

Novell Linux Volume Manager Reference

Open Enterprise Server 11 SP3

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About This Guide

The Novell Linux Volume Manager (NLVM) allows you to use NetWare partitions on a Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) server. This guide describes NLVM and how to use it with Novell Storage Services (NSS) file systems, Linux POSIX file systems, and Novell Cluster Services.

- ◆ Chapter 1, “Overview of NLVM,” on page 9
- ◆ Chapter 2, “What’s New or Changed in Novell Linux Volume Manager,” on page 11
- ◆ Chapter 3, “Installing or Upgrading NLVM,” on page 19
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Audience

This guide is intended for storage and cluster administrators.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation.

Documentation Updates

For the most recent version of the *OES 11 SP3: NLVM Reference*, visit the [OES 11 SP3 website \(http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html\)](http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html).

Additional Documentation

For documentation on OES 11 SP3, see the [OES 11 SP3 Documentation website \(http://www.novell.com/documentation/oes11/\)](http://www.novell.com/documentation/oes11/).

1 Overview of NLVM

The Novell Linux Volume Manager (NLVM) provides management of Novell Storage Services (NSS) storage objects in Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3). The command line interface (CLI) commands can be used in a Linux console or in a script. The NSS management tools use the NLVM library of APIs to create and manage NSS storage objects. NLVM also provides options to create Linux POSIX file systems, such as Btrfs, Ext2, Ext3, ReiserFS, and XFS.

This command reference describes how to use command line commands to manage the following storage objects:

- ◆ [Devices and Partitions](#)
- ◆ [Linux POSIX Volumes](#)
- ◆ [NSS Pools](#)
- ◆ [NSS Pool Snapshots](#)
- ◆ [NSS Software RAIDs](#)
- ◆ [NSS Volumes](#)

2 What's New or Changed in Novell Linux Volume Manager

This section describes the changes made to Novell Linux Volume Manager (NLVM) since the Novell Open Enterprise Server (OES) 11 release.

- ◆ [Section 2.1, “What’s New \(OES 11 SP3\),” on page 11](#)
- ◆ [Section 2.2, “What’s New \(OES 11 SP2\),” on page 11](#)
- ◆ [Section 2.3, “What’s New \(OES 11 SP1\),” on page 15](#)
- ◆ [Section 2.4, “What’s New \(OES 11\),” on page 17](#)

2.1 What’s New (OES 11 SP3)

Besides bug fixes, there are no other changes for this component.

2.2 What’s New (OES 11 SP2)

Novell Linux Volume Manager (NLVM) supports OES 11 SP2 file systems running on 64-bit SUSE Linux Enterprise Server (SLES) 11 SP3. For information about NLVM commands and usage, see the [OES 11 SP2: NLVM Reference \(http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html\)](http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html).

In addition to bug fixes, the following changes and enhancements were made to NLVM in the OES 11 SP2 release:

General

- ◆ **Novell Type Partitions:** NetWare type partitions are now referred to as Novell type partitions in guides, help, and error messages.
- ◆ **NLVM options:** The following enhancements were made to [NLVM Options \(http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvmopt.html\)](http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvmopt.html):
 - ◆ NLVM options can appear in any order in the command after `nlvm`. Previously, the NLVM options had to follow immediately after `nlvm`.
 - ◆ The `--terse` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvmopt.html#nlvmopt_terse) option can be used with `nlvm list` commands to display the output in a format for parsing. Values are labeled in the format `ParameterName=value`. Information about a storage object is output in a single line. If the target object contains storage objects (such as partitions on a device or segments in a software RAID), subsequent lines contain information about each of its member objects.
- ◆ **Common options:** The common options `more` and `all` were added for use with the following `nlvm list` commands to provide additional details beyond the standard output. You can use them with or without the `--terse` NLVM option.

```

nlvm [-t] list devices [exclude] [more|all]
nlvm [-t] list linux volumes [more|all]
nlvm [-t] list moves [more|all]
nlvm [-t] list partitions [device] [mask] [more|all]
nlvm [-t] list pools [exclude] [more|all]
nlvm [-t] list snaps [more|all]
nlvm [-t] list volumes [more|all]

```

See “Common Options” (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvm_common_options.html).

- ♦ **Viewing Error Code Messages:** The NSS utility now provides an `/err` switch that can be used from the command prompt. You can use this option to view an error message if a failed NLVM command line operation provides an error code without a corresponding message.

```
nss /err=<error_code_number>
```

For information about error codes, see “NLVM Error Codes” (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvm_ec.html).

Availability for prior releases: November 2012 Scheduled Maintenance for OES 11 SP1

Devices

- ♦ **Unsharing a device:** The `nlvm unshare <device_name>` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/unshare.html) command allows you to disable the Shareable for Clustering state for a device without stopping Novell Cluster Services on the node. The command fails if the device contributes space to an SBD partition, or to a shared pool or a cluster-enabled pool that is used in any cluster resource. Previously, it was necessary to temporarily stop Novell Cluster Services in order to unshare a device after you disabled clustering for a pool.

Partitions

- ♦ **Creating a partition:** The `type=<partition_type>` option in the `nlvm create partition` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_part.html) command added support for partition type 1ac for snap partitions.

Linux Volumes

- ♦ **Creating a Linux volume:** The following enhancements and changes were made to the `nlvm create linux volume` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_lxvol.html) command:
 - ♦ **Devices option:** The `device=<device_name>` option was modified to allow you to alternatively specify a shared device with no data partitions or an uninitialized device for a clustered LVM volume. Previously, you could specify only an unshared initialized device.
 - ♦ **Partition option:** The `part=<partition_name>` option allows you to specify an existing partition as the location for a non-clustered Linux volume. It can be used instead of the `device` and `size` options.
 - ♦ **Size:** The minimum size for a Linux volume was increased from 1 MB to 8 MB. This change is consistent with the minimum size allowed in NSSMU.
 - ♦ **NCP volume ID for clustered LVM volumes:** The `valid=<ncp_volume_id>` option can be used in combination with the `shared` and `ncp` options to specify an NCP volume ID for an NCP-enabled clustered LVM volume. If the `valid` option is not used, an ID is automatically assigned by Novell Cluster Services when the resource is created. This allows you to assign an NCP volume ID that is unique across all nodes in a cluster, and across all nodes in every peer cluster in a Business Continuity Cluster.

- ♦ **Enforcing name restrictions for NCP-enabled LVM volumes:** For NCP-enabled LVM volumes, the `nlvm create linux volume` command has been modified to enforce the NCP length restriction of 14 characters, and to use uppercase letters for the name in the Novell Cluster Services cluster resource scripts for a cluster-enabled LVM volume. Previously, a new LVM volume cluster resource would go comatose immediately after creation if the name specified with the `NCP_VOLUME` parameter in the script was more than 14 characters, or if it included lowercase letters.

Availability for prior releases: November 2012 Scheduled Maintenance for OES 11 SP1

- ♦ **Linux POSIX Volumes Are Not Supported on NSS Software RAIDs:** Linux POSIX file systems should not be created on NSS software RAIDs. NLVM commands have been modified to block NSS software RAIDs from being used as a device when you create a Linux POSIX volume.

Availability for prior releases: September 2012 Scheduled Maintenance for OES 11 and OES 11 SP1

- ♦ **Listing details for a Linux volume:** The `nlvm list linux volume <lx_volume_name>` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_lxvol.html) command displays detailed information for a specified Linux volume.
- ♦ **Mounting a Linux volume:** The `nlvm linux mount <lx_volume_name>` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/linux_mount.html) command allows you to mount non-LVM and LVM volumes in Linux using the mount parameters stored in the `/etc/fstab` file. You can optionally specify the mount options. If the Linux volume is NCP-enabled, it also automatically mounts the volume for NCP, and NCP assigns it a volume ID.
- ♦ **Unmounting a Linux volume:** The `nlvm linux unmount <lx_volume_name>` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/linux_unmount.html) command allows you to unmount non-LVM and LVM volumes in Linux. If the Linux volume is NCP-enabled, it also automatically dismounts the volume for NCP before it dismounts it in Linux.

NSS Pools and Volumes

- ♦ **Creating a volume:** The `valid=<ncp_volume_id>` option in the `nlvm create volume` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_vol.html) command can be used in combination with a clustered NSS pool to assign an NCP volume ID for a clustered NSS volume. If the `valid` option is not used, an ID is automatically assigned by Novell Cluster Services when the resource is created. This allows you to assign an NCP volume ID that is unique across all nodes in a cluster, and across all nodes in every peer cluster in a Business Continuity Cluster.
- ♦ **Listing attributes for an NSS volume:** The `nlvm list volumes` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_vols.html) command displays attribute information for NSS volumes when you use the `more` or `all` option.
- ♦ **Logging NCP and NSS volume dismounts:** NCP Server has been modified to automatically log dismounts of NSS volumes and NCP volumes.
Availability for prior releases: January 2013 Scheduled Maintenance for OES 11 and OES 11 SP1
- ♦ **Pausing a pool move:** The `nlvm move` command uses NSS software RAID mirroring underneath to copy the data to the target location. If server performance is too slow during a move, you can temporarily pause the mirroring with the `nlvm pause move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/pause_move.html) command. While the move is paused, the pool move status is reported as `Not Enabled`.
- ♦ **Resuming a pool move:** If you have paused a pool move, you can resume the mirroring with the `nlvm resume move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/resume_move.html) command. The pool move continues from where it was paused.

- ◆ **Unmounting a pool:** The `nlvm unmount <poolname>` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/unmount.html) command has been modified to additionally remove the Device Mapper object for the pool, the link to the Device Mapper object, and the mount point for the pool. This allows you to gracefully log out of the server from an iSCSI device that contains a pool.

See “Logging Out of an iSCSI Device that Contains an NSS Pool” (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/b13pzlj1.html).

Availability for prior releases: January 2013 Scheduled Maintenance for OES 11 and OES 11 SP1

NSS Pool Snapshots

- ◆ **Creating a snapshot:** The following enhancement and change were made for the `nlvm create snap` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_snap.html) command:
 - ◆ **Partition option:** The `part=<snap_partition>` option allows you to specify an existing snap partition as the target location for an NSS pool snapshot. It can be used instead of the `device` and `size` options.
 - ◆ **Size:** The minimum snapshot size was increased from 1 MB to 50 MB. This change is consistent with the minimum size allowed in NSSMU.

NSS Software RAIDs

- ◆ **Creating an NSS software RAID:** The following enhancements and changes were made to the `nlvm create raid` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_raid.html) command:
 - ◆ **Mirroring an Existing Partition:** The following options have been modified:
 - ◆ **Name option:** The `name` option is mandatory except when you mirror an existing SBD partition. If you specify a name (which should be the cluster name), the RAID1 is given that name. If the name is not specified, the RAID1 name defaults to the SBD partition’s name.
 - ◆ **Type option:** The `type` option is optional when you mirror an existing NSS or SBD partition. It uses the type of the existing partition.

Availability for prior releases: November 2012 Scheduled Maintenance for OES 11 and OES 11 SP1

- ◆ **Mirroring MSDOS Devices:** The command has been modified to transparently accommodate the metadata size differences required by GPT and MSDOS partitioned devices. When mirroring a pool that consumes an entire MSDOS partitioned disk, you can use an MSDOS or GPT partitioned device of the same size. Previously, the GPT device had to be at least 4 MB larger than the MSDOS partitioned device.

Availability for prior releases: November 2012 Scheduled Maintenance for OES 11 and OES 11 SP1

- ◆ **Renaming an NSS software RAID:** The `nlvm rename raid` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/rename_raid.html) command is new. Use this command to rename a specified NSS software RAID device.

Availability for prior releases: September 2012 Scheduled Maintenance for OES 11 and OES 11 SP1

2.3 What's New (OES 11 SP1)

Novell Linux Volume Manager (NLVM) supports OES 11 SP1 file systems running on 64-bit SUSE Linux Enterprise Server (SLES) 11 SP2. For information about NLVM commands and usage, see the [OES 11 SP1: NLVM Reference \(http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html\)](http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html).

In addition to bug fixes, the following changes and enhancements were made in the OES 11 SP1 release:

General

- ◆ **Sizes:** The following enhancements are available for the `size` option:
 - ◆ The default multiplier for sizes was changed from M (megabytes) to G (gigabytes). If no multiplier is provided, the value is assumed to be in gigabytes. For example:

```
size=20 (20 gigabytes is used)
```
 - ◆ Use the T multiplier to specify sizes in terabytes (TB).
 - ◆ All sizes can be entered as whole numbers or with fractional parts such as 200.45G and 3.98T.
- ◆ **Multiple Devices:** You can specify multiple devices for the following commands:
 - ◆ **Init:** You can specify multiple devices to be initialized at the same time. Each device is formatted with the same specified partitioning scheme and share state.
 - ◆ **Share:** You can specify multiple devices to be shared at the same time.
 - ◆ **Unshare:** You can specify multiple devices to be unshared at the same time.
- ◆ **Multiple Device and Size Instances:** You can specify multiple device and size instances for the following commands. Each device entry must have a corresponding size entry.
 - ◆ **Create Pool:** You can specify multiple device and size instances to be used for a new pool.
 - ◆ **Expand Pool:** You can specify multiple device and size instances to be added to an existing pool.
- ◆ **Confirmation Prompt:** You are automatically prompted to confirm actions for certain commands that destroy data, such as when you initialize a device or delete Linux POSIX volumes, pool moves, partitions, pools, RAID, RAID segments, snapshots, and NSS volumes.
- ◆ **No Prompt:** The `--no-prompt` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/nlvmopt.html#nlvmopt_noprompt) NLVM option can be used with certain commands to prevent a confirmation message from being displayed, such as when you initialize a device or delete Linux POSIX volumes, pool moves, partitions, pools, RAID, RAID segments, snapshots, and NSS volumes.

Linux Volumes

- ◆ **Create Linux Volume:** The following enhancements were made for the `nlvm create linux volume` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_lxvol.html) command:
 - ◆ **Btrfs:** Support was added for the Btrfs file system. The Btrfs file system is now available as an alternative to other supported file systems (Ext2, Ext3, Reiserfs, and XFS) when you create a Linux volume. The `btrfsprogs` package is required. You can use NSSMU or NLVM to manage the Btrfs volumes as you would manage other Linux data volumes. Btrfs volumes can also be configured for NCP file access and for clustering with Novell Cluster Services.

- ◆ **NCP option:** The `ncp` option for the `nlvm create linux volume` command can be used to enable the Linux POSIX file system on the volume to be accessed with the NetWare Core Protocol (NCP).

When you enable NCP for a Linux volume, an NCP volume of the same name (using all capital letters) is created. An NCP share is created at the root of the Linux volume. For clustered LVM volumes, the NCP Virtual Server object is automatically created and the NCP mount, dismount, and status commands are added to scripts for the LVM volume group cluster resource.

- ◆ **List Linux Volumes:** The `nlvm list linux volumes` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_lxvol.html) command displays NCP if the Linux volume is enabled for NCP.

NSS Pools and Volumes

- ◆ **Create Pool:** The following enhancements were made for the `nlvm create pool` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_pool.html) command:
 - ◆ **Device and Size:** You can specify multiple device and size instances to be used for a new pool. Each device entry must have a corresponding size entry.
 - ◆ **CIFS Virtual Server Name:** When creating a cluster enabled NSS pool, the default CIFS virtual server name is based on the NCP virtual server name.
- ◆ **Expand Pool:** The `nlvm expand pool` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/expand_pool.html) command allows you to specify multiple device and size instances to be added to an existing pool. Each device entry must have a corresponding size entry.
- ◆ **List Move:** The following enhancements have been made to the `nlvm list move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_move.html) command:
 - ◆ You can alternatively specify the pool name instead of the pool move name.
 - ◆ The display includes the names of the devices that are being used in the move with the `from` parameter and `to` parameter.
 - ◆ The concept of *move blocks* has been renamed as *regions*.
 - ◆ The `complete` parameter (formerly the `percentage` parameter) displays the number of regions moved so far and the percentage of regions moved so far.
- ◆ **Delete Move:** The following enhancements were made for the `nlvm delete move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/delete_move.html) command:
 - ◆ You can alternatively specify the pool name instead of the pool move name.
 - ◆ The `abort` option has been deprecated.

The `nlvm delete move` command deletes the move request, returns the pool to its original location, and removes the new location. You can delete the move at any time while the move is in progress, even if it is pending only the `nlvm complete move` command to be finalized.
- ◆ **Rename Volume:** You can use the `nlvm rename volume` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/rename_volume.html) command to rename a specified NSS volume. This option is new.

2.4 What's New (OES 11)

The Novell Linux Volume Manager (NLVM) replaces the Enterprise Volume Management System (EVMS) for the management of Novell Storage Services (NSS) storage objects in Novell Open Enterprise Server (OES) 11. For information about NLVM commands and usage, see the [OES 11: NLVM Reference](http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html) (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/bookinfo.html).

NLVM provides the same media management functionality that was used by NSS in EVMS, and makes the following enhancements for OES 11:

- ♦ **Initialize a Device with a DOS or GPT Partitioning Scheme:** The `nlvm init` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/init_device.html) command allows you to specify partitioning scheme format of MS-DOS (the default) or GPT. MS-DOS has a 2 TB size limit. Devices of any size can be configured with GPT.
- ♦ **8 TB Device Size for Pools:** The `nlvm create pool` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_pool.html) command allows you to use devices up to 8 TB in size. The maximum pool size is 8 TB. Previously, pools could use devices of up to 2 TB in size.
- ♦ **Move Pool:** The `nlvm move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/move_pool.html) command allows you to move an NSS pool from one location to a new location on the same system.

See also the related commands:

- ♦ `nlvm complete move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/complete_move.html)
- ♦ `nlvm delete move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/delete_move.html)
- ♦ `nlvm list move` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_move.html)
- ♦ `nlvm list moves` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/list_moves.html)
- ♦ **Rescan:** The `nlvm rescan` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/rescan.html) command performs a rescan of the storage objects (such as partitions, NSS pools, and NSS software RAIDs) on known devices, and creates or updates any Device Mapper device or partition objects as needed.
- ♦ **Expand Partition:** The `nlvm expand partition` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/expand_part.html) command allows you to expand a partition by using free contiguous space that follows the partition.
- ♦ **Create Linux Volume:** The `nlvm create linux volume` (http://www.novell.com/documentation/oes11/stor_nlvm_lx/data/create_lxvol.html) command allows you to create a volume with a Linux POSIX file system. The volume can be created as a traditional Linux volume or as a Linux Logical Volume Manager 2 (LVM2) volume on an LVM2 volume group. If the device is shared with nodes in a Novell Cluster Services cluster, you can cluster-enable the LVM2 volume group.

3 Installing or Upgrading NLVM

The Novell Linux Volume Manager command line tool and libraries are installed and upgraded by default whenever you install or upgrade Novell Storage Services (NSS) on your Novell Open Enterprise Server (OES) 11 (or later) server. No action is required.

For information about installing NSS on your OES 11 (or later) server, see “[Installing and Configuring Novell Storage Services](#)” in the *OES 11 SP3: NSS File System Administration Guide for Linux*.

For general information about installing, upgrading, and patching OES Services on your OES 11 (or later) server, see the *OES 11 SP3: Installation Guide*.

4 Using NLVM in a Virtualized Environment

The Novell Linux Volume Manager (NLVM) utility runs in a virtualized environment just as it does on a physical server running Novell Open Enterprise Server 11 and later, and requires no special configuration or other changes.

- ♦ For information on setting up virtualized OES 11, see “[Installing, Upgrading, or Updating OES on a VM](#)” in the *OES 11 SP3: Installation Guide*.
- ♦ To get started with Xen virtualization, see the [Virtualization with Xen documentation \(http://www.suse.com/documentation/sles11/book_xen/data/book_xen.html\)](http://www.suse.com/documentation/sles11/book_xen/data/book_xen.html).
- ♦ To get started with KVM virtualization, see the [Virtualization with KVM documentation \(http://www.suse.com/documentation/sles11/book_kvm/data/book_kvm.html\)](http://www.suse.com/documentation/sles11/book_kvm/data/book_kvm.html).
- ♦ To get started with third-party virtualization platforms, such as Hyper-V from Microsoft and the different VMware product offerings, refer to the documentation for the product you are using.

For information about using the Novell Linux Volume Manager for Novell Storage Services (NSS) volumes in a virtualized environment with Novell Open Enterprise Server 11 and later, refer to the guidelines and requirements in “[Using NSS in a Virtualization Environment](#)” in the *OES 11 SP3: NSS File System Administration Guide for Linux*.

5 Planning for NLVM

Consider the requirements and caveats in this section when planning to use Novell Linux Volume Manager (NLVM) command line commands on Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) servers.

- ♦ [Section 5.1, “Root User,” on page 23](#)
- ♦ [Section 5.2, “Naming Conventions for Storage Objects,” on page 23](#)
- ♦ [Section 5.3, “NSS Pools on the System Device,” on page 25](#)
- ♦ [Section 5.4, “NSS Pools Created on NetWare Servers,” on page 26](#)
- ♦ [Section 5.5, “NSS Pools Created on OES 2 Servers and OES 1 Servers,” on page 26](#)
- ♦ [Section 5.6, “Linux LVM Volume Group,” on page 26](#)
- ♦ [Section 5.7, “Linux LVM Volume Group Cluster Resources,” on page 26](#)
- ♦ [Section 5.8, “Using NLVM with NSS Software RAID5,” on page 27](#)
- ♦ [Section 5.9, “Using NLVM with Linux Software RAID5,” on page 27](#)
- ♦ [Section 5.10, “Using iSCSI Devices with NSS Software RAID5,” on page 28](#)
- ♦ [Section 5.11, “Using Antivirus Software with NCP Volumes,” on page 28](#)

5.1 Root User

The Linux system `root` user privileges are required to use the NLVM commands.

5.2 Naming Conventions for Storage Objects

Consider the naming conventions in this section when you create or rename storage objects with NLVM.

- ♦ [Section 5.2.1, “NSS Pool and Volume Names,” on page 23](#)
- ♦ [Section 5.2.2, “NSS Pool Snapshot Names,” on page 24](#)
- ♦ [Section 5.2.3, “NSS Software RAID Names,” on page 24](#)
- ♦ [Section 5.2.4, “NCP Volume Names,” on page 24](#)
- ♦ [Section 5.2.5, “Linux LVM Volume Group and Logical Volume Names,” on page 25](#)

5.2.1 NSS Pool and Volume Names

Novell Storage Services (NSS) pool names and volume names must be unique from other pools and volumes on the server. In a cluster, the names of shared pools and volumes must be unique across all nodes in the cluster.

Pool and volume names can be 2 to 15 characters.

Uppercase letters A to Z, number characters 0 to 9, and underscore (`_`) are valid characters for all pools and volumes. Names cannot start or end in an underscore, and cannot contain double underscores. When you create an NSS pool or volume, the name you specify is automatically converted to uppercase.

If the pool is not shared, the pool name or volume name can also contain special characters:

```
!@#$$%&()
```

Names that contain special characters must be enclosed in quotation marks in all commands and scripts.

The names cannot be reserved names such as `con`, `com`, `lpt`, `pipe`, `all`, and so on.

5.2.2 NSS Pool Snapshot Names

An NSS pool snapshot name must be a unique snap name on the server.

Pool snapshot names are 2 to 15 characters.

The naming conventions for a pool snapshot are the same as for NSS pools and volumes. When you create an NSS pool snapshot, the name you specify is automatically converted to uppercase.

5.2.3 NSS Software RAID Names

An NSS software RAID name must be unique from other devices on the server. In a cluster, the names of shared software RAID names must be unique across all nodes in the cluster.

RAID names are 2 to 58 characters.

Names are preferred to use characters A to Z, a to z, 0 to 9, and underscore (`_`). Names cannot start or end in underscore, and cannot contain double underscores. Printable ASCII characters (see decimal codes 33 to 122 in a code chart) are valid. The name is case sensitive; it can contain uppercase and lowercase characters.

RAID names can contain special characters such as:

```
!@#$$%&()
```

Names that contain special characters must be enclosed in quotation marks in all commands and scripts. On the BASH command line, each special character must be escaped by preceding it with a backslash character (`\`).

The RAID names cannot be reserved names such as `con`, `com`, `lpt`, `pipe`, `all`, and so on.

5.2.4 NCP Volume Names

NCP volume names can be up to 14 alphanumeric characters, using uppercase letters A through Z and numbers 0 through 9. Underscores (`_`) are allowed.

If you NCP enable a Linux volume as you create it with NSSMU or the `nlvm create linux volume` command, the NCP volume name is based on the specified Linux volume name, but all letters are capitalized. Ensure that the specified Linux volume name does not exceed 14 characters and does not use special characters. Letters A-Z, letters a-z, numbers 0-9, and underscores are supported.

5.2.5 Linux LVM Volume Group and Logical Volume Names

Consider the following conventions for naming Linux Logical Volume Manager (LVM) volume groups and logical volumes:

- ♦ “NLVM Requirements for LVM Names” on page 25
- ♦ “LVM2 Requirements for LVM Names” on page 25
- ♦ “Clustered LVM Requirements for LVM Names” on page 25

NLVM Requirements for LVM Names

NLVM requires that Linux LVM volume group names and logical volume names be unique from any volume, device, pool, RAID, and other Device Mapper name. The LVM group name is limited to 128 characters. The LVM logical volume name is limited to 64 characters.

When you create a Linux LVM logical volume without specifying an LVM volume group name, NLVM assigns the volume name to the volume group.

LVM2 Requirements for LVM Names

LVM2 allows volume group names and logical volume names to contain characters A to Z, a to z, 0 to 9, underscore (`_`), hyphen (`-`), dot (`.`), and plus (`+`). The names cannot begin with a hyphen.

Reserved names and character strings that are used internally by LVM cannot be used as volume group names or logical volume names. A volume group cannot be called anything that exists in `/dev/` at the time of creation. It cannot be named `.'` (a single dot) or `..'` (double dot).

A logical volume cannot be named the following reserved words:

```
. (a single dot)
.. (double dot)
snapshot
pvmove
```

The logical volume name also cannot contain the following strings:

```
_mlog
_mimage
```

Clustered LVM Requirements for LVM Names

In a Novell Cluster Services cluster, the names of clustered LVM volume groups and logical volumes must be unique across all nodes in the cluster.

5.3 NSS Pools on the System Device

You can create an NSS pool on the system device where you installed the operating system if there is free space available on the device. This capability is not supported at install time. When you create the pool, select the system device (such as `sda`) and specify the amount of free space to use for the pool.

5.4 NSS Pools Created on NetWare Servers

NLVM is compatible with NSS pools that were created on NetWare servers.

For information about relocating a pool from a standalone NetWare server to an OES 11 SP3 server, see “[Migrating NSS Devices to OES 11 SP3](#)” in the *OES 11 SP3: NSS File System Administration Guide for Linux*.

For information about cluster migrating a shared pool cluster resource to an OES 11 SP3 node during a rolling cluster conversion, see the *OES 11 SP3: Novell Cluster Services NetWare to Linux Conversion Guide*.

5.5 NSS Pools Created on OES 2 Servers and OES 1 Servers

NLVM is compatible with NSS pools that were created on OES 2 servers and OES 1 servers.

For information about relocating a pool from a standalone OES 2 server or OES 1 server to an OES 11 SP3 server, see “[Migrating NSS Devices to OES 11 SP3](#)” in the *OES 11 SP3: NSS File System Administration Guide for Linux*.

For information about cluster migrating a shared pool cluster resource to an OES 11 SP3 node during a rolling cluster upgrade, see “[Upgrading Clusters from OES 2 SP3 to OES 11 SPx](#)” in the *OES 11 SP3: Novell Cluster Services for Linux Administration Guide*.

5.6 Linux LVM Volume Group

NLVM uses the Linux Logical Volume Manager to create volume groups. LVM requires that the devices you use to create a volume group are already initialized and contain no partitions. LVM uses the entire device for the volume group.

5.7 Linux LVM Volume Group Cluster Resources

Novell Cluster Services 2.0, NLVM, and NSSMU use the Clustered Logical Volume Manager (CLVM) to manage LVM volume group cluster resources. CLVM requires the Linux kernel 2.6.32.45-0.3 or later. You can get the latest kernel version by using the SLES 11 SP4 update channel.

When you create clustered LVM volume groups on shared storage, all of the nodes in the cluster must have shared physical access to the devices that you want to use to create the volume group. A quorum of nodes must be present in the cluster. The volume group cluster resource is brought online on only one node at a time.

LVM requires that the devices you use to create a volume group are already initialized and contain no partitions. In a cluster, a device should be physically attached to all nodes in a cluster. The device must not be marked as Shareable for Clustering because that adds a 4 KB partition on the device to store the shared state. LVM uses the entire device for the volume group.

5.8 Using NLVM with NSS Software RAIDs

NSS software RAIDs are supported for use with NSS pools. You can use the `nlvm create raid` command with `type=sbd` to mirror an SBD partition on two shared LUN devices for the Novell Cluster Services SBD (split-brain-detector). The `sbd` type for a software RAID1 is also used by the Novell Cluster Services SBD Utility (`sbdutil`) to mirror the SBD partition.

IMPORTANT: Do not create linux partitions (or any non-Novell type partition) on an NSS software RAID device. Doing so causes all pool creations on that RAID device to fail.

5.9 Using NLVM with Linux Software RAIDs

Linux Software RAIDs are intended to be used with Linux tools and file systems. Consider the caveats in this section before implementing Linux Software RAIDs on your OES server.

- ♦ [Section 5.9.1, “Linux Software RAIDs,” on page 27](#)
- ♦ [Section 5.9.2, “Linux Software RAIDs Are Not Cluster Aware,” on page 27](#)
- ♦ [Section 5.9.3, “Linux Software RAIDs Are Not Recommended for the System Device,” on page 28](#)

5.9.1 Linux Software RAIDs

We recommend that you do not use Linux software RAIDs (such as MD RAIDs and Device Mapper RAIDs) for devices that you plan to use for storage objects that are managed by NSS management tools. The Novell Linux Volume Manager (NLVM) utility and the NSS Management Utility (NSSMU) list Linux software RAID devices that you have created by using Linux tools. Beginning with Linux Kernel 3.0 in OES 11 SP1, NLVM and NSSMU can see these devices, initialize them, and allow you to create storage objects on them. However, this capability has not yet been fully tested.

IMPORTANT: In OES 11, a server hang or crash can occur if you attempt to use a Linux software RAID when you create storage objects that are managed by NSS management tools.

For NSS pools, you can use hardware RAID devices or NSS Software RAID devices to achieve disk fault tolerance.

For Linux POSIX volumes, LVM volume groups, and cLVM volume groups, you can use hardware RAID devices on your storage subsystem to achieve disk fault tolerance.

5.9.2 Linux Software RAIDs Are Not Cluster Aware

Do not use Linux Software RAIDs for devices that you plan to use for shared storage objects. Linux Software RAID devices do not support concurrent activation on multiple nodes; that is, they are not cluster aware. They cannot be used for shared-disk storage objects, such as the OCFS2 file system, cLVM volume groups, and Novell Cluster Services SBD (split-brain-detector) partitions.

For shared disks, you can use hardware RAID devices on your storage subsystem to achieve fault tolerance.

5.9.3 Linux Software RAID5s Are Not Recommended for the System Device

We recommend that you do not use Linux software RAID5s (such as MD RAID5s and Device Mapper RAID5s) on the system device if you plan to use free space on the device later for storage objects managed by NSS tools. During the SLES and OES installation, if you create a Linux software RAID device to use as the system device for the root (/) file system, the free space on the system device cannot be used later for NSS pools because the configuration of NSS storage objects on Linux software RAID5s has not yet been fully tested.

IMPORTANT: In OES 11, a server hang or crash can occur if you attempt to use a Linux software RAID when you create storage objects that are managed by NSS management tools.

For the Linux system device, you can use a hardware RAID device to achieve fault tolerance. This allows NSS tools to see and use any available free space on the system device for unshared NSS pools.

5.10 Using iSCSI Devices with NSS Software RAID5

Using iSCSI devices on the iSCSI initiator server to create NSS software RAID5 devices can cause poor performance. If you would like RAID5 protection, create the RAID5 on the target server and present that RAID device to the initiator as a single iSCSI device.

5.11 Using Antivirus Software with NCP Volumes

For information about using antivirus software with NCP volumes, see “[McAfee Antivirus Requires Additional Configuration](#)” in the *OES 11 SP3: Planning and Implementation Guide*.

6 NLVM Commands

The Novell Linux Volume Manager (NLVM) command line interface (CLI) for Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) provides commands that can be used in a Linux console or in a script. The Novell Storage Services (NSS) management tools use NLVM to create and manage NSS storage objects. NLVM provides options to create Linux POSIX file systems, such as Btrfs, Ext2, Ext3, ReiserFS, and XFS.

This section describes the syntax and usage for NLVM commands.

