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White Paper:

**Easier Windows NT Workstation 4.0
Deployment with Disk Image Copying and the
Microsoft System Preparation Tool**

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Abstract

Scenario: A business needs to deploy 200 new fully configured PCs (or refresh existing machines). The new desktops will include the Microsoft® Windows NT® Workstation 4.0 operating system and a full suite of commercial and line-of-business applications, plus it will give users access to the same printers, a sales-information database, the human resource department intranet site, and word-processing templates.

The business has several options for deploying these systems. The least desirable and most time consuming method is for IT professionals to go machine to machine installing each application and customization. In another method, IT professionals could create an installation script that automates key aspects of set-up. This can make deployment faster, but lab testing often reveals that it is not possible to create a script that consistently automates every aspect of desktop configuration. As a result this too would require a visit (albeit brief) by an administrator to each system. The final method, called disk image copying, is very promising. A single master system is created and the image files are literally copied onto the new systems. The method is very comprehensive, fast, and requires virtually no user interaction.

For businesses deploying new or refreshing existing PCs running the Microsoft® Windows NT® Workstation 4.0 operating system, Microsoft believes the most cost effective strategy is to use disk image copying in conjunction with the *Microsoft System Preparation tool*.

Disk image copying – the process of copying a single “master” image to identical or similarly configured “target” systems – enables businesses to more rapidly, easily, and cost effectively deploy PCs compared with other automated installation methods. Further, disk image copying is generally more comprehensive than other automated deployment methods, allowing businesses to preconfigure nearly every aspect of a user’s desktop environment, including the operating system, retail and line-of-business applications, and desktop customizations.

Microsoft recently introduced the *System Preparation tool*, which prepares Windows NT Workstation 4.0 to be “imaged” and duplicated. Once prepared, an administrator can use one of the disk image copying utilities available from leading independent software vendors such as PowerQuest and Symantec to create and distribute the images.

This document introduces the general benefits and considerations to be made when evaluating disk image copying and the System Preparation tool versus other automated methods. Because disk image copying is not appropriate in every situation, the goal of this white paper is to provide businesses with baseline criteria for deciding whether to move to the next step of more thoroughly evaluating disk image copying for their specific environment. Resources for making a more thorough evaluation are listed in the Appendix.¹

¹ Any discussion of deployment, including disk image copying, assumes that software, including the operating system, is being copied in accordance to the licensing agreements with the software manufacturer.

Introduction

The goal of every information technology (IT) group is to automate the PC deployment process, including installing the operating system, applications, and customizations. Anything less than full automation costs money and ultimately is a barrier for taking advantage of new technologies. As a result, a number of solutions have emerged to help enable more effective automated desktop deployment. On the broadest level, these options include:

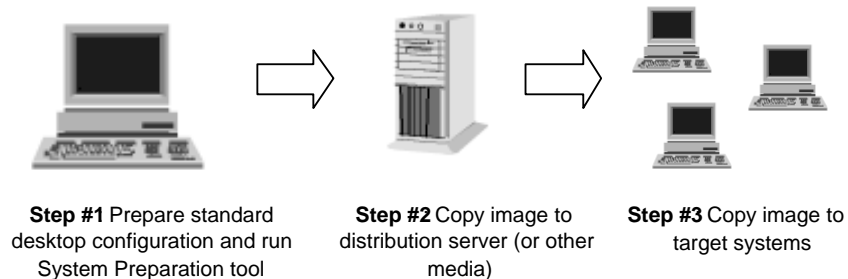
- **Installation scripts.** As the most common automated deployment option, installation scripts are typically script files that automate a software or operating system installation program. For example, Windows NT Workstation 4.0 setup can be automated using an "UNATTEND.TXT" installation script. The installation script is used to install software with little or no user interaction by automatically answering setup questions and implementing customizations. However, some customizations may require extensive research or trial and error to implement, and others may require some user and/or administrator interaction at the local system. Further, because application installation programs vary greatly, IT professionals creating installation scripts often find themselves overwhelmed by the number of different installation script languages they must learn.
- **Electronic Software Distribution.** Electronic software distribution (ESD) software is specialized software for installing software to desktops across a network. Unlike other deployment methods, ESD is generally a component of more comprehensive enterprise management suites available from companies such as Hewlett Packard, Intel, Microsoft, and Tivoli. Although specific approaches vary, ESD often relies on the same installation scripts that can be used separately to install the operating system, although some ESD solutions provide a more extensive graphical environment for creating these scripts and stronger integration with application setup languages. ESD solutions can also be used to generate reports on the success and progress of deployments. Further, enterprise management suites enable better management of the deployment process, such as the ability to schedule remote installations to better use network bandwidth. However, with this greater capability comes greater complexity relative to disk image copying. For example, it takes more time to create an infrastructure for ESD than for creating and copying images. Also, some ESD solutions are dependent on the presence of hardware technologies.

