HP-UX Logical Volume Manager and MirrorDisk/UX Release Notes
HP-UX 11i v3 March 2008 (B.11.31)

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Logical Volume Manager and MirrorDisk/UX Release Notes

About this Document

This document provides information about the Logical Volume Manager (LVM) and MirrorDisk/UX products in the March 2008 release of HP-UX 11i v3.

LVM and MirrorDisk/UX Overview

Logical Volume Manager (bundle BaseLVM) is the HP-UX default Volume Manager. It provides the user with flexibility in configuring and managing mass storage resources. In HP-UX 11i v3, the LVM kernel and commands are bundled with the core HP-UX product.

MirrorDisk/UX (bundle B2491BA) is an optionally purchased HP-UX product to enable LVM mirroring functionality.

Overview of Changes

The initial HP-UX 11i v3 release of LVM and MirrorDisk/UX was integrated with the new mass storage stack, delivering significant performance, scalability, availability, and usability enhancements. LVM was enhanced to support larger logical volumes, temporary quiescing of volume groups, and striping with mirroring. Operations that previously required deactivation or re-creation of a volume group—such as replacing a disk, resizing a LUN, and modifying volume group characteristics—can now be performed online.

The March 2008 release of LVM and MirrorDisk/UX extends the limits of mass storage, supporting much larger volume groups, logical volumes, and physical volumes, more mirrors, and simplified volume group creation.

New and Changed Features in This Release

New Features

The following LVM features are new with the March 2008 release of HP-UX 11i v3:

Version 2.0 Volume Groups

LVM and MirrorDisk/UX now support two versions of volume groups.

Version 1.0 is the version supported on all current and previous versions of HP-UX 11i. The procedures and command syntax for managing Version 1.0 volume groups are unchanged from previous releases, except for the enhancements described in "Changed Features" (page 8). When creating a new volume group, vgcreate defaults to Version 1.0.

Version 2.0 enables the configuration of larger volume groups, logical volumes, physical volumes, and other parameters. This version is transparently integrated with nearly all HP-UX subsystems and products. Version 2.0 volume groups can coexist with Version 1.0 volume groups on a server, and are managed exactly like Version 1.0 volume groups, with the following exceptions:

- Version 2.0 volume groups have simpler options to the vgcreate command, as described in "Creating a Version 2.0 Volume Group" (page 6).
- Version 2.0 volume groups are not recognized on previous releases of HP-UX, including versions of HP-UX 11i v3 before March 2008.
- Version 2.0 volume groups do not support root, boot, swap, or dump logical volumes. The lvlnboot and lvrmboot commands display an error message if run on a Version 2.0 volume group.
- Version 2.0 volume groups do not support bootable physical volumes. You cannot add a physical volume created with pvcreate -B to a Version 2.0 volume group.

- Version 2.0 volume groups do not support disk sparing. Using the `-z` option to the `vgextend` or `pvchange` command displays an error message.
- The `pvck` and `vgmodify` commands are not supported on Version 2.0 volume groups.
- Some HP-UX products, as described in "Compatibility Issues" (page 12), do not support Version 2.0 volume groups.

Table 1 compares the configuration limits of Version 1.0 and Version 2.0 volume groups. These limits are independent — for example, a server can be configured with 256 Version 1.0 volume groups and 512 Version 2.0 volume groups at the same time.

Table 1 LVM Volume Group Version Limits

	Version 1.0 Volume Groups	Version 2.0 Volume Groups
Maximum number of volume groups on a system	256	512
Maximum number of physical volumes in a volume group	255	511
Maximum number of logical volumes in a volume group	255	511
Maximum size of a physical volume	2 TB	16 TB
Maximum size of a volume group	510 TB	2048 TB
Maximum size of a logical volume	16 TB	256 TB
Maximum size of a physical extent	256 MB	256 MB
Maximum size of a stripe	32 MB	256 MB
Maximum number of stripes	255	511
Maximum number of logical extents per logical volume	65535	33554432
Maximum number of physical extents per physical volume	65535	16777216
Maximum number of mirror copies (MirrorDisk/UX product required)	2	5

You can display the volume group limits with the `lvmadm` command. For more information, see "`lvmadm` Command" (page 7).

