IBM System Storage N series

SnapDrive 5.1 Installation and Administration Guide for Linux

GC52-1293-06

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Preface

Supported features

IBM System Storage N series storage systems are driven by NetApp Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details.

Information about supported features can also be found on the N series support website (accessed and navigated as described in Websites).

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:

  www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:

  www.ibm.com/storage/support/nseries/

  This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:

  www.ibm.com/systems/storage/network/interophome.html
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:

  publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure they are connected.
- Check the power switches to make sure the system is turned on.

- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Refer to the N series support website (accessed and navigated as described in Websites) for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the N series support website (accessed and navigated as described in Websites).

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, ensure that you run the latest level of firmware. Any firmware updates are posted to the N series support website (accessed and navigated as described in Websites).

Note: If you do not see new firmware updates on the N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

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SnapDrive for UNIX overview

SnapDrive for UNIX simplifies data management and increases the availability and reliability of application data through simplified storage provisioning and file system consistent Snapshot copies. It also provides you a role-based access control (RBAC) wizard for storage and Snapshot copy management.

The SnapDrive for UNIX tool simplifies data backup, so that you can recover the data if it is deleted or modified. SnapDrive for UNIX creates an image (a Snapshot copy) of the data on a shared or unshared storage system attached to a UNIX host. When you restore a Snapshot copy, it replaces the current data on the storage system with the image of the data in the Snapshot copy.

SnapDrive for UNIX provides storage features that enable you to manage the entire storage hierarchy, such as the host-side application-visible file, the volume manager, and the storage-system-side logical unit number (LUN) that provide the repository.

SnapDrive for UNIX provides support for role-based access control. Using RBAC, a storage administrator can restrict a user's access to the storage system based on the role and task that the user performs. To use RBAC, Operations Manager 3.7 or later should be part of the network infrastructure.

Features in SnapDrive for UNIX

The following are the features of SnapDrive for UNIX.

- Role-based access control (RBAC) permissions
- SnapDrive for UNIX wizard
- Enhanced clone-split operation
- Create and use Snapshot copies
- Volume-based SnapRestore
- Smart Command-Line Interface (CLI) options
- Data collection utility
- SnapDrive 5.0 for UNIX or later version supports Data ONTAP 8.1 operating in Cluster-Mode features.
- Capability to execute SnapDrive operations in the changed storage system name.
- `-mntopts` option is introduced for `snap connect` and `snap restore` operations.
- `-dump` and `-dumpall` options added to SnapDrive operations to automatically collect logs for a specific operation or all available operations.
- Ext4 support is available from RHEL 6 and OEL 6 onwards
- NFSv4 support
- SnapDrive transparently handles the errors caused by Data ONTAP features volume migration and IBM N series Data Motion for vFiler, and are controlled using the appropriate configuration variables.
- SnapDrive supports RDM LUN in Linux.

Note: The latest information about SnapDrive for UNIX and its requirements is in the N series interoperability matrix website (accessed and navigated as described in Websites).

Data ONTAP Cluster-Mode features added in SnapDrive for UNIX

The following features of Data ONTAP operating in Cluster-Mode are supported from SnapDrive 5.0 for UNIX and later versions.

- Port set
- Vserver
- SnapDrive for UNIX transparently handles the errors caused by Data ONTAP operating in Cluster-Mode feature Volume migration, and are controlled using the appropriate configuration variables.

Related concepts:

"Storage system name change in SnapDrive for UNIX" on page 53

"Using port set in SnapDrive for UNIX" on page 55

"Managing volume migration in SnapDrive for UNIX" on page 13

"SnapDrive for UNIX support for Vserver" on page 5

SnapDrive for UNIX operations on stand-alone UNIX systems

SnapDrive for UNIX on stand-alone UNIX systems enable you to create storage and manage Snapshot copy of LUNs, file systems, logical volumes, and disk groups.

With SnapDrive for UNIX installed on stand-alone UNIX systems, you can perform the following tasks:

- Create storage that include LUNs, file systems, logical volumes, and disk groups.

  After storage creation, you can increase or delete the storage. You can connect the storage to a host or disconnect it. You can also display information about the storage that you create.
- Create a Snapshot copy of one or more volume groups on a storage system.

  The Snapshot copy can contain file systems, logical volumes, disk groups, LUNs, and NFS directory trees. After you create a Snapshot copy, you can rename, restore, or delete the Snapshot copy. You can also connect a Snapshot copy to a different location on the same or different host. After you connect the Snapshot copy, you can view and modify the content, or disconnect. You can also display information about Snapshot copies that you create.

SnapDrive for UNIX support for guest operating systems

SnapDrive for UNIX support for guest operating systems enables you to create storage and manage Snapshot copies of LUNs, file systems, logical volumes, and disk groups. For provisioning RDM LUNs, you need to specify the *FCP* protocol in the `snapdrive.conf` file.

With SnapDrive for UNIX installed on support for guest operating systems, you can perform the following tasks:

- Create storage that includes LUNs, RDM LUNs, file systems, logical volumes, and disk groups. After storage creation, you can increase or delete the storage. You can connect the storage to a host or disconnect. You can also display information about the storage that you create.
- Create a Snapshot copy of one or more volume groups on a storage system.

  The Snapshot copy can contain file systems, logical volumes, disk groups, LUNs, RDM LUNs, and NFS directory trees. After you create a Snapshot copy, you can rename, restore, or delete the Snapshot copy. You can also connect a Snapshot copy to a different location on the same or different host. After you connect the Snapshot copy, you can view and modify the content, or disconnect the Snapshot copy. You can also display information about Snapshot copies that you create.

SnapDrive for UNIX support for Vserver

SnapDrive for UNIX supports Vserver support. Vserver is a secure virtual storage server, which supports multiple protocols and unified storage. A Vserver contains data volumes and one or more LIFs through which it serves data to the clients.

A Vserver securely isolates the shared virtualized data storage and network, and appears as a single dedicated server to the clients. Each Vserver has a separate administrator authentication domain and can be managed independently by a Vserver administrator.

The volumes of each Vserver are related through junctions and are mounted on junction paths. The file system of each volume appears to be mounted at the junctions. The root volume of a Vserver is at the top level of the namespace hierarchy; additional volumes are mounted to the Vserver's root volume to extend the global namespace. A Vserver's data volumes contain files and LUNs.

When working on a Vserver, keep in mind the following:

- SnapDrive for UNIX provides storage provisioning operations, Snapshot operations, and configuration operations on a Vserver.
- Application data does not get stored in the root volume of the Vserver.
- Snapshot operations does not support on a Vserver, if the root of the Vserver is a qtree.
- Every volume that is created on the Vserver must be mounted on a junction path.

For more information about Vserver setup, see the *Data ONTAP Software Setup Guide for Cluster-Mode*

Related concepts:

“Configuration information for Vserver environment” on page 83

“Login information for Vserver” on page 84

Related tasks:

“Verifying login information for Vserver” on page 84

“Specifying login information for Vserver” on page 84

“Deleting a user for a Vserver” on page 84

SnapDrive for UNIX support for vFiler units

SnapDrive for UNIX does not support vFiler units through Fibre Channel (FC). Also, SnapDrive for UNIX supports SnapDrive operations on a vFiler unit, created on a FlexVol volume.

When working on a vFiler unit, keep in mind the following:

- SnapDrive for UNIX provides storage provisioning operations, Snapshot operations, configuration operations on a vFiler unit, created on a FlexVol volume.

SnapDrive operations are not supported on a vFiler unit that is created on a qtree, however these operations are allowed only if the vFiler unit owns the entire storage volume.

- When configuring SnapDrive for UNIX to support with vFilers, neither the management nor the datapath can be configured for an interface on vFiler0.
- In Data ONTAP operating in 7-Mode, you must ensure that the Data ONTAP configuration variable `vfiler.vol_clone_zapi_allow` is set to `on` to connect to a Snapshot copy for a volume/LUN in a vFiler unit.

Note: For more information about VFiler units, see the *Data ONTAP MultiStore Management Guide for 7-Mode*

Considerations for using SnapDrive for UNIX

To use SnapDrive for UNIX, you need to keep in mind a few considerations such as space reservation settings, FC or iSCSI configurations, and root volume.

- Use the default value for the space reservation setting for any LUN managed by SnapDrive for UNIX.
- In FC and iSCSI configurations, set the `snap reserve` option on the storage system to zero percent for each volume.
- Place all LUNs connected to the same host on a dedicated storage system volume accessible only by that host.
- If you use Snapshot copies, you cannot use the entire space on a storage system volume to store your LUNs.

  The storage system volume that hosts the LUNs should be at least twice the combined size of all the LUNs on the storage system volume.
- Data ONTAP uses `/vol/vol0` (root volume) to administer the storage system.

  Do not use this volume to store data. Also, if you have configured any other volume (other than `/vol/vol0`) as root volume to administer the storage system, do not use it to store data.

Storage management using an LVM and raw entities using SnapDrive for UNIX

SnapDrive for UNIX helps you manage LVM (Logical Volume Manager) and raw entities. SnapDrive for UNIX also provides commands that help in provisioning and managing storage when you create storage entities.

SnapDrive for UNIX provisioning in an LVM environment

SnapDrive for UNIX storage commands provision LVM entities by creating LVM objects.

If you request a SnapDrive for UNIX storage operation that provisions an LVM entity—for example, a disk group that includes host volumes or file systems—the `snapdrive storage` command works with the LVM to create the LVM objects and file systems that use the storage.

During storage provisioning operation, the following actions occur:

- The host LVM combines LUNs from a storage system into disks, or volume groups.

  The storage is then divided into logical volumes, which are used as if they were raw disk devices to hold file systems or raw data.

- SnapDrive for UNIX integrates with the host LVM to determine which LUNs make up each disk group, host volume, and file system requested for a Snapshot copy.

  Because the data from any specified host volume can be distributed across all disks in the disk group, Snapshot copies can be made and restored only for whole disk groups.

SnapDrive for UNIX and raw entities

SnapDrive for UNIX enables storage operation for a raw entity such as a LUN, or a file system that can be created directly on a LUN, SnapDrive for UNIX performs the storage operation without using the host system, LVM.

SnapDrive for UNIX storage commands manage raw entities such as LUNs without activating the LVM. SnapDrive for UNIX enables you to create, delete, connect, and disconnect LUNs, and the file systems that they contain, without activating the LVM.

Snapshot copies of LVM, raw and NFS entities

You can use the SnapDrive for UNIX commands to create, restore, and manage Snapshot copies of LVM, raw and NFS entities.

SnapDrive for UNIX provides commands that you enter on the host to create, restore, and manage Snapshot copies of storage entities.

- Volume Manager entities—These are disk groups with host volumes and file systems that you created using the host volume manager.
- Raw entities—These are either LUNs or LUNs that contain file systems without creating any volumes or disk groups. These raw entities are mapped directly to the host.
- NFS entities—These are NFS files and directory trees.

The Snapshot copy that you create can span multiple storage systems and storage system volumes. SnapDrive for UNIX checks the read/writes against the storage entities in the Snapshot copy to ensure that all Snapshot copy data is crash-consistent. SnapDrive does not create a Snapshot copy unless the data is crash-consistent.

Security considerations

You can enable SnapDrive for UNIX to access the storage systems connected to the host, and must configure the host to use the login names and passwords assigned to the storage systems. If you do not provide this information, SnapDrive for UNIX cannot communicate to the storage system.

A root user can allow other users to use specific commands depending on the roles assigned to them. You need not be a root user to perform storage and snap management operations.

SnapDrive for UNIX stores user authentication information about the host in an encrypted file. On Linux hosts, by default, SnapDrive for UNIX encrypts the password information and sends it across the network. SnapDrive for UNIX communicates using HTTPs over the standard IP connection.

Access permissions on a storage system

Access permissions indicate whether a host can perform certain Snapshot copy and storage operations. Access permissions do not affect any of the SnapDrive storage show or SnapDrive storage list operations. SnapDrive for UNIX enables you to specify access permissions for each host in a file that resides on the storage system.

You can also specify the action SnapDrive for UNIX should take when it does not find a permission file for a specified host, you can do this by setting the value in the `snapdrive.conf` configuration file for the *all-access-if-rbac-unspecified* variable. You can enable or disable the access to the storage system depending on the access permissions.

Note: From SnapDrive 4.0 for UNIX and later, you can perform storage operations depending on the role-based access control capabilities that are assigned to you.

Requirements for storage systems

The operating system on each of the storage systems in SnapDrive for UNIX configuration must be Data ONTAP 7.3.5 or later.

Component	Minimum requirement
Operating system	Data ONTAP 7.3.5 or later • SnapDrive for UNIX supports FlexVol volumes but does not take advantage of all FlexVol volume features. • Configurations that use NFS must use Data ONTAP 7.3.5 or later and FlexVol volumes must use `snapdrive snap connect` to read and write to a connected NFS file or directory tree. Configurations with traditional volumes are provided with read-only access to NFS files and directory trees.
Storage system setup	You must specify the partner IP address in the High-Availability (HA) pair that can be used if a storage system failover occurs. **Note:** You specify this address when you run the setup program on the storage system.
Licenses	• FC, iSCSI, or NFS, depending on the host platform • FlexClone license **Note:** You must have appropriate protocols running on the storage system for SnapDrive for UNIX to execute. • SnapRestore software • MultiStore software You should set the SnapRestore and MultiStore licenses when you set up the storage system. You need a MultiStore license if you want to set up a vFiler environment. • Secure HTTP access to the storage system.

SnapDrive for UNIX operations are not case-sensitive with respect to storage system hostname, you must ensure that the IP address are unique when you configure the storage system.

SnapDrive for UNIX stack requirements

SnapDrive for UNIX requires a host operating system, host file systems, NFS, volume managers, FC or iSCSI Host Utilities, storage system licenses, Data ONTAP software, MultiStore software, and Internet Protocol access.

Host-side entities

The following is a list of host-side entities:

- The host operating system
- A volume manager
- File system
- Linux Host Utilities

Guest-side entities for RDM LUN Support

The following is a list of guest-side entities:

- The guest operating system
- A volume manager
- File system
- Linux iSCSI Host Utility alone is adequate, if the protocol is iSCSI

SnapDrive for UNIX stack

The following constitutes the SnapDrive for UNIX stack:

Note: It is mandatory to enter the acceptable values for *multipathing-type*, *fstype*, *default-transport*, and *vmtype* variables in the `snapdrive.conf` file as provided in the matrix stack. You must ensure that the values entered are installed and running in your host system.