- **Disk image copying.** Disk image copying, sometimes called “cloning,” is rapidly emerging as an effective deployment method. Disk image copying means creating an image of a standard desktop and then copying that image onto new or existing systems. Disk image copying is generally fast and cost effective because without any user interaction nearly every component can be configured, including the operating system, applications, and desktop customizations. However, disk image copying is not appropriate for every situation and environment. Windows NT Workstation 4.0 disk images work only on identical or very similarly configured hardware. Before disk image copying, all user settings and data on existing systems must be stored in another location, such as on a server, because they are generally lost during the disk image copying process. Finally, disk image copying does not provide any capabilities for post-installation configuration management. For example, it is not possible to image an application upgrade without also reinstalling all of the other applications.

The Disk Image Copying Process

Disk image copying involves configuring a standard PC, preparing it with the System Preparation tool, using a utility to copy the master image to a distribution server or other media, and then using the same utility to copy the master image to new or existing systems.

The graphic below depicts how image copying works when storing and distributing an image over the network. Images can be distributed using other methods such as by CDs, replicating hard drives or using removable storage.



Step #1: Configuring and preparing the master desktop. The standard desktop image should include every aspect of a user's desktop – the operating system, service packs, retail and line of business applications, persistent network connections, printer paths, desktop customizations such as menu items, shortcuts, templates, and other files, and shortcuts to any post-deployment scripts. Preconfiguring systems makes it extremely easy for users since they are not required to do any installation themselves. The System Preparation tool is used to prepare the image so that new systems onto which images will be copied receive their own unique security ID, or SID. Windows NT Workstation 4.0 requires that each PC must have its own unique security ID.

Step #2. Creating distribution media. Once the image is prepared, it is copied to the distribution media, such as a network share or CD. Any of the disk image copy utilities from independent software vendors such as Altiris, Micro House International, PowerQuest, or Symantec will take administrators through the process of copying files and creating a distribution method.

Step #3. Installing the image. Depending on the distribution media, users may use a boot floppy to access the network share with the image (disk image utilities will help administrators create boot floppies, and a graphical interface will help users find the image on the network). After using a third-party utility to copy the image files to the target PC, Windows NT Workstation 4.0 boots and then goes through the mini-setup wizard, which can be fully automated using a script file. Because the master image was prepared with the System Preparation tool, each target PC receives its own unique security ID.

Post installation. Because the newly created system is virtually identical to the master desktop image (except for the security ID), administrators need to add unique machine and user settings, such as setting up specific e-mail accounts and joining the system to the network. This can be accomplished by creating post-installation scripts. These scripts are generally easy to create using one of the many scripting tools and languages that are supported by Windows NT Workstation 4.0 (see Appendix for more information on scripting resources.)

Benefits of Disk Image Copying

Disk image copying is one of the fastest ways businesses can deploy new systems or refresh existing systems. The following provides an overview of some of the key benefits.

Very fast installation

Disk imaging is generally the fastest method for deploying a standardized desktop. Depending on the size, once the master system and distribution media are created, a new system can be created in as little as five to 15 minutes per desktop. The fastest installations are those where a master image is copied from local media, such as a CD or hard drive. For network installations, disk image copying utilities make optimal use of available bandwidth with support for compression and IP multicasting.

