Installing Linux on Compaq ProLiant Servers

The Compaq ProLiant Linux Team   **March 23, 2001 Version 0.7**

This guide was designed to facilitate the installation of various Linux distributions on Compaq ProLiant Servers.

Notice

Installing and Running Linux on Compaq ProLiant Servers How-To
Solution Guide prepared by Compaq ProLiant Linux Team

Seventh Edition (March, 23 2001) Version 0.7

1.0 Introduction

Compaq ProLiant servers provide an excellent platform for Linux. These machines are engineered from the ground up to provide performance, reliability, and scalability using industry-standard components. This guide provides additional details for installing Linux on Compaq ProLiant servers.

Compaq recognizes that there are many distributions of Linux available today and this guide is geared toward the four distributions officially supported by Compaq: Caldera, Red Hat, SuSE, and TurboLinux.

1.1 Compaq Hardware

Compaq supports both Intel and Alpha based platforms for Linux. The current list of supported Intel based servers is shown below. If your Compaq server is not listed here, you will still be able to benefit from the information contained in this guide. For more details on tested and certified Compaq servers, visit: http://www.compaq.com/linux.

Compaq Servers

The following table represents the Compaq ProLiant servers this guide primarily targets. All servers listed below are base models and do not include any additional options. Base model descriptions can be found at http://www.compaq.com/products/servers/linux or http://www.compaq.com/products/servers/linux/cert-arc.html for older system support and distributions.

If the Compaq server is not listed within this document, please check our archive records located at http://www.compaq.com/products/servers/linux/archive-howto.html

ProLiant DL320	ProLiant ML350 1GHz
ProLiant DL360	ProLiant ML370
ProLiant DL380	ProLiant ML530
ProLiant DL580	ProLiant ML570
ProLiant DL760 (NEW)	ProLiant ML750 (NEW)
ProLiant ML330	ProLiant 8000
ProLiant ML330e (NEW)	ProLiant 8500
ProLiant ML350	

Compaq Storage Controllers

The Wide Ultra2 SCSI or Wide Ultra2 SCSI-3 Controller series are based on Symbios Logic (LSI Logic) chips, while the Wide-Ultra3 SCSI controllers are based on Adaptec technology. The Linux 2.2.x kernel supports these controllers and includes driver support for the Compaq Smart Array Controller family, the Compaq 64-Bit/66 MHz Fibre Channel Host Adapter, and the Compaq Smart Array 5300. Compaq storage drivers are also available on our Open Source web page http://www.opensource.compaq.com.

Network Interface Controllers (NICs)

Current models of Compaq servers ship with one or more Compaq NC 31xx NICs that are based on the Intel 8255x chipset. The first driver available for these chipsets was the eepro100 driver provided by SCYLD; however, the current and preferred driver for use with the Compaq NC31xx controllers is the Compaq certified Intel e100 driver which is available for download from the Compaq website at the following address: http://www.compaq.com/support/files/server/us/locate/2882.html. Compaq Gigabit Network controllers currently use the e1000 from Intel available at http://support.intel.com/support/network/adapter/1000/index.htm. Older model Compaq servers with NetFlex-3 NICs are based on the Texas Instruments ThunderLAN (or TLAN) chipset, which uses the TLAN driver. Compaq network drivers are also available on our Open Source web page http://www.opensource.compaq.com.

1.2 Compaq Configuration Software

As an added feature, the Compaq System Partition, created during a SmartStart installation, will reserve an area of the boot disk to store configuration utilities simplifying server configuration and server diagnostics. The System Configuration Utility installs to this partition providing system configuration and server diagnostic tools. Although not required, Compaq recommends creating and maintaining this partition making future system configuration sessions easy. Having the Compaq System Partition in place on systems that support it can save about an hours worth of time if it is necessary to use those utilities.

2.0 Preparing for the Linux Installation

Caldera, Red Hat, SuSE, and TurboLinux can easily be installed on most Compaq servers. However, many newer Compaq ProLiant servers utilize more efficient peer PCI bus architecture that the older PCI discovery code (*pci.c* in Linux kernels prior to version 2.2.14) in the Linux kernel does not recognize. As a result, the entire secondary PCI bus is not discovered during the boot up process. Linux distributions containing a kernel version newer than 2.2.14 (Red Hat 6.2 for example) have corrected this problem. The following section addresses issues involving Linux distributions that do not discover the peer PCI bus architecture.

2.1 Linux Kernel

Peer Bus Architecture

Many Compaq servers use a peer PCI bus architecture in which two or more PCI buses use multiple PCI host bridges to connect to the processor bus. The Linux 2.2 kernel (prior to version 2.2.14) discovers PCI slots starting at the first PCI host bridge (also called the primary PCI bus), and then discovers additional bridged PCI devices (installed in slots). Since the kernel does not see multiple PCI host bridges, any PCI adapters or devices connected to peer PCI host bridges are not discovered. Therefore, these devices are not available to the operating system unless the kernel is patched.

Linux kernels, beginning with version 2.2.14 (such as the kernel in Red Hat 6.2), have been updated to properly discover all PCI devices located on peer PCI buses.

Note: This issue is not specific to Compaq, and affects any server implementing a dual peer PCI bus architecture.

Listed below are Compaq servers with multiple PCI buses. Slots on the primary PCI bus are shown. If your Compaq Server is not listed, please check our archive section at http://www.compaq.com/products/servers/linux/archive-howto.html.

- ProLiant DL360: Slot #2 (**Note**: Integrated Dual Compaq NC3163 NICs are on the secondary peer PCI bus)
- ProLiant DL380: Slot #1
- ProLiant DL580: Slot #6
- ProLiant DL760: Slot #7, 8, 9
- ProLiant ML330: Slot #3, 4, 5, 6
- ProLiant ML330e: Slot #3, 4, 5, 6
- ProLiant ML350: Slot #1, 4, 5, 6
- ProLiant ML350 1GHz: Slot #1, 4, 5, 6
- ProLiant ML370: Slot #1, 2
- ProLiant ML530: Slot #1
- ProLiant ML570: Slot #6
- ProLiant ML750: Slot #1, 2, 3, 4
- ProLiant 8000: Slot #1, 2, 3, 4
- ProLiant 8500: Slot #7, 8, 9

Linux Kernel Patch

If the Linux kernel contained on your Linux distribution cannot detect devices or adapters on the secondary PCI bus, Linux will not use the secondary PCI bus until the kernel is patched.

Compaq is currently hosting a number of ongoing open source software projects running on ProLiant server platforms. The Compaq open source website contains engineering projects, technical papers, news and articles from within the Compaq open source community. Compaq also aids in the support of Linux by regularly contributing software to the Linux kernel. Visit us at http://www.opensource.compaq.com/.

If you are using Red Hat 6.1, Compaq provides a boot and installation kernel you can use to detect the devices or adapters on the secondary PCI bus. Download the SoftPaq named "*Compaq Kernel Patch for Red Hat 6.1*" at http://www.compaq.com/support/files/server/us/locate/2003.html. For more software downloads, visit our website at http://www.compaq.com/products/servers/linux/linux-drivers.html or http://www.compaq.com/support/files/server/us. The SoftPaq includes the source code to patch *pci.c* so it correctly discovers all PCI buses in the system and fixed the issue that caused a lockup when a NC3131 dual port network adapter was installed.

Compaq provides a boot and install kernel you can use to detect the devices or adapters on the secondary PCI bus if your version of Linux uses a kernel prior to 2.2.14. Download the SoftPaq called "*Compaq Kernel Patch for Linux PCI bus scanning*", (**Note:** This SoftPaq works with any Linux distribution using a kernel version prior to 2.2.14.). Download the SoftPaq from http://www.compaq.com/support/files/server/us/locate/2650.html. This SoftPaq includes the source code to patch *peerbus.patch* so it correctly discovers all PCI buses in the system. See section 5.6 for instructions to patch the Peer-Bus for 2.2.x Linux kernel and rebuild the kernel.
For additional SoftPaq downloads, see http://www.compaq.com/products/servers/linux/linux-drivers.html or http://www.compaq.com/support/files/server/us.

Note: Any distribution using kernel 2.2.16 (i.e. Red Hat 7.0 or later), should correctly work with peer bus architecture.

2.2 Driver Caveats

SYMBIOS 53C1510 chipset / Integrated Smart Array Controller

Some Compaq ProLiant servers use a newer Symbios (now LSI Logic) SCSI chip called the SYM53C1510 and is an extension of the 53c8xx series. This chip supports an optional array cache board, which when installed allows the SYM53C1510 chip to be configured as an array controller. We call this configuration, when the cache board is installed, the Integrated Smart Array Controller, and is controlled by the cpqarray driver. The SYM53C1510 chip without the cache board installed is called the Embedded Dual Channel SCSI Controller, and is controlled by the sym53c8xx driver.

