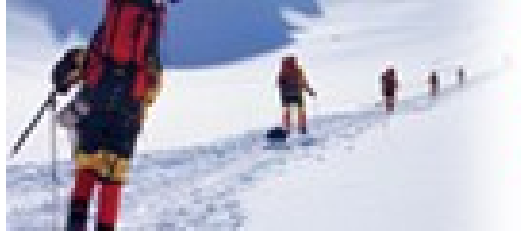


Data Communications and Networking Fourth Edition

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

1-1 DATA COMMUNICATIONS

Effective Characteristics of Data Communication

Delivery (intended Reciever)
Accuracy (unchanged data)
Timeliness
Jitter (uneven delay in audio/video streaming)

Figure 1.1 *Five components of data communication*

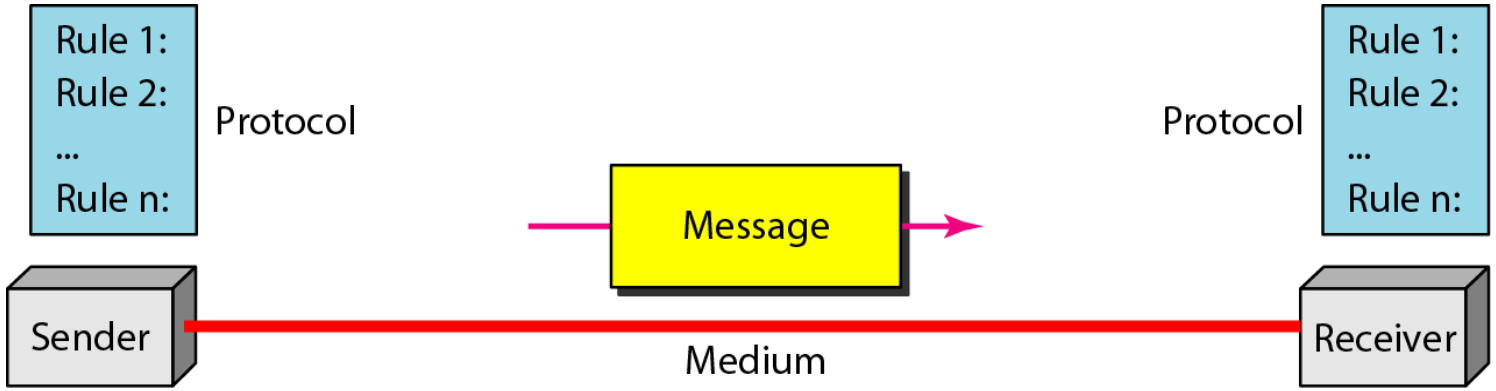
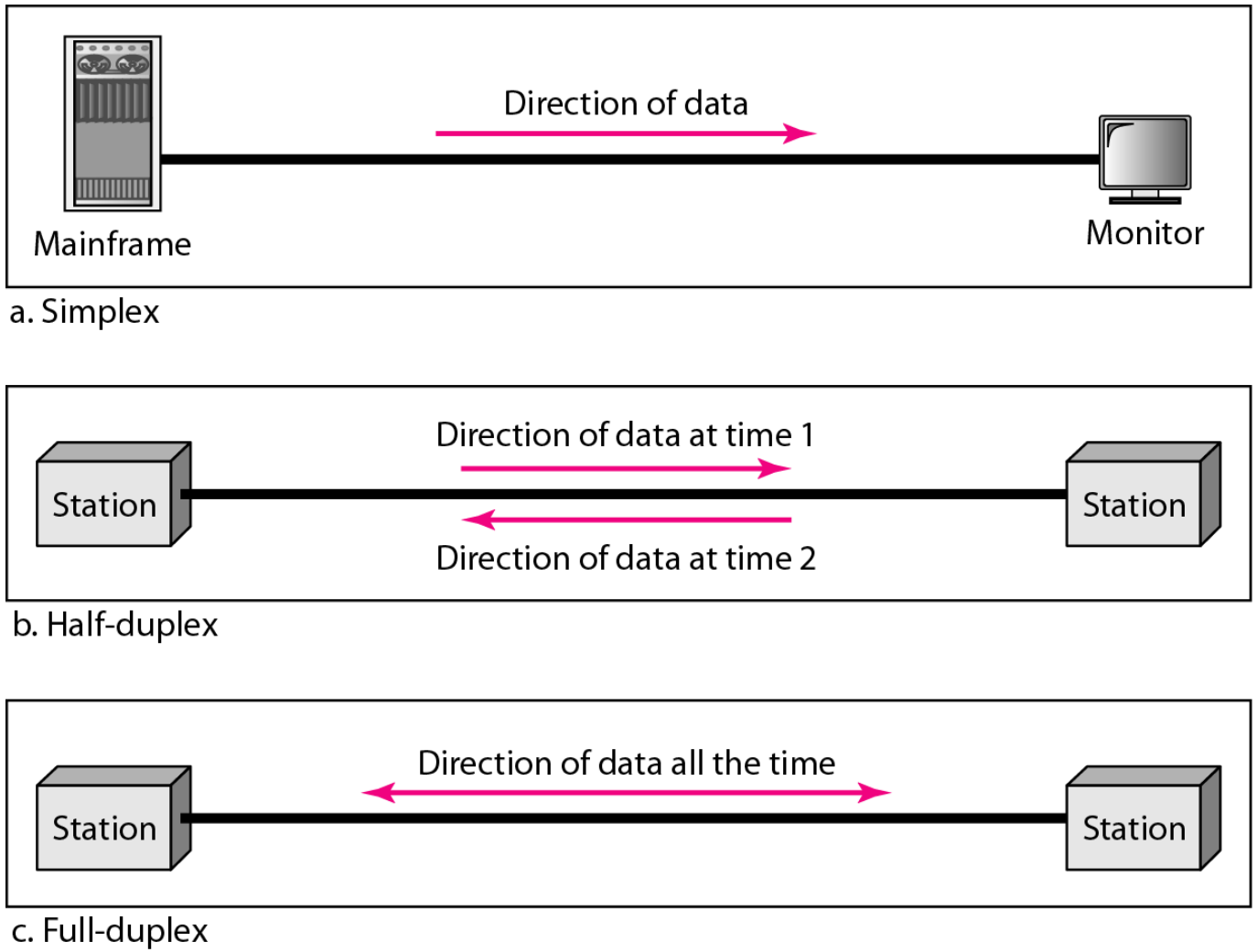