Comprehensive

Disk image copying can preconfigure nearly all aspects of a user's desktop environment. This includes the operating system, service packs, retail and line of business applications, persistent network connections, printer paths, desktop customizations such as menu items, shortcuts, templates, and other files, and shortcuts to any post-deployment scripts. In general, the only task required of the user is to turn on the system power and log on.

Easy

Disk image copying is among the easiest methods of deployment. Creating a master system does not require specialized knowledge or skills beyond knowing how to install and configure an operating system and applications. In general, it takes a matter of hours to fully configure and prepare the master image. (Additional knowledge may be needed if post-installation scripts are required to complete the deployment process. See next section.)

Helps reduce support costs

Disk image copying ensures a fully standard desktop image, which in turn helps lower total cost of ownership by reducing support and administrative costs. For example, administrators can thoroughly test the interaction of applications and hardware on a standard configuration, ensuring that each system using the master image is reliable and predictable. Also, because the entire configuration "state" is known, technical and support resources can more easily troubleshoot and correct problems than with a non-standard system. If a problem is encountered, it is also possible to proactively correct other systems built using the same image. Finally, if something goes wrong, a system can easily be rebuilt using the original installation image (extra steps are needed, though, to restore user specific information).

Opportunity for managing desktops

One of the most effective ways to reduce total cost of ownership is by reducing complexity and more tightly managing desktops. Disk imaging is an effective way for administrators to implement components of “best management” practices. For example, when creating the master image, it is easy to hide unnecessary Control Panel applets from users, such as the ability to change display settings (administrators and/or power users can still gain access to these settings). While desktop management can also be implemented post-installation through scripting or through the Zero Administration Kit for Windows® (see www.microsoft.com/ntworkstation for more information on ZAK), disk imaging does not require setup or maintenance of server-based configurations or specialized knowledge about scripting.

Key Considerations

The following section provides businesses with an overview of key issues for deciding whether to move to the next step of evaluating disk image copying for their specific environment. This section is not meant to be exhaustive, but rather to highlight areas of consideration.

Hardware must match

Disk images work only on identical or very similar hardware configurations, even if the hardware is from the same manufacturer. This makes imaging less effective for businesses with many different hardware configurations. There are some exceptions, such as when using a driver that is designed to work across multiple devices. For example, some networking cards from the same manufacturer share a common driver. A VGA driver can be used to configure virtually any video display, with more specific drivers configured post-installation. But these examples are generally the exception rather than the rule. Since every deployment is unique, the best way to determine if an image will work across different systems is to consult with the manufacturer or through trial and error.

Conserving user data and settings

As with other deployment methods, administrators need a strategy for configuring or migrating “user state” (e.g., documents, e-mail configuration, specific applications and preferences) to the new desktop. User- and machine-specific settings should not be deployed in the master image. For example, pre-configuring an e-mail profile as part of the master image means that *all* recipients of that image will have the same e-mail account. Other machine- and user-specific settings that cannot be configured in the image include joining the new system to the network domain and redirecting/rejoining user data on a server-based folder.

Most of these tasks can be fully automated after the installation using one of the many scripting tools that work with Windows NT Workstation. For example, Microsoft provides a tool called ScriptIt that is designed specifically for configuring systems. As part of the master image, an administrator can include a script for that new system to automatically join the domain. Alternately, Windows Scripting Host, the scripting host in Windows NT Workstation, supports several other scripting languages that can be used to add machine- and user-specific settings.

Image distribution

Once the image is created, businesses need to consider how they will distribute it. For example, a self-contained CD is the easiest method for users and does not use any network bandwidth, but the physical media must be distributed. Using a network share can also be effective, but that requires users (or administrators) to use a boot floppy to gain access to the network. Network capacity is another consideration. Other methods include hard disk replication or using transportable media such as large-capacity tape drives (e.g., Zip).

Image Management

Because images work only on systems with identical or very similarly configured hardware, businesses using disk image copying should consider how they plan to manage images for different system configurations. For example, a user calls the helpdesk because their system fails to boot. The helpdesk staff needs an efficient way to locate the proper image for that system. Most disk image copying utilities include image management tools.

