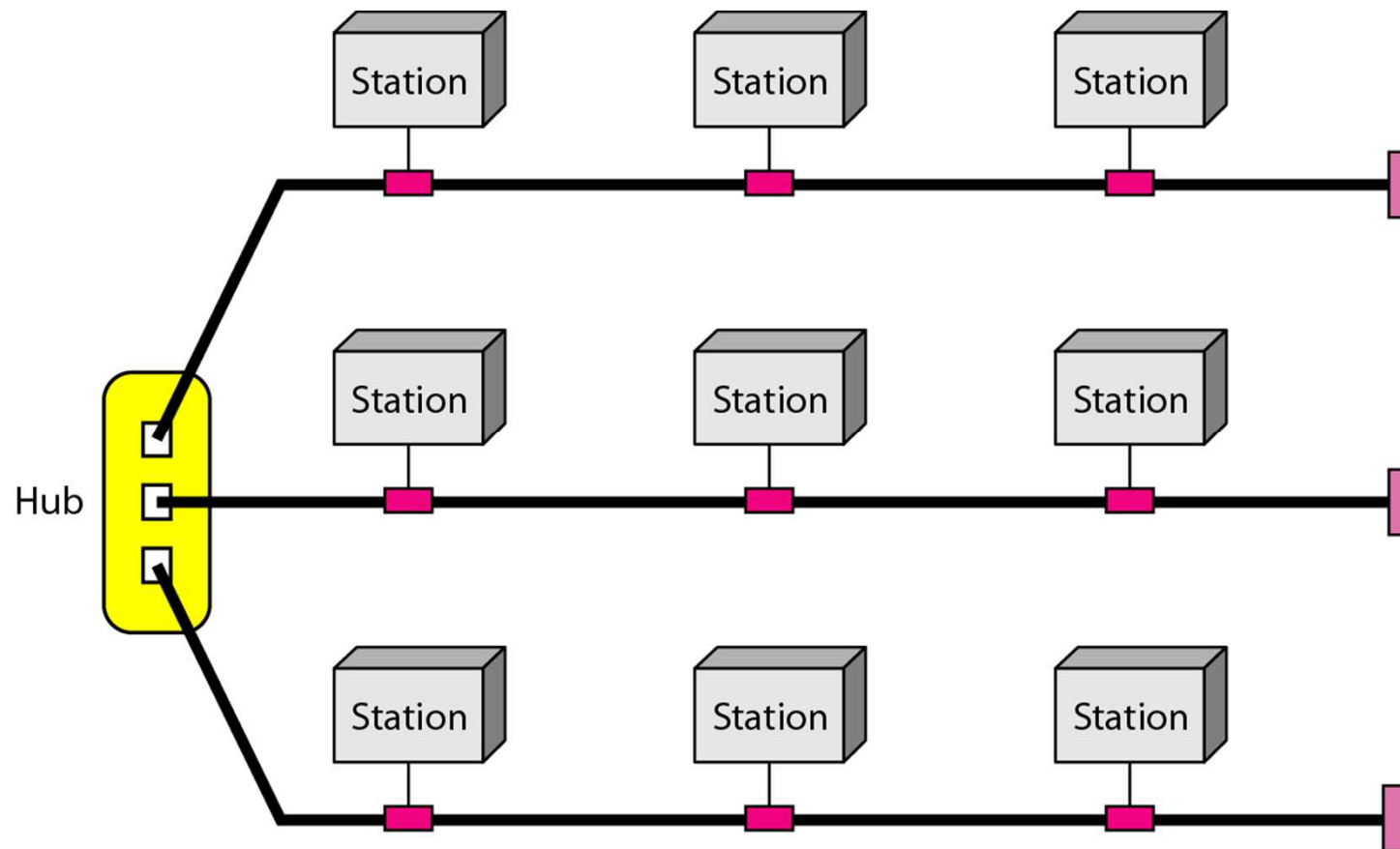
**Figure 1.7** *A bus topology connecting three stations*



