Operating System

Automated Deployment Options: An Overview

White Paper

Abstract

New deployment tools and methods introduced with the Microsoft® Windows® 2000 Professional operating system make it easier, more efficient, and less expensive to deploy. This paper gives an overview of the main options that organizations can choose if they wish to deploy Windows 2000 Professional automatically, and outlines the process of upgrading from prior versions of the Windows operating systems.

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Introduction

Until recently, any organization that deployed a desktop operating system had to invest a significant amount of money and resources in the deployment process. Even so-called automated deployment methods were expensive and drained resources—the methods were not always truly fully automated, and since they were usually too complicated for novices to use, even a partially automated deployment required the attention of an information technologies (IT) professional.

Deployment tools and methods introduced with Microsoft® Windows® 2000 Professional, Microsoft's latest desktop operating system for businesses, make it easier, more efficient, and less expensive to deploy. Based on the results of research with business customers, and specifically IT professionals who deploy desktop systems, Microsoft designed Windows 2000 Professional from the ground up to improve automated deployment.

Automated Deployment Methods

Windows 2000 Professional supports a variety of automated deployment methods:

- **Automated installation scripts**, which are used to define basic settings and user information on the destination machine during setup without mandating user interaction. This method can be used for both new installations (or "clean installs") and upgrades of existing systems.
- **Disk-image copying**, or duplication, which is the process of creating a master image, preparing that image for duplication, then copying it to other systems. This method is intended for new installations.
- **Remote installation**, which is the process of installing the operating system on client machines from a remote location using network boot capabilities of the client PC. This method is intended for new installations.
- **Automated installation from a bootable CD-ROM**, which is a practical way to deploy the operating system automatically on computers in organizations lacking an IT department, or at remote sites with slow connections to a central server. This method is intended for new installations.
- **Software distribution**, which entails the distribution of operating system source and configuration files to appropriate servers and distribution points, where client machines then access them for installation. This method is intended for upgrades only.

Upgrading to Windows 2000 Professional

Three of the methods listed above are meant for new installations of the operating system. In many cases, however, business users will want to

upgrade to the new operating system over their existing configurations, and thus save time and resources in the overall setup and migration process. Windows 2000 Professional supports upgrades from any of the following operating systems:

- Windows NT® Workstation 4.0
- Windows NT Workstation 3.51
- Windows 98
- Windows 95

The upgrade process for each operating system can be completely automated and scripted.

This paper provides an overview of the ways in which Windows 2000 supports the automated deployment methods listed above and outlines the process of upgrading from prior versions of the Windows operating systems. It is not intended as a comprehensive treatment of these areas; for in-depth information, please refer to the "Deployment Planning Guide" provided in the Technical Library of the Windows 2000 Web site at http://www.microsoft.com/windows2000/library/planning, and the "Upgrading to Windows 2000" section at http://www.microsoft.com/windows2000/upgrade. (For detailed information about customized deployments of Microsoft Office and Microsoft Internet Explorer please refer respectively to the Office Resource Kits available at http://www.microsoft.com/office/ork and the Internet Explorer Administration Kit available at http://www.microsoft.com/windows/ieak).

Using Automated Installation Scripts

Automated installation scripts are used to answer questions during setup. While primarily intended for performing new installations, they can also be used for upgrades. A well-crafted, truly automated script saves an organization time and resources—administrators need not visit each desktop during installation, and users need not answer questions during installation.

Windows 2000 Professional significantly expands support for automated installation scripts in the following ways:

- **Installation can be completed with no user interaction.** All aspects of Windows 2000 Professional installation can be automated without requiring input from the user.
- **Installation can be completely scripted.** Windows 2000 Professional supports keys that make it possible to script a complete installation, including installation of modems, sound cards, time-zone settings, and other components that have traditionally been difficult to script.
  Windows 2000 Professional supports several tools that make it easier for administrators to customize their systems, for example by setting static IP addresses or using a list of machine names.
- **Setup Manager makes it easier to create scripts.** Setup Manager, a graphical tool, takes care of many challenging tasks—such as using correct syntax and eliminating typographical errors—that have traditionally made script writing difficult for administrators. The administrator can import a text file of computer names from which Setup Manager can create a universal disk format (UDF) file that is used to apply custom settings to desktops during setup.
- **Scripts are more reliable.** The Windows 2000 Professional setup process does not halt the installation process if a non-critical device—for example, a modem—does not install properly. Reporting mechanisms are also better, making it easier for administrators to troubleshoot installations that fail.
- **It's easier to create distribution shares.** Using Setup Manager, an administrator can include components, such as unique device drivers, that are not part of the original Windows 2000 Professional installation CD-ROM. Windows 2000 Professional also supports system startup CD-ROMs, which make it easier to deploy the operating system on computers that do not have high-speed connectivity.