Figure 1.2 *Data flow (simplex, half-duplex, and full-duplex)*



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

1-2 NETWORKS

Network Criteria

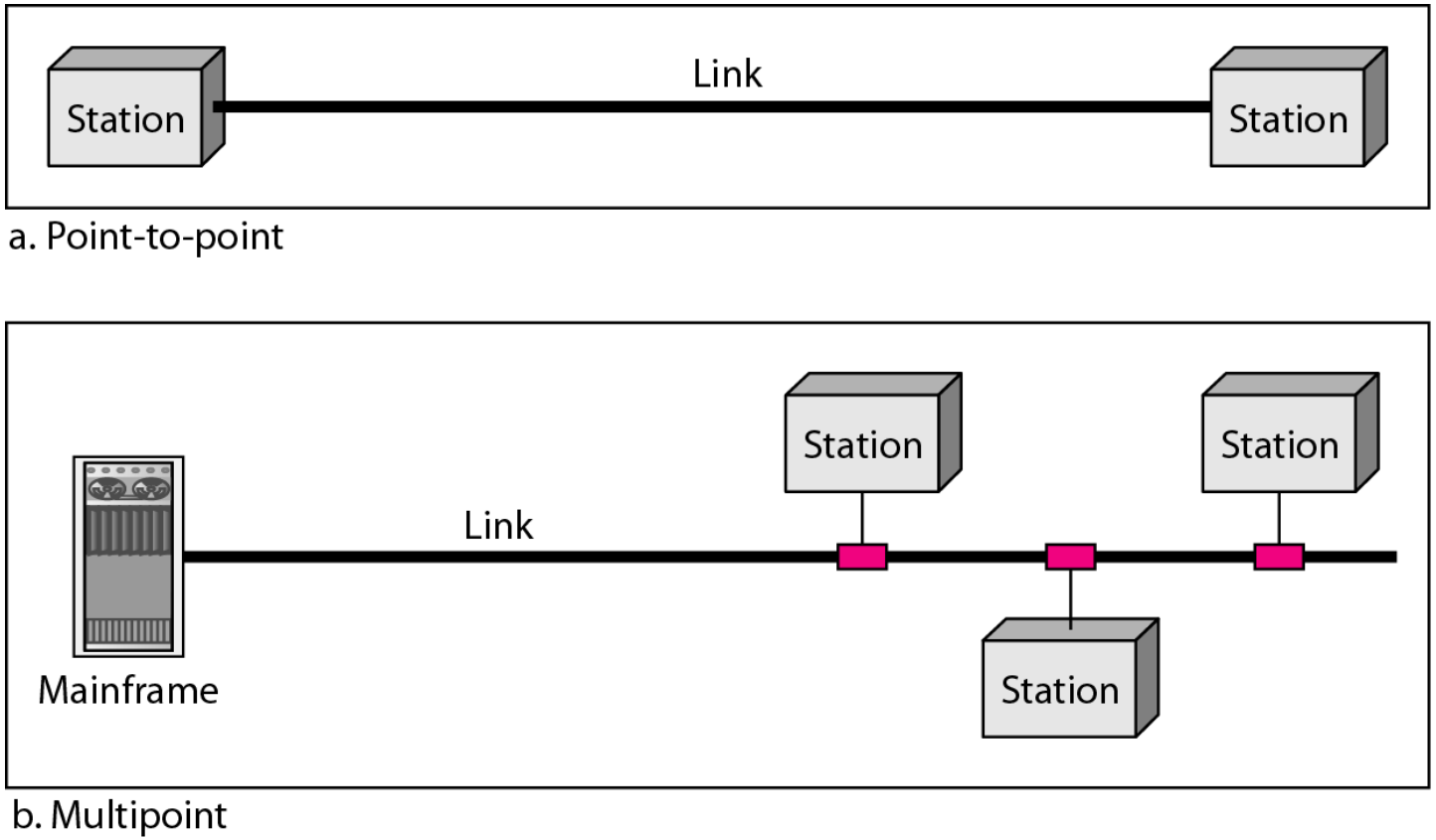
Performance:

- transit time (device to device)
- response time (enquiry to response)
- Throughput
- delay

Reliability

Security

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



If several devices can use the link simultaneously, it is a *spatially shared* connection. If users must take turns, it is a *timeshared* connection.

