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Basic Network Concepts

Knowing how computers communicate in a network environment is essential to passing the Network+ certification exam and to being a good network professional who can troubleshoot networking issues. This chapter introduces you to the basics of what makes a network tick, and covers basic topics and terminology that will set the foundation for the rest of your studies.

We will look at the various topologies, network operating systems, and common terminology used in day-to-day discussions between IT professionals. In this chapter, you will learn the purpose of a network, the different types of networks, network topologies, cables, and connectors, and you will learn about network architectures. You will finish the chapter by learning about some of the most popular network operating systems.

CERTIFICATION OBJECTIVE 1.01

Identifying Characteristics of a Network

More and more people are building home and small office networks now as a result of the low cost of networking devices such as hubs and home routers. As a Network+ Certified Professional, you will need to ensure that you can support these small, medium, and large networks, so you will start by learning some basic terms.

A network is a group of systems that are connected to allow sharing of resources—such as files or printers—or sharing of services—such as an Internet connection. There are two aspects of setting up a network: the hardware used to connect the systems together and the software installed on the computers to allow them to communicate. This chapter is designed to give you an understanding of the hardware used to build a network, and later chapters discuss the software needed. The network hardware is made up of two basic components: the entities that want to share the information or resources, such as servers and workstations, and the medium that enables the entities to communicate, which is a cable or a wireless medium.

Servers, Workstations, and Hosts

A typical network involves having users sit at workstations, running such applications as word processors or spreadsheet programs. The workstation also is

known as a client, which is just a basic computer running a client operating system such as Windows XP or Linux. These users typically store their files on a central server so that they can share the files with other users on the network. The server is a special computer that contains more disk space and memory than are found on client workstations. The server has special software installed that allows it to function as a server. This special software can provide file and print services (to allow sharing of files and printers), provide web pages to clients, or provide e-mail functionality to the company.

The term *host* refers to any computer or device that is connected to a network and sends or receives information on that network. A host can be a server, a workstation, a printer with its own network card, or a device such as a router. We can summarize by saying that any system or device that is connected to the network is known as a host.

WANs, LANs, and MANs

Some other terms that you will hear often are LAN, WAN, and MAN. A *local area network (LAN)* typically is confined to a single building, such as an office building, your home network, or a college campus. A *wide area network (WAN)* spans multiple geographic locations and is typically made up of multiple LANs. For example, I have a company with an office in Halifax, Nova Scotia (that's a city in Canada next door to the penguins) that has 100 computers all connected together. This would be considered a LAN. Now if we expand the company and create an office in Toronto, the network in Toronto also would be considered a LAN. If we want to allow the two offices to share information with one another, we would connect the two LANs together, creating a WAN.

The term *metropolitan area network (MAN)* is not used often anymore; it refers to a network that exists within a single city or metropolitan area. If we had two different buildings within a city that were connected together, it would be considered a MAN.

Types of Networks

Organizations of different sizes, structures, and budgets need different types of networks. A local newspaper company has needs for its network that would be different from the needs of a multinational company. Networks can be divided into one of two categories: peer-to-peer or server-based networks.

Peer-to-Peer Network

A *peer-to-peer* network has no dedicated servers; instead, a number of workstations are connected together for the purpose of sharing information or devices. When there is no dedicated server, all workstations are considered equal; any one of them can participate as the client or the server. Peer-to-peer networks are designed to satisfy the networking needs of home networks or of small companies that do not want to spend a lot of money on a dedicated server but still want to have the capability to share information or devices. For example, a small accounting firm with three employees that needs to access customer data from any of the three systems or print to one printer from any of the three systems may not want to spend a lot of money on a dedicated server. A small peer-to-peer network will allow these three computers to share the printer and the customer information with one another (see Figure 1-1). The extra cost of a server was not incurred because the existing client systems were networked together to create the peer-to-peer network.

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The Microsoft term for a peer-to-peer network is a workgroup. Be aware that peer-to-peer networks typically consist of fewer than 10 systems.

