

## Chapter 7 Installation and Boot Process Overview

An IT professional is typically asked to perform software installations, including application software and operating systems. Installing an Operating System (OS), especially a Network Operating System (NOS), can be one of the most complex installation tasks. This chapter overviews the NOS installation process, including how to plan for the installation and how to troubleshoot installation problems.

### 7.1 Preparing for the Installation

#### 7.1.1 Installing NOS

Network Operating System (NOS) installation refers to the process of creating and copying NOS system files to a hard disk. System files are the files that allow the operating system to function. Many vendors ship computers with the operating system already installed. This is especially true with desktop computers.

*What are the advantages of a preinstalled operating system?*

*What are the disadvantages?*

*Why would network administrators prefer to install the NOS themselves?*

#### 7.1.2 Planning the system

The NOS installation should be carefully prepared. First, inventory the system's hardware. There is no one NOS that works with all computer hardware, so determine whether the currently available hardware will work with the NOS. Second, determine whether or not the NOS supports all application software that will be loaded on the system. Third, become familiar with the NOS itself. As part of the installation process, important, and sometimes irreversible, configuration decisions will have to be made.

*What are minimum hardware requirements?*

*How is a hardware inventory performed?*

#### 7.1.3 Planning hardware installation

The first step that the server hardware specialist should attempt is to verify that everything specified in the installation plan is ready and available before beginning the installation.

*What are the key elements of the system's hardware to consider when installing a NOS?*

*What other components should be considered when installing a NOS?*

*What is the Microsoft Upgrade Advisor?*

#### Worksheet 7.1.3 Planning the Installation

#### 7.1.4 Server hardware components

First the network administrator needs to check the components that will be used to assemble the network server. Some network server vendors do not assemble all the hardware for a network server when they are ordered. The network administrator must be able to take all the components and assemble them into a working network server.

#### Worksheet 7.1.4 Server Components

### 7.1.5 Hardware requirements

The most current versions of popular NOSs, such as Windows XP and Red Hat 7, can only run on certain hardware configurations. When choosing a NOS version to install, verify that the key elements of the system hardware meet the minimum requirements of the NOS. These key areas are CPU type (architecture), CPU speed (measured in megahertz [MHz] or gigahertz [GHz]), amount of RAM, and amount of available hard disk space.

#### Worksheet 7.1.5 Hardware Requirements

### 7.1.6 Creating a hardware inventory

The hardware inventory should be created before any installation programs are run or before any attempt to prepare the hard disk for installation.

If necessary, open the system case and examine the expansion cards in order to determine the manufacturer and chipset used. If manuals have come with the system, consult these as well.

Finally, if another operating system is already installed on the system, use the system utilities, such as Window's Device Manager, to get information on the installed hardware.

*What information should be included on the hardware inventory for each device?*

*What are the considerations if a system has older expansion cards or software?*

### 7.1.7 Identifying hardware using Device Manager

Previously, the devices were installed only if the user installed the device drivers. Today PCI-based plug-and-play is the new method. It is still easy to see which devices have not had drivers installed. In the Windows 2000 OS, the device will appear with a yellow question mark next to the device name in Device Manager.

#### Lab Activity 7.1.7 Using Device Manager in Windows 2000 Server

### 7.1.8 Checking hardware compatibility lists

After completing the hardware inventory, check with the NOS and hardware manufacturers to verify that the hardware is compatible with the NOS.

What is the most up-to-date source of this information?

#### Worksheet 7.1.8 File System

Please note that for this worksheet, the answers to the questions are not available in the course. It is recommended to have the students research and answer the questions outside of class. Then, the instructors can discuss the answers with the students in class.

#### Lab Activity 7.1.8 Using the HCL

### **7.1.9 Verifying the network**

The network configuration consists of selecting the network protocol and configuring it to operate correctly on the network. Most network servers use either the TCP/IP protocol or the IPX/SPX protocol or both.

*What information is needed to configure TCP/IP?*

*What is ping?*

## **7.2 The Installation Process**

### **7.2.1 Installation media**

After selecting the NOS that meets network and hardware requirements, the installation medium must be determined, such as a CD-ROM, the network, or floppy disks.