Creating a Version 2.0 Volume Group

Version 2.0 volume groups are easier to configure at creation time than Version 1.0 volume groups. For Version 2.0 volume groups, the `vgcreate` command does not require maximum values for the number of physical volumes (`-p`), number of logical volumes (`-l`), or extents per physical volume (`-e`). Instead you must specify only the extent size (`-s`) and the maximum size to which the volume group can grow (`-S`). This gives LVM greater flexibility in managing space; you can use the same parameters for a volume group with many small PVs and for a volume group with a few large PVs. For example:

```
# vgcreate -V 2.0 -s pe_size -S vg_size /dev/vgname list_of_PVs
```

You must use all of the following options:

`-V 2.0`	Version 2.0 volume group
`-s pe_size`	Size of a physical extent in MB
`-S vg_size`	Maximum future size of the volume group
	The size of a volume group is the sum of the user data space on all physical volumes assigned to the volume group. `vg_size` is not the size of the volume group at creation; it is the size to which the volume group can grow in the future. This value can be specified in megabytes, gigabytes, terabytes, or petabytes, by adding the character `m`, `g`, `t`, or `p`, respectively. For example, to specify a maximum size of two terabytes, use `-S 2t`.

The number of physical extents in a volume group has an architectural limit, so your choice of physical extent size affects the maximum size of the volume group. To display the maximum volume group size for a given physical extent size, use the -E option to vgcreate with the -s option. For example:

```
# vgcreate -V 2.0 -E -s 256
Max_VG_size=2p:extent_size=256m
```

Conversely, to display the minimum physical extent size for a given volume group size, use the -E option to vgcreate with -S. For example:

```
# vgcreate -V 2.0 -E -S 2t
Max_VG_size=2t:extent_size=1m
```

For more information about Version 2.0 volume groups, see the white paper *LVM 2.0 Volume Groups in HP-UX 11i v3* described in "Related Documentation" (page 13).

lvmadm Command

This release introduces the lvmadm command, which displays the volume group limits shown in Table 1 (page 6). For example, to show the Version 1.0 volume group limits, enter the following:

```
# lvmadm -t -V 1.0
--- LVM Limits ---
VG Version                 1.0
Max VG Size (Tbytes)       510
Max LV Size (Tbytes)       16
Max PV Size (Tbytes)       2
Max VGs                    256
Max LVs                    255
Max PVs                    255
Max Mirrors                2
Max Stripes                255
Max Stripe Size (Kbytes)   32768
Max LXs per LV             65535
Max PXs per PV             65535
Max Extent Size (Mbytes)   256
```

For more information, see *lvmadm*(1M).

Changed Features

The following features have changed in the March 2008 release of LVM and MirrorDisk/UX:

vgcreate Autocreation of Volume Group File

The `vgcreate` command now automatically creates the device file /dev/*vgname*/group to manage the volume group, regardless of the volume group version.

If you want to specify the minor number of the group file, create /dev/*vgname*/group before running the `vgcreate` command. To create the volume group device file, follow these steps:

1. Create a directory for the volume group. For example:

    # **mkdir /dev/*vgname***

    By convention, *vgname* is vg*nn*, where *nn* is a unique number across all volume groups. However, you can choose any unique name up to 255 characters.

2. Create a device file named `group` in the volume group directory with the `mknod` command. For example:

    # **mknod /dev/*vgname*/group c *major minor***

    The `c` following the device file name specifies that `group` is a character device file.

    major is the major number for the `group` device file. For a Version 1.0 volume group, it is 64. For a Version 2.0 volume group, it is 128.

    minor is the minor number for the `group` file in hexadecimal. For a Version 1.0 volume group, *minor* has the form 0x*nn*0000, where *nn* is a unique number across all Version 1.0 volume groups. For a Version 2.0 volume group, *minor* has the form 0x*nnn*000, where *nnn* is a unique number across all Version 2.0 volume groups.

