

## ■ BBM452 Data Communications

- <https://web.cs.hacettepe.edu.tr/~ozdemir/teaching/BBM452/>
- <https://piazza.com/hacettepe.edu.tr/fall2021/bbm452/home>

## ■ Prof. Dr. Suat Özdemir

- [ozdemir@cs.hacettepe.edu.tr](mailto:ozdemir@cs.hacettepe.edu.tr)
- <https://web.cs.hacettepe.edu.tr/~ozdemir/>
- <https://www.linkedin.com/in/suat-ozdemir-308764b/>
- Twitter: @\_suatozdemir

## ■ Thursdays @9:00 Online

- I will be in my office
- We will use Zoom and classes will be recorded
- Office Hour will be after the class, in person or online. I will be in my office for questions.
- You can drop by or arrange a personal online meeting with me.

## ■ Book

- Forouzan B.A., Data Communications and Networking, 4/e, McGraw-Hill, 2007.

## ■ Grading

- Quiz 20%
- HW 20%
- Midterm 30%
- Final 30%

## ■ Honor Code

- Students are allowed to discuss and collaborate. However, all collaboration must be in terms of exchanging ideas.
- The quizzes, projects and homework must be prepared solely by students on their own.



# 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.*

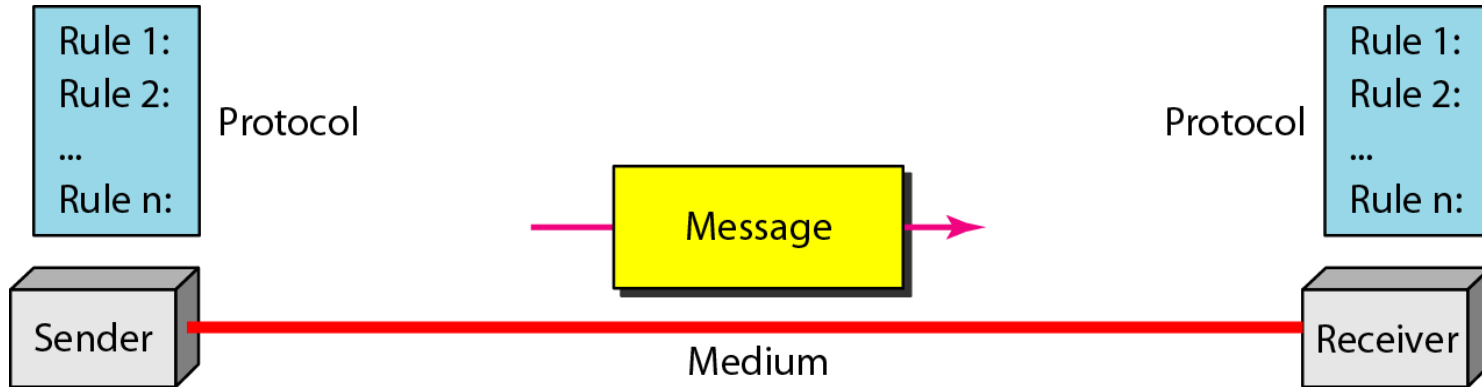
## **Topics discussed in this section:**

