Chapter I

Introduction to Computer Networking and Hardware Concepts

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Abstract

This chapter provides an introduction to computer networking and hardware concepts and highlights the use of software and hardware tools as an aid to enhance teaching and learning computer networking and hardware fundamentals. A basic knowledge of network topology, channel access protocol, network traffic, and networking devices is needed when designing and implementing a LAN. The term computer hardware refers to the physical components of a computer system — those that one can see and touch. The CPU, memory, and input and output devices are the main components of a computer. To understand the operation of a modern processor, it is important that the student grasp the basic concepts of computer hardware.

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Learning Objectives

After completing this chapter, you will be able to:

- Give an overview of computer networking and hardware fundamentals.
- Draw a block diagram of a computer.
- Discuss the significance of interactive teaching in introductory computer networking and hardware courses.
- Appreciate the need for software/hardware tools for teaching and learning various aspects of computer networks and hardware.

Overview of Computer Networking

A computer network consists of two or more computers or other intelligent devices linked by communication media (e.g., cable or wireless media) to achieve successful communication. Computer networking is used in many aspects of our lives, and its applications are proliferating. For example, computer networks can be found in universities, secondary schools, and colleges, while in the corporate world, networks link geographically separated offices. Local and state government offices use computer networks, as do military organizations, medical facilities, and the Internet.

Computer networks can be categorized as: (1) local area networks (LANs), (2) metropolitan area networks (MANs), and (3) wide area networks (WANs). The fundamental differences among LANs, MANs, and WANs are distance coverage, transmission speed, media, and error rate. A LAN is a class of computer network that covers a relatively small geographic area, for example, a room, a building or a campus. A LAN is owned by a single organization and physically located within the organization’s premises. IEEE 802.3 Ethernet CSMA/CD (Carrier Sense Multiple Access with Collision Detection) is an example of a LAN (IEEE 802.3, 1998). More details about LANs, in general, can be found in many textbooks (Forouzan, 2003; Keiser, 2002; Stamper, 2001), and LAN design is discussed in Fitzgerald and Dennis (2002) and Sarkar and Petrova (2005b). A MAN is a backbone network that links multiple LANs in a large city or a metropolitan region covering up to 40 km. The IEEE 802.6 Fibre Distributed Data Interface (FDDI) is an example of a MAN (Comer, 2001; Forouzan, 2004). A WAN is a class of network that covers a large geographical area (e.g., a country or a continent). Telephone networks and the Internet are examples of WANs.