

Chapter 5 Overview of Network Services

The ability to access a remote system allows a system administrator to efficiently maintain a network. A directory service provides system administrators with centralized control of all users and resources across the entire network. Other NOS services that allows users to communicate, share files, and print are covered.

5.1 Network Services

5.1.1 An introduction to network/NOS services

Networking Operating Systems (NOSs) are designed to provide network processes to clients and peers. Network services include the World Wide Web (WWW), file sharing, mail exchange, directory services, remote management, and print services. Remote management is a powerful service that allows administrators to configure networked systems that are miles away.

What are these network processes called in Windows 2000?

What are these network processes called in Linux?

What are these network processes called in Novell?

Recent versions of popular NOSs, such as Windows 2000 and Red Hat Linux 7, restrict the number of network services that are "on" by default. When deploying a NOS, key network services will need to be enabled manually.

Worksheet 5.1.1 Network/NOS Services

5.2 Remote Administration and Access Services

5.2.1 What is remote access?

Remote access is becoming more important as network users become more mobile. Companies need remote access as they expand their business to multiple locations or open their resources to selected outsiders without putting those resources on the Internet.

List the uses for remote access.

5.2.2 Telecommuting

Dialup access is the most common way for telecommuting employees to connect to the company LAN. However, in some cases, a dedicated connection might make more sense than the dialup access. If a company has many telecommuting employees, the remote access server requires multiple modems or a modem bank. With a modem bank numerous connections can be made simultaneously.

5.2.3 Mobile users

A laptop or notebook computer is a security threat as well because the computer and its contents could be physically stolen. A better solution might be for the mobile user to dial in to the company LAN. The mobile user's account is authenticated, and then the mobile user can access the data there instead of copying it to their own hard disk.

5.2.4 Terminal emulation services

Terminal emulation is the process of accessing a remote system via a local computer terminal. The local terminal runs software that emulates, or mimics, the look of the remote system's terminal. Using terminal emulation, the local user can type commands and execute programs on the remote system. The terminal emulation program runs on the local system like any other program.

List the common terminal types.

In addition to remote management, what is terminal emulation used for?

5.2.5 Telnet services

Telnet is the main Internet protocol for creating a connection with a remote machine. Telnet gives the user the opportunity to be on one computer system and do work on another. This work may be across the street or thousands of miles away. Telnet provides an error free connection. Telnet will be covered in depth further in chapter eight and chapter nine as it relates specifically to Windows 2000 and Linux.

5.2.6 Configuring remote access for a client

Today most computers are connected to the network on a permanent basis through the systems network card. These types of connections are done through assigning IP addresses to the system, which was covered in Chapter 4, "TCP/IP Networking". Sometimes establishing a remote connection to a computer must be done in other ways when the computer might be located somewhere that is not connected to a network. Therefore, a dialup telephone connection, ISDN, or broadband connection must be used to connect to the computer.

What is PPP?

What is pppd?

What are the two ways to create a PPP connection?

What is the KPPP dialer?

How is the KPPP dialer configured?

Discuss connecting with ISDN, DSL, and Cable modems.

5.2.7 Controlling remote access rights

When setting up a server for remote access, it is important to maintain a strict access rights policy. This can be a major network administration operation. The Linux operating system provides many options to choose from when controlling remote access rights. When setting up remote access controls, it is a good idea to use a combination of at least two of these options. The reason for using at least two options is that if one should fail, or go down, the user will always have a back up.

Discuss firewalls

Discuss the GUI Configuration Tool

What are TCP wrappers?

How are passwords used to control remote access?

What are file permissions used for?

5.2.8 Remote administration to Linux system

One benefit of using the Linux operating system on a server is that it provides many ways to remotely administer the system. This is the reason that it is so important to control access rights. As with any type of remote access to a system there are some security risks that need to be addressed. Many of these were discussed in the previous section. However, remote administration can be very convenient and also necessary in some cases. Linux provides several tools for remote administration. These include, text-mode logins, GUI logins, file transfers, and dedicated remote administration protocols.

Discuss text mode logins.

How are file transfers used in remote administration?

What are remote administration protocols?

5.3 Directory Services

5.3.1 What is a directory service?

A directory service provides system administrators with centralized control of all users and resources across the entire network. A directory service provides an administrator with the ability to organize information. Directory services help to simplify the management of the network by providing a standard interface for common system administration tasks. This feature is important when a large network is running multiple operating systems and various network protocols.

With a single directory service in place, the network administrator can centrally manage all such resources with a defined set of tools instead of manually attending to each device separately. These directory services can be local, which means it is restricted to one machine or the directory information can be spread across multiple machines. This is referred to as distributed directory database.

Explain the difference between a file system directory and the NOS directory.

What are the benefits of using directory services on a network?

5.3.2 Directory service standards

It is necessary to conform to a standard when creating distributed directories. To operate within a NOS, different directory services need to have a common method of naming and referencing objects.