**Components**

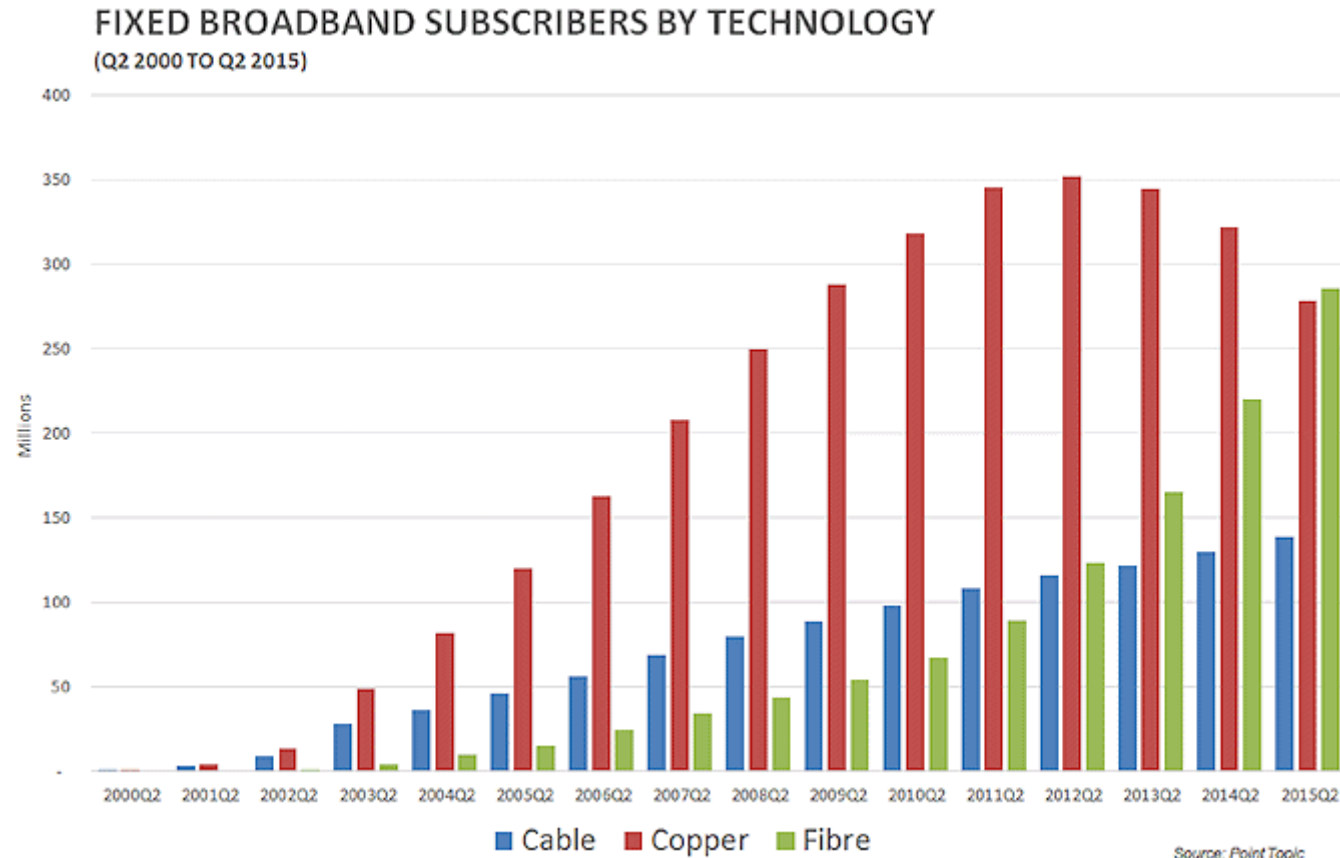
**Data Representation**

**Data Flow**

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



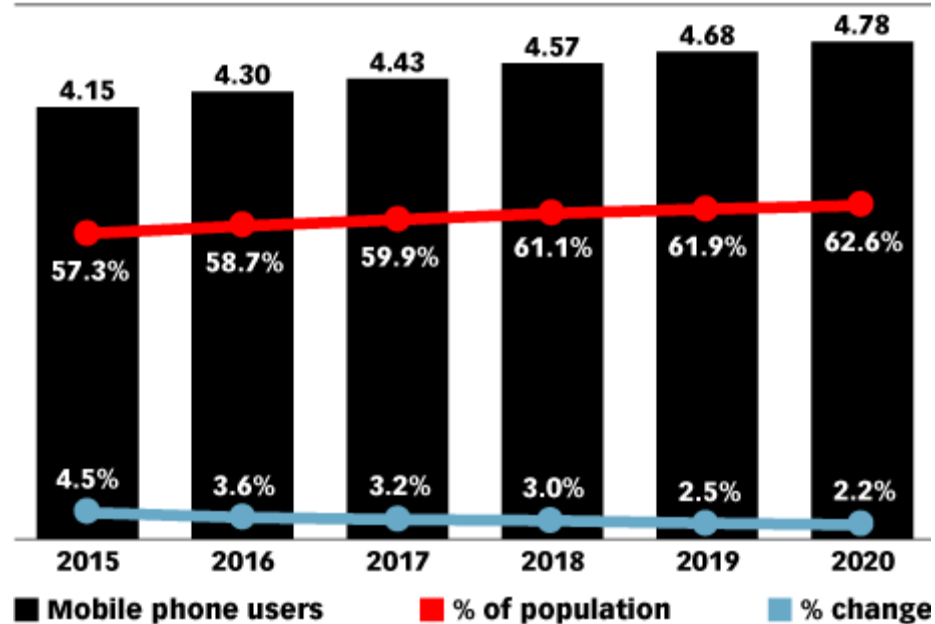
# Fixed



# Mobile

## Mobile Phone Users and Penetration Worldwide, 2015-2020

billions, % of population and % change



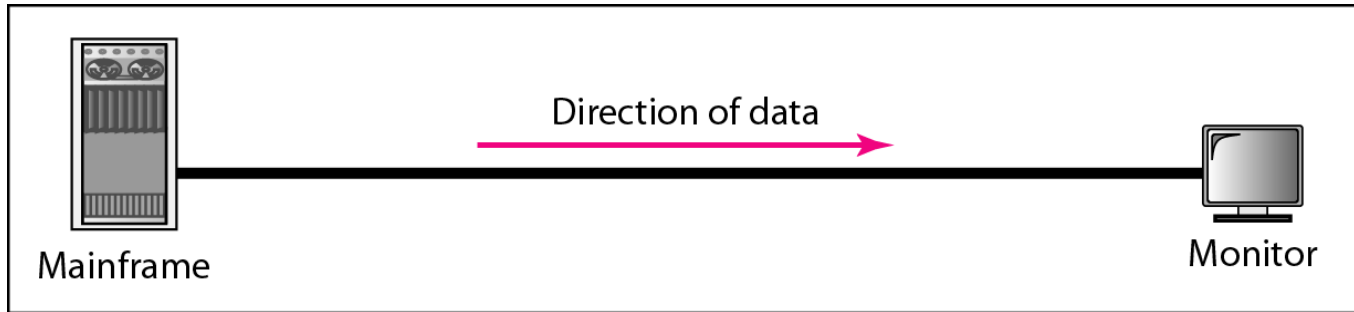
Note: individuals of any age who own at least one mobile phone and use the phone(s) at least once per month

Source: eMarketer, Sep 2016

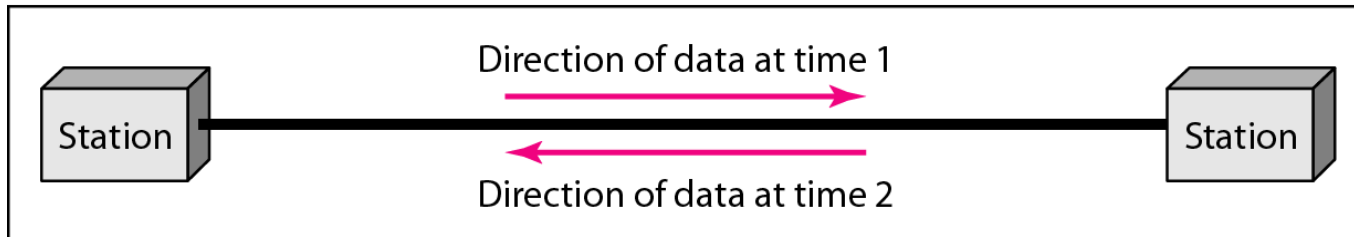
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www.eMarketer.com

