

Intel® vPro™ Technology Use Case Reference Design

Enhanced Remote Repair with Microsoft* Windows* PE

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1 Preface

Microsoft* has a version of Windows* 7 called Windows PE (WinPE). It is able to boot from a CD-ROM and be a light weight, one-size-fits-all OS. WinPE can be used to troubleshoot systems and image new OSs. Coupled with Intel AMT many of these tasks can be performed remotely. This document outlines creating a WinPE .iso image using the Windows Automated Installation Kit (WAIC) for Windows 7 and a RealVNC VNC* Server. The VNC Server provides a Graphical User Interface for the connection to the remote system running WinPE when KVM Remote Control is not used.

1.1 Document Scope

This document covers the process of building a base WinPE, integrating basic service to aide in remote use, and streamlining WinPE to be small and fast. It also covers remotely booting WinPE and performing basic operations. This document does not cover WinPE in details. For that information refer to the links in the Related Documentation section below.

1.2 Intended Audience

WinPE is a tool that aides in remote diagnostics and repair using Intel vPro technology. As such this document is intended for Information Technology (IT) professionals who desire to learn more about and deploy this type of use case.

1.3 Related Documentation and Software

The download package for this Use Case Reference Design and supporting files referenced in this document, can be found at the following link:

<http://communities.intel.com/docs/DOC-5095>

Technet – “Work with Windows PE”

[http://technet.microsoft.com/en-us/library/cc766387\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/cc766387(WS.10).aspx)

Technet – “Windows Automated Install Kit”

[http://technet.microsoft.com/en-us/library/dd349343\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/dd349343(WS.10).aspx)

Some BCD options

[http://msdn.microsoft.com/en-us/library/ff542205\(v=VS.85\).aspx](http://msdn.microsoft.com/en-us/library/ff542205(v=VS.85).aspx)

BCD paper

<http://www.microsoft.com/whdc/system/platform/firmware/bcd.mspx>

2 Introduction

Anyone who has worked on PCs for a time is familiar with using DOS to troubleshoot and repair PCs. You can flash the BIOS, format the hard drive, install a new OS image, and much more. But, when it comes to repairing the Windows registry or backing up user data DOS is limited. This is where Windows PE shines. Like DOS, it has a one-size-fits-all nature. However, unlike DOS, WinPE 3.0 is based on Windows 7. Therefore, it can be used to access a local Windows 7 formatted drive including editing the registry. It can also access network shares for easier OS imaging and user data backup.

Couple WinPE with Intel vPro and many repair tasks that usually require a desk side visit can now be performed remotely. This document steps through the basics of building a WinPE boot disk, with the bare essential services needed to aid in remote repair. It will also step through remotely booting a managed PC to WinPE using IDER and performing basic tasks like mapping a drive.

That said, the WinPE boot image can be quite large. This can cause remote booting to be slow. Therefore this document will also focus on trimming WinPE to be small. Please note that other size reductions may be possible. Internet searches will provide more information. As more information becomes available, this document will be updated.

Another note is that, like DOS, a WinPE boot disk is only as useful as the tools installed on it. This document focuses on a minimal build with few tools.

This document is the first in a series that will help make WinPE more useful and address some of the challenges with slow network boot times.

2.1 Requirements

Help Desk Console	Any PC with Microsoft* Windows XP or later. Note: This document is written to pertain to Windows 7.
Console PC	Any PC with Microsoft* Windows XP or later.
Managed Client with Intel vPro technology	<ul style="list-style-type: none"> Intel AMT 2.0 or higher. For KVM Remote Control - Intel AMT 6.0 or higher with Intel Integrated Graphics Note: Document example uses an Intel® Desktop Board DQ57TM based system as an example.

2.2 Process Overview

The process consists of two primary steps, each with respective sub steps.

1. Create the WinPE ISO image
 - a) Gather and install the tools
 - b) Obtain a WinPE base image
 - c) Add RealVNC VNC* Server and other tools, drivers, etc.
 - d) Create the .iso file
2. Use IDER to boot the remote managed client to the WinPE ISO and perform basic management tasks remotely.
 - a) KVM Remote Control / IDER
 - b) SOL/IDER
 - c) Perform various tasks to become familiar with WinPE

3 Detailed Steps

This chapter and its subsections step you through creating the WinPE .iso image file. The section layout is meant to make integration of future documents and methods easy.

