



# SMART-NET PXE BOOT ENVIRONMENT

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# Smart-Net Network Booting with PXE

(Technical Level - Advanced)

## What is PXE?



PXE (Pre eXecution Environment), affectionately pronounced Pixie (as in fairy dust), is a method of having a computer (client) boot using only its network card.

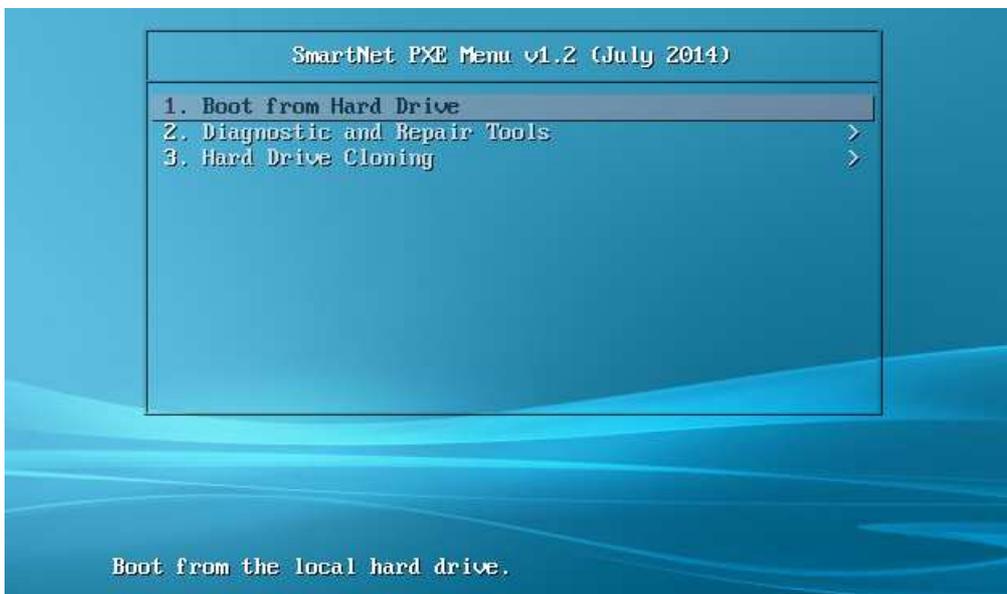
**Assumptions and Prerequisites:** This document assumes your computers support PXE booting and you know how to enable PXE in your computers BIOS.

## Why use PXE?

Have you ever needed to troubleshoot or diagnose a problematic computer or backup and restore images to a computer?

In the event of hardware or software failure, a computer can be booted into the PXE environment to allow a technician to diagnose and perhaps fix the problem or to restore a good image to the machine.

## What PXE options are available?



The standard Smart-Net PXE menu will show three options, with a default timeout of 7 seconds to before it will boot from the computer's hard drive.

1. Boot from Hard Drive – proceed with standard OS boot from the hard drive
2. Diagnostic and Repair Tools – various tools to allow computers hardware to be diagnosed or file systems repaired (*see section on Diagnostic and Repair Tools*).
3. Hard Drive Cloning – Imaging solution to allow the backup and restore of computer hard drives (*see section on Hard Drive Cloning*).

## Configuring PXE Support in Smart-Net

PXE support in Smart-Net can be configured by editing the file `/smart/etc/serverconfig` or via the Smart-Net Intranet PXE Boot icon under Server Management / System Configuration.

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### PXE Boot

Preboot Execution Environment

PXE Boot Server
Clonezilla Images

**PXE Server Settings**

Enable PXE Server:

Select Boot Loader: PXE Linux ▼

PXE Server IP address: 192.168.1.1

PXE Server Menu Password: t00b3xp

**PXE Image Server**

Image Server IP address: 192.168.1.1

UNC path to Clonezilla images: \\SATURN\pxe\images\clonezilla

Connect to the server using:

Username: pxeboot

Password: t00b3xp

Reset Defaults
Save Settings

Some sites may have had custom PXE menu solutions implemented before Smart-Net's official support for a PXE Boot system. In these cases the serverconfig variable `"%DHCPD_PXE_CUSTOM_MENU% = yes"` and the following message will display when the PXE Boot icon is clicked in Smart-Net. Any updates to Smart-Net's PXE menu system will not apply to servers with this configuration.

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### PXE Boot

Preboot Execution Environment

**Your current PXE boot configuration is unsupported.**

**Please contact Smart Computer Systems to activate the Smart-Net PXE Boot menu.**

## Clonezilla Images

The Clonezilla Images tab will automatically list all images that have been created. Clicking the **[Update]** button will refresh your PXE boot menu for Clonezilla, with a menu item for all restorable images.

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### PXE Boot

Preboot Execution Environment

PXE Boot Sever
Clonezilla Images


**Desktop Images**

Brand	Model	Image Name	Created
Gigabyte	H55M-UD2H	2014-07-17-w81-i5-320gb	July 17 2014, 22:46:18
Gigabyte	H55M-UD2H	2014-07-21-w81-i5-500gb	July 21 2014, 07:37:27

**Laptop Images**

Brand	Model	Image Name	Created
Acer	Aspire one	aspire_one_d250-w7p_x86	April 09 2014, 22:04:45

Click the **[Update]** button below to refresh the "Restore a Hard Drive image (Show All Images)" PXE menu.