- ◆ [All NLVM Commands \(A to Z\)](#)
- ◆ [General Options](#)
- ◆ [Devices and Partitions](#)
- ◆ [Linux POSIX Volumes](#)
- ◆ [NSS Pools](#)
- ◆ [NSS Pool Snapshots](#)
- ◆ [NSS Software RAIDs](#)
- ◆ [NSS Volumes](#)

General Options

- ◆ [Section 6.1, “Syntax Overview,” on page 32](#)
- ◆ [Section 6.2, “NLVM Options,” on page 34](#)
- ◆ [Section 6.3, “Common Options,” on page 35](#)

Devices and Partitions

- ◆ [Section 6.6, “Create Partition,” on page 41](#)
- ◆ [Section 6.13, “Delete Partition,” on page 52](#)
- ◆ [Section 6.19, “Expand Partition,” on page 56](#)
- ◆ [Section 6.22, “Init Device,” on page 59](#)
- ◆ [Section 6.23, “Label,” on page 60](#)
- ◆ [Section 6.26, “List Device,” on page 62](#)
- ◆ [Section 6.27, “List Devices,” on page 65](#)
- ◆ [Section 6.32, “List Partition,” on page 75](#)
- ◆ [Section 6.33, “List Partitions,” on page 77](#)
- ◆ [Section 6.45, “RAID,” on page 100](#)
- ◆ [Section 6.49, “Rescan,” on page 104](#)
- ◆ [Section 6.51, “Share,” on page 105](#)
- ◆ [Section 6.53, “Unshare,” on page 106](#)

Linux POSIX Volumes

- ◆ [Section 6.5, “Create Linux Volume,” on page 36](#)
- ◆ [Section 6.11, “Delete Linux Volume,” on page 51](#)

- ◆ Section 6.24, “Linux Mount,” on page 61
- ◆ Section 6.25, “Linux Unmount,” on page 62
- ◆ Section 6.28, “List Linux Volume,” on page 68
- ◆ Section 6.29, “List Linux Volumes,” on page 69

NSS Pools

- ◆ Section 6.4, “Complete Move,” on page 36
- ◆ Section 6.7, “Create Pool,” on page 43
- ◆ Section 6.12, “Delete Move,” on page 52
- ◆ Section 6.14, “Delete Pool,” on page 53
- ◆ Section 6.20, “Expand Pool,” on page 57
- ◆ Section 6.30, “List Move,” on page 72
- ◆ Section 6.31, “List Moves,” on page 74
- ◆ Section 6.34, “List Pool,” on page 82
- ◆ Section 6.35, “List Pools,” on page 85
- ◆ Section 6.40, “Mount,” on page 97
- ◆ Section 6.41, “Move,” on page 97
- ◆ Section 6.42, “Pause Move,” on page 99
- ◆ Section 6.43, “Pool Activate,” on page 99
- ◆ Section 6.44, “Pool Deactivate,” on page 100
- ◆ Section 6.46, “Rename Pool,” on page 102
- ◆ Section 6.49, “Rescan,” on page 104
- ◆ Section 6.50, “Resume Move,” on page 105
- ◆ Section 6.52, “Unmount,” on page 106

NSS Pool Snapshots

- ◆ Section 6.9, “Create Snap,” on page 48
- ◆ Section 6.17, “Delete Snap,” on page 55
- ◆ Section 6.36, “List Snap,” on page 89
- ◆ Section 6.37, “List Snaps,” on page 90

NSS Software RAIDs

- ◆ Section 6.8, “Create RAID,” on page 45
- ◆ Section 6.15, “Delete RAID,” on page 54
- ◆ Section 6.16, “Delete RAID Segment,” on page 54
- ◆ Section 6.21, “Expand RAID,” on page 58
- ◆ Section 6.45, “RAID,” on page 100
- ◆ Section 6.47, “Rename RAID,” on page 103

NSS Volumes

- ◆ Section 6.10, “Create Volume,” on page 49
- ◆ Section 6.18, “Delete Volume,” on page 56

- ◆ Section 6.38, “List Volume,” on page 92
- ◆ Section 6.39, “List Volumes,” on page 94
- ◆ Section 6.48, “Rename Volume,” on page 103
- ◆ Section 6.54, “Volume Mount,” on page 107
- ◆ Section 6.55, “Volume Unmount,” on page 107

All NLVM Commands (A to Z)

- ◆ Section 6.1, “Syntax Overview,” on page 32
- ◆ Section 6.2, “NLVM Options,” on page 34
- ◆ Section 6.3, “Common Options,” on page 35
- ◆ Section 6.4, “Complete Move,” on page 36
- ◆ Section 6.5, “Create Linux Volume,” on page 36
- ◆ Section 6.6, “Create Partition,” on page 41
- ◆ Section 6.7, “Create Pool,” on page 43
- ◆ Section 6.8, “Create RAID,” on page 45
- ◆ Section 6.9, “Create Snap,” on page 48
- ◆ Section 6.10, “Create Volume,” on page 49
- ◆ Section 6.11, “Delete Linux Volume,” on page 51
- ◆ Section 6.12, “Delete Move,” on page 52
- ◆ Section 6.13, “Delete Partition,” on page 52
- ◆ Section 6.14, “Delete Pool,” on page 53
- ◆ Section 6.15, “Delete RAID,” on page 54
- ◆ Section 6.16, “Delete RAID Segment,” on page 54
- ◆ Section 6.17, “Delete Snap,” on page 55
- ◆ Section 6.18, “Delete Volume,” on page 56
- ◆ Section 6.19, “Expand Partition,” on page 56
- ◆ Section 6.20, “Expand Pool,” on page 57
- ◆ Section 6.21, “Expand RAID,” on page 58
- ◆ Section 6.22, “Init Device,” on page 59
- ◆ Section 6.23, “Label,” on page 60
- ◆ Section 6.24, “Linux Mount,” on page 61
- ◆ Section 6.25, “Linux Unmount,” on page 62
- ◆ Section 6.26, “List Device,” on page 62
- ◆ Section 6.27, “List Devices,” on page 65
- ◆ Section 6.28, “List Linux Volume,” on page 68
- ◆ Section 6.29, “List Linux Volumes,” on page 69
- ◆ Section 6.30, “List Move,” on page 72
- ◆ Section 6.31, “List Moves,” on page 74
- ◆ Section 6.32, “List Partition,” on page 75
- ◆ Section 6.33, “List Partitions,” on page 77
- ◆ Section 6.34, “List Pool,” on page 82

- ♦ [Section 6.35, “List Pools,” on page 85](#)
- ♦ [Section 6.36, “List Snap,” on page 89](#)
- ♦ [Section 6.37, “List Snaps,” on page 90](#)
- ♦ [Section 6.38, “List Volume,” on page 92](#)
- ♦ [Section 6.39, “List Volumes,” on page 94](#)
- ♦ [Section 6.40, “Mount,” on page 97](#)
- ♦ [Section 6.41, “Move,” on page 97](#)
- ♦ [Section 6.42, “Pause Move,” on page 99](#)
- ♦ [Section 6.43, “Pool Activate,” on page 99](#)
- ♦ [Section 6.44, “Pool Deactivate,” on page 100](#)
- ♦ [Section 6.45, “RAID,” on page 100](#)
- ♦ [Section 6.46, “Rename Pool,” on page 102](#)
- ♦ [Section 6.47, “Rename RAID,” on page 103](#)
- ♦ [Section 6.48, “Rename Volume,” on page 103](#)
- ♦ [Section 6.49, “Rescan,” on page 104](#)
- ♦ [Section 6.50, “Resume Move,” on page 105](#)
- ♦ [Section 6.51, “Share,” on page 105](#)
- ♦ [Section 6.52, “Unmount,” on page 106](#)
- ♦ [Section 6.53, “Unshare,” on page 106](#)
- ♦ [Section 6.54, “Volume Mount,” on page 107](#)
- ♦ [Section 6.55, “Volume Unmount,” on page 107](#)

6.1 Syntax Overview

Novell Linux Volume Manager can be used to manage NSS file systems or Linux POSIX file systems on your OES 11 SP3 server. This section describes the general syntax and conventions for NLVM.

- ♦ [Section 6.1.1, “Syntax,” on page 32](#)
- ♦ [Section 6.1.2, “Syntax Conventions,” on page 32](#)
- ♦ [Section 6.1.3, “Documentation Conventions,” on page 34](#)
- ♦ [Section 6.1.4, “Files,” on page 34](#)

6.1.1 Syntax

Using commands for the NLVM program requires `root` user privileges. NLVM options must follow immediately after `nlvm`.

```
nlvm [nlvm_options] <command> <command_options>
```

6.1.2 Syntax Conventions

When issuing NLVM commands, consider the following general syntax conventions:

- ♦ [“NSS Pool and Volume Names” on page 33](#)
- ♦ [“NSS Software RAID Names” on page 33](#)

- ♦ “NCP Volume Names” on page 33
- ♦ “Order of Command Options” on page 33
- ♦ “Sizes” on page 33
- ♦ “Name Format” on page 33

NSS Pool and Volume Names

All NSS pool names and NSS volume names are automatically converted to uppercase.

NSS Software RAID Names

NSS software RAID names are case sensitive.

NCP Volume Names

When you create an NCP volume, the name is automatically converted to uppercase.

Order of Command Options

Command options can be specified in any order except where it is otherwise noted. Options with an equal sign (=) can be in any order.

Sizes

All sizes are in bytes and can be specified with one of the following multipliers: K, M, G, and T. Multipliers are case insensitive and are multiples of 1024. If no multiplier is specified, it is assumed to be G by default. If 'max' is entered, all of the free unpartitioned space on the device is used. All sizes can be entered as whole numbers or with fractional parts such as 200.45G and 3.98T.

Examples for common command options:

`size=20` (If no multiplier is used, it is assumed to be G (gigabytes).)

`size=20G` (You can also specify `max` instead of a value and multiplier.)

`size=3.98T` (You can specify a value with decimal places.)

Name Format

Examples for common name formats used in command options:

`device=sdb` (You can specify the leaf node name of the device, including multipath names.)

`device=/dev/mapper/mpatha` (You can specify the full Linux path of the device.)

`device=anydisk` (You can specify `anydisk` or `anyshared` keywords if the command allows it.)

`part=sdc1.1` (You can specify only the partition node name, not the full Linux path.)

`part=cluster1.sbd`

`name=MYPOOL1` (All NSS pool names and NSS volume names are converted to uppercase.)

6.1.3 Documentation Conventions

In the command syntax for NLVM, the mandatory command options are surrounded by angle brackets (<>). The optional command options are surrounded by square brackets ([]). The brackets are not used when you issue the command. For example, the command syntax conventions are:

```
nlvm [nlvm_options] command <mandatory_value> [options]
```

6.1.4 Files

The following are key files used by NLVM:

`/etc/opt/novell/nss/nlvm.conf`

Location of the NLVM configuration file.

`/opt/novell/nss/sbin/nlvm`

Location of the NLVM utility. It also has a link in the `sbin` directory so that it is in the search path.

`/var/opt/novell/nss/debug`

Location of the debug log files.

6.2 NLVM Options

The NLVM options can be used as needed with any command, except where it is otherwise noted. NLVM options can appear in any order in the command after `nlvm`.

```
nlvm [nlvm_option] <command> [command_options]
```

- ◆ `-d, --debug`
- ◆ `-f, --force`
- ◆ `-l, --getlock`
- ◆ `-m`
- ◆ `--no-prompt`
- ◆ `-r, --rescan`
- ◆ `-s, --share`
- ◆ `-t, --terse`

`-d, --debug`

This option causes a `/var/opt/novell/log/nss/debug/nlvm_debug.log` file to be created so that the operations can be reviewed. This is helpful in diagnosing problems in running the NLVM utility. Up to 10 debug files can be created; they are numbered automatically.

NOTE: The debug can be turned on always by using the `/etc/opt/novell/nss/nlvm.conf` file.

`-f, --force`

This option can be used with certain commands to force the command to complete. Support for this NLVM option is indicated in the individual commands.

-l, --getlock

This option forces the command to get the `nlvm` lock. The lock protects multiple users from modifying things at the same time.

Use with caution! This option is to be used only if the lock does not get released properly due to a segment fault or other operation aborts.

-m

This option prevents pools that have been unmounted from being mounted.

Pools are by design auto mounted. Therefore, running the `nssmu` utility, or running most `nlvm` commands without the `-m` option can cause an unmounted pool to be remounted if underlying devices and partitions still exist. To execute an `nlvm` command without mounting the unmounted pools, you must include the `-m` option. The `nlvm mount` command internally sets the `-m` flag, so only the specified pool is mounted.

--no-prompt

This option can be used with certain commands to prevent a confirmation message from being displayed, such as when you initialize a device or delete Linux POSIX volumes, pool moves, partitions, pools, RAIDs, RAID segments, snapshots, and NSS volumes. Support for this NLVM option is indicated in the individual commands.

-r, --rescan

This option forces a fresh rescan of the system before executing a command to update the device and partition objects. Use this if something changed the information outside the NSSMU, iManager, or `nlvm` utility.

-s, --share

This option sets the shared override bit for the command being executed.

In a Novell Cluster Services cluster, NLVM uses the cluster's SBD to detect if a node is a cluster member and to lock against concurrent changes to physically shared storage. Without an SBD, NLVM cannot detect whether a node is a member of the cluster and cannot acquire the locks it needs to execute tasks. In this state, you can use the `-s` option with NLVM commands to prepare a device and create an SBD partition. To minimize the risk of corruption, you must ensure that nobody else is changing any storage on any nodes at the same time.

-t, --terse

This option can be used with `nlvm list` commands to display the output in a format for parsing. Values are labeled in the format `ParameterName=value`. Information about a storage object is output in a single line. The line wraps automatically if the output exceeds the console width.

A request might return multiple lines if the target object contains storage objects, such as partitions on a device or segments in a software RAID. The target object's information appears on the first line, and subsequent lines contain information about each of its member objects. A single blank line separates output for some target objects.

6.3 Common Options

Common options can be used as noted with specific commands. Common options are specified at the end of the command.

- ♦ `all`
- ♦ `more`

all

This option can be used with `nlvm list` commands to display detailed information for all objects of that type on the server. It displays the same information as a specific `nlvm list` request against an object. It can be used with the `-t` or `--terse` NLVM option to format the detailed output for parsing.

more

This option can be used with `nlvm list` commands to display more information than appears in the standard output. It can be used with the `-t` or `--terse` NLVM option to format the enhanced output for parsing.

6.4 Complete Move

complete move <move_name>

Check to see if an NSS pool move is complete. If the move is complete, the old location is deleted. If the move is not completed, it will return an error 11 (EAGAIN).

If a pool is cluster-enabled, issue the command on the node where its pool cluster resource is currently online.

```
nlvm [nlvm_options] complete move <move_name>
```

Command Option

move_name

Mandatory. Specify the name of the move object to check. The move name typically looks like `POOLNAME_move`.

Command Example

```
nlvm complete move MYPOOL1_move
```

Verify that the move `MPOOL1_move` is complete. If it is, delete the old location of the pool.

6.5 Create Linux Volume

create linux volume <type> <<device> [size] | <part>> [mp] [mkopt] [mntopt] [lvm] [name] [group] [shared] [ip] [ncp] [valid]

Create a Linux POSIX volume on a device.

```
nlvm [nlvm_options] create linux volume <type> <<device> [size] | <part>> [mp] [mkopt] [mntopt] [lvm] [name] [group] [shared] [ip] [ncp] [valid]
```

For a cluster-enabled LVM volume, issue the command from the master node in the cluster.

Command Options

type=fstype

Mandatory. Specify the type of Linux POSIX file system to use for `mkfs`.

Supported file system types are `btrfs` (in OES 11 SP1 and later; requires the `btrfsprogs` package), `ext2`, `ext3`, `reiserfs`, and `xf`s.

Examples

```
type=ext3
type=reiserfs
```

device=<devicename|anydisk>

Mandatory unless the `part` option is used. Specify the device to use for the Linux POSIX volume, or specify the keyword `anydisk`.

IMPORTANT: NLVM does not support using Linux software RAID devices or NSS software RAID devices with Linux POSIX file systems. You can use a hardware RAID device to achieve device fault tolerance for Linux POSIX volumes.

If the device is seen by a single server, or a single node in a cluster, do not use the `shared` option.

If the device is seen by multiple nodes in a Novell Cluster Services cluster, you must specify the `devicename` and use the `shared`, `ip`, `name`, `lvm`, and `group` (optional) options to create the Linux volume group cluster resource. Specify an unshared initialized device. For OES 11 SP2 and later, you can alternatively specify a shared device with no data partitions or an uninitialized device. The cluster-enabled LVM volume group uses the entire device. Novell Cluster Services mounts the cluster resource exclusively on one node at a time.

Examples

```
device=sdb
device=/dev/sdb
device=anydisk
device=mpatha
device=/dev/mapper/mpatha
```

size=<value[K|M|G|T]|max>

Mandatory unless the `shared` option is used, or unless the `part` option is used instead of the `device` option. Specify a size of the partition to create for the Linux volume, or specify `max` to use all of the free unpartitioned space for the volume. The minimum allowed size is 8 MB.

If the `shared` option is used, the entire device is dedicated to the LVM volume group. If the `size` option is specified, it is ignored.

If the `part` option is used, the entire partition is dedicated to the volume. If the `size` option is specified, it is ignored.

Examples

```
size=20G
size=100m
size=max
```

part=partition_name

Specify the node name (such as `sdc2`) for the partition you want to use for a non-clustered volume. The partition must exist; it is not created with this command. The partition type must be compatible with the type of Linux volume you want to create on it, such as type 83 for a Linux native volume or type 8E for a Linux LVM volume. The entire partition is used for the volume you create.

Do not specify the `part` option in combination with the `device` option. The `size` option is ignored.

Do not specify the `part` option in combination with the `shared` option. You can use a partition only for non-clustered volumes.

Example

```
part=sdc2
```

mp=</mount_path>

Specify the path of the mount point where the volume is to be mounted. If the path does not currently exist, it will be created.

For LVM volumes, the name option must be used with the `lvm` option to specify a volume name. The full mount point path can specify a directory path that is the same or different than the specified volume name. If a mount path is not specified for an LVM volume or a clustered LVM volume, the utility assigns a default mount path of `/usr/novell/<volume_name>`.

For Linux POSIX volumes, the final directory of the full mount point path is used as the volume name. For example, if the mount point is `/home/users/bob`, the volume name is `bob`. The final directory name must be unique as a volume name on the server. If you use the `ncp` option, the NCP volume name is based on the final directory name, but all letters are capitalized. Ensure that the final directory name does not exceed 14 characters and does not use special characters. Letters A-Z, letters a-z, numbers 0-9, and underscores are supported.

If a mount path is not specified for a Linux POSIX volume, the utility assigns a default mount path of `/usr/novell/<file_system_type>_<next_available_number>`. For example, if the file system type is `ext3`, the default mount path is `/usr/novell/ext3_0`. If that path is not available, the path is `/usr/novell/ext3_1`, and so forth until a unique volume name is achieved.

Example

```
mp=/home
```

mkopt=<option1[,option2,...]>

Specify the options to use when running `mkfs`. For a list of available options, see the `mkfs(8)` man page. No default option is specified.

Example

```
mkopt=-v
```

mntopt=<option1[,option2[,...]>

Specify the options to use when mounting the volume. For a list of available options, see the `mount(8)` man page. The default `mntopt` value is `rw`.

Example

```
mntopt=rw
```

lvm

Used to specify that an LVM volume and volume group is to be created.

If the `lvm` option is used, the `name` option must be provided to specify a name for the LVM volume. Specifying a different name for the LVM volume group is optional.

Example

```
lvm
```

name=</lvm_volume_name>

Used with the `lvm` option to specify a name for the LVM volume.

If you do not specify the `group` option, this name is also used as the LVM volume group name.

For LVM logical volume naming conventions, see [Section 5.2.5, “Linux LVM Volume Group and Logical Volume Names,” on page 25](#). If you use the `ncp` option, the NCP volume name is based on the LVM volume name, but all letters are capitalized. Ensure that the name does not exceed 14 characters and does not use special characters. Letters A-Z, letters a-z, numbers 0-9, and underscores are supported.

If the `lvm` option is not specified, this option is ignored.

Example

```
name=mylvmvol1
```

group=<lvm_volume_group_name>

Optional. Used with the `lvm` option to specify a name for the LVM volume group. If the `group` option is not specified, the volume group name is the same as the LVM volume name.

For LVM volume group naming conventions, see [Section 5.2.5, “Linux LVM Volume Group and Logical Volume Names,” on page 25](#).

If the `lvm` option is not specified, this option is ignored.

Example

```
group=clustervg01
```

shared

Used to cluster-enable an LVM volume group. This creates an LVM volume group cluster resource, including its load, unload, and monitoring scripts, for use in an existing Novell Cluster Services cluster. The cluster resource name is the LVM volume group name plus `_resource`; that is, `<lvm_vg_name>_resource`. For example, `mylvmvg01_resource`. The resource is created and set to an Offline state. You can use the Clusters plug-in in iManager to modify the scripts and resource settings as needed, and then use iManager or cluster commands to online the resource.

If the `shared` option is used, the `ip`, `name`, and `lvm` options must also be provided. You can use the `group` option to specify a different name for the LVM volume group.

The device should already be initialized, but do not mark the device as shareable. The LVM volume group uses the entire device. Use Novell Cluster Services tools or commands to online the cluster resource exclusively on one node at a time.

Examples

```
shared lvm ip=10.10.10.101 name=mylvmvol1
shared lvm ip=10.10.10.101 name=mylvmvol1 group=mylvmvg1
```

ip=<IP_address_for_LVM_volgroup_cluster_resource>

Used with the `shared` option to specify the IP address to use for the Linux volume group cluster resource. This is required for cluster-enabled Linux volume groups on Novell Cluster Services clusters. Specify the IP address in IPv4 format.

If the `shared` option is not specified, this option is ignored.

Example

```
ip=10.10.10.101
```

ncp

Used to enable the Linux POSIX file system on the volume to be accessed with the NetWare Control Protocol (NCP). An NCP volume ID is assigned automatically to the volume. You can use the `valid` option in combination with the `shared` and `ncp` options to assign an NCP volume ID for a clustered LVM volume.

If you use the `ncp` option, the volume name used for the `name` option must comply with the name limitations described in [Section 5.2.4, “NCP Volume Names,”](#) on page 24.

valid=value

(Optional) Used in combination with the `shared` and `ncp` options to assign an NCP volume ID for a clustered LVM volume. If the `valid` option is not used, a volume ID is automatically assigned. For clustered volumes, the valid range is 254 to 0, in descending order.

In a Novell Cluster Services cluster, the volume ID must be unique across all member nodes. In a Business Continuity Cluster, the volume ID must be unique across all nodes in every peer cluster.

Example

```
lvm shared ip=10.10.10.134 name=lvmvol140 ncp valid=240
```

The `valid` option requires the `shared` and `ncp` options. The `shared` option requires the `lvm`, `ip`, and `name` options.

Command Examples

```
nlvm create linux volume type=ext3 device=sdf size=10G mp=/home/bob mntopt=rw
```

Create a 10 GB Linux POSIX volume using the Ext3 file system on the `/dev/sdf` device. Mount the volume on path `/home/bob` with the Read/Write mount option.

```
nlvm create linux volume type=ext3 device=/dev/sdf mp=/home/bob mntopt=rw lvm shared ip=10.10.10.101 group=clustervgbob name=clustervolbob
```

Create and cluster-enable an LVM volume group on the `/dev/sdf` device with a resource IP address of 10.10.10.101, an LVM volume name of `clustervolbob`, and an LVM volume group name of `clustervgbob`. Create a Linux POSIX volume on the LVM volume using the Ext3 file system. The entire device is dedicated to the LVM volume.

This command automatically creates an LVM volume group cluster resource called `clustervgbob_resource` in a Novell Cluster Services cluster where the node is a member. It creates its resource load, unload, and monitoring scripts; sets the resource to offline; and waits to be brought online by using the cluster commands. You manage the resource by using Novell Cluster Services tools and commands.

```
nlvm create linux volume type=ext3 device=sdf mp=/home/bob mntopt=rw lvm shared ip=10.10.10.101 group=clustervgbob name=clustervolbob ncp valid=240
```

Create and cluster-enable an LVM volume group on the `/dev/sdf` device with a resource IP address of 10.10.10.101, an LVM volume group name of `clustervgbob`, and an LVM volume name of `clustervolbob`. Create a Linux POSIX volume on the LVM volume using the Ext3 file system. The entire device is dedicated to the LVM volume.

NCP-enable the volume and automatically assign it the NCP name of `CLUSTERVOLBOB`, which is the assigned LVM name in all capital letters. Assign it the NCP volume ID of 240, which the administrator knows to be unique across all member nodes in the Novell Cluster Services cluster and across all peer clusters in a Business Continuity Cluster.

This command automatically creates an LVM volume group cluster resource called `clustervgbob_resource` in a Novell Cluster Services cluster where the node is a member. It creates its resource load, unload, and monitoring scripts; sets the resource to offline; and waits to be brought online by using the cluster commands. You manage the resource by using Novell Cluster Services tools and commands.

6.6 Create Partition

create partition <type> <device> <size> [label] [dm]

Create a partition on a disk.

```
nlvm [nlvm_options] create partition <type> <device> <size> [label] [dm]
```

The number of partitions per device can be limited by the device partitioning scheme, the partition type, or the device driver, whichever is the most restrictive.

- ♦ **Partitioning scheme:** The MS-DOS format allows up to 4 primary partitions, where 1 can be an extended partition with logical partitions. The GPT format allows up to 128 partitions.
- ♦ **Partition type:** If a device contains only Novell type partitions, the number of partitions is limited only by the space on the disk. If there are any non-Novell partitions on the device, each partition created, including Novell type partitions, will be a physical partition and limited by Linux to 255 partitions.
- ♦ **Device driver:** Check your device vendor's documentation to determine driver restrictions. For example, the Hewlett-Packard CCISS device driver supports up to 15 partitions per device, regardless of the partition type.

Best Practices for Creating Partitions

- ♦ Disks using Novell partitions should have only Novell partitions on the device.
- ♦ Do not create more than 15 partitions on a device.

Command Options

type=partition_type

Mandatory. You must specify the partition type in hexadecimal, without the leading 0x.

Before you create a Novell Cluster Services SBD (split brain detector) partition with `type=1ad`, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.

Examples

```
type=83 (partition type for Linux)
type=8e (partition type for Linux LVM)
type=169 (partition type for NSS)
type=1ad (partition type for Novell Cluster Services SBD partition)
type=1ac (partition type for snapshots)
```

device=<devicename|anydisk|anyshared>

Mandatory. Specify the device to use for the partition, or specify the keyword `anydisk` or `anyshared`.

If you use NLVM to create an SBD, the `nlvm create partition` command can accept an initialized or uninitialized device when you use the `type=1ad` option. NLVM checks the specified device to see if it is initialized, and takes the following actions:

- ♦ **Uninitialized device:** NLVM initializes the device, marks it as Shareable for Clustering, and creates the requested SBD partition.
- ♦ **Initialized and shared device:** NLVM creates the requested SBD partition.
- ♦ **Initialized and unshared device:** NLVM creates the requested SBD partition, but does not alter the shared state. It returns an error warning that the SBD partition is not shared.

You must manually mark the device as Shareable for Clustering after the partition is created. You can use the `nlvm share` command to share the device.

Examples

```
device=sdb
device=/dev/sdb
device=anydisk
device=anyshared
```

size=<value[K|M|G|T]|max>

Mandatory. Specify the size of the partition to create, or specify `max` to use all free unpartitioned space. The minimum allowed size is 1 MB.

Because a physical partition must end on a cylinder boundary, its size might be slightly different than the size you specify. If the size does not fall naturally on a cylinder boundary, the partition size is rounded up or down, depending on the partition type, the size specified, and the amount of free space. For a Novell type partition (NSS or SBD), the size is rounded down. For a Linux type partition, the size is rounded up if enough free space is available; otherwise, the size is rounded down.

Examples

```
size=20G
size=100.45M
size=max
```

label="Label for the partition"

Specify the label to be added to a Novell partition type. This option is ignored for other partition types. If the label contains spaces, you must put quotation marks around it. If the label contains a special character, you must escape the character by adding a backslash character (`\`) in front of it.

If you create a Novell Cluster Services SBD partition, the label should be the cluster name. For example, if the cluster name is `cluster1`, NLVM creates a partition named `cluster1.sbd`. If an SBD partition already exists for the cluster, the new partition is named `cluster1.sbd1`, and the cluster does not recognize it. To use the new partition for the cluster, you must delete the old partition. Then the new partition is automatically renamed as `cluster1.sbd`, and is used by the cluster.

Examples

```
label="This label has spaces"
label=engineering
label=special\character
label=cluster1
```

dm

Create a device mapper object for this partition in the `/dev/nss` directory. This is useful when creating Novell partition types that need to be accessed directly.

Example

```
dm
```

Command Examples

```
nlvm create partition type=169 device=sdb size=20G dm
```

Create an NSS partition on the `/dev/sdb` device of size 20 GB. Also create a device mapper object for the partition, `/dev/nss/sdb1.1`.

```
nlvm create partition type=83 device=sdc size=200G
```

Create a Linux partition on the `/dev/sdc` device of size 200 GB.

```
nlvm create partition type=8e device=sdf size=200G
```

Create a Linux LVM partition on the `/dev/sdf` device of size 200 GB.

```
nlvm -s create partition type=lad device=sdg size=max label=cluster1
```

Take the cluster down and stop Novell Cluster Services. Create a Novell Cluster Services SBD partition on the `/dev/sdg` device, and use all available free space on the device. Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

6.7 Create Pool

```
create pool <name> <size [device]|part> [ip] [vsfn] [csn] [cifs] [afp]
```

Create an NSS pool.

```
nlvm [nlvm_options] create pool <name> <size [device]|part> [ip] [vsfn] [csn] [cifs] [afp]
```

For a cluster-enabled pool, issue the command from the master node in the cluster.

Command Options

name=*pool_name*

Mandatory. Specify the name of the pool to create. This name must be unique from other pools. The pool name is automatically converted to uppercase.

Pool names are 2 to 15 characters. Uppercase letters A to Z, number characters 0 to 9, and underscore (`_`) are valid characters for all pools. Names cannot start or end in underscore, and cannot contain double underscores.

If the pool is not shared, the pool can also contain special characters:

```
!@#$$%&()
```

Names that contain special characters must be enclosed in quotation marks in all commands and scripts.

The names cannot be reserved names such as `con`, `com`, `lpt`, `pipe`, `all`, and so on.

Example

```
name=MYPOOL1
```

size=*<value[K|M|G|T]|max>*

Mandatory. Specify the amount of space to be used on the associated device. The size is not used if you specify the `part=` option instead of `device=`. The total pool size must be greater than 10 megabytes.

If multiple devices are specified, each `device` option instance must have a matching `size` option instance. The first `size` instance is matched to the first `device` instance, and so on.

Examples

```
size=200G
size=3.98T
```

device=*<devicename|anydisk|anyshared>*

Specify the device to use for the pool, or specify the keyword `anydisk` or `anyshared`.

Do not specify the `device` option in combination with the `part` option.

You can specify multiple device instances to create a pool composed of multiple segments. Each `device` option instance must have a matching `size` option instance. The first `device` instance is matched to the first `size` instance, and so on. When specifying multiple devices, device names must be provided for each instance.

Examples

```
device=sdb  
device=sde device=sdf device=sdg    (Specify a size for each instance.)  
device=anydisk  
device=anyshared
```

part=partition_name

Specify the node name (such as `sdcl.1`) for the partition where you want to create the pool. The partition must exist; it is not created with this command. The entire partition is used for the pool.

Do not specify the `part` option in combination with the `device` option.

Example

```
part=sdcl.1
```

ip=ip_address

Specify this option to create a cluster enabled pool. If using this option, the device or partition must be shared. This option is mandatory if you are creating a cluster enabled pool.

Example

```
ip=10.10.10.41
```

vsn=virtual_server_name

Specify the virtual server name for a cluster enabled pool. It is optional and used only for cluster enabled pools. If a name is not supplied, the default name will be used in the format of `<clusterName>-<poolName>-SERVER`. Underscores in the cluster name or pool name are changed to hyphens. If you customize the virtual server name, you can use letters, numbers, hyphens, and underscores.

Examples

```
vsn=CLUSTER2-POOL-2-SERVER  
vsn=C1-P1-SERVER  
vsn=MY-CUSTOM-NAME
```

csn=cifs_virtual_server_name

Specify the CIFS virtual server name for a cluster enabled pool. It is optional and used for cluster enabled pools where CIFS is enabled as an advertising protocol. The name can be up to 15 characters, which is a restriction of the CIFS protocol.

For users to collaborate effectively, all paths for user access should be identical, independent of the access protocol used. This is possible only if the same name is used for the NCP virtual server name and the CIFS virtual server name, and the name can be only up to 15 characters.

