**installing Linux®
on hp Itanium®
2-based servers
and workstations**

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**hp enablement kit
for Linux®**

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Notices

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Overview

The HP Enablement Kit for Linux® delivers tools and functionality
to optimize Linux on Itanium® 2-based systems. Its simple menu
options and configuration screens facilitate the installation or
recovery of your operating system and allow you to install a golden
image on one or more systems. In addition, the enablement kit pro-
vides tools for Linux experts to evaluate and repair a system.

Note   If Linux was pre-installed on your Itanium 2-based
          system you can power on your server or workstation
          and configure it as prompted. The functionality
          provided by the enablement kit has already been
          applied.

The enablement kit automates most of the configuration processes
associated with each menu option, including:

• Configuration of storage controllers

• Disk partitioning

• Linux installation from distributor media (e.g. CD-Rom)

• Recovery of a pre-installed operating system.

This booklet provides:

• *HP Enablement Kit for Linux CD* content list

• Directions for getting started with the enablement kit

• An explanation of menu options with accompanying instructions

• An explanation of the enablement kit's automated processes

• Web resources for Linux.

HP Enablement Kit For Linux CD Contents

Note	When viewed from the EFI Shell, only a subset of the contents of the CD are visible. Full CD contents are visible when mounted under Linux or any other operating system with iso9660 filesystem support.

The *HP Enablement Kit for Linux CD* contains the following:

- The elilo bootstrap program

- Source and binary packages for the open source packages used on the enablement kit CD, including the Linux kernel

- The ramdisk image used for most enablement kit operations

- SystemImager® server and client packages

- A \doc directory containing the *HP Enablement Kit for Linux CD Booklet*, Release Notes, and a SystemImager 2.0 manual. Updates to these documents are available on the Web at http://docs.hp.com/linux/.

Getting Started with the HP Enablement Kit for Linux

Note   Though the enablement kit software works with serial as well as keyboard and VGA consoles, use a VGA font with serial consoles for optimal screen rendering and consistent arrow key function. For more information on firmware and Linux configuration for serial consoles, see "Setting Up a Serial Console" in this section.

The *HP Enablement Kit for Linux* CD menu options automate the processes that optimize Linux on your HP Itanium 2-based system. To bring up the menu, power on your system, insert the enablement kit CD in the drive, and use the directions below.

1. Select EFI Shell [Built-in] from the list of boot options presented.

2. From the displayed list of choices with the **fs** prefix, enter the one that contains the text, "CDROM," at the shell prompt and follow it with a colon. For example, if **fs0** contains the text,

"CD-ROM," enter **fs0:** at the shell prompt.

3. Enter **elilo** at the fs0:\> prompt to boot the enablement kit menu options.

4. Highlight a menu option using the arrow keys and press **Enter** to execute. If you want customized control of the menu options' automated processes, enter kernel command line arguments in the text entry box below the main menu before pressing **Enter**.

Note   If using a serial console, specify the port and baud rate number at the boot prompt to identify the console to the kernel and configure it appropriately. For example: **console=ttyS0,115200n8**. See General Help Instructions in online help for more details. Also see "Setting Up a Serial Console" in the following section and related issues in "Frequently Asked Questions/Troubleshooting."

For a thorough explanation of the actions associated with each menu selection, see "Enablement Kit Automated Processes" in the

following section of this booklet.

Note To return to the EFI shell from the enablement kit menu without choosing an option, press **Ctrl C**.

Setting Up a Serial Console

The Linux kernel's serial console behavior depends on the console paths configured in the EFI boot maintenance menu. To use a serial console under Linux, you must enable a single UART (serial port) for both Console In and Console Out. The kernel recognizes the UART you select as **ttyS0**.

Follow the instructions below to set up a serial console prior to using the enablement kit:

Firmware set up for a serial console:
1. Select the Boot option maintenance menu from the EFI Boot Manager screen when your system boots.

2. From the main menu, highlight Select Active Console Output Devices and press **Enter**.

3. The resulting screen displays a list of UARTs and PCI devices available for console input/output.

- UART identifiers of PNP0501 describe modes available for the "Serial A" (on rx2600/zx6000) or "Serial 1" (on zx2000) built-in UART.

- UART identifiers of HWP0002 describe modes available for the "Console" UART on the management processor.

