

Comparison of operating system deployment preparation with Microsoft System Center Configuration Manager 2007: Dell Lifecycle Controller Integration vs. HP PXE deployment processes

Executive Summary

Dell Inc. (Dell) commissioned Principled Technologies (PT) to compare operating system (OS) deployment workflows using Microsoft® System Center Configuration Manager 2007 (ConfigMgr) with the following solutions:

- ConfigMgr with the Dell™ Server Deployment Pack (DSDP) and the Dell Lifecycle Controller Integration for Configuration Manager tool
- ConfigMgr with the HP OS Deployment Pack using Preboot Execution Environment (PXE)

This report focuses on the simplicity of use and the time benefits of Dell's Lifecycle Controller-based remote deployment and discovery procedures with ConfigMgr versus the HP manual import process with ConfigMgr using PXE.

Microsoft System Center Configuration Manager 2007 is a robust systems management solution for medium to large enterprises that allows for multiple capabilities, including the important task of operating system deployment. Using ConfigMgr 2007, businesses and organizations can deploy Windows operating systems in an automated manner,

KEY FINDINGS

- Using the Dell Server Deployment Pack and Dell Lifecycle Controller Integration for ConfigMgr, the hands-on time required by an IT Administrator to remotely discover systems on the network is demonstrably reduced to a negligible level due to the auto-discover functionality embedded in Dell's 11G PowerEdge servers. (See Figure 1.)
- The Dell Lifecycle Controller Integration for Microsoft® System Center Configuration Manager 2007 (ConfigMgr) combined with the Dell Server Deployment Pack eliminates the need for a Preboot Execution Environment (PXE)-based provisioning network.¹ Utilizing the Dell deployment process with System Center Configuration Manager, IT administrators can securely and remotely install servers on existing production networks, saving time, resources, and associated operational expenses.
- The total server deployment preparation time, comprised of both machine wait time and hands-on time, to discover and import blade servers in the ConfigMgr 2007 environment is up to 60% faster when using the PXE-less automated process enabled by Dell Lifecycle Controller than when using the manual import process required for HP blades in ConfigMgr 2007 environments. (See Figure 2.)

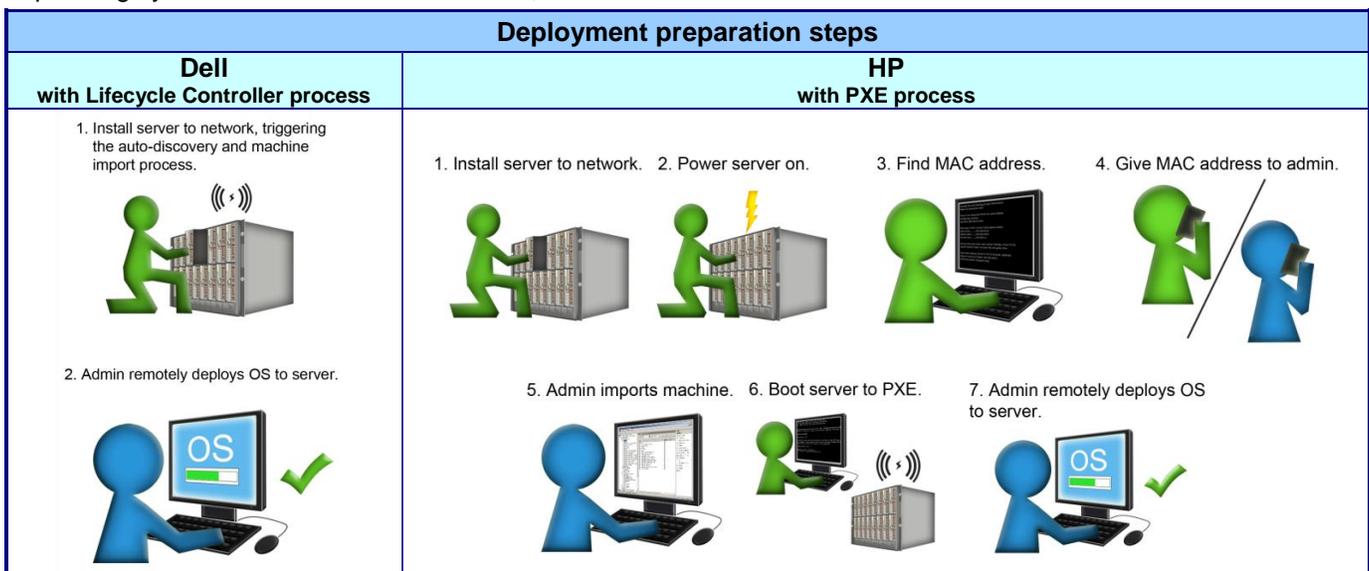


Figure 1: Deployment preparation steps using Dell and HP deployment tools with ConfigMgr. For information on the specific steps, see the Test Methodology section.

¹ Principled Technologies® Comparison of operating system deployment preparation with Microsoft System Center Configuration Manager 2007: Dell Lifecycle Controller Integration vs. HP PXE deployment processes; a February 2010 report commissioned by Dell. For the full Principled Technologies report, visit http://www.principledtechnologies.com/clients/reports/Dell/SCCM-Lifecycle_controller.pdf.

reducing the potential for human-error across corporate, branch, and remote IT infrastructure. Server manufacturers, in this case Dell and HP, have developed specialized tools for ConfigMgr 2007 to further enhance and automate each vendor's server OS installation process.

Taking automation and removal of human error even further, however, Dell has released Dell Lifecycle Controller Integration for ConfigMgr, which automates server discovery and provides a view of the onboard repository of drivers embedded in Dell's hardware platform.

After installation and configuration of the Dell Lifecycle Controller Integration for ConfigMgr tool combined with the Dell Server Deployment Pack, the Dell deployment solution provided automated discovery of hardware with no intervention from our technical staff. The HP OS Deployment Pack for System Center Configuration Manager provided little in the way of automating the import or discovery of new machines, and required manual intervention by technical staff to import the machines and prepare for deployment. Figure 1 shows the number of steps involved in the discovery and import (Dell) compared to the import (HP) of the target machines in a typical installation. In preparing for server OS deployment, the discovery and import of servers when using the Dell Lifecycle Controller Integration for ConfigMgr tool combined with the Dell Server Deployment Pack is an automated, two-step process compared to the more manual seven-step discovery and import process employed when utilizing the HP OS Deployment Pack for System Center Configuration Manager.²

Testing Overview

In this testing scenario, we set up two deployment environments powered by Microsoft ConfigMgr: one for Dell using an auto-discovery and deployment method without PXE and one for HP using a traditional manual import and PXE-based deployment method. The Dell scenario did not require a PXE service point installed in ConfigMgr because the Dell's 11th generation PowerEdge servers include the auto-discover feature and integrate closely with ConfigMgr, communicating directly with provisioned systems via a web service as opposed to using the PXE protocol. In both the HP PXE-based scenario and the Dell Lifecycle Controller Integration scenario, we measured both machine wait time and hands-on IT administrator time to setup each environment and to discover or import machines for operating system deployment.

We tested both rack servers and blade servers for both the Dell Lifecycle Controller Integration for ConfigMgr solution and the HP PXE-based solution. The rack servers we tested were the Dell PowerEdge R710 and the HP ProLiant DL380 G6. The blade servers we tested were the Dell PowerEdge M610 and the HP ProLiant BL460c G6. For more details on the complete test bed setup, refer to the Test Bed Setup section on Page 4.

We used Microsoft System Center Configuration Manager 2007 SP1 for both the Dell and HP deployment scenarios. We used version 1.0 of the Dell Lifecycle Controller Integration tool for ConfigMgr.