Figure 1.4 *Categories of topology*

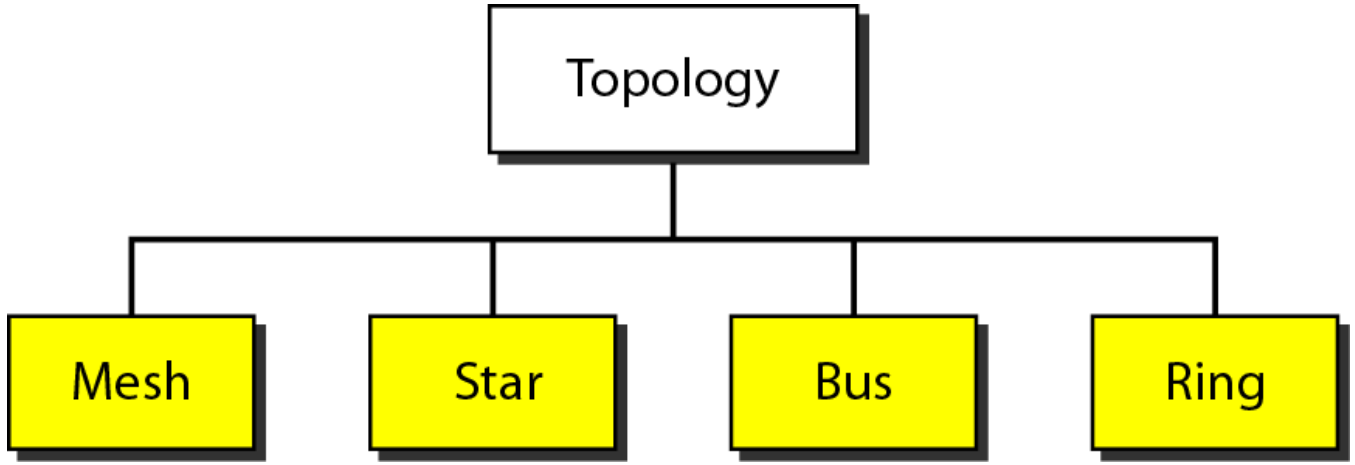
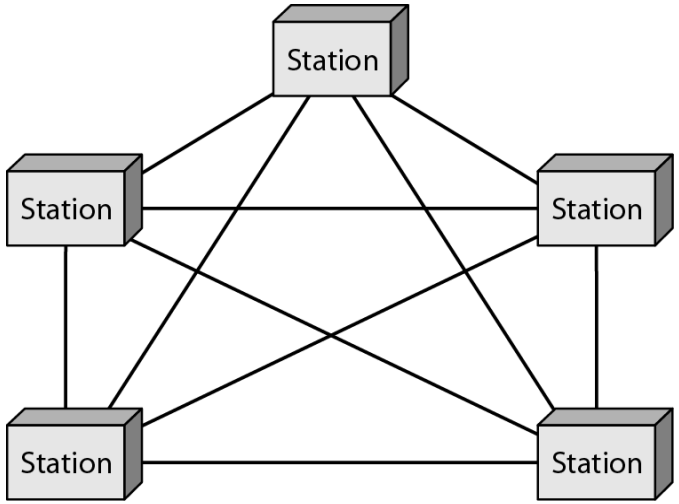


Figure 1.5 *A fully connected mesh topology (five devices)*

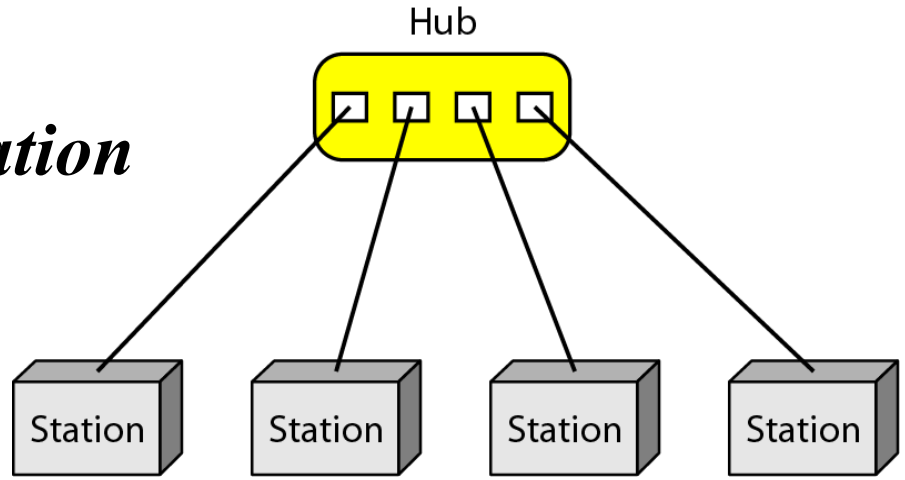


- ***High speed, Little network failure***
- ***Privacy and Security***
- ***Fault isolation***
- ***Fault identification***

