

Building a Single Image for Dell PowerEdge Servers

Using Altiris Deployment Solution

Using hardware-independent images for OS deployment can free administrators from creating and maintaining separate images for each hardware vendor and server model in their environment, helping significantly simplify server provisioning processes. Altiris® Deployment Solution™ software enables administrators to create and deploy these images on Dell™ PowerEdge™ servers.

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Image-based OS deployment processes typically require creating, maintaining, and deploying separate images for each hardware vendor and server model in an IT environment. Using hardware-independent images, however, can eliminate this need, thereby helping simplify server provisioning preparation and deployment processes. Administrators can use Altiris management software to create and deploy these images as part of a comprehensive build process for bare-metal server provisioning—including configuring the BIOS, Dell Remote Access Controller (DRAC), baseboard management controller (BMC), and RAID components; setting up image-based or scripted deployments; remotely deploying server applications and platforms such as Dell OpenManage™ Server Administrator, Microsoft® SQL Server™ 2005, Oracle® Database 10g, and VMware® ESX Server; and patching hardware with Dell Update Packages (DUPs).

This article focuses on creating hardware-independent images for Dell PowerEdge servers running Microsoft Windows Server® 2003 operating systems, but includes methodologies that can be applied to the Microsoft

Windows® XP and Windows 2000 operating systems as well. One key enabler of hardware-independent images is a common hardware abstraction layer (HAL) for the servers being provisioned. Because Dell PowerEdge servers from the third generation through the current ninth generation share a common HAL based on the Advanced Configuration and Power Interface (ACPI), administrators in data centers using PowerEdge servers can take advantage of the methods described in this article for building and testing these images.

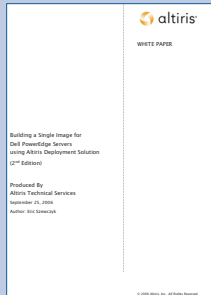
Identifying the benefits of hardware-independent images

Enterprise IT staff typically invest substantial time and effort in system deployment and management, including tasks such as the following:

- Building and maintaining separate images for each hardware vendor, hardware model, and OS for image-based deployments

LEARN MORE ABOUT ALTIRIS DEPLOYMENT SOLUTION

This article is excerpted from the Altiris white paper “Building a Single Image for Dell PowerEdge Servers Using Altiris Deployment Solution,” which provides detailed step-by-step instructions, best practices, and links to supporting files such as an image creation checklist, the Microsoft Sysprep utility, a sample Sysprep.inf file, Dell drivers, and the Altiris Deployment Solution AClient. The complete white paper and testing matrix are available at apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf.



- Deploying and patching operating systems, software, and hardware
- Performing regular version-control maintenance—including service packs, security updates, and hot fixes—to keep software up-to-date on both static images and production systems
- Avoiding or managing inconsistent computer builds deployed by different IT staff members (including elements such as driver versions, configuration methods, and overall look-and-feel)

Maintaining and deploying hardware-independent images for Dell PowerEdge servers helps simplify many of these types of tasks by offering the following potential benefits:

- **Efficient image management:** IT staff only need to maintain a single image for all PowerEdge servers, rather than separate images for each model, which helps significantly reduce the time required for bare-metal OS deployments.
- **Flexible automated deployment:** In addition to using Altiris Deployment Solution, administrators can deploy self-extracting images through a bootable CD or DVD, network share, USB drive, storage area network, and so on.¹
- **Simplified updates:** Administrators can use Altiris Patch Management Solution™ software to identify software and hardware vulnerabilities and remotely deploy current service packs, security updates, hot fixes, and DUPs once they have installed the Altiris agent and moved the system into production.
- **Robust version control and licensing:** Rather than preinstalling applications in a static image and increasing the frequency of image maintenance to keep these applications up-to-date,

administrators can repackage applications with Altiris RapidInstall™ software (included with Altiris Deployment Solution) or Wise Package Studio (acquired by Altiris), which enables them to maintain control over application updates and licenses separately from the OS image. They can then deploy the applications with Altiris Deployment Solution or Altiris Software Delivery Solution™ software using push methodologies to help reduce the time spent on image updates.