*What is the most common way to install the NOS?*

*Can the NOS be installed over a network?*

*What protocols would be used for a network installation?*

*What is the advantage of installing over a network?*

*Discuss the different installation methods.*

### **7.2.2 BIOS settings**

Particularly with older motherboards and older operating systems, the Basic Input Output System (BIOS) settings play a large part in the installation process. The system BIOS typically resides in ROM on the motherboard and is the first program run when a system is powered on.

*What is the POST?*

*Is the BIOS capable of automatically detecting disk drives and other hardware on older systems?*

*Only one BIOS setting is important for CD-based installations on newer systems. What is it?*

### **7.2.3 The installation program**

An installation program controls and simplifies the installation process. Depending on the NOS, the installation program prompts the user for configuration information. Most installation programs allow partitioning and formatting of the hard disk before copying system files.

*What is the installation program called in Windows?*

*What is the installation program called in Red Hat Linux?*

*When would a custom installation be chosen?*

### **7.2.4 Disk partitions**

In order to efficiently use the storage space on a hard disk, the disk is divided into sections called Partitions or Slices. Each partition, or slice, is a logical division of the hard disk. A disk can have one or more partitions. Typically, a network server is configured with multiple partitions before installing the NOS.

*What is a logical division?*

*What are the advantages of multiple disk partitions?*

*What are the considerations for a partition?*

*Why are the partitions formatted?*

*Is partitioning done before or during installation?*

### **7.2.5 Partitioning a disk**

Information about the number of partitions, their size, and their location on the disk is kept in the first sector of the disk. This information is called the Partition Table. Partition tables can conform to one of several formats, including DOS and BSD/Sun.

*What is the first sector of the disk called?*

*What is the VTOC?*

*How many primary partitions can a DOS-type partition table handle?*

*How many primary partitions can a Sun-type partition table handle?*

*What information is included on the partition table?*

*What happens if the MBR or disk label is corrupted or lost?*

*What are two types of partitions?*

*What is an extended partition?*

*What is the FDISK?*

### **7.2.6 Swap files**

A swap file is an area of the hard disk that is used for virtual memory. Virtual memory is hard disk space that is used to supplement RAM. Data is written to the swap file, also called a Paging File, when there is not enough RAM available. Data is then swapped between RAM and the swap file, as needed.

If the system has sufficient RAM, the swap file may be small and used infrequently. If RAM usage increases, the swap file may grow larger and swaps may occur more frequently. This allows programs to be run that the system would otherwise be unable to support.

*How do Windows and Linux handle swap files?*

### **Lab Activity 7.2.6 Adding Swap File Space in a Linux System**

### **7.2.7 Formatting the disk**

The formatting process defines the file system of the partition.

*What are the file systems for a Windows NOS?*

*What are the file systems for UNIX or Linux?*

*Are there other file systems?*

### **7.2.8 Creating initial administrative accounts**

One of the most important parts of any NOS installation is the creation of the administrative user account. The administrative account has unrestricted access to create and delete users and files. The administrative account is called the Super User Account on some systems.

*Why is extra security required for the administrative account?*

*Are there any other considerations for an administrative account?*

### **7.2.9 Completing the installation**

After providing the installation program with the necessary information, the program will create the NOS system files on the hard disk. Other basic applications and components will also be copied to the hard disk, as determined by the installation program.

Depending on the size of the NOS, the number of selected components, and the speed of server, it can take from a few minutes to over an hour to complete the copying process.

Once the copying process is complete, the installation program may ask some final configuration questions before it reboots the system. After the system reboots, the administrator should be able to login to the newly installed NOS using the administrative account created during the installation process.

## **7.3 The Boot Process**

### **7.3.1 The steps of the boot process**

**Note:** This section covers the boot process as it relates to the Windows 2000 operating system. Keep in mind that while the Windows 2000 boot process is discussed here, the same steps take place in Linux although the files names will be different.