If the `cifs` option is used without the `csn` option, the NCP virtual server name is used as the CIFS virtual server name. In this case, if the name is more than 15 characters, the CIFS virtual server name uses the rightmost 13 characters and adds `-w`. For example, an NCP virtual server name of `CLUSTER1-P_USERS` is modified to `STER1-P_USERS-w` for the CIFS virtual server name. If a default NCP virtual server name was used in the form of `<clusterName>-<poolName>-SERVER` and the name exceeds 15 characters, the CIFS virtual server name uses the rightmost 13 characters of the `<clusterName>-<poolName>` part of the name and adds `-w`. For example, an NCP virtual server name of `CLUS1-P123-SERVER` is modified to `CLUS1-P123-w` for the CIFS virtual server name.

To use the NCP virtual server name for the CIFS server name, use the `nlvm` command as follows without the `csn` option:

```
nlvm create pool name=a4 size=15M device=sdb ip=10.10.10.39 vsn=pqr cifs
```

In this example, `pqr` is used as the NCP virtual server name and CIFS virtual server name. If an administrator user later changes the NCP virtual server name in NSSMU or iManager, NSSMU automatically applies the name change to the CIFS virtual server name, so that the administrator does not need to make the change twice. To use a different server name for the CIFS virtual server name, you can change the CIFS virtual server name by using the CIFS management tools. This change will not affect the NCP virtual server name.

Examples

```
csn=CLUS1-P1  
csn=c1-p123
```

cifs

Specify this option to enable CIFS as an advertising protocol when you create a cluster enabled pool. By default, CIFS is disabled as an advertising protocol. Novell CIFS must be installed on the machine in order for this option to work.

You can use the `csn` option to specify a CIFS virtual server name. Without the `csn` option, the NCP virtual server name is used as the CIFS virtual server name. See the `csn` option for details.

Example

```
cifs
```

afp

Specify this option to enable AFP as an advertising protocol when you create a cluster enabled pool. By default, AFP is disabled as an advertising protocol. Novell AFP must be installed on the machine in order for this option to work.

Example

```
afp
```

Command Examples

```
nlvm create pool name=MYPOOL1 size=20G device=sdb
```

Create a pool named MYPOOL1 on device `/dev/sdb` that is 20 GB in size.

```
nlvm create pool name=MYPOOL2 size=20G device=sdb size=100G device=sdg
```

Create a pool named MYPOOL2 that is a total of 120 GB in size. Use 20 GB of free space from device `/dev/sdb`. Use 100 GB of free space from device `/dev/sdg`.

```
nlvm create pool name=MYPOOL2 size=200G device=anydisk
```

Create a pool named MYPOOL2 on any device that has 200 GB of free unpartitioned space available.

```
nlvm create pool name=MYPOOL3 size=100G device=anyshared
```

Create a pool named MYPOOL3 on any shared device that has 100 GB of free unpartitioned space available.

```
nlvm create pool name=MYPOOL4 part=sd1.1
```

Create a pool named MYPOOL4 on partition `/dev/sd1.1` and use all of the partition.

6.8 Create RAID

```
create raid <name> <raid> [type] <size> <device> [stripe] [part]
```

Create an NSS software RAID device or an SBD software RAID device.

```
nlvm [nlvm_options] create raid <name> <raid> [type] <size> <device> [stripe]
[part]
```

Command Options

name=*raid_name*

Mandatory except when you mirror an existing SBD partition. This name must be unique from other RAID devices. The RAID name is case sensitive.

When you create an NSS software RAID device, you must specify the name of the device to create.

When you create a new Novell Cluster Services SBD RAID 1 device, you must specify the name of the device to create. The name must match the name of an existing cluster (such as `cluster1`) that has a Cluster object in NetIQ eDirectory. This allows the SBD to be used by the cluster. The name is case sensitive.

When you mirror an existing Novell Cluster Services SBD partition, the name is optional. If you specify a name (which should be the cluster name), the RAID 1 is given that name. If the name is not specified, the RAID 1 name defaults to the SBD partition's name.

RAID names are 2 to 58 characters. Names are preferred to use characters A to Z, a to z, 0 to 9, and underscore (`_`). Names cannot start or end in underscore, and cannot contain double underscores. Printable ASCII characters (see decimal codes 33 to 122 in a code chart) are valid.

RAID names can also contain the following special characters:

```
!@#$$%&()
```

Names that contain special characters must be enclosed in quotation marks in all commands and scripts. On the BASH command line, each special character must be escaped by preceding it with a backslash character (`\`).

The names cannot be reserved names such as `con`, `com`, `lpt`, `pipe`, `all`, and so on.

Example

```
name=MYRAID1
```

raid=<0|1|5>

Mandatory. Specify the RAID type. Valid options are 0 for striping, 1 for mirrored, or 5 for striping with parity.

Example

```
raid=1
```

type=<nss|sbd>

Mandatory except when you mirror an existing partition. Specify the type of partition to mirror. This option is used only for RAID 1. Valid options are `nss` and `sbd` (Novell Cluster Services split-brain detector). The default mirror type is `nss`.

Before you create a new SBD RAID 1, you must take the cluster down, and stop Novell Cluster Services from running on all nodes. This is not necessary when you mirror an existing SBD partition.

Examples

```
type=nss
type=sbd
```

size=<value[K|M|G|T]|max>

Mandatory except when you mirror an existing partition. Specify the size of each segment of the RAID. The minimum size is 12 megabytes.

Because a physical partition must end on a cylinder boundary, its size might be slightly smaller than the size you specify. If the size does not fall naturally on a cylinder boundary, the partition size is rounded down for Novell type partitions.

Examples

```
size=20G
size=1.45T
```

device=devicename

Mandatory. Specify the device to create a RAID segment on. This option is used multiple times, once for each segment to create. RAID 0 or RAID 1 requires a minimum of two devices. RAID 5 requires a minimum of three devices. Devices must be unique for each instance.

Example

```
device=sdb device=sdC device=sdd
```

stripe=stripe_size

Specify the RAID stripe size in bytes. This option is applicable only for RAID 0 and RAID 5. The stripe size must be a power of 2, with a minimum size of 4 KB and a maximum size of 256 KB. The default stripe size is 64 KB.

Example

```
stripe=64K
```

part=partition_name

Specify the node name for the partition to be mirrored. Use this option to mirror an existing NSS partition (such as `sdC1.1`) or Novell Cluster Services SBD partition (such as `cluster1.sbd`). The existing partition is the first segment of a RAID 1 mirror.

If the `part` option is used, the RAID size option is ignored. Each segment's size is the size of the existing partition. The data on the original partition is mirrored on up to three specified devices.

After you mirror the partition, you manage the RAID 1 device by using the normal NSS software RAID management tools and commands.

Examples

```
part=sdC1.1
part=cluster1.sbd
```

Command Examples

```
nlvm create raid name=MYRAID5 size=20G raid=5 device=sdb device=sdC device=sdd
```

Create a RAID 5 (striping with parity) device that has segments of 20 GB each on devices `/dev/sdb`, `/dev/sdC`, and `/dev/sdd`. The default stripe size of 64 KB is automatically applied. The default partition type is `nss`.

```
nlvm create raid name=MYRAID1 raid=1 device=sdf part=sdC1.1
```

Create a RAID 1 (mirror) for the existing NSS pool partition `/dev/sdC1.1` on the `/dev/sdf` device. The partition type is the same as the existing partition's type. The pool's existing partition becomes the first segment of the RAID, and its existing data is mirrored to device `/dev/sdf`.

```
nlvm -s create raid name=cluster1 raid=1 type=sbd device=sdc size=max
device=sde
```

Before you issue the command, take the cluster down, and then stop Novell Cluster Services on all nodes. Create a new Novell Cluster Services SBD RAID 1 device for a cluster named `cluster1`. Use devices `sdc` and `sde`. Use the maximum space available as the partition size, based on the smaller of the two devices. Specify the size only once. Use the `-s` NLVM option to override the shared locking requirement and force the command to execute. Afterwards, join the nodes to the cluster.

```
nlvm create raid name=cluster2 raid=1 part=cluster2.sbd device=sdf
```

Mirror an existing Novell Cluster Services SBD partition named `cluster2.sbd`. The RAID type is RAID 1. The name `cluster2` is the same name as the cluster that uses the SBD partition. This name is also the same as the label on the existing SBD partition. The partition is mirrored on the previously initialized and shared device `/dev/sdf`. Device `sdf` is at least the size of the existing partition, and can be formatted as MSDOS or GPT. The new SBD RAID 1 device is named `cluster2.sbd`. The mirrored SBD partitions are named `cluster2.msbd0` and `cluster2.msbd1`.

6.9 Create Snap

```
create snap <name> <pool> <<device> <size>|<part>> [chunk]
```

Create a snapshot of an NSS pool.

```
nlvm [nlvm_options] create snap <name> <pool> <<device> <size>|<part>> [chunk]
```

For the stored-on location, you can specify the device and size, or specify an existing snap partition (type 1AC).

Command Options

name=*snapshot_name*

Mandatory. Specify the name of the NSS snapshot. This name must be a unique snap name on the server. The snap name is automatically converted to uppercase.

Pool snapshot names are 2 to 15 characters. The naming conventions are the same as for pools.

Example

```
name=POOL1SNAP
```

pool=*pool_name*

Mandatory. Specify the name of an existing pool that you want to snap.

Example

```
pool=MYPOOL1
```

device=*devicename*

Specify the device where you want to store the copy-on-write data for this snapshot. Use the `size` option to specify the amount of space to use on the device.

The `device` and `size` options are used instead of the `part` option.

Example

```
device=sdb
```


size=<value[K|M|G|T]|max>

Specify the amount of space to use on the specified device. The minimum size is 50 MB; there is no maximum. A snap partition (type 1AC) of the specified size is created on the specified device.

NSSMU restricts the maximum snapshot size to 8 TB.

Examples

```
size=20G
size=100.50M
```

part=<snap_partition>

Specify an existing, but currently unused, snap partition (type 1AC) where you want to store the copy-on-write data for this snapshot. Because the partition will be re-initialized and associated with this snapshot, it must not belong to any current snapshot. A snap partition can be used by only one snapshot.

Only a partition of type 1AC (snapshot) is allowed; all other partition types result in an error.

The `part` option is used instead of the `device` and `size` options.

Example

```
part=sdd3
```

chunk=chunk_size

Specify the chunk size of the snapshot in bytes. The default size is 64 KB. The chunk size must be a power of 2, with the minimum size of 512 bytes, and a maximum size of 256 KB.

Example

```
chunk=128K
```

Command Example

```
nlvm create snap name=POOL1SNAP pool=MYPPOOL1 device=sdb size=20G chunk=128K
```

Create a snapshot named `POOL1SNAP` of pool `MYPPOOL1`. The copy-on-write partition is on device `/dev/sdb` and of size 20 GB, and the snapshot chunk size is 128 KB.

```
nlvm create snap name=POOL2SNAP pool=MYPPOOL2 part=sdd3 chunk=128K
```

Create a snapshot named `POOL2SNAP` of pool `MYPPOOL2`. The copy-on-write partition uses an existing but unused partition `/dev/sdd3` of type 1AC (snapshot), and the snapshot chunk size is 128 KB. The specified partition is re-initialized and assigned to snap `POOL2SNAP`.

6.10 Create Volume

create volume <name> <pool> [passw] [quota] [valid]

Create an NSS volume on an existing pool. NSS volumes are always mounted at `/media/nss/<VolumeName>` unless otherwise specified.

```
nlvm [nlvm_options] create volume <name> <pool> [passw] [quota] [valid]
```

Command Options

name=volume_name

Mandatory. Specify the name of the NSS volume to create. This name must be unique from other volumes. The volume name is automatically converted to uppercase.

Volume names are 2 to 15 characters. The naming conventions are the same as for pools.

Example

```
name=MYVOL1
```

pool=pool_name

Mandatory. Specify the name of an existing NSS pool where you want to create the volume.

Example

```
pool=MYPOOL1
```

passw=password

Specify a password if the volume is an encrypted volume.

Example

```
passw=novell
```

quota=size

Optional. Specify a quota for the volume. A quota is the maximum amount of space in the pool that can be used by the volume. If no quota is specified or if the quota value exceeds the size of the pool, the volume can grow to the size of the pool.

If the maximum pool size is smaller than the specified volume quota, the volume can grow only to the size of the pool. If you later expand the size of the pool, then the volume quota is again the limiting factor.

Example

```
quota=500G
```

valid=value

(Optional) Used in combination with a clustered NSS pool to assign an NCP volume ID for a clustered NSS volume. If the `valid` option is not used, a volume ID is automatically assigned. For clustered volumes, the valid range is 254 to 0, in descending order.

In a Novell Cluster Services cluster, the volume ID must be unique across all member nodes. In a Business Continuity Cluster, the volume ID must be unique across all nodes in every peer cluster.

Example

```
pool=MYPOOL50 valid=250
```

MYPOOL50 is a clustered NSS pool.

Command Examples

```
nlvm create volume name=MYVOL1 pool=MYPOOL1
```

Create a non-encrypted NSS volume on an existing pool named MYPOOL1.

```
nlvm create volume name=MYVOL1 pool=MYPOOL1 passw=novell
```

Create an NSS volume on an existing pool named MYPOOL1, and encrypt the volume using the password of `novell`.

```
nlvm create volume name=MYVOL1 pool=MYPOOL1 quota=500G
```

Create a non-encrypted NSS volume on an existing pool named MYPOOL1. The volume has a quota of 500 GB.

```
nlvm create volume name=MYVOL50 pool=MYPPOOL50 valid=250
```

Create a non-encrypted, clustered NSS volume on an existing clustered NSS pool named MYPPOOL50. Assign it the NCP volume ID of 250, which the administrator knows to be unique across all member nodes in the Novell Cluster Services cluster and across all peer clusters in a Business Continuity Cluster.

6.11 Delete Linux Volume

delete linux volume <volume_name>

Delete an existing Linux POSIX volume. You cannot delete the root (/) volume. You must unmount the volume before you can delete it.

If the volume is a clustered LVM volume group and logical volume, you must take the cluster resource offline, and then delete the resource before you can delete the volume.

```
nlvm [nlvm_options] delete linux volume <volume_name>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

You can use the `nlvm list linux volumes` command to find the *volume_name*. A Linux POSIX volume is preceded by a forward slash, such as `/vol1`. This is the last directory of the mount point path that you provided when you created the Linux POSIX volume with NLVM or NSSMU. An LVM volume name is the volume name you used when you created the volume, such as `lvvol1`.

Command Options

volume_name

Mandatory. Specify the name of the volume to delete.

Examples

For a Linux POSIX volume mounted at `/home/bob`, the volume name is `/bob`.

For an LVM logical volume that you named `lvvol1` that is mounted at `/mnt/lvvol1`, the volume name is `lvvol1` (with no forward slash).

For an LVM logical volume that you named `lvvol2` that is mounted at `/home/users`, the volume name is `lvvol2` (not `/users`).

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Examples

```
nlvm delete linux volume /bob
```

Delete the Linux POSIX volume that is mounted at `/home/bob`.

```
nlvm delete linux volume lvvol1
```

Delete the Linux LVM logical volume `lvvol1` that is mounted at `/mnt/lvvol1`.

```
nlvm --no-prompt delete linux volume lvvol2
```

Delete the Linux LVM logical volume `lvvol2` that is mounted at `/home/users`. The confirmation message is not displayed.

6.12 Delete Move

delete move <<*move_name*>|< *pool_name*>>

Delete an NSS pool move. This command deletes the move request, returns the pool back to its original location, and removes the new location. You can delete the move at any time while the move is in progress, even if it is pending only the `complete move` command to be finalized.

Use the `complete move` command if you want to keep the new location and remove the original location.

If a pool is cluster-enabled, issue the command on the node where its pool cluster resource is currently online.

```
nlvm [nlvm_options] delete move <<move_name>|<pool_name>>
```

You are automatically prompted to confirm the delete action. Respond by typing `yes` or `no`, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Command Options

move_name or *pool_name*

Mandatory. Specify the name of the NSS pool move to delete, such as `POOLNAME_move`. You can alternatively specify the pool name.

`--no-prompt`

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Example

```
nlvm delete move MYPOOL_move
```

Delete the pool move named `MYPOOL_move`. This removes the new location, and sets the pool to the original location.

6.13 Delete Partition

delete partition <*partition_name*>

Delete an existing partition by name.

```
nlvm [nlvm_options] delete partition <partition_name>
```

You are automatically prompted to confirm the delete action. Respond by typing `yes` or `no`, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Before you create a Novell Cluster Services SBD partition, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.

Command Options

partition_name

Mandatory. Specify the node name (such as `sdc1.1`) of the partition to be deleted.

Example

```
sdc1.1
```

-f, --force

Optional. The `force` NLVM option can be used with the `delete partition` command if the partition is part of a pool or move. If the partition is part of a pool, deleting the partition automatically deletes the pool. If the partition is part of a move destination, deleting the partition automatically deletes the pool move.

Examples

```
-f
--force
```

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Examples

```
nlvm delete partition sdc1.1
```

Delete the partition `/dev/sdc1.1`.

```
nlvm --force delete partition sdd1.2
```

Delete the partition `/dev/sdd1.2` that is part of an NSS pool move destination. The pool move is deleted as well.

6.14 Delete Pool

delete pool <pool_name>

Delete an existing NSS pool by name.

```
nlvm [nlvm_options] delete pool <pool_name>
```

You are automatically prompted to confirm the delete action. Respond by typing `yes` or `no`, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Command Options

pool_name

Mandatory. Specify the name of the NSS pool to be deleted.

Example

```
MYPOOL1
```

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Example

```
nlvm delete pool MYPOOL1
```

Delete the NSS pool named `MYPOOL1`.

6.15 Delete RAID

delete raid <raid_name>

Delete an existing NSS software RAID device by name.

If the RAID device is a single element RAID 1, this command removes the RAID 1 mirror object from the pool partition and leaves the pool on the corresponding partition. The pool is not deleted and no data is destroyed.

When you delete a single element RAID1 mirror for an SBD (split-brain detector) partition, it removes the mirror object and leaves the SBD in the corresponding partition. The SBD is not deleted and no data is destroyed.

For a RAID1 that contains multiple elements, deleting the RAID1 deletes all mirrors and the pool partitions or SBD partitions on them. All data is destroyed. If you want to keep the pool or SBD on one of the member devices, use the `nlvm delete partition` command to delete the partitions for mirror elements you do not want to keep. For the remaining single-element mirror, go to the RAIDs page and delete the RAID1 mirror element. This removes the RAID1 object and leaves the pool partition or SBD partition.

```
nlvm [nlvm_options] delete raid <raid_name>
```

You are automatically prompted to confirm the delete action. Respond by typing `yes` or `no`, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

For single element RAID 1 devices, this command duplicates the `nlvm raid delete` command, which deletes a single element mirror from a pool, leaving the pool on the corresponding partition.

Before you delete a Novell Cluster Services SBD RAID 1, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.

Command Options

raid_name

Mandatory. Specify the name of the NSS software RAID device to be deleted.

Example

```
MYRAID1
```

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Example

```
nlvm delete raid MYRAID1
```

Delete the NSS software RAID device named MYRAID1.

6.16 Delete RAID Segment

delete raid <raid_name> segment <number>

Delete a specified segment of an existing NSS software RAID device. This is valid only for RAID 1 and RAID 5 devices. RAID 5 can remove only 1 segment, but it must be replaced by another segment in order to have redundancy.

```
nlvm [nlvm_options] delete raid <raid_name> segment <number>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Use the `--force` NLVM option to remove out-of-sync segments.

Command Options

raid_name

Mandatory. Specify the name of the NSS software RAID device that contains the segment to be deleted.

Example

```
MYRAID1
```

number

Mandatory. Specify the segment index (zero relative) to be removed. For RAID 1, the value must be 0 to 3. For RAID 5, the value must be 0 to 13.

Example

```
0
```

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

-f, --force

Optional. Specify this NLVM option to force the command to delete out-of-sync segments.

Command Example

```
nlvm delete raid MYP00L1 segment 0
```

Delete the first segment of the NSS software RAID device named MYRAID1.

```
nlvm --force delete raid MYP00L1 segment 1
```

Delete the second segment of the NSS software RAID device named MYRAID1. Use the `--force` option to force the deletion of an out-of-sync segment.

6.17 Delete Snap

delete snap <snap_name>

Delete an existing NSS pool snapshot by name.

```
nlvm [nlvm_options] delete snap <snap_name>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Command Options

snap_name

Mandatory. Specify the name of the NSS pool snapshot to be deleted.

Example

```
POOL1SNAP
```

```
--no-prompt
```

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Example

```
nlvm delete snap POOL1SNAP
```

Delete the NSS pool snapshot named POOL1SNAP.

6.18 Delete Volume

delete volume <volume_name>

Delete an existing NSS volume by name.

```
nlvm [nlvm_options] delete volume <volume_name>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Command Options

volume_name

Mandatory. Specify the name of the NSS volume to be deleted.

Example

```
MYVOL1
```

```
--no-prompt
```

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Example

```
nlvm delete volume MYVOL1
```

Delete the NSS volume named MYVOL1.

6.19 Expand Partition

expand partition <partition_name> <size>

Expand an existing partition.

This command does not add a partition, but expands the existing partition. There must be free space contiguously following this partition in order to expand it.

```
nlvm [nlvm_options] expand partition <partition_name> <size>
```


Command Options

partition_name

Mandatory. Specify the node name (such as `sdc1.1`) of the partition to be expanded. This must be the first command option.

Example

```
sdc1.1
```

size=<value[K|M|G|T]|max>

Mandatory. Specify the amount of space to add to the existing partition.

Examples

```
size=20G  
size=200.45G
```

Command Example

```
nlvm expand partition sdc1.1 size=20G
```

Expand the `/dev/sdc1.1` partition by adding the next 20 GB of contiguous free unpartitioned space. For example, if the original partition is 20 GB, the expanded size is 40 GB.

6.20 Expand Pool

expand pool <pool_name> <size device | part >

Expand an existing NSS pool by adding a new partition. Either a partition must be specified, or the device and size must be specified.

If the specified device is the same device as the last segment of the existing pool, and free space exists following the last segment, the utility tries to expand the partition first before trying to add a new partition.

```
nlvm [nlvm_options] expand pool <pool_name> <size device | part >
```

Command Options

pool_name

Mandatory. Specify the name of the NSS pool to be expanded. This must be the first command option.

Example

```
MYPOOL1
```

device=device_name

Specify the device to use for the expanded space.

You can specify multiple `device` option instances to create a pool comprised of multiple segments. Each `device` option instance must have a matching `size` option instance. The first `device` instance is matched to the first `size` instance, and so on.

Example

```
device=sdb
```

size=<value[K|M|G|T]|max>

Specify the amount of space to add to the existing pool.

If multiple devices are specified, each `device` option instance must have a matching `size` option instance. The first `size` instance is matched to the first `device` instance, and so on.

Examples

```
size=20G
size=100.50M
```

part=partition_name

Specify the name of a partition to add to the pool. The entire partition size is added to the pool's capacity. The partition must be of type 0X169 (`nss`).

Example

```
part=sdcl.1
```

Command Examples

```
nlvm expand pool MYPOOL1 device=sdf size=20G
```

Expand the NSS pool named MYPOOL1 by adding the 20 GB of free space from device `/dev/sdf`.

```
nlvm expand pool MYPOOL2 device=sdf size=20G device=sdg size=100G
```

Expand the NSS pool named MYPOOL1 by adding the 20 GB of free space from device `/dev/sdf` and 100 GB of free space from device `/dev/sdg`.

```
nlvm expand pool MYPOOL1 part=sdcl.1
```

Expand the NSS pool named MYPOOL1 by adding the `/dev/sdcl.1` partition to it. The partition is type 0X169. The entire partition size is added to the pool's capacity.

6.21 Expand RAID

expand raid <raid_name> <device>

Expand an existing NSS software RAID device by adding a new segment. Specify the RAID name and the device to use. The device option can be specified multiple times to specify additional segments. Each device must have a free space area at least as big as the segment size of the RAID.

```
nlvm [nlvm_options] expand raid <raid_name> <device>
```

Command Options

raid_name

Mandatory. Specify the name of the NSS software RAID device to be expanded. This must be the first command option.

Example

```
MYRAID1
```

device=device_name

Specify the device to use for the expanded space.

Example

```
device=sdb
```

Command Examples

```
nlvm expand raid MYRAID1 device=sdf
```

Expand the NSS software RAID device named MYRAID1 by adding the device `/dev/sdf`.

```
nlvm expand raid MYRAID5 device=sdg device=sdh
```

Expand the NSS software RAID device named MYRAID5 by adding the `/dev/sdg` and `/dev/sdh` devices as two new segments.

6.22 Init Device

init <device_name> [format] [shared|unshared]

Initialize a device by deleting all partitions on the device and setting the partitioning scheme.

```
nlvm [nlvm_options] init <device_name> [format] [shared|unshared]
```

You are automatically prompted to confirm the initialize action. Respond by typing `yes` or `no`, then press Enter. Use the `--no-prompt` NLVM option to suppress the confirmation prompt.

You can optionally specify whether to set the device as shared or unshared. If neither the `shared` nor `unshared` option is added, the device is initialized, the partitioning scheme is set, and the shared state remains what it was before the initialize command.

Command Options

device_name

Mandatory. Specify the name of the device to be initialized. This must be the first command option.

You can enter multiple devices by separating the device names with a comma and no spaces.

Examples

```
sdb  
sde, sdf, sdg
```

format=<gpt|msdos>

Specify the partitioning scheme as `gpt` or `msdos`. The default is `msdos`. The MSDOS partitioning scheme supports device sizes that are less than or equal to 2 TB. If the device size is greater than 2 TB and the partitioning scheme is not specified, the default partitioning scheme of MSDOS applies, and the device size is truncated to 2 TB with the remainder as unusable space. Devices of any size can be set to use the GPT partitioning scheme.

Example

```
format=msdos
```

shared

After initializing the device, the device is set as shared. A small partition is created on the device to store the shared setting. The remainder of the device is free space.

For example, use this option to mark a device as Shareable for Clustering if you plan to use it for a shared NSS pool. NSS looks for this setting to cluster enable the pool.

unshared

After initializing the device, the device is not marked as shared. The device is unpartitioned free space.

Use this option to remove all partitions from a device. For example, LVM requires that a device contains no partitions before it creates a volume group on it.

-f, --force

Optional. Specify this NLVM option to force the initialization. This option is required if the device contains a root (/), swap, or boot partition, or if the `init` command cannot delete any pools on the disk.

Examples

```
-f
--force
```

--no-prompt

Optional. Specify this NLVM option to prevent a confirmation message from being displayed.

Example

```
--no-prompt
```

Command Examples

```
nlvm --force init sdb
```

Force the initialization of a previously formatted device `/dev/sdb`, and set its partitioning scheme to use the default setting of `msdos`. If the device size is greater than 2TB, the device has only 2 TB of usable space. If the device was previously set as shared, the shared setting remains after the initialization. Otherwise, the device is unshared.

```
nlvm init sdd format=gpt unshared
```

Initialize the device `/dev/sdd`, and set its partitioning scheme to GPT. If the device was previously set as shared, this removes the shared setting from the device. The device is unpartitioned free space.

```
nlvm init sde format=gpt shared
```

Initialize the device `/dev/sde`, set its partitioning scheme to GPT, and mark the device as shared. The device contains a small partition to hold the shared setting, and the rest is free space.

```
nlvm --no-prompt init sde,sdf,sdg format=gpt unshared
```

Initialize multiple devices at a time. Set each device's partitioning scheme to GPT. If a device was previously set as shared, the `unshared` option removes its shared setting. The devices are each unpartitioned free space. The confirmation message is not displayed.

6.23 Label

label <partition_name> <"label text">

Modify or add a label to a Novell type partition (NSS, SBD, or RAID).

```
nlvm [nlvm_options] label <partition_name> <"label text">
```

Command Options

partition_name

Mandatory. Specify the node name (such as `sdc1.1`) of the partition. This must be the first command option.

Example

```
sdc1.1
```

"label text"

Mandatory. Specify the text word or phrase to use for the label. If the text has spaces, use quotation marks.

Example

```
"This is the label"  
engineering
```

Command Example

```
nlvm label sdc1.1 "This is the label"
```

Add the label "This is the label" to the /dev/sdc1.1 partition.

6.24 Linux Mount

linux mount <lx_volume_name>

Mount a specified Linux POSIX volume on Linux. If the volume is NCP-enabled, this command also mounts the volume for NCP, and NCP assigns it a volume ID.

```
nlvm [nlvm_options] linux mount <lx_volume_name>
```

Command Options

lx_volume_name

Mandatory. Specify the name of the Linux POSIX volume to mount.

Use the name format as it is displayed in NSSMU or with the `nlvm list volumes` command. For a non-LVM volume that is not NCP-enabled, specify the name as a forward slash with the name of the final directory of the mount point (`/<dir_name>`). For an LVM volume that is not NCP-enabled, specify the volume name of the LVM logical volume. For an NCP-enabled volume, specify the NCP name in all capital letters. Volume names are case sensitive.

Examples

LV_VOL1	[ex: an LVM volume that is NCP-enabled]
lv_vol1	[ex: an LVM volume that is not NCP-enabled]
HOME	[ex: a non-LVM volume that is NCP-enabled]
/home	[ex: a non-LVM volume that is not NCP-enabled]

mntopt=<option1[,option2][,...]>

Specify the options to use when mounting the volume. For a list of available options, see the `mount (8)` man page. The default `mntopt` option is `rw`.

Example

```
mntopt=rw
```

Command Examples

```
nlvm linux mount LV_VOL1
```

Mounts the NCP-enabled LVM volume LV_VOL1 in Linux using the parameters from the `/etc/fstab` file, and then mounts it in NCP. NCP automatically assigns a volume ID.

```
nlvm linux mount /home
```

Mounts the non-LVM volume using the parameters from the `/etc/fstab` file.

```
nlvm linux mount HOME
```

Mounts the NCP-enabled non-LVM volume in Linux using the parameters from the `/etc/fstab` file, and then mounts it in NCP. NCP automatically assigns a volume ID.

```
nlvm linux mount HOME mntopt=rw,user_xattr
```

Mounts the NCP-enabled non-LVM volume in Linux using the specified mount parameters for an Ext3 file system type, and then mounts the volume in NCP. NCP automatically assigns a volume ID.

6.25 Linux Unmount

linux unmount <lx_volume_name>

Dismount a specified Linux volume. If the volume is NCP-enabled, it also dismounts it from NCP before it dismounts it from Linux.

```
nlvm [nlvm_options] linux unmount <lx_volume_name>
```

Command Option

lx_volume_name

Mandatory. Specify the name of the Linux POSIX volume to dismount.

Use the name format as it is displayed in NSSMU or with the `nlvm list volumes` command. For information, see `nlvm linux mount`.

Examples

LV_VOL1	[ex: an LVM volume that is NCP-enabled]
lv_vol1	[ex: an LVM volume that is not NCP-enabled]
HOME	[ex: a non-LVM volume that is NCP-enabled]
/home	[ex: a non-LVM volume that is not NCP-enabled]

Command Example

```
nlvm volume unmount HOME
```

Dismounts the NCP-enabled non-LVM volume `HOME` from NCP, and then dismounts it from Linux.

```
nlvm volume unmount /home
```

Dismounts the non-LVM volume `/home` from Linux.

```
nlvm volume unmount lv_vol1
```

Dismounts the LVM volume `lv_vol1` from Linux.

6.26 List Device

list device <device_name>

Print the details of a specified device.

```
nlvm [nlvm_options] list device <device_name>
```

Command Option

device_name

Mandatory. Specify the desired device.

Example

```
sdb
```

Command Example

```
nlvmlist device sdb
```

Print the details for the `/dev/sdb` device.

Response Parameters

The device details include the following values. Most labels are self-explanatory.