Table 1. Linux matrix stack

Host platform	default transport type	multipathing type	fstype	vmtype
Linux	FCP	none	ext4	lvm
	iscsi	none	ext4	lvm
	FCP	nativempio	ext4	lvm
	iscsi	nativempio	ext4	lvm
	FCP	none	ext3	lvm
	iscsi	none	ext3	lvm
	FCP	nativempio	ext3	lvm
	iscsi	nativempio	ext3	lvm

Note: SnapDrive for UNIX does not support Ext2 file system.

- If you have both FCP and iSCSI storage stacks, SnapDrive for UNIX supports either FCP or iscsi at a time to perform SnapDrive operations.

- The host operating system and appropriate patches for Linux.
- The volume manager for Linux is LVM2
- Linux Host Utilities
- Data ONTAP software on your storage system
- MultiStore software on your storage system for vFiler unit setup
- Internet Protocol (IP) access between the host and storage system

IBM adds host utilities and components on an ongoing basis. To keep up with these changes, see the N series interoperability matrix website (accessed and navigated as described in Websites) for using IBM N series products in a SAN environment.

The storage system license and the MultiStore license constitute the storage-system-side entities.

Storage system licensing requirements

The following storage system licenses are required:

- An FC, iSCSI, or NFS license, depending on your configuration
- A FlexClone license
- A SnapRestore license on the storage system

Related concepts:

"Unable to select a storage stack" on page 253

Supported FC, iSCSI, or NFS configurations

SnapDrive for UNIX supports host cluster and HA pair topologies. FC or iSCSI configurations support the same host cluster and HA pair configurations that the FC Host Utilities or iSCSI Host Utilities supports.

SnapDrive for UNIX supports the following host cluster and HA pair topologies:

- A stand-alone configuration in which a single host is connected to a single storage system
- Any of the topologies involving HA pair failover of a storage system
- Any of the topologies involving host clusters supported by IBM

For more information about the recommended configurations for your host and the storage systems you are using, see the Linux Host Utilities documentation.

Note: If you need a SnapDrive for UNIX configuration that is not mentioned in the utilities documentation, consult your technical support representative.

Limitations in SnapDrive for UNIX

There are few limitations in SnapDrive for UNIX.

Generic Limitations in SnapDrive for UNIX

- SnapDrive for UNIX does not support snap operations on an NFS mount point when the volume is exported with Kerberos security authentication type krb5, krb5i, or krb5p.

- Snap operations may be inconsistent if you perform snap restore on a mount point where a different entity is mounted other than what was taken in the Snapshot copy.
- SnapDrive modifies the mount point permissions from non-root user to root user for a qtree after VBSR operations.
- Due to the non-availability of the Consistency Group Snapshots (CGS) feature in Data ONTAP 8.1 operating in Cluster-Mode, SnapDrive 5.0 for UNIX and later versions does not support Data ONTAP 8.1 operating in Cluster-Mode in SAN environments that are running the UNIX or Linux operating systems. CGS is required in most SAN environments that are running the UNIX or Linux operating systems to take application-consistent Snapshot copies that can then be restored and recovered successfully.

  However, SnapDrive 5.0 for UNIX and later versions continues to support Data ONTAP 8.1 operating in Cluster- Mode in NFS environments as mentioned in the N series interoperability matrix website (accessed and navigated as described in Websites).

Limitations of SnapDrive for UNIX on Linux platform

- SnapDrive for UNIX does not support operations on file specification/LUNs, which span across Data ONTAP operating in 7-Mode and Data ONTAP operating in Cluster-Mode storage system.
- In DATA ONTAP operating in Cluster-Mode to configure Vserver with SnapDrive for UNIX, ensure that the IP address of the Vserver's management logical interface (LIF) is mapped to the Vserver name either in DNS or in the `/etc/hosts` file. You must also ensure that the Vserver name is configured in SnapDrive for UNIX by using the `snapdrive config set <vsadmin> <Vserver name>` command.
- Aggregates which contain Vserver volumes must be assigned to the Vserver's aggregate list to configure the Vserver and execute SnapDrive operations.
- SnapDrive for UNIX does not support `snapdrive config prepare luns` command in RDM LUN environment.

Limitations of LUNs managed by SnapDrive for UNIX

A LUN managed by SnapDrive for UNIX cannot serve either as a boot disk or system disk. Also, there are limits on how many LUNs you can create.

When using SnapDrive for UNIX, keep in mind the following limitations:

- A LUN managed by SnapDrive for UNIX cannot serve either as a boot disk or a system disk.
- Linux hosts have operating system limits on how many LUNs you can create.

  To avoid having a problem when you create LUNs on these hosts, use the `snapdrive config check luns` command.
- SnapDrive for UNIX does not support the colon (:) symbol in the long forms of the names for LUNs and Snapshot copies.

  The only place where SnapDrive for UNIX accepts colons is between the components of a long Snapshot copy name or between the storage system name and the storage system volume name of a LUN. For example, `toaster:/vol/vol1:snap1` is a typical long Snapshot copy name, while `toaster:/vol/vol1/lunA` is a typical long LUN name.

Limitations of RDM LUNs managed by SnapDrive for UNIX

SnapDrive for UNIX has a few limitations for provisioning RDM LUNs.

When using SnapDrive for UNIX, keep in mind the following:

- An RDM LUN managed by SnapDrive for UNIX cannot serve either as a boot disk or a system disk.
- SnapDrive for UNIX does not support the colon (:) symbol in the long forms of the names for LUNs.
- SnapDrive for UNIX does not support MPIO in the guest operating system, although VMware ESX server supports MPIO.
- When the transport protocol is *FCP*, the igroup that is passed in the SnapDrive CLI is ignored by SnapDrive for UNIX, and the igroup is automatically created by the virtual interface.

VMware limitations:

- Each guest operating system can be configured with four SCSI controllers, and each SCSI controllers can be mapped to 16 devices. However, one device is reserved per controller and therefore a total of 60 (16 *4 – 4) RDM LUNs can be mapped to the guest operating system.
- Each ESX server can be mapped to maximum of 256 RDM LUNs.

Note: For more information, see: VMware limitations.

SnapDrive for UNIX limitations in Data ONTAP operating in Cluster-Mode

SnapDrive for UNIX has the following limitations in Data ONTAP operating in Cluster-Mode.

- SnapDrive support for Data ONTAP operating in Cluster-Mode is available only in Linux.
- Crash-consistent Snapshot copies are not supported.
- Storage provisioning and Snapshot management operations are not supported on Vserver root volume.
- RBAC with Operations Manager is not supported.
- RDM LUN for Data ONTAP Cluster-Mode for Vservers is not supported.
- SnapDrive does not support operations on file specification/LUNs, which span across Data ONTAP operating in 7-Mode and Data ONTAP Cluster-Mode storage system.
- SnapDrive does not support symbolic links that reside inside a mount point.
- Nested junctions are not supported. SnapDrive does not support NFS operations on a volume, if it contains nested junction path. The following are the examples of junction path that are supported and not supported.

Volumes...	Junction path...	Supported...
oracle_db1	`/oracle`	Yes
oracle_db1_data	`/oracle/data`	No
oracle_db1_data_log	`/oracle/data/log`	No

- Aggregates which contain Vserver volumes must be assigned to the Vserver's aggregate list to configure the Vserver and execute SnapDrive operations.

- Snap connect operation with `-readonly` option mounts only `'.snapshot'` directory on the host and does not create clone volume. In Data ONTAP operating in Cluster-Mode, export policy is defined only at volume level and not in qtree or directory level. Hence, `'.snapshot'` directory could not be exported to the secondary host (the host which does not have export permission on the parent volume).

IBM N series Data Motion for vFiler support in SnapDrive for UNIX

SnapDrive for UNIX supports Data Motion for vFiler. When Data Motion for vFiler is performed, there are few possibilities of SnapDrive operation failures during cut-over phase.

You need to set the *datamotion-cutover-wait* variable in the `snapdrive.conf` file to execute SnapDrive operations.

For more information about Data Motion for vFiler, see the N series Data Motion publication.

Volume migration support in SnapDrive for UNIX

SnapDrive for UNIX supports volume migration, which enables you to non-disruptively move a volume from one aggregate to another within the same controller for capacity utilization, improved performance, and to satisfy service-level agreements. In a SAN environment, FlexVol volumes and the LUNs in the volumes are moved non-disruptively from one aggregate to another.

For information about volume migration in Data ONTAP Cluster-Mode, see the *Data ONTAP Logical Storage Management Guide for Cluster-Mode*. The Volume migration is supported in Data ONTAP 8.x Cluster-Mode release families.

For information about volume migration in Data ONTAP 7-Mode, see the *Data ONTAP SAN Administration Guide for 7-Mode*. The Volume migration is supported in Data ONTAP 8.x 7-Mode release families.

Managing volume migration in SnapDrive for UNIX

You can execute SnapDrive operations during volume migration.

The volume migration consists of three phases viz. setup, move, and cut-over. SnapDrive for UNIX operations function smoothly in setup and move phases.

When you execute any SnapDrive commands during the cut-over phase, SnapDrive for UNIX can retry the operation as defined in the variables *volmove-cutover-retry* and *volmove-cutover-retry-sleep* in the `snapdrive.conf` file.

Note: During volume migration, SnapDrive for UNIX does not support volume-based SnapRestore (VBSR) because of the SnapMirror relationship that exists.

NFS files or directory trees

SnapDrive for UNIX does not provide storage provisioning commands for NFS files or directory trees. The `snapdrive snap connect` and `snapdrive snap disconnect` commands that involve NFS require Data ONTAP 7.3.5 or later and FlexVol volumes.

SnapDrive for UNIX supports the `snapdrive snap create` and `snapdrive snap restore` commands on versions of Data ONTAP 7.3.5 and later. However, `snapdrive snap connect` and `snapdrive snap disconnect` commands that involve NFS use the Data ONTAP FlexVol volumes feature for read and write access, and therefore require Data ONTAP 7.3.5 or later and FlexVol volumes. Configurations with Data ONTAP 7.3.5 or later and traditional volumes can create and restore Snapshot copies, but the Snapshot connect operation is restricted to read-only access.

Thin provisioning

Within SnapDrive for UNIX, you cannot set the fractional reserve value, and there is no integration with Data ONTAP features such as autodelete and autosize. These Data ONTAP features might be safely used with SnapDrive for UNIX, but there is no awareness within SnapDrive for UNIX, if an autodelete or autosize event occurs.

Volume managers on SnapDrive for UNIX

On Linux, the volume manager is Native LVM2.

The following table describes the volume managers on your host platform.

Host	**Volume manager**	**Volume or disk groups**	**Location of logical volumes**	**Location of multipathing devices**

RHEL 4 and RHEL 5	Native LVM2	Volume groups *vg*	`/dev/mapper/dgname-lvolname`	`/dev/mpath`
				`/dev/mapper`
				`/dev/dm`

RHEL 6	Native LVM2	Volume groups *vg*	`/dev/mapper/dgname-lvolname`	`/dev/mapper` `/dev/dm`
SLES 10 and SLES 11	Native LVM2	Volume groups *vg*	`/dev/mapper/dgname-volname`	`/dev/mapper` `/dev/dm`

New features in SnapDrive 5.1 for UNIX

SnapDrive 5.1 for UNIX has the following new features.

- Configuration wizard is introduced to configure your settings in SnapDrive for UNIX.
- SnapDrive for UNIX logs the messages in the EMS log of Data ONTAP operating in Cluster-Mode.
- SnapDrive allows to connect to a host volume of cloned disk group or a subset file systems without connecting the entire volume group by using the *allow-partial-clone-connect* variable.
- SnapDrive operations are supported in SAN boot environment.

Note: For updated information about SnapDrive for UNIX and its requirements is available in the N series interoperability matrix website (accessed and navigated as described in Websites).

Related concepts:

“How SnapDrive for UNIX uses AutoSupport” on page 91

Related tasks:

“SnapDrive configuration wizard in NFS, SAN, and Mixed environment” on page 77

Preparing to install SnapDrive for UNIX

Before installing SnapDrive for UNIX on your host system, you must ensure that your system meets the applicable hardware and software requirements, including applicable licenses. You must also complete certain configuration-specific and general preparation steps.

Hardware and software configuration

Depending on your storage system, you can configure FC, iSCSI, or an NFS configuration that uses NFS directory trees.

FC or iSCSI configuration checks

Earlier, FCP and iSCSI were distributed as a separate utility. You can find both FCP and iSCSI configuration support available in Linux Host Utilities.

If you have a configuration that uses FC or iSCSI, you must complete the following tasks before you install SnapDrive for UNIX:

- For FC and iSCSI configurations, confirm that you have installed Linux Host Utilities on your host system.
- Set up your host and storage systems.

  Follow the instructions provided with the utilities to your storage systems to work with the host. Configurations that include multipathing or Volume Manager software must use the software that is supported by Linux Host Utilities and SnapDrive for UNIX.

Note: The latest information about SnapDrive for UNIX and its requirements is in the N series interoperability matrix website (accessed and navigated as described in Websites).

NFS configuration checks

For configurations that use NFS, you must check that NFS clients are operating correctly, before you set up your host and storage systems.

If you have a configuration that uses NFS, you must complete the following tasks:

- Ensure that NFS clients are operating correctly.
- Set up your host and storage systems.

  To use SnapDrive for UNIX with NFS-mounted directories on the storage systems, you should ensure that the storage system directories are exported to the host correctly. If your host has multiple IP interfaces to the storage system, ensure that the directory is exported correctly to each one of them. SnapDrive for UNIX issues warnings unless all such interfaces have read or write permission, or in the case of the `snapdrive snap connect` command with the `-readonly` option, or at least read-only permission. The `snapdrive snap restore` and `snapdrive snap connect` commands fail if none of those interfaces has permission to access the directory.

Preparing your storage system

Before you install SnapDrive for UNIX, you need to prepare your storage system by checking various conditions.

- Storage system readiness
- System requirements
- Storage system partner IP address
- SnapDrive for UNIX configurations on an NFS environment
- Volume preparation for UNIX LUNs and NFS entities
- The `snap reserve` option to 0 percent
- In Data ONTAP operating in 7-Mode, must ensure that the Data ONTAP configuration variable `vfiler.vol_clone_zapi_allow` is set to `on` to connect to a Snapshot copy for a volume/LUN in a vFiler unit.

Verification of storage system readiness and licenses

Before you install SnapDrive for UNIX, you must verify the storage system readiness.

- The storage systems are online.
- The storage systems meet the minimum system requirements for SnapDrive for UNIX.
- The HBAs or network interface cards (NICs) in your storage systems meet the requirements for your host operating system.
- The hosts and the storage systems can communicate using an IP interface. (You should have set this up when you set up the storage system.)
- Licenses for the following:
  - SnapRestore
  - MultiStore software
  - Secure HTTP access to the storage system

Storage system partner IP address or interface name confirmation

When you run the setup program on your storage system, it prompts you to provide an IP address or interface name for a partner storage system to use in a failover case. You should confirm that you supplied the IP address or the interface name. If you have not supplied it, SnapDrive for UNIX cannot inquire about the storage entities on a storage system that it took over.