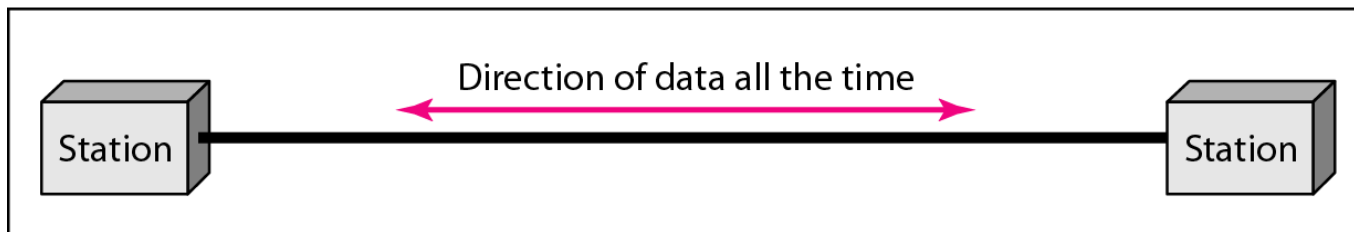
**Figure 1.2** *Data flow (simplex, half-duplex, and full-duplex)*



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**

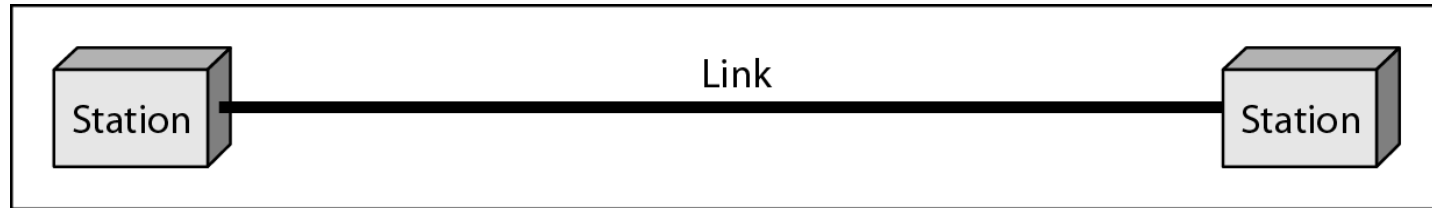
**Categories of Networks**

**Interconnection of Networks: Internetwork**

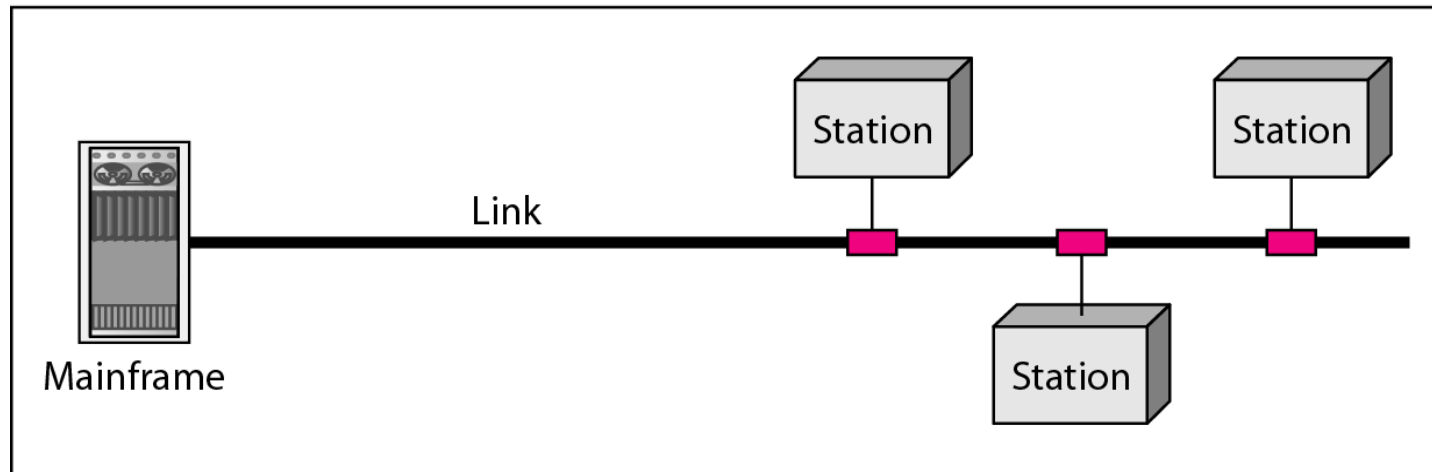
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**Figure 1.3** *Types of connections: point-to-point and multipoint*

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a. Point-to-point

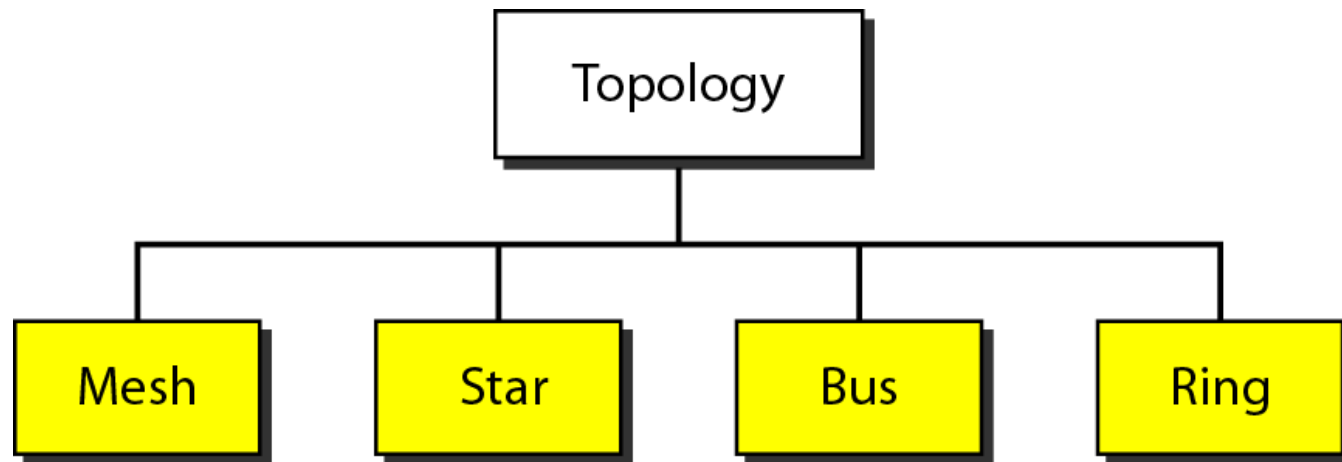


b. Multipoint

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**Figure 1.4** *Categories of topology*

