



BUILDING A

COMMON IMAGE

Developing a common software image
for the HP dc7900, 8000 Elite, and
6000 Pro desktop models

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Table of Contents:

Introduction	2
Windows Licensing Notice	3
Definition of Terms	3
Advantages of a Common Image.....	4
Limitations of a Common Image.....	4
Choosing a Base Image	5
Customizing the Image	5
Removing Preinstalled Software.....	5
Adding software	5
Matrix of Common Hardware.....	6
Additional customization	8
Obtaining drivers for the product family	8
Pooling the drivers on the reference machine (Windows XP)	10
Extending the process (Windows XP).....	10
Extending hardware support in the image.....	10
Supporting non-bundled hardware devices	10
Supporting setup.exe installations.....	11
Using SYSPREP.exe	11
Creating SYSPREP.inf.....	11
Required SYSPREP.inf settings for Windows XP	11
cmdlines.txt	13
oobeinfo.ini (Windows XP)	13
Running SYSPREP (Windows XP).....	13
Creating a Common Image for Windows Vista / Windows 7	14
Example SYSPREP.xml (<i>unattend.xml</i>) Answer file	16
Frequently asked questions.....	19

Summary	21
Appendix A: Sample Answer Files	22
Windows XP sysprep.inf.....	22
Cmdlines.txt.....	23
Oobeinfo.ini	23

Introduction

The goal of this document is to guide IT professionals through the process of creating a Microsoft Windows XP, Windows Vista, or Windows 7 image that can be deployed across the various platforms within an HP product family; specifically the dc7900, 8000 Elite, and 6000 Pro platforms. Due to the high level of testing and qualification that goes into the image preinstalled on HP products; HP recommends the following:

- The assumption is an image for the dc7900 already exists.
- Begin with the dc7900 preinstalled image as a base on which to build a customized common image.
- If the pre-install image has been modified since delivery, use the provided “RestoreCD Plus!” (Windows XP) or “RestoreDVD Plus” (Windows Vista / Windows 7) solution to restore the factory image to the hard drive. In addition, if the operating system is Windows Vista or Windows 7, the product family may support an F11 feature that will also restore the factory image to the hard drive.
- If the first two options are not possible or preferable, a clean installation may be performed using the method and media of choice.

This white paper will not guide you through this process of creating a new operating system installation; instead, you should refer to Microsoft documentation obtained through appropriate channels. This information can be obtained from the appropriate Microsoft Windows operating system Resource Kit, Microsoft’s website, or other Microsoft subscriptions.

This document will not cover image capture, deployment, or management. Due to the high number of infrastructures available for these processes, it will be left to each customer to decide, research, and implement these portions of the imaging process.

With Windows Vista, Microsoft delivered a set of tools to update images without having to install them. Below is a synopsis of the changes for Windows 7.

- **ImageX** allows multiple images to be modified simultaneously. The Windows Imaging API (WIMGAPI) is still available and is included in every Windows 7 edition.
- **DISM (Deployment Image Servicing and Management)** is the consolidation of the offline management tools (including pkgmgr.exe and intlcfg.exe) into a single tool, known as **DISM (Deployment Image Servicing and Management)**. DISM supports logging, inventory commands, offline INF driver package installation, direct application of MS update packages, international settings, and PEImg support for WinPE.

- Search www.microsoft.com for the **Windows Automated Installation Kit (WAIK)**. The WAIK autorun page contains links to the other Application Compatibility and Deployment toolkits.

Windows Licensing Notice

This document does not provide a license to create and/or distribute an operating system image. This document is intended to be a *technical* resource for those who have the proper license to deploy Microsoft Windows XP, Windows Vista, or Windows 7 operating systems.

The operating system license shipped with HP PC's does not grant re-imaging and deployment rights. Before using the document to deploy an image, please contact your Microsoft licensing representative to obtain the proper license agreements. HP cannot be held liable if a customer uses this document to create or deploy an image that violates Microsoft license agreements.

Definition of Terms

This document will detail processes that use the following terms.

Product Family—A product family is defined as a set of form-factor types within a *numerically-defined series*. For example, the dc7900 product family consists of the convertible mini-tower, small form factor, and ultra-small form factor. While the ultra-small form factor machines are considered to be within a product family, their size could dictate some hardware differences including possible chipset components. These differences in hardware components do not negate the possibility of a common image; however, they do add risk and complexity.

Common Image—For the purposes of this paper, a “Common Image” is defined as an operating system image that works across multiple hardware platforms such as the dc7900, 8000 Elite and 6000 Pro products.

Identical Image—An “Identical Image” is an operating system image that is deployed across machines of a single product line, all using the exact same hardware options, or configuration. If you are creating an “Identical Image”, you can disregard the section entitled “obtaining drivers for the product family”.

Driver Support—Driver support in a common image includes the functionality that can be obtained via an INF-based install of the driver by the operating system. This includes device recognition and basic functionality; however, any functionality that is normally achieved by running a setup program will not be available. For information on adding setup application processing, please see the section entitled “extending the process”.

Reference Machine—The Reference Machine is the term used to describe the system that is being used to perform work to pool drivers, customize software and set OS options and parameters. This will be the machine from which the image is captured.

ImageX—This is a Microsoft command-line tool for capturing, servicing, and applying Windows Imaging Format (WIM) files, which are file-based Windows disk images used by Windows Vista. This, in addition to other tools documentation and samples to enable the IT professional to perform automated deployment of the Windows Vista or Windows 7 operating system, is available in the Microsoft

Windows Automated Installation Kit (WAIK) which can be downloaded from the Microsoft Download Center as a free download.

SYSPREP (System preparation tool)—This is a Microsoft tool that prepares the operating system for imaging. This tool must be run before imaging a system and then deploying that image.

SYSPREP.exe can be found on your operating system CD obtained either from HP or Microsoft. SYSPREP, as well as other useful documentation and tools, is contained in the named **deploy.cab**, located in the **support\tools** directory for Windows XP. SYSPREP is located in the SYSPREP folder at %SYSTEMROOT%\system32\SYSPREP for Windows Vista and Windows 7.

Advantages of a Common Image

Creating a common image has several advantages.

