



HP Workstations for Linux

User Guide

SUMMARY

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Table of contents

1 Linux on HP Workstations

Introduction	1
Red Hat Enterprise Linux	1
Novell SUSE Linux Enterprise	2
Warranty	2
Graphics cards	2
System RAM	2
Audio	3
Network cards	3
Hyper-threading	3
NUMA	3

2 HP Installer Kit for Red Hat Linux

Introduction	5
HP Driver CDs	9
Description	9
Installing with the HP Driver CD	10
Installing with the HP Installer Kit for Linux	10

3 HP Installer Kit for Novell

Obtaining the HP Enhancement CD for Linux	11
Restoring Novell SLED	12
Creating restore media	12

4 Linux graphics for HP workstations

Linux graphics drivers for HP workstations	13
NVIDIA® Graphics Workstations	13
X Server configuration	13
SLI Graphics Acceleration	14
Xinerama / NVIDIA TwinView	14
30-bit (10-bit-per-channel) X Visuals	14
AMD® / ATI graphics workstations	15
Troubleshooting	16

5 Software RAID in HP Linux workstations

Introduction	17
Software RAID considerations	17

Performance considerations	17
Configuring software RAID	18

6 Installing and configuring SAS hardware RAID

Introduction	19
Supported Configurations	20
LSI 3041E and Integrated LSI 1064/1068 Setup	20
LSI 8344ELP and LSI 8888ELP Setup	24
Additional RAID Information	31

7 Links

Appendix A Appendix—HP release notes for Linux operating systems

Introduction	35
Customer advisories for Red Hat Enterprise Linux WS 3	36
Customer advisories for Red Hat Enterprise Linux WS 4	39
Customer advisories for Red Hat Enterprise Linux Client 5	42
Customer advisories for SUSE Linux Enterprise Desktop 11	44

1 Linux on HP Workstations

Introduction

This document describes the supported use of the Linux® operating system on HP Workstations. HP offers a variety of Linux solutions for HP Workstation customers:

- HP certifies and supports versions of Red Hat Enterprise Linux (RHEL) on HP Workstations.
- HP certifies versions of Novell SUSE® Linux Enterprise Desktop (SLED) and Server (SLES) on HP workstations.
- HP offers a Novell SLED 11 preload on the Z400 and xw4600 Workstations.

For information about Linux on HP Workstations:

1. See <http://www.hp.com/linux/>.
2. Select **Certification & Support** in the Platforms and distributions section.
3. Select **Workstations**.
4. Choose the appropriate tab for the desired distribution.

Red Hat Enterprise Linux

The HP Z400, Z600, and Z800 Workstations are certified and supported on RHEL 4.7 and RHEL 5.3, both 32-bit and 64-bit versions. Other HP Workstation models are certified on various versions of RHEL. For details of RHEL support on HP Workstations please refer to the Hardware Support Matrix for HP Linux Workstations at http://www.hp.com/support/linux_hardware_matrix.

HP offers the HP Linux Installer Kit to facilitate installation of certified RHEL versions on HP Workstations. This kit contains tested drivers which augment and/or replace (as necessary) those found in RHEL to enable proper use and behavior on HP Workstations. This kit does not include the RHEL operating system, which must be purchased from Red Hat.

The HP Linux Installer Kit is available as an operating system option on all HP Workstations. The contents of the Linux Installer Kit are also available for download at <http://www.hp.com/go/workstationsupport>.

HP offers a preload option based on FreeDOS which includes the HP Linux Installer Kit DVD media. This operating system option accommodates those who have a customized Linux distribution, or who have licensed versions of RHEL and would like to install the HP-recommended driver additions.

For information about Red Hat certifications on HP workstations, see <https://hardware.redhat.com/>.

Novell SUSE Linux Enterprise

HP offers a 64-bit SLED 11 preload on Z400 and xw4600 Workstations, and supports both 32-bit and 64-bit SLED 11 on these Workstations.

Other HP Workstation models are certified on various versions of SLED and SLES. For information about Novell certifications on HP Workstations, refer to the Novell certification bulletin search page at <http://developer.novell.com/yesearch/>. Novell provides support for certified versions of SLED and SLES on HP Workstations.


Warranty

As part of the HP Workstation hardware warranty, HP provides software configuration and installation support for certified versions of Red Hat Linux for up to 90 days from date of purchase.

HP provides configuration and installation support for SLED 11 on Z400 and xw4600 workstations for up to 90 days from date of purchase. Novell also provides support for all versions of SLED or SLES that are certified on HP Workstations.

Graphics cards

HP Workstations can be ordered without a graphics card, or with numerous cards that have been through extensive verification by HP. See the Hardware Support Matrix for HP Linux Workstations at http://www.hp.com/support/linux_hardware_matrix for a complete list of cards supported on HP Workstations.

 **NOTE:** Not all graphics cards are available on every workstation. Limitations generally occur for cards that consume large amounts of power in lower-power workstations.

Proprietary graphics drivers that are supported by HP and the graphics vendors are available with the HP Linux Installer Kit, with the SLED 11 preload on the xw4600 and Z400, and from HP Workstation Support at <http://www.hp.com/go/workstationsupport>.

These proprietary drivers are not a standard part of the RHEL, SLED, or SLES distributions because they are not open source. More recent drivers are supported directly by the vendor.

System RAM

HP supports different amounts of total RAM in various HP Workstations based on the number of hardware DIMM slots and the capabilities of the system. The total memory supported for each configuration is listed in the Hardware Support Matrix for HP Linux Workstations at http://www.hp.com/support/linux_hardware_matrix.

Audio

All HP Workstations come with built-in audio hardware. The audio hardware is supported by Advanced Linux Sound Architecture (ALSA) sound drivers included with all modern Linux distributions.

The audio hardware provides basic playback and recording features. The ability to simultaneously play audio from multiple sources, such as applications and CDROM, is provided by software mixing functionality in the ALSA driver. The performance of software audio mixing and playback functionality is greatly improved in ALSA version 1.0.13 and later drivers.

Network cards

All HP Workstations include 1 or 2 integrated network interface controllers. Specific network interface controller cards are also supported as optional devices. Please refer to the Hardware Support Matrix for HP Linux Workstations at http://www.hp.com/support/linux_hardware_matrix for details on which cards are supported.

Hyper-threading

The **Z400**, **Z600**, and **Z800** Workstations support Intel Hyper-Threading Technology. This technology can provide performance benefits in certain situations.

Hyper-Threading is enabled in the system BIOS. As the system is booting, press **F10** to enter the BIOS Setup Utility. Select **Advanced > Processors**. Use the arrow keys to set Hyper-Threading to Enable, and then press **F10** to exit the menu. Select the **File > Save Changes and Exit**. Hyper-Threading is enabled when the system is restarted.

On most recent Linux distributions including RHEL 5.3, SLED/SLES 10 SP2, and SLED/SLES 11, the kernel will automatically detect that Hyper-Threading is enabled and work correctly. Certain older Linux distributions such as RHEL 4.7 require the use of the `largesmp` kernel for Hyper-Threading support on dual-socket quad core **Z600** and **Z800** configurations.

NUMA

Non-Uniform Memory Access (NUMA) is available on the **Z600**, **Z800**, and **xw9400** Workstations. NUMA offers the potential to improve memory bandwidth and latency for multi-process or multi-threaded applications or workloads. Observed performance improvements depend on the operating system, customer workload, system configuration, and the degree to which the applications used are designed to be NUMA-aware/efficient.

NUMA requires that both processor sockets be populated, and installed memory should be balanced between both processors for maximum performance.

NUMA is enabled if Memory Node Interleave is disabled in the system BIOS. As the system is booting, press **F10** to enter the BIOS Setup Utility. Select **Advanced > Chipset/Memory**. Use the arrow keys to set Memory Node Interleave to Disable. Press **F10** to exit the menu. Select **File > Save Changes and Exit**. NUMA is enabled when the system is restarted.

The **Z600** and **Z800** BIOS also provide a NUMA Split Mode option, which must be set to Disable when running Linux.

On most recent 64-bit Linux distributions, including RHEL 5.3, SLED/SLES 10 SP2, and SLED/SLES 11, the kernel automatically detects that NUMA is enabled. Certain older 64-bit Linux distributions such as RHEL 4.7 require the use of the `numa=acpi` kernel parameter on the **Z600** and **Z800** Workstations.

2 HP Installer Kit for Red Hat Linux

Introduction

The HP Installer Kit for Linux enables you to install Red Hat Linux on HP workstations. The kit provides updated drivers, tools, and an operating system to enable HP hardware with various Linux operating system versions. This kit does not include the RHEL operating system, which must be purchased from Red Hat.

This document discusses the CDs (ISOs) contained in the HP Installer Kit for Linux, the platforms, and how to download the CDs (ISOs) from the HP support website.

For information on driver updates and HPIKL images:

1. See <https://www.hp.com/support/>.
2. Select the desired country.
3. Select **Download drivers and software...**
4. Enter the desired platform and select >>.
5. Select the desired operating system.
6. Select the desired package.
7. Download the associated package and install as directed.

