Computer Networks

- Prof. Ishani Saha

Program: Master of Computer Applications (MCA)				**Semester:** I	
Course: Computer Networks				**Code:**	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Prerequisite: NA

Course Objective

This course provides the fundamental knowledge of computer networks through understanding each layer of computer network architecture, and transmission systems to network applications. It also focuses on congestion control techniques, protocols, and application layer functions.

Course Outcomes

After completion of the course, students will be able to -

1. Explain the concepts of computer networks, topologies and data communication.
2. Analyze the various error detection and correction and medium access techniques.
3. Apply network layer addressing and routing techniques to different network topologies.
4. Analyze the different protocols of the layered architecture of computer networks.

Detailed Syllabus

Unit	Description	Duration
1	**Introduction** Computer Network, Peer-to-peer and client-server communication, Classifications of computer networks, Network Topologies.	**02**
2	**Physical Layer** Introduction to OSI and TCP/IP model, Transmission Media.	**02**
3	**Data Link Layer and Medium Access Sub Layer** Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, Flow Control and Error control; error control mechanism - CRC; flow control protocols - Stop and Wait ARQ, Go-back-N ARQ, Selective Repeat ARQ, Multiple access protocols - Random Access - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.	**07**
4	**Network Layer** Switching techniques, IPV4 addressing, subnet mask, classless inter-domain routing (CIDR), IPV6; Address mapping – ARP, RARP, and DHCP, shortest path algorithm- RIP, Bellman-ford algorithm, link state routing, Dijkstra's algorithm, Open shortest path first protocol (OSPF).	**09**
5	**Transport Layer** Process to Process Communication, User Datagram Protocol (UDP)-services, operation; Transmission Control Protocol (TCP) - features, 3-way handshaking, comparison of UDP and TCP, SCTP, Congestion Control - open loop and close-loop; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.	**06**
6	**Application Layer** HTTP, DNS, FTP, SMTP.	**04**
	Total	**30**

Text Books

1. A. S. Tanenbaum, *Computer Networks*, 5th edition, Pearson Prentice Hall, 2018
2. Behrouz A. Forouzan, *Data Communications and Networking*, 5th edition, McGraw-Hill Higher Education, 2017

Reference Books

1. W. Stallings, *Data and Computer Communications*, 8th edition, Pearson Prentice Hall, 2017
2. Behrouz A. Forouzan and Sophia Chung Fegan, TCP/IP Protocol Suite, 4th edition, McGraw-Hill Higher Education, 2019 (Re-print)
3. Alberto Leon-Garcia and Indra Widjaja, *Communication Networks: Fundamental Concepts and Key Architectures*, 2nd edition, McGraw-Hill, 2004 (Classic)
4. James F. Kurose and Keith W. Ross, *Computer Networking - A Top-down Approach*, 8th edition, Pearson, 2018 (Re-print)

Laboratory Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus.

Signature
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AY 2023-24

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.