- Image reduction – By creating a product family-based common image, image management becomes easier because the *number* of images that require management is reduced.
- Image validation – By using the image preinstalled by HP, you will start with an image that has already undergone extensive testing and validation with the hardware on which it will be deployed. This will save considerable testing resources in your environment. In addition, using the HP image as a base will bypass the Microsoft Windows Activation process that requires each user to activate their copy of Windows (Activation is only required in Windows XP, Windows Vista and Windows 7).
- Operating System-controlled driver installation – By implementing the .inf file-based driver installation method outlined in this white paper, it is assured that hardware will be installed in the most optimal manner possible.

Limitations of a Common Image

While the use of a common image can be extremely advantageous, it is not without caveats. Creating a common image causes a shift in the support liability from the PC OEM back to the organization creating the common image.

It is also very important to be aware of the operating system license as well as licensed applications that are part of the common image. Royalty-based applications typically have strict guidelines surrounding deployment and usage. For example, devices such as DVD have strict distribution restrictions regarding how DVD software is distributed.

Please contact your Microsoft licensing representative for the proper operating system license.

Choosing a Base Image

As mentioned previously, it is recommended by HP to begin with the factory preinstalled image as a “base” for the common image. If the file system type or the partition structure is not desirable, HP recommends that you still use the factory preinstalled image to build the common image. File system and partitioning can be customized during the image load phase of the deployment process.

If the preinstalled image is modified and the operating system is Windows Vista or Windows 7 on a reference PC that supports the F11 restore-feature, a clean factory preinstalled image can be restored by rebooting the PC and pressing F11 at the start of the reboot. After pressing the “NEXT” button, check the “Recover the factory installed operating system, drivers and applications” option and accept the default prompts. The “HP Backup and Recovery Manager” PC Recovery will restore the factory preinstalled image to the system.

If the factory preinstalled image has already been removed from the hard drive, you may restore that image using the RestoreCD Plus! (Windows XP) or RestoreDVD Plus! (Windows Vista / Windows 7) recovery media using the associated RestorePlus documentation included with the computer.

Finally, you may choose to forgo both of these options in favor of a “clean” installation directly from operating system media. You should reference Microsoft Corporate Deployment documentation in order to build the base image, and then continue with the next section of this document to build a common image.

Customizing the Image

There are several steps you may take to customize an operating system image before capturing and deploying that image.

Removing Preinstalled Software

HP pre-installs several applications and software packages that provide additional value to customers. If you do not want to include some of these applications in the common image, they can be removed by using the Add or Remove Programs utility, located in the Control Panel.

Note:

You may notice that software marked as a “Hotfix” cannot be removed. This is by design and is intended to ensure that you have the latest fixes and security updates from Microsoft at the time the system was shipped. HP recommends that you do not uninstall these updates. In addition, any operating system Service Packs preinstalled by HP cannot be removed.

Adding software

Please refer to the documentation provided by software vendors on a case-by-case basis for installing additional, non-HP provided software on the image.

Matrix of Common Hardware

Integrated	Add-On Options	dc7900	8000 Elite	6000 Pro
Audio				
ADI AD1884A HD Audio		X		
Realtek ALC261 HD Audio			X	X
TV Tuner				
	HP TV Tuner (North America) Mini PCIe or PCIe based on form factor		X	X
LAN, Wireless, Modem				
Intel GbE Network Connection		X		X
Intel 82567LM GbE NIC			X	
	Broadcom NetXtreme GbE Ethernet NIC Card	X		
	Broadcom NetXtreme GbE Plus DASH 1.1 NIC		X	
	Broadcom NetXtreme GbE Ethernet Plus PCIe			X
	Intel Pro 1000 CT GbE NIC	X	X	X
LSI Hi-Speed 56K Int'l SoftModem PCIe Card		X	X	X
	HP Wireless NIC 802.11b/g/n PCIe	X	X	X
	Intel WiFi Link 5100 a/b/g/n Mini PCI NIC Card	X	X	

Integrated	Add-On Options	dc7900	8000 Elite	6000 Pro
Graphics				
Intel Graphics Media Accelerator 4500		X		
Intel Graphics Media Accelerator 4500HD			X	X
	ATI Radeon HD 2400 XT (256MB DH) PCIe x16 Card	X		
	ATI Radeon HD 3470 (256MB SH) PCIe x16 Graphics Card	X		X
	ATI Radeon HD 3650 (512MB DH) PCIe x16 Card	X		
	ATI Radeon HD 4550	X	X	X
	ATI Radeon HD 4650 DP	X	X	
	ATI Radeon HD 4650 DP (1GB) DH PCIe			X
	NVIDIA Quadro NVS 290 256MB PCIe x16 VGA Card	X	X	X
	NVIDIA Quadro NVS 295 Graphics Card 256MB DH PCIe	X	X	X
	NVidia GeForce 310 DP (512MB)		X	X

Integrated	Add-On Options	dc7900	8000 Elite	6000 Pro
Security / Manageability				
Trusted Platform Module		X	X	
Infineon 1.2 TPM				X
Intel(R) AMT LMS_SOL for AMT 5.xx		X	X	X
Intel Active Client Manager HECI Device		X	X	X
Intel Mgmt agent for vPro CPUs only dc7900		X		

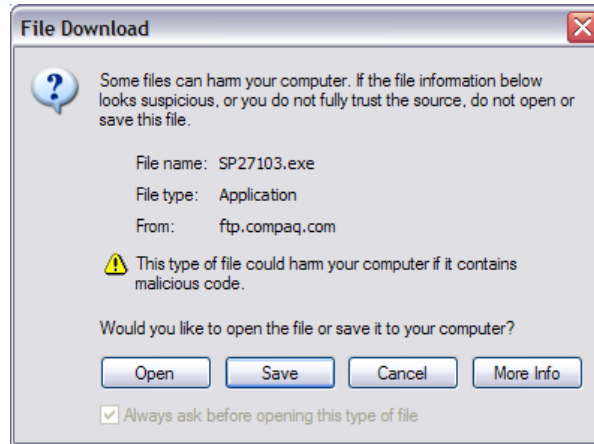
Additional customization

At this time, any additional customizations should be applied. Typical examples are applying a custom wallpaper or desktop theme, changing power profile settings, setting device options, etc.

