

2011

Portlock Network Boot



Portlock Corporation
4/19/2011

Portlock Network Boot

April 19, 2011

Version 1.02

Copyright 2000-2011 Portlock Corporation

The Portlock storage management software described in this document is furnished under a License Agreement and may be used only in accordance with the terms of the agreement.

Version: 1.02

Date of Publication: April, 2011

NO WARRANTY. The technical documentation is being delivered to you AS IS and Portlock makes no warranty as to its accuracy or use. Any use of the technical documentation or the information contained therein is at the risk of the user. Documentation may include technical errors, typographical errors or other inaccuracies. Portlock reserves the right to make changes without prior notice.

All technical documentation made available by Portlock is the copyrighted work of Portlock. No part of this publication may be copied without the express written permission of Portlock.

Copyright 2000-2011 Portlock. All Rights Reserved. Portlock, the Portlock logo, Portlock Storage Manager, Portlock Scorpion, Portlock Volume Defrag, Portlock Disk Test and Portlock Storage Suite are trademarks of Portlock.

Other vendor product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged. Printed in the United States.

Table of Contents

Chapter 1. Introduction	6
Introduction	6
Requirements.....	6
Portlock Storage Manager (Windows).....	6
Portlock Boot CD	6
Portlock Netboot Package.....	6
How does this work?	7
Technical Issues.....	7
Chapter 2. Setting up the Portlock TFTP Server	8
Introduction	8
Enable the Portlock TFTP Server	8
Step 1: Set the Portlock TFTP Server Base Directory	9
Step 2: Install the Portlock Network Boot Package.....	9
Step 3: Enable or Start the Portlock TFTP Server.	9
Chapter 3. Setting up the Portlock PXE Server.....	10
Introduction	10
Enable the Portlock PXE Server	10
Step 1: Set the Portlock TFTP Server	10
Step 2: Set the Boot File.....	10
Step 3: Enable or Start the Portlock PXE Server.	10
Chapter 4. PXE Client Management	11
PXE Boot File Location	11
Chapter 5. Enable Network Booting.....	12
Chapter 6. Troubleshooting	13
Step 1: DHCP Server.....	13
Step 2: TFTP Server	13
Step 3: PXE Server	13
Appendix A. PXE Boot Programs	14
ABORTPX.COM	14
PXEBOOT.N12.....	14
Appendix A. Frequently Asked Questions	15

How are the Portlock network boot servers implemented? 15

What is PXE?..... 15

Is a DHCP Server Required? 15

Why is the boot process slow on some of my systems? 15

Can I use another vendor's TFTP Server? 15

Which ports does the Portlock PXE Server use? 15

Which port does the Portlock TFTP Server use? 15

Glossary 16

 BootP 16

 DHCP 16

 NBP 16

 PXE 16

 PXE-Capable Hardware 16

 TFTP 16

 NFS..... 16

Chapter 1. Introduction

Introduction

Portlock Storage Manager supports booting computers over the network. This document describes Portlock Network Boot for the Portlock Boot CD. This support requires version 5.17 of Portlock Storage Manager (Windows).

Portlock Network Boot requires two services to be setup and running: Portlock PXE Server and Portlock TFTP Server. These services are part of Portlock Storage Manager (Windows).

The Portlock Network Boot features support booting a computer over the network with the Portlock Boot CD. Other boot platforms such as Linux or Windows are not tested or supported at this time.

Requirements

- Portlock Storage Manager 5.17.
- Portlock Netboot Package.
- DHCP Server running on the Network.
- Computers with PXE Boot (Network Boot) enabled.

Portlock Storage Manager (Windows)

Portlock Storage Manager is a Windows program that manages Portlock licenses, Portlock products, downloads and libraries of objects (Portlock Images, ISO Images, etc.).

Portlock Storage Manager provides direct support for NetWare servers. Key features include:

- Scanning the network for NetWare servers.
- Displaying NetWare storage objects.
- Downloading and installing Portlock Storage Manager to a NetWare server.
- Licensing Portlock Storage Manager on a NetWare server.
- Script creation wizard.
- Imaging a NetWare server.
- Managing Portlock Images.
- Managing NetWare servers that are part of Novell Clusters Services.