Although Linux supports the SYM53C1510 chip, you need to ensure that the updated SYM53c8xx driver is included in the distribution you are installing. For example, Red Hat 6.1 does not support this controller so consider upgrading to Red Hat 6.2 or later. Another option would be to perform an Expert Install and provide the driver when prompted during the installation process. A driver diskette for this controller is available as a SoftPaq available for download at
http://www.compaq.com/support/files/server/us/locate/2652.html.
Download more SoftPaqs by visiting
http://www.compaq.com/products/servers/linux/linux-drivers.html or
http://www.compaq.com/support/files/server/us.

ATI Rage IIC Console Driver

Many Linux distributions may have some ghosting problems with XFree86 on the integrated ATI Rage IIC video controller. This problem stems from enabling the ATI Mach64 console driver that interferes with the XFree86 Mach64 driver. The problem can be severe depending on the video mode chosen. Red Hat distributions do not have this issue.

If you see this condition (machines with the Rage IIC and more than 4MB of video RAM are more likely to see this problem), eliminate it by creating a new Linux kernel with the ATI Mach64 console driver disabled and then booting from this new kernel. Chapter 5 of this document discusses how to build a new kernel.

2.3 Boot Manager

Copy System Configuration Partition

Here are some things to remember when disk partitioning.

1. The Compaq System Partition is not required for a Linux installation. Although not required, Compaq recommends that you create and maintain this partition to make future system configuration sessions easier. If you choose not to create or keep this partition, use floppy disks to complete the configuration process.

2. When using a Smart Array hosted disk system, all drives must be configured before installing Linux. Compaq Array Controllers are configured either using the ACU (Array Configuration Utility), which is available on the SmartStart CD-ROM or the Array configuration tool that resides in Option ROM on certain Smart Array controllers, the Option ROM Configuration for Array, (ORCA).

3. A maximum of four primary partitions are allowed on each hard drive.

4. An extended partition counts as one primary partition. An extended partition can have multiple logical drives within it.

5. Most operating systems can only boot from a primary partition. A logical drive within an extended partition is normally not bootable. Many find that this is not a problem with Linux, but it is important to note when setting up multiple operating systems on a single system.

6. The boot kernel must reside completely below the 1024 cylinder limit. If the kernel is placed beyond the 1024 cylinder limit, the operating system cannot boot.

Sample Partition Sizes

These suggested partition sizes could be used as guidelines for your Linux installation.

- Primary Partition #1 (**Note:** This partition normally shows up as Partition #3)
    - o Description: Compaq System Partition
    - o Size: 39 MB
    - o Type: Compaq Diagnostics (0x12)
- Primary Partition #2 (**Note:** This needs to be marked active)
    - o Description: Linux Boot Partition (/boot)

- o Size: 10 MB to 30MB depending on how many kernel images you want to host

- o Type: Linux

- Extended Partition #3

  - o Description: Hosts various logical drives and swap partition

  - o Size: Remainder of hard drive

  - o Logical Drive #1

    - Description: Swap Partition

    - Type: Swap (0x82)

    - Size: usually 2 * amount of RAM

  - o Logical Drive #2

    - Description: / partition (Linux root file system)

    - Type: Linux

    - Size: 265 MB or larger

  - o Logical Drive #3 (recommended)

    - Description: /var partition (Linux log area)

    - Type: Linux

    - Size: 265MB or larger

  - o Logical Drive #4 (optional)

    - Description: /usr partition (shared software among users)

    - Type: Linux

    - Size: Variable, about 1/2 the remaining capacity of the hard drive

  - o Logical Drive #5 (optional)

    - Description: /home partition (user directories)

    - Type: Linux

    - Size: Variable, about 1/2 the remaining capacity of the hard drive

Notes

The remaining disk space usually divides equally between /home and /usr. For a typical install, /usr should at least be 900MB and a complete installation could be as much as 3GB. This varies with other Linux distributions.

Note: if /usr is not created, then / has to be large enough to hold all of the programs and applications.

Create a 10MB to 30MB partition for /boot.

By default, the Compaq System Partition will generally show up as partition #3 instead of partition #1. This partition should always be preserved.

Most operating systems can make use of the Extended Partition. Primary partitions are bootable, but you are limited to a total of 3 (3 primary partitions plus one extended partition). With the 1st partition used up by the Compaq System Partition, the 2nd partition used by /boot so Linux can boot up, and the 3rd partition can be used as an extended partition for the other Linux partitions. The /boot partition should reside completely below the 1024 cylinder limit to ensure that you don't encounter any booting problems. Booting problems can occur when the software required to boot an operating system reside above the 1024 cylinder limit.

The Linux kernel 2.2.x (and higher) supports up to 2 GB of swap space per swap partition. To get more, simply create and mkswap additional swap partitions, and add the appropriate entries into */etc/fstab*. Most distributions will do this automatically if more than one partition is labeled 0x82 (Linux Swap) during installation.

Notes on /boot

Systems with the Compaq F10 Partition: Here is the recommended method of installation:

- /boot should be a primary partition (partition # 1-4).

- /boot should not be a logical drive (partition #5 or higher).

- /boot should be marked active.

- /boot should be below the 1024 cylinder limit (it is preferred to have /boot immediately following the Compaq F10 Partition).

- LILO should be installed to the /boot partition and not to the MBR (Master Boot Record).

If LILO is installed to the MBR, then an entry can be made in */etc/lilo.conf* in order to access the F10 partition; however, this is not the recommend location for installing LILO. Details for adding an entry to /etc/lilo.conf for the F10 partition are located in section 5.

Systems without the F10 partition but have the F10 BIOS (RBSU) instead:

- /boot can be either a primary partition or logical drive (logical drives reside in the extended partition).

- /boot will not need to be marked active. Logical drives may not be marked active.

- /boot will need to be below the 1024 cylinder limit (it is preferred to have /boot at the front of the drive).

- LILO should be installed to the MBR.

Distributions

Not all Linux distributions will automatically partition the hard drive according to the guidelines described above. Multiple primary partitions (hidden system partitions, Windows partitions, etc.) may confuse some utilities. If the boot partition is a logical drive (in the extended partition), the system cannot boot without special care. To access Linux, LILO will need to be installed onto the MBR, an alternate boot manager used, or a Linux boot floppy will need to be used.

The Disk Druid Utility is now bundled with many Linux distributions and aids greatly in partitioning the hard drive. Many distributions also offer the FDISK utility (or CFDISK utility) to perform this function providing more control over the procedure. Red Hat 6.2 or later moved the FDISK utility into the Expert Installation. If fdisk is needed, you may need to enter the Expert Installation mode to get it.

Note: Disk Druid from Red Hat 6.1 does not properly allow you to create /boot as a primary partition. /boot will have to be created using FDISK to make it a primary partition. In Red Hat 6.2 and other newer distributions, Disk Druid has been altered so that if you create /boot as the very first partition, it creates as a primary partition.

2.4 Hardware

Memory

Installing with more than 1 GB of memory

On a 2.2.x kernel, the Linux installation will fail if more than 1 GB of memory is installed. If you wish to install with more than 1 GB, limit the amount the install process discovers by typing:

```
linux mem=960M
```

at the boot prompt. To use more than 1 GB of memory after installing Linux, a new kernel must be built with a specified upper limit of 2 GB (Red Hat 6.2). Memory above 2 GB requires extensive modification to the 2.2.x kernel source tree. The 2.4.2 Linux kernel and the 2.2.x Enterprise kernel from Red Hat both support more than 2GB of memory, but not during the install.

Note: This issue is not unique to Compaq servers. This issue applies to all servers with more than 1 GB of memory.

Using more than 16 MB of memory

On some older Compaq servers, the Linux installation procedure may only detect 16 MB of memory. The installation should be restarted, and the correct amount of memory specified at the boot prompt by typing linux mem=XM where X is the correct amount of memory on the system. If Linux detects only 16 MB of memory, the installation will proceed at a much slower pace than normal.

To avoid having to type this command each time you boot Linux, edit the */etc/lilo.conf* file and add an "append" line:

append="mem=48M"

This change must be added very close to the "read-only" line. The */etc/lilo.conf* section will look similar to the following:

image=/boot/vmlinuz-2.2.16

      label=linux

      root=/dev/sda2

      append="mem=48M"

      read-only

Save */etc/lilo.conf* and then run */sbin/lilo* to install a fresh copy of LILO.

3.0 Installation Process

This section outlines several installation procedures for various Linux distributions.