- ***No. of links***
- ***No. of I/O ports***
- ***Costing***

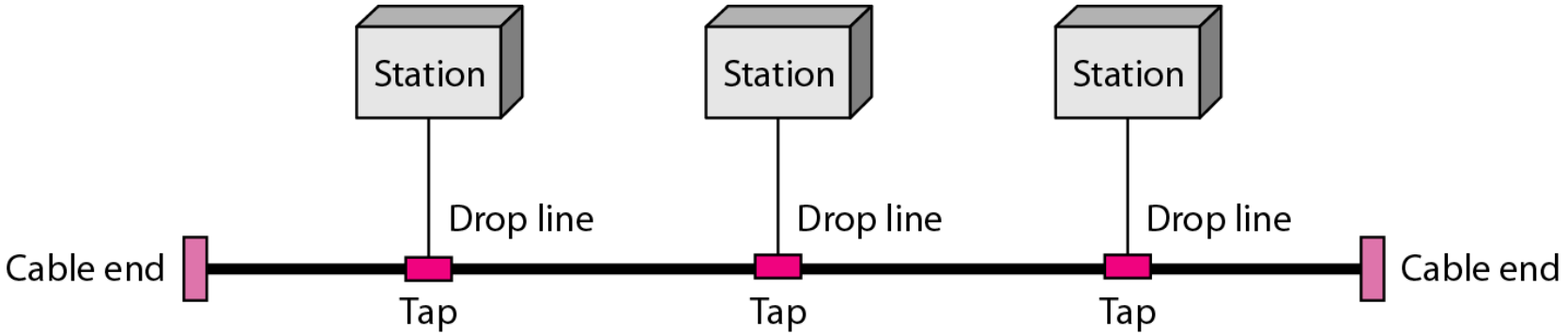
Figure 1.6 *A star topology connecting four stations*

Installation, reconfigure
Fault isolation and identification
Costing, I/O ports



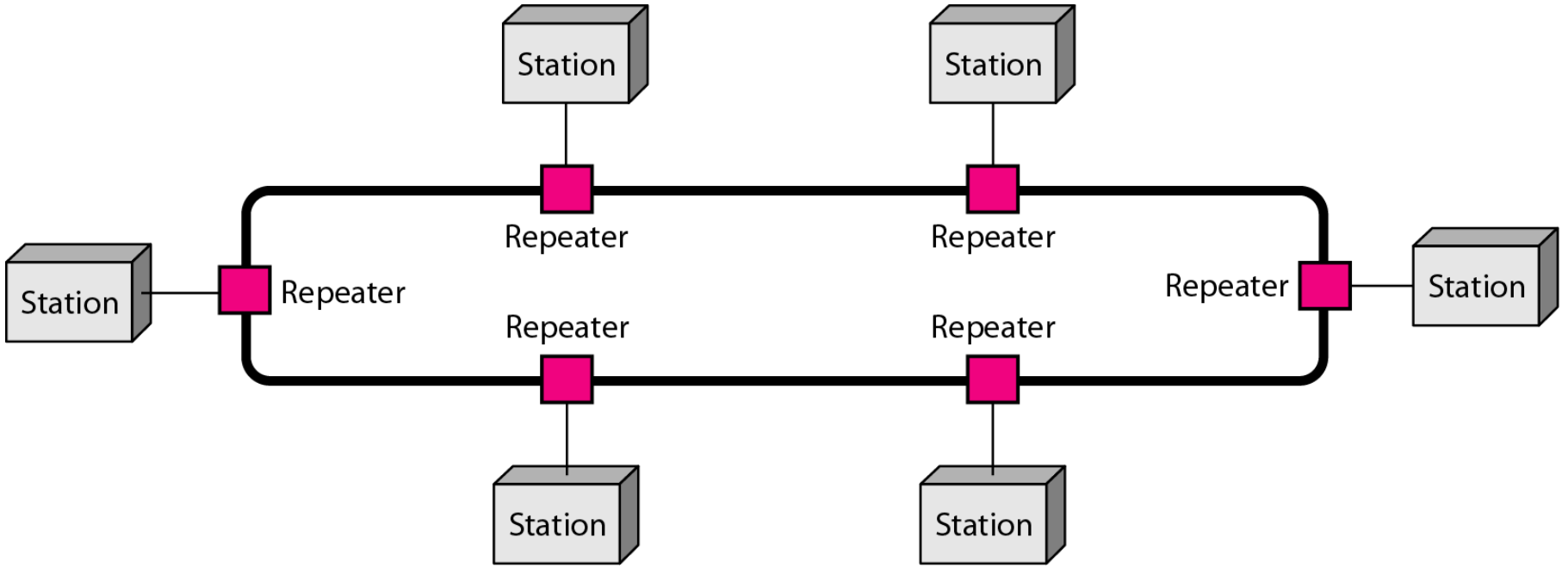
Single point of dependency

Figure 1.7 *A bus topology connecting three stations*



Long distance issue
Installation
Number & length of cables
Reconnection, signal reflection