The boot process of the Windows 2000 operating system is very different from Windows 9x. The Windows 9x boot process is much simpler and straightforward. Both Windows 9x and Windows 2000 have completely different files that are used to start the operating systems.

While Windows 9x has a few files that load the startup programs and check for device drivers, the Windows 2000 boot process is much more involved and requires the use of many more files. Windows 2000 requires a few extra steps and files because of the added features it offers, like the security features and logon features. In addition, many of the features that are supported in Windows 98, like specific device drivers for example, are not supported by the Windows NT/2000 operating system.

*What are the five stages of the Windows 2000 boot process?*

### **7.3.2 Basic files required**

It is important to note that this chapter is referring to an Intel-based boot process. The boot process will be slightly different on systems not based on Intel because NTLDR is not needed. On these systems there is a file called OSLOADER.EXE that performs this function. The NETDECT.COM file is not needed on systems that are not Intel-based. This is because the function is performed during the POST, and the information gathered from the POST is given to NTOSKRNL.EXE through OSLOADER.EXE. From that point on, Intel-based and systems not based on Intel boot the same way.

### **7.3.3 BIOS interaction**

The boot process cannot function without the BIOS because the BIOS controls all aspects of the boot process. The instructions and data in the

ROM chip that control the boot process and the computer's hardware are known as the Basic Input/Output System (BIOS).

*Review the BIOS during the boot process.*

### **7.3.4 Detailed steps of the boot process**

After the power is turned on, the first step of the boot process is the POST. This is actually something that every computer will do, regardless of its operating system.

*Why is it important to understand the boot process?*

### **7.3.5 The Linux boot process**

The boot process between Windows 2000 and Linux is very similar. One obvious difference is the file types that are used.

*Explain the difference between the Windows and the Linux boot process.*

#### **Worksheet 7.3.5.1 The Boot Process**

#### **Worksheet 7.3.5.2 Linux Boot Process**

Please note that in this worksheet, question 5 is a fill-in-the-blank question. It is not a True or False question.

## **7.4 Troubleshooting NOS Installation**

### **7.4.1 Unable to boot from installation media**

If the system will not boot from the installation media, such as a CD or floppy disk, then the installation program will not run.

*What are the steps to take to troubleshoot this problem?*

### **7.4.2 Problems during the installation process**

Occasionally, something goes wrong during the installation process. If an incorrect choice is made while using the installation program, look for a "back" button or key so that the configuration can be reversed.

*Discuss the other problems that can occur.*

### **7.4.3 Post-installation problems**

After installing the Network Operating System (NOS), the system may not load the NOS properly or will not allow a logon. If the system fails to load the NOS, consult the manufacturer's website and documentation. First time load failures are difficult to troubleshoot. Very specific information about the system and the NOS will need to be gathered. If the system reports specific errors, write those down and search for information about those errors on the web or in the documentation. If necessary, call a technical support line and ask for help.

*What are the most common logon problems?*

## Chapter 7 Summary

This chapter discussed how to plan, install, and troubleshoot a NOS installation. Some of the important concepts to retain from this chapter include the following:

- The planning process includes gathering information about the minimum system requirements and known hardware compatibility issues. In some cases, a utility program can be used that can verify if the system will work with the NOS.
- The hardware inventory should include the following information for each device:
  - Device type
  - Manufacturer
  - Model number
  - Device driver version
- There are two types of partitions, primary and extended. Every system requires at least one primary partition. The first primary partition is always labeled with a "C" on a Windows system. There can be only one extended partition on a system, but an extended partition can be subdivided into multiple logical partitions. The logical partitions that make up an extended partition are called Volumes, or Logical Drives.
- The formatting process defines the file system of the partition. When formatting a partition on a Windows NOS, choose between the following file systems: New Technology File System (NTFS), FAT32 and FAT. NTFS is recommended for network servers. When formatting a UNIX or Linux partition, choose between the following file systems: UNIX File System (UFS) or EXT3.
- The Windows 2000 boot process is similar to Linux. The Windows 2000 boot has five stages:
  - Preboot sequence
  - The boot sequence
  - The kernel load
  - Kernel initialization
  - The logon process
- Occasionally, there are problems with the installation. When this happens, reverse the process to ensure all steps were followed correctly. Gather all the information about the system and search for resolution on the web or in the documentation. If necessary, call a technical support line and ask for help.