    For more information on `mknod`, see *mknod*(1M); for more information on major numbers and minor numbers, see *HP-UX System Administrator's Guide: Logical Volume Management*.

vgremove Removal of Volume Group File

The `vgremove` command now supports a `-X` option to remove the volume group device files in /dev.

Display Enhancements

The `lvdisplay`, `pvdisplay`, `vgdisplay` and `vgcfgrestore` commands display additional information.

*   `vgdisplay` displays the volume group version, the maximum size to which the volume group can grow, and the maximum number of physical extents. For example:

```
# vgdisplay vg00
--- Volume groups ---
VG Name                     /dev/vg00
VG Write Access             read/write
VG Status                   available
Max LV                      255
Cur LV                      7
Open LV                     7
Max PV                      16
Cur PV                      1
Act PV                      1
Max PE per PV               4328
VGDA                        2
PE Size (Mbytes)            16
Total PE                    4319
Alloc PE                    4318
Free PE                     1
Total PVG                   0
```

```
Total Spare PVs              0
Total Spare PVs in use       0
VG Version                   1.0
VG Max Size                  1082g
VG Max Extents               69248
```

- lvdisplay displays the logical extent status for up to six physical extents, to accommodate the increased mirror copies for Version 2.0 volume groups.
- pvdisplay with the -d option displays the offsets to the start and end of the user data in 1KB blocks from the beginning of the physical volume. For example:

```
# pvdisplay -d /dev/disk/disk201_p2
--- Physical volumes ---
PV Name                      /dev/disk/disk201_p2
VG Name                      /dev/vg00
PV Status                    available
Allocatable                  yes
VGDA                         2
Cur LV                       7
PE Size (Mbytes)             16
Total PE                     4319
Free PE                      1
Allocated PE                 4318
Stale PE                     0
IO Timeout (Seconds)         default
Autoswitch                   On
Data Start                   2912
Data End                     70765408
Boot Disk                    yes
Relocated Blocks             0
Proactive Polling            On
```

In this example, physical extent 0 starts at block 2912 and the last physical extent ends at block 70765408.

- vgcfgrestore with the -v option displays the volume group version. For a Version 2.0 volume group, it displays the maximum size to which the volume group can grow. For example:

```
# vgcfgrestore -n /dev/vg1 -v -l
Volume Group Configuration information in "/etc/lvmconf/vg1.conf"
VG Name /dev/vg1
 ---- Physical volumes : 1 ----
     PV          Type        Size (kb)         Start (kb)    PVkey
     disk23   Non-Boot        512640           1024           0

max_pv 511  max_pe 256 max_lv 511 vg_version 2.0 vg_size 1g
```

MirrorDisk/UX Operating Environment

MirrorDisk/UX is now delivered as an optional product in the HP-UX 11i v3 BOE, VSE-OE, HA-OE, and DC-OE.

Deprecated or Obsolete Features

The following features are deprecated or obsolete with the March 2008 release of HP-UX 11i v3:

Obsolete Command Options for Version 2.0 Volume Groups

The following LVM command options are obsolete. Using them with Version 2.0 volume groups either displays an error message and fails, or displays a warning message and ignores the option.

`vgcfgrestore`	`-F` option displays a warning.
`vgcreate`	`-e`, `-l`, `-p`, `-f` options all display an error.
`vgextend`	`-f` and `-z n` options display a warning.
`pvchange`, `vgextend`	`-z y` option displays an error.
`pvchange`	`-z n` option displays a warning.
`pvcreate`	`-s` option displays a warning.
`lvcreate`, `lvextend`, `lvreduce`, `lvchange`	`-r` option displays a warning.

Known Problems Fixed in This Version

The following table lists the known LVM and MirrorDisk/UX problems fixed in the March 2008 release of HP-UX 11i v3.

Table 2 LVM Fixes in HP-UX 11i v3 March 2008

Defect ID	Description
QXCR1000587682	When booting in Maintenance Mode, the root volume group fails to activate and displays the message: `vgchange: Couldn't activate volume group "vg00": Invalid argument`
QXCR1000765832	The `pvck` command may core dump if the disk contains partial LVM metadata
QXCR1000765849	The `vgcfgrestore` command may core dump if the backup file is corrupt

Known Problems and Limitations

No known problems were identified for this release of LVM and MirrorDisk/UX.

