Operating System Deployment on Dell Enterprise Client Systems using Microsoft System Center Configuration Manager 2007

A Dell Best Practices White Paper

Dell │TechCenter

Warren Byle

Dell │Product Group

Sandeep Karandikar

Table of Contents

Introduction

IT departments typically manage a heterogeneous mix of decentralized client hardware and various software applications. Administration of large enterprises requires the use of centralized systems management processes that use consistent methods for managing the diverse network clients. Some typical IT administration activities involve deploying standardized corporate operating systems to client hardware, and using a consistent mechanism to gather application software, hardware, and operating system (OS) information across the network from a central management console like Microsoft System Center Configuration Manager 2007 (ConfigMgr).

The Dell™ Client System Deployment CABs (Driver CABs) provide the mechanism for an IT professional to rapidly develop and deploy customized corporate OS images on Dell client systems. This whitepaper provides an overview of how to leverage the operating system deployment (OSD) capabilities of [Microsoft System Center Configuration Manager (ConfigMgr/SCCM) 2007](#)™ in conjunction with the Dell™ Client System Deployment CABs to deploy a customized OS image on Dell client systems.

The intended audiences for this paper are IT and network professionals or managers who need to integrate the Dell Driver CABs into their ConfigMgr 2007 OSD Task Sequences for deployment on Dell Enterprise Client systems. The reader is expected to have a basic understanding of ConfigMgr 2007 OSD and has a Task Sequence created.

If you are new to OS Deployment, Dell has a plug-in for ConfigMgr 2007 called Dell Client Deployment Pack which is helpful if you need help building your OS deployments from the ground up. It won't be discussed in this whitepaper, but more information on the Dell Client Deployment Pack can be found on Dell TechCenter at http://www.delltechcenter.com/page/Dell+Client+Deployment+Pack. Also, Microsoft has very good introductory information on how to use the Operating System Deployment features in ConfigMgr 2007 at the following link. http://technet.microsoft.com/en-us/library/bb632767.aspx

Client System Deployment CAB Overview

The Dell Client System Deployment CAB files offer new levels of ease and flexibility for creating and deploying customized OS images on Dell Enterprise Client systems. Those Enterprise Client systems include Latitude™, Optiplex™, and Precision™ systems.

The key capabilities provided by the Dell Client Systems Deployment CABs are:

- Delivers all system applicable drivers in a single archive which is optimized for consumption by ConfigMgr 2007.
- Simplifies the process of deploying corporate standard images on Dell client systems

With the Dell Client System Deployment CABs, an IT Professional can perform the following tasks:

- Create a system-level optimized deployment task sequence
- Manage Boot Image (WinPE) drivers
- Optimize the deployment of targeted system-specific driver packages

The Driver CAB's are available on support.dell.com. They can also be found, with additional information, on http://delltechcenter.com.

Naming Convention

All recent Dell CABs use the following file naming convention:

<Model>-<OS>-<Version>-<release#>.cab. So the Windows 7 Driver CAB for a Latitude E4310 notebook would be named: E4310-Win7-A01-R278010.cab.

A typical system cabinet for a Latitude E4310 notebook is displayed in Figure 1 below.
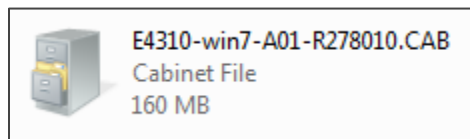

E4310-win7-A01-R278010.CAB
Cabinet File
160 MB

Figure 1: Typical system cabinet file after being downloaded

CAB Editing Tools

IT professionals will need to extract the CABs, and only add drivers that are needed for the configurations they support. Windows Explorer supports native viewing of CAB contents or you can use WinZip (or similar archive file program) to examine or extract the contents of the cab.

Optionally Microsoft provides tools in the Windows XP Service Pack 2 Support Tools for examining cabinet files. Extraction tools (CabArc and Extract) are available from Microsoft at the following location

http://www.microsoft.com/downloads/details.aspx?FamilyId=49AE8576-9BB9-4126-9761-BA8011FABF38&displaylang=en.

- CAB Management Tool from Microsoft
  Using CabArc to extract the driver contents and maintain directory structure:
  *CabArc.exe -p x <cab file path> *.* <output path>*
  *(e.g. C:\Cabarc.exe –p x C:\E4310-Win7-A01-R278010.cab *.* C:\drivers\)*
- Extract Utility from Microsoft
  Once you are in the directory where you want to extract, enter the following command:

  extract /Y /E E4310-Win7-A01-R278010.cab

CAB Content Details

Once the CAB is extracted, the readme.txt and Manifest.xml files provide additional content details and information. The manifest file includes specifics such as:

- Driver versions

- Release date
- Supported devices in that particular release

The readme.txt and a summary of the Manifest.xml can be found on http://delltechcenter.com if you would like to review them before downloading or for future reference.

The readme.txt and manifest.xml file location is displayed in Figure 2 below.
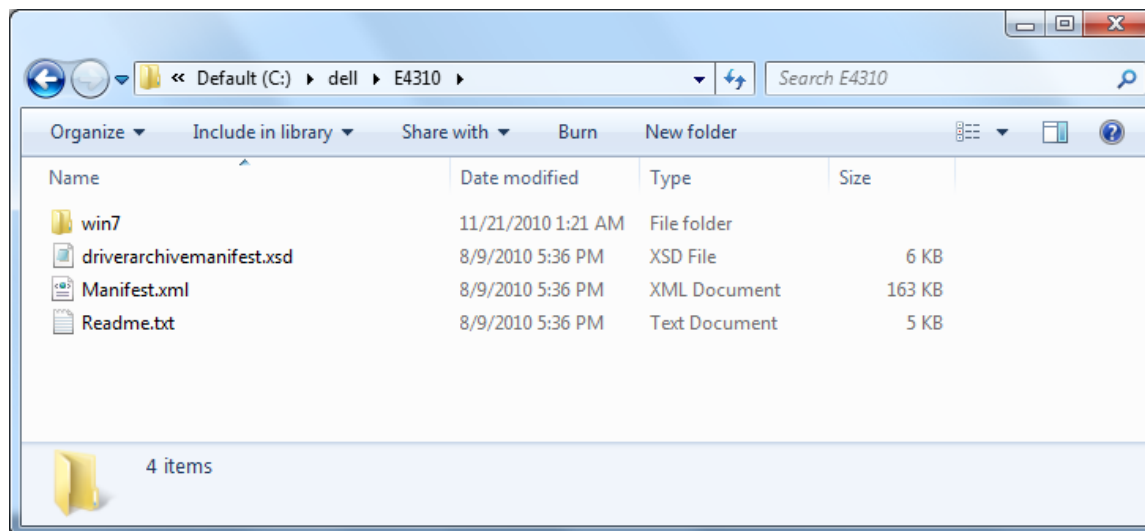
Figure 2: Readme.txt and Manifest.xml file location