Figure 1.1 *Five components of data communication*

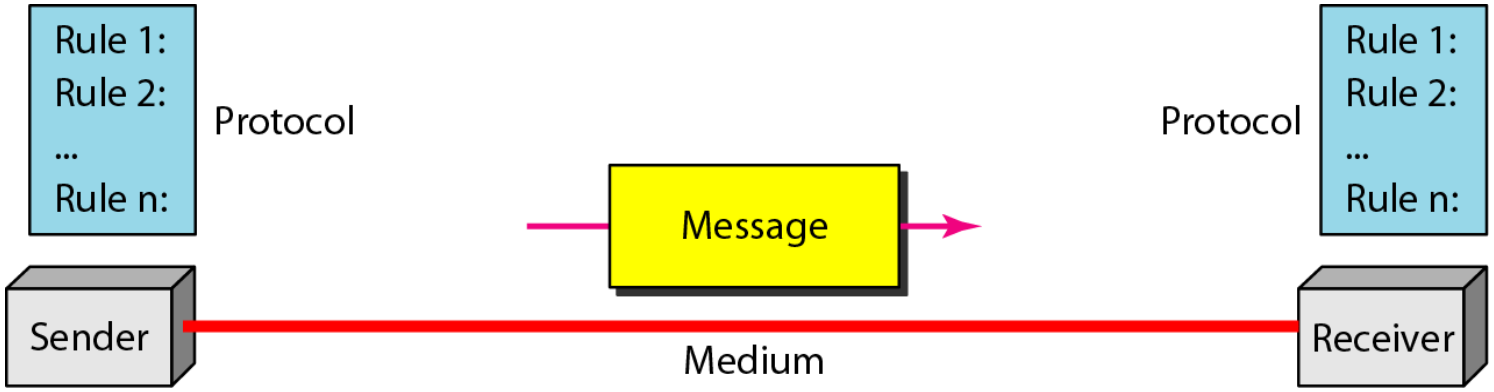
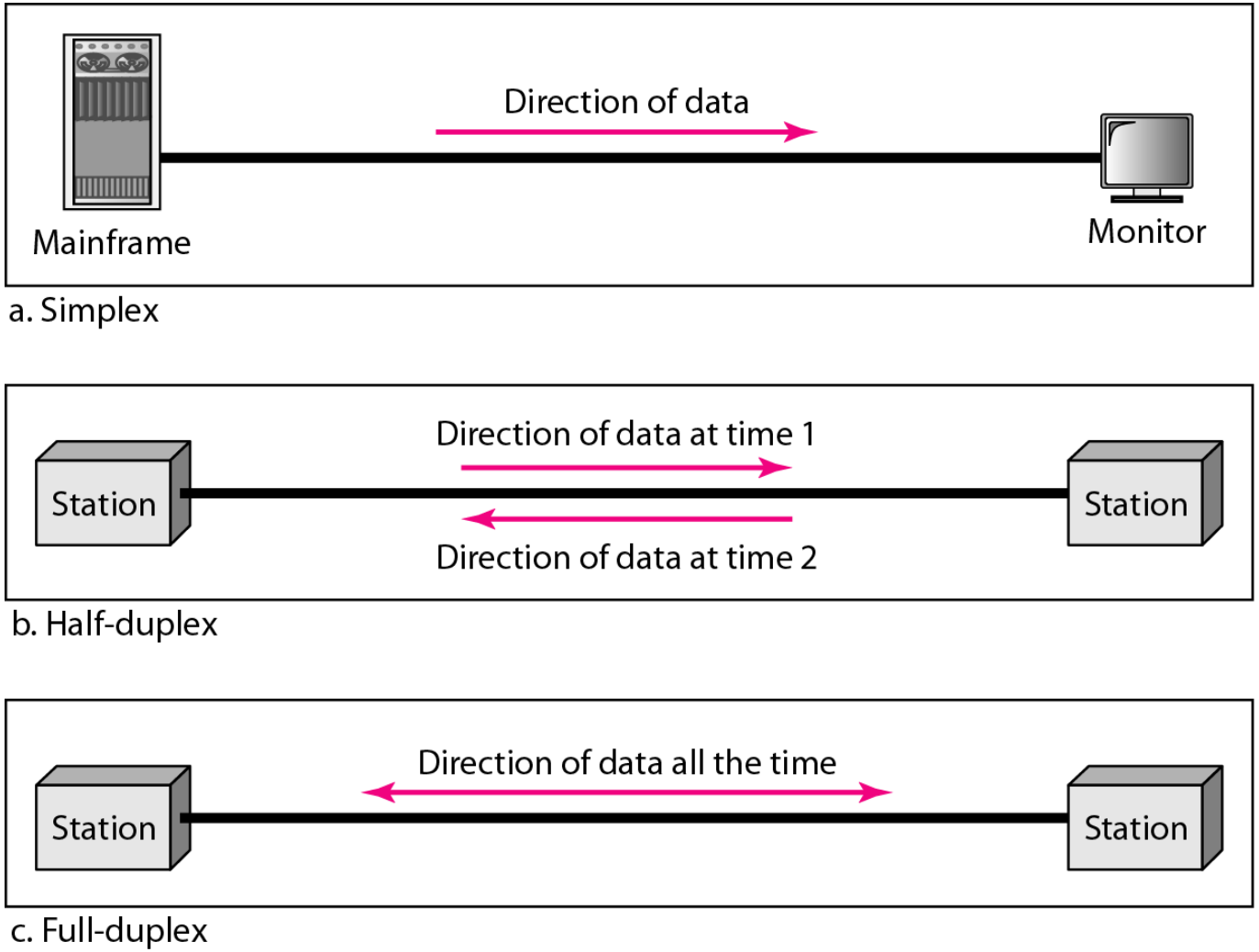


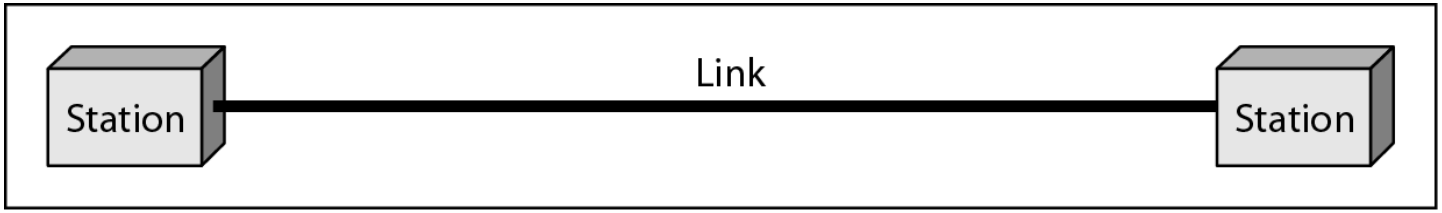
Figure 1.2 *Data flow (simplex, half-duplex, and full-duplex)*