Table 2-1 Red Hat Linux supported hardware platforms

Red Hat Enterprise Linux 5 Desktop (x86)			
Red Hat Enterprise Linux 5 Desktop (x86-64)			
Revision	Supported Red Hat update	Supported hardware platforms	CDs (ISOs) in the HP Installer Kit for Linux
Rev. A	Update 0	xw4400	HP Installer Kit for Linux—HP Driver CD for RHEL 5
		xw4600	
		xw6400	
		xw8400	
		xw9400	

Table 2-1 Red Hat Linux supported hardware platforms (continued)

Update 1 Rev. B	Update 1	xw4400	HP Installer Kit for Linux—HP Driver CD for RHEL 5
		xw4550	
		xw4600	
		xw6400	
		xw6600	
		xw8400	
		xw8600	
Update 2 Rev. B	Update 2	xw9400	HP Installer Kit for Linux—HP Driver CD for RHEL 5
		xw4550	
		xw4600	
		xw6600	
		xw8600	
Update 3 Rev. C	Update 3	xw9400	HP Installer Kit for Linux—HP Driver CD for RHEL 5
		xw4600	
		xw6600	
		xw8600	
		xw9400	
		Z400	
Z600			
Z800			
Red Hat Enterprise Linux 4 (x86)			
Red Hat Enterprise Linux 4 (AMD64 / EM64T)			
Revision	Supported Red Hat update	Supported hardware platforms	CDs (ISOs) in the HP Installer Kit for Linux
Update 1 Rev. A	Update 1	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 4 HP Installer Kit for Linux—Red Hat Drivers Disk for RHEL 4
		xw4300	
		xw6200	
		xw8200	
		xw9300	
Update 2 Rev. A	Update 2	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw4300	
		xw6200	
		xw8200	
		xw9300	

Table 2-1 Red Hat Linux supported hardware platforms (continued)

Update 3 Rev. A	Update 3	xw4300	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw6200	
		xw6400	
		xw8200	
		xw8400	
		xw9300	
Update 4 Rev. A	Update 4	xw4300	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw4400	
		xw6200	
		xw6400	
		xw8200	
		xw8400	
Update 5 Rev. A	Update 5	xw4400	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw4600	
		xw6400	
		xw8400	
		xw9400	
Update 6 Rev. B	Update 6	xw4400	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw4550	
		xw4600	
		xw6400	
		xw6600	
		xw8400	
		xw8600	
		xw9400	
Update 7 Rev. B	Update 7	xw4550	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw4600	
		xw6600	
		xw8600	
		xw9400	
Update 8 Rev. C	Update 8	xw4600	HP Installer Kit for Linux—HP Driver CD for RHEL 4
		xw6600	
		xw8600	
		xw9400	
		Z400	
		Z600	
		Z800	

Table 2-1 Red Hat Linux supported hardware platforms (continued)

Red Hat Enterprise Linux 3 (x86)			
Red Hat Enterprise Linux 3 (AMD64 / EM64T)			
Revision	Supported Red Hat update	Supported hardware platforms	CDs (ISOs) in the HP Installer Kit for Linux
Update 1 Rev. B	Update 1	xw4100	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw6000	
		xw8000	
Update 2 Rev. A	Update 2	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 3 HP Installer Kit for Linux—Red Hat Drivers Disk for RHEL 3
		xw6200	
		xw8200	
Update 4 Rev. A	Update 4	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw6200	
		xw8200	
		xw9300	
Update 5 Rev. B	Update 5	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw4300	
Update 5 Rev. A		xw6200	HP Installer Kit for Linux—Red Hat Drivers Disk for RHEL 3
		xw8200	
		xw9300	
Update 5 Rev. B	Update 6	xw4200	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw4300	
		xw6200	
		xw8200	
		xw9300	
Update 7 Rev. B	Update 7	xw4300	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw6200	
		xw6400	
		xw8200	
		xw8400	
		xw9300	
Update 8 Rev. A	Update 8	xw4300	HP Installer Kit for Linux—HP Driver CD for RHEL 3
		xw4400	
		xw6200	
		xw6400	
		xw8200	
		xw8400	
		xw9300	
		xw9400	

HP Driver CDs

Description

HP supports multiple versions of Red Hat Linux on HP xw and Z Workstation series. The supported versions include Red Hat Enterprise Linux WS 3 (RHEL WS 3), RHEL WS 4, and RHEL Desktop 5.

To provide flexibility in installing the Red Hat operating system version, HP has created Driver CDs. These CDs are included in the HP Installer Kit for Linux. The CD images (ISOs) for these CDs can be downloaded from the HP support website at <http://www.hp.com/go/workstationsupport>.

The Installer Kit does not include the operating system, so you must download the operating system from the web or purchase a Red Hat box-set with the Red Hat version to be used with the Driver CD. To view the existing Installation Support Matrix for HP Linux workstations and the supported configurations and operating systems, see http://www.hp.com/support/linux_hardware_matrix.

HP provides a Driver CD for a Red Hat Enterprise Linux version when the amount of content added by HP for drivers and other software packages (called RPMs) is small, and not as critical as when HP provides an Installer CD. Recent versions of Red Hat Linux include the most recent device drivers and typically only require up-to-date driver updates with minor fixes to support HP workstations. These recent releases can usually be supported using the Driver CD. This Driver CD can be used as a post-installation utility for the standard Red Hat Linux install.

After the standard Red Hat install is complete and the system is restarted, a Red Hat *first-boot* utility is invoked to set up the security level, time and date, root password, user accounts, and other settings. The last thing that first-boot does is enable you to load additional CDs.


The Driver CD is designed for use during this additional CD phase. (Refer to *Installing with the HP Installer Kit for Linux*.) All the content added by HP is in the /HP directory on the CD. You can use it to build your own image or to browse the HP content.

HP provides Driver CDs for various RHEL versions. The Driver CDs include software packages (called RPMs) that enable or enhance the functionality or performance of RHEL on HP Workstations.

Installing with the HP Driver CD

Install the operation system using the CDs included in the Red Hat Linux box-set.

1. If there is a Red Hat Driver Disk that corresponds to the Red Hat Linux operating system that is being installed, enter `linux dd` on the initial install splash screen, and then press [Enter](#).


 **NOTE:** You must enter `linux dd` before pressing [Enter](#).

2. When asked if you have a driver CD, select **Yes**. Place the Red Hat Driver Disk in the drive, and select the appropriate `drive:hd[abcd]`. Continue the normal installation.
3. After successfully installing the Red Hat Linux operating system, reboot the workstation.
The Red Hat Setup Agent (also known as first-boot) now sets up system parameters such as networking, time/date, and adding new users.
4. Insert the HP Driver CD.
5. When prompted, select **Install** for the Additional CD option. This process initializes the system with HP Driver CD components.
6. When the driver installation task is completed, continue following the prompts until the operating system is successfully installed.
7. Reboot the workstation to enable post-installation driver configuration.

Installing with the HP Installer Kit for Linux

To install using the HP Driver CD:

1. Install the operation system using the CDs included in the Red Hat Linux box-set.
2. If there is a Red Hat Driver Disk that corresponds to the Red Hat Linux operating system that is being installed, enter `linux dd` on the initial install splash screen and then press [Enter](#).

 **NOTE:** (Do not press [Enter](#) only, without first entering `linux dd`.)

3. When asked if you have a driver CD, select **Yes**. Place the Red Hat Driver Disk in the drive, and select the appropriate `drive:hd[abcd]`. Continue the normal installation.
4. After successfully installing the Red Hat Linux operating system, restart the workstation.
5. The Red Hat Setup Agent (also known as first-boot) will set up system parameters such as networking, time/date, adding new users, etc.
6. Complete this process. The Additional CDs screen displays, and you initialize the system with HP Driver CD components.
7. Insert the HP Driver CD.
8. When prompted, select **Install** for the Additional CD option.
9. When the driver installation task is completed, finish the first-boot setup.
10. Continue following the prompts until the operating system is successfully installed.
11. Restart the workstation to enable the proper post-installation driver configuration.

3 HP Installer Kit for Novell

HP provides an HP Installer Kit for SUSE Linux Enterprise Desktop 11 CD. This CD includes software packages (called RPMs) that enable or enhance the functionality or performance of SLED 11 on the Z400 and xw4600 Workstations. The contents of this CD are included in the SLED 11 preload on these workstations. The CD is useful for installing a copy of SLED 11, or for restoring the SLED 11 preload on the Z400 and xw4600 Workstations.

After the operating system has been installed, insert the HP Driver CD included with the workstation or downloaded from <http://www.hp.com/support>.

The content added by HP is in the /HP directory on the CD. You can use it to build an image or to browse the HP content.

Obtaining the HP Enhancement CD for Linux

SUSE Linux Enterprise Desktop 11 (x86)		
SUSE Linux Enterprise Desktop 11 (AMD64/ EM64T)		
Revision	Supported HW Platforms	HP Enhancement CD's (ISO's)
11 Rev. A	xw4600 and Z400	HP Workstation Enhancements for SUSE Linux Enterprise Desktop 11
11 Rev. B	xw4600 xw6600 xw8600 xw9400 Z400 Z600 Z800	HP Installer Kit for Linux - HP Driver CD for SLED11

To obtain the HP Installer Kit CD for Linux from the HP support website:

1. See <http://www.hp.com/go/workstationsupport>.
2. Select the desired workstation.
3. Select **Download drivers and software** in the Tasks for... section.
4. Select the desired operating system.
5. Select **Software** in the Quick jump to downloads by category section.
6. Download the ISO title.
7. Untar the ISOs. (Use a command such as: `tar -zxf<filename>`).