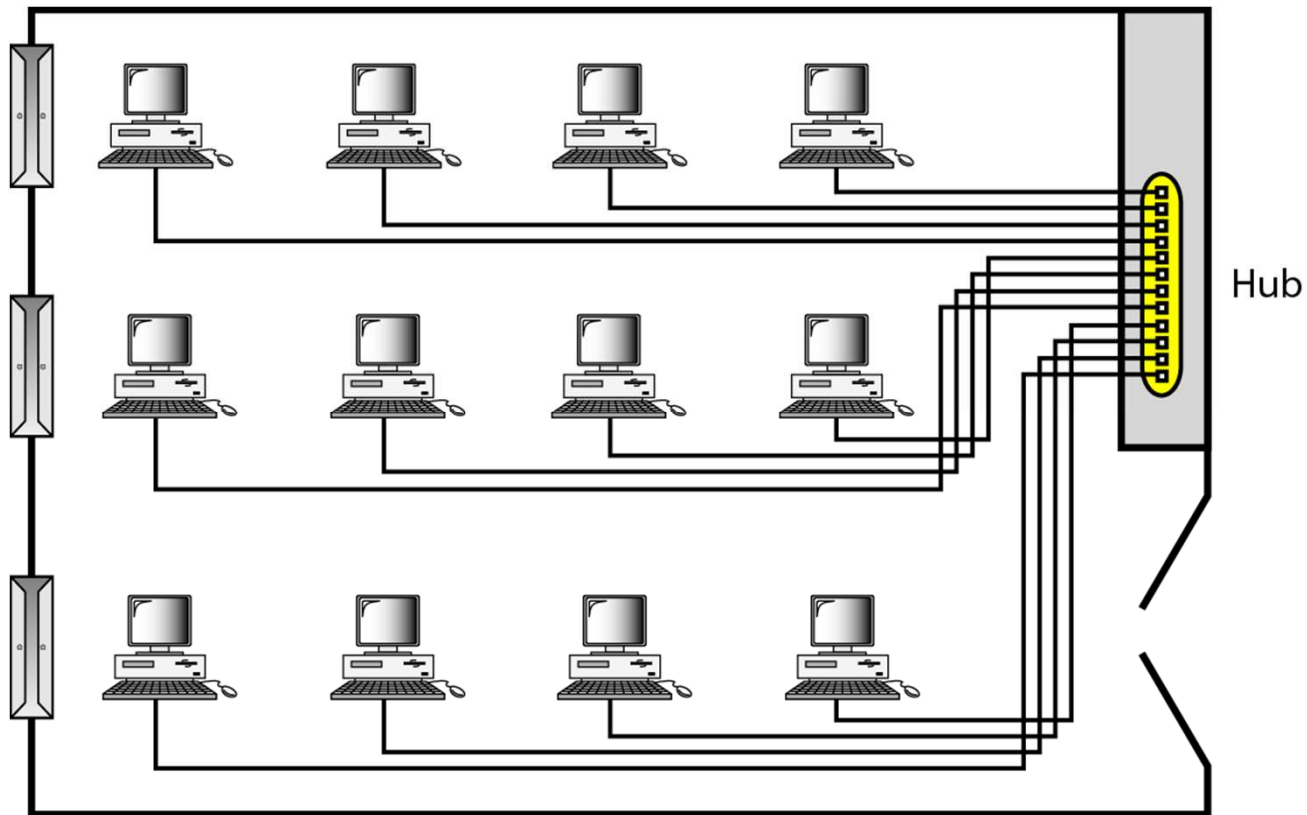
**Figure 1.8** *A ring topology connecting six stations*