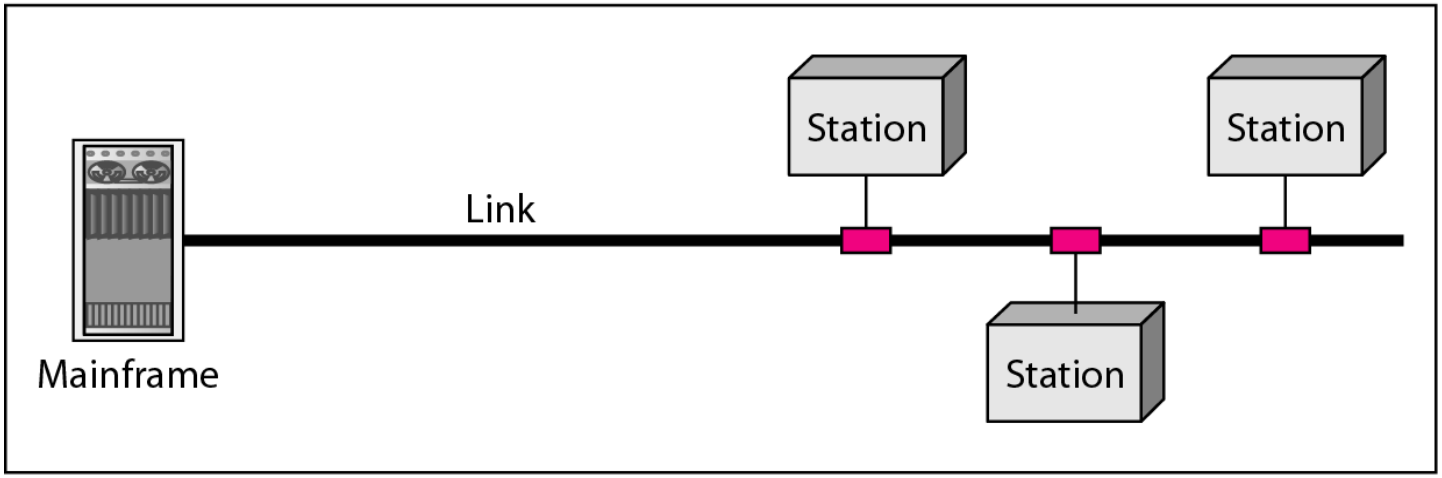
1-2 NETWORKS

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.