As stated above, the goal is to build a WinPE image that is as small as possible to reduce remote boot times. This means making careful choices about what to include in the image. Ideally an image would work on all Intel vPro systems and have a LAN driver so that a network share can be mapped. Mapping a network drive allows tools to be downloaded and run on the Managed Client, OS images to be stored and applied, and user data to be backed up and recovered. If the network share is a DFS (Distributed File System share), performance may be further increased as the accessed files will be “closer” on the network.

Other basic tools are optional, depending on your needs. For example, WinPE is a graphical OS. Thus, some kind of VNC or RDP session must be established to access and use it remotely. For Intel AMT 6, use KVM Remote Control. For other Intel AMT versions, embed a VNC server in the WinPE image, or automate the loading of such a tool from a mapped drive.

Also, WinPE offers a command prompt over a serial port using Microsoft’s “Emergency Management Services”. This means that a command line can be accessed from any Intel AMT system over SOL. Unfortunately this feature only works on some OEM systems. As such, it is recommended to test your specific OEM before planning to use this feature. However, if it works, you can use WinPE from a text based interface without the need for a VNC server.

Another option when building WinPE is the choice of—32 bit or 64 bit. When making this choice be aware that a 64 bit WinPE cannot run 32 bit tools, and vice versa. Make your choice before beginning. Please note, in many cases it is possible to repair a 64 bit windows install using a 32 bit WinPE build. The main reason to use a 64 bit WinPE is to run the setup.exe from a 64 bit Windows 7 installer.

Note: Although not strictly required, these steps assume the Technician PC’s architecture matches your choice here. In other words, if you want to build a 32 bit WinPE your technician PC should have 32 bit Windows installed. If you choose not to follow this advice, some steps will need to be modified.

Provided below are steps to build a 32 bit or 64 bit WinPE with LAN drivers included. You may optionally follow steps to include one of RealVNC’s VNC Servers. The free version supports 32 bit. For 64 bit, purchase and use a license for VNC Enterprise edition. To further automate the process, Serial over LAN drivers may be added and used to communicate with Remote ISO launcher. This will notify the user when WinPE has finished booting and optionally start a VNC session automatically.



NOTE

These steps are not the only method possible. In fact, similar processes are documented by Microsoft and many technology enthusiasts on the Internet. These steps are meant as a baseline example. Please modify them based on your needs. Check the WAIK documentation for more details. [http://technet.microsoft.com/en-us/library/dd349343\(WS.10\).aspx](http://technet.microsoft.com/en-us/library/dd349343(WS.10).aspx)

3.1 Obtain the Files

Download the necessary files as described in the following subsections.

3.1.1 WAIK for Windows 7

Click the link below to obtain the Windows Automated Installation Kit for Windows 7.

<http://www.microsoft.com/downloads/details.aspx?familyid=696DD665-9F76-4177-A811-39C26D3B3B34&displaylang=en>

This results in an .iso file. Mount this .iso file (we suggest using Virtual CloneDrive for mounting .iso files) or burn it to a CD and insert the CD.

Install the WAIK with default options (select **Windows AIK Setup** from the CD's default GUI menu).

3.1.2 LAN Drivers for Windows 7:

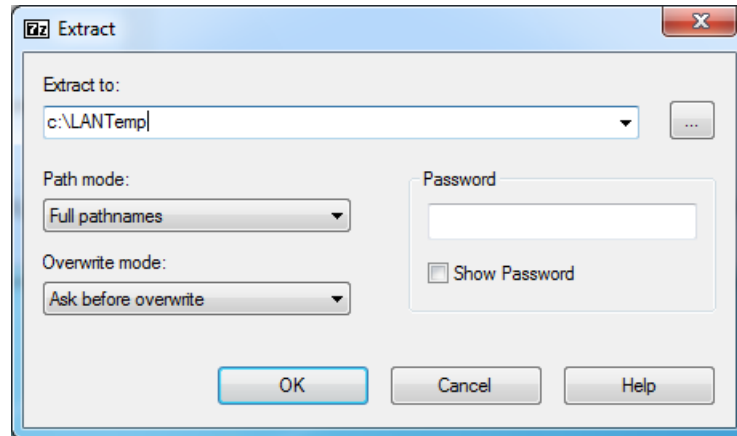
LAN Drivers for Intel vPro based systems are backward compatible, thus you only need to install the latest driver for the latest version of Intel vPro in your WinPE image. Also, since WinPE is a lightweight OS, you do not need any extra OEM specific tools. As such, we recommend that you use the latest Windows 7 driver version from the newest Intel vPro technology capable Intel® Desktop Board. At this time, Intel Desktop Board DQ67SW is the recommended board in this document. Follow the link below and search for DQ67SW.