Label	Description
Name	Device name such as <code>sdb</code> or <code>raid1</code>
Size	Total amount of space on the device in KB, MB, GB, or TB, and the number of whole sectors in that space <code>Size=623.91MB (1277773)</code>
Used	Used space on the device in KB, MB, GB, or TB, and the number of whole sectors in that space.
Free	Available space on the device in KB, MB, GB, or TB, and the number of whole sectors in that space
Format	MSDOS, GPT, CSM (legacy EVMS Cluster Segment Manager), LVM (clustered Linux LVM volume), None (not initialized)
Shared	Yes or No; whether this device is marked as Shareable for Clustering
RAID	Yes or No; whether this is an NSS software RAID device
M:M	Major:Minor numbers, such as 8:112
H:S	Heads:Sectors geometry per track, such as 255:32

If the device contains partitions, it provides the following information:

Label	Description
Part	Partition name such as <code>sdb1.1</code> , <code>sdc2</code> , or <code>cluster.sbd</code>
Partition=	
Type	Partition type, including NSS, NSS RAID, SBD, Linux, Linux_swap, LVM
Size	Amount of space allocated to the partition in KB, MB, GB, or TB
Sectors	Number of whole sectors allocated to the partition
Pool	If the partition is the NSS type, the name of the pool that resides on the partition (if any)

For NSS software RAID devices, it provides the following information:

Label	Description
RAID	No or RAID type (0, 1, or 5)
Sync	Yes or %; whether the RAID is in sync or if a sync is in progress
Segs	Number of segments defined for the RAID
Enbl	Yes or No; whether the RAID is enabled on this node
Missing	Segment number (if any) that is missing in the RAID
Stripe	RAID stripe size in bytes (typically KB) for RAID types 0 and 5

For RAID segments, it provides the following information:

Label	Description
Segment	Segment index number
Name	Segment name, such as sdb1.4
Device	Name of the device that contains the segment, such as sdb
Size	Segment size in KB, MB, GB, or TB
Sectors	Number of whole sectors allocated to the partition

Sample Command Responses

Sample 1: Standard Device

```
nlvm list device sdb
Name=sdb
Size=1.00GB(2097152) Used=400.01MB(819232) Free=623.98MB(1277920)
Format=MSDOS Shared=No RAID=No M:M=8:16 H:S=255:32
Partitions on the device:
Part  Type          Size  Sectors  Pool
sdb1.1 NSS           100.00MB  204800  PMOVE
sdb1.2 NSS           100.00MB  204800
sdb1.3 NSS           100.00MB  204800  BIGLONGPOOLNAME
sdb1.4 NSS Raid       100.00MB  204800
```

Sample 2: NSS RAID 1 (Mirror) Device (not initialized)

```
nlvm list device MyRaid1
Name=MyRaid1
Size=99.98MB(204768) Used=0KB(0) Free=99.98MB(204768)
Format=None Shared=No RAID=1 Sync=Yes M:M=253:2 H:S=255:32
Segs=2 Enbl=Yes
Segments of the RAID:
Segment Name  Device  Size  Sectors  Sync
0      sdb1.2 sdb    100.00MB  204800  Yes
1      sdc5.1 sdc    100.00MB  204800  Yes
```


Sample 3: NSS RAID 0 Device

```
nlvm list device rr0
Name=rr0
Size=199.96MB(409536) Used=100.01MB(204832) Free=99.95MB(204704)
Format=MSDOS Shared=No RAID=0 Sync=Yes M:M=253:15 H:S=255:32
Segs=2 Enbl=Yes Missing=None Stripe=64k
Segments of the RAID:
Segment Name Device Size Sectors
  0 sdb1.4 sdb 100.00MB 204800
  1 sdc8.1 sdc 100.00MB 204800
Partitions on the device:
Part Type Size Sectors Pool
rr0p1.1 NSS 50.00MB 102400
rr0p1.2 NSS 50.00MB 102400 RRPOOL
```

6.27 List Devices

list devices [exclude] [more|all]

Print a list of the devices. For each device, display the device name, size, free available space, partitioning type, if it is marked as Shareable for Clustering, and if it is an NSS software RAID device. If no other options are specified, this prints a list of all devices and software RAID devices.

```
nlvm [-t] list devices [exclude] [more|all]
```

Command Options

exclude=<raid|nonraid|shared|nonshared|lvm|nonlvm>

Exclude the specified type of devices. This option can be used multiple times to add exclusions for different types. Valid device types are `raid`, `nonraid`, `shared`, `nonshared`, `lvm`, or `nonlvm`.

Example

```
exclude=raid exclude=nonshared
```

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the devices. This is the same information that is printed for the `nlvm list device <device_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list devices exclude=raid exclude=nonshared exclude=lvm all
```

Print detailed information for all non-LVM shared devices that are not software RAID devices.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following standard information about the devices on the server:

Label	Description
Name	Device name such as <code>sdb</code> or <code>raid1</code>
Size	Total amount of space on the device in KB, MB, GB, or TB
Used	Used space on the device in KB, MB, GB, or TB
Free	Available space on the device in KB, MB, GB, or TB
Format	MSDOS, GPT, CSM (legacy EVMS Cluster Segment Manager), LVM (clustered Linux LVM volume), None (not initialized)
Shared	Yes or No; whether this device is marked as Shareable for Clustering
RAID	Yes or No; whether this is an NSS software RAID device
Enabled	Yes or No; whether the RAID is enabled on this node

More Output

The command returns the following additional information about the devices on the server:

Label	Description
RAID	Type (0, 1, or 5) or No; type of NSS RAID device, or not a RAID
Sync	Yes or %; whether the RAID is in sync or percent completed
M:M	Major:Minor numbers, such as 8:112

All Output

If the `all` option is used, the command returns the same information about each device as is displayed for the `nlvm list device <device_name>` command. This includes information about its partitions, or about its partitions and segments for RAID devices.

Sample Command Responses

Sample 1: nlvm list devices

Name	Size	Used	Free	Format	Shared	RAID	Enabled
<code>sda</code>	20.00GB	19.99GB	1008KB	MSDOS	No	No	
<code>sdb</code>	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
<code>sdc</code>	1.00GB	710.78MB	298.82MB	MSDOS	No	No	
<code>sdd</code>	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	
<code>rr0</code>	199.96MB	100.01MB	99.95MB	MSDOS	No	0	Yes
<code>MyRaid1</code>	99.98MB	0KB	99.98MB	None	No	1	Yes

Sample 2: nvml list devices --terse

```
Name=sda Size=20.00GB Used=19.99GB Free=1008KB Format=MSDOS Shared=No RAID=No
Name=sdb Size=1.00GB Used=400.01MB Free=623.98MB Format=MSDOS Shared=No RAID=No
Name=sd c Size=1.00GB Used=710.78MB Free=298.82MB Format=MSDOS Shared=No RAID=No
Name=sdd Size=8.00GB Used=50.01MB Free=7.95GB Format=MSDOS Shared=Yes RAID=No
Name=rr0 Size=199.96MB Used=100.01MB Free=99.95MB Format=MSDOS Shared=No RAID=0
Enabled=Yes
Name=MyRaid1 Size=99.98MB Used=0KB Free=99.98MB Format=None Shared=No RAID=1
Enabled=Yes
```

Sample 3: nvml list devices more

Name	Size	Used	Free	Format	Shared	RAID	Sync	Maj:Min
sda	20.00GB	19.99GB	1008KB	MSDOS	No	No		8:0
sdb	1.00GB	400.01MB	623.98MB	MSDOS	No	No		8:16
sd c	1.00GB	710.78MB	298.82MB	MSDOS	No	No		8:32
sdd	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No		8:48
rr0	199.96MB	100.01MB	99.95MB	MSDOS	No	0	Yes	253:15
MyRaid1	99.98MB	0KB	99.98MB	None	No	1	Yes	253:2

Sample 4: nvml list devices all

```
Name=sda
Size=20.00GB(41943040) Used=19.99GB(41941024) Free=1008KB(2016)
Format=MSDOS Shared=No RAID=No M:M=8:0 H:S=255:32
Partitions on the device:
Part Type          Size  Sectors  Pool
sda1 Linux Swap      1.00GB 2103296
sda2 Linux          15.98GB 33527808
sda3 Linux          3.00GB 6309888

Name=sdb
Size=1.00GB(2097152) Used=400.01MB(819232) Free=623.98MB(1277920)
Format=MSDOS Shared=No RAID=No M:M=8:16 H:S=255:32
Partitions on the device:
Part Type          Size  Sectors  Pool
sdb1.1 NSS         100.00MB 204800  PMOVE
sdb1.2 NSS         100.00MB 204800
sdb1.3 NSS         100.00MB 204800  BIGLONGPOLNAME
sdb1.4 NSS Raid    100.00MB 204800

Name=sd c
Size=1.00GB(2097152) Used=710.78MB(1455680) Free=298.82MB(612000)
Format=MSDOS Shared=No RAID=No M:M=8:32 H:S=255:32
Partitions on the device:
Part Type          Size  Sectors  Pool
sd c1 Linux LVM     103.57MB 212128
sd c2 Linux LVM     103.59MB 212160
sd c3 Linux         103.59MB 212160
sd c4 DOS Extended 713.20MB 1460640
sd c5.1 NSS        100.00MB 204800
sd c7.1 NSS        100.00MB 204800  POOL1
sd c8.1 NSS Raid   100.00MB 204800
sd c9.1 NSS        100.00MB 204800  PMOVE_move

Name=sdd
Size=8.00GB(16777216) Used=50.01MB(102432) Free=7.95GB(16674784)
Format=MSDOS Shared=Yes RAID=No M:M=8:48 H:S=255:32
Partitions on the device:
Part Type          Size  Sectors  Pool
cluster.sbd Cluster 50.00MB 102400

Name=rr0
Size=199.96MB(409536) Used=100.01MB(204832) Free=99.95MB(204704)
Format=MSDOS Shared=No RAID=0 Sync=Yes M:M=253:15 H:S=255:32
Segs=2 Enbl=Yes Missing=None Stripe=64k
Segments of the RAID:
Segment Name Device  Size  Sectors
0          sdb1.4 sdb   100.00MB 204800
```

```

    1   sdc8.1 sdc      100.00MB  204800
Partitions on the device:
Part  Type              Size  Sectors  Pool
rr0p1.1 NSS              50.00MB  102400
rr0p1.2 NSS              50.00MB  102400  RRPOOL

Name=MyRaid1
Size=99.98MB(204768) Used=0KB(0) Free=99.98MB(204768)
Format=None Shared=No RAID=1 Sync=Yes M:M=253:2 H:S=255:32
Segs=2 Enbl=Yes
Segments of the RAID:
Segment Name Device      Size  Sectors  Sync
0   sdb1.2 sdb      100.00MB  204800  Yes
1   sdc5.1 sdc      100.00MB  204800  Yes

```

6.28 List Linux Volume

list linux volume <lx_volume_name>

Print detailed information about a specified Linux volume.

```
nlvm [nlvm_options] list linux volume <lx_volume_name>
```

Command Option

lx_volume_name

Mandatory. Specify the name of the Linux POSIX volume.

Use the name format as it is displayed in NSSMU or with the `nlvm list volumes` command. For a non-LVM that is not NCP-enabled, specify the name as a forward slash with the name of the final directory of the mount point (`/<dir_name>`). For an LVM volume that is not NCP-enabled, specify the volume name of the LVM logical volume. For an NCP-enabled volume, specify the NCP name.

Examples

```

LV_VOL1           [ex: an LVM volume that is NCP-enabled]
lv_vol1          [ex: an LVM volume that is not NCP-enabled]
MYLVMVOL         [ex: an LVM volume that is not NCP-enabled]
HOME             [ex: a non-LVM volume that is NCP-enabled]
/home            [ex: a non-LVM volume that is not NCP-enabled]

```

Command Example

```
nlvm list linux volume MYLVMVOL
```

Print detailed information about the NCP-enabled LVM volume named `MYLVMVOL`.

Response Parameters

The Linux volume details include the following. Most labels are self-explanatory.

Label	Description
Name	Volume name. The format of the name depends on the type of volume and whether it is NCP-enabled.
Group	LVM group name or NA (not applicable) for non-LVM volumes
Mounted	Yes or No; whether the volume is mounted for user access
Size	Size of the volume in KB, MB, GB, or TB
Shared	Yes or No; whether volume's device is marked as Shareable for Clustering
Type	Type of file system (such as btrfs, ext2, ext3, reiserfs, or xfs)

Label	Description
LVM	Yes or No; whether the volume is an LVM volume
NCP	Yes or No; whether the volume is NCP-enabled
Mountpoint	Full Linux path where the volume is mounted
Path	Path of the device or partition. For LVM, this is typically <code>/dev/<volume_group_name>/<logical_volume_name></code> . If it is not LVM, this is the partition path.
MountOptions	Defaults or specified mount options, such as <code>rw</code>

Sample Command Responses

Sample 1: Non-LVM Volume

```
nlvm list linux volume /home
Name=/home
Group=NA Mounted=Yes Size=3.00GB
Shared=No Type=ext3 LVM=No NCP=No
Mountpoint=/home
Path=/dev/sda3
MountOptions=defaults
```

Sample 2: LVM Volume

```
nlvm list linux volume mylvm
Name=mylvm
Group=ajlvm Mounted=No Size=100.00MB
Shared=No Type=ext3 LVM=Yes NCP=No
Mountpoint=/usr/novell/mylvm
Path=/dev/mylvm/mylvm
MountOptions=rw
```

Sample 3: NCP-Enabled Non-LVM Volume

```
nlvm list linux volume NCP3
Name=NCP3
Group=NA Mounted=Yes Size=103.59MB
Shared=No Type=ext3 LVM=No NCP=Yes
Mountpoint=/usr/novell/NCP3
Path=/dev/sdc3
MountOptions=rw
```

Sample 4: NCP-Enabled LVM Volume

```
nlvm list linux volume LVMNCP
Name=LVMNCP
Group=lvmncp Mounted=No Size=100.00MB
Shared=No Type=ext3 LVM=Yes NCP=Yes
Mountpoint=/usr/novell/lvmncp2
Path=/dev/lvmncp/LVMNCP
MountOptions=rw
```

6.29 List Linux Volumes

list [-t] linux volumes [more|all]

Print a list of Linux POSIX volumes and for each, display its path, mount point, file system type, NCP enabled status, and mount status.

```
nlvm [-t] list linux volumes [more|all]
```

Command Options

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the Linux volumes. This is the same information that is printed for the `nlvm list linux volume <volume_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list linux volumes
```

Print a list of Linux POSIX volumes and the paths where they are mounted.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following standard information about the Linux volumes on the server:

Label	Description
Name	Volume name. The format of the name depends on the type of volume and whether it is NCP-enabled.
Group	LVM group name or NA (not applicable) for non-LVM volumes
Mounted	Yes or No; whether the volume is mounted for user access
Size	Size of the volume in KB, MB, GB, or TB
Shared	Yes or No; whether volume's device is marked as Shareable for Clustering
Type	Type of file system (such as btrfs, ext2, ext3, reiserfs, or xfs)
LVM	Yes or No; whether the volume is an LVM volume
NCP	Yes or No; whether the volume is NCP-enabled
Mountpoint	Full Linux path where the volume is mounted

More Output

The command returns the following additional information about the Linux volumes on the server:

Label	Description
Path	Path of the device or partition. For LVM, this is typically <code>/dev/<volume_group_name>/<logical_volume_name></code> . If it is not LVM, this is the partition path.

All Output

If the `all` option is used, the command returns the same information about each Linux volume as is displayed for the `nlvm list volume <volume_name>` command.

Sample Command Responses

Sample 1: nlvm list linux volumes

Name	Group	Mounted	Size	Shared	Type	LVM	NCP	Mountpoint
/		Yes	15.98GB	No	ext3	No	No	/
/home		Yes	3.00GB	No	ext3	No	No	/home
mylvm	mylvm	No	100.00MB	No	ext3	Yes	No	/usr/novell/mylvm
LVMNCP	lvmncp	No	100.00MB	No	ext3	Yes	Yes	/usr/novell/lvmncp2
NCP3		Yes	103.59MB	No	ext3	No	Yes	/usr/novell/NCP3

Sample 2: nlvm list linux volumes --terse

```
Name=/ Group=NA Mounted=Yes Size=15.98GB Shared=No Type=ext3 LVM=No NCP=No
Mountpoint=/
Name=/home Group=NA Mounted=Yes Size=3.00GB Shared=No Type=ext3 LVM=No NCP=No
Mountpoint=/home
Name=mylvm Group=mylvm Mounted=No Size=100.00MB Shared=No Type=ext3 LVM=Yes
NCP=No Mountpoint=/usr/novell/mylvm
Name=LVMNCP Group=lvmncp Mounted=No Size=100.00MB Shared=No Type=ext3 LVM=Yes
NCP=Yes Mountpoint=/usr/novell/lvmncp2
Name=NCP3 Group=NA Mounted=Yes Size=103.59MB Shared=No Type=ext3 LVM=No NCP=Yes
Mountpoint=/usr/novell/NCP3
```

Sample 3: nlvm list linux volumes more

Name	Group	Mounted	Size	Shared	Type	LVM	NCP	Mountpoint	Path
/		Yes	15.98GB	No	ext3	No	No	/	/dev/sda2
/home		Yes	3.00GB	No	ext3	No	No	/home	/dev/sda3
mylvm	mylvm	No	100.00MB	No	ext3	Yes	No	/usr/novell/mylvm	/dev/
mylvm/mylvm									
LVMNCP	lvmncp	No	100.00MB	No	ext3	Yes	Yes	/usr/novell/lvmncp2	/dev/
lvmncp/LVMNCP									
NCP2		Yes	103.59MB	No	ext3	No	Yes	/usr/novell/NCP3	/dev/sdc3

Sample 4: nlvm list linux volumes all

```
Name=/
Group=NA Mounted=Yes Size=15.98GB
Shared=No Type=ext3 LVM=No NCP=No
Mountpoint=/
Path=/dev/sda2
MountOptions=acl,user_xattr

Name=/home
Group=NA Mounted=Yes Size=3.00GB
Shared=No Type=ext3 LVM=No NCP=No
Mountpoint=/home
Path=/dev/sda3
MountOptions=defaults

Name=mylvm
Group=mylvm Mounted=No Size=100.00MB
Shared=No Type=ext3 LVM=Yes NCP=No
Mountpoint=/usr/novell/mylvm
Path=/dev/mylvm/mylvm
MountOptions=rw
```

```

Name=LVMNCP
  Group=lvmncp Mounted=No Size=100.00MB
  Shared=No Type=ext3 LVM=Yes NCP=Yes
  Mountpoint=/usr/novell/lvmncp2
  Path=/dev/lvmncp/LVMNCP
  MountOptions=rw

Name=NCP3
  Group=NA Mounted=Yes Size=103.59MB
  Shared=No Type=ext3 LVM=No NCP=Yes
  Mountpoint=/usr/novell/NCP3
  Path=/dev/sdc3
  MountOptions=rw

```

6.30 List Move

list move <<*move_name*>>|<*pool_name*>>

Print detailed information about a specified NSS pool move. It lists the devices you are moving from and the devices you are moving to, such as

```
from=sdc,sdd,sde to=sdg
```

If a pool is cluster-enabled, the pool move is enabled and active only on the node where the pool cluster resource is currently online. On other nodes in the cluster, the pool move is not enabled.

```
nlvm [nlvm_options] list move <<move_name>>|<pool_name>>
```

The move occurs as a low-level block mirror between the original location and the new location. The entire pool area is mirrored. The response reports the number of mirror regions to be moved for the pool relative to the maximum source pool size, which is unrelated to the NSS blocks in use. The region count for the old pool location does not change during the move. The complete parameter indicates the number of regions that have been moved so far and the percentage that it represents of the total number of regions to be moved.

The size of a mirror region is determined internally based on the total size of the mirror. One sector is used to track the number of mirror regions that are currently synchronized. A bit represents a mirror region, and there are 4096 bits total (512 * 8) to track. A shift technique is used so that the mirror region size is always a power of 2 (128, 256, 512, and so on) and the total number of regions to move is less than or equal to 4096. Except for very small mirrors, the number of mirror regions is usually between 2048 and 4096. The minimum mirror region size used is 64 sectors (32 KB). There is no maximum. For an 8 TB pool, the mirror region size is 2 GB. When a complete region is mirrored, the bit is set. If a region is partially mirrored during a system failure or cluster resource migration, the entire region is remirrored when mirroring resumes.

The response lists the set of devices that are being used for the original location (from) and the new location (to).

Command Option

move_name* or *pool_name

Mandatory. Specify the name of the move, such as `POOLNAME_move`. You can alternatively specify the pool name.

Example

```
MYPOOL_move
```


Command Example

```
nlvm list move MYPOOL_move
```

Print detailed information about the MYPOOL_move move.

Response Parameters

The command returns the following information about the specified pool move:

Label	Description
Name	Name of the move. Typically, <pool_name>_move.
Pool	Name of the pool being moved
FromStat	Status of the "from" group of devices that make up the source pool (Active, ReadError, WriteError, Missing, NotEnabled)
ToStat	Status of the "to" group of devices that make up the new instance of the pool (Active, ReadError, WriteError, Missing, NotEnabled)
Complete	Percent complete
OldSize	Size of the old/source pool in MB, GB, or TB, and the number of whole sectors in that space
From	From set of devices for the pool being moved
To	To set of devices for the pool in its new location
M:M	Major:minor numbers of the move object
Regions	Total number of mirror regions to be moved
RegionsComplete	Number of mirror regions that are complete

Sample Command Responses

Sample 1: nlvm list move MYPOOL_move

```
Name=MYPOOL_move
Pool=MYPOOL FromStat=Active ToStat=Active Complete=100%
OldSize=99.00MB(202752) From=sdb To=sd
M:M=253:21 Regions=3168 RegionsComplete=3168
```

Sample 2: Cluster Node where the Pool Cluster Resource Is Active

```
Name=CLUSPOOL_move
Pool=CLUSPOOL FromStat=Active ToStat=Active Complete=33%
OldSize=7.19GB(15087616) From=sd, sdd, sde, sdf To=sdh
M:M=253:21 Regions=3684 RegionsComplete=1245
```

Sample 3: Any Cluster Node where the Pool Cluster Resource Is Not Active

```
Name=CLUSPOOL_move
Pool=CLUSPOOL FromStat=NotEnabled ToStat=NotEnabled
From=sd, sdd, sde, sdf To=sdh
Move is not enabled on this node.
```

6.31 List Moves

list moves [more|all]

Print a list of current NSS pool moves.

If a pool is cluster-enabled, the pool move is enabled and active only on the node where the pool cluster resource is currently online. On other nodes in the cluster, the pool move is not enabled.

```
nlvm [-t] list moves [more|all]
```

Command Options

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the pool moves. This is the same information that is printed for the `nlvm list moves <move_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list moves
```

Print a list of NSS pool moves that are in progress now.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following standard information about the pool moves on the server:

Label	Description
Name	Name of the move. Typically, <code><pool_name>_move</code> .
Pool	Name of the pool being moved
FromStat	Status of the "from" group of devices that make up the source pool (Active, ReadError, WriteError, Missing, NotEnabled)
ToStat	Status of the "to" group of devices that make up the new instance of the pool (Active, ReadError, WriteError, Missing, NotEnabled)
Complete	Percent complete

More Output

The command returns the following additional information about the pool moves on the server:

Label	Description
OldSize	Size of the old/source pool in MB, GB, or TB, and the number of whole sectors in that space
From	From set of devices for the pool being moved
To	To set of devices for the pool in its new location

All Output

If the `all` option is used, the command returns the same information about each pool move as is displayed for the `nlvm list move <move_name>` command.

Sample Command Responses

Sample 1: Server with No Active Moves

```
nlvm list moves
No moves
```

Sample 2: nlvm list moves

```
Name          Pool    FromStat  ToStat  Complete
MYPOOL_move  MYPOOL Active   Active  100%
```

Sample 3: nlvm list moves --terse

```
Name=PMOVE_move Pool=PMOVE FromStat=Active ToStat=Active Complete=100%
```

Sample 4: nlvm list moves more

```
Name          Pool    FromStat  ToStat  Complete  OldSize  From  To
MYPOOL_move  MYPOOL Active   Active  100%    99.00MB  sdb   sdc
```

Sample 5: nlvm list moves all

```
Name=MYPOOL_move
Pool=MYPOOL FromStat=Active ToStat=Active Complete=100%
OldSize=99.00MB(202752) From=sdb To=sdc
M:M=253:21 Regions=3168 RegionsComplete=3168
```

Sample 6: Cluster Node where the Pool Cluster Resource Is Active

```
Name          Pool    FromStat  ToStat  Complete
MYPOOL_move  MYPOOL Active   Active  71%
```

Sample 7: Any Cluster Node where the Pool Cluster Resource Is Not Active

```
Name          Pool    FromStat  ToStat  Complete
MYPOOL_move  MYPOOL NotEnabled NotEnabled 0%
Move is not enabled on this node.
```

6.32 List Partition

list partition <partition_name>

Print detailed information about a specified partition.

```
nlvm [nlvm_options] list partition <partition_name>
```

Command Option

partition_name

Mandatory. Specify the node name (such as `sdc1.1`) for the partition.

Example

```
sdc1.1
```

Command Example

```
nlvm list partition sdc1.1
```

Print detailed information about the `/dev/sdc1.1` partition.

Response Parameters

The command returns the following information about the specified partition:

Label	Description
Name	Name of the partition
Type	Partition type in both hex and type name if known
Start	Starting sector of the partition
Size	Size of the partition in MB, GB, or TB, and the number of whole sectors that consist in that space
Device	Device the partition is on, such as <code>sda</code> or <code>raid1</code>
Shared	Whether the partition is marked Shareable for Clustering (1, 0)
M:M	Major:minor numbers of the partition (if applicable)
Pool	Name of the NSS pool using this partition (if applicable)
Label	Label for SBD partition (if applicable). Typically, the same as the cluster name.

Sample Command Responses

Sample 1: Linux Swap Partition

```
nlvm list partition sda1  
  
Name=sda1  
Type=82(Linux Swap) Start=2048 Size=1.00GB(2103296)  
Device=sda Shared=No M:M=8:1 Pool=None
```

Sample 2: NSS Pool Partition

```
nlvm list partition sdd1.1  
  
Name=sdd1.1  
Type=169(NSS) Start=32 Size=1023.96MB(2097088)  
Device=sdd Shared=No M:M=0:0 Pool=TEST2
```

Sample 3: NSS RAID Partition

```
nlvm list partition sde1.2  
  
Name=sde1.2  
Type=1CF(NSS_Raid) Start=204832 Size=100.01MB(204832)  
Device=sde Shared=No M:M=0:0 Pool=None
```

Sample 4: NSS Pool Snapshot Partition

```
nlvm list partition sdi6.1

Name=sdi6.1
Type=1AC(Snapshot) Start=206880 Size=75.00MB(153600)
Device=sdi Shared=No M:M=253:17 Pool=SNAP1
```

Sample 5: Novell Cluster Services SBD Partition

```
nlvm list partition clstr.sbd

Name=clstr.sbd
Type=1AD(Cluster) Start=32 Size=100.00MB(204800)
Device=sde Shared=No M:M=253:4 Pool=None
Label: clstr
```

Sample 6: Linux Partition

```
nlvm list partition sdc1

Name=sdc1
Type=83(Linux) Start=32 Size=103.57MB(212128)
Device=sdc Shared=No M:M=8:33 Pool=None
```

Sample 7: Linux LVM Partition

```
nlvm list partition sdc2

Name=sdc2
Type=8E(Linux_LVM) Start=212160 Size=103.59MB(212160)
Device=sdc Shared=No M:M=8:34 Pool=None
```

Sample 8: DOS Extended Partition

```
nlvm list partition sdc4

Name=sdc4
Type=5(DOS_Extended) Start=530400 Size=765.00MB(1566720)
Device=sdc Shared=No M:M=8:36 Pool=None
```

6.33 List Partitions

list partitions [device] [mask] [more|all]

Print a list of partitions based on the options. If no command options are specified, all data partitions are listed.

```
nlvm [-t] list partitions [device] [mask] [more|all]
```

Command Options

device=*device_name*

Print a list of the partitions on the specified device.

Example

```
device=sdb
```

mask=<free|all|nss|nssfree>

Print a list of the partitions that meet the specified mask option.

Mask Options

free

Print a list of only the free space partitions.

all

Print a list of both data and free space partitions.

nss

Print a list of only NSS type partitions.

nssfree

Print a list of free space that can be used to create NSS partitions. This option combines contiguous free space together to give a true view of available space.

Example

```
mask=nss
```

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the partitions. This is the same information that is printed for the `nlvm list partition <partition_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list partitions device=sdb mask=nss
```

Print a list of partitions of type nss on the `/dev/sdb` device.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following information about the partitions on the server:

Label	Description
Name	Name of the partition
Type	Partition type in both hex and type name if known
Start	Starting sector of the partition
Size	Size of the partition in MB, GB, or TB
Device	Device the partition is on, such as <code>sda</code> or <code>raid1</code>

More Output

The command returns the following additional information about the partitions on the server:

Label	Description
Shared	Whether the partition is marked Shareable for Clustering (1, 0)
M:M	Major:minor numbers of the partition (if applicable)
Pool	Name of the NSS pool using this partition (if applicable)

All Output

If the `all` option is used, the command returns the same information about each partition as is displayed for the `nlvm list partition <partition_name>` command.

Sample Command Responses

Sample 1: nlvm list partitions

```
nlvm list partitions
```

Name	Type	Start	Size	Device
sda1	82 (Linux_Swap)	2048	1.00GB	sda
sda2	83 (Linux)	2105344	15.98GB	sda
sda3	83 (Linux)	35633152	3.00GB	sda
sdb1.1	169 (NSS)	32	100.00MB	sdb
sdb1.2	169 (NSS)	204832	100.00MB	sdb
sdb1.3	169 (NSS)	409632	100.00MB	sdb
sdb1.4	1CF (NSS_Raid)	614432	100.00MB	sdb
sdc1	8E (Linux_LVM)	32	103.57MB	sdc
sdc2	8E (Linux_LVM)	212160	103.59MB	sdc
sdc3	83 (Linux)	424320	103.59MB	sdc
sdc4	5 (DOS_Extended)	636480	713.20MB	sdc
sdc5.1	169 (NSS)	636512	100.00MB	sdc
sdc7.1	169 (NSS)	1060832	100.00MB	sdc
sdc8.1	1CF (NSS_Raid)	1272992	100.00MB	sdc
sdc9.1	169 (NSS)	1485152	100.00MB	sdc
cluster.sbd	1AD (Cluster)	409664	50.00MB	sdd
sde1	83 (Linux)	32	103.57MB	sde
sde2	83 (Linux)	212160	103.59MB	sde
sde3	8E (Linux_LVM)	424320	103.59MB	sde
sde4	5 (DOS_Extended)	636480	713.20MB	sde
sde5	83 (Linux)	636512	103.57MB	sde
sde6	83 (Linux)	848672	103.57MB	sde
sde7.1	1AC (Snapshot)	1060832	50.00MB	sde
sdf1.1	169 (NSS)	32	100.00MB	sdf
sdf2	83 (Linux)	212992	95.00MB	sdf
sdf3.1	169 (NSS)	407552	100.00MB	sdf
sdh1	5 (DOS_Extended)	204800	919.75MB	sdh
sdh5	7 (NTFS/HPFS)	409600	200.05MB	sdh
sdh6	7 (NTFS/HPFS)	819347	200.00MB	sdh
sdi1	5 (DOS_Extended)	32	499.98MB	sdi
sdi5	7 (NTFS/HPFS)	64	100.96MB	sdi
sdi6.1	1AC (Snapshot)	206880	75.00MB	sdi
rr0p1.1	169 (NSS)	32	50.00MB	rr0
rr0p1.2	169 (NSS)	102432	50.00MB	rr0

Sample 2: nlvms list partitions more

```
nlvms list partitions more
```

Name	Type	Start	Size	Device	Shared	Maj:Min	Pool
sda1	82(Linux_Swap)	2048	1.00GB	sda	No	8:1	
sda2	83(Linux)	2105344	15.98GB	sda	No	8:2	
sda3	83(Linux)	35633152	3.00GB	sda	No	8:3	
sdb1.1	169(NSS)	32	100.00MB	sdb	No	0:0	PMOVE
sdb1.2	169(NSS)	204832	100.00MB	sdb	No	0:0	
sdb1.3	169(NSS)	409632	100.00MB	sdb	No	0:0	BIGLONGPOOLNAME
sdb1.4	1CF(NSS_Raid)	614432	100.00MB	sdb	No	0:0	
sdcl	8E(Linux_LVM)	32	103.57MB	sdcl	No	8:33	
sdcl.2	8E(Linux_LVM)	212160	103.59MB	sdcl	No	8:34	
sdcl.3	83(Linux)	424320	103.59MB	sdcl	No	8:35	
sdcl.4	5(DOS_Extended)	636480	713.20MB	sdcl	No	8:36	
sdcl.5.1	169(NSS)	636512	100.00MB	sdcl	No	0:0	
sdcl.7.1	169(NSS)	1060832	100.00MB	sdcl	No	0:0	POOL1
sdcl.8.1	1CF(NSS_Raid)	1272992	100.00MB	sdcl	No	0:0	
sdcl.9.1	169(NSS)	1485152	100.00MB	sdcl	No	0:0	PMOVE_move
cluster.sdb	1AD(Cluster)	409664	50.00MB	sdd	Yes	253:20	
sde1	83(Linux)	32	103.57MB	sde	No	8:65	
sde2	83(Linux)	212160	103.59MB	sde	No	8:66	
sde3	8E(Linux_LVM)	424320	103.59MB	sde	No	8:67	
sde4	5(DOS_Extended)	636480	713.20MB	sde	No	8:68	
sde5	83(Linux)	636512	103.57MB	sde	No	8:69	
sde6	83(Linux)	848672	103.57MB	sde	No	8:70	
sde7.1	1AC(Snapshot)	1060832	50.00MB	sde	No	253:6	SNAPSHOT1
sdf1.1	169(NSS)	32	100.00MB	sdf	No	0:0	T1
sdf2	83(Linux)	212992	95.00MB	sdf	No	8:82	
sdf3.1	169(NSS)	407552	100.00MB	sdf	No	0:0	T2
sdh1	5(DOS_Extended)	204800	919.75MB	sdh	No	8:113	
sdh5	7(NTFS/HPFS)	409600	200.05MB	sdh	No	8:117	
sdh6	7(NTFS/HPFS)	819347	200.00MB	sdh	No	8:118	
sdi1	5(DOS_Extended)	32	499.98MB	sdi	No	8:129	
sdi5	7(NTFS/HPFS)	64	100.96MB	sdi	No	8:133	
sdi6.1	1AC(Snapshot)	206880	75.00MB	sdi	No	253:17	SNAP1
rr0p1.1	169(NSS)	32	50.00MB	rr0	No	0:0	
rr0p1.2	169(NSS)	102432	50.00MB	rr0	No	0:0	RRPOOL