Note   The management processor is part of the Management card. It monitors system status and can control various aspects of the system operation, such as power, resets, software/firmware upgrades, and cooling. See the *Operation and Maintenance Guide, HP Workstation zx6000 and HP Server rx2600* at **http://h20000.www2.hp.com/bizsupport** for more information about the management processor.

Highlight the UART you want to use and press **Enter**. On the same screen, highlight Save Settings to NVRAM and press **Enter**. The system prompts you to save NVRAM if you omit this step.

4. Highlight `Select Active Console Input Device` from the main menu and press **Enter**.

5. From the list on the resulting screen, highlight the same UART you selected as your output device and press **Enter**. Then highlight `Save Settings to NVRAM` and press **Enter**.

6. To apply the changes you have selected, choose `Cold Reset` from the main menu.

7. The firmware and serial console are configured after reboot. You are now ready to use the enablement kit for Linux.

Note	For information on Linux UART discovery order and specifying a serial console to the Linux kernel, please see the "Frequently Asked Questions/Troubleshooting" section at the end of this booklet.

Menu Options

Note　　　When you select a menu option, the enablement kit searches for a NetRAID 2M card and reminds you to configure it if it finds one. If you are loading the operating system on your RAID arrays, you must run an EFI configuration utility manually. Otherwise you do not need to configure the NetRAID 2M card.

The hpctrm.efi tool in the \EFI\HP\TOOLS\IO_CARDS\NETRAID directory has a menu interface to configure your RAID array that you can run from the EFI shell. See "Storage System Controllers" in the "Enablement Kit Automated Processes" section of this booklet for more information.

1. Recover factory pre-configured image
Select this option to recover a factory pre-configured operating system image. To complete recovery, you need the system image that came as part of the Linux media with your purchase from HP.

After selecting this option, insert the CD with the preconfigured

image into the drive, choose the disk you want to install to from the displayed list, and select **Ok.** Any data on the disk you select will be destroyed and overwritten by the system image. Click **Ok** when system image recovery is complete and reboot the system at the prompt. To exit without recovering, select **Cancel:** .

2. Install Linux from distributor media
Choose this option to install Linux yourself. Before operating system installation, the enablement kit prompts you to prepare respective boot and service partitions, allocating 500MB of storage from your disk for them. The boot partition is left empty. The service partition is reserved for optional diagnostics and utilities.

When the partitions have been created and system preparation is complete, the enablement kit prompts you to insert Linux distribution media (e.g. CDs). Select "Reboot System" and follow the distribution's installation instructions.

3. Install golden image from network
This option, based on SystemImager software, allows you to pull a customized operating system image, also known as a golden image, from a SystemImager server and deploy it to similar systems in

your environment. You must configure your network in order to execute this option. The enablement kit allows you to do so manually or automatically via a DHCP or BOOTP server.

Note   If you are on a serial console, set the boot parameter on the main menu to `console=ttyS0`.

Although installing a golden image over the network requires more initial configuration than recovering a factory pre-installed image, it provides more flexibility, allowing you to do things such as vary disk partitioning schemes. For more information on creating and deploying a golden image, see the SystemImager manual in the `/doc` directory on the *HP Enablement Kit for Linux* CD.

Note   The enablement kit does not automatically place the HP service partition on the disk with this menu option. Include the service partition in your golden image if desired. See the SystemImager 2.0 manual in the `/doc` directory on enablement kit CD for more information.

Note   The enablement kit contains SystemImager software for the server as well as the client, which must both run

the same version.

a. After selecting **Install golden image from network**, you see the following prompt:
```
Do you want the network to be configured
automatically using DHCP/BOOTP?
```
Select **Yes** for automatic configuration via DHCP/BOOTP.
Select **No** to configure the network manually.

b. For manual configuration, you will be prompted to enter the following: (Note that any parameters you enter manually are purely for the purpose of retrieving the image from the server and will not be reflected in the final system configuration.)
   1. Hostname for your machine
   2. Domain for your machine
   3. IP address for the name server for your network
   4. IP address for the machine you are installing on
   5. Netmask for your network
   6. Broadcast address for your network
   7. Default gateway address for your network
   8. IP address for the SystemImager server
   9. Name of the image you wish to use, or leave blank to use the

default.

c. Confirm your network parameter selections when prompted. Your system attempts to contact the image server, boots into a restore kernel, gets disk partition information from the SystemImager server, partitions the disk drive, and places filesystems on partitions. The client system retrieves the files from the server and installs them on the client system. When the client system is installed, the disk partitions are unmounted, and you can reboot the installed system.

