

Dell™ OpenManage™
Deployment Toolkit Version 2.3
User's Guide

Notes and Notices



NOTE: A NOTE indicates important information that helps you make better use of your computer.



NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

Abbreviations and Acronyms

For a complete list of abbreviations and acronyms, see "Glossary."

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Introduction

The Dell™ OpenManage™ Deployment Toolkit (DTK) includes a set of utilities for configuring and deploying Dell PowerEdge™ systems. The DTK is designed for customers who need to build scripted installations to deploy large numbers of servers in a reliable fashion without having to dramatically change their current deployment processes.

In addition to the command line utilities used to configure various system features, the DTK also provides sample scripts and configuration files to perform common deployment tasks and documentation. These files and scripts describe the use of DTK in Microsoft® Windows® Preinstallation Environment (Windows PE) and embedded Linux environments.

The benefits of the DTK:

- Provides the tools necessary to automate the pre-operating system configuration tasks and the unattended operating system installation tasks when deploying PowerEdge systems.
- Scales to support from one to many system deployment efforts.
- Facilitates consistent system configurations across multiple systems.
- Provides diverse and useful deployment tools that can be utilized in many different ways.

Introduction to the DTK User's Guide

While the DTK is designed to be flexible and expandable, this guide is limited to providing general, best practices procedures that focus on the basic tasks for a successful deployment. Users might find many alternative solutions to the best practices guidelines described in this guide and many additional uses for the DTK utilities beyond what is covered in this guide or in the *Dell OpenManage Deployment Toolkit CLI Reference Guide*.



NOTICE: The best practices guidelines described in this document were developed and tested on specific systems with specific hardware and software configurations. As a result, the examples and instructions described in this guide are not applicable to every environment. The open nature of the DTK utilities and scripting methodology is designed to allow the flexibility to modify the examples, procedures, and suggestions to best fit your specific environment. Using the DTK examples without first making modifications based on your specific IT environment is likely to result in failed deployments.

Information in this guide is distinctly divided for Windows PE and embedded Linux. Even though the nature of topics covered for both environments is similar, the contents are very different, and has been organized into separate sections. This will enable the user to read only those sections that are relevant. Content in this *User's Guide* is organized as documented in Table 1-1.

Table 1-1. Information Organization in This Guide

Topics	Section for Windows PE	Section for Embedded Linux
Introduction, that includes information on: <ul style="list-style-type: none"> • DTK • What's new for this release • Prerequisites and requirements • DTK deployment overview 	Introduction	Introduction
Planning, that includes best practices for choosing a deployment method	"Choosing a Microsoft® Windows® PE-Based Deployment Method"	"Choosing an Embedded Linux-Based Deployment Method"
Preparing the deployment directory structure, that includes best practices for: <ul style="list-style-type: none"> • Installing DTK • Gathering and organizing deployment files (DTK, operating system, drivers, systems management software, and so on) • Preparing an optimally configured source system 	"Preparing the Directory Structure for Deployment in Microsoft® Windows® PE"	"Preparing the Directory Structure for Deployment in Embedded Linux"
Preparing the deployment script files, that includes best practices for: <ul style="list-style-type: none"> • Editing and modifying sample scripts • Capturing basic input/output system (BIOS), baseboard management controller (BMC), and remote access controller (RAC) configuration profiles from an optimally configured source system 	"Preparing the Script Files for Deployment Using Microsoft® Windows® PE"	"Preparing the Script Files for Deployment Using Embedded Linux"
Running a scripted deployment that includes best practices for: <ul style="list-style-type: none"> • Creating deployment media • Running the deployment 	"Running Deployment Scripts Using DTK and Microsoft® Windows® PE"	"Running Deployment Scripts Using DTK and Embedded Linux"



NOTE: The best practices examples included in this guide are intended to provide illustrations for using specific scripts and configurations that have been tested on specific PowerEdge systems.

This guide also includes a "Known Issues and Frequently Asked Questions" section.

What's New

The Deployment Toolkit version 1.0 was the first release of a Dell-designed and tested suite of MS-DOS[®]—based utilities, sample script files, and best practices models to use for configuring and deploying Dell systems in a customized, predictable, and unattended manner.

The new features for DTK version 2.3 include:

- Support for PowerEdge 2970 systems
- Support for installing Red Hat[®] Enterprise Linux[®] Server version 5 (32- and 64-bit)
- A new utility partition image
- Support for Redundant Array of Independent Disks (RAID) replication feature
- Support for Dell Update Packages in pre-operating system embedded Linux environment

Prerequisites and Requirements

The DTK is a collection of Windows PE- and Linux-based utilities and scripts that assist in performing pre-operating system tasks and deploying Dell systems. An advanced knowledge of Windows PE and Linux is required for users who want to use the DTK utilities to perform pre-operating system configuration tasks or to run a scripted deployment in the respective environments.

A pre-operating system environment is defined as the environment used to configure system hardware *before* a major operating system, such as Windows or Linux, is installed. The DTK utilities and scripts, for example, are executed in a Windows PE or embedded Linux environment for hardware configuration.

Because of the open nature of the utilities and scripts and the environment in which they can be used, it is strongly recommended that DTK users have an advanced understanding of the Windows PE and Linux environment and scripting knowledge for the respective environments. DTK users with an advanced understanding of Windows PE and Linux can take full advantage of the utilities and exploit their capabilities above and beyond what the sample scripts can provide.



NOTICE: Some of the DTK utilities can destroy data if used incorrectly. To avoid the potential risk of data loss, take all necessary precautions to protect data so that mission-critical systems are not disrupted in the unlikely event of a failure. See the *Deployment Toolkit CLI Reference Guide* for complete information about the capabilities of each DTK utility.


Supported Operating Systems to Run DTK Utilities


For Windows PE, the DTK utilities support Windows PE version 2005 (created using Microsoft Windows Server[®] 2003 family with Service Pack 1 [SP1]).

For embedded Linux, the DTK utilities support Red Hat Enterprise Linux Server (version 4, update 4) 32-bit.

Supported Systems

Table 1-2 lists the supported PowerEdge systems for DTK version 2.3.

 **NOTE:** Additional PowerEdge systems may be supported with this release. See the Dell Support website at support.dell.com for the latest supported PowerEdge systems.

 **NOTE:** x8xx series systems with dual-core processors are supported.


 **NOTE:** RAIDCFG utility is not supported on PowerEdge 1655 systems.

Table 1-2. Supported Systems

DTK Version	Supported PowerEdge Systems			
	x6xx Series Systems	x7xx Series Systems	x8xx Series Systems	x9xx Series Systems
2.3	650	700	800	1900
	1600SC	750	830	1950
	1650	1750	840	1955
	1655MC		850	2900
	2600		860	2950
	2650		1800	2970
	4600		1850	6950
	6600		1855	1435SC
	6650		2800	
			2850	
			6800	
			6850	

Supported BIOS Firmware Versions

A minimum BIOS version is recommended on some of the platforms for all the DTK options to work correctly. In general, it is good practice to use the latest ("n") version of BIOS firmware or the "n-1" version that is available on the Dell Support website at support.dell.com.

Installation Prerequisites

Before installing the DTK components for Windows PE, ensure that you have the following:


- The DTK self-extracting zip file (**dtk-2.X-winpe-AXX.exe**), which contains the utilities, sample scripts, sample configuration files, and documentation you need to deploy your Dell system
- A Windows workstation that has at least 500 MB of free hard-drive space

Before installing the DTK components for embedded Linux, ensure that you have the following:

- The DTK ISO image, which contains the utilities, sample scripts, sample configuration files, and documentation you need to deploy your Dell system
- A Linux workstation that has at least 200 MB of free hard-drive space


Deployment Prerequisites

Before beginning the deployment process for Windows PE, ensure that you have all of the following tools, software, and information ready to use or consult:

- Advanced knowledge of Windows
- OEM Preinstallation Kit (OPK) or Windows PE CD and Windows Server 2003 (with SP1) to build Windows PE 2005
- An unzip utility
- Working knowledge to build Windows PE 2005 (See the Microsoft documentation for customizing Windows PE 2005)
- Working knowledge of Microsoft Remote Installation Services (RIS) and Automated Deployment Services (ADS) (including setting up of RIS and ADS environments), or any other third party deployment system or tool
- A workstation with the following capabilities:
 - A writable CD drive and CD-writing software (optional)
 - Network access
- A target system with a CD drive, if performing a local deployment
- A target system with a CD drive and network access, if performing a network deployment
- All DTK utilities, sample scripts, and sample configuration files
- All other utilities and files necessary to perform the deployment, including all required Windows PE drivers, operating system drivers, and the Dell utility partition image file
- DTK documentation:
 - *Dell OpenManage Deployment Toolkit Version 2.3 CLI Reference Guide*
 - *Dell OpenManage Deployment Toolkit Version 2.3 User's Guide*
- The *Dell PowerEdge Service and Diagnostic Utilities* CD
 -  **NOTE:** If your system does not have a *Service and Diagnostic Utilities* CD, obtain the latest drivers from the Dell Support website at support.dell.com.
- The *Dell PowerEdge Installation and Server Management* CD
- Your operating system software and documentation
- An optimally configured source system with network access

For embedded Linux, ensure that you have all of the following tools, software, and information ready to use or consult:

- Advanced knowledge of Linux and Linux scripting (Bash), Linux networking, installing and working with Red Hat Package Managers (RPMs), and creating and modifying loop file systems
- Any third party deployment system or tool


- A workstation with the following capabilities:
 - A writable CD drive and CD-writing software (optional)
 - Network access
- A target system with a CD drive, if performing a local deployment
- A target system with a CD drive and network access, if performing a network deployment
- All DTK utilities, sample scripts, and sample configuration files
- All other utilities and files necessary to perform the deployment, including all required Linux drivers, operating system drivers, and the Dell utility partition file
- DTK documentation:
 - *Deployment Toolkit Version 2.3 CLI Reference Guide*
 - *Deployment Toolkit Version 2.3 User's Guide*
- The *Service and Diagnostic Utilities* CD
 -  **NOTE:** If your system does not have a *Service and Diagnostic Utilities* CD, obtain the latest drivers from the Dell Support website at support.dell.com.
- The *Installation and Server Management* CD
- Your operating system software and documentation
- An optimally configured source system with network access

Deploying Operating Systems

After the system hardware is versioned and configured, an operating system can be installed using unattended setup files, samples of which are provided as part of the DTK. While these sample configuration files are operating system specific, they have been enhanced for Dell systems. See your operating system documentation for more information about how to modify these unattended installation files.

For Windows PE, the sample configuration files contain examples to deploy the following operating systems:

- Windows Server 2003 with SP1
- Windows Server 2003 with SP2
- Windows 2000 with SP4

 **NOTE:** For the latest supported operating systems, see the Windows PE documentation.

For embedded Linux, the sample configuration files contain examples to deploy the following operating systems:

- Red Hat Enterprise Linux Server version 3 (32- and 64-bit)
- Red Hat Enterprise Linux Server version 4 (32- and 64-bit)
- Red Hat Enterprise Linux Server version 5 (32- and 64-bit)
- SUSE® Linux Enterprise Server version 10 (64-bit)

Deployment Methods

Dell systems can be deployed using several different methods. The most common method is using the *Installation and Server Management* CD that is shipped with your system. Currently, this method is used to deploy a single server at a time with the installation wizard. The DTK, on the other hand, offers a complete set of utilities and sample scripts that can be used to automate deployment of large numbers of Dell systems. This guide is designed to help guide you through some of the most basic planning considerations, logistical preparations, and deployment procedures to get you started using the DTK to deploy Dell systems.

DTK Deployment Overview

Preparing for Deployment

The deployment process can be separated into two main tasks: preparation and the actual deployment.

To prepare for using the DTK utilities and scripts to deploy to a target system in the Windows PE environment:

- 1 Copy or extract the DTK utilities, sample scripts, sample configuration files, and drivers provided (in the zip file) into the Windows PE image.
- 2 Organize the DTK utilities, scripts, and configuration files, the operating system installation files, and the requisite system files and drivers on a network share or local media.
- 3 Set up an optimally configured source system by using the *Installation and Server Management* CD to configure the system and install your operating system; and the *Service and Diagnostics* CD to load drivers. (This source system will be the master server that will be used to replicate settings onto target servers.)



NOTE: If your system does not have a *Service and Diagnostic Utilities* CD, you can obtain the latest drivers from the Dell Support website at support.dell.com.

- 4 Edit the DTK sample script files that read the system configuration files to set up the system BIOS, BMC, RAID, and RAC and then install an operating system on a target system.
- 5 Generate a system BIOS, BMC, RAID, and/or RAC configuration profile from the optimally configured source system. (This source system will be the master server that will be used to replicate settings onto target servers.) You can obtain the system BIOS, BMC, RAID, and/or RAC configuration files by booting from the DTK Windows PE ISO image and running the **SYSCAP.BAT**, **RAIDCAP.BAT**, and **RACCAP.BAT** scripts. Then, copy the generated configuration files to a read/write share onto the workstation.



NOTE: You can use a system profile generated on a specific PowerEdge system to deploy only that same system model. For example, you can use a system BIOS configuration profile generated for an optimally configured PowerEdge 1850 system to deploy only other, similarly configured PowerEdge 1850 systems.


- 6 Create an operating system answer file that contains unattended operating system software installation information.

To prepare for using the DTK utilities and scripts to deploy to a target system in the embedded Linux environment:

- 1 Obtain the DTK Linux ISO image, which is a self-contained bootable ISO image.
- 2 Use and customize the sample scripts per your requirements.
- 3 Set up an optimally configured source system by using the *Installation and Server Management* CD to configure the system and install your operating system. Use the *Service and Diagnostics* CD to load drivers.

 **NOTE:** If your system does not have a *Service and Diagnostic Utilities* CD, obtain the latest drivers from the Dell Support website at support.dell.com.

- 4 Install an operating system on a target system.
- 5 Generate a system BIOS, BMC, RAID, and/or RAC configuration profile from the optimally configured source system. (This source system will be the master server that will be used to replicate settings onto target servers.) You can obtain the system BIOS, BMC, RAID, and/or RAC configuration files by booting from the DTK Linux ISO image and running the `syscap.sh`, `raidcap.sh`, and `raccap.sh` scripts. Then, copy the generated configuration files to a read/write share onto the workstation.

 **NOTE:** You can use a system profile generated on a specific PowerEdge system to deploy only that same system model. For example, you can use a system BIOS configuration profile generated for an optimally configured PowerEdge 1850 system to deploy only other, similarly configured PowerEdge 1850 systems.

- 6 Create an operating system answer file that contains unattended operating system software installation information.

Deploying

After you have prepared all scripts, files, and utilities, you are ready to proceed with the deployment process. While there are many ways to use the DTK utilities to deploy Dell systems, this guide focuses on the two most common methods for Windows PE and embedded Linux: CD-based deployment (local) and network-based deployment (remote).

Deployment Using Removable Boot Media With a Network Connection (CD-Based)

- 1 Create a deployment CD containing a bootable image with the appropriate CD and network drivers, along with any utilities needed to connect to a network share. The deployment CD initiates the deployment process by mapping to the network share where the deployment directory structure resides.
- 2 Insert the bootable CD into the appropriate drive of the system to be deployed.
- 3 Boot or reboot the system.

The configuration process begins:

- Windows PE or embedded Linux, as the case may be, is loaded from the CD.
- Network shares are mapped.
- The DTK scripts execute the necessary DTK utilities from the network share or the CD itself.
- Configuration information is read from the network share.
- The operating system is installed from a network share. (This installation may happen after your system reboots.)

Deployment Using Removable Boot Media Without a Network Connection (CD-Based)

- 1 Create a deployment CD containing a bootable image with the appropriate drivers. The CD must also include the complete deployment directory structure, which contains all the DTK utilities, scripts, and configuration files, an operating system installation answer file, and the required operating system installation files and drivers.
- 2 Insert the bootable CD into the CD drive of the system to be deployed (the target system).
- 3 Boot or reboot the target system.

The deployment process begins:

- Windows PE or embedded Linux, as the case maybe, is loaded from the CD.
- The DTK scripts execute the necessary DTK utilities from the CD.
- Configuration information is read from the CD.
- The operating system is installed from the CD.

Network-Based Deployment (Remote)

For Windows PE environments, deployment using RIS is recommended. (For details, see the Microsoft RIS documentation.) You can also use any other deployment tool such as ADS.

For embedded Linux environments, a PXE set up is recommended. (For details, see documentation available on your Linux operating system.)

Other Dell Documents You Might Need

In addition to this *User's Guide* and the *Deployment Toolkit CLI Reference Guide*, both of which are available as part of the DTK download and on the Dell Support website at support.dell.com, you can find the following guides either on the Dell Support website or on the documentation CD:

- The *Dell OpenManage Installation and Security User's Guide* provides additional information about performing an unattended installation of Server Administrator on systems running supported Windows, Red Hat Enterprise Linux Server, and SUSE Linux Enterprise Server operating systems.
- The *Dell OpenManage Server Administrator Compatibility Guide* provides compatibility information about Server Administrator installation and operation on various hardware platforms (or systems) running supported Windows, Red Hat Enterprise Linux Server, and SUSE Linux Enterprise Server operating systems.
- The *Dell Remote Access Controller 4 User's Guide* provides comprehensive information about using the **RACADM** command line utility to configure a Dell Remote Access Controller (DRAC) 4.
- The *Dell Remote Access Controller 5 Firmware User's Guide* provides comprehensive information about using the **RACADM** command line utility to configure a DRAC 5.
- The *Dell Remote Access Controller Racadm User's Guide* provides comprehensive information about using the **RACADM** command line utility.

- The *Dell Baseboard Management Controller Utilities User's Guide* provides information about configuring a managed system to use the BMC Management Utility to manage your system through its BMC.
- The *Dell Update Packages User's Guide* provides information about obtaining and using Dell Update Packages as part of your system update strategy.

Additionally, the Deployment Toolkit **readme.txt** file, which is available as part of the DTK download and on the Dell Support website at support.dell.com, provides the latest available information for the installation and operation of the DTK components.

Other Supporting Documents You Might Need

Besides the Dell-provided documentation, there are numerous other resources to aid you in planning and executing a DTK-assisted deployment:

- Operating system documentation to prepare for and execute the unattended installation process. In addition, you should consult the available Web-based resources such as:
 - The Microsoft Tech Net database at www.microsoft.com/technet
 - The Red Hat Enterprise Linux support pages at www.redhat.com
 - The SUSE Linux Enterprise Server support pages at www.novell.com
- Windows PE, OEM Preinstallation Kit (OPK), and ADS documentation
- Imaging software documentation, if you are creating a bootable CD or are planning to deploy from an image (deploying from an image is not covered in this guide)

Obtaining Technical Assistance

If at any time you do not understand a procedure described in this guide or if your product does not perform as expected, help tools are available to assist you. For more information about these help tools, see "Getting Help" in your system's *Hardware Owner's Manual*.

Additionally, Dell Enterprise Training and Certification is available; see www.dell.com/training for more information. This service may not be offered in all locations.

Choosing a Microsoft® Windows® PE-Based Deployment Method

A well-thought-out deployment plan is critical to the success of your deployment effort and includes the following considerations:

- Assessing your existing IT environment
- Selecting an operating system
- Selecting the optimum Dell™ OpenManage™ systems management software configuration for your system
- Choosing a deployment method

The Deployment Toolkit (DTK) is designed to be flexible enough to fit into almost any deployment plan. For the purposes of this document, however, the focus is on two specific deployment methods: CD-based deployment (local) and network-based deployment (remote).

Choosing a Deployment Method for Windows PE

The DTK components can be used in many different ways to assist IT staff in deploying Dell systems in large numbers. Because all the tools and scripts are task oriented, many of them can be used separately to perform a specific task on many systems or collectively to perform many tasks on many systems at once.

The configuration complexity and pros and cons of each deployment method are provided in Table 2-1. After you have decided which deployment method best fits your needs, you are ready to begin preparing for the deployment.

CD-Based Local Deployment

The general CD-based deployment process includes:

- Creating a bootable Windows PE CD
- Integrating latest drivers to recognize Dell-specific components
- Integrating DTK and its components (tools and scripts)
- Integrating operating system installation files for deployment

This deployment method is easy to assemble, but is the least flexible. Any change to the system configuration, for example, requires the creation of a new bootable CD. This method does not provide a writable media, making it necessary to use predefined and tested configuration files.


Creating a Customized Bootable Windows PE CD

See "Running Deployment Scripts Using DTK and Microsoft® Windows® PE" for details on how to create a customized version of a single Windows PE image that can work across all supported Dell PowerEdge™ systems. You must include Dell-customized drivers and instrumentation drivers into your Windows PE CD-based operating system.

Complete Deployment Using DTK and Operating System Files From a CD Bootable Media

After the customized version of the bootable Windows PE CD is created, IT administrators can take advantage of the sample task-oriented scripts provided in DTK to automate the whole deployment process. For this purely CD-based deployment, it is necessary to add the operating system installation files on the CD media. After the configuration is completed using DTK tools, the operating system can be installed using its native installer in unattended mode.


CD-Based Local Deployment With Networking Enabled

 **NOTE:** The DTK network-based deployment is not supported from mapped Novell® NetWare® systems.

This method provides greater flexibility and is highly recommended in large deployments. The prerequisites are the availability of network bandwidth and that all target systems are connected to the network. A brief description of the tasks for this method is given below.

Bootable Windows PE CD With Networking Enabled

This process includes:

- Creating a bootable Windows PE CD with the appropriate network drivers. This step enables networking services to start, get an IP address, and bring the target system into a functioning network.
 -  **NOTE:** See "Running Deployment Scripts Using DTK and Microsoft® Windows® PE" for details on how to create a customized version of a single Windows PE bootable CD that works across all Dell supported PowerEdge Servers and provides an underlying networking stack.
- Creating scripts to automatically *map* to a predefined network share.
- Accessing scripts, configuration files, and operating system installation files from the network.

Preparing and Populating the Network Share

This process includes:

- Creating a network share on a system that is always available over the network for the target systems to be deployed
- Ensuring that a large amount of space is available for storing operating system installation files
- Ensuring that proper permissions are assigned to this share so that the target systems can read files from and write files to the share

This deployment method is also easy to assemble. In addition, it provides greater flexibility in terms of making changes to the scripts and configuration files. Any change to the system configuration, for example, will not require re-creation of the bootable CD. This method also provides access to the remote share as writable media. Hence, the configuration files captured during the deployment automation process can be saved to this remote share.

Using a Third-Party Deployment Solution Framework

You can use the DTK with any existing third-party deployment solution framework that provides a Automated Deployment Services (ADS) booting infrastructure that can be used as the transport mechanism for the DTK utilities. Because each third-party deployment framework is unique, however, these solutions fall outside the scope of this document. If you plan to utilize a third-party deployment solution framework, keep in mind that the DTK is a Windows PE-based set of tools and scripts, so the deployment solution framework must also support embedded Windows PE as a pre-operating system environment.