Advantages of Dell Lifecycle Controller Integration

In the overall bare-metal server and OS deployment process, Dell has distinct advantages with the integration of Lifecycle Controller features with Microsoft System Center Configuration Manager. The Dell deployment solution for ConfigMgr saves setup and discovery time. It also eliminates complexity and potential for human error by auto-discovering newly provisioned machines and by leveraging the Dell PowerEdge 11G servers' embedded driver repository. Also, in contrast to the HP PXE-based deployment solution, the Dell deployment solution for ConfigMgr is more secure and allows IT administrators to deploy servers directly on a production network, instead of using a detached provisioning network.

- **Time savings.** The auto-discovery feature of the Dell Lifecycle Controller Integration for ConfigMgr saves time for system administrators and data center operators. In our lab testing, the Dell Server Deployment Pack and Lifecycle Controller discovery and import process was up to 53 percent faster overall on the Dell PowerEdge R710 than was the import process with the HP OS Deployment Pack with PXE scenario

² Principled Technologies® Comparison of operating system deployment preparation with Microsoft System Center Configuration Manager 2007: Dell Lifecycle Controller Integration vs. HP PXE deployment processes; a February 2010 report commissioned by Dell. For the full Principled Technologies report, visit http://www.principledtechnologies.com/clients/reports/Dell/SCCM-Lifecycle_controller.pdf.

on the HP ProLiant DL380 G6.³ The Dell Deployment Pack and Lifecycle Controller discovery and import process was up to 60 percent faster overall on the Dell PowerEdge M610 blade servers than was the import process with the HP OS Deployment Pack with PXE scenario on the HP ProLiant BL460C G6 blade servers.⁴ This includes both employee hands-on time and machine wait time. Figure 2 shows the detailed time results for each system.

Server	Dell import time with auto-discovery	HP manual import time	Dell percentage advantage
One rack server	3 minutes 2 seconds	6 minutes 26 seconds	53%
Four blade servers	5 minutes 1 second	12 minutes 31 seconds	60%

Figure 2: Import time using the auto-discovery features of the Dell Lifecycle Controller Integration tool versus the HP manual import method.⁵

- Automation.** With the reduction of steps necessary for discovery and import reduced to simply plugging the server in, the Dell Lifecycle Controller Integration for ConfigMgr tool saves IT administrators' time and reduces complexity, which compounds over time as you install more servers. (See Figure 3.) With the HP PXE-based solution, several steps remain necessary for the import of each machine, resulting in greater potential for human error and more time consumed by IT staff. In contrast, with the Dell solution, simply plug in your servers; no further hands-on time is required.
- Simplicity.** Dell Lifecycle Controller for ConfigMgr reduces the complexity of IT maintenance tasks. After the initial configuration of the environment, the only task to be performed is cabling the rack server into the network infrastructure or simply inserting the blade. The auto-discover process then automatically injects the server information in the System Center Configuration Manager console, where the IT administrator can then schedule deployments. This contrasts with the HP PXE-based configuration, where the data center technician must, at a minimum, ensure that the BIOS boot order is set to boot to PXE, record the MAC address, and communicate the MAC address to the ConfigMgr administrator. The ConfigMgr administrator must then manually import the machine to System Center Configuration Manager. (See Figure 1.)
- Reduction in potential for human error.** Dell Lifecycle Controller Integration for ConfigMgr exposes and leverages multiple operating systems' drivers that reside directly onboard the specified target Dell 11G PowerEdge Server. This ensures that, as a part of the operating system deployment process, the driver installations that occur are less prone to error because Dell has validated and tested these embedded drivers at the factory.

Recurring cost of system discovery and import
HP PXE method versus Dell Lifecycle Controller Integration method

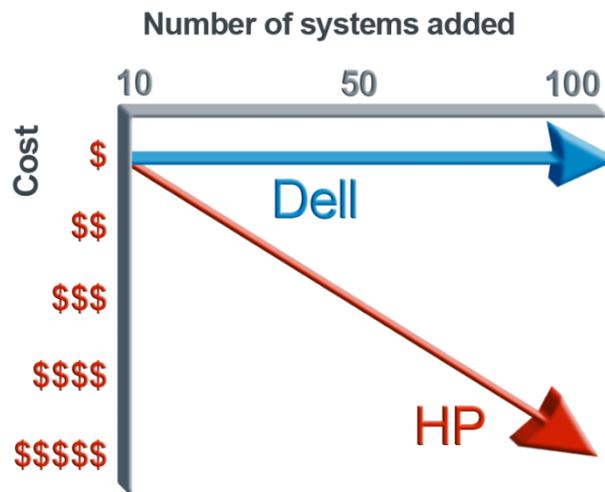


Figure 3: Compounding costs of system provisioning efforts.

³ Principled Technologies® Comparison of operating system deployment preparation with Microsoft System Center Configuration Manager 2007: Dell Lifecycle Controller Integration vs. HP PXE deployment processes; a February 2010 report commissioned by Dell. For the full Principled Technologies report, visit http://www.principledtechnologies.com/clients/reports/Dell/SCCM-Lifecycle_controller.pdf.

⁴ *Ibid.*

⁵ This includes only recurring discovery and/or import timings and excludes both one-time setup times and deployment times.

- **Security.** By default, Dell 11G servers include the Lifecycle Controller and ship with a factory-issued client certificate for security. This ensures that the operating system deployment is secure from the time the servers arrive. Customers can import lists of specific service tags to ensure accuracy in installing only targeted servers or can disable the Lifecycle Controller features if necessary during the configuration of System Center Configuration Manager.
- **Cost savings.** The auto-discovery features of Dell Lifecycle Controller Integration for ConfigMgr on Dell 11G servers eliminate the need for a PXE environment, which is advantageous for a number of reasons:
 - **PXE security issues.** Because of PXE-related security risks, PXE environments are often implemented in a detached network staging area, requiring extra hardware and IT resources. The Dell Lifecycle Controller Integration for ConfigMgr tool enables deployment directly on the production network, removing the PXE service point as a dependency and the need for additional IT resources.
 - **Reduction in maintenance, backups, and power usage.** Like any other utility server, machines used for utility functions such as PXE add to overall server count, power consumption, and backup needs. Full time employee (FTE) cost, backup time and capacity, and power consumption are all directly correlated to the number of servers in the environment. Each server removed from the environment reduces operational expenses and saves money for the organization.

Test Bed Setup

We set up two parallel test beds for each of our ConfigMgr scenarios: one using the Dell Lifecycle Controller Integration for ConfigMgr tool (Dell), and one using the PXE service point functionality in ConfigMgr (HP). Below, we describe each test bed and the general steps we followed to prepare each test bed for the discovery and import process. Figure 4 shows the diagram of the test servers we used for the Dell Lifecycle Controller Integration-based process with ConfigMgr and Figure 5 shows the diagram of the test servers we used for the HP PXE-based process with ConfigMgr.

In the Dell test bed, we used two Dell PowerEdge R510 servers, one for Active Directory and DHCP services, and one for System Center Configuration Manager 2007. For target deployment servers, we used four Dell PowerEdge M610 blade servers and one Dell PowerEdge R710 server. We used a Dell PowerConnect 5448 1Gb Ethernet switch for connecting this test bed. For the Dell Lifecycle Controller-based configuration, we performed the following setup tasks. See the Test Methodology section for more specific details.