- **Consistent builds:** Using the same image across different PowerEdge servers enables systems to maintain the same foundational drivers, configurations, and look-and-feel.

Images provide one important method of OS deployment, but administrators also have another method available: scripted installations. One method may be more suitable than the other based on the network environment, which is in turn dictated by complex IT policies, diverse network architectures, IT staff preferences, and so on. Altiris software helps administrators perform both types of deployments. Figures 1 and 2 summarize the advantages and disadvantages of each method.

Building hardware-independent images

Altiris Deployment Solution enables administrators to easily capture OS images and deploy them to multiple systems. It also serves as the environment for add-on products such as Altiris Deployment Solution for Dell Servers, which helps administrators perform bare-metal provisioning of Dell PowerEdge servers as well as post-deployment

Advantages of image-based deployment	Disadvantages of image-based deployment
<ul style="list-style-type: none"> • <i>Minimal deployment time:</i> A 2 GB 16-bit DOS image might take only 6–8 minutes to deploy, and a 2 GB 32-bit Windows Preinstallation Environment (WinPE) or Linux® OS image might take only 2–3 minutes to deploy. • <i>Efficient distribution:</i> Images can be multicasted to multiple systems simultaneously, which helps reduce network bandwidth and bottleneck constraints based on the broadcast method. • <i>Single image:</i> A single image can be created for different Dell PowerEdge models, eliminating the need to create and maintain separate images for each OS and model. • <i>Consistent builds:</i> Administrators can maintain OS build consistency without intervention or post-deployment scripts. 	<ul style="list-style-type: none"> • <i>Inflexible updating:</i> After the image has been captured, the software and drivers contained in the image become outdated over time and require updates. Typically, administrators must either regularly deploy, update, and recapture the master image, or load management agents in the image and deploy updates later with policy-based distributions.

Figure 1. Advantages and disadvantages of image-based OS deployments

¹ For more information, see the “Option 2 – Deploying the Image Independent of Deployment Solution” section in the complete Altiris white paper at apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf.

tasks such as software installation, OS and hardware patching, and inventories. This section outlines some basic tips for building hardware-independent images.

Identify HAL compatibilities. When deploying hardware-independent images, the master and destination server HALs must be compatible. For example, an image captured from a non-ACPI-compliant system and deployed to an ACPI-compliant system typically fails or becomes caught in a continuous boot cycle. Fortunately, most PowerEdge servers—those from the third generation through the current ninth generation—have the same HAL, so incompatibility typically is not a problem when creating and deploying images on Dell servers.

Identify a reference server for image creation. To help simplify image creation and deployment to target hardware, administrators should select a standard PowerEdge server model as a reference server from which to create the image. This server should not include any superfluous hardware or configurations—for example, it should use SCSI rather than RAID, and DRACs and other add-on cards should be removed or disabled. If not using the Altiris Deployment Solution for Dell Servers add-on to provision the hardware, or if using a PowerEdge model not supported by the Dell OpenManage Deployment Toolkit and therefore not supported by this add-on, administrators can initially provision the hardware and deploy the OS using Dell OpenManage Server Assistant, which is

included on a CD with PowerEdge servers and available for download from support.dell.com.

Many hardware components are embedded on the motherboard and can be disabled either from the system BIOS or by opening the case and physically removing the modules. (Administrators should consult the hardware manual and warranty before attempting to physically remove modules themselves.) For example, a server with an embedded PowerEdge Expandable RAID Controller (PERC) can be disabled in the system BIOS, which then defaults to using SCSI. Disabling a PERC allows administrators to build an image from one SCSI drive with a small OS partition, rather than three drives with a typical RAID-5 configuration, thereby simplifying the image build to help increase the success rate when mass deploying.

