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

<u>**start here**</u>
**hp enablement kit
for Linux®**

January 2004

Notices

Contents

Overview

Use the HP Enablement Kit for Linux® CD with your Itanium® 2-based system to facilitate installation or recovery of your Linux operating system, install a golden image on one or more systems, use tools to evaluate and repair your system, and access the Debian GNU/Linux Installer.

Note	If Linux was pre-installed on your Itanium 2-based system, power on your machine and configure as prompted. The functionality provided by the installation kit has already been applied.

The enablement kit automates the following processes:

- Hardware discovery

- Disk partitioning

- Configuration of storage controllers

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

- Recovery of a pre-installed operating system.

This booklet provides:

- Instructions for configuring your console and getting started with the enablement kit

- An explanation of the enablement kit's menu options

- *HP Enablement Kit for Linux CD* content list

- An appendix with directions for using Smart Array with Linux on Itanium 2-based servers

- Answers to frequently asked questions

- Web resources for Linux.

Note   For latest updates to this document, please see
            http://www.docs.hp.com/linux.

Configuring Your Console

The default console configuration for the Itanium 2-based system is a local graphics display using a USB keyboard and requires no setup.

The display screen can also be a remote serial console connected through a serial port or through a terminal attached to a serial port. Examples include a management processor's serial port or a network connection through a management processor that the system treats like a serial port. If you plan to use a serial console, configure it using the directions in this section before using the HP Enablement Kit for Linux.

Note   The management processor is part of the management card. It monitors system status and can control aspects of system operation such as power, resets, software/firmware upgrades, and cooling.

See **http://h20000.www2.hp.com/bizsupport** for documentation about the management processor. Select **manuals** from the **support services** link on the

right side of the page. Select **workstations** under the **personal computing** link or **Itanium®-based servers** under the **servers** link to access the appropriate manual.

Configuring Serial Console

Before Linux boots, all console interaction is through firmware. To modify the default local graphics display to a serial console path, configure a single serial port (UART) for both Console In and Console Out in the boot manager interface. When the Linux kernel boots, it interprets the UART as **ttyS0** and sends the computer output to the chosen display screen.

To begin:
1. When your system boots, select the Boot option maintenance menu from the EFI Boot Manager screen and press **Enter**.

2. From the 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" or "Serial 1" built-in UART.

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

  Highlight a UART 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**. Next highlight Save Settings to NVRAM and press **Enter**.

6. To apply the changes you have selected, highlight Cold Reset from the main menu and press **Enter**.

7. Select `Reboot the System` and `OK`. The firmware and serial console are configured after reboot.

8. Complete the steps listed in the "Getting Started with the HP Enablement Kit for Linux" section of this booklet to make a selection from the enablement kit main menu.

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

Reverting to VGA from Serial Console

If you're on serial console and want to revert to VGA:
1. Login to the system
   a. Bring up the `elilo.conf` file to edit.
   b. In the append line, remove console=ttyS0 parameters in any stanza in which you want to use VGA only and save your

changes.

Note   If you are using a Debian operating system, the file is
         /etc/elilo.conf. Once this file is saved, type
         /usr/sbin/elilo at the prompt and press **Enter**.

---

2. Edit /etc/securetty.
   a. Ensure you have an entry with tty1 for VGA functionality
      before completing Step 3.

   b. (**Optional**. Perform only if you want to remove the login
      prompt from the serial port.) From the list of terminals on
      which root is allowed to login, remove ttyS0 and and save.

3. Bring up the /etc/inittab file:
   a. Ensure you have a getty with tty1 for VGA functionality.

   b. (**Optional**. Perform only if you want to remove the login
      prompt from the serial port.) Delete the getty that runs on the
      serial port in ttyS0.

4. (**Optional**) If you want your system to start up X instead of text

mode, edit /etc/inittab and change the init default token from
"3" to "5", save, and reboot to return to a VGA display.

To revert to serial console from VGA, follow the directions
under "Configuring Serial Console" in this booklet.

Getting Started with the HP Enablement Kit for Linux

Use one of the two following options to boot the HP Enablement Kit for Linux CD. Option 1 is recommended. Once the enablement kit main menu is up, proceed to instructions under "Enablement Kit Menu Options."

Note	To use a serial console as your display screen, configure it prior to using the enablement kit for Linux. See "Configuring Your Console" in this booklet for more information.

Boot Option 1

1. Insert the HP Enablement Kit for Linux CD in the drive and reboot the machine. The EFI boot manager loads.

2. At the `Please Select a Boot Option` prompt, use your arrow keys to highlight `Boot Option Maintenance Menu` and press **Enter**.

3. At the `Select an operation` prompt, `Boot from a`

file is highlighted. Press **Enter**.

4. Under Boot From a File. Select a Volume, use your arrow keys to highlight Removable Media Boot and press **Enter** to bring up the HP Enablement Kit for Linux main menu. Now see the information in the "Enablement Kit Menu Options" section in this booklet.