Update

## Serverconfig Settings

An explanation of Smart-Net PXE options are below:

%DHCPD_PXE_ENABLED%	Specify whether to enable PXE on your server. To enable PXE support, set this variable to “yes”. <i>Default: no</i>
%DHCPD_PXE_FILENAME%	<b>Advanced users only:</b> The PXE boot environment supports several boot loaders – pxelinux.0, gppeundionly.kpxe, ipxeundionly.kpxe <i>Default: ipxeundionly.kpxe</i>
%DHCPD_PXE_NEXTSERVER_IP%	The IP address of the server running TFTP. Default: %ETHO_IP%
%DHCPD_PXE_PASSWORD%	Plain text password for the PXE boot menu options. <i>Default: t00b3xp</i>
%DHCPD_PXE_PASSWORD_SHA1%	SHA1 encrypted password for the PXE boot menu. The encrypted password variable is automatically generated.
%DHCPD_PXE_CUSTOM_MENU%	<b>Advanced users only:</b> It is possible to replace Smart-Net’s PXE boot environment with your own. Set this option to “yes” to prevent custom PXE boot environments from being overridden. <i>Default: no</i>
%DHCPD_PXE_IMAGE_SERVER_IP%	The IP address of the server containing the share to store images. <i>Default: %ETHO_IP%</i>
%DHCPD_PXE_IMAGE_SERVER_SHARE%	The share and path name where images are stored. <i>Default: pxe/images/clonezilla</i>
%DHCPD_PXE_IMAGE_SERVER_SMBPATH%	The full UNC pathname of the location where images are stored, e.g. <a href="#">\\SATURN\pxe\images\clonezilla</a> . <i>Default: %NB_NAME%\pxe\images\clonezilla</i>
%DHCPD_PXE_IMAGE_SERVER_USER%	The username to connect to the image server share. You should not change this option. <i>Default: pxeboot</i>
%DHCPD_PXE_IMAGE_SERVER_PASSWORD%	The password to connect to the image server share. You should not change this option. <i>Default: t00b3xp</i>

**IMPORTANT:** To enable the PXE boot menu system on your Smart-Net server, set %DHCPD\_PXE\_ENABLED% to yes and optionally change the PXE boot menu password %DHCPD\_PXE\_PASSWORD%.

From an SSH terminal, type:

```
reconfigure_server.pl -s dhcpd
```

## PXE file share location in Smart-Net

The “pxe” file share on Smart-Net is hidden by default, i.e. you will not see the share when you browse to <a href="#">\\SERVERNAME\</a> .	/smart/saturn/pxe/images/clonezilla
Smart-Net PXE images file location	
Smart-Net TFTP server environment	/smart/saturn/pxe/tftpboot Contains all of the tools and software for the PXE boot environment.

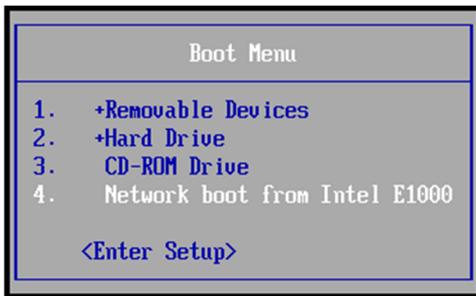
## Can I add my own menu items to Smart-Net’s PXE menu?

Yes! (*For advanced users only*).

Smart-Net TFTP custom menu items location	/smart/saturn/pxe/tftpboot/custom You can install custom PXE images and menus within subfolders of this location.
	<p><i>Example (Symantec Ghost):</i></p> <p>Create a subfolder. /smart/saturn/pxe/tftpboot/custom/ghost</p> <p>Copy the bootable WinPE ISO image into this folder. ghost_winpe50_x86.iso</p> <p>Create your PXE menu file. This must be given the same name as the folder you’ve created, i.e. .../ghost/ghost.menu. You MUST include the line “MENU TITLE” as this is what get picked up for the top-level PXE menu.</p> <p>e.g. MENU TITLE Symantec Ghost MENU BACKGROUND backgrounds/ghostmenu.png LABEL ghost_winpe50_x86 MENU LABEL ^1. Ghost - WinPE 5.0 x86 (32bit) KERNEL pxelinux.cfg/memdisk APPEND raw iso initrd=custom/ghost/ghost_winpe50_x86.iso TEXT HELP Symantec Ghost 11.5.1 - WinPE 5.0 32bit environment * Requires 512MB+ RAM ENDTEXT</p> <p>Additional items will be automatically added to Smart-Net’s PXE menu after you run: <code>reconfigure_server.pl -s dhcpd</code></p>

## What do I see on my computer screen when it PXE boots?

On most PC computers, pressing F12 on the BIOS screen will display options for booting from your network card.



When selected, your PC will attempt to obtain a DHCP lease from the server, then connect to the PXE server.