Use the minimum available hard disk or partition size. Typically, the source hard drive or partition used to create an image should not be larger than the target hard drive or partition; for example, administrators should not create an image from an 80 GB drive or partition and deploy it to a 40 GB drive or partition. One way to avoid potential problems is create a small partition for image creation. For example, a 6–8 GB partition typically allows space for the OS, the \i386 directory copied from the Windows media CD, and any service packs, security updates, and hot fixes—while still providing some extra space if needed.

Select a target server for image testing. To verify that an image has been configured properly, administrators should test the image on a different PowerEdge model with different chipsets and hardware than the reference server. If no such server is available, administrators can also test the image on the reference server by re-enabling all the hardware components and configurations that had been disabled, if applicable. This method is not as reliable as using an entirely different model, however, because even though the Sysprep utility should remove the current hardware devices installed on the reference server, the drivers are still present in the system directories and could be reinstalled when the system boots up again.

Obtain the appropriate version of Microsoft Sysprep. There are currently three versions of Sysprep available from Microsoft: version 1.0, included with the Windows 2000 product CD; version 1.1, the current version for Windows 2000; and Version 2.0, the current version for Windows Server 2003 and Windows XP.²

Use a volume license key. Administrators should use volume license keys and media for the OS that the hardware-independent image will be built from, which avoids Windows activation on the target systems.

Identify target system hardware. To successfully build a hardware-independent image, administrators should identify the different hardware devices that exist in the environment, such as DRACs, PERCs, modems, network interface cards, and so on.

Advantages of scripted deployment	Disadvantages of scripted deployment
<ul style="list-style-type: none"> • <i>Flexible updating:</i> Service packs, hot fixes, and driver updates can be added to the installation process to help keep OS deployments up-to-date. • <i>Simple customization:</i> Administrators can easily customize components during installation. 	<ul style="list-style-type: none"> • <i>Lengthy deployment time:</i> OS deployments can take 2–4 hours depending on the number and size of the updates. • <i>Inefficient distribution:</i> Installations cannot be multicasted to multiple systems simultaneously. • <i>Tedious update maintenance:</i> The process of continually maintaining the latest updates and slipstreaming them into the OS deployment can be monotonous. (One alternative is to use patch management software such as Altiris Patch Management Solution for Windows, which allows the management agent to identify OS vulnerabilities after deployment, and then push out the updates as part of a policy-based distribution.) • <i>Time-consuming preparation:</i> Administrators must perform initial preparatory tasks on the deployment server, such as copying media files and drivers and editing answer files, before they can use predefined scripted OS jobs.

Figure 2. Advantages and disadvantages of scripted OS deployments

²Version 2.0 is included in the supporting files for the complete Altiris white paper, available at apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf. For more information about Sysprep, see the "Introduction to Microsoft Sysprep" section in the complete white paper.

```

sysinfo.txt - Notepad
File Edit Format View Help
asset=
biosver=1.1.0
cpucount=2
cpuspeed=3200MHZ
mem=4096MB
svctag=FH46CB1
sysid=01B2
sysname=PowerEdge 2950
uuid=44454c4c480010348036c04f434231

PCI Bus: 2, Device: 14, Function: 0
Vendor: 1028 - Dell
Device: 0015 - PowerEdge Expandable RAID controller 5
Sub Vendor:1028 - Dell
Sub Device:1F03 - Unknown
Slot: 00
Class: 01 - Storage
SubClass: 04 - RAID

PCI Bus: 5, Device: 0, Function: 0
Vendor: 14E4 - Broadcom Corporation
Device: 164C - NetXtreme II BCM5708 gigabit Ethernet
Sub Vendor:1028 - Dell
Sub Device:01B2 - Unknown
Slot: 00
Class: 02 - Network
SubClass: 00 - Ethernet

PCI Bus: 12, Device: 0, Function: 0
Vendor: 1077 - QLogic Corp.
Device: 2432 - QLA2432 Fibre Channel Adapter
Sub Vendor:1077 - QLogic Corp.
Sub Device:0138 - Unknown
Slot: 01
Class: 0C - Serial
SubClass: 04 - Fiber Channel

PCI Bus: 16, Device: 13, Function: 0
Vendor: 1002 - ATI Technologies Inc
Device: 515E - ES1000
Sub Vendor:1028 - Dell
Sub Device:01B2 - Unknown
Slot: 00
Class: 03 - Display
SubClass: 00 - VGA