Obtaining drivers for the product family

- There are three ways to obtain drivers for an entire product family. From the RestoreCD Plus! (Windows XP) or Restore DVD Plus! (Windows Vista / Windows 7) provided with the reference system. The Restore CD/DVD has the advantage of containing all drivers in one place. In addition, all of the drivers are packaged in a manner that is very cohesive with the image deployment process. However, the Restore CD/DVD usually does not contain the very latest versions of all drivers. Rather, it contains the versions of the drivers that shipped from the factory release of the product. To get the latest versions of the driver, please see one of the other options below. Please note that the contents of the Restore CD/DVD are typically compressed in cabinet, or 'cab' format. There are several tools available to uncompress this format including 'expand.exe', which is included in the "%windir%\system32" directory. After gathering drivers from the Restore CD/DVD, all extracted files must be expanded prior to use within the common image scenario.

- Obtain the files from the HP support website. Go to <http://www.hp.com> and choose the “Support and Drivers” link. Select (or enter) the product name for which you want to download drivers, and the corresponding operating system. For each driver, choose to “Save” the Softpaq when prompted with this screen:



Once the Softpaq has been saved, there are several ways to handle it.

- Open the .exe file with a utility such as WinZip and extract the files (may not work with all Softpaqs).
- If the Softpaq is an InstallShield “PackageForTheWeb” file, it will have this icon:



If this is the case, the contents can be extracted by running the following command line:

```
SPXXXXX.exe /f <path> /e /s
```

/f – Specifies the directory in which to land the files

/e – Specifies the command to run. Most Softpaqs will automatically launch a setup or other executable. Passing in a blank value to the **/e** switch will disable this auto-launch functionality and allow for simply extracting the files.

/s – Specifies “silent” operations. No user interaction is required.

<path> - Indicates the location to store the files. If the directory doesn’t exist, it will be created.

For example, the dc7900 chipset Softpaq can be extracted by running:

```
Sp27532.exe /f c:\compaq\chipset /e /s
```

- Finally, you may choose to simply execute the Softpaq to extract and/or install the software.
- Subscribe to the HP Support Software CD service, which is a service that provides monthly CD updates containing the latest drivers for a product.

Pooling the drivers on the reference machine (Windows XP)

After you have obtained the necessary drivers using one of the methods mentioned above, you need to copy the INF files of the drivers in a Flat-file format at the root of the reference machine. This is to support Plug-and-Play detection for installation.

HP uses the following directories for drivers:

```
C:\Compaq\Video; C:\Compaq\Nic; C:\Compaq\Audio; C:\Compaq\Modem;  
C:\Compaq\Misc1; C:\Compaq\Misc2; C:\Compaq\Misc3;  
C:\Compaq\Misc4; C:\Compaq\Misc5; C:\Compaq\Network; C:\Compaq\MSD;  
C:\Compaq\Chipset; C:\Compaq\kbd; C:\Compaq\usb.
```

Drivers are placed in this directory structure so that the operating system will know where to find them during Plug-and-Play detection. This is known as the “Plug-and-play driver path”. If drivers are placed in any other folder, the following key in `SYSPREP.inf` will need to be updated:

```
[Unattended]  
OemPnPDriversPath = "Compaq\Video;Compaq\Nic;Compaq\..."
```

Extending the process (Windows XP)

Extending hardware support in the image

To repeat, this document describes the process of creating an image that is intended for products within a single product family; utilizing the same chipset. While this is the recommended approach, you may also include support for products using a different chipset within the same product family, or simply add support for a product outside of a product family. In order to do this, you should use the processes already described, but utilize the different drivers for each respective product.

One caveat to this approach is potential file collision (duplicated driver names but different actual drivers) in the Plug-and-Play driver directory structure. To prevent this, you may create unique folder names for each driver type. For example, rather than placing all video drivers in the “`c:\compaq\video`” folder, you can create several folders such as “`video1`”, “`video2`”, etc. If you use this technique, be sure to update the “`OEMPnpDriversPath`” setting in `SYSPREP.inf`.

Supporting non-bundled hardware devices

If you need to support hardware devices that were not included as part of your HP system (such as video cards, bio-metric devices, etc.), you can include those as part of your common image as well. Obtain the driver for all devices through the hardware vendor and place those drivers in a Plug-and-Play driver directory of your choice. The INF file for the driver should be at the root of the PNP driver directory (for example, the INF file for a video card should be placed in `c:\compaq\video`). Be sure to update the “`OEMPnpDriversPath`” setting in `SYSPREP.inf` with any directories you add.

For more information on building the Plug-and-Play driver directory structure, see the documentation included in `deploy.cab` in the **support\tools** directory on the operating system CD.

Supporting setup.exe installations

If you cannot install a device using an .inf file, you may be forced to rely on setup.exe-based installation. You can either install these devices manually by running the associated setup program, or you can hook these programs to run automatically when the end-user unbundles the common image. There are several ways of accomplishing this. More specifically, you can add the command-line for each setup program in CmdLines.txt or SYSPREP.inf. For information on launching executables from SYSPREP.inf or CmdLines.txt, please see the documentation included in deploy.cab in the **support\tools** directory on the operating system CD.

Using SYSPREP.exe

After all customizations have been made and drivers have been pooled in the correct directory structure, the system is ready to be prepared for imaging. This is accomplished by running a Microsoft tool named SYSPREP.

To start, create a directory on the root of the "c:\\" drive named "SYSPREP". To obtain SYSPREP.exe, insert the operating system CD obtained either from HP or Microsoft into the CD-ROM drive and browse to the "support\tools" directory. A file named deploy.cab will be located in this directory. Double-click on deploy.cab and view the files. Copy the files "SYSPREP.exe" and "setupcl.exe" to the "c:\SYSPREP" directory.

Note:

The deploy.cab file also contains other useful files. For Windows XP, it contains deploy.chm, a useful guide for creating corporate deployment images and an answer-file reference guide named ref.chm.