Sample 3: nlvms list partitions all

```
nlvms list partitions all
```

```
Name=sda1
Type=82(Linux_Swap) Start=2048 Size=1.00GB(2103296)
Device=sda Shared=No M:M=8:1 Pool=None

Name=sda2
Type=83(Linux) Start=2105344 Size=15.98GB(33527808)
Device=sda Shared=No M:M=8:2 Pool=None

Name=sda3
Type=83(Linux) Start=35633152 Size=3.00GB(6309888)
Device=sda Shared=No M:M=8:3 Pool=None

Name=sdb1.1
Type=169(NSS) Start=32 Size=100.00MB(204800)
Device=sdb Shared=No M:M=0:0 Pool=PMOVE

Name=sdb1.2
Type=169(NSS) Start=204832 Size=100.00MB(204800)
Device=sdb Shared=No M:M=0:0 Pool=None

Name=sdb1.3
Type=169(NSS) Start=409632 Size=100.00MB(204800)
Device=sdb Shared=No M:M=0:0 Pool=BIGLONGPOOLNAME
Label: This partition belongs to big long pool name.

Name=sdb1.4
Type=1CF(NSS_Raid) Start=614432 Size=100.00MB(204800)
Device=sdb Shared=No M:M=0:0 Pool=None
```



```

Name=sdc1
  Type=8E(Linux_LVM) Start=32 Size=103.57MB(212128)
  Device=sdc Shared=No M:M=8:33 Pool=None

Name=sdc2
  Type=8E(Linux_LVM) Start=212160 Size=103.59MB(212160)
  Device=sdc Shared=No M:M=8:34 Pool=None

Name=sdc3
  Type=83(Linux) Start=424320 Size=103.59MB(212160)
  Device=sdc Shared=No M:M=8:35 Pool=None

Name=sdc4
  Type=5(DOS_Extended) Start=636480 Size=713.20MB(1460640)
  Device=sdc Shared=No M:M=8:36 Pool=None

Name=sdc5.1
  Type=169(NSS) Start=636512 Size=100.00MB(204800)
  Device=sdc Shared=No M:M=0:0 Pool=None

Name=sdc7.1
  Type=169(NSS) Start=1060832 Size=100.00MB(204800)
  Device=sdc Shared=No M:M=0:0 Pool=POOL1

Name=sdc8.1
  Type=1CF(NSS_Raid) Start=1272992 Size=100.00MB(204800)
  Device=sdc Shared=No M:M=0:0 Pool=None

Name=sdc9.1
  Type=169(NSS) Start=1485152 Size=100.00MB(204800)
  Device=sdc Shared=No M:M=0:0 Pool=PMOVE_move

Name=cluster.sbd
  Type=1AD(Cluster) Start=409664 Size=50.00MB(102400)
  Device=sdd Shared=Yes M:M=253:20 Pool=None
  Label: cluster

Name=sde1
  Type=83(Linux) Start=32 Size=103.57MB(212128)
  Device=sde Shared=No M:M=8:65 Pool=None

Name=sde2
  Type=83(Linux) Start=212160 Size=103.59MB(212160)
  Device=sde Shared=No M:M=8:66 Pool=None

Name=sde3
  Type=8E(Linux_LVM) Start=424320 Size=103.59MB(212160)
  Device=sde Shared=No M:M=8:67 Pool=None

Name=sde4
  Type=5(DOS_Extended) Start=636480 Size=713.20MB(1460640)
  Device=sde Shared=No M:M=8:68 Pool=None

Name=sde5
  Type=83(Linux) Start=636512 Size=103.57MB(212128)
  Device=sde Shared=No M:M=8:69 Pool=None

Name=sde6
  Type=83(Linux) Start=848672 Size=103.57MB(212128)
  Device=sde Shared=No M:M=8:70 Pool=None

Name=sde7.1
  Type=1AC(Snapshot) Start=1060832 Size=50.00MB(102400)
  Device=sde Shared=No M:M=253:6 Pool=SNAPSHOT1

Name=sdf1.1
  Type=169(NSS) Start=32 Size=100.00MB(204800)
  Device=sdf Shared=No M:M=0:0 Pool=T1

Name=sdf2
  Type=83(Linux) Start=212992 Size=95.00MB(194560)
  Device=sdf Shared=No M:M=8:82 Pool=None

```

```

Name=sdf3.1
Type=169(NSS) Start=407552 Size=100.00MB(204800)
Device=sdf Shared=No M:M=0:0 Pool=T2

Name=sdh1
Type=5(DOS_Extended) Start=204800 Size=919.75MB(1883650)
Device=sdh Shared=No M:M=8:113 Pool=None

Name=sdh5
Type=7(NTFS/HPFS) Start=409600 Size=200.05MB(409715)
Device=sdh Shared=No M:M=8:117 Pool=None

Name=sdh6
Type=7(NTFS/HPFS) Start=819347 Size=200.00MB(409600)
Device=sdh Shared=No M:M=8:118 Pool=None

Name=sdi1
Type=5(DOS_Extended) Start=32 Size=499.98MB(1023968)
Device=sdi Shared=No M:M=8:129 Pool=None

Name=sdi5
Type=7(NTFS/HPFS) Start=64 Size=100.96MB(206784)
Device=sdi Shared=No M:M=8:133 Pool=None

Name=sdi6.1
Type=1AC(Snapshot) Start=206880 Size=75.00MB(153600)
Device=sdi Shared=No M:M=253:17 Pool=SNAP1

Name=rr0p1.1
Type=169(NSS) Start=32 Size=50.00MB(102400)
Device=rr0 Shared=No M:M=0:0 Pool=None

Name=rr0p1.2
Type=169(NSS) Start=102432 Size=50.00MB(102400)
Device=rr0 Shared=No M:M=0:0 Pool=RRPOOL

```

Sample 4: Partitions that Contain a Specified String in the Name

```

nlvm list partitions | grep LH-DFS01-

Name                               Type      Start    Size    Device
D1_LH-DFS01-1_part1.1             169(NSS)    32    24.99GB D1_LH-DFS01-1

```

6.34 List Pool

list pool <pool_name>

Print detailed information about a specified NSS pool.

```
nlvm [nlvm_options] list pool <pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool.

Example

```
MYPOOL1
```

Command Example

```
nlvm list pool MYPOOL1
```

Print detailed information about the pool MYPOOL1.

Response Parameters

The command returns the following information about the specified pool:

Label	Description
Name	Name of the pool
State	State of the pool (Active, Deactive, Maintenance, Unknown, Not Mounted (for snapshot pool))
Size	Size of the pool in MB, GB, or TB
Shared	Yes or No; whether the pool's device is marked as Shareable for Clustering
IsSnap	Yes or No; whether the pool is a snapshot
Used	Used space in the pool in KB, MB, GB, or TB
Free	Free space in the pool in KB, MB, GB, or TB
Segs	Number of segments in the pool
Volumes	Number of volumes in the pool
Snapshots	Number of snapshots, or No
Move	Name of the pool move (if applicable), or No
Status	Status of the pool move (if applicable)
Complete	Percent complete for the pool move (if applicable)
SnapshotNames	Names of the pool snapshots (if applicable)
Created	If the pool is mounted, the date and time the pool was created

The command returns the following information about the pool's segments:

Label	Description
Index	Index number of the segment
Start	Starting offset in the pool
Next	Next offset in the pool
Size	Size of the segment in MB, GB, or TB
Partition	Partition name for this segment

The command returns the following information about each of the pool's volumes if the pool is active and it has volumes:

Label	Description
Volume	Volume name
State	Volume state (Active, Deactive)
Mounted	Yes or No; whether the volume is mounted for user access
Quota	Volume quota in MB, GB, or TB, or None (if the volume can grow to the size of the pool)
Used	Used size of the volume in KB, MB, GB, or TB
Free	Free size of the volume in KB, MB, GB, or TB

Sample Command Responses

Sample 1: Pool with 3 Volumes and 1 Snapshot

```
nlvm list pool POOL1

Name=POOL1
State=Active Size=99.00MB Shared=No IsSnap=No
Used=11.75MB Free=87.24MB Segs=1 Volumes=3 Snapshots=1 Move=No SnapNames=SNAP1
Created=Wed May 22 16:03:26 2013
Pool segments:
  Index      Start          Next          Size  Partition
  1           0            204768       99.98MB sdc7.1
Volumes on this pool:
Volume      State Mounted  Quota   Used     Free
NSS1       Active  Yes      None    1.28MB   87.27MB
TESTVOL    Active  Yes      None    564KB    87.27MB
VOL1       Active  Yes      None    600KB    87.27MB
```

Sample 2: Snapshot Pool for POOL1, Active with 2 of 3 Snap Volumes Mounted

```
nlvm list pool SNAP1

Name=SNAP1
State=Active Size=99.00MB Shared=No IsSnap=Yes
Used=10.96MB Free=88.03MB Segs=1 Volumes=2 Snapshots=0 Move=No
Created=Wed Jun 5 16:57:21 2013
Pool segments:
  Index      Start          Next          Size  Partition
  1           0            202752       99.00MB sdi6.1
Volumes on this pool:
Volume      State Mounted  Quota   Used     Free
NSS1_SV     Active  Yes      None    572MB    88.05MB
VOL1_SV     Active  Yes      None    600KB    88.05MB
```

Sample 3: Pool with a No Volumes and 1 Snapshot

```
nlvm list pool POOL2

Name=POOL2
State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=1 Move=No
SnapNames=SNAPSHOT1
Created=Wed May 22 16:03:27 2013
Pool segments:
  Index      Start          Next          Size  Partition
  1           0            204768       99.98MB sdb1.3
```

Sample 4: Snapshot Pool for POOL2, Not Mounted

```
nlvm list pool SNAPSHOT1

Name=SNAPSHOT1
State=NotMounted Size=99.00MB Shared=No IsSnap=Yes
Used=NA Free=NA Segs=1 Volumes=NA Snapshots=0 Move=No
Pool segments:
  Index      Start          Next      Size  Partition
    1         0          204768   99.98MB  sde1.1
```

Sample 5: Pool with a Pool Move at 100% Complete but before a Complete Move

```
nlvm list pool TEST

Name=TEST
State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=0
Move=TEST_move Status=Active:Active Complete=100%
Created=Tue Jun 11 17:18:08 2013
Pool segments:
  Index      Start          Next      Size  Partition
    1         0          204768   99.98MB  sdb1.1
Volumes on this pool:
  Volume    State Mounted  Quota   Used    Free
VOL2      Active   Yes      None   572MB   88.05MB
VOL3      Active   Yes      None    600KB   88.05MB
```

Sample 6: Pool Is Deactive

```
nlvm list pool TEST2

NAME=TEST2
State=Deactive Size=1019.00MB Shared=No IsSnap=No
Used=NA Free=NA Segs=2 Volumes=NA Snapshots=0 Move=No
Created: Mon Sep 23 16:33:20 2013
Pool segments:
  Index      Start          Next      Size  Partition
    1         0          1044416  509.96MB  sdf1.1
    2      1044416          2088832  509.96MB  sde1.1
```

6.35 List Pools

list pools [exclude] [more|all]

Print a list of all NSS pools.

```
nlvm [-t] list pools [exclude] [more|all]
```

Command Options

exclude=<nss|shared|nonshared|snap|snapnomount>

Specify types of pools to exclude from the list. The `exclude` option can be used multiple times to add exclusions.

Exclude Options

nss

NSS pools

shared

Shared pools

nonshared

Pools that are not shared

snap

Snapshot pools that are mounted

snapnomount

Snapshot pools that are not mounted

Example

```
exclude=snap exclude=snapnomount
```

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the NSS pools. This is the same information that is printed for the `nlvm list pool <pool_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list pools more exclude=shared
```

Print detailed information about each of the pools, but exclude shared pools.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following information about the pools on the server:

Label	Description
Name	Name of the pool
State	State of the pool (Active, Deactive, Maintenance, Unknown, Not Mounted (for snapshot pool))
Size	Size of the pool in MB, GB, or TB
Shared	Yes or No; whether the pool's device is marked as Shareable for Clustering
IsSnap	Yes or No; whether the pool is a snapshot

More Output

The command returns the following additional information about the pools on the server:

Label	Description
Used	Used space in the pool in KB, MB, GB, or TB
Free	Free space in the pool in KB, MB, GB, or TB
Segs	Number of segments in the pool
Volumes	Number of volumes in the pool
Move	If there is a pool move, its percent complete; or No

All Output

If the `all` option is used, the command returns the same information about each pool as is displayed for the `nlvm list pool <pool_name>` command.

Sample Command Response

Sample 1: nlvm list pools

```
nlvm list pools

Name           State      Size Shared IsSnap
POOL1          Active    99.00MB No      No
PMOVE          Active    99.00MB No      No
BIGLONGPOOLNAME Active    99.00MB No      No
RRPOOL         Active    49.00MB No      No
SNAP1          Active    99.00MB No      Yes
SNAPSHOT1     NotMounted 99.00MB No      Yes
T1             Active    99.00MB No      No
T2             Active    99.00MB No      No
```

Sample 2: nlvm list pools more

```
nlvm list pools more

Name           State      Size Shared IsSnap  Used      Free Segs Vols Move
POOL1          Active    99.00MB No      No      11.75MB  87.24MB  1    3    No
PMOVE          Active    99.00MB No      No      10.78MB  88.21MB  1    0    100%
BIGLONGPOOLNAME Active    99.00MB No      No      10.78MB  88.21MB  1    0    No
RRPOOL         Active    49.00MB No      No      10.78MB  38.21MB  1    0    No
SNAP1          Active    99.00MB No      Yes     10.96MB  88.03MB  1    2    No
SNAPSHOT1     NotMounted 99.00MB No      Yes     NA       NA       1    NA   No
T1             Active    99.00MB No      No      10.78MB  88.21MB  1    0    No
T2             Active    99.00MB No      No      10.78MB  88.21MB  1    0    No
```

Sample 3: nlvm list pools all

```
nlvm list pools all

Name=POOL1
State=Active Size=99.00MB Shared=No IsSnap=No
Used=11.75MB Free=87.24MB Segs=1 Volumes=3 Snapshots=1 Move=No
SnapNames=SNAP1
Created: Wed May 22 16:03:26 2013
Pool segments:
  Index   Start      Next      Size Partition
   1       0      204768    99.98MB sdc7.1
Volumes on this pool:
Volume   State Mounted  Quota   Used     Free
NSS1     Active Yes      None    1.28MB  87.27MB
TESTVOL  Active Yes      None    564KB   87.27MB
VOL1     Active Yes      None    600KB   87.27MB

Name=PMOVE
```

State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=0
Move=PMOVE_move Status=Active:Active Complete=100%
Created: Tue Jun 11 17:18:08 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	204768	99.98MB	sdb1.1

Name=BIGLONGPOOLNAME

State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=1 Move=No
SnapNames=SNAPSHOT1
Created: Wed May 22 16:03:27 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	204768	99.98MB	sdb1.3

Name=RRPOOL

State=Active Size=49.00MB Shared=No IsSnap=No
Used=10.78MB Free=38.21MB Segs=1 Volumes=0 Snapshots=0 Move=No
Created: Wed Jun 12 17:30:53 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	102368	49.98MB	rr0p1.2

Name=SNAP1

State=Active Size=99.00MB Shared=No IsSnap=Yes
Used=10.96MB Free=88.03MB Segs=1 Volumes=2 Snapshots=0 Move=No
Created: Wed Jun 5 16:57:21 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	202752	99.00MB	sdi6.1

Volumes on this pool:

Volume	State	Mounted	Quota	Used	Free
NSS1_SV	Active	Yes	None	572KB	88.05MB
VOL1_SV	Active	Yes	None	600KB	88.05MB

Name=SNAPSHOT1

State=NotMounted Size=99.00MB Shared=No IsSnap=Yes
Used=NA Free=NA Segs=1 Volumes=NA Snapshots=0 Move=No
Pool segments:

Index	Start	Next	Size	Partition
1	0	204768	99.98MB	sde7.1

Name=T1

State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=0 Move=No
Created: Tue Jun 25 17:33:25 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	204768	99.98MB	sdf1.1

Name=T2

State=Active Size=99.00MB Shared=No IsSnap=No
Used=10.78MB Free=88.21MB Segs=1 Volumes=0 Snapshots=0 Move=No
Created: Fri Jun 28 10:25:43 2013
Pool segments:

Index	Start	Next	Size	Partition
1	0	204768	99.98MB	sdf3.1

Sample 4: nlvms list pools all --terse

```
nlvm list pools all --terse

Name=POOL1 State=Active Size=99.00MB Shared=No IsSnap=No Used=11.75MB
Free=87.24MB Segs=1 Volumes=3 Snapshots=1 Move=No SnapNames=SNAP1
Created=Wed May 22 16:03:26 2013
Index=1 Start=0 Next=204768 Size=99.98MB Part=sd7.1
Volume=NSS1 State=Active Mounted=Yes Quota=None Used=1.28MB Free=87.27MB
Volume=TESTVOL State=Active Mounted=Yes Quota=None Used=564KB Free=87.27MB
Volume=VOL1 State=Active Mounted=Yes Quota=None Used=600KB Free=87.27MB

Name=PMOVE State=Active Size=99.00MB Shared=No IsSnap=No Used=10.78MB
Free=88.21MB Segs=1 Volumes=0 Snapshots=0 Move=PMOVE_move Status=Active:Active
Complete=100%
Created=Tue Jun 11 17:18:08 2013
Index=1 Start=0 Next=204768 Size=99.98MB Part=sdb1.1

Name=BIGLONGPOOLNAME State=Active Size=99.00MB Shared=No IsSnap=No Used=10.78MB
Free=88.21MB Segs=1 Volumes=0 Snapshots=1 Move=No SnapNames=SNAPSHOT1
Created=Wed May 22 16:03:27 2013
Index=1 Start=0 Next=204768 Size=99.98MB Part=sdb1.3

Name=RRPOOL State=Active Size=49.00MB Shared=No IsSnap=No Used=10.78MB
Free=38.21MB Segs=1 Volumes=0 Snapshots=0 Move=No
Created=Wed Jun 12 17:30:53 2013
Index=1 Start=0 Next=102368 Size=49.98MB Part=rr0p1.2

Name=SNAP1 State=Active Size=99.00MB Shared=No IsSnap=Yes Used=10.96MB
Free=88.03MB Segs=1 Volumes=2 Snapshots=0 Move=No
Created=Wed Jun 5 16:57:21 2013
Index=1 Start=0 Next=202752 Size=99.00MB Part=sdi6.1
Volume=NSS1_SV State=Active Mounted=Yes Quota=None Used=572KB Free=88.05MB
Volume=VOL1_SV State=Active Mounted=Yes Quota=None Used=600KB Free=88.05MB

Name=SNAPSHOT1 State=NotMounted Size=99.00MB Shared=No IsSnap=Yes Used=NA Free=NA
Segs=1 Volumes=NA Snapshots=0 Move=No
Index=1 Start=0 Next=204768 Size=99.98MB Part=sde7.1

Name=T1 State=Active Size=99.00MB Shared=No IsSnap=No Used=10.78MB Free=88.21MB
Segs=1 Volumes=0 Snapshots=0 Move=No
Created=Tue Jun 25 17:33:25 2013
Index=1 Start=0 Next=204768 Size=99.98MB Part=sdf1.1

Name=T2 State=Active Size=99.00MB Shared=No IsSnap=No Used=10.78MB Free=88.21MB
Segs=1 Volumes=0 Snapshots=0 Move=No
Created=Fri Jun 28 10:25:43 2013
Index=1 Start=0 Next=204768 Size=99.98MB Part=sdf3.1
```

6.36 List Snap

list snap <snap_name>

Print detailed information about a specified snapshot.

```
nlvm [nlvm_options] list snap <snap_name>
```

Command Example

```
nlvm list SNAP1
```

Print detailed information about SNAP1.

Response Parameters

The command returns the following information about the specified pool snapshot:

Label	Description
Name	Name of the snapshot
Pool	Name of the pool being snapped
Mounted	Yes or No; whether the snapshot is mounted as a pool
Size	Size of the pool in MB, GB, or TB
Shared	Yes or No; whether the snapshot's device is marked as Shareable for Clustering. Typically, No, because snapshots are not supported for clustered pools at this time.
PoolSize	Source pool in KB, MB, GB, or TB
Chunk	Snapshot chunk size in KB (ex: 128)
Full	Percent of space on the partition that is used for copy-on-write-data
PartSize	Partition size in MB, GB, or TB, and the number of whole sectors in that space
Partition	Name of the partition for the snapshot
M:M	Major:minor of the snapshot object
Writeable	Yes or No; whether the snapshot is writeable

Sample Command Responses

Sample 1: Snap Is Not Mounted

```
nlvm list snap SNAPSHOT1

Name=SNAPSHOT1
Pool=BIGLONGPOOLNAME Mounted=No Shared=No
PoolSize=99.98MB Chunk=128 Full=1%
PartSize=50.00MB(102400) Partition=sde7.1
M:M=253:8 Writeable=Yes
```

Sample 2: Snap Is Mounted

```
nlvm list snap SNAP1

Name=SNAP1
Pool=POOL1 Mounted=Yes Shared=No
PoolSize=99.00MB Chunk=128 Full=12%
PartSize=75.00MB(153600) Partition=sdi6.1
M:M=253:19 Writeable=Yes
```

6.37 List Snaps

list snaps [more|all]

Print a list of all NSS pool snapshots. For each, display its pool name and its mount state.

```
nlvm [-t] list snaps [more|all]
```

Command Options

`-t, --terse`

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the snapshots. This is the same information that is printed for the `nlvm list snapshot <snap_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list snaps more
```

Print a list of all snapshots and detailed information about each one.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following information about the pool snapshots on the server:

Label	Description
Name	Name of the snapshot
Pool	Name of the pool being snapped
Mounted	Yes or No; whether the snapshot is mounted as a pool
Size	Size of the pool in MB, GB, or TB
Shared	Yes or No; whether the snapshot's device is marked as Shareable for Clustering. Typically, No, because snapshots are not supported for clustered pools at this time.

More Output

The command returns the following additional information about the pool snapshots on the server:

Label	Description
PoolSize	Source pool in KB, MB, GB, or TB
Chunk	Snapshot chunk size in KB (ex: 128)
Full	Percent of space on the partition that is used for copy-on-write-data
PartSize	Partition size in MB, GB, or TB, and the number of whole sectors in that space
Partition	Name of the partition for the snapshot

All Output

If the `all` option is specified, the information returned for each pool snapshot is the same as for the `nlvm list snap <snap_name>` command.

Sample Command Response

Sample 1: nlvm list snaps

```
nlvm list snaps

Name      Pool           Mounted Shared
SNAP1     POOL1          Yes      No
SNAPSHOT1 BIGLONGPOOLNAME No       No
```

Sample 2: nlvm list snaps more

```
nlvm list snaps more

Name      Pool           Mounted Shared PoolSize Chunk Full PartSize Partition
SNAP1     POOL1          Yes      No      99.00MB 128  12%  75.00MB sdi6.1
SNAPSHOT1 BIGLONGPOOLNAME No       No      99.98MB 128  1%   50.00MB sde7.1
```

Sample 3: nlvm list snaps all

```
nlvm list snaps all

Name=SNAP1
Pool=POOL1 Mounted=Yes Shared=No
PoolSize=99.00MB Chunk=128 Full=12%
PartSize=75.00MB(153600) Partition=sdi6.1
M:M=253:19 Writeable=Yes

Name=SNAPSHOT1
Pool=BIGLONGPOOLNAME Mounted=No Shared=No
PoolSize=99.98MB Chunk=128 Full=1%
PartSize=50.00MB(102400) Partition=sde7.1
M:M=253:8 Writeable=Yes
```

Sample 4: nlvm list snaps all --terse

```
nlvm list snaps all --terse

Name=SNAP1 Pool=POOL1 Mounted=Yes Shared=No PoolSize=99.00MB Chunk=128 Full=12%
PartSize=75.00MB(153600) Partition=sdi6.1 M:M=253:19 Writeable=Yes

Name=SNAPSHOT1 Pool=BIGLONGPOOLNAME Mounted=No Shared=No PoolSize=99.98MB
Chunk=128 Full=1% PartSize=50.00MB(102400) Partition=sde7.1 M:M=253:8
```

6.38 List Volume

list volume <volume_name>

Print detailed information about a specified NSS volume.

```
nlvm [nlvm_options] list volume <volume_name>
```

Command Option

volume_name

Mandatory. Specify the name of the NSS volume.

Example

```
MYVOL1
```

Command Example

```
nlvm list volume MYVOL1
```

Print detailed information about the volume MYVOL1.

Response Parameters

The command returns the following information about the specified NSS volume:

Label	Description
Name	Name of the volume
Pool	Name of the pool
State	Volume state (Active, Deactive)
Mounted	Yes or No; whether the volume is mounted for user access
Shared	Yes or No; whether the volume's device is marked Shareable for Clustering
Mountpoint	Full Linux path where the volume is mounted; typically, /media/nss/<volume_name>
Used	Amount of used space in KB, MB, GB, or TB
Avail	Amount of available space (free space plus purgeable space) in KB, MB, GB, or TB
Quota	None, or amount of the volume quota in MB, GB, or TB
Purgeable	Amount of purgeable space in KB, MB, GB, or TB
Attributes	Volume attributes (such as Salvage, Compression, User Space Quotas, Directory Quotas)
ReadAheadBlocks	Setting for the Read Ahead Blocks parameter
PrimaryNameSpace	Primary lookup name space; the default is LONG
Objects	Number of objects
Files	Number of files
BlockSize	Block size; typically, 4096 bytes
ShredCount	Number of shredding cycles (1 to 7), where 0 is no shredding
AuthModelID	Authentication model ID (1, 0)
SupportedNameSpaces	Supported name spaces (DOS, MAC, UNIX, LONG)
CreateTime	Date created (Day Month dd hh:mm:ss yyyy)
ArchiveTime	Date last archived (Never , Day Month dd hh:mm:ss yyyy), or Never

Sample Command Response

Sample 1: NSS Volume, Mounted, Unshared

```
nlvm list volume NSS1

Name=NSS1
Pool=POOL1 State=Active Mounted=Yes Shared=No
Mountpoint=/media/nss/NSS1
Used=1.28MB Avail=87.27MB Quota=None Purgeable=12KB
Attributes=Salvage,Compression
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Objects=28 Files=23
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed May 22 16:03:26 2013
ArchiveTime: Never
```

Sample 2: NSS Volume, Not Mounted, Unshared

```
nlvm list volume NSS1

Name=NSS1
Pool=POOL1 State=Deactive Mounted=No Shared=No
Mountpoint=/media/nss/NSS1
CreateTime: Wed May 22 16:03:26 2013
ArchiveTime: Never
```

Sample 3: NSS Snapshot Volume, Mounted, Unshared

```
nlvm list volume NSS1_SV

Name=NSS1_SV
Pool=SNAP1 State=Active Mounted=Yes Shared=No
Mountpoint=/media/nss/NSS1_SV
Used=572KB Avail=88.05MB Quota=None Purgeable=12KB
Attributes=Salvage,Compression
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Objects=15 Files=15
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed Jun 5 16:57:21 2013
ArchiveTime: Never
```

6.39 List Volumes

list volumes [more|all]

Print a list of NSS volumes on the system. For each, display its pool name and volume state (active or deactive).

```
nlvm [-t] list volumes [more|all]
```

Command Options

-t, --terse

Use this NLVM option to format the output for parsing.

more

Prints more information than appears in the standard output. It can be used with or without the `-t` NLVM option.

Example

```
more
```

all

Prints detailed information about each of the NSS volumes. This is the same information that is printed for the `nlvm list volume <nss_volume_name>` command. It can be used with or without the `-t` NLVM option.

Example

```
all
```

Command Example

```
nlvm list volumes [more]
```

Print a list of NSS volumes, and display detailed information about each volume.

Response Parameters

You can issue the commands with the `--terse` NLVM option to output the same information in a format that is more easily parsed.

Standard Output

The command returns the following information about the NSS volumes on the server:

Label	Description
Name	Name of the volume
Pool	Name of the pool
State	Volume state (Active, Deactive)
Mounted	Yes or No; whether the volume is mounted for user access
Shared	Yes or No; whether the volume's device is marked Shareable for Clustering

More Output

The command returns the following additional information about the NSS volumes on the server:

Label	Description
Used	Amount of used space in KB, MB, GB, or TB
Avail	Amount of available space (free space plus purgeable space) in KB, MB, GB, or TB
Quota	None, or amount of the volume quota in MB, GB, or TB
Attributes	Volume attributes (such as Salvage, Compression, User Space Quotas, Directory Quotas)

All Output

If the `all` option is specified, the information returned for each volume is the same as for the `list volume <volume_name>` command.

Sample Command Response

Sample 1: nlvm list volumes

```
nlvm list volumes

Name      Pool      State Mounted Shared
NSS1     POOL1     Active Yes      No
NSS1_SV  SNAP1     Active Yes      No
TESTVOL  POOL1     Active Yes      No
VOL1     POOL1     Active Yes      No
VOL1_SV  SNAP1     Active Yes      No
```

Sample 2: nlvm list volumes more

```
nlvm list volumes more

Name      Pool      State Mounted Shared   Used   Avail   Quota Attributes
NSS1     POOL1     Active Yes      No    1.28MB 87.27MB None Salvage,
Compression
NSS1_SV  SNAP1     Active Yes      No    572KB  88.05MB None Salvage,
Compression
TESTVOL  POOL1     Active Yes      No    564KB  87.27MB None Salvage
VOL1     POOL1     Active Yes      No    600KB  87.27MB None Salvage
VOL1_SV  SNAP1     Active Yes      No    600KB  88.05MB None Salvage
```

Sample 3: nlvm list volumes more --terse

```
nlvm list volumes more --terse

Name=NSS1 Pool=POOL1 State=Active Mounted=Yes Shared=No Used=1.28MB Avail=87.27MB
Quota=None Attributes=Salvage,Compression
Name=NSS1_SV Pool=SNAP1 State=Active Mounted=Yes Shared=No Used=572KB
Avail=88.05MB Quota=None Attributes=Salvage,Compression
Name=TESTVOL Pool=POOL1 State=Active Mounted=Yes Shared=No Used=564KB
Avail=87.27MB Quota=None Attributes=Salvage
Name=VOL1 Pool=POOL1 State=Active Mounted=Yes Shared=No Used=600KB Avail=87.27MB
Quota=None Attributes=Salvage
Name=VOL1_SV Pool=SNAP1 State=Active Mounted=Yes Shared=No Used=600KB
Avail=88.05MB Quota=None Attributes=Salvage
```

Sample 4: nlvm list volumes all

```
nlvm list volumes all

Name=NSS1
Pool=POOL1 State=Active Mounted=Yes Shared=No
Used=1.28MB Avail=87.27MB Quota=None Purgeable=12KB
Attributes=Salvage,Compression
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Mountpoint=/media/nss/NSS1
Objects=28 Files=23
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed May 22 16:03:26 2013
ArchiveTime: Never

Name=NSS1_SV
Pool=SNAP1 State=Active Mounted=Yes Shared=No
Used=572KB Avail=88.05MB Quota=None Purgeable=12KB
Attributes=Salvage,Compression
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Mountpoint=/media/nss/NSS1_SV
Objects=15 Files=15
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed Jun 5 16:57:21 2013
ArchiveTime: Never

Name=TESTVOL
Pool=POOL1 State=Active Mounted=Yes Shared=No
Used=564KB Avail=87.27MB Quota=None Purgeable=8KB
Attributes=Salvage
```



```

ReadAheadBlocks=16 PrimaryNameSpace=LONG
Mountpoint=/media/nss/TESTVOL
Objects=14 Files=14
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Mon Jun 17 15:21:02 2013
ArchiveTime: Never

Name=VOL1
Pool=POOL1 State=Active Mounted=Yes Shared=No
Used=600KB Avail=87.27MB Quota=None Purgeable=12KB
Attributes=Salvage
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Mountpoint=/media/nss/VOL1
Objects=15 Files=15
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed May 22 16:03:26 2013
ArchiveTime: Never

Name=VOL1_SV
Pool=SNAP1 State=Active Mounted=Yes Shared=No
Used=600KB Avail=88.05MB Quota=None Purgeable=12KB
Attributes=Salvage
ReadAheadBlocks=16 PrimaryNameSpace=LONG
Mountpoint=/media/nss/VOL1_SV
Objects=15 Files=15
BlockSize=4096 ShredCount=1 AuthModelID=1
SupportedNameSpaces=DOS,MAC,UNIX,LONG
CreateTime: Wed Jun 5 16:57:21 2013
ArchiveTime: Never

```

6.40 Mount

mount <pool_name>

Mount a specified NSS pool.