Setup Manager

The Windows 2000 Professional Setup Manager is a comprehensive, wizard-based feature that guides administrators through the process of creating custom setup scripts. (The Setup Manager tool is located in the \Support\Tools\Deploy.cab file on the Windows 2000 Professional CD-ROM; the administrator must first extract all of the contents of the file to a designated folder and then run the program by double-clicking its icon.)

Administrators can use Setup Manager to set many of the answer-file parameters that automate the setup process and therefore require no user interaction. For example, using the Setup Manager Wizard, the administrator can:

- **Set user interaction.** The Setup Manager Wizard calls up a dialog box (Figure 1 below) that asks the administrator to set the level of user interaction that is appropriate during the setup process.

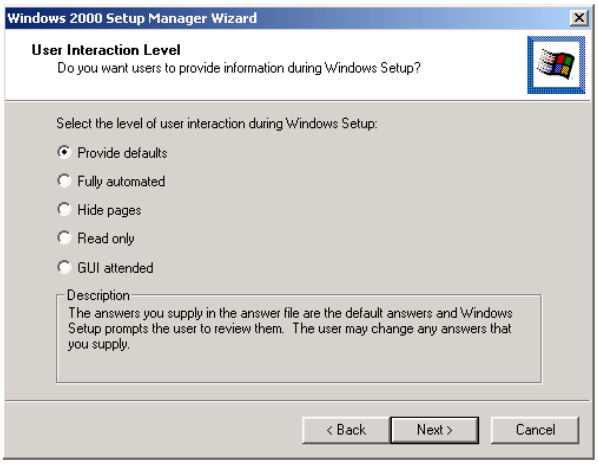

Figure 1. Windows 2000 Professional administrators can use the Setup Manager Wizard to set the level of user interaction required during the setup process, from allowing the user to review and change defaults to fully automating and hiding the setup process from the user.

- **Set default user information**. A dialog box requests that the administrator specify a user name and organization.

- **Define computer names**. When an administrator enters multiple names in the Computer Names dialog box (Figure 2 below) during the setup process, Setup Manager automatically generates the UDF file that is required in order to add those unique names to each system during setup. If the administrator imports names from a text file, Setup Manager creates one UDF file for all the names. The administrator can also set an option to generate unique machine names, allowing for a fully automated process in a new installation scenario.

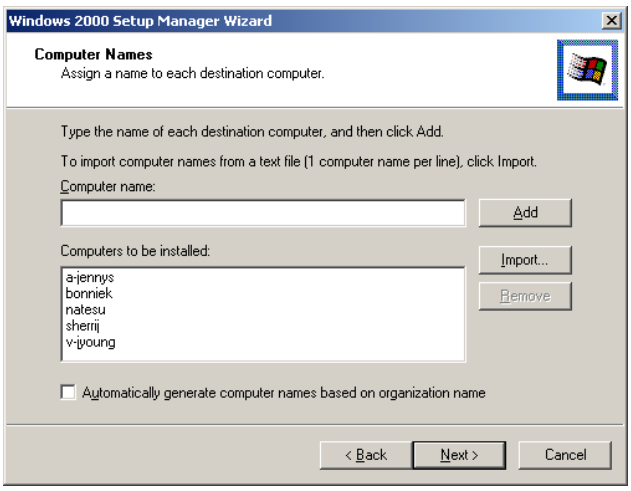

Figure 2. The Computer Names dialog box in the Setup Manager Wizard allows administrators to specify the names of the computers to be added to the system.

- **Set an administrator password**. The administrator can set an administrative password and hide it from users. The Setup Manager Wizard can also be set to prompt the user for the administrative password during setup.
- **Set display settings**. The administrator can automatically set the display color depth, screen area, and refresh frequency display settings.

- **Configure network settings.** Any custom network-setting option that can be configured from the desktop can be configured remotely in the Networking Components box (Figure 3 below) of the Setup Manager Wizard. The interface for setting network settings in the wizard is the same interface that the user sees on their desktop. Using Setup Manager the administrator can also join computers to a domain or workgroup, or automatically create accounts in the domain.