3.1 SmartStart

Compaq SmartStart configures Compaq hardware, loads optimized drivers, and assists with the software installation. It also provides functionality for integrating operating systems on Compaq servers to achieve optimum reliability and performance. Integration Management features extend the benefits of SmartStart and facilitate consistency and reliability of server deployment and maintenance.

Compaq recommends that you begin with SmartStart when installing Linux on a ProLiant server. Always use the latest version of SmartStart with your installation. SmartStart supports manual path installation of Linux. The following steps are based on SmartStart Release 4.90.

1. Start with a System Erase. Starting with a system erase ensures you begin the installation process from a known non-configured state.
   a) Boot from the SmartStart CD-ROM.
   b) Select **Run System Erase Utility** from the Main Menu → **Yes**.
   c) Restart the server.
2. Begin the installation process.
   a) Select the language and locale settings.
   b) Select **Manual Installation** → **Begin**.
   c) Select **Linux** in the Operating System Selection Screen.
      When using SmartStart 4.60 or earlier select **UnixWare2.**
      SmartStart configures your server hardware including options, such as an array controller, if present. SmartStart also creates the Compaq System Partition and installs the System Partition files.
3. Restart the server.
4. Configure the Compaq Array controller (if applicable) using the Array Configuration Utility (ACU).
5. Continue until the screen prompts you for the appropriate operating system media.
6. Insert the Linux installation CD-ROM (or floppy if required) and press **Enter**. The system will now boot off of the Linux installation disk.
7. Proceed with Linux Installation.

   See instructions for specific distributions below.

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3.2 Caldera

eServer 2.3.1

Hardware

These installation instructions apply to the Compaq servers in the following list. Servers marked with a number have special instructions described further below.
If your Compaq server is not listed within this document, please check our archive records located at http://www.compaq.com/products/servers/linux/archive-howto.html

ProLiant DL320 [1]	ProLiant ML350 1GHz
ProLiant DL360 [2]	ProLiant ML370
ProLiant DL380	ProLiant ML530
ProLiant DL580	ProLiant ML570
ProLiant DL760 (NEW)	ProLiant ML750 (NEW)
ProLiant ML330	ProLiant 8000
ProLiant ML330e [3] (NEW)	ProLiant 8500
ProLiant ML350	

Installation

Important!
Caldera eServer 2.3.1 is maintenance release that is only available directly from Caldera at www.calderasystems.com.

Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   See section 3.1 for SmartStart setup.
2. Insert the Caldera eServer 2.3.1 CD when prompted.
3. Select **Custom (Expert Only!)** at the Installation Target screen.
   This allows you to keep the Compaq System Partition. The Compaq System Partition is not required to install Linux. Compaq recommends you create the partition to facilitate system configuration. The partition contains SmartStart diagnostic tools and is also required to run the tools off the SmartStart CD (SCU for example). If you choose not to create or keep this partition, floppy disks containing the utilities may be made from the SmartStart CD-ROM. Please consult the SmartStart documentation for further information. If you choose not to keep the Compaq System Partition, it is not necessary to select the **Custom (Expert Only!)** installation.

4. Partition the hard drive:
DO NOT edit or delete the Compaq System Partition.
See section 2.3 for tips on disk partitioning.
Note: *We do not recommend using logical drives during install if you are having problems with this distribution.*
  a) Create the / (root) partition first. (Example: */dev/sda1*)
  - Make sure that the end cylinder number is less than 1024.
  - Make sure that the **Bootable** and **Format** boxes are selected.
  - Write down the / (root) partition device number. You may need the root partition device number for later use.
  b) Create the swap partition:
  - Select **Linux Swap** from the Partition Type Section.
  - The swap Partition is usually 2X the system RAM
  c) Create other partitions
    Note: *Do not create a /boot partition.*
5. Save the partition configuration by selecting **Write** option.
6. Format the chosen partitions.
7. Select the installation packages.
8. Set up the network.
9. Select **Install LILO** on TARGET Partition (example */dev/sda1*) at the Linux Loader screen to preserve the Compaq System Partition.
   Note: If you put LILO into the MBR, you will be unable to access the Compaq System Configuration Utilities by pressing **F10** during system boot up (unless your system has ROM-based utilities). If LILO is placed on the /boot partition, or in this case the / (root) partition, and that partition marked active, the **F10** key functions properly. If you prefer to put LILO in the master boot record, you can set up LILO such that it will boot the Compaq partition using LILO mechanisms instead of the **F10** key. If the MBR will be used, the MBR radio button must be selected before the MBR device can be changed.

   Important: For 'ROM Based Setup Utility' (RBSU) units (such as the ProLiant ML330, ProLiant ML330e, ProLiant ML350, ML350 1Ghz and ProLiant DL320), install LILO into the MBR.

10. Log on to the server after the installation completes.
11. Open a terminal emulation window.
12. Verify in the */etc/lilo.conf* file that the keyword linear appears near the top of the file, if it is not there, then add it, then save and exit.
    Note: *If using an integrated array controller on a DL360 see note (2) below.*
13. Type /sbin/lilo at the prompt.
    Important: The sever will fail to reboot if you fail to modify the *lilo.conf* file and run /sbin/lilo
14. Reboot the server.

Special Instructions:

(1) **ProLiant DL 320**

SCSI model:
- Follow steps #1 through #14 above.

ATA model:
- Download the SoftPaq named, "*Caldera Bootable Diskette*", from http://www.compaq.com/support/files/server/us/locate/2777.html or http://www.compaq.com/products/servers/linux/linux-drivers.html.
- Create a Caldera Bootable Diskette from the downloaded image. Refer to the *README* file in the downloaded SoftPaq for instructions to create a boot disk.
- Run SmartStart on the server: Erase Utility → Manual → Linux OS.
- Insert the SoftPaq named, "*Caldera bootable diskette*", and the Caldera eServer 2.3.1 CD when prompted.
- At the initial boot prompt type:
  - linux10 for the 10GB ATA-100 drive model
    - **- OR -**
  - linux20 for the 20GB ATA-100 drive model
    - **- OR -**
  - For all other ATA drives, type: linux hde="cylinder, head, sector" (example, linux hde=2586,240,63).

  Note: The cylinder = Addressable Sectors / 240 / 63

  Note: These commands allow Caldera kernel to detect the ATA drive size properly.
- Perform step #3.
- For the DL320 ATA Model, delete the Compaq System Partition (created by SmartStart) prior to create Linux partitions. Do step #4.
- Continue with step #5.

(2) **ProLiant DL360**
- Follow step #1 through #12 above.
- Make sure that *lilo.conf* has the correct drive parameters displayed for boot=/dev/ida/c0d0p# (where # is the actual partition number). This is the information from step 4.a. above.
- Under the 'image=' section, the root parameter should look like: root=/dev/ida/c0d0p# (where # is the actual partition number of the root directory).
- Under the 'root=…' enter in the following line: initrd = /boot/initrd-2.2.14.gz
- Continue with steps #13 and #14

(3) **ProLiant ML 330eATA model**:

- Download the SoftPaq named, "*Caldera Bootable Diskette*", available at http://www.compaq.com/support/files/server/us/locate/2777.html or from http://www.compaq.com/products/servers/linux/linux-drivers.html.
- Create a Caldera Bootable Diskette from the downloaded image. Refer to the *README* file in the downloaded SoftPaq for instructions to create a boot disk.
- Run SmartStart on the server: Erase Utility → Manual → Linux OS.
- Insert the SoftPaq named, "*Caldera bootable diskette*", and the Caldera eServer 2.3.1 CD when prompted.
- At the initial boot prompt type:
    - linux10 for the 10GB ATA-100 drive model
        - **- OR -**
    - linux20 for the 20GB ATA-100 drive model
        - **- OR -**
    - linux hde=4865,255,63 for the 40GB ATA-100 drive model

    Note: The cylinder = Addressable Sectors / 240 / 63
    Note: These commands allow Caldera kernel to detect the ATA drive size properly.
    Note: For all other ATA drives, type: linux hde="cylinder, head, sector**"** (example, linux hde=4865,255,63 for 40GB drives)

- Perform step #3.
- For the ML330e, delete the Compaq System Partition (created by SmartStart) prior to create Linux partition. Do Step #4.
- Perform steps #5 through #14.
- At reboot, invoke the <F9> option in the RBSU (ROM based Setup Utility). Under Advanced Options set "MPS Table Mode" to "Full Table Mapped".