```

Figure 3. Altiris Deployment Solution for Dell Servers hardware inventory output for a Dell PowerEdge 2950 server

Altiris Inventory Solution[®] software, Altiris Inventory Solution for Servers (an upcoming release), Altiris Real-Time System Manager Solution[™] software, and even the Altiris Deployment Solution for Dell Servers add-on can identify the hardware that exists in an environment. For example, Altiris Deployment Solution can capture commonly requested inventory through the Altiris AClient agent and display it through the Altiris Deployment Solution console. The Altiris Deployment Solution for Dell Servers add-on can also use the Dell OpenManage Deployment Toolkit (DTK) to capture and output detailed hardware inventory to a text file (see Figure 3), and can run in a pre-OS environment without an agent.

After gathering this information, administrators can download the appropriate vendor-specific or third-party Plug and Play (PnP) drivers for each hardware device, chipset, and so on, so that they can properly gather and bundle these drivers into the single image for remote installation during the PnP detection process. Although some or most of these drivers may be native to the OS itself, administrators typically should download the drivers from the hardware vendor itself—in the case of PowerEdge servers, from support.dell.com.³

Identify legacy devices. Legacy devices are those that do not support PnP and may require manual installation and configuration after image deployment. Identifying these devices beforehand helps save time and effort later, and may help identify an automated work-around to avoid manual intervention—for example, because

Altiris Deployment Solution can deploy any type of script in a pre-OS or post-OS environment, administrators may be able to set up an unattended script that Altiris Deployment Solution can then deploy without manual intervention.

Properly build the SysprepMassStorage section of Sysprep.inf.

One of the most critical (and tedious) parts of creating a hardware-independent image is properly building the SysprepMassStorage section of the Sysprep.inf file, which identifies elements such as the PnP PCI vendor IDs extracted from the vendor-specific .inf files, the location of the drivers contained in the image, and so on, so that they can be properly identified and installed during the post-deployment mini-setup process. Building this section incorrectly may cause errors during the pre-deployment Sysprep process if the OS cannot properly identify and load the appropriate mass storage controller drivers.⁴

For an example Sysprep.inf file, see the supplemental online section of this article at www.dell.com/powersolutions.

Simplifying image-based OS deployment

Using hardware-independent images helps dramatically simplify image-based server provisioning—including provisioning of Dell PowerEdge servers. Altiris Deployment Solution along with other Altiris software tools can provide a flexible way for administrators to create and deploy these images. Implementing Altiris software in conjunction with the methods outlined in this article enables an efficient, robust deployment process for enterprise data centers.

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FOR MORE INFORMATION

Szewczyk, Eric. "Building a Single Image for Dell PowerEdge Servers Using Altiris Deployment Solution." Altiris Technical Services, September 25, 2006. apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf

Supporting files for complete Altiris white paper:

apl-ibase.altiris.com/resources/dell/single_image/onedellimage.zip

Altiris and Dell server deployment:

www.altiris.com/delldeploy

Altiris and the Dell Alliance:

www.altiris.com/dell

Altiris products:

www.altiris.com/products

³ For more information, see the "Gathering Dell Drivers for Inclusion in the Hardware Independent Image" section in the complete Altiris white paper at apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf.

⁴ A sample Sysprep.inf file and Dell drivers are included with the supporting files for the complete Altiris white paper, available at apl-ibase.altiris.com/resources/dell/single_image/WP_Single_Image_for_Dell_Servers_v2.pdf. For more information and step-by-step instructions on properly creating this section, see the "Building the [SysprepMassStorage] Section of the SYSPREP.INF File" section in the complete white paper.