<http://downloadcenter.intel.com/>

Note that when newer Intel vPro technology based systems come out (i.e., Intel AMT 8.0), you will want to revise your image with newer drivers to support the newer Intel vPro technology.

Follow the steps below:

1. Once the drivers are downloaded, they need to be extracted as follows.
2. Install 7 Zip from <http://www.7-zip.org/>
3. Right click on the downloaded file. For example ProWin64.exe. A menu will appear.
4. Choose 7Zip -> Extract File.



5. Extract to c:\LANtemp as shown in the picture above.
6. For 32 bit, **copy the contents of C:\LANtemp\PRO1000\Win32\NDIS62 to c:\drivers\lan.**
7. For 64 bit, **copy the contents of C:\LANtemp\PRO1000\Winx64\NDIS62 to c:\drivers\lan.**

3.2 Obtain a base Windows* PE Image

The WAIK includes a base image for WinPE. This image is stored as a .wim (Windows Image) file. Basically this file is a compressed image taken from a hard drive. Also included in the WAIK are tools for manipulating .wim files and building .iso images. In this step we obtain the base WinPE image and the iso build environment.

1. Click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
2. For 32 bit, type **copy c:\winpe**.
3. For 64 bit, type **copy amd64 c:\winpe**.
4. Type **copy c:\winpe\winpe.wim c:\winpe\ISO\sources\boot.wim**.

Boot.wim is the image file you will be using. Winpe.wim will remain unused. It is available in case you need to start over for any reason.

3.3 Add Tools and Drivers to the Image

Follow the steps below to add tools and drivers to the image.

3.3.1 Mount the Image

Files with a .wim extension can be mounted. This means that all files in the .wim file are temporarily copied to a location on the local hard drive. Once there, the files can be manipulated, added to or removed. When the image is unmounted, all changes can be written back to the image.

1. If you have not already done so, click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
2. Mount the image:

```
Dism /mount-WIM /wimfile:c:\winpe\ISO\sources\boot.wim /index:1
/mountdir:c:\winpe\mount
```

3.3.2 Add Drivers

Follow the steps below to add the drivers.

3.3.2.1 For 32 bit

Add LAN driver:

```
Dism /image:C:\winpe\mount /Add-Driver /driver:C:\drivers\lan\e1k6232.inf
Dism /image:C:\winpe\mount /Add-Driver /driver:C:\drivers\lan\e1c6232.inf
```

Note: adjust the path to point to the bolded file.

3.3.2.2 For 64 bit

Add LAN driver:

```
Dism /image:C:\winpe\mount /Add-Driver /driver:C:\drivers\lan\e1k62x64.inf
Dism /image:C:\winpe\mount /Add-Driver /driver:C:\drivers\lan\e1c62x64.inf
```

Note: adjust the path to point to the bolded file.

3.3.3 Optional: Add RealVNC VNC* Server

These steps add a RealVNC VNC* Server into the WinPE image. As stated above, this is optional. However, it is useful because it allows full GUI remote control of WinPE. Note that this is not needed if you are using Intel AMT 6 with KVM Remote Control or if using Emergency Management Services via SOL or if WinPE is performing Unattended/Automated tasks.

3.3.3.1 32 bit

When running these steps, be sure the technician PC has a 32 bit windows.



NOTE

To run RealVNC VNC server in WinPE, WinPE's firewall must be disabled.

1. Download RealVNC Viewer Free Edition:
<http://realvnc.com/products/free/4.1/index.html>
2. Install RealVNC VNC Viewer and Server – Choose options for User Mode.
3. Configure RealVNC VNC Server (**Start -> Programs -> RealVNC -> VNC Server 4 (User-Mode) -> Configure User Mode Settings**).
 - Be sure to set a VNC Password of 8 characters.
 - Unless a local user will be present, do not set "Prompt local User..."
 - Leave everything else default

4. At the command prompt type **mkdir "c:\winpe\mount\Program Files\RealVNC\VNC4\"**
5. At the command prompt type **copy "c:\Program Files\RealVNC\VNC4*.*" "c:\winpe\mount\Program Files\RealVNC\VNC4*.*"**
6. Run **Regedit** as an **administrator**.
7. Go to **[HKEY_CURRENT_USER\Software\RealVNC]**.
8. Right-click and select **Export**.
9. Save as **c:\winpe\mount\program files\RealVNC\VNC4\settings.reg**.
10. If you have not already done so:
 - d) Click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
 - e) Type **Dism /mount-WIM /wimfile:c:\winpe\ISO\sources\boot.wim /index:1 /mountdir:c:\winpe\mount**
11. Delete **Unins000.*** from **c:\winpe\mount\Program Files\RealVNC\VNC4**.
12. Open **c:\winpe\mount\windows\system32\startnet.cmd** in a text editor like Notepad.
13. Edit the file to look like this:

```
@echo off
wpeinit
regedit /s "x:\Program Files\RealVNC\VNC4\settings.reg"
wpeutil disablefirewall
start "" "x:\Program Files\RealVNC\VNC4\winvnc4.exe" -noconsole
```



NOTE

WinPE runs startnet.cmd as part of its normal boot process. This means any task may be added to this file for the purpose of automation.