Restoring Novell SLED

The SLED restore media is required to restore the Linux operating system.

Creating restore media

THE SUSE Linux Enterprise Desktop preload includes a SUSE ISO icon on the desktop. Select this icon to go to the `/iso` directory. The `/iso` directory contains all iso images used to preload the workstation. Open the file that contains the instructions to create and restore the SUSE Linux Enterprise Desktop at `/iso/ReadMe`, or select the SUSE ISO icon.

4 Linux graphics for HP workstations


This chapter provides an overview of accelerated graphics solutions for HP Workstations running the Linux operating system and the X.org X Window System. It covers vendor-specific driver configuration utilities, system functionality, and support information for workstation users. This chapter assumes familiarity with Linux configuration, basic X server usage, window managers, and essential video graphics card fundamentals such as PCI Express versus PCI, VGA versus DVI connectors, and 3D versus 2D accelerated graphics.

Linux graphics drivers for HP workstations

While Linux distributions offer graphics support within their packaging, HP recommends using the accelerated device drivers available for its workstations at <http://www.hp.com> or support media included with the products. These drivers enable the latest features for supported and are quality tested for specific enterprise Linux distributions. They are available with the HP Linux Installer Kit, with the Novell SLED 11 preload on the xw4600 and Z400 workstations, and from the HP Workstation Support site at <http://www.hp.com/go/workstationsupport>.



Driver packages available from HP build proprietary kernel modules provided by the graphics vendors. They require properly matched kernel development source header files and compiler tools to properly install on configured workstations. They also require system administrator (root) privileges and a system restart to complete installation

 **NOTE:** If installation is attempted while an X server is running at system init level 5, then installation and enablement take place after the workstation is restarted. See individual vendor sections below for additional installation specifics.

NVIDIA® Graphics Workstations

This section describes NVIDIA graphics configurations for HP Linux workstations.

X Server configuration

HP recommends that you use the interactive configuration utilities provided by Nvidia after you install their accelerated driver packages.

If you use the HP version of the tested Nvidia drivers, use the `/usr/bin/nvidia-settings` command to access the desktop icon for the graphical utility:



This utility provides access to:

- X Server information
- X Server Display Information - includes screen layouts, display resolutions and timings, and TwinView™ settings.
- X Screen # - includes color gamma correction, XVideo settings, cursor and OpenGL settings, and Antialiasing requirements
- GPU # - includes thermal, power, and probed monitor information

Use `/usr/bin/nvidia-settings` to output a usable X server configuration file. This utility can merge existing contents, write a clean file, or specify an alternate location so that the X -config startup line can be used to test a configuration before accepting.

Additional documentation is installed in the `/usr/share/doc/NVIDIA_GLX-1.0` directory. This directory includes:

- **README.txt**—Complete Nvidia features discussion and X server configuration options
- **NVIDIA Changelog**—Driver version release notes
- Sample X server configuration files.

SLI Graphics Acceleration

Dual PCIe can be linked together to drive a single graphics display to achieve up to two times more performance of a single graphics card. This is accomplished through Scalable Link Interface (™), a card-bridge technology provided by Nvidia. Only specific graphics card models support SLI™ technology, and SLI requires that the be of the same type (homogenous configuration). For more information on these advanced settings, see the documentation provided with the drivers.

Xinerama / NVIDIA TwinView

The X.org extension supports continuous display technology on the X server for multiple card and monitor configurations. When enabled, it changes independent displays to continuous displays. Xinerama is configured with a `ServerFlags` option or enabled with a command-line option. Additionally, NVIDIA cards recognize TwinView configuration options to manage continuous desktops across screens hosted on the same card. The `/usr/bin/nvidia-settings` configuration tool provides the most accurate and reliable management of these options for multiple NVIDIA .

30-bit (10-bit-per-channel) X Visuals


Except for NVS-series cards, NVIDIA Quadro® cards with G80 or later GPUs support internal circuitry for 30-bit (10-bit-per-channel) color. Cards that support the DisplayPort connection standard can generate signals to drive select high-color-gamut DisplayPort monitors (including the HP DreamColor

Professional Displays). These cards have higher fidelity than standard DVI-driven or VGA-driven monitors that support 24-bit, 8-bit-per-channel signals.

Work to support 30-bit visuals on the enterprise desktop is ongoing with X.org X servers at X11 R7.4 or later. (To correctly manage mixed 30-bit and 24-bit visual requests, these servers require later versions of GDM , Gnome, and KDE display managers). For more information on these advanced settings, see the documentation provided with the drivers and the Linux distribution.

AMD® / ATI graphics workstations

ATI™ provides a command line tool to automatically configure the Xorg configuration file `/etc/X11/xorg.conf`. The `aticonfig` tool should be used immediately after the ATI graphics driver is installed to perform the initial configuration of the `xorg.conf` file.

 **NOTE:** The ATI graphics driver will not become functional until the following command is issued:

```
<prompt> # aticonfig --initial
```

HP recommends the interactive configuration utilities provided by ATI. These utilities provide access to:


- 3D Performance Management
- X Server Display Information and Management- including screen layouts, display resolutions and timings, multi-display settings and Xinerama.
- X Screen # - including color gamma correction, XVideo settings, and Antialiasing requirements
- GPU # - including vbios version, clock speed, driver, and probed monitor information

Configuration changes can be previewed and saved by clicking “Apply” in the utility interface.


Additional documentation in html format is installed in the `/usr/share/doc/ati` directory.

In addition to the Catalyst Control Center application, some of the features that can be configured using the `aticonfig` application include:

- **Xinerama**— the X.org/XFree86 extension that supports continuous display technology on the X server. When enabled, it changes independent displays to continuous displays. Xinerama is configured with a `ServerFlags` option or enabled with a command-line option.

 **NOTE:** Xinerama only supports accelerated 3D between screens controlled by independent cards with the most recent Nvidia drivers (not ATI drivers). The `NVIDIA-settings` applet tool supports interactive configuration of this and other layout-specific features for the X server.

- **ATI Big Desktop**—an ATI-specific driver configuration mode that supports Xinerama-like functionality across the two video ports of an ATI graphics card. When configured, it allows the X server to manage dual video ports as one independent display. User windows can traverse the entire graphics card framebuffer

 **NOTE:** This mode is configurable only with the `aticonfig` configuration tool provided by ATI.



- **ATI Overdrive**—enables you to change core or memory clock values.



NOTE: Use of this feature may reduce the life of the graphics card.

- **Framelock/ Genlock**—Genlock is commonly used in video post-production, nonlinear editing (NLE), and broadcast studios. It ensures that workstation graphics output is locked (LOCK) to an externally generated (GEN) signal. This guarantees that the studio's devices (cameras, videotape recorders, or character or title generators) work together effectively.

Frame lock uses hardware to synchronize the frames on each display in a connected system. When graphics and video are displayed across multiple monitors, framed systems help maintain image continuity to create a virtual canvas. Frame lock is especially critical for stereo viewing, where the left and right fields must be in sync across all displays.

Troubleshooting

When editing an `xorg.conf` or `XF86Config` X server configuration file, know that each time the X server is started it writes out the `/var/log/Xorg.0.log` or `/var/log/XFree86.0.log` log file. If the results are not as expected, or the X server fails to start, check this log file. The X server and OEM accelerated drivers write configuration confirmations, warnings, and errors to this file.

Most often you can resolve configuration issues based simply on output in the log file. If you want additional X server debugging output, start the X server manually with a request for verbose logging:

```
X -logverbose 6 -s -ac 0 :0
```


This example outputs a level 6 detailed set of messages into the `/var/log/Xorg.0.log` file.

For technical support of Nvidia drivers, use the `/usr/bin/nvidia-bug-report.sh` system profiling utility. This utility generates `nvidia-bug-report.log`—a comprehensive report to further diagnose configuration issues.

5 Software RAID in HP Linux workstations

Introduction

This chapter provides an summary of software RAID considerations for HP workstations running the Linux operating system. In addition references to procedures on configuring software RAID are also provided in this chapter.

 **NOTE:** While BIOS messages might refer to hardware RAID, only SAS hardware RAID is supported by HP Linux workstations. See [Installing and configuring SAS hardware RAID on page 19](#) the for information about configuring hardware RAID.

Software RAID considerations

The Linux kernel offers integrated software RAID without the need for additional hardware disk controllers or kernel patches. All that is required are multiple hard disks and a small amount of setup. Unlike most hardware RAID solutions, software RAID can be used with all types of disk technologies, including SATA, SAS, SCSI and solid state drives.