Extracted Folder Structure

The extracted Driver CAB folder structure is as follows:
<model><OS><architecture><category><release#>. Grouping the driver content in this manner provides the customer with the ability to remove any architecture-specific folder that is not required for a particular model in their environment. The listing granularity provides the flexibility to replace any device drivers in the future if needed.

Figure 3 provides an overview of the architecture-specific folder structure.

Figure 3: Architecture-specific folder structure overview

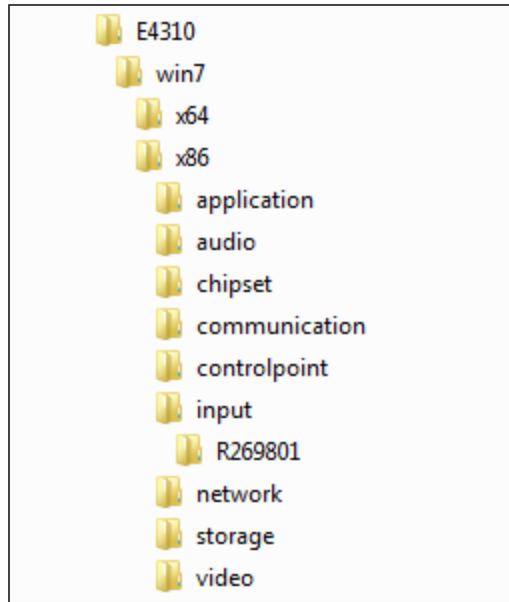# ConfigMgr 2007 OS Deployment with the Driver CABs

The following sections describe how an IT professional can customize ConfigMgr 2007 to better deploy Dell hardware in their environment by using the Dell Client System Deployment CABs.

Larger enterprise customers typically have multiple Dell models spanning several generations. IT Professionals can use the model names to target the specific model for applicable drivers when deploying a new operating system like Windows 7.

Model-centric driver targeting offers the following advantages for OS deployments:

- Simplifies driver management
- Shortens driver testing cycles
- Limits troubleshooting to a single driver package

Dell drivers are used in both the Boot Image and the Task Sequence during OS Deployment with ConfigMgr 2007. We'll look at each of the processes in detail below.

Boot Image Driver Management

Support for a new model may require that corresponding network and mass storage driver support be added to the Boot Image, a Windows pre-installation environment (WinPE) within ConfigMgr 2007. WinPE 2.1 is included in ConfigMgr 2007 RTM and ConfigMgr 2007 SP1, and requires the Windows Vista-based storage and network drivers. For ConfigMgr 2007 SP2, WinPE 3.0 is used which requires Windows 7-based storage and network drivers.

Dell provides WinPE CABs for both WinPE 2.1 and WinPE 3.0 which include network and mass storage drivers in 32-bit and 64-bit versions for all supported systems. ConfigMgr 2007 has a process for adding

drivers from the driver store to a Boot Image or you can create a custom WinPE with the drivers already included.

IT Professionals can choose to include some or all of the WinPE CAB drivers into their Boot Image to support the Dell systems that are used in their environment. However, as of this writing, WinPE 3.0 is relatively new and requires very few (if any) additional drivers to support Dell Enterprise Client systems.

Details on which additional WinPE drivers are required for a given platform are available on http://delltechcenter.com.

For more details on configuring Boot Images within ConfigMgr 2007, visit the following Web address:

http://technet.microsoft.com/en-us/library/bb680372.aspx

The following steps describe the process of importing a WinPE Driver CAB into the ConfigMgr 2007 driver store and then including the imported drivers into a Boot Image.

1. Extract the WinPE CAB to a shared network folder that is accessible by UNC path.
2. Right Click on Drivers in the ConfigMgr Console and select Import to launch the Import New Driver Wizard. See Figure 4 below.
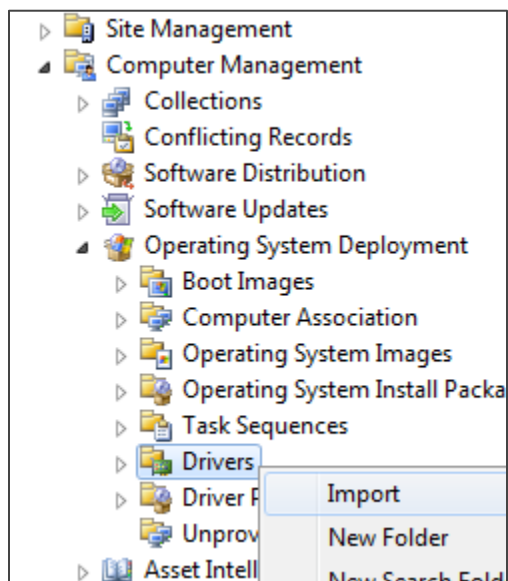

Figure 4: Driver Import launch location

3. For the Source Folder select the location of the extracted WinPE CAB and select the appropriate architecture subfolder (x86 or x64) to correspond with the WinPE architecture used in the Boot Image you are updating. Click Next. See Figure 5 below.
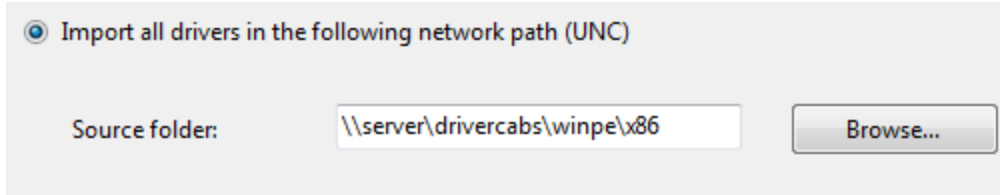
Figure 5: WinPE Driver CAB source location

