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Configuring a Preboot eXecution Environment (PXE) using Red Hat Linux 7.2 on Compaq ProLiant Servers

Abstract: This integration note discusses configuring a Preboot eXecution Environment (PXE) using Red Hat Linux 7.2 on Compaq ProLiant servers. Its focus is on anonymous ftp access.

The following topics are covered in detail throughout this integration note:

- Setting up a Red Hat Linux operating system including the prerequisites and minimum requirements
- Preparing the Red Hat Linux server
- Installing the Red Hat Linux software
- Launching the PXE for Red Hat Linux

The Appendix has a listing of Compaq Web resources and other helpful websites for the Linux operating system.

For information about Linux on ProLiant servers, visit <http://www.compaq.com/linux/>.

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Integration Note prepared by ISSG Technology Communications

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Setting up a Red Hat Linux Operating System Image

Red Hat Linux and many other Linux distributions support the Preboot eXecution Environment (PXE). PXE can be used to install the operating system or create a diskless client. These directions were written for Red Hat Linux 7.2; however, other versions of Red Hat Linux will work with minor changes in paths and filenames.

This link downloads original, older documentation for Red Hat produced by Intel:
<ftp://download.intel.com/ial/wfm/pxesdklinux.pdf>

Additional information on the Linux operating system is also available here:
<http://www.linuxdocs.org>.

A separate DHCP or BOOTP server may be running on the same network when using Linux as a PXE server; however, it is possible to have the Linux server act as both a DHCP/BOOTP and PXE server. A caveat with this approach is that the `dhcpd` must be started first. Otherwise, `dhcpd` will complain that it cannot bind and that the port is in use. If a second system is used, the operating system may be an issue; some problems have been observed when using other operating systems for the DHCP server. The Linux PXE server requires approximately 2 gigabytes (GB) of available hard disk space after installation of the operating system.

Due to the way the client interacts with the server, setting up a Red Hat Linux PXE server may require installing multiple rpms. The Red Hat source package contains the PXE server and all the code bits necessary for Linux to boot from images on a Linux PXE server.

If you need more information on setting up and using Linux, refer to the documentation on the Red Hat website <http://www.redhat.com/index.html>.

Prerequisites and Minimum Requirements

Running the Red Hat Linux 7.2 operating system requires the following server hardware:

- Pentium 166 MHz or Pentium II 200 MHz or faster processor
- 64 MB of RAM (96 to 128 MB preferred)
- At least 2 GB free hard drive space
- 10 Mb/s network adapter (100 Mb/s recommended)
- CD-ROM drive
- Optional: A separate DHCP/BOOTP server may be running on the same network segment

Running the Red Hat Linux 7.2 operating system requires the following client server hardware:

- PXE-enabled personal computer with a minimum PXE revision of NetPC.99c and a minimum of 64 MB RAM
- System must be set up to boot from the network before HDD
- Active DHCP server on the network so the client can acquire an IP address

Figure 1 shows a typical setup for Red Hat Linux 7.2, including the servers and the target client machine.

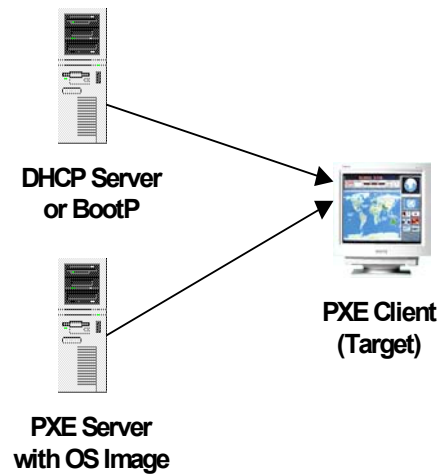


Figure 1. Typical PXE setup for Red Hat Linux 7.2

Preparing for a Red Hat Linux PXE Server

Before proceeding with PXE server setup, be sure to install Red Hat Linux with the following aspects:

- Anonymous FTP server support
- C and C++ Development
- Static IP Address
- Red Hat Source (RPMS, specifically, the PXE SRPM)

The PXE package for Red Hat contains the Preboot eXecution Environment server. Code bits needed for Linux to boot from a boot disk image is available on your Red Hat install and source disks or from the following link: <http://rpmfind.net/linux/rpm2html/search.php?query=pxe>.