Most of the modern operating systems such as Windows XP and Windows Vista already have built-in peer-to-peer networking capabilities, which is why building a peer-to-peer network would be a "cheap" network solution. The disadvantage of a peer-to-peer network is the lack of centralized administration—with peer-to-peer networks, you need to build user accounts and configure security on each system.

FIGURE 1-1

A peer-to-peer network

Workstation A

Hub

Laser printer

Workstation B

Workstation C
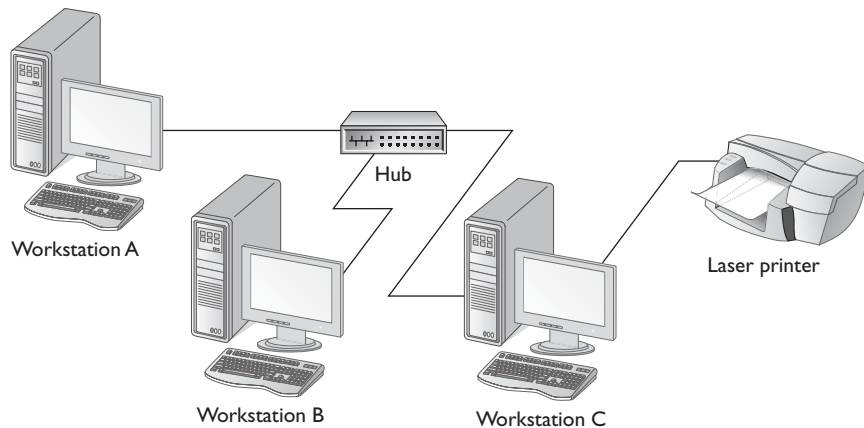
It is important to note that peer-to-peer networks are designed for fewer than 10 systems, and with Microsoft client operating systems such as Windows XP Professional, only 10 concurrent network connections to those clients are allowed. This means that if you have 15 or 20 employees, you eventually will need to implement a server-based network.
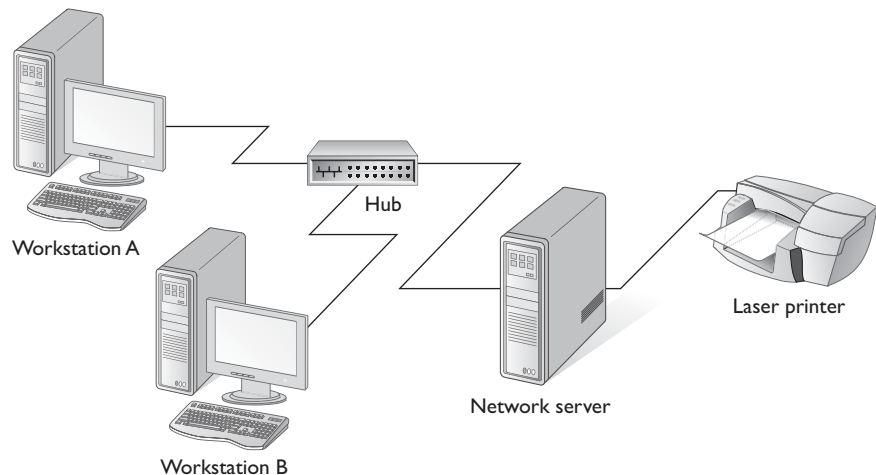
Server-Based Networks

A big disadvantage of peer-to-peer networking is that you can't do your day-to-day administration in a single place. With peer-to-peer networking, user accounts typically are created on all the systems, and data files are stored throughout all the systems. This leads to a more complicated environment and makes your job harder as a network administrator. Usually after four or five systems have been networked, the need for a dedicated server to store all of the user accounts and data files becomes apparent—this is a server-based network (see Figure 1-2).

The advantage of a server-based network is that the data files that will be used by all of the users are stored on the one server. This will help you by giving you a central point to set up permissions on the data files, and it will give you a central point from which to back up all of the data in case data loss should occur. With a server-based network, the network server stores a list of users who may use network resources and usually holds the resources as well.

FIGURE 1-2

A server-based network

Workstation A

Hub

Workstation B

Network server

Laser printer