- Following the completion of the installation, complete the following steps to enable ATA-100 performance:
    - Download the SoftPaq named SP16306, "*Compaq IDE Hard Disk Parameter Setting*", available at http://www.compaq.com/support/files/server/us.
    - After installation type the following commands to extract the software:
        # tar –xzvf sp16306.tar.gz [ENTER]

    - The following files should be created:
        cpqhdparm-1.0-1.i386.rpm
        readme.txt

    - Refer to readme.txt provided with the SoftPaq for instructions on installing the fix.

3.3 Red Hat

Red Hat 7.0

Hardware

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ProLiant DL760 (NEW)	ProLiant ML750 (NEW)
ProLiant ML330	ProLiant 8000
ProLiant ML330e [1] (NEW)	ProLiant 8500
ProLiant ML350	

Installation

Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   See section 3.1 for SmartStart setup.
2. Insert the Red Hat CD-ROM when prompted.
3. Select **Custom** in the Install Type Screen.
   This allows you to keep Compaq System Partition.
4. Partition the hard drive(s):
   DO NOT edit or delete the Compaq System Partition.
   See section 5 for more information

   Important: You may need to remember the root partition device number for later use.

5. Select to install the LILO boot record on "***/dev/… first sector of boot partition***" at the LILO Configuration Screen. This will allow you easy access to the Compaq System Partition later by not installing LILO to the MBR.

Note: For a list of known problems and their solutions, check the Red Hat errata for updates at http://www.redhat.com/errata.

Special Instructions:

(1) **ProLiant ML 330e <u>ATA model</u>**:
- Download the SoftPaq named SP16306, "*Compaq IDE Hard Disk Parameter Setting*", available at <u>http://www.compaq.com/support/files/server/us</u>.
- After installation type the following commands to extract the software:
    # tar –xzvf sp16306.tar.gz [ENTER]

- The following files should be created:
    cpqhdparm-1.0-1.i386.rpm
    readme.txt

Refer to readme.txt provided with the SoftPaq for instructions on installing the fix.

Red Hat 6.2

Hardware

These installation instructions apply to the Compaq servers in the following list. Servers marked with a number have special instructions described further below.
If your Compaq server is not listed within this document, please check our archive records located at <u>http://www.compaq.com/products/servers/linux/archive-howto.html</u>

ProLiant DL320	ProLiant ML350 1GHz
ProLiant DL360	ProLiant ML370
ProLiant DL380	ProLiant ML530
ProLiant DL580	ProLiant ML570
ProLiant ML330	ProLiant 8000
ProLiant ML350	ProLiant 8500

Installation

<u>Server must be configured using the SmartStart CD-ROM before proceeding.</u> <u>See Section 3.1 before proceeding with these instructions.</u>

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
    <u>See section 3.1 for SmartStart setup.</u>
2. Insert the Red Hat CD-ROM when prompted.
3. Select **Custom** in the Install Type Screen.
    This allows you to keep Compaq System Partition.

4. Partition the hard drive(s):
   DO NOT edit or delete the Compaq System Partition.
   See section 5 for more information
   a) Create the /boot partition first in the Disk Druid Screen.
      - This is usually 10 to 30 MB; make sure that the end cylinder number is less than 1024.
   b) Create the swap partition:
      - Select **Linux Swap** from the Partition Type Section.
      - Usually the size of swap is 2X the system RAM (2 GB max!)
   c) Create the / partition (root partition).
      - You may select the option **Grow to fill disk?** Allowing the / partition to utilize the remaining disk space.
      - Write down the / (root) partition device number. Example, *sdaX* where *X* is the partition device number.
      - **Important:** You may need the / (root) partition device number for later use.

5. Select to install the LILO boot record on "*/dev/… **first sector of boot partition***" at the LILO Configuration Screen.
6. Select **Test this Configuration** at the X Configuration Screen.
7. Create a boot disk when prompted (you might need it later).
8. Reboot the server after the installation completes.

Note: For a list of known problems and their solutions, check the Red Hat errata for updates at http://www.redhat.com/errata.

3.4 TurboLinux 6.0.5

Hardware

These installation instructions apply to the Compaq servers in the following list. Servers marked with a number have special instructions described further below.
If your Compaq server is not listed within this document, please check our archive records located at http://www.compaq.com/products/servers/linux/archive-howto.html

ProLiant DL320	ProLiant ML350 1GHz
ProLiant DL360	ProLiant ML370
ProLiant DL380	ProLiant ML530
ProLiant DL580	ProLiant ML570
ProLiant ML330	ProLiant 8000
ProLiant ML350 [1]	ProLiant 8500

Installation

Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.

1. Run SmartStart on the server: Erase Utility → Manual → Linux OS.
   See section 3.1 for SmartStart setup.
2. Insert the TurboLinux 6.0.5 CD-ROM, or later, when prompted.
3. Select **Auto Probe for Hardware Devices** to assist you with what hardware modules to load.
4. Create the partitions using CFDISK or FDISK.
   DO NOT edit or delete the Compaq System Partition.
   a) Create the / (root) partition first.
   b) Make the / partition bootable.
   c) Create a primary partition for Linux Swap partition.
5. Save the partition configuration by selecting the **Write** option.
6. Format the partitions.
7. Setup the network.
8. Select the installation packages.
   a) Select **First Sector of the Boot Partition** at the LILO installation screen to preserve the Compaq System Partition.
   b) Select **Auto Probe** for the video card.
      This assists you with which video driver to load.
   c) Select the video card discovered by Auto Probe.
9. Select **Do It Later** at Finish X Configuration Screen because it could lock up your system if a wrong video driver is chosen.
10. Use the Turboxcfg or Xconfigurator Utility to setup X after you have rebooted your system.

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11. Remove the TurboLinux CD-ROM and reboot the server once the installation completes.

Special Instructions:

(1) **ProLiant ML350** servers:
- Follow steps #1 through #7 above.
- Select **Serial** at the Service Status Board Screen.
- Disable the serial service.
- Continue with steps #8 through #11.

3.5 SuSE

SuSE 7.0

Hardware

These installation instructions apply to the Compaq servers in the following list. Servers marked with a number have special instructions described further below.
If your Compaq server is not listed within this document, please check our archive records located at http://www.compaq.com/products/servers/linux/archive-howto.html

ProLiant DL320 [(1)]   ProLiant ML350

ProLiant DL360   ProLiant ML350 1GHz

ProLiant DL380   ProLiant ML370

ProLiant DL580   ProLiant ML530

ProLiant DL760 (NEW)   ProLiant ML570

ProLiant ML330   ProLiant ML750 (NEW)

ProLiant ML330e (NEW)

Installation

Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.

1. Erase Utility → Manual → Linux OS.
    See section 3.1 for SmartStart setup.
2. Insert the SuSE 7.0 CD-ROM #1 when prompted.
3. Select Language/ Keyboard/Time zone.
4. Select Custom Partitioning – For Experts.
5. Create the partitions:
    a) Create the /boot partition first (+30M -primary).
    b) Create the / swap partition (+500M).
    c) Create the / (root) partition (-rest).
    DO NOT edit or delete the Compaq System Partition.
6. Select the installation packages.
7. Select **Custom** LILO Installation.
8. Select **Write LILO to the /boot partition.**
9. Check **Use linear option.**

Special Instructions:

(1) **ProLiant DL320**:
SCSI model:
- Follow steps #1 - # 9 above.

ATA model:
- Follow steps #1 through #2 above.

- For the 10GB ATA-100 drive model:
  Type linux hde=1292,240,63 ide2=dma at the initial boot**:** prompt.
  Note: You have about 2 seconds to start entering the command before installation automatically begins. This command allows SuSE kernel to recognize the ATA drive size properly. For the SCSI model, no parameters are needed.

  – OR –

- For the 20GB ATA-100 drive model:

  Type linux hde=2586,240,63 ide2=dma at the initial boot**:** prompt.

- Perform steps #3 through #7.

- For step #8, choose to write LILO to the MBR

  Note: If LILO is installed to the /boot partition, the installation will complete normally but will reboot to a "Missing Operating System" error message.

- Continue with step #9.

SuSE 6.3

Hardware

These installation instructions apply to the Compaq servers in the following list. Servers marked with a number have special instructions described further below.
If your Compaq server is not listed within this document, please check our archive records located at http://www.compaq.com/products/servers/linux/archive-howto.html

ProLiant DL320 [1]	ProLiant ML350 1GHz
ProLiant DL360	ProLiant ML370
ProLiant DL380	ProLiant ML530
ProLiant DL580	ProLiant ML570
ProLiant ML330	ProLiant 8000
ProLiant ML350	ProLiant 8500

Installation

Server must be configured using the SmartStart CD-ROM before proceeding. See Section 3.1 before proceeding with these instructions.

1. Erase Utility → Manual → Linux OS.
    a) **See section 3.1 for SmartStart setup.**
    b) Insert the SuSE 6.3 CD-ROM #2 when prompted.
2. Type linux pci=irqrt at initial **boot:** prompt.