1. Installed Windows Server 2008 x64 on a Dell PowerEdge R510 and promoted it to be a primary domain controller.
2. Enabled the DHCP role on the domain controller server.
3. Installed Windows Server 2008 x64 and SQL Server 2008 on a separate Dell PowerEdge R510 to act as our ConfigMgr server.
4. Configured the Dell PowerEdge R510 for ConfigMgr as specified by Microsoft documentation.⁶
5. Installed System Center Configuration Manager 2007 SP1 on the Dell PowerEdge R510 designated for ConfigMgr.
6. Installed the Dell Server Deployment Pack version 1.1 for ConfigMgr.
7. Installed the Dell Lifecycle Controller Integration

Dell Lifecycle Controller Solution

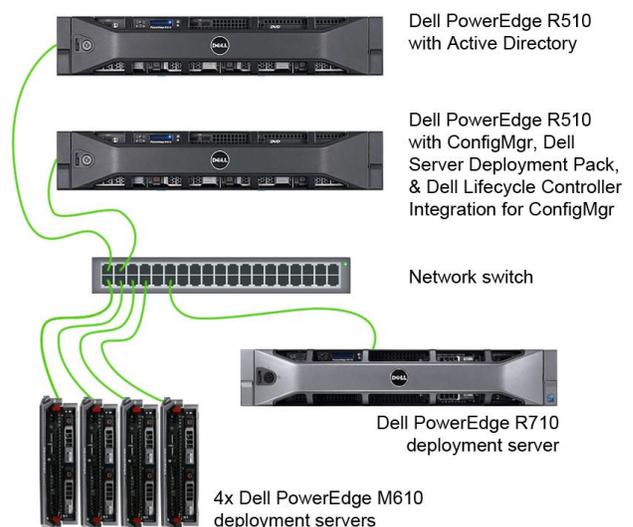


Figure 4: The test servers we used for the Dell Lifecycle Controller Integration tool for ConfigMgr.

⁶ How to Configure Windows Server 2008 for Site Systems. <http://technet.microsoft.com/en-us/library/cc431377.aspx>

- for ConfigMgr version 1.0 for ConfigMgr.
8. Imported the specific servers' driver sets from a Dell Systems DVD. Although we used the drivers onboard the Dell Lifecycle Controller, these drivers are still required in the task sequence configuration for the purposes of backup and failover.
 9. Managed and updated all software packages and boot images to the distribution point in ConfigMgr.
 10. Installed and captured a reference machine, for both the Dell PowerEdge M610 and Dell PowerEdge R710 deployments.
 11. Added a vendor scope option to the DHCP server, which in our case was the domain controller.
 12. Verified auto-discovery settings on the iDRAC of the target machines.

In the HP test bed, we used two HP ProLiant DL180 servers, one for Active Directory and DCHP services, and one for ConfigMgr. For target deployment servers, we used four HP ProLiant BL460c G6 blade servers and one HP ProLiant DL380 G6 server. We used a Dell PowerConnect 5448 1Gb Ethernet switch for connecting this test bed. For the HP PXE-based System Center Configuration Manager configuration, we performed the following setup tasks. See the Test methodology section for more specific details.

1. Installed Windows Server 2008 x64 on an HP ProLiant DL180, and promoted it to be a primary domain controller.
2. Enabled the DHCP role on the domain controller server.
3. Installed Windows Server 2008 x64 and SQL Server 2008 on a separate HP ProLiant DL180 to act as our ConfigMgr server.
4. Configured the HP ProLiant DL180 for ConfigMgr as specified by Microsoft documentation.⁷
5. Installed System Center Configuration Manager 2007 SP1 on the HP ProLiant DL180 designated for ConfigMgr.
6. Installed Windows Deployment Services on the ConfigMgr server, as required by the PXE Service point.
7. Installed the PXE Service point role in ConfigMgr.
8. Installed the HP Operating System Deployment Pack for ConfigMgr.
9. Managed and updated all software packages and boot images to the distribution point in ConfigMgr.
10. Installed and captured a reference machine, for both the HP ProLiant BL460c G6 and HP ProLiant DL380 G6 deployments.

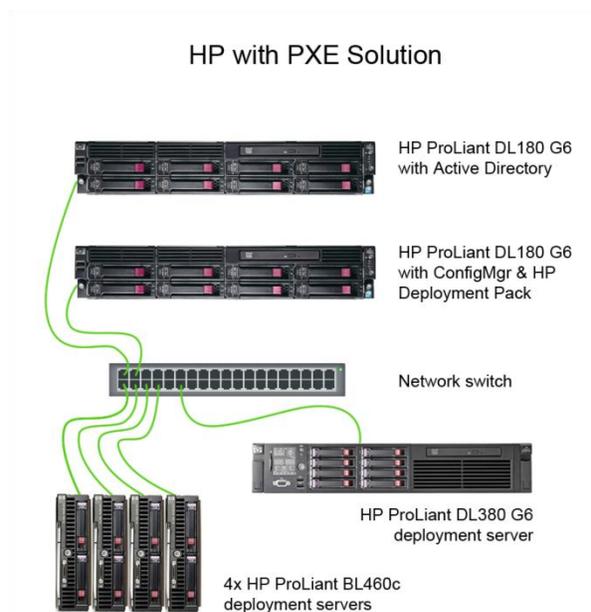


Figure 5: The test servers we used for the HP deployment pack with PXE and ConfigMgr.

⁷ How to Configure Windows Server 2008 for Site Systems. <http://technet.microsoft.com/en-us/library/cc431377.aspx>

Test Methodology

Because portions of the two test bed setups were identical, we followed similar steps where possible. Where steps differ, we note this in the header of each section with (Dell only) or (HP only). We also note below the sections that we timed specifically for this report.

Installing Windows Server 2008 x64 with SP2 on the domain controller servers and the ConfigMgr servers (both Dell and HP)

1. Insert the installation DVD for Windows Server 2008 x64 with SP2 into the DVD drive.
2. Select the language, time and currency, and keyboard input. Click Next.
3. Click Install Now.
4. Select Windows Server Enterprise (Full Installation), and click Next.
5. Accept the license terms, and click Next.
6. Click Custom.
7. Click the Disk, and click Drive options (advanced).
8. Click New, Apply, Format, and click Next.
9. Let the installation process continue. The server will reboot several times.
10. After the installation completes, click OK to set the Administrator password.
11. Enter the administrator password twice, and click OK.
12. Click Start, Control Panel, and double-click System.
13. Click Change Settings.
14. Click Change.
15. Enter the new computer name, and click OK.
16. Click OK to restart, click Close, and click Restart Now.
17. Repeat steps 1 through 16 for the remaining Dell PowerEdge and HP ProLiant servers.

Installing Windows updates on the domain controller servers and the ConfigMgr servers (both Dell and HP)

1. Click Start, Windows Update.
2. Click View Advanced Options.
3. Click Check for Updates.
4. When the application prompts you to install an update for Windows Update, click Install Now.
5. Click View available updates to ensure you install the necessary updates.
6. Click Install.
7. Agree to the license terms, and click Finish.
8. Reboot the server when the application requests you do so.
9. After reboot, check Windows Update again for further updates.
10. Repeat steps 3 through 9 until no further updates appear.
11. If Windows lists no important updates, close the updates window.
12. Repeat steps 1 through 11 for the remaining Dell PowerEdge and HP ProLiant servers.

Installing Active Directory on the domain controller (both Dell and HP)

1. On the relevant Dell PowerEdge R510 and HP ProLiant DL180, set a static IP address:
 - a. Right-click the network icon in the quick-launch bar, and select Network and Sharing Center.
 - b. Click Manage network connections.
 - c. Right-click the local area connection, and select Properties.
 - d. Select Internet Protocol Version (TCP/IPv4), and click Properties.
 - e. Select the Use the following IP address radio button, and type 192.168.10.10 in the IP address field.
 - f. Press Tab to auto-fill 255.255.255.0 in the Subnet mask field.
 - g. In the Preferred DNS server field, type 127.0.0.1 and click OK to close the IPv4 properties window.
 - h. Click OK, and close.
2. Promote the server to domain controller:
 - a. Select Start→Command Prompt.