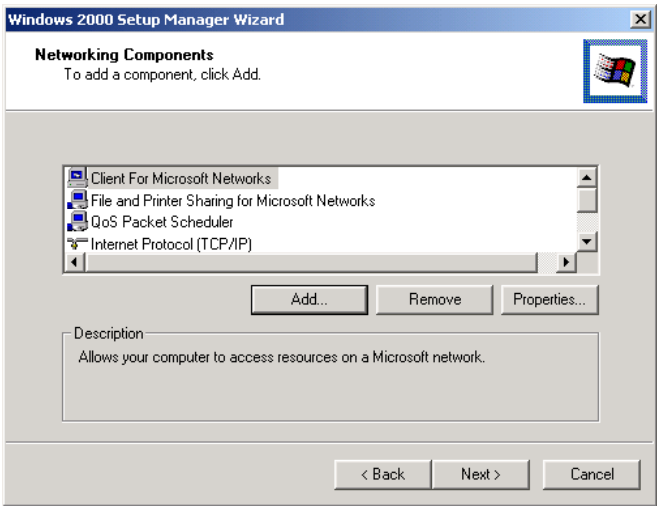

Figure 3. Using the Setup Manager Wizard, the administrator can configure which networking components will be available for the user.

- **Set time zone and regional settings**. The administrator can set the correct time zone using the same property sheet that a user would access to change the time zone locally. Regional settings such as date, time, numbers, character sets, and keyboard layout can also be set.

- **Configure Internet Explorer settings**. The administrator can use Setup Manager to carry out the basic setup for Internet connections, such as connecting to proxy servers. If the organization wishes to customize the browser, the administrator can use Setup Manager to access the customization tool that is part of the Internet Explorer Administration Kit available from http://www.microsoft.com/windows/ieak.

- **Set telephony settings**. The administrator can set telephony properties such as area codes and dialing rules.

- **Run commands at end of setup**. Using the Cmdlines.txt file, the administrator can specify commands—such as for launching an application setup file—that run at the end of the setup process and before users log onto the system. For example, to have a tool installed during setup, the administrator can add the command line for the tool's install routine in the Cmdlines.txt file.

- **Create an installation folder**. The administrator can generate a unique

installation folder during setup by choosing the default installation folder, Winnt, or designate a custom folder for installation.

- **Install printers**. The administrator can set up multiple network printers as part of the installation process.
- **Add commands to the Run Once section**. The administrator can set up commands that will run automatically the first time a user logs on. These may include running an application setup program, running a resource-kit utility, or changing security settings.
- **Create distribution folder**. The administrator can use the Distribution Folder Name dialog box (Figure 4 below) in the Setup Manager Wizard to create a distribution folder on the network that includes the required Windows source files. The administrator can also modify the distribution folder to include special files to be copied to the user's computer or additional device drivers for use with Windows.

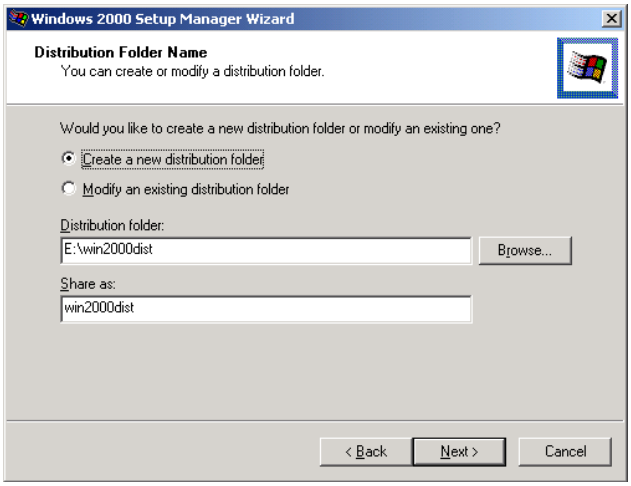

Figure 4. Use Setup Manager to create or modify a distribution folder on the network.

Disk-Image Copying

Disk-image copying is the process of creating a master image, preparing that image for duplication using the Microsoft System Preparation tool (Sysprep), then copying that image to other systems using a third-party disk-image copying utility such as Norton Ghost available from Symantec, PowerQuest DriveImage, or ImageCast from StorageSoft. The master image can include applications and any custom settings in addition to the operating system. For more information about disk-imaging, see the deployment resources available at http://www.microsoft.com/windows2000/library/planning.

The System Preparation Tool

The System Preparation tool prepares a system-disk image to be copied onto another system with a compatible, if not identical, configuration. To prepare a system to be copied, the System Preparation tool does the following:

- Configures the system to run a program that creates a unique local domain Security ID (SID) on the next system start.
- Forces the system to run a silent Plug and Play device detection. This allows the administrator to create an image on one computer, and then copy it onto another computer with different devices such as display adapters, and so forth.
- Launches a Mini-Setup Wizard on the next system start. The Mini-Setup Wizard prompts the user for user-specific information such as the Microsoft License Agreement (formerly called the End-User License Agreement), product ID, user name, and company name. The Mini-Setup Wizard can be scripted to eliminate user interaction.

(The Sysprep tool is located in the \Support\Tools\Deploy.cab file on the Windows 2000 CD-ROM; the administrator must first extract all of the contents of the file to a designated folder and then run the program by double-clicking its icon.)