    Important: You have about 2 seconds to start entering the command below before installation begins automatically. This command allows SuSE 6.4 kernel to detect the SCSI/Array Controller on secondary PCI bus.

3. Select **Load SCSI Modules** to load the SCSI driver, and then select NCR **53c8XX.**
    If the SCSI driver fails to install:
    a) Select **More Modules**.
    b) Insert the SuSE 6.4 Modules diskette.
    c) Select **Compaq Smart Array Controller or SYM896** for the latest Compaq Array and SCSI controller support.
        Note: For the ML 350 1GHz select the AIC7XXX Adaptec controller.
    d) Press **Enter** when prompted to enter the parameter for SCSI.

4. (Optional) Select **Load network card module** to load a NIC driver → Select Intel EtherExpress Pro100.
   If the NIC driver fails to install:
   a) Select **More Modules.**
   b) Insert the SuSE 6.4 Modules diskette.
   c) Select **Compaq Netelligent 10/100 NIC** for the latest Compaq NIC driver.
      Note: You must install the Compaq Netelligent 10/100 NIC (TLAN) driver for ProLiant 800 and ProLiant 1600.
   d) Press **Enter** when prompted to enter the parameter for the NIC.
   e) Go to Main Menu by selecting **Back.**
5. Select **Start Installation / System**.
6. Select **Start Installation / Update**.
7. Select the version of YaST to use for the installation screen→ select **YaST1 – Text based**.
8. Select **Install Linux from Scratch** at Type of Installation Screen.
9. Select **Partitioning** at Partition Hard Drive Screen.
   DO NOT edit or delete the Compaq System Partition.
   See section 5 for more information
   a) Create the **/boot** partition first.
      This is usually 10 to 30 MB; make sure that the end cylinder number is less than 1024.
   b) Create the **swap** partition:
      Select **Linux Swap** from the Partition Type Section.
      Usually size of swap is 2X the system RAM (2 GB max!)
   c) Create the / partition (root partition).
      Write down the / (root) partition device number. Example: *sdaX* where *X* is the partition device number.

      Important: You may need the root partition device number for later use.

10. Select **Start installation** at the Installation Screen.
11. Select **Main Menu** after the installation completes.
12. Select **Boot sector of the /boot partition** to configure the Linux loader, check the **Linear** option, and generate the boot configuration by pressing **F4=New Config**.
13. Reboot the server after the installation completes.

Special Instructions:

(1) **ProLiant DL320**:

SCSI model:
- Follow steps #1 - #13 above.

ATA model:
- Follow step #1 above.

For the 10GB ATA-100 drive model:

- Type linux hde=1292,240,63 pci=irqrt at the initial boot**:** prompt.
Note: You have about 2 seconds to start entering the command before installation automatically begins. This command allows SuSE kernel to recognize the ATA drive size properly and also to detect the SCSI/Array Controller on secondary PCI bus.

    – OR –

For the 20GB ATA-100 drive model:

- Type linux hde=2586,240,63 pci=irqrt at the initial boot**:** prompt.

    – OR –

For all other ATA-100 drive models:

- Type linux hde="cylinder, head, sector" pci=irqrt (example, linux hde=1956,240,63 pci=irqrt) at the boot: prompt.
Note: The cylinder = Addressable Sectors / 240 / 63

- Continue with steps #3 through #12.
- Modify the */etc/lilo.conf* file before rebooting the server by changing the line boot=/dev/... to boot=/dev/hde and save the file.
- Type **/sbin/lilo** at the prompt.
Important: The server will reboot to "Missing Operating System" error message if you fail to modify the *lilo.conf* file and run /sbin/lilo.
- Continue with step #13.

4.0 Troubleshooting

4.1 Problems During Installation

Problem: Kernel panic occurs during installation

Possible Causes:

1. More than 960MB of memory in the server

2. Drives on the array not configured

Possible Solutions:

1. Verify that Linux uses less than 960MB of memory in the server during the install by using the following parameters given to the boot: prompt. "linux mem=960M".

2. Verify that all drives attached to the array controller have been properly configured by the ACU (Array Configuration Utility), which is available from the SmartStart main menu.

Problem: No storage controller is recognized

Possible Causes:

1. More recent driver needed for the controller (SYM53C8xx)

2. The embedded or stand-up storage controller interfaces to a secondary/tertiary PCI bus and the Linux distribution kernel is less than 2.2.16

Possible Solutions:

1. Download a more recent driver for the controller at http://www.compaq.com/linux.

2. Use a Linux distribution with kernel 2.2.16 or later.

3. Check the HOWTO that is available at (http://www.compaq.com/products/servers/linux/compaq-howto.html) or the archived HOWTO (http://www.compaq.com/products/servers/linux/archive-howto.html) for installation procedures.

4.2 Problems Booting

Problem: Linux hangs during boot when starting networking

Possible Cause:

Bugs in eepro100 driver

Possible Solutions:

1. Try using the Intel e100.o device driver available for download from Compaq at http://www.compaq.com/support/files/server/us/locate/2882.html.

2. The EEPro100 Mailing List archive, is available at http://www.tux.org/hypermail/linux-eepro100/, and is another good source of information.

Problem: LILO or Linux hangs during boot

Possible Causes:

1. /boot above the 1024 cylinder limit

2. Problem in *etc/lilo.conf*

3. Problem in *etc/fstab*

4. Linear addressing might be needed for SCSI drives

Possible Solutions:

1. Use FDISK to make sure the /boot partition is one of the first partitions on the drive and that it does not extend beyond cylinder 1024.

2. Rerun *sbin/lilo*. Put LILO into the Master Boot Record (MBR). This means omitting any digits at the end of the first line as follows: boot=/dev/sda or boot=/dev/ida/c0d0.

3. Verify that all the information in *etc/fstab* is correct.

4. Boot to the floppy created during installation. Add the keyword Linear to the *etc/lilo.conf* file or run *sbin/lilo –l*.

Problem: Black screen after POST (Power-On-Self-Test) completes (blinking cursor in the upper left-hand corner)

Possible Causes:

1. No active partition

2. /boot in the extended partition

3. Master Boot Record (MBR) corrupt

4. Problem with *etc/lilo.conf*

5. LILO is not using linear mode

Possible Solutions:

1. Verify that there is an active partition.

2. Verify that /boot partition is numbered less than 5.

3. Repair the Master Boot Record with DOS 6.22 or the Windows 95 boot disk using the FDISK /mbr command.

4. Put LILO into the Master Boot Record. This means omitting any digits at the end of the first line.

5. Edit your */etc/lilo.conf* file if you are installing to a ProLiant ML330 or ProLiant ML350 and LILO is installed on the master boot record. Make sure that the keyword linear appears in the top section.

Problem: Linux does not report the correct amount of system memory

Possible Causes:

1. Memory not specified in */etc/lilo.conf*

2. Kernel not compiled to recognize all of physical memory

Possible Solutions:

1. Add the following line to your */etc/lilo.conf* just before the read-only line (adjust for your amount of memory), and re-run LILO to make this change take effect:

   append="mem=48M" or append="mem=49152k"

2. Check memory settings by changing the present working directory to */usr/src/linux* and typing make config, make menuconfig, or make xconfig, as appropriate. It may be necessary to apply the bigmem patch (this patch is included in Red Hat 7.0 and SuSE 7.0) to recognize greater than two gigabytes of physical RAM.

4.3 Other Issues

Redundancy for some Smart Array Controllers Not Supported

The Smart Array 4250ES (ProLiant 8000 and ProLiant 7000) and the Smart Array 3100ES (ProLiant 7000) optional redundancy feature is not available for Linux.

Tape Drives on Embedded Array Controller Not Supported by cpqarray driver

The Linux cpqarray driver does not support tape drives. Either an additional SCSI controller must be added to control the tape drive, or an additional Array controller added for the hard drives and the Integrated Smart Array cache chip be removed from the System I/O Board.

F10 Access to the Compaq System Configuration Utility is missing

The ability to access the system partition by pressing **F10** at startup is controlled by the Master Boot Record. If you overwrite the MBR with LILO, you will not be able to access the system partition by pressing **F10** on startup. This option is also not available if the partition does not exist. Here are the steps to recover **F10** functionality.

1. Make sure you have a verified backup and have your boot diskettes available. This procedure is not destructive to data, but a backup is recommended when modifying the MBR.