The next chapter details the Windows 2000 operating system. The student will learn the steps to complete the installation through the administrative logon.



## Chapter 8 Windows 2000 Professional

This chapter details the Windows 2000 operating system. There are four steps to the installation. Once it is verified that the system is compatible, Windows 2000 guides the administrator to the final step of logging on. Managing user accounts and the file system is covered to provide the administrator with the necessary information to share folders, files, and assign permissions. The student will also learn about Windows 2000 services that are configured to provide access to the web, e-mail, and other computers.

### 8.1 Installation

#### 8.1.1 Installing Windows 2000

There are a few things to consider before installing Windows 2000. First, check to make sure that the hardware is capable of running Windows 2000.

*What are the requirements that Microsoft recommends?*

*What is the HCL?*

*How is the HCL viewed?*

#### **Understanding the Steps in Windows 2000 Installation**

There are four main steps in the Windows 2000 installation process.

*What are the four steps?*

#### **The Setup Program**

The first step of the installation process is to prepare the hard drive for the other stages of installation. Files that are needed to run the setup wizard are copied and the text portion of the setup is displayed. The Windows 2000 installation can be started by using the Setup Boot Disks or by booting from the CD-ROM.

*Which installation method is easier?*

*What happens during this portion of Setup?*

#### **The Setup Wizard**

The Setup Wizard begins the Graphical User Interface (GUI) portion of the installation process and prompts the administrator through the next stage of the installation process. The wizard gathers information about the administrator, the organization, and the computer. This step installs the security features and configures the system devices.

*What are regional settings?*

*What other information is required?*

#### **Installing Windows 2000 Networking**

Since Windows 2000 was designed to be a Network Operating System (NOS), installing the network settings is a major step in the installation process. After gathering information about the computer, the Windows 2000 Setup program automatically installs the network software.

*Describe the steps to install network components.*

## **Completing the Setup Program**

Once the networking components have been installed, the Setup wizard copies additional files to configure Windows 2000 Professional. The Setup program will automatically start the fourth step in the installation process. There are four basic steps to the final stage of the installation process.

*What are these steps?*

### **Windows 2000 Setup Options**

The installation steps that are mentioned in the section above are the typical or default installation procedures.

There are three other setup options that can be selected when installing Windows 2000.

There are three options for a desktop and one for a portable or laptop.

*Describe each option.*

## **Lab Activity 8.1.1 Installation Demonstration of Windows 2000**

### **Worksheet 8.1.1 Installing the OS**

#### **8.1.2 Installation of OS add-on options**

After successfully installing the Windows 2000 operating system, there might be some features that the user will need which are considered add-on options.

*List examples of these add-on options.*

*How are add-ons installed?*

### **Lab Activity 8.1.2 Configuring an IP Address and Default Gateway in Windows 2000**

## **8.2 Administrator/User Interface**

### **8.2.1 Log in procedures**

The first step in using any Network Operating System (NOS) is to log onto the system. Windows 2000 implements a Graphical User Interface (GUI) and allows a user to log on to the system using the "Log On to Windows" screen.

After first booting the computer into Windows 2000, users may be prompted to press the **CTRL**, **ALT**, and **DELETE** keys simultaneously to display this window. The required user name and password can be entered on this screen, as well as more detailed information, such as the network domain assigned to the user.

*Why are password characters displayed with asterisks (\*)?*

*What is meant by case sensitive?*

### **Lab Activity 8.2.1 Logging on to Windows 2000**

Please note that the password should be "password", not "cisco". It was set as "password" in Lab 8.1.1.

### **8.2.2 Graphical user interface (GUI)**

At this point the user should already be familiar with basic Graphical User Interface (GUI) navigation, such as how to operate a mouse.