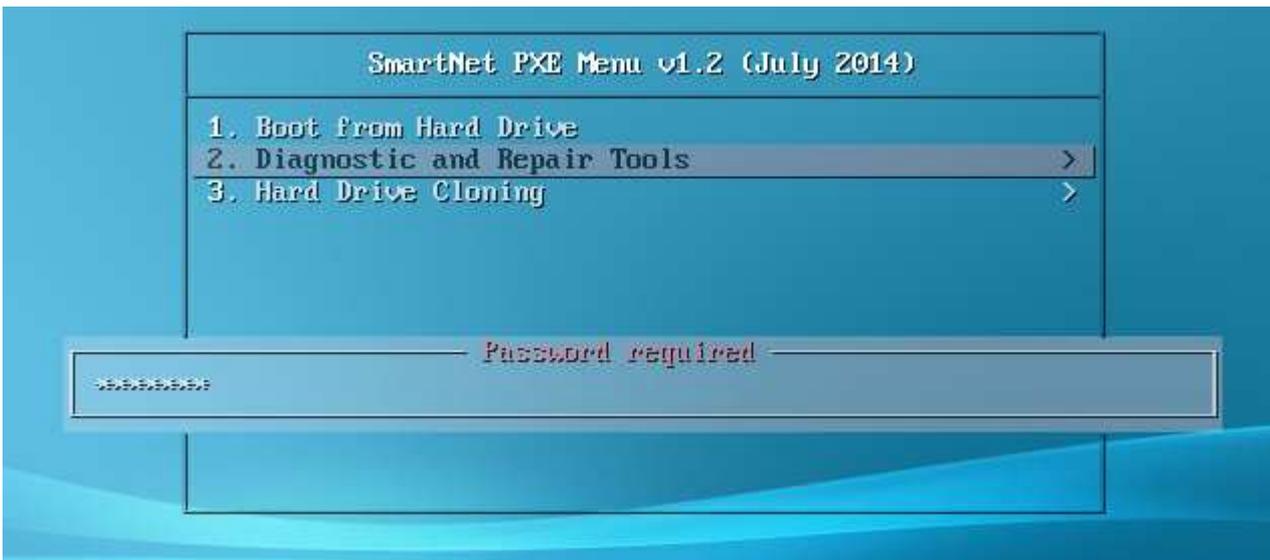
```
Network boot from Intel E1000
Copyright (C) 2003-2008 VMware, Inc.
Copyright (C) 1997-2000 Intel Corporation

CLIENT MAC ADDR: 00 0C 29 D4 6F 2C  GUID: 564DE2DA-F136-E2E0-78C9-EB15CBD46F2C
DHCP.._
```

## Diagnostic and Repair Tools

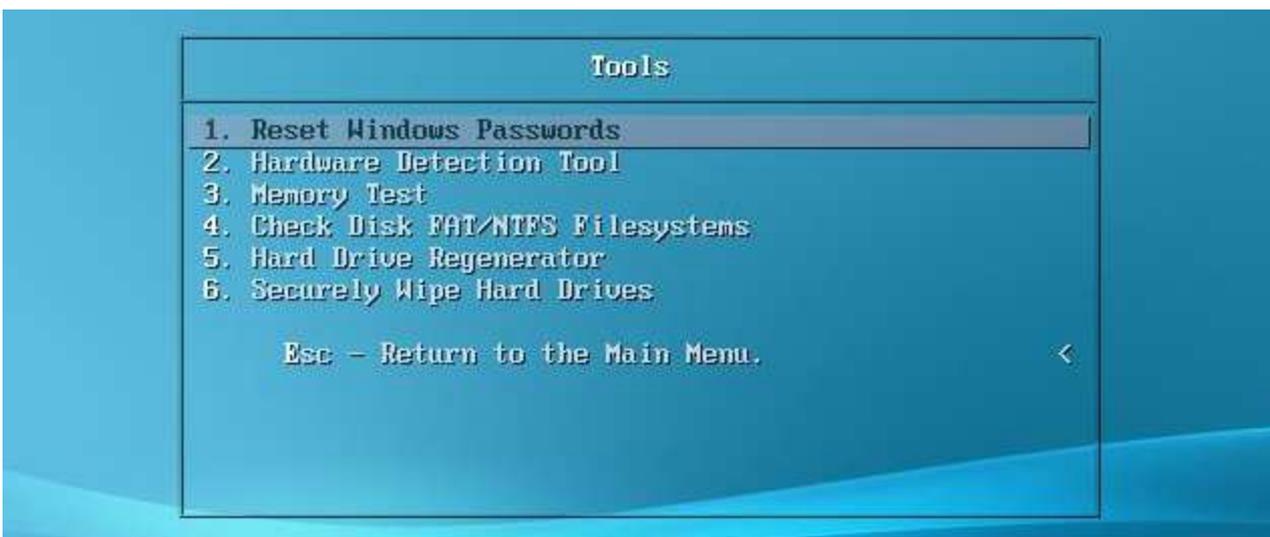
Several freely available Diagnostic and Repair Tools are provided for troubleshooting, file system repair and diagnosing hardware.

While the tools provided are very robust and well tested, there are no guarantees they will fix or accurately diagnose all computer problems.



You will be prompted to enter your PXE boot password when accessing the Diagnostic and Repair Tools menu.

**CAUTION:** Some of these tools are destructive to your computer's hard drive and may render your computer unusable.



There are six tools available on the Diagnostic and Repair Tools menu, providing options for resetting Windows passwords, repairing Windows file systems, detecting and diagnosing hardware and securely wiping hard drives.

## Reset Windows Passwords

This is a utility to resets the password for any user that has a valid local account on your Windows system. Supports all Windows from NT 3.5 through to Windows 8.1 (32/64 bit) and also server versions (2003, 2008 and 2012).

**WARNING:** Do not run this tool on EFS encrypted file systems. Doing so will render your Windows installation unusable.