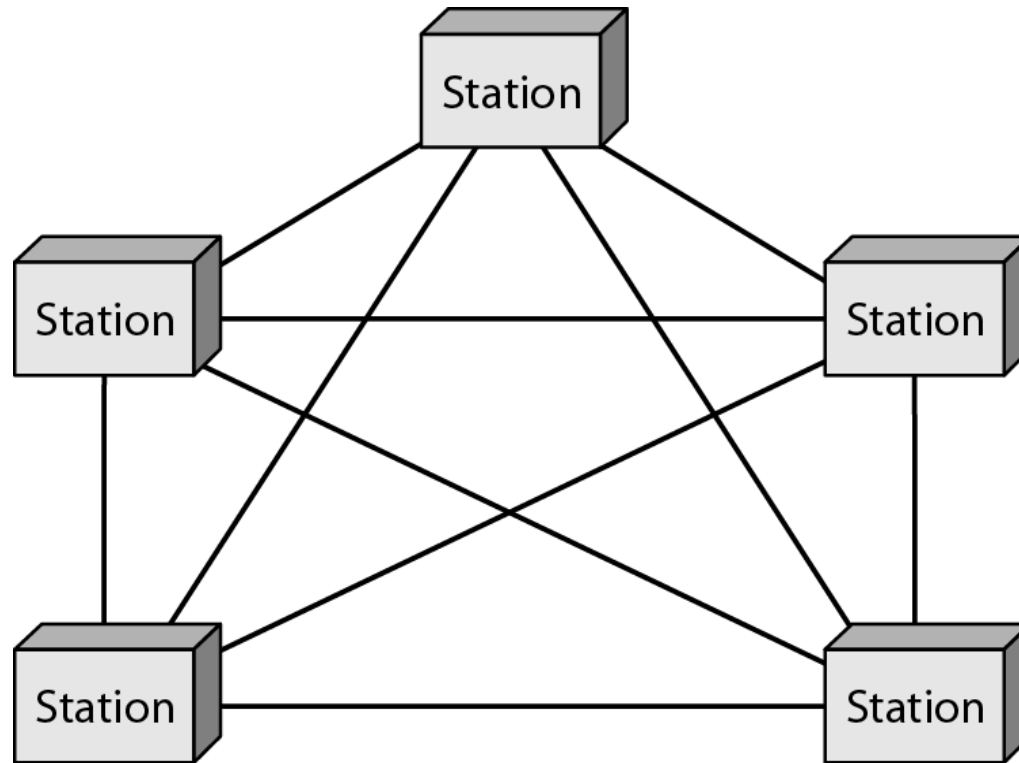
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**Figure 1.5** *A fully connected mesh topology (five devices)*

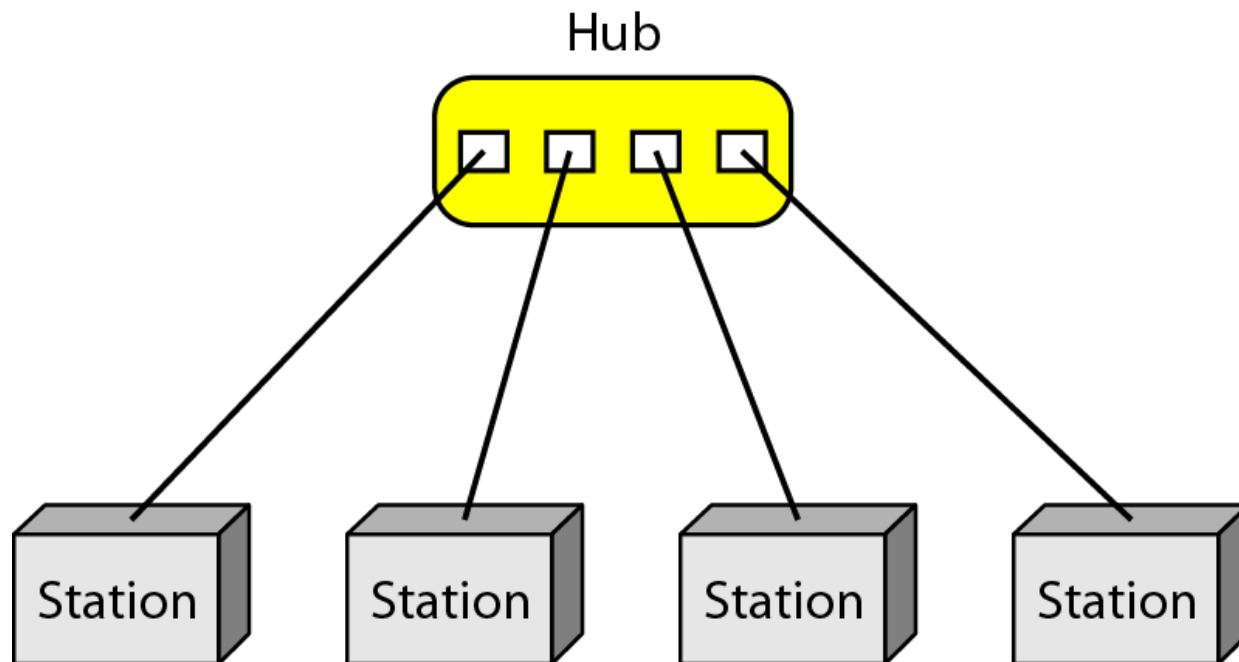
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**Figure 1.6** *A star topology connecting four stations*