Creating SYSPREP.inf

SYSPREP.inf can be generated by setupmgr.exe, a tool located in deploy.cab. However, HP strongly recommends that you use the SYSPREP.inf provided in **Appendix A: Sample Answer Files** on p. 22 of this document as a baseline. For advanced customization or functionality, you can make modifications to this copy of SYSPREP.inf. For information on the settings used in this file, please see the documentation included in the deploy.cab file. If you built the Plug-and-play driver path according to this document, the provided SYSPREP.inf will work without modification. Otherwise, you will need to ensure that the directory structure you implemented is reflected in the OEMPnpDriversPath setting in SYSPREP.inf. For Windows XP, please see the deploy.chm file included in deploy.cab. Once SYSPREP.inf has been created, place it in the c:\SYSPREP directory.

Required SYSPREP.inf settings for Windows XP

The following settings should be used as a baseline in your SYSPREP.inf in order to create a common Windows XP image. You can, of course, tailor this file to suit your

specific needs. For the complete file that is used by HP, please see the **Appendix A: Sample Answer Files** on p. 22.

```
[Unattended]
OemPnPDriversPath =
"Compaq\Video;Compaq\Nic;Compaq\Audio;Compaq\Modem;Compaq\Misc1;Compaq\Misc2;Compaq\Misc3;Compaq\Misc4;Compaq\Misc5;Compaq\Chipset;Compaq\KBD;Compaq\MSD;Compaq\USB;Compaq\Network"
InstallFilesPath = "C:\i386"

[SYSPREPMassStorage]
PCI\VEN_8086&DEV_2410 = %systemroot%\inf\machine.inf ; INTEL PCI-ISA bridge
PCI\VEN_8086&DEV_7110&CC_0601 = %systemroot%\inf\machine.inf ; INTEL PIIX4
PCI-ISA bridge (ISA mode)
PCI\VEN_8086&DEV_7110&CC_0680 = %systemroot%\inf\machine.inf ; INTEL PIIX4
PCI-ISA bridge (EIO mode)

PCI\VEN_8086&DEV_1222 = %systemroot%\inf\mshdc.inf ;Intel PIIX
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_1230 = %systemroot%\inf\mshdc.inf ;Intel PIIX (DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7010 = %systemroot%\inf\mshdc.inf ;Intel PIIX3 (DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7111 = %systemroot%\inf\mshdc.inf ;Intel PIIX4 (DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_2411 = %systemroot%\inf\mshdc.inf ;Intel ICH (DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_2421 = %systemroot%\inf\mshdc.inf ;Intel ICH-0 (DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7199 = %systemroot%\inf\mshdc.inf ;Intel 7199 (SINGLE)
PCI\VEN_8086&DEV_244B = %systemroot%\inf\mshdc.inf ;Intel 82801BA
PCI\VEN_1106&DEV_0571 = %systemroot%\inf\mshdc.inf ;VIA IDE controller
PCI\VEN_10DE&DEV_01BC = %systemroot%\inf\mshdc.inf ;Nvidia IDE controller
PCI\cc_0101 = %systemroot%\inf\mshdc.inf ;Generic IDE
pci\cc_0601 = %systemroot%\inf\machine.inf ;pci-isa bridge
pci\cc_0604 = %systemroot%\inf\machine.inf ;pci-pci bridge
PCI\VEN_1000&DEV_0001 = %systemroot%\inf\pnpscsi.inf ;symc810
PCI\VEN_1000&DEV_0002 = %systemroot%\inf\pnpscsi.inf ;symc8xx
PCI\VEN_1000&DEV_0003 = %systemroot%\inf\pnpscsi.inf ;symc8xx
PCI\VEN_1000&DEV_0004 = %systemroot%\inf\pnpscsi.inf ;symc8xx
PCI\VEN_1000&DEV_0005 = %systemroot%\inf\pnpscsi.inf ;symc8xx
PCI\VEN_1000&DEV_0006 = %systemroot%\inf\pnpscsi.inf ;symc8xx
PCI\VEN_1000&DEV_000B = %systemroot%\inf\pnpscsi.inf ;sym_hi

PCI\VEN_1000&DEV_000C = %systemroot%\inf\scsi.inf ;Symbios 8952U2
PCI\VEN_1000&DEV_000D = %systemroot%\inf\scsi.inf ;symc8xx
PCI\VEN_1000&DEV_000F = %systemroot%\inf\scsi.inf ;Symbios 53C875 & 53C876
pci\ven_9004&dev_5075 = %systemroot%\inf\scsi.inf ;aic78xx
pci\ven_9004&dev_8178 = %systemroot%\inf\scsi.inf ;Adaptec 2940WU
pci\ven_9005&dev_0010 = %systemroot%\inf\scsi.inf ;Adaptec 2940WU2
pci\ven_9005&dev_0080 = %systemroot%\inf\scsi.inf ;Adaptec 29160N
pci\ven_9005&dev_00C0 = %systemroot%\inf\scsi.inf ;Adaptec 3960D
pci\ven_9005&dev_008F = %systemroot%\inf\scsi.inf ;Adaptec 7892 (Embedded)
pci\ven_9005&dev_00CF = %systemroot%\inf\scsi.inf ;Adaptec 7899 (Embedded)
pci\VEN_1000&DEV_0020 = c:\compaq\msd\oemsetup.inf ;Symbios 53C1010-33
pci\VEN_1000&DEV_0021 = c:\compaq\msd\oemsetup.inf ;Symbios 53C1000,53C1010-
66
PCI\VEN_9005&DEV_801F = c:\compaq\msd\ADPU320.INF ;Adaptec AIC-7902 -
Ultra320 PCI\VEN_9005&DEV_8011 = c:\compaq\msd\ADPU320.INF ;Adaptec SCSI
Card 39320D - Ultra320 SCSI
PCI\VEN_1000&DEV_0621 = c:\compaq\msd\symmpi.inf ;LSI
PCI\VEN_1000&DEV_0622 = c:\compaq\msd\symmpi.inf ;LSI
PCI\VEN_1000&DEV_0624 = c:\compaq\msd\symmpi.inf ;LSI
PCI\VEN_1000&DEV_0030 = c:\compaq\msd\symmpi.inf ;LSI
```

Note:

For complete copies of the SYSPREP.inf files used by HP, please see **Appendix A: Sample Answer Files** on p. 22.

cmdlines.txt

In addition to the SYSPREP directory and .inf file, you will need to create the directory "c:\i386\%oem%". Within this directory, you will need to place a file named "cmdlines.txt" containing at least the following lines:

```
[Commands]
"c:\SYSPREP\SYSPREP -clean"
```

This will ensure that all services related to non-used mass storage devices will be removed from the system.

oobeinfo.ini (Windows XP)

In addition to SYSPREP.inf, Windows XP relies heavily on the oobeinfo.ini file. This file resides in the directory: "C:\windows\system32\oobe". If you are using HP preinstalled or restored images, then this file should be intact and all settings should be correct.

