

HP StorageWorks

LUN migration and persistence utilities application notes

Legal and notice information

Copyright © 1998-2005 Hewlett-Packard Development Company, L.P
.Copyright © 1998–2005 by QLogic Corp.

Hewlett-Packard Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information, which is protected by copyright. No part of this document may be photocopied, reproduced, or translated into another language without the prior written consent of Hewlett-Packard. The information contained in this document is subject to change without notice.

Linux is a U.S. registered trademark of Linus Torvalds.

Hewlett-Packard Company shall not be liable for technical or editorial errors or omissions contained herein. The information is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Hewlett-Packard Company products are set forth in the express limited warranty statements for such products. Nothing herein should be construed as constituting an additional warranty.

LUN migration and persistence utilities application notes

About this document

This section covers the following topics:

- [Intended audience](#)
- [Other documentation](#)

Intended audience

This document is intended for customers who are using Secure Path 3.0C SP1 for Linux® and want to migrate to the QLogic driver in failover mode.

Other documentation

Other documentation available for the QLogic failover driver includes:

- *Using the QLogic driver for single-path or multi-path failover mode on Linux systems application notes*, part number, AA-RVGWC-TE
- QLogic failover driver documentation that came with your QLogic Host Bus Adapter (HBA) kit

Additional documentation, including white papers and best practices documents, is available on the HP web site: <http://www.hp.com>.

Migrating LUNs from Secure Path to the QLogic failover driver

The Logical unit number (LUN) migration utility is intended to migrate LUNs managed by Secure Path to the QLogic failover driver. This utility enables a smooth transition of devices from Secure Path and ensures that the applications using these devices do not require any configuration changes after removing Secure Path. This utility is qualified for migrating from Secure Path 3.0C SP1.



NOTE:

The `hpdevlabel` utility is used only for the LUN migration and persistence of Linux 2.4 kernels.

The following sections include information about migrating LUNs managed by Secure Path to the QLogic driver in failover mode for 2.4 kernel variants:

- [Migration prerequisites](#)
- [Supported hardware and software](#)
- [Installing the migration utility](#)

Migration Prerequisites

The following conditions *must* be met in order to migrate LUNs from Secure Path to QLogic failover:

- Ensure that all clustering software used is supported by HP and supported with the QLogic failover solution.
- Do not change the SAN configuration during the LUN migration process
- Migrate only hosts connected to HP storage arrays and managed by Secure Path.
- Stop all applications, including daemons, cron jobs, and cluster services, and unmount logical volumes that access the file system on the devices being migrated.
- Identify any dependencies the Storage Area Network (SAN) and applications may have with Secure Path, such as persistent devices created by Secure Path.

Supported hardware and software

Table 1 lists hardware and software supported for LUN migration on 2.4 kernel variants.

Table 1 Supportability matrix

Host feature	Requirement
Operating system	Red Hat Enterprise Linux 2.1 Update6, AS, 32-bit:2.4.9-e.59smp, 2.4.9-e59enterprise
	Red Hat Enterprise Linux 2.1 Update6, AS, 64-bit:2.4.18-e.52smp
	Red Hat Enterprise Linux 3.0 Update4, AS, 32-bit: 2.4.21-27.El.smp, 2.4.21-27.El.hugemem
	Red Hat Enterprise Linux 3.0 Update4, AS, 64-bit: 2.4.21-27.EL
	SUSE Linux Enterprise Server 8/United Linux 1.0, SP3, 32-bit: 2.4.21-261-smp
	SUSE Linux Enterprise Server 8/United Linux 1.0, SP3, 64-bit: 2.4.21-261-itanium2-smp
RAID storage systems	StorageWorks EVA3000 (3.020/3.025), EVA5000 (3.020/3.025) MSA1000/1500 (4.42/4.86)
HBA	FCA2214/FCA2214DC 2-Gb PCI-X and A6826A, driver version 7.00.03 and later.

Installing the migration utility

Use the following steps to install the HP LUN migration utility for Linux 2.4 kernel variants:

1. Log on to the Linux system as superuser (`root`).
2. Copy the `LMPutils.tar.gz` file to a temporary directory.
3. Extract the `hpdevlabel` package by entering the following command:

```
# tar -zxvf LMPutils.tar.gz
```
4. Execute the script `install.sh` by entering the following commands:

```
# cd ./LMPutils  
# ./install.sh
```
5. Enter **1** at the prompt.
6. Follow the instructions displayed at the completion of `install.sh`.

7. Execute the `postinstallscript` (`postinstall.sh`) by entering the following commands:

```
# cd /opt/hp/hp-devlabel
# ./postinstall.sh
```

When you have rebooted the system with the QLogic failover driver, the LUNs managed by Secure Path are successfully migrated. The migration process is complete.
8. Execute `hpdevlabel status` from the command prompt to show the mapping of symbolic links to the kernel named devices.