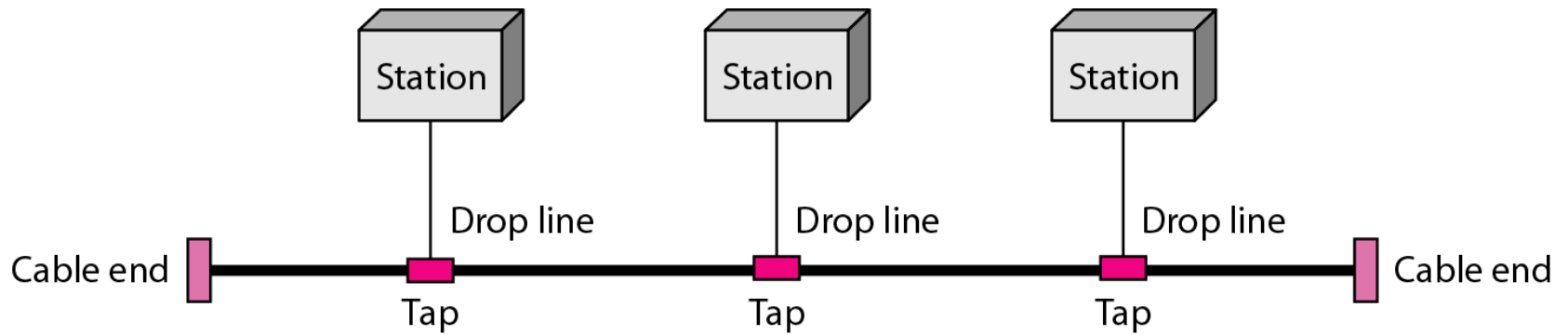
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**Figure 1.7** *A bus topology connecting three stations*

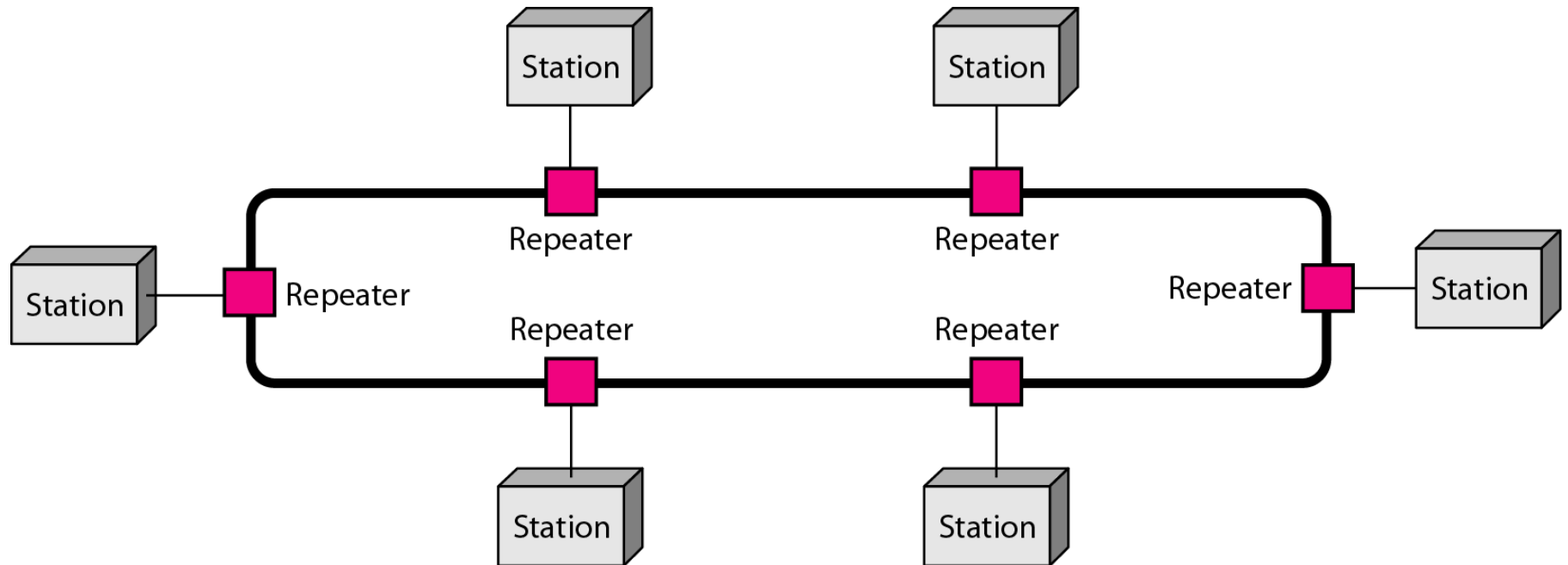
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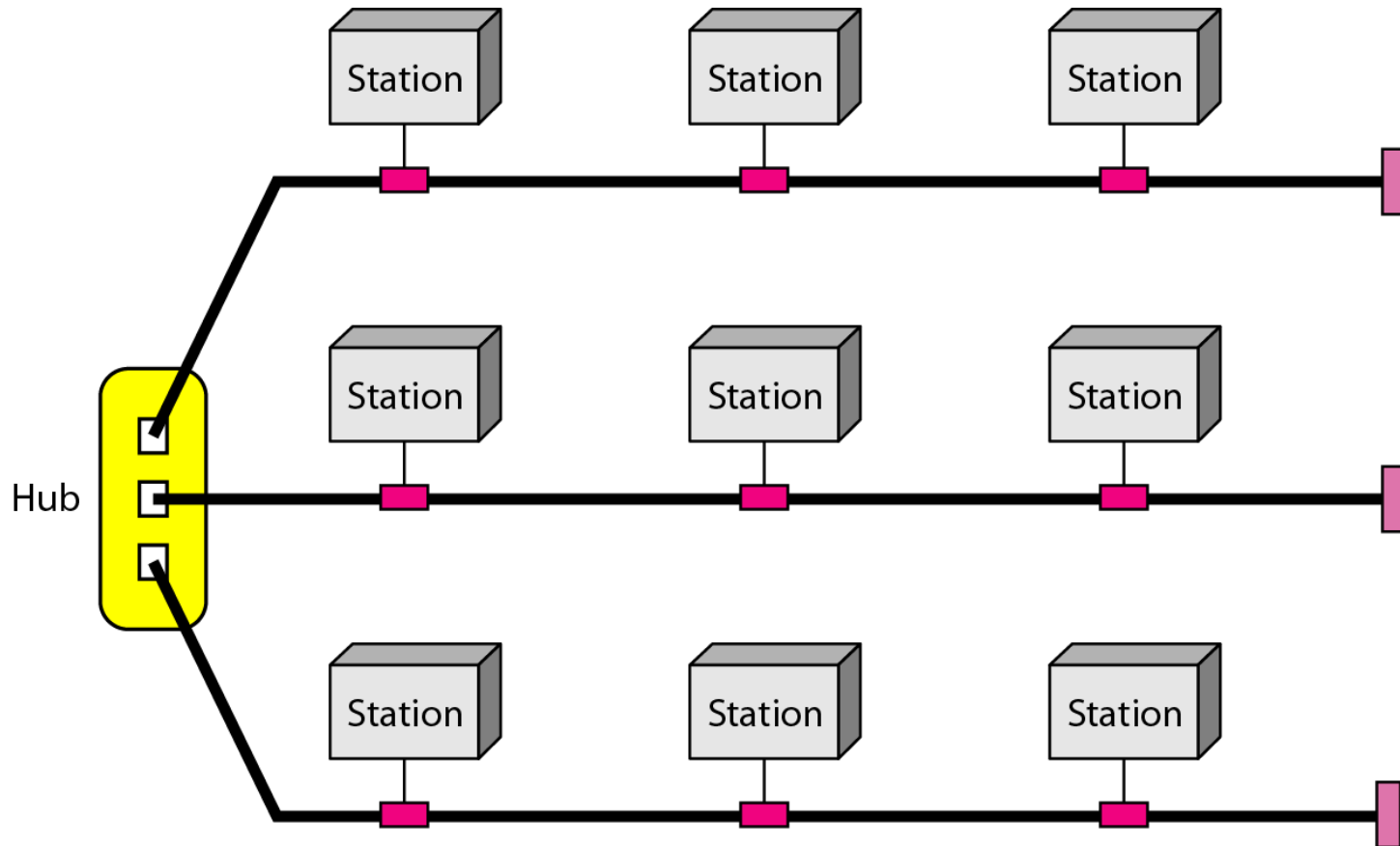
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**Figure 1.8** *A ring topology connecting six stations*