Note:

This file will be different for Windows XP Home Edition and Windows XP Professional.

Running SYSPREP (Windows XP)

After the previous steps have been completed, you will be ready to run sysprep.exe to prepare the system for imaging. Please see the documentation included in deploy.chm for Sysprep.exe command-line options. After running Sysprep.exe, you will be ready to capture then deploy your image.

Note:

Windows XP may present a warning that the resale limit has been reached, and your WPA grace period will not be reset. If you are using the HP-provided image, i386 folder contents, sysprep.inf and have not altered the file "C:\windows\system32\oobe\oobeinfo.ini", then you can disregard this message. Your image will not rely on Windows Product Activation. Otherwise, end-users will be required to "Activate" their product with Microsoft during OOBE.

Creating a Common Image for Windows Vista / Windows 7

This section specifically addresses Windows Vista / Windows 7 and focuses on assembling Plug and play drivers on the reference machine. These drivers may be identical or different for platforms in the same family. However, the following discussion will show one way of integrating the Plug and Play drivers into a common image that will make these drivers available to the respective platform on which it is installed.

After obtaining the relevant drivers, using one of the methods described above, copy the INF files to a location on the drive. You may create unique folder name for each type. However, assigning names that reflect the type of drivers that are installed is helpful in establishing a process flow. For example, HP uses the following directories and paths for drivers:

```
C:\Swsetup\Drivers\Audio1; C:\Swsetup\Drivers\Chipset1
C:\Swsetup\Drivers\Video1; C:\Swsetup\Drivers\Modem1
C:\Swsetup\Drivers\Video2; C:\Swsetup\Drivers\Audio2
C:\Swsetup\Drivers\Chipset2; C:\Swsetup\Drivers\Modem2
C:\Swsetup\Drivers\Video; C:\Swsetup\Drivers\Chipset
```

The INF files of each driver are placed in these locations and the **“C:\Swsetup\Drivers”** path is added to the **“Microsoft-Windows-PnpCustomizationsNonWinPE”** component in a SYSPREP.XML answer file (see SYSPREP.XML file below). Using an answer file while SYSPREing the image allows the drivers to be copied to the driver store of the Windows installation during the AuditSystem configuration pass. Later when the deployed image is first booted, and the system runs Plug and Play, these drivers will be available to install hardware on the target computer.

After all customizations have been made on the reference machine and drivers have been copied to desired locations, the system is ready to be prepared for imaging. This is accomplished by running a Microsoft tool named SYSPREP. SYSPREP.exe is located in the %WINDIR%\system32\SYSPREP directory. SYSPREP must always be run from the %WINDIR%\system32\SYSPREP directory and must run on the version of Windows with which it was installed. SYSPREP can be run using three different methods:

- From the command line
- From the UI (User Interface)
- From an answer file

Running SYSPREP from an answer file is chosen primarily because of the ability to instruct Windows Vista / Windows 7 how to configure itself on first boot after the image is applied to a PC. An answer file will automate OS setup – **Computer name, product key, time zone**, and others (see SYSPREP.xml example below). Most importantly, one can add settings to the answer file in the OOBE and audit configuration passes that will be processed on the target PC on first boot. Further detailed information on how SYSPREP works is available on Microsoft Technet at www.microsoft.com.

The SYSPREP.xml now needs to be created. It can be named anything you want with an .XML extension. SYSPREP.xml is created using the Windows System Image Manager (WSIM). WSIM is part of the Windows Automated Installation Kit (WAIK) which is available from the Microsoft download center. If you need to know how to use WSIM, see articles on Microsoft sites and related links on the web. Please see [Example SYSPREP.xml](#).

Copy the newly created SYSPREP.xml to the reference PC. That is Copy SYSPREP.xml to the %WINDIR%\system32\SYSPREP folder. Before you run SYSPREP on the reference PC, you may need to clean up the PC by removing residue of the previous customization. For example:

- Delete any user profiles that you do not need
- Delete any .ZIP or .EXE program/driver files you might have copied to the PC to install and no longer need.
- Delete any extra folders you might have created and do not need.
- Run "Delete" in Internet Explorer > Internet Options to clear out temp files, cookies, settings, and others.
- Uninstall any utility applications you might have used for testing and do not need in the final image.

Once you have cleaned up the reference PC, open an Administrative command prompt, change directory to %WINDIR%\system32\SYSPREP and type:

```
SYSPREP.exe /audit/generalize/reboot /unattend:<name_of_answer_file.xml>
```

The **/unattend** switch uses the SYSPREP answer file you created with WSIM.

The **/generalize** switch does its own PC clean up (Remove SIDs, clear event logs, etc).

The **/audit** switch prompts you to start the computer in audit mode after running the configuration passes in auditSystem and audit user.

The **/reboot** switch forces the PC to reboot once SYSPREP is finished running.

Please note that when the PC reboots into audit mode this allows you to do additional customizations and test these customizations prior to deploying the image. These could include adding device drivers, installing applications, and installing software updates. One of the benefits in this mode is the copying of the driver files to the driver store during the auditSystem configuration pass. Subsequent first boot on the target PC will make the drivers available for hardware installation after Plug and Play runs.

If you are satisfied with your latest customizations and test in audit mode, run SYSPREP one more time before capturing the final image. Open an Administrative command prompt, change directory to %WINDIR%\system32\SYSPREP and type:

```
SYSPREP.exe /oobe/shutdown /unattend:<name_of_answer_file.xml>
```

The **/oobe** switch prompts you to start the computer in Windows welcome mode the next time it is booted up.