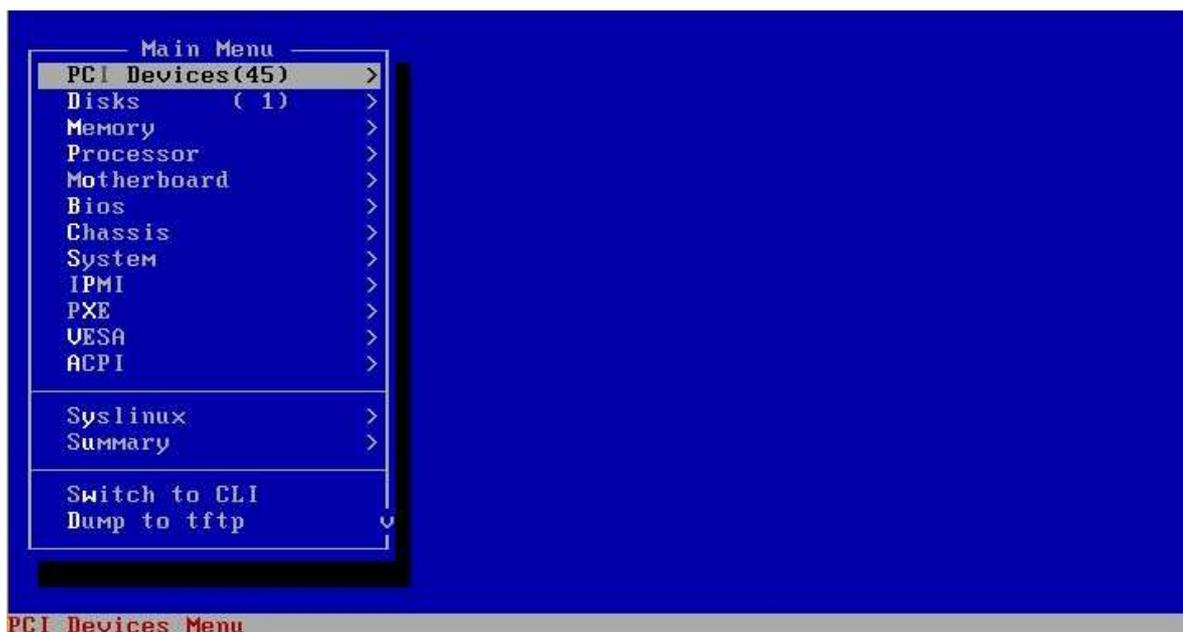
```

*****
* Windows Password Reset & Registry Edit Utility
* (c) 1997 - 2014 Petter N Hagen - pnordahl@eunet.no
* GNU GPL v2 license, see files on CD
*
* HINT: If things scroll by too fast, press SHIFT-PGUP/PGDOWN
*****
=====
There are several steps to go through:
- Automatic search for windows installations
- Select which windows install to change (if more than one)
- Then finally the password change or registry edit itself
- If changes were made, write them back to disk
DON'T PANIC! Usually the defaults are OK, just press enter
  all the way through the questions
=====
# Step ONE - Select disk partition where the Windows installation is
=====
n device bytes  GB  MB  === DISK PARTITIONS:
-----
1 sda1 102400 0 100
2 sda2 62816112 59 61338
-----
100 MB partition sda1 is NTFS. No windows there
61338 MB partition sda2 is NTFS. Found windows on: Windows/System32/config
=====
--- Possible windows installations found:
-----
1 sda2          61338MB Windows/System32/config
-----
Please select partition by number or
q = quit      o = go to old disk select system
d = automatically start disk drivers
m = manually select disk drivers to load
f = fetch additional drivers from floppy / usb
a = show all partitions found (disk)
l = show propbable Windows partitions only
Select: [1]

```

## Hardware Detection Tool

HDT (Hardware Detection Tool) displays low-level information for any x86 compatible system. It provides both a command line interface and a semi-graphical menu mode for browsing.



## Memory Test

Memtest86+ is a standalone memory test for x86 architecture computers. Please be aware that not all errors reported by MemTest86 are due to bad memory. Memtest86+ implicitly tests the CPU, L1 and L2 caches as well as the motherboard. It is impossible for the test to determine what causes the failure to occur. However, most failures will be due to a problem with memory module. When it is not, the only option is to replace parts until the failure is corrected.

Once a memory error has been detected, determining the failing SIMM/DIMM module is not a clear cut procedure. With the large number of motherboard vendors and possible combinations of memory slots it would be difficult if not impossible to assemble complete information about how a particular error would map to a failing memory module. However, there are steps that may be taken to determine the failing module. Here are four techniques that you may wish to use:

- Removing modules

This is simplest method for isolating a failing modules, but may only be employed when one or more modules can be removed from the system. By selectively removing modules from the system and then running the test you will be able to find the bad modules. Be sure to note exactly which modules are in the system when the test passes and when the test fails.

- Rotating modules

When none of the modules can be removed then you may wish to rotate modules to find the failing one. This technique can only be used if there are three or more modules in the system. Change the location of two modules at a time. For example put the module from slot 1 into slot 2 and put the module from slot 2 in slot 1. Run the test and if either the failing bit or address changes then you know that the failing module is one of the ones just moved. By using several combinations of module movement you should be able to determine which module is failing.

- Replacing modules

If you are unable to use either of the previous techniques then you are left to selective replacement of modules to find the failure.

```

Memtest86+ 5.01 | Intel(R) Core(TM) i7-2600K CPU @ 3.40GHz
CLK: 3800 MHz (X64 Mode) | Pass %
L1 Cache: 32K 39176 MB/s | Test %
L2 Cache: 256K 62297 MB/s | Test #2 [Address test, own address Parallel]
L3 Cache: 8192K 190006 MB/s | Testing:
Memory : 2048M 74512 MB/s | Pattern: | Time: 0:00:00
-----
Core#: 0 (SMP: Disabled) | CPU Temp | RAM: 0 MHz (DDR3- 0) - BCLK: 0
State: W Running... | °C | Timings: CAS 0-0-0-0 @ 64-bit Mode
Cores: 32 Active / 1 Total (Run: All) | Pass: 0 Errors: 0
-----
  
```

## Check Disk FAT/NTFS Filesystems

Check Disk verifies the file system integrity on hard drives and fixes logical file system errors. It can repair problems related to bad sectors, lost clusters, cross-linked files, and directory errors. These types of problems can arise in a variety of ways. System crashes or freezes, power glitches, and incorrectly turning off a computer can all cause corruption in the file or folder structure.

