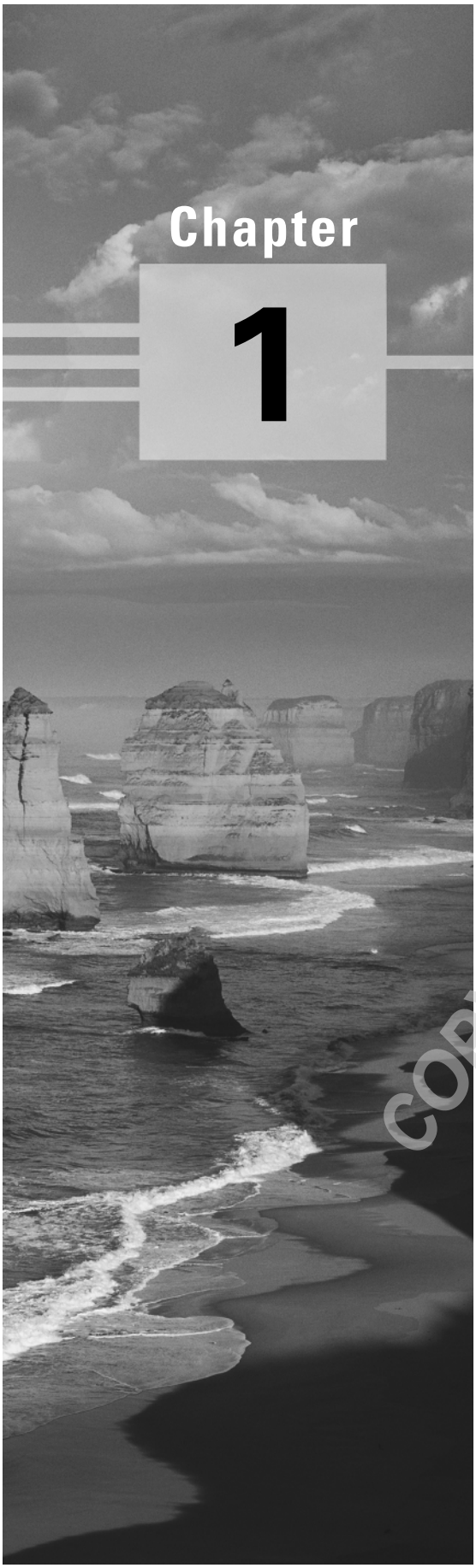

Chapter

1

IT Systems and Services Overview

THE CIW EXAM OBJECTIVE GROUPS COVERED IN THIS CHAPTER:

- ✓ **Identify common IT services related to various hardware platforms and frequently used operating systems, including but not limited to: mission-critical services, system maintenance, connectivity, platform strategies.**

In this chapter you will gain an understanding of the duties that systems administrators perform in an *Information Technology (IT)* department. We will look at the tasks that systems administrators perform to maintain and enhance backbone and mission-critical services on local area networks (LANs) and wide area networks (WANs). You will see that these tasks include installing systems, configuring systems, and maintaining systems in order to optimize performance, availability, and responsiveness to users. You will also see that efficiently managing users and groups will allow you to share resources securely in order to maximize the usefulness of your network. This chapter serves as an overview of all these topics, each of which will be developed in later chapters in much greater detail.

The IT department is responsible for administering servers and supporting end users in an organization. As a systems administrator, you may work in an IT department in which each employee is responsible for one specific area, such as installing servers, supporting end users, configuring web servers, configuring e-mail, or maintaining the system. However, it is more likely that you will be required to work in several areas. In a single day, you might install Windows 2000 Server to facilitate file transfer between departments, help an end user check e-mail for the first time, and configure a Linux web server.

The purpose of this chapter is to discuss some of the common systems with which a server administrator will work.

Common IT Tasks and Services

As businesses adopt Internet-based services such as websites and e-mail, IT departments must expand their capabilities to support services and enable businesses to fulfill goals. Therefore, the IT professional's role is to provide the following services:

- Install and configure systems and services
- Support users, which includes troubleshooting applications and managing systems

Table 1.1 lists and describes some of the tasks that an IT department performs. It also lists and describes some of the services you will administer throughout your career as an IT professional.