Compared to hardware-based RAID, software RAID has disadvantages in managing the disks, breaking up data as necessary, and managing parity data. The CPU must assume some extra loading. It has been found that heavily disk-intensive workloads result in roughly double the CPU overhead (for example, from 15% to 30%) when software RAID is in use. For most applications, this overhead is easily handled by excess headroom in the processors. But for some applications where disk and CPU performance are very well balanced and already near-bottleneck levels, this additional CPU overhead can become troublesome. Hardware RAID offers advantages because of its large hardware cache and the capability for better scheduling of operations in parallel. However, software RAID offers more flexibility for disk and disk controller setup. Additionally, hardware RAID requires that a failed RAID controller must be replaced with an identical model to avoid data loss, whereas software RAID imposes no such requirements.

Some software RAID schemes offer data protection through mirroring (copying the data to multiple disks in case one fails) or parity data (checksums that allow error detection and limited rebuilding of data in case of a failure), but all software RAID solutions on HP workstations require the shutdown of the system so that the failed drive can be replaced before redundancy can be restored. The replacement of failed drives in software RAID requires only a minimum amount of work.

Performance considerations

Disk I/O bandwidth is typically limited by the system bus speeds, the disk controller, and the disks themselves. The balance of these hardware limitations, as affected by the software configuration, determines where the real bottleneck is in the system.

Several RAID levels offer improved performance relative to a standalone disk. If the disk throughput is lessened by a single disk controller, there is probably little you can do with RAID to improve the performance without adding another controller. On the other hand, if the raw disk performance is the bottleneck, a tuned software RAID solution can dramatically improve the throughput. The slower the disk is relative to the rest of the system, the better RAID performance will scale, because the slowest piece of the performance pipeline is being directly addressed by moving to RAID.

Configuring software RAID

See the following links for additional resources on how to configure software RAID on Red Hat Enterprise Linux or Novell SUSE Linux Enterprise Desktop (SLED):

- **Red Hat Enterprise Linux 5**—Deployment Guide Software RAID:http://www.redhat.com/docs/en-US/Red_Hat_Enterprise_Linux/5/html/Deployment_Guide/s1-raid-config.html.
- **Red Hat Enterprise Linux 4**—System Administrator Guide Software RAID at:http://www.redhat.com/docs/manuals/enterprise/RHEL-4-Manual/en-US/System_Administration_Guide_/Software_RAID_Configuration.html.
- **SLED 11**—Deployment Guide Software RAID at:http://www.novell.com/documentation/sled11/sled11_deployment/data/sec_yast2_system_raid.html.
- **SLED 10 SP2**—Deployment Guide Software RAID:http://www.novell.com/documentation/sled10/sled_deployment_sp2/data/sec_yast2_system_raid.html.

See the following web sites for more information:

- <http://h10018.www1.hp.com/wwsolutions/linux/index.html>
- <http://h20331.www2.hp.com/hpsub/cache/286526-0-0-225-121.html>
- <http://linux.corp.hp.com/>

6 Installing and configuring SAS hardware RAID

Introduction

This chapter provides an overview of hardware RAID solutions for HP workstations running the Linux operating system. It assumes a basic understanding of computer hardware, filesystems, and the Linux operating system. It covers an overview of hardware RAID solutions, the differences between software and hardware RAID offerings, and information regarding the configuration of hardware RAID on HP Linux workstations.

There are different levels of hardware RAID available. Not all of them are supported options for HP Linux workstations.

- Hardware-assisted RAID is a step up from software RAID, but is not considered true hardware RAID. Hardware-assisted SAS RAID uses the LSI megaraid driver already present in the Linux kernel. It is provided by the LSI 3041E plug-in card on the HP xw4x00 and xw6x00 Workstation series and by the LSI 1064 and 1068 controllers on the motherboard on the HP xw8000 and xw9000 Workstation series.
- True hardware RAID, also known as raid-on-chip, or ROC, makes use of a dedicated RAID processor. It is provided by the LSI 8344ELP and 8888ELP plug-in cards on the HP xw8x00 and xw9x00 family platforms. SAS drives are the only drives supported for use with RAID on HP Linux workstations.
- Hardware-assisted SATA RAID requires use of the dmraid interface, and is not supported on HP Linux workstations.

Supported Configurations

Hardware RAID for HP Linux workstations is currently supported for user-configured RAID solutions for the HP workstations below. Not all configurations that are made available by the RAID chipsets or plugin cards are supported by HP; only the configurations listed below are supported on HP Linux workstations.

Table 6-1 Maximum supported hard drives

	xw4600	xw6600	xw8600	xw9400	Z400	Z600	Z800
LSI 3041E	4	3			4	3	
LSI 8344ELP				4			
LSI 8888ELP	4	4	6*		4	3	5
LSI 1068				5			
LSI 1068e							5


* HP xw8600 Workstation can accommodate six internal 2.5" drives

Not all possible hardware RAID configurations are supported on HP Linux workstations.

- Only SAS drives are supported with hardware-assisted and full hardware RAID.
- SATA and PATA drives are not supported with hardware RAID, but can be used with software RAID solutions.
- Supported operating systems are:
 - Red Hat Enterprise Linux 4.5 and later
 - Red Hat Enterprise Linux 5.0 and later
 - SUSE Linux Enterprise Server 9 SP4 and later
 - SUSE Linux Enterprise Server 10 SP1 and later
 - SUSE Linux Enterprise Desktop 10 SP1 and later
 - SUSE Linux Enterprise Desktop 11 and later
- The Linux Hardware Matrix contains information on all current platforms and is a good place to learn which RAID controllers are supported on a given platform.

LSI 3041E and Integrated LSI 1064/1068 Setup

The LSI 3041E is a 4-port SATA/SAS RAID controller providing SAS support for the HP xw4000 and xw6000 Workstation series as well as the Z400 and Z600.

 **NOTE:** While the controller provides functionality for SATA RAID, SATA RAID is not supported on HP Linux workstations.

The HP xw8000 and xw9000 and Z800 Workstation series use an onboard LSI 1064, 1068 or 1068e SAS controller, which uses the same BIOS configuration utility as the LSI 3041E plug-in card.

Use the following steps as a guide to set up the LSI 3041E or the onboard LSI controllers for SAS RAID. Details vary based on the specific configuration, such as RAID level and number of disks used.

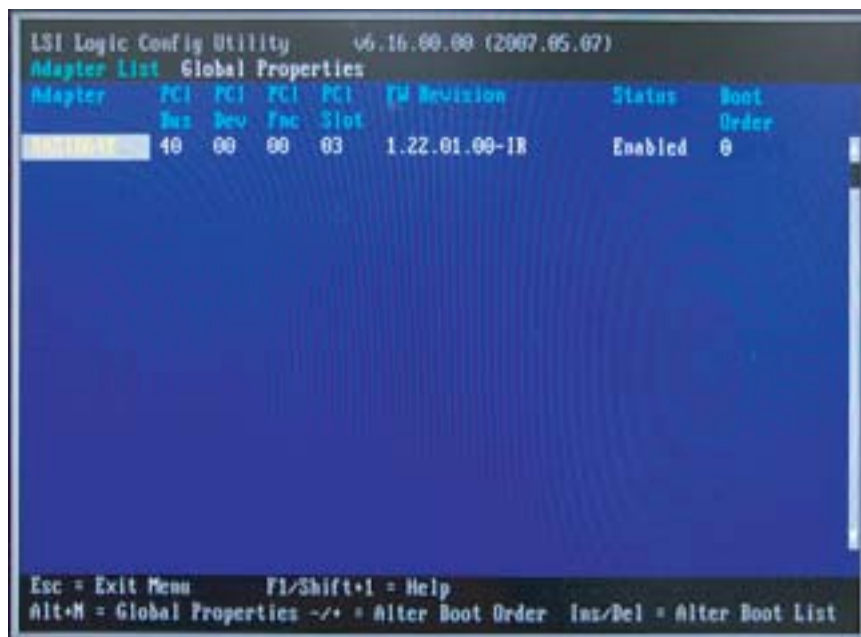
1. Boot the workstation, and when prompted, press any key to view option ROM messages. A message indicating the presence of the LSI onboard controller or plug-in card and the LSI Logic MPT SAS BIOS appears.

Figure 6-1 LSI Logic MPT SAS BIOS



2. Press CTRL-C when indicated to begin RAID configuration and enter the LSI Logic MPT Setup Utility. The first screen will display a list of available adapters. The LSI 3041E plug-in card appears on this list as the SAS1064E, the LSI onboard controllers are listed as the LSI1064 or LSI1068. This screen can be used to change the boot order of the adapters.

Figure 6-2 LSI Logic MPT Setup Utility – Adapter selection



- Press enter to select and configure the highlighted adapter from the list. The next screen will display properties of the selected adapter. Information on the attached drives, any RAID arrays present, and more advanced adapter properties is available.