Portlock Boot CD

Portlock Boot CD is a complete bootable operating system based upon WinPE 2.1 (Windows Server 2008) or for older hardware WinPE 1.6 (Windows Server 2003). Portlock Storage Manager running on the Portlock Boot CD has nearly the same feature set as when running under NetWare.

Portlock Netboot Package

The package is a special set of files that support PXE boot and files from the Portlock Boot CD. These files are installed by default to c:\tftpboot and are managed by the Portlock TFTP Server.

How does this work?

The basic steps that occur over the network are:

- The computer's BIOS is set to "PXE Boot" or "Network Boot".
- The computer is restarted and the BIOS on the Ethernet controller sends a DHCP request over the network to obtain a TCP/IP address.
- The DHCP server issues a TCP/IP address.
- The Portlock PXE Server issues a DHCP response that includes information about the name of the bootfile and the address of the TFTP server.
- The computer completes the DHCP address request process.
- The computer requests the bootfile from the Portlock TFTP server.
- The computer executes the downloaded bootfile, which then begins the process of downloading additional files such as bootmanager.exe and BCD. The file bootmanager.exe will process that BCD to determine the final operating system file to download which is typically boot.wim.
- The file boot.wim is mounted into memory and started just like a normal Windows installation.

Technical Issues

The key to the network boot process is the PXE protocol implemented in the Ethernet controller's BIOS. Modern systems built within the last few years have solid implementations of PXE but there were a lot of incompatibilities and bugs with PXE in older systems.

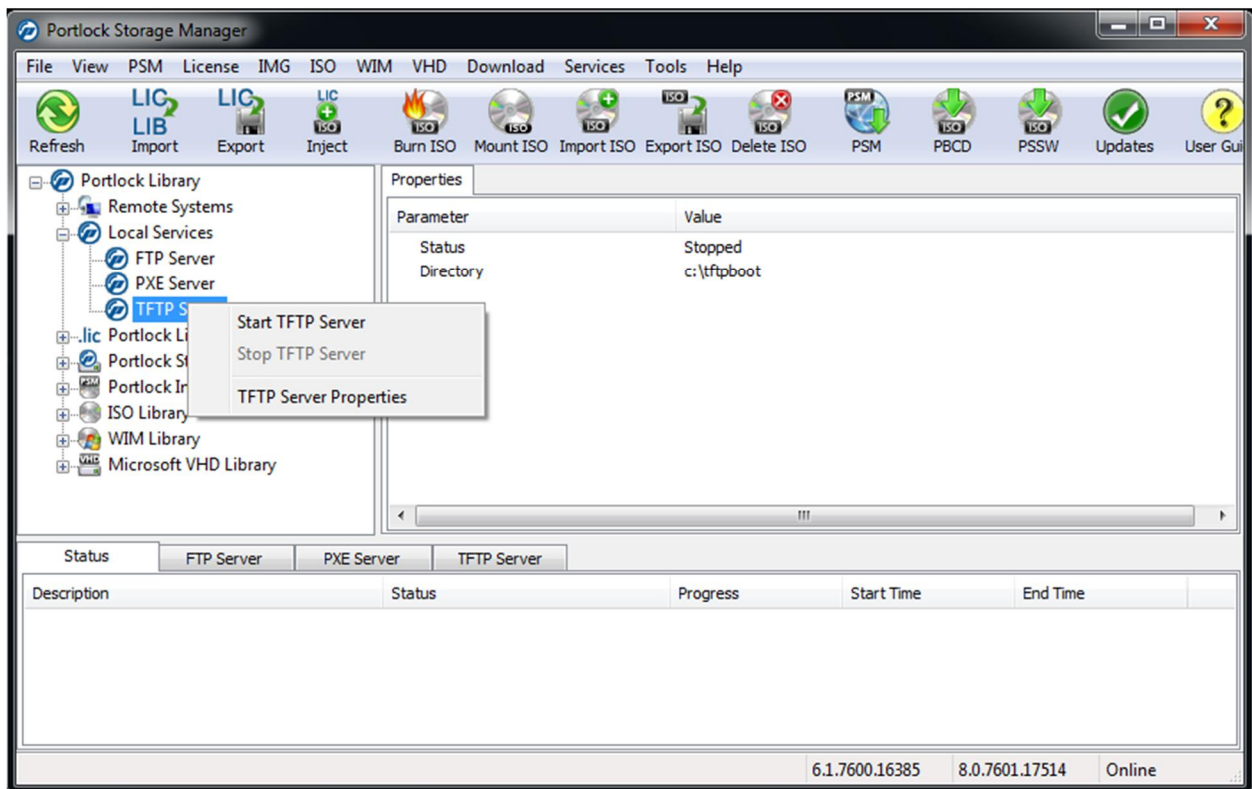
Chapter 2. Setting up the Portlock TFTP Server