Microsoft Support for Disk Imaging

When Windows NT Workstation was first introduced, Microsoft did not endorse or provide technical support for systems created using disk image copying because of security concerns. These concerns were related to how security IDs, or SIDs, are generated on duplicated systems. Specifically, the Windows NT security model requires each system to have its own unique, local SID. When an image was duplicated, there was no assurance that each duplicated system had its own security ID.

To address these concerns, Microsoft introduced the *System Preparation tool* for Windows NT Workstation 4.0. When used in conjunction with existing imaging tools such as Symantec Ghost or PowerQuest Drive Image Professional, the System Preparation tool prepares a new installed system to receive its own unique local security ID.

Microsoft will fully support any Windows NT Workstation desktop system that was created using an image prepared using the System Preparation tool. Microsoft still does not support disk image copying for Windows NT Server, unless it is a standalone server. Also, Microsoft does not provide support for systems created with SID duplicating tools other than the System Preparation tool.

Licensing the System Preparation Tool

The System Preparation tool is available free of charge to any customer with an active Microsoft volume licensing agreement, including Select or Enterprise agreements or Open License agreement. In addition, any Microsoft Certified Solution Providers at the Partner level may obtain a license separately to use the System Preparation tool on behalf of Microsoft customers with volume licensing agreements. Customers and Solution Providers must also license disk image copying software from one of the many independent software vendors focused on this market.

Microsoft Select is a volume software licensing program designed for business, government, and education customers with more than 1,000 desktops.

Microsoft Enterprise Agreements are designed for customers who have made the technology decision to use Microsoft's platform of products, and who are able to commit to a fixed number of desktop licenses for a three-year period.

The Microsoft Open License program is designed to provide a simple volume licensing solution for small and medium-sized businesses, government, and educational organizations with as few as five PCs or as many as several thousand.

The Microsoft Certified Solution Provider program is open to any channel organization that can demonstrate the MSCP program requirements of competency.

More information about licensing the System Preparation tool can be found at www.microsoft.com/networkstation.

Next Steps

Disk image copying used in conjunction with the System Preparation tool is an effective automated deployment method, but is not recommended in every situation. Businesses that are interested in using disk image copying and the System Preparation tool should proceed with a more in-depth evaluation. Businesses can conduct this evaluation for themselves, contact their Microsoft representative or work with a Microsoft Certified Solution Provider.

This evaluation should include:

- ✓ Obtain System Preparation tool license
- ✓ Identify specific technical and deployment issues associated with disk image copying and the System Preparation tool
- ✓ Obtain license and experience using a disk image copying utility, such as Symantec Ghost or PowerQuest Drive Image Professional
- ✓ Obtain experience creating post-deployment scripts to add user- and machine-specific settings

Resources for each of these areas can be found at www.microsoft.com/networkstation.

Additional Resources

The following provides references for additional resources on disk image copying, the System Preparation tool, and why Windows NT Workstation 4.0 is the premier desktop environment for businesses.

Benefits of Windows NT Workstation 4.0

Why Windows NT Workstation 4.0 Today?

<http://www.microsoft.com/networkstation/basics/features/default.asp?site=ntw&custarea=bus&OpenMenu=ProdBasic&HighlightedItem=Overview>

Windows NT Workstation Deployment tools

Tools Overview

<http://www.microsoft.com/NTworkstation/Deployment/deployment/default.asp?site=ntw&custarea=bus&OpenMenu=DeployTools&HighlightedItem=Deployment+Resources>

Windows NT Automated Deployment Guide

<http://www.microsoft.com/NTWorkstation/Deployment/Deployment/downloadguideautomate.asp?custarea=bus&site=ntw&openmenu=deploytools&highlighteditem=deployment+resources>

System Preparation Tool

Licensing and additional technical information

<http://www.microsoft.com/NTWorkstation/Deployment/Deployment/SysPrepTool.asp?custarea=bus&site=ntw&openmenu=deploytools&highlighteditem=deployment+resources>

Disk Image Copying Tools Vendors

- PowerQuest www.powerquest.com
- Symantec www.symantec.com
- Micro House International www.microhouse.com
- Altiris (formerly KeyLabs) www.altiris.com