Figure 1.8 *A ring topology connecting six stations*



Uni-directional

Installation

Repeaters

Fault isolation

Dual ring

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

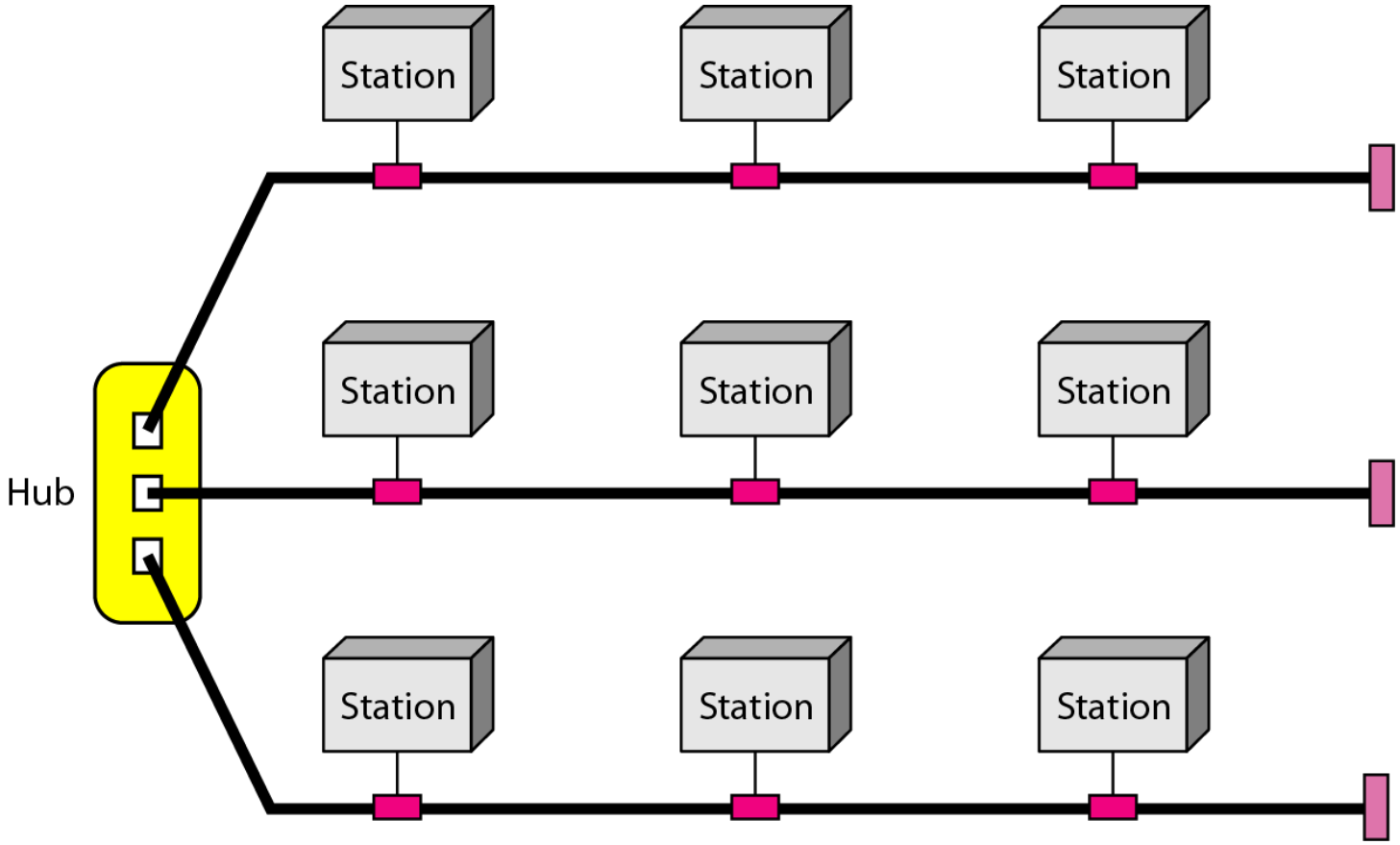
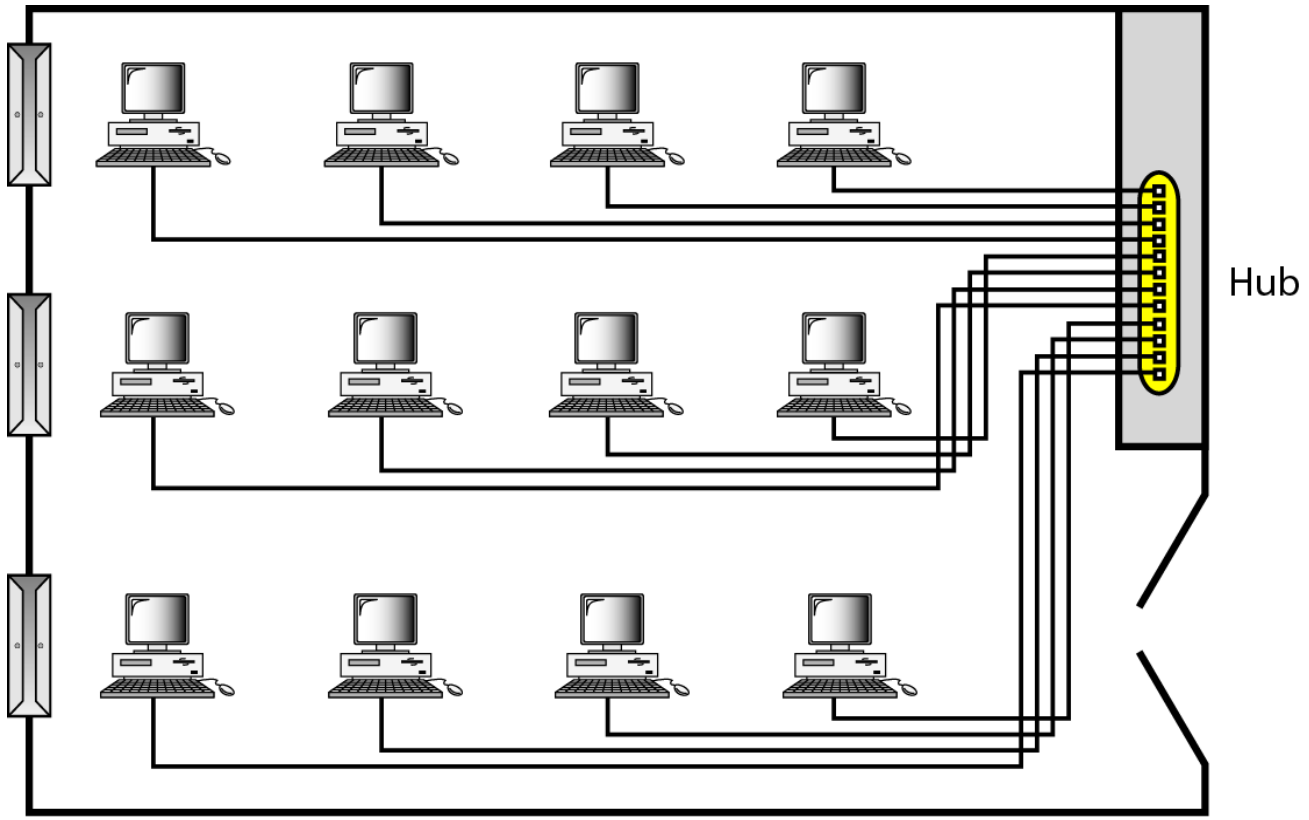