Partner IP address or the interface name is the IP address or the interface name of the partner storage system in a HA pair setup. If the primary storage system fails, the partner storage system takes over the functioning of the primary storage system.

Example: storage system setup script

The following sample output of the storage system setup script requests the IP address. This example uses the IP address 10.2.21.35.

```
storage_system_A> setup...
Should interface e0 take over a partner IP address during failover?
[n]: y
Please enter the IP address or interface name to be taken over by e0
[]: 10.2.21.35
storage_system_A> reboot -t 0
```

Considerations for NFS configurations

Before you install SnapDrive for UNIX, you should consider the location at which the NFS service runs and the location where the storage system directories are exported. You should check the NFS client permissions and the interface read-write permissions.

When you are using SnapDrive for UNIX to restore or connect to NFS-mounted directories, you must ensure that the storage system directories are exported correctly to the host. If your host has multiple IP interfaces that can access the storage system, you must ensure that the directory is exported correctly to each one of them.

SnapDrive for UNIX issues warnings unless all such interfaces have read-write permissions, or in the case of `snapdrive snap connect` with the `-readonly` option, or at least read-only permission. The `snapdrive snap restore` and `snapdrive snap connect` commands fail if none of these interfaces have permission to access the directory.

When you perform SFSR as a root user, you must ensure that the storage system directories are exported with read-write permissions on the host, and the following export rules must be set.

- `rw=<hostname>`, `root=<hostname>` in Data ONTAP operating in 7-Mode.
- `rwrule = sys`; `rorule=sys`; `superuser= sys` in Data ONTAP operating in Cluster-Mode.

Storage system volume preparation

You can either use the command prompt on the storage system or FilerView to create a storage system volume for dedicated use of SnapDrive for UNIX.

You must complete the following tasks on the storage system to create a volume that can hold the SnapDrive for UNIX LUNs or NFS entities attached to a single host:

- Create a storage system volume.

  For more information about creating storage system volume, see the *Data ONTAP Block Access Management Guide* for your version of Data ONTAP.
- If you are in an FC or iSCSI environment, reset the `snapdrive snap reserve` option to zero percent on the storage system volume that holds all the LUNs attached to the host.

When you create a volume on a storage system to hold LUNs or the NFS directory trees, check for the following considerations:

- You can create multiple LUNs or NFS directory trees on a storage system volume.
- You should not store user data in the root volume on the storage system or vFiler unit.

Volume optimization in an FC or iSCSI environment

You can optimize your volume usage in an FC and iSCSI environment by having host-specific LUNs on the same volume. You can perform a few other tasks that can help you to achieve volume optimization.

- When multiple hosts share the same storage system, each host should have its own dedicated storage system volume to hold all the LUNs connected to that host.
- When multiple LUNs exist on a storage system volume, it is best for the dedicated volume on which the LUNs reside to contain only the LUNs for a single host. It must not contain any other files or directories.

Reset the snap reserve option

When you use Data ONTAP in an FC or iSCSI environment, you should reset the `snap reserve` option to zero percent on all storage system volumes holding SnapDrive for UNIX LUNs.

Resetting the snap reserve option on the storage system

When you use Data ONTAP in an FC or iSCSI environment, you should reset the `snap reserve` option to 0 percent on the storage system.

Procedure

1. Access the storage system either by using a command such as `telnet` from the host or by going to the storage system console.
2. Enter the following command:

   `snap reserve` *vol_name 0*

   vol_name is the name of the volume on which you want to set the `snap reserve` option.

Resetting the snap reserve option by using FilerView

When you use Data ONTAP in an FC or iSCSI environment, you should reset the `snap reserve` option to 0 percent by using FilerView.

Procedure

1. Open a FilerView session to the storage system holding the volume whose `snap reserve` setting is to be changed.
2. From the main FilerView, navigate to **Volumes** > **Snapshot** > **Configure**.
3. In the **Volume** field, select the volume whose `snap reserve` setting is to be changed.
4. In the **Snapshot Reserve** field, enter 0.
5. Click **Apply**.

Host preparation for installing SnapDrive for UNIX

You must prepare the host before you can install SnapDrive for UNIX on your system. As part of the host preparation you must install the Linux Host Utilities.

Note: Before installing SnapDrive for UNIX on a 64-bit environment, you must ensure that the 32-bit version of `glibc` is installed in your system. If the 32-bit version of `glibc` is found missing, as a result, SnapDrive for UNIX fails to install in your system.

Installing Linux Host Utilities

If your configuration requires Linux Host Utilities, you must install them and ensure that the system is set up correctly.

Use the documentation that came with Linux Host Utilities. It contains information about volume managers, multipathing, and other features you must set up before you install SnapDrive for UNIX.

Verify that the hosts are ready

You must perform few checks to verify that the hosts are ready. To start the checks, you should first test whether the host is connected to the storage system by entering the `ping filername` command. You must also confirm that the host and storage system can communicate to each other. To confirm this, execute `snapdrive storage show -all` command and check if the host and storage system are communicating.

Verify that the hosts are ready by performing the following tasks:

- Confirm that you have set up the host and storage system correctly according to the instructions in the Linux Host Utilities documentation for the host.

  Note: For the Linux Host Utilities, see the N series support website (accessed and navigated as described in Websites).
- If you have a configuration that uses NFS, configure the exports file. For more information, see the *File Access and Protocols Management Guide* on the N series support website (accessed and navigated as described in Websites).
- Verify that the host meets the minimum requirements for SnapDrive for UNIX, including the required operating system patches.

Guest OS preparation for installing SnapDrive for UNIX

You must prepare the guest system before you can install SnapDrive for UNIX on your system. As part of the guest preparation, you must install the Linux Host Utilities.

Related concepts:

"Limitations of RDM LUNs managed by SnapDrive for UNIX" on page 12

"Configuration options and their default values" on page 59

Related tasks:

"Configuring Virtual Storage Console for SnapDrive for UNIX" on page 82

"Verifying login information for Virtual Storage Console" on page 83

Installing Linux Host Utilities

Before you install SnapDrive for UNIX, you must install the Linux Host Utilities.

Procedure

To install the Linux Host Utilities, see the Linux Host Utilities documentation to ensure that the system is set up correctly. It contains information about volume managers, multipathing, and other features you must set up before you install SnapDrive for UNIX.

Verifying that the guest is ready

SnapDrive for UNIX must ensure that the guest is ready to communicate with the storage system.

Before you begin

Ensure that the Backup and Recovery capability of IBM N series for VMware vSphere is installed in the Windows system and registered with the vCenter.

About this task

IBM N series configuration is required only for RDM FC LUNs.

Procedure

Enter the following command:

```
snapdrive config set -viadmin user viadmin_name
```

After the command is complete, you can confirm that the guest can communicate to the storage system by running the `snapdrive storage show -all` command.

Installing or upgrading SnapDrive for UNIX

To install SnapDrive for UNIX on your host systems, you must perform certain tasks. Before you begin the installation, you should be aware of various system requirements and configuration considerations.

System requirements for FC or iSCSI configurations

To install SnapDrive for UNIX, you must ensure that the system requirements are met. SnapDrive for UNIX supports both FC and iSCSI configurations simultaneously on the same host.

The following describes the minimum requirements for using SnapDrive for UNIX on a Linux host in an FC or iSCSI environment.

- To ensure that you have the correct version of the utility, go to the N series support website (accessed and navigated as described in Websites).

  Before you install SnapDrive for UNIX, you must set up the host and storage system according to the instructions provided in the Setup Guide of Linux utility.
- Additional disk space

  SnapDrive for UNIX maintains the audit, recovery, and trace log files.

  While SnapDrive for UNIX rotates the files when they reach a maximum size, ensure you have enough disk space for them.

  Based on the default settings for the audit and trace log files, you need at least 1.1 MB of space. There is no default size for the recovery log because it rotates only after an operation completes, not when it reaches a specific size.

Moving downloaded file to a local directory

Move the downloaded SnapDrive for UNIX package to your Linux system. If you downloaded the file and did not place it on the Linux host, you must move it to that host.

Procedure

Copy the downloaded file to the Linux host. You can place it in any directory on the host. You can use commands similar to the following ones to move the file you downloaded from the N series support website (accessed and navigated as described in Websites) to the host system.

```
# mkdir /tmp/linux
# cd /tmp/linux # cp /u/inux/ontap.snapdrive.linux_5_1.rpm
```

Ensure you include the period (.) at the end of the copy command line.

What to do next

Ensure that all the supported Service Packs are installed on the host before installing SnapDrive 5.1 for UNIX.

Installing SnapDrive for UNIX on a Linux host

To install SnapDrive for UNIX, ensure that you are logged in as a root user. If you are executing this file remotely and the system configuration does not allow you to log in as root, use the su command to become root. If the directory where SnapDrive for UNIX is installed is deleted, there can be problems with starting and stopping the daemon.

Before you begin

- The sg3_utils package must be available on all Linux systems for a proper functioning of SnapDrive for UNIX commands.

  Note: Ensure that the sg3_utils and sg3_utils-libs must be available for RHEL and OEL/OL versions. However, the sg3_utils libraries are available for SLES version in the sg3_utils.rpm package.
- The 32-bit version of glibc must be installed in your system. In case, the 32-bit version of glibc is found missing, as a result, SnapDrive for UNIX fails to install in your system.
- When the transport protocol is FCP, the libHBAAPI package or vendor specific package must be installed to work with SnapDrive for UNIX.
- If the default transport is FCP or iSCSI, and the multipathing type is nativempio with nolvm configuration, the snap management operation fails in a SLES environment. For example, ensure to modify the kpartx udev rules from _part to p in /etc/udev/rules.d/70-kpartx.rules.

Procedure

1. Download the software from the N series support website (accessed and navigated as described in Websites).
2. Change to the directory on your Linux host where you have downloaded the software from the N series support website (accessed and navigated as described in Websites).
3. Enter the following rpm command to install the software:

   ```
   # rpm -U -v <pathname>/ontap.snapdrive.linux_5_1.rpm
   ```

   The rpm command installs the SnapDrive for UNIX software. It writes installation information to a log file.

   ```
   # rpm -U -v ontap.snapdrive.linux_5_1.rpm
   Preparing packages for installation...
     ontap.snapdrive-5.1
   ```
4. Verify the installation. The following example uses the rpm command with the -qai option to verify the installation. The -qai option gives you detailed information about the SnapDrive for UNIX installation package.

```
# rpm -qai ontap.snapdrive
 Name : ontap.snapdrive Relocations: (not relocatable)
 Version : 5.1 Vendor: IBM
 Release : 1 Build Date: Friday, 16,May,2009
 05:25:49 PM IST
 Install Date: Thur 14 Oct 2010 12:02:50 PM IST Build Host: bldsvl205-fe.
 eng.com
 Group : Applications Source RPM: ontap
.snapdrive-5.1-1.src.rpm
 Size : 30597556 License: ibm
 Signature : (none)

 Summary : SnapDrive for Linux
 Description :
 SnapDrive is a SAN storage management utility.
 It provides an easy to use interface that allows the user to create
 snapshots of LVM objects (i.e. volume groups) and restore from those
 snapshots. SnapDrive also provides a simple interface to allow for the
 provisioning of LUNs for mapping LVM objects to them.
```

5. Complete the setup by configuring SnapDrive for UNIX for the system. Most of this information is set by default; however, you need to specify the following information:
   - The login information for the storage system
   - The AutoSupport settings

Uninstalling SnapDrive for UNIX from a Linux host

To uninstall SnapDrive for UNIX from a Linux system, complete the following steps. Also, ensure that you are logged in as a root user.

Procedure

1. Enter the `rpm` command to remove the software. The following example uses the `rpm` command with the `-e` option to uninstall the SnapDrive for UNIX software.

   ```
   # rpm -e ontap.snapdrive
   ```

   Note: This command does not remove the log files. You must go to the `/var/log` directory and manually remove them.
2. Verify that the package is uninstalled. The following example verifies that SnapDrive for UNIX is no longer installed.

   ```
   # rpm -e ontap.snapdrive
   ```

Post-installation checks

After the installation is complete, you must perform a few tasks to ensure that SnapDrive for UNIX is installed successfully.

1. Verify that the installation program has installed all the necessary files on your host.
2. Confirm that the configuration variables in the `snapdrive.conf` file have the correct settings.

   For the majority of these variables, the default values should be applicable.
3. Supply SnapDrive for UNIX with the current storage system login information.

When you set up your storage system, you supplied a user login for it. SnapDrive for UNIX needs this login information to work with the storage system.

4. To use role-based access control (RBAC), set the *rbac-method=dfm* variable in the `snapdrive.conf` file.

   By default, SnapDrive 4.0 for UNIX and later accesses the storage systems using the root credentials. The RBAC functionality is not turned on.
5. To use HTTPs for a secure connection with the storage system and daemon service, you must set the *use-https-to-sdu-daemon=on* in the `snapdrive.conf` file.

   Note: SnapDrive 5.0 for UNIX and later versions support HTTPs for daemon communication. By default, the option is set to `off`.
6. Install the server certificate that is used by SnapDrive for UNIX at the `sdu-daemon-certificate-path=/opt/ontap/snapdrive/snapdrive.pem`. path as specified in the `snapdrive.conf` file.
7. SnapDrive for UNIX daemon service s tarts with a default password. Change this password using the `snapdrived passwd` command.
8. To check the details of the installed configuration components, see `/var/log/sdconfcheck.out`.

Files installed by SnapDrive for UNIX

SnapDrive for UNIX installs multiple files on the host, such as executables, configuration files, uninstall files, diagnostic files, and man pages. These files serve different purposes.

Related concepts:

"Types of logs" on page 86

Executables installed by SnapDrive for UNIX

SnapDrive for UNIX installs executables for Linux operating system.

These executables are installed at the following locations:

- `/opt/ontap/snapdrive/bin/`
- `/opt/ontap/snapdrive/bin/snapdrived`

Configuration files installed by SnapDrive for UNIX

SnapDrive for UNIX installs the `snapdrive.conf` file, which stores configuration information for the current version of the product.

You should modify the `snapdrive.conf` file for your system. If you upgrade your version of SnapDrive for UNIX, it maintains your current `snapdrive.conf` file. The configuration file is available at the following location:

```
/opt/ontap/snapdrive/snapdrive.conf
```

Diagnostic files installed by SnapDrive for UNIX

SnapDrive for UNIX installs IBM content diagnostic files that help detect problems in SnapDrive for UNIX.