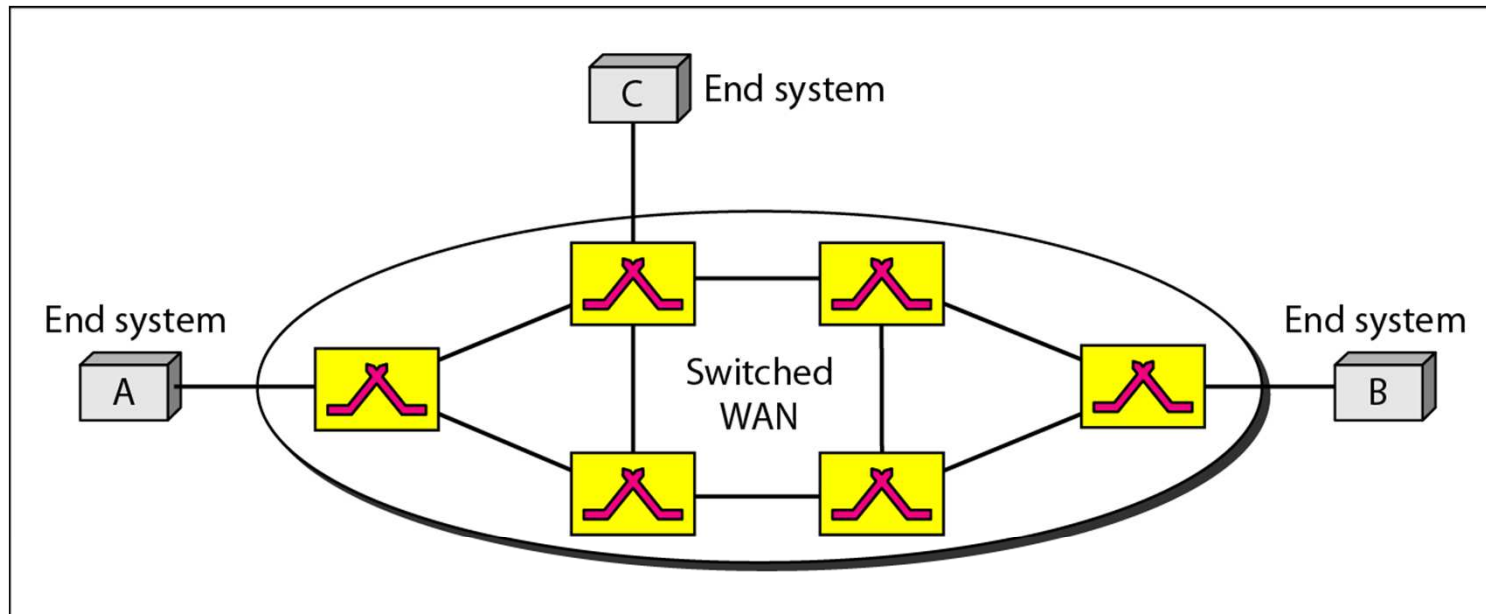
**Figure 1.9** *A hybrid topology: a star backbone with three bus networks*



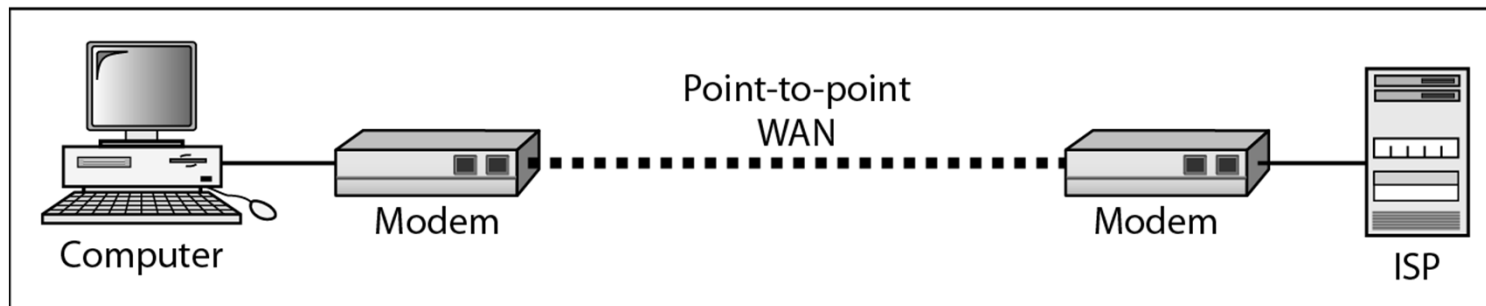
**Figure 1.10** *An isolated LAN connecting 12 computers to a hub in a closet*