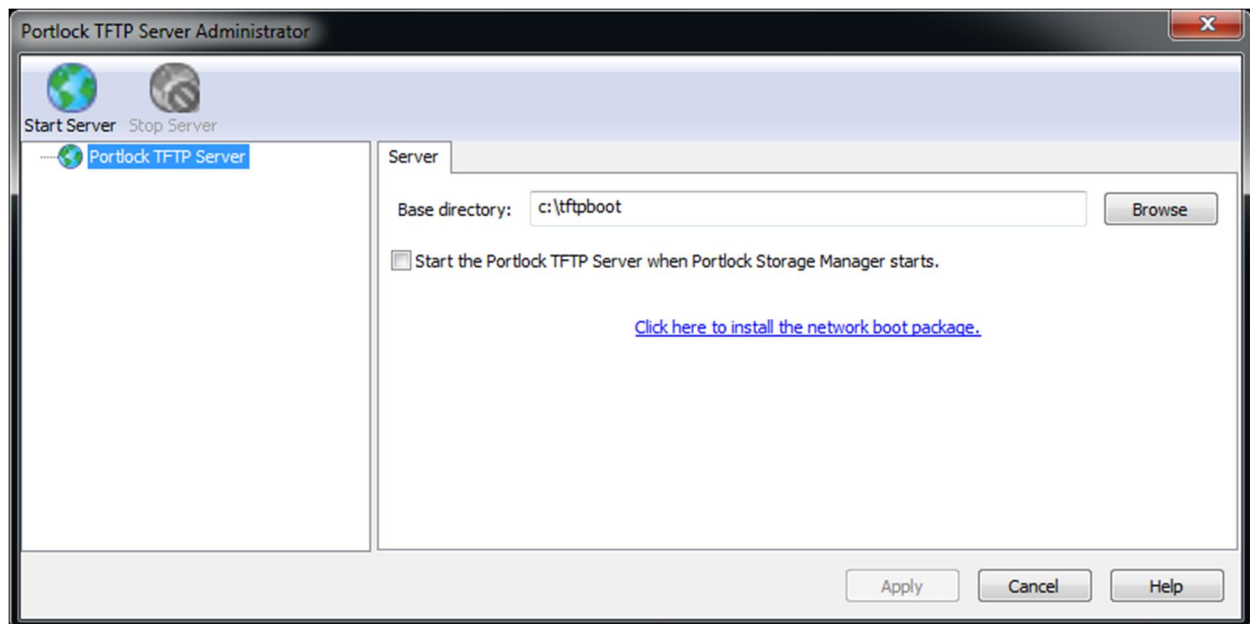
Introduction

The Portlock TFTP Server provides support for transferring files using the “Trivial FTP” protocol. When a remote system is booting over the network, the PXE protocol requests files from the TFTP server.

Enable the Portlock TFTP Server

From Portlock Storage Manager (Windows) expand the tree window item “Local Services”. Select the “TFTP Server” entry. Right-click on “TFTP Server” and select “TFTP Server Properties”.





Step 1: Set the Portlock TFTP Server Base Directory

The default path for the Portlock TFTP Server is "c:\tftpboot". This can be changed to any location on your system. This directory will be the location where the Portlock Netboot Package is installed.

Step 2: Install the Portlock Network Boot Package.

Click on the link "Click here to install the network boot package". This action will download the Portlock Netboot Package from our web site. This package includes the files necessary to support PXE boot and the required files from the Portlock Boot CD.

Step 3: Enable or Start the Portlock TFTP Server.