Mini-Setup Wizard

The Mini-Setup Wizard can be automated with the System Preparation tool answer file (see below). It can also be run interactively, prompting the user with some or all of the following screens:

- Welcome
- Microsoft License Agreement
- Product ID
- Regional settings
- User name and company

- Computer name
- Network configuration
- Join workgroup or domain (workstation only)
- Server licensing (server only)
- Time-zone selection
- Finish/Restart

Command-Line Options

The administrator can also apply the following command-line options:

- **/quiet.** Runs Sysprep without displaying onscreen messages. This is useful for the administrator who wants to automate Sysprep by adding it to the [GuiRunOnce] key of the Unattend.txt file.
- **/nosidgen.** Runs Sysprep without generating a security identifier (SID). This is useful for the administrator who doesn't intend to clone the computer on which Sysprep is running or who wishes to preinstall domain controllers.
- **/pnp.** Forces full hardware detection on reboot; the system will actively seek new devices on the system, whether they are Plug and Play or not. Since this mode increases the time required for Mini-Setup, it is only useful if the computer on which the image is being loaded has non–Plug and Play hardware that cannot be dynamically detected.
- **/reboot.** Forces the computer to reboot automatically and then start Mini-Setup. This is useful for auditing the system and verifying that Mini-Setup is operating correctly.

When Hardware Configurations Differ

While the System Preparation tool is especially useful in streamlining the deployment process for large organizations whose desktops and servers have identical hardware configurations, it can also be used for deploying Windows 2000 in heterogeneous computing environments. The only requirement is that destination machines have configurations that are compatible with the copied image. Machines with different modems, display adapters, and other hardware devices *that are not critical during startup* should pose no difficulty, since Windows 2000 Professional supports hardware detection and Plug and Play: Once the operating system files are copied to the destination machine, Plug and Play runs through the process of detecting and installing whatever hardware devices are on the destination system.

Duplicating onto Computers with Different Mass Storage Controllers

But where hardware devices *are critical during startup*, they must be compatible with the configuration of the copied image. To help address this issue, the latest version of Sysprep (version 1.1)[*] has an important enhancement that gives administrators the ability to create one master image that they can install onto destination computers with different mass storage controllers. This helps reduce the number of images they need to maintain for their various configurations.

Sysprep requires that the mass storage controller on the master computer be identical to the controllers on the destination computers. To meet this requirement, the administrator must identify the different mass storage controllers that may be installed on each destination computer in the Sysprep.inf file before creating the master image. This allows Sysprep to pre-populate the necessary driver information so that Windows 2000 can load the correct drivers when it boots on a computer that has one of the predefined mass storage controllers. This method is ideal for the following situations:

- **IDE to IDE.** The master image is created on a computer that uses a different IDE controller than the destination computers. For example, the master computer uses a PCI IDE controller; the destination computers use an Intel IDE controller.
- **IDE to SCSI.** The master image is created on a computer that uses an IDE controller, and the destination computers use SCSI controllers. For example, the master computer uses a PCI IDE controller; some of the destination computers start from a SCSI controller such as an Adaptec 7800.
- **SCSI to SCSI.** The master image is created on a computer that uses a different SCSI controller than the destination computers. For example, the master computer uses an Adaptec 7800 controller; the destination computers use a Qlogic controller.
- **SCSI to IDE.** The master image is created on a computer that uses a SCSI controller, and the destination computers use IDE controllers. For example, the master computer uses an Adaptec 7800 controller; some of the destination computers start from an IDE controller.

For more information about copying images onto computers with varying hardware that is critical during system startup, see the "Remote Operating System Installation" section of this document.

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[*] Sysprep version 1.0, which shipped on the Windows 2000 CD-ROM, does not offer support for different HALs or mass storage controllers, and for this reason we recommend using Version 1.1 (Please check Microsoft.com/Windows2000 for the latest version of Sysprep).

System Preparation Tool Answer File (Sysprep.inf)

The answer file used with the System Preparation tool is named Sysprep.inf. It uses the same syntax and key names as the Windows 2000 Professional Setup answer file, Unattend.txt. Unattend.doc in the Windows 2000 Resource Kit provides additional information about using an answer file. The following are the sections and keys of the answer file that are supported:

[Unattended]

ExtendOemPartition	Only valid on Windows NT file system (NTFS) partitions. Used to extend the partition on which Windows 2000 is being installed; causes Setup to extend this destination partition into any available unpartitioned space that physically follows it on the disk.
InstallFilesPath	Only valid for Sysprep.inf. Specifies the location of files that may be necessary for installation during Mini-Setup, such as the language files, so that the installation isn't interrupted to prompt for user input.
KeepPageFile	Only valid for Sysprep.inf. When Sysprep is run, the Mini-Setup Wizard automatically regenerates the system's pagefile to accommodate differences in the amount of RAM between the master and destination computers.
OemPnPDriversPath	Specifies the path to folders that contain Plug and Play (PnP) drivers that do not ship on the Windows 2000 CD. The folders must contain all the files necessary to install the particular devices—catalog files, .inf files, and drivers.