Check Disk can also serve as an early warning that a hard drive is deteriorating. Disks gradually wear out and sectors may become bad. If Check Disk starts finding bad sectors that is a sign that a drive may need replacing.

```
Index verification completed.
CHKDSK is verifying security descriptors (stage 3 of 3)...
Security descriptor verification completed.
Correcting errors in the uppercase file.
Windows has made corrections to the file system.

102399 KB total disk space.
 21968 KB in 43 files.
   20 KB in 37 indexes.
    0 KB in bad sectors.
 2723 KB in use by the system.
 2048 KB occupied by the log file.
 77688 KB available on disk.

 4096 bytes in each allocation unit.
25599 total allocation units on disk.
19422 allocation units available on disk.

Checking file system on E:
The type of the file system is NTFS.

CHKDSK is verifying files (stage 1 of 3)...
File verification completed.
CHKDSK is verifying indexes (stage 2 of 3)...
5 percent completed.
```

## Hard Drive Regenerator

Common defects of hard drives are bad sectors on the disk surface. As a result of bad sectors you may have difficulties to read and copy data from your hard disk, your operating system becomes unstable and finally your computer may be unable to boot altogether. Hard Drive Regenerator can detect and may be able to repair (reallocate) bad sectors, resulting in previously unreadable and inaccessible information being restored.

```
HDD Regenerator v2011

HDD Regenerator allows to repair bad sectors on damaged hard disk
drives without losses of the existing data. It supports many types
of hard drives and can be used with any file system including FAT,
NTFS, ext3, hfs+ etc. Unformatted and unpartitioned disks are also
supported.

Choose disk drive to scan:

1. 20 Gb in 41943040 sectors

Only one drive found
```

**WARNING:** There are no guarantees that any data will be recovered. This software should only be used on mechanical hard drives, and not Solid State Drives. Using this software may be a last resort, however users are advised to use the repair option at their own risk!

## Securely Wipe Hard Drives

The program (DBAN) is designed to securely erase a hard disk until data are permanently removed and no longer recoverable. DBAN is free erasure software designed for consumer use. It automatically deletes the contents of any hard disk that it can detect. This method can help prevent identity theft before recycling a computer.

### Darik's Boot and Nuke

**Warning:** This software irrecoverably destroys data.

This software is provided without any warranty; without even the implied warranty of merchantability or fitness for a particular purpose. In no event shall the software authors or contributors be liable for any damages arising from the use of this software. This software is provided "as is".

<http://www.dban.org/>

- \* Press the **F2** key to learn about DBAN.
- \* Press the **F3** key for a list of quick commands.
- \* Press the **F4** key to read the RAID disclaimer.
- \* Press the **ENTER** key to start DBAN in interactive mode.
- \* Enter **autonuke** at this prompt to start DBAN in automatic mode.

**IMPORTANT:** This software does not securely wipe Solid State Drives (SSDs).

**WARNING:** This software is destructive and irrecoverably destroys data.

# Hard Drive Cloning

Hard Drive Cloning is done with Clonezilla. Clonezilla is a partition and disk imaging/cloning program similar to True Image® or Norton Ghost®. It helps you to do system deployment, bare metal backup and recovery.

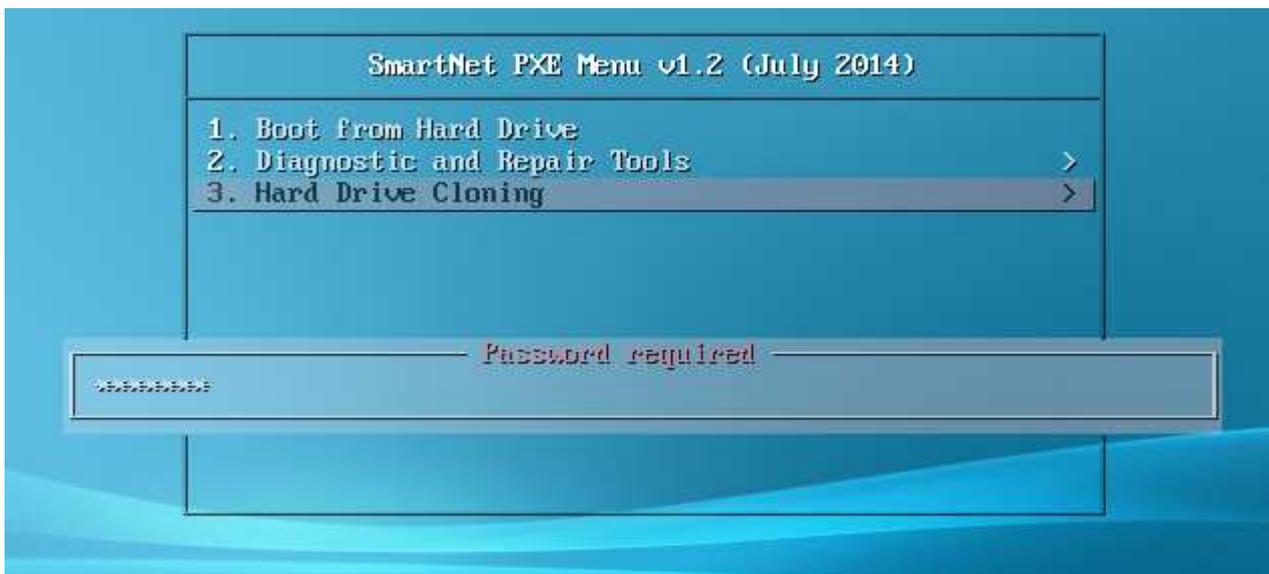
File systems supported by Clonezilla are numerous, including but not limited to: EXT2, EXT3, EXT4, REISERFS, REISER4, FAT16, FAT32, NTFS (Windows) and HFS+ (Mac).