4. Add a category for these drivers like "WinPE30x86" so that you can easily find them in the driver store. Click Next. See Figure 6 below.
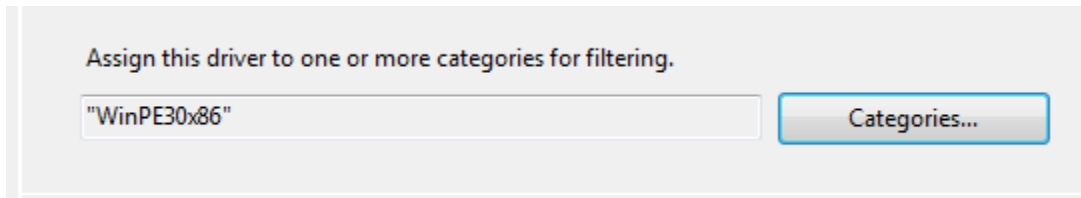
Figure 6: WinPE Driver CAB category example

5. You do not need to add these drivers to a Driver Package. Click Next.
6. Select your Boot Image and check the box to "Update distribution points when finished", unless you would rather update them at a later time. Click Next. See Figure 7 below.
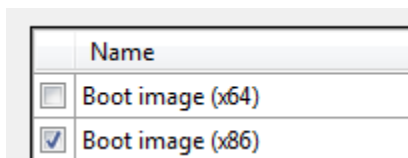
Figure 7: Boot Image selection

7. Click Next after reviewing the Summary page.
8. Click Close when the Import process is complete.

Your Boot Image now contains all of the Dell network and mass storage drivers for the supported Dell systems.

A detailed walk-through of the previous steps along with the process to embed drivers into WinPE without using ConfigMgr 2007 is available on Dell TechCenter at
http://www.delltechcenter.com/page/Create+a+WinPE+Bootable+disk+to+Support+Dell+Hardware+%28NIC%2C+Mass+Storage+Injection%29

Task Sequence Driver Management

ConfigMgr 2007 provides a feature-rich OS Deployment toolkit which simplifies deployments by enabling you to deploy one OS task sequence to many different systems. There are two mechanisms for managing drivers in the OSD Task Sequence. In this section we will explore the basics of the two options along with Dell's recommendation and steps for implementing it.

1. Auto Apply Drivers
    a. Use the Import Drivers wizard and import each driver from the extracted Driver CAB into the ConfigMgr 2007 driver store.
    b. Once the drivers have been imported, the OS deployment task sequence can use plug-and-play enumeration to apply needed drivers by using the Auto Apply Drivers task sequence item.
    c. Categories can be applied to provide granular control of the Auto Apply Drivers process.
2. Apply Driver Package
    a. Create a Driver package with one of the steps below.
        i. Import - Use the Import Drivers wizard and import the drivers from the extracted Driver CAB into the driver store and assigns them to a model specific Driver Package.
        ii. Raw – Use the extracted Driver CAB as the source for the Driver Package without importing the drivers into the driver store. Note: ConfigMgr 2012 does not support and cannot migrate, raw driver packages.
    b. The driver packages are targeted to the appropriate model using a WMI query associated with the Apply Driver Package task sequence item.

Dell recommends using the Apply Driver Package (options 2) method for the following reasons:

- Apply Driver Package is the only process that supports all methods of ConfigMgr 2007 OSD delivery, specifically Standalone Media which requires Apply Driver Package.
- Post-deployment hardware configuration changes, like SATA Operation, are handled appropriately since all of the drivers are staged during OS Deployment.
- Using model specific driver packages ensures a consistent OS deployment across the given model set.
- Adding or removing Driver Packages, or drivers within a Driver Package, will only affect the targeted systems. This minimizes testing time and limits the impact on other systems.
- Note: ConfigMgr 2012 can only migrate ConfigMgr 2007 driver packages that have been imported into the ConfigMgr driver store. The ability to use raw driver packages is no longer available in ConfigMgr 2012

Imported vs. Raw Driver Packages

Your decision to create driver packages from imported driver or directly from the CABs depends on your environment and your personal preferences. Here are a few things to help you decide.

Importing drivers gives you more driver information in the console, and makes drivers available for use in Boot Images, but requires managing the extracted driver CABs and the imported drivers in the driver store.

Using raw driver packages makes for easy driver maintenance as they are not in the driver store in addition to the extracted CAB location, but requires that you separately import drivers for WinPE and XP mass storage drivers.

Note: ConfigMgr 2012 requires that drivers be imported. You will not be able to migrate ConfigMgr 2007 driver packages that were not imported (raw).

Creating a Driver Package with Imported Drivers

The following steps outline how to create a driver package for use with the Apply Driver Package function of ConfigMgr 2007 OSD when importing a Driver CAB into the ConfigMgr driver store.

1. Extract the Driver CAB to a shared folder that is accessible by UNC path.
2. Right Click on Drivers in the ConfigMgr Console and select Import to launch the Import New Driver Wizard. See Figure 4 above for an example.
3. For the Source Folder select the location of the extracted CAB and select the appropriate architecture subfolder (x86 or x64) to correspond with the architecture being deployed with your OSD task sequence. Click Next. See Figure 8 below.
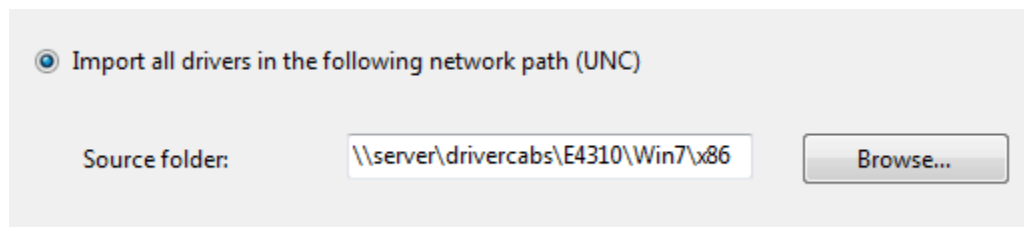