- b. Type `dcpromo`, and press Enter.
- c. Click Next.
- d. Click Next.
- e. Select Create a new domain forest, and click Next.
- f. Type `<domainname>` as the FQDN (Fully Qualified Domain Name), and click Next.
- g. Set the forest functional level to Windows Server 2003, and click Next.
- h. Set the domain functional level to Windows Server 2003, and click Next.
- i. Leave defaults on the Additional Domain Controller Options screen, and click Next.
- j. If a warning window appears asking about dynamically assigned IP addresses, click Yes.
- k. Click Yes to Continue.
- l. Leave defaults at the Location for Database, Log Files, and SYSVOL screen. Click Next.
- m. At the Directory Services Restore Mode Administrator Password screen, type `Password1`.
- n. At the summary screen, click Next.
- o. Click Finish.
- p. Click Restart now.

Configuring DHCP on the Active Directory server (both Dell and HP)

1. Click Start, Administrative Tools, Server Manager.
2. Click Roles.
3. Click Add Roles.
4. Click Next.
5. Select DHCP, and click Next.
6. Click Next.
7. Accept the default network connection for DHCP, and click Next.
8. Accept the default DNS settings, and click Next.
9. At the WINS screen, click Next.
10. At the scope screen, click Add.
11. Provide a scope name, starting IP, ending IP, subnet, and gateway (optional).
12. Leave the activate checkbox checked, and click OK.
13. Click Next.
14. At the DHCP stateless mode screen, choose to disable DHCPv6, and click Next.
15. Choose to use current credentials, and click Next.
16. Click Install.

Installing and configuring IIS on the ConfigMgr server (both Dell and HP)

1. On the ConfigMgr server, navigate to Start→All Programs→Administrative Tools→Server Manager to start Server Manager.
2. At the Select Features page of the Add Features Wizard, select BITS Server Extensions.
3. When the application prompts you to do so, click Add Required Role Services to add the dependent components, including the Web Server (IIS) role.
4. Select Remote Differential Compression, and click Next.
5. At the Web Server (IIS) page of the Add Features Wizard, click Next.
6. At the Select Role Services page of the Add Features Wizard, under Application Development, select ASP.NET and, when the application prompts you to do so, click Add Required Role Services to add the dependent components.
7. Under Security, select Windows Authentication.
8. In the Management Tools node, under IIS 6 Management Compatibility, ensure that both IIS 6 Metabase Compatibility and IIS 6 WMI Compatibility are selected, and click Next.
9. At the Confirmation page, click Install, and complete the rest of the wizard.
10. Click Close to exit the Add Features Wizard, and close Server Manager.

Installing and configuring WebDAV on the ConfigMgr server (both Dell and HP)

1. Run the WebDAV installation executable (available from <http://go.microsoft.com/fwlink/?LinkId=108052>).
2. Enable WebDAV, and create an Authoring Rule:

- a. Navigate to Start→All Programs→Administrative Tools→Internet Information Services (IIS) Manager to start Internet Information Services 7 Application Server Manager.
 - b. In the Connections pane, expand the Sites node in the navigation tree, and click Default Web Site if you are using the default Web site for the site system or SMSWEB if you are using a custom Web site for the site system.
 - c. In the Features View, double-click WebDAV Authoring Rules.
 - d. When the WebDAV Authoring Rules page appears, in the Actions pane, click Enable WebDAV.
 - e. After WebDAV has been enabled, in the Actions pane, click Add Authoring Rule.
 - f. In the Add Authoring Rule dialog box, under Allow access to, click All content.
 - g. Under Allow access to this content to, click All users.
 - h. Under Permissions, click Read, and click OK.
3. Change the property behavior:
 - a. In the WebDAV Authoring Rules page, in the Actions pane, click WebDAV Settings.
 - b. In the WebDAV Settings page, under Property Behavior, set Allow anonymous property queries to True.
 - c. Set Allow Custom Properties to False.
 - d. Set Allow property queries with infinite depth to True.
 - e. If this is a BITS-enabled distribution point, under WebDAV Behavior, set Allow hidden files to be listed to True.
 - f. In the Action pane, click Apply.
 - g. Close Internet Information Services (IIS) Manager.

Joining the Active Directory Domain on the ConfigMgr server (both Dell and HP)

1. On the ConfigMgr server, click Start, Control Panel.
2. Double-click Network and Sharing Center.
3. Click Manage network connections.
4. Right-click the relevant connection, and select Properties.
5. Click Internet Protocol Version 4 (TCP/IPv4), and click Properties.
6. Click Use the following IP address, and enter a valid IP address for the domain.
7. Enter a valid subnet mask.
8. Click Use the following DNS server addresses, and enter the domain controller IP address.
9. Click OK, and click Close.
10. Close the Network Connections window.
11. Click Start→Control Panel.
12. Double-click System.
13. Click Change Settings.
14. Click Change.
15. Click Member of Domain.
16. Type the domain name, and click OK.
17. Enter the username and password of the domain administrator, and click OK.
18. Click OK on the Welcome to the domain dialog box.
19. Click OK twice.
20. Reboot the computer.

Installing Windows Server Updates Services 3.0 SP2 on the ConfigMgr server (both Dell and HP)

1. Click Start→All Programs→Administrative Tools→Server Manager to start Server Manager.
2. Click Add Roles in the right pane of the Server Manager, and click Next.
3. At the Select Roles page, select Windows Server Update Services.
4. When the application prompts you to do so, click Add Required Role Services to add the dependent components, and click Next.
5. At the Introduction to Web Server (IIS) page, click Next.
6. At the Select Role Services page, click Next.
7. At the Windows Server Updates Services page, click Next.
8. At the Confirm Installation Selections page, click Install.
9. When the WSUS 3.0 SP2 setup Wizard starts, click Next.

10. At the License Agreement screen, click the I accept radio button, and click Next.
11. If you see a warning about a required component, click Next.
12. At the Select Update Source page, click Next.
13. At the Database Options page, click Next.
14. At the Web Site Selection page, click Next.
15. At the Ready to Install page, click Next.
16. At the Completing the Windows Server Update services screen, click Finish.
17. At the Before you Begin screen, click Next.
18. At the Microsoft Update Improvement Program, uncheck the Yes box, and click Next.
19. At the Choose Upstream Server screen, click Next.
20. At the Specify Proxy Server, click Next.
21. At the Connect to Upstream Server screen, select Start Connecting.
22. Skip to the next page in the wizard, and complete the steps in the wizard that begin on the To Continue installing WSUS 3.0 SP2 page.

Configuring Active Directory credentials for SQL Server and the ConfigMgr Network Access account on the domain controller (both Dell and HP)

1. On the Active Directory server, click Start→Administrative Tools→Active Directory Users and Computers.
2. Expand the domain, right-click users, and click New user.
3. Enter a username and password for the SQL Service account, uncheck the user must change password at next login box, and ensure the password is not set to expire.
4. Repeat steps 2 and 3 for the ConfigMgr Network Access Account.
5. To configure a service principal name for SQL Server, follow these steps:
 - a. Click Start, click Run, and type `cmd` to enter a command prompt.
 - b. Enter the following command to set the service principal name for SQL Server:
`setspn -A MSSQLSvc/ConfigMgrserver:1433 domainname\serviceaccount`
6. To configure the permissions for the Network Access Account for ConfigMgr, follow these steps:
 - a. On the ConfigMgr server, click Start→Administrative Tools→Computer Management.
 - b. Click Local Users and Groups, and click Groups.
 - c. Double-click Administrators.
 - d. Click Add, and add the domain user for the Network Access Account to the local Administrators group.
 - e. Click OK.