You can start the Portlock TFTP Server manually via the "Start Server" button or enable the Portlock TFTP Server to start automatically when Portlock Storage Manager starts.

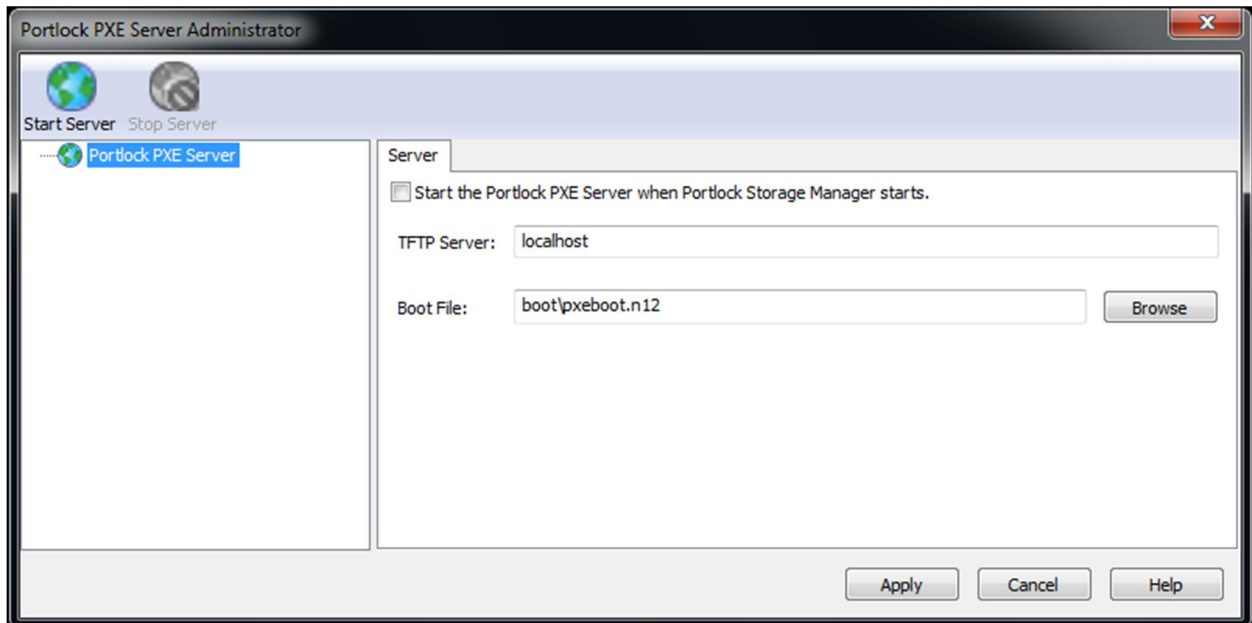
Chapter 3. Setting up the Portlock PXE Server

Introduction

The Portlock PXE Server provides support booting computers over the network using the Preboot eXecution Environment (PXE).

Enable the Portlock PXE Server

From Portlock Storage Manager (Windows) expand the tree window item "Local Services". Select the "PXE Server" entry. Right-click on "PXE Server" and select "PXE Server Properties".



Step 1: Set the Portlock TFTP Server

The default configuration is to use the Portlock TFTP server built into Portlock Storage Manager. You can also use another TFTP Server. Enter the TCP/IP address for the TFTP Server.