14. Save the file and exit the editor.

3.3.3.2 64 bit

At the time of this writing, RealVNC does not have a free version that will run in a 64 bit WinPE. However, their enterprise version works just fine. The first step is to get a license for it. Contact RealVNC for more information.

When running these steps, be sure the technician PC has a 32bit windows.

Once you have a license, follow these steps.

1. Download RealVNC Enterprise Edition.
<http://www.realvnc.com/products/enterprise/>.
2. Install RealVNC Enterprise Edition. Choose options to exclude the mirror driver and printer driver. When prompted, cancel the license key entry. All other options may be left default.
3. Upon completion of installation, a VNC Server (Service Mode) dialog will appear. Use it to configure the VNC server as follows:
 - a) Click Options
 - b) Set "When VNC Viewers Connect" to "Do Nothing"
 - c) Set Authentication to "VNC Password"
 - d) Click Configure.
 - e) Set the VNC Password. Be sure it's exactly 8 characters. This will be the password you use when connecting via VNC to your WinPE. Click OK.
 - f) Leave everything else default.
 - g) Click OK
4. Close the VNC Server (Service Mode) Window.
5. If you have not already done so:
 - a) Click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
 - b) Type **Dism /mount-WIM /wimfile:c:\winpe\ISO\sources\boot.wim /index:1 /mountdir:c:\winpe\mount**
6. Create the following directory "c:\winpe\mount\Program Files\RealVNC\VNC4\"
7. Copy the following files from "c:\Program Files\RealVNC\VNC4\" to "c:\winpe\mount\Program Files\RealVNC\VNC4\"
 - a) Logmessages.dll
 - b) Saslib.dll
 - c) Vncconfig.exe
 - d) Winvnc4.exe
 - e) Wm_hooks.dll
8. Run **Regedit** as an **administrator**.
9. Go to **[HKEY_LOCAL_MACHINE\Software\RealVNC]**.
10. Right-click and select **Export**.
11. Save as **c:\winpe\mount\program files\RealVNC\VNC4\settings.reg**.
12. Open **c:\winpe\mount\windows\system32\startnet.cmd** in a text editor like Notepad.

13. Edit the file to look like this. Note: replace %VNCLIC% with your license key.

```
@echo off
wpeinit
regedit /s "x:\Program Files\RealVNC\VNC4\settings.reg"
wpeutil disablefirewall
"x:\Program Files\RealVNC\VNC4\vncconfig.exe" -noconsole -license %VNCLIC%
"x:\Program Files\RealVNC\VNC4\winvnc4.exe" -register
"x:\Program Files\RealVNC\VNC4\winvnc4.exe" -start
```



NOTE

WinPE runs startnet.cmd as part of its normal boot process. This means any task may be added to this file for the purpose of automation.

14. Save the file and exit the editor.



NOTE

At this point the Server component RealVNC Enterprise can be uninstalled from the Console PC. However, keep (or reinstall) the Viewer component as it will be used to connect to the VNC Server running in WinPE.

3.3.4 Optional: Notify Support Agent when WinPE has booted

By using Serial over LAN (SOL) it is possible to send a text based message back to the console. This can be used to notify the Support Agent that WinPE has booted and is ready for use. It can also be used to automate tasks like starting a VNC Session. This may be most useful when KVM Remote Control is not in use as KVM Remote Control allows the support agent full view of the screen of the Managed Client. However, this SOL message may still be useful with KVM Remote Control as it can trigger automated tasks.



NOTE

If the SOL driver is added, Microsoft EMS (see section 5, Appendix A: SAC) will not be accessible. Since EMS is OEM dependant and does not work on all systems, this may not be of concern.

3.3.4.1 SOL Driver

To send messages over SOL, WinPE needs SOL drivers. WinPE does not automatically load serial support, so these drivers must be loaded differently than LAN Drivers. Also, although the driver itself is native to windows, there is no universal .inf to load it. As such, the default .inf must be modified. Steps are provided below.