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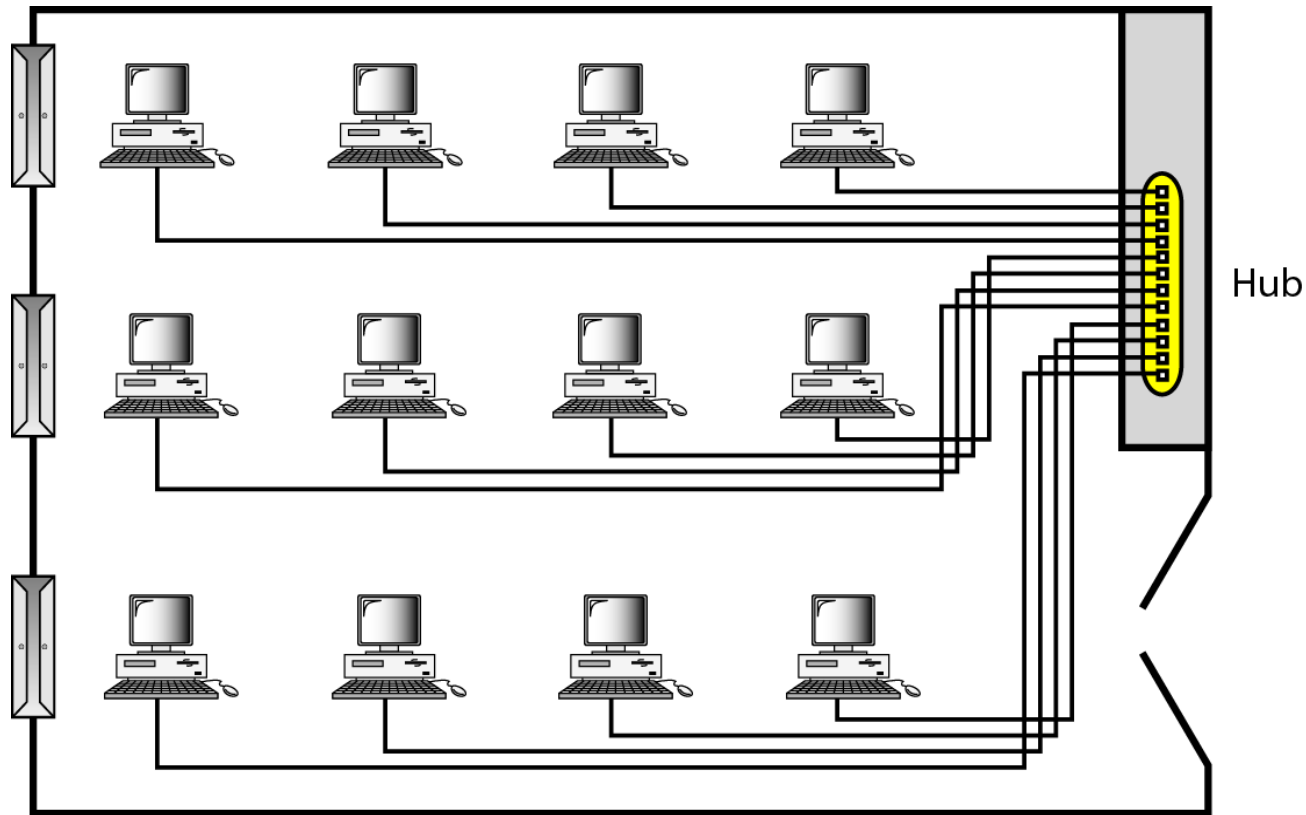