Figure 6-3 LSI Logic MPT Setup Utility – Adapter properties



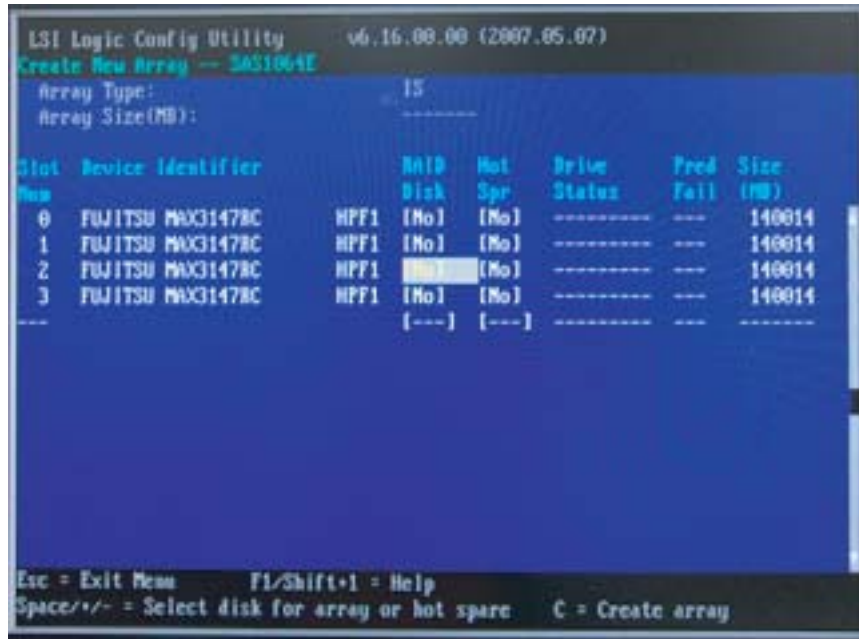
- To create, manage or delete a SAS RAID array, highlight RAID Properties and press enter. If an array is presently configured on the controller, the “View Existing Array” will be present.

Figure 6-4 Logic MPT Setup Utility – RAID properties



- To create a new array, select one of the options to create either an IM, IME, or IS volume and press enter. IM, or Integrated Mirroring, is also known as RAID-1. IME, or Integrated Mirroring Enhanced, is RAID-10. IS, or Integrated Striping, is RAID-0. The next screen will list the disks. For each disk to be part of the array, move to the column labeled “RAID Disk” and press the space bar to add the disk to the array. The next column, “Hot Spr,” can be used to mark disks to be hot spares in case of disk failure. When the disks have been marked as desired, press C to create the array.

Figure 6-5 LSI Logic MPT Setup Utility – Array creation



- After an array has been created, the utility gives options for managing it through the “View Existing Array” menu. Viewing the array will display various properties of the RAID array, including the disks present and their status.

Figure 6-6 LSI Logic MPT Setup Utility – View array



7. Select **Manage Array** and press **Enter** to use the management features. From here, the disks that are configured to be hot spares can be managed, the array can be activated, deactivated, or deleted, and if the array is not at an **Optimal** status due to a disk failure or other problem, it can be synchronized from this menu.

Figure 6-7 LSI Logic MPT Setup Utility – Manage array



When finished, or at any step in the process, press the escape key to exit the current view, canceling or saving any changes.

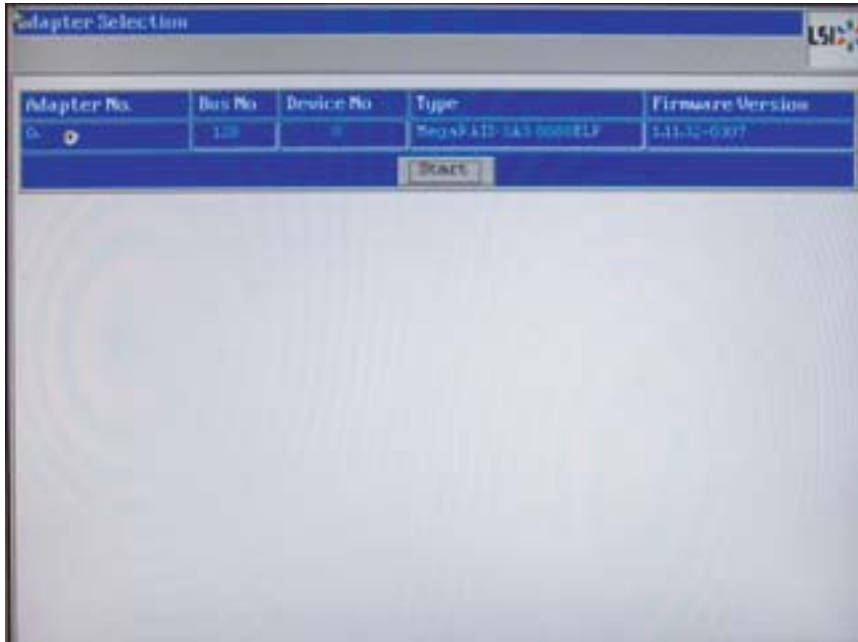
LSI 8344ELP and LSI 8888ELP Setup

The LSI 8344ELP and LSI 8888ELP are 8-port SATA/SAS RAID controllers providing additional SAS support for the HP xw8000 and xw9000 and Z family platforms. Note that while the controller provides functionality for SATA RAID, SATA RAID is not supported on HP Linux workstations. The HP xw8000 and xw9000 and Z800 family platforms also have onboard SAS RAID capabilities that can be described best as hardware-assisted RAID; the 8344ELP and 8888ELP plug-in cards are considered to be full hardware RAID.

Use the following steps as a guide to set up the LSI 8344ELP or the LSI 8888ELP or SAS RAID. Details will vary based on the specific configuration used.

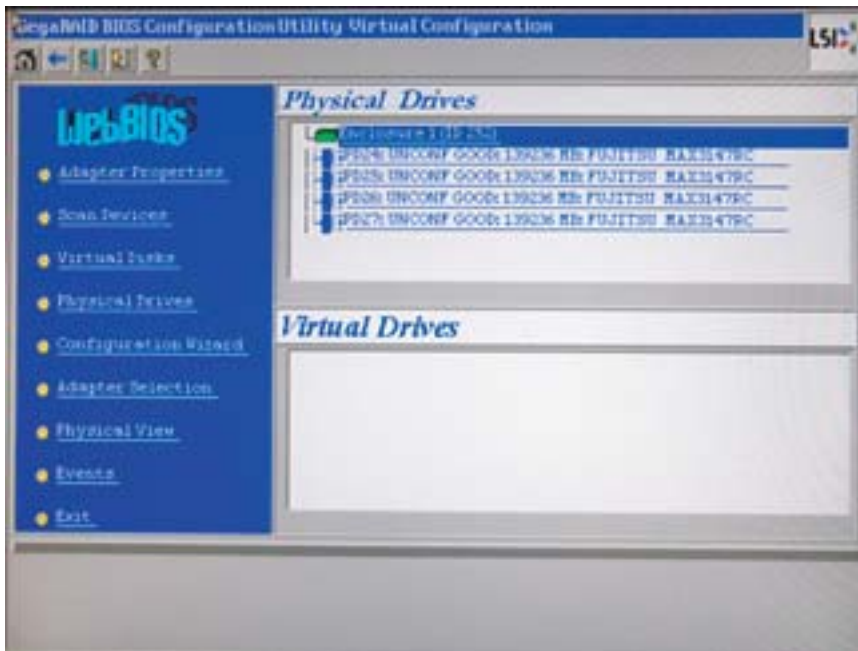
1. Boot the workstation, and when prompted, press CTRL-H to enter LSI's WebBIOS utility. WebBIOS will be run after POST completes. Select the desired adapter from the Adapter Selection screen and press start to enter the utility.

Figure 6-8 LSI WebBIOS – Adapter selection



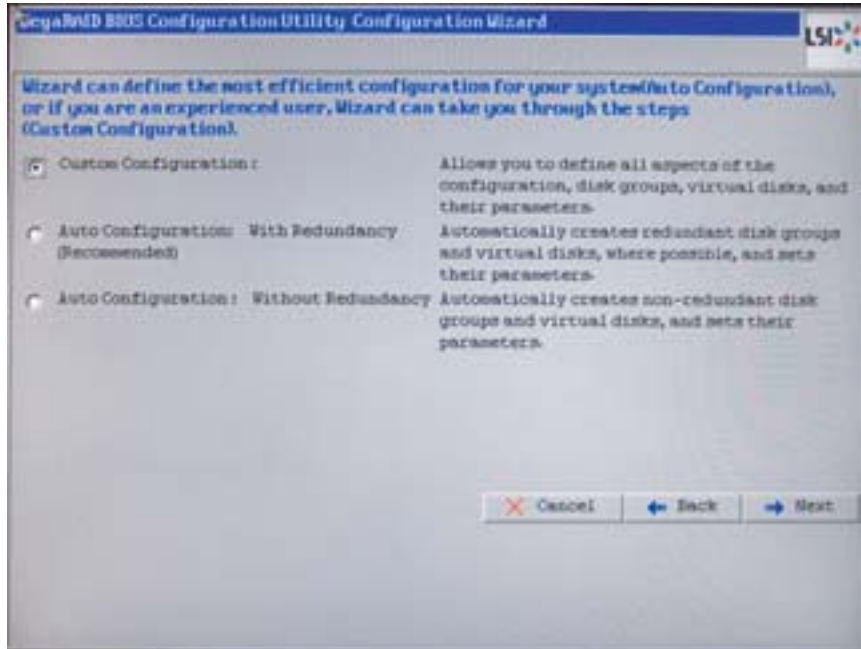
2. The main WebBIOS screen can be used to configure the adapter, the physical disks, and the virtual disks or RAID arrays. The first view shows the physical disks connected to the adapter, any RAID arrays presently configured, as well as the status of both physical and virtual disks.