5. If Removable Media Boot is not listed as an option in Step 4, follow the directions for Boot Option 2 below.

Boot Option 2:

If the preceding instructions did not list Removable Media Boot as an option in the EFI boot manager, follow these directions to use the elilo bootloader to boot the HP Enablement Kit for Linux.

Note   In Step 2, select the EFI Shell [Built-in] boot option within five seconds to avoid booting a default option. For example, if your machine already has an operating system installed, the EFI boot manager boots that as the default.

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1. Insert the HP Enablement Kit for Linux CD in the drive and power on your system.

Note   To use a serial console as your display screen, configure it prior to using the enablement kit for Linux. See "Configuring Your Console" in this booklet for more information.

---

2. Within five seconds, use your arrow keys to select EFI Shell [Built-in] from the list of boot options presented and press **Enter**.

   If the machine boots an operating system before you make a selection, reboot it to redisplay the list of boot options. Or if the boot manager's default is to run an EFI application such as offline diagnostics, exit to return to the EFI shell.

3. A list of mapping table choices is displayed which may not fit on one screen if many disks are attached to the system. If necessary, type **map-b** at the EFI shell prompt to see the list screen by screen.
   a. Locate the list entry with the fs prefix that contains the

text, CDROM.
   b. At the shell prompt, input this list entry followed by a colon.
      For example, if fs0 contains the text CDROM:
      1. Type **fs0:**
      2. Press **Enter**.

 4. To execute the elilo bootloader and bring up the HP Enablement
    Kit for Linux Main Menu:
    a. Type **elilo** at the fs0:\> prompt
    b. Press **Enter** and proceed to the information in the "Enablement
       Kit Menu Options" section.

Information to Know Before You Select a Menu Option

Hardware discovery

When you select an enablement kit 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 to work with.

Linux for Itanium 2-based systems can be installed directly on disks attached to SCSI or IDE/ATAPI storage system controllers, or on a volume configured on a Smart Array controller.

Note	When you select a menu option on an Itanium 2-based server, the enablement kit searches for a Smart Array controller and reminds you to configure it if it finds one. See "Appendix A - Using Smart Array with Linux on Itanium 2-based Servers" at the end of this booklet for more information.

The enablement kit Linux kernel also includes a driver for a Fibre Channel Host Bus Adapter (HBA). For information on configuring

a Fibre Channel Storage array for Linux, see documentation at
http://h18006.www1.hp.com/storage/arraysystems.html.

Partitioning Before installing the operating system, the system
storage disk must be partitioned. The enablement kit automates par-
titioning after you select the target disk in some instances, such as
when recovering a pre-configured image with Menu Option 1.
When using Menu Option 2 to install Linux from distributor media,
the enablement kit sets up two EFI partitions that are standardized
across all supported operating systems for HP Itanium 2-based
products.

Note	Selecting the default partitions in your Linux distributor's installer (e.g. Red Hat's Anaconda) may overwrite the HP partitions created by the enablement kit. Create custom partitions when using your Linux distributor's installer to keep the HP partitions intact when installing your operating system.

The first partition is 100 megabytes and holds a FAT-16 filesystem
for a boot partition. The second partition is 400 megabytes and
holds a FAT-32 filesystem for optional installation of the offline
diagnostics and utilities that shipped on CD with your hardware.

Enablement Kit Menu Options

Note   Read the instructions in "Executing a Menu Option" in this section for important information before making a selection and using the instructions provided here.

1. Recover factory pre-configured image
Select this option to recover a factory pre-configured operating system image. To complete recovery, use the image on the System Recovery CD 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 respec-

tive 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 should you choose to install them from CD.

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 complete the steps in "Getting Started with the HP Enablement Kit for Linux" to boot the Linux distributor's CD, then follow the installation instructions provided by your operating system distributor.

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. The manual is also available at http://www.docs.hp.com/linux.

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 3.0 manual 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 (for Linux experts)

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. You can use these tools to examine and repair Linux file systems 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.

5. Debian GNU/Linux Installer

Use this option to perform a standard installation of Debian GNU/Linux. To install packages beyond the base provided on the enablement kit CD, you need network access to a Debian mirror or CD-Roms containing additional packages. The Debian installer

allows you to choose from a list of network mirrors or you can select one of your own.

Executing a Menu Option

1. If using a serial console as your display, specify the port and baud rate number at the `kernel options:` prompt located below the menu selections to identify the console to the kernel and configure it appropriately. If using VGA, do not enter anything.

   The console is factory pre-configured for 9600 baud. If you have not reconfigured this value, type:
   ```
   kernel options: console=ttyS0,9600n8
   ```
   To set another baud rate, type:
   ```
   kernel options: console=ttyS0,<baud rate>n8
   ```

2. Now highlight a menu option using the arrow keys and press **Enter** to execute.

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

3. After you press **Enter** to execute your menu option, the enablement kit unpacks a Linux kernel and the screen displays these messages:

```
Uncompressing Linux... done
Loading initrd \efi\boot\root.bin...done
```

followed by several screens of computer output.