Installing SQL Server 2008 on the ConfigMgr server (both Dell and HP)

1. Insert a SQL Server 2008 Enterprise Edition DVD into the DVD drive.
2. If an AutoPlay window appears, click Run SETUP.EXE.
3. If an AutoPlay window does not appear, navigate to the DVD drive, and double-click to run SETUP.EXE.
4. At the Program Compatibility Assistant prompt, click Run program.
5. Click OK to install any remaining prerequisites SQL Server 2008 requires.
6. When the SQL Server Installation Center window appears, click Installation.
7. Click New SQL Server stand-alone installation.
8. Click Run program.
9. After the Rule check completes with no errors, click OK.
10. Enter the product key for your copy of SQL Server 2008, and click Next.
11. Check the box beside I accept the license terms, and click Next.
12. Click Install to install Setup Support Files.
13. Once the Setup Support Files finish installing, SQL Server 2008 Setup will open a new window.
14. SQL Server 2008 will then run a check of the Setup Support Rules.
15. Once it is finished with no errors, click Next.
16. At the Feature Selection screen, check the box beside the following features:
 - Database Engine Services
 - Client Tools Connectivity
 - Client Tools Backwards Compatibility
 - Management Tools – Basic

- Management Tools – Complete
17. Click Next.
 18. At the Instance Configuration screen, accept the defaults, and click Next.
 19. Ensure that you have the required disk space to install, and click Next.
 20. Enter domain credentials for SQL Server service account, and click Next.
 21. Keep Windows Authentication selected, and click Add Current User.
 22. Click Next.
 23. At the Error and Usage Reporting screen, click Next.
 24. Once the Installation Rules check is complete, click Next.
 25. Click Install.
 26. When the Installation is complete, click Next.
 27. Click Close.
 28. Close all open windows.

Installing SQL Server 2008 SP1 on the ConfigMgr server (both Dell and HP)

Service Pack 1 is available for download from

<http://www.microsoft.com/downloads/details.aspx?FamilyID=66ab3dbb-bf3e-4f46-9559-ccc6a4f9dc19&displaylang=en>.

1. Run SQLServer2008SP1-KB968369-x64-ENU.exe.
2. At the Welcome screen, click Next.
3. At the License terms screen, accept the license terms, and click Next.
4. At the Features screen, select available features, and click Next.
5. At the Check files in use screen, wait for the installer to complete its check, and click Next.
6. At the Update screen, click Update.
7. When the update completes, click Next, and click Close.

Extending the Active Directory schema for ConfigMgr⁸ on the domain controller server (both Dell and HP)

1. Extend the Active Directory schema:
 - a. On the Active Directory machine, log in with domain administrator privileges.
 - b. Disconnect the domain controller from the network by unplugging the network cable.
 - c. Extract the ConfigMgr installation to the Active Directory server.
 - d. At a command prompt, browse to the C:\SCConfigMgr07_EVAL_EN \SMSSETUP\BIN\1386 folder.
 - e. Run extadsch.exe, located in the C:\SCConfigMgr07_EVAL_EN \SMSSETUP\BIN\1386 folder on the Configuration Manager 2007 installation media, to add the new classes and attributes to the Active Directory schema.
 - f. Verify that the schema extension was successful by reviewing the extadsch.log, located in the root of the system drive.
 - g. Reconnect the domain controller to the network.
2. Create the System Management container:
 - a. On the Active Directory machine, on the taskbar, click Start, and click Run.
 - b. Type `adsiedit.msc` and click OK.
 - c. Right-click ADSI Edit, and connect to the domain in which the site server resides.
 - d. In the console pane, expand Domain, expand hpmelville, and right-click CN=System.
 - e. Click New, and click Object.
 - f. In the Create Object dialog box, select Container, and click Next.
 - g. In the Value field, type `System Management`, and click Next.
 - h. Click Finish.
3. Set security permissions on the System Management container:
 - a. On the Active Directory machine, on the taskbar, click Start, and click Run.
 - b. Type `adsiedit.msc`, and click OK.

⁸ Source: <http://technet.microsoft.com/en-us/library/bb633121.aspx>

- c. Right-click ADSI Edit, and connect to the domain in which the site server resides.
- d. In the console pane, expand Domain, expand dellmelville, and expand CN=System.
- e. Right-click CN=System Management, and select Properties.
- f. Click the Security tab.
- g. Click Add to add the site server computer account, and grant Full Control permissions.
- h. Click Advanced, select the site server's computer account, and click Edit.
- i. In the Apply onto list, select This object and all descendant objects, and click OK.
- j. Click OK twice.

Running the prerequisite checker for System Center Configuration Manager 2007 SP1 on the ConfigMgr server (both Dell and HP)

1. Extract the ConfigMgr download ZIP to the ConfigMgr server.
2. In Windows Explorer, browse to the extracted folder.
3. Double-click splash.hta to run Microsoft System Center Configuration Manager 2007 setup.
4. At the Start screen, click Run the prerequisite checker.
5. At the Installation Prerequisite Check Options screen, click the Primary Site radio button, and enter the machine name for SQL Server and machine name for SDK Server. Click OK.
6. At the Installation Prerequisite Check, no further prerequisites should be required.

Installing Microsoft System Center Configuration Manager 2007 SP1 on the ConfigMgr server (both Dell and HP)

1. In Windows Explorer, browse to the extracted folder for ConfigMgr installation files.
2. Double-click splash.hta to run Microsoft System Center Configuration Manager 2007 setup.
3. Under Install, click Configuration Manager 2007 SP1.
4. At the Welcome screen, click Next.
5. At the Available Setup Options screen, click the Install a Configuration Manager site server radio button, and click Next.
6. At the Microsoft Software License Terms screen, check the I accept these license terms checkbox, and click Next.
7. At the Installation Settings screen, click the Custom settings radio button, and click Next.
8. At the Site Type screen, click the Primary site radio button, and click Next.
9. At the Customer Experience Improvement Program Configuration screen, click the No, I do not want to participate right now radio button, and click Next.
10. At the Product Key screen, enter the product key, and click Next.
11. At the Destination Folder screen, click Next.
12. At the Site Settings screen, create a Site code and Site name, type them in the appropriate text boxes, and click Next.
13. At the Site Mode screen, click the Configuration Manager Mixed Mode radio button, and click Next.
14. At the Client Agent Selection screen, ensure that the check boxes for Software inventory, Hardware inventory, Advertised programs, Software updates, Software metering, Desired configuration management, and Remote tools are all checked, and click Next.
15. At the Database Server screen, enter the SQL Server and instance and ConfigMgr site database information, and click Next.
16. At the SMS Provider Settings screen, enter the installation location for the provider, and click Next.
17. At the Management point screen, click the install a management point radio button, and click Next.
18. At the Port Settings screen, ensure that the Use default port (80) radio button is selected, and click Next.
19. At the Updated Prerequisite Components screen, click Check for updates and download newer versions to an alternate path radio, and click Next.
20. At the Updated Prerequisite Component Path screen, specify the alternate path for storage of updated components, and click Next.
21. At the Success screen, click Begin Install.
22. At the Settings Summary screen, review the settings, and click Next.
23. At the Setup Action Status Monitoring screen, click Begin Install.
24. When installation completes, click Next.

25. At the Completing the Microsoft System Center Configuration Manager 2007 SP1 Setup Wizard screen, click Finish.

Setting compatibility level to SQL Server 2005 on the ConfigMgr server for installation of the OEM Deployment Packs (both Dell and HP)

1. Click Start, All Programs, Microsoft SQL Server 2008, SQL Server Management Studio.
2. Click Connect.
3. Expand Databases, right-click the SMS_<sitename> database in the Object Explorer, and select Properties.
4. Click Options to access database options.
5. Under the Compatibility level drop-down, select SQL Server 2005 (90).
6. Click OK.