1. Download the latest 32 bit, Windows 7, Intel AMT driver for the latest Executive Series Intel Desktop board from <http://downloadcenter.intel.com/>. At the time of this writing, the recommended board is the Intel® Desktop Board DQ67SW.
2. Right click on the downloaded file (e.g., **MEI_AMT_ALLOS_6.1.0.1042_PV.exe**) and choose **7Zip -> Extract...**
3. Save the file as **c:\MEITemp**.
4. Create a folder **c:\drivers\SOL**.
1. Copy c:\meiTemp\drivers\sol\mesrl.inf and mesrle.inf to c:\drivers\SOL
2. Open c:\drivers\SOL\mesrl.inf in a text editor like notepad.
3. Find the [Intel.NTx86.6.0] section and adjust it to look like this:

```
[Intel.NTx86.6.0]
; Windows Vista
;AMT 7
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_3B67&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_1C3D&CC_0700"
;AMT 6
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_3B67&CC_0700"
;AMT 5
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E07&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E17&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E27&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E37&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E97&CC_0700"
;AMT 4
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A47&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A57&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A67&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A77&CC_0700"
;AMT 3
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29B7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29C7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29D7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29E7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29F7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28B7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28C7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28D7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28E7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28F7&CC_0700"
```

```
;AMT 2.5
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A07&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A17&CC_0700"
;AMT 2
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2987&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2997&CC_0700"
```

4. Open c:\drivers\SOL\mesrle.inf in a text editor like notepad.
5. Find the [Intel.NTamd64] section and adjust it to look like this:

```
[Intel.NTamd64]
;AMT 7
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_3B67&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_1C3D&CC_0700"
;AMT 6
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_3B67&CC_0700"
;AMT 5
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E07&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E17&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E27&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E37&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2E97&CC_0700"
;AMT 4
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A47&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A57&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A67&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A77&CC_0700"
;AMT 3
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29B7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29C7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29D7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29E7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_29F7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28B7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28C7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28D7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28E7&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_28F7&CC_0700"
;AMT 2.5
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A07&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2A17&CC_0700"
;AMT 2
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2987&CC_0700"
%SRL_DeviceDesc% = ComPort, "PCI\VEN_8086&DEV_2997&CC_0700"
```

6. If you have not already done so:
 - a) Click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
 - b) Type **Dism /mount-WIM /wimfile:c:\winpe\ISO\sources\boot.wim /index:1 /mountdir:c:\winpe\mount**
7. Copy **c:\drivers\SOL\mesrl.inf** and **mesrle.inf** to **c:\winpe\mount\windows\inf**.
8. Open **c:\winpe\mount\windows\system32\startnet.cmd** in a text editor like Notepad.
9. Add the following lines to the end:

```
:: Load SOL driver
:: mesrl.inf for 32, mesrle.inf for 64
Set COMPORT=nul
set SOLINF=mesrl.inf
if %PROCESSOR_ARCHITECTURE%==AMD64 set SOLINF=mesrle.inf
drvload %SYSTEMDRIVE%\windows\inf\%SOLINF% 2>&1 >nul

:: Find SOL port
for /f "tokens=3" %%A in ('reg query HKLM\Hardware\Devicemap\Serialcomm /s ^|
find /i "REG_SZ"') do (
set COMPORT=%%A
)
```

3.3.4.2 VNC Server Started

To notify the user when the VNC Server has started, add the following line to the end of **startnet.cmd**:

```
if not "%COMPORT%"==" " echo WinPE has finished booting.>%COMPORT%
```

The above line will send the message "WinPE has finished booting." Change the message as desired.



NOTE

If, for some reason, the SOL driver fails to load, this line will be skipped.

3.3.4.3 Automatically start VNC Viewer

If you are using Remote ISO Launcher (RIL) (<http://communities.intel.com/docs/DOC-5943>) to perform IDE-R boots, this SOL technique may be used to have RIL automatically start RealVNC Viewer. To do this RIL must be configured to allow execution of local commands. To achieve auto starting of the VNC Viewer add the following lines to the end of **startnet.cmd**.



NOTE

Default paths are assumed. Adjust as needed.

```
:: Get the IP address.
for /f "delims=: tokens=2" %%A in ('ipconfig ^| find /i "IPv4 Address"') do (
set IP=%%A
)
:: If no IP, no need to load a VNC Server
if "%IP%"==" " goto no_ip

if not "%COMPORT%"==" " echo EXECUTE c:\vnc4\vncviewer.exe %IP%:5900.>%COMPORT%

:no_ip
```

Save the file and exit the editor.