- `/opt/ontap/snapdrive/diag/snapdrive.dc`
- `/opt/ontap/snapdrive/diag/filer_info`
- `/opt/ontap/snapdrive/diag/linux_info`

- /opt/ontap/snapdrive/diag/SHsupport.pm
- /opt/ontap/snapdrive/diag/Telnet.pm

Man pages installed by SnapDrive for UNIX

SnapDrive for UNIX provides man pages in several formats.

The man pages are available at the following location:

- /opt/ontap/snapdrive/docs/man1/snapdrive.dc.1
- /opt/ontap/snapdrive/docs/man1/snapdrive.1
- /opt/ontap/snapdrive/docs/man1/filer_info.1
- /opt/ontap/snapdrive/docs/man1/linux_info.1
- /opt/ontap/snapdrive/docs/snapdrive.1.html

Upgrade SnapDrive for UNIX to current version

You can easily upgrade SnapDrive for UNIX to the latest version. As part of the upgrade process, few variables change in the snapdrive.conf file. To ensure that SnapDrive for UNIX is functioning correctly, check the various default values in the snapdrive.conf file.

To upgrade your current version of SnapDrive for UNIX, you do not have to uninstall it. Instead, you should install the latest version of the software on top of the current version.

When you install a new version, SnapDrive for UNIX checks if you already have a version installed. If you do, it preserves the current snapdrive.conf file and renames the version of the file it is installing to snapdrive.conf.x. In this way, it avoids overwriting your snapdrive.conf file, so you do not lose any customized settings in the file.

By default, SnapDrive for UNIX comments out the variables in the snapdrive.conf file. This means it automatically uses the default values for all variables except the ones you customize. If you want to change these values, you must add the variables to your current snapdrive.conf file and specify the values you want.

Note: When you perform a patch upgrade, the SnapDrive version in the snapdrive.conf file does not change. However, the snapdrive version command provides the appropriate version.

A quick look at SnapDrive for UNIX

This chapter provides a brief overview of SnapDrive for UNIX and how you can install and configure it.

What SnapDrive for UNIX is

SnapDrive for UNIX simplifies the storage management tasks for you. SnapDrive for UNIX uses Snapshot technology to create an image of data stored on a shared or unshared storage system. SnapDrive also helps you with storage provisioning.

The following are a few of the important tasks you can accomplish using SnapDrive for UNIX:

- **Back up and restore data:** SnapDrive for UNIX enables you to use Snapshot technology to make an image (Snapshot copy) of host data that is stored on a storage system. This Snapshot copy provides you with a copy of that data, which you can restore later. The data in the Snapshot copy can exist on one storage system or span multiple storage systems and their volumes. These storage systems can be in HA pair or node-local file systems or disk groups, or LUNs in a host cluster environment.
- **Manage storage:** You can create and delete storage components, including disk groups, host volumes, file systems, and LUNs on host cluster and non-cluster environment. SnapDrive for UNIX enables you to manage this storage by expanding it, connecting it to a host, and disconnecting it.
- **Role-Based Access Control:** SnapDrive for UNIX provides Role-Based Access Control (RBAC). RBAC allows a SnapDrive administrator to restrict access to a storage system for various SnapDrive operations. This limited or full access for storage operations depends on the role that is assigned to the user. RBAC allows the storage administrators to limit the operations that SnapDrive users can perform depending on their assigned roles.

Terms used in this guide

Before you use SnapDrive for UNIX, you must know about disk groups, volume groups, logical volumes, host volumes, Snapshot copies, file_spec, and LUNs.

Term	Description
Disk group and volume group	Some of the platforms that SnapDrive for UNIX supports use the term *disk group* while others use the term *volume group*. As a result, some commands include both *-dg* and *-vg*. In general, you can use either argument and get the same result. To make this guide easier to follow, it uses the term disk group and *-dg* to refer to both disk and volume groups.
Logical volume and host volume	Some of the platforms that SnapDrive for UNIX supports use the term volume or host volume while others use the term logical volume. To simplify the terminology and make a distinction between volumes on the host and volumes on the storage system, this guide uses the term host volume and the command line argument *-hostvol* to refer to all volumes on the host.

Term	Description
Snapshot copy	Snapshot copy is an image of data on one or more storage systems that was made at a specific point in time using Snapshot technology. You can use this Snapshot copy to recover the data that has been accidentally deleted or modified since you took the Snapshot copy.
file_spec	file_spec is an object, like a host volume, disk group, file system or Network File System (NFS) file, or directory tree, which SnapDrive for UNIX uses to create a Snapshot copy.
LUN	Logical Unit Number (LUN) refers to a logical unit of storage identified by a number.

Installing SnapDrive for UNIX

You can quickly install and set up SnapDrive for UNIX. The following steps take you through the basic installation and configuration steps. It also provides pointers to where you can find more information about a step.

Procedure

1. Ensure that your host and storage systems are set up correctly.

   The host must have the following configurations:

   - If you have an FC or iSCSI configuration, ensure the FC Host Utilities or iSCSI Host Utilities is installed and you have performed the following tasks. These tasks are explained in the FC Host Utilities and iSCSI Host Utilities documentation.

     Note: From SnapDrive 4.2 for UNIX and later versions, the products FC Host Attach Kit and iSCSI Support Kit are named FC Host Utilities and iSCSI Host Utilities.
     - Set up the multipathing software, if it is supported on your host platform.
     - Verify that the host and storage system can communicate.
   - Ensure that the host meets the SnapDrive for UNIX system requirements.

     Note: SnapDrive for UNIX requirements are a subset of the FC Host Utilities or iSCSI Host Utilities system requirements.

   The storage system must have the following configurations:

   - Check that it meets the system requirements, including having the following setup:
     - Data ONTAP
     - The IP address on the HA pair (used if a takeover occurs)
     - The correct protocol license for your platform (FCP or iSCSI)
     - The SnapRestore license
     - Secure HTTP access to the storage system
     - MultiStore software on your storage system for vFiler unit setup
   - For NFS configurations:
     - The NFS service is on and operational
     - You have configured the exports file
     - You have a FlexClone license, for configurations with Data ONTAP 7.1 and FlexVol volumes

2. You can install the product software from software updates available for download.

   Check the N series support website (accessed and navigated as described in Websites).
3. Log in as root and go to the directory where you placed the SnapDrive for UNIX software package.

   Execute the install script or command to install SnapDrive for UNIX on your host:
   - Linux: #rpm -U -v *pathname*/ontapsnapdrive.linux_5_0.rpm

     Note: Linux includes Red Hat Enterprise Linux, SUSE Linux, and Oracle Enterprise Linux.
4. Specify the current login information for each storage system by using the `snapdrive config set` user command. SnapDrive for UNIX needs this information to access the storage system.

   To get the user names for storage systems attached to the host, execute the `snapdrive config list` command. This command does not display the storage system passwords.
5. Note that the AutoSupport option is enabled by default, the *autosupport-enabled=on* variable is set in the `snapdrive.conf` file. In SnapDrive 4.2 for UNIX and later versions, the *autosupport-filer* variable is not available in the `snapdrive.conf` file. The `snapdrive.conf` file is located in your installation directory. Use a text editor to edit it.
   - `/opt/ontap/snapdrive/snapdrive.conf`

   Note: The `snapdrive.conf` file contains several settings you can change, including the locations for the log files. In most cases, it is recommended that you accept the default values.
6. Specify the protocol that SnapDrive for UNIX uses as the transport type, when creating storage, if a decision is required. Enter *iscsi* or *fcp* value for the *default-transport* variable.
7. Specify the multipathing software to be used by using the *multipathing-type* variable. The default value depends on the host operating system. This option applies only if one of the following is true:
   - There are more than one multipathing solutions available.
   - The configurations that include LUNs.
8. Specify the type of file system that you want to use in SnapDrive for UNIX operations by using the *fstype* variable.
9. Specify the type of volume manager that you want to use in SnapDrive for UNIX operations by using the *vmtype* variable.

Some configuration commands

There are few commands that help you in configuring SnapDrive for UNIX.

The following table summarizes additional commands that are helpful in configuring SnapDrive for UNIX.

Command or action	**Description**
Configuring and verifying your version of SnapDrive for UNIX software	
`snapdrive config show`	Check the values in the `snapdrive.conf` file.

Command or action	Description
`snapdrive version`	Check the version of SnapDrive for UNIX.
`snapdrived start`	Start the SnapDrive for UNIX daemon.
`snapdrive config prepare luns -count count_value`	Prepare the host for creating a specific number of LUNs as well as to determine how many LUNs you can create.
`snapdrive config set -viadmin <user> <viadmin_name>`	Prepare the guest for creating RDM LUN on Linux guest OS. **Note:** You can use these commands only on Linux host by using FCP protocol with no host utilities.
`snapdrive clone split`	Estimate, start, stop, and query the status of split for a volume clone or a LUN clone.
Edit the variables in the `snapdrive.conf` file.	Change the path name and options for the log files. SnapDrive for UNIX logs information to three files: • An audit file • A recovery file • A trace file
Setting and displaying access control permissions between a host and a storage system.	
Edit the access control permissions file (sd *hostname*.prbac) on the storage system associated with that host.	Specify the access control permissions a host has on a storage system. You can set the following access levels for a host on a storage system: • NONE—No access. • SNAP CREATE—Create Snapshot copies. • SNAP USE—Delete and rename Snapshot copies. • SNAP ALL—Create, restore, delete, and rename Snapshot copies. • STORAGE CREATE DELETE—Create, resize, and delete storage. • STORAGE USE—Connect and disconnect storage. • STORAGE ALL—Create, delete, connect, and disconnect storage. • ALL ACCESS—All operations.
`snapdrive config access show <filer_name>`	Display information about the access control permissions a host has to a storage system.
`snapdrive config delete <filername> [<filername> . . .]`	Remove the specified user name-password pair from SnapDrive for UNIX.

Snapshot copies and storage in SnapDrive for UNIX

You can view high-level steps that describe creating and using Snapshot copies and provisioning storage. It also enables you to use a sample script to work with Snapshot copies and storage.

SnapDrive for UNIX to create Snapshot copies

You can start using SnapDrive for UNIX to take Snapshot copies. The steps provide the basic information needed to work with Snapshot copies as well as to set up a sample Snapshot copy and work with it.

Note: The following steps focus on the SnapDrive for UNIX Snapshot copy commands; they do not use the storage commands.

These steps and their examples show how you can easily perform the following tasks:

- Create a Snapshot copy
- Display information about the Snapshot copy
- Rename a Snapshot copy
- Restore disk groups, file systems, or LUNs from a Snapshot copy
- Connect a Snapshot copy to a different location on the host
- Disconnect a Snapshot copy from a location on the host
- Delete a Snapshot copy

It is assumed that you have experience setting up and running applications on your host operating system. It is recommended that you must read and understand the guidelines of Snapshot operations before you perform them.

Performing Snapshot operations

SnapDrive for UNIX enables you to execute Snapshot copy commands. It is assumed that you have a volume group named vg1 and a storage system named toaster. When performing this exercise, it is recommended that you do it on a test system to ensure that you do not accidentally create a problem on a production system.

Creating a Snapshot copy

You can create a Snapshot copy using SnapDrive for UNIX.

Procedure

Create a Snapshot copy of a volume group called vg1 using the `snapdrive snap create` command, and then provide a Snapshot copy name as snap1.

```
# snapdrive snap create -vg vg1 -snapname snap1
```

Example

Example 1:

The following command lines use the `snapdrive snap create` command with disk groups dg1 and dg2, which have host volumes myvol1 and myvol2. The host volume `dg1/myvol2` has a file system mounted on `/myfs/fs2`. Each command line creates a Snapshot copy called `toaster:/vol/vol1:snap1`.

```
# snapdrive snap create -fs /myfs/fs2 -snapname snap1

# snapdrive snap create -dg dg1 dg2 -snapname snap1

# snapdrive snap create -hostvol dg1/myvol1
-snapname snap1 -force

# snapdrive snap create -hostvol dg1/myvol2 -fs /fs2
-snapname snap1
```

Example 2:

The following example creates a Snapshot copy of storage system entities that do not have dependent writes during Snapshot copy creation. SnapDrive for UNIX creates a Snapshot copy in which the file system `/mnt/fs1` and the disk group dg1 are crash consistent as individual storage entities, but are not treated as a group:

```
# snapdrive snap create -fs /mnt/fs1 -dg dg1 -unrelated -snapname fs1_dg1
```

Example 3:

The following example creates a Snapshot copy of a shared file system on dg testdg:

```
# snapdrive snap create -dg testdg -snapname sfractestdgsnap
```

Example 4:

The following example creates a Snapshot copy of NFS volumes and directories:

```
# snapdrive snap create -fs /mnt/nfs -snapname nfs_snap
Successfully created snapshot nfs_snap on abc:/vol/vol1
```

You can also create Snapshot copies of volume groups that span multiple storage system volumes or multiple storage systems. SnapDrive for UNIX checks the reads or writes against the storage entities in the Snapshot copy to ensure that all Snapshot copy data is crash consistent. SnapDrive for UNIX will not create a Snapshot copy unless the data is crash consistent.

Displaying information about a Snapshot copy

You can see the information about the Snapshot copies executing the `snapdrive snap show` command.

Procedure

Display information about the Snapshot copy you just created by using the following command:
`snapdrive snap show`

```
# snapdrive snap show
-snapname toaster:/vol/vol1:snap1
```

Note: You can use either `snapdrive snap show` or `snapdrive snap list` in the command line. These commands are synonyms.

Examples of additional command lines:

These are valid `snapdrive snap show` command lines. If you are not sure of a Snapshot copy name, you can include a wildcard character (*), but only at the end of a Snapshot copy name.

```
# snapdrive snap show
-snapname toaster:/vol/vol2:snapA snapX snapY
# snapdrive snap show -verbose -snapname toaster:/vol/vol2:snapA /vol/vol3:snapB snapC
# snapdrive snap show -snapname toaster:/vol/vol2:snapA
# snapdrive snap show toaster:/vol/vol2:snapA
# snapdrive snap show toaster:/vol/vol0:*
# snapdrive snap show -verbose -hostvol hplvol23
# snapdrive snap show -verbose -snapname toaster:/vol/vol2:snapA
# snapdrive snap show -verbose -dg dg21
# snapdrive snap show -verbose toaster:/vol/vol2:snapA /vol/vol3:snapB snapC
```

Restoring a Snapshot copy

You can restore a Snapshot copy.

Procedure

Restore the Snapshot copy using the `snapdrive snap restore` command.

```
# snapdrive snap restore -dg vg1 -snapname toaster:/vol/vol1:bkup40105
```

Ensure that you are not in the directory while restoring the Snapshot copy using this command.