OemSkipEula	Determines whether the user should be prompted to accept the Microsoft License Agreement (previously known as the End User License Agreement or EULA) included with Windows 2000. Writing this key and setting it to Yes imply that the person performing the installation has read and agreed to the contents of the License Agreement included with the product. It also implies that the end user on whose behalf Windows 2000 is being installed has agreed to the License Agreement.
UpdateHAL	Only valid for Sysprep.inf. Required if the administrator is using compatible hardware abstraction layers (HALs) that are based on an Asynchronous Processor Interrupt Controller (APIC) uni-processor (UP) master computer image that is to be placed on a compatible multi-processor (MP) destination computer.
UpdateUPHAL	Only valid for Sysprep.inf. Required if the administrator is using compatible HALs that are based on an APIC MP master computer image that is to be placed on compatible APIC UP or MP destination computers.
[Oem_Ads]	All keys are supported.
[GuiUnattended]	
AdminPassword	Sets up the Administrator account password. This is only valid if the administrator password on the master computer was blank.
AutoLogon	Sets up the computer to automatically log on once with the Administrator account if set to Yes. This key is not valid on upgrades.

AutoLogonAccountCreation	Specifies whether a computer account should be created automatically for the user whose name is specified by FullName. AutoLogonAccountCreation also allows the generated user account to automatically logon to the computer.
AutoLogonCount	Specifies the number of times that the computer automatically logs on using the Administrator account and password specified. The value decrements after each logon and the feature is disabled after the specified number of logon attempts.
OemDuplicatorString	Only valid for Sysprep.inf. This string contains a description of the duplication utility used, as well as any other information an OEM or administrator wants to store in the registry. The value is stored in the **HKLM\System\Setup\OemDuplicatorString** registry key.
OemSkipRegional	Allows unattended Setup to skip the Regional Options page in GUI-mode Setup and Mini-Setup.
OemSkipWelcome	Allows unattended Setup to skip displaying the Welcome page in GUI-mode Setup and Mini-Setup.
TimeZone	Specifies the time zone where the computer is located. If the key is not present, the user is prompted to select a time zone.
[UserData]	All keys are supported.
[LicenseFilePrintData]	All keys are supported.
[GuiRunOnce]	All keys are supported.
[Display]	All keys are supported.
[RegionalSettings]	All keys are supported, provided the files are available on the hard disk.

[TapiLocation]	All keys are supported. The values are only valid if a modem is present on the computer.
[Networking]	No keys are required.
[Identification]	All keys are supported.

Remote Operating System Installation

The Windows 2000 platform (client and server) includes another important change- and configuration-management feature: Remote Operating System (OS) Installation. With the Remote OS Installation feature, an administrator can use the Pre-Boot eXecution Environment (PXE) remote-start technology to install Windows 2000 Professional from a remote source onto a client machine's local hard disk. The remote source is any Windows 2000 Server that has the Remote Installation Service (RIS) installed and configured to respond to requests by remote boot–enabled client computers. (Note that RIS requires the Active Directory™ service.) The administrator can create Windows 2000 Professional setup shares that are CD-ROM-based or disk-image-based.

CD-ROM-based Installation

The CD-ROM-based option is similar to setting up a workstation directly from the Windows 2000 Professional CD-ROM; however, the source files reside on available RIS servers on the network.

Once the images are posted to the RIS server, users equipped with remote boot–enabled client computers can request to install those images from any available RIS server on the network. Since the user can install the operating system alone from this point on, the administrator is free to complete other tasks.

Disk-Image-based Installation

Using the Remote Installation Preparation (RIPrep) imaging option, a network administrator can clone a standard desktop configuration, complete with OS configurations, desktop customizations, and locally installed applications. After installing and configuring Windows 2000, its services, and any standard applications on a computer, the network administrator runs the Remote Installation Preparation Wizard that prepares the installation image and replicates it onto an available RIS server on the network.

Using the RIPrep imaging option, an administrator can also use the same image on systems with different storage controllers. Either the client computer's BIOS or a specifically configured remote-start floppy diskette can initiate a network service start. When an administrator requests a network service start, the Dynamic Host Configuration Protocol (DHCP) provides an IP address for the client computer. The client can then download the Client Installation Wizard. The wizard prompts the user to log on, and, depending on the user's credentials or security group membership, the wizard then displays a menu that offers the appropriate installation options. The user's security level determines which unattended OS image they will be able to install. The administrator may restrict the user to one OS choice, or allow the user to access a variety of unattended OS installation choices.

