**Learning Tips for Chapter 6**

This chapter begins by describing communication functions at the Data Link and Physical layers of the TCP/IP network in wired LANs and backbone networks (BNs). The latter part of the chapter focuses on wired infrastructure, especially that in Ethernet networks.

The chapter introduces several Data Link communication functions (including media access controls and error detection) that are used in both wired and wireless networks but focuses on how they are implemented in wired networks. The differences in how they are implemented in wireless networks are described in Chapter 7.

You should not overlook the fact that most Data Link and Physical layer communication functions are performed by network adapters. Adapters build frames and implement media access controls and error detection processes. Each adapter has a unique MAC address.

Traditional media access controls (such as CSMA/CD) developed for early wired networks that included shared media (such as hubs) are turned off in switched networks. Data link controls, such as bit-level synchronization, are sufficient media access controls in wired networks.

Although some modems convert digital electronic signals to analog electronic signals, wired networks use line encoding to represent bits as electronic digital signals on copper cabling. NRZI used in conjunction with 4B/5B family block encoding is used in Ethernet networks.

Because signals attenuate, erode, or can be affected by error-causing noise, repeaters are widely used for signal cleanup and regeneration.

Structured cabling standards are followed for wired infrastructure in most business buildings. These primarily apply to copper cabling (UTP and STP Ethernet cables) but also reference fiber optic infrastructure.

Ethernet continues to evolve, and newer generations accommodate higher transmission rates. There are many different Ethernet physical deployment specifications. Power over Ethernet is becoming more common; most new Ethernet switches support PoE.

Backbone networks are common on business and other campuses. The three-layer hierarchical model provides BN deployment guidance.

Adapters, cabling, adapters, and switches are important Physical and Data Link layer technologies.

Do not ignore the Key Concepts in Chapter 6 Presentation.

You are also encouraged to leverage the supplement videos and readings for this chapter.

Use the Chapter 6 Problems and Exercises tips to assist with any problems and exercises that you may be assigned.

The appendices for Chapter 6 provide additional information on numerous topics in this chapter.

**Especially Important Sections**

Section 6.1 and each of its subsections

Sections 6.2.1 and 6.2.2 and each of their subsections

Section 6.2.3

Sections 6.3.1 and 6.3.2

Section 6.3.4

Section 6.4.1 and each of its subsections

Section 6.4.3

Section 6.5 and each of its subsections

**Especially Important Figures and Tables**

*Note:* It is important to read/study the discussion related to each figure and table that is identified.

Figure 6-1 and Table 6-1

Figure 6-2

Figures 6-3 and 6-4

Table 6-2

Figure 6-5

Figure 6-8

Figure 6-10 and Table 6-4

Figures 6-11, 6-12, and 6-13

Figures 6-14 and Table 6-15

Figure 6-16 and Table 6-6

Table 6-7

Table 6-6 and Figure 6-19

Table 6-10

Tables 6-11 and 6-12

Table 6-13 and Figure 6-23

Figure 6-24

Table 6-16

Figure 6-27

Figures 6-28 and 6-29

Figures 6-32 and 6-33

Figure 6-34

**Especially Important Key Terms**

Backbone

Burst error

Controlled access protocols

Data link control

Line encoding

Media access control

Multiple access control protocols

Network resilience

Noise

Power over Ethernet (PoE)

Random access protocols

Routed backbone

Signaling

Signal regeneration

Switched backbone

Symbol

Symbol rate

**Especially Important Review Questions**

Questions 1, 3-18, 20-22, 25, 27-30

**Especially Valuable Problems and Exercises**

Exercises 6-1 and 6-2