Setting Up the Linux PXE Server

After configuring a static IP address, allowing for both anonymous FTP support and software development support, setup the PXE server by following the steps detailed in the subsequent sections.

Software Installation

The following instructions specify paths and filenames for Red Hat Linux 7.2. If you are using a different version of Red Hat and/or a different installation option, you will need to adjust the directions to compensate for these differences.

1. Install the PXE software by doing the following:

- Insert Red Hat Linux 7.2 Disk 2 (Binary CD) into CD-ROM drive.
- Type:

```
mount /dev/cdrom /mnt/cdrom
rpm -ivh /mnt/cdrom/RedHat/RPMS/pxe-0.1-23.i386.rpm
umount /mnt/cdrom
```
- Insert Red Hat Linux 7.2 Disk 4 (Sources CD) into CD-ROM drive.
- Type:

```
mount /dev/cdrom /mnt/cdrom
rpm -ivh /mnt/cdrom/SRPMS/pxe-0.1-23-src.rpm
umount /mnt/cdrom
cd /usr/src/redhat/SOURCES
tar -xzf pxe-linux.tar.gz
cp pxe-linux/server/linux.0 /tftpboot/X86PC/UNDI/linux-install
```

2. Add the following lines to `/etc/services`:

```
mtftp 1759/udp
pxe    67/udp
pxe    4011/udp
```

3. Add these lines to `/etc/xinetd.conf` before `includedir /etc/xinetd.d`:

```
service mtftp
{
  socket_type    = dgram
  wait          = yes
  user          = root
  server        = /usr/sbin/in.mtftpd
  server_args   = /tftpboot
}
```

4. Start the PXE Daemon on reboots in level 2, 3, 5 by typing:

```
cd /etc/init.d/
chkconfig --level 235 pxe on
```

5. Add these lines to the end of your `/etc/rc.d/rc.local` file:

```
route add -host 255.255.255.255 eth0
route add -net 224.0.0.0 netmask 224.0.0.0 eth0
```

6. Place the OS installation files on the PXE server.

- Create a directory under /var/ftp for anonymous ftp access.
- Copy the contents of CDs 1 and 2 into that directory.
- Allow the copy to overwrite files with the same name, for example, TRANS.TBL.

7. Perform the following to copy the boot images.

- Insert CD #1:
- Type:

```
mount /mnt/cdrom
cp /mnt/cdrom/images/pxeboot/vmlinuz /tftpboot/X86PC/UNDI/linux-install/linux.1
cp /mnt/cdrom/images/pxeboot/initrd.img /tftpboot/X86PC/UNDI/linux-install/linux.2
```

8. Test the PXE server by restarting the server or by typing:

```
service xinetd restart
```

Upon restart, boot up a PXE enabled client. The client's PXE boot process should receive an IP address from DHCP.

9. Press **F8** when you see the following on the client:

```
Press <F8> to view menu...
```

```
A PXE boot menu displays stating the following:
```

```
Local Boot
Linux Install
```

10. Select **Linux Install** and press **Enter**. You should see text similar to the following appear on the screen.

```
MD w.x.y.z
BOOT SERVER IP: w.x.y.z
MTFTP..
Intel Linux NBP, PXE-2.0 Beta-x (build nnn)
Downloading linux kernel image
```

If you see this message, you configured the PXE server and TFTP/MTFTP daemons correctly.

Launching the PXE Image for installing Red Hat Linux 7.2

If you have completed all the steps detailed in the previous section, you are now ready to launch the PXE image for Red Hat Linux 7.2.

1. Connect the target server and the PXE server on an isolated network. After PXE support has been enabled and setup to boot to the network, power on the target server.
2. Press **F12** when prompted for network boot. The target server connects to the PXE server and attempts to obtain an IP address from the DHCP server.

Note: If the Show Setup prompt is disabled on a ProLiant DL360, this **F12** will not appear. The system will boot according to the order selected in the Option ROM Setup.