*What are the basic elements of a GUI?*

*What is the proper way to power down a PC?*

#### **Lab Activity 8.2.2 Using the Windows 2000 GUI**

### **8.2.3 Command-line interface (CLI)**

The Windows 2000 command-line interface (CLI) is based on the previously popular MS-DOS operating system of the 1980s. CLI is now referred to as the Windows 2000 command interpreter although many users probably still think of CLI as classic MS-DOS.

*The basic function of the CLI is identical to MS-DOS with what exceptions?*

*How is the CLI launched?*

*How are commands entered?*

*What is doskey?*

*How is the CLI viewed in full screen?*

*What is the proper way to close the CLI?*

#### **Lab Activity 8.2.3 Using the Windows 2000 CLI**

### **8.2.4 Windows Explorer navigation**

Windows Explorer is an important component of Windows 2000 and of every other Windows operating system since and including Windows 95. Windows Explorer is not to be confused with Internet Explorer, which is used for browsing the Internet. Windows Explorer is used for navigating the entire file system.

*What are the features of Windows Explorer?*

*What is the easiest way to start Windows Explorer?*

#### **Lab Activity 8.2.4 Navigating the Windows 2000 File System with “Windows Explorer” and “My Computer”**

## **8.3 User Accounts**

### **8.3.1 Adding users**

Before logging on to any Windows 2000 client, a user account must first be created on the appropriate network server. This account will allow the user to log on to a specific network domain using the account information created by the system administrator.

*How is the Computer Management tool accessed?*

*What are the requirements of the user name?*

*What are illegal characters?*

### **Lab Activity 8.3.1 Adding Users in Windows 2000**

Please note that in this lab the instructor should have the students use studentA1 and studentA2 as the new user names. Those two accounts will be used again in the next lab, Lab 8.3.2.

#### **8.3.2 Managing user accounts**

As discussed earlier, the Computer Management tool is the primary means for a system administrator to add and manage users in Windows 2000. These tasks should be much more intuitive in this GUI environment in comparison to a CLI such as Linux.

Instead of memorizing command names, Windows 2000 users can carry out these operations in a number of ways, ranging from simple menu selections to keyboard commands.

### **Lab Activity 8.3.2 Managing User Accounts in Windows 2000**

#### **Worksheet 8.3.2 User Accounts**

## **8.4 Managing the File System**

#### **8.4.1 Creating and sharing folders**

As a system administrator, an important task is to create folders and directories that users throughout the network will share and where users will backup files.

*Discuss the ways to create and share folders.*

### **Lab Activity 8.4.1 Creating Files and Directories Using Windows 2000**

#### **8.4.2 Creating groups and adding users**

Windows 2000 allows system administrators to create groups of many different types and uses. The different types of groups vary in both scope and functionality and are used by Windows 2000 system administrators to manage large numbers of users on a network. In contrast, local groups are not used across a network but do provide a sufficient example of how to use groups in Windows 2000.

*What are the different types of groups?*

### **Lab Activity 8.4.2 Creating Groups in Windows 2000**

Please note that in this lab the Note under Procedures is incorrect. The Note should read "The two accounts studentA1 and studentA2 were deleted in Lab 8.3.2."

#### **8.4.3 Passwords and permissions**

Maintaining a network of countless users can pose serious security issues for a system administrator. As mentioned earlier, security is one of the primary considerations for all system administrators, and steps must be taken to ensure that users do not abuse or accidentally interfere with network operations. The most basic user related security tools available to an administrator are passwords and permissions.

*What is a password?*

*What are passwords used for?*

*Why should passwords contain alpha and numeric characters?*

*Discuss security issues.*

*What are the types of permissions?*

### **Lab Activity 8.4.3 Assigning Permissions in Windows 2000**

## **8.5 Services**

### **8.5.1 Hypertext Transfer Protocol (HTTP)**

Configuring Hypertext Transfer Protocol (HTTP) services on Windows XP is the same as configuring HTTP services on Windows 2000. By enabling the HTTP service on a NOS, the computer becomes a web server capable of sending out information over the World Wide Web (WWW).

In prior versions of the Windows NOS, separate programs were necessary to allow the system to handle such operations. However, with the release of Windows 2000, the tools to perform Internet services are included and built into the software.