Figure 6-9 LSI WebBIOS – Main screen



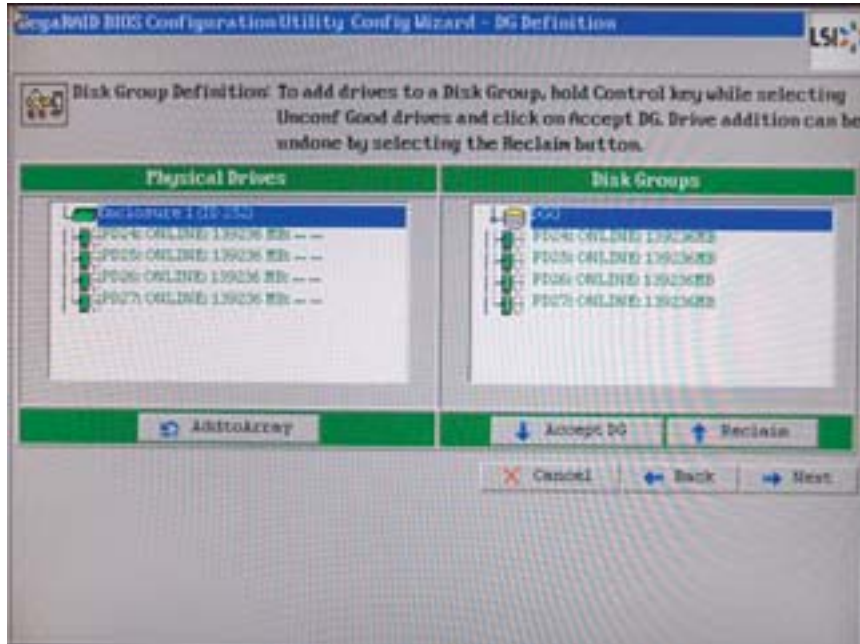
3. The Configuration Wizard can be used to create a new RAID array on the device. From the MegaRAID Configuration Wizard screen, there are options available to clear any existing device configuration, add new drives to an existing configuration, or create a new configuration from scratch. Clicking on either “New Configuration” or “Add Configuration” proceeds to the next step of the wizard, where there are options for either custom or automatic configurations.

Figure 6-10 LSI WebBIOS – Configuration wizard



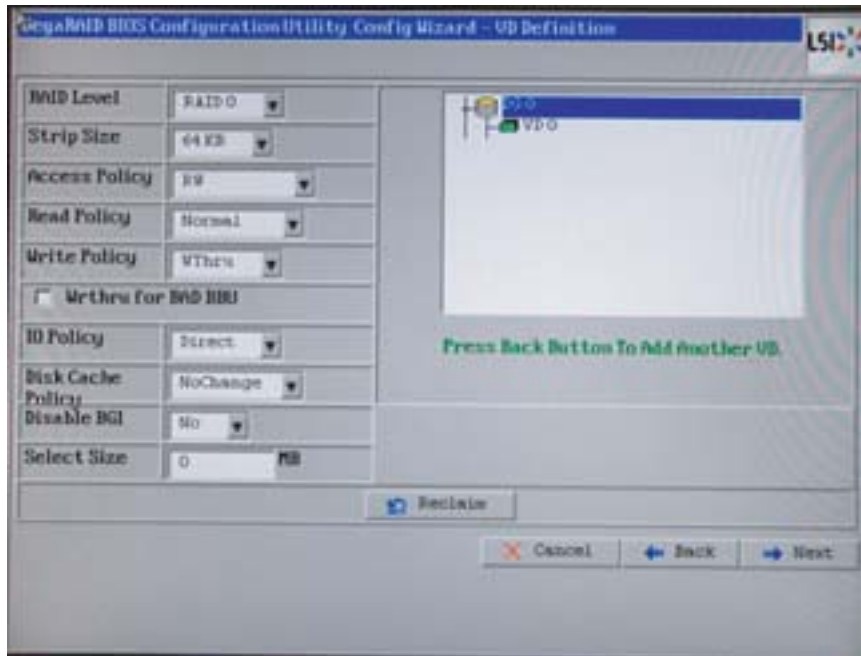
- Automatic configurations will automatically add all available disks to a RAID array, with the RAID level determined by whether or not redundancy is selected. Custom configuration allows the user to select disks, array size, and RAID level. The next screen allows for the selection of the disks which will be part of the RAID array. Select from the available disks those disks that will be part of the RAID array and click "Accept DG" to proceed.

Figure 6-11 LSI WebBIOS – Configuration of disk group



- The next screen allows for more advanced configuration of the RAID array. Many details about the disk policies can be selected here. The most important options on this screen are the RAID level and size. First select the RAID level from the drop-down menu- the RAID levels available will vary depending on the number of physical disks in the disk group. The configuration window to the right of the screen will display information on the maximum size of the RAID array for the different available RAID levels. In the Select Size text box, enter a size in MB up to this available maximum size. When these options have been selected, further customization can be done, or click "Accept" or "Next" to move to the next step of configuration.

Figure 6-12 LSI WebBIOS – Virtual disk configuration



- The next screen will display the physical disks on the left and the proposed virtual disk (RAID array) on the right as a preview of the proposed disk configuration. If changes are needed, press “Back” to go back and change details of the configuration, or press “Accept” to accept the configuration. On the next screen, press “Yes” to save the configuration, then press “Yes” to initialize the new RAID array. If a disk in the RAID array fails or needs to be replaced for any reason, the WebBIOS utility can be used to easily rebuild the RAID array. If a disk failure occurs, the change to the RAID array will be indicated by a message on the screen before entering the utility.

Figure 6-13 Foreign configuration on LSI adapter

```
Serial ATA AHCI BIOS, Version 1.05 07182006
Copyright (c) 2003-2006 Intel Corporation
** This version supports only Hard Disk and CDROM drives **
Please wait. This will take few seconds.

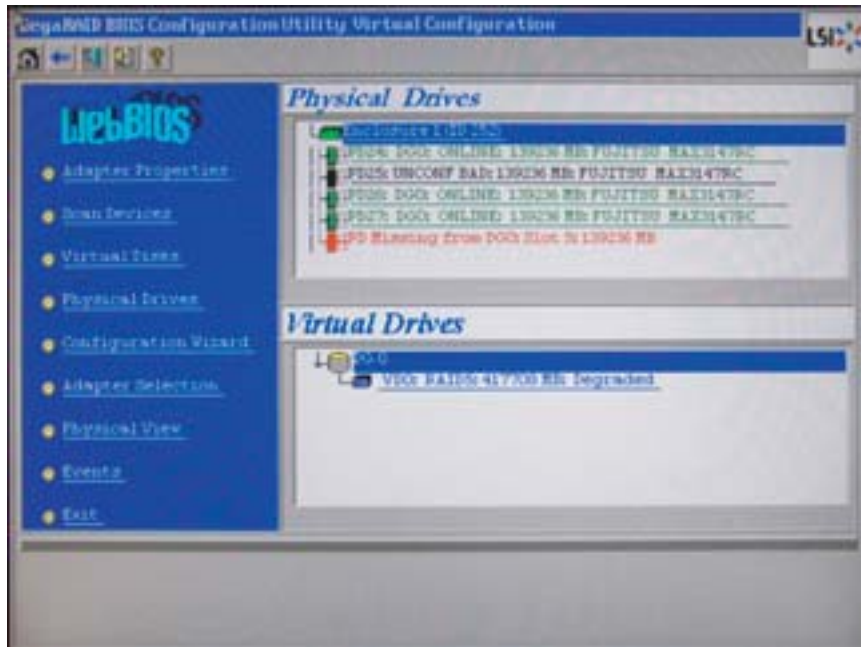
Controller Bus#00, Device#1F, Function#02: 06 Ports, 02 Devices
Port-00: CDROM, ATAPI  DVD 0  0M160YS
Port-01: Hard Disk, ST3160012AS
        (Drive is controlled by the RAID BIOS)
Port-02: No device detected
Port-03: No device detected
Port-04: No device detected
Port-05: No device detected
AHCI BIOS installed

LSI MegaRAID SAS-MFI BIOS Version NT10 (Build Apr 05, 2007)
Copyright(c) 2007 LSI Logic Corporation
HA -0 (Bus 120 Dev 0) MegaRAID SAS 8888ELP
FW package: 6.0.1-0074

Foreign configuration(s) found on adapter
Press any key to continue or 'C' load the configuration utility,
or 'F' to import foreign configuration(s) and continue.
```