The **/shutdown** switch shuts down the computer once SYSPREP has run.

One way to capture the final image on the reference PC is to use the IMAGEX tool. IMAGEX is part of the Windows Automated Installation Kit (WAIK) for Windows Vista. Please consult the documentation for the WAIK. It includes an OPK.chm

compiled HTML help files on IMAGEX command-line options. The following example shows how to

- Boot to the reference PC
 - Capture the image with IMAGEX
 - Save the image on a server
1. Obtain a USB flash drive, or CD with Windows 7 WinPE version (WinPE 3.0) on it, and boot your reference PC.
 2. Map a drive to the server you will be saving the image to.
 3. Now use Imagex to capture an image of the PC and save it to the server.
`ImageX.exe /capture /check c: z:\CommonImage.wim "commonImage"`
 - **/capture** – tells IMAGEX it will be capturing an image
 - **/check** – tells IMAGEX to check the integrity of the image file
 - **C:** - is the drive being imaged
 - **Z:\CommonImage.wim** – is the mapped drive on the server and image file name you are creating on the server
 - **"commonImage"** – is a descriptive name for the image within the WIMNow that you have captured and created a common image file and saved it on a server, it can be used to image other PCs within a designated family. Applying an IMAGEX image file is very similar to capturing one.
 4. Use the WinPE based USB flash drive or CD and boot up the target PC
 5. Map a drive to the server where the common image file is stored:
 6. Since IMAGEX does not partition or format a drive when applying an image, you need to prepare the hard-drive by partitioning and formatting it. If this had not been done, you can use the Microsoft DISKPART utility to create the partition and run FORMAT from the command prompt to format it.
 7. Now use IMAGEX to apply an image to the PC
`ImageX.exe /apply z:\CommonImage.wim "commonImage" C:\`
 - **Z:\CommonImage.wim** – is the mapped server location and image file name being applied
 - **"commonImage"** – is the descriptive name of the image you want to apply
 - **C:** - is the destination root directory of the applied image

Once the image is successfully applied, you can type, at the WINPE command prompt, WPEUTIL Reboot or WPEUTIL shutdown to reboot or shut down the PC.

Example SYSPREP.xml (*unattend.xml*) Answer file

```
<?xml version="1.0" encoding="utf-8"?>
<unattend xmlns="urn:schemas-microsoft-com:unattend">
  <settings pass="oobeSystem">
    <component name="Microsoft-Windows-International-Core"
      processorArchitecture="x86" publicKeyToken="31bf3856ad364e35" language="neutral"
      versionScope="nonSxS" xmlns:wcm="http://schemas.microsoft.com/WMIConfig/2002/State"
      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
      <InputLocale>en-us</InputLocale>
      <SystemLocale>en-us</SystemLocale>
      <UILanguage>en-us</UILanguage>
```



```

        <UILanguageFallback>en-us</UILanguageFallback>
        <UserLocale>en-us</UserLocale>
    </component>
    <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="x86"
    publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
    xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
        <OOBE>
            <HideEULAPage>true</HideEULAPage>
            <NetworkLocation>Work</NetworkLocation>
            <ProtectYourPC>1</ProtectYourPC>
            <SkipUserOOBE>true</SkipUserOOBE>
        </OOBE>
        <RegisteredOrganization>Bmankind</RegisteredOrganization>
        <RegisteredOwner>Bmankind</RegisteredOwner>
        <UserAccounts>
            <LocalAccounts>
                <LocalAccount wcm:action="add">
                    <Password>
                        <Value>dABvAHgAdQB0AGEAdABQAGEAcwBzAHcAbwByAGQA</Value>
                        <PlainText>>false</PlainText>
                    </Password>
                    <Name>Testuser</Name>
                    <Group>administrators</Group>
                    <DisplayName>Testuser</DisplayName>
                </LocalAccount>
            </LocalAccounts>
            <AdministratorPassword>
                <Value>dABvAHgAdQB0AGEAdABBAGQAbQBpAG4AaQBzAHQAcgBhAHQAbwByAFAAYQBzAHMAAdwBvAHIAZAA=</
                Value>
                <PlainText>>false</PlainText>
            </AdministratorPassword>
        </UserAccounts>
    </component>
</settings>
<settings pass="auditSystem">
    <component name="Microsoft-Windows-PnpCustomizationsNonWinPE"
    processorArchitecture="x86" publicKeyToken="31bf3856ad364e35" language="neutral"
    versionScope="nonSxS" xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
        <DriverPaths>
            <PathAndCredentials wcm:keyValue="dfbbff91" wcm:action="add">
                <Path>C:\SWSetup\Drivers</Path>
            </PathAndCredentials>
        </DriverPaths>
    </component>
    <component name="Microsoft-Windows-Deployment" processorArchitecture="x86"
    publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
    xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
        <Reveal>
            <Mode>Audit</Mode>
        </Reveal>
        <AuditComputerName>
            <MustReboot>>false</MustReboot>
            <Name>*</Name>
        </AuditComputerName>
    </component>
    <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="x86"
    publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
    xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