Verifying that Configuration Manager can publish to Active Directory on the ConfigMgr server (both Dell and HP)

1. On the ConfigMgr Server, click Start, All Programs, Microsoft System Center, Configuration Manager 2007, ConfigMgr Console.
2. In the Configuration Manager console, navigate to System Center Configuration Manager→Site Database→Site Management→<site code> - <site name>.
3. Right-click <site code> - <site name>, and click Properties.
4. On the Advanced tab of site properties, select the Publish this site in Active Directory Domain Services check box.

Configuring the Network Access Account on the ConfigMgr server (both Dell and HP)

1. On the ConfigMgr server, in the Configuration Manager console, navigate to System Center Configuration Manager→Site Database→Site Management→<site code> - <site name>→Site Settings→Client Agents.
2. In the results pane, double-click Computer Client Agent.
3. In the Computer Client Agent Properties dialog box, on the General tab, for the Network Access Account, click Set.
4. In the Windows User Account dialog box, enter the credentials for the ConfigMgr Network Access account, and click OK.

Installing Windows Deployment Services on the ConfigMgr server (HP only)

1. On the ConfigMgr server, click Start, Administrative Tools, Server Manager.
2. Right-click Roles, and select Add roles.
3. Click Next.
4. Select Windows Deployment Services.
5. Click Next.
6. At the Role Services screen, verify that Deployment Server and Transport Server are checked, and click Next.
7. Click Install.

Configuring the PXE Service Point on the ConfigMgr server⁹ (HP only)

1. On the ConfigMgr server, put the local computer name account in the local administrators group:
 - a. Click Start→Administrative Tools→Computer Management.
 - b. Expand Local Users and Groups, and click Groups.
 - c. Double-click the local Administrators group.
 - d. Click Add, and click Object Types.
 - e. Check Computers, and click OK.
 - f. Enter the computer name, click Check Names, and click OK.
 - g. Click OK, and close the Computer Management window.
2. In the Configuration Manager console, navigate to System Center Configuration Manager→Site Database→Site Management→<site code> - <site name>→Site Settings→Site Systems→<site name>.

⁹ Source: <http://technet.microsoft.com/en-us/library/bb680668.aspx>

3. To start the New Site Role Wizard, click Action on the Configuration Manager console, and click New Roles.
4. At the General page of the wizard, click Next.
5. At the System Role Selection page, select PXE Service Point, and click Next.
6. Click Yes to open UDP ports on the site system.
7. At the PXE-General page, enable PXE service point to respond to incoming PXE requests, and disable Require a password for computers to boot using PXE.
8. Under Interfaces, select Respond to PXE requests on specific network interfaces.
9. Add the MAC address associated with the site system, and click OK.
10. If multiple PXE service points are used, enter the number of seconds the PXE service point should wait before responding to PXE requests in the Delay box. Use this option only when there are multiple PXE servers on the same subnet.
11. Click Next.
12. At the PXE-Database page, specify the account the PXE service point should use to connect with the Configuration Manager 2007 database by selecting Use the PXE service point's computer account.
13. Accept defaults for Create a self-signed certificate.
14. Click Next to review the installation summary.
15. Click Next to complete the installation.
16. Browse to System Center Configuration Manager→Site Database→Site Management→<site code> - <site name>→Site Settings→Certificates→PXE.
17. Right-click the certificate that is not blocked, and select Open.
18. Select Install Certificate, and click Next.
19. Select Place all certificates in the following store.
20. Click Browse.
21. Select Trusted Root Certification Authorities, and click Next.
22. Click Finish, and click Yes on the Security Warning prompt.

Downloading the HP Operating System Deployment Pack for ConfigMgr software (HP only)

1. Open Internet Explorer and browse to <http://h18013.www1.hp.com/products/servers/management/integration-msc.html>.
2. Click Try Insight Control.
3. Click Click here to register.
4. Under Software specification, scroll down to Insight Control for System Center, and select it.
5. Fill in customer information.
6. Click Next after filling in all the required items.
7. Under Deliverables, click Get Download.
8. On the right, under electronic downloads, click the first entry (Insight_Control_for_System_Center_ISO_578605_001.iso).
9. Click Download Directly.

Downloading the Dell Server Deployment Pack 1.1 and Lifecycle Controller Integration for ConfigMgr tools (Dell only)

1. Open a browser, and browse to <http://support.dell.com>.
2. Select Support for Enterprise IT.
3. Select Drivers and downloads.
4. Browse to the relevant 11G server model, and confirm your selection.
5. Choose Microsoft Windows 2008 x64 as the operating system.
6. Under Systems Management, click Download next to Server Deployment Pack for Microsoft System Center Configuration Manager.
7. Download the Server Deployment Pack to the machine.
8. Under Lifecycle Controller, click Download next to ConfigMgr Dell Lifecycle Controller Plug-in.

Installing Dell Server Deployment Pack 1.1 (DSDP) on ConfigMgr 2007 server (Dell only)

1. Double-click the Dell Server Deployment Pack executable.
2. At the Welcome screen, click Next.

3. At the License Terms screen, check the I accept these license terms checkbox, and click Next.
4. At the Set Up Type screen select Complete, and click Next.
5. Click Install.
6. At the completing the Dell Server Deployment Pack, click Finish.

Installing the HP Operating System Deployment Pack for ConfigMgr software on the ConfigMgr server (HP only)

1. Burn the ISO image to a CD.
2. Insert the HP ProLiant Operating System Deployment for ConfigMgr CD.
3. Choose to run the autorun executable.
4. Accept the license agreement, and click Next.
5. Click the Product and documentation tab.
6. Click HP ProLiant Server OS Deployment for Configuration Manager 2007.
7. Click Install to extract the software.
8. At the Welcome screen, click Next.
9. At the license agreement screen, accept the license, and click Next.
10. Click complete, and click Next.
11. Click Install.
12. Click Finish.

Installing the Dell Lifecycle Controller Integration for Microsoft ConfigMgr (Dell only)

1. Extract the Dell Lifecycle Controller ZIP file, and copy the x64 Utility to the ConfigMgr server.
2. Double-click the Dell Lifecycle Controller Utility.
3. At the Welcome screen, click Next.
4. At the License Terms screen, check the I accept these license terms checkbox, and click Next.
5. Enter User Credentials for iDRAC access, and click Next. Do not use the root user. Create a new user that ConfigMgr will provision onto the iDRAC, such as ConfigMgr user. ConfigMgr will put these credentials on the iDRAC of target machines.
6. Enter account details for ConfigMgr, and click Next.
7. Click Install.
8. At the completing the Dell Lifecycle Controller Utility, click Finish.

Adjusting the security posture for Discovery and Handshake on the ConfigMgr server (Dell only)

1. On the ConfigMgr server, click Start, run, type `cmd`, and click OK.
2. Browse to `C:\Program Files (x86)\Dell\DPS\bin`.
3. Execute the following command to turn certificate checking off for this configuration:

```
import.exe -CheckCertificate false
```

Adjusting further security configurations for the provisioning web service (Dell only)

1. Click Start, Run, type `mmc`, and click OK.
2. Click File, Add/Remove Snap In.
3. Choose Certificates.
4. Click Add.
5. Click Finish.
6. Click OK.
7. Expand Certificates.
8. Right-click Personal, and choose All tasks, Import.
9. Click Next.
10. Click Browse.
11. Browse to `C:\Program Files (x86)\Microsoft Configuration Manager\AdminUI\XmlStorage\Extensions\bin\deployment\Dell\PowerEdge\LC\IISSetup`.
12. Choose `PS2.pfx`, and click Open.
13. Click Next.