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



a. Point-to-point



b. Multipoint

Figure 1.4 *Categories of topology*

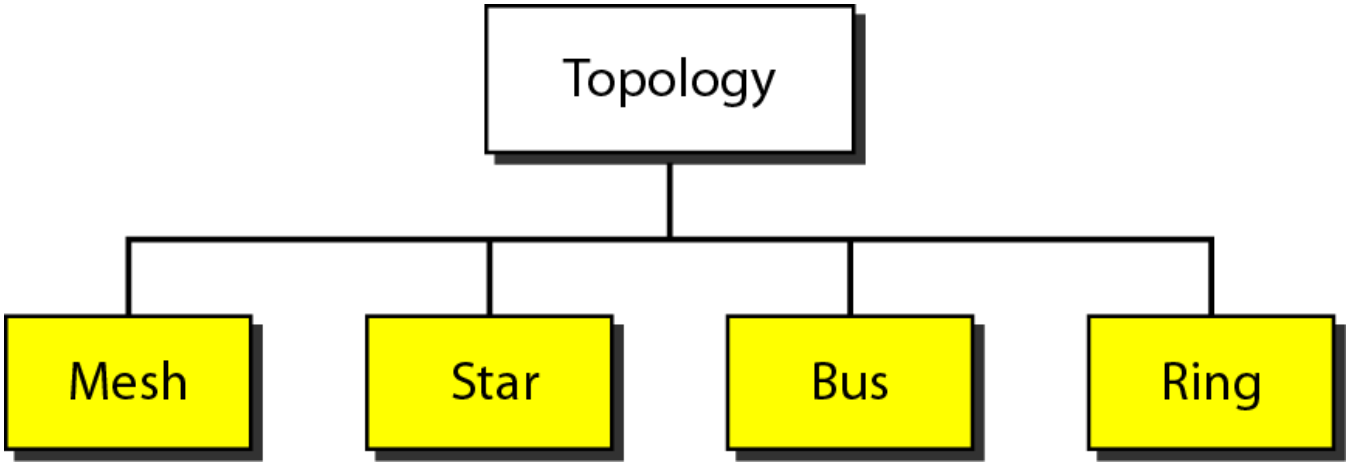