TABLE 1.1 Common IT Tasks and Services

Task or Service	Description
Install systems	Install and configure an *operating system (OS)*.
Configure a web server	Enable the transfer of information to Internet, intranet, and extranet users via *Hypertext Transfer Protocol (HTTP)*.
Configure and manage an FTP server	Enable the transfer of large files across the Internet using the *File Transfer Protocol (FTP)*.
Configure name resolution	Using the *Domain Name System (DNS*), the *Windows Internet Naming Service (WINS),* and *Samba*, provide *local area network (LAN)* and *wide area network (WAN)* naming.
Install and support e-mail servers	Enable communication among users across a LAN or a WAN. Popular e-mail servers include Microsoft Exchange, Unix sendmail, and shareware servers such as EMWAC e-mail server.

TABLE 1.1 Common IT Tasks and Services *(continued)*

Task or Service	Description
Install and support e-commerce servers	Install and maintain settings for services devoted to buying and selling on the Internet using tools such as IBM Net.Commerce and Microsoft Transaction Server E-commerce Edition.
Install and support database servers	Sample database servers include Oracle, Microsoft SQL Server, and IBM DB2.
Manage users	Add, delete, and manage users using Novell, Unix, and Windows 2000 servers. Managing can also include providing (or disabling) user identification services such as finger.
Monitor and optimize servers	Use native programs that help determine optimal usage of CPU, hard drive, and RAM. Such programs include UNIX ps and top and the Performance snap-in in Windows 2000.
Back up files	Use backup programs such as Unix dump and cpio, as well as native Windows 2000 programs such as Disk Administrator, to safeguard against system failure.
Routing	Ensure that messages and packets travel from one user to another in a controlled and timely manner. This function is accomplished with routers, bridges, and switches.
Establish and manage shares	Establishing a share offers space on a server's hard drive to remote users. Unix systems allow access through the use of the *Network File System (NFS)*, whereas Windows 2000 utilizes Microsoft Networking.
Plan LANs and WANs	Network design and planning requires experts in TCP/IP, routing, user management, e-mail addressing, and security.

TABLE 1.1 Common IT Tasks and Services *(continued)*

Task or Service	Description
Manage security	Once the network is operational, qualified individuals must monitor the network for problems. Security issues can include monitoring network routers and servers for various attacks, determining user-level access problems, checking servers for improper permissions, checking logs, and checking the configuration of network servers (e-mail, DNS, web, and so forth).
Manage addressing	Many networks use the *Dynamic Host Configuration Protocol (DHCP)* to ensure that all computers on the network can to communicate on the network. You can configure a special server to assign addresses to client computers.

The primary difference between a service (that is, a *daemon*) and an application is that a service runs more or less full-time on the "back end" (for example, on a Windows 2000 server or a Unix box). Applications are deployed for specific user tasks, such as checking e-mail, editing a file, or configuring an IP address.

As you can see from Table 1.1, IT departments offer a multitude of services. These services are categorized as either backbone or mission-critical and can be more appropriate for a LAN or a WAN.

Backbone Services

Backbone services provide the foundation for a working LAN or WAN. Because these services generally operate in the background, they are often invisible to users and may be taken for granted until and unless there is a malfunction. That problem may have critical network-wide consequences that must be quickly remedied. Backbone services help organize users by allowing them to work with machines by name rather than by IP address.

Problems with these services can include a failure of client computers to obtain an IP address, the inability to resolve IP addresses to friendly host names, or the inability to locate resources on the network through a central logon to a directory service.

The following is a list of the most essential services:

Naming services These services include the Domain Name System (DNS), the Windows Internet Naming Service (WINS), and Samba (Samba enables Unix systems to participate in Windows networking). Naming services also include Dynamic DNS (DDNS), which allows DNS automatic name-to-IP address mapping changes. Companies such as TZO (`www.tzo.com`) offer this service. With the advent of Windows 2000, dynamic DNS has become popular in LANs, as well.

Address management You can coordinate DHCP servers with naming servers to ensure that all systems have the most current addressing information.

Directory services These services centralize system resources such as servers, printers, and Internet access. Examples of directory services include Novell Directory Services (NDS), the Windows *NT Directory Services (NTDS)* found in Windows NT 4, and the Windows NT Active Directory found in Windows 2000.

Central logon This single logon point allows access to additional resources (such as servers, printers, and the Internet). A service of this type lets users maintain a single username and password and yet have access to multiple resources. Examples of central logon services include Windows NT and NIS domains, as well as the *Kerberos* implementations found in Windows 2000 and various Unix flavors (including Linux). Kerberos is a secure method of providing a central logon. Kerberos authentication does not allow passwords to travel across the network and provides granular access to resources on a timed basis.