Deployment Matrix (Windows PE)

Depending on the scope, current business needs, network setup, and process, you might select any of the suggested methods of deployment. Table 2-1 outlines three typical methods of deployment and the environment most suitable for each.

Table 2-1. Deployment Method Matrix

Deployment Methods	Complexity	Advantages	Disadvantages
Local deployment (bootable CD)	Relatively simple	<ul style="list-style-type: none"> Necessary if a network connection is not available or is too slow. Can install supported Windows operating systems. 	<ul style="list-style-type: none"> Any change requires the creation of a new bootable CD. Limited space on CD for some operating system installation files. Deployment tasks must be performed at the individual target system. CDs are read-only media and require the creation of a RAMDISK for temporary data storage. Installation time is high.

Table 2-1. Deployment Method Matrix (continued)

Deployment Methods	Complexity	Advantages	Disadvantages
Remote deployment over a network (bootable Windows PE CD with network stack loaded)	Moderate	<ul style="list-style-type: none">• Everything is in one place in a network share.• Easy to manage—changes have to be made in only one place.• Data captured (profiles) can be stored in a network share.• Data can be replicated from a network share.• Can install supported Windows operating systems.	<ul style="list-style-type: none">• Must have network connection.• Deployment tasks must be performed at the individual target system.• Must locate the appropriate Windows PE network drivers.• Not supported from a mapped NetWare system.
Deployment solution framework from a third-party vendor	Mixed	<ul style="list-style-type: none">• The DTK can be used in the context of third-party deployment solution framework.• Third-party deployment solution framework is used as the deployment transport mechanism.• Tasks and scripts can be pushed to the target systems.	Must either acquire and learn to use or have an existing third-party deployment solution framework.

After you have determined which deployment method best suits the needs of your organization, you are ready to begin building the DTK deployment directory structure on a network volume. For instructions on installing the DTK components and populating the deployment directory structure, see "Preparing the Directory Structure for Deployment in Microsoft® Windows® PE."

Preparing the Directory Structure for Deployment in Microsoft® Windows® PE

This section describes some of the procedures necessary to begin the deployment process, including:

- Downloading and unzipping the Deployment Toolkit (DTK) components, including a comprehensive matrix of the DTK components
- Setting up a directory structure to facilitate a successful deployment, including a list of the supporting components that are not included with the DTK, but are needed to use the DTK
- Setting up an optimally configured source system

Upgrading Your DTK Version

When upgrading from a previous release (1.x) of the DTK, ensure that you create the new DTK version 2.x environment separately from your previous version of DTK. This step is necessary because the environments and requirements for DTK version 2.x are completely different.

Obtaining DTK

The DTK components are provided in a self-extracting zip file on the Dell™ Support website at support.dell.com. The self-extracting file can be opened on any system running a Windows operating system. By default, the **dtk-2.X-winpe-AXX.exe** files are extracted to the root directory of your local hard drive, C:\. This location can be changed by giving a different path when extracting the files, but it is strongly recommended that you keep the DTK default directory structure if you plan to use the sample deployment scripts provided with the DTK.

Perform the following steps to extract the DTK components to a workstation running Windows:

- 1 Download the DTK file **dtk-2.X-winpe-AXX.exe** from the Dell Support website at support.dell.com and save it anywhere on your system.
- 2 After the file downloads, double-click the file.
- 3 Click OK.

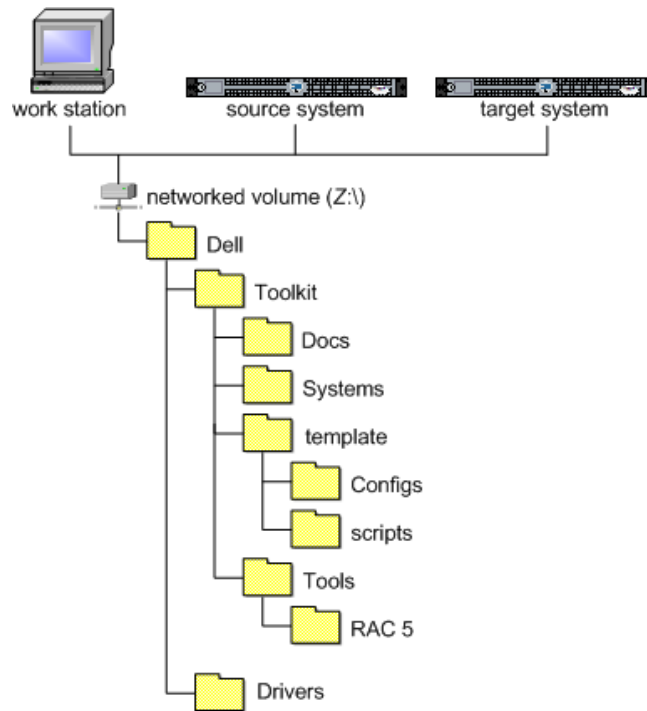
4 Click Unzip.

By default, files are unzipped to C:\. You can unzip the DTK components to your local hard drive and then copy them later to a network volume, or you can change the installation path to an available network share. For example, you can unzip the files directly to the network share (for example, Z:\) that you plan to use in the deployment process.

NOTE: Do not copy the DTK components to a Novell® NetWare® network volume. The DTK network-based deployment is not supported from mapped Novell NetWare systems. The DTK utilities do not run in Windows PE when Novell's Client32 is loaded.

The files are unzipped in the directory structure shown in Figure 3-1.

Figure 3-1. Sample DTK Default File Structure



Workstation is the system on which the DTK components are extracted.

Source system is an optimally configured system from which the system settings are captured.

Target system is the system on which the settings captured from the source system are replicated.

The DTK utilities are in Z:\Dell\Toolkit\Tools.

The DTK sample scripts are in Z:\Dell\Toolkit\template\scripts.

The DTK sample configuration files are in **Z:\Dell\Toolkit\template\Configs**.

The DTK *User's Guide* and *CLI Reference Guide* are in **Z:\Dell\Toolkit\Docs**.

The directory **Z:\Dell\Toolkit\System**s is created as a placeholder that can be used for all system information that is captured using sample scripts and tools (for example, the system specific basic input/output system (BIOS) and baseboard management controller (BMC) configuration files used by the DTK utilities for configuring a system).

See "Setting Up a Directory Structure for Deployment" for further discussion of the deployment directory structure.

DTK Contents

The DTK contains Windows PE-based utilities, sample scripts, sample configuration files, drivers, and documentation for automating the deployment of Dell systems. The following sections provide a complete list of the DTK contents and a short description of each component. For a more complete explanation of the DTK utilities, see the *CLI Reference Guide*. For an explanation of the sample configuration files and scripts, see "Editing the Sample Batch Files to Perform a Complete System Deployment in Windows PE."

System Utilities and Supporting Files

Table 3-1 describes the files, located in **Z:\Dell\Toolkit\Tools**. These are the core tools (utilities) that perform pre-operating system configuration and deployment tasks. See the *CLI Reference Guide* for complete information about the capabilities of each DTK utility.

Table 3-1. System Utilities and Supporting Files

Toolkit Components	Purpose
config.ini	Configuration file used by RAIDCFG.EXE . NOTE: Do not edit this file. Incorrect edits might cause RAIDCFG.EXE to fail.
mr2kserv.exe	Service that needs to be running for RAIDCFG.EXE to function.
pci.ids	Used with SYSCFG.EXE to report PCI devices.
RAC 5	Configures Dell Remote Access Controller (DRAC) 5 remote access controllers.
RACADM.exe	Configures DRAC 4/P and DRAC 4/I remote access controllers.
racadmErrorCodes.txt	Lists the error codes and messages for the RACADM.EXE tool.
RAIDCFG.EXE	Creates and reports Redundant Array of Independent Disks (RAID) information.
RaidcfgErrorCodes.txt	Lists the error codes and messages for the RAIDCFG.EXE tool.
stsvc.ini	Configuration file used by RAIDCFG.EXE . NOTE: Do not edit this file. Incorrect edits might cause RAIDCFG.EXE to fail.
sys.ini	A .ini file used with syscfg .

Table 3-1. System Utilities and Supporting Files (continued)

Toolkit Components	Purpose
SYSCFG.EXE	<ul style="list-style-type: none"> • Reports and configures: <ul style="list-style-type: none"> – BIOS settings and options – BMC settings and options – RAC 5 settings and options • Maintains system state between reboots • Reports hardware devices and other system-related information
SyscfgErrorCodes.txt	Lists the error codes and messages for the SYSCFG.EXE tool.
sysdrmk.exe	Used by UPINIT.BAT to patch the boot sector and Master Boot Record (MBR).
UpinitErrorCodes.txt	Lists the error codes and messages for UPINIT.BAT.
version.txt	Contains the DTK version in use.

Sample Configuration Files

Table 3-2 describes examples of configuration files used to perform a scripted deployment. These files are located in **Z:\Dell\Toolkit\template\Configs** folder.



NOTE: All configuration files are provided as examples only. These sample configuration files must be edited before they can be used in any deployment tasks.

Table 3-2. Sample Configuration Files

Toolkit Components	Purpose	Location
RACCFG.INI	Sample configuration file for DRAC 4 remote access controllers.	Move to the directory Z:\Dell\Toolkit\System\<system> .
RAIDCFG.INI	Sample output file to enable RAID replication.	Move to the directory Z:\Dell\Toolkit\System\<system> .
SYSCFG.INI	Sample configuration file for SYSCFG utility to configure the BIOS and BMC settings.	Move to the directory Z:\Dell\Toolkit\System\<system> .
UNATTEND.TXT	Sample file used with unattended installation of Microsoft Windows operating systems. This file is populated with all the necessary information for Dell-supported mass storage devices.	Move to the directory Z:\Dell\Toolkit\System\<system> after the UNATTEND.TXT file is edited.
WINBOM.INI	Sample file used to start the racsvc and mr2kserv services.	Z:\Dell\Toolkit\template\Configs
WINPEOEM.SIF	Sample file to add support for Dell mass storage drivers.	Z:\Dell\Toolkit\template\Configs

Sample Scripts

Table 3-3 lists sample scripts of those necessary to perform a scripted deployment. The sample scripts are located in `Z:\Dell\Toolkit\template\scripts`.



NOTE: All DTK scripts are provided as examples only. Many of these sample scripts must be edited before they can be used in a deployment. Some customers may need to develop their own scripts entirely from scratch. Customers deploying multiple systems must provide unique information for each Dell PowerEdge™ system where appropriate. For example, system host names, IP addresses, and BIOS asset tags need to be unique for each system. The batch scripts and configuration files must be modified to reflect the unique information for each deployed system. Many options are available to optimize this process. See "Preparing the Script Files for Deployment Using Microsoft® Windows® PE" for information about using the sample scripts to perform a full deployment on supported Dell systems.

Table 3-3. Sample Scripts

Toolkit Components	Purpose
createup.cfg	This file is used by UPINIT.BAT .
DISKPARTCLR.CFG	Used by PARTCFG.BAT to clear the partitions on the selected disks.
DISKPARTOS.CFG	Used by PARTCFG.BAT to create deployment partition to install the operating system.
ERRHNDL.BAT	Handles errors returned in the DTK scripts.
LISTUP.CFG	This file is used by UPINIT.BAT .
MOUNTUP.CFG	This file is used by UPINIT.BAT .
PARTCFG.BAT	Creates and populates the Dell utility partition and creates the operating system partition on a specified hard drive. Before doing so, however, this script cleans out all existing partitions in your system.
RACCAP.BAT	Captures remote access controller (RAC) settings to a file for DRAC 4 remote access controllers.
RACREPBAT	Applies (replicates) the RAC settings saved in a file to the target system.
RAIDCFG.BAT	Configures the selected RAID controllers on the system.
SYSCAP.BAT	Captures BIOS and BMC configuration settings and saves them to a file.
SYSREPBAT	Applies (or replicates) BIOS and BMC configuration settings and configures the target system.
TKENVSET.BAT	Sets the path of the DTK installation and variables for the specific system being deployed.
UMOUNTUP.CFG	This file is used by UPINIT.BAT .
UPINIT.BAT	Creates and populates the Dell utility partition.
WININST.BAT	Performs an unattended installation of a supported Microsoft Windows operating system.

Documentation

Table 3-4 describes documents containing reference information for each DTK utility and instructions for using the DTK utilities and sample scripts. Documentation can be found at `Z:\Dell\Toolkit\Docs`.

Table 3-4. Documentation

Toolkit Components	Purpose
<i>CLI Reference Guide</i>	Describes all DTK utilities, including all command line arguments and values, syntax, help, and examples.
<i>User's Guide</i>	Contains best practices guidelines for performing a scripted deployment.

Drivers

Table 3-5 describes the essential and optional drivers required for Dell-supported hardware to build your Windows PE environment.



NOTE: The drivers provided have been tested successfully in the Windows PE environment built during the test.

Table 3-5. Drivers

Drivers	Purpose
DRIVERINST.BAT	Used to install Dell-provided drivers (from <code>Z:\Dell\Drivers</code>) into the customized Windows PE image.
Hardware application programming interface (HAPI)	Essential drivers for the DTK tools to work.
Mass Storage	Essential drivers for mass storage controllers (for example, RAID and SAS [Serial Attached SCSI]) to work.
Network interface card (NIC)	Recommended drivers for NICs.
RAC 4	Essential drivers for RACADM to work.
RAIDCFG	Essential drivers for RAIDCFG to work.

Miscellaneous

The document `readme.txt`, located at `Z:\Dell\Toolkit`, provides the latest product information.

Other Supporting Tools and System Files

While the DTK provides all the necessary utilities and scripts for deploying Dell systems, there are additional applications, utilities, and system files needed to create the pre-operating system environment in which this toolkit is used. Table 3-6 is a matrix of system files and other tools that you need to use the DTK utilities and its sample scripts.



NOTE: Ensure that the tools are 32-bit compatible.

Table 3-6. Supporting Tools and System Files


Additional Tools	Purpose	Source	Save in DTK location
OEM Preinstallation Kit (OPK) or Windows PE CD and Microsoft Windows Server® 2003 (with SP1) to build Windows PE 2005	Create a bootable CD. NOTE: Contact Microsoft to obtain the latest version of OPK or Windows PE CD.	www.microsoft.com	Save in the root directory of the bootable CD.
32-bit unzip utility	Unzip utility partition images in Windows PE.	www.info-zip.org NOTE: This utility is not provided with the Dell-supplied DTK zip file. However, if you choose to use any other unzip utility than the one specified above, ensure that you rename the utility to UNZIP.EXE and that it supports the <code>-d</code> option to extract the contents to a specified directory.	Save in one of the path directories of your Windows PE image, preferably <code>\I386\system32</code> .
upimg.bin	Contains system-specific Dell utility partition files. NOTE: In the previous releases, each PowerEdge system required a unique upimg.bin file. Beginning this release, the upimg.bin file is common for all PowerEdge systems.	Z:\Dell\Toolkit\ Systems, the Dell Support website at support.dell.com, or the <i>Dell PowerEdge Installation and Server Management</i> CD	Save in the directory Z:\Dell\Toolkit\ Systems.

Setting Up a Directory Structure for Deployment

To perform a DTK-enabled deployment, you must create a deployment directory structure on either a network share or your local workstation hard drive. The deployment directory structure is a central repository for all deployment files and can be used successively as a testing space, a repository for a network deployment, and a repository to build a bootable deployment CD. If you plan to perform a network-based deployment, you must set up the directory structure on a network volume that is accessible from your workstation, the source system (to generate configuration information), and the target system (to deploy).


If you plan to run a scripted deployment from the DTK sample scripts, ensure that the following files are correctly structured in the deployment directory. The DTK sample scripts use this structure to set the default paths for deployment. If you make changes to the directory structure, you must also make changes to the sample scripts. The deployment directory structure consists of the following files:

- DTK utilities and files
- System-specific directories
- Operating system installation files directories

 **NOTE:** Do not create your DTK directory structure on a NetWare network volume. The DTK network-based deployment is not supported from mapped NetWare systems.

DTK Utilities and Files

All necessary DTK files are provided as part of the initial installation. It is strongly suggested that you use the default directory structure created in the initial installation of the DTK components. The sample scripts provided with the DTK are set up to use these default paths. See Figure 3-1.

 **NOTE:** If you choose to create a directory structure for the DTK components that is different from the one provided in the initial installation, carefully review and edit each sample script (where necessary) to reflect the different directory structure.

A 32-bit unzip utility is needed to create the Dell utility partition. This utility should be copied into one of the path directories of your Windows PE image, preferably `\I386\system32`.

System-Specific Files

The directory `Z:\Dell\Toolkit\System`s acts as a central repository for all the system-specific deployment information. For example, you can store all profile configuration files for an optimally configured PowerEdge 2850 in the directory `Z:\Dell\Toolkit\System\pe2850`. See Figure 3-2. These files can then be accessed from this directory when deploying multiple PowerEdge 2850 systems. For more information about obtaining Dell utility partition files, see "How to Obtain Dell Utility Partition Files."

This directory can also be subdivided into multiple system-specific directories such as:

`Z:\Dell\Toolkit\System\pe2850` for PowerEdge 2850 systems and `Z:\Dell\Toolkit\System\pe1850` for PowerEdge 1850 systems. See Figure 3-2.


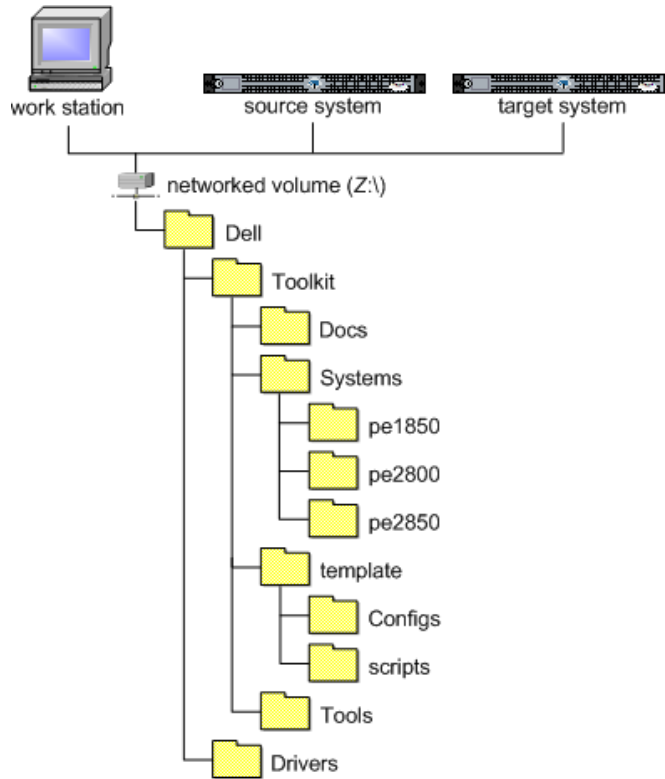
 **NOTE:** If you choose to create a directory structure for the system-specific files that is different from the one suggested in this guide, be sure to carefully review and edit each sample script (where necessary) to reflect the different directory structure.

Figure 3-2. DTK System-Specific File Structure



Operating System Installation Files

Creating Operating System Installation Directories for Supported Windows Operating Systems

NOTE: The following procedures are provided as a best practices guideline for creating operating system distribution folders compatible with the DTK sample scripts. For complete instructions on setting up an installation directory structure for an unattended installation, see your operating system documentation.

For deployment of supported Windows operating systems, perform the following steps:

- 1 Create an operating system-specific directory in the root directory of the network share. For example, for Windows 2000 Server operating system source files, you can use the following directory name:
`Z:\W2Ksrc`
- 2 Create a \I386 directory in the \W2Ksrc directory.

3 Copy the contents of the `\I386` directory on the Windows operating system installation media to the `Z:\W2Ksrc\I386` directory on your network share.

4 Create a `\OEM` directory in each system directory (`\OEM.NET` for Windows Server 2003 and `\OEM.W2K` for Windows 2000). For example, for Windows 2000:


```
Z:\Dell\Toolkit\System\pe1850\$OEM$.W2K
```

The `\OEM` directory provides the location of supplemental files such as drivers and configuration files to be copied to the target system during deployment.

5 Create a `\textmode` directory in the `\OEM` directory. For example:

```
X:\Dell\Toolkit\System\PE1850\$OEM$.W2K\textmode
```

The `\textmode` directory is created as a repository for the mass storage device drivers and the `Txtsetup.oem` mass storage configuration file.

 **NOTE:** All files listed in the `[OEMBootFiles]` section of the `UNATTEND.TXT` answer file must be placed in the `\textmode` directory.

6 Create a `\$1` directory in the `\$OEM$` directory. For example:

```
X:\Dell\Toolkit\System\PE1850\$OEM$.W2K\$1
```

The `\$1` directory is created as a repository for other drivers and configuration files necessary for an operating system deployment.

See Figure 3-3 for a sample directory structure for a deployment of Windows 2000 Server.


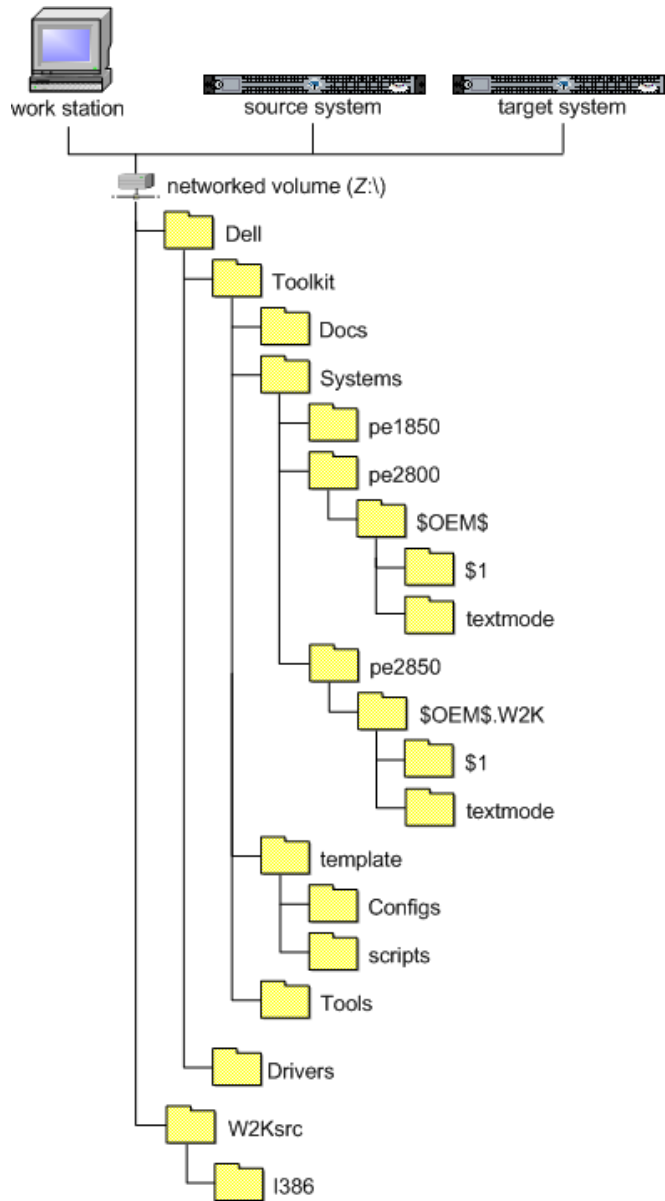
 **NOTE:** If you choose to create a directory structure for the Windows installation files that is different from the one suggested in this guide, carefully review and edit each sample script (where necessary) to reflect the different directory structure.