Figure 1.5 *A fully connected mesh topology (five devices)*

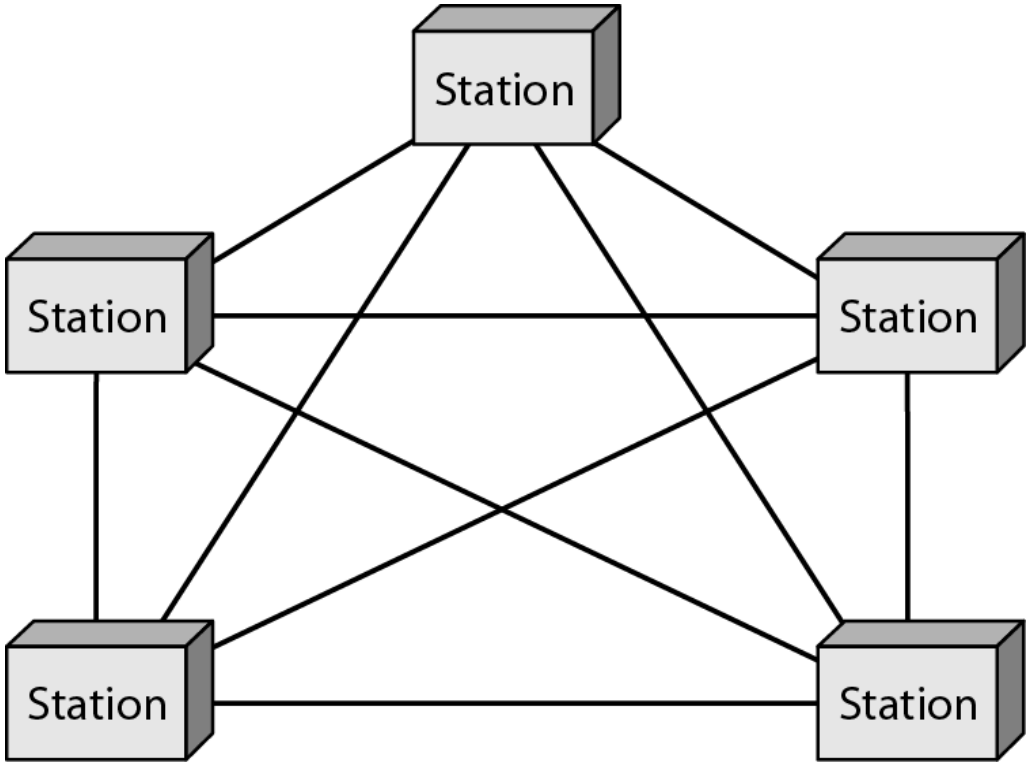


Figure 1.6 *A star topology connecting four stations*

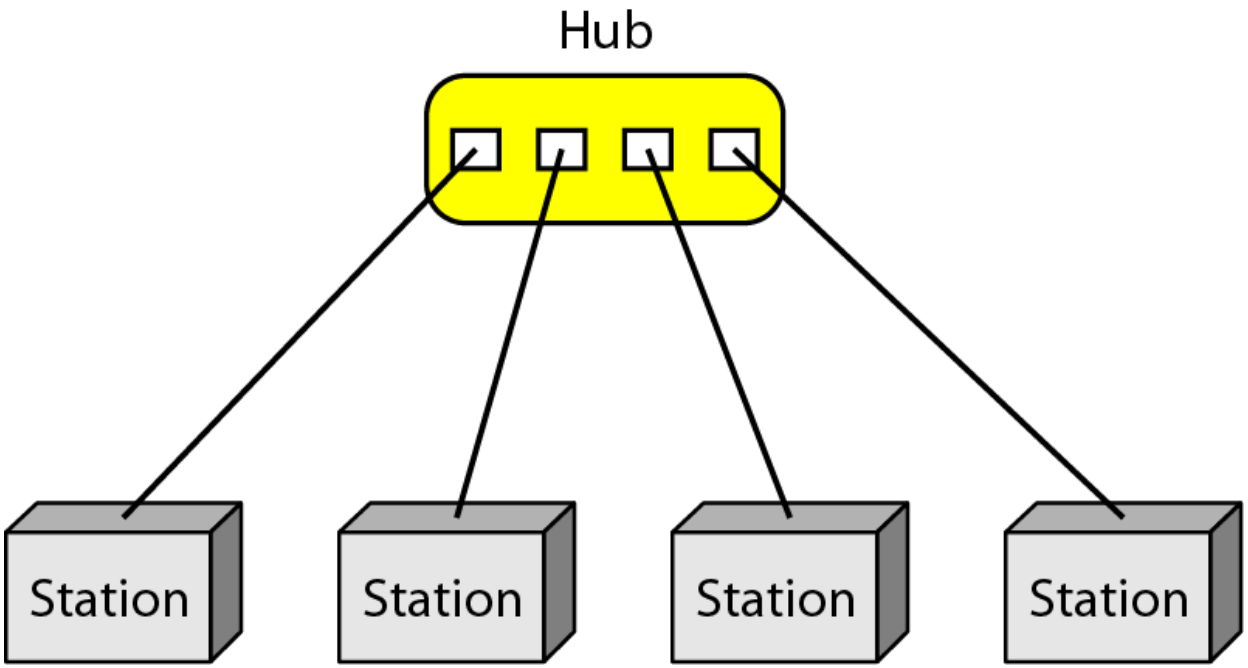