Figure 8: Driver Cab location

4. Add a category for the drivers that correspond with your import, like "E4310-Win7x86" so that you can easily find them in the driver store. Click Next. See Figure 5 above for an example.
5. Unless you already have an empty driver package created, click the New Package button and provide a name for the package like "E4310-Win7x86" and select a location where ConfigMgr 2007 can store the imported drivers. This should be a different location from the extracted CAB. See Figure 9 below.
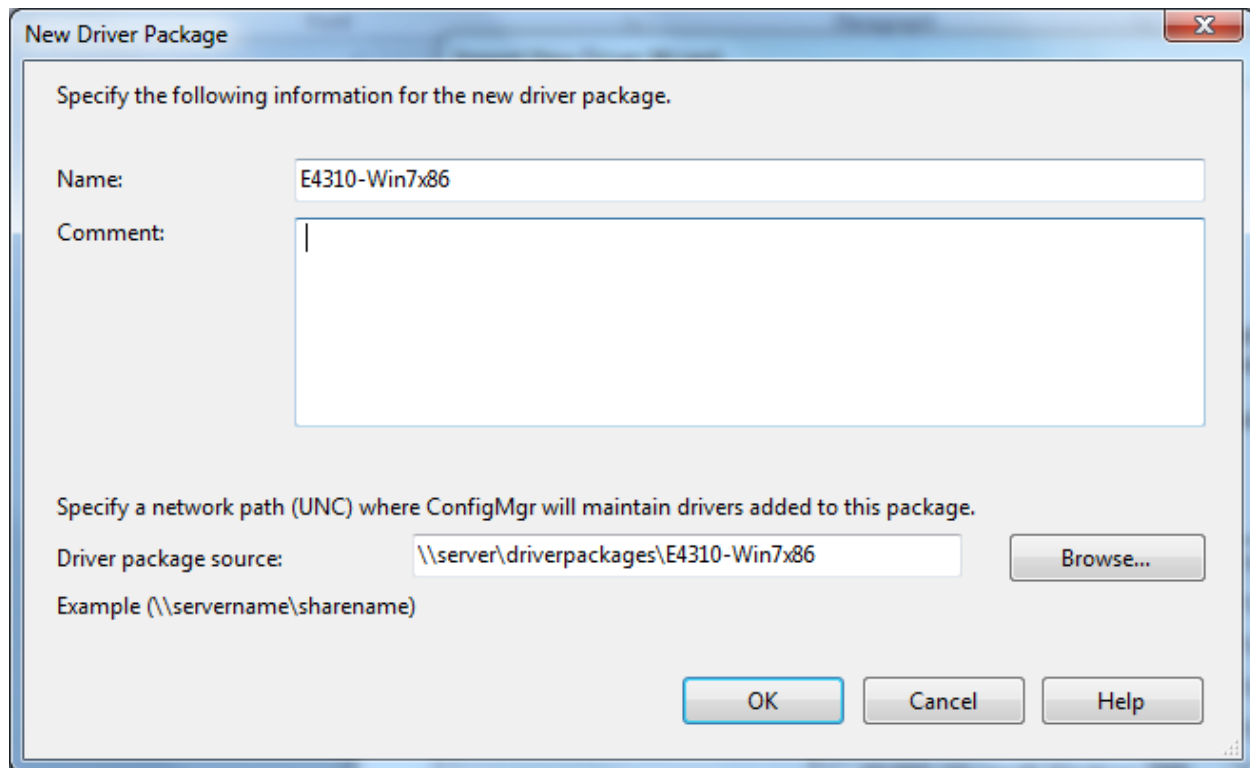
Figure 9: New Driver Package during import

6. Check the "update distribution points when finished" checkbox if you are ready to send this package out to your DP's. Leave it unchecked if you will be updating the DP's manually at a more appropriate time. Click Next.
7. Click Next to the "Add drivers to Boot Images" screen as most of the drivers do not apply to Boot Images.
8. Click Next to the Summary page
9. Click Close when the process is complete.

The package is now ready to be used by your OSD Task Sequence. We'll cover that process in the "Apply Driver Package in a Task Sequence" section below.

Creating a Driver Package with Raw Drivers

The following steps outline how to create a driver package for use with the Apply Driver Package function of ConfigMgr 2007 OSD without importing the Driver CAB into the ConfigMgr driver store.

Note: ConfigMgr 2012 does not allow Raw driver packages and cannot migrate ConfigMgr 2007 driver packages that were not imported.