Automated Installation from a Bootable CD-ROM

For those organizations that may lack the means or infrastructure—such as remote sites with slow connections to a central server—to deploy Windows 2000 Professional using any of the aforementioned methods, the bootable-CD-ROM method presents a practical alternative for new installations. The bootable-CD-ROM method runs Winnt32.exe, which allows for a fast installation.

There are three requirements for using the bootable-CD-ROM method:

- The target computer must have El Torito No Emulation support for bootable CD-ROMs.
- The administrator must create an answer file containing a [Data] section that has the required keys.
- The answer file must be named Winnt.sif and be located on a floppy disk.

When the Setup program on the CD-ROM first initializes, the answer file is used to provide the target computer with installation parameters for the operating system.

For more information about answer file parameters and syntax, see the "Microsoft Windows 2000 Guide to Unattended Setup" (Unattend.doc) on the Windows 2000 operating system CD-ROM. The Unattend.doc file is part of the Deploy.cab file in the \Support\Tools folder.

Note again that this method can only be used for new installations; upgrades require running Winnt32.exe from within the existing operating system. Also, all necessary files must be on the CD-ROM; Uniqueness Database Files (UDFs) cannot be used with this method.

Software Distribution Using Systems Management Server

Administrators can use Systems Management Server to plan and execute a centralized deployment of Windows 2000 Professional upgrade packages to any number of desktop computers, regardless of their locations in the network. Note that Systems Management Server is used only for installations on computers that contain a previously installed operating system. Before upgrading using Systems Management Server, it is important for administrators to assess their existing network infrastructure, including bandwidth, hardware, and geographical constraints.

There are several benefits in using Systems Management Server in the remote upgrade process—for example:

- The flexible, dynamic target evaluation in Systems Management Server provides automated control over the systems that are being upgraded.
- Full status reporting, an integral part of Windows 2000 Professional setup, means that the administrator can manage and monitor distributed upgrades from a central location.
- Using Systems Management Server an administrator can conduct an upgrade in locked-down or low-rights environments.
- Since upgrades can be executed without a user logged on, Systems Management Server helps an administrator support headless servers (servers without user accounts) and conduct off-hours upgrades to the operating system.
- Extensive scheduling options support varied deployment policies, including *absolute mandatory*, *delayed mandatory*, and *optional*.
- Automatic load balancing between distribution points accommodates large numbers of concurrent or near-concurrent upgrades.

The primary advantage of upgrading using Systems Management Server is that it allows administrators to maintain centralized control of the upgrade process. They can control when upgrades take place (for example, during or after training, after hardware verification, and after user data is backed up), which computers will be upgraded, and how they apply network constraints.

Systems Management Server provides additional management features, such as support for pre-Windows 2000-based and mixed environments, advanced software-distribution capabilities, remote software and hardware inventory management, license-metering, and remote diagnostics functionality.

For more information on Systems Management Server, please refer to http://www.microsoft.com/smsmgmt.

Upgrading to Windows 2000 Professional

We have thus far treated the various features of Windows 2000 Professional that serve to automate its deployment in a network; primarily, we have been concerned with clean installations, but as we have seen, one automated deployment method, software distribution using Systems Management Server, is intended only for upgrades. This raises a very important issue apart from automated deployment: What should organizations take into account and what steps should they take *before* they upgrade their desktop computers to Windows 2000 Professional from earlier versions of the Windows operating systems? To address this question, this section provides a general overview of the various issues and steps involved in upgrading from each of the most popular operating systems used in business today. (For the latest upgrade information, please refer to the "Upgrading to Windows 2000" page at http://www.microsoft.com/windows2000/upgrade.)

To reiterate, organizations can upgrade to Windows 2000 Professional from any of the following operating systems:

- Windows NT Workstation 4.0
- Windows NT Workstation 3.51
- Windows 98
- Windows 95

All other operating systems—including Windows 3.1, Windows NT Server 3.51 with Citrix Software, and Microsoft BackOffice® Small Business Server—require new installations of Windows 2000.

The upgrade process for each operating system can be completely automated and scripted. In addition, administrators can use automated installation scripts to augment the upgrade (for example, to add drivers that are not part of the standard Windows 2000 Professional installation).

Compatibility-checking Utility

To help administrators plan upgrades, the setup program in Windows 2000 Professional includes a compatibility-checking utility (Figure 5 below) that runs before the upgrade is executed. It can also run in stand-alone mode by starting Winnt32.exe at the command prompt with the **/checkupgradeonly** option (please consult the documentation included on the Windows 2000 Professional CD).