Figure 1.10 *An isolated LAN connecting 12 computers to a hub in a closet*



Categories of Networks

LAN

- Privately owned for office, home, buildings etc.
- limited to few kms.
- resource sharing
- generally one type of transmission medium
- speed
- WLAN

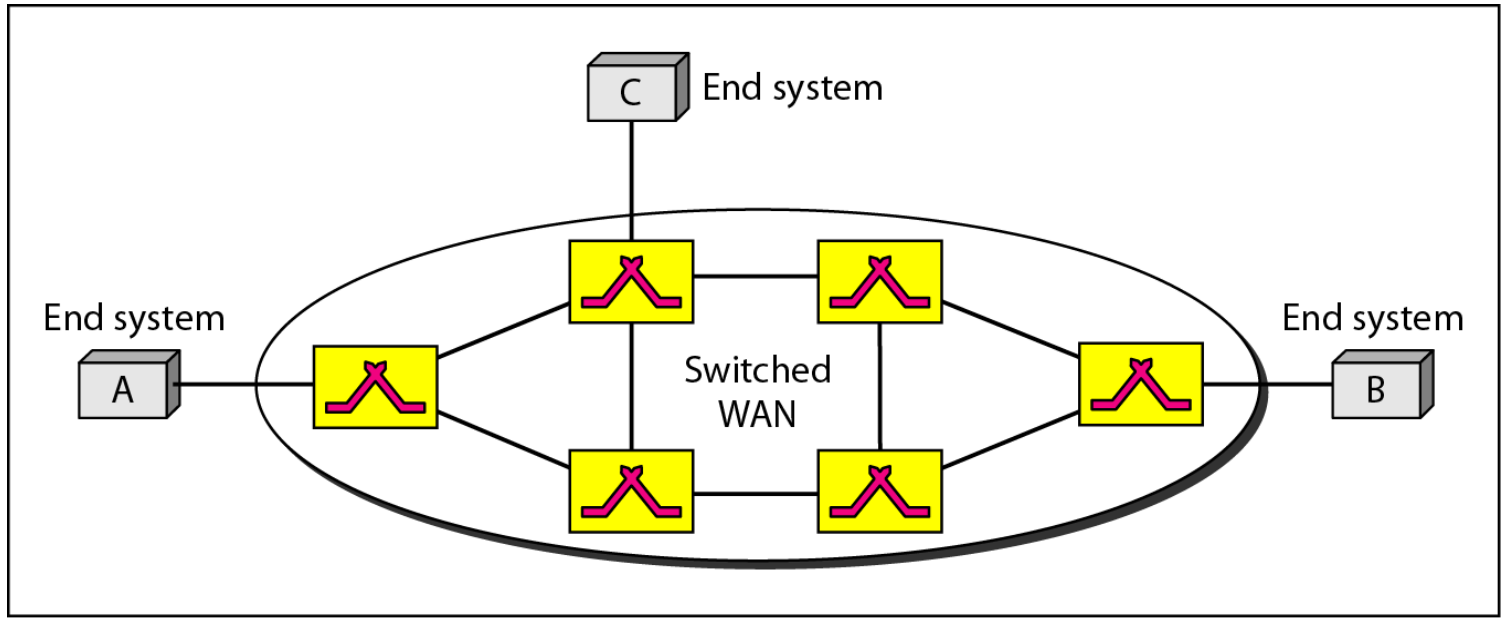
WAN

- Long distance transmission
- either complex (*Switched WAN*) or simple (*point to point WAN*)
- e.g. X.25 >> Frame Relay >> ATM
- Wireless WAN