1. Extract the Driver CAB to a shared folder that is accessible by UNC path.

2. Right Click on Driver Packages in the ConfigMgr Console and select New -> Driver Package. See Figure 10 below.

Figure 10: New Driver Package launch location
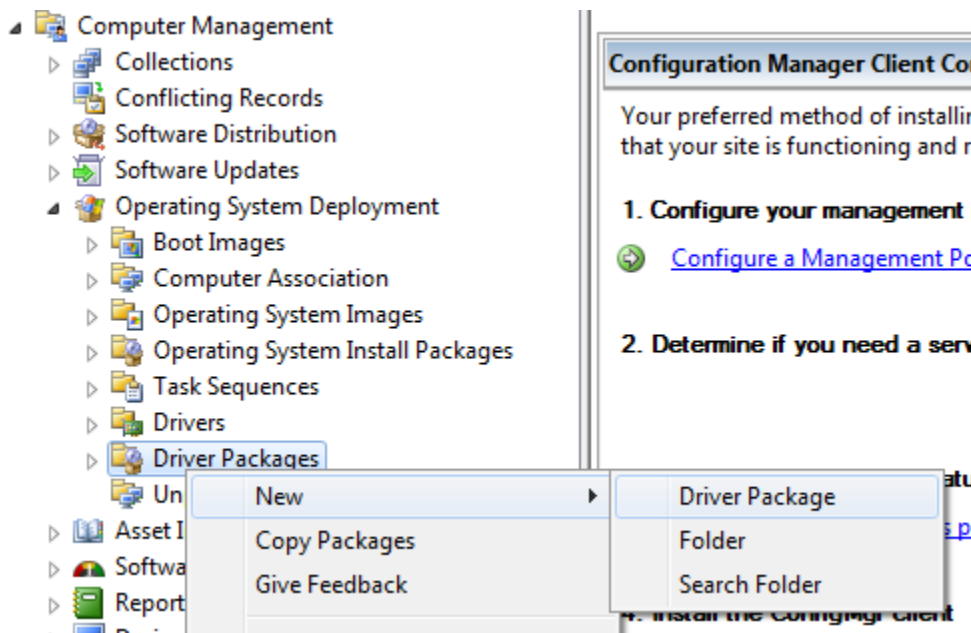
3. Provide an appropriate name to reflect the contents of Driver package like "E4310-Win7x86" and for the Package Source Folder select the location of the extracted CAB. Make sure you select the appropriate architecture subfolder (x86 or x64) to correspond with the architecture being deployed with your OSD task sequence. Click OK to create the driver package. See Figure 11 below.
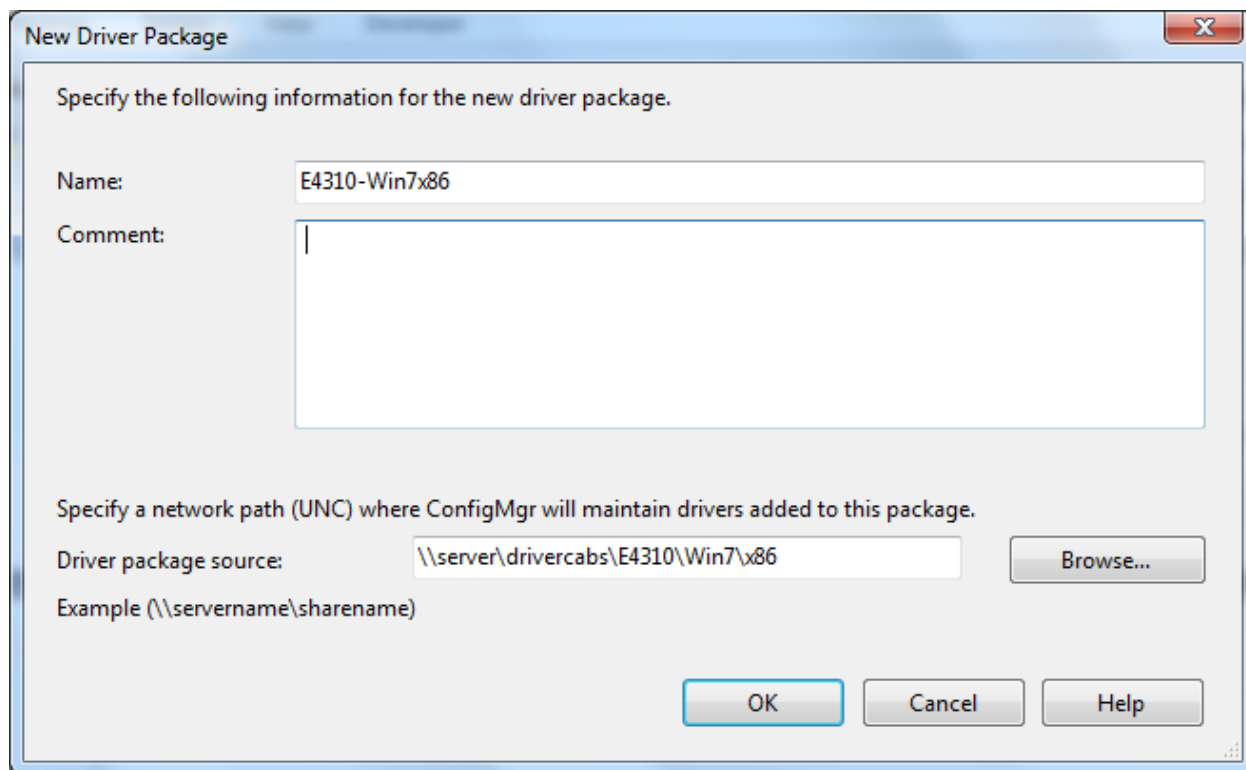
Figure 11: New Driver Package without importing

4. Once the driver package has been created, ensure that the distribution points are updated so that they are available for the OSD Task Sequence to use.

The package is now ready to be used by your OSD Task Sequence.

Apply Driver Package in a Task Sequence

Now that you have created a driver package and have it available on your distribution points, it is time to include it in your task sequence. The following steps will show you how to accomplish this.

If you do not already have a working task sequence, then refer to the following Microsoft documentation to get your task sequence created. http://technet.microsoft.com/en-us/library/bb632767.aspx

1. In the ConfigMgr Console, right click on your task sequence and select Edit to launch the Task Sequence Editor. See Figure 12 below.
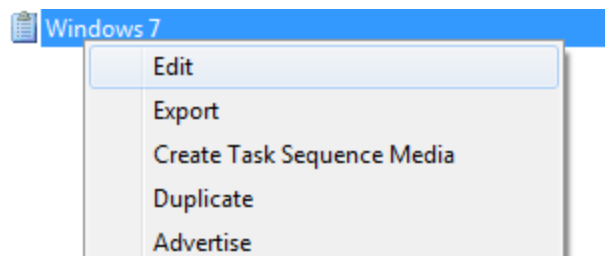
Figure 12: Launch Task Sequence Editor

2. Select Add->Drivers->Apply Driver Package from the drop down menu. Make sure you place this step after "Apply Network Settings" and before "Setup Operating System". See Figure 13 below.
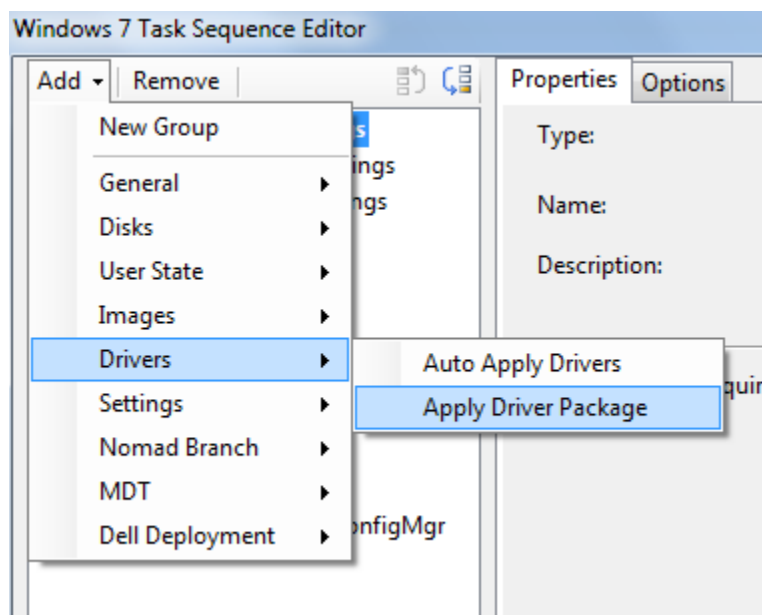
Figure 13: Add Apply Driver Package item