2. Configure LILO to install to /boot instead of the MBR:

   - Edit /etc/lilo.conf

   - Make reference of your /boot partition (*boot=/dev/sda1*) in */etc/lilo.conf* instead of the MBR (*boot=/dev/sda*) by adding the partition number to the device name. **Note**: Here we reference the /boot partition by its specific partition number; therefore, we do not point to the MBR

   - Point to your / (root) partition If /boot is not in its own partition.

   - Verify that *image=/boot/vmlinuz-2.2.16* points to a valid kernel name, and that *root=/dev/ida/c0d0p6* points to the actual / or root partition.

   - Save your changes and exit the editor.

   - Run */sbin/lilo*. This installs the boot record and makes your changes take effect.

3. Ensure the /boot partition is active by running FDISK, and check that the /boot partition is the only partition marked active.

4. Restore **F10** functionality by booting with a DOS or Windows diskette and running *fdisk /mbr*. This restores the MBR and allows access to the system partition (This applies to servers that do not use the linear mode of */etc/lilo.conf*).

Now you should be able to access the system partition by pressing **F10** during POST. In addition, you should be able to boot back to Linux by just booting the server (and not pressing any keys). If you are unable to boot to Linux, see the section "LILO is corrupt".

LILO is corrupt

This section discusses three methods for recovering your system if LILO no longer points to your root and /boot partitions. The recovery process involves using a Linux boot diskette or the Linux installation CD-ROM, mounting the root and /boot partitions, correcting the */etc/lilo.conf* and */etc/fstab* files, and running */sbin/lilo*. You may find that */usr/sbin/chroot* helps during this process.

Recovering LILO from within Linux

If you are forced to boot Linux from a diskette to repair LILO:

1. Boot Linux from floppy.
2. Edit the */etc/lilo.conf* and */etc/fstab* files.
3. Run */sbin/lilo* to repair the copy of LILO on the /boot partition.
4. Verify that the /boot partition is the only active partition and is a primary partition.

Recovering LILO using boot and root diskettes

1. Boot the server using the Linux Boot Disk created during the installation process.
2. Type **rescue** at the lilo: prompt.
3. Insert the rescue diskette (which was created from the images directory on the Linux Installation CD-ROM) when prompted.

In one of the directories (probably /dev or /tmp), you will find device nodes that point to your hard drive and partitions.

4. Make a mount point

   ```
   # mkdir /mnt
   # mkdir /mnt/drive
   ```

5. Mount your root partition.

   ```
   # mount /dev/sda6 /mnt/drive
   ```

6. Mount your /boot partition.

   ```
   # mount /dev/sda2 /mnt/drive/boot
   ```

7. Run chroot to /mnt/drive.

   ```
   # /mnt/drive/usr/sbin/chroot /mnt/drive
   # cd /
   ```

You can print your partitions in FDISK to see what numbers you should be using in */etc/lilo.conf* and */etc/fstab* files.

8. Edit your */etc/lilo.conf* and */etc/fstab* and make sure you have the correct partition numbers.

9. Save your files *(/etc/lilo.conf* and */etc/fstab*).

10. Generate a fresh copy of LILO. (Using the verbose mode may be helpful: /sbin/lilo -v)

   # /sbin/lilo

11. Exit from your chroot shell.

   # exit
   # cd /

12. Unmount your boot and root partitions.

   # cd /
   # umount /mnt/drive/boot
   # umount /mnt/drive

13. Remove any bootable CD or floppy disks and reboot.

Your Linux server should reboot using the hard drive.

Recovering LILO using Original Installation Media

1. Boot the server using the same installation media that was originally used to install the system.
2. Use the Linux installation program to load your SCSI device drivers.
   Note: Do not proceed beyond the screen that allows you to select the type of install. This "type of install" screen will have choices for Custom, Workstation, Server, etc.
3. Access the BASH# prompt by pressing CTRL+ALT+F2 from the GUI or ALT+F2 from a text based screen. Pressing this key combination will switch you away from the installer screen (usually F1 for text based and F7 for GUI based) to the 2nd virtual console where the BASH# prompt is located during installation. You may be unable to access the BASH# prompt until you proceed to the "Welcome" screen.
   Note: Do not proceed beyond the screen that allows you to select the type of install. This "type of install" screen will have choices for Custom, Workstation, Server, etc.
4. Once you reach the BASH# prompt, make two directories: /mydev and /mymnt:

   - `# mkdir /mydev`
   - `# mkdir /mymnt`

5. Check the /dev directory for the device nodes needed for your SCSI controller. If the device nodes are not present in the /dev directory, then create them in the /mydev directory according to the Device Node Table below:

   Here is an example using entries for the cpqarray driver:

   - `# mknod /mydev/c0d0 b 72 0`
   - `# mknod /mydev/c0d0p1 b 72 1`
   - …
   - `# mknod /mydev/c0d0p15 b 72 15`

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Device Node Table

Regular SCSI	cpqarray	cciss
sda b 8 0	c0d0 b 72 0	c0d0 b 104 0
sda1 b 8 1	c0d0p1 b 72 1	c0d0p1 b 104 1
sda2 b 8 2	c0d0p2 b 72 2	c0d0p2 b 104 2
sda3 b 8 3	c0d0p3 b 72 3	c0d0p3 b 104 3
sda4 b 8 4	c0d0p4 b 72 4	c0d0p4 b 104 4
sda5 b 8 5	c0d0p5 b 72 5	c0d0p5 b 104 5
sda6 b 8 6	c0d0p6 b 72 6	c0d0p6 b 104 6
sda7 b 8 7	c0d0p7 b 72 7	c0d0p7 b 104 7
sda8 b 8 8	c0d0p8 b 72 8	c0d0p8 b 104 8
sda9 b 8 9	c0d0p9 b 72 9	c0d0p9 b 104 9
sda10 b 8 10	c0d0p10 b 72 10	c0d0p10 b 104 10
sda11 b 8 11	c0d0p11 b 72 11	c0d0p11 b 104 11
sda12 b 8 12	c0d0p12 b 72 12	c0d0p12 b 104 12
sda13 b 8 13	c0d0p13 b 72 13	c0d0p13 b 104 13
sda14 b 8 14	c0d0p14 b 72 14	c0d0p14 b 104 14
sda15 b 8 15	c0d0p15 b 72 15	c0d0p15 b 104 15

6. Use "fdisk –l" to get a listing of your partitions

   Here is an example using fdisk to list partitions on an array controller:

   - `# fdisk –l /mydev/c0d0`

7. Mount your root partition to /mymnt. You will know which partition is your root partition because it will contain etc/fstab.

   Here is an example mounting a root partition. In this example partition 6 is our root partition.

   - `# mount /mydev/c0d0p6 /mymnt`
   - `# ls /mymnt/etc/fstab`

   - If "ls" does not list the fstab file, then the partition mounted is probably not the root partition. Try another partition until the root partition is found.

- If present "e2label" may be helpful in determining which partition is which. Here is an example of using e2label on partition number 5:

  ```
  # e2label /dev/c0d0p5
  ```

  e2label should then respond with what mount point c0d0p5 uses. It is possible that e2label may not be available. It is also possible that the partitions may not have been labeled.

8. Once you have your root partition mounted, mount the rest of your partitions according to the contents of etc/fstab.
   - `# cat /mymnt/etc/fstab`
   - `# mount /mydev/c0d0p7 /mymnt/usr`
   - `# mount /mydev/c0d0p1 /mymnt/boot`
9. Use chroot to make /mymnt your new temporary root partition.
   - `# /mymnt/usr/sbin/chroot /mymnt`
10. Su to root
    - `# su -`
11. Now make necessary repairs to your system. This usually involves repairing /etc/lilo.conf and possibly /etc/fstab. If there is anything kernel related you would need to do in order to bring the system up, then do that now as well.
    - `# cat /etc/lilo.conf`
    - `# cat /etc/fstab`
    - `# /sbin/lilo`
12. Once all repairs have been made, then lets exit out of the repair mode.
    a) Exit from su -
       - `# exit`
    b) Exit from chroot
       - `# exit`
    c) Unmount all partitions you mounted
       - Use the mount command to list partitions you have mounted.
       - `# mount`
       - Use the umount command to unmount partitions.
       - `# umount /mymnt/boot`
       - `# umount /mymnt/usr`
       - `# umount /mymnt`
13. Reboot. It is not necessary to do anything about /mymnt, /mydev, nor their contents as these directories and device nodes were created in a ram disk. As soon as you reboot the computer will discard the contents of the ram disk.

Unable to dual boot server with both Windows NT and Linux

If the server is configured as a dual boot system with Linux and Windows NT, running Windows NT Disk Administrator causes the partition numbers to change. To correct this problem:

1. Boot the server using a Linux boot disk or CD-ROM.
2. Install a new boot record.
3. Modify the */etc/fstab* file to point to the correct partition numbers.