**Figure 1.11** *WANs: a switched WAN and a point-to-point WAN*

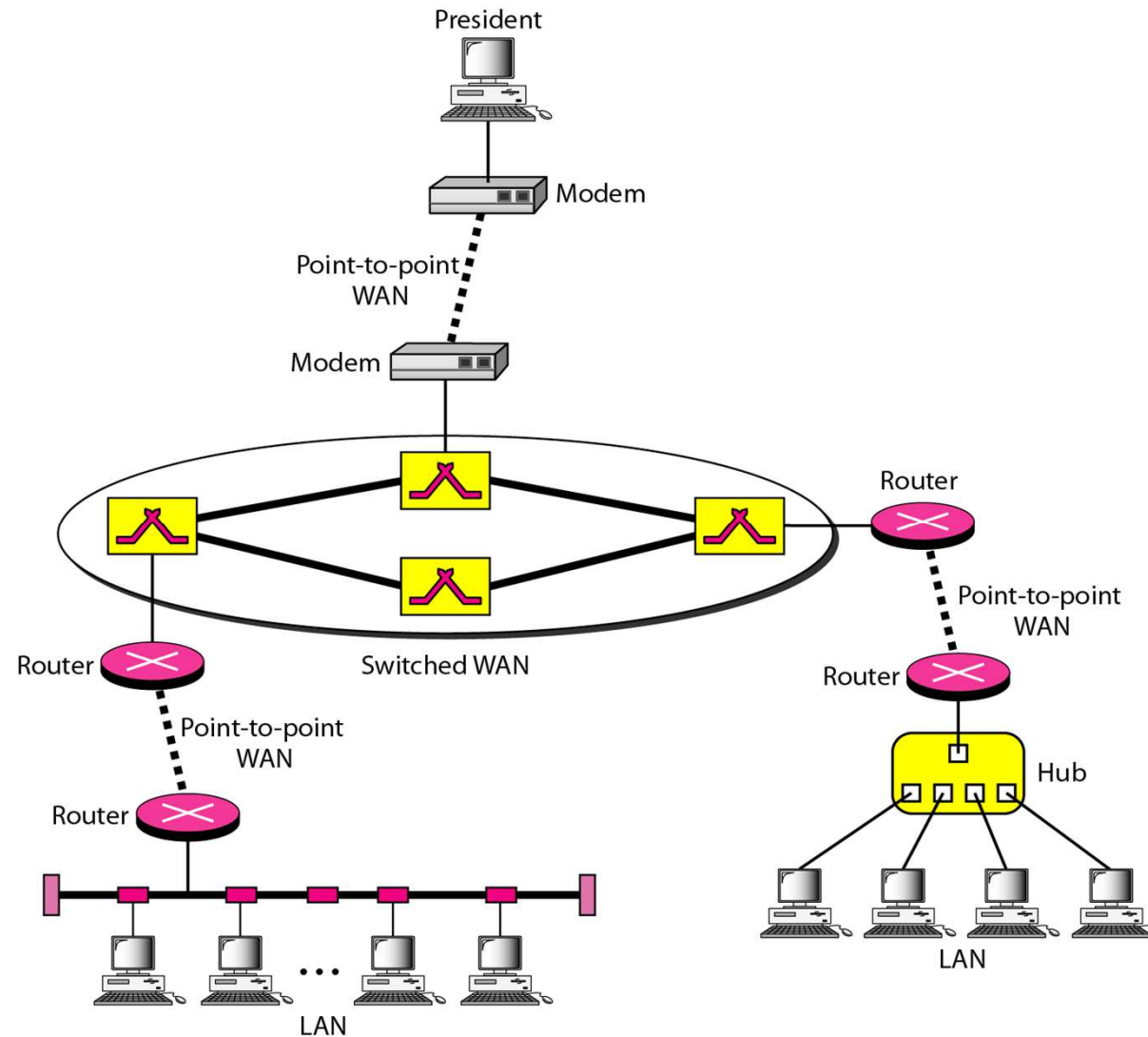


a. Switched WAN



b. Point-to-point WAN

**Figure 1.12** *A heterogeneous network made of four WANs and two LANs*



## 1-3 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.*

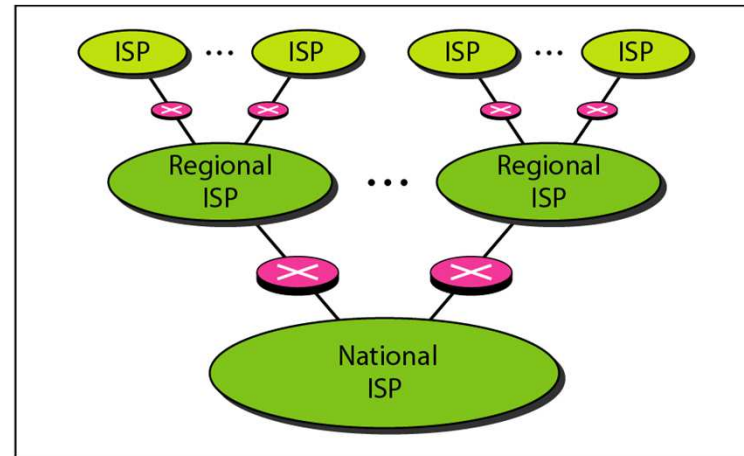
*Topics discussed in this section:*

**A Brief History**

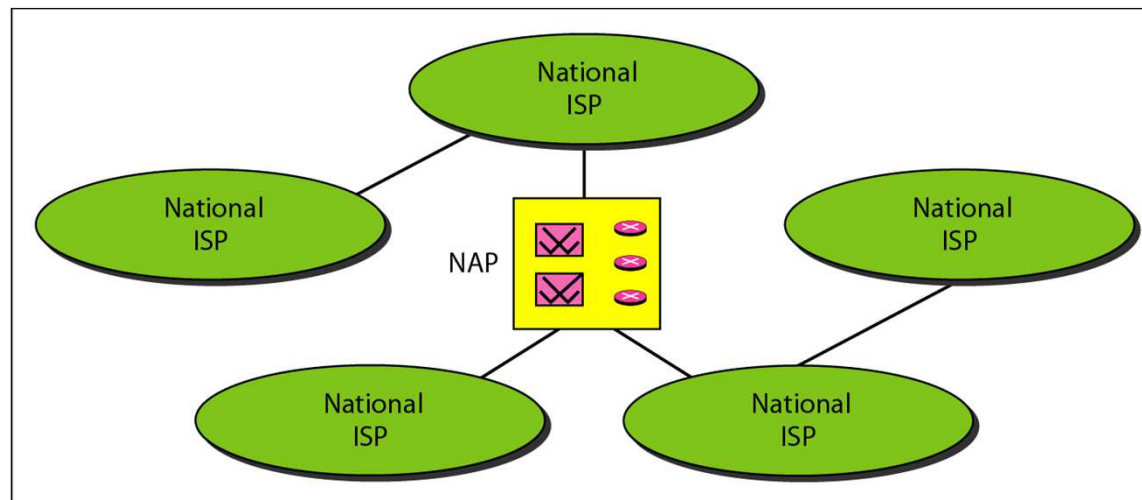
**The Internet Today (ISPs)**



**Figure 1.13** *Hierarchical organization of the Internet*



a. Structure of a national ISP



b. Interconnection of national ISPs

## 1-4 PROTOCOLS AND STANDARDS

*In this section, we define two widely used terms: **protocols** and **standards**. First, we define protocol, which is synonymous with rule. Then we discuss standards, which are agreed-upon rules.*

### *Topics discussed in this section:*

Protocols

Standards

Standards Organizations

Internet Standards