```

```

    <AutoLogon>
      <Username>Administrator</Username>
      <Enabled>>true</Enabled>
      <LogonCount>2</LogonCount>
    </AutoLogon>
  </component>
</settings>
<settings pass="specialize">
  <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="x86"
publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <ProductKey>xxxxx-xxxxx-xxxxx-xxxxx-xxxxx</ProductKey>
    <ShowWindowsLive>>false</ShowWindowsLive>
    <TimeZone>Eastern Standard Time</TimeZone>
    <Display>
      <ColorDepth>32</ColorDepth>
      <DPI>106</DPI>
      <HorizontalResolution>1280</HorizontalResolution>
      <RefreshRate>75</RefreshRate>
      <VerticalResolution>1024</VerticalResolution>
    </Display>
    <ComputerName>*</ComputerName>
    <CopyProfile>>true</CopyProfile>
  </component>
  <component name="Microsoft-Windows-Security-Licensing-SLC-UX"
processorArchitecture="x86" publicKeyToken="31bf3856ad364e35" language="neutral"
versionScope="nonSxS" xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <SkipAutoActivation>>true</SkipAutoActivation>
  </component>
  <component name="Microsoft-Windows-UnattendedJoin" processorArchitecture="x86"
publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <Identification>
      <Credentials>
        <Domain>arbor01</Domain>
        <Password>nopass</Password>
        <Username>installman</Username>
      </Credentials>
      <JoinDomain>arbor01</JoinDomain>
    </Identification>
  </component>
  <component name="Microsoft-Windows-Deployment" processorArchitecture="x86"
publicKeyToken="31bf3856ad364e35" language="neutral" versionScope="nonSxS"
xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <RunSynchronous>
      <RunSynchronousCommand wcm:action="add">
        <Order>1</Order>
        <Path>net user administrator /active:yes</Path>
      </RunSynchronousCommand>
    </RunSynchronous>
  </component>
</settings>
<settings pass="generalize">
  <component name="Microsoft-Windows-Security-Licensing-SLC"
processorArchitecture="x86" publicKeyToken="31bf3856ad364e35" language="neutral"
versionScope="nonSxS" xmlns:wcm="http://schemas.microsoft.com/WMICConfig/2002/State"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <SkipRearm>0</SkipRearm>
  </component>

```

```
</settings>  
<cpi:offlineImage cpi:source="wim://arbors01/installs/vistaos/install.wim#Windows  
Vista ULTIMATE" xmlns:cpi="urn:schemas-microsoft-com:cpi" />  
</unattend>
```

Frequently asked questions

Q: What is a common image?

A: A common image may be defined as a software image that can be installed on a mixed set of PC hardware devices without modification. The software image contains all of the appropriate operating system and device driver files. The image may be installed and run on “any” of the representative hardware configurations that the image supports.

Q: What are the benefits of a common image?

A: The benefits of a common image are as follows:

- Single image can be developed for multiple HP Business Desktop models
- Significantly lowers number of drivers and utilities to manage
- Fewer changes to software images which reduces qualification costs – test/validate on one platform and deploy on any other platform supported by the common image
- Easier management of standard images
- Lower Total Cost of Ownership

Q: What are the types of Common Images?

A: The following are types of Common Images:

- *Common, “shared” hardware* – This type of common image starts with the hardware design process using similar product components. PC systems that use a single supplier for certain components (for example, NIC, audio, etc) can reduce the image complexity by reducing the number of driver and image components. HP believes customers value the ability to scale hardware solutions across their entire environment, and thus this approach is not ideally suited for deployments that serve a vast range of diverse user needs.
- *Super Image* - A software image that contains a large set of drivers to accommodate a full range of hardware devices. While a super image can reduce the number of images, it can be complex to manage by the sheer number of additional number of drivers to test, qualify and keep current, vastly complicating root-cause issues. This approach can also lead to a significant larger image size.
- *Combination* – A single solution cannot be predictable for every need. Sharing product architecture across a product family makes sense to help IT professionals reduce the image management churn. While many user needs can be put into a common architecture “bucket”, every corporation will have user needs outside of the standard bucket. For example, some users will require very advanced graphic solutions while others will require specialized peripherals. Servicing these users will require corporate image adjustments. HP believes that customers want PC design simplicity yet require flexibility to adapt to their unique needs. Our innovative hardware

designs allow IT professionals to simplify their image development to create a combination common image.

Q: What is HP doing in the area of “Common Image”?

A: HP supports the use of Common Images in the following ways:

- For desktops, The HP dc7900, 8000 Elite, and 6000 Pro product families share a common integrated architecture allowing IT professionals to easily manage and deploy a shared image across their environment.
- HP Professional Services available. The HP PCCS (PC Custom Solutions) organization can work with you to consult on common image creation. PCCS has vast experience with HP hardware and common image creation to solve your complex needs and simplify your work. Contact your HP Account Manager to engage with the HP PCCS organization.
- HP provides white papers, Manageability tools and ready access to software which ease image creation and management.

Q: Can a common image be created and shared across both desktop and notebook products?

A: It’s possible. While HP does not deliver a common image compatible between both desktop and portable systems, we do have customers who are deploying common images across these systems in their environments. There are some technical differences between desktop and notebook architecture that must be taken into consideration prior to creating a common image across these products. The HP PCCS organization can help you deliver this solution in your environment. Contact your HP Account Representative for more information on how to contact PCCS.

Q: How can I ensure that I have the proper license to build and deploy a common image?

A: Contact your Microsoft licensing representative.

Q: Can I build an image that will work on desktop products in other product families?

A: Yes, see the “extending the process” section of this document for details.

Q: Can I build a common image that will work on PC’s from different manufacturers?

A: No. When you purchase a product from a hardware vendor such as HP, your license for the operating system is tied to that vendor’s hardware. In addition, Windows Product Activation will detect the hardware differences and prompt users to register their operating system with Microsoft.

Q: Can I deploy a common image on systems that originally contained a different operating system?

A: Not without the proper licensing obtained from Microsoft. Please contact your Microsoft licensing representative to ensure you have the proper license.

Summary

Thank you for your purchase of and interest in HP business PC products. HP hopes that this white paper was useful in your creation of a corporate deployment image. For advanced image topics including image building, customization, answer file reference, SYSPREP, OOBE, corporate deployment scenarios, etc., please see references listed in the appendices of this document.