What would happen without these standards?

X.500

X.500 defines Electronic Directory Service (EDS) standards. The directory services described in X.500 are designed to work in conjunction with X.400 messaging services.

What are the three primary components of an X.500 compliant directory?

What are the standards defined by X.500?

DAP and LDAP

Directory Access Protocol (DAP) enables the Directory User Agent (DUA) to communicate with the Directory System Agent (DSA). DAP defines the

means by which the user can search the directory to read, add, delete, and modify directory entries.

What is LDAP?

What improvements were made with LDAPv3?

5.3.3 Windows 2000 Active Directory

With the release of Windows 2000 Server, Microsoft made fundamental changes to its networking components. These changes are even more significant than those made by Novell in the transition from NetWare 3 to NetWare 4. The Active Directory is central to these changes. Where Novell's NDS functions as a service that works with the NOS, Microsoft's Active Directory functions as an application that is deeply integrated with the operating system.

The information for the active directory database structure is stored in what three files?

What is the Sysvol?

What is meant by group policy?

Windows 2000 Domains

The logical structure of the Active Directory is based on units called Domains. Although the same terminology is used, domains in Windows 2000 function differently from those in Windows NT. In both Windows NT and Windows 2000, a domain represents a security and administrative boundary, as well as a replication unit. However, Windows NT uses a flat domain structure, and Windows 2000 arranges domains in hierarchical *domain trees*.

How is active directory different from NDS?

Windows 2000 Organizational Units (OUs)

Active Directory, like NDS, uses Organizational Units (OUs) to organize resources within domains. Administrative authority can be delegated to individual OUs. In contrast, NT networking enables administrative privileges to be assigned only at the domain level.

Active Directory and DNS

Active Directory uses Domain Name Services (DNS) naming conventions and is dependent on DNS to operate. There must be a DNS server on every Windows 2000 network. In addition, DNS zone information updates can be integrated with Active Directory replication, which is more efficient than traditional DNS update methods.

Windows 2000 supports Dynamic DNS (DDNS), which enables the automatic updating of the DNS database.

Active Directory Servers

To use Active Directory, at least one server must be configured as a Domain Controller (DC). It is recommended that there be at least two DCs in each domain, for fault tolerance. Configuring the first domain controller on the network creates the directory for that domain.

Unlike Windows NT, in Windows 2000 there is not one primary domain controller. All DCs contain a read/write copy of the Active Directory partition. This information is kept up to date and synchronized through the

process of replication. This process is discussed in the next section of this chapter.

Active Directory Replication

Replication is the process of copying data from one computer to one or more other computers and synchronizing that data so that it is identical on all systems.

What does active directory use to copy directory information between the domain controllers in a domain?

Active Directory Security

Each object in Active Directory has an Access Control List (ACL) that contains all access permissions associated with that object. Permissions can be either explicitly allowed or denied, on an individual basis.

What are the two different types of permissions?

Who assigns permissions?

Should the checkbox at the bottom of the object security properties sheet be checked?

Active Directory Compatibility

Active Directory is dependent on the operating system and runs only on Windows 2000 servers. Because Active Directory is LDAP compatible, services and information can be accessed or exchanged with other LDAP directory services. Microsoft also provides tools for migrating information from other directories, such as NDS, into Active Directory.

Worksheet 5.3.3 Windows 2000 Active Directory

5.3.4 Network Information Service (NIS)

Linux uses another version of Directory Service called the Network Information Service (NIS). NIS provides a simple network lookup service consisting of databases and processes. NIS is a service that provides the information required on all machines on the network.

Where is support for NIS found?

Is NIS installed by default?

How does NIS function?

The NIS Structure

In a NIS configuration, the network will consist of the NIS Server, Slaves, and Clients. The NIS Servers is where the NIS database is created and maintained.

What are NIS slaves?

What are NIS clients?

What is meant by load balancing?

Lab Activity 5.3.5 Configuring Linux as a NIS Client

5.4 Other NOS services

5.4.1 Mail

Mail may be the most important network process of all. Mail provides users with a mechanism to send and receive electronic mail (e-mail). Mail services come in various forms. Over the years, many companies have developed proprietary methods of exchanging e-mail. Today, virtually all mail services rely on TCP/IP or can at least act as a gateway between proprietary and TCP/IP mail services.

What is MTA?

What is MUA?

What is MDA?

What are the two common protocols used to retrieve mail?

Should every NOS on a network run a mail service?

5.4.2 Printing

Although the world is quickly headed into an electronic era, a need still exists for physical printouts of data. In large and some small networks, it is impractical to provide every workstation computer with a printer. The solution is to provide networked printers to support all users within a physical location.

For this reason, network administrators use print services to help manage these network printers and their respective print queues.

What is FIFO?