NOTE:

Installing the HP LUN migration utility creates the `/opt/hp/hp-devlabel` directory and copies the necessary scripts needed for migration. It also copies operating system-specific binaries and scripts to the `/usr/bin/hp` and `/sbin` system directories. All the migrated LUN information for persistence is maintained in `/etc/sysconfig/hpdevlabel`, HP does not recommend that you edit this file. Refer to [Configuring devices using hpdevlabel for 2.4 kernels](#) for how to use the HP LUN migration and persistence utilities.

Adding persistency to the QLogic driver

Linux assigns SCSI device names dynamically whenever a SCSI logical unit is detected during device discovery. These device names such as `/dev/sda`, `/dev/sdb` are mapped to SCSI logical units and can vary across reboots due to any SAN changes.

LUN persistence is the ability of the host to ensure the devices maintain the same name for the SCSI logical units across reboot without getting affected due to the SAN changes. This is accomplished by maintaining the mapping of the device unique identifier with the desired device name in a database.

The following sections provide information about the LUN persistency utility for the QLogic driver in failover mode:

- [Prerequisites](#)
 - [General Prerequisites](#)
 - [Prerequisites for 2.4 Kernels](#)
 - [Prerequisites for 2.6 Kernels](#)
- [Supported hardware and software for Linux 2.4 and 2.6 kernels](#)
- [Installing the persistence utility](#)
- [Removing the migration or persistence utility](#)
- [Configuring devices using hpdevlabel for 2.4 kernels](#)
- [Configuring devices using udev for 2.6 kernels](#)
- [Troubleshooting](#)
- [Limitations of the LUN migration and persistence utilities](#)

Prerequisites

The following conditions *must* be met before installing the LUN persistence utility for QLogic failover.

General Prerequisites

- Ensure that all clustering software is supported by HP and supported with the QLogic failover solution.
- Stop all applications including daemons, cron jobs, and cluster services, and unmount logical volumes that access the file system on the devices being persisted. The configurations of the applications need to be changed to point to the new persistent device name after the actual device is configured for persistence.

Prerequisites for 2.4 Kernels

- If you want persistency for the device partitions, you must install the `partx` utility.

Prerequisites for 2.6 Kernels

- The QLogic driver must be configured as a failover driver.
- The `udev` utility should come bundled with all Linux 2.6 based distributions. However, if that Linux 2.6 distribution is not running the latest version of `udev`, then download `udev` from the following web site: <http://www.us.kernel.org/pub/linux/utils/kernel/hotplug/>
HP recommends installing the most up-to-date hotplug scripts. Hotplug scripts can also be downloaded from the same web site.
- Ensure that Linux 2.6 kernels are enabled with the kernel option `CONFIG_HOTPLUG`. `CONFIG_HOTPLUG` is enabled on default Linux vendor kernels.
- Ensure that the `sysfs` filesystem is mounted.

Supported hardware and software for Linux 2.4 and 2.6 kernels

Table 2 lists hardware and software supported by the HP LUN persistence utilities.

Table 2 Supportability matrix for Linux 2.4 and 2.6 kernels

Package and kernel version	Host feature	Requirement
hpdevlabel Linux Kernel 2.4	Operating system	Red Hat Enterprise Linux 2.1 Update6, AS, 32-bit:2.4.9-e.59smp, 2.4.9-e59enterprise
		Red Hat Enterprise Linux 2.1 Update6, AS, 64-bit:2.4.18-e.52smp
		Red Hat Enterprise Linux 3.0 Update4, AS, 32-bit: 2.4.21-27.Elsm, 2.4.21-27.Elhugemem
		Red Hat Enterprise Linux 3.0 Update4, AS, 64-bit: 2.4.21-27.Elsm
		SUSE Linux Enterprise Server 8/United Linux 1.0, SP3, 32-bit: 2.4.21-261-smp, 2.4.21-261-smp4G
	SUSE Linux Enterprise Server 8/United Linux 1.0, SP3, 64-bit: 2.4.21-261-itanium2-smp	
	RAID storage systems	StorageWorks EVA3000 (3.020/3.025), EVA5000 (3.020/3.025) MSA1000/1500 (4.42/4.86), VA 7100/7110/7400/7410, XP128/1024/12000
hpdevlabel Linux kernel 2.4 and hpudev-cfg Linux kernel 2.6	HBA	FCA2214/FCA2214DC 2-Gb PCI-X and A6826A, driver version 7.00.03 and later.
hpudev-cfg Linux kernel 2.6	Operating system	Red Hat Enterprise Linux 4 (2.6.9-5.El) ia32
		SLES 9 SP1 (2.6.5 - 7-139smp) ia32
	RAID storage systems	StorageWorks EVA3000 (3.020/3.025), EVA5000 (3.020/3.025) MSA1000/1500 (4.42/4.86), VA 7100/7110/7400/7410, XP128/1024/12000

Installing the persistence utility

Choose one of the following Linux kernel distributions and utilities to install HP LUN persistence:

- Use the following procedure to install LUN persistence for Linux 2.4 kernels using hpdevlabel utility:
 1. Log on to the Linux system as superuser (root).
 2. Copy the LMPutils.tar.gz file to a temporary directory.
 3. Extract the hpdevlabel package by entering the following command:
tar -zxvf LMPutils.tar.gz
 4. Execute the install.sh script by entering the following commands:
cd ./LMPutils
./install.sh
 5. Enter **2** at the prompt.