3. Change the name of the new Apply Driver Package step to something useful like "E4310-Win7x86" and click Browse and select the driver package you created in the previous section.
4. Check the "Do unattended installation of unsigned drivers on versions of Windows where this is allowed" checkbox. See Figure 14 Below.
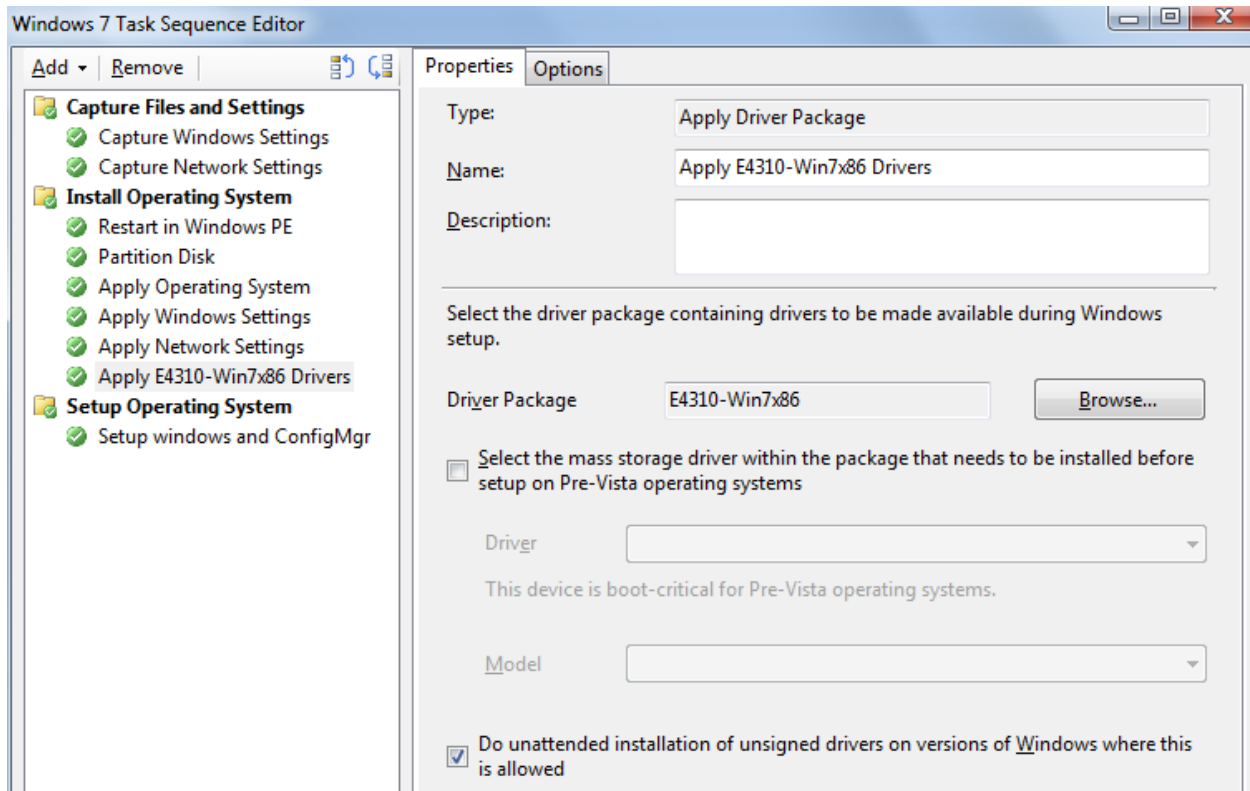
Figure 14: Configure Apply Driver Package item

5. Click on the Options tab and we will create a query to target this driver package to only the model it is intended.
6. Select Add a condition->Query WMI from the drop down menu. See Figure 15 below.
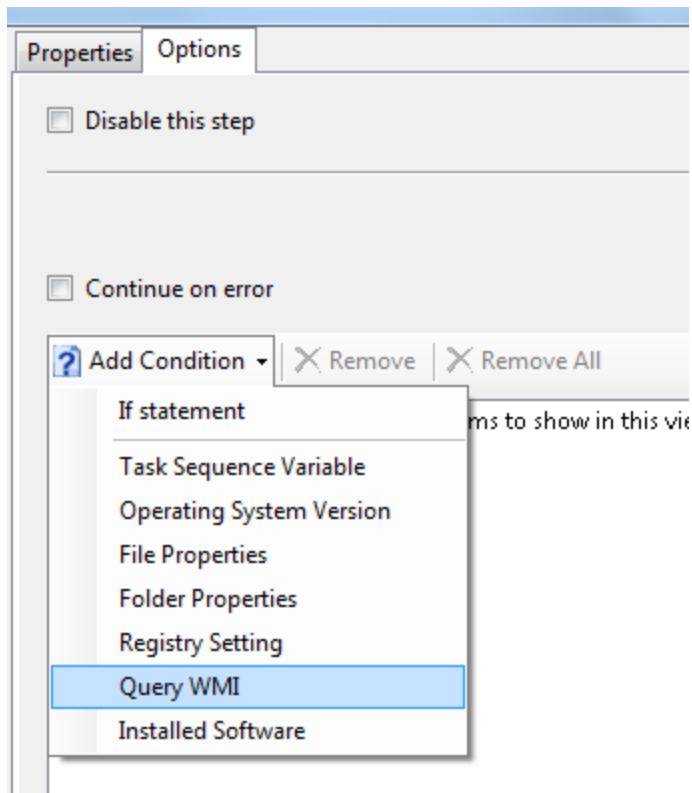
Figure 15: Create Query WMI condition

7. In the query window type *select * from Win32_ComputerSystem where Model like 'Latitude E4310%' and* click OK. *The query will now appear as a required condition in order to run the task sequence step.* Note: Dell Enterprise Client systems have trailing spaces after the model name in WMI. This is the reason for using "like" instead of the equal sign. See Figure 16 below.