Step 2: Set the Boot File

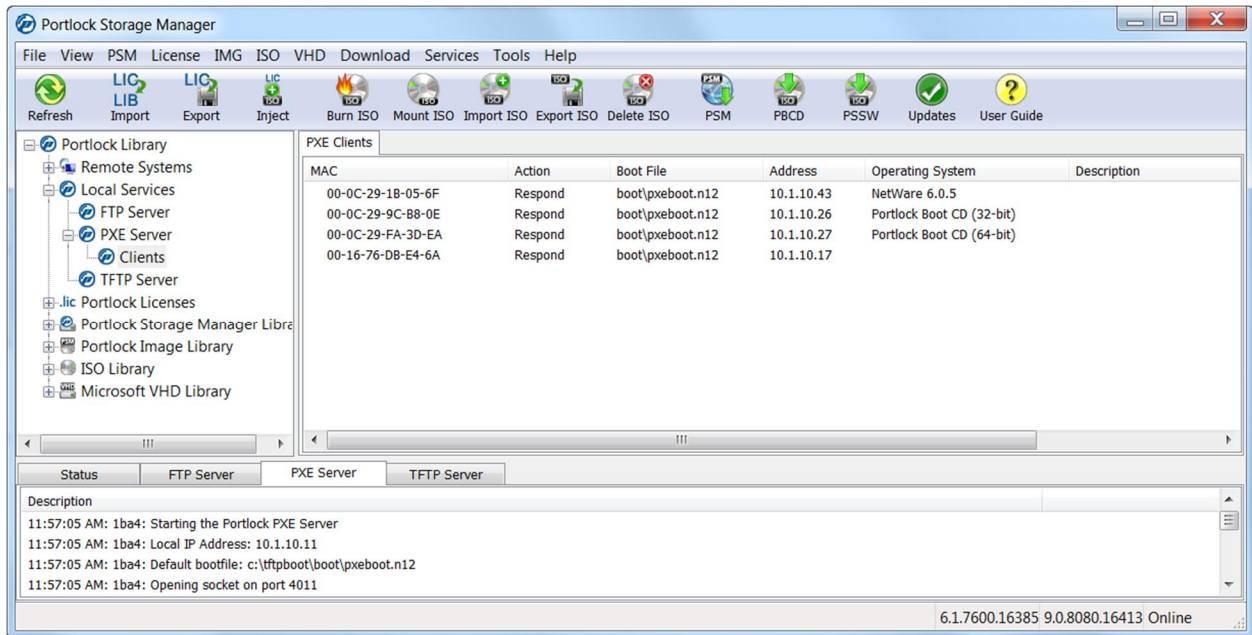
Enter the filename to use for the first stage PXE boot program. The default boot file is "pxeboot.n12" which is part of the Portlock Network Boot Package.

Step 3: Enable or Start the Portlock PXE Server.

You can start the Portlock PXE Server manually via the "Start Server" button or enable the Portlock PXE Server to start automatically when Portlock Storage Manager starts.

Chapter 4. PXE Client Management

Under the "PXE Server" tree item is an item for PXE Clients. You can right-click on a client to control its properties such as Action, Boot File and client properties.



PXE Boot File Location

Starting from the root of the TFTP directory, which defaults to `c:\tftpboot`, are directories for each client based upon the MAC address. The Portlock TFTP Server will first look in the directory with the same name as the MAC address and the TFTP root directory.

For example, a client with the MAC address `00-0C-29-1B-05-6F` sends a PXE boot request:

The client is looked up in the client table and the action parameter is checked. If the action is `IGNORE`, then no response will be sent to the client. If the action is `RESPOND` then the boot file will be checked in the following order:

- `C:\tftpboot\00-0C-29-1B-05-6F\boot\pxeboot.n12`
- `C:\tftpboot\boot\pxeboot.n12`

