



Procedure for Making a Windows PE Bootable SDI Image

(Booting Windows PE into a Read/Writable RAM Disk)

Deployment Procedure, WinPE Version 2005

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Revision History

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August 22, 2007	0.2	Initial release.

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Introduction

This document describes how to prepare a Windows pre-installation environment (Windows PE) System Disk Image (SDI) enabled to boot from system RAM.

Booting Windows PE allows for a temporary feature-rich operating environment with the capability to access networks, configure system components, and manage or repair NTFS volumes. Booting Windows PE from an SDI image loaded into RAM enables a faster, more reliable boot process. Using an SDI image provides distinct advantages than using an ISO image to boot Windows PE. Where an ISO image is entirely read-only and has no available free space remaining when they are loaded into RAM, an SDI image can offer within it some additional read-writable virtual drive space and it's resident files are also read-writable. Having this free virtual drive space within the SDI allows for a better scripting environment for holding temporary files, processing configuration data, developing new scripts, etc.

Intended Audience

This document is intended for:

- OEM customers who own the license to redistribute the customized Windows PE CD with Server Configuration Utilities
- Windows System Administrators

Prerequisites

- A computer running Microsoft Windows XP* or Windows Server 2003*.
- A pre-built customized Windows PE folder tree.
(see *Intel® Server Utilities for Windows Pre-installation Environment*)
- Windows Embedded Trial
<http://www.microsoft.com/windows/embedded/eval/trial.msp>
- Windows Server 2003 Resource Kit Tools
<http://www.microsoft.com/downloads/details.aspx?FamilyID=9D467A69-57FF-4AE7-96EE-B18C4790CFFD&displaylang=en>

Booting Windows PE into a Read/Writable RAM Disk

Step 1: Build Preparation

1. Download and install Microsoft Windows Embedded Trial.

From Windows Embedded Trial, we will need the

SDIMgr.wsf utility for creating a compressed NTFS SDI image and

sdiloader.exe for mounting the image as a virtual drive.

2. Download and install Windows Server 2003 Resource Kit Tools

From the Resource Kit we will only need

robocopy.exe for populating the SDI image with the customized Windows PE.

3. Create a folder on your system to store the SDI image along with the other fundamental files for booting Windows PE into RAM. In future steps, this is referred to as the *<SDI_location>*.

Step 2: Create the SDI Image.

1. Create a new SDI image file. We will call ours WinPE.SDI.

```
cscript SDIMgr.wsf <SDI_location>\WinPE.SDI /new
```

2. Adjust the size of the WinPE.SDI to be large enough to hold all of your customized WinPE files plus enough extra for you to work with your own files within the virtual drive space after WinPE has booted. The WinPE.SDI will be loaded into RAM Disk allowing for the remaining RAM in the system to be used by the WinPE kernel. So don't make the WinPE.SDI too big either. For our example we will adjust the size to ~240K bytes.

```
cscript SDIMgr.wsf <SDI_location>\WinPE.SDI /createdisk:240000000
```

Step 3: Prepare the SDI Image as a Virtual Hard Drive.

1. Start the **sdiloader.exe** (found in Windows Embedded Trial \bin folder) and load the newly created **WinPE.SDI**. You can load the **WinPE.SDI** file by clicking 'Browse' and navigate to the *SDI_location*.
2. The **WinPE.SDI** file is now introduced to Windows as a new un-initialized virtual hard drive. You will have to use either Disk Manager (gui) or Diskpart.exe (command line) to

initialize and partition this new virtual drive as NTFS with COMPRESSION ENABLED. For this example, we will assign the drive letter 'W:'

Disk Manger (gui method)

Open Disk Manager and right-click on the new un-initialized 240,00 byte-sized drive. It becomes intuitive from here how to initialize, partition, and assign a drive letter for the WinPE.SDI virtual drive.

DISKPART.EXE (command lline method)

At the command line, start DISKPART.EXE. To find the new un-initialized drive, use the following command:

```
DISKPART> list disk
```

Unless you have been adding other devices during this process, the WinPE.SDI virtual drive should be the last disk in the list with the highest disk number and 240,000 bytes in size. We will refer to the actual number here with the '**Disk#**'. To initialize, partition and assign a drive letter to the SDI image issue these commands:

```
DISKPART> select disk Disk#
```

```
DISKPART> create partition primary
```

```
DISKPART> list volume
```

```
DISKPART> select volume Vol#           (Vol# is last in the volume  
list)
```

```
DISKPART> assign letter=W           (there is not a ':' after the letter  
'W')
```

Now that the driver letter W: has been assigned, the partition can be labeled and formatted as NTFS with COMPRESSION ENABLED with this command:

```
format W: /Y /Q /V:yourlabel /FS:NTFS /C
```

Step 4: Add Customized WinPE Files to the SDI Image.