Figure 1.7 *A bus topology connecting three stations*

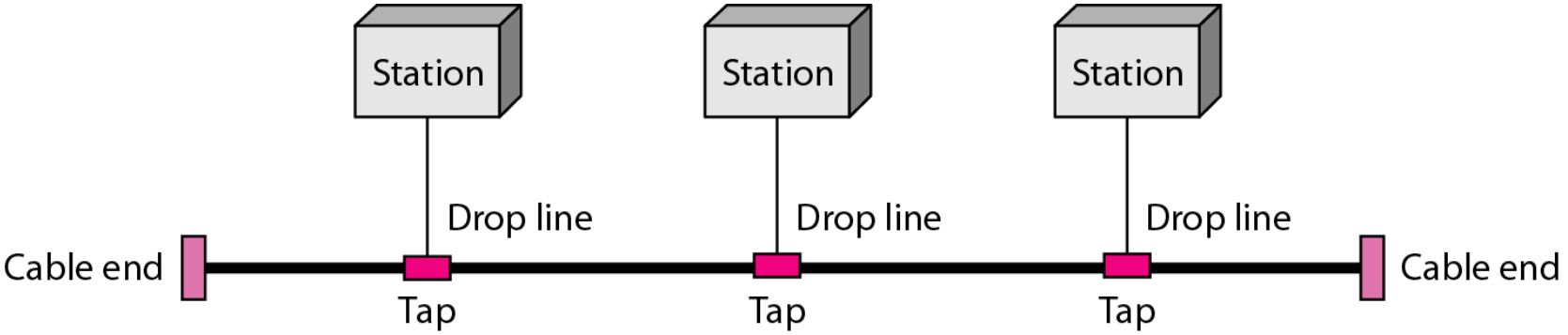


Figure 1.8 *A ring topology connecting six stations*

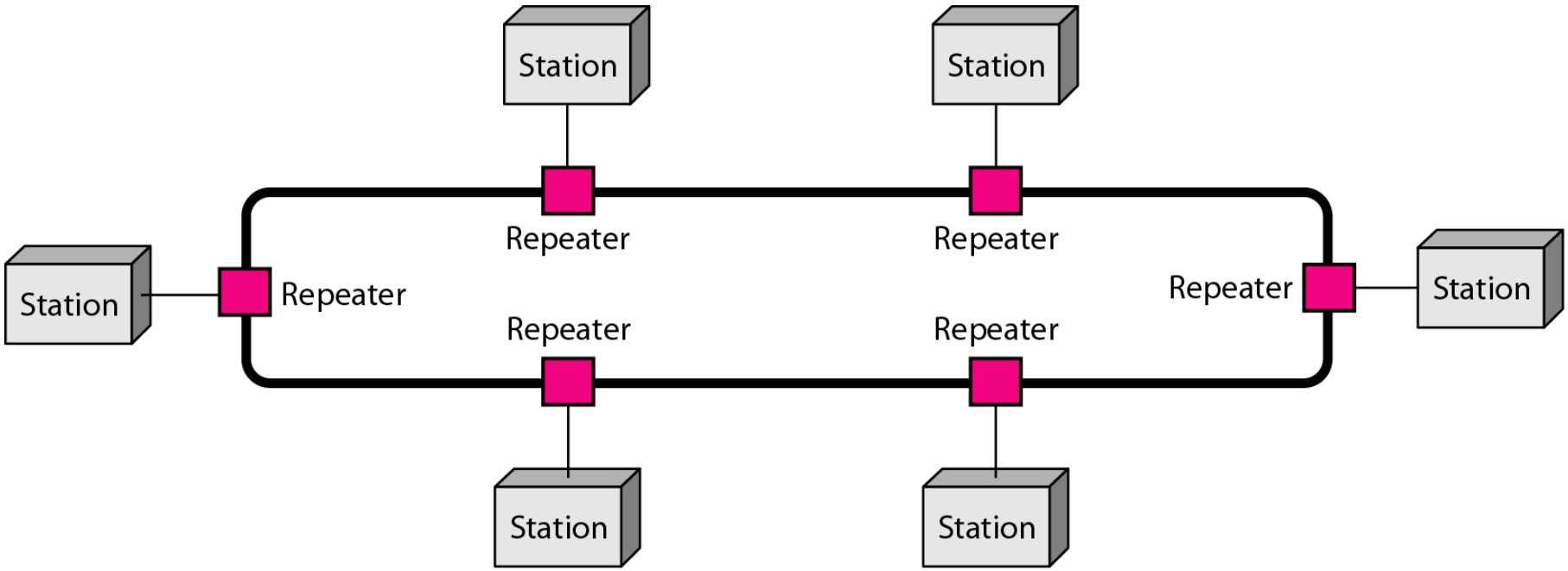