Figure 3-3. Sample Operating System-Specific File Structure (Windows 2000)



Configuring a Source System

You need an optimally configured system both for testing purposes and as the source for the SYSCFG and RAC configuration files to be used in the deployment process. See "Using the DTK Sample Scripts to Capture Configuration Information in Windows PE" for instructions on using the sample DTK scripts, **SYSCAP.BAT** and **RACCAP.BAT**, to generate SYSCFG and RAC configuration files that are used to configure the target system.

You can use the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs supplied with your system to streamline the operating system installation; to setup and configure your system, including automatic discovery and configuration of Dell-provided RAID controllers and network adapters; to access and load the latest utilities, drivers, and diagnostics for your system; and to install Dell OpenManage™ systems management software.



NOTE: If your system does not have a *Service and Diagnostic Utilities* CD, obtain the latest drivers from the Dell Support website at support.dell.com.

For complete information about using the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs, see the *Dell OpenManage Software Quick Installation Guide*, which is available from the Dell Support website at support.dell.com.

After you have loaded the operating system and all applicable device drivers from the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs, check the Dell Support website at support.dell.com for the latest drivers. Put all necessary drivers to be used in the deployment in the system directory for the target system. For example, if your target system is a PowerEdge 1850, put all necessary files in the **Z:\Dell\Toolkit\System\pe1850** directory; or if your target system is a PowerEdge 850, put all necessary files in the **Z:\Dell\Toolkit\System\pe0850** directory.

How to Obtain Dell Utility Partition Files

Obtain the Dell utility partition files from **Z:\Dell\Toolkit\System**, the Dell Support website at support.dell.com, or the *Installation and Server Management* CD.

RAC Configuration

Configure the RAC on your source system using the **RACADM.EXE** utility, if applicable. See the *Dell Remote Access Controller Racadm User's Guide* for comprehensive information about using the **RACADM.EXE** utility to configure the RAC on your source system.

After you have successfully prepared your directory structure for a deployment and fully configured your source system, you are ready to write, review, or edit the deployment sample scripts. For instructions on editing the sample scripts necessary to run a full deployment, see "Preparing the Script Files for Deployment Using Microsoft® Windows® PE."

Preparing the Script Files for Deployment Using Microsoft® Windows® PE

This section describes the steps required to use the Deployment Toolkit (DTK) sample scripts to perform a full deployment of a target system in the Windows PE environment.

There are four main tasks:

- Writing the deployment master batch file (as an example, referred to as **DEPLOY.BAT** in this document) or deployment script, editing the **TKENVSET.BAT** script, to set the variable values used in the deployment scripts
- Editing the supporting task scripts, as necessary
- Using the DTK sample scripts to capture basic input/output system (BIOS), baseboard management controller (BMC) (SYSCFG), and remote access controller (RAC) configuration information from an optimally configured source system
- Preparing the operating system installation scripts and answer files



NOTICE: Due to limitations of older product generations with the implementation of the Windows PE environment, you cannot configure Dell™ Remote Access Controller (DRAC) III, DRAC III/XT, ERA, ERA/O, and ERA/MC controllers using DTK 2.2 (Windows PE version) and later. To configure any of the DRAC III controllers, do one of the following:

- If your DRAC III, DRAC III/XT, ERA, ERA/O, and ERA/MC controllers have a set valid IP address already, you can use Dell OpenManage™ Server Administrator running on any system on the same network to remotely configure DRAC III controllers. For details, refer to the *Dell OpenManage Server Administrator User's Guide*.
- Continue with the setup and operating system deployment of your system, and then use Server Administrator on the same system to configure DRAC III, DRAC III/XT, ERA, ERA/O, and ERA/MC controllers.
- Use the Linux version of DTK 2.3 to set up your DRAC III, DRAC III/XT, ERA, ERA/O, and ERA/MC controllers.

Using the Sample DTK Scripts to Run a Full Deployment in Windows PE

The Master Batch File

A scripted DTK deployment relies on the master batch file to integrate all the applicable DTK task scripts and utilities and perform pre-operating system configuration tasks before launching the operating system installation files. The master batch file, along with the **TKENVSET.BAT** scripts, make up the master set of instructions that drives the deployment process. This file is not provided with the sample scripts.

Editing the Sample Batch Files to Perform a Complete System Deployment in Windows PE

Using the Sample Scripts in a Scripted Deployment

The sample scripts utilize the DTK utilities, the additional supporting utilities, the source system configuration files, the target system hardware drivers, and the operating system installation files to perform a full deployment of the target system.

The sample scripts provided with the DTK can be edited and customized using any ASCII text editor that conforms to the hardware available on the target systems. While it is recommended that you use the DTK sample scripts to automate your deployment tasks, you can create your own system deployment batch files using any ASCII text editor by incorporating the various DTK utilities and commands in the batch file.



NOTE: For more information about scripting batch files and specific batch file commands, see your Windows PE documentation.


Each of the utilities, scripts, and system configuration files are described below. Depending on your requirements, you may use all or only some of them in your deployment:

Master Batch File— You can write your master batch file to perform a full deployment of a system with the help of utilities, scripts, and configuration files. This file is not provided with the sample scripts.

Scripts

- **TKENVSET.BAT** — Sets the path of the DTK installation and variables for the system to be deployed and configured. The variables and paths specified in this file must be specified before any of the other supporting scripts can be used.
 - **SYSCFG.EXE** — Used by **TKENVSET.BAT** to discover the system type.
- **RACCAP.BAT** — Captures RAC settings to a file for DRAC 4 remote access controllers.
 - **TKENVSET.BAT** — Used by **RACCAP.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **RACADM.EXE** — Used by **RACCAP.BAT** to retrieve RAC information and to configure settings.

- **RACREP.BAT** — Applies the RAC configuration settings saved in a file to the current system.
 - **TKENVSET.BAT** — Used by **RACREP.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **RACADM.EXE** — Used by **RACREP.BAT** to replicate RAC information and to configure settings.
- **SYSCAP.BAT** — Captures BIOS and BMC configuration settings and saves them to a file.
 - **TKENVSET.BAT** — Used by **SYSCAP.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **SYSCFG.EXE** — Used by **SYSCAP.BAT** to configure the BIOS and BMC settings.
- **SYSREP.BAT** — Applies the BIOS and BMC settings saved in a file to the current system.
 - **TKENVSET.BAT** — Used by **SYSREP.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **SYSCFG.EXE** — Used by **SYSREP.BAT** to configure the BIOS and BMC settings.
- **RAIDCFG.BAT** — Configures the selected Redundant Array of Independent Disks (RAID) controller detected in the system.
 - **TKENVSET.BAT** — Used by **RAIDCFG.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **RAIDCFG.EXE** — Used by **RAIDCFG.BAT** to retrieve RAID information and to configure settings.
- **PARTCFG.BAT** — Creates and populates the Dell™ utility partition (UP) and the operating system partition on a specified disk.
 - **TKENVSET.BAT** — Used by **PARTCFG.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **DISKPART.EXE** — Provided by Windows; this script is used to create partitions on your disk. When creating a Windows PE image, ensure that **DISKPART.EXE** tool is present in the Windows PE image you created. This script uses the following files for noninteractive (unattended) operations:
 - **UPINIT.BAT** — Used by **PARTCFG.BAT** create and populate the Dell utility partition.
 - **FORMAT.EXE** — Provided by Windows to format the partition.

- **UPINIT.BAT** — Creates and populates the Dell utility partition.
 -  **NOTE:** Do not make any modifications to the **UPINIT.BAT** script.
 - **TKENVSET.BAT** — Used by **UPINIT.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **DISKPART.EXE** — Provided by Windows, it is used to create partitions on your disk.
 - **UNZIP.EXE** — Used by **UPINIT.BAT** to unzip the contents of **UPIMG.BIN**.
 - **FORMAT.EXE** — Provided by Windows to format the partition.
 - **UPIMG.BIN** — Contains the zipped contents of the Dell utility partition.
 - **SYSDRMK.EXE** — Used by **UPINIT.BAT** to patch the boot sector and Master Boot Record (MBR).
- **WININST.BAT** — Performs an unattended installation of a supported Windows operating system.
 - **TKENVSET.BAT** — Used by **WININST.BAT** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **WINNT32.EXE** — Used by **WININST.BAT** to install the operating system in conjunction with the **UNATTEND.TXT** answer file.
 - **UNATTEND.TXT** — Used by **WININST.BAT** in conjunction with **WINNT32.EXE** to install the operating system files.

The majority of the editing required for the DTK sample scripts involves the following script. As a result, the majority of the scripting discussion focuses on:

TKENVSET.BAT

Other task scripts might require edits in certain situations. These optional edits are discussed in "Editing DTK Task Scripts."

TKENVSET.BAT

The **TKENVSET.BAT** script sets the path of the DTK installation and variables for the system to be deployed and configured. The variables and paths specified in this file must be specified before any of the other supporting scripts can be used.

Specifying DTK Installation Paths

The **TKENVSET.BAT** sample script is provided with the following default values. These values must be confirmed, in some cases, and modified, in other cases, before a deployment. Locate the **Deployment Toolkit Installation Paths** heading to find the following lines:

```
set DT_DRIVE=X:
set DT_PATH=%DT_DRIVE%\Dell\Toolkit
set DT_TOOLS=%DT_PATH%\Tools
```

```
set DT_SYSTEMS=%DT_PATH%\Systems
set DT_SCRIPTS=%DT_PATH%\Template\Scripts
set DT_STOP_ON_ERROR=FALSE
```

Perform the following steps to confirm and/or edit the installation path variables:

- 1 Set the variable that represents the drive letter where the DTK deployment files are located (`DT_DRIVE`). This variable is set to `X:` by default in the sample script. Edit this drive letter to reflect the actual drive letter for the DTK deployment files, if necessary.
- 2 Set the variable that defines the path to the full set of DTK deployment files (`DT_PATH`). This variable is set to `%DT_DRIVE%\Dell\Toolkit` by default in the sample script. Edit this path to reflect the actual location of the DTK deployment files, if necessary.
- 3 Set the variable that defines the directory containing the DTK utilities (`DT_TOOLS`). This variable is set to `%DT_PATH%\Tools` by default in the sample script. Edit this path to reflect the actual location of the DTK utilities, if necessary.
- 4 Set the variable that defines the directory containing the configuration files for your Dell PowerEdge™ systems (`DT_SYSTEMS`). This variable is set to `%DT_PATH%\Systems` by default in the sample script.
- 5 Set the variable that defines the directory containing the DTK deployment scripts (`DT_SCRIPTS`). This variable is set to `%DT_PATH%\Template\Scripts` by default in the sample script. Edit this path to reflect the actual location of the DTK deployment scripts, if necessary.
- 6 Set the variable that indicates whether you want the deployment process to exit when any error is returned (`DT_STOP_ON_ERROR`). This variable is set to `FALSE` by default in the sample script, indicating that errors will be handed by the `ERRHNDL.BAT` script. Set the value to `TRUE` only if you want the deployment to exit on any error.

Specifying the SYSCFG Variables

The SYSCFG replication file is set to `syscfg.ini` by default. If you used the `SYSCAP.BAT` sample script to generate the `syscfg.ini` file, there should be no need to edit these default settings. If you have made any modifications to the sample scripts or to the suggested directory structure, you must confirm that `syscfg.ini` is correctly named and that the path is set correctly for your deployment.

To edit the SYSCFG capture variables, locate the following lines in `SYSCAP.BAT`:

```
set DT_SYS_CAPFILE=%DT_SYSTEMS%\%DT_PLATFORM%\syscfg.ini
```

To edit the SYSCFG replication variables, locate the following lines in `SYSREP.BAT`:

```
set DT_SYS_REPFILE=%DT_SYSTEMS%\%DT_PLATFORM%\syscfg.ini
```



NOTE: If the replication requires a change in the memory redundancy mode, the target server should be rebooted and the script should be executed again to complete the replication.

Specifying the RAC Configuration Variables

The IP address for your target system RAC is set in the sample script to 10.98.8.121 by default. Edit this value to reflect the actual IP address of your target system RAC, if applicable. Additionally, the RAC configuration file used to configure your RAC is set by default to **raccfg.ini**. If you use the **RACCAP.BAT** sample script to generate the **raccfg.ini** file, there should be no need to edit this default setting. If you have made any modifications to the sample scripts or to the suggested directory structure, you must confirm that **raccfg.ini** is correctly named and that the path is correctly set for your deployment. To edit the RAC configuration variables, locate the following lines in **RACCAP.BAT**:

```
set DT_RAC_CAPFILE=%DT_SYSTEMS%\%DT_PLATFORM%\raccfg.ini
```

To edit the RAC configuration variables, locate the following lines in **RACREP.BAT**:

```
:: RAC section
```

```
set DT_NICCFG=10.98.8.121
```

```
set DT_RAC_CAPFILE=%DT_SYSTEMS%\%DT_PLATFORM%\raccfg.ini
```

Specifying Variables Used to Create Disk Partitions and Install the Dell Utility Partition



NOTE: If the primary deployment state (DT_PARTN) is set to OFF in **PARTCFG.BAT**, the partitioning deployment state subsection is skipped.

The **PARTCFG.BAT** sample script provides the following disk partitioning default values. These values must be confirmed, in some cases, and modified, in other cases, before performing a deployment. Locate the **partn** label to find the following lines in **PARTCFG.BAT**:

```
set DT_PARTN_UP=ON
```

```
set DT_MOUNT=H
```

```
:: Default Hard Drive
```

```
set DT_HD=0
```

```
:: PARTCFG section
```

```
set DT_OS_SIZE=4000
```

```
set DT_OS_FSTYPE=FAT32
```




```




if not "%DT_PARTN_UP%"=="ON" goto ospart
:: DELLUP section
set DT_UP_SIZE=32
set DT_UP_IMAGE=%DT_SYSTEMS%\UPIMG.BIN

:: RAIDCFG section
set DT_VD_SIZE=10480
:: default size for virtual disk

```

 **NOTICE:** `DT_MOUNT` specifies the mount point of the Dell utility partition. If your RAMDRIVE, hard drive, or other device already owns this designation, mount will not override the setting and the utility partition will not be created.

Perform the following steps to edit the default partition configuration default values, as necessary.

- 1 Edit the default utility partitioning variable (`DT_PARTN_UP=ON`), if necessary. This variable sets whether you want to install the Dell utility partition.
 -  **NOTE:** Dell recommends that you install the Dell utility partition.
- 2 Edit the default variable value for the default hard drive (`DT_HD=0`), if applicable.
 -  **NOTE:** Ensure that the default variable value for `DT_HD` is set to a valid non-removable disk, and not to removable media such as virtual media.
- 3 Edit the default variable value (in MB) for the primary operating system partition (`DT_OS_SIZE=4000`), if applicable.
- 4 Edit the default variable value for file system type (`DT_OS_FSTYPE=FAT32`), if applicable.
 -  **NOTE:** The valid values are FAT32 and NTFS.
- 5 If the `DT_PART_UP` variable is set to ON, edit the default variable value (in MB) for the utility partition (`DT_UP_SIZE=32`), if applicable.
- 6 If the `DT_PART_UP` variable is set to ON, edit the default variable value for the utility partition installation package location (`DT_UP_IMAGE=%DT_SYSTEMS%\UPIMG.BIN`), if applicable.

You should have already copied the **UPIMG.BIN** file to the proper directory, as instructed in "Preparing the Directory Structure for Deployment in Microsoft® Windows® PE." Edit this variable only if you have changed the name or path of the utility partition installation package.

Editing DTK Task Scripts

The task scripts called by the master batch file do not require any edits (with the following exceptions) if the default variable values are utilized in the **TKENVSET.BAT** scripts. However, if you make any changes to the default values set by the **TKENVSET.BAT**, you must make the same edits to the matching default values set in the appropriate task scripts. Locate the "USER MODIFICATION REQUIRED" heading in the task scripts to find the variable values you might need to edit. Each of the following task scripts can be called by the user-written master batch script during a full deployment:

- **RACREP.BAT**
- **RAIDCFG.BAT**
- **SYSREP.BAT**
- **PARTCFG.BAT**

RACREP.BAT

The **RACREP.BAT** sample script applies RAC configuration options to the target system based on configuration information that has been saved in a configuration file. User input is optional, depending on variables set in the **RACREP.BAT** sample script. This script uses the **RACADM.EXE** utility to configure the RAC in the target system using the RAC configuration file, **raccfg.ini**, passed as the first parameter to this script. If this parameter is not passed, the default variables values used in this script are set in the **TKENVSET.BAT** scripts. An optional second parameter can be passed to this file, which specifies the IP address to be used to configure the RAC. The **raccfg.ini** file is generated with the **RACCAP.BAT** sample script. See "RACCAP.BAT" for information about using the **RACCAP.BAT** sample script to capture RAC configuration information.

RAIDCFG.BAT

The **RAIDCFG.BAT** sample script configures RAID controllers detected on the system. User input is optional to run this script. The parameter is a name or path to a log file. This parameter is not set to any value by default, and no log file is generated. The default variable values used in this script are set in the **TKENVSET.BAT** scripts. This script uses the **RAIDCFG.EXE** utility to automatically configure the detected controllers on your target system. For example, for the first controller discovered, if **RAIDCFG.EXE** discovers only one attached hard drive, the script tries to create RAID 0; if two hard drives are discovered, a RAID 1 configuration is enabled; if three or more hard drives are discovered, a RAID 5 configuration is enabled.




NOTE: On the detected controller, a RAID virtual disk is created only if the array disks connected to that particular controller have space available and, where applicable, are not part of already existing array group.

SYSREP.BAT


The **SYSREP.BAT** sample script applies SYSCFG options to the target system based on configuration information that has been saved in a configuration file. User input is optional to run this script, depending on the variable settings in the **SYSREP.BAT** scripts. This script uses the **SYSCFG.EXE** utility to configure the BIOS and BMC in the target system using the configuration file, **syscfg.ini**,

passed as the first parameter to this script. If this parameter is not passed, the default variables values used in this script are set in the **SYSREP.BAT** scripts. The **syscfg.ini** file is generated with the **SYSCAP.BAT** sample script. See "SYSCAP.BAT" for information about using the **SYSCAP.BAT** sample script to capture BIOS and BMC settings. The second parameter is a name or path to a log file. This parameter is not set to any value by default, and no log file is generated.

 **NOTE:** If the replication requires a change in the memory redundancy mode, the target server should be rebooted and the script should be executed again to complete the replication.

PARTCFG.BAT

The **PARTCFG.BAT** sample script creates and populates the Dell utility partition using **UPINIT.BAT** and creates the operating system partition on a specified disk. (See "UPINIT.BAT" for more information about using the **UPINIT.BAT** tool.) User input is not required to run this script. The default variable values used in this script are set in the **TKENVSET.BAT** scripts.


 **NOTE:** Ensure that **DT_HD** is set to the required disk to be configured before you execute the **PARTCFG.BAT** script.

Using the DTK Sample Scripts to Capture Configuration Information in Windows PE

The **SYSCFG.EXE** and **RACADM.EXE** utilities can read the source system configuration and duplicate that configuration on a target system using a sample DTK script file. These configuration files are used during a full deployment to configure the target system's BIOS, BMC, and RAC settings. The following sections provide instructions for using the **SYSCAP.BAT** and **RACCAP.BAT** sample scripts to create configuration files.

Capturing the System BIOS and BMC Configuration With the SYSCAP.BAT Sample Script

You can replicate the system BIOS and BMC configurations from a source Dell PowerEdge system to an identical target Dell PowerEdge system (for example, from one PowerEdge 1850 to another PowerEdge 1850).

 **NOTE:** For the script to complete successfully, the source system must have access to the network share that includes the prebuilt DTK directory structure.

SYSCAP.BAT

The **SYSCAP.BAT** sample script captures BIOS and BMC configuration settings and saves them to a specified location. An optional user input can be passed as a parameter. You can provide the path or filename as an input to this script. The default variable values used in this script are set in the script to the correct default values to perform a scripted deployment. The **SYSCAP.BAT** script uses the **SYSCFG.EXE** utility to retrieve BIOS and BMC configuration settings from the source system and to save the settings in a file named **syscfg.ini** in the **Z:\Dell\Toolkit\System\<target system>** directory.

Perform the following steps to run the **SYSCAP.BAT** sample script to capture BIOS and BMC configuration information in the **syscfg.ini** file:

- 1 Edit the **startnet.cmd** file on your Windows PE image to call the **SYSCAP.BAT** script after the network share with the prebuilt DTK directory structure is mounted. For example, add:

```
call Z:\Dell\Toolkit\Template\Scripts\SYSCAP.BAT
```

- 2 Boot the source system into Windows PE.

The script runs and saves configuration information in the **Z:\Dell\Toolkit\System\<target system>** directory.

- 3 Edit the **startnet.cmd** file in your Windows PE image to remove the text you added in step 1.

Capturing the RAC Configuration With the **RACCAP.BAT** Sample Script

If your system has a RAC, you can replicate the RAC configuration from a source Dell PowerEdge system's RAC to an identical target Dell PowerEdge system with an identical RAC (for example, from one PowerEdge 1850 with a DRAC4/I to another PowerEdge 1850 with a DRAC4/I).



NOTE: For the script to complete successfully, the source system must have access to the network share that includes the prebuilt DTK directory structure.

RACCAP.BAT

The **RACCAP.BAT** sample script captures RAC configuration settings and saves them to a specified location. An optional user input can be passed as a parameter. You can provide the path or file name as an input to this script. The default variable values used in this script are set in the script to the correct default values to perform a scripted deployment. The **RACCAP.BAT** script uses the **RACADM.EXE** utility to retrieve RAC configuration settings from the source system and to save the settings in a file named **raccfg.ini** in the **Z:\Dell\Toolkit\System\<target system>** directory.

Perform the following steps to run the **RACCAP.BAT** sample script to capture RAC configuration information in the **raccfg.ini** file:


- 1 Edit the **startnet.cmd** file on your Windows PE image to call the **RACCAP.BAT** script after the network share with the prebuilt DTK directory structure is mounted. For example, add:


```
call Z:\Dell\Toolkit\Template\Scripts\RACCAP.BAT \Z:\raccfg.ini
```

- 2 Boot the source system into Windows PE.

The script runs and saves configuration information in the **Z:\Dell\Toolkit\System\<target system>** directory.