3. Press **F8** and select **Remote Install** to begin the network boot and download the PXE image. After the Linux image takes over, the Linux installation process begins. Several prompts for language and keyboard appear.
4. Select FTP access to the Red Hat Linux 7.2 CD when prompted. Enter the static IP address of the PXE server and the corresponding path to the Red Hat Linux 7.2 CD. This path is relative to `/var/ftp`.

After completing the steps above, the remainder of the installation works the same as a regular CD-ROM installation.

ProLiant Health Driver for Linux

A ProLiant Health driver (cpqhealth) is available for Linux users. This driver provides hardware monitoring support for select ProLiant servers using Red Hat Linux 7.2. The driver is available on the Compaq Server Download Center website:

<http://www.compaq.com/support/files/server/us/index.html>.

Additional information on using this driver is available in the Linux Health Driver HOWTO document located at <ftp://ftp.compaq.com/pub/products/servers/linux/linuxhealth.pdf>.

Appendix A - Web Resources

Table 1 lists Compaq resources on the Web.

Table 1. Compaq web resources

Resource Description	Web Location
Compaq and Linux commit to deliver the best systems and services available in the industry, built upon a foundation of strong commitment to industry standards. Our support for Linux includes close alliances with the major Linux distributions, contributions to open source projects, and expansion of our portfolio of solutions, technology, and services to incorporate support for Linux.	http://www.compaq.com/linux/
Compaq OpenSource contains a listing of current opensource projects and additional information regarding the opensource movement.	http://opensource.compaq.com/
Compaq ActiveUpdate offers proactive notification and delivery of the latest software updates. Subscribe to Compaq ActiveUpdate for automatic delivery of software updates for your Compaq servers, desktops, workstations, and portables.	http://www.compaq.com/activeupdate
Compaq Intelligent Manageability products maximize the availability, performance and operations of all Compaq servers, storage systems, workstations, desktops, and portables. Compaq, with its partners, offers best-in-class industry-standard management systems to deploy, operate, and maintain your hardware investment. This website also provides tools, guides, and information to reduce expense, minimize complexity, and speed execution.	http://www.compaq.com/manage
Compaq SmartStart for Servers provides everything you need to get your servers up and running with full Compaq support.	http://www.compaq.com/products/servers/SmartStart/index.html
Compaq System ROMPaqs supporting Red Hat Linux 7.2 are available for Compaq industry-standard server products.	http://www.compaq.com/support/files/server/us/locOsCat/70_16.html
Customer Advisories inform you of any known problems and workarounds regarding Compaq products.	http://www3.compaq.com/support/reference_library/selectproduct.asp
Press releases and Communiqués announce the availability of new products and versions.	http://www.compaq.com/newsroom/
Server Software Download Center website provides the capability to download device drivers, utilities, services, and BIOS required for Compaq ProLiant servers.	http://www.compaq.com/support/files/server/us/index.html All software supporting Red Hat Linux 7.2 can be found at: http://www.compaq.com/support/files/server/us/locOsCat/70.html
White Papers (complete listing) inform you of ways to optimize your environment and obtain the maximum benefit from software enhancements.	http://www3.compaq.com/support/reference_library/selectproduct.asp

Table 2 lists other helpful Web resources to assist in setting up PXE server.

Table 2. Linux and Red Hat web resources

Resource Description	Web Location
Intel Wired for Management Development Tools provides a link to the Intel® Preboot Execution Environment (PXE) Software Development Kit (SDK) for Linux.	http://developer.intel.com/ial/wfm/tools/pxesdk20linux/
Red Hat website contains information specific to Red Hat Linux distributions.	http://www.redhat.com/index.html
Justlinux , the complete Linux guide website, provides links to everything you want to know about Linux.	http://www.justlinux.com/
Compaq / InformIT Linux website contains premium and extensively linked content with many helpful features.	http://compaq.informit.com/linux/content/
The RPM Resource PXE website contains the PXE package including the Preboot eXecution Environment server and code bits needed for Linux to boot from a boot disk image for Red Hat Linux 7.2.	http://rpmfind.net/linux/rpm2html/search.php?query=pxe
The LinuxDocs.org website contains Linux HOWTOs help you install, set up, and troubleshoot your Linux system.	http://www.linuxdocs.org