System Requirements for Clonezilla:

- x86-64 processor (e.g. Intel or AMD)
- Minimum 256MB RAM
- The client supports network booting and is connected via a LAN cable.

Limitations:

- The destination partition must be equal or larger than the source drive, i.e. hard drive sizes must be identical when cloning.
- Differential/incremental backup is not yet supported.
- Cloning Software RAID/firmware RAID is not supported.
- Due to the image format limitation, images cannot be explored or mounted.



You will be prompted to enter your PXE boot password when accessing the Hard Drive Cloning menu.

## Guidelines for creating images

### Useful Tips:

- Try to keep images small and optimised as this will allow imaging to complete faster and use less resources on the server.
- Use meaningful computer names such as library-xxx, acer533-xxx where the purpose or the model of the computer is stated and xxx stands for digits that should be changed after imaging. This allows network administrators to track machines easily.
- Use the same base machine if possible for updating images as activation settings will be preserved.

### Things to Remember:

- Computer names will need to be changed after imaging.
- Windows may require re-activation after imaging if it is MAK activated.
- Microsoft Office 2010 or later require re-activation after imaging.
- To activate Microsoft software without proxy settings, the Smart-Net Firewall must be disabled.
- To activate Microsoft software with proxy settings, the following sites need to be added to the No Authentication list on Smart-Net:
  - activation.sls.microsoft.com
  - curl.microsoft.com
  - go.microsoft.com

Alternatively you may specify “.microsoft.com” to match all Microsoft sites.

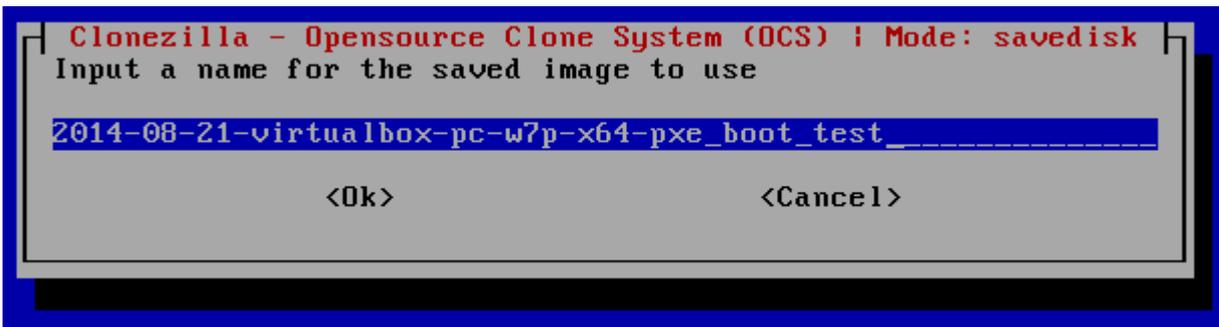
## Create a Hard Drive image

To create an image for backup or deployment, select “Create a Hard Drive image” from the menu.

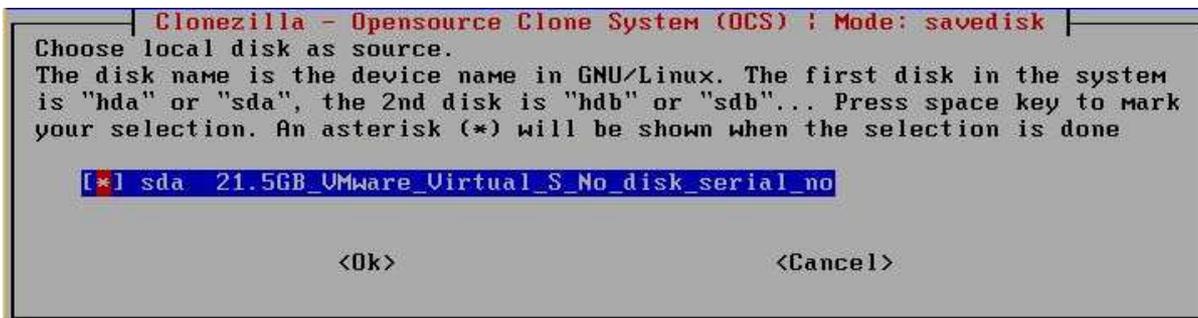
Clonezilla will prompt you to enter a name for image. It will automatically display the date and time as a prefix for the image name.

To make it easier to identify images you’ve created, use the following format to name your images:  
*date-manufacturer-model-os-osarch-purpose*

e.g. 2014-07-11-virtualbox-pc-w7p-x64-pxe\_boot\_test



Clonezilla will ask you which disk you want to create an image from. It will automatically select the first drive it finds (sda). Each additional drive in your computer will be labelled in sequential order, e.g. sdb, sdc etc...