3 Edit the `startnet.cmd` file in your Windows PE image to remove the text you added in step 1.

 **NOTE:** The RAC configuration file is referred to as the `.cfg` file in the *Dell Remote Access Controller Racadm User's Guide* and the *Dell Remote Access Controller 4 User's Guide*. See the *Dell Remote Access Controller Racadm User's Guide* or the *Dell Remote Access Controller 4 User's Guide* for additional information about manually creating a RAC configuration file.


 **NOTE:** Do not replicate the RAC IP address when creating a `.cfg` file. Replicating the RAC IP address can leave the system inaccessible because multiple systems are configured with the same IP address.

UPINIT.BAT

UPINIT.BAT is a tool used to create and populate the Dell utility partition.

 **NOTE:** You can use this script to create a new Dell utility partition only if there are no existing partitions on your hard disk.

You can also use this script to upgrade or downgrade an existing Dell utility partition. Upgrades or downgrades can be made only to existing Dell utility partitions using the overwrite option.

 **NOTICE:** The existing Dell utility partition should be the first primary partition on the hard disk. Also, the Dell utility partition must be greater than or equal to 32 MB and less than 2 GB.


For details on the command line arguments to be used for UPINIT.BAT, refer to the *Deployment Toolkit CLI Reference Guide*.

Preparing the Operating System Installation Scripts for Windows PE

The WININST.BAT script is used to install supported Windows operating systems.

WININST.BAT

The WININST.BAT sample script is used to perform an unattended installation of a supported Windows operating system. The variables and paths must be specified before the operating system can be installed.

 **NOTICE:** It is strongly recommended that you consult your Windows operating system documentation and unattended deployment documentation to develop a thorough understanding of the Windows unattended installation process before attempting to perform a full scripted deployment.

The syntax for WININST.BAT is

```
wininst.bat [W2K|NET]
```

Choose W2K (default) to install Windows 2000 or NET to install Windows Server 2003.

Utilities Used

WINNT32.EXE — Used to install the operating system in conjunction with the UNATTEND.TXT answer file.

External Dependencies

The DT_PLATFORM variable is set by TKENVSET.BAT using platform discovery.

The WININST.BAT script uses the UNATTEND.TXT file in conjunction with WINNT32.EXE utility to install the operating system files. See "UNATTEND.TXT" for more information about preparing the UNATTEND.TXT file.

Specifying the Windows Installation Variables and Installation Paths

To edit the Windows operating system installation variables, locate the following lines in WININST.BAT:

```
:: The location where source files for the OS reside
set DT_OSSRC=%DT_DRIVE%\W2KSRC\I386

:: Location of Unattend.txt file
set DT_UNATTEND=%DT_SYSTEMS%\%DT_PLATFORM%\unattend.txt
```

After you have either confirmed or edited the Windows operating system installation variables, you are ready to prepare the UNATTEND.TXT file to be used in the operating system installation.

UNATTEND.TXT

The UNATTEND.TXT file is the default name of the answer file that you use to automate Windows Setup during an unattended installation. A sample copy of the UNATTEND.TXT file is provided as part of the DTK download in the Z:\Dell\Toolkit\Template\Configs directory. UNATTEND.TXT contains the headings and parameters that instruct Windows Setup to perform various configuration tasks. Before a full deployment can be run, you must edit all appropriate headings and parameters, as necessary.



NOTE: See your operating system documentation for instructions on modifying the options in the operating system unattended installation file to customize the scripted installation of your operating system.

When you have completed all necessary modifications of the UNATTEND.TXT file, save the completed file in the Z:\Dell\Toolkit\System\<target system> directory.

After you have successfully edited your deployment scripts, you are ready to create your deployment media and run your deployment. For instructions on creating deployment media and running a full deployment, see "Running Deployment Scripts Using DTK and Microsoft® Windows® PE."

Running Deployment Scripts Using DTK and Microsoft® Windows® PE

This section provides best practices procedures and scenarios for using the Deployment Toolkit (DTK) to perform pre-operating system configuration tasks and to install supported operating systems on supported Dell™ PowerEdge™ systems.

After you have populated the deployment directory structure with all necessary files and carefully edited the deployment scripts and configurations files, you are ready to begin the final stage of the deployment process. Before running the deployment, however, you need to create specific deployment media to facilitate your chosen deployment method. The common deployment scenarios are:

- CD-based local deployment
- CD-based local deployment with networking enabled
- Using a third-party deployment solution framework

For the CD-based deployment methods, you begin by creating and customizing Windows PE for Dell systems.

Obtaining Windows OEM Preinstallation Kit (OPK) or Windows PE CD


Contact Microsoft to obtain the latest version of OPK or Windows PE CD.

Copying Tools From OPK or Windows PE CD on a Development System


- 1 Create and name a directory on your development system hard drive, such as `\WinPE_OPKTools`.
- 2 Insert the Windows OPK CD or Windows PE CD into your development system CD drive.
- 3 Copy all of the CD files from the Windows PE directory (`<cd-drive>:\winpe*.*`) to the `\WinPE_OPKTools` directory.
- 4 Copy `factory.exe` and `netcfg.exe` from `<cd-drive>:\tools\x86` directory to the `\WinPE_OPKTools` directory.
- 5 Remove the Windows OPK CD or Windows PE CD from the CD drive.

Creating a Standard Windows PE

For building a standard Windows PE with OPK tools, refer to the help files available on the OPK CD. You can get to the help files after you install OPK on your development system. Brief instructions are provided here on how to build a standard Windows PE.

 **NOTE:** You must have read-write permissions on your development system. You cannot run `mkimg.cmd` from a read-only device, such as a CD drive.

- 1 Create and name a directory on your development system hard drive such as `\DellWinPEBuild`. This directory serves as a `<destination_directory>` used with `mkimg.cmd` used to create Windows PE.
- 2 Insert the 32-bit Windows Server 2003 (with SP1) product CD into the CD drive.
- 3 Open a command prompt and navigate to the `\WinPE_OPKTools` directory you created earlier.
- 4 Run the command: `mkimg.cmd <source_directory> <DellWinPEBuild> \PNP \WMI .`

 **NOTE:** The `\PNP` option enables support for Plug and Play device drivers; the `\WMI` option enables support for Windows Management Instrumentation.

 **NOTE:** Ensure that you include the `\WMI` option with `mkimg.cmd` for the DTK tools to run properly.

The `<source_directory>` specifies the location of the Windows Server 2003 product CD.

- If the `<source_directory>` is a CD drive, you need to specify only the drive letter.
- If the `<source_directory>` is a network path, the path must be to the parent directory of the `\I386` directory.

 **NOTE:** Do not include a trailing slash in the `<source_directory>`.

 **NOTE:** If you plan to use virtual media within your Windows PE environment, ensure that your Windows PE image has `cdrom.sys` and `flpydisk.sys` drivers.

The `\DellWinPEBuild` specifies the path where the files necessary to create the Windows PE are temporarily stored. If this directory does not already exist, `mkimg.cmd` creates it.


This process extracts all the necessary files from `\I386` on the Windows Server 2003 product CD and puts them in `\DellWinPEBuild` drive. These files include drivers that are part of the Windows Server 2003 CD. These drivers may be old and may not recognize the new peripherals integrated in your new Dell system. Proceed to add the latest drivers in the standard Windows PE build you just created.

Integration of DTK Directory Structure in Windows PE Build

This task involves a five-step process:


- 1 Integrating DTK tools and scripts: Copy the folder `\dell` that you unzipped from the Dell-supplied zip file to `<DellWinPEBuild>`, or extract the Dell-supplied file directly into the Windows PE build.
- 2 Installing necessary drivers into Windows PE: Execute `\Dell\Drivers\DRIVERINST.BAT` with two required arguments:
 - Path to `<DellWinPEBuild>`
 - Path where the Dell-provided drivers are located. These drivers can be found in the DTK zip file under the `\Dell\drivers` folder.

3 Adding support for mass storage drivers into Windows PE:


 **NOTE:** You must implement this step to ensure mass storage drivers are installed into Windows PE.

In the `winpeoem.sif` file (available under `I386\SYSTEM32` in your Windows PE directory), edit the following text to remove the semicolons from the `Oem Driver Params` section and append the directory names for the Dell mass storage drivers:

```
OemDriverRoot=" "  
OemDriverDirs=MRAID, PERC4IM, PERC5, SAS5
```


 **NOTE:** A sample `winpeoem.sif` file is available under `\Dell\Toolkit\template\Configs`.

4 Starting required services: `mr2kserv` service should be installed and started for RAID to function; `racsvc` service should be installed and started for RACADM to function. For details on how to start the required services, see the sample `winbom.ini` file under `\Dell\Toolkit\template\Configs`.

 **NOTE:** When booting the target system, ensure that the RAC and the `mr2kserv` services are running.

5 Extracting the following files from your Windows Server 2003 product CD to `\Dell\Toolkit\Tools`:

- `rpcns4.dll`
- `rpct4.dll`
- `rpss.dll`

 **NOTE:** The directory name should not have any spaces.

 **NOTE:** You can now proceed to customize Windows PE per your requirements.

Creating a Bootable Windows PE ISO Image

After you have completed the DTK integration and customization, you are now ready to convert all the files in `<DellWinPEBuild>` into an ISO image using the OPK tool. Follow the steps below to create a bootable ISO image from `<DellWinPEBuild>`.

- 1 Create and name a directory on your development system hard drive such as `FINALBUILD`. This is where the ISO file is stored.
- 2 Open a command prompt and navigate to the `\WinPE_OPKTools` directory you created earlier.
- 3 Run the command: `OSCDIMG -bETFSBOOT.COM -n <DellWinPEBuild> <iso_filename>`

Here, `ETFSBOOT.COM` (boot sector file) is a part of the OPK tools you copied in `\WinPE_OPKTools` directory. These files make the Windows PE CD bootable. For example, if the final target folder for storing ISO image is `C:\FINALBUILD`, and your Windows PE file set is in `<DellWinPEBuild>`, the following command line creates a bootable ISO image called `Dellx86winpe.iso`:

```
C:\WINPE_OPKTOOLS\OSCDIMG -bETFSBOOT.COM -n c:\DELLWINPEBUILD  
C:\FINALBUILD\Dellx86winpe.iso
```

After you create an ISO image, you can use any CD burning software to burn the image onto a CD. After burning the ISO image, ensure that it boots from the CD drive for all the supported Dell systems you plan to deploy. After it boots, you are advised to test all the tools and scripts on these systems to ensure that the integration went well and there are no issues with hardware components not being recognized.

CD-Based Local Deployment

You are now ready to use your bootable CD to call the deployment components from the directory structure on the CD:

- 1 Boot the target system with the bootable deployment CD.
- 2 Execute the master batch file, which calls individual task scripts and utilities from the CD to complete the deployment process.

CD-Based Local Deployment With Networking Enabled

You can also use your bootable CD to call the deployment components from the directory structure on the CD and the remaining components from the network share:

- 1 Boot the target system with the bootable deployment CD.
- 2 Execute the master batch file, which calls individual task scripts and utilities from the network share to complete the deployment process.

Using a Third-Party Deployment Solution Framework

You can use the DTK with any existing third-party deployment solution framework that provides a Automated Deployment Services (ADS) booting infrastructure that can be used as the transport mechanism for the DTK utilities. Because each third-party deployment framework is unique, however, these solutions fall outside the scope of this document. If you plan to utilize a third-party deployment solution framework, keep in mind that the DTK is a Windows PE-based set of tools and scripts, so the deployment solution framework must also support Windows PE as a pre-operating system environment.

Choosing an Embedded Linux-Based Deployment Method

A well-thought-out deployment plan is critical to the success of your deployment effort and includes the following considerations:

- Assessing your existing IT environment
- Selecting an operating system
- Selecting the optimum Dell™ OpenManage™ systems management software configuration for your system
- Choosing a deployment method


The Deployment Toolkit (DTK) is designed to be flexible enough to fit into almost any deployment plan. For the purposes of this document, however, the focus is on two specific deployment methods: CD-based deployment (local) and network-based deployment (remote).

Choosing a Deployment Method for Embedded Linux

The DTK components can be used in many different ways to assist IT staff in deploying Dell systems in large numbers. Because all the tools and scripts are task oriented, many of them can be used separately to perform a specific task on many systems or collectively to perform many tasks on many systems at once.

The configuration complexity and pros and cons of each deployment method are provided in Table 6-1. After you have decided which deployment method best fits your needs, you are ready to begin preparing for the deployment.

Network-Based Deployment

 **NOTE:** The DTK network-based deployment is not supported from mapped Novell® NetWare® systems.

The general network-based deployment process includes the following steps:

- 1 Modify the appropriate section in `pxe config` file.
- 2 Boot the target server from PXE.

The DTK start-up phase mounts the network share specified in the `pxe config` file.

The DTK start-up phase runs the script (name specified in the `pxe config` file) from the network.

Alternatively, you can integrate the DTK components into an existing third-party deployment solution framework. See "Using a Third-Party Deployment Solution Framework."

CD-Based Deployment With Network Access

The general steps include:

- 1 Copy the DTK ISO image into a share.
- 2 Modify the appropriate section in the `isolinux/isolinux.cfg` file.
- 3 Reburn the contents into a CD (this will be the master CD).
- 4 Boot the target server from the master CD.

The DTK start-up phase mounts the network share specified in the `isolinux.cfg` file.

The DTK start-up phase runs the script (name specified in the `isolinux.cfg` file) from the network.

Creating a Bootable CD With Network Stack

You will need a bootable CD to use in a remote deployment. This bootable CD must have the embedded Linux network stack with specific network drivers to facilitate networking. After you have a network share created and populated with all the necessary DTK components and supporting files, you can access all required files by mounting a network share from the target system. You can perform all of these tasks automatically. This deployment method is recommended if a network connection is available to the target system—the space on a network share can be very large, and a single set of utilities and scripts can be accessed by many systems, making the deployment process easy to manage.

After a network drive is mapped from a target system to a network share, all of the utilities and scripts are available to use. The master deployment script on the network share can be called from the bootable CD to perform a task or multiple tasks on the target server. For example, pre-operating system configuration tasks can be deployed from the network and operating system files can be installed.

Creating a Customized Bootable CD with Network Stack

See "Running Deployment Scripts Using DTK and Embedded Linux" for details on how to create a customized version of a single embedded Linux bootable CD that works across all Dell PowerEdge™ systems and provides an underlying network stack.

Using a Third-Party Deployment Solution Framework

You can use the DTK with any existing third-party deployment solution framework that provides a PXE booting infrastructure that can be used as the transport mechanism for the DTK utilities. Because each third-party deployment framework is unique, however, these solutions fall outside the scope of this document. If you plan to utilize a third-party deployment solution framework, keep in mind that the DTK is an embedded Linux-based set of tools and scripts, so the deployment solution framework must also support embedded Linux as a pre-operating system environment.

CD-Based Local Deployment for Embedded Linux

The general CD-based deployment process includes the following steps:

- 1 Copy the DTK ISO image into a share.
- 2 Modify the appropriate section in the `isolinux/isolinux.cfg` file.
- 3 Reburn the contents into a CD (which will be the master CD).
- 4 Boot the target server from the master CD.

The DTK startup phase mounts the CD.

The DTK startup phase runs the script (name specified in the `isolinux.cfg` file) from the CD.

This deployment method is the easiest to assemble, but is the least flexible. Any change to the system configuration, for example, requires the creation of a new bootable CD. This method does not provide a writable media making it necessary to use predefined and tested configuration files.

Creating a Bootable CD

Bootable CDs can be created using any commonly available CD burning software in a two-part process that requires a self-bootable ISO image with drivers that load from system files. When you create a bootable CD, this image is supplied to the CD burning software along with the complete deployment directory structure, which includes all necessary supporting files to perform the deployment. The CD burning software creates an image of the self-bootable ISO image and the deployment files on the CD.



NOTE: See "Running Deployment Scripts Using DTK and Embedded Linux" for more information about creating an embedded Linux-bootable CD.

Using DTK Utilities and Scripts From a Bootable CD

The bootable CD can be configured to start and execute the master deployment file during the booting process. The master deployment file performs all necessary pre-operating system configuration tasks and then installs the operating system from the files in the deployment directory structure on the CD.



NOTE: You must write the master deployment file. This file is not provided with the sample scripts.



NOTE: You must create a RAMDISK for temporary data storage when using a bootable CD for a local deployment.

Creating a Customized Bootable CD

See "Running Deployment Scripts Using DTK and Embedded Linux" for details on how to create a customized version of a single embedded Linux image that can work across all PowerEdge systems.

Using DTK Utilities and Scripts From a Customized Bootable CD

After the customized bootable embedded Linux CD is created, IT administrators can take advantage of the sample scripts to automate the entire deployment process. In this purely CD-based deployment, it is necessary to add the operating system installation files on the CD media.

Deployment Matrix (Embedded Linux)

Depending on the scope, current business needs, network setup, and process, you might select any of the suggested methods of deployment. Table 6-1 outlines four typical methods of deployment and the environment most suitable for each.

Table 6-1. Deployment Method Matrix

Deployment Methods	Complexity	Advantages	Disadvantages
Local deployment (bootable CD)	Relatively simple	<ul style="list-style-type: none">• Necessary if a network connection is not available or is too slow.• Can perform a minimal installation of supported Linux operating systems.	<ul style="list-style-type: none">• Any change requires the creation of a new bootable CD.• Limited space on CD for some operating system installation files.• Deployment tasks must be performed at the individual target system.• CDs are read-only media and require the creation of a RAMDISK for temporary data storage.• Installation time is high.
Remote deployment over a network (bootable embedded Linux CD with network stack loaded)	Moderate	<ul style="list-style-type: none">• Everything is in one place in a network share.• Easy to manage—changes have to be made in only one place.• Data captured (profiles) can be stored in a network share.• Data can be replicated from a network share.• Can install supported Linux operating systems.	<ul style="list-style-type: none">• Must have network connection.• Deployment tasks must be performed at the individual target system.• Must locate the appropriate embedded Linux network drivers.• Not supported from a mapped NetWare system.

Table 6-1. Deployment Method Matrix (continued)

Deployment Methods	Complexity	Advantages	Disadvantages
Deployment solution framework from a third-party vendor	Mixed	<ul style="list-style-type: none">• The DTK can be used in the context of third-party deployment solution framework.• Third-party deployment solution framework is used as the deployment transport mechanism.• Tasks and scripts can be pushed to the target systems.	Must either acquire and learn to use or have an existing third-party deployment solution framework.
PXE boot	High	<ul style="list-style-type: none">• Everything is in one place on a network share.• Easy to manage—changes have to be made in only in one place.• High flexibility for remote deployment.• No media required.• Faster deployment.	<ul style="list-style-type: none">• Must have high-speed connectivity to network (LAN).• Set up time is longer.

After you have determined which deployment method best suits the needs of your organization, you are ready to begin building the DTK deployment directory structure on a network volume. For instructions on installing the DTK components and populating the deployment directory structure, see "Preparing the Directory Structure for Deployment in Embedded Linux."

Preparing the Directory Structure for Deployment in Embedded Linux

This section describes some of the procedures necessary to begin the deployment process, including:

- Downloading and unzipping the Deployment Toolkit (DTK) components, including a comprehensive matrix of the DTK components
- Setting up a directory structure to facilitate a successful deployment, including a list of the supporting components that are not included with the DTK, but are needed to use the DTK
- Setting up an optimally configured source system

Upgrading Your DTK Version

When upgrading from a previous release of the DTK 1.xx version, ensure that you create the new DTK version 2.3 environment separately from your previous version of DTK. This step is necessary because the environments and requirements for DTK version 2.3 are completely different.

Installation for Embedded Linux

The DTK components are provided in an ISO image on the Dell™ Support website at support.dell.com. You can use CD-burning software to burn the ISO image on a bootable CD or loop mount the ISO image to access the image contents.

Perform the following steps to extract the DTK components to a workstation running a Linux operating system:

- 1 Download the ISO image **dtk-2.X-xxx.iso** from the Dell Support website at support.dell.com and save it anywhere on your system (where X is the latest version of DTK and xxx is the latest build for the DTK release).
- 2 After the image downloads, burn it on a CD.

The directory structure on the CD (after it is mounted) is shown in Figure 7-1.

Figure 7-1. CD Directory Structure

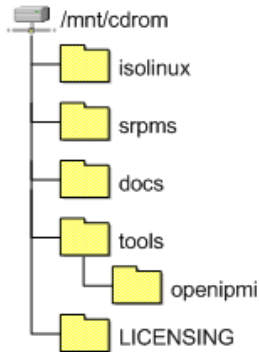


Table 7-1 describes the files, components, and other contents of the mounted CD.

Table 7-1. Mounted CD Contents

Contents	Details	Location
dchiplm32.ini	Configuration file for the instrumentation software.	/opt/dell/toolkit/lib/bin
docs	Contains: <ul style="list-style-type: none"> • <i>CLI Reference Guide</i> • <i>User's Guide</i> 	/mnt/cdrom/docs
LICENSING	Contains all the licenses for the open source components used in this CD.	/mnt/cdrom/LICENSING
omreg.cfg	Configuration file for the instrumentation software. NOTE: DTK utilities will fail if this configuration file is not present in /etc.	/mnt/cdrom/tools
openipmi	Contains IPMI drivers and support scripts to install them. These drivers are required for all Baseboard Management Controller (BMC) and Dell Remote Access Controller (DRAC) related commands.	/mnt/cdrom/tools
prereqcheck	Contains files that are used by <code>srvadmin-openipmi.sh</code> to run preliminary requisite checks.	/mnt/cdrom/tools/openipmi/suppportscripts
sa.1	Contains the Linux kernel images	/mnt/cdrom/isolinux
sa.2	Initial RAM disk containing the embedded Linux component and the DTK tools	/mnt/cdrom/isolinux
Source RPMS (SRPMs)	Contains open source components used in the Dell-provided embedded Linux	/mnt/cdrom/srpms

Table 7-1. Mounted CD Contents (continued)

Contents	Details	Location
srvadmin-hapi.<version number>.i386.rpm	Contains a set of drivers and libraries used by the DTK tools to interact with the hardware. Used to build your custom ISO.	/mnt/cdrom/tools
srvadmin-omilcore-hapi.<version number>.i386.rpm	Contains a set of drivers and libraries used by the DTK tools to interact with the hardware. Used to build your custom ISO.	/mnt/cdrom/tools
srvadmin-openipmi.sh	Checks if the OpenIPMI driver needs to be installed or upgraded, and if required, attempts to do so. Also displays status information and information about any action it attempts.	/mnt/cdrom/tools/openipmi/supportscripts
start-stage3.sh	The startup script used by the toolkit ISO image to boot.	/mnt/cdrom/tools
start-hapi.sh	The startup script to load and configure the HAPI drivers.	/mnt/cdrom/tools
start-raid.sh	Contains the basic setup for raidcfg to work.	/mnt/cdrom/tools

Boot the CD onto a target system. Figure 7-2 shows the directory structure on the target system.