```
nlvm [nlvm_options] mount <pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool to mount.

The `nlvm mount` command internally sets the `-m` flag, so only the specified pool is mounted.

Example

```
MYPOOL1
```

Command Example

```
nlvm mount MYPOOL1
```

Mount the pool MYPOOL1.

6.41 Move

move <pool_name> <device> <size> [<device> <size>...]

Move an NSS pool from one location to another on the same system. If the new location is larger than the original location, the pool is automatically expanded after the move is complete.

```
nlvm [nlvm_options] move <pool_name> <device> <size> [<device> <size>...]
```

You can use the `device` and `size` combination multiple times to create a move target comprised of multiple segments. You must specify a size for each device. The device and size options can be used in any order. The first device instance is matched to the first size instance, and so on. The move target's size is the sum of the space contributed from the specified segments.

The total size of the target must be at least as big as the pool. You cannot shrink a pool by using the move command. If the size is larger, the pool size is expanded when the move is complete.

If a pool is cluster-enabled, issue the command on the node where the pool cluster resource is currently online. The move advances only when the resource is online. If the pool cluster resource is cluster migrated to another node, the move is enabled and active on the new node when the resource is brought online, and then the pool move continues. The status of the pool move can be reported only on the node where the resource is online.

The `move` command uses NSS software RAID mirroring underneath to copy the data to the target location. If server performance is too slow during a move, you can temporarily pause the mirroring with the `nlvm pause move` command. While the move is paused, the pool move status is reported as `Not Enabled`. Resume the mirroring with the `nlvm resume move` command. The pool move continues from where it was paused. The move will automatically resume in a cluster setup under certain conditions. See the `nlvm resume move` command for details.

You can check the status of a pool move by using the `nlvm list move` command.

When the move status is 100% complete, it is not yet final. You can issue the `nlvm complete move <move_name>` command to finalize the move. This sets the pool to the new location and removes the original location. Other NSS utilities might also complete the move. For information, see "Moving a Pool" in the *OES 11 SP3: NSS File System Administration Guide for Linux*.

You can delete a pool move by using the `nlvm delete move` command with the `abort` option. This sets the pool back to the original location and removes the new location.

In a cluster, issue the commands to complete, delete, or list the pool move from the node where the pool cluster resource is currently online.

Command Options

`pool_name`

Mandatory. Specify the name of the NSS pool to be moved. This must be the first command option.

Example

```
MYPOOL1
```

`device=device_name`

Mandatory. Specify the target device where the pool will be relocated.

You can specify multiple device instances to create a move target comprised of multiple segments. Each device instance must have a matching `size` instance. The first device instance is matched to the first size instance, and so on.

Example

```
device=sdg
```

`size=<value[K|M|G|T]|max>`

Mandatory. Specify the size of the target partition. The size must be the same size or larger than the source pool.

If multiple devices are specified, each device instance must have a matching `size` instance. The first size instance is matched to the first device instance, and so on.

Example

```
size=200G
size=3.98T
```

Command Examples

```
nlvm move MYPOOL1 device=sdg size=200G
```

Move the NSS pool named MYPOOL1 to the `/dev/sdg` device and allocate 200 GB to the partition.

```
nlvm move MYPOOL1 device=sdg size=200G device=sdh size=500G
```

Move the NSS pool named MYPOOL1 to a 700 GB space comprised of 200 GB of free space from device `sdg` and 500 GB of free space from device `sdh`.

6.42 Pause Move

pause move *<move_name | pool_name>*

Temporarily pause the mirroring for a specified pool move. While the move is paused, the pool move status is reported as `Not Enabled`.

```
nlvm [nlvm_options] pause move <move_name | pool_name>
```

The `move` command uses NSS software RAID mirroring underneath to copy the data to the target location. If server performance is too slow during a move, you can use this command to temporarily pause the mirroring. For example, you can pause the move during the server's peak usage times, and resume the move during the server's off-peak usage times.

Use the `nlvm resume move` command to resume mirroring for the pool move.

Command Option

move_name

Mandatory. Specify the name of the pool move that you want to pause. The move name typically looks like `POOLNAME_move`.

pool_name

Mandatory. Specify the name of the NSS pool that is being moved.

Example

```
MYPOOL1
```

Command Example

```
nlvm pause move MYPOOL1
```

Temporarily pause the mirroring for the pool move for the pool `MYPOOL1`.

6.43 Pool Activate

pool activate *<pool_name>*

Activate a specified NSS pool.

```
nlvm [nlvm_options] pool activate <pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool to activate.

Example

```
MYPOOL1
```

Command Example

```
nlvm pool activate MYPOOL1
```

Activate the pool MYPOOL1.

6.44 Pool Deactivate

pool deactivate <pool_name>

Deactivate a specified NSS pool.

```
nlvm [nlvm_options] pool deactivate <pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool to deactivate.

Example

```
MYPOOL1
```

Command Example

```
nlvm pool deactivate MYPOOL1
```

Deactivate the pool MYPOOL1.

6.45 RAID

raid <raid_action> <raid_name>

Perform actions on an NSS software RAID device.

```
nlvm [nlvm_options] raid <raid_action> <raid_name>
```

RAID Actions

abort <raid_name>

Abort the restripe or remirror currently in progress on the specified NSS software RAID. If the restripe/remirror is complete, the command has no effect.

Example

```
nlvm raid abort MYRAID1
```

delete <raid_name>

Delete a single element mirror from a pool, and leave the pool on the corresponding partition. This applies for RAID 1 (mirror) objects only.

This is a duplicate of the `nlvm delete raid` command, but it is added here for support reasons. This command removes only a single element mirror object.

Example

```
nlvm raid delete MYRAID1
```

disable <raid_name>

Disable an NSS software RAID device from remirroring or restriping on this server, and do not allow stamp updates to occur.

This command is used in Novell Cluster Services clusters to disable an NSS software RAID device that is active on another node.

Example

```
nlvm raid disable MYRAID1
```

enable <raid_name>

Enable a RAID device to remirror or restripe on this server. This enables an NSS software RAID device that was disabled by using the `nlvm raid disable` command.

This command is used in Novell Cluster Services clusters to enable an NSS software RAID device for this node. It is important that the RAID device be enabled on only one node at a time.

WARNING: Use caution when in a cluster configuration to avoid possible corruption that can occur if the RAID is enabled on multiple nodes at the same time.

Example

```
nlvm raid enable MYRAID1
```

force <raid_name>

Force a single element mirror to be in sync. This condition can occur if a mirror element was removed, and the last element shows that it is not in sync due to a crash after a successful remirror. This command is only valid on NSS software RAID 1 (mirror) devices.

If you have a single element RAID 1 where the element shows out of sync, you can alternatively put it into sync (if you feel that it has all of the data) by selecting the Restripe (F6) function on the Software RAID page in NSSMU.

WARNING: If a remirror has not completed successfully on this element, using the `nlvm raid force` command causes the element to look in sync, but the data is not there, and is corrupt. Use this command only if you know that a remirror was completed successfully on this element.

Example

```
nlvm raid force MYRAID1
```

pause <raid_name>

Pause a remirror process to allow other I/O to happen during a heavy I/O process. This command is valid only on NSS software RAID 1 (mirror) devices. Because remirroring can cause many I/Os to the devices, a pause allows other I/Os to happen more quickly.

The device must be resumed again by using the `nlvm raid resume` command. The pause is intended to be used only for a short time.

Example

```
nlvm raid pause MYRAID1
```

remirror <raid_name>

Restart a remirror or restripe process on the specified NSS software RAID device that has either been aborted or has failed.

Examples

```
nlvm raid remirror MYRAID1
nlvm raid remirror MYRAID5
```

resume <raid_name>

Resume a remirror process that was paused by using the `nlvm raid pause` command. This command is valid only on NSS software RAID 1 (mirror) devices.

Example

```
nlvm raid resume MYRAID1
```

status [raid_name]

Check the status on one or all NSS software RAID devices. The name is optional. If a name is specified, it returns detailed status for the given RAID device. If the name is omitted, it returns the status for all the NSS software RAID devices on the server.

Examples

```
nlvm raid status MYRAID1
nlvm raid status
```

Command Option

raid_name

Mandatory when specified. Specify the name of the NSS software RAID device to be acted upon.

Example

```
MYRAID1
```

Sample Command Responses

Sample 1: RAID Status During a Remirror

```
nlvm raid status LH_DFS01_01_R1

LH_DFS01_01_R1 is remirroring at 9%
--> D1_LH-DFS01-1_part1.1 (100%) In Sync
--> D2_LH-DFS01-1_part1.1 (9%) Out of Sync
```

Sample 2: RAID Status During a Remirror on a Cluster Node where the RAID Is Not Active

```
nlvm raid status

LH_DFS01_01_R1 is remirroring at 5%
LH_DFS02_R1 is Synchronized
tst-nda04150cl.sbd is not active on this node
```

6.46 Rename Pool

rename pool <pool_name> <new_pool_name>

Rename a specified NSS pool.

```
nlvm [nlvm_options] rename pool <pool_name> <new_pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool to rename.

Example

MYPOOL1

new_pool_name

Mandatory. Specify the new name of the NSS pool.

For pool naming conventions, see the [create pool](#) command.

Example

P_SALES

Command Example

```
nlvm rename pool MYPOOL1 P_SALES
```

Rename the pool MYPOOL1 as P_SALES.

6.47 Rename RAID

rename raid <raid_name> <new_raid_name>

Rename a specified NSS software RAID device.

If the RAID device is shared, issue the command on the node where the device is currently online.

```
nlvm [nlvm_options] rename raid <raid_name> <new_raid_name>
```

Command Option

raid_name

Mandatory. Specify the name of the NSS software RAID device to rename.

Example

MYRAID1

new_raid_name

Mandatory. Specify the new name of the NSS software RAID device. See the [create raid](#) command for RAID naming conventions.

Example

R1_SALES

Command Example

```
nlvm rename raid MYRAID1 R1_SALES
```

Rename the NSS software RAID device MYRAID1 as R1_SALES.

6.48 Rename Volume

rename volume <volume_name> <new_volume_name> [encryption_password]

Rename a specified NSS volume. If the volume is encrypted, you might also need to provide its encryption password.

If a volume's pool is cluster-enabled, issue the command on the node where the pool cluster resource is currently online.

```
nlvm [nlvm_options] rename volume <volume_name> <new_volume_name>
[encryption_password]
```

Command Option

volume_name

Mandatory. Specify the name of the NSS volume to rename.

Example

```
MYVOL1
```

new_volume_name

Mandatory. Specify the new name of the NSS volume.

Volume names are 2 to 15 characters. The naming conventions are the same as for pools. See the `create pool` command for naming conventions.

Example

```
V_SALES
```

encryption_password

Optional. If the volume is encrypted, the volume's encryption password might be needed. You can try the command without the password. If the password is needed, you are prompted to enter it.

Example

```
novell
```

Command Example

```
nlvm rename volume MYVOL1 V_SALES
```

Rename the NSS volume MYVOL1 as V_SALES.

```
nlvm rename volume MYVOL2 V_FINANCE novell
```

Rename the encrypted NSS volume MYVOL2 as V_FINANCE. In this example, the encryption password is novell.

6.49 Rescan

rescan

Performs a rescan of the storage objects (such as partitions, NSS pools, and NSS software RAIDs) on known devices, and creates any Device Mapper device or partition objects, or updates them as needed. It also mounts all pools that are not mounted unless you use the `-m` option. There are no command options.

```
nlvm [nlvm_options] rescan
```

Command Example

```
nlvm rescan
```

Scans for storage objects, creates and updates Device Mapper objects, and mounts pools as needed.

6.50 Resume Move

resume move <move_name | pool_name>

Resume the mirroring for a specified pool move that has been paused with the `nlvm pause move` command. The pool move continues from where it was paused.

```
nlvm [nlvm_options] resume move <move_name | pool_name>
```

If the pool is cluster-enabled, you must issue the command on the node where the pool is currently active. You cannot resume a paused pool move while the pool cluster resource is offline. A paused pool move for a clustered pool will resume automatically:

- ♦ If the pool cluster resource fails over to a different node
- ♦ If you cluster migrate the pool cluster resource to a different node
- ♦ If you take the pool cluster resource offline and bring it online again

To re-pause the pool move, use the `nlvm pause move` command.

Command Option

move_name

Mandatory. Specify the name of the paused pool move that you want to resume. The move name typically looks like `POOLNAME_move`.

pool_name

Mandatory. Specify the name of the NSS pool that is being moved.

Example

```
MYPOOL1
```

Command Example

```
nlvm resume move MYPOOL1
```

Resume mirroring for the pool move for the pool `MYPOOL1`.

6.51 Share

share <device_name>

Set the specified device as shared.

```
nlvm [nlvm_options] share <device_name>
```

Command Option

device_name

Mandatory. Specify the device to be shared.

You can enter multiple devices by separating the device names with a comma and no spaces.

Examples

```
sdb  
sde, sdf, sdg
```

Command Example

```
nlvm share sdb
```

Sets the `/dev/sdb` device as shared.

```
nlvm share sde,sdf,sdg
```

Sets the `/dev/sde`, `/dev/sdf`, and `/dev/sdg` devices as shared.

6.52 Unmount

unmount *<pool_name>*

Unmount a specified NSS pool. This removes the pool from NSS and causes any open files to be closed and any volumes to be deactivated. It also removes the Device Mapper object for the pool, the link to the Device Mapper object, and the mount point for the pool. This allows you to gracefully log out the server from an iSCSI device that contains a pool. Use this command with caution.

```
nlvm [nlvm_options] unmount <pool_name>
```

Command Option

pool_name

Mandatory. Specify the name of the NSS pool to unmount.

Use the `unmount` command to temporarily unload a pool in order to manage underlying devices. Pools are by design auto mounted. Therefore, running the `nssmu` utility, or running most `nlvm` commands without the `-m` option can cause an unmounted pool to be remounted if underlying devices and partitions still exist. To execute an `nlvm` command without mounting the unmounted pools, you must include the `-m` option. The `nlvm mount` command internally sets the `-m` flag, so only the specified pool is mounted.

Example

```
MYPOOL1
```

Command Example

```
nlvm unmount MYPOOL1
```

Unmount the pool `MYPOOL1`.

6.53 Unshare

unshare *<device_name>*

Set the specified device as not shared.

```
nlvm [nlvm_options] unshare <device_name>
```

Command Option

device_name

Mandatory. Specify the device to be unshared.

You can enter multiple devices by separating the device names with a comma and no spaces.

Examples

```
sdb  
sde,sdf,sdg
```

Command Example

```
nlvm unshare sdb
```

Sets the `/dev/sdb` device as not shared.

```
nlvm unshare sde,sdf,sdg
```

Sets the /dev/sde, /dev/sdf, and /dev/sdg devices as not shared.

6.54 Volume Mount

volume mount <volume_name> [encryption_password]

Mount a specified NSS volume. This also activates the volume before mounting it.

```
nlvm [nlvm_options] volume mount <volume_name> [encryption_password]
```

Command Options

volume_name

Mandatory. Specify the name of the NSS volume to mount.

Example

```
MYVOL
```

encryption_password

Optional. The password is required to mount an encrypted NSS volume on the first mount after a reboot. Thereafter, the password is stored encrypted in system memory until the next server reboot.

Example

```
novell
```

Command Examples

```
nlvm volume mount MYVOL
```

Mount the volume MYVOL.

```
nlvm volume mount MYVOL2 novell
```

Mount the encrypted volume MYVOL2 on the first mount after a reboot. Thereafter until the next reboot, the password is not used to mount the volume. For example:

```
nlvm volume mount MYVOL2
```

6.55 Volume Unmount

volume unmount <volume_name>

Dismount a specified NSS volume. This also deactivates the volume before dismounting it.

```
nlvm [nlvm_options] volume unmount <volume_name>
```

Command Option

volume_name

Mandatory. Specify the name of the NSS volume to dismount.

Example

```
MYVOL
```

Command Example

```
nlvm volume unmount MYVOL
```

Dismount the volume MYVOL.

7 NLVM Examples for the NSS File System

This section provides examples for using the Novell Linux Volume Manager (NLVM) to manage the Novell Storage Services (NSS) file system on your Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) servers.

For information about using NLVM commands to create and manage Linux POSIX volumes on your OES 11 SP3 servers, see “[Managing Linux Volumes with NLVM Commands](#)” in the *OES 11 SP3: Linux POSIX Volume Administration Guide*.

- [Section 7.1, “Creating an NSS Pool and Volume,”](#) on page 109
- [Section 7.2, “Mirroring a Pool Partition,”](#) on page 109
- [Section 7.3, “Recovering a Mirror where All Elements Report ‘Not in Sync’,”](#) on page 110
- [Section 7.4, “Logging Out of an iSCSI Device that Contains an NSS Pool,”](#) on page 110
- [Section 7.5, “Creating a Linux Volume on a Device that Contains a Novell Partition,”](#) on page 111

7.1 Creating an NSS Pool and Volume

Enter commands at a terminal command prompt as the `root` user.

Create an NSS pool named `MYPOOL1` with a size of 100 GB on device `/dev/sdb`. Create a volume on the new pool named `MYVOL`.

```
nlvm create pool device=sdb size=100G name=MYPOOL1
nlvm create volume name=MYVOL pool=MYPOOL1
```

The command to create an NSS pool creates the partition, pool, Device mapper object, (such as `/dev/nss/sdb1.1`), and activates the pool.

The command to create the volume creates the volume and automatically mounts it if the pool is not shared. If the pool is shared and cluster enabled, you must configure the pool cluster resource and use the Novell Cluster Services commands to bring the resource and its volume online.

7.2 Mirroring a Pool Partition

You can mirror an existing NSS pool partition by using the `Create RAID` command with the `part=<existing_partition_name>` option as follows:

```
nlvm [nlvm_options] create raid
  name=<raid_name>
  raid=1
  [type=nss|sbd]
  part=<pool_partition_name>
  device=<device_name>
```

This command specifies the existing pool partition as the first segment of a RAID1 mirror. You must specify the `device` option one time with the device to use as its mirror. You do not specify a size in the command. The size of the existing partition determines the amount of space that is used for the

mirrored segment. The partition type created for the mirror is the same type as the original partition. After you mirror the partition, you manage the RAID1 device by using the normal NSS software RAID management tools and commands.

For example, if `POOL1` uses partition `sdcl.1`, the following command creates an NSS software RAID 1 mirrored device named `POOL1RAID1`. The pool's existing partition becomes the first segment of the RAID, and its existing data is mirrored to device `sdf`.

```
nlvm create raid name=POOL1RAID1 raid=1 part=sdcl.1 device=sdf
```

7.3 Recovering a Mirror where All Elements Report 'Not in Sync'

If all elements of a mirrored RAID report a status of "not in sync", use the following procedure to recover the mirror.

- 1 Determine which element you believe to be the in-sync element.
- 2 Log in to the server as the `root` user, then open a terminal console.
- 3 Using the `nlvm delete raid segment` command, remove all of the elements from the mirror except the element you want to keep.

For each element that you want to remove, enter the following command. When you are prompted to confirm, type `yes`, then press Enter. Wait for the segment to be removed before you remove the next segment.

```
nlvm --force delete raid <raid_name> segment <segment_number>
```

Use the `--force` NLVM option to force the deletion of an out-of-sync segment. When you are done, you have a RAID1 device that consists of the single element that you believed to be the in-sync element.

For example, enter

```
nlvm -f delete raid MYRAID1 segment 0
```

When prompted to confirm the deletion, type `yes`, then press Enter.

- 4 Force the single RAID element to be in sync. At the command prompt, enter

```
nlvm raid force <raid_name>
```

- 5 Add elements back into the mirror as desired by using the `nlvm raid expand` command. At the command prompt, enter

```
nlvm expand raid <raid_name> device=<device_name>
```

The `device` option can be specified multiple times to specify additional segments.

7.4 Logging Out of an iSCSI Device that Contains an NSS Pool

Before you log out of an iSCSI device that is used for an NSS pool, you must first unmount the volumes, deactivate the pool, and unmount the pool. Log out of iSCSI immediately after you unmount the pool.

IMPORTANT: The `nlvm unmount <poolname>` command removes the pool's Device Mapper object and allows the device to be disconnected gracefully. Otherwise, a server hang can occur.

- 1 Log in to the server as the `root` user, then launch a terminal console.
- 2 Launch NSSMU.

```
nssmu
```

- 3 Dismount the volumes on the pool.
 - 3a In the NSSMU main menu, select *Volumes*, then press Enter.
 - 3b Select the volume, then press F7 to dismount it.
 - 3c If the pool contains multiple volumes, repeat [Step 3b](#) for each volume.
 - 3d Press Esc to exit the Volumes page.
- 4 Deactivate the pool.
 - 4a In the NSSMU main menu, select *Pools*, then press Enter.
 - 4b Select the pool, then press F7 to deactivate it.
 - 4c Press Esc to exit the Pools page.
- 5 Press Esc to exit NSSMU.

Ensure that you have exited NSSMU before you continue. It is essential that there be no cached states for device, partition, and pool objects within NSSMU.

- 6 Use NLVM to unmount the pool.

```
nlvm unmount <poolname>
```

An unmounted pool is a temporary state. You must log out of the iSCSI connection immediately after executing the `nlvm unmount <poolname>` command before any NLVM or NSSMU command is executed. As soon as NSSMU is run, NSSMU remounts the pool in order to manage it. In addition, almost any NLVM command that is run after the unmount also causes the pool to be remounted unless you use the `-m` option.

- 7 Log out of the iSCSI connection.
 - 7a Launch YaST to manage the iSCSI client.

```
yast2 iscsi-client
```

- 7b Select the *Connected Targets* tab, then select the iSCSI device and click *Logout*.

7.5 Creating a Linux Volume on a Device that Contains a Novell Partition

As a best practice, disks using Novell partitions should have only Novell partitions on the device. If you mix Novell and Linux partition types on the same device, the recommended method is to create a Linux volume first, and then create the NSS pool.

In OES 11 SP2 and later, you can use the following procedure to create a Linux partition on a device that already contains a Novell type partition, and then specify the Linux partition as the location for a non-clustered Linux volume.

To add a Linux volume to an unshared device with an existing NSS partition and pool on it:

- 1 Log in to the server as the `root` user, then open a terminal console.
- 2 Create a Linux partition on the device. Enter

```
nlvm create partition type=<83|8E> device=<node_name> size=<value[K|M|G|T]|max>
```

Specify the partition type based on the type of Linux volume you plan to create.

```
type=83                (Linux native volume)
type=8E                (Linux LVM volume)
```

For example, to create an LVM partition type on device `sdd` that is 500 GB, enter

```
nlvm create partition type=8E device=sdd size=500G
```

- 3 Unmount all NSS pools on the device. Enter

```
nlvm unmount pool <poolname>
```

For example, to dismount `POOL1` and `POOL2` on device `sdd`, enter

```
nlvm unmount pool POOL1
nlvm unmount pool POOL2
```

- 4 Do any one of the following to allow NLVM to recognize the new Linux storage object on the device for Device Mapper:

- ◆ Mount the pools on the device. For each pool, enter

```
nlvm mount pool <poolname>
```

- ◆ Rescan the device for storage objects and allow NLVM to automatically mount all pools on the device.

```
nlvm rescan
```

- ◆ Restart the server.

- 5 Create a non-clustered Linux volume on the new partition.

```
nlvm create linux volume type=<fs_type> part=<partition_name> mp=<mount_path>
[mkopt=<opt1[,opt2,...]>] [mntopt=<opt1[opt2]...>]
[lvm] [name=<lvm_volume_name>] [group=<lvm_vg_name>]
[ncp]
```

The volume type must match the type of partition you created in [Step 2](#).

Continuing the example, on a type 8E partition named `sdd3`, create an Ext3 file system on an ncp-enabled LVM logical volume named `MYVOL3`. Enter:

```
nlvm create linux volume type=ext3 part=sdd3 mp=/usr/novell/lvm/myvol3 mntopt=rw lvm
name=MYVOL3 ncp
```

8 NLVM Examples for Clustering with Novell Cluster Services

This section provides examples for using the Novell Linux Volume Manager (NLVM) with Novell Cluster Services on your Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) servers.

- ◆ [Section 8.1, “Creating or Mirroring an SBD Partition,” on page 113](#)
- ◆ [Section 8.2, “Unmirroring a Mirrored SBD Partition with NLVM,” on page 125](#)
- ◆ [Section 8.3, “Deleting an SBD Partition with NLVM,” on page 126](#)

8.1 Creating or Mirroring an SBD Partition

If a single node (or group of nodes) somehow becomes isolated from other nodes, a condition called *split brain* results. Each side believes the other has failed, and forms its own cluster view that excludes the nodes it cannot see. Neither side is aware of the existence of the other. If the split brain is allowed to persist, each cluster will fail over the resources of the other. Since both clusters retain access to shared disks, corruption will occur when both clusters mount the same volumes.

Novell Cluster Services provides a split-brain detector (SBD) function to detect a split-brain condition and resolve it, thus preventing resources from being loaded concurrently on multiple nodes. The SBD partition contains information about the cluster, nodes, and resources that helps to resolve the split brain condition.

Novell Cluster Services requires an SBD partition for a cluster if its nodes use physically shared storage. Typically, you create the SBD when you configure the cluster on the first node. You can alternatively configure an SBD for the cluster after you configure the first node, but before you configure Novell Cluster Services on the second node of the cluster. You might also need to delete and re-create an SBD partition if the SBD becomes corrupted or its device fails.

An SBD must exist and the cluster must be enabled for shared disk access before you attempt to create shared storage objects such as pools and volumes in a cluster. NLVM and other NSS management tools need the SBD to detect whether a node is a member of the cluster and to get exclusive locks on physically shared storage.

Typically, you use the Novell Cluster Services SBD Utility (`sbdutil`) to create or delete an SBD partition for a cluster, as described in [“Creating or Deleting Cluster SBD Partitions”](#) in the *OES 11 SP3: Novell Cluster Services for Linux Administration Guide*. However, you can also use NLVM commands in OES 11 SP1 and later to create or delete SBD partitions.

Use the procedures in this section to create a non-mirrored or mirrored SBD partition:

- ◆ [Section 8.1.1, “Requirements and Guidelines for Creating an SBD Partition,” on page 114](#)
- ◆ [Section 8.1.2, “Creating a Non-Mirrored SBD Partition with NLVM,” on page 116](#)
- ◆ [Section 8.1.3, “Mirroring an Existing SBD Partition with NLVM,” on page 120](#)
- ◆ [Section 8.1.4, “Creating a Mirrored SBD Partition with NLVM,” on page 122](#)

8.1.1 Requirements and Guidelines for Creating an SBD Partition

Consider the requirements and guidelines in this section when you create a Novell Cluster Services SBD (split-brain detector) partition.

- ◆ [“Preparing Novell Cluster Services” on page 114](#)
- ◆ [“Using a Shared Disk System” on page 114](#)
- ◆ [“Preparing a SAN Device” on page 114](#)
- ◆ [“Working with NLVM Commands in a Cluster” on page 115](#)
- ◆ [“Initializing and Sharing a Device for the SBD” on page 115](#)
- ◆ [“Determining the SBD Partition Size” on page 115](#)
- ◆ [“Replacing an Existing SBD Partition” on page 115](#)

Preparing Novell Cluster Services

Before you create an SBD partition for an existing cluster, you must take the cluster down and stop Novell Cluster Services software on all nodes. Do not restart Novell Cluster Services and rejoin nodes to the cluster until after you create the new SBD and configure the Shared Disks flag attribute for the Cluster object.

You can mirror an existing SBD while the cluster is up and running.

Using a Shared Disk System

You must have a shared disk system (such as a Fibre Channel SAN or an iSCSI SAN) connected to your cluster nodes before you create a split-brain-detector (SBD) partition. For information, see [“Shared Disk Configuration Requirements”](#) in the *OES 11 SP3: Novell Cluster Services for Linux Administration Guide*.

Preparing a SAN Device

Use the SAN storage array software to carve a LUN to use exclusively for the SBD partition. The device should have at least 20 MB of free available space. Connect the LUN device to all nodes in the cluster.

For device fault tolerance, you can use the `nlvm create raid` command to mirror the SBD partition on another SAN device. Before you mirror the device, you must carve a second LUN of the same size, and connect the LUN device to all nodes in the cluster.

The device you use to create the SBD must not be a software RAID device. A hardware RAID configured in a SAN array is seen as a regular device by the server.

If you attach new devices to the server while it is running, you should scan for new devices on each cluster node to ensure that the devices are recognized by all nodes. Log in as the `root` user, launch a terminal console, then enter

```
nlvm -s rescan
```

Working with NLVM Commands in a Cluster

If an SBD does not exist in the cluster, NLVM cannot detect whether a node is a member of the cluster, and therefore, it cannot get exclusive locks to the physically shared storage. In this state, you must use the `-s` NLVM option to override the shared locking requirement and force NLVM to execute the commands you use to create the SBD partition. To minimize the risk of possible corruption, you are responsible for ensuring that you have exclusive access to the shared storage at this time.

Initializing and Sharing a Device for the SBD

When you use `sbdutil` to create an SBD, you must initialize the SAN device that you created for the SBD, and mark it as Shareable for Clustering before you create the SBD partition. When you mark the device as Shareable for Clustering, share information is added to the disk in a free-space partition that is about 4 MB in size. This space becomes part of the SBD partition.

When you use NLVM to create an SBD, the `nlvm create partition` command can accept an initialized or uninitialized device when you use the `type=lad` option. NLVM checks the specified device to see if it is initialized, and takes the following actions:

- ♦ **Uninitialized device:** NLVM initializes the device, marks it as Shareable for Clustering, and creates the requested SBD partition.
- ♦ **Initialized and shared device:** NLVM creates the requested SBD partition.
- ♦ **Initialized and unshared device:** NLVM creates the requested SBD partition, but does not alter the shared state. It returns an error warning that the SBD partition is not shared.

You must manually mark the device as Shareable for Clustering after the partition is created. You can use the `nlvm share` command to share the device.

Determining the SBD Partition Size

When you create the SBD partition by using the `nlvm create partition` command, you can specify how much free space to use for the SBD, or you can specify the `max` option to use the entire device. If you specify a device to use as a mirror, the same amount of space is used. If you specify to use the maximum size and the mirror device is bigger than the SBD device, you will not be able to use the excess free space on the mirror for other purposes.

Because an SBD partition must end on a cylinder boundary, the partition size might be slightly smaller than the size you specify. When you use an entire device for the SBD partition, you can use the `max` option as the size, and let the software determine the size of the partition.

Replacing an Existing SBD Partition

To replace an existing SBD partition, you must first delete the old SBD partition, and then create the new one. To reuse the SBD partition's device, you must remove the SBD partition, and then re-initialize and share the device.

You must take the cluster down and stop Novell Cluster Services on all nodes before you delete the existing SBD partition. Do not restart Novell Cluster Services and rejoin nodes to the cluster until after you create the new SBD.

8.1.2 Creating a Non-Mirrored SBD Partition with NLVM

Use the procedure in this section to create a new SBD partition. If an SBD partition already exists, you must first delete the SBD as described in [Section 8.3, “Deleting an SBD Partition with NLVM,”](#) on [page 126](#).

- 1 Ensure that nobody else is changing any storage on any nodes at this time.

Until the SBD exists and the cluster is set up for shared disk access, you are responsible for ensuring that you have exclusive access to the shared storage.

- 2 Take the cluster down:

2a Log in to any node in the cluster as the `root` user, then open a terminal console.

2b At the command prompt, enter

```
cluster down
```

- 3 On each cluster node, stop Novell Cluster Services:

3a Log in to the cluster node as the `root` user, then open a terminal console.

3b At the command prompt, enter

```
rcnovell-ncs stop
```

3c After you have stopped Novell Cluster Services on all nodes, continue with the next step.

- 4 Prepare a SAN device to use for the SBD partition:

4a Use the SAN storage array software to carve a device to use exclusively for the SBD partition.

4b Attach the device to all nodes in the cluster.

4c On each node, log in as the `root` user and rescan for devices:

```
nlvm -s rescan
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

- 5 Log in to any node in the cluster as the `root` user, then open a terminal console.