Routing Whenever you connect one LAN to another, you can use a bridge, a router, or a switch. A router is the popular connection. You might be asked to configure routers or handle other routing issues.

Mission-Critical Services

Now that we've looked at backbone services, we need to understand mission-critical services. Any service provided by IT is potentially mission critical. Generally, the more visible a system is and the more users depend on it, the

more mission-critical the system is. *Mission-critical services* can include the following:

- World Wide Web servers such as Microsoft Internet Information Server (IIS), Apache Server, and so forth
- Database, application, and e-commerce servers (any service designed to collect, gather, and present information across a network)
- FTP servers such as Wu-FTPD and IIS

The best way to identify a mission-critical service is to identify the nature of the business. E-commerce sites focus on web servers and accompanying support servers, including databases and other *middleware*. Middleware is software that extends the capabilities of a web server. Middleware can include Java servlets, application servers, and other servers that let you organize and direct information between an end user and a web server.

For example, when a business wants to provide real-time audio and video, a streaming video server, such as RealServer (`www.real.com`), becomes mission-critical to that business. You must prioritize the various services your company offers.

E-mail

For many companies, the e-mail server is the ultimate mission-critical service. Mail servers can store, send, and receive e-mail messages using several protocols, including *Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP)*, and the *Internet Mail Access Protocol* (*IMAP*). These three protocols reside at the application layer of the OSI (Open Standards Interconnect) Reference Model. Sometimes, the SMTP and POP3 servers are located on separate machines. Popular mail servers include Netscape Messaging Server and Microsoft Exchange Server. Let's take a look at the e-mail protocols:

SMTP Is responsible solely for sending e-mail messages. In Unix, for example, the sendmail program activates in response to a command and sends the requested message.

POP Is the simplest protocol for storing and receiving e-mail messages. It is currently called POP3 because it is in its third iteration. POP responds to a request, asks for the appropriate password, and then downloads the message from the server to the intended recipient, who can then read, delete, or otherwise manage it.

IMAP Handles messages in a more sophisticated manner than POP by allowing a user to browse and manage files remotely.

End-User Support: Troubleshooting

An often overlooked role filled by IT professionals is that of troubleshooter. An efficient IT professional can assess a problem quickly and has the proper tools to resolve it. Although the IT professional's job is mostly technical in nature, good interpersonal skills are critical for successful interactions with users. Often, in order to isolate the source of a problem, an IT professional must interview a user to find out what changed just before a problem occurred.

User issues can include resetting lost passwords, removing viruses, granting users permissions to resources, and installing, fixing and upgrading software and hardware. We will see that you can use group policy in Windows 2000 to reduce the Total Cost of Ownership (TCO) by standardizing user desktops and automatically installing and upgrading software.

A network administrator must also prioritize tasks based on the number of users affected. Is one user's e-mail down or is the e-mail server down so that all users are affected? If a large number of users are having problems with a certain application, you must isolate, document, and remedy the cause to prevent further incidents.

LAN vs. WAN Services

Many of the services discussed thus far offer a variety of applications depending on the situation. For example, because of security issues, it is not wise to extend NFS or Microsoft shares over Internet connections. Therefore, offer these services from your machine only in a LAN or controlled WAN environment.

In contrast, e-mail, Web, and FTP services apply to almost any environment. You can offer these services within a LAN environment to create an intranet, or you can offer them across the Internet or an extranet. An *intranet* is a network that provides Internet-based services to end users within a specific organization or division within an organization. An *extranet* is a private network shared by organizations or company divisions over a public connection, such as the Internet. An extranet employs a virtual private network (VPN) connection to encrypt transmissions.

System Configuration

As a systems administrator, you must be able to configure both end-user and back-end systems. This configuration includes binding protocols such as TCP/IP to the network interface card (NIC) and checking the status of the communication protocol being used (for example, TCP/IP, NetBEUI, or IPX/SPX). Additional issues include the following:

- Addressing
- Configuring gateways
- Configuring name resolution
- Installing and managing services and applications
- Configuring automated and manual IP addressing

You can configure clients so that they automatically receive information about addressing, name resolution, and gateways.

These issues permeate the remaining chapters of this book. Chapter 3 is especially helpful to our understanding of IP addressing, and Chapters 7 and 8 focus on how to configure DNS, WINS, and Samba name resolution.