14. Enter the following for the password: fW7kd2G
15. Click Next.
16. Choose Place All Certificates in the following store, and ensure it is the Personal store. Click Next.
17. Click Finish.
18. At the success screen, click OK.
19. Right-click Trusted Root Certificate Authorities, and choose All tasks, Import.
20. Click Next.
21. Click Browse.
22. Browse to C:\Program Files (x86)\Microsoft Configuration Manager\AdminUI\XmlStorage\Extensions\bin\deployment\Dell\PowerEdge\LC\IISSetup.
23. Choose RootCA.PEM, and click Open.
24. Click Next.
25. Choose Place All Certificates in the following store, and ensure it is the Trusted Root Certificate Authorities store. Click Next.
26. Click Finish.
27. At the success screen, click OK.
28. Right-click Intermediate Certification Authorities, and choose All tasks, Import.
29. Click Next.
30. Click Browse.
31. Browse to C:\Program Files (x86)\Microsoft Configuration Manager\AdminUI\XmlStorage\Extensions\bin\deployment\Dell\PowerEdge\LC\IISSetup.
32. Choose ProvisioningCTL.stl, and click Open.
33. Click Next.
34. Choose Place All Certificates in the following store, and ensure it is the Intermediate Certification Authorities store. Click Next.
35. Click Yes to confirm you wish to copy this CTL file into this store.
36. Click Finish.
37. At the success screen, click OK.

Adding the DHCP scope vendor option to the DHCP server for auto-discovery (Dell only)

1. On the DHCP server, click Start, Administrative Tools, DHCP.
2. Expand your DHCP site.
3. Expand IPv4.
4. Right-click IPv4, and choose Define Vendor Classes.
5. Click Add.
6. For Display Name, type LifecycleController.
7. Click the white area under ASCII, and type LifecycleController.
8. Click OK.
9. Click Close.
10. Right-click IPv4, and choose Set Predefined options.
11. In the Option class dropdown, choose LifecycleController.
12. Click Add, type LifecycleController for the name, choose String for the data type, type 1 for the code, and click OK.
13. Expand Scope.
14. Select Scope Options.
15. Right-click Scope Options, and choose Configure Options.
16. Click Advanced.
17. In the Vendor class dropdown, choose LifecycleController.
18. Select the checkbox beside 001 LifecycleController.
19. In the String value field, enter the IP of the ConfigMgr server.
20. Click OK.

Configuring Auto-Discover on the iDRAC of the machine if not factory configured (Dell only)

Note: These steps are only necessary if Auto-Discovery is not enabled at the factory. To avoid these steps, simply select the Auto-Discovery option when configuring your servers.

1. Boot the machine in question, and enter the iDRAC by pressing Ctrl+E when the iDRAC portion of the POST appears.
2. Scroll down to Reset Configuration, and reset the iDRAC to defaults.
3. After the reset is complete, scroll up to iDRAC LAN, and choose On if not On by default.
4. Scroll to LAN Configuration, and press Enter.
5. Scroll to IPv4, and choose Enable.
6. Scroll to IPv4 source, and choose DHCP.
7. Set DNS Servers from DHCP to On.
8. Scroll up to the top section on the LAN Configuration.
9. Set Domain Name from DHCP to On.
10. Press Escape to return to the main menu.
11. Scroll to LAN User Configuration, and press Enter.
12. Change the admin user access to be disabled. Change the Auto-Discover feature to be enabled.
13. Press Escape.
14. Press Escape, and choose to Save the changes and exit.

Altering the HTTP compression scheme in IIS (Dell only)

In order to work around an issue with IIS and Windows Server Update services conflicting with the provisioning Web site, we had to alter compression.

1. On the ConfigMgr machine, click Start, Run, and type the following command:

```
%windir%\system32\inetsrv\appcmd.exe set config-  
section:system.webServer/httpCompression /-[name='xpress']
```

Creating a new collection (HP only)

1. In the Configuration Manager console, navigate to System Center Configuration Manager→Site Database→Computer Management/Collections.
2. Right-click Collections, and select New Collection.
3. At the General screen, provide a name for the new collection, and click Next.
4. At the Membership Rules screen, uncheck the Update this collection on a schedule box, and click Next.
5. Click OK if the application prompts you to do so.
6. At the Advertisements screen, click Next.
7. At the Security screen, click Next.
8. Click Close.

Retrieve MAC Address information and verify PXE boot order (HP only).

Note: We timed both hands-on IT staff time and machine wait time in this section for reporting purposes.

1. Boot the HP server.
2. Press F9 when prompted by the POST to enter the BIOS.
3. With System Options highlighted, write down the MAC address of the NIC that will be used for PXE communication.
4. Using the arrow keys, scroll down to Standard Boot Order (IPL), and press Enter.
5. Verify the NIC is first in the boot order. If not, alter the boot order.
6. Exit the BIOS.
7. Communicate the MAC address via email to the system administrator for ConfigMgr.

Importing the machine to the new collection (HP only).

Note: We timed both hands-on IT staff time and machine wait time in this section for reporting purposes.

1. In the Configuration Manager console, navigate to System Center Configuration Manager→Site Database→Computer Management→Operating System Deployment→Computer Association.
2. Right-click Computer Association.
3. Select Import Computer Information.
4. At the Select Source screen, select Import single computer, and click Next.
5. At the Single Computer screen, provide a computer name, enter the MAC address associated with the target system, and click Next.

6. At the Data Preview screen, click Next.
7. At the Choose Target Collection screen, select Add computers to the following collection, and click Browse.
8. Select the appropriate collection, and click OK.
9. Click Next.
10. At the Summary screen, click Next.
11. Click Close.

Auto-discovering the server in the Dell Environment (Dell only).¹⁰

Note: We timed both hands-on IT staff time and machine wait time in this section for reporting purposes.

1. For the blade server, insert the blade into the blade chassis. For the rack server, plug in the network cable.
2. In the ConfigMgr console, browse to collections and refresh approximately every 30 seconds.

Deploying the OS via PXE (HP only)

After you import the system in the HP scenario, you create a task sequence, advertise the task sequence to the relevant collection, and manually reboot the target deployment server to PXE boot.

Deploying the OS via Dell Lifecycle Controller Integration (Dell only)

After the system is auto-discovered in the Dell scenario, you create a task sequence, advertise the task sequence to the relevant collection, create a WinPE ISO image to store on the network, launch the Dell Lifecycle Controller Config utility, and reboot the targeted collection.

¹⁰ Principled Technologies® Comparison of operating system deployment preparation with Microsoft System Center Configuration Manager 2007: Dell Lifecycle Controller Integration vs. HP PXE deployment processes; a February 2010 report commissioned by Dell. For the full Principled Technologies report, visit http://www.principledtechnologies.com/clients/reports/Dell/SCCM-Lifecycle_controller.pdf.

Appendix A – System configuration information for the ConfigMgr servers and the domain controller servers

Figure 6 provides detailed configuration information about each of the ConfigMgr server systems and the servers we used as our domain controllers.