Figure 7-2. Target System Directory Structure

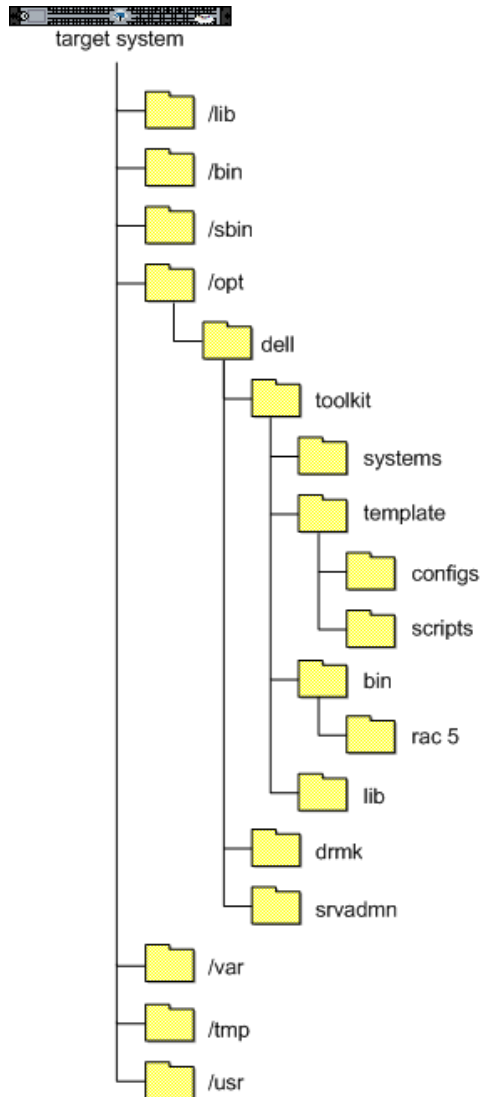


Table 7-2 describes the contents of the directory structure on the target system.

Table 7-2. Target System Directory Structure Contents

Contents	Details
/lib	The libraries and drivers required for embedded Linux to function.
/bin	Basic utilities (ls, chmod, and so on)
/sbin	Utilities that are required by the system superuser to perform administrative tasks.
/opt	The libraries, binaries, and scripts required for the toolkit to function, which are available at: <code>/mnt/cdrom/tools/dell.tar.gz</code> . NOTE: The <code>/opt/dell/srvadmin</code> directory should be writable.
/var	Any run-time variable data that might be required for embedded Linux and tools to function.
/tmp	The only safe, writable area. However, you will lose all data in this folder every time you reboot.
/usr	Miscellaneous tools and libraries for embedded Linux to function.

DTK Contents

The DTK contains embedded Linux-based utilities, sample scripts, sample configuration files, drivers, and documentation for automating the deployment of Dell systems. The following sections provide a complete list of the DTK contents and a short description of each component. For a more complete explanation of the DTK utilities, see the *CLI Reference Guide*. For an explanation of the sample configuration files and scripts, see "Preparing the Script Files for Deployment Using Embedded Linux."

System Utilities and Supporting Files

Table 7-3 describes the files, located at `/opt/dell/toolkit/bin` and the supporting libraries located in `/opt/dell/toolkit/lib`. See the *CLI Reference Guide* for complete information about the capabilities of each DTK utility.

Table 7-3. System Utilities and Supporting Files

Toolkit Components	Purpose
config.ini	Configuration file used by <code>raidcfg</code> .
pci.ids	Used with <code>syscfg</code> to report PCI devices.
racadm	Wrapper script which invokes <code>racadm3</code> or <code>racadm4</code> , depending on the remote access controller (RAC) on your system.
racadm3	Configures Dell Remote Access Controller (DRAC) III, DRAC III/XT, embedded remote access (ERA), ERA/O, and ERA/MC RACs.
racadm4	Configures DRAC 4/P and DRAC 4/I RACs.
rac 5	Configures DRAC 5 RACs.
racadmErrorCodes.txt	Lists the error codes and messages for the <code>racadm</code> tool.

Table 7-3. System Utilities and Supporting Files (continued)

Toolkit Components	Purpose
racser	Chat script to bring up a Point-to-Point Protocol (PPP) connection required to transport <code>racadm3</code> .
racsvc3.sh	Start-up script for DRAC III, DRAC III/XT, ERA, ERA/O, and ERA/MC RACs.
racsvc4.sh	Start-up script for DRAC 4/P and DRAC 4/I RACs.
raidcfg	Creates and reports RAID information.
RaidcfgErrorCodes.txt	Lists the error codes and messages for the <code>raidcfg</code> tool.
stsvc.ini	Configuration file used by <code>raidcfg</code> .
syscfg	<ul style="list-style-type: none"> • Reports and configures: <ul style="list-style-type: none"> – basic input/output system (BIOS) settings and options – baseboard management controller (BMC) settings and options • Maintains system state between reboots • Reports hardware devices and other system-related information
SyscfgErrorCodes.txt	Lists the error codes and messages for the <code>syscfg</code> tool.
sys.ini	A <code>.ini</code> file used with <code>syscfg</code> .
UpinitErrorCodes.txt	Lists the error codes and messages for <code>upinit.sh</code> .

Sample Configuration Files

Table 7-4 describes examples of configuration files used to perform a scripted deployment. These files are located at `opt/dell/toolkit/template/configs`.



NOTE: All configuration files are provided as examples only. These sample configuration files must be edited before they can be used in any deployment tasks.

Table 7-4. Sample Configuration Files

Toolkit Components	Purpose
autoinst.xml	Sample file used with unattended installation of SUSE [®] Linux Enterprise Server operating systems.
ks.cfg	Sample file used with unattended installation of Red Hat [®] Enterprise Linux [®] Server (versions 3 and 4) operating systems.
ks-rhel5.cfg	Sample file used with unattended installation of Red Hat Enterprise Linux Server (version 5) operating system.
racefg.ini	Sample configuration file for DRAC 4 RACs.
raidcfg.ini	Sample output file to enable RAID replication.
syscfg.ini	Sample configuration file for SYSCFG utility to configure the BIOS and BMC settings.

Sample Scripts

Table 7-5 lists sample scripts necessary to perform a scripted deployment.



NOTE: All DTK scripts are provided as examples only. Many of these sample scripts must be edited before they can be used in a deployment. Some customers may need to develop their own scripts entirely from scratch. Customers deploying multiple systems must provide unique information for each Dell PowerEdge™ system where appropriate. For example, system host names, IP addresses, and BIOS asset tags need to be unique for each system. The batch scripts and configuration files must be modified to reflect the unique information for each deployed system. Many options are available to optimize this process. See "Preparing the Script Files for Deployment Using Embedded Linux" for information about using the sample scripts to perform a full deployment on supported Dell systems.

Table 7-5. Sample Scripts

Toolkit Components	Purpose
errhdl.sh	Handles errors returned in the DTK scripts.
lininst.sh	Performs an unattended installation of a supported Red Hat Enterprise Linux Server operating system.
partcfg.sh	Creates and populates the Dell utility partition and creates the deployment partition on a specified hard drive. Before doing so, however, this script cleans out all existing partitions in your system.
raccap.sh	Captures RAC settings to a file.
racrep.sh	Applies (replicates) the RAC settings saved in a file to the target system.
raidcfg.sh	Configures all RAID controllers detected in a system.
suseinst.sh	Performs an unattended installation of a supported SUSE Linux Enterprise Server operating system.
syscap.sh	Captures BIOS and BMC configuration settings and saves them to a file.
sysdrmk	Used by <code>upinit.sh</code> to patch the boot sector.
sysrep.sh	Applies (or replicates) BIOS and BMC configuration settings and configures the target system.
tkenvset.sh	Sets the path of the DTK installation and variables for the specific system being deployed.
upinit.sh	Creates and populates the Dell utility partition.

Documentation

Table 7-6 describes documents containing reference information for each DTK utility and instructions for using the DTK utilities and sample scripts. Documentation can be found at `mnt/cdrom/docs`.

Table 7-6. Documentation

Toolkit Components	Purpose
<i>CLI Reference Guide</i>	Describes all DTK utilities, including all command line arguments and values, syntax, help, and examples.
<i>User's Guide</i>	Contains best practices guidelines for performing a scripted deployment.

Drivers and Dell Real Mode Kernel (DRMK)

Hardware application programming interface (HAPI) drivers are essential for DTK tools to work in the embedded Linux environment.

DRMK contains a file necessary to create a bootable Dell utility partition. This file is `mbr`.

Miscellaneous

The document `readme.txt`, located at `mnt/cdrom/docs`, provides the latest product information.

Other Supporting Tools and System Files

While the DTK provides all the necessary utilities and scripts for deploying Dell systems, additional applications, utilities, and system files are needed to create the pre-operating system environment in which this toolkit is used. Table 7-7 is a matrix of system files and other tools that you need to use the DTK utilities and its sample scripts.

Table 7-7. Supporting Tools and System Files

Additional Tools	Purpose	Source	Save in DTK location
<code>mkfs.*</code>	To format hard-drive partitions.	Any system running a Linux operating system.	In the path.
<code>fdisk</code>	To partition the hard drive.	Any system running a Linux operating system.	In the path.
<code>unzip</code>	To unzip files in Linux.	Any system running a Linux operating system.	In the path.

Table 7-7. Supporting Tools and System Files (continued)

Additional Tools	Purpose	Source	Save in DTK location
upimg	Contains system-specific Dell utility partition files. NOTE: In the previous releases, each PowerEdge system required a unique upimg file. Beginning this release, the upimg file is common for all PowerEdge systems.	/opt/dell/toolkit/systems, the Dell Support website at support.dell.com , or the <i>Dell PowerEdge Installation and Server Management CD</i>	/opt/dell/toolkit/systems
kernel image	Used during a Linux unattended installation.	Available on the first disk of the Linux CD.	/opt/dell/toolkit/systems/linux
initial ramdisk	Used during a Linux unattended installation. NOTE: For legacy operating systems, you may need to load the driver disk. At the end of the Red Hat Enterprise Linux Server installation, you may need to install the drivers available on the <i>Installation and Server Management CD</i> .	Available on the Linux operating system CD or on the <i>Installation and Server Management CD</i> .	/opt/dell/toolkit/systems

Setting Up a Directory Structure for Deployment



To perform a DTK-enabled deployment, you must create a deployment directory structure on either a network share or your local workstation hard drive. The deployment directory structure is a central repository for all deployment files and can be used successively as a testing space, a repository for a network deployment, and a repository to build a bootable deployment CD. If you plan to perform a network-based deployment, you must set up the directory structure on a network volume that is accessible from your workstation, the source system (to generate configuration information), and the target system (to deploy).

If you plan to run a scripted deployment from the DTK sample scripts, ensure that the following files are correctly structured in the deployment directory. The DTK sample scripts use this structure to set the default paths for deployment. If you make changes to the directory structure, you must also make changes to the sample scripts. The deployment directory structure consists of the following files:

- DTK utilities and files
- System-specific directories
- Operating system installation files directories

DTK Utilities and Files

All necessary DTK files are provided on the ISO image. The sample scripts provided with the DTK are set up to use the default paths.

-  **NOTE:** If you choose to create a directory structure for the DTK components that is different from the one provided in the initial installation, carefully review and edit each sample script (where necessary) to reflect the different directory structure.
-  **NOTE:** The unzip utility is needed to create the Dell utility partition. This utility should be copied into the `/systems` folder.

System-Specific Files

The directory `/opt/dell/toolkit/systems/system name` acts as a central repository for all the system-specific deployment information. The `/systems` folder acts a repository for the common files required for systems. For example, you can store all profile configuration files for an optimally configured PowerEdge 2850 in the directory `/opt/dell/toolkit/systems/pe2850`. These files can then be accessed from this directory when deploying multiple PowerEdge 2850 systems. For more information about obtaining Dell utility partition files, see "How to Obtain Dell Utility Partition Files."

This directory can also be subdivided into multiple system-specific directories such as: `/opt/dell/toolkit/systems/pe2850` for Dell PowerEdge 2850 systems and `/opt/dell/toolkit/systems/pe1850` for Dell PowerEdge 1850 systems. See Figure 7-3.



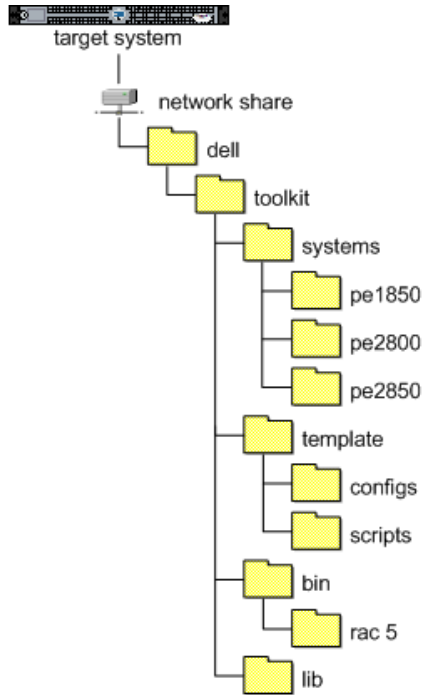
-  **NOTE:** You should mount the network share on to the target system in the master deployment file you created.
-  **NOTE:** If you choose to create a directory structure for the system-specific files that is different from the one suggested in this guide, be sure to carefully review and edit each sample script (where necessary) to reflect the different directory structure.

Figure 7-3. DTK System-Specific File Structure



Creating Operating System Installation Directories for Supported Linux Operating Systems

NOTE: The following procedures are provided as a best practices guideline for creating operating system distribution folders compatible with the DTK sample scripts. For complete instructions on setting up an installation directory structure for an unattended installation, see your operating system documentation.

For deployment of supported Linux operating systems, copy the ISO images for the operating system installation to a folder on your network (for example, `/linuxboot`). This folder should be accessible after DTK completes its tasks.

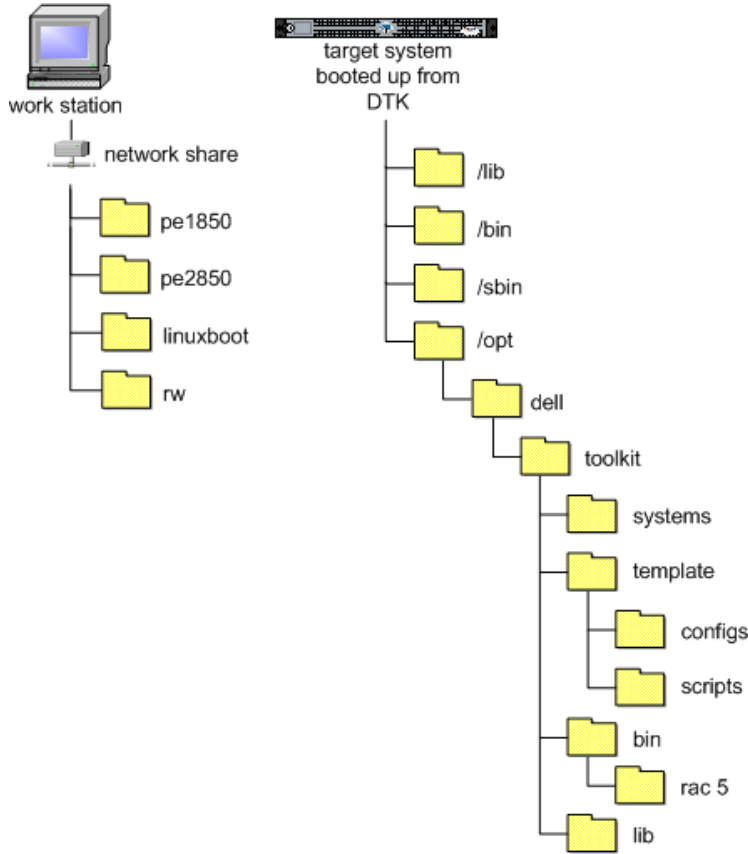
Also, copy the following into the `/linuxboot` folder:

- `kernel image` (from the Linux operating system CD)
- `initial ramdisk` from the *Installation and Server Management* CD

See Figure 7-4 for a sample directory structure for deployment of a supported Linux operating system.

NOTE: If you choose to create a directory structure for the Linux installation files that is different from the one suggested in this guide, be sure to carefully review and edit each sample script (where necessary) to reflect the different directory structure.

Figure 7-4. Sample Operating System-Specific File Structure (Linux Operating System)



Configuring a Source System

You need an optimally configured system both for testing purposes and as the source for the SYSCFG and RAC configuration files to be used in the deployment process. See "Using the DTK Sample Scripts to Capture Configuration Information in Embedded Linux" for instructions on using the sample DTK scripts, `syscap.sh` and `raccap.sh`, to generate SYSCFG and RAC configuration files that are used to configure the target system.

You can use the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs supplied with your system to:

- Streamline the operating system installation
- Setup and configure your system, including automatic discovery and configuration of Dell-provided RAID controllers and network adapters
- Access and load the latest utilities, drivers, and diagnostics for your system
- Install Dell OpenManage™ systems management software



NOTE: If your system does not have a *Service and Diagnostic Utilities* CD, obtain the latest drivers from the Dell Support website at support.dell.com.

For complete information about using the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs, see the *Dell OpenManage Software Quick Installation Guide*, which is available from the Dell Support website at support.dell.com.

After you have loaded the operating system and all applicable device drivers from the *Installation and Server Management* and *Service and Diagnostic Utilities* CDs, check the Dell Support website at support.dell.com for the latest drivers. Put all necessary drivers to be used in the deployment in the system directory for the target system. For example, if your target system is a PowerEdge 1850, put all necessary files in the `/opt/dell/toolkit/systems/pe1850` directory; or if your target system is a PowerEdge 850, put all necessary files in the `/opt/dell/toolkit/systems/pe0850` directory.

How to Obtain Dell Utility Partition Files

Obtain the Dell utility partition files from `/opt/dell/toolkit/systems`, the Dell Support website at support.dell.com, or the *Installation and Server Management* CD.

RAC Configuration

Configure the RAC on your source system using the `racadm` utility, if applicable. See the *Dell Remote Access Controller Racadm User's Guide* for comprehensive information about using the `racadm` utility to configure the RAC on your source system.

After you have successfully prepared your directory structure for a deployment and fully configured your source system, you are ready to write, review, or edit the deployment sample scripts. For instructions on editing the sample scripts necessary to run a full deployment, see "Preparing the Script Files for Deployment Using Embedded Linux."

Preparing the Script Files for Deployment Using Embedded Linux

This section describes the steps required to use the Deployment Toolkit (DTK) sample scripts to perform a full deployment of a target system in the embedded Linux environment.

There are four main tasks:

- Writing the master deployment file and editing the `tkenvset.sh` script to set the variable values used in the deployment scripts
- Editing the supporting task scripts, as necessary
- Using the DTK sample scripts to capture basic input/output system (BIOS), baseboard management controller (BMC)(SYSCFG), and remote access controller (RAC) configuration information from an optimally configured source system
- Preparing the operating system installation scripts and answer files

Using the Sample DTK Scripts to Run a Full Deployment in Embedded Linux

The Master Deployment File


A scripted DTK deployment relies on the master deployment file to integrate all the applicable DTK task scripts and utilities and perform pre-operating system configuration tasks before launching the operating system installation files. The master deployment file, along with the `tkenvset.sh` scripts, make up the master set of instructions that drives the deployment process.

Editing the Sample Batch Files to Perform a Complete System Deployment in Embedded Linux

Using the Sample Scripts in a Scripted Deployment

The sample scripts utilize the DTK utilities, the additional supporting utilities, the source system configuration files, the target system hardware drivers, and the operating system installation files to perform a full deployment of the target system.

The sample scripts provided with the DTK can be edited and customized using any ASCII text editor that conforms to the hardware available on the target systems. While it is recommended that you use the DTK sample scripts to automate your deployment tasks, you can create your own system deployment batch files using any ASCII text editor by incorporating the various DTK utilities and Linux commands in the batch file.


 **NOTE:** For more information about scripting batch files and specific batch file commands, see your Linux operating system documentation.

Each of the utilities, scripts, and system configuration files are described below. Depending on your requirements, you may use all or only some of them in your deployment:

The master deployment file— You can write your master deployment file to perform a full deployment of a system with the help of utilities, scripts, and configuration files. This file is not provided with the sample scripts.

Scripts

- **tkenvset.sh** — Sets the path of the DTK installation and variables for the system to be deployed and configured. The variables and paths specified in this file must be specified before any of the other supporting scripts can be used.
 - **syscfg** — Used by **tkenvset.sh** to discover the system type.
- **raccap.sh** — Captures RAC settings to a file for Dell™ Remote Access Controller (DRAC) 4 RACs.
 - **tkenvset.sh** — Used by **raccap.sh** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **racadm** — Used by **raccap.sh** to retrieve RAC information and to configure settings. The wrapper script, **racadm**, calls **racadm3** or **racadm4** depending on the system configuration.
 - **syscfg** — Used by **raccap.sh** to configure DRAC5.
- **racrep.sh** — Applies the RAC configuration settings saved in a file to the current system.
 - **tkenvset.sh** — Used by **racrep.sh** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **racadm** — Used by **racrep.sh** to replicate RAC information and to configure settings. **racadm** is the wrapper script which calls **racadm3** or **racadm4** depending on the system configuration.
 - **syscfg** — Used by **racrep.sh** to configure DRAC5.
- **syscap.sh** — Captures BIOS and BMC configuration settings and saves them to a file.
 - **tkenvset.sh** — Used by **syscap.sh** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **syscfg** — Used by **syscap.sh** to configure the BIOS and BMC settings.

- `sysrep.sh` — Applies the BIOS and BMC settings saved in a file to the current system.
 - `tkenvset.sh` — Used by `sysrep.sh` to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - `syscfg` — Used by `sysrep.sh` to configure the BIOS settings.
- `raidcfg.sh` — Configures the selected RAID controller detected in the system.
 - `tkenvset.sh` — Used by `raidcfg.sh` to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - `raidcfg` — Used by `raidcfg.sh` to retrieve RAID information and to configure settings.
- `partcfg.sh` — Creates and populates the Dell utility partition and the deployment partition on a specified disk. The `partcfg.sh` script uses a `/tmp` folder to store a few temporary files critical to its execution.
 - `tkenvset.sh` — Used by `partcfg.sh` to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - `fdisk` — Used to create partitions on your disk. When creating an embedded Linux ISO image, ensure that `fdisk` is present in the embedded Linux you created. This script uses the following file for noninteractive (unattended) operations:
 - `upinit.sh`— Used by `partcfg.sh` to create and populate the Dell utility partition.
- `upinit.sh` — Creates and populates the Dell utility partition.
 -  **NOTE:** Do not make any modifications to the `upinit.sh` script.
 - `tkenvset.sh` — Used by `upinit.sh` to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - `fdisk` — Used to create partitions on your disk.
 - `mbr` — File necessary to create a bootable Dell utility partition.
 - `sysdrmk` — Used by `upinit.sh` to patch the boot sector.
 - `unzip` — Used by `upinit.sh` to populate the Dell utility partition.
 - `mke2fs` — Used to make a `ext2` file system.
 - `upimg.bin` — Contains the zipped contents of the Dell utility partition.