Figure 16: WMI query details

8. You can use the Test Query button to verify the query. It will return a 1 if your ConfigMgr Console is installed on the model being queried. Otherwise, it will return a 0.
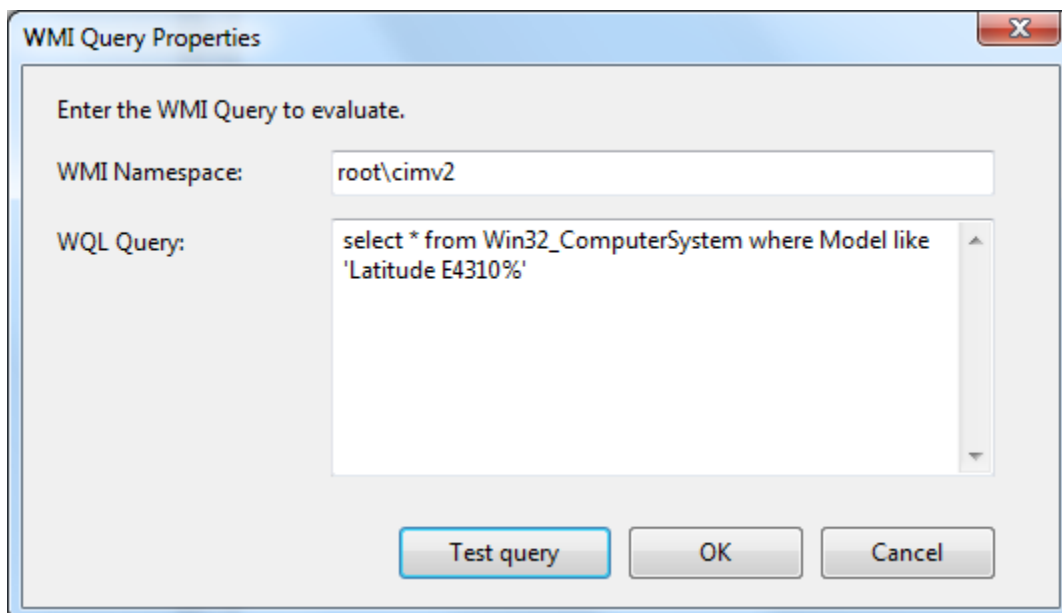9. Click OK in the Task Sequence Editor window to save the changes to your task sequence.

Your task sequence is now configured to apply the E4310-Win7x86 driver package to only E4310 systems. If you have more models to support, create additional driver packages for them in the same manner.

More information and discussions on Task Sequence driver management can be found on http://delltechcenter.com

Windows XP Requirements

There are some extra steps to successfully deploy Windows XP with ConfigMgr 2007. In this section we will address mass storage driver pre-staging and the Windows XP hotfixes that are required.

Configuring Mass Storage Drivers for XP

Windows XP OS setup requires that the mass storage device be pre-staged prior to the initial boot into the deployed OS image. Failure to properly pre-stage storage drivers on Windows XP systems may result in a continuous reboot with the following error: 0x0000007B (INACCESSIBLE_BOOT_DEVICE). The following steps show the additional storage driver setup when using the "Apply Driver Package" step in the task sequence:

1. Open the Task Sequence Editor in the ConfigMgr Console by right clicking on your XP task sequence and choosing Edit. See Figure 12 above for an example.
2. Click on the Apply Driver Package step for the model that needs a storage driver pre-staged.
3. In the Properties tab, check the "Select the mass storage driver within the package that needs to be installed before setup on Pre-Vista operating systems" check box.
4. Using the Table 1 below, choose the Driver and Model of mass storage driver from the drop down menus that apply to your system. See Figure 17 below.

Figure 17: Pre-stage XP mass storage driver

    5.   Click OK to save the changes to the Task Sequence.

If you did not import the XP driver CAB into the ConfigMgr driver store, you will not have any mass storage drivers listed as ConfigMgr is not aware of the contents of the driver package unless it has been imported. The solution is to create a driver package with only the mass storage drivers required and import it into the driver store.

Also, if you want to support all modes of mass storage operation available on a system you will want to create additional Apply Driver Package steps to add the other mass storage drivers as you are only able to add a single mass storage driver per Apply Driver Package step.

Table 1 shows the required XP mass storage driver for the associated BIOS setting for SATA operation.