**Figure 1.9** *A hybrid topology: a star backbone with three bus networks*

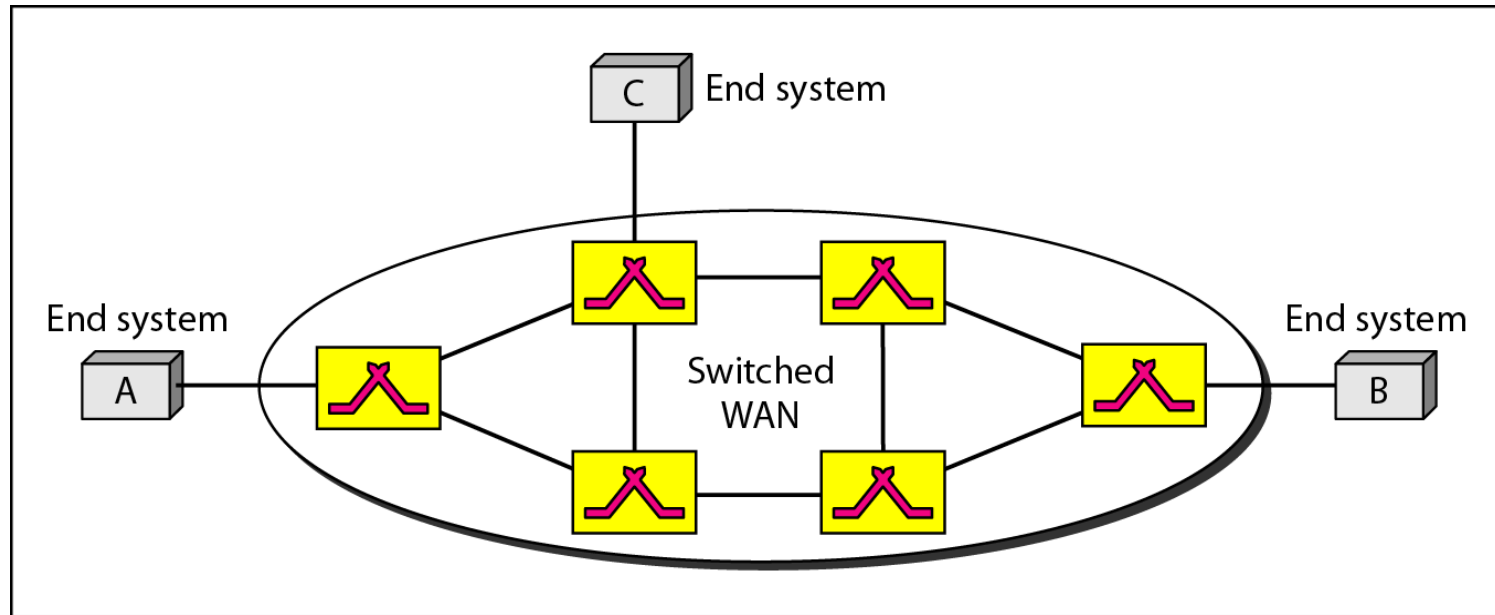




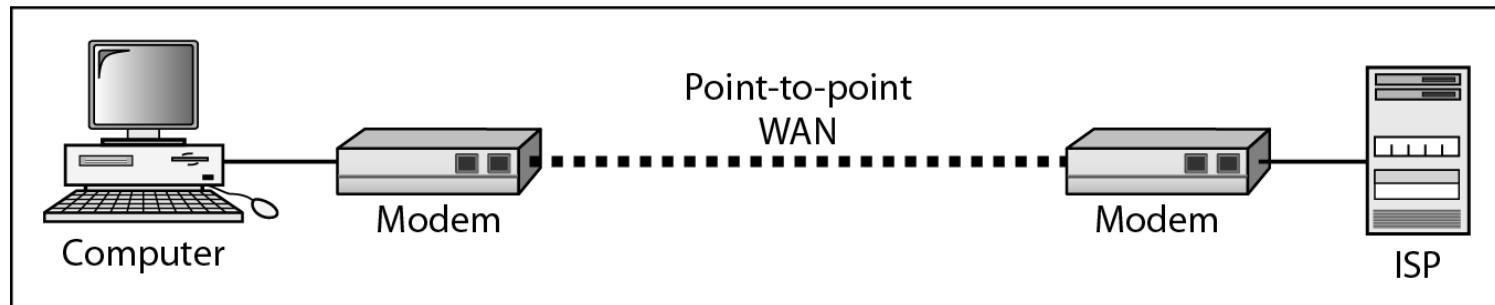
**Figure 1.10** *An isolated LAN connecting 12 computers to a hub in a closet*