4. Recovery shell (experts only)
Linux experts can use this option to diagnose and/or repair a damaged system rather than perform a complete reinstallation. This selection provides access to a running kernel in a RAM-based root file system with a set of standard Linux tools for examining and repairing running Linux system instances on disks. All the tools used to implement the other enablement kit menu options are available here for manual use. If you select this option, it takes you to a shell prompt from which you can proceed. For more information on these tools, see the man pages in any standard Linux system.

Enablement Kit Automated Processes

This section outlines the enablement kit's automated processes for optimizing Linux on Itanium 2-based systems.

Hardware Discovery

When you pick a menu option, the bootloader loads a Linux kernel and RAM-based root filesystem. The kernel performs hardware discovery, looking for bootable devices, chip sets, ethernet cards, disk drives, and storage system controllers that the operating system will work with.

Linux for Itanium 2-based systems can be installed directly on disks attached to simple SCSI or IDE/ATAPI storage system controllers, or on a NetRAID 2M controller. When the kernel discovers a NetRAID 2M storage system controller, you must run a configuration utility as detailed in the following section. Once configured, installation proceeds as it would for a disk on a direct interface, such as SCSI or IDE/ATAPI.

Configuring NetRAID 2M

NetRAID 2M is the only supported storage controller that requires

configuration prior to installing the operating system. If a NetRAID card is discovered during the installation or restoration of Linux on your system, the enablement kit reminds you that you must configure your NetRAID-based storage subsystem before you can use it with Linux.

From the EFI shell, you can run the NetRAID 2M configuration utilities the enablement kit provides in the `\efi\hp\tools\io_cards\netraid` directory. See the Readme file in that directory for more information.

The `hpctrm.efi` tool has a menu-based interface to configure your RAID array. The command line program `hpmrc.efi` is best for configuring options such as enabling and disabling the audio alert. If either of these tools hangs your machine, you are either using a version of the NetRAID 2M not certified for use in HP Itanium 2-based systems or have an incorrect version of firmware on your NetRAID 2M card. If you have an unsupported NetRAID card, procure the latest model for use on your HP Itanium 2-based system before proceeding. To update the firmware on a supported card, use the firmware flashing utility in the `\efi\hp\tools\io_cards\netraid` directory on the

enablement kit.

Partitioning

Before installing the operating system, the system storage disk must be partitioned. Partitioning is automatic after you select the target disk in some instances, such as when restoring a pre-configured image. When installing Linux from distributor media, the enablement kit sets up two partitions that are standardized across all supported operating systems for HP Itanium 2-based products.

The first partition is 100 megabytes and holds a FAT-16 partition where the firmware locates operating system bootstrap programs. The second partition is 400 megabytes and holds a FAT-32 partition for optional installation of the offline diagnostics and utilities that shipped on CD with your hardware.

Frequently Asked Questions/Troubleshooting

- **Q. How does the Linux kernel order UARTs (serial ports)?**

  A. 1. HCDP Console UART is the UART set in the EFI Console- In/Out table. It will always be **ttyS0** regardless of whether the operating system uses a serial console.

  2. ACPI Namespace UARTs are the built-in UARTs on rx2600, zx6000, and zx2000 systems. They are numbered in order (i.e. 1, 2 or A, B).

Note   Port [1|A] may be selected for Console-In/Out, and would therefore be discovered as **ttyS0**.

---

  3. PCI UARTs include the serial lines on the management processor. Ports are numbered as follows:

  1. UPS/AUX Port
  2. Console Port
  3. Modem/Remote Session
  4. Local Session

UARTs are numbered consecutively starting with **ttyS0**.

Examples:

- rx2600/zx6000/zx2000 without a management processor

  (built-in UART select for Con-In/Out)

  ttyS0: Serial [A|1]
  ttyS1: Serial [B|2]

- rx2600/zx6000 with a management processor (built-in UART

  select for Console-In/Out)

  ttyS0: Serial [A|1]
  ttyS1: Serial [B|2]
  ttyS2: UPS/AUX Port
  ttyS3: Console Port
  ttyS4: Modem/Remote Session
  ttyS5: Local Session

Note   This will have the same ordering if there are no UARTs selected for Console-In/Out.