5.4.3 File sharing

The ability to share files over a network is an important network service. There are many file sharing protocols and applications in use today. Within a corporate or home network, files are typically shared using Windows File Sharing or the Network File Sharing (NFS) protocol. In such environments, an end user may not even know if a given file is on a local hard disk or on a remote server. Windows File Sharing and NFS allow users to easily move, create, and delete files in remote directories.

How are files shared over the Internet?

What is Gnutella?

What is peer-to-peer networking?

5.4.4 FTP (File Transfer) web services

Many organizations make files available to remote employees, customers, and to the general public via the File Transfer Protocol (FTP). FTP services are made available to the public in conjunction with web services. For example, a user may browse a Web site, read about a software update on a web page, and then download the update using FTP. Smaller companies may use a single server to provide FTP and HTTP services, while larger companies may choose to use dedicated FTP servers.

Network administrators must be careful when configuring an FTP server. Why?

What is meant by session-oriented?

What is an idle timeout?

FTP connections are established through GUI programs or by using what standard CLI command?

Are FTP services enabled by default?

FTP sites can be targeted for what kind of attacks?

5.4.5 Web services

The World Wide Web is today's most visible network service. In less than a decade, the World Wide Web has become a global network of information, commerce, education, and entertainment. Millions of companies, organizations, and individuals maintain Web sites on the Internet. Web sites are collections of Web pages stored on a server or group of servers.

What model is the World Wide Web based on?

In the early 1990s, HTTP was used to transfer static pages. What is used today?

List examples of Web services software.

What are Web services used for?

5.4.6 Intranets

Web services play a significant role on private and corporate networks. An organization can deploy a private WWW network for a variety of purposes.

What are Intranets used for?

What technology is utilized to employ an Intranet?

5.4.7 Extranets

Extranets are an emerging technology that many of the largest corporations in the world are beginning to build. Extranets provide a means of including the outside world such as customers, suppliers, as well as a means of gaining valuable market research.

5.4.8 Automating tasks with script services

Modern NOS software provides system administrators and users with many built-in tools and automated features to increase productivity. Sometimes these features and commands are not enough to perform certain tasks efficiently. For this reason, most NOSs include support for "scripts". A script is a simple text program that allows the user to perform many automated tasks at once. Depending on their design, scripts can range from single lines of code to lengthy amounts of programming logic.

Why are scripts preferred over programming for a NOS administrator?

List scripting languages and their advantages.

Script Solutions

Most average NOS users will not create and execute their own scripts. The majority of scripting is performed by system administrators and experienced users who are comfortable with the concepts of programming. They tend to build such scripts for the purpose of automating specific tasks through the execution of a single script file. These script files can then be

scheduled to run at set times, to run when an event occurs, or to be executed manually by the user.

Discuss examples of scripts.

5.4.9 Domain Name Service (DNS)

The Domain Name Service (DNS) protocol translates an Internet name, like `www.cisco.com` for example, into an IP address. Many applications rely on the directory services provided by DNS to do this work. Web Browsers, e-mail programs, and file transfer programs all use the names of remote systems. The DNS protocol allows these clients to make requests to DNS servers in the network for the translation of names to IP addresses. Applications can then use the addresses to send their messages.

What would happen without this directory lookup service?

5.4.10 DHCP

The purpose of Dynamic Host Configuration Protocol (DHCP) is to enable individual computers on an IP network to extract their configurations from the DHCP server or servers. These DHCP servers have no exact information about the individual computers until information is requested.

The overall purpose of this is to reduce the work necessary to administer a large IP network.

What is the most significant piece of information distributed?

DHCP also allows for recovery and the ability to automatically renew network IP addresses through a leasing mechanism. This mechanism allocates an IP address for a specific time period, releases it, and then assigns a new IP address. DHCP allows all this to be done by a DHCP server which saves the system administrator considerable amounts of time.

5.4.11 Domains

A Domain is a logical grouping of networked computers that share a central directory or database. The directory or database is installed on computers called Servers. A server usually manages all security related and user related domain interactions. A server also provides a centralized place from which to administer these services.

The idea of a domain is not physical, but rather a logical grouping of a company's computers and servers.

What are the advantages of domains?

Chapter 5 Summary

This chapter discussed the Network Services. Some of the important concepts to retain from this chapter include the following:

- Remote administration allows an administrator to access a file database of a system, run various programs, or even download information or files from another room, another city, or another country.
- Several applications and protocols can be used to remotely administer a network server. The most common method of remote administration is terminal emulation.
- Microsoft's Active Directory functions as an application that is deeply integrated with the operating system.

- Linux uses another version of Directory Service called Network Information Service (NIS). NIS provides a simple network lookup service consisting of databases and processes.
- The World Wide Web is today's most visible network service. The intranet does not allow public access to private servers. It is specific to an individual company. The extranet is an emerging technology that combines the best of the Internet and the Intranet.

NOS computers take on specialized roles to accomplish concurrent access to shared resources. The next chapter discusses the characteristics of the Network Operating System (NOS).