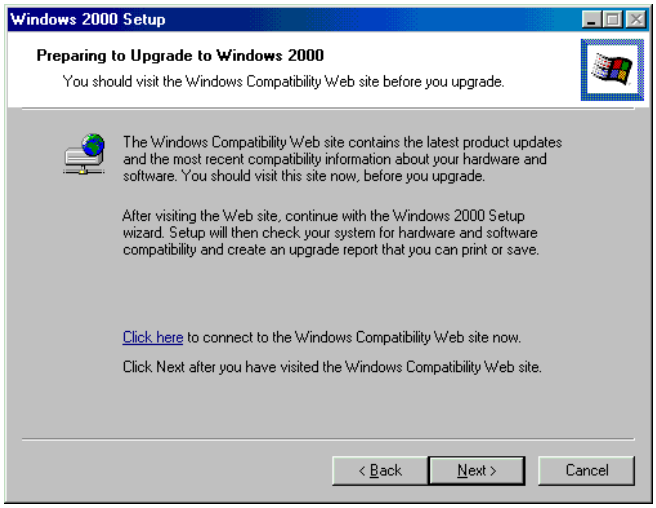

Figure 5. Before the compatibility-checking utility scans the operating system to be upgraded, it requests that the user connect to the Windows Compatibility Web site for the latest compatibility information.

At the beginning of the setup process, this tool automatically scans the existing system and generates a report on any known software or hardware compatibility issues (Figure 6 below). It is by no means exhaustive; for additional support and tools—such as the online Readiness Analyzer—please refer to the compatibility information available on the Windows 2000 Web site at http://www.microsoft.com/windows2000/upgrade/compat.

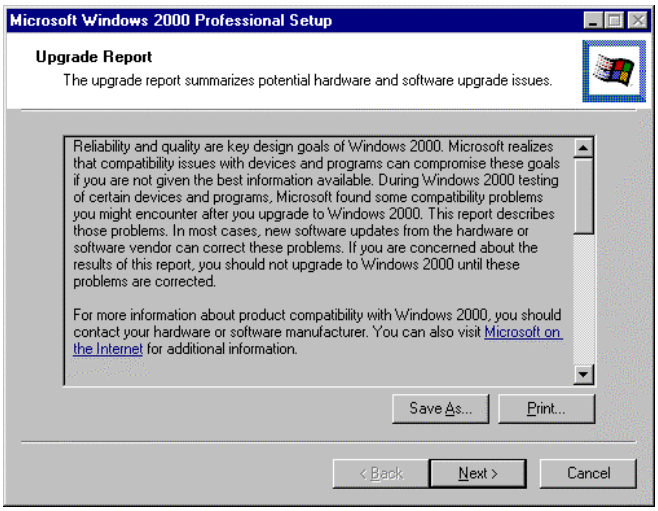

Figure 6. The Upgrade Report tells the administrator about any potential compatibility problems.

The administrator can create additional distribution folders using the information contained in these reports. Folders may include missing components, such as upgraded device drivers, migration dynamic link libraries (DLLs), and other files. Since these additional files are included in the installation scripts, they are then automatically installed in the system during the upgrade process.

Upgrading from Windows NT Workstation 3.51 and Windows NT Workstation 4.0

It is easiest to upgrade to Windows 2000 Professional from Windows NT Workstation 3.51 or 4.0 because these operating systems share a common heritage. They also have the following core features in common:

- Registry database and structure
- File system and folder architecture
- Security architecture
- Operating system kernel architecture
- Device driver model

For these reasons, an upgrade from Windows NT Workstation 3.51 or 4.0 requires significantly less planning and preparation than an upgrade from Windows 95 or Windows 98.

To upgrade from Windows NT Workstation 3.51 or 4.0 to Windows 2000 Professional, an administrator should follow these steps:

- Verify that the computers to be upgraded have the appropriate drivers for the devices that need them.
- Replace or upgrade software, such as anti-virus software, that may rely on

specific file systems.

- Run the setup program, which upgrades Windows NT Workstation 3.51 or 4.0 files. (The administrator can fully script the setup program.)

Upgrading from Windows 95 and Windows 98

Upgrading to Windows 2000 Professional from Windows 95 or Windows 98 requires more planning and preparation than upgrading from Windows NT Workstation 3.51 or from Windows NT Workstation 4.0. This is because the registry structure, file locations, and system-function calls in Windows 95 and Windows 98 differ from those in Windows 2000 Professional. Straightforward or standardized corporate desktops should upgrade smoothly. Businesses or departments that primarily use Microsoft Office or other major commercial applications should also upgrade smoothly. However, businesses with customized line-of-business applications and third-party system utilities may need to make some preparations before an upgrade. The upgrade process itself involves preparing files that help ensure software compatibility, appropriate drivers, and additional user information.