1. We need to use robocopy.exe (found in the Windows resource Kits \Tools folder) to copy all of the files from the customized WinPE tree into the new virtual drive W:, because NTFS with COMPRESSION ENABLED is a bit slow in keeping up. Where a normal xcopy would likely fail. Robocopy has the ability to attempt retries (in this example: 3) to insure that a complete file copy is successful. To add the WinPE files (whose location is referred to below as <custWinPE>, use the following command:

```
robocopy.exe /MIR <custWinPE> W:\ /R:3 /W:4
```

This may take several minutes.

After the copy is finished, use either Disk Manger or DISKPART to remove the W: drive letter. You MUST also unload the disk from the SDILoader. Failure to unload the disk from SDILoader will interfere with using the WinPE.SDI file later in step 5. To remove the volume using DISKPART. Enter these commands:

```
DISKPART> select volume Vol#
```

```
DISKPART> remove
```

Step 5: Add Files for Booting the SDI Image from RAM Disk

By this step you have completed building an SDI image file that is capable of booting a customized Windows PE build. Now we will add some the files necessary to bootstrap the SDI image into RAM Disk from a CD-ROM.

Inside the `<SDI_location>` directory, create a new directory name `i386`.

```
mkdir <SDI_location>\i386
```

and copy the bootloader files needed from your Windows 2003 Server Service Pack 1 CD (referred to here as `<W2K3SP1>`) to this `i386` directory.

```
copy <W2K3SP1>\i386\NTDETECT.COM <SDI_location>\i386
```

```
copy <W2K3SP1>\i386\SETUPLDR.BIN <SDI_location>\i386
```

Next, create this file `<SDI_location>\WINNT.SIF` with the following contents:

WINNT.SIF

```
[SetupData]
BootDevice = "ramdisk(0)"
BootPath = "\I386\System32\"
OsLoadOptions = "/noguiboot /fastdetect /minint/rdimageoffset=36352
/rdpath=WinPE.SDI"
Architecture = "I386"
```

The `<SDI_location>` folder should now contain..

```
<SDI_location>
```

```
WinPE.SDI
WINNT.SIF
I386\NTDETECT.COM
I386\SETUPLDR.BIN
```

Step 6: Create the RAM Disk Bootable WinPE CD

Having completed previous step, we can now create a bootable ISO image from the contents in the `<SDI_location>` directory.

1. From the generic WinPE CD, run the following command to create the bootable ISO:

```
oscdimg.exe -b etfsboot.com -n <SDI_location> <your ISO filename>
```

where:

- `oscdimg.exe` and `etfsboot.com` can be found in the WinPE folder on the Windows PE 2005 build tools CD.
- `<SDI_location>` is the folder we finished populating in Step 3: , above.
- `<iso_image>` is the location and filename for the image that is to be created.

Example:

```
C:\build\oscdimg -bc:\build\etfsboot.com -n c:\SDI c:\winpeRAM.iso
```

2. Use your CD-recording software to burn the ISO image file to a blank CD. This CD can be used to boot the target system with the Windows PE OS.

(bonus) Step 7: Booting the WinPE Into RAM from USB

You can now make WinPE bootable CD's into a Read-Writable RAM Disk. You may want to boot this same SDI image from a more versatile USB flash drive. To do this, we will require the use of a free tool to configure the master boot record of the flask drive called **PeToUSB.exe** which can be downloaded here: <http://gocoding.com/page.php?al=petousb>

1. Run PeToUSB.exe to format and label your USB flash drive. There is no need to specify the WinPE location. All we want is for PeToUSB to format the device and lay down the master boot record. After that, we can close PeToUSB
2. Next we need to add some files to the `<SDI_location>` tree to enable booting from the USB drive. The root of our device will need an NTDETECT.COM and an NTLDR file to boot successfully. We can make copy these files from the `<SDI_location>\i386` folder.

```
cd <SDI_location>\i386
```

```
copy NTDETECT.COM ..\NTDETECT.COM
```

```
copy SETUPLDR.BIN ..\NTLDR (note the renaming from SETUPLDR.BIN to NTLDR)
```

3. Copy the contents of `<SDI_location>` to the USB flash drive and it is ready to boot WinPE.

```
xcopy /s/v/e <SDI_location>\* <USB Drive Letter>
```

Glossary

Term	Definition
SDI Image	A System Disk Image file which can be mounted and used as a virtual drive using SDILoader.exe
PeToUSB	Tool for creating a WinPE bootable USB flash drive.
Windows PE	The Microsoft Windows Pre-installation Environment (Windows PE) is a minimal Win32 subsystem with limited services, based on the Windows kernel running in protected mode.