- **lininst.sh** — Performs an unattended installation of a supported Red Hat® Enterprise Linux® Server operating system.
 - **tkenvset.sh** — Used by **lininst.sh** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **grub** — Used to install the operating system in conjunction with the **unattended answer** file. It also uses the following images in conjunction with the **unattended answer** file to perform unattended operations:
 - **initial ramdisk**— Available on the *Installation and Server Management CD*
 - **kernel image**— Available on the *Linux operating system CD*
 - **ks.cfg** — Used by **lininst.sh** in conjunction with **grub** to install the Red Hat Enterprise Linux Server (versions 3 and 4) operating system files.
 - **ks-rhel5.cfg** — Used by **lininst.sh** in conjunction with **grub** to install the Red Hat Enterprise Linux Server (version 5) operating system files.
- **suseinst.sh** — Performs an unattended installation of a supported SUSE® Linux Enterprise Server operating system.
 - **tkenvset.sh** — Used by **suseinst.sh** to inform the task scripts where to find the DTK utilities, scripts, and configuration files.
 - **grub** — Used to install the operating system in conjunction with the **unattended answer** file. It also uses the following images in conjunction with the **unattended answer** file to perform unattended operations:
 - **initial ramdisk**— Available on the *SUSE Linux Enterprise Server operating system CD*
 - **kernel image**— Available on the *SUSE Linux Enterprise Server operating system CD*
 - **autoinst.xml** — Used by **suseinst.sh** in conjunction with **grub** to install the operating system files.

The majority of the editing required for the DTK sample scripts involves the following script. As a result, the majority of the scripting discussion focuses on:

tkenvset.sh

Other task scripts might require edits in certain situations. These optional edits are discussed in "Editing DTK Task Scripts."

tkenvset.sh

The **tkenvset.sh** script sets the paths for the DTK utilities and scripts and sets the variables for the systems to be deployed and configured. These variables and paths must be specified before any of the scripts can be used.

Specifying DTK Installation Paths

The `tkenvset.sh` sample script is provided with the following default values. These values must be confirmed, in some cases, and modified, in other cases, before a deployment. Locate the **Deployment Toolkit Installation Paths** heading to find the following lines:

```
DT_PATH=$dt_drive/opt/dell/toolkit
DT_TOOLS=$dt_path/bin
DT_SYSTEMS=$dt_path/systems
DT_SCRIPTS=$dt_path/template/scripts
DT_STOP_ON_ERROR=FALSE
DT_DRMK=$dt_path/opt/dell/drmk
```

Perform the following steps to confirm and/or edit the installation path variables:

- 1 Set the variable that defines the path to the full set of DTK deployment files (`DT_PATH`). This variable is set to `$dt_drive/opt/dell/toolkit` by default in the sample script. Edit this path to reflect the actual location of the DTK deployment files, if necessary.
- 2 Set the variable that defines the directory containing the DTK utilities (`DT_TOOLS`). This variable is set to `$dt_path/bin` by default in the sample script. Edit this path to reflect the actual location of the DTK utilities, if necessary.
- 3 Set the variable that defines the directory containing the configuration files for your Dell PowerEdge™ systems (`DT_SYSTEMS`). This variable is set to `$dt_path/systems` by default in the sample script. Edit this path to add a subdirectory for the PowerEdge system you plan to deploy. For example, `$dt_path/systems/pe1850`.
- 4 Set the variable that defines the directory containing the DTK deployment scripts (`DT_SCRIPTS`). This variable is set to `%DT_PATH%\Template\Scripts` by default in the sample script. Edit this path to reflect the actual location of the DTK deployment scripts, if necessary.
- 5 Set the variable that indicates whether you want the deployment process to exit when any error is returned (`DT_STOP_ON_ERROR`). This variable is set to `FALSE` by default in the sample script, indicating that errors will be handed by the `errhdl.sh` scripts. Set the value to `TRUE` only if you want the deployment to exit on any error.
- 6 Set the variable that defines the directory containing the DRMK system files necessary to create a Dell utility partition (`DT_DRMK`). This variable is set to `$dt_path/opt/dell/drmk` by default in the sample script. Edit this path to reflect the actual location of the DRMK files, if necessary.

Specifying the SYSCFG Variables

The SYSCFG replication file is set to `syscfg.ini` by default. If you used the `syscap.sh` sample script to generate the `syscfg.ini` file, you do not have to edit these default settings. If you have made any modifications to the sample scripts or to the suggested directory structure, you must confirm that the `syscfg.ini` file is correctly named and that the path is set correctly for your deployment.

To edit the SYSCFG capture variables, locate the following lines in `syscap.sh`:

```
set DT_SYS_CAPFILE=$dt_systems/$dt_platform/syscfg.ini
```

To edit the SYSCFG replication variables, locate the following lines in `sysrep.sh`:

```
DT_SYS_REPFILE=$dt_systems/$dt_platform/syscfg.ini
```



NOTE: If the replication requires a change in the memory redundancy mode, the target server should be rebooted and the script should be executed again to complete the replication.

Specifying the RAC Configuration Variables

The IP address for your target system RAC is set in the sample script to `10.98.8.121` by default. Edit this value to reflect the actual IP address of your target system RAC, if applicable. Additionally, the RAC configuration file used to configure your RAC is set by default to `raccfg.ini`. If you use the `raccap.sh` sample script to generate the `raccfg.ini` file, you do not have to edit this default setting. If you have made any modifications to the sample scripts or to the suggested directory structure, you must confirm that `raccfg.ini` is correctly named and that the path is correctly set for your deployment.

To edit the RAC configuration variables, locate the following lines in `raccap.sh`:

```
DT_RAC_CAPFILE=$dt_systems/$dt_platform/raccfg.ini
```

To edit the RAC configuration variables, locate the following lines in `racrep.sh`:

```
# RAC section
```

```
DT_NICCFG=10.98.8.121
```

```
set DT_RAC_CAPFILE=$dt_systems/$dt_platform/raccfg.ini
```

Specifying Variables Used to Create Disk Partitions and Install the Dell Utility Partition



NOTE: If the primary deployment state (`DT_PARTN`) is set to `off`, the partitioning deployment state subsection is skipped.

The `partcfg.sh` sample script provides the following disk partitioning default values. These values must be confirmed, in some cases, and modified, in other cases, before performing a deployment. Locate the `partn` label to find the following lines in `partcfg.sh`:

```
DT_PARTN_UP=on
```

```
DT_MOUNT=/tmp/up
```

```

# Default Hard Drive
DT_HD=/dev/sda


# PARTCFG section
set DT_OS_SIZE=4000

# DELLUP section
set DT_UP_SIZE=32
set DT_UP_IMAGE=$dt_systems/upimg.bin


# RAIDCFG section
DT_VD_SIZE=10480

# default size for virtual disk

```

 **NOTICE:** `DT_MOUNT` specifies the mount point of the Dell utility partition. If your RAMDRIVE, hard drive, or other device already owns this designation, mount will not override the setting and the utility partition will not be created.

Perform the following steps to edit the default partition configuration default values, as necessary:

- 1 Edit the default utility partitioning variable (`DT_PARTN_UP=on`), if necessary. This variable sets whether you want to install the Dell utility partition.
 -  **NOTE:** Dell recommends that you install the Dell utility partition.
- 2 Edit the default variable value for the default hard drive (`DT_HD=sda`), if applicable.
- 3 Edit the default variable value (in MB) for the primary operating system partition (`DT_OS_SIZE=4000`), if applicable.
- 4 Edit the default variable value for file system type (`DT_OS_FSTYPE=FAT32`), if applicable.
- 5 If the `DT_PART_UP` variable is set to `on`, edit the default variable value (in MB) for the utility partition (`DT_UP_SIZE=32`), if applicable.
- 6 If the `DT_PART_UP` variable is set to `on`, edit the default variable value for the utility partition installation package location (`DT_UP_IMAGE=$dt_systems/upimg.bin`), if applicable.

You should have already copied the `upimg.bin` file to the proper directory, as instructed in "Preparing the Directory Structure for Deployment in Embedded Linux." Edit this variable only if you have changed the name or path of the utility partition installation package.

Editing DTK Task Scripts

The task scripts called by the master batch file do not require any edits (with the following exceptions) if the default variable values are utilized in the `tkenvset.sh` scripts. However, if you make any changes to the default values set by the `tkenvset.sh`, you must make the same edits to the matching default values set in the appropriate task scripts. Locate the "USER MODIFICATION REQUIRED" heading in the task scripts to find the variable values you might need to edit. Each of the following task scripts can be called by the master batch script during a full deployment:

- `racrep.sh`
- `raidcfg.sh`
- `sysrep.sh`
- `partcfg.sh`

`racrep.sh`

The `racrep.sh` sample script applies RAC configuration options to the target system based on configuration information that has been saved in a configuration file. User input is optional, depending on variables set in the `racrep.sh` sample script. This script uses the `racadm` wrapper script or the `syscfg` utility (depending on the version of RAC on your system) to configure the RAC in the target system using the RAC configuration file, `raccfg.ini`, passed as the first parameter to this script. If this parameter is not passed, the default variables values used in this script are set in the `tkenvset.sh` scripts. An optional second parameter can be passed to this file, which specifies the IP address to be used to configure the RAC. The `raccfg.ini` file is generated with the `raccap.sh` sample script. See "raccap.sh" for information about using the `raccap.sh` sample script to capture RAC configuration information.



NOTE: For `x9xx` systems, `racrep.sh` and `sysrep.sh` have duplicate functions. If you run `racrep.sh` followed by `sysrep.sh`, the latter overwrites the former's settings.

`raidcfg.sh`



The `raidcfg.sh` sample script configures RAID controllers detected on the system. User input is optional to run this script. The parameter is a name or path to a log file. This parameter is not set to any value by default, and no log file is generated. The default variable values used in this script are set in the `tkenvset.sh` scripts. This script uses the `raidcfg.sh` utility to automatically configure the detected controllers on your target system. For example, for the first controller discovered, if `raidcfg.sh` discovers only one attached hard drive, the script tries to create RAID 0; if two hard drives are discovered, a RAID 1 configuration is enabled; if three or more hard drives are discovered, a RAID 5 configuration is enabled.



NOTE: On the detected controller, a RAID virtual disk is created only if the array disks connected to that particular controller have space available and, where applicable, are not part of an already existing array group.


sysrep.sh

The `sysrep.sh` sample script applies SYSCFG options to the target system based on configuration information that has been saved in a configuration file. User input is optional to run this script, depending on the variable settings in the `sysrep.sh` scripts. This script uses the `syscfg` utility to configure the BIOS and BMC in the target system using the configuration file, `syscfg.ini`, passed as the first parameter to this script. If this parameter is not passed, the default variables values used in this script are set in the `sysrep.sh` scripts. The `syscfg.ini` file is generated with the `syscap.sh` sample script. See "syscap.sh" for information about using the `syscap.sh` sample script to capture BIOS and BMC settings. The second parameter is a name or path to a log file. This parameter is not set to any value by default, and no log file is generated.

-  **NOTE:** If the replication requires a change in the memory redundancy mode, the target server should be rebooted and the script should be executed again to complete the replication.
-  **NOTE:** For `x9xx` systems, `racrep.sh` and `sysrep.sh` have duplicate functions. If you run `racrep.sh` followed by `sysrep.sh`, the latter overwrites the former's settings.

partcfg.sh

The `partcfg.sh` sample script creates and populates the Dell utility partition using `upinit.sh` and creates the deployment partition on a specified disk. (See "upinit.sh" for more information about using the `upinit.sh` tool.) User input is not required to run this script. The default variable values used in this script are set in the `tkenvset.sh` scripts.


-  **NOTE:** Ensure that `DT_HD` is set to the required disk to be configured before you execute the `partcfg.sh` script.

Using the DTK Sample Scripts to Capture Configuration Information in Embedded Linux

The `syscfg` and `racadm` utilities can read the source system configuration and duplicate that configuration on a target system using a sample DTK script file. These configuration files are used during a full deployment to configure the target system's BIOS, BMC, and RAC settings. The following sections provide instructions for using the `syscap.sh` and `raccap.sh` sample scripts to create configuration files.

Capturing the System BIOS and BMC Configuration With the `syscap.sh` Sample Script

You can replicate the system BIOS and BMC configurations from a source PowerEdge system to an identical target PowerEdge system (for example, from one PowerEdge 1850 to another PowerEdge 1850).

-  **NOTE:** For the script to complete successfully, the source system must have access to the network share that includes the prebuilt DTK directory structure.

syscap.sh

The `syscap.sh` sample script captures BIOS and BMC configuration settings and saves them to a specified location. An optional user input can be passed as a parameter. You can provide the path or file name as an input to this script. The default variable values used in this script are set in the script to the correct default values to perform a scripted deployment. The `syscap.sh` script uses the `syscfg` utility to retrieve BIOS and BMC configuration settings from the source system and to save the settings in a file named `syscfg.ini` in the `Z:\Dell\Toolkit\System\<target system>` directory.

Perform the following steps to run the `syscap.sh` sample script to capture BIOS and BMC configuration information in the `syscfg.ini` file:

- 1 Edit the start-up script file on your embedded Linux image to call the `syscap.sh` script after the network share with the prebuilt DTK directory structure is mounted. For example, add:

```
source/opt/dell/toolkit/template/scripts/syscap.sh
```

- 2 Boot the source system into embedded Linux.

The script runs and saves configuration information in the `/opt/dell/toolkit/systems/<target system>` directory.

- 3 Edit the start-up script file in your embedded Linux image to remove the text you added in step 1.



NOTE: For `x9xx` systems, `raccap.sh` and `syscap.sh` have duplicate functions. If you run `raccap.sh` followed by `syscap.sh`, the latter overwrites the former's settings.

Capturing the RAC Configuration With the `raccap.sh` Sample Script

If your system has a RAC, you can replicate the RAC configuration from a source PowerEdge system's RAC to an identical target PowerEdge system with an identical RAC (for example, from one PowerEdge 1850 with a DRAC4/I to another PowerEdge 1850 with a DRAC4/I).



NOTE: For the script to complete successfully, the source system must have access to the network share that includes the prebuilt DTK directory structure.

raccap.sh

The `raccap.sh` sample script captures RAC configuration settings and saves them to a specified location. An optional user input can be passed as a parameter. You can provide the path or filename as an input to this script. The default variable values used in this script are set in the script to the correct default values to perform a scripted deployment. The `raccap.sh` script uses the `racadm` wrapper script or `syscfg` utility (depending on the RAC version on your system) to retrieve RAC configuration settings from the source system and to save the settings in a file named `raccfg.ini` in the `/opt/dell/toolkit/systems/<target system>` directory.

Perform the following steps to run the `raccap.sh` sample script to capture RAC configuration information in the `raccfg.ini` file:


- 1 Edit the start-up script file on your embedded Linux image to call the `raccap.sh` script after the network share with the prebuilt DTK directory structure is mounted. For example, add:


```
source/dell/toolkit/template/scripts/raccap.sh
```


- 2 Boot the source system into embedded Linux.

The script runs and saves configuration information in the `/opt/dell/toolkit/systems/<target system>` directory.

- 3 Edit the start-up script file on your embedded Linux image to remove the text you added in step 1.


 **NOTE:** The RAC configuration file is referred to as the `.cfg` file in the *Dell Remote Access Controller Racadm User's Guide* and the *Dell Remote Access Controller 4 User's Guide*. See these guides for additional information about manually creating a RAC configuration file.

 **NOTE:** Do not replicate the RAC IP address when creating a `.cfg` file. Replicating the RAC IP address can leave the system inaccessible because multiple systems are configured with the same IP address.


 **NOTE:** For `x9xx` systems, `raccap.sh` and `syscap.sh` have duplicate functions. If you run `raccap.sh` followed by `syscap.sh`, the latter overwrites the former's settings.

upinit.sh

The `upinit.sh` tool is used to create and populate the Dell utility partition.

 **NOTE:** You can use this script to create a new Dell utility partition only if there are no existing partitions on your hard disk.

You can also use this script to upgrade or downgrade an existing Dell utility partition. Upgrades or downgrades can be made only to existing Dell utility partitions to capture BIOS and BMC settings.


 **NOTICE:** The existing Dell utility partition should be the first primary partition on the hard disk. Also, the Dell utility partition must be greater than or equal to 32 MB and less than 2 GB.

For details on the command line arguments to be used for `upinit.sh`, refer to the *Deployment Toolkit CLI Reference Guide*.

Preparing the Operating System Installation Scripts

Red Hat Enterprise Linux Server Operating Systems

The `lininst.sh` script is used to install supported Red Hat Enterprise Linux Server operating systems.

 **NOTE:** While installing Linux, ensure that you install `grub` in the boot partition. Otherwise, you will not be able to boot to the utility partition by pressing the **F10** key during reboot.

lininst.sh

The `lininst.sh` sample script is used to perform an unattended installation of a supported Red Hat Enterprise Linux Server operating system. The variables and paths must be specified before the operating system can be installed.



NOTICE: It is strongly recommended that you consult your Red Hat Enterprise Linux Server operating system documentation and unattended deployment documentation to develop a thorough understanding of the unattended installation process before attempting to perform a full scripted deployment.

Utilities Used

grub — Used in conjunction with the **kernel image** and **initial ramdisk** files, along with the **unattended answer** file to install the operating system.

Variables Used

- `DT_OS_DISK` — Sets the disk on which to deploy the Red Hat Enterprise Linux Server operating system.
- `DT_OS_SRC` — Sets the location from where to copy the **kernel image** and **initial ramdisk** files.

External Dependencies

The `DT_PLATFORM` variable is set during deployment by `tkenvset.sh` using platform discovery.

The `lininst.sh` script uses the **unattended answer** file in conjunction with the **grub** utility and **kernel image** and **initial ramdisk** files to install the operating system files. See "ks.cfg (For Red Hat Enterprise Linux Server Versions 3 and 4) and ks-rhel5.cfg (For Red Hat Enterprise Linux Server Version 5)" for more information about preparing the **unattended answer** file.

ks.cfg (For Red Hat Enterprise Linux Server Versions 3 and 4) and ks-rhel5.cfg (For Red Hat Enterprise Linux Server Version 5)

Depending on the version of the Red Hat Enterprise Linux Server operating system, the `ks.cfg` or `ks-rhel5.cfg` files are the default names of the answer files that you use to automate an unattended Red Hat Enterprise Linux Server installation. A sample copy of the `ks.cfg/ks-rhel5.cfg` files are provided as part of the DTK download in the `/opt/dell/toolkit/template/configs` directory. The `ks.cfg/ks-rhel5.cfg` files contain the headings and parameters that instruct the installation utility to perform various configuration tasks. Before a full deployment can be run, you must edit all appropriate headings and parameters, as necessary.



NOTE: The sample file provided to install Red Hat Enterprise Linux Server (version 5) is named `ks-rhel5.cfg`. To use the sample `ks-rhel5.cfg` file to install Red Hat Enterprise Linux Server (version 5) using `lininst.sh`, ensure that you rename the file to `ks.cfg`.



NOTE: See your operating system documentation for instructions on modifying the options in the `ks.cfg/ks-rhel5.cfg` file to customize the scripted installation of your operating system.

When you have completed all necessary modifications of the `ks.cfg/ks-rhel5.cfg` file, save the completed file in the `/opt/dell/toolkit/systems/<target system>` directory.

SUSE Linux Enterprise Server Operating Systems

The `suseinst.sh` script is used to install supported SUSE Linux Enterprise Server operating systems.



NOTE: While installing Linux, ensure that you install `grub` in the boot partition. Otherwise, you will not be able to boot to the utility partition by pressing the **F10** key during reboot.

`suseinst.sh`

The `suseinst.sh` sample script is used to perform an unattended installation of a supported SUSE Linux Enterprise Server operating system. The variables and paths must be specified before the operating system can be installed.



NOTICE: It is strongly recommended that you consult your SUSE Linux Enterprise Server operating system documentation and unattended deployment documentation to develop a thorough understanding of the unattended installation process before attempting to perform a full scripted deployment.

Utilities Used

`grub` — Used in conjunction with the `kernel image` and `initial ramdisk` files, along with the `unattended answer` file to install the operating system.

Variables Used

- `DT_OS_DISK`— Sets the disk on which to deploy the SUSE Linux Enterprise Server operating system.
- `DT_OS_SRC`— Sets the location from where to copy the `kernel image` and `initial ramdisk` files.
- `DT_OS_PART`— Sets the valid partition to install the `grub` files.
- `DT_OS_IMG_PATH`— Sets the network share where the operating system files are located.
- `DT_SUSE_AUTOINST`— Sets the network share from where the `autoinst.xml` file can be picked up.

External Dependencies

The `DT_PLATFORM` variable is set during deployment by `tkenvset.sh` using platform discovery.

The `suseinst.sh` script uses the `unattended answer` file in conjunction with the `grub` utility and `kernel image` and `initial ramdisk` files to install the operating system files. See "autoinst.xml (for SUSE Linux Enterprise Server)" for more information about preparing the `unattended answer` file.

autoinst.xml (for SUSE Linux Enterprise Server)

The **autoinst.xml** file is the default name of the answer file that you use to automate an unattended SUSE Linux Enterprise Server installation. A sample copy of the **autoinst.xml** file is provided as part of the DTK download in the `/opt/dell/toolkit/template/configs` directory. The **autoinst.xml** file contains the headings and parameters that instruct the installation utility to perform various configuration tasks. Before a full deployment can be run, you must edit all appropriate headings and parameters, as necessary.



NOTE: See your operating system documentation for instructions on modifying the options in the **autoinst.xml** file to customize the scripted installation of your operating system.

When you have completed all necessary modifications of the **autoinst.xml** file, save the completed file in the `/opt/dell/toolkit/systems/<target system>` directory.

After you have successfully edited your deployment scripts, you are ready to create your deployment media and run your deployment. For instructions on creating deployment media and running a full deployment, see "Running Deployment Scripts Using DTK and Embedded Linux."

Running Deployment Scripts Using DTK and Embedded Linux

This section provides best practices procedures and scenarios for using the Deployment Toolkit (DTK) to perform pre-operating system configuration tasks and to install supported operating systems on supported Dell™ PowerEdge™ systems.

After you have populated the deployment directory structure with all necessary files and carefully edited the deployment scripts and configurations files, you are ready to begin the final stage of the deployment process. Before running the deployment, however, you need to create specific deployment media to facilitate your chosen deployment method. The common deployment scenarios are:

- Deployment using Dell-provided embedded Linux
- Deployment using customized embedded Linux
- Using a Third-Party Deployment Solution Framework

Deployment Using Dell-Provided Embedded Linux

There are two common scenarios:

- Network-based deployment
- CD-based deployment

Network-Based Deployment

The procedure below enables you to boot DTK over network and pass parameters (startup script location and name) during boot using the Pre-boot eXecution Environment (PXE) configuration file. This will automatically launch the start-up script off the network share, when DTK is booted.