Installation Requirements

This section describes the installation requirements for this release.

Required Hardware

LVM and MirrorDisk/UX have no hardware requirements beyond the requirements of the HP-UX 11i v3 operating system. Both products run on all supported HP 9000 and HP Integrity servers.

Required Software

Since LVM is installed with the HP-UX 11i v3 operating environment, there are no software requirements beyond the requirements of the HP-UX 11i v3 operating system.

MirrorDisk/UX requires the BaseLVM product.

Required Patches

For each of the following subsystems, you can download patches from the following website:

http://www2.itrc.hp.com/service/patch/mainPage.do

Mass Storage Critical Resource Analysis

The Mass Storage Critical Resource Analysis (MS CRA) tool checks for a maximum of two mirror copies of a logical volume. However, Version 2.0 volume groups allow up to five mirror copies. To enable MS CRA to check for a maximum of five mirror copies of a volume, you must install the following patch:

- PHCO_37562

`mkfs` and `mkboot` Commands

The `mkfs` and `mkboot` commands check whether a specified disk device is being used by LVM; if so, they display an error message. For these commands to correctly check whether a device is part of a Version 2.0 volume group, you must install the following patches:

- PHCO_37328
- PHCO_37340
- PHCO_37394

These patches are delivered in the `FEATURE11i` bundle.

Serviceguard

To support Version 2.0 volume groups, Serviceguard 11.18 requires the following patch:

- PHSS_37602

VxVM 4.1 Commands

Several VxVM 4.1 commands check whether a specified disk device is being used by LVM before overwriting it. For these commands to correctly check whether a device is part of a Version 2.0 volume group, you must install the following patch:

- PHCO_37836

Required Disk Space

Since LVM is installed with the HP-UX 11i v3 operating environment, it consumes no additional disk space.

MirrorDisk/UX consumes no additional disk space aside from a license key.

Compatibility Issues

This release is specific for HP-UX 11i v3 (B.11.31). The following compatibility issues exist in the March 2008 release of HP-UX 11i v3.

Version 2.0 Volume Groups

- Version 2.0 volume groups are not recognized on previous releases of HP-UX, including previous versions of HP-UX 11i v3. Version 1.0 volume groups are supported on all supported versions of HP-UX, including 11i v1, 11i v2, and 11i v3.
- There is currently no method for converting a volume group *in place* from one version to another. To migrate a Version 1.0 volume group to Version 2.0, you must create a new Version 2.0 volume group and copy the data.
- The following HP-UX products do not currently support Version 2.0 volume groups:
  - HP Process Resource Manager (HP PRM)
  - Encrypted Volume and File System (EVFS v1.0)

  These products plan to add support of Version 2.0 volume groups. For the most recent information on these products, see the IT Resource Center (ITRC) at http://itrc.hp.com, or consult the release notes for the specific product.

Moving from HP-UX 11i v2 to HP-UX 11i v3

If you are migrating a system from HP-UX 11i v2 to HP-UX 11i v3, please refer to the LVM migration white paper described in the "Related Documentation" section. It contains information on migrating an LVM configuration from the legacy naming model to the agile naming model.

Existing LVM configurations created on HP-UX 11i v2 continue to work on HP-UX 11i v3 under the legacy naming model. However, there is a change in behavior:

- **Alternate Links (PVLinks)**: In HP-UX 11i v3, management of multi-pathed devices is available outside of LVM using the next generation mass storage stack. By default, the next generation mass storage stack distributes I/O requests across all available paths to a multi-pathed disk, even when using legacy device special files. Using LVM with persistent or legacy device special files may cause I/O requests to be sent across alternate links, even if the links are not configured as PVLinks; this should not introduce any errors, but it does differ from PVLink behavior in previous releases.

  HP recommends converting volume groups with multi-pathed disks to persistent device special files and native multi-pathing, as described in the migration white paper in "Related Documentation".