NOTE:

Installing the HP LUN persistence utility copies the necessary scripts needed for persistence into `/opt/hp/hp-devlabel`. It also copies operating system-specific binaries to the `/usr/bin/hp` and `/sbin` system directories. All the migrated LUN information for persistence is maintained in `/etc/sysconfig/hpdevlabel`. HP does not recommend that you edit this file. Refer to [Configuring devices using hpdevlabel for 2.4 kernels](#) for how to use the HP LUN migration and persistence utilities.

- Use the following procedure to install LUN persistence for Linux 2.6 kernels using the `hpudev-cfg` package:
 1. Log on to your Linux system as superuser (`root`).
 2. Install the `udev` utility
 - a. Download `udev-version.tar.gz` from the following web site:
<http://www.us.kernel.org/pub/linux/utils/kernel/hotplug/>
Copy `udev-version.tar.gz` to a directory of your choice.
 - b. Enter the following commands:

```
# tar -zxvf udev-version.tar.gz
# cd udev-version
# make
# make install
```
 3. Copy the `LMPutils.tar.gz` file to a temporary directory.
 4. Enter the following commands to install `hpudev-cfg`:

```
# tar -zxvf LMPutils.tar.gz
# cd ./LMPutils
# ./install.sh
```
 5. Enter **3** at the prompt.
 6. Follow the instructions in the [Configuring devices using udev for 2.6 kernels](#) section to configure HP storage devices for persistence.



NOTE:

Installing the `hpudev-cfg` package creates the `/opt/hp/hpudev-cfg` directory and the copies the necessary scripts needed for persistence. All the LUN information for persistence is maintained in the `.rules` file under the `/etc/udev/rules.d` directory. It creates a rule file `10-HP-Local.rules` in `/etc/udev/rules.d`. You can generate the rule using the `hp_gen_rules` script. For more information about the `udev` utility, refer to the `udev` man pages.

Removing the migration or persistence utility

Select one of the following procedures to remove the HP LUN persistence utility for either Linux 2.4 kernels or Linux 2.6 kernels:

- Use the following procedure to remove Linux LUN migration or persistence for Linux 2.4 kernels using the `hpdevlabel` utility:
 1. Log on to your Linux system as superuser (`root`).
 2. Execute the `uninstall.sh` script located in the `/opt/hp/hp-devlabel` directory:


```
# cd /opt/hp/hp-devlabel
# ./uninstall.sh
```
- Use the following procedure to remove Linux LUN persistence for Linux 2.6 kernels using the `hpudev` utility:
 1. Log on to your Linux system as superuser (`root`).
 2. Enter the following command:


```
# rpm -e hpudev-cfg
```

Configuring devices using `hpdevlabel` for 2.4 kernels

This section describes how to add and remove persistence for LUNs in 2.4 kernels by using `hpdevlabel`.

When you use `hpdevlabel`, symbolic links (aliases) are created. These links can be:

- Regular aliases that point to file system partitions on a device
- Raw partitions on the device
- The device itself

Do not access the device through its `/dev/sdX` name; use the symbolic link instead.

There is no preferred location to store symbolic links. However, HP recommends that you keep them all in the same location to facilitate management.

The following examples show two ways to create symbolic links:

```
hpdevlabel add -d /dev/sdb1 -s /dev/myalias
hpdevlabel add -u UUID -s /dev/myalias
```

The `hpdevlabel add -s /dev/raw/raw1 -d /dev/sda1` command binds raw device `raw1` to partition 1 on the device `/dev/sda1`. If `sda1` moves on the SCSI bus, `hpdevlabel` updates the symlink pointer so that `/dev/raw/raw1` continues to point to the device with UUID defined by `/dev/sda1` when it was added to the database file `/etc/sysconfig/hpdevlabel`.

Use the `hpdevlabel remove -s /dev/myalias` command to remove a symbolic link from the database.



NOTE:

Always inform the system administrator when you add or remove a symbolic link.

Use the `hpdevlabel status` command to view the current status of all symbolic links.

For more information about the `hpdevlabel` command, refer to the `hpdevlabel` man pages.