Figure 1.9 *A hybrid topology: a star backbone with three bus networks*

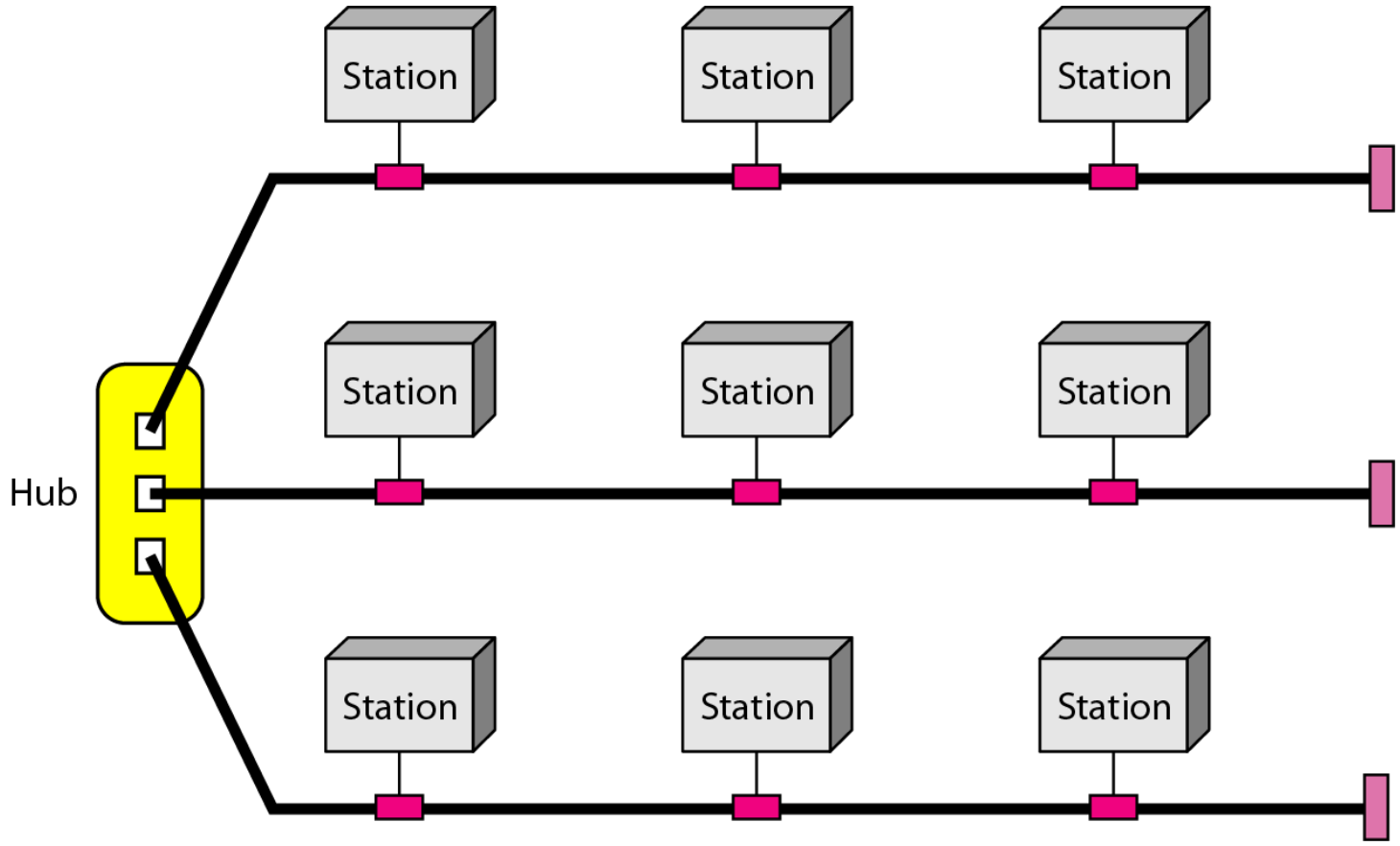
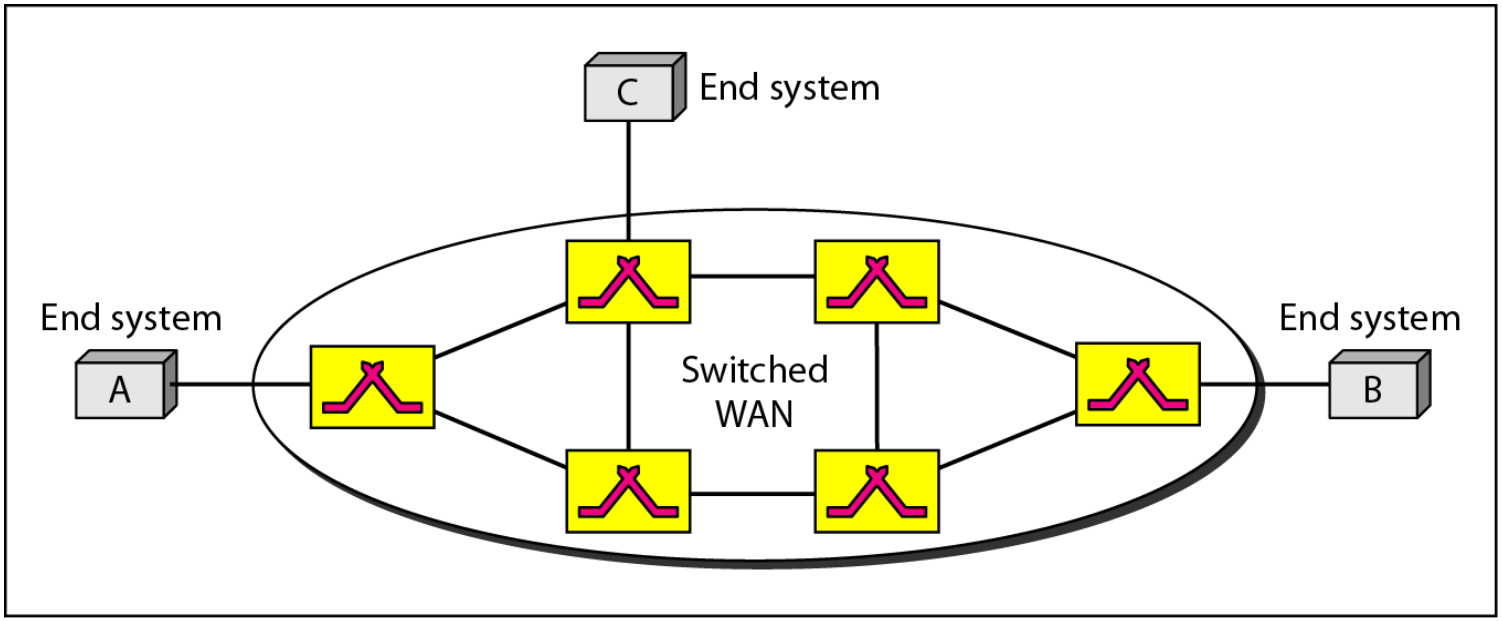
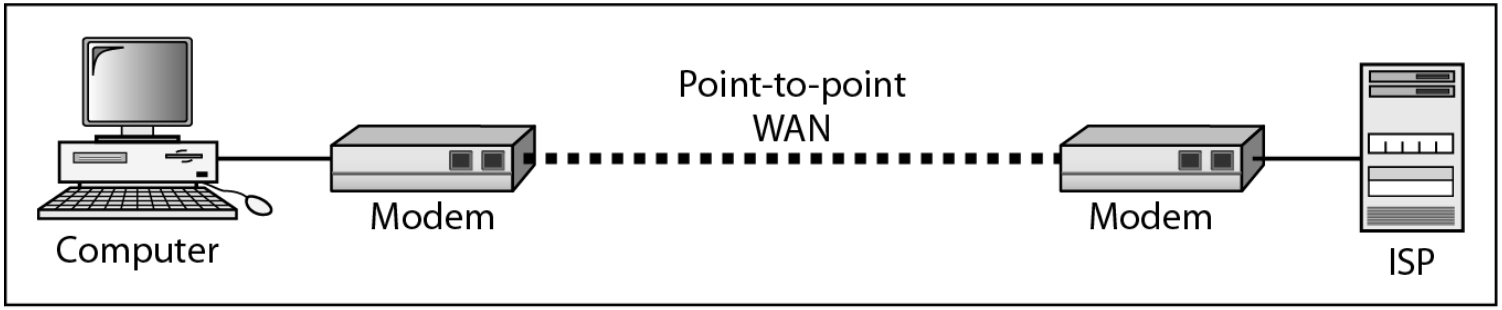