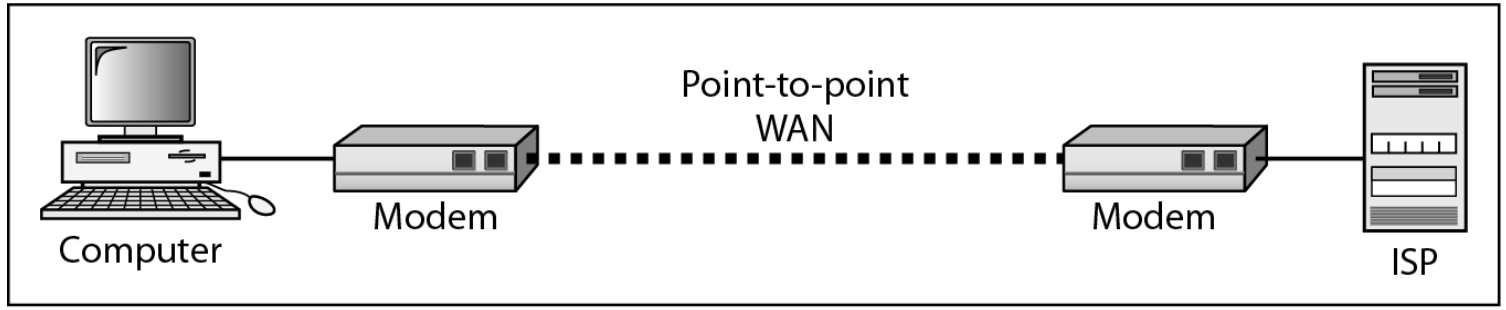
MAN

- High speed, DSL, Cable TV network

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

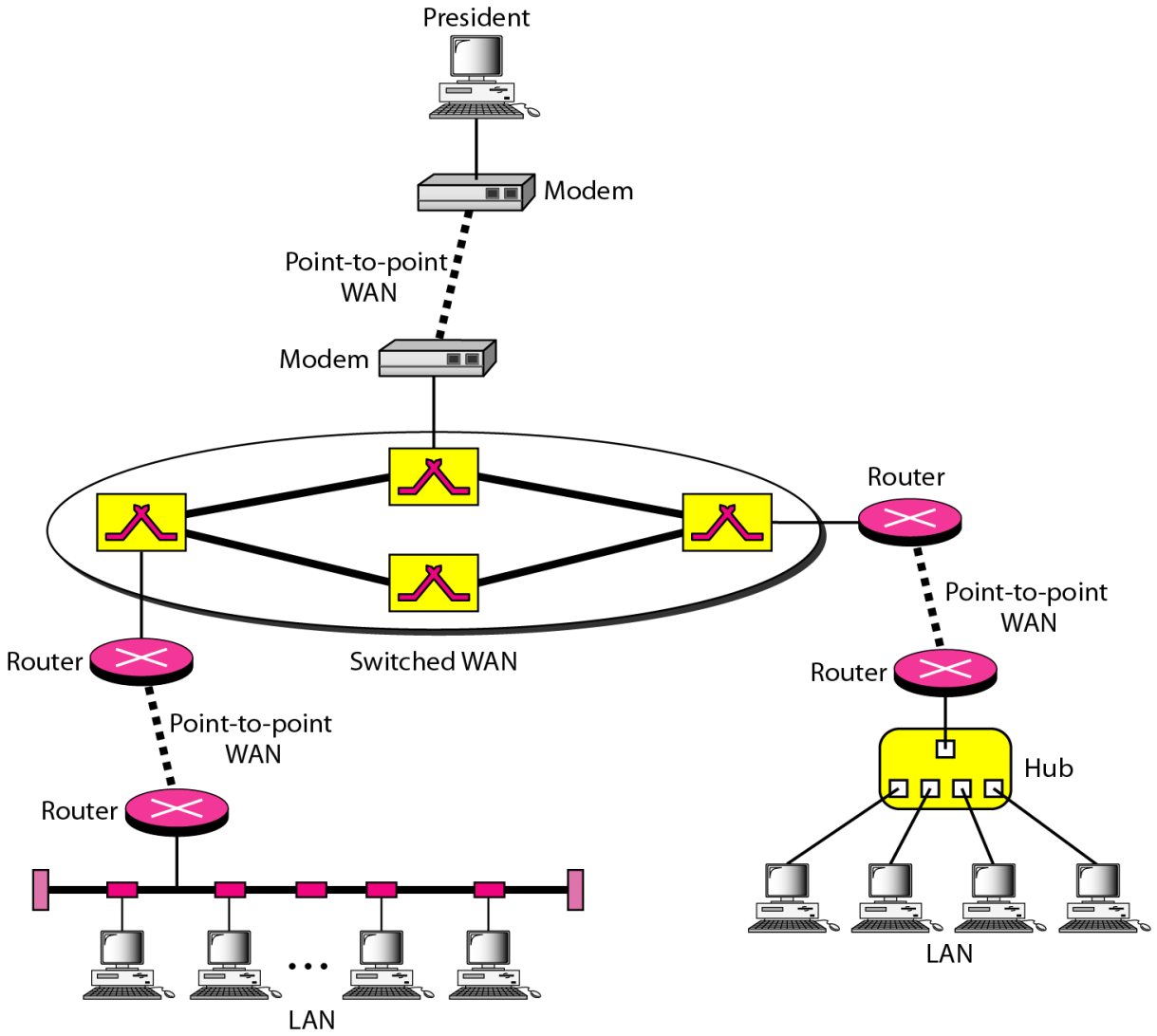


a. Switched WAN



b. Point-to-point WAN

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



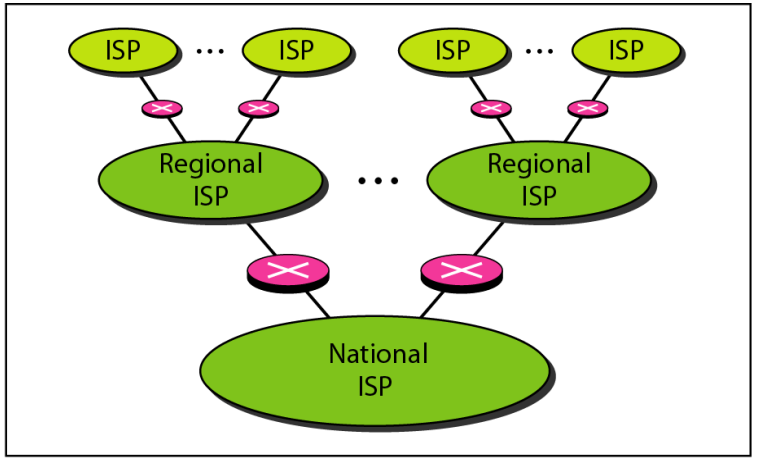
1-3 THE INTERNET

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.

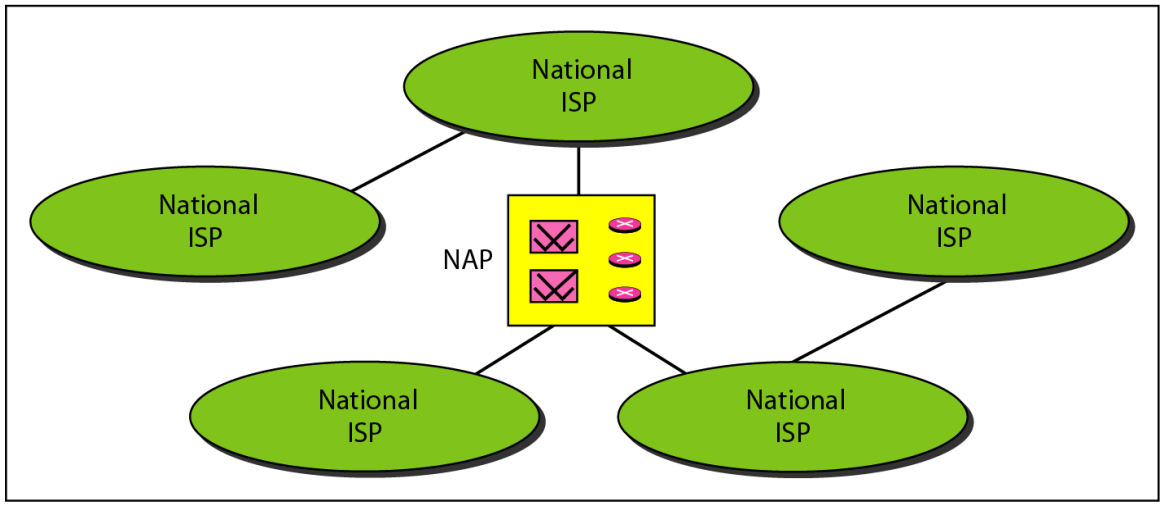
Topics discussed in this section:

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

1-4 PROTOCOLS AND STANDARDS

Protocols (rules)

what to communicate, how to communicate and when to communicate

Key Elements of Protocols

1.Syntax

Structure of format of data

2.Semantics

Meaning of each section bits

3.Timing

When to send and how fast..

1-4 PROTOCOLS AND STANDARDS

Standards (agreed upon rules)

Categories of Standards

1. **De facto.**
   - By convention or by fact
2. **De jure.**
   - By Law or by Government