Note: The `snapdrive snapshot restore` command can restore only Snapshot copies that are created by SnapDrive for UNIX

Attention: This command replaces the current contents of the LUNs that make up the host disk groups with the contents of the LUNs in the specified Snapshot copy. It can take several minutes. Do not press Ctrl-C during this procedure. If you try to halt the procedure, you risk leaving the disk groups in an incomplete state. The following are a few examples of `snapdrive snap restore` command lines:

```
# snapdrive snap restore -fs /mnt/dir -snapname toaster:/vol/vol1:NewSnap33
# snapdrive snap restore -dg dg1 dg2 -snapname toaster:/vol/vol1:Tuesday
```

The following set of command lines use a host that has a disk group *dg1* with the host volumes *myvol1* and *myvol2*. The volume `dg1/myvol2` has a file system mounted on `/fs2`. The disk group *dg1* has three LUNs in it: `toaster:/vol/vol1/lun0`, `toaster:/vol/vol1/lun1`, and `toaster:/vol/vol1/lun2`. All of the following commands restore the same data:

```
# snapdrive snap restore -dg dg1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -vg dg1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -hostvol dg1/myvol2 dg1/myvol1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -hostvol dg1/myvol2 -fs /fs2 -snapname toaster:/vol/vol1:snap1
```

Example

These are examples of `snapdrive snap restore` command lines:

```
# snapdrive snap restore -fs /mnt/dir -snapname toaster:/vol/vol1:NewSnap33
# snapdrive snap restore -dg dg1 dg2 -snapname toaster:/vol/vol1:Tuesday
```

The following example shows how to restore a storage entity in a host cluster environment:

```
# snapdrive snap restore -fs /mnt/sfortesting -snapname f270-197-109:/vol/vol2:testsfarcsnap
```

The following set of command lines uses a host that has a disk group `dg1` with the host volumes `myvol1` and `myvol2`. The volume `dg1/myvol2` has a file system mounted on `/fs2`. The disk group *dg1* has three LUNs in it: `toaster:/vol/vol1/lun0`, `toaster:/vol/vol1/lun1`, and `toaster:/vol/vol1/lun2`. All of the following commands restore the same data:

```
# snapdrive snap restore -dg dg1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -vg dg1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -hostvol dg1/myvol2 dg1/myvol1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap restore -hostvol dg1/myvol2 -fs /fs2 -snapname toaster:/vol/vol1:snap1
```

The following command line restores an NFS entity:

```
# snapdrive snap restore -fs /mnt/nfs -snapname toaster:/vol/vol1:tru1
```

Note: Use this command to restore failed and takeover filespecs in a host cluster environment.

Connecting a Snapshot copy to a different location

You can connect a Snapshot copy to a different location.

Procedure

Connect a Snapshot copy to a new location on a host in which you took the Snapshot copy.

```
# snapdrive snap connect -fs /db2/datafiles2 /db2_bkup40105 -snapname
toaster:/vol/vol1:bkup40105
```

The following command can be used to connect a Snapshot copy to a new location on the same host or a different host. The following are sample `snapdrive snap connect` command lines:

```
# snapdrive snap connect -hostvol srcdg/myvol destdg/myvol -snapname toaster:/vol/vol1:snap1
# snapdrive snap connect -vg vg2 -snapname toaster:/vol/vol1:snap1
# snapdrive snap connect -fs /db2/datafiles2 /db2_snap1 -snapname toaster:/vol/vol1:snap1
# snapdrive snap connect -fs /db2/datafiles2 -snapname toaster:/vol/vol1:snap1 -autoexpand
-autorenam
```

The following command can be used to connect to a Snapshot copy that contains the NFS volume and directory:

```
# snapdrive snap connect -fs /mnt/nfs -snapname toaster:/vol/vol1:nfs_snap -autorename
```

Note: When you identify a disk group to be connected by specifying a logical volume or file system, you must specify all the logical volumes contained in that disk group in order to connect the entire disk group. The `-autoexpand` option simplifies this process by allowing you name only a subset of the logical volumes or file systems in the disk group. The option then expands the connection to the rest of the logical volumes or file systems in the disk group. The `-autorename` option communicates with SnapDrive for UNIX to rename the destination entities as needed to avoid naming conflicts.

Disconnecting a Snapshot copy from a location on a host

You can disconnect a Snapshot copy from a location on a host.

Procedure

Remove the mappings between the host and the LUNs in the Snapshot copy bkup40105 by using the `snapdrive snap disconnect` command.

```
snapdrive snap disconnect -fs /bkup40105
```

Note: SnapDrive for UNIX does not modify the Snapshot copy during a disconnect except to delete the temporary LUNs that were created during the `snapdrive snap connect` operation.

Example

Example 1:

The following are sample `snapdrive snap disconnect` command lines:

```
# snapdrive snap disconnect -hostvol dg5/myvolume
# snapdrive snap disconnect -vg vg1 vg10
# snapdrive snap disconnect -dg dg1 dg2 dg3
```

Example 2:

The following command disconnects a Snapshot copy that contains shared storage entities:

```
# snapdrive snap disconnect -lun long_lun_name [lun_name...]
```

Deleting a Snapshot copy

You can delete a Snapshot copy by using SnapDrive for UNIX.

Procedure

Delete the Snapshot copy bkup40105 using the `snapdrive snap delete` command.

```
# snapdrive snap delete toaster:/vol/vol1:bkup40105
```

Example of additional command lines:

The `snapdrive snap delete` command displays a list of Snapshot copies that are deleted. The following is an example of the type of output it provides:

```
# snapdrive snap delete -v toaster:/vol/vol0:snap1 snap2 snap3
snapdrive: deleting
toaster:/vol/vol0:snap1
toaster:/vol/vol0:snap2
toaster:/vol/vol0:snap3
```

SnapDrive for UNIX for storage provisioning

SnapDrive for UNIX provides end-to-end storage management. It provides a number of storage options that enable you to automate storage provisioning tasks on the storage system to manage the entire storage hierarchy.

SnapDrive for UNIX allows you perform the following storage tasks:

- Create storage by creating LUNs, file systems, logical volumes, and disk groups
- Display information about storage entities
- Connect LUNs and storage entities to the host
- Resize storage by increasing the size of the storage
- Disconnect LUN and storage entities' mappings from the host
- Connect to host-side storage entities
- Disconnect from host-side storage entities
- Delete storage

In addition to helping you to set up a sample storage system and work with it, each step also includes the examples of additional SnapDrive for UNIX command lines.

These steps assume you have experience setting up and running applications on your host operating system. You should read and understand the guidelines of storage operations before you perform them.

Creating a storage entity

This section describes how to create a storage entity using SnapDrive for UNIX.

Procedure

Create a host volume and file system on a 1-GB LUN using the `snapdrive storage create` command.

```
snapdrive storage create -fs /mnt/qa/sdufs1 -fstype jfs2 -lun
f270c-198-147:/vol/hacmpvol/sdulun1 -lunsize 1g

LUN f270c-198-147:/vol/hacmpvol/sdulun1 ... created
mapping new lun(s) ... done
discovering new lun(s) ... done
LUN to device file mappings:
- f270c-198-147:/vol/hacmpvol/sdulun1 => /dev/hdisk4
disk group sdufs1_SdDg created
host volume sdufs1_SdHv created
file system /mnt/qa/sdufs1 created
```

In this example, the `-fstype` option is used to specify the file system type. This option applies only if there is more than one file system type available on the host.

The snapdrive storage create command automatically performs all the tasks needed to set up LUNs, including preparing the host, performing discovery mapping, and connecting to each LUN you create.

Displaying information about a storage entity

You can display the information about the storage entity using the snapdrive storage show command.

Disconnecting a storage entity that is mapped to a host

You can disconnect a storage entity that is mapped to a host.

Procedure

Disconnect a disk group called sdufs1_SdDg from the host using the snapdrive storage disconnect command.

```
snapdrive storage disconnect -dg sdufs1_SdDg -full disconnecting disk group sdufs1_SdDg
- hostvol sdufs1_SdDg/sdufs1_SdHv ...
disconnected
- dg sdufs1_SdDg ... disconnected
- LUN f270c-198-147:/vol/hacmpvol/sdulun1 ...

disconnected
0001-669 Warning:

Please save information provided by this command.
You will need it to re-connect disconnected filespecs.
```

The storage disconnect operation removes the LUNs, or the LUNs and storage entities that were mapped to the host. When SnapDrive for UNIX removes the LUN mappings, it exports the disk groups or file systems that the LUNs contain.

Connecting a storage entity to a host

You can connect a storage entity using SnapDrive for UNIX.

Procedure

Connect a file system and host volume to the LUN on the host using the snapdrive storage connect command.

Note: If you pass any invalid *-mntopts* options for storage and snap operations, SnapDrive for UNIX does not validate those invalid mount options.

```
snapdrive storage connect -fs /mnt/qa/sdufs1 -hostvol sdufs1_SdDg/sdufs1_SdHv -lun f270c-198-
147:/vol/hacmpvol/sdulun1

mapping lun(s) ... done
discovering lun(s) ... done
LUN f270c-198-147:/vol/hacmpvol/sdulun1 connected
- device filename(s): /dev/hdisk4
Importing sdufs1_SdDg
Connected fs /mnt/qa/sdufs1
```

You can use the snapdrive storage connect command to map storage to a new location, and to access existing storage from a different host than the one used to create it. It also lets you make existing LUNs, file systems, disk groups, and logical volumes accessible on a new host.

Disconnecting a storage entity from the host side

You can disconnect a storage entity from the host side.

Procedure

Disconnect sdufs1_SdDg from the host without unmapping the LUN using the snapdrive host disconnect command.

```
snapdrive host disconnect -dg sdufs1_SdDg -full

disconnecting disk group sdufs1_SdDg
- fs /mnt/qa/sdufs1 ... disconnected
- hostvol sdufs1_SdDg/sdufs1_SdHv ...

disconnected
- dg sdufs1_SdDg ... disconnected
```

Connecting a storage entity from the host side

You can connect to a storage entity from the host side.

Procedure

Connect the file system and host volume to the host using the snapdrive host connect command.

```
snapdrive host connect -fs /mnt/qa/sdufs1 -hostvol sdufs1_SdDg/sdufs1_SdHv -lun
f270c-198-147:/vol/hacmpvol/sdulun1
discovering lun(s) ... done
LUN f270c-198-147:/vol/hacmpvol/ sdulun1 connected
- device filename(s): /dev/hdisk4
Importing sdufs1_SdDg
Connected fs /mnt/qa/sdufs1
```

Increasing the storage entity size

You can increase the size of a storage entity.

Procedure

Increase the size of the disk group by adding a LUN using the snapdrive storage resize command.

```
snapdrive storage resize -dg sdufs1_SdDg -growto 2g -
addlun
discovering filer LUNs in disk group sdufs1_SdDg...done
LUN f270c-198-147:/vol/hacmpvol/sdufs1_SdLun ...
created
mapping new lun(s) ... done
discovering new lun(s) ... done.
initializing LUN(s) and adding to disk group
sdufs1_SdDg...done
Disk group sdufs1_SdDg has been resized
Desired resize of host volumes or file systems
contained in disk group must be done manually
```

The snapdrive storage resize command enables you to increase the size of the storage in the following ways:

- By specifying a target size that you want the host entity to reach
- By entering a set number of bytes by which you want to increase the storage

Note: The storage resize operation can only increase the size of a disk group and not the size of a file system. You have to manually increase the file system size.

Deleting a storage entity

You can delete a storage entity.

Procedure

Delete the disk group sdufs1_SdDg using the `snapdrive storage delete` command.

```
snapdrive storage delete -dg sdufs1_SdDg -full

deleting disk group sdufs1_SdDg
- fs /mnt/qa/sdufs1 ... deleted
- hostvol sdufs1_SdDg/sdufs1_SdHv ... deleted
- dg sdufs1_SdDg ... deleted
- LUN f270c-198-147:/vol/hacmpvol/sdulun1 ...
deleted
- LUN f270c-198-147:/vol/hacmpvol/sdufs1_SdLun
... deleted
```

The `snapdrive storage delete` command removes all the specified host side entities, their underlying entities, and the LUNs associated with them.

Snapshot copies and storage

You can perform simplified versions of many tasks in a production environment. By going through these examples, you can quickly start using SnapDrive for UNIX to manage Snapshot copies and storage on your host system.

Note: You can execute the commands in the following steps. When performing an exercise such as this, it is recommended that you do it on a test system to ensure that you do not accidentally create a problem for a production system.

The steps that follow show you how to perform the following actions:

- Create a volume group and file system to be used as storage.
- Display information about the storage.
- Increase the size of the storage.
- Take a Snapshot copy of the volume group.
- Destroy the data in the volume group and then restore it using a Snapshot copy.
- Disconnect the LUNs from the host.
- Reconnect the Snapshot copy to the host.

Each step also includes the examples of additional SnapDrive for UNIX commands so that you can see other ways to use the command.

These steps assume you have experience setting up and running applications on your host operating system.

Note: To make the exercises in these steps easier to follow, they do not use all the options available for each SnapDrive for UNIX command.

Setting up a file system on a host entity

You can set up a file system on a host entity.

Procedure

Create a volume group vg1 with three LUNs (lunA, lunB, and lunC) on a storage system toaster and a file system /db1/datafiles1. Assign each LUN a size of 100 MB.
Enter the following snapdrive storage create command:

```
# snapdrive storage create -vg vg1 -lun toaster:/vol/vol1/lunA lunB lunC -lunsize 100m
-fs /db1/datafiles1
```

Now create a stand-alone LUN called lunD:

```
# snapdrive storage create -lun toaster:/vol/vol1/lunD -lunsize 100m
```

The following is the snapdrive storage create command that indicates how you can specify information when you are creating storage.

Example:

The command line provides the minimal information required for setting up a file system. It creates a file system in a 100 MB disk group by specifying only the file system mount point, the disk group size, and the storage system volume. SnapDrive for UNIX supplies the default values for the other parameters, including the volume group name, number of LUNs, LUN size, and file system type.

```
# snapdrive storage create -fs /mnt/myfs -dgsize 100m -filervol toaster:/vol/vol1
```

Displaying information about the storage

You can display the information about the storage system.

Procedure

Confirm that SnapDrive for UNIX created all the necessary parameters by executing the snapdrive storage show command.

```
# snapdrive storage show -vg vg1
```

Note: You can use either snapdrive storage show or snapdrive storage list in the command line. These commands are synonyms.