Figure 1.11 *WANs: a switched WAN and a point-to-point WAN*

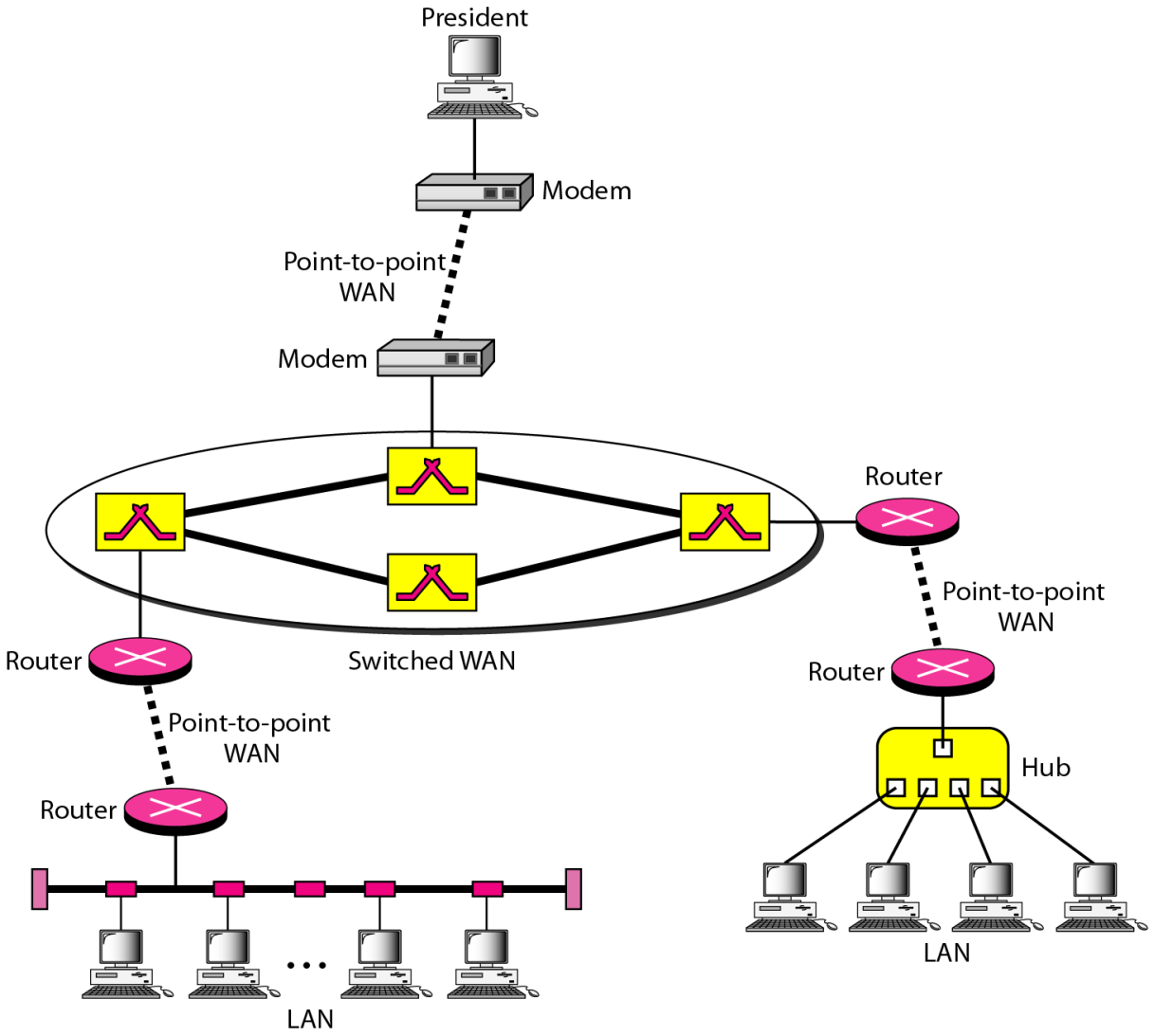


a. Switched WAN



b. Point-to-point WAN

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



HOW INTERNET WORKS ?????