  However, if you want backward-compatible PVLink behavior, you must use legacy device special files for physical volumes, and disable the mass storage stack multi-pathing for those physical volumes. To disable multi-pathing on legacy device special files, use the `scsimgr` command to configure a global device tunable called `leg_mpath_enable`.

  For each multi-pathed disk, enter the following command:

  ```
  # scsimgr save_attr -D /dev/rdisk/diskn -a leg_mpath_enable=false
  ```

  Alternatively, you can disable multi-pathing for all legacy device files with this command:

  ```
  # scsimgr save_attr -a leg_mpath_enable=false
  ```

  Note that this has no effect on multi-pathing through persistent device special files. For more information, see *scsimgr*(1M).

Moving Volume Groups from HP-UX 11i v3 to Previous HP-UX Releases

If a volume group used on HP-UX 11i v3 is accessed from a system running a previous release of HP-UX 11i, you may encounter these compatibility issues:

- **Version 2.0 volume groups**: As noted in "Version 2.0 Volume Groups" (page 12), Version 2.0 volume groups are not recognized on previous releases of HP-UX.
- **Logical volumes larger than 2 TB**: Releases prior to HP-UX 11i v3 can only access data within the first 2 TB of a logical volume. If a logical volume larger than 2 TB is created on HP-UX 11i v3, its use is not recommended on any previous HP-UX release. The volume group can be activated and the logical volume can be used, but any data in that logical volume beyond 2 TB will be inaccessible.

NOTE: Patches PHKL_36745 and PHCO_36746 resolve this compatibility issue for HP-UX 11i v2. Installing these patches enables the creation and use of logical volumes up to 16 TB.

- **Striped Mirrors**: Releases prior to HP-UX 11i v3 only support extent-based striping via the `-D` option to `lvcreate`. If a logical volume using simultaneous mirroring and non-extent-based striping is created on HP-UX 11i v3, attempts to import or activate its associated volume group will fail on a previous HP-UX release. To import the volume group, you must remove the incompatible logical volumes or reduce them to a single mirror.

NOTE: Patches PHKL_36745 and PHCO_36746 resolve this compatibility issue for HP-UX 11i v2. Installing these patches enables the creation and use of striped mirrors.

- **Mirror Write Cache (MWC)**: When a volume group containing a logical volume using the Mirror Write Cache is activated on HP-UX 11i v3, its Mirror Write Cache format is converted to a new format. Importing or activating the volume group on a previous HP-UX release does not recognize the new format and triggers a full resynchronization of the mirrors.

NOTE: PHKL_36244 adds support for the new MWC format to HP-UX 11i v2. Installing that patch avoids the unnecessary resynchronization.

Related Documentation

The latest documentation for LVM is available in English at http://docs.hp.com in the *HP-UX Operating Environment* collection. Available documents include:

- *HP-UX Logical Volume Manager and MirrorDisk/UX Release Notes* (this version and previous versions)
- *HP-UX System Administrator's Guide: Logical Volume Management* (this document is localized)
- *LVM 2.0 Volume Groups in HP-UX 11i v3*
- *LVM Limits*
- *LVM Migration from Legacy to Agile Naming Model: HP-UX 11i v3*
- *LVM Online Disk Replacement (LVM OLR)*
- *LVM Volume Group Dynamic LUN expansion (DLE) / vgmodify*
- *LVM Volume Group Quiesce/Resume*
- *SLVM Single-Node Online Reconfiguration (SLVM SNOR)*
- *When Good Disks Go Bad: Dealing with Disk Failures under LVM*

Software Availability in Native Languages

The commands delivered with LVM and MirrorDisk/UX support localized message catalogs. The kernel components which generate messages directly to the console and the system log are available only in the English language.

LVM and MirrorDisk/UX manpages are available in English and Japanese. The *HP-UX System Administrator's Guide: Logical Volume Management* is available in English, French, German, Italian, Japanese, Korean, Spanish, Simplified Chinese, and Traditional Chinese. These documents are on http://docs.hp.com.