Servers	2 x Dell PowerEdge R510	2 x HP ProLiant DL180 G6
General dimension information		
Height (inches)	3.4	3.4
Width (inches)	18.0	17.6
Depth (inches)	27.0	28.2
U size in server rack (U)	2	2
Power supplies		
Total number	2	2
Wattage of each (W)	1,100	750
Cooling fans		
Total number	5	4
Dimensions (h x w) of each	2.5" x 2.5"	2.5" x 2.5"
Voltage (V)	12	12
Amps (A)	1.68	2.45
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	4	4
Number of hardware threads per core	2	2
CPU		
Vendor	Intel	Intel
Name	Xeon E5540	Xeon E5540
Stepping	D0	D0
Socket type	LGA 1366	LGA 1366
Core frequency (GHz)	2.53	2.53
L1 cache	4 x 32 KB + 32 KB	4 x 32 KB + 32 KB
L2 cache	4 x 256 KB	4 x 256 KB
L3 cache (MB)	8	8
Platform		
Vendor and model number	Dell PowerEdge R510	HP ProLiant DL180 G6
Motherboard model number	Dell 0W844P	82801JR
Motherboard revision number	13	13
BIOS name and version	Dell 1.1.4 (11/04/2009)	HP 020 (02/04/2010)
BIOS settings	Default	Default
Memory modules		
Total RAM in system (GB)	8	8
Vendor and model number	Crucial CT51272BB	Hynix HMT151R7BFR4C
Type	PC3-10600	PC3-10600

Servers	2 x Dell PowerEdge R510	2 x HP ProLiant DL180 G6
Speed (MHz)	1,333	1,333
Speed in the system currently running @ (MHz)	1,066	1,066
Timing/latency (tCL-tRCD-iRP-tRASmin)	8-8-8-20	7-7-7-20
Size (GB)	4 GB	4 GB
Number of RAM modules	2 x 4 GB	2 x 4 GB
Chip organization	Double-sided	Double-sided
Hard disk		
Vendor and model number	2 x Seagate ST330656SS	2 x Seagate ST3450856SS
Number of disks in system	2	2
Size (GB)	300	300
Buffer size (MB)	16	16
RPM	15,000	15,000
Type	SAS	SAS
Operating system		
Name	Windows Server 2008 x64 Enterprise	Windows Server 2008 x64 Enterprise
Build number	6002	6002
File system	NTFS	NFTS
Language	English	English
Network card/subsystem		
Vendor and model number	2x Broadcom BCM5709C NetXtreme II GigE 2X Broadcom BCM5716C NetXtreme II GigE	HP NC362i DP Gigabit
Type	PCI-E, Integrated	Integrated
Optical drive		
Vendor and model number	Lite-On DS-8A3S	TEAC DV-W28S-RS
USB ports		
Number	4	4
Type	USB 2.0	USB 2.0

Figure 6: Detailed system configuration information for the two Dell PowerEdge R510 test servers and the two HP ProLiant DL180 G6 test servers.

Appendix B – Deployment rack server system configuration information

Figure 7 provides detailed configuration information about each of the rack server systems we discovered or imported.

Servers	Dell PowerEdge R710	HP ProLiant DL380 G6
General dimension information		
Height (inches)	3.50	3.39
Width (inches)	17.50	17.53
Depth (inches)	27.00	25.81
U size in server rack (U)	2	2
Power supplies		
Total number	1	2
Wattage of each (W)	570	460
Cooling fans		
Total number	5	6
Dimensions (h x w) of each	2.50" x 2.50"	2.38" x 2.50"
Voltage (V)	12	12
Amps (A)	1.60	2.45
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	4	4
Number of hardware threads per core	2	2
CPU		
Vendor	Intel	Intel
Name	Xeon X5570	Xeon X5570
Stepping	D0	D0
Socket type	LGA1366	LGA1366
Core frequency (GHz)	2.93	2.93
L1 cache	4 x 32 KB + 32 KB	4 x 32 KB + 32 KB
L2 cache	4 x 256 KB	4 x 256 KB
L3 cache (MB)	8	8
Platform		
Vendor and model number	Dell PowerEdge R710	HP ProLiant DL380 G6
Motherboard model number	0M233H	PADAB0G9VXC1CQ
Motherboard revision number	13	0G
BIOS name and version	Dell 1.3.6 (12/14/2009)	HP BIOS P62 (01/13/2010)
BIOS settings	Default	Default
Memory modules		
Total RAM in system (GB)	12	12
Vendor and model number	Samsung M393B5673DZ1-CF8	Samsung M393B5673DZ1-CF8
Type	PC3-8500R	PC3-8500R

Servers	Dell PowerEdge R710	HP ProLiant DL380 G6
Speed (MHz)	1,066	1,066
Speed in the system currently running @ (MHz)	1,066	1,066
Timing/latency (tCL-tRCD-iRP-tRASmin)	7-7-7-37.5	7-7-7-37.5
Size (GB)	2	2
Number of RAM modules	6	6
Chip organization	Double-sided	Double-sided
Hard disk		
Vendor and model number	Seagate ST973451SS	Seagate ST973451SS
Number of disks in system	2	2
Size (GB)	73	73
Buffer size (MB)	16	16
RPM	15,000	15,000
Type	SAS	SAS
Network card/subsystem		
Vendor and model number	Broadcom NetXtreme II 5709C Dual-Port Ethernet	Broadcom NetXtreme II 5709C Dual-Port Ethernet
Type	Integrated	Integrated
Optical drive		
Vendor and model number	TSSTcorp TS-L333A DVD-ROM	LG GDR-D20N DVD-ROM
USB ports		
Number	4	4
Type	2.0	2.0

Figure 7: Detailed system configuration information for the two rack servers we discovered or imported.

Appendix C – Deployment blade server system configuration information

Figure 8 provides detailed configuration information about each of the blade server systems we discovered or imported.

Servers	4 x Dell PowerEdge M610	4 x HP ProLiant BL460c G6
Enclosure		
Model	Dell PowerEdge M1000e	HP BladeSystem c7000
General dimension information		
Height (inches)	17.3	17.5
Width (inches)	17.6	17.5
Depth (inches)	29.7	32.0
U size in server rack (U)	10	10
Power supplies		
Total number	6	6
Wattage of each (W)	2,360	2,250
Cooling fans		
Total number	9	10
Dimensions (h x w) of each	3.1" x 3.5"	2.75" x 2.25"
Voltage (V)	12	12
Amps (A)	7.0	16.5
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	4	4
Number of hardware threads per core	2	2
CPU		
Vendor	Intel	Intel
Name	Xeon E5540	Xeon E5540
Stepping	D0	D0
Socket type	LGA 1366	LGA 1366
Core frequency (GHz)	2.53	2.53
L1 cache	4 x 32 KB + 32 KB	4 x 32 KB + 32 KB
L2 cache	4 x 256 KB	4 x 256 KB
L3 cache (MB)	8	8
Platform		
Vendor and model number	Dell PowerEdge M610	HP ProLiant BL460c G6
Motherboard model number	0N582M	531221-001
Motherboard revision number	13	13
BIOS name and version	Dell 1.3.6 (10/30/2009)	HP I24 (07/25/2009)
BIOS settings	Default	Default

Servers	4 x Dell PowerEdge M610	4 x HP ProLiant BL460c G6
Memory modules		
Total RAM in system (GB)	24	24
Vendor and model number	Hynix HMT151R7BFR4C-H9T	Micron MT36JSZF51272PY-1G4D1AB
Type	PC3-10600R	PC3-10600R
Speed (MHz)	1,333	1,333
Speed in the system currently running @ (MHz)	1,066	1,066
Timing/latency (tCL-tRCD-iRP-tRASmin)	7-7-7-20	7-7-7-20
Size (GB)	4	4
Number of RAM modules	6 X 4 GB	6 x 4 GB
Chip organization	Double-Sided	Double-Sided
Hard disk		
Vendor and model number	Seagate ST973452SS	Seagate ST9146852SS
Number of disks in system	2	2
Size (GB)	73	72
Buffer size (MB)	16	16
RPM	15,000	15,000
Type	SAS	SAS
Network card/subsystem		
Vendor and model number	Broadcom BCM5709S NetXtreme	Broadcom NetXtreme II 5709C
Type	Integrated	Integrated
USB ports		
Number	2	2
Type	2.0	2.0

Figure 8: Detailed system configuration information for the four Dell PowerEdge M610 blade servers and four HP ProLiant BL460C G6 blade servers we discovered or imported.

About Principled Technologies

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help you assess how it will fare against its competition, its performance, whether it's ready to go to market, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.



Principled Technologies, Inc.
1007 Slater Rd., Suite 300
Durham, NC 27703
www.principledtechnologies.com
info@principledtechnologies.com

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