Examples of additional command lines:

The following is a list of sample command lines that you can use with the storage show command:

```
# snapdrive storage show -filer toaster1 toaster2 -verbose
# snapdrive storage list -dg dg1 dg2
# snapdrive storage show -fs /mnt/myfs /mnt/myfs2
# snapdrive storage show -hostvol dg2/vol1 dg4/myvol3
# snapdrive storage list -dg dg2 -fs /mnt/myfs
```

Increasing the size of storage

You can increase the size of storage.

Procedure

Use the `snapdrive storage resize` command with the `-growby` option to expand the size of the storage. The `-growby` option combined with the `-addlun` option communicates with SnapDrive for UNIX to increase the size of the volume group by adding a LUN that is say, 155 MB, to the volume group.

```
# snapdrive storage resize -vg vg1 -addlun -growby 155m
```

This command line includes the `-growto` option with the `-addlun` option to communicate with SnapDrive for UNIX to increase the size of the storage until it reaches a total of 155 MB. SnapDrive for UNIX adds a LUN to the volume group and bases its size on the difference between the current size of the storage and 155 MB.

```
# snapdrive storage resize -vg myvg -addlun -growby 155m
```

Making a Snapshot copy

You can create a Snapshot copy.

Procedure

1. Add three files. Make the size of each file to 1 MB and name the files file1, file2, and file3.

   ```
   # cd /db1/datafiles1
   # mkfile 1m file1 file2 file3
   # cd ..
   ```

   Note: After you have created the files, leave that directory (that is, it should not be your current directory). Certain SnapDrive for UNIX commands, such as the `snapdrive snap restore` command, do not work if you are in the directory you want to restore.
2. Create a Snapshot copy called snap1 using the `snapdrive snap create` command.

   ```
   # snapdrive snap create -vg vg1 -snapname snap1
   ```

Examples of additional command lines:

The following `snapdrive snap create` command lines assume you have disk groups *dg1* and *dg2* with host volumes *myvol1* and *myvol2*. The host volume `dg1/myvol2` has a file system mounted on `/myfs/fs2`. The disk groups have three LUNs: `toaster:/vol/vol1/lun0`, `toaster:/vol/vol1/lun1`, and `toaster:/vol/vol1/lun2`. These command lines all create a Snapshot copy called `toaster:/vol/vol1:snap1`.

```
# snapdrive snap create -fs /myfs/fs2 -snapname snap1
# snapdrive snap create -dg dg1 dg2 -snapname snap1
# snapdrive snap create -vg dg1 -snapname snap1
# snapdrive snap create -hostvol dg1/myvol1 -snapname snap1 -force
# snapdrive snap create -hostvol dg1/myvol2 -fs /fs2 -snapname snap1
```

Restoring a Snapshot copy

You can restore a Snapshot copy.

Procedure

1. Remove the files you created earlier by using the command `# rm -rf /db1/datafiles1/*`.
2. Restore a Snapshot copy using the `snapdrive snap restore` command. Ensure you are not in the directory where you want to restore the files, or you will receive an error message.

   ```
   # snapdrive snap restore -vg vg1 -snapname snap1
   ```

   Attention: This procedure might take several minutes. Do not press Ctrl-C during this procedure. If you try to halt the procedure, you risk leaving the disk groups in an incomplete state.

Examples of additional command lines:

The following command lines assume you have a Snapshot copy that includes data from *vg1* and *vg2*. The first command line performs a partial restore. It restores the Snapshot copy data from *vg2* only. The second one restores data for both *vg2* and *vg1*.

```
# snapdrive snap restore -vg vg2 -snapname snap1
# snapdrive snap restore -vg vg1 vg2 -snapname snap1
```

Disconnecting the LUN mappings from the host

You can disconnect a LUN from a host.

Procedure

Disconnect lunD from the host where you created it by using the `snapdrive storage disconnect` command.

```
# snapdrive storage disconnect -lun toaster:/vol/vol1/lunD
```

Note: If you want to disconnect a host-side entity that contains other entities, you must include the `-full` option on the command line.

Examples of additional command lines:

These are sample `storage disconnect` command lines.

```
# snapdrive storage disconnect -lun toaster:/vol/vol1/lunA muffin:/vol/vol1/lunB
# snapdrive storage disconnect -dg dg1 dg2 dg3 -full
# snapdrive storage disconnect -hostvol dg1/mylvol1
```

Connecting an existing LUN to the host

You can connect an existing LUN to a host.

Procedure

Reconnect a lunD to the host by using the `snapdrive storage connect` command.

```
# snapdrive storage connect -lun toaster:/vol/vol1/lunD
```

Note: You can use this command to connect LUNs not created with SnapDrive for UNIX as well as LUNs created with it.

Examples of additional command lines:

The following are examples of `snapdrive storage connect` command lines:

```
# snapdrive storage connect -lun filer1:/vol/vol1/ntap_lun2
# snapdrive storage connect -lun filer1:/vol/vol1/ntap_lun2 ntap_lun3 ntap_lun4
```

Deleting storage from the host

You can delete storage from a host.

Procedure

Delete the volume group, LUNs, and file system using the `snapdrive storage delete` command. Because you are deleting the file system, you do not need to specify the volume group and LUN names. (Do not unmount the file system before you delete the storage, or SnapDrive for UNIX will not be able to find it.)

```
# snapdrive storage delete -fs /db1/datafiles1
```

Note: If you want to delete a host-side entity that contains other entities, you must include the `-full` option on the command line.

Examples of additional command lines:

The following are examples of the `snapdrive storage delete` command lines.

```
# snapdrive storage delete -lun toaster:/vol/vol1/lunC
# snapdrive storage delete -vg vg1
# snapdrive storage delete -dg dg1 dg2 dg3
# snapdrive storage delete -hostvol mydg/vol3 mydg/vol5
# snapdrive storage delete -dg dg1 dg2 dg3 -full
```

The SnapDrive for UNIX daemon

Before you run any SnapDrive for UNIX command, you must understand the Web services and daemon and how to use them. All the SnapDrive for UNIX commands work using the daemon service. Before you can use SnapDrive for UNIX on your Linux host, you must start the daemon that enables SnapDrive for UNIX to integrate seamlessly and securely with other third-party products.

What the Web service and daemon are

The SnapDrive for UNIX Web service provides a uniform interface for all the SnapManager and third-party products to integrate seamlessly with SnapDrive for UNIX.

Various SnapManager products use the command-line interface (CLI) to communicate with SnapDrive for UNIX. Using the CLI puts a constraint on the performance and manageability of SnapManager and SnapDrive for UNIX. When you use the SnapDrive for UNIX daemon, all the commands work as a unique process. Daemon service does not affect the way SnapDrive for UNIX commands are used.

The SnapDrive for UNIX Web service allows third-party applications to integrate with SnapDrive for UNIX seamlessly. They interact with SnapDrive for UNIX using APIs.

When you start the SnapDrive for UNIX daemon, it first checks whether the daemon is running. If the daemon is not running, it starts the daemon. If the daemon is already running and you try to start it, SnapDrive for UNIX displays this message: `snapdrive daemon is already running`

You can check the status of the daemon to see whether it is running or not. You should check the status before deciding to start the daemon. If a user other than root tries to check the status, SnapDrive for UNIX checks the credentials of a user and displays this message: `snapdrive daemon status can be seen only by root user`

When you try to stop the daemon, SnapDrive for UNIX checks your credentials. If you are a user other than root, SnapDrive for UNIX displays this message: `snapdrive daemon can be stopped only by root user`

After you stop the daemon, you must restart it for any changes to the configuration file or any module to take effect. If a user other than root tries to restart, SnapDrive for UNIX checks the credentials of a user and displays this message: `snapdrive daemon can be restarted only by root user`

Checking the status of the daemon

You can check the status of the daemon to see whether it is running. If the daemon is already running, you do not need to restart it until the SnapDrive for UNIX configuration file has been updated.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command to check the status of the daemon:
```
snapdrived status
```

Starting the SnapDrive for UNIX daemon

You must start and run the SnapDrive for UNIX daemon before you can use any SnapDrive for UNIX command.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command to start the daemon:
```
snapdrived start
```

Changing the default daemon password

SnapDrive for UNIX comes with a default daemon password, which you can change. This password is stored in an encrypted file with read and write permissions assigned to only the root user. After the password is changed, all the client applications must be notified about it manually.

Before you begin

Ensure that you are logged in as the root user.

Procedure

1. Enter the following command to change the default password:
   ```
   snapdrived passwd
   ```
2. Enter the password.
3. Confirm the password.

Stopping the daemon

If you change the SnapDrive for UNIX configuration file, you must stop and restart the daemon. You can stop the daemon nonforcibly or forcibly.

Nonforcibly stopping the daemon

If your SnapDrive for UNIX configuration file is changed, you must stop the daemon for the configuration file changes to take effect. After the daemon is stopped and restarted, the changes in the configuration file take effect. Nonforcibly stopping the daemon, allows all queued commands to complete. After the stop request is received, no new commands are executed.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command to nonforcibly stop the daemon:
`snapdrived stop`

Forcibly stopping the daemon

You can forcibly stop the daemon when you do not want to wait for all the commands to complete execution. After the request to forcibly stop the daemon is received, the SnapDrive for UNIX daemon cancels any commands that are in execution or in queue.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command to forcibly stop the daemon:
`snapdrived -force stop`

Note: When you forcibly stop the daemon, the state of your system might be undefined. This method is not recommended.

Restarting the daemon

You must restart the daemon after you stop it so that changes that you make to the configuration file or to the other modules take effect. The SnapDrive for UNIX daemon restarts only after completing all the commands that are in execution and in queue. After the restart request is received, no new commands are executed.

Before you begin

- Ensure that you are logged in as a root user.
- Ensure that no other sessions are running on the same host in parallel. The `snapdrived restart` command hangs the system in such situations.

Procedure

Enter the following command to restart the daemon: `snapdrived restart`

Forcing daemon restart

You can force the daemon to restart. A forceful restart of the daemon stops the execution of all running commands.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command to forcefully restart the daemon: `snapdrived -force restart`

After the force restart request is received, the daemon stops all the commands in execution and in queue. The daemon is restarted only after cancelling execution of all running commands.

Secure daemon communication using HTTPs

You can use HTTPs for secure Web services and daemon communication. Secure communication is enabled by setting some configuration variables in the `snapdrive.conf` file, and generating and installing the self-signed certificate.

You must provide the self-signed certificate at the path specified in the `snapdrive.conf` file. To use HTTPs for communication, you must set the following parameters in the `snapdrive.conf` file:

- `use-https-to-sdu-daemon=on`
- `contact-https-port-sdu-daemon=4095`
- `sdu-daemon-certificate-path=/opt/ontap/snapdrive/snapdrive.pem`

Note: SnapDrive 5.0 for UNIX and later versions support HTTPs for daemon communication. By default, the option is set to "`off`".

Generating self-signed certificate

The SnapDrive for UNIX daemon service requires that you generate a self-signed certificate for authentication. This authentication is required while communicating with the CLI.

Procedure

1. Generate an RSA key.

   ```
   $ openssl genrsa 1024 > host.key
   $ chmod 400 host.key
   ```

   ```
   # openssl genrsa 1024 > host.key Generating
   RSA private key, 1024 bit long modulus
   ...............................++++++ ...++++++ e is 65537(0x10001)
   # chmod 400 host.key
   ```

2. Create the certificate.

   ```
   $ openssl req -new -x509 -nodes -sha1 -days 365 -key host.key > host.cert
   ```

   The `-new`, `-x509`, and `-nodes` options are used to create an unencrypted certificate. The `-days` option specifies the number of days the certificate remains valid.

3. When asked to fill out the certificate's x509 data, enter your local data.

```
# openssl req -new -x509 -nodes -sha1 -days 365 -key host.key > host.cert
You are about to be asked to enter information that will be incorporated into your
certificate request.
What you are about to enter is what is called a Distinguished Name or a DN. There are
quite a few fields
but you can leave some blank For some fields there will be a default value, If you enter
'.', the field will be left blank.

Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:Sunnyvale
Organization Name (eg, company) [Internet Widgits Pty Ltd]:abc.com
Organizational Unit Name (eg, section) []:
Common Name (eg, YOUR name) []:localhost
Email Address []:postmaster@example.org
```

Note: The `Common Name` should be *localhost*.

4. Extract metadata (optional).

```
$ openssl x509 -noout -fingerprint -text < host.cert > host.info
```

You can save the certificate metadata for your quick reference.

5. Combine key and certificate data.

SnapDrive for UNIX requires the key and certificate data to be in the same file. The combined file must be protected as a key file.

```
$ cat host.cert host.key > host.pem \
&& rm host.key
$ chmod 400 host.pem
```

```
# cat host.cert host.key >  # /opt/ontap/snapdrive/snapdrive.pem

# rm host.key rm: remove regular file `host.key'? y
# chmod 400 # /opt/ontap/snapdrive/snapdrive.pem
```

6. Add the complete path of the daemon certificate to the *sdu-daemon-certificate-path* variable of the `snapdrive.conf` file.

Storage system name change in SnapDrive for UNIX

If a Snapshot copy is created and the storage system's name is changed after the copy was created, SnapDrive for UNIX allows you to execute Snapshot operations as long as you have re-authenticated all of your clients (hosts).

Snapshot operations such as restore, connect, disconnect, display, and delete continues to work in the host system only after you re-authenticate your clients because the host name is used as part of the registry key to hold the password.

Configuring a new storage system name to a host system

To execute the SnapDrive operations using the new storage system, you must configure the new storage system name for the host system.

Before you begin

- You can use the new storage system name only if that name is registered with a Domain Name System (DNS) server in your network or in the `/etc/hosts` file.
- Ensure that the old storage system name is deleted from the host system by using the `snapdrive config delete` command.

Procedure

Enter the following command in the host system: `snapdrive config set` *`old_storage_system_name new_storage_system_name`*

```
snapdrive config set root roaster
Password for root:
Retype password:
```

The *roaster* new storage system is ready to execute the SnapDrive operations in the host system.

Viewing the list of storage system

You can view the list of all the storage system name entries using the `snapdrive config list` command in the host system.

Procedure

Enter the following command to view the list of all the storage systems: `snapdrive config list`

```
snapdrive config list
username appliance name appliance type
-----------------------------------------------------
root      roaster     StorageSystem
```

Results

The new storage system *roaster* is added in the SnapDrive configuration list.

Migrating from old storage system to new storage system name

You can migrate from the old storage system to new storage system using the `snapdrive config migrate set` command.

Procedure

Enter the following command to set the equivalent storage system name. `snapdrive config migrate set` *`old_storage_system_name new_storage_system_name`*

Example

The following example shows that it migrates from old storage system "tuffleskin" to new storage system "roaster".

```
snapdrive config migrate set tuffleskin roaster
```

What to do next

After the storage system name is migrated, you can perform all the SnapDrive operations in the host system using the new storage system.