See also http://www.linuxdoc.org/HOWTO/mini/Linux+NT-Loader.html for further info on dual booting Linux and Windows NT.

5.0 Further Reading

5.1 Understanding Linux Partition Names and Device Names

Partition names consist of a device name, device number, and partition number. Here are some examples:

Device + Device Number + Partition Number = Full device name

/dev/sd + a + 2 = /dev/sda2 = 2nd primary partition on 1st SCSI disk drive

/dev/sd + a + none = /dev/sda = 1st SCSI disk drive

/dev/hd + c + none = /dev/hdc = MBR on 3rd IDE device

/dev/ida/ + cx + dy + pz = controller *x* on logical drive *y* with a partition number of *z*.

Primary partitions are numbered from 1 to 4. An extended partition takes up one primary partition number. Logical drives in the extended partition always start at 5 and go up.

LILO can load most operating systems including the Compaq System Partition. To boot to another partition you should add a section similar to the following:

other=/dev/sda3

   label=F10

   table=/dev/sda

- The first line–other=/dev/sda3–should point to the partition to boot.
- The second line–label=F10–shows up when you press **Tab** at the LILO prompt.
- The third line–table=/dev/sda–needs to point to the MBR of the above named partition.

Changes in */etc/lilo.conf* should be saved and */sbin/lilo* run. You should be able to boot to your other choice by typing the appropriate label at the lilo: prompt. Press the **Tab** or **?** to see your choices.

5.2 Creating and Adding New Partitions:

Use FDISK to create your new partition: For example - *fdisk /dev/ida/c0d0.* For this example, your new partition name is */dev/ida/c0d0p10* because partition 10 is the next available partition.

1. Create your file system.

   mkfs -V -t ext2 -c -v /dev/ida/c0d0p10

2. Edit your *fstab* to add a line for your partition and a mount point.

See the */mynewprtn* line below which was added in using */dev/ida/c0d0p10* as an example. Here is an example of the contents of /etc/fstab.

```
/dev/ida/c0d0p6 / ext2 defaults 1 1

/dev/ida/c0d0p1 /boot ext2 defaults 1 2

/dev/ida/c0d0p9 /home ext2 defaults 1 2

/dev/ida/c0d0p8 /usr ext2 defaults 1 2

/dev/ida/c0d0p7 /var ext2 defaults 1 2

/dev/ida/c0d0p10 /mynewprtn ext2 defaults 1 2

/dev/ida/c0d0p5 swap swap defaults 0 0

/dev/fd0 /mnt/floppy ext2 noauto 0 0

/dev/cdrom /mnt/cdrom iso9660 noauto,ro 0 0

none /proc proc defaults 0 0

none /dev/pts devpts mode=0622 0 0
```

3. Make a directory in the root directory for a mount point.

   # mkdir /mynewprtn

4. Mount the partition or reboot.

   # mount -t ext2 /dev/ida/c0d0p10 /mynewprtn
   or
   # mount -a

5.3 Questions and Answers:

Compaq Related

Where can I get more information on Compaq and Linux?

The Compaq Linux website hosts an array of information, such as the distributions Compaq supports, white papers, customer advisories, support matrices, and a direct link to all Linux SoftPaqs for servers and storage options located at http://www.compaq.com/linux/

Does Compaq have Open Source projects?

Compaq is hosting a number of ongoing open source software projects running on ProLiant platforms. The Compaq open source website contains engineering projects, technical papers, news and articles from within the Compaq open source community. Compaq also aids in the support of Linux by regularly contributing software to the Linux kernel. Visit us at http://www.opensource.compaq.com/

Why start with a system erase?

Starting with a system erase ensures you begin the installation process from a known non-configured state.

How do I perform a system erase?

Boot from the SmartStart CD-ROM and choose System Erase from the Main Menu.

How do I get to the main menu of SmartStart if all that shows is a boot: instead of the graphical menu when booting to the SmartStart CD?

One method is to build and use the System Erase Diskette. Create this diskette from the Compaq Disk Builder by inserting the SmartStart CD-ROM into a system running Microsoft Windows; the Autorun feature automatically starts the Disk Builder Program.

Why choose UnixWare 2 as the operating system to install?

For SmartStart version 4.6 or later, select Linux as the operating system to install. Earlier versions of SmartStart did not include Linux as an operating system option. In this case, the UnixWare 2 setting configures the server's hardware (including chipset-level settings such as the APIC mode) in a manner appropriate for Linux.

Why choose Custom Install when installing Red Hat or Caldera Linux?

Custom Install allows you to keep an existing Compaq System Partition, while Server Install or Workstation Install options delete the System Partition.

Why use FDISK instead of Disk Druid when installing older versions of Red Hat Linux?

Once Disk Druid (from Red Hat 6.1) sees a primary partition, it creates all remaining partitions within a non-bootable extended partition. Since this version of Disk Druid does not take into account the Compaq System Partition, it will incorrectly install /boot into the extended partition. You cannot boot from the extended partition. The only way to correctly partition the primary hard disk is to use FDISK. Disk Druid from Red Hat 6.2 has been corrected in Red Hat 6.2 as long as /boot is the first partition created.

Why put LILO on the first sector of the /boot partition instead of the MBR?

If you put LILO into the MBR, you will not be able to access the System Configuration Utilities by pressing **F10** during system boot up. The F10 key functions properly if LILO is placed on the /boot partition and that partition marked active.

Note: If you prefer to put LILO in the master boot record, you can set up LILO so that it can boot the Compaq partition using LILO mechanisms instead of the **F10** key.

Why put the /boot partition immediately after the Compaq System Partition?

This keeps the /boot partition completely below the 1024 cylinder limit.

How do you verify that the SCSI controllers have been identified during installation?

Use the **LEFT ALT+F3** and **LEFT ALT+F4** buttons to change screen views.

- If a SMART Array controller is installed, these screens indicate the controller was found. The Compaq System Partition appears as partition three (ida/c0d0: p3).

  ```
  Compaq Smart2 Driver (v 0.9.9)

  Found 1 controller(s)

  Finding drives on ida0 (SMART-221)

  ida/c0d0: blksz=512 nr_blks=4096320

  ida/c0d0: p3
  ```

- If you have an embedded SCSI controller, you should see an indication that it has been found:

  ```
  sym53c8xx: ................
  ```

  OR

  ```
  ncr53c8xx: ................
  ```

5.4 FDISK tutorial

Linux FDISK confuses some but in reality, FDISK is quite simple. Here are some FDISK commands:

- **A** marks a partition as active (do not mark more than one partition active at any time)

- **D** deletes a partition that you no longer need.

- **M** is your help key; it lists a menu of actions you can perform.

- **N** creates new partitions

- **P** indicates what your partitions look like. Use P frequently to make sure that your partitions are sized correctly.

- **Q** exits without saving your changes

- **T** changes the type of partition. Use this to change your swap partition to type Linux Swap.

- **W** saves your changes.

Partition Types:

- 0x5 is an extended partition.

- 0x12 is a Compaq System Utilities partition.

- 0x82 is Linux Swap file partition.

- 0x83 is Linux ext2 file system partition.

Unless you alter the partition types (not recommended), the only partition type you must change is the swap partition. Change the swap partition to type Linux Swap (type 0x82).

Creating Primary Partitions:

1. Type **N** for new partition.

2. Type **P** for primary.

3. Select the next available primary partition # (1-4).

4. Select the given starting cylinder.

5. Type in the desired size of the partition (for example: +30M for 30MB partition).

Creating Extended Partitions:

1. Type **N** for new partition.

2. Type **E** for extended partition.

3. Select the next available primary partition # (1-4).

4. Select the given starting cylinder.

5. Type in the last cylinder available (it is best for the extended partition to go all the way to the end of the drive).

Note: The Extended Partition shows up as type 5 (extended).

Creating a Logical Drive in the Extended Partition:

1. Type **N** for new partition.

2. Type **L** for logical partition.

3. Select the given starting cylinder.

4. Type in the desired partition size (for example: +265M for 265MB partition).

Note: Logical Drives start at partition number 5 and go up.

Make sure to mark a partition for /boot as the only bootable partition using the **A** command in FDISK. Make sure to change the type of your swap partition to type swap (82) using the **T** command in FDISK. Save your changes in FDISK by using the **W** command.

Example of Partitioning your Hard Drives with FDISK

We will now go through the command line driven utility FDISK to create partitions.

1. Type **P** to get a listing of your current partitions.

   You should see a /tmp/ida/c0d0p3 with an ID of 12, your Compaq System Partition. Leave this partition alone.

2. Create the /boot partition.

   This partition will be primary, active, from 10MB to 30MB (choose 30MB for now).