Now, create C:\vnc4 folder. Copy c:\program files\realvnc\vnc4*. * to c:\vnc4*. *

3.3.5 Trim the Image

In this step you are instructed to delete some non-essential files in an effort to trim the image. Note that there may be other files that can be trimmed. Also, although this is not expected, some tools may require the files that are removed in these steps. If you add tools beyond what is listed in this document, it is advisable to test your WinPE build. As we discover more files can be removed or are needed for specific tools, this document will be updated.

Reasons for why these files have been chosen for removal are provided.

File or Folder to delete	Reason
C:\winpe\ISO\boot\fonts	Used for the startup screen only
C:\winpe\ISO\boot\bootfix.bin	Removes the "Press Any Key" message when booting this image
C:\winpe\ISO\boot\etfsboot.com	The CD boot loader – not needed in this directory.
C:\winpe\ISO\EFI\	BCD files for Itanium
C:\winpe\Mount\Windows\Boot	Support files for various unused boot options such as PXE. Note: the image must be mounted to remove this directory.

3.3.6 Unmount the Image

The commands below will unmount the image. You can either commit the changes made to the image or discard the changes and start over. Both options are provided below.

1. If you have not already done so, click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
2. To save changes and unmount, enter:

```
Dism /unmount-WIM /mountdir:c:\winpe\mount /commit
```

OR

To discard changes and unmount (so you can start over), enter:

```
Dism /unmount-WIM /mountdir:c:\winpe\mount /discard
```

3.3.7 Create the .iso Image

Follow the steps below to create the ISO image:

1. If you have not already done so, click **Start -> Programs -> Microsoft Windows AIK -> Deployment Tools Command Prompt** then right-click **Deployment Tools Command Prompt** and select **Run As Administrator**.
2. Type **oscdimg -n -bc:\winpe\etfsboot.com c:\winpe\iso c:\winpe\winpe.iso**.

The resulting .iso file is your WinPE boot disc. If you wish, you may burn it to a CD and boot your Intel vPro technology enabled system from a CD drive to test it.

4 Perform IDER Boot and Basic Remote Tasks

This section outlines three methods of booting and using WinPE. The first method uses KVM Remote Control and IDER. This is useful for Intel AMT 6 with Intel® Integrated Graphics. The second and third methods use SOL/IDER plus the VNC server built into WinPE (as described above). This is useful for any Intel vPro technology based system.

Note that the time an IDER boot takes can vary based on a number of factors such as LAN speed, load on the Help Desk Console, and the size and complexity of the image being booted to. Unfortunately, WinPE's size is not conducive for fast remote booting. In lab testing on a Gigabit network, the image resulting from the steps above was able to boot in roughly two minutes. Your results will likely vary. To improve boot times, see the "Faster Booting over IDER" Reference Design:

<http://communities.intel.com/docs/DOC-5552>

4.1 KVM Remote Control and IDER

This example uses RealVNC's VNC* Viewer Plus, although you can substitute your favorite KVM Remote Control and IDER capable tools. Also, this example uses an Intel® Desktop Board DQ57TM that has been provisioned locally. We are using the admin digest credential and no TLS. See the following for more information.

http://communities.intel.com/docs/DOC-4795	Quick KVM Remote Control for Brand New Intel Core vPro Processor Based PCs
http://communities.intel.com/docs/DOC-4354	Local Setup and Configuration Using a USB Flash Drive
http://communities.intel.com/docs/DOC-4910	Help Desk Console for Non-TLS Environments; more information about VNC Viewer Plus

If your system is using Kerberos and/or TLS, adjust the steps below as needed.

1. If desired, download and install RealVNC's VNC Viewer Plus:
<http://www.realvnc.com/products/viewerplus/index.html>
2. Open VNC Viewer Plus.
3. Enter the IP address of the remotely managed Intel vPro technology based system.
4. Set **Connection mode** to **Intel AMT**.
5. Set **Encryption** to **None** (or adjust based on your setup).
6. Click **Connect**.
7. Enter your Intel AMT Admin credentials and click **OK**.
8. Enter a **User Consent Code** if prompted.

9. Click the **Mount Disk Images** menu icon, shown in Figure 1 below.



Figure 1: The VNC* Viewer Plus Mount Disk Images Menu Icon

10. An IDE Redirection window is displayed. Click **Browse** next to CD/DVD.
11. Enter **select the WinRE image created above**.
12. Click **Mount**.
13. Place the mouse near the top of the screen and click the Power icon.
14. Click **Reset**.
15. Choose **Boot to CD/DVD**.
16. Click **Reset**.

The Intel vPro technology based system will now reboot. It will automatically boot from the WinPE ISO file created above. As it boots, the KVM Remote Control session will display progress.