Related concepts:

"Migrating to new Vserver name" on page 56

Viewing the migrated new storage system

You can verify if the new migrated storage system is added by executing the `snapdrive config migrate list` command.

Procedure

Enter the following command. `snapdrive config migrate list`

```
New Entry           Old Entry
------------------------------------------------
roaster             tuffleskin
```

Deleting a storage system mapping information from the host system

You can delete the storage system mapping information from the host system.

Procedure

Enter the following command. `snapdrive config migrate delete` *new_storage_system_name* [*new_storage_system_name*...]

- *new_storage_system_name* is the name of the new storage system.
- *[new_storage_system_name...]* defines that you can delete multiple storage system names on one command line.

```
snapdrive config migrate delete roaster
Deleted entry for appliance: roaster
```

Using port set in SnapDrive for UNIX

Port set is a group of SAN data port or interface, and is used to control the path available to a host by grouping the set of SAN data port or interface.

Port set configuration is created by the storage administrator on the storage system, and it is an optional task. When there is no port set configured on the host, the host can view all the paths, depending on the host scsi configuration limits. SnapDrive for UNIX allows the storage administrator to specify a single port set per Vserver. Therefore, there is a restriction in the number of paths that the host can view through the Vserver.

Adding a port set in SnapDrive

Configuring the port set is a one time activity and it must be done before using the storage system. You can add port set(s) in the storage system to communicate to a Vserver.

About this task

Note: If you wish to upgrade to SnapDrive 5.1 for UNIX, ensure that the earlier versions of SnapDrive for UNIX igroups are associated to the port set by the storage administrator manually.

The following is a port set example in which the storage administrator uses the Vserver name instead of an IP address, and verifies that the Vserver name is registered on a DNS server.

Procedure

Enter the following command on the host `snapdrive portset add` *portset_name filername* [*filername*...]
filername is the name of the port set
filername is the name of the Vserver

```
snapdrive portset add ps2 vs91
Added portset configuration for appliance: vs91
```

The port set ps2 is added successfully in SnapDrive.

Viewing the list of port set

You can use the `snapdrive portset list` command to view all the port sets that are configured in SnapDrive on the host.

Procedure

Enter the following command on the host system `snapdrive portset list`

```
snapdrive portset list
appliance name   Portset name
-----------------------------
vs91       ps2
```

Removing a port set from SnapDrive

You can use the `snapdrive portset delete` command to delete a port set that is configured in SnapDrive.

Procedure

Enter the following command on the host system `snapdrive portset delete` *`filername`* [*`filername`*...]
filername is the Vserver name on which the port set is configured.

```
snapdrive portset delete vs91
Deleted portset configuration for appliance: vs91
```

The port set that is configured for SnapDrive is removed successfully.

Migrating to new Vserver name

If you have migrated from old Vserver to new Vserver, you must ensure that the new Vserver name is configured on the host system to execute any SnapDrive operations on the Vserver.

The following steps must be performed on the host system whenever you migrate to a new Vserver name.

1. Delete the old Vserver name that is configured using the following command:

   `snapdrive config delete` *appliance_name*

   The old configured Vserver name is removed from the host system.
2. Delete the port set that is assigned to the old configured Vserver using the following command:

   `snapdrive portset delete` *filername* [*filername* ...]
3. Configure the new Vserver name using the following command:

   `snapdrive config set` *vsadmin filername* [*filername* ...]
4. Assign the port set using the following command:

   `snapdrive portset add` *portset_name* filername [*filername* ...]
5. Migrate the new Vserver name using the following command:

   `snapdrive config migrate set` *old_entry new_entry*

After you have migrated to a new Vserver, you are ready to execute SnapDrive operations in the host system for this new Vserver name.

Related tasks:

"Migrating from old storage system to new storage system name" on page 54

Configuring igroups in SnapDrive for UNIX

SnapDrive for UNIX allows you to configure an igroup that exists on the storage system, and the configured igroup is used to map the LUNs on the storage system.

Note that the igroups must contain the source initiator and the destination initiator.

Adding an igroup

SnapDrive for UNIX allows you to add a particular igroup for the storage system to the host and perform SnapDrive operations using the configured igroup. Ensure that the igroup must be available in the storage system.

Procedure

Enter the following command on the host: `snapdrive igroup add` *igroup_name filer_name* [*filer_name*...]

```
snapdrive igroup add ig toaster
Added igroup configuration for appliance: toaster
```

The igroup `ig` is added successfully for the storage system toaster.

Removing a igroup from the storage system

You can use the `snapdrive igroup delete` command to delete a port set that is configured for a Vserver.

Procedure

Enter the following command on the host: `snapdrive igroup delete` *filer_name*

```
snapdrive igroup delete toaster
Deleted igroup configuration for appliance: toaster
```

The igroup `ig` that is configured for the storage system `toaster` is removed successfully.

Viewing the list of igroups

You can use the `snapdrive igroup list` command to view all the igroups that are configured on the host.

Procedure

Enter the following command on the host system:
`snapdrive igroup list`

```
snapdrive igroup list
appliance name   igroup name
-----------------------------
toaster        ig
```

Configuring SnapDrive for UNIX

You need to set your SnapDrive for UNIX configuration options and understand how to use SnapDrive for UNIX.

Configuration information in SnapDrive for UNIX

SnapDrive for UNIX comes with a configuration file called `snapdrive.conf`. This configuration file holds all the configuration variables used in SnapDrive for UNIX. You can edit this file to enable or disable options according to your requirements. You can also add variables that can be used for some host specific usage. When there are any modifications done in the `snapdrive.conf` file, ensure to restart the daemon to reflect the changes to take effect.

What the snapdrive.conf file is

The `snapdrive.conf` file contains a name-value pair for each configurable variable. SnapDrive for UNIX automatically checks the information in this file each time it starts. You can use a text editor to modify this file.

The `snapdrive.conf` file is in the SnapDrive for UNIX installation directory. (For the complete path to this directory, see the installation instructions of your operating system.) The `snapdrive config show` command displays the current and active contents of the `snapdrive.conf` file.

Configuration options and their default values

To determine the current configurable items and their settings, run the `snapdrive config show` command.

The supported configurable items and their default settings can vary across host operating systems and the different versions of SnapDrive for UNIX. For example, on Linux the default path is `/var/log/...`. A way to determine current configurable items and their settings is to run the `snapdrive config show` command.

The following table describes the variables in the `snapdrive.conf` file.

Variable	Description
all-access-if-rbac-unspecified=on	Specifies the access-control permissions for each host on which SnapDrive for UNIX runs by entering the permission string in an access-control file. The string that you specify controls which SnapDrive for UNIX Snapshot copy and other storage operations a host might perform on a storage system. (These access permissions do not affect the show or list operations.) Set this value to either `on` or `off` where: • `on`—Specifies that SnapDrive for UNIX enables all access permissions if no access-control permissions file exists on the storage system. The default value is `on`. • `off`—Specifies that storage system allows the host only the permissions that are mentioned in the access-control permissions file. If you provide an access-control file, this option has no effect.
allow-partial-clone-connect=on	SnapDrive for UNIX allows you to connect to a subset of file systems or only to the host volume of the cloned disk group. Set this value to `on` or `off` where: • `on` - Specifies that SnapDrive for UNIX allows you to connect to a subset of file systems or only to the host volume of the cloned disk group. • `off` - Determines that SnapDrive for UNIX cannot connect to a subset of file systems or only to the host volume of the cloned disk group.
audit-log-file="/var/log/sd-audit.log"	Specifies the location where SnapDrive for UNIX writes the audit log file. The default value depends on your host operating system. The path shown in the example is the default path for a Linux host.
audit-log-max-size=20480	Specifies the maximum size, in bytes, of the audit log file. When the file reaches this size, SnapDrive for UNIX renames it and starts a new audit log. The default value is `20480` bytes. Because SnapDrive for UNIX never starts a new log file in the middle of an operation, the correct size of the file could vary slightly from the value specified here. **Note:** You should use the default value. If you decide to change the default value, remember that too many log files can take up space on your disk and might eventually affect performance.

Variable	Description
audit-log-save=2	Determines how many old audit log files SnapDrive for UNIX should save. After this limit is reached, SnapDrive for UNIX discards the oldest file and creates a new one. SnapDrive for UNIX rotates this file based on the value you specify in the `audit-log-max-size` variable. The default value is `2`. **Note:** You should use the default value. If you decide to change the default value, remember that too many log files can take up space on your disk and might eventually affect performance.
autosupport-enabled	Determines that the option `autosupport-enabled` is `on` by default. This option is enabled by default to store the AutoSupport information in the Event Management System (EMS) log of the storage system. **Note:** SnapDrive 4.2 for UNIX and later versions do not have the option `autosupport-filer`.
available-lun-reserve=8	Specifies the number of LUNs that the host must be prepared to create when the current SnapDrive for UNIX operation completes. If few operating system resources are available to create the number of LUNs specified, SnapDrive for UNIX requests additional resources, based on the value supplied in the *enable-implicit-host-preparation* variable. The default value is `8`. **Note:** This variable applies only to systems that require host preparation before you can create LUNs. Linux Hosts require this preparation. This variable is used on configurations that include LUNs.
bypass-snapdrive-clone-generated-check	Specifies that the deletion of the SnapDrive generated or Non-snapdrive generated FlexClones. Set this value to either `on` or `off` where: • `on`—Specifies that SnapDrive for UNIX allow to delete the FlexClone volume of the snapdrive-generated and non-snapdrive generated FlexClones. • `off`—Specifies that SnapDrive for UNIX allows to delete only the FlexClone volume of the snapdrive- generated. The default value is `off`.

Variable	Description
check-export-permission-nfs-clone	Determines that setting the NFS export permission allows/disables to create cloning in the secondary host (host which does not have export permissions on the parent volume). - on - SnapDrive for UNIX checks for appropriate export permission on the volume for the secondary host. The default value is on. - off - SnapDrive for UNIX does not check appropriate export permission on the volume for the secondary host. SnapDrive for UNIX does not allow to clone if there is no export permission for a volume in an NFS entity. To overcome this situation, disable this variable in the snapdrive.conf file. As a result of the cloning operation, SnapDrive provides appropriate access permissions on the cloned volume.
cluster-operation-timeout-secs=600	Specifies the host cluster operation timeout, in seconds. You should set this value when working with remote nodes and High-Availability (HA) pair operations to determine when the SnapDrive for UNIX operation should time out. The default value is 600 seconds. Other than the non-master node, the host cluster master node can also be the remote node, if the SnapDrive for UNIX operation is initiated from a non-master node. If SnapDrive for UNIX operations on any node in the host cluster exceed the value you set, or the default of 600 seconds (if you set no value), the operation times out with the following message: `Remote Execution of command on slave node sfrac-57 timed out. Possible reason could be that timeout is too less for that system. You can increase the cluster connect timeout in snapdrive.conf file. Please do the necessary cleanup manually. Also, please check the operation can be restricted to lesser jobs to be done so that time required is reduced.`
contact-http-port=80	Specifies the HTTP port to use for communicating with a storage system. The default value is 80.
contact-ssl-port=443	Specifies the SSL port to use for communicating with a storage system. The default value is 443.
contact-http-port-sdu-daemon	Specifies the HTTP port to use for communicating with the SnapDrive for UNIX daemon. The default value is 4094.
contact-http-dfm-port = 8088	Specifies the HTTP port to use for communicating with an Operations Manager server. The default value is 8088.
contact-ssl-dfm-port = 8488	Specifies the SSL port to use for communicating with an Operations Manager server. The default value is 8488.

Variable	Description
contact-viadmin-port=8043	Specifies the HTTP/HTTPS port to communicate with the Virtual Administration server. The default value is 8043. **Note:** This variable is available for RDM LUN support.
datamotion-cutover-wait=120	Specifies the number of seconds SnapDrive for UNIX waits for the Data Motion for vFiler (cutover phase) operations to complete and then retries the SnapDrive for UNIX commands. The default value is 120 seconds.
dfm-api-timeout	Specifies the number of seconds SnapDrive for UNIX waits for the dfm api to return. The default value is 180 seconds.
dfm-rbac-retries=12	Specifies the number of times SnapDrive for UNIX checks access retries for an Operations Manager refresh. The default value is 12.
dfm-rbac-retry-sleep-secs=15	Specifies the number of seconds SnapDrive for UNIX waits before retrying an access check for an Operations Manager refresh. The default value is 15.
default-noprompt=off	Specify if you want the `-noprompt` option to be available. The default value is `off` (not available). If you change this option to `on` SnapDrive for UNIX does not prompt you to confirm an action requested by `-force`.
device-retries=3	Specifies the number of inquiries that the SnapDrive for UNIX can make about the device where the LUN resides. The default value is 3. In normal circumstances, the default value should be adequate. In other circumstances, LUN queries for a snap create operation could fail because the storage system is exceptionally busy. If the LUN queries keep failing even though the LUNs are online and correctly configured, you might want to increase the number of retries. This variable is used on configurations that include LUNs. **Note:** You should configure the same value for the `device-retries` variable across all the nodes in the host cluster. Otherwise, the device discovery involving multiple host cluster nodes can fail on some nodes and succeed on others.

Variable	Description
device-retry-sleep-secs=1	Specifies the number of seconds SnapDrive for UNIX waits between inquiries about the device where the LUN resides. The default value is 1 second. In normal circumstances, the default value should be adequate. In other circumstances, LUN queries for a snap create operation could fail because the storage system is exceptionally busy. If the LUN queries keep failing even though the LUNs are online and correctly configured, you might want to increase the number of seconds between retries. This variable is used on configurations that include LUNs. **Note:** You should configure the same value for the `device-retry-sleep-secs` option across all the nodes in the host cluster. Otherwise, the device discovery involving multiple host cluster nodes can fail on some nodes and succeed on others.
default-transport=iscsi	Specifies the protocol that SnapDrive for UNIX uses as the transport type when creating storage, if a decision is required. The acceptable values are `iscsi` or `FCP`. The *default -transport* value `FCP` is accepted for both FC and FCoE configurations. **Note:** If a host is configured for only one type of transport and that type is supported by SnapDrive for UNIX, SnapDrive for UNIX uses that transport type, irrespective of the type specified in the `snapdrive.conf` file.
enable-alua="on"	Determines that the ALUA is supported for multipathing on the igroup. The storage systems must be HA pair and the HA pair failover state in *single-image* mode. • The default value is `on` to support ALUA for igroup • You can disable the ALUA support by setting the option `off`
enable-fcp-cache="on"	Specifies whether to enable or disable the cache. SnapDrive maintains a cache of available active ports and the port names (WWPNs) information to send the response faster. This variable is useful in few scenario where there is no FC cables connected to the port or wrap plug is used in the port, SnapDrive for UNIX may experience long delays to fetch the information about FC interface and their corresponding WWPNs. The caching helps to resolve/improve the performance of SnapDrive operations in such environments. The default value is `on`.