Appendix A: Sample Answer Files

Windows XP sysprep.inf

Location: c:\sysprep\sysprep.inf

Contents:

```
[Unattended]
OemSkipEula=No
OemPnPDriversPath =
"Compaq\Video;Compaq\Nic;Compaq\Audio;Compaq\Modem;Compaq\Misc1;Compaq\Misc2;Compaq\Misc3;Compaq\Misc4;Compaq\Misc5;Compaq\Chipset;Compaq\KBD;Compaq\MSD;Compaq\USB;Compaq\Network"
InstallFilesPath = "C:\i386"

[GuiUnattended]
AdminPassword=*
EncryptedAdminPassword=NO
AutoLogon=Yes
AutoLogonAccountCreation=NO
AutoLogonCount=1
OEMSkipRegional=0
OemSkipWelcome=0
WaitForReboot=NO

[UserData]
ComputerName=*

[RegionalSettings]
LanguageGroup=1

[Identification]
JoinWorkgroup=WORKGROUP

[Networking]
InstallDefaultComponents=Yes

[OEM_Ads]
Background=BACKGRND.BMP

[Data]
UseBIOSToBoot=1

[SysprepMassStorage]
PCI\VEN_8086&DEV_2410      = %systemroot%\inf\machine.inf      ;INTEL PCI-ISA
bridge
PCI\VEN_8086&DEV_7110&CC_0601 = %systemroot%\inf\machine.inf      ;INTEL PIIX4 PCI-ISA
ISA bridge (ISA mode)
PCI\VEN_8086&DEV_7110&CC_0680 = %systemroot%\inf\machine.inf      ;INTEL PIIX4 PCI-ISA
ISA bridge (EIO mode)

PCI\VEN_8086&DEV_1222      = %systemroot%\inf\mshdc.inf        ;Intel PIIX
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_1230      = %systemroot%\inf\mshdc.inf        ;Intel PIIX
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7010      = %systemroot%\inf\mshdc.inf        ;Intel PIIX3
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7111      = %systemroot%\inf\mshdc.inf        ;Intel PIIX4
(DUAL_GOOD_IDE)
```

```

PCI\VEN_8086&DEV_2411      = %systemroot%\inf\mshdc.inf      ;Intel ICH
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_2421      = %systemroot%\inf\mshdc.inf      ;Intel ICH-0
(DUAL_GOOD_IDE)
PCI\VEN_8086&DEV_7199      = %systemroot%\inf\mshdc.inf      ;Intel 7199 (SINGLE)
PCI\VEN_8086&DEV_244B      = %systemroot%\inf\mshdc.inf      ;Intel 82801BA

PCI\VEN_1106&DEV_0571      = %systemroot%\inf\mshdc.inf      ;VIA IDE controller
PCI\VEN_10DE&DEV_01BC      = %systemroot%\inf\mshdc.inf      ;Nvidia IDE controller

PCI\cc_0101 = %systemroot%\inf\mshdc.inf      ;Generic Device ID for IDE
(DUAL_GOOD_IDE)
pci\cc_0601 = %systemroot%\inf\machine.inf    ;pci-isa bridge
pci\cc_0604 = %systemroot%\inf\machine.inf    ;pci-pci bridge

PCI\VEN_1000&DEV_0001      = %systemroot%\inf\pnpscsi.inf    ;symc810
PCI\VEN_1000&DEV_0002      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_0003      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_0004      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_0005      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_0006      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_000B      = %systemroot%\inf\pnpscsi.inf    ;sym_hi
PCI\VEN_1000&DEV_000C      = %systemroot%\inf\pnpscsi.inf    ;Symbios 8952U2
PCI\VEN_1000&DEV_000D      = %systemroot%\inf\pnpscsi.inf    ;symc8xx
PCI\VEN_1000&DEV_000F      = %systemroot%\inf\pnpscsi.inf    ;Symbios 53C875 & 53C876
(Embedded)
PCI\VEN_1000&DEV_0020      = %systemroot%\inf\pnpscsi.inf    ;Symbios 53C1010-33 (LSI
U160)
PCI\VEN_1000&DEV_0021      = %systemroot%\inf\pnpscsi.inf    ;Symbios 53C1000,53C1010-66
(LSI U160)

pci\ven_9004&dev_5075      = %systemroot%\inf\scsi.inf       ;aic78xx
pci\ven_9004&dev_8178      = %systemroot%\inf\scsi.inf       ;Adaptec 2940WU
pci\ven_9005&dev_0010      = %systemroot%\inf\scsi.inf       ;Adaptec 2940WU2
pci\ven_9005&dev_0080      = %systemroot%\inf\scsi.inf       ;Adaptec 29160N
pci\ven_9005&dev_00C0      = %systemroot%\inf\scsi.inf       ;Adaptec 3960D
pci\ven_9005&dev_008F      = %systemroot%\inf\scsi.inf       ;Adaptec 7892 (Embedded)
pci\ven_9005&dev_00CF      = %systemroot%\inf\scsi.inf       ;Adaptec 7899 (Embedded)
PCI\VEN_9005&DEV_801F      = c:\compaq\msd\ADPU320.INF       ;Adaptec AIC-7902 -
Ultra320 SCSI
PCI\VEN_9005&DEV_8011      = c:\compaq\msd\ADPU320.INF       ;Adaptec SCSI Card 39320D
- Ultra320 SCSI Adapter
PCI\VEN_1044&DEV_A501&SUBSYS_C03C1044 = %systemroot%\inf\pnpscsi.inf    ;Adaptec 2000S
PCI\VEN_1000&DEV_0030      = C:\compaq\MSD\symmpi.inf        ; LSI Logic 1030 Ultra320 SCSI
Adapter

```

Cmdlines.txt

Location: c:\i386\\$oem\$\cmdlines.txt

Contents:

```

[Commands]
"c:\sysprep\sysprep -clean"

```

Oobeinfo.ini

This file contains many settings used during the “Out Of Box Experience” (OOBE). It will be included in any HP preinstalled or restored image, but you may create the file yourself if you wish. HP recommends that you use the copy of this file provided in the image and customize it to fit your specific needs; however, attempting to use

the copy of this file provided by HP in any other way than as specifically directed in this document will be a violation of your HP and Microsoft License Agreements.

Location: c:\windows\system32\oobe\oobeinfo.ini

```
[StartupOptions]
DesktopStartURL = "http://www.fabrikam.com/signup"
DesktopWindowHeight = 530
DesktopWindowWidth = 640
OEMAuditBoot = 1
Offline = 1
Registration = 1
ScreenResolutionCheck = 0

[options]
MouseTutorial=0
JoinDomain=1
AdminPw=1

[OEMRegistrationPage]
OEMAddRegPage=0
PostToOEM=0
RegPostURL=

[Signup]
ISPSignup=MSN
OfferCode=0
Locales=1,81
IDLocales=1,81,33,49,107,61,44

[Version]
ProductKey = "12345-ABCDE-67890-FGHIJ-12345"
```



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