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

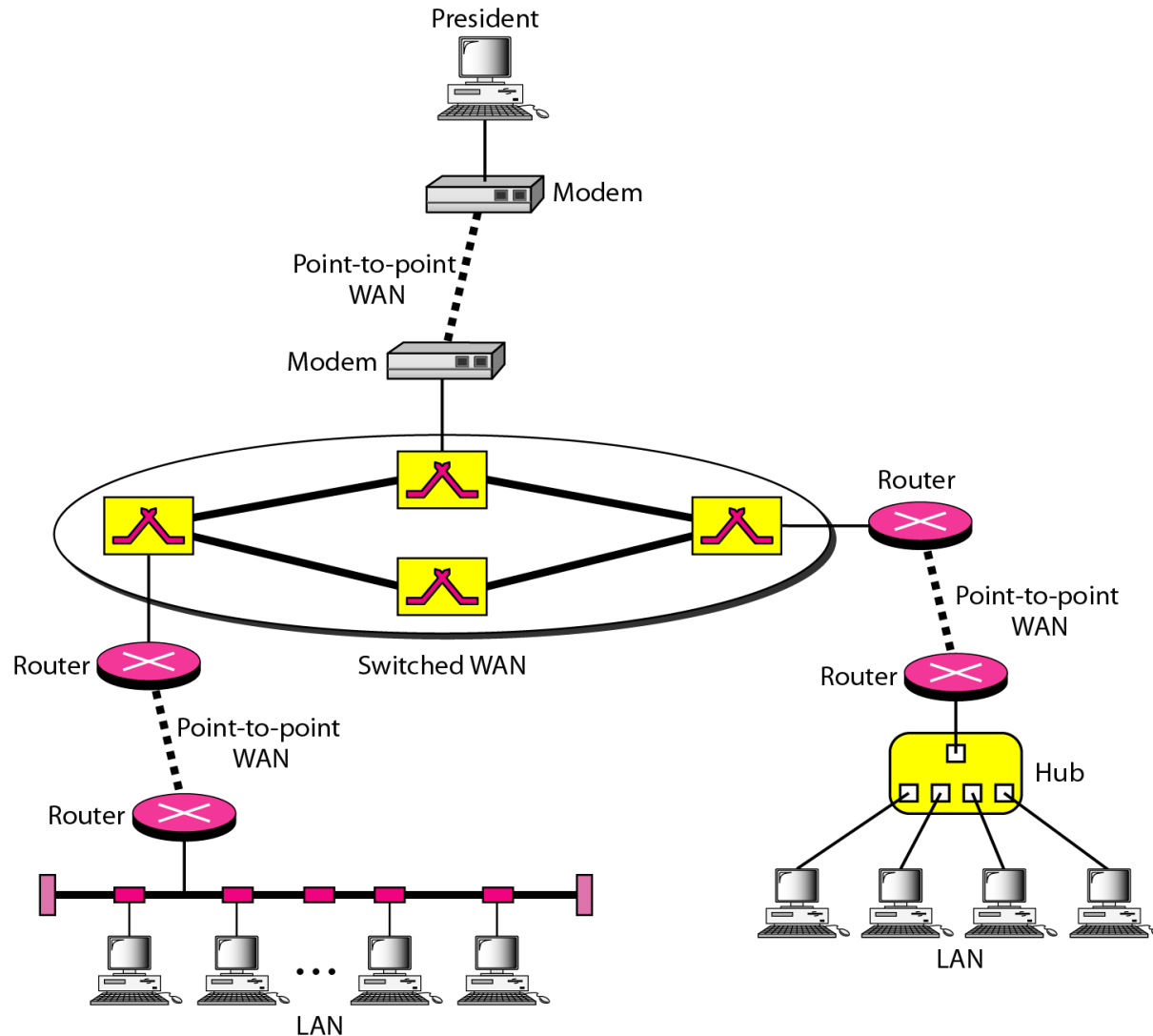


a. Switched WAN



b. Point-to-point WAN

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



## 1-3 THE INTERNET

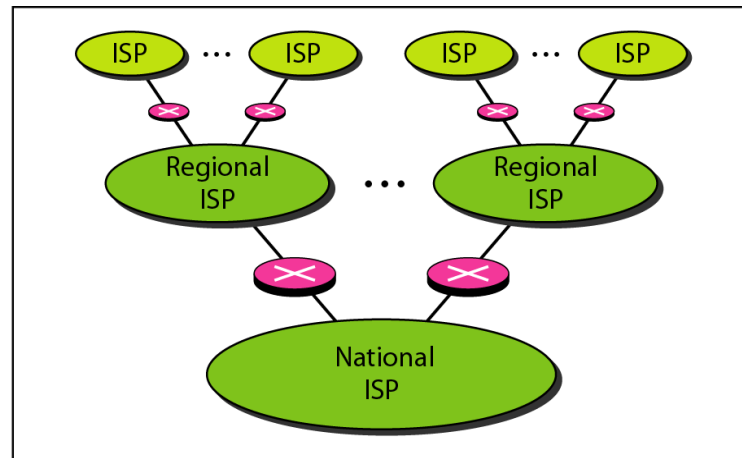
*The **Internet** has revolutionized many aspects of our daily lives. It has affected the way we do business as well as the way we spend our leisure time. The Internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use.*

### *Topics discussed in this section:*

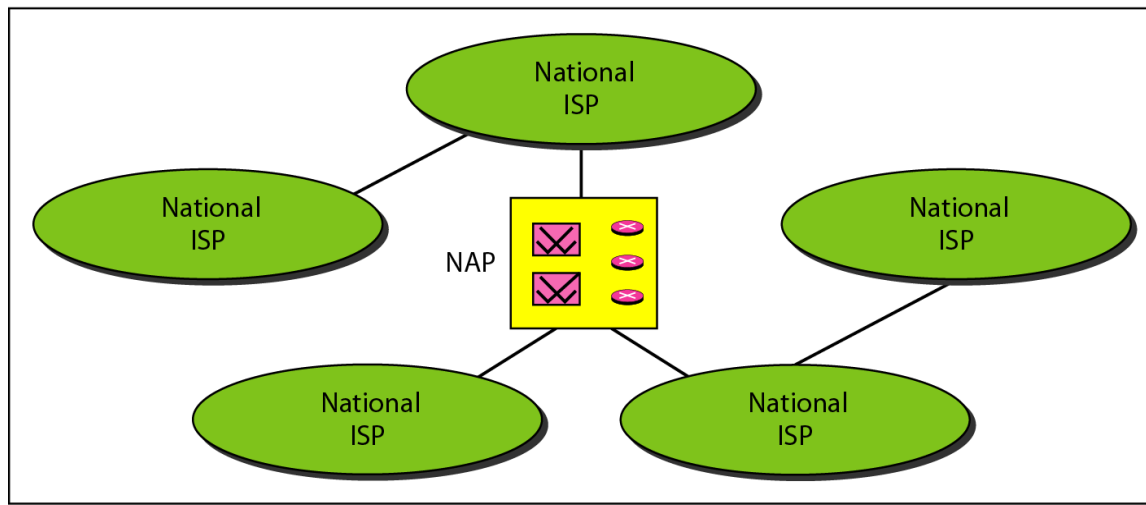
A Brief History

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