- 1 Obtain the ISO image of the embedded Linux available on the Dell Support website at support.dell.com.
- 2 Burn the ISO image using any commonly available CD burning software.



NOTE: When you create a bootable CD, this image is supplied to the CD burning software along with the complete deployment directory structure, which includes all necessary supporting files to perform the deployment.

The CD burning software creates a self-bootable CD when the CD is booted.

- 3 Set up the Trivial File Transfer Protocol (TFTP) services and the Dynamic Host Configuration Protocol (DHCP) services on your network to boot the target system using Pre-Boot Execution Environment (PXE).

- 4 Copy the contents of the embedded Linux DTK ISO image (SA.1, SA.2, and `isolinux.cfg`) from `/mnt/cdrom/isolinux` to the `tftp` folder.
- 5 The `isolinux.cfg` file has various boot options. Select the method you want, and edit the `isolinux.cfg` file for the following:
 - IP address of the network share
 - Share path of the network share
 - Name of your startup script
- 6 The `isolinux.cfg` file is ready for PXE-booting. Copy this `isolinux.cfg` file into the PXE configuration folder.
- 7 Create your own start-up script and place it in the network share specified in your modified `isolinux.cfg` file.
- 8 The modified script is picked up and executed during the boot process.






NOTE: The network share on which you have the scripts and DTK files are mounted to `/opt/dell/toolkit/systems`.



NOTE: Ensure that you specify the correct RAMDISK size in the `pxe config` file before booting through PXE. (A sample `pxe config` file is provided in `/mnt/cdrom/isolinux/isolinux.cfg`.)

CD-Based Deployment

- 1 Obtain the ISO image of the embedded Linux available on the Dell Support website at support.dell.com.
 - 2 Burn the ISO image using any commonly available CD burning software.
 -  **NOTE:** When you create a bootable CD, this image is supplied to the CD burning software along with the complete deployment directory structure, which includes all necessary supporting files to perform the deployment.
- The CD burning software creates an image of the self-bootable ISO image and the deployment files on the CD.
- 3 Extract the contents of the ISO image to a folder on your hard drive.
 - 4 Copy your custom scripts into the folder you created in step 3. (See "Installation for Embedded Linux" for an example of the folder structure.)
 -  **NOTE:** Your scripts should also take care of copying miscellaneous items to unlock the CD, so that the CD can be mounted and ejected as required by the operating system's installation process.
 - 5 In `/mnt/cdrom/isolinux.cfg`, edit the `cd install` section to point to your customized start-up script.
 -  **NOTE:** The scripts that you copy into the CD will be copied to the RAM disk and run from the RAM disk. This task is done to ensure the CD is not locked. Ensure that your sample scripts have valid path names.
 - 6 Copy the directory structure created your work station into the root folder that you created in step 3. This folder contains the DTK CD, files necessary for operating system installation, and files required for replication.


- 7 Burn the contents of the folder you created in step 3 to a CD. (Use the `islinux` utility to make the CD bootable.)
- 8 Your ISO image is ready for booting.


Deployment Using Customized Embedded Linux

Ensure that you have the following basic libraries, Dell toolkit libraries, tools, and utilities required for DTK to work in your customized Linux deployment environment (see Table 7-1 for details on files and RPMs to customize your embedded Linux):

- Drivers for all your hardware installed in your embedded Linux (from the Dell Support website at support.dell.com)
- Serial port configuration utilities (`setserial` and `stty`) for `racadm`
- Installed and working instrumentation drivers (from `/mnt/cdrom/tools`)
- Point-to-Point Protocol (PPP) tools
- Open Intelligent Platform Management Interface (IPMI) drivers
- Basic libraries and utilities for Linux to execute customized scripts
- DTK tools and utilities extracted from the embedded Linux CD (`/mnt/cdrom/tools/dell.tar.gz`)
- Necessary entries in the `ld.so.config` file so that the libraries get loaded

Integrate all the above mentioned libraries, Dell toolkit libraries, tools, and utilities into your embedded Linux environment and proceed with deployment.

 **NOTE:** Ensure that the `raidcfg` executable in the `/bin` directory is a symbolic link to the `raidcfg` in the Dell-provided `/lib` folder.

 **NOTE:** Refer to `start-stage3.sh`, `start-hapi.sh`, or `start-raid.sh` on `/mnt/cdrom/tools` to see how Dell-provided utilities and drivers are loaded.

 **NOTE:** The `/opt/dell/srvadmin/shared` and `/opt/dell/srvadmin/hapi` directories should have Read-Write permissions. Refer to `start-stage3.sh` and `start-hapi.sh` for details.

Using a Third-Party Deployment Solution Framework

You can use the DTK with any existing third-party deployment solution framework that provides a PXE booting infrastructure that can be used as the transport mechanism for the DTK utilities. Because each third-party deployment framework is unique, however, these solutions fall outside the scope of this document. If you plan to utilize a third-party deployment solution framework, keep in mind that the DTK is an embedded Linux-based set of tools and scripts, so the deployment solution framework must also support embedded Linux as a pre-operating system environment.

Running Dell Update Packages in Embedded Linux

This section provides best practice procedures and scenarios for running Dell™ Update Packages in the embedded Linux environment on supported Dell PowerEdge™ systems.

The common scenarios for running Update Packages are:

Running Update Packages in Dell-Provided Embedded Linux

- 1 Obtain the required update packages from the *Dell PowerEdge Server Update Utility* CD or from the Dell Support website at support.dell.com.
- 2 Save the update packages on a network share.
- 3 Mount the network share where you saved the update packages and run the individual packages.



NOTE: See the *Dell Update Packages for Linux User's Guide* for help on using Dell Update Packages and information on error codes.

Running Update Packages in Customized Embedded Linux

Before running update packages in your customized embedded Linux environment, ensure that you meet the dependencies listed in Table 10-1.

Table 10-1. Dependencies for Dell Update Packages to Run in Customized Embedded Linux


Update Packages	Dependency	Dependencies Available On
BIOS	Instrumentation drivers	/mnt/cdrom/tools
	dell_rbu	Kernel
ESM	OpenIPMI	/mnt/cdrom/tools
	Instrumentation drivers	/mnt/cdrom/tools
PERC	/etc/dataeng	/mnt/cdrom/tools
	megaraid driver 2.4.2.0	/mnt/cdrom/tools
	SCSI drivers	Kernel
RAC3	/etc/racser	/mnt/cdrom/tools
	PPP	/mnt/cdrom/tools
	racser3.sh	/mnt/cdrom/tools

Table 10-1. Dependencies for Dell Update Packages to Run in Customized Embedded Linux (continued)

Update Packages	Dependency	Dependencies Available On
RAC4	Open IPMI	/mnt/cdrom/tools
	Instrumentation drivers	/mnt/cdrom/tools
	racser4.sh	/mnt/cdrom/tools
RAC 5	Open IPMI	/mnt/cdrom/tools
	Instrumentation drivers	/mnt/cdrom/tools
Dell PowerVault™ 220S	SCSI drivers	Kernel
SAS	SAS drivers	Kernel
Any Update Package	RPM	
	sysvinit	
	grep	
	sed	Linux CD or any open source website
	awk	
	less	
	fmt	
	targz	

After ensuring that you have met all the dependencies, run the update packages in your customized embedded Linux environment as follows:

- 1 Obtain the required update packages from the *Dell PowerEdge Server Update Utility* CD or from the Dell Support website at support.dell.com.
- 2 Store the update packages on a network share.
- 3 Mount the network share where you stored the update packages and run the individual packages.

 **NOTE:** For help on usage of Dell Update Packages and information on error codes, see the *Dell Update Packages for Linux User's Guide*.

Known Issues and Frequently Asked Questions

This section describes known issues with the Deployment Toolkit (DTK) utilities and scripts, including answers to some frequently asked questions.

Known Issues

The following issues are organized by the DTK utility or other function.

General Issues

- Virtual disk creation and/or deletion takes a long time on Microsoft® Windows® PE.

RAIDCFG Issues

- If you have created Redundant Array of Independent Disks (RAID) 1 with background initialization operation on CERC SATA 1.5/2S, CERC SATA 1.5/6CH, or PERC 3/Di, you cannot delete the virtual disk using RAIDCFG, until the background initialization operation is completed. You must go to the controller basic input/output system (BIOS) to delete the virtual disk and then create another virtual disk using another option.
- If you delete a virtual disk on PowerEdge™ Expandable RAID controller (PERC) 4/IM on Windows PE, you need to reboot the system.
- Due to a rounding limitation, for RAID 0, RAID 1, and RAID 5, RAIDCFG can accept a virtual disk size that is 1 MB greater than the maximum allowable virtual disk size when creating a virtual disk. However, RAIDCFG will create the maximum virtual disk size and not give an error. If you need the maximum allowable virtual disk size, it is recommended that you do not provide the size in the CLI and let RAIDCFG calculate the size for the RAID type.
- Before creating a virtual disk using RAIDCFG on Cost-Effective RAID Controller (CERC) Serial Advanced Technology Attachment (SATA) 1.5/2S and CERC SATA 1.5/6CH, initialize the array disk(s) through the controller BIOS.
- Currently, RAIDCFG neither creates nor replicates dedicated hotspare.

SYSCFG Issues

- Setup passwords and system passwords cannot be cleared using DTK.

RACADM Issues

- Dell™ Remote Access Controller (DRAC) III, DRAC III/XT, embedded remote access (ERA), ERA/O, and ERA/MC controllers are not supported on Windows PE.

Windows PE Installation Issues

- If virtual flash is enabled and does not contain a valid image (for example, if the virtual flash contains a corrupt or random image), you may not be able to install Windows 2000 or Windows Server 2003 locally or remotely. To fix this issue, install a valid image on virtual flash or disable virtual flash if it will not be used during the installation procedure.

Frequently Asked Questions

The following questions are organized by the DTK utility or other function.

General Deployment Questions

Q: While running SYSCFG.EXE on a Windows PE image, the SYSCFG.EXE tool silently fails.

A: Ensure that you have built your Windows PE image with the `\WMI` option. See "Running Deployment Scripts Using DTK and Microsoft® Windows® PE."

Q: When I use the sample DTK scripts to deploy multiple systems, do I need to edit the configuration files to reflect unique information (such as unique system names, IP address, and BIOS asset tags) for each system?

A: The sample scripts are provided as examples for users who want to develop their own deployment process. You may find that the scripts work perfectly in your environment, or you may need to develop your own scripts entirely from scratch. If you are deploying multiple systems, for example, you will need to provide unique information for each system when appropriate. To perform this task, you will need to modify each `.ini` (or other configuration script) file to reflect the unique information for each system you are deploying (such as the remote access controller (RAC) IP addresses and BIOS asset tags). There are many options available to optimize this process and it is suggested that you conduct an Internet search for available tools.

Q: When I change my hard drive controller from SCSI to RAID (or RAID to SCSI), the system prompts me for confirmation during POST. How can I stop this from happening?

A: Use the `--noraidprompt` option with the `--embbsciraid` option to prevent the system from prompting during POST. Data loss will result from changing the state of the disk controller, so you should be certain before skipping the prompt. There is no method for using the `--noraidprompt` in the input file. If you want to change the controller state through an input file, you must configure your script to call the SYSCFG.EXE utility twice, once to specify the input file, and once to change the controller state with the `--noraidprompt` option.

Q: What do I do if the PARTCFG script fails?

A: Ensure that `DT_HD` is set to the required disk to be configured before you execute the PARTCFG script.

RAIDCFG Questions

Q: Why does RAIDCFG not give an error message when I use invalid **read**, **write**, and **cache** policies and/or stripesizes for a particular controller?

A: All RAID controllers have their own default read, write, and cache policies and stripesizes. It is possible that if you provide an invalid policy or a stripesize for a particular controller, RAIDCFG may not give an error but will and create the virtual disk with the default policy and/or stripesize.

Q: When I execute RAIDCFG with the RAID level of "01," RAIDCFG creates RAID 1, not RAID 01.

A: This behavior occurs because the RAIDCFG CLI parser ignores zeros preceding any parameter value. For example, `-r=01` will be parsed as `-r=1`.

Q: On PowerEdge 1655MC system running embedded Linux, RAIDCFG displays the error: `megadev : Bad file descriptor`.

A: Ignore this message. The error message is generated by Megalib because it is trying to open a device driver that is not present on your system.

Q: What is strict creation?

A: Strict creation is an optional flag that has been added to the **create virtual disk** command. It allows you to create virtual disks only if the array disks (that is, hard drives) are within a specified percentage of disk space of each other.

Q: Why is the drive location of array disks displayed like 0:0:0?

A: The nexus used to display array disks is "channel:target:lun." The Logical Unit Number (LUN) is always "0." The channel and the target IDs are necessary to identify array disks when dealing with SCSI devices.

When dealing with SAS devices, the array disk location is displayed as "channel:target:enclosure." It is possible to have the enclosure value as non-zero. If the enclosure has a non-zero value, then all three numbers (channel, target, and enclosure) have to be included on the command line.

Q: Do I need to specify RAID type and size when creating virtual disk(s)?

A: No. The default RAID type is RAID 0. If RAID size is not provided, the maximum size allowed for virtual disk is created. The mandatory fields required to create virtual disks are the controller slot ID and the array disks.

Q: What is a hotspare (failover drive)?

A: A hotspare is an extra and unused disk drive that is part of an array disk subsystem. A hotspare is always in standby mode. If a disk failure occurs, the hotspare replaces the failed drive without interrupting the system.

Q: What is **mr2kserv.exe**?

A: This is a service needed to configure all LSI RAID controllers in Windows PE. It provides Plug and Play support.

Q: What features have changed from the MS-DOS® version of RAIDCFG to the Windows PE and embedded Linux versions?

A: New features for the Windows PE embedded Linux RAIDCFG include:

Support for the following controllers:

- PERC 3/DC, PERC 3/QC, PERC 3/SC
- PERC 4/SC, PERC 4/DC, PERC 4/Di, PERC 4/IM
- PERC 4e/DC, PERC 4e/Di, PERC 4e/Si
- PERC 5/E Adapter, PERC 5/I Integrated, and PERC 5/I Adapter
- CERC SATA 1.5/6-Channel (CH), CERC SATA 1.5/2S, and PERC 3/Di (These controllers are supported in Linux only.)
- SAS 5/iR

Features that have been removed from the DOS version include:

- The `--name` and `--wait` options in the create command
- The `--runlocation` and the `--scratchlocation` options
- The `--getpercentcomplete` environment variables

Q: What is the minimum virtual disk size that I can create?

A: For CERC-SATA 1.5/6ch controllers:

- RAID 0: 10MB
- RAID 1: 9MB
- RAID 5: 9MB

For PERC 3 controllers:

- RAID 0: 10MB
- RAID 1: 10MB
- RAID 5: 10MB

For PERC 4 (except PERC 4/IM) controllers:

- RAID 0: 10MB
- RAID 1: 10MB
- RAID 5: 10MB

For PERC 5 controllers:

- RAID 0: 100MB
- RAID 1: 100MB
- RAID 5: 100MB

Q: Why can't I see any controllers using RAIDCFG?

A: Ensure that the RAID controller(s) can be seen in the BIOS during POST. If the BIOS does not detect the controller, then RAIDCFG will also not detect it. Also ensure that the controller is set to RAID mode and not any other mode in the controller BIOS.

Q: What is span length?

A: Span length is the field needed when you try to create a RAID 50. The number represents the span size of the RAID 5.

Q: What pre-operating system environments are PERC 3/Di, CERC SATA 1.5/6ch, and CERC SATA 1.5/2s controllers supported on?

A: They are supported only on embedded Linux.

Q: PARTCFG cannot enumerate the virtual disk(s) created by RAIDCFG. What should be done?

A: A reboot is required for PARTCFG to enumerate virtual disks after creating a virtual disk using the RAIDCFG command.

SYSCFG Questions



NOTE: In a Linux environment, the DTK utilities do not have a .exe extension.

Q: On PowerEdge x7xx systems, when I set arguments for `--sata0` and `--sata1` using DTK CLI and reboot the system, the BIOS setup shows the earlier settings for `--sata0` and `--sata1`.

A: You need to set the `--idectl` to auto before you can change the settings for `--sata0` and `--sata1`.

Q: On PowerEdge x7xx systems, the BIOS setup shows `--conred` arguments of `--serial1` and `--rac`, whereas the DTK CLI shows them of `--serial1` and `--serial2`.

A: The `--serial2` argument in the DTK CLI corresponds to the `--rac` argument in BIOS setup.

Q: Can I use the SYSCFG utility to configure Point-to-Point Protocol (PPP) over the serial port to my access my RAC?

A: No. The baseboard management controller (BMC) firmware does not support PPP configurations for the serial port.

Q: The SYSCFG utility `--lancfgparams` option has suboptions that configure the IP address, Gateway, and Subnet Mask for the system BMC. There is also a MAC address. Are these the same as the managed system's operating system network parameters?

A: No. The BMC has its own IP address, Gateway, Subnet Mask, and MAC address values.

Q: What is the minimum configuration needed to support BMC Platform Event Filtering?

A: You must enable LAN-channel access "pefaalerting" and ensure that you set the BMC IP address and Gateway values for alerting.

Q: I loaded the factory defaults for my system's BMC. Then, I enabled BMC user ID 3. What is the username for this user ID?

A: The default username for user IDs 3 to 10 is NULL.

Q: Can I use this NULL username to remotely log in to a system's BMC?

A: No. Remote login using a NULL username is not allowed. It is recommended that you always provide a non-null, valid username for the user ID when you enable a BMC user ID.

Q: Are duplicate usernames allowed in the BMC?

A: No. If you enter a username value that already exists, the `SYSCFG` utility returns an error code of 89, which means `This username is already in use. Enter a unique username.`

Q: In `--solcfgparams`, when I set the Serial Over LAN (SOL) character send threshold using `solcharsendthreshold` to be 225, I get a `Hardware subsystem error. Invalid data field in request.` What are the valid values?

A: The range of valid values for `--solcfgparams`, `--solcharsendthreshold` are from 1 to 220.

Embedded Linux Questions

Q: After installing Linux, I am not able to boot to the utility partition by pressing the **F10** key during reboot.

A: Recreate the utility partition using the `upinit.sh` script and install `grub` in the boot partition.

Q: When booting DTK through PXE, my system displays error messages, unknown behavior, and also leads to a kernel panic sometimes. However, booting from the CD causes no problems.

A: Ensure that you specify the correct `RAMDISK` size in the `pxe config` file before booting through PXE. (A sample `pxe config` file is provided in `/mnt/cdrom/isolinux/isolinux.cfg`.)

Q: What is the version of the Linux kernel used?

A: The Linux kernel is derived from 2.6.9-42. The source RPM (SRPM) for the Linux kernel is available on `/mnt/cdrom/srpms`.

Q: Can I use a 2.4 Linux kernel?

A: Yes. You could integrate the DTK tools into your own embedded Linux. See "Deployment Using Customized Embedded Linux."

Q: Can we use the same sample scripts that we have from earlier versions of DTK?

A: The scripts written for the previous versions (1.x) of DTK will not work in DTK 2.x versions for embedded Linux. See the directory `/opt/dell/toolkit/template/scripts` for the sample scripts.

Q: After I install legacy operating system on a newer Dell system, the Linux kernel does not boot and panics.

A: After installing the initial ramdisk image, you could install the driver or you could update to a newer version of the kernel.

Q: After the DTK deployment is complete, the Red Hat® Enterprise Linux® Server installation keeps going into attended mode or halts with the message `ks.cfg not found`.

A: Always use `initrd` for the Red Hat Enterprise Linux Server installation from the *Dell PowerEdge Installation and Server Management* CD available on the path `server_assistant/drivers`.

If the **initrd** is not available for your operating system, try the latest update of Red Hat Enterprise Linux Server. Otherwise, you might need to prepare driver disks for your network or disk controller. Use the drivers from the *Installation and Server Management* CD available on the path `server_assistant/drivers`.

Windows PE Questions

Q: My system gets the error `Illegal or Missing File Types Specified in Section Files.SCSI.Name` during an unattended installation of a supported Windows operating system on supported Dell PowerEdge systems.

A: This behavior can occur when the line in the `Txtsetup.oem` file under the `[Files.SCSI.name]` heading is not a supported file type. To resolve this behavior, you must remove the line in the `Txtsetup.oem` file. The dynamic-link library (DLL) file can be copied to the correct location of the installation by placing it in the `I386\Oem\OEMDIR` folder. (**OEMDIR** is the destination folder where the file would normally be located, if installed to a running operating system. For example, INF files are normally found in the `%SystemRoot%\INF` folder. The correct **OEMDIR** destination can be found by searching the INF file used to install the device or driver.) For more information, see Microsoft Knowledge Base Article 275334 on the Microsoft website.

Q: When I try to install network interface controller (NIC) drivers into my Windows PE image using `DRVINST.EXE` [provided in the OEM Preinstallation Kit (OPK) CD], the `DRVINST.EXE` fails with an error message that there are some files missing.

A: Dell recommends that you use `DRIVERINST.BAT` (provided with DTK).

However, if you use `DRVINST.EXE` from Microsoft to install the NIC drivers into your Windows PE image, you need to download and extract required NIC drivers for Windows 2000 and Windows Server 2003 to a common directory. Then, merge the contents of `Base_drivers` from both. Use the merged contents with `DRVINST.EXE` to integrate the NIC drivers into your Windows PE image.

Glossary

The following list defines or identifies technical terms, abbreviations, and acronyms used in your system documents.

adapter card

An expansion card that plugs into an expansion-card connector on the system's system board. An adapter card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral device. Examples of adapter cards include network cards, sound cards, and SCSI adapters.

ADS

Automated Deployment Services (ADS) is a feature pack for Microsoft® Windows Server® 2003, Enterprise Edition, and Microsoft Windows® 2003, Datacenter Edition, that lets you deploy Windows Server operating systems onto "bare-metal" servers over large installations.

ANSI

Abbreviation for American National Standards Institute.

API

Abbreviation for application program interface, which is a set of routines, protocols, and tools for building software applications that act as an interface between the operating system and application programs.

Argument

The value supplied with an option, such as in the following command line instance:

```
utilname --option=argument
```

ARP

Acronym for Address Resolution Protocol, which is a method for finding a host's Ethernet address from its Internet address.