Dell System	BIOS Setting for SATA Operation	OSD Driver Name	OSD Model Name
Desktops			
Optiplex 755	RAID Autodetect/ AHCI (factory default)	Intel® 82801 FBM SATA AHCI Controller	Intel® ICH9 SATA AHCIController (Desktop ICH9R)
Optiplex 760/780/960/980	RAID Autodetect/ AHCI	Intel® ESB2 SATA AHCI Controller	Intel® ICH10D/DO SATA AHCI Controller
Optiplex 760/780/960/980	RAID Autodetect/ ATA	Intel® ESB2 SATA AHCI Controller	Intel® ICH10D/DO SATA AHCI Controller
Optiplex 760/780/960/980	RAID On (factory default)	Intel® ESB2 SATA RAID Controller	Intel® ICH8R/ICH9R/ICH10R/DO SATA RAID Controller
Precision Workstations (x90)	RAID Autodetect/AHCI (Factory Default) RAID Autodetect/ATA	Intel® 82801 FBM SATA AHCI Controller	Intel® 631xESB/632xESB SATA AHCI Controller (Server/Workstation ESB2)
Precision Workstations (x90)	RAID On	Intel® 82801 HEM SATA RAID Controller	Intel® 631xESB/632xESB SATA RAID Controller (Server/Workstation ESB2)
Precision Workstations	AHCI	Intel® ESB2 SATA AHCI Controller	Intel® ICH9R/DO/DH SATA AHCI Controller
Precision Workstations	RAID	Intel® ESB2 SATA RAID Controller	Intel® ICH8R/ICH9R/ICH10R/DO SATA RAID Controller
Precision Workstations	SAS Controller ON	Dell SAS 5/E Adapter Controller	Dell SAS 5x and SAS 6x Controller Driver (Windows XP 32-bit)
Precision Workstations	PERC Controller ON	Dell PERC 5/E Adapter RAID Controller	Dell PERC5 and PERC6/CERC6 RAID Controller Driver (Windows XP)
Notebooks			
Latitude Dx30	AHCI	Intel® 82801FR SATA AHCI Controller	Intel® 82801 HEM/HBM SATA AHCI Controller (Mobile ICH8M-E/M)
Latitude E and Precision Mx4x0	ATA	Intel® ESB2 SATA AHCI Controller	Intel® ICH9M-E/M SATA AHCI Controller
Latitude E and Precision Mx4x0	AHCI	Intel® ESB2 SATA AHCI Controller	Intel® ICH9M-E/M SATA AHCI Controller
Latitude E and Precision Mx4x0	IRRT (factory default)	Intel® ESB2 SATA RAID Controller	Intel® ICH8-M-E/ICH9M-E SATA RAID Controller

Table 1: XP drivers required for a given model by SATA operation

For the latest information on XP mass storage driver requirements, go to the Dell TechCenter page
http://www.delltechcenter.com/page/Operating+System+Deployment+-
+XP+Mass+Storage+Driver+Reference

Apply Hotfix in OSD Task Sequence

Microsoft releases hotfixes to fix certain OS-related hardware issues. The release of the hotfixes determines whether they will be in the next service pack. Table 2 contains a list of hotfixes that are not present in the SP2/SP3 XP releases, and are needed to correctly enable audio on E-Series systems. If the identified hotfixes aren't part of the base image, they need to be added to the installed OS during an OS-deployment task sequence to ensure proper hardware functioning.

OS	Hotfix reference	Download Link
Windows XP 64 Bit SP1	KB901105	http://support.microsoft.com/kb/901105
Window XP 32 Bit (SP2 /SP3)	KB835221	http://support.microsoft.com/kb/835221

Table 2: Required hotfixes for audio on E-series systems

NOTE: The hotfixes need to be applied as soon as the OS has booted with the appropriate storage drivers, but before any of the add-on drivers are applied. This will ensure that the appropriate the PnP device enumeration and driver matching occurs during deployment.

Supported Dell Hardware and Operating Systems

Most of the recent Latitude, Optiplex, and Precision systems have driver CABs available for the Windows OS's supported by the given model. You can check the support.dell.com site and the CABs will be listed in the Systems Management section of the driver downloads section for the model selected. You can also visit the Dell TechCenter (http://www.delltechcenter.com/page/Dell+Business+Client+Operating+System+Deployment+-+The+.CAB+Files), which keeps a current list and details of available driver CABs.

Table 3 lists the supported models and the operating systems that have CABs available.

System	Win7	Vista	XP
Optiplex FX160		X	X
Optiplex 160		X	X
Optiplex 360	X	X	X
Optiplex 380	X		X
Optiplex 580	X	X	X
Optiplex 760	X	X	X
Optiplex 780	X	X	X
Optiplex 960	X	X	X
Optiplex 980	X	X	X
Optiplex XE	X	X	X
Latitude 2100	X	X	X
Latitude 2110	X	X	X

Latitude E4200	X	X	X
Latitude E4300	X	X	X
Latitude E4310	X	X	X
Latitude E5400	X	X	X
Latitude E5410	X	X	X
Latitude E5500	X	X	X
Latitude E5510	X	X	X
Latitude E6400	X	X	X
Latitude E6400ATG	X	X	X
Latitude E6410	X	X	X
Latitude E6500	X	X	X
Latitude E6510	X	X	X
Latitude XT2	X	X	X
Latitude Z600	X	X	
Precision M2400	X	X	X
Precision M4400	X	X	X
Precision M4500	X	X	X
Precision M6400	X	X	X
Precision M6500	X	X	X
Precision R5400	X	X	
Precision T3500	X	X	X
Precision T7500	X	X	X

Table 3: Systems with CABs by OS

OSD Checklist

Here is a checklist of items to ensure that you are successful in deploying a new operating system on Dell Enterprise Clients.

1. Download and extract the required model CABs.
2. Download WinPE CABs if needed or add the appropriate NIC or storage driver to your Boot Image. Remember that WinPE 2.x requires Vista drivers and WinPE 3.0 requires Win7 drivers.
3. Create driver packages by model and OS/architecture combination and include in the corresponding task sequence using the Apply Driver Package function with WMI query targeting.
4. If task sequence is XP, pre-stage mass storage drivers and ensure required hotfixes are in the image or task sequence.
5. Dell also recommends installing the Dell Systems Software (DSS) to get the latest applicable software updates for your specific system. DSS includes custom Microsoft hotfixes specific to Dell hardware that is only available from DSS. To download the DSS, please visit http://support.dell.com and select your system model to download the appropriate version for your system. Additional details on installing DSS can be found on Dell TechCenter at http://www.delltechcenter.com/page/Installing+Dell+System+Software
6. Some system devices require additional software that is cannot be installed as a part of the driver installation process. Bluetooth, Mobile Broadband, and Touchpad software would be

good examples. You can download these applications from http://support.dell.com and include them later in your task sequence.

Summary

The Dell Client System Deployment CABs provide IT professionals with consolidated operating system driver packs for use with ConfigMgr 2007. The CABs are designed to ease the complexity associated with identifying, managing, and deploying device drivers on Dell Enterprise Client systems. This helps minimize administrative downtime by:

- Provide a single component for download with which to manage deployment
- Ensure that the hardware is functional post-deployment without supporting applications
- Provide flexibility to manage and update drivers at a device level

References

http://www.delltechcenter.com/page/Client+Deployment

ConfigMgr 2007 Product Overview – Microsoft Corporation

Operating System Deployment in Configuration Manager – Microsoft Corporation