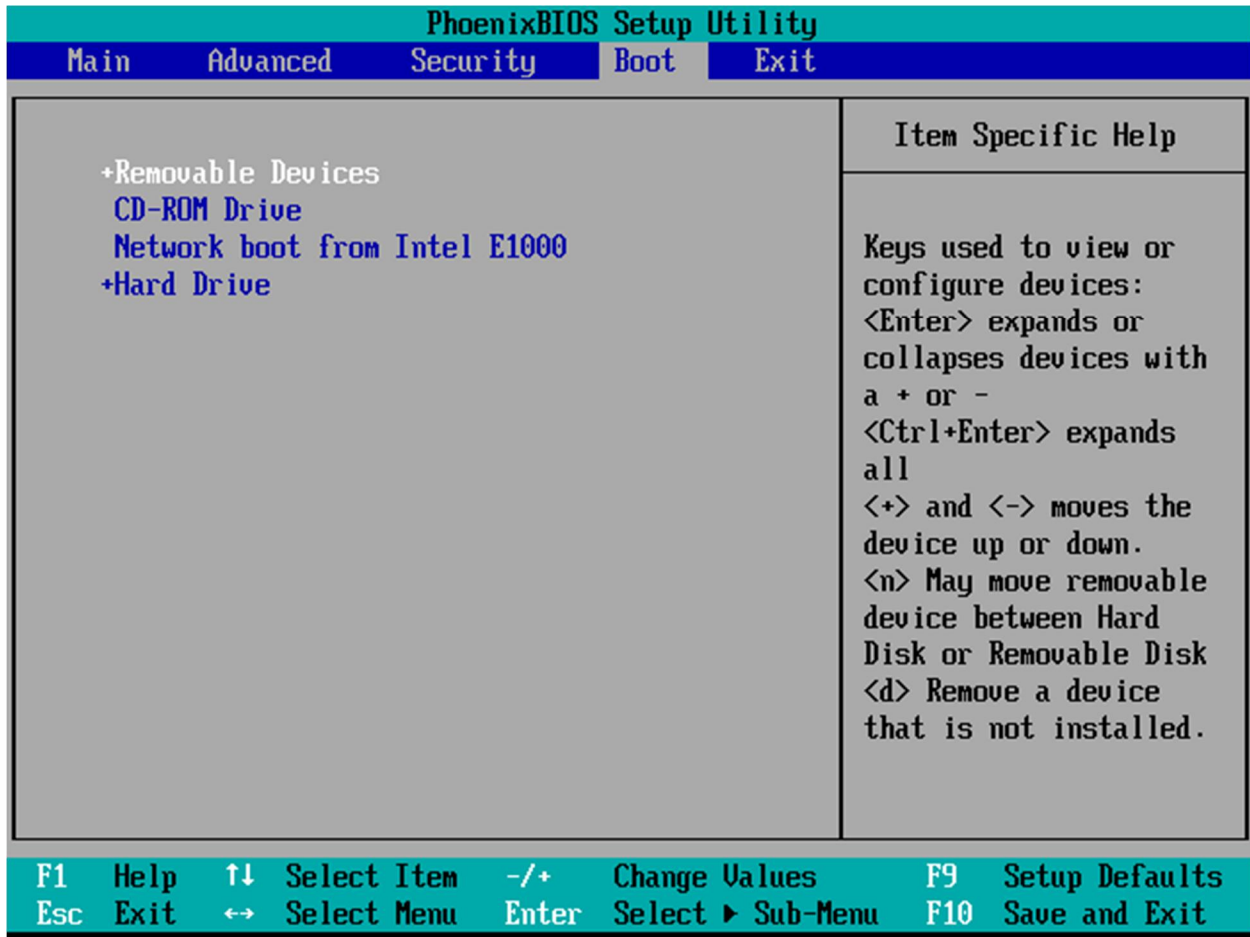
The same actions will be taken for each file that the client requests from the Portlock PXE Server. For example the primary operating system boot file is `boot.wim`. This will be checked for in the following directories:

- `C:\tftpboot\00-0C-29-1B-05-6F\sources\boot.wim`
- `C:\tftpboot\sources\boot.wim`

Chapter 5. Enable Network Booting

To enable network boot, the computer must support network boot in the BIOS. Enter the system's BIOS and either enable network boot or change the boot order to support booting from the network as a higher priority than from the hard disk. Refer to the following screen shot to see an example from a VMware virtual machine.

Some systems support pressing F12 to boot from the network or pressing ESC to enter the boot menu.



Chapter 6. Troubleshooting

Step 1: DHCP Server

Verify that a DHCP Server is functioning on your network. The network boot process requires that a DHCP Server if accessible from the same subnet and is assigning a TCP/IP address to the computer.

Step 2: TFTP Server

Verify that the TFTP Server is functioning. The network boot process requires downloading files from a TFTP Server.

Open a Command Prompt. Using the Microsoft TFTP Client or a third-party product, download the default boot file from the TFTP Server. The default boot file is "boot/pxeboot.n12". The following example uses the Microsoft TFTP Client that is part of Windows XP.

```
tftp -i localhost GET boot/pxeboot.n12
```

If the TFTP client returns "timeout" or "Cannot connect", verify that the Portlock TFTP Server is running. From the "Services" menu, select "TFTP Server" -> "Start TFTP Server". Then from the "View" menu, select "Status Window". Then select the "TFTP Server" tab in the bottom window. Review the log messages to see if there are errors starting the TFTP Server.