Next, Clonezilla will switch to a console screen where you can confirm you want to continue with your image creation. Type “y” and press Enter to continue.

```

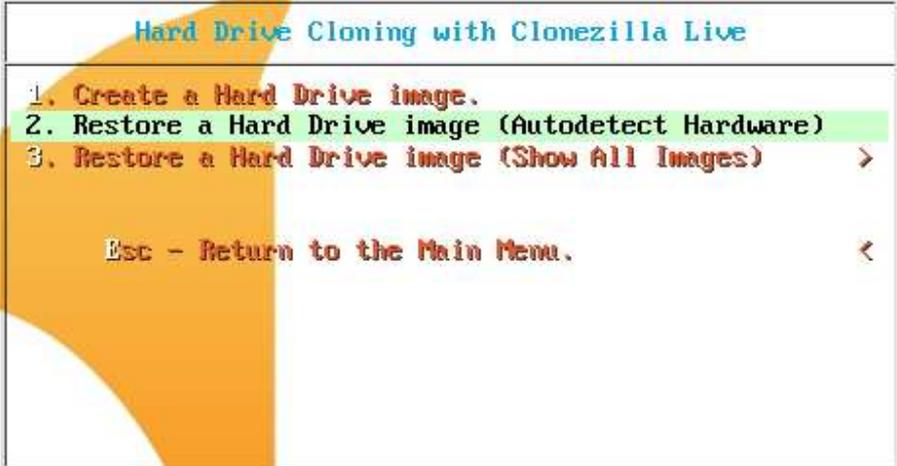
The following step is to save the hard disk/partition(s) on this machine as an i
mage:
*****
Machine: UMware Virtual Platform
sda (21.5GB_UMware_Virtual_S_No_disk_serial_no)
sda2 (18G_ext4(In_UMware_Virtual_S)_No_disk_serial_no)
*****
-> "/home/partimag/2014-07-11-HP-ProBook-4540-W7P-64bit".
Are you sure you want to continue? (y/n)
  
```



## Restore a Hard Drive image

**IMPORTANT:** Be aware that restoring an image to a computer will overwrite all contents of the hard drive, so ensure that important work has been backed up before proceeding.

To restore an image created with Clonezilla, select “Restore a Hard Drive image (Autodetect Hardware)”.



Hard Drive Cloning with Clonezilla Live

1. Create a Hard Drive image.
2. Restore a Hard Drive image (Autodetect Hardware)
3. Restore a Hard Drive image (Show All Images) >

Esc - Return to the Main Menu. <

Restore a disk image with Clonezilla Live v2.2.2-32-i686.  
Images stored @ \\EVERGREEN\pxe\images\clonezilla

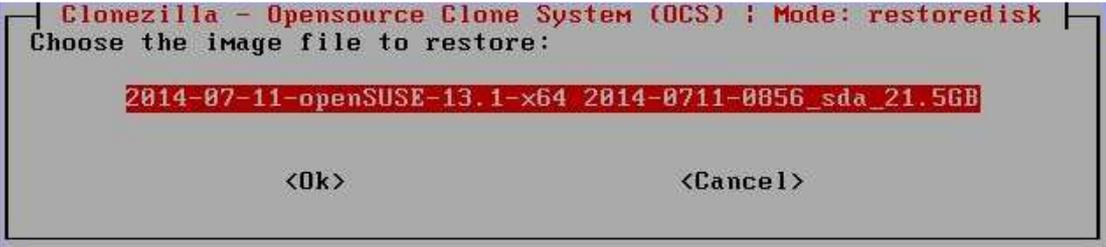
+ Computer will reboot on completion.



Bootable, disaster recovery and disk cloning solution.



Clonezilla will show you a list of images to restore from, which match the hardware brand and model of the computer you're restoring the image to.



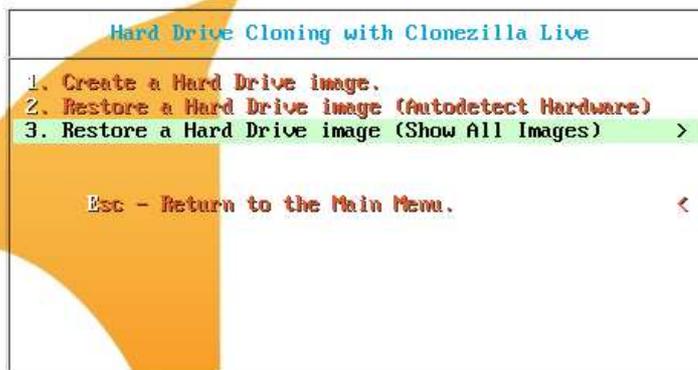
Clonezilla - Opensource Clone System (OCS) : Mode: restoredisk  
Choose the image file to restore:

2014-07-11-openSUSE-13.1-x64 2014-0711-0856\_sda\_21.5GB

<Ok> <Cancel>

Select the Clonezilla image you wish to restore to hard drive.

To restore an image that has been created from a different hardware platform, select “Restore a Hard Drive image (Show All Images)” from the menu.