- rx2600/zx6000 with a management processor (management processor console selected for Console-In/Out)

  ttyS0: Console Port
  ttyS1: Serial [A|1]
  ttyS2: Serial [B|2]
  ttyS3: UPS/AUX Port
  ttyS4: Modem/Remote Session
  ttyS5: Local Session

- rx5670 (management processor console selected for Console-In/Out)

  ttyS0: Console Port
  ttyS1: UPS/AUX Port
  ttyS2: Modem/Remote Session
  ttyS3: Local Session

- **Q. Why does Linux default to a VGA console after I've set up a serial console for firmware and how do I fix it?**
  A. Even if you set up a serial console for firmware, Linux defaults to a VGA console. If no VGA device is present, console output goes to a dummy device (i.e. not to anything visible). To specify a serial console, you must pass the `console=` parameter to the kernel. This can either be done as an extra parameter to the kernel or via an `append=` line in `elilo.conf`. Example:

```
--- manual boot option:

fs0:\> elilo linux "console=ttyS0"

ELILO boot: linux console=ttyS0

--- automatic via elilo.conf:

append="console=ttyS0"


 - The format of the console parameter is as follows:

 console=ttyS<n>[,<s><p><b>]
```

```
<n> = Serial line.  Note: for HP systems, ttyS0 is
the *ONLY* valid line for a serial console.  Exactly
one UART MUST be selected in the EFI Console-In/Out
tables for a serial console to work.  ttyS0 is the
UART selected in this table.

<s> = Speed.  Ex: 9600, 19200, 38400, 57600, 115200
     (9600 is the default if no speed is specified.
      115200 is the maximum for HP UARTs)

<p> = Parity. Ex: n (no parity, typical case)

<b> = Bit Encoding. Ex: 7, 8 (8 is the typical case)

For a 115200 baud console, the following syntax is
used:
console=ttyS0,115200n8
```

- **Q. Why doesn't anything happen after I choose a menu option?**
  A. If you are using a serial console, reboot and add a parameter to identify the console to the kernel and configure it properly.

For example, `console=ttyS0`. See online help for more
details.

- **Q. Why did the partition reserved for offline diagnostics
  and utilities disappear?**
  A. If you direct the installation tools on your distributor's
  media to use the entire disk, the offline diagnostics and utilities
  partition created by the enablement kit may be overwritten.
  Using space not allocated on the disk may solve the problem if
  your distributor provides this option.

- **Why does my machine hang when I use RAID configura-
  tion tools?**
  If your machine hangs when you use the `hpctrm.efi` or
  `hpmrc.efi` tools, you probably have an incorrect version of
  firmware on your NetRAID 2M card, or are using a version of
  NetRAID 2M not certified for use in HP Itanium 2-based sys-
  tems. To update the firmware on a supported card, use the firm-
  ware flashing utility in the
  `\efi\hp\tools\io_cards\netraid` directory on the
  enablement kit. If you have an unsupported NetRAID card,
  procure the latest model for use on your HP Itanium 2-based
  system before proceeding.

- **Q. Why does tar complain about files dated in the future?**

  A. When restoring the pre-installed image, Linux reads the time from the EFI RTC, so you should set the time correctly using the `date` and `time` commands from the EFI shell. You can also set the time using the `date` command from a Linux command prompt. The format is `date [MMDDhhmm[[CC]YY][.ss]]`. To store this date to the RTC, use the command `hwclock --systohc`.

- **Q. How are disks named in Linux?**

  A. IDE disks are named hd<n> where 'n' starts at 'a' and increases. Disk 'a' is the master on IDE channel 0, 'b' is the slave on that channel. Disk 'c' is the master on IDE channel 1, 'd' is the slave on that channel. IDE disks are not necessarily consecutive (e.g. if you do not have a slave device on channel 0, Disk w/ ID hdb is simply skipped).

  SCSI disks are named sd<n> where 'n' is 'a' to 'z', then 'aa' to 'az', etc. Discs are ordered first by controller, then by number on the bus. Disk 'a' is the lowest SCSI ID on the first controller, 'b' is the next lowest, etc.

As each driver is initialized, it claims any controllers it can handle and assigns them the next available controller number. If a driver can handle several controllers, it determines the registration. For example, the sym53c8xx driver in the stock Linux kernel looks for all 875 controllers, then all 896 controllers, then all 1010 controllers.

Web Resources

Documentation:
http://docs.hp.com/linux

Software updates:
http://www.software.hp.com

HP Support Web Site:
http://www.itrc.com

SystemImager:
http://www.systemimager.org/