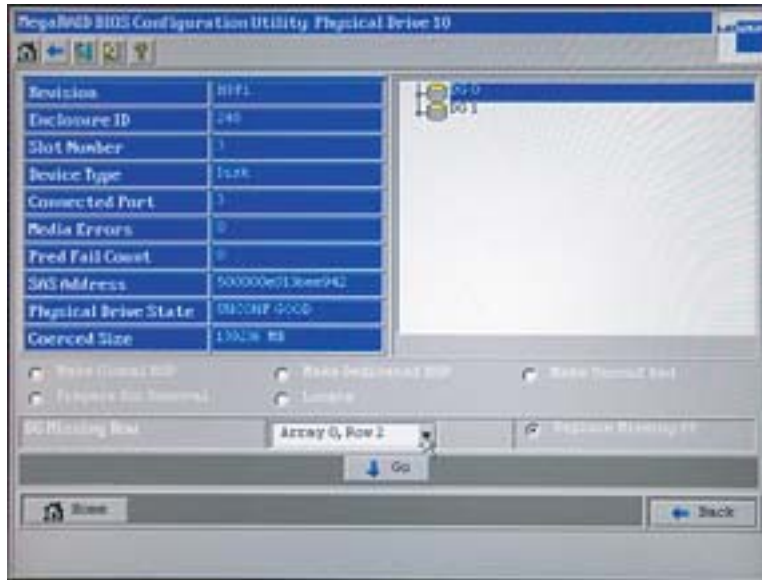
7. Press C or CTRL-H when indicated to enter the utility. When the home screen appears, the new disk will be marked as “Unconfigured bad” and the missing disk will be labeled in red. Click on the new unconfigured disk in order to configure it and add it to the RAID array.

Figure 6-14 LSI WebBIOS – Unconfigured bad disk



- From the next screen, select the option to make the disk *Unconfigured good* so it can be made to be part of a disk group, and then select **Go**. The next screen displays the configured disk groups. The group from which the original disk was missing is indicated. Select the location of the disk from the row labeled *DG Missing Row*, where the listed options are the locations where a disk was missing from the RAID array. The radio button marked *Replace Missing PD* is checked. Select **Go** to complete the operation.

Figure 6-15 LSI WebBIOS – Replacing a physical disk



- After the disk has been replaced, it will start with an offline status. Select **Make Online** to bring the physical disk online and finish rebuilding the RAID array.

At any point during RAID configuration or management, press the home button to return to the main screen of the configuration utility. The exit button cancels any unsaved changes and exits the application.

Additional RAID Information

OS Installation

The above steps document the process for setting up a hardware RAID array using the tools provided by the hardware RAID adapter. After this setup process is complete, an operating system can be installed. If the user does not wish to have the RAID array be bootable, a separate SATA or SAS boot disk can be used, and the RAID array can be a separate disk group for data storage only. During operating system installation, the configured RAID array will be recognized as a logical disk group, and can be set up and partitioned as desired.

Other Workstation Platforms

The above information applies only to the desktop workstation platforms discussed herein. Hardware RAID support is not available on the HP xw4550, since only SAS RAID is supported on HP Linux workstations. The xw4550 only supports SATA drives, and SATA RAID support is not available. The HP xw460c blade workstation supports hardware RAID levels 0 or 1 using the SAS drives that are available for use on that platform.

7 Links

Check the following resources for additional information on topics presented in this user manual.

- Linux on HP workstations: <http://www.hp.com/linux>
 - Select **Platforms and printers**
 - Select **Workstations**
- Driver Updates & HPIKL images: <http://www.hp.com/support/>
 - Select the country
 - Select **Download drivers and software...**
 - Enter the desired platform, and then select >>
 - Select the operating system
 - Select the desired package
 - Download the associated package and install as directed
- HP Linux workstation certifications at: <http://www.hp.com/go/linux>
 - Select **Certification & Support** under the Platforms and distributions section
 - Select **Workstations** under the Linux on Clients section
 - Select the tab for the desired distribution
- HP Workstations Home Page: <http://www.hp.com/workstations>
- Hardware support matrix for HP xw Linux Workstations: http://www.hp.com/support/linux_hardware_matrix
- HP User Manual for HP xw Linux Workstations: http://www.hp.com/support/linux_user_manual
- General web information on DVDs: <http://www.dvdhelp.us/>
- For additional information on HP products and services, see <http://www.hp.com/>.
- For the location of the nearest sales office, call:
 - United States: +1 800 637 7740
 - Japan: +81 3 3331 6111
 - Canada: +1 905 206 4725
 - Latin America: +1 305 267 4220
 - Australia/New Zealand: +61 3 9272 2895
 - Asia Pacific: +8522 599 7777
 - Europe/Africa/Middle East: +41 22 780 81 11

For more information, contact any of our worldwide sales offices or HP Channel Partners (in the U.S. call 1 800 637 7740).

A Appendix—HP release notes for Linux operating systems

Introduction

Release Notes for Red Hat Enterprise Linux (RHEL) contain a list of known issues on HP Linux workstations when using RHEL 3, RHEL 4, and RHEL Client 5 as of June 2009.

For additional information or updates, see <http://www.hp.com/go/workstationsupport> and complete the following steps:

1. Select the desired workstation.
2. Select **Troubleshoot a problem** in the *I would like to* section.
3. Select **Operating system** in the *useful documents* section.
4. Locate the Linux section.

If you are interested in other distributions that are certified on HP workstations, see <http://www.hp.com/go/workstationsupport>.

Customer advisories for Red Hat Enterprise Linux WS 3

Use the following table to determine which advisories are applicable to the RHEL 3 workstation.

Table A-1 Customer advisories for Red Hat Enterprise Linux WS 3

Advisory	Update 8	Update 7	Update 6	Update 5	Update 4	Update 3	Update 2
/c00911429 NVIDIA Quadro FX Fails to Start X Server	xw4200	xw4200	xw4200	xw4200	xw4200	xw4200	xw4200
	xw4300	xw4300	xw4300	xw4300	xw6200	xw6200	xw6200
	xw6200	xw6200	xw6200	xw6200	xw8200	xw8200	xw8200
	xw8200	xw8200	xw8200	xw8200	xw9300		
	xw9300	xw9300	xw9300	xw9300			
/c00676466 ATI Graphics Resolution Unexpected	xw6200	xw6200					
	xw8200	xw8200					
/c00529204 X Hang with 100% CPU Utilization				xw4200	xw4200	xw4200	xw4200
				xw4300	xw6200	xw6200	xw6200
				xw6200	xw8200	xw8200	xw8200
				xw8200	xw9300		
				xw9300			
/c01117497 (AMD64/EM64T) [AMD64/EM64T] Configured With 4GB to 4.5GB Of Memory May Panic During Boot					xw8200	xw8200	
/c01117503 (AMD64/EM64T) Kernel Panic with Greater than or Equal to 4GB of Memory					xw8200	xw8200	
/c01131107 Creating X configs with ATI FireGL V3100	xw4200	xw4200	xw4200	xw4200			
	xw4300	xw4300	xw4300	xw4300			
	xw6200	xw6200	xw6200	xw6200			
	xw8200	xw8200	xw8200	xw8200			
/c01131106 ATI FireGL Driver Fails to Save and Restore libGL	xw4200	xw4200	xw4200	xw4200			
	xw4300	xw4300	xw4300	xw4300			
	xw6200	xw6200	xw6200	xw6200			
	xw8200	xw8200	xw8200	xw8200			
/c01122456 (i386) System May Hang with UP Kernel							xw6200
							xw8200
/c00576088 (AMD64/EM64T) X Server May Hang				xw4200	xw9300		
				xw4300			
				xw9300			
/c01117519 (x86) SMP Kernel Requires Additional Boot Option							xw4200
/c01122454 (AMD64/EM64T) System Hangs Booting if APIC Disabled							xw4200
/c00676511 ATI Graphics X Hangs	xw4300	xw4300					
	xw4400	xw6400					
	xw6400	xw8400					
	xw8400						

Table A-1 Customer advisories for Red Hat Enterprise Linux WS 3 (continued)

Advisory	Update 8	Update 7	Update 6	Update 5	Update 4	Update 3	Update 2
/c00676526 No Audio with UP Kernel	xw4300 xw4400 xw6400 xw8400 xw9400	xw4300 xw6400 xw8400					
/c00676466 ATI Graphics Resolution Unexpected	xw4300 xw4400 xw6400 xw8400	xw4300 xw6400 xw8400					
/c00532521 Missing Audio Driver			xw4300				
/c00645844 Lan Driver Issues				xw4300			
/c01095522 (AMD64/EM64T) Total Memory May Report Less than Expected	xw9300	xw9300	xw9300	xw9300	xw9300		
/c01117500 (x86) Total Memory May Report Less than Expected	xw9300	xw9300	xw9300	xw9300	xw9300		
/c01117506 USB 2.0 DOK Device Limitations			xw9300	xw9300	xw9300		
/c01117498 (AMD64/EM64T) Kernel May Panic if Memory on CPU #1			xw9300	xw9300	xw9300		
/c01095604 (AMD64/EM64T) Networking Requires Some Setup					xw9300		
/c01111037 (AMD64/EM64T) NVIDIA Driver May Fail to Install					xw9300		
/c01122431 (AMD64/EM64T) PXE Boot and Network Install Issues					xw9300		
/c01122424 (x86) Network Driver Not Functional					xw9300		
/c00767604 High Speed USB Fails	xw4400						
/c00680525 FX4500 Graphics Problems	xw4400 xw6400 xw8400	xw6400 xw8400					
/c00767062 ATI Graphics Install Problems	xw4400 xw6400 xw8400						
/c00768052 RHEL3U8 x86 Currently Not Supported	xw9400						
/c00768016 Network Interface eth0 May Fail	xw9400						

Table A-1 Customer advisories for Red Hat Enterprise Linux WS 3 (continued)

Advisory	Update 8	Update 7	Update 6	Update 5	Update 4	Update 3	Update 2
/c00767049 Wake-on-LAN May Fail	xw9300						
/c00909919 (AMD64/EM64T) FX4600 issues with vesa driver	xw4400 xw6400 xw8400 xw9400	xw6400 xw8400					

Customer advisories for Red Hat Enterprise Linux WS 4

Use the following tables to determine which advisories are applicable to the RHEL 4 workstation.