User Management

User management includes adding and removing users from the system and utilizing the applications specific to that operating system. For example, the Computer Management snap-in performs this function in Windows 2000. The Useradd program performs the same tasks in Unix systems. Additional user management issues include the following:

Permissions Can be granted to users over resources that belong to an individual server or over resources that are controlled by a centralized logon server such as a Windows Primary Domain Controller (PDC) or a Kerberos server.

Group membership The most efficient way to manage user permissions

Password aging Making a password expire after a certain period of time

Account lockout Locking out an account permanently or for a certain period of time if a user logon repeatedly fails

Password history Requiring users not to reuse passwords

Password complexity Requiring users to use strong passwords

Controlled access Providing user-level access to directories and files

System Performance

Another IT department function is performance monitoring—determining exactly how a particular system is performing. Performance monitoring involves checking system components, including keeping watch on the following:

- Bandwidth and access rate issues
- System I/O performance, including traffic on the NIC
- Hard drive access statistics, including capacity and access rate
- CPU usage
- Usage of random access memory (RAM)

In Chapter 2, you will learn how to monitor performance in both Windows 2000 and Unix as you implement various internetworking services.

Maintenance and Backup

System maintenance and backup issues are related to performance. Your tasks will include the following:

- Upgrading operating systems
- Installing service packs and hot fixes
- Upgrading services, including web and e-mail servers
- Scanning hard drives for errors
- Upgrading hard drives to provide more storage capacity

A *service pack* is a self-contained, all-inclusive patch designed to bring the Windows 2000 operating system up to the latest vendor-mandated specifications. Most vendors issue service packs regularly (for example, approximately every six months). A *hot fix* is generally a vendor solution for a specific problem. Most vendors issue hot fixes as problems are discovered and solved. Although delivery times vary, hot fixes have been issued within days or weeks of each other. Most of the time, a service pack contains all the relevant hot fixes issued in previous months.

Backup tasks include the following:

- Archiving user-created files, such as Microsoft Word and Excel documents
- Keeping copies of entire operating systems, complete with customized configurations
- Storing changes to databases, as well as other volatile data stores such as human resources and e-commerce databases
- Storing backups offsite to protect data against fires and natural disasters

Internet Operating Systems and Platforms

Visit the following sites to learn more about common Internet operating systems and platforms:

`www.microsoft.com`

`www.sun.com`

`www.redhat.com`

`www.oracle.com`

`www.ibm.com`

`www.apache.org`

`www.mdaemon.com`

`www.sendmail.org`

`www.compaq.com`

`www.adaptec.com`

`www.sybex.com`

These sites are only a few of those central to deploying Internet servers.

Summary

In this chapter you learned about the services an IT department performs in fulfilling its primary mission of administering servers and supporting end users in an organization. These services include installing and configuring systems and services and supporting users, which includes troubleshooting applications and managing systems.

Among those services, you learned to distinguish backbone and mission-critical services. You learned that backbone services provide the foundation for a working LAN or WAN and that these services include naming services, address management, and directory services. You also learned that mission-critical services are those whose disruption would have an immediate and critical negative impact on the ability of an organization to perform its primary mission. Mission-critical services typically include World Wide Web, database, application, e-commerce, and FTP servers. For many companies, e-mail servers are the ultimate mission-critical server.

Finally, we discussed the IT concepts of system maintenance, including fault tolerance, server optimization, and backup.

Exam Essentials

Be able to identify backbone services, which provide the ability to share, find, and connect to resources. Backbone naming services such as Dynamic DNS, WINS, and Samba provide the ability to find resources by using a host name or a NetBIOS name that is friendlier and easier to remember than an IP address. A central logon to a directory service allows universal access to resources based on permissions. In Windows 2000 and Unix, Kerberos implements security for a central logon.

Specify mission-critical services, the loss of which would immediately disrupt a company's ability to perform key operational tasks. World Wide Web, FTP, database and application services, and e-mail are often key and interdependent elements of a company's business operations.

Key Terms

Before taking the exam, you should be familiar with the following terms:

- backbone services
- daemon
- Domain Name System (DNS
- Dynamic Host Configuration Protocol (DHCP)
- extranet
- File Transfer Protocol (FTP).
- hot fix
- Hypertext Transfer Protocol (HTTP)
- IMAP
- Information Technology (IT)
- Internet Mail Access Protocol
- intranet
- Kerberos
- local area network (LAN)
- middleware
- mission-critical services
- Network File System (NFS)
- NT Directory Services (NTDS)
- operating system (OS)
- Post Office Protocol (POP)
- Samba
- service pack
- Simple Mail Transfer Protocol (SMTP)
- wide area network (WAN)
- Windows Internet Naming Service (WINS)

Review Questions

1. Jonathan is director of Human Resources for Great Escapes. He is advertising for a systems administrator. Which common IT tasks and services will job candidates be expected to perform? Choose the two most common tasks.