The enablement kit interface then displays screens for the menu option you selected. Please refer to the instructions on Enablement Kit menu options earlier in this section for more information.

HP Enablement Kit For Linux CD Contents

Note   Because of EFI limitations, only a subset of the
contents of the CD are visible from the EFI shell. 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 the SystemImager manual. See `http://docs.hp.com/linux/` for document
  updates.

Frequently Asked Questions/Troubleshooting

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

  A. 1. HCDP (Headless Console and Debug Port) 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 HP Itanium 2-based 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

Note	The "Console" may be selected as for Console-In/Out, and would therefore be discovered as **ttyS0**.

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]

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

   - 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 Linux 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.

- **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 /dev/hd<n> where 'n' starts at 'a' and

increases. Disk 'a' is the master on IDE channel 0, and 'b' is the slave on that channel. Disk 'c' is the master on IDE channel 1, and '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 /dev/sd<n> where 'n' is 'a' to 'z', then 'aa' to 'az', etc. Disks 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 registers all the disks on the controllers it supports. When a disk is registered, it is assigned the next drive name in order. A single driver may support multiple controllers, and the order in which it discovers controllers is driver-dependent. For example, the sym53c8xx driver in stock Linux kernels looks for all 875 controllers, then all 896 controllers, then all 1010 controllers.

Similarly, if you have two controllers with two disks each supported by the sym53c8xx driver, and one controller with three disks supported by the mptscsih driver, disk naming will depend

on the order in which the drivers are loaded. If the sym53c8xx driver is loaded first, sda and sdb will be on one controller, while sdc and sdd will be on the other. The disks on the mptscsih-supported controllers will be sde, sdf and sdg.

By loading the drivers in the opposite order, you will have sda, sdb, and sdc on the mptscsih-supported controller, and your remaining disks will be sdd, sde, sdf and sdg. In the latter example, if you add a disk to your mptscsih-supported controller, it will cause sdd to be registered by the mptscsih driver, and the disks on your sym53c8xx controller will be renamed sde, sdf, sdg and sdh.

Smart Array devices are named /dev/cciss/c0d0p0, where "c" is the the controller number, "d" is the virtual drive number corresponding to a volume configured on the controller, and "p" stands for the partition number.

Appendix A- Using Smart Array with Linux On Itanium 2-based Servers

If your Itanium 2-based server has a Smart Array card, it is detected when you power on your system, and you see the following prompts:

```
Press F8 to use the Option ROM Configuration
for Arrays Utility

Press Esc to skip configuration and continue
```

If you don't configure the RAID arrays when you boot the server, the HP Enablement Kit for Linux prompts you to reboot and configure when it finds the Smart Array controller during its hardware discovery process.

Note   Some serial consoles do not support function keys, although HP recommends using serial consoles that do. To access the Option ROM Configuration for Arrays (ORCA) menu from a console that doesn't, press **Esc** then **8** to simulate **F8**.

See "Configuring an Array" in the *Smart Array Users Guide* for more information about using ORCA and the Array Configuration Utility (ACU). Currently, only the scripting portion of the ACU is supported for Linux on Itanium 2-based servers.

Updating Smart Array Utilities

1. Go to http://h10018.www1.hp.com/wwsolutions/linux/products /server/itanium.html
2. Select the appropriate driver under **software and drivers**.

3. Select the **Utility Smart Array** quickjump to access the Smart Array Utility choices.

4. Select **System Management - Agents** to get to storage agent choices.

5. Select the download link for the appropriate file.

Updating Controller Firmware and Device Drivers

1. Go to http://h18000.www1.hp.com/support/files/.
2. Select **Proliant Storage** from the **storage** heading.

3. Make a selection from the **product** drop down box.

4. Make a selection from the **model or processor** drop down box.

5. Choose the appropriate operating system if updating controller firmware.

6. Click **locate software**.

7. If updating controller firmware, use the firmware flash utility on the software download page and its accompanying instructions.

Troubleshooting Smart Array

Internal Hard Drives

1. The Smart Array controller cannot see drives that have been Hot Added to the internal drive backplanes of Itanium 2-based systems. To rebuild a failed drive on the internal backplane, reboot the system so the controller can discover the new hard drive. Smart Array 5302/5304 controllers with firmware of 3.50 or greater and Smart Array 6402 controllers with firmware of 1.80 or greater can be configured to rebuild an added drive without rebooting.

2. Smart Array 5302/5304/6402 controllers are not compatible with the DS2300 or DS21xx enclosures. For the HP Integrity rx5670/rx2600, use Smart Array 5302/5304/6402 controllers connected to Storage Works 4314/4354 enclosures only.

Diagnosing Array Problems

The Array Diagnostics Utility is not currently supported on Itanium 2-based systems.

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/

Debian:
http://www.debian.org/

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