Configuring devices using `udev` for 2.6 kernels

This section describes how to add and remove persistence for LUNs in 2.6 kernels by using the `udev` utility.

Creating rules for a device

In order to add persistence to a device or LUN, you must create a rule for that LUN. To create a rule you must edit the `/etc/udev/rules.d/10-HP-Local.rules` by using the following steps:

1. Generate a rule for a device using the `hp_gen_rules` script that is delivered as part of the `hpudev-cfg` package. For example: Generate a rule for the device `/sys/block/sda` with `mylink` as the name of the link and enter the following command:

```
# hp_gen_rules sda mylink-sda
```

The following computer output appears:

```
BUS="scsi", KERNEL="sd?", PROGRAM="scsi_id",  
RESULT="360060e80042747000000274700000315",  
NAME="%k", SYMLINK="hpdev/mylink-sda"
```
2. Edit the `/etc/udev/rules.d/10-HP-Local.rules` file by appending the output of 1 to the end of the file.

Creating links for persistence

Select from one of the following options:

- Creating a single link for persistence:
To create a single persistence link, enter the following command:

```
# udevstart
```

The links are created under the directory mentioned in the `udev_root` path variable that is set in `/etc/udev/udev.conf` file. For example the link shown in 1 is created as `$udev_root/hpdev/mylink-sda`.
- Creating multiple links for persistence:
To create multiple links for any device, add space separated names on the corresponding rule in `/etc/udev/rules.d/10-HP-Local.rules`. For example:

```
BUS="scsi", KERNEL="sd?",  
RESULT="360060e80042747000000274700000315",  
NAME="%k", SYMLINK="hpdev/mylink-sda hpdev/myanotherlink-sda"
```

Removing persistence from a device or a LUN

Removing persistence from a device/LUN requires removing the corresponding rule in `/etc/udev/rules.d/10-HP-Local.rules` file. Use the following steps to remove persistence from a device or a LUN:

1. Delete the corresponding link from the `$udev_root` directory. For example
Delete the link `$udev_root/hpdev/mylink-sda`
2. Delete the corresponding rule from the `/etc/udev/rules.d/10-HP-Local.rules` file.
3. Enter the following command to update the persistence links of devices or LUNs:

```
# udevstart
```

Troubleshooting

You can get an error message similar to the following message when you add persistency for device partitions:

```
Uniqueness check failed. The following devices have the same UUID:  
/dev/sdX1  
/dev/sdX2  
Failure.
```

The device UUID for `/dev/sdX1` is identical to other devices on your system. Because of this, you cannot use `hpdevlabel` with this device.

If you get such an error, determine if the `partx` utility, which comes with the `util-linux` package, is installed by entering the following command:

```
# rpm -ql util-linux | grep partx
```

Use the following procedure if `partx` is not installed:

1. Copy the `util-linux` source rpm package from the Linux installation CDs.
2. Install the `util-linux` source rpm package by entering the following command:

```
# rpm -ivh util-linux-version-src.rpm
```
3. Build the `util-linux` source rpm by entering one of the following commands:
 - For Redhat:

```
# cd /usr/src/redhat/SPECS
```
 - For SUSE:

```
# cd /usr/src/package/SPECS
```
4. Finish building the `util-linux` source rpm by entering the following command:

```
# rpmbuild -bb util-linux.spec
```
5. Build the `partx` utility by entering one of the following commands:
 - For Redhat:

```
# cd /usr/src/redhat/BUILD/ util-linux-version/partx
```
 - For SUSE:

```
# cd /usr/src/package/BUILD/util-linux-version/partx
```
 - For all:

```
# make all
```
6. Copy `partx`, `addpart`, and `delpart` to the `/usr/bin/` directory.

Limitations of the LUN migration and persistence utilities

This section describes the limitations of the LUN migration and persistence utilities for either Linux 2.4 kernels or Linux 2.6 kernels.

- For 2.4 kernels using the `hpdevlabel` utility
 - The HP LUN persistence utility is not qualified with the Logical Volume Manager (LVM)
 - The HP LUN persistence utility does not provide an automated way to create persistency for multiple devices at once. Persistency for each device is created individually by entering the following command:

```
# hpdevlabel add
```
 - The HP LUN persistence utility does not provide persistency during system BIOS and Boot Loader startup, because the root file system must be mounted for the HP LUN persistence utility scripts to execute. Ensure that the system can always find the kernel root file system and boot files.
 - Changes in the SAN require a reload of the QLogic driver to establish the changes. Use the `hp_devlabel restart` command to update various symbolic links.
- For 2.6 kernels using the `udev` utility:
 - The `udev` utility is not qualified with the Logical Volume Manager (LVM) and device partition usage.
 - The `udev` utility does not provide persistency during system BIOS and Boot Loader startup, because the root file system must be mounted for the `udev` utility scripts to execute. Ensure that the system can always find the kernel root file system and boot files.