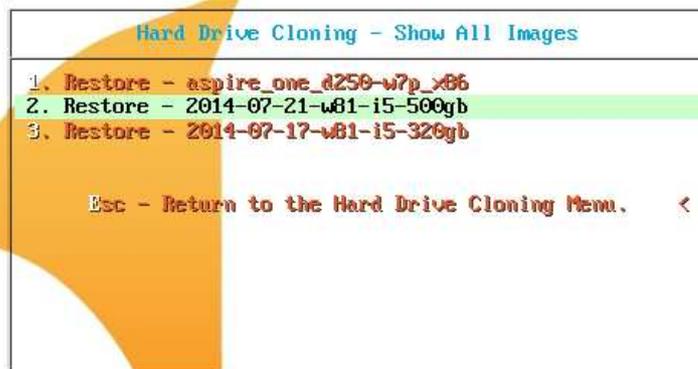


**Clonezilla**

Bootable, disaster recovery and disk cloning solution.



The PXE menu will show all available images on the server. Select the menu option for the image you wish to restore.



Restore Desktop - Gigabyte -> H55M-UD2H -> 2014-07-21-w81-i5-500gb.  
Images stored @ \\EVERGREEN\pxe\images\clonezilla

+ Computer will reboot on completion.

**Clonezilla**

Bootable, disaster recovery and disk cloning solution.



**IMPORTANT:** When restoring an image, make sure the target computer’s hard drive is equal in size or larger than the hard drive used to create the image.

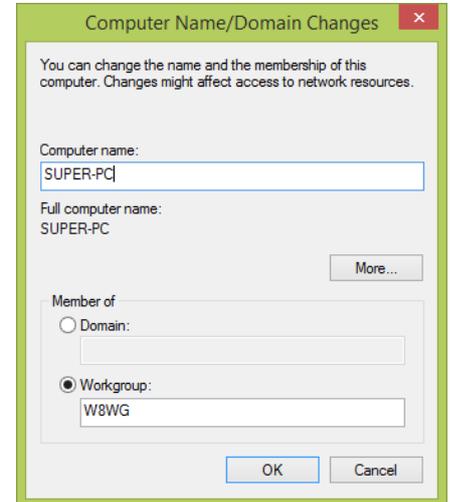


## After Imaging

There are several steps to complete after restoring an image to a computer. Even if Windows and Microsoft Office were activated before you created your original image, you will need to re-activate them after restoring an image.

- Rename the computer. Do this by going to *System Properties*, select the *Computer Name* tab and click the *Change* button.

Ensure that your Workgroup is set to W7WG for Windows 7 or W8WG for Windows 8.



- Activate **Windows** by going to *System* and select *Activate Windows now*.

Windows activation

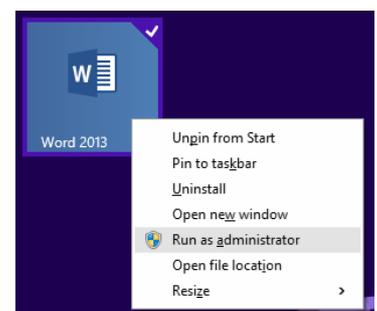


- Activate **Microsoft Office** in Windows 7 by opening **Word** and select *I want to activate the software over the Internet*.



**IMPORTANT:** To activate **Microsoft Office** in **Windows 8**, you must launch **Word** as an administrator from the **Metro** screen, even when UAC is turned off.

Right-click **Word** from the Metro screen and choose *Run as administrator*.



## Where does Clonezilla store my images?

All images for Clonezilla are stored in the “images” subfolder of the “pxe” file share on your Smart-Net server. This is a hidden share so to access it, you will need to browse to it manually by typing “\\SERVERNAME\pxe” from Windows Explorer.

**TIP:** You may wish to map this share in the logon script for network administrators. To do this, add your network administrator’s account to the “pxeboot” group in Smart-Net.

### Group members are listed below.

**Group:** pxeboot

**Description:** Users who belong to this group are granted access to the pxe share.

[+Add Multiple Users...](#)

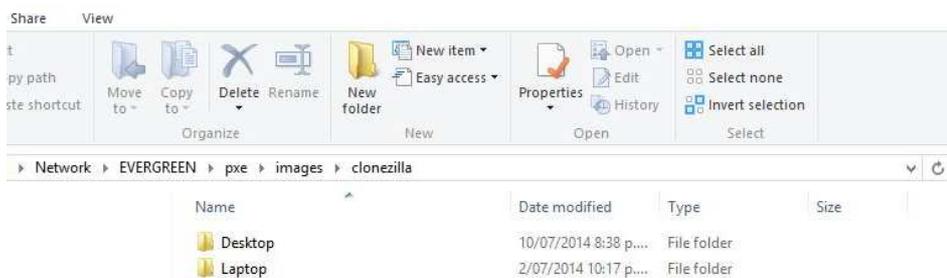
Username	Display Name	
sysadmin	System Administrator	✘

Then add the following lines to “local.bat” in the netlogon share on your Smart-Net server (make sure you choose an available drive letter to map the share to):

```
x:\ismember pxeboot
if errorlevel 1 net use z: \\SERVERNAME\pxe\images %Persistent%
```

This will map to the “images” folder in the “pxe” share.

Images are categorised into Desktop and Laptop folders, and beneath them by brand and model of computer. This information is automatically obtained when an image is created.



# FAQ

**Q.** Can Clonezilla image from a large hard drive to a smaller hard drive?

**A.** Clonezilla is a partition imaging tool and does not know anything about the files on the file system, it just knows where the used blocks are on the hard drive. Because of this reason, the target partition size must be equal or larger than the original one so that Clonezilla can restore the used blocks on that partition.

**Q.** Can I stretch Windows system partition size if I've restored an image that was created on a small hard drive to a large hard drive?

**A.** Yes, but only if the free space is adjacent to the partition which you're going to expand.

Go into Disk Management from Windows 7 / 8, right-click on the partition you want to stretch and select Extend Volume.