- 6 View a list of the devices and identify the leaf node name (such as `sdc`) of the SAN device that you want to use for the SBD partition. At the command prompt, enter

```
nlvm -s list devices --terse
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

The device information shows the leaf node name, the size, the amount of free available space, the partitioning format (such as MSDOS or GPT), the shared state (whether it is marked as Shareable for Clustering), and the RAID state (whether the device is an NSS software RAID device). Do not use an NSS software RAID for the device.

For example, the uninitialized device `sdc` reports a used and free size of 0 KB, a format of `None`, and a shared state of `No`:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
sda	20.00GB	19.99GB	1008KB	MSDOS	No	No	
sdb	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
sdc	102.00MB	0KB	0KB	None	No	No	
sdd	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	

7 Initialize and share the device. At the command prompt, enter

```
nlvm -s init <device_name> format=msdos shared
```

WARNING: Initializing a device destroys all data on the device.

Replace *device_name* with the leaf node name (such as `sdc`) of the SAN device you want to use as the SBD partition.

Specify a partitioning format of `msdos`.

Specify the `shared` option to mark the device as Shareable for Clustering.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

You can list the devices to visually verify that the device is formatted and shared:

```
nlvm -s list devices
```

For example, the formatted device `sdc` reports values for used and free size, a format of `MSDOS`, and a shared state of `Yes`:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
<code>sda</code>	20.00GB	19.99GB	1008KB	MSDOS	No	No	
<code>sdb</code>	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
<code>sdc</code>	102.00MB	16KB	101.98MB	MSDOS	Yes	No	
<code>sdd</code>	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	

8 Create the SBD partition. At the command prompt, enter (all on the same line):

```
nlvm -s create partition  
type=1ad  
device=<device_name>  
size=<value[K|M|G|T] |max>  
label="<cluster_name>"
```

Specify a type of `1ad` to create the SBD partition type.

Replace *device_name* with the leaf node name (such as `sdc`) of the SAN device you want to use as the SBD partition.

Replace *value* with the amount of space to use for the SBD partition and select a unit of measure as its multiplier, or specify `max` to use the entire device. If you specify a value without a multiplier, gigabytes (G) is assumed.

Replace *cluster_name* with the name of the cluster, such as `cluster1`. This name must match the name of an existing cluster that has a Cluster object in eDirectory. The name is case sensitive.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to create an SBD partition for a cluster named `cluster1` on device `sdc` that has already been initialized and shared, enter

```
nlvm -s create partition type=1ad device=sdc size=max label="cluster1"
```

A partition is created named `cluster1.sbd`. It uses all available free space on the specified device.

9 View a list of partitions and verify that the new partition appears in the list. At the command prompt, enter

```
nlvm -s list partitions
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

The partition information shows the partition name, the leaf node name of the device, the partition type (1AD), the starting location, and the partition size. Because an SBD partition must end at a cylinder boundary, the partition size might be slightly smaller than the device size, or the size you specified for the partition.

For example, for device `sdc` that is 102 MB in size, the partition created is 99.59 MB in size:

Name	Type	Start	Size	Device
<code>sda1</code>	83 (Linux)	2048	297.00MB	<code>sda</code>
<code>sda2</code>	82Linux_Swap)	610304	1.00GB	<code>sda</code>
<code>sda3</code>	83 (Linux)	2715648	7.99GB	<code>sda</code>
<code>cluster1.sbd</code>	1AD(Cluster)	32	99.59MB	<code>sdc</code>

If you specified the maximum size for the SBD partition, you can list devices again to see that all space on the device is used for the SBD partition:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
<code>sda</code>	20.00GB	19.99GB	1008KB	MSDOS	No	No	
<code>sdb</code>	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
<code>sdc</code>	102.00MB	102.00MB	0KB	MSDOS	Yes	No	
<code>sdd</code>	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	

10 Modify the Cluster object in eDirectory to enable its NCS: Shared Disk Flag attribute.

This step is required only if the cluster has never had an SBD partition. However, it does no harm to verify that the *NCS: Shared Disk Flag* attribute is enabled.

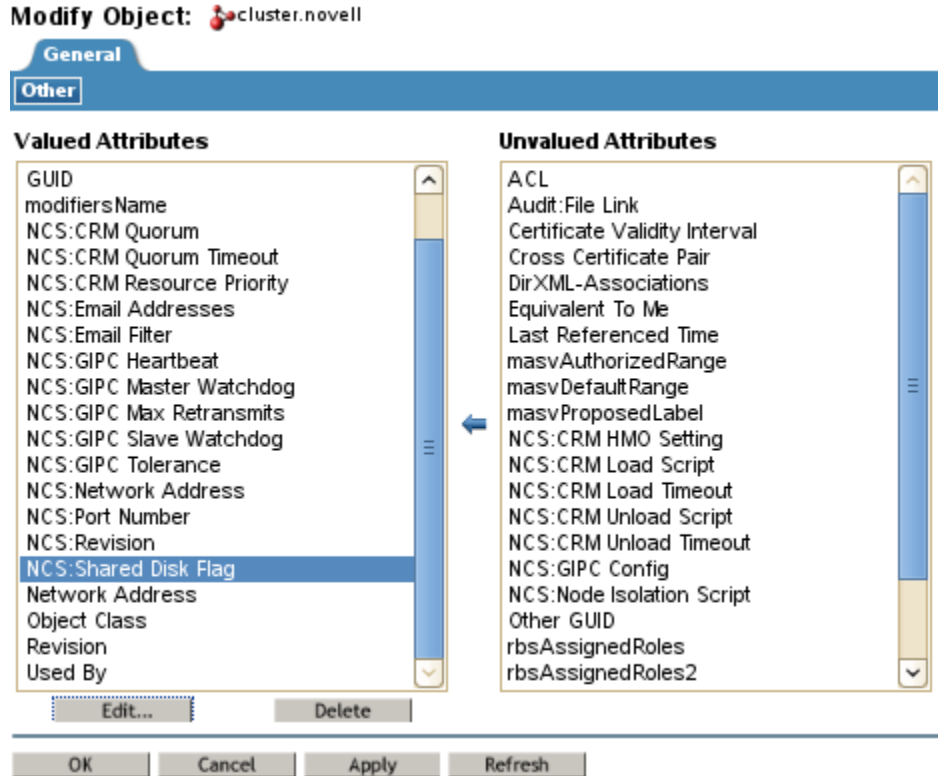
10a In a web browser, open iManager, then log in to the eDirectory tree that contains the cluster you want to manage.

IMPORTANT: Log in as an administrator user who has sufficient rights in eDirectory to delete and modify eDirectory objects.

10b Select *Directory Administration*, then select *Modify Object*.

10c Browse to locate and select the Cluster object of the cluster you want to manage, then click *OK*.

10d Under *Valued Attributes*, select the *NCS: Shared Disk Flag*, then click *Edit*.



10e Select (enable) the *NCS: Shared Disk Flag* check box, then click *OK*.



10f Click *Apply* to save changes.

11 On each cluster node, start Novell Cluster Services:

11a Log in to the cluster node as the `root` user, then open a terminal console.

11b At the command prompt, enter

```
rcnovell-ncs start
```

11c After you have restarted Novell Cluster Services on all nodes, continue with the next step.

12 On each cluster node, join the cluster. At the command prompt, enter

```
cluster join
```

13 (Optional) Continue with [Section 8.1.3, “Mirroring an Existing SBD Partition with NLVM,”](#) on page 120.

8.1.3 Mirroring an Existing SBD Partition with NLVM

You can mirror an existing Novell Cluster Services SBD partition to provide device fault tolerance. It is not necessary to take the cluster down or stop the cluster software.

- 1 Prepare a SAN device to use as the mirror segment for the SBD partition:
 - 1a Use the SAN storage array software to carve a device that is at least the size of the existing SBD partition's device.
 - 1b Attach the device to all nodes in the cluster.
 - 1c On each node, log in as the `root` user and rescan for devices:

```
nlvm rescan
```

- 2 Log in to any member node of the cluster as the `root` user, then open a terminal console.
- 3 View a list of the devices and identify the leaf node name (such as `sde`) of the SAN device that you want to use as the mirror for the existing SBD partition. At the command prompt, enter

```
nlvm list devices
```

For example, the uninitialized device `sde` reports a used and free size of 0 KB, a format of `None` and a shared state of `No`:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
sda	20.00GB	19.99GB	1008KB	MSDOS	No	No	
sdb	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
sdc	102.00MB	102.00MB	0KB	MSDOS	Yes	No	
sdd	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	
sde	102.00MB	0KB	0KB	None	No	No	

- 4 Initialize and share the device. At the command prompt, enter

```
nlvm init <device_name> format=msdos shared
```

WARNING: Initializing a device destroys all data on the device.

Replace `device_name` with the leaf node name (such as `sde`) of the SAN device you want to use as the mirror for the existing SBD partition.

Specify a partitioning format of `msdos`.

Specify the `shared` option to mark the device as Shareable for Clustering.

You can list the devices to visually verify that the device is formatted and shared:

```
nlvm list devices
```

For example, the formatted device `sde` reports a format of `MSDOS` and a shared state of `Yes`:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
sda	20.00GB	19.99GB	1008KB	MSDOS	No	No	
sdb	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
sdc	102.00MB	102.00MB	0KB	MSDOS	Yes	No	
sdd	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	
sde	102.00MB	16KB	101.98MB	MSDOS	Yes	No	

- 5 Mirror the SBD partition. At the command prompt, enter (all on the same line):

```
nlvm create raid
raid=1
name=<cluster_name>
type=sbd
part=<partition_name>
device=<device_name>
```


Specify a RAID type of 1 for mirroring.

Replace *cluster_name* with the name of the SBD's cluster, such as `cluster1`. This name must match the name of an existing cluster that has a Cluster object in eDirectory. The name is case sensitive.

Specify a type of `sbd` to create SBD partitions on the RAID1 device. The `type` option must precede the `part` option in the command.

Replace *partition_name* with the partition name of the existing SBD partition.

Replace *device_name* with the leaf node name (such as `sde`) of the SAN device you want to use as the mirror for the existing SBD partition. The device must be at least the same size as the partition you want to mirror.

You do not specify a size in the command. The size of the existing partition determines the amount of space that is used for the mirrored segment.

For example, to mirror the SBD partition `cluster1.sbd` with device `sde` for a cluster named `cluster1`, enter

```
nlvm create raid raid=1 type=sbd name=cluster1 part=cluster1.sbd device=sde
```

For our example, a RAID1 (mirror) device is created named `cluster1.sbd` that is made up of device `sdc` and device `sde`. The existing SBD partition is renamed from `cluster1.sbd` to `cluster1.msbd0`. A new partition named `cluster1.msbd1` is created on device `sde`.

- 6 View a list of devices to verify the current state of both devices and to verify that a RAID1 device named `cluster1.sbd` was created. At the command prompt, enter

```
nlvm list devices
```

The entries of interest in the devices list are the devices that you use for the SBD partition (such as `sdc` and `sde`) and the newly created RAID1 device:

Name	Size	Used	Free	Format	Shared	RAID	Enabled
<code>sda</code>	20.00GB	19.99GB	1008KB	MSDOS	No	No	
<code>sdb</code>	1.00GB	400.01MB	623.98MB	MSDOS	No	No	
<code>sdc</code>	102.00MB	102.00MB	0KB	MSDOS	Yes	No	
<code>sdd</code>	8.00GB	50.01MB	7.95GB	MSDOS	Yes	No	
<code>sde</code>	102.00MB	102.00MB	0KB	MSDOS	Yes	No	
<code>cluster1.sbd</code>	99.57MB	97.57MB	0KB	None	Yes	1	Yes

- 7 View a list of partitions to verify the status of mirrored SBD partitions `cluster1.msbd0` and `cluster1.msbd1`. At the command prompt, enter

```
nlvm list partitions
```

The entries of interest in the list are `cluster1.msbd0` and `cluster1.msbd1`:

Name	Type	Start	Size	Device
<code>sda1</code>	83 (Linux)	2048	297.00MB	<code>sda</code>
<code>sda2</code>	82Linux_Swap	610304	1.00GB	<code>sda</code>
<code>sda3</code>	83 (Linux)	2715648	7.99GB	<code>sda</code>
<code>cluster1.msbd0</code>	1AD(Cluster)	32	99.59MB	<code>sdc</code>
<code>cluster1.msbd1</code>	1AD(Cluster)	32	99.59MB	<code>sde</code>

8.1.4 Creating a Mirrored SBD Partition with NLVM

You can create a mirrored Novell Cluster Services SBD partition to provide device fault tolerance for the SBD. You must take the cluster down and stop the cluster software. If an SBD partition already exists, you must first delete the SBD as described in [Section 8.3, “Deleting an SBD Partition with NLVM,” on page 126](#).

Use the procedure in this section to create a new mirrored SBD partition by using NLVM commands.

- 1 Ensure that nobody else is changing any storage on any nodes at this time.

Until the SBD exists and the cluster is set up for shared disk access, you are responsible for ensuring that you have exclusive access to the shared storage.

- 2 Take the cluster down:

- 2a Log in to any node in the cluster as the `root` user, then open a terminal console.

- 2b At the command prompt, enter

```
cluster down
```

- 3 On each cluster node, stop Novell Cluster Services:

- 3a Log in to the cluster node as the `root` user, then open a terminal console.

- 3b At the command prompt, enter

```
rcnovell-ncs stop
```

- 3c After you have stopped Novell Cluster Services on all nodes, continue with the next step.

- 4 Prepare two SAN devices to use for the mirrored SBD partition:

- 4a Use the SAN storage array software to carve two devices of equal size to use exclusively for the mirrored SBD partition.

- 4b Attach the devices to all nodes in the cluster.

- 4c On each node, log in as the `root` user and rescan for devices:

```
nlvm -s rescan
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

- 5 Log in to any node in the cluster as the `root` user, then open a terminal console.

- 6 View a list of the devices and identify the leaf node name (such as `sdC`) of the two SAN devices that you want to use for the mirrored SBD partition. At the command prompt, enter

```
nlvm -s list devices
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

The device information shows the leaf node name, the size, the amount of free available space, the partitioning format (such as MSDOS or GPT), the shared state (whether it is marked as Shareable for Clustering), and the RAID state (whether the device is an NSS software RAID device). Do not use an NSS software RAID for the device.

- 7 Initialize and share the two devices. At the command prompt, enter

```
nlvm -s init <device_name1>,<device_name2> format=msdos shared
```

WARNING: Initializing a device destroys all data on the device.

Replace *device_name1* and *device_name2* with the leaf node names (such as `sdc` and `sdd`) of the two SAN devices you want to use for the mirrored SBD partition.

Specify a partitioning format of `msdos`.

Specify the `shared` option to mark the devices as Shareable for Clustering.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to initialize devices `sdc` and `sdd`, enter

```
nlvm -s init sdc,sdd format=msdos shared
```

You can list the devices to visually verify that the device is formatted and shared:

```
nlvm -s list devices
```

- 8 Create the mirrored SBD partition. At the command prompt, enter (all on the same line):

```
nlvm -s create raid
raid=1
type=sbd
name=<cluster_name>
device=<device_name1> size=max
device=<device_name2>
```

Specify a RAID type of 1 for mirroring.

Specify a type of `sbd` to create SBD partitions on the RAID1 device.

Replace *cluster_name* with the name of the cluster, such as `cluster1`. This name must match the name of an existing cluster that has a Cluster object in eDirectory. The name is case sensitive.

Replace *device_name1* and *device_name2* with the leaf node names (such as `sdc` and `sdd`) of the two SAN devices you want to use for the mirrored SBD partition. The `cluster1.msbd0` mirrored SBD partition is created on the first device option instance in the command. The `cluster1.msbd1` mirrored SBD partition is created on the second device option instance in the command.

Specify a size of `max` to use all of the available space. Specify the size only once. Both devices should be the same size; however, if they are not, the size of the RAID segments is determined by the size of the smaller device.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to create a mirrored SBD for a cluster named `cluster1` with devices `sdc` and `sdd` that have already been initialized and shared, enter

```
nlvm -s create raid raid=1 type=sbd name="cluster1" device=sdc size=max device=sdd
```

A RAID1 device is created named `cluster1.sbd`. The `cluster1.msbd0` partition is created on device `sdc`. The `cluster1.msbd1` partition is created on device `sdd`.

- 9 View a list of devices to verify the current state of both devices and to verify that a RAID1 device named `cluster1.sbd` was created. At the command prompt, enter

```
nlvm -s list devices
```

- 10 View a list of partitions and verify that the new partitions appear in the list. At the command prompt, enter

```
nlvm -s list partitions
```

The partition information shows the partition name, the leaf node name of the device, the partition type (1AD), the starting location, and the partition size. Because an SBD partition must end at a cylinder boundary, the partition size might be slightly smaller than the device size, or the size you specified for the partition.

You can list devices again to see the amount of space that is unused beyond the cylinder boundary. Our example devices show 2.39 MB of free space after the partition is created, as shown in [Step 9](#).

- 11 Modify the Cluster object in eDirectory to enable its NCS: Shared Disk Flag attribute.

This step is required only if the cluster has never had an SBD partition. However, it does no harm to verify that the NCS: Shared Disk Flag attribute is enabled.

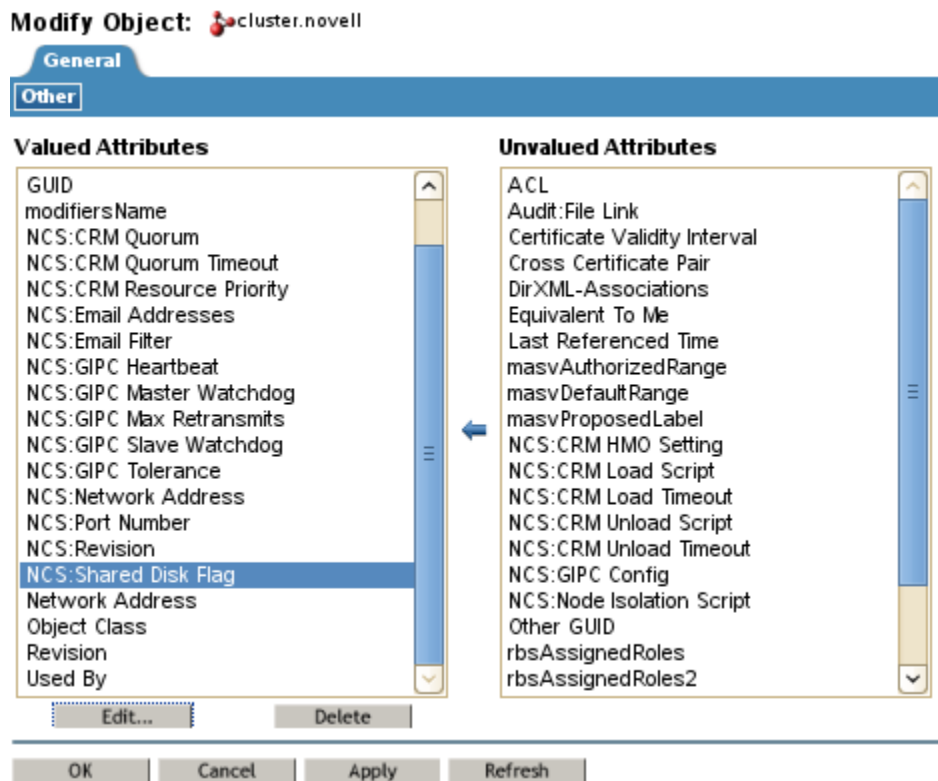
- 11a In a web browser, open iManager, then log in to the eDirectory tree that contains the cluster you want to manage.

IMPORTANT: Log in as an administrator user who has sufficient rights in eDirectory to delete and modify eDirectory objects.

- 11b Select *Directory Administration*, then select *Modify Object*.

- 11c Browse to locate and select the Cluster object of the cluster you want to manage, then click *OK*.

- 11d Under *Valued Attributes*, select the *NCS: Shared Disk Flag*, then click *Edit*.



- 11e Select (enable) the *NCS: Shared Disk Flag* check box, then click *OK*.



Edit Attribute

NCS: Shared Disk Flag

OK Cancel

- 11f Click *Apply* to save changes.
- 12 On each cluster node, start Novell Cluster Services:
- 12a Log in to the cluster node as the `root` user, then open a terminal console.
- 12b At the command prompt, enter
- ```
rcnovell-ncs start
```
- 12c After you have restarted Novell Cluster Services on all nodes, continue with the next step.
- 13 On each cluster node, join the cluster. At the command prompt, enter
- ```
cluster join
```

8.2 Unmirroring a Mirrored SBD Partition with NLVM

Use the procedure in this section to remove the mirrored segment from a mirrored SBD partition, and then to remove the single element mirror from the SBD. This leaves a single device that contains an SBD partition.

- 1 Log in to any node as the `root` user, then launch a terminal console.
- 2 Delete the mirrored segment from the mirrored SBD partition. At the command prompt, enter

```
nlvm [--force] [--no-prompt] delete raid <raid_name> segment <segment_number>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. You can use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Replace *raid_name* with the name of the mirrored SBD RAID device that contains the segment to be deleted, such as `cluster1.sbd`. The RAID name is case sensitive.

Replace *segment_number* with the segment index (zero relative) to be removed. For a mirrored SBD RAID the possible values are 0 and 1.

Use the `--force` NLVM option to remove out-of-sync segments.

For example, to delete segment 1 of the `cluster1.sbd` RAID1 device, enter

```
nlvm delete raid cluster1.sbd segment 1
```

- 3 View a list of partitions and verify that the SBD partition named `<cluster_name>.msbd1` has been deleted. At the command prompt, enter

```
nlvm list partitions
```

- 4 View a list of RAID1s and verify that the SBD RAID1 device `<cluster_name>.sbd` still exists. At the command prompt, enter

```
nlvm list raids
```

- 5 Delete the single element mirror from the SBD. At the command prompt, enter

```
nlvm [--no-prompt] delete raid <raid_name>
```

You are automatically prompted to confirm the delete action. Respond by typing `yes` or `no`, then press Enter. You can use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Replace *raid_name* with the name of the mirrored SBD RAID device that contains the segment to be deleted, such as `cluster1.sbd`. The RAID name is case sensitive.

Because the RAID device is now a single element RAID1, this command removes the single element mirror from the SBD, and leaves the SBD partition on the device. The SBD partition is renamed from `<cluster_name>.msbd0` to `<cluster_name>.sbd`, and the RAID1 device `<cluster_name>.sbd` is deleted.

- 6 View a list of RAID1s and verify that the SBD RAID1 device `<cluster_name>.sbd` has been removed. At the command prompt, enter

```
nlvm list raids
```

- 7 View a list of partitions and verify that the SBD partition name has been changed from `<cluster_name>.msbd0` to `<cluster_name>.sbd`. At the command prompt, enter

```
nlvm list partitions
```

For example, the SBD partition entry is now:

```
cluster1.sbd device=sdC type=1AD(Cluster) start=32 size=99.59MB(203968)
```

8.3 Deleting an SBD Partition with NLVM

You might need to delete and re-create a Novell Cluster Services SBD partition if the SBD becomes corrupted or its device fails. Use the procedure in this section to delete the SBD partition, and then to create a new SBD partition by using one of the methods in [Section 8.1, "Creating or Mirroring an SBD Partition,"](#) on page 113.

IMPORTANT: You must take the cluster down and stop Novell Cluster Services on all nodes before you delete the existing SBD partition. Do not restart Novell Cluster Services and rejoin nodes to the cluster until after you create a new SBD.

- 1 Ensure that nobody else is changing any storage on any nodes at this time.

Until the SBD exists and the cluster is set up for shared disk access, you are responsible for ensuring that you have exclusive access to the shared storage.

- 2 Take the cluster down:

- 2a Log in to any node in the cluster as the `root` user, then open a terminal console.

- 2b At the command prompt, enter

```
cluster down
```

- 3 On each cluster node, stop Novell Cluster Services:

- 3a Log in to the cluster node as the `root` user, then open a terminal console.

- 3b At the command prompt, enter

```
rcnovell-ncs stop
```

- 3c After you have stopped Novell Cluster Services on all nodes, continue with the next step.

- 4 Log in to any node in the cluster as the `root` user, then launch a terminal console.

5 If the SBD partition is mirrored, unmirror the SBD partition:

- 5a** Delete the mirrored segment from the mirrored SBD partition. At the command prompt, enter

```
nlvm -s [--force] [--no-prompt] delete raid <raid_name> segment <segment_number>
```

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. You can use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Replace *raid_name* with the name of the mirrored SBD RAID device that contains the segment to be deleted, such as `cluster1.sbd`. The RAID name is case sensitive.

Replace *segment_number* with the segment index (zero relative) to be removed. For a mirrored SBD RAID the possible values are 0 and 1.

Use the `--force` NLVM option to remove out-of-sync segments.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to delete segment 1 of the `cluster1.sbd` RAID1 device, enter

```
nlvm -s --force delete raid cluster1.sbd segment 1
```

- 5b** Delete the single element mirror from the SBD. At the command prompt, enter

```
nlvm -s [--no-prompt] delete raid <raid_name>
```

Because the RAID device is now a single element RAID1, this command removes the single element mirror from the SBD, and leaves the SBD partition on the device.

You are automatically prompted to confirm the delete action. Respond by typing *yes* or *no*, then press Enter. You can use the `--no-prompt` NLVM option to suppress the confirmation prompt.

Replace *raid_name* with the name of the mirrored SBD RAID device that contains the segment to be deleted, such as `cluster1.sbd`. The RAID name is case sensitive.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to delete the single element mirror from the `cluster1.sbd` device, enter

```
nlvm -s delete raid cluster1.sbd
```

- 5c** View a list of RAID devices and verify that the SBD RAID1 device `<cluster_name>.sbd` has been removed. At the command prompt, enter

```
nlvm -s list raids
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

- 5d** View a list of partitions and verify that the SBD partition name has been changed from `<cluster_name>.msbd0` to `<cluster_name>.sbd`. At the command prompt, enter

```
nlvm -s list partitions
```

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, the SBD partition entry is now:

```
cluster1.sbd device=sdc type=1AD(Cluster) start=32 size=99.59MB(203968)
```

- 6 Delete the SBD partition. At the command prompt, enter

```
nlvm -s delete partition <partition_name>
```

Replace *partition_name* with the name of the SBD partition, such as `cluster1.sbd`. The partition name is case sensitive.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

For example, to delete the single element mirror from the `cluster1.sbd` device, enter

```
nlvm -s delete partition cluster1.sbd
```

- 7 If you plan to reuse the device for the SBD, initialize and share the device. At the command prompt, enter

```
nlvm -s init <device_name> format=msdos shared
```

WARNING: Initializing a device destroys all data on the device.

Replace *device_name* with the leaf node name (such as `sde`) of the SAN device.

Specify a partitioning format of `msdos`.

Specify the `shared` option to mark the device as Shareable for Clustering.

Use the `-s` NLVM option to override the shared locking requirement and force the command to execute.

You can list the devices to visually verify that the device is formatted and shared:

```
nlvm -s list devices
```

- 8 To re-create the SBD partition, continue with [Section 8.1, “Creating or Mirroring an SBD Partition,”](#) on page 113.

Do not restart Novell Cluster services and rejoin nodes to the cluster until after you create the new SBD.

9 Troubleshooting NLVM

This section identifies common problems and troubleshooting tips for Novell Linux Volume Manager (NLVM) on your Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) server.

- ♦ [Section 9.1, “Viewing Error Code Messages,” on page 129](#)
- ♦ [Section 9.2, “Failure to Create an LVM Volume Group,” on page 129](#)
- ♦ [Section 9.3, “Failure to Create a Clustered LVM Volume Group,” on page 129](#)
- ♦ [Section 9.4, “Device Is Not Available for Use in an LVM Volume Group,” on page 130](#)
- ♦ [Section 9.5, “NLVM Pool Move Fails and Deactivates the Pool,” on page 130](#)
- ♦ [Section 9.6, “Error 20897 - This node is not a cluster member,” on page 130](#)
- ♦ [Section 9.7, “NLVM Error Codes,” on page 131](#)
- ♦ [Section 9.8, “NSS Error Codes,” on page 139](#)

For additional troubleshooting information, see the [Novell Technical Support website \(http://www.novell.com/support\)](http://www.novell.com/support).

9.1 Viewing Error Code Messages

If an error message for a failed NLVM command line operation provides an error code without a corresponding message, you can use the `nss /err` command to view the message. At a command prompt, enter

```
nss /err=<error_code_number>
```

You can also use the following command to view the error code message in the NSS Console (`nsscon`):

```
nsscon /ErrorCode=<error_code_number>
```

Type `exit` and press Enter to close the NSS console and return to the command prompt.

9.2 Failure to Create an LVM Volume Group

When you create an LVM volume group or clustered LVM volume group, the command fails with the following error:

```
Error 23384: Not enough free space to handle requested size
```

This error occurs if any one of the devices you used for the volume group is not initialized. Uninitialized devices report that there is no available free space on the device. Initialize the device and try again.

9.3 Failure to Create a Clustered LVM Volume Group

When you create a clustered Logical Volume Manager (LVM) volume group, the command fails with the following error:

```
Error 23384: Device /dev/sde is not shared by clvmd
```

This error can occur if the installed Linux kernel does not contain the latest Clustered LVM software. Clustered LVM requires the Linux kernel 2.6.32.45-0.3 or later. You can get the latest kernel version by using the SUSE Linux Enterprise Server (SLES) 11 SP1 update channel for OES 11. For information about applying patches for your server, see [“Updating \(Patching\) an OES 11 SP3 Server”](#) in the *OES 11 SP3: Installation Guide*.

The correct version of CLVM software is included in the SLES 11 SP2 or later releases.

9.4 Device Is Not Available for Use in an LVM Volume Group

A device cannot be used to create an LVM volume group if any of the following conditions exist:

- ♦ The device is not initialized.
- ♦ The device contains partitions.
- ♦ The device is marked as Shareable for Clustering, which adds a 4 KB partition on the device to store the shared state.

9.5 NLVM Pool Move Fails and Deactivates the Pool

If a hardware error is encountered during an `nlvm move`, the pool move fails, and the pool is automatically deactivated. Currently, no error is returned, but the pool will not activate. The pool move cannot continue because of the hardware error. You must delete the move to clear the move:

```
nlvm delete move [<poolname>|<movename>]
```

After the move is deleted, you can activate the pool.

Because of the hardware error, you cannot use the `nlvm move` command to move the pool. You can move the pool's data to another SAN device by restoring files from backup media, or by copying the files from the old pool to a new pool.

9.6 Error 20897 - This node is not a cluster member

If Novell Cluster Services is installed on a node, but an SBD does not exist, NLVM commands return the following error:

```
Error 20897 - This node is not a cluster member.
```

In a Novell Cluster Services cluster, NLVM uses the cluster's SBD to detect whether a node is a cluster member and to lock against concurrent changes to physically shared storage. Without an SBD, NLVM cannot detect whether a node is a member of the cluster and cannot acquire the locks it needs to execute tasks. In this state, you can use the `-s` option with NLVM commands to prepare a device and create an SBD partition. To minimize the risk of corruption, you must ensure that nobody else is changing any storage on any nodes at the same time.

For information about creating an SBD partition by using NLVM commands, see [Section 8.1, “Creating or Mirroring an SBD Partition,”](#) on page 113.