   A. Install and configure operating systems and services.

   B. Monitor the contents of user e-mails for appropriateness.

   C. Train and evaluate junior IT personnel.

   D. Design databases.

   E. Support users.

2. Mary runs `MostGifts.com`, which provides website hosting with a shopping cart for independent gift shops. The independent gift shops must upload their price lists to their individual website and communicate with customers expeditiously. Which services would be mission critical for `MostGifts.com`? Select all that apply.

   A. Real Player

   B. SQL server

   C. Exchange server

   D. A proxy server

   E. Checkpoint firewall

   F. IIS

3. Edward wants to ensure that his business will survive the failure of a server. When he comes to work in the morning, which element of his system does he always check?

   A. The UPS

   B. The backup logs

   C. Web server configuration

   D. Operating system and service installation and configuration

4. Jason is configuring name resolution for NT 4, Windows 2000, and Linux. Which of the following name servers would Jason configure? Select all that apply.

   A. DHCP

   B. DNS

   C. WINS

   D. SMBD

5. Heather's network has grown so that she now has two junior network administrators. Users sometimes complain that they are unable to communicate on the network because they get an error message stating that a duplicate IP address is in use. Which server should Heather implement to minimize IP address conflicts?

   A. DNS

   B. WINS

   C. Active Directory

   D. A database server

   E. DHCP

6. Jim works as a tutor for `eLearning.com`. One of his fellow tutors is a principal player in a start-up company and says he could use Jim's talents. He tells Jim that he can't announce what the company does until first-round financing is completed; however he asks Jim if he is familiar with IBM Net.Commerce or Microsoft Transaction Server E-commerce Edition. What can Jim surmise about the startup company?

   A. It will be an online training company.

   B. It will be well funded.

   C. It will be selling a product or a service on the Internet.

   D. It will be using Windows XP.

   E. It will be using NDS.

7. Jason is concerned about the risk of passwords traveling across the network and the possibility of stolen credentials being reused over a long period of time. Which authentication method will alleviate Jason's concerns?

   A. Kerberos

   B. NTLM

   C. EAP

   D. NDS

   E. IPSEC

8. Mike is part of a large server administration team at Global Interconnect. He is responsible for backbone services. Which of the following statements are true about Mike's duties? Choose all that apply.

   A. His job is secure.

   B. The services he supports operate in the background.

   C. Mike supports naming and directory services.

   D. Mike supports routing.

9. Patrick is looking at third party e-mail servers at `www.tucows.com`. His boss wants a reasonably priced e-mail server that will not only send mail but allow users to receive mail and manipulate that e-mail on the server. Patrick's boss wants to ensure that if a large message is received before several smaller but more important messages, the large message does not have to be downloaded first. To make this a reality, which e-mail protocols need to be supported on the system? Choose all that apply.

   A. SMTP

   B. POP

   C. IMAP

   D. Daemon

   E. Sendmail

10. Penny and Bill have formed a partnership between their firms and want to exchange encrypted information over a VPN. Which of the following terms describes the secure interchange of information between their companies?

    A. Internet

    B. Intranet

    C. Extranet

    D. E-commerce

    E. WAN

    F. LAN

11. Denise wants to share HR benefits information within her organization with users of diverse computers from manufacturers including Macintosh, Novell, Windows XP, and Linux. All client computers have browsers. Which of the following network technologies should Denise deploy?

    A. Internet

    B. Intranet

    C. Extranet

    D. E-commerce

    E. WAN

    F. LAN

12. Fred wants to administer the access users have to resources and to do so in an organized manner. Which two of the following constructs are most appropriate for this task?

    A. Permissions

    B. Group membership

    C. Auditing

    D. Group policies

    E. Kerberos

13. Rajesh is the only user with administrative rights on his network of 100 Windows 2000 computers. He is concerned about repeated data dictionary attacks against the administrator account in order to hack its password. What should Rajesh do to minimize this risk? Choose the two best answers.

A. Change his password every 60 days.

B. Use a complex password.

C. Rename the administrator account.

D. Set an account lockout duration of 12 hours.

E. Disable the administrator account until needed.

14. Hank's Windows 2000 server has been successfully attacked by a new worm that exploits numerous holes in IIS. What should Hank do to patch these holes?