Ensuring Application Compatibility

Many applications install differently depending on which operating system is on the installation computer. Applications that were originally installed on a Windows 95– or Windows 98–based computer may not run properly on computers running Windows 2000 Professional without modification.

There are two ways to overcome this difficulty:

- Uninstall applications on the Windows 95– or Windows 98–based computer and reinstall them after the operating system upgrade. This process is generally straightforward, assuming that the application setup can be scripted to run in quiet mode, but it does not work for every type of application.
- Write or obtain a migration DLL file from the original software vendor for each application. A migration DLL is a program that converts the registry settings to make them compatible with Windows 2000 Professional. Because registry settings are unique, every application that installs differently based on the operating system must have a migration DLL as part of the upgrade. Many migration DLLs from major independent software vendors are included as part of the Windows 2000 Professional setup. Custom migration DLLs can be included as part of an automated installation script.

Key Considerations in the Windows 95/Windows 98 Upgrade Process

Administrators should closely monitor DLLs, device drivers, and file system support during an upgrade or migration to Windows 2000.

DLLs. Businesses with internally developed line-of-business applications may want to consider writing migration DLLs for their in-house applications. Administrators can create migration DLLs that:

- Replace or upgrade Windows 95– or Windows 98–specific files with Windows NT Workstation–compatible files.
- Move Windows 95 or Windows 98 application- and user-specific settings that Setup did not detect to their proper location in the Windows 2000 Professional registry.
- Map Windows 95– or Windows 98–specific registry keys to the appropriate Windows 2000 Professional locations.

Device drivers. Some devices and peripherals that work with Windows 95 or Windows 98 need updated drivers in order to work with Windows 2000 Professional. The driver update is necessary because some hardware drivers written for Windows 95 or Windows 98 and for 16-bit Windows 3.*x*–based applications running on Windows 95 or Windows 98 were based on the older virtual (VxD) driver model, which Windows 2000 Professional does not support. Many of these drivers are available as part of the Windows 2000 Professional setup. Drivers that are not part of setup can be added using scripts.

Recent drivers based on the Windows Driver Model (WDM) are compatible with Windows 2000 Professional; these drivers work without modification.

Many updated drivers are included on the Windows 2000 Professional CD-ROM. However, when critical device drivers such as hard-drive controllers are not compatible with Windows 2000 Professional and cannot be found on the CD-ROM or elsewhere, the setup program will abort the upgrade until updated drivers are available.

File system support. Windows 2000 Professional will continue to provide support for existing file systems. FAT16 and FAT32 file system users have the option of converting to the NTFS file system version 5 (NTFS5). However, compressed drives running Windows 95 or Windows 98 cannot be upgraded. These drives will need to be uncompressed before they can be upgraded.

Installing Service Packs

Windows 2000 Professional makes it significantly easier for administrators to add service packs. Previously, service packs had to be installed separately, after the operating system had been installed. Windows 2000 Professional, by contrast, supports service-pack “slipstreaming”—the service pack is added directly to the operating system’s distribution share during installation.

Furthermore, with Windows 2000 Professional it is no longer necessary to reinstall components that were installed before the service pack. This makes it much easier to install service packs on existing systems.

Summary

Windows 2000 Professional provides a number of features and fully supported tools that serve to make the deployment process easier, more efficient, and more cost-effective. The operating system provides extensive support for:

- Automated installation scripts (whose creation or modification the Setup Manager tool makes simple).
- Disk-image copying (using Sysprep, the System Preparation tool).
- Remote OS installation (using a RIS server, and, in the case of disk-image-based installations, the RIPrep imaging tool).
- Centralized deployment for upgrades (using Systems Management Server).

In addition, the operating system can be installed using a bootable CD-ROM together with a specially created answer file. Because of these features and tools, there is effectively no need for the user to intervene in the deployment process; if so desired, the administrator can handle it all from beginning to end.

Computers running prior versions of Windows—whether Windows NT Workstation 3.51, Windows NT Workstation 4.0, Windows 95, or Windows 98—can all be upgraded to Windows 2000 Professional. The compatibility-checking utility that runs as part of the setup program helps ensure that any known problems administrators may have in performing their system upgrades are made apparent beforehand. Upgrading to Windows 2000 from earlier versions of the Windows NT operating system is a straightforward process since they all share the same code base; upgrading from Windows 95 and Windows 98, however, requires closer attention, particularly where it concerns the translation of system DLLs, device drivers, and file systems.

Service packs are easier than ever to install on systems running Windows 2000 Professional: service packs can be installed automatically (“slipstreamed”) together with the operating system, and pre-installed components no longer require reinstallation once a service pack has been added to the system.

For More Information

For the latest information on Microsoft Windows 2000 Professional, please refer to our World Wide Web site at http://www.microsoft.com/windows2000.