If the TFTP client returns "Cannot open file", verify that the Portlock Network Boot Package has been installed. Verify that the file pxeboot.n12 exists and is accessible to the Portlock TFTP Server. By default this file is located at "c:\tftpboot\boot\pxeboot.n12".

Step 3: PXE Server

Verify that the PXE Server is functioning. The network boot process requires downloading files from a TFTP Server and the location of the TFTP Server is determined by messages sent by the PXE Server.

Verify that the Portlock PXE Server is running. From the "Services" menu, select "PXE Server" -> "Start PXE Server". Then from the "View" menu, select "Status Window". Then select the "PXE Server" tab in the bottom window. Review the log messages to see if there are errors starting the PXE Server.

Appendix A. PXE Boot Programs

The Portlock Netboot Package includes two PXE boot programs. These programs control what happens when PXE is booting a system via the network.

ABORTPX.COM

This program causes the PXE boot process to terminate and continue with the next boot device in the BIOS. This program would be used for systems where network boot is enabled but you do not want to actually boot over the network and you do not want to wait for the system to timeout trying to boot via the network.

PXEBOOT.N12

This program is the normal PXE boot program to load Windows Vista (WIM Image) type operating systems over the network.

Appendix A. Frequently Asked Questions

How are the Portlock network boot servers implemented?

The Portlock PXE Server and TFTP Server are implemented as user mode threads within Portlock Storage manager (Windows) and are not services that are installed on your system. This means that the PXE and TFTP functions will not function if Portlock Storage Manager is not running on your system.

What is PXE?

PXE stands for Preboot Execution Environment and is part of Intel's Wired for Management (WfM).

Intel has published a detailed specification on PXE:

<http://download.intel.com/design/archives/wfm/downloads/pxespec.pdf>

Is a DHCP Server Required?

Yes a DHCP server is required. This is part of the PXE protocol.

Why is the boot process slow on some of my systems?

There are two phases to the network boot process: the first is the DHCP and PXE negotiation and the second is the TFTP file transfer. These are implemented in the Ethernet controller's BIOS and some systems are not optimized for performance.

Can I use another vendor's TFTP Server?

Yes, change the "TFTP Server" entry in the Portlock PXE Server properties dialog box with the TCP/IP address of your TFTP Server. You will also need to copy the Portlock Netboot Package to the default directory of your TFTP server.

Which ports does the Portlock PXE Server use?

The Portlock TFTP Server uses UDP ports 67 and 4011. You may have to enable these in your firewall.

Which port does the Portlock TFTP Server use?

The Portlock TFTP Server uses UDP port 69. You may have to enable this in your firewall.

Glossary

BootP

Acronym, stands for "*Bootstrap Protocol*". Predecessor to DHCP. Can be configured to allow PXE booting, but that is not covered here.

DHCP

Acronym, stands for "*Dynamic Host Configuration Protocol*". DHCP is a service provided in many networks as a method of obtaining an IP address on a network. When the DHCP server sends the client the IP address, it may also send the IP address of a TFTP server and a file to download from the TFTP server that the client should download and run.

NBP

Acronym, stands for "*Network Bootstrap Program*". This is the file initially downloaded by the PXE client, and then executed to take over booting the computer from there.

PXE

Acronym, stands for "*Pre-boot eXecution Enviroment*". PXE is a method for booting a computer over the network, without touching any physical storage on the computer (less RAM).

PXE-Capable Hardware

PXE-Capable Hardware is simply a device that services DHCP with the needed options to PXE boot. This is specially mentioned because not many consumer-level devices support this. Your average Linksys home router will *not* support PXE booting, and you *must* either purchase a [device that supports PXE booting](#), or run a DHCP daemon that supports these options in place of the router.

TFTP

Acronym, stands for "*Trivial FTP*" (server). Trivial FTP is a scaled-down version of FTP that uses UDP packets instead of TCP packets. TFTP is used in PXE booting to obtain an NBP to run upon boot, and more often than not, additional files that the NBP would need.

NFS

Acronym, stands for Network File System

[End of Document]