Once the boot process is complete, you will see a command prompt:

x:\windows\system32. Proceed to section 4.4 for some of the tools and possibilities available at this point.

4.2 Serial over LAN and IDER with Radmin*

This example uses Radmin*, although you can substitute your favorite SOL and IDER capable tools. Also, this example uses an Intel® Desktop Board DQ57TM that has been provisioned locally. We are using the admin digest credential and no TLS. See the following for more information:

http://communities.intel.com/docs/DOC-4354	Local Setup and Configuration Using a USB Flash Drive If your system is using Kerberos and/or TLS, please adjust the steps as needed
http://communities.intel.com/docs/DOC-4309	Radmin* Help Desk Tool for Use With Intel vPro Technology

Follow the steps below:

1. If desired, download and install Radmin Viewer (server is not needed):
<http://www.radmin.com/>
2. Open the Radmin Viewer.
3. On the menu bar, click **Connection > New Connection**.

4. Enter a name for the remotely managed Intel vPro technology based system.
5. Enter the remotely managed system's IP address.
6. Click **OK**.
7. Right-click the remotely managed system and select **Intel AMT -> Network Boot** from the menu.
8. Enter your admin credentials.
9. Select **Boot from ISO or Image File**.
10. Click **Browse** and browse to **C:\winpe\winpe.iso**.
11. Click **OK**.
12. A SOL window will open and the Intel vPro technology based system will reboot and boot the WinPE ISO file.
13. If you see a **SAC>** prompt, see Appendix A: SAC on page 29 for more information. You can do almost everything from the SOL window.
14. If you opted to add SOL drivers and a completion message this will be displayed in the SOL window.
15. Once the remotely managed system boots, it will display a command window:
x:\windows\system32.

**NOTE**

The following steps rely on having the VNC Sever embedded in WinPE. If you opted not to include it, you cannot continue.

16. Open RealVNC Free Viewer (you installed it in 3.3.3 on page 13).
17. Enter the IP address of your remotely managed Intel vPro based system and click **OK**.
18. Enter the VNC Server password you set in section 3.3.3 on page 13.

You now have full remote control of WinPE. Proceed to section 4.3 for some of the tools and possibilities available from here.

4.3 Serial over LAN and IDER with Remote ISO Launcher.

This example uses Remote ISO Launcher although you can substitute your favorite SOL and IDER capable tools. Also, this example uses a Dell Optiplex 960 (with Intel AMT 5 firmware) that has been provisioned locally. We are using the admin digest credential and no TLS. See the following for more information:

http://communities.intel.com/docs/DOC-4354	Local Setup and Configuration Using a USB Flash Drive If your system is using Kerberos and/or TLS, please adjust the steps as needed
http://communities.intel.com/docs/DOC-5943	Remote ISO Launcher

Follow the steps below:

1. If desired, download and install Remote ISO Launcher:
<http://communities.intel.com/docs/DOC-5943>
2. Open Remote ISO Launcher.
3. Click the **Settings** Tab.
4. Enter credentials and options for the managed client.
5. If automated start of the VNC Viewer is desired be sure to select **Allow application to execute local commands**.
6. Select the **Launch** Tab.
7. From the File menu select **Edit ISO Images**.
8. Enter **WinPE** for Friendly Name.
9. Enter **c:\winpe\winpe.iso** for ISO Path.
10. Click **Add**.
11. Click **Done**.
12. On the Launch tab, enter the IP address of the managed client.
13. Click the **WinPE** button.
14. The managed client will now reboot to the winpe.iso image. (click **OK** at warning message).
15. If you wish to see any output on from the SOL console, select the **Terminal** Tab.
16. If you see a **SAC>** prompt, see Appendix A: SAC on page 29 for more information. You can do almost everything from the SOL window.
17. If you opted to add SOL drivers and a completion message, this will be displayed in the SOL window.
18. If you opted to include an autostart command for the RealVNC Viewer, it will open by itself. Skip to step 22.
19. Once the remotely managed system boots, it will display a command window:
x:\windows\system32.



NOTE

The following steps rely on having the VNC Sever embedded in WinPE. If you opted not to include it, you cannot continue.

20. Open RealVNC Viewer (you installed it in section 3.3.3 on page 13).
21. Enter the IP address of your remotely managed Intel vPro based system and click **OK**.
22. Enter the VNC Server password you set in section 3.3.3 on page 13.

You now have full remote control of WinPE. Proceed to section 0 for some of the tools and possibilities available at this point.