A. Install a service pack.

B. Apply a hot fix.

C. Use system tools.

D. Use NLM.

15. Jessica just installed Windows 2000 Professional and wants to use Windows Update to fix existing problems and security vulnerabilities. What should Jessica download? Choose all that apply.

A. A service pack

B. A hot fix

C. A driver cache update

D. System tools

E. Driver signing

16. Frank is configuring an Internet server. Users will be downloading large audio files. What server service should Frank set up to enable fast and reliable file download?

A. A file server

B. A web server

C. An FTP server

D. An e-mail server

17. Tom wants the higher security of a central logon using Kerberos, because Kerberos does not allow passwords to travel across the network, and access to resources is granted only for a finite time span. Which servers support Kerberos? Choose all that apply.

    A. Unix

    B. NT 4

    C. Novell

    D. Windows 2000

18. Dennis works for a major ISP. He wants a separate set of e-mail servers to send e-mail and a separate set of e-mail servers to receive e-mail in order to distribute the load on the e-mail servers, speed up e-mail processing, and provide scalability for greater e-mail loads. Which services can Dennis separate? Choose two.

    A. NNTP

    B. POP3

    C. SMTP

    D. SSL

    E. FTP

19. Jessica wants to master the intricacies of the most common web server on the Internet so she can get a position as a Webmaster. What is the most common web server used on the Internet?

    A. IIS

    B. Apache

    C. Netscape

    D. Red Hat

20. InternetBank.com wants to create a comprehensive backup policy. Which backup issues of this policy will they address?

    A. Offsite storage

    B. Archiving user-created files

    C. Keeping copies of entire operating systems

    D. Storing changes to temporary files

    E. Storing changes to databases

Answers to Review Questions

1. A, E. The IT professional's role is to install and configure systems and services and to support users.

2. B, C, F. Internet Information Server (IIS) provides a WWW server to offer products for sale on the Internet and an FTP server for gift shops to upload their websites, including price lists, to `MostGifts.com`. The price lists and customer orders would be stored on a SQL database server. Finally, customer orders would be confirmed using a Microsoft Exchange e-mail server.

3. B. The file backup service provides a disaster recovery method in the event of server disk drive failure.

4. B, C, D. For name resolution, NT 4 typically uses WINS and DNS. On the other hand, Windows 2000 typically uses Dynamic DNS and can use standard DNS and/or WINS. Finally, Linux and Unix typically use DNS or Dynamic DNS to resolve host names.

5. E. Heather should implement a Dynamic Host Configuration Protocol (DHCP) server to automatically hand out IP addresses and IP configuration information.

6. C. E-commerce servers are used to sell products on the Internet. They integrate with web servers and database servers.

7. A. Kerberos provides a secure central logon. Passwords do not travel over the network, and the access ticket has an expiration time. Kerberos authentication is supported in Windows 2000 and Unix/Linux, but not in NT 4.

8. B, C, D. Backbone services operate in the background and include naming services and directory services, as well as services that provide address management, central logon, and routing.

9. A, C. SMTP is used to send e-mail, and IMAP is used to receive mail with the additional capability of manipulating e-mail on the server. POP can also be used to receive mail, but without the capability of downloading headers and then selectively downloading messages or deleting mail on the server before it is received on the client computer.

10. C. Penny and Bill have formed an extranet.

11. B. Denise should set up an intranet that provides Internet-based services to browser-based clients within her organization.

12. A, B. Fred should create users, add the appropriate users to groups, and assign permissions to the groups.

13. B, C. Rajesh should rename the administrator account and use a complex password. He wouldn't want to lock this account out for 12 hours at a time. Also, he should change the password more frequently than 60 days. The administrator account cannot be disabled.

14. B. Hank should apply a hot fix downloaded from Microsoft's website. Any patches to disable the new virus have probably not yet been incorporated into a service pack.

15. A, B. Service packs and hot fixes are used to fix known bugs.

16. C. An FTP server enables the reliable transfer of large files across the Internet.

17. A, D. Kerberos authentication is supported in Windows 2000 and Unix.

18. B, C. Dennis should separate the sending service (SMTP) from the receiving service (POP3).

19. B. Apache is the most common web server on the Internet.

20. A, B, C, E. Backup issues include archiving user-created files, keeping copies of entire operating systems, storing changes to databases, and storing backups offsite to protect data against fires and natural disasters.