   • Type **N** to create a new partition.

   • Type **P** for primary.

   • Select #1 (the first available partition number).

   • Type in the first available cylinder (in this case 10).

   • Type in **+30M** to make this a 30MB partition.

   • Type **P** to get a partition listing.

- Type **A** to make this partition active→ **1** (to make partition #1 active) → **P** (to list your partitions).

  There should only be one partition with a star under the boot column.

3. Make the extended partition:

   - Type **N** (new) → **E** (extended) → **2** (next available partition #).

   - Type the next available cylinder number (ours is 26).

   - Enter the last available cylinder number (ours is 502).

   - Type **P** to list your partitions.

4. Create the swap partition:

   - Type **N** (new) → **L** (logical).

   - Select the next available cylinder # (ours is 26).

   - Type in your size (this example uses +128M here since it is limited on space).

   - Type **P** to list your partitions.

   - Type **T** (to change the type) → **5** (to select your swap partition) → **82** (to change to type swap).

   - Type **P** to print and review your partitions.

5. Create the root (/) partition:

   - Type **N** (new) → **L** (logical).

   - Select the next available cylinder # (ours is 59).

   - Type in your size (we chose 256MB for the root partition).

   - Type **P** to list your partitions.

6. Create the /var partition:

   - Type **N** (new) → **L** (logical).

   - Select the next available cylinder # (ours is 124).

   - Type in your size (we chose 256MB for the /var partition).

   - Type **P** to review your partitions.

7. Create the /home partition:

43

- Type **N** (new) → **L** (logical).

- Select the next available cylinder # (ours is 189).

This example puts 50% for /home and 50% for /usr, to calculate this: 502 (ending cylinder) - 189 (starting cylinder = 313; 313/2=156.5; 156+189=345. We used 345 for the ending cylinder.

- Type **P** to review your partitions.

8. Create the /usr partition.

- Type **N** (new) → **L** (logical).

- Select the next available cylinder (example is 346).

- Select the last cylinder (ours is 502).

This example used 50% of free space for /home and 50% for /usr.

- Type **P** to review your partitions.

9. Double check that your swap partition (probably partition # 5) is set for type "swap."

10. Make sure that /boot is active.

11. Type **W** to write your changes to the hard drives.

12. Select "done" to continue with installation.

5.5 Configuration File Examples

- Multiple NICs (3 NE-2000's, Red Hat5.2 Linux) – Here are the contents from an example /etc/conf.modules:

```
alias eth0 ne

alias eth1 ne

alias eth2 ne

options ne io=0x300,0x280,0x240
```

- Multiple NICs (2 TLANs, Red Hat5.2 Linux). Here are contents from an example /etc/conf.modules:

```
alias scsi_hostadapter ncr53c8xx

alias eth0 tlan

alias eth1 tlan
```

- Adding System Partition to LILO (embedded SCSI). Here are contents from an example /etc/lilo.conf:

```
boot=/dev/sda1

map=/boot/map

install=/boot/boot.b

prompt

timeout=50

image=/boot/vmlinuz-2.2.16

      label=linux

      root=/dev/sda6

      initrd=/boot/initrd-2.2.16.img

      read-only

other=/dev/sda3

      label=scu

      table=/dev/sda
```

- Adding System Partition to LILO (Compaq Array Controller). Here are the contents from a sample /etc/lilo.conf:

```
boot=/dev/ida/c0d0p1

map=/boot/map
```

```
install=/boot/boot.b

prompt

timeout=50

image=/boot/vmlinuz-2.2.16

      label=linux

      root=/dev/ida/c0d0p6

      initrd=/boot/initrd-2.2.16.img

      read-only

other=/dev/ida/c0d0p3

      label=scu

      table=/dev/ida/c0d0
```

5.6 General Instruction to patch the Peer Bus for 2.2.x Linux Kernel and rebuild the kernel

1. As root, change directory.

    # cd /usr/src/linux

2. Mount the floppy drive.

    # mount –t vfat /dev/fd0 /mnt/floppy

3. Apply patch. This patch, of course, is the one that comes from SP10775 or SP10776, the PCI Peer Bus patch.

    # patch –p1 </mnt/floppy/peerbus.patch

4. Rebuild the kernel.

    # make menuconfig or make xconfig or make config
    # make dep
    # make clean
    # make bzImage
    # cd arch/i386/boot
    # cp bzImage /boot/bzImage

5. Edit /etc/lilo.conf and add the new boot line.

6. Run the /sbin/lilo command at the boot prompt.

If necessary:

```
make modules
cd /lib/modules
mv 2.2.x.x 2.2.x.x-old
cd 2.2.x.x-old
cd block
insmod loop.o
cd /usr/src/linux
make modules_install
make initrd 2.2.xx
```

5.7 Compaq Web Resources

The following Compaq links contain valuable information regarding Linux, ProLiant servers, software downloads, and technical documentation.

- http://www.compaq.com/linux/ Compaq main Linux page.

- http://www.compaq.com/products/servers/linux/ Compaq ProLiant server information page.

- http://www.compaq.com/products/servers/linux/linux-drivers.html: Compaq direct link to Linux SoftPaqs and drivers.

- http://www.compaq.com/products/servers/linux/OSMatrix1.html – Compaq list of supported servers.

- http://www.compaq.com/products/servers/linux/OptionsMatrix.html – Compaq list of supported options.

- http://opensource.compaq.com: Compaq Open Source software projects.

- http://www.compaq.com/alphaserver/linux: Compaq Alpha Server information page

- http://www.alphalinux.org: A web site dedicated to information about Linux and Alpha processor-based computer systems by Compaq and other vendors.

- http://forum.compaq.com: Useful forum for technical support of Compaq products (account required from http://forum.compaq.com)

- http://www.geocities.com/rlcomp_1999: Richard Black, Compaq Technical Support, has done a tremendous job pulling this stuff together.

- ftp://ftp.compaq.com/pub/products/drivers/linux/ The Compaq SMART/2 Array Controller device driver site

- http://www.compaq.com/support/files/server/us/locate/2882.html: The latest Linux drivers for Compaq Fast Ethernet NICs based on the Intel 82558 or 82559 chips are available here.

- http://opensource.compaq.com: The latest Linux drivers for Compaq Fast Ethernet NICs based on the TI ThunderLAN chip are available here.

5.8 Useful Linux Links

- http://www.linuxdoc.org: The Linux Documentation Project: Guides, HOWTOs, FAQs, man pages, and the Linux Gazette.

- http://www.linux.org: Linux Online

- http://www.li.org: Linux International

- http://www.gnu.org: The GNU project

- http://www.fsf.org: The Free Software Foundation

- http://www.tux.org: Several east coast (U.S.) Linux Users Groups

- http://www.redhat.com: Red Hat Linux distribution

- http://www.caldera.com: Caldera Linux distribution

- http://www.suse.com: SuSE Linux distribution

- http://linux.tucows.com/: HOWTOs, and other information.

- http://mirror.ox.ac.uk/rpm2html/ If you are looking for rpm, here is a site that has them all.

- http://lxr.linux.no/source/: Linux kernel code browsing online utility.

- http://home.xnet.com/~blatura/linapp6.html: Tools and utilities for Linux

- http://www.linux.org.uk/SMP/title.html: Useful information on Symmetric Multi-Processing under Linux

- http://www.phy.duke.edu/brahma/smp-faq: Linux SMP FAQ (mirrored from http://www.irisa.fr/prive/dmentre/smp-faq)

- http://www.cs.cmu.edu/People/AUIS/ftp/web/andrew-home.html: The Andrew Consortium site; you can obtain the Andrew EZ program for viewing Andrew EZ format documents (such as the SMP document posted on the http://www.linux.org.uk site).

- http://www.xfree86.org: The Xfree86 Project. Most Linux distributions (including Caldera, SuSE, and Red Hat) include the free X server developed by this organization.

- http://www.freshmeat.net: A large index of ports of software for Linux and other platforms. If you are looking for a particular utility or program, try looking here first.

- http://www.slashdot.org: A useful site for daily news

- http://www.linux.com: Your one-stop Linux web page, from chatting to news to links -- and more!

- http://www.kernel.org: The Linux Kernel Archives

- http://linuxtoday.com/: Linux Today - Linux News On Internet Time

5.9 Feedback

If you have feedback regarding ways to improve this document, technical corrections, or additional information that should be included, please email the Compaq ProLiant Linux team at linux.feedback@compaq.com.

The above email address is for feedback only; issues requiring technical assistance should be directed to Compaq Technical Support at support@compaq.com.

Visit the Compaq Linux web site at http://www.compaq.com/linux.