INTRODUCTION

In the previous chapter, we investigated the technology requirements for an online teaching/learning system. Networks are one of the major components in an online teaching/learning system infrastructure. As mentioned earlier, an online teaching/learning system is often constructed on a client-server structure. A network is used to link the tiers of the client-server structure. Through the network, the client side can send requests to the server side and get response from the server.

A network consists of routers, switches, network adapters, modems, multiplexers, different types of transmission media, network protocols, and network management tools. There are different types of networks such as local area networks, wide area networks, Internet, and so on. Not only does an online teaching/learning system depend on a reliable and secure network infrastructure, many technology-based courses also use networks for hands-on practice.

In this chapter, we will focus on issues related to networks. We will examine how a network works and how it can be used to support the online teaching/learning system. We will also take a closer look at different networks and how they can be used in the online teaching/learning system. We will also investigate what roles can be played by the open source network tools in developing and managing a network infrastructure for the online teaching/learning system.

We will start with the description of the client-server infrastructure. Then, we will investigate various types of client-server structures and compare their features.
We will check into the functionalities of each tier of the client-server structure and how they are able to implement the online teaching/learning system.

After the client-server infrastructure is introduced, we will look at the network equipment used to construct various networks. We will investigate the hardware and protocols used in developing an enterprise-level network. Many of the open source protocols play an important role in various types of network structures. Detailed discussion about these open source protocols will be given in this chapter.

There are various open source network management tools. Many of them can be used to develop online teaching/learning systems. We will categorize these open source tools based on their functionalities. Then, we will discuss them in detail and look into their features and how they can be used in developing and managing the network for an online teaching/learning system.

At the enterprise level, one of the network management tools is Lightweight Directory Access Protocol (LDAP). LDAP is a client-server protocol that can be used for delivering directory services. A directory service defines the namespaces of all the objects on a network. It stores the authentication information about users, computers, and other network resources such as files, printers, and so on. It decides what permissions a user will have and how a computer or other network resources can be accessed. This chapter will demonstrate how to create a directory service with the open source directory service tool OpenLDAP. It will also discuss the configuration issues and the open source tools used in the development process.

**BACKGROUND**

Constructing networks for an online teaching/learning system is a strenuous project. It often requires tremendous effort and sophisticated skills. First, it needs a careful design on a network’s infrastructure to meet the requirements of the online teaching/learning system. Like the development of many IT projects, designing a network infrastructure includes the planning, designing, and implementation phases. For designing large scale networks, readers can find technical details from the book by Cisco Systems Inc., Thomas, and Khan (1999). Readers can find the design of three kinds of networks, campus, wide area, and remote connections from the technical point of view. Some studies on designing networks for universities have been done. Kapadia and Fortes (1998) described Purdue University’s network computing hubs’ prototype which is a demand-based network computing system for reducing duplicated effort. There are other studies on planning and creating IT infrastructures. Penrod and Harbor (2000) presented a case study on designing and implementing an e-learning system for a large university. They discussed the issues related to the
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