Table A-2 Customer advisories for Red Hat Enterprise Linux WS 4

Advisory	Updates 7 & 8	Update 6	Update 5	Update 4	Update 3	Update 2	Update 1	Base
/WO050209_CW02 Install Failure with Mix of USB/PS2				xw4200 xw4300 xw6200 xw8200 xw9300	xw4200 xw6200 xw8200	xw4200 xw6200 xw8200	xw4200 xw6200, xw8200	xw4200 xw6200 xw8200
/WV050209_CW01 (AMD64/EM64T) NVIDIA Quadro FX 540/1400 Fails to Start X Server				xw4200 xw6200 xw8200	xw4200 xw6200 xw8200	xw4200 xw6200 xw8200	xw4200 xw6200 xw8200	xw4200 xw6200 xw8200
/c00676466 ATI Graphics Resolution Unexpected	xw4300 xw4400 xw6200 xw6400 xw8200 xw8400	xw4300 xw4400 xw6200 xw6400 xw8200 xw8400	xw4300 xw4400 xw6200 xw6400 xw8200 xw8400	xw4300 xw4400 xw6200 xw6400 xw8200 xw8400	xw 4300 xw6200 xw6400 xw8200 xw8400			
/c00646207 (AMD64/ EM64T) Install May Fail					xw6200 xw6400 xw8200 xw8400 xw9300			
/c00572928 (AMD64/ EM64T) Kernel May Panic During NVIDIA 8184 Installation							xw6200 xw8200	
/c00532509 FX5400 Needs 7676 Driver							xw4300 xw6200 xw8200 xw9300	
/c00576088 (AMD64/ EM64T) X Server May Hang							xw4200 xw4300 xw6200 xw8200 xw9300	
/WA050209_CW01 Audio Volume Defaults to Zero							xw4200 xw6200 xw8200 xw9300	
/c00513625 Audio Muted by Default				xw4300	xw4300	xw4300	xw4300	
/WV050624_CW02 Creating X Configs with ATI FireGL V3100				xw4300	xw4300	xw4300	xw4300	

Table A-2 Customer advisories for Red Hat Enterprise Linux WS 4 (continued)

Advisory	Updates 7 & 8	Update 6	Update 5	Update 4	Update 3	Update 2	Update 1	Base
/c00517759 (x86) SMP Kernel may Panic after X Starts						xw4300 xw9300		
/c00645864 LAN Driver Issues						xw4300		
/c00632558 Network Issues with System BIOS Prior to v2.05		xw9300	xw9300	xw9300	xw9300	xw9300	xw9300	
/c00767049 Wake-on-LAN May Fail				xw9300				
/c00677579 ACPI Errors Can be Ignored					xw6400 xw8400 xw9300			
/c00516933 (AMD64/EM64T) Kernel May Panic Starting X						xw9300		
/WO050906_CW01 (AMD64/EM64T) SMP Kernel May Panic							xw9300	
/WO050217_CW01 (x86) Install on SCSI Harddrive May Fail							xw9300	
/c00680525 FX4500 Graphics Problems				xw4400 xw6400 xw8400	xw6400 xw8400			
/c00769110 Internal Speakers Output of Right Channel is Missing				xw4400 xw6400 xw8400 xw9400				
/c00768016 Network Interface eth0 May Fail			xw9400	xw9400				
/c00769127 CPU Frequency Adjustments May be Slow		xw9400	xw9400	xw9400				
/c00778021 (AMD64/EM64T) Kernel May Panic in time_cpufreq_notifier		xw6400 xw8400	xw6400 xw8400	xw6400 xw8400	xw6400 xw8400			
/c00683113 Audio is Muted					xw6400 xw8400			
/c00909919 (AMD64/EM64T) FX4600 issues with vesa driver				xw6400 xw8400	xw6400 xw8400			

Table A-2 Customer advisories for Red Hat Enterprise Linux WS 4 (continued)

Advisory	Updates 7 & 8	Update 6	Update 5	Update 4	Update 3	Update 2	Update 1	Base
/c01106514 X may fail to start with Specific NVIDIA Quadro Graphics Cards and certain Red Hat Linux 32 bit versions		xw6400 xw8400	xw6400 xw8400	xw6400 xw8400	xw6400 xw8400			
/c00767604 USB 2.0, Hi-Speed USB Devices may fail to function properly with some versions of Red Hat Enterprise Linux		xw4400	xw4400	xw4400				
/c01742190 Linux Operating Systems using NVIDIA Graphics Driver Need to be Upgraded	xw4600 xw6600 xw8600 xw9400 Z400 Z600 Z800							
/c01766812 HP Workstations - Workstations Connected to a Dual Link Monitor or a HP LP3065 Monitor Display Black Screen when Installing the Linux Operating System	xw4600 xw6600 xw8600 xw9400 Z400 Z600 Z800							

Customer advisories for Red Hat Enterprise Linux Client 5

Use the following tables to determine which advisories are applicable to the RHEL Client 5 workstation.

Table A-3 Customer advisories for Red Hat Enterprise Linux Client 5

Advisory	Update 3	Update 1	Base
/c00910216 (x86_64) xw9400 may panic during install		xw9400	xw9400
/c00910190 (x86) Installed kernel may report less memory than expected			xw4400 xw6400 xw8400 xw9300 xw9400
/c00910967 xw9300 or xw9400 may report time issue with Xen kernel		xw9300 xw9400	xw9300 xw9400
/c00911010 Support for Fully Virtualized guest OS requires BIOS setting		xw4400 xw6400 xw8400 xw9400	xw4400 xw6400 xw8400 xw9400
/c00909919 (x86_64) FX4600 issues with vesa driver			xw4400 xw6400 xw8400 xw9400
/c01160514 X may fail to start with Specific NVIDIA Quadro Graphics Cards and certain Red Hat Linux 32 bit versions		xw4400 xw6400 xw8400	xw4400 xw6400 xw8400
/c01210315 Certain NVIDIA Quadro Graphics Cards may display a Black Screen during Red Hat Enterprise Linux 5 Desktop [x86_64] Install			xw4600 xw9400
/c01210325 Updated NVIDIA Graphics Driver Required for Dual Graphics Cards and Certain Red Hat Linux Versions			xw4600
/c01210413 Black Screen with NVIDIA Quadro FX 4600 or FX 5600 Graphics Card and Red Hat Enterprise Linux 5 [x86_64]			xw4600 xw9400
/c01742190 Linux Operating Systems using NVIDIA Graphics Driver Need to be Upgraded	xw4600 xw6600 xw8600 xw9400 Z400 Z600 Z800		

Table A-3 Customer advisories for Red Hat Enterprise Linux Client 5 (continued)

Advisory	Update 3	Update 1	Base
/c01742190 Linux Operating Systems using NVIDIA Graphics Driver Need to be Upgraded		xw4600	
		xw6600	
		xw8600	
		xw9400	
		Z400	
		Z600	
		Z800	
/c01766812 HP Workstations - Workstations Connected to a Dual Link Monitor or a HP LP3065 Monitor Display Black Screen when Installing the Linux Operating System		xw4600	
		xw6600	
		xw8600	
		xw9400	
		Z400	
		Z600	
		Z800	
/c01766989 HP Z400 and Z600 Workstations - System is Sluggish when Running Red Hat Enterprise Linux 5		Z400	
		Z600	

Customer advisories for SUSE Linux Enterprise Desktop 11

Advisory	Base
/c01742190 HP Z series Workstations - Linux Operating Systems using NVIDIA Graphics Driver Need to be Upgraded	xw4600
	xw6800
	xw9400
	Z400
	Z600
	Z800
/c01742287 HP xw4600 and Z400 Workstations - Configure Audio on HP Workstations running SuSE Linux Enterprise Desktop 11	xw4600
	Z400
/c01766812 HP Workstations - Workstations Connected to a Dual Link Monitor or a HP LP3065 Monitor Display Black Screen when Installing the Linux Operating System	xw4600
	xw6600
	xw8600
	xw9400
	Z400
	Z600
	Z800
/c01766767 HP Workstations - Workstations running SUSE Linux Enterprise Desktop 11 will go to Sleep when Trying to 'Switch Users'	xw4600
	xw6600
	xw8600
	xw9400
	Z400
	Z600
Z800	