4.4 What You Can Do Once You are Connected

At this point you can access the remote computer's main hard drive. Try this:

1. On the remotely managed system, change location to the remote system's primary drive partition, typically **C:**.



NOTE

C: is not always the primary drive letter, so try others if c: is not the primary drive. If you can't see the main hard drive a few things may be at fault:

- *Full Disk Encryption – Many FDE vendors provide WinPE drivers for their FDE solutions. For example, PGP drivers are here: https://pgp.custhelp.com/app/answers/detail/a_id/1779/~/_windows-pe-%26-bartpe-tools-for-pgp-desktop-10 . Follow their steps to add the driver and you should gain access to the local hard drive.*
- *RAID or non-standard SATA drivers – Just as LAN drivers can be added so can hard driver controller drivers. Adjust the steps above for adding LAN to include the appropriate driver. Then you should gain access to the local hard drive.*
- *Or, the hard drive partition may be corrupt. – The diskpart command line tool can be used to view local drives and partitions.*

2. Enter the following command:

```
Dir/w
```

If all is right, this command should display the contents of your c: drive. You should also have network access. Try entering the following command:

```
Ipconfig
```

You can map network drives. See example command below:

```
Net use z: \\dc1\public /user:vprodemo\itproadmin (note: use your own info)
```

With a mapped drive you can back up and replace files, image a new OS, copy .dmp files for debugging, and you can edit the registry. For Example:

1. Type Regedit. Regedit will open.
2. Select HKey_Local_Machine.
3. Select **Load Hive** from the **File** menu.
4. Select **c:\windows\system32\config\SYSTEM**.
5. Select **Local_system** for **Key Name**.
6. Now the local computer's System hive can be edited under HKey_Local_Machine\Local_system.
7. When you are done editing, select **Unload Hive** from the **File** menu to save changes.

You can edit text files like **system.ini**, as shown below:

1. Type Notepad.
2. Click **File > Open** and open **C:\windows\system.ini**.
3. Make any needed changes.
4. Save the file.
5. Close the text editor.

Other tools include bootsec.exe (for repairing a bad boot sector) and bcdedit.exe (for editing/repairing Windows Vista and Windows 7 startup options).

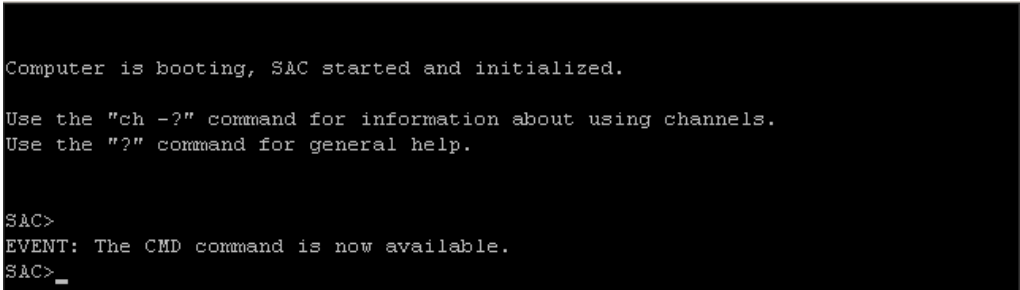
Future reference designs will cover performing more specific operations and other tools.

5 Appendix A: SAC

Some Intel vPro technology based systems will allow use of the System Administration Console provided by WinPE. Unfortunately, for various reasons, not all systems support this console. One system that does is the Intel Desktop Board DQ45CB. On systems like the Intel Desktop Board DQ45CB, you can use a command shell via your SOL connection. Follow the steps below:

Using your favorite management console perform a SOL/IDE-R boot on a remotely managed Intel vPro based client, booting it to the WinPE .iso image described in this document. Instructions vary for consoles so they are not provided.

Once the remotely managed system has fully booted, the SOL window will appear similar to the following:



```
Computer is booting, SAC started and initialized.  
Use the "ch -?" command for information about using channels.  
Use the "?" command for general help.  
  
SAC>  
EVENT: The CMD command is now available.  
SAC>_
```

Figure 2: SOL Window

To get a command prompt type the following:

1. cmd
2. ch -si 1

From here you can access the computer's main hard drive. Try this:

1. c:
2. dir/w

If all is right, this should display the contents of your c: drive. You should also have network access. Try this:

```
ipconfig
```

You can map network drives. For example:

```
net use z: \\dc1\public /user:vprodemo\itproadmin (note: use your own info)
```

With a mapped drive you can back up and replace files, image a new OS, copy .dbg files for debugging, and anything else you can dream up. For now, however, we'll leave the details of those as an exercise for the reader.