9.7 NLVM Error Codes

Use the information in this section to manage your storage when Novell Linux Volume Manager (NLVM) error conditions exist. NLVM error codes are usually displayed in positive decimal numbers with a message and a `status=` prefix. For example:

```
Pool is not active: status=23357
```

- ◆ [Section 9.7.1, “NLVM Error List,” on page 131](#)
- ◆ [Section 9.7.2, “NLVM Error Descriptions,” on page 133](#)

9.7.1 NLVM Error List

NLVM error code numbers can be categorized as follows:

- ◆ NLVM General Errors (23300 to 23309)
 - ◆ [23300 zERR NLVM LOCKED](#)
 - ◆ [23301 zERR NLVM BOOT DEVICE](#)
 - ◆ [23302 zERR NLVM DEVICE HAS RAID](#)
 - ◆ [23303 zERR NLVM NO LOCK](#)
 - ◆ [23304 zERR NLVM VLDB SYMBOL ERROR](#)
 - ◆ [23305 zERR NLVM NOT PERMITTED](#)
 - ◆ [23306 zERR NLVM PARSE ERROR](#)
 - ◆ [23307 zERR NLVM INVALID PARAMETER](#)
- ◆ NLVM Device Errors (23310 to 23319)
 - ◆ [23310 zERR NLVM CSM DEVICE](#)
 - ◆ [23311 zERR NLVM DEVICE NOT FOUND](#)
 - ◆ [23312 zERR NLVM PART NOT FOUND](#)
 - ◆ [23313 zERR NLVM READ FAILURE](#)
 - ◆ [23314 zERR NLVM WRITE FAILURE](#)
 - ◆ [23315 zERR NLVM PART EXPAND FAILURE](#)
 - ◆ [23316 zERR NLVM SIZE TOO SMALL](#)
 - ◆ [23317 zERR NLVM SIZE TOO BIG](#)
 - ◆ [23318 zERR NLVM INVALID PART TYPE](#)
 - ◆ [23319 zERR NLVM DEVICE NOT INIT](#)
- ◆ NLVM General File System Errors (23320 to 23329)
 - ◆ [23320 zERR NLVM ERROR OPENING DB](#)
 - ◆ [23321 zERR NLVM DB MATCH ERROR](#)
 - ◆ [23322 zERR NLVM INVALID MODE](#)
 - ◆ [23323 zERR NLVM ERROR OPENING CONFIG](#)
 - ◆ [23324 zERR NLVM ERROR OPENING DEBUG](#)
 - ◆ [23325 zERR NLVM ERROR OPENING DEV](#)
 - ◆ [23326 zERR NLVM ERROR READING DEV](#)
 - ◆ [23327 zERR NLVM INVALID VERSION](#)

- ◆ 22328 (reserved)
- ◆ 22329 (reserved)
- ◆ NLVM Device Mapper Errors (23330 to 23340)
 - ◆ 23330 zERR NLVM ERROR OPENING DM
 - ◆ 23331 zERR NLVM DM IOCTL ERROR
 - ◆ 23332 zERR NLVM BAD SEGMENT COUNT
 - ◆ 22333 (reserved)
 - ◆ 23334 zERR NLVM BAD IDENTIFIER
 - ◆ 23335 zERR NLVM DM OBJECT NOT FOUND
 - ◆ 23336 zERR NLVM INVALID OBJECT
 - ◆ 23337 zERR NLVM OBJECT EXISTS
 - ◆ 23338 zERR NLVM OBJECT BUSY
 - ◆ 23339 zERR NLVM INVALID TYPE
 - ◆ 23340 zERR NLVM LOAD ERROR
- ◆ NLVM Create Snapshot Error (23341)
 - ◆ 23341 zERR NLVM SNAP NOT FOUND
- ◆ NLVM Create Partition Errors (23342 to 23345)
 - ◆ 23342 zERR NLVM LIMIT ERROR
 - ◆ 23343 zERR NLVM PART CREATE
 - ◆ 23344 zERR NLVM PART DELETE
 - ◆ 23345 zERR NLVM PART WRITE
- ◆ NLVM NSS Pool and Volume Errors (23341 to 23359)
 - ◆ 23346 zERR NLVM UNABLE TO EXPAND POOL
 - ◆ 23347 zERR NLVM UNABLE TO CREATE POOL
 - ◆ 23348 zERR NLVM SHARED MISMATCH
 - ◆ 23349 zERR NLVM TYPE MISMATCH
 - ◆ 23350 zERR NLVM HAS POOL
 - ◆ 23351 zERR NLVM DIRECTORY TOO LONG
 - ◆ 23352 zERR NLVM UNABLE TO CREATE DIR
 - ◆ 23353 zERR NLVM UNABLE TO CREATE NODE
 - ◆ 23354 zERR NLVM POOL UPDATE
 - ◆ 23355 zERR NLVM POOL MOUNT ERROR
 - ◆ 23356 zERR NLVM POOL MAX SIZE
 - ◆ 23358 zERR NLVM GROUP NOT FOUND
 - ◆ 23359 (reserved)
- ◆ NLVM NSS Pool Snapshot Errors (23360 to 23369)
 - ◆ 23360 zERR NLVM SNAPSHOT ERROR
 - ◆ 23361 to 23369 (reserved)
- ◆ NLVM NSS Software RAID Errors (23370 to 23379)
 - ◆ 23370 zERR NLVM DUPLICATE DEVICE

- ◆ 23371 zERR NLVM MAX ELEMENTS
- ◆ 23372 zERR NLVM TOO FEW ELEMENTS
- ◆ 23373 zERR NLVM SIZE MISMATCH
- ◆ 23374 zERR NLVM NOT A RAID
- ◆ 23375 zERR NLVM NOT A MIRROR
- ◆ 23376 zERR NLVM TOO MANY PARTITIONS
- ◆ 23377 zERR NLVM RAID NOT IN SYNC
- ◆ 23378 zERR NLVM RAID NOT ENABLED
- ◆ 23379 zERR NLVM RAID NONE IN SYNC
- ◆ NLVM Linux POSIX Volume Errors (23380 to 23390)
 - ◆ 23380 zERR NLVM FSTAB UPDATE
 - ◆ 23381 zERR NLVM OPEN ERROR
 - ◆ 23382 zERR NLVM NO VOLUME NAME
 - ◆ 23383 zERR NLVM NO IP ADDRESS
 - ◆ 23384 zERR NLVM ERROR CREATING LVM VOL
 - ◆ 23385 zERR NLVM ERROR MAKING FS
 - ◆ 23386 zERR NLVM ERROR DELETING RES
 - ◆ 23387 zERR NLVM ERROR DELETING LVM VOL
 - ◆ 23388 zERR NLVM ERROR SENDING CMD
 - ◆ 23389 zERR NLVM NCP ERROR
 - ◆ 23390 zERR NLVM DUPLICATE MP
- ◆ NLVM eDirectory Errors (23391 to 233 92)
 - ◆ 23391 zERR NLVM EDIR OBJECT NOT FOUND
 - ◆ 23392 zERR NLVM Invalid CRC
 - ◆ 23393 to 23399 (reserved)

9.7.2 NLVM Error Descriptions

- ◆ “NLVM General Errors (23300 to 23309)” on page 134
- ◆ “NLVM Device Errors (23310 to 23319)” on page 134
- ◆ “NLVM General File System Errors (23320 to 23329)” on page 135
- ◆ “NLVM Device Mapper Errors (23330 to 23340)” on page 135
- ◆ “NLVM Create Snapshot Error (23341)” on page 136
- ◆ “NLVM Create Partition Errors (23342 to 23345)” on page 136
- ◆ “NLVM NSS Pool and Volume Errors (23346 to 23369)” on page 136
- ◆ “NLVM NSS Pool Snapshot Errors (23360 to 23369)” on page 137
- ◆ “NLVM NSS Software RAID Errors (23370 to 23379)” on page 137
- ◆ “NLVM Linux POSIX Volume Errors (23380 to 23390)” on page 138
- ◆ “NLVM eDirectory Errors (23391 to 233 99)” on page 139

NLVM General Errors (23300 to 23309)

23300 zERR NLVM LOCKED

The NLVM lock is already locked.

23301 zERR NLVM BOOT DEVICE

This device contains `/boot`, `root (/)`, or `swap` partitions.

23302 zERR NLVM DEVICE HAS RAID

This device contains RAID partitions.

23303 zERR NLVM NO LOCK

A function was called without the NLVM lock.

23304 zERR NLVM VLDB SYMBOL ERROR

An error occurred when importing the Novell Distributed File Services (DFS) VLDB (volume location database) library or functions.

23305 zERR NLVM NOT PERMITTED

This request is not permitted.

23306 zERR NLVM PARSE ERROR

An error occurred when parsing the data.

23307 zERR NLVM INVALID PARAMETER

An invalid parameter was passed in.

NLVM Device Errors (23310 to 23319)

23310 zERR NLVM CSM DEVICE

This device contains a Cluster Segment Manager (CSM) container.

23311 zERR NLVM DEVICE NOT FOUND

The device was not found in NLVM.

23312 zERR NLVM PART NOT FOUND

The partition was not found in NLVM.

23313 zERR NLVM READ FAILURE

An error occurred while reading a stamp from the disk.

23314 zERR NLVM WRITE FAILURE

An error occurred while writing a stamp to the disk.

23315 zERR NLVM PART EXPAND FAILURE

An error occurred while expanding the partition.

23316 zERR NLVM SIZE TOO SMALL

The specified size is too small.

23317 zERR NLVM SIZE TOO BIG

Unable to find a space big enough for the request.

23318 zERR NLVM INVALID PART TYPE

The specified partition type is invalid.

23319 zERR NLVM DEVICE NOT INIT

The device is not initialized.

NLVM General File System Errors (23320 to 23329)**23320 zERR NLVM ERROR OPENING DB**

An error occurred while opening the database file.

23321 zERR NLVM DB MATCH ERROR

The current object does not match the database object.

23322 zERR NLVM INVALID MODE

Invalid mode opening the database file.

23323 zERR NLVM ERROR OPENING CONFIG

An error occurred while opening the NLVM configuration file.

23324 zERR NLVM ERROR OPENING DEBUG

An error occurred while opening the NLVM debug file.

23325 zERR NLVM ERROR OPENING DEV

An error occurred while opening the device for I/O.

23326 zERR NLVM ERROR READING DEV

An error occurred while reading from the device.

23327 zERR NLVM INVALID VERSION

The stamps have an unsupported version.

23328 (reserved)

Not used.

23329 (reserved)

Not used.

NLVM Device Mapper Errors (23330 to 23340)**23330 zERR NLVM ERROR OPENING DM**

An error occurred while opening the Device Mapper.

23331 zERR NLVM DM IOCTL ERROR

An error occurred while sending Device Mapper I/O Control (`ioctl`).

23332 zERR NLVM BAD SEGMENT COUNT

A segment count mismatch occurred.

23333 (reserved)

Not used.

23334 zERR NLVM BAD IDENTIFIER

The object identifier does not match a Device Mapper object ID.

23335 zERR NLVM DM OBJECT NOT FOUND

The Device Mapper object was not found.

23336 zERR NLVM INVALID OBJECT

The object is invalid.

23337 zERR NLVM OBJECT EXISTS

The object already exists in Device Mapper.

23338 zERR NLVM OBJECT BUSY

The object is busy.

23339 zERR NLVM INVALID TYPE

Invalid type parameter.

23340 zERR NLVM LOAD ERROR

An error occurred while loading a module.

NLVM Create Snapshot Error (23341)**23341 zERR NLVM SNAP NOT FOUND**

The NSS pool snapshot was not found.

NLVM Create Partition Errors (23342 to 23345)**23342 zERR NLVM LIMIT ERROR**

An error occurred while getting the device limits.

23343 zERR NLVM PART CREATE

An error occurred while creating a partition object.

23344 zERR NLVM PART DELETE

An error occurred while deleting a partition object.

23345 zERR NLVM PART WRITE

An error occurred while writing to a partition object.

NLVM NSS Pool and Volume Errors (23346 to 23369)**23346 zERR NLVM UNABLE TO EXPAND POOL**

Unable to expand the NSS pool.

23347 zERR NLVM UNABLE TO CREATE POOL

Unable to create the NSS pool.

23348 zERR NLVM SHARED MISMATCH

The shared states do not match.

23349 zERR NLVM TYPE MISMATCH

The partition types do not match.

23350 zERR NLVM HAS POOL

The partition already has an NSS pool.

23351 zERR NLVM DIRECTORY TOO LONG

The specified directory is too long.

23352 zERR NLVM UNABLE TO CREATE DIR

Unable to create the directory.

23353 zERR NLVM UNABLE TO CREATE NODE

Unable to create the device node.

23354 zERR NLVM POOL UPDATE

An error occurred while updating the NSS pool.

23355 zERR NLVM POOL MOUNT ERROR

An error occurred while updating the NSS pool.

23356 zERR NLVM POOL MAX SIZE

The NSS pool is already at the maximum size.

23357 zERR NLVM POOL NOT ACTIVE

The NSS pool is not active.

23358 zERR NLVM GROUP NOT FOUND

The group was not found in NLVM.

23359 (reserved)

Not used.

NLVM NSS Pool Snapshot Errors (23360 to 23369)**23360 zERR NLVM SNAPSHOT ERROR**

A pool snapshot error occurred.

23361 to 23369 (reserved)

Not used.

NLVM NSS Software RAID Errors (23370 to 23379)**23370 zERR NLVM DUPLICATE DEVICE**

The device is already used in this RAID.

23371 zERR NLVM MAX ELEMENTS

The RAID already has the maximum number of elements.

23372 zERR NLVM TOO FEW ELEMENTS

There are too few elements to create the RAID.

23373 zERR NLVM SIZE MISMATCH

The element sizes do not match.

23374 zERR NLVM NOT A RAID

The device is not a RAID device.

23375 zERR NLVM NOT A MIRROR

The device is not a RAID1 device.

23376 zERR NLVM TOO MANY PARTITIONS

You are trying to add too many partitions to a RAID.

23377 zERR NLVM RAID NOT IN SYNC

The RAID is not in sync.

23378 zERR NLVM RAID NOT ENABLED

The RAID is not enabled.

23379 zERR NLVM RAID NONE IN SYNC

No partition of the RAID device is in sync.

NLVM Linux POSIX Volume Errors (23380 to 23390)**23380 zERR NLVM FSTAB UPDATE**

An error occurred while updating the `/etc/fstab` file.

23381 zERR NLVM OPEN ERROR

An error occurred while opening the file.

23382 zERR NLVM NO VOLUME NAME

No volume name was specified.

23383 zERR NLVM NO IP ADDRESS

No IP address was specified.

23384 zERR NLVM ERROR CREATING LVM VOL

An error occurred while creating the LVM2 volume.

23385 zERR NLVM ERROR MAKING FS

An error occurred while making the file system on a volume.

23386 zERR NLVM ERROR DELETING RES

An error occurred while deleting a cluster resource for a volume.

23387 zERR NLVM ERROR DELETING LVM VOL

An error occurred while deleting the LVM2 volume.

23388 zERR NLVM ERROR SENDING CMD

An error occurred while sending the XML command.

23389 zERR NLVM NCP ERROR

An error occurred while adding a volume to NCP (NetWare Core Protocol).

23390 zERR NLVM DUPLICATE MP

A duplicate mount point was specified.

NLVM eDirectory Errors (23391 to 233 99)**23391 zERR NLVM EDIR OBJECT NOT FOUND**

The eDirectory object was not found.

23392 zERR NLVM Invalid CRC

Invalid CRC (cyclic redundancy check) in GPT (GUID partition table) partitions.

23393 to 23399 (reserved)

Not used.

9.8 NSS Error Codes

For information about Novell Storage Services error codes, see the *Novell Storage Services Error Codes* (<http://www.novell.com/documentation/nwec/nwec/data/al3s3ui.html>).

10 Security Considerations

This section describes the security considerations for the Novell Linux Volume Manager (NLVM) on a Novell Open Enterprise Server (OES) 11 Support Pack 3 (SP3) server.

- ♦ [Section 10.1, “Root User Privileges,” on page 141](#)
- ♦ [Section 10.2, “Files,” on page 141](#)

10.1 Root User Privileges

The Linux system `root` user privileges are required to use NLVM commands.

10.2 Files

`/dev/nss/`

Location where NSS software RAID and SBD partition device mapper objects are created.

`/dev/pool/`

Location where NSS pool device mapper objects are created.

`/etc/opt/novell/nss/nlvm.conf`

Location of the NLVM configuration file.

`/opt/novell/nss/mnt/.pools/`

Location where NSS pool objects are mounted.

`/opt/novell/nss/nlvm/`

Location of the NLVM storage configuration database files. The database files are named `nlvm.<number.>db`, such as `nlvm.db`, `nlvm.1.db`, and so on. The default is to keep the 10 most recent files. The number of NLVM database files to keep is set in the `/etc/opt/novell/nss/nlvm.conf` file.

`/opt/novell/nss/sbin/nlvm`

Location of the NLVM utility. It also has a link in the `sbin` directory so that it is in the search path.

`/var/opt/novell/log/nss/debug/`

Location of the debug log files when debug is enabled. The debug files are named `nlvm_debug.<number.>log`, such as `nlvm_debug.log`, `nlvm_debug.1.log`, and so on. The default is to keep the 10 most recent files. The number of debug log files to keep is set in the `/etc/opt/novell/nss/nlvm.conf` file.

`/var/run/novell-nss/nlvm.lock`

Local lock file for NLVM.

A Configuring Settings for the NLVM Library

The Novell Linux Volume Manager (NLVM) library software has some configurable settings that are exposed in the `/etc/opt/novell/nss/nlvm.conf` file. The default settings are automatically configured. To modify the default behavior, use the options described in [Table A-1](#).

Table A-1 Default Settings for the NLVM Library

Parameter	Description
<code>Debug on</code>	<p>If this line is enabled, the command allows the debug feature of the NLVM utility to run every time without needing to use the <code>-d</code> option.</p> <p>The default is off (commented out). You can enable debug as needed by using the <code>-d</code> option when you start the utility.</p> <p>To enable debug to run every time, you can uncomment the <code>Debug on</code> command in the <code>nlvm.conf</code> file.</p> <p>To return to the default debug behavior with the <code>-d</code> option, you can comment out the <code>Debug on</code> command again.</p>
<code>Debug files 10</code>	<p>If this line is enabled, the command specifies the number of NLVM debug log files to keep before deleting the oldest file. A log file shows actions that were performed by the NLVM library.</p> <p>The default is to keep the 10 most recent files. The minimum value is 1. The default setting applies when the command is commented out.</p> <p>To modify the number of files kept, uncomment the line and specify a new value.</p> <p>To use the default setting, comment out the command again.</p> <p>When debug runs, a debug log file is opened in the <code>/var/opt/novell/log/nss/debug</code> directory. The debug files are named <code>nlvm_debug.<number.>log</code>, such as <code>nlvm_debug.log</code>, <code>nlvm_debug.1.log</code>, and so on.</p>

Parameter	Description
Data base files 10	<p>If this line is enabled, the command specifies the number of NLVM database files to keep before deleting the oldest file. Database files are stored every time a change is made to the system with the NLVM library.</p> <p>The default is to keep the 10 most recent files. The minimum value is 1. The default setting applies when the command is commented out.</p> <p>To modify the number of files kept, uncomment the line and specify a new value.</p> <p>To use the default setting, comment out the command.</p> <p>When a change is made to the system, a database file is opened in the <code>/opt/novell/nss/nlvm/</code> directory. The database files are named <code>nlvm.<number.>db</code>, such as <code>nlvm.db</code>, <code>nlvm.1.db</code>, and so on.</p>
Auto refresh off	<p>If this line is enabled, the command turns off the autorefresh. The system gets its information from the database files. This results in much faster load times for utilities, but might require a refresh within the utility. If the autorefresh is off, a refresh can be triggered by using the <code>-r</code> option when you start the NLVM utility.</p> <p>IMPORTANT: If Novell Cluster Services is on, the autorefresh is always on.</p> <p>The default is that autorefresh is enabled (the line is commented out). This allows the NLVM library to refresh the system each time it is used. The autorefresh picks up any changes to the system that happened outside the library.</p>

B Documentation Updates

This section contains information about documentation content changes made to the *Novell Linux Volume Manager Reference* since the initial release of Novell Open Enterprise Server (OES) 11.

This document was updated on the following dates:

- ♦ [Section B.1, “January 2014 \(OES 11 SP2\),” on page 145](#)
- ♦ [Section B.2, “August 2012 \(OES 11 SP1\),” on page 150](#)

B.1 January 2014 (OES 11 SP2)

Updates were made to the following section. The changes are explained below.

- ♦ [Section B.1.1, “NLVM Commands,” on page 145](#)
- ♦ [Section B.1.2, “NLVM Examples for the NSS File System,” on page 148](#)
- ♦ [Section B.1.3, “Planning for NLVM,” on page 149](#)
- ♦ [Section B.1.4, “Troubleshooting NLVM,” on page 149](#)
- ♦ [Section B.1.5, “What’s New or Changed in Novell Linux Volume Manager,” on page 149](#)

B.1.1 NLVM Commands

Location	Change
Section 6.1.2, “Syntax Conventions,” on page 32	Device names support node names (<code>sd</code> and <code>mpatha</code>), full Linux path names (<code>/dev/sd</code> and <code>/dev/mapper/mpatha</code>), and keywords <code>anydisk</code> or <code>anyshared</code> (for commands that support keyword use).
Section 6.2, “NLVM Options,” on page 34	NLVM options can appear in any order in the command after <code>nlvm</code> . Previously, the NLVM options had to follow immediately after <code>nlvm</code> .
<code>-m</code> option in Section 6.2, “NLVM Options,” on page 34	This option prevents pools that have been unmounted from being mounted. Pools are by design auto mounted. Therefore, running the <code>nssmu</code> utility, or running most <code>nlvm</code> commands without the <code>-m</code> option can cause an unmounted pool to be remounted if underlying devices and partitions still exist. To execute an <code>nlvm</code> command without mounting the unmounted pools, you must include the <code>-m</code> option. The <code>nlvm mount</code> command internally sets the <code>-m</code> flag, so only the specified pool is mounted.

Location	Change
-s, --share in Section 6.2, “NLVM Options,” on page 34	In a cluster, if the SBD does not exist or fails, you can use the -s option with NLVM commands to prepare a device and create an SBD partition. To minimize the risk of corruption, you must ensure that nobody else is changing any storage on any nodes at the same time.
-t, --terse option in Section 6.2, “NLVM Options,” on page 34	This NLVM option is new. You can use the --terse option with <code>nlvm list</code> commands to display output in a format for parsing.
Section 6.3, “Common Options,” on page 35	This section is new. You can use the <code>more</code> or <code>all</code> options with <code>nlvm list</code> commands to display additional or detailed information about storage objects.
Section 6.41, “Move,” on page 97	<p>You can check the status of a pool move by using the <code>nlvm list move <move_name></code> command.</p> <p>You can issue the <code>nlvm complete move <move_name></code> command to finalize the move. Other NSS utilities might also complete the move. For information, see “Moving a Pool” in the <i>OES 11 SP3: NSS File System Administration Guide for Linux</i>.</p>
Section 6.5, “Create Linux Volume,” on page 36	If you use the <code>ncp</code> option, the volume name used for the <code>name</code> option must comply with the name limitations described in Section 5.2.4, “NCP Volume Names,” on page 24 .
Section 6.5, “Create Linux Volume,” on page 36	You can use the <code>valid</code> option in combination with the <code>shared</code> and <code>ncp</code> options to assign an NCP volume ID to a clustered LVM volume that is unique across all nodes in every peer cluster of a Business Continuity Cluster.
Section 6.5, “Create Linux Volume,” on page 36	You can use the <code>part=<partition_name></code> option instead of the <code>device</code> and <code>size</code> options to specify an existing partition as the location for a non-clustered Linux volume.
Section 6.5, “Create Linux Volume,” on page 36	<p>Specify an unshared initialized device. For OES 11 SP2 and later, you can alternatively specify a shared device with no data partitions or an uninitialized device.</p> <p>For a cluster-enabled LVM volume, issue the command from the master node in the cluster.</p>
Section 6.52, “Unmount,” on page 106	The <code>nlvm unmount <poolname></code> command also removes the Device Mapper object for the pool, the link to the Device Mapper object, and the mount point for the pool. This allows you to gracefully log out the server from an iSCSI device that contains a pool.
Section 6.6, “Create Partition,” on page 41	Because a physical partition must end on a cylinder boundary, its size might be slightly different than the size you specify.

Location	Change
Section 6.6, "Create Partition," on page 41	<p>Added:</p> <p><code>type=8e</code> (partition type for Linux LVM)</p> <p><code>type=1ac</code> (partition type for snapshots)</p>
Section 6.6, "Create Partition," on page 41	<p>A physical partition size might be rounded up or down to the next nearest cylinder boundary depending on the partition type, the specified size, and the amount of free space.</p>
Section 6.6, "Create Partition," on page 41	<p>Before you create a Novell Cluster Services SBD partition, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.</p>
Section 6.7, "Create Pool," on page 43	<p>For a cluster-enabled pool, issue the command from the master node in the cluster.</p>
Section 6.8, "Create RAID," on page 45	<p>When mirroring a pool that consumes an entire MSDOS partitioned disk, you can use an MSDOS or GPT partitioned device of the same size.</p>
Section 6.8, "Create RAID," on page 45	<p>The <code>type</code> option is optional for mirroring existing partitions.</p> <p>The <code>name</code> option is optional for mirroring an existing SBD partition.</p>
Section 6.8, "Create RAID," on page 45	<p>Because a physical partition must end on a cylinder boundary, its size might be slightly different than the size you specify.</p>
Section 6.8, "Create RAID," on page 45	<p>For Novell type partitions, the physical partition size might be rounded down to the next nearest cylinder boundary.</p> <p>When you mirror an existing partition, the <code>type</code> option must precede the <code>part</code> option in the command.</p> <p>Before you create a Novell Cluster Services SBD RAID 1, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.</p> <p>Added examples for creating a mirrored SBD RAID 1 device and for mirroring an existing SBD partition.</p>
Section 6.9, "Create Snap," on page 48	<p>The <code>part</code> option for the <code>enlvm create snap</code> command allows you to specify a snap partition (type 1AC) as the target of the snapshot. The minimum snapshot size was increased from 1 MB to 50 MB.</p>
Section 6.10, "Create Volume," on page 49	<p>You can use the <code>valid</code> option in combination with a clustered NSS pool to assign an NCP volume ID to a clustered NSS volume that is unique across all nodes in every peer cluster of a Business Continuity Cluster.</p>
Section 6.13, "Delete Partition," on page 52	<p>Before you delete a Novell Cluster Services SBD partition, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.</p>

Location	Change
Section 6.15, "Delete RAID," on page 54	Before you delete a Novell Cluster Services SBD RAID 1, you must take the cluster down, and stop Novell Cluster Services from running on all nodes.
Section 6.24, "Linux Mount," on page 61	This command is new.
Section 6.25, "Linux Unmount," on page 62	This command is new.
Section 6.28, "List Linux Volume," on page 68	This command is new.
Section 6.27, "List Devices," on page 65	The <code>more</code> option prints additional information about the storage object.
Section 6.29, "List Linux Volumes," on page 69	
Section 6.31, "List Moves," on page 74	The <code>all</code> option prints detailed information about the storage object. This is the same information as for the specific <code>nlvm list</code> command for an object.
Section 6.33, "List Partitions," on page 77	
Section 6.35, "List Pools," on page 85	
Section 6.37, "List Snaps," on page 90	The <code>-t</code> or <code>--terse</code> NLVM option can be used with <code>nlvm list</code> commands to print the output in a format for parsing.
Section 6.39, "List Volumes," on page 94	
Section 6.40, "Mount," on page 97	The <code>nlvm mount</code> command internally sets the <code>-m</code> flag, so only the specified pool is mounted.
Section 6.41, "Move," on page 97	You can pause and resume a pool move.
Section 6.42, "Pause Move," on page 99	This command is new.
Section 6.47, "Rename RAID," on page 103	This command is new.
Section 6.50, "Resume Move," on page 105	This command is new.
Section 6.52, "Unmount," on page 106	Use the <code>unmount</code> command to temporarily unload a pool in order to manage underlying devices. Pools are by design auto mounted. Therefore, running the <code>nssmu</code> utility, or running most <code>nlvm</code> commands without the <code>-m</code> option can cause an unmounted pool to be remounted if underlying devices and partitions still exist. To execute an <code>nlvm</code> command without mounting the unmounted pools, you must include the <code>-m</code> option. The <code>nlvm mount</code> command internally sets the <code>-m</code> flag, so only the specified pool is mounted.

B.1.2 NLVM Examples for the NSS File System

Location	Change
Section 7.4, "Logging Out of an iSCSI Device that Contains an NSS Pool," on page 110	This section is new.

B.1.3 Planning for NLVM

Location	Change
Section 5.9, "Using NLVM with Linux Software RAID5," on page 27	<p>We recommend that you do not use Linux software RAID5 (such as MD RAID5 and Device Mapper RAID5) for devices that you plan to use for storage objects that are managed by NSS management tools. The Novell Linux Volume Manager (NLVM) utility and the NSS Management Utility (NSSMU) list the Linux software RAID devices that you have created by using Linux tools. Beginning with Linux Kernel 3.0 in OES 11 SP1, NLVM and NSSMU can see these devices, initialize them, and allow you to create storage objects on them. However, this capability has not yet been fully tested.</p> <p>IMPORTANT: In OES 11, a server hang or crash can occur if you attempt to use a Linux software RAID when you create storage objects that are managed by NSS management tools.</p>
Section 5.10, "Using iSCSI Devices with NSS Software RAID5," on page 28	This section is new.

B.1.4 Troubleshooting NLVM

Location	Change
Section 9.1, "Viewing Error Code Messages," on page 129	<p>With the latest OES 11 SP1 patches, the NSS utility provides an <code>/err</code> switch that can be used from the command prompt to view error messages for NLVM commands error codes:</p> <pre>nss /err=<error_code_number></pre>
Section 9.6, "Error 20897 - This node is not a cluster member," on page 130	This section is new.
"NLVM Fails to Mirror from a DOS Partitioned Device to a GPT Partitioned Device of the Same Size"	This issue is fixed in OES 11 SP2. This issue was fixed in the November 2012 Scheduled Maintenance Patches for OES 11 and OES 11 SP1.

B.1.5 What's New or Changed in Novell Linux Volume Manager

Location	Change
Section 2.2, "What's New (OES 11 SP2)," on page 11	This section is new.

B.2 August 2012 (OES 11 SP1)

Updates were made to the following sections. The changes are explained below.

- ♦ Section B.2.1, “Installing and Upgrading NLVM,” on page 150
- ♦ Section B.2.2, “NLVM Commands,” on page 150
- ♦ Section B.2.3, “NLVM Examples for the NSS File System,” on page 152
- ♦ Section B.2.4, “Planning for NLVM,” on page 152
- ♦ Section B.2.5, “Troubleshooting NLVM,” on page 152
- ♦ Section B.2.6, “Using NLVM in a Virtualized Environment,” on page 152
- ♦ Section B.2.7, “What’s New or Changed in Novell Linux Volume Manager,” on page 152

B.2.1 Installing and Upgrading NLVM

This section is new.

B.2.2 NLVM Commands

Location	Change
“Create Linux Volume” on page 36	The <code>npc</code> option is new. NLVM does not support using Linux software RAID devices and NSS software RAID devices with Linux POSIX file systems.
“Create Linux Volume” on page 36	Corrected a typo for the <code>mntopt</code> option. If no mount point path is specified for an LVM volume, the default mount point path is <code>/usr/novell/<volume_name></code> , where the volume name is the name you specified with the <code>name</code> option. If no mount point path is specified for a Linux POSIX volume, the default mount point path is <code>/usr/novell/<fs_type>_<number></code> .
“Create Partition” on page 41	When you create an SBD partition, if you specify a device that is uninitialized, NLVM initializes the device and marks it Shareable for Clustering.
“csn=cifs_virtual_server_name” on page 44 “cifs” on page 45	If the <code>csn</code> option is not specified in combination with the <code>cifs</code> option, the NCP virtual server name is used as the CIFS virtual server name. In this case, if the name is more than 15 characters, the CIFS virtual server name is truncated from the left to 13 characters and <code>-w</code> is added at the end.

Location	Change
“NLVM Options” on page 34 “Delete Linux Volume” on page 51 “Delete Move” on page 52 “Delete Partition” on page 52 “Delete Pool” on page 53 “Delete RAID” on page 54 “Delete RAID Segment” on page 54 “Delete Snap” on page 55 “Delete Volume” on page 56 “Init Device” on page 59	The <code>--no-prompt</code> NLVM option can be used with certain commands to prevent a confirmation message from being displayed.
“Create Partition” on page 41	Added information about the maximum number of device partitions.
“Create Pool” on page 43 “Expand Pool” on page 57	You can specify multiple device and size instances for certain commands.
“Create RAID” on page 45	When mirroring a pool that consumes an entire MSDOS partitioned disk, the device used to mirror it must also be MSDOS if it is the same size. If the device is at least 4 MB larger, it can be either MSDOS or GPT.
“Init Device” on page 59 “Share” on page 105 “Unshare” on page 106	You can specify multiple devices for certain commands.
“Sizes” on page 33 “Create Linux Volume” on page 36 “Create Partition” on page 41 “Create Pool” on page 43 “Create RAID” on page 45 “Create Snap” on page 48 “Expand Partition” on page 56 “Expand Pool” on page 57 “Move” on page 97	A terabyte (TB) multiplier of <code>T</code> is supported for OES 11 with the latest patches applied. If no multiplier is specified, the default multiplier of gigabytes is assumed.
“Sizes” on page 33	All sizes can be entered as whole numbers or with fractional parts such as <code>200.45G</code> and <code>3.98T</code> .
“Delete Move” on page 52	The abort option has been deprecated.
“List Linux Volume” on page 68	Print a list of Linux POSIX volumes and for each, display its path, mount point, file system type, NCP enabled status, and mount status.
“List Move” on page 72	You can alternatively specify the pool name instead of the pool move name.
“Move” on page 97	The <code>nlvm delete move</code> command sets the pool back to the original location and removes the new location. You can delete the move at any time while the move is in progress, even if it is pending only the <code>complete move</code> command to be finalized.

B.2.3 NLVM Examples for the NSS File System

Location	Change
Section 7.3, "Recovering a Mirror where All Elements Report 'Not in Sync'," on page 110	This section is new.

B.2.4 Planning for NLVM

Location	Change
Section 5.2.4, "NCP Volume Names," on page 24	This section is new.
Section 5.8, "Using NLVM with NSS Software RAIDs," on page 27	This section is new.

B.2.5 Troubleshooting NLVM

Location	Change
Section 9.5, "NLVM Pool Move Fails and Deactivates the Pool," on page 130	This section is new.
"NLVM Fails to Mirror from a DOS Partitioned Device to a GPT Partitioned Device of the Same Size"	This section is new.
Section 9.7, "NLVM Error Codes," on page 131	This section is new.
Section 9.8, "NSS Error Codes," on page 139	This section is new.

B.2.6 Using NLVM in a Virtualized Environment

This section is new.

B.2.7 What's New or Changed in Novell Linux Volume Manager

Location	Change
Section 2.3, "What's New (OES 11 SP1)," on page 15	This section is new.