*How is HTTP configured?*

*What is a loopback address?*

### **Lab Activity 8.5.1 Configuring HTTP Services on Windows 2000**

### **8.5.2 File Transfer Protocol (FTP)**

In the earlier versions of Microsoft's Windows NOS, providing users with File Transfer Protocol (FTP) service was only possible through the installation of a separate program. With the release of the current Windows 2000 NOS, this service has been included as a standard feature that can be easily configured. Before initiating the service, it must be determined if the appropriate tools have been loaded during the Windows 2000 installation. Specifically, the Internet Information Services (IIS) tools are necessary to run both the FTP and HTTP services, among others, for Windows 2000 computers.

*How is it determined that IIS is installed?*

*How is FTP configured?*

### **Lab Activity 8.5.2 Configuring FTP Services on Windows 2000**

### **8.5.3 Telnet**

Before a Telnet connection can be established with a remote Windows 2000 computer, the system must be configured to accept incoming Telnet sessions via the Telnet Server Administration tool. Select **Start > Programs > Administrative Tools > Telnet Server Administration**. Here the Telnet service can be started, stopped, and configured by a system administrator.

*What are the security considerations for Telnet?*

*How is Telnet configured?*

*What is NTLM?*

## Lab Activity 8.5.3 Configuring Telnet on Windows 2000

### 8.5.4 Stopping and Starting Services in Windows

- Describe the procedure for starting/stopping services
- Describe the different options for starting/stopping services
- Given a screenshot of running services, describe the status of a service
- Describe the process for changing the starting status of a service

### 8.5.5 E-mail server/client relationship

Typically in a network environment there will be an e-mail server. Microsoft uses Exchange as the e-mail server. The client side of the e-mail service can be a variety of office suite products. The most widely used client software is Outlook. Outlook is distributed by Microsoft and works with Exchange.

*What are other examples of server and client e-mail?*

*What does the e-mail server do?*

*What is store and forward?*

*What is instant messaging?*

### 8.5.6 Printing in Windows 2000

In addition to sharing important information in directories and setting up an e-mail server/client relationship, networks enable users to share expensive printing devices. By using the print services, a network can make an expensive high-speed printer accessible to many users as if the printer were directly attached to the user's own computers. The network can carry print requests and copies of documents from many users to a central print service where these requests are processed. Multiple printer services, each offering a different quality of output, can be implemented according to the requirements of users.

*What components should a print server have?*

*What is the role of the print server?*

*How is a printer shared?*

*How is a printer connected?*

*How is a printer added?*

*What happens when a print job is spooled?*

*What is the `net use` command?*

### 8.5.7 Scripts

Windows 2000 can accommodate many types of scripting languages using its built-in Windows Script Host (WSH). This component of Windows 2000 and XP enables users to create scripts using either the VBScript or JavaScript languages. WSH can also recognize any other scripting language the user desires. When a text file is created, the user simply

names the file with the appropriate file extension to indicate its scripting language to WSH.

*What is a .vbs file?*

*What is a .js file?*

*How is scripting different from programming?*

### **Lab Activity 8.5.6 Writing a Script in Windows 2000**

## **Chapter 8 Summary**

This chapter discussed the Windows 2000 Operating System. Some of the important concepts to retain from this chapter include the following:

- There are four main steps in the Windows 2000 installation process. The installation begins when the Setup program runs. This prepares the hard disk and copies files. Setup then runs a wizard that provides informational pages, which are used to complete the rest of the installation.
- Windows Explorer provides system administrators with an easy way to view all the files that are on the network or are located on a server. Collapsing and expanding folders will display all of the content in the right side window.
- The Computer Management tool allows a system administrator to manage all aspects of a particular computer, including authorized users, and in the case of a network server, the authorized users of a network domain.
- Many users will not have the proper training to take advantage of scripting in Windows 2000, but system administrators are more likely to spend the necessary time studying these languages. Doing so allows many of the common administration tasks to be simplified and automated.

Although there are similarities in the Windows 2000 and Linux installation processes, there are also many differences. The next chapter details the installation for the Linux operating system.