ASCII

Acronym for American Standard Code for Information Interchange. A text file containing only characters from the ASCII character set (usually created with a text editor, such as Notepad in Windows), is called an ASCII file.

asset tag code

An individual code assigned to a system, usually by a system administrator, for security or tracking purposes.

autoexec.bat file

The **autoexec.bat** file is executed when you boot your system (after executing any commands in the **config.sys** file). This start-up file contains commands that define the characteristics of each device connected to your system, and it finds and executes programs stored in locations other than the active directory.

backup

A copy of a program or data file. As a precaution, you should back up your system's hard drive on a regular basis. Before making a change to the configuration of your system, you should back up important start-up files from your operating system.

baud rate

A measurement of data transmission speed. For example, modems are designed to transmit data at one or more specified baud rate(s) through the COM (serial) port of a system.

Bash

Bash is the shell, or command language interpreter, that will appear in the GNU operating system. Bash is an sh-compatible shell that incorporates useful features from the Korn shell (ksh) and C shell (csh).

binary

A base-2 numbering system that uses 0 and 1 to represent information. The system performs operations based on the ordering and calculation of these numbers.

BIOS

Acronym for basic input/output system. Your system's BIOS contains programs stored on a flash memory chip. The BIOS controls the following:

- Communications between the microprocessor and peripheral devices, such as the keyboard and the video adapter
- Miscellaneous functions, such as system messages

bit

The smallest unit of information interpreted by your system.

BMC

Abbreviation for baseboard management controller, which is the controller interface between the RAC and the managed system's ESM.

boot routine

When you start your system, it clears all memory, initializes devices, and loads the operating system. Unless the operating system fails to respond, you can reboot (also called warm boot) your system by pressing <Ctrl><Alt>; otherwise, you must perform a cold boot by pressing the reset button or by turning the system off and then back on.

bootable diskette

You can start your system from a diskette. To make a bootable diskette on a system running Windows, insert a diskette in the diskette drive, type `sys a:` at the command line prompt, and press <Enter>. Use this bootable diskette if your system will not boot from the hard drive.

bus

An information pathway between the components of a system. Your system contains an expansion bus that allows the microprocessor to communicate with controllers for all the various peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the microprocessor and RAM.

byte

Eight contiguous bits of information, the basic data unit used by your system.

cache

A fast storage area that keeps a copy of data or instructions for quicker data retrieval. For example, your system's BIOS may cache ROM code in faster RAM. Or, a disk-cache utility may reserve RAM in which to store frequently accessed information from your system's disk drives; when a program makes a request to a disk drive for data that is in the cache, the disk-cache utility can retrieve the data from RAM faster than from the disk drive.

CD-ROM

Abbreviation for compact disc read-only memory. CD drives use optical technology to read data from CDs. CDs are read-only storage devices; you cannot write new data to a CD with standard CD drives.

CERC

Cost-Effective RAID Controller (CERC) is a half-sized Peripheral Component Interconnect (PCI) adapter card that provides a way to improve the performance and availability of your storage subsystems.

CHAP

Acronym for Challenge-Handshake Authentication Protocol, an authentication scheme used by PPP servers to validate the identity of the originator of the connection upon connection or any time later.

CLI

Abbreviation for command line interface.

Command

The combination of an option and argument or just an option if no argument is required, such as in the following command line instances:

```
utilname --option
```

```
utilname --option=argument
```

command line instance

A series of valid commands, options, and arguments typed in the command line. For example, the Deployment Toolkit (DTK) utility name and all necessary options and arguments as they are entered through the operating system shell:

```
A:>utilname --option --option=argument
```

COM n

The device names for the first through fourth serial ports on your system are COM1, COM2, COM3, and COM4. The default interrupt for COM1 and COM3 is IRQ4, and the default interrupt for COM2 and COM4 is IRQ3. Therefore, you must be careful when configuring software that runs a serial device so that you don't create an interrupt conflict.

config.sys file

The **config.sys** file is executed when you boot your system (before running any commands in the **autoexec.bat** file). This start-up file contains commands that specify which devices to install and which drivers to use. This file also contains commands that determine how the operating system uses memory and controls files.

console redirection

Console redirection is a function that directs a managed system's display screen, mouse functions, and keyboard functions to the corresponding devices on a management station. You may then use the management station's system console to control the managed system.

controller

A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a disk drive or the keyboard.

control panel

The part of the system that contains indicators and controls, such as the power switch, hard drive access indicator, and power indicator.

conventional memory

The first 640 KB of RAM. Conventional memory is found in all systems. Unless they are specially designed, MS-DOS[®] programs are limited to running in conventional memory.

CPU

Abbreviation for central processing unit. See also microprocessor.

device driver

A program that allows the operating system or some other program to interface correctly with a peripheral device, such as a printer. Some device drivers—such as network drivers—must be loaded from the **config.sys** file (with a **device=** statement) or as memory-resident programs (usually, from the **autoexec.bat** file). Others—such as video drivers—must load when you start the program for which they were designed.

DHCP

Abbreviation for Dynamic Host Configuration Protocol, a protocol that provides a means to dynamically allocate IP addresses to computers on a LAN.

DIMM

Acronym for dual in-line memory module. A small circuit board containing DRAM chips that connects to the system board.

directory

Directories help keep related files organized on a disk in a hierarchical, "inverted tree" structure. Each disk has a "root" directory; for example, a C:\> prompt normally indicates that you are at the root directory of hard drive C. Additional directories that branch off of the root directory are called subdirectories. Subdirectories may contain additional directories branching off of them.

DKS

Abbreviation for dynamic kernel support.

DMA

Abbreviation for direct memory access. A DMA channel allows certain types of data transfer between RAM and a device to bypass the microprocessor.

DRAC 4

Acronym for Dell™ OpenManage™ Remote Access Controller, version 4.

DRAM

Acronym for dynamic random-access memory. A system's RAM is usually made up entirely of DRAM chips. Because DRAM chips cannot store an electrical charge indefinitely, your system continually refreshes each DRAM chip in the system.

EEPROM

Acronym for electrically erasable programmable read-only memory.

EIDE

Abbreviation for enhanced integrated drive electronics. EIDE devices add one or more of the following enhancements to the traditional IDE standard:

- Data transfer rates of up to 16 MB/sec
- Support for drives other than just hard drives, such as CD and tape drives
- Support for hard drives with capacities greater than 528 MB
- Support for up to two controllers, each with up to two devices attached

EMM

Abbreviation for expanded memory manager. A utility that uses extended memory to emulate expanded memory on systems with an Intel386™ or higher microprocessor.

EMS

Abbreviation for Expanded Memory Specification.

EPROM

Acronym for erasable programmable read-only memory.

ERA

Abbreviation for embedded remote access.

ERA/MC

Abbreviation for embedded remote access modular computer. See modular system.

ERA/O

Abbreviation for embedded remote access option.

ESM

Abbreviation for embedded systems management, which is a set of instruction coding in system software and firmware that notifies a user about potential hardware problems on a system.

expanded memory

A technique for accessing RAM above 1 MB. To enable expanded memory on your system, you must use an EMM. You should configure your system to support expanded memory only if you run application programs that can use (or require) expanded memory.

extended memory

RAM above 1 MB. Most software that can use it, such as the Windows operating system, requires that extended memory be under the control of an XMM.

external cache memory

A RAM cache using SRAM chips. Because SRAM chips operate at several times the speed of DRAM chips, the microprocessor can retrieve data and instructions faster from external cache memory than from RAM.

FAT

Acronym for file allocation table. FAT and FAT32 are file systems that are defined as follows:

- **FAT** — A file system used by MS-DOS, Windows 3.x, Windows 95, and Windows 98. Windows NT® and Windows 2000 also can use the FAT file system. The operating system maintains a table to keep track of the status of various segments of disk space used for file storage.
- **FAT32** — A derivative of the FAT file system. FAT32 supports smaller cluster sizes than FAT, thus providing more efficient space allocation on FAT32 drives.

FEPRM

Acronym for flash erasable programmable read-only memory. Flash memory is a kind of nonvolatile storage device similar to EEPROM, but the erasing is done only in blocks or the entire chip.

firmware

Software (programs or data) that has been written onto read-only memory (ROM). Firmware can boot and operate a device. Each controller contains firmware which helps provide the controller's functionality.

flash bios

A BIOS that is stored in flash memory rather than in ROM. A flash BIOS chip can be updated in place, whereas a ROM BIOS must be replaced with a newer chip.

flash memory

A type of EEPROM chip that can be reprogrammed from a utility on diskette while still installed in a system; most EEPROM chips can only be rewritten with special programming equipment.

format

To prepare a hard drive or diskette for storing files. An unconditional format deletes all data stored on the disk.

function commands

Commands that specify an action to be performed.

GB

Abbreviation for gigabyte(s). A gigabyte equals 1024 megabytes or 1,073,741,824 bytes.

graphics mode

A video mode that can be defined as x horizontal by y vertical pixels by z colors.

GUI

Acronym for graphical user interface.

GUID

Abbreviation for Globally Unique Identifier, which is a random number used in software applications. Each generated GUID is supposed to be unique.

HAPI

Acronym for Hardware Abstraction Programming Interface, which is the lowest layer that is installed on the operating system by the Instrumentation Service. This layer is re-used by Dell Update Packages and firmware tools, and flash utilities to access the hardware through a reusable pipe.

h

Abbreviation for hexadecimal. A base-16 numbering system, often used in programming to identify addresses in the system's RAM and I/O memory addresses for devices. The sequence of decimal numbers from 0 through 16, for example, is expressed in hexadecimal notation as: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10. In text, hexadecimal numbers are often followed by h.

HBA

Abbreviation for host bus adapter. A PCI adapter card that resides in the system whose only function is to convert data commands from PCI-bus format to storage interconnect format (examples: SCSI, Fibre Channel) and communicate directly with hard drives, tape drives, CD drives, or other storage devices.

HMA

Abbreviation for high memory area. The first 64 KB of extended memory above 1 MB. A memory manager that conforms to the XMS can make the HMA a direct extension of conventional memory. Also see XMM.

host adapter

A host adapter implements communication between the system's bus and the controller for a peripheral device. (hard drive controller subsystems include integrated host adapter circuitry.) To add a SCSI expansion bus to your system, you must install or connect the appropriate host adapter.

HPFS

Abbreviation for the High Performance File System option in the Windows NT operating systems.

HTTP

Abbreviation for Hypertext Transfer Protocol. HTTP is the client-server TCP/IP protocol used on the World Wide Web for the exchange of HTML documents.

HTTPS

Abbreviation for HyperText Transmission Protocol, Secure. HTTPS is a variant of HTTP used by Web browsers for handling secure transactions. HTTPS is a unique protocol that is simply SSL underneath HTTP. You need to use "https://" for HTTP URLs with SSL, whereas you continue to use "http://" for HTTP URLs without SSL.

ID

Abbreviation for identifier, commonly used when referring to a user identifier (user ID), object identifier (object ID), or hardware identifier (controller ID).

IDE

Abbreviation for Integrated Drive Electronics. IDE is a computer system interface, used primarily for hard drives and CDs.

I/O

Abbreviation for input/output. The keyboard is an input device, and a printer is an output device. In general, I/O activity can be differentiated from computational activity. For example, when a program sends a document to the printer, it is engaging in output activity; when the program sorts a list of terms, it is engaging in computational activity.

internal microprocessor cache

An instruction and data cache built in to the microprocessor. The Intel® Pentium® microprocessor includes a 16-KB internal cache, which is set up as an 8-KB read-only instruction cache and an 8-KB read/write data cache.

IP address

Abbreviation for Internet Protocol address. See TCP/IP.

IPMI

Abbreviation for Intelligent Platform Management Interface, which is a part of systems management technology.

IRQ

Abbreviation for interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the microprocessor. Each peripheral connection must be assigned an IRQ number. For example, the first serial port in your system (COM1) is assigned to IRQ4 by default. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

KB

Abbreviation for kilobyte(s), 1024 bytes.

key combination

A command requiring you to press multiple keys at the same time. For example, you can reboot your system by pressing the <Ctrl><Alt> key combination.

LAN

Acronym for local area network. A LAN system is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

local bus

On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. Some local-bus designs allow peripherals to run at the same speed and with the same width data path as the system's microprocessor.

LPT#

The device names for the first through third parallel printer ports on your system are LPT1, LPT2, and LPT3.

LRA

Abbreviation for local response agent.

MB

Abbreviation for megabyte(s). The term megabyte means 1,048,576 bytes; however, when referring to hard drive storage, the term is often rounded to mean 1,000,000 bytes.

memory

A system can contain several different forms of memory, such as RAM, ROM, and video memory. Frequently, the word memory is used as a synonym for RAM; for example, an unqualified statement such as "a system with 16 MB of memory" refers to a system with 16 MB of RAM.

memory address

A specific location, usually expressed as a hexadecimal number, in the system's RAM.

memory manager

A utility that controls the implementation of memory in addition to conventional memory, such as extended or expanded memory.

memory module

A small circuit board containing DRAM chips that connects to the system board.

MHz

Abbreviation for megahertz.

microprocessor

The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one microprocessor must usually be revised to run on another microprocessor. CPU is a synonym for microprocessor.

modem

A device that allows your system to communicate with other systems over telephone lines.

modular system

A system that can include multiple server modules. Each server module functions as an individual system. To function as a system, a server module is inserted into a chassis which includes power supplies, fans, a system management module, and at least one network switch module. The power supplies, fans, system management module, and network switch module are shared resources of the server modules in the chassis. See server module.

MS-DOS

Acronym for Microsoft Disk Operating System.

NIC

Acronym for network interface controller.

NTFS

Abbreviation for the Windows NT File System option in the Windows NT operating system. NTFS is an advanced file system designed for use specifically within the Windows NT operating system. It supports file system recovery, extremely large storage media, and long file names. It also supports object-oriented applications by treating all files as objects with user-defined and system-defined attributes. See also FAT.

NVRAM

Acronym for nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

option

An argument to a command that modifies its function rather than providing data and is usually set off by a delimiter such as - or /. Some options may or must be followed by a value, for example:

```
utilname -option=argument
```

parameter

A value or option that you specify to a program. A parameter is sometimes called a switch or an argument.

partition

You can divide a hard drive into multiple physical sections called partitions with the fdisk command. Each partition can contain multiple logical drives. After partitioning the hard drive, you must format each logical drive with the format command.

PCI

Abbreviation for Peripheral Component Interconnect. The predominant 32-bit or 64-bit local-bus standard developed by Intel Corporation.

PCMCIA

Personal Computer Memory Card International Association. An international trade association that has developed standards for devices, such as modems and external hard drives, that can be plugged into portable computers.

PERC

Acronym for PowerEdge Expandable RAID controller.

peripheral device

An internal or external device—such as a printer, a disk drive, or a keyboard—connected to a system.

Plug and Play

An industry-standard specification that makes it easier to add hardware devices to personal computers. Plug and Play provides automatic installation and configuration, compatibility with existing hardware, and dynamic support of mobile computing environments.

POST

Acronym for power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM, the disk drives, and the keyboard.

PPP

Short for Point-to-Point Protocol, it is a method of connecting a computer to the Internet.

pre-operating system environment

A shell environment, such as DOS, used to configure system hardware before a major operating system, such as Microsoft Windows or Linux, is installed.

program diskette set

The set of diskettes from which you can perform a complete installation of an operating system or application program. When you reconfigure a program, you often need its program diskette set.

PXE

Abbreviation for Pre-boot eXecution Environment.

RAC

Acronym for remote access controller.

RAID

Acronym for Redundant Array of Independent Disks.

RAM

Acronym for random-access memory. A system's primary temporary storage area for program instructions and data. Each location in RAM is identified by a number called a memory address. Any information stored in RAM is lost when you turn off your system.

RAM disk

A memory-resident program that emulates a hard drive.

read-only file

A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:

- Its read-only attribute is enabled.
- It resides on a physically write-protected diskette or on a diskette in a write-protected drive.
- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

readme file

A text file included with a software package or hardware product that contains information supplementing or updating the documentation for the software or hardware. Typically, readme files provide installation information, describe new product enhancements or corrections that have not yet been documented, and list known problems or other things you need to be aware of as you use the software or hardware.

RIS

Provided by Microsoft, you can use the Remote Installation Services (RIS) to install Windows operating systems to any number of client computers simultaneously from a central location.

ROM

Acronym for read-only memory. Your system contains some programs essential to its operation in ROM code. Unlike RAM, a ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

RPM

Abbreviation for Red Hat® Package Manager.

SAS

Short for Serial Attached SCSI, SAS is an evolution of parallel SCSI into a point-to-point serial peripheral interface in which controllers are linked directly to disk drives.

SATA

Abbreviation for Serial Advanced Technology Attachment, it refers to a newer interface standard for PC hard-disk drives. Each SATA port communicates through a small cable, to a single hard drive.

schema

A collection of class definitions that describes managed objects in a particular environment. A CIM schema is a collection of class definitions used to represent managed objects that are common to every management environment, which is why CIM is called the Common Information Model.

SCSI

Acronym for small computer system interface. An I/O bus interface with faster data transmission rates than standard ports. You can connect up to seven devices (15 for some newer SCSI types) to one SCSI interface.

server module

A modular system component that functions as an individual system. To function as a system, a server module is inserted into a chassis which includes power supplies, fans, a system management module, and at least one network switch module. The power supplies, fans, system management module, and network switch module are shared resources of the server modules in the chassis. See modular system.

service tag number

A bar code label that identifies each system in the event that you need to call for customer or technical support.

SMART

Acronym for Self-Monitoring Analysis and Reporting Technology. A technology that allows hard drives to report errors and failures to the system BIOS, which then displays an error message on the screen. To take advantage of this technology, you must have a SMART-compliant hard drive and the proper support in the system BIOS.

SMBIOS

Acronym for system management BIOS.

SNMP

Abbreviation for Simple Network Management Protocol. SNMP, a popular network control and monitoring protocol, is part of the original TCP/IP protocol suite. SNMP provides the format in which vital information about different network devices, such as network servers or routers, can be sent to a management application.

SNMP trap

A notification (event) generated by the RAC or ESM that contains information about state changes on the managed system or about potential hardware problems.

SOL

Abbreviation for Serial Over LAN. SOL enables suitably designed servers to transparently redirect the serial character stream of a baseboard UART to/from a remote client over a shared LAN. The architecture requires software running on the managed system's BMC and client software running on a management station and/or a central network proxy.

support commands

Commands that specify how an action should be performed.

syntax

The rules that dictate how you must type a command or instruction so that the system understands it. A variable's syntax indicates its data type.

system configuration information

Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

system diskette

System diskette is a synonym for bootable diskette.

system memory

System memory is a synonym for RAM.

System Setup program

A BIOS-based program that allows you to configure your system's hardware and customize the system's operation by setting such features as password protection and energy management. Some options in the System Setup program require that you reboot the system (or the system may reboot automatically) in order to make a hardware configuration change. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

system.ini file

A start-up file for the Windows operating system. When you start Windows, it consults the **system.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **system.ini** file records which video, mouse, and keyboard drivers are installed for Windows.

Running the Control Panel or Windows Setup program may change options in the **system.ini** file. On other occasions, you may need to change or add options to the **system.ini** file manually with a text editor, such as Notepad.

TCP/IP

Abbreviation for Transmission Control Protocol/Internet Protocol. A system for transferring information over a computer network containing dissimilar systems, such as systems running Windows and UNIX.

text editor

An application program for editing text files consisting exclusively of ASCII characters. Windows Notepad is a text editor, for example. Most word processors use proprietary file formats containing binary characters, although some can read and write text files.

text mode

A video mode that can be defined as x columns by y rows of characters.

TFTP

Abbreviation for Trivial File Transfer Protocol, a simple form of the File Transfer Protocol (FTP). TFTP uses the User Datagram Protocol (UDP) and provides no security features. It is often used by servers to boot diskless workstations, X-terminals, and routers.

UART

Acronym for universal asynchronous receiver-transmitter. The UART is a system component that handles asynchronous serial communication by converting parallel bytes from the processor into serial bits for transmission (and vice versa).

unicode

A fixed width, 16-bit world wide character encoding, developed and maintained by the Unicode Consortium.

upper memory area

The 384 KB of RAM located between 640 KB and 1 MB. If the system has an Intel386 or higher microprocessor, a utility called a memory manager can create UMBs in the upper memory area, in which you can load device drivers and memory-resident programs.

URL

Abbreviation for Uniform Resource Locator (formerly Universal Resource Locator).

USB

Abbreviation for Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice, keyboards, printers, and computer speakers. USB devices can also be connected and disconnected while the system is running.

utility

A program used to manage system resources—memory, disk drives, or printers, for example.

utility partition

A bootable partition on the hard drive that provides utilities and diagnostics for your hardware and software. When activated, the partition boots and provides an executable environment for the partition's utilities.

UUID

Abbreviation for Universal Unique Identification.

variable

A component of a managed object. A temperature probe, for example, has a variable to describe its capabilities, its health or status, and certain indexes that you can use to help you in locating the right temperature probe.

VESA

Acronym for Video Electronics Standards Association.

virtual memory

A method for increasing addressable RAM by using the hard drive. For example, in a system with 16 MB of RAM and 16 MB of virtual memory set up on the hard drive, the operating system would manage the system as though it had 32 MB of physical RAM.

VT-100

Abbreviation for Video Terminal 100, which is used by the most common terminal emulation programs.

WAN

Abbreviation for wide area network.

Web server

An application that makes Web pages available for viewing by Web browsers using the HTTP protocol.

WH

Abbreviation for watt-hour(s).

win.ini file

A start-up file for the Windows operating system. When you start Windows, it consults the **win.ini** file to determine a variety of options for the Windows operating environment. Among other things, the **win.ini** file records what printer(s) and fonts are installed for Windows. The **win.ini** file also usually includes sections that contain optional settings for Windows application programs that are installed on the hard drive. Running the Control Panel or Windows Setup program may change options in the **win.ini** file. On other occasions, you may need to change or add options to the **win.ini** file manually with a text editor such as Notepad.

winbom.ini

A **.ini** file that provides a bill-of-materials to incorporate into the Windows installation. **winbom.ini** can control different points of the installation and configuration process: for example, it can control Windows preinstallation when starting from the Windows Preinstallation Environment (Windows PE), or Windows XP configuration during Windows Welcome.

Windows 95

An integrated and complete Microsoft Windows operating system that does not require MS-DOS and that provides advanced operating system performance, improved ease of use, enhanced workgroup functionality, and simplified file management and browsing.

Windows NT

High-performance server and workstation operating system software developed by Microsoft that is intended for technical, engineering, and financial applications.

Windows Preinstallation Environment (Windows PE)

The Microsoft Windows Preinstallation Environment (Windows PE) is a minimal Win32 subsystem with limited services, based on the Windows kernel running in protected mode. It contains the minimal functionality that you need to run Windows Setup, install an operating system from a network share, automate basic processes, and perform hardware validation.

write-protected

Read-only files are said to be write-protected. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position or by setting the write-protect feature in the System Setup program.

XMM

Abbreviation for extended memory manager, a utility that allows application programs and operating systems to use extended memory in accordance with the XMS.

XMS

Abbreviation for eXtended Memory Specification.

X Windows system

The graphical user interface used in the Red Hat Enterprise Linux[®] Server environment.

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