Variable	Description
enable-implicit-host-preparation="on"	Determines whether SnapDrive for UNIX implicitly requests host preparation for LUNs or notifies you that it is required and exits. • `on`—SnapDrive for UNIX SnapDrive for UNIX implicitly requests the host to create more resources, if there is inadequate amount of resources available to create the required number of LUNs. The number of LUNs created are specified in the *available-lun-reserve* variable. The default value is `on`. • `off`—SnapDrive for UNIX informs you if additional host preparation is necessary for LUN creation and SnapDrive exits the operation. You can then perform the operations necessary to free up resources needed for LUN creation. For example, you can execute the `snapdrive config prepare luns` command. After the preparation is complete, you can reenter the current SnapDrive for UNIX command. **Note:** This variable applies only to systems where host preparation is needed before you can create LUNs for the Linux hosts that require the preparation. This variable is used only on configurations that include LUNs.
enable-migrate-nfs-version	Allows to clone/restore by using the higher version of NFS. In a pure NFSv4 environment, when snap management operations such as clone and restore are attempted with a Snapshot copy created on NFSv3, snap management operation fails. The default value is `off`. During this migration, only the protocol version is considered and other options such as `rw` and `largefiles` are not taken into account by SnapDrive for UNIX. Therefore, only the NFS version for the corresponding NFS filespec is added in the `/etc/fstab` file. Ensure that the appropriate NFS version is used to mount the file specification by using `–o vers=3` for NFSv3 and `-o vers=4` for NFSv4. If you want to migrate the NFS file specification with all the mount options, it is recommended to use `-mntopts` in the snap management operations. It is mandatory to use `nfs` in the attribute value of the Access Protocol in the export policy rules of the parent volume during migration in Data ONTAP operating in Cluster-Mode.

Variable	Description
enable-ping-to-check-filer-reachability	If the ICMP protocol access is disabled or ICMP packets are dropped between the host and storage system network where SnapDrive for UNIX is deployed, this variable must be set to `off`, so that SnapDrive for UNIX does not ping to check if the storage system is reachable or not. If this variable is set to `on`, only SnapDrive snap connect operation does not work due to the ping failure. By default, this variable is set to `on`.
enable-split-clone="off"	Enables splitting the cloned volumes or LUNs during Snapshot connect and Snapshot disconnect operations, if this variable is set to `on` or `sync`. You can set the following values for this variable: • `on`—enables an asynchronous split of cloned volumes or LUNs. • `sync`—enables a synchronous split of cloned volumes or LUNs. • `off`—disables the split of cloned volumes or LUNs. The default value is `off`. If you set this value to `on` or `sync` during the Snapshot connect operation and `off` during the Snapshot disconnect operation, SnapDrive for UNIX does not delete the original volume or LUN that is present in the Snapshot copy. You can also split the cloned volumes or LUNs by using the `-split` option.
enable-strong-ciphers	Set this variable to `on` for the SnapDrive daemon to enforce TLSv1 to communicate with the client. It enhances the security of communication between the client and the SnapDrive daemon using better encryption. By default, this option is set to off.
filer-restore-retries=140	Specifies the number of times SnapDrive for UNIX attempts to restore a Snapshot copy on a storage system if a failure occurs during the restore. The default value is `140`. In normal circumstances, the default value should be adequate. Under other circumstances, this operation could fail because the storage system is exceptionally busy. If it keeps failing even though the LUNs are online and correctly configured, you might want to increase the number of retries.

Variable	Description
filer-restore-retry-sleep-secs=15	Specifies the number of seconds SnapDrive for UNIX waits between attempts to restore a Snapshot copy. The default value is `15` seconds. In normal circumstances, the default value should be adequate. Under other circumstances, this operation could fail because the storage system is exceptionally busy. If it keeps failing even though the LUNs are online and correctly configured, you might want to increase the number of seconds between retries.
filesystem-freeze-timeout-secs=300	Specifies the number of seconds that SnapDrive for UNIX waits between attempts to access the file system. The default value is `300` seconds. This variable is used only on configurations that include LUNs.
flexclone-writereserve-enabled=off	It can take any one of the following values: • `on` • `off` Determines the space reservation of the FlexClone volume created. Acceptable values are `on` and `off`, based on the following rules. • Reservation: on • Optimal: file • Unrestricted: volume • Reservation: off • Optimal: file • Unrestricted: none
fstype="ext3"	Specifies the type of file system that you want to use for SnapDrive for UNIX operations. The file system must be a type that SnapDrive for UNIX supports for your operating system. The acceptable values for Linux is `ext4` or `ext3`. You can also specify the type of file system that you want to use by using the `-fstype` option through CLI.
lun-onlining-in-progress-sleep-secs =3	Specifies the number of seconds between retries when LUN onlining is in progress after volume-based SnapRestore. The default value is `3`.
lun-on-onlining-in-progress-retries=40	Specifies the number of retries when LUN onlining is in progress after a volume-based SnapRestore. The default value is `40`.
mgmt-retry-sleep-secs=2	Specifies the number of seconds SnapDrive for UNIX waits before retrying an operation on the Manage ONTAP control channel. The default value is `2` seconds.
mgmt-retry-sleep-long-secs=90	Specifies the number of seconds SnapDrive for UNIX waits before retrying an operation on the Manage ONTAP control channel after a failover error message occurs. The default value is `90` seconds.

Variable	Description
multipathing-type="none"	Specifies the multipathing software to use. The default value depends on the host operating system. This variable applies only if one of the following statements is true: • More than one multipathing solution is available. • The configurations include LUNs. The acceptable values are `none` or `nativempio`. Linux: For SnapDrive 4.1.1 for UNIX and later versions, Native MPIO multipathing is supported on Linux host.
`PATH="/sbin:/usr/sbin:/bin:/usr/lib/vxvm/bin:/usr/bin:/opt/ontap/SANToolkit/bin:/opt/ontapsanlun/bin:/opt/VRTS/bin:/etc/vx/bi n"`	Specifies the search path the system uses to look for tools. You should verify that this is correct for your system. If it is incorrect, change it to the correct path. The default value might vary depending on your operating system. This path is the default for Linux host.
`/opt/ontap/snapdrive/.pwfile`	Specifies the location of the password file for the user login for the storage systems. The default value might vary depending on your operating system. The default path for linux is `/opt/ontap/snapdrive/.pwfile`
ping-interfaces-with-same-octet	Avoids unnecessary pings through all the available interfaces in the host that might have different subnet IPs configured. If this variable is set to `on`, SnapDrive for UNIX considers only the same subnet IPs of the storage system and pings the storage system to verify address response. If this variable is set to `off`, SnapDrive takes all the available IPs in the host system and pings the storage system to verify address resolution through each subnet, which may be locally detected as a ping attack.
prefix-filer-lun=" "	Specifies the prefix that SnapDrive for UNIX applies to all LUN names it generates internally. The default value for this prefix is an empty string. This variable allows the names of all LUNs created from the current host, but not explicitly named on a SnapDrive for UNIX command line, to share an initial string. **Note:** This variable is used only on configurations that include LUNs.
prefix-clone-name	The string given is suffixed with the original storage system volume name, to create a name for the FlexClone volume.

Variable	Description
prepare-lun-count=16	Specifies how many LUNs SnapDrive for UNIX should prepare to create. SnapDrive for UNIX checks this value when it receives a request to prepare the host to create additional LUNs. The default value is `16`, which means the system is able to create 16 additional LUNs after the preparation is complete. **Note:** This variable applies only to systems where host preparation is needed before you can create LUNs. This variable is used only on configurations that include LUNs. Linux hosts require that preparation.
rbac-method=dfm	Specifies the access control methods. The possible values are `native` and `dfm`. If the variable is set to `native`, the access-control file that is stored in `/vol/vol0/sdprbac/sdhost-name.prbac` or `/vol/vol0/sdprbac/sdgeneric-name.prbac` is used for access checks. If the variable is set to `dfm`, Operations Manager is a prerequisite. In such a case, SnapDrive for UNIX issues access checks to Operations Manager.
rbac-cache=on	Specifies whether to enable or disable cache. SnapDrive for UNIX maintains a cache of access check queries and the corresponding results. SnapDrive for UNIX uses this cache only when all the configured Operations Manager servers are down. You can set the value of the variable to either `on` to enable cache, or to `off` to disable it. The default value is `off`, which configures SnapDrive for UNIX to use Operations Manager and the set *rbac-method* configuration variable to `dfm`.
rbac-cache-timeout	Specifies the rbac cache timeout period and is applicable only when *rbac-cache* is enabled. The default value is `24` hrs. SnapDrive for UNIX uses this cache only when all the configured Operations Manager servers are down.
`recovery-log-file="/var/log/sdrecovery. log"`	Specifies where SnapDrive for UNIX writes the recovery log file. The default value depends on your host operating system. The path shown in this example is the default path for a Linux host.
recovery-log-save=20	Specifies how many old recovery log files SnapDrive for UNIX should save. After this limit is reached, SnapDrive for UNIX discards the oldest file when it creates a new one. SnapDrive for UNIX rotates this log file each time it starts a new operation. The default value is `20`. **Note:** You should use the default value. If you decide to change the default, remember that having too many large log files can take up space on your disk and might eventually affect performance.

Variable	Description
san-clone-method	Specifies the type of clone that you can create. It can take the following values: - `lunclone` Allows a connection by creating a clone of the LUN in the same storage system volume. The default value is `lunclone`. - `optimal` Allows a connection by creating a restricted FlexClone volume of the storage system volume. - `unrestricted` Allows a connection by creating a unrestricted FlexClone volume of the storage system volume.
secure-communication-among-clusternodes=on	Specifies a secure communication within the host cluster nodes for remote execution of SnapDrive for UNIX commands. You can direct SnapDrive for UNIX to use RSH or SSH by changing the value of this configuration variable. The RSH or SSH methodology adopted by SnapDrive for UNIX for remote execution is determined only by the value set in the installation directory of the `snapdrive.conf` file of the following two components: - The host on which the SnapDrive for UNIX operation is executed, to get the host WWPN information and device path information of remote nodes. For example, `snapdrive storage create` executed on master host cluster node uses the RSH or SSH configuration variable only in the local `snapdrive.conf` file to do either of the following: – Determine the remote communication channel. – Execute the `devfsadm` command on remote nodes. - The non-master host cluster node, if the SnapDrive for UNIX command is to be executed remotely on the master host cluster node. To send the SnapDrive for UNIX command to the master host cluster node, the RSH or SSH configuration variable in the local `snapdrive.conf` file is consulted to determine the RSH or SSH mechanism for remote command execution. The default value of `on` means that SSH is used for remote command execution. The value `off` means that RSH is used for execution.

Variable	Description
snapcreate-cg-timeout=relaxed	Specifies the interval that the `snapdrive snap create` command allows for a storage system to complete fencing. Values for this variable are as follows: • `urgent`—specifies a short interval. • `medium`—specifies an interval between urgent and relaxed. • `relaxed`—specifies the longest interval. This value is the default. If a storage system does not complete fencing within the time allowed, SnapDrive for UNIX creates a Snapshot copy using the methodology for Data ONTAP versions before 7.2.
snapcreate-check-nonpersistent-nfs=on	Enables and disables the Snapshot create operation to work with a non-persistent NFS file system. Values for this variable are as follows: • `on`—SnapDrive for UNIX checks whether NFS entities specified in the snapdrive `snap create` command are present in the file system mount table. The Snapshot create operation fails if the NFS entities are not persistently mounted through the file system mount table. This is the default value. • `off`—SnapDrive for UNIX creates a Snapshot copy of NFS entities that do not have a mount entry in the file system mount table. The Snapshot restore operation automatically restores and mounts the NFS file or directory tree that you specify. You can use the `-nopersist` option in the `snapdrive snap connect` command to prevent NFS file systems from adding mount entries in the file system mount table.
snapcreate-consistency-retry-sleep=1	Specifies the number of seconds between best-effort Snapshot copy consistency retries. The default value is 1 second.

Variable	Description
snapconnect-nfs-removedirectories=off	Determines whether SnapDrive for UNIX deletes or retains the unwanted NFS directories from the FlexClone volume during the Snapshot connect operation. • `on`—Deletes the unwanted NFS directories (storage system directories not mentioned in the `snapdrive snap connect` command) from the FlexClone volume during the Snapshot connect operation. The FlexClone volume is destroyed if it is empty during the Snapshot disconnect operation. • `off`—Retains the unwanted NFS storage system directories during the Snapshot connect operation. The default value is `off`. During the Snapshot disconnect operation, only the specified storage system directories are unmounted from the host. If nothing is mounted from the FlexClone volume on the host, the FlexClone volume is destroyed during the Snapshot disconnect operation. If you set this variable to `off` during the connect operation or `on` during the disconnect operation, the FlexClone volume is not to be destroyed, even if it has unwanted storage system directories and is not empty.
snapcreate-must-make-snapinfo-on-qtree= off	Set this variable to `on` to enable the Snapshot create operation to create Snapshot copy information about a qtree. The default value is `off` (disabled). SnapDrive for UNIX always attempts to write snapinfo at the root of a qtree if the LUNs are still snapped and are at the qtree. When you set this variable to `on`, SnapDrive for UNIX fails the Snapshot create operation if it cannot write this data. You should set this variable only to `on` if you are replicating Snapshot copies using qtree SnapMirror. **Note:** Snapshot copies of qtrees work the same way Snapshot copies of volumes do.
snapcreate-consistency-retries=3	Specifies the number of times SnapDrive for UNIX attempts a consistency check on a Snapshot copy after it receives a message that a consistency check failed. This variable is particularly useful on host platforms that do not include a freeze function. This variable is used only on configurations that include LUNs. The default value is `3`.

Variable	Description
snapdelete-delete-rollback-withsnap= off	Set this value to on to delete all rollback Snapshot copies related to a Snapshot copy. Set it to off to disable this feature. The default value is off. This variable takes effect only during a Snapshot delete operation and is used by the recovery log file if you encounter a problem with an operation. It is best to accept the default setting.
snapmirror-dest-multiple-filervolumesenabled= off	Set this variable to on to restore Snapshot copies that span multiple storage systems or volumes on (mirrored) destination storage systems. Set it to off to disable this feature. The default value is off.
snaprestore-delete-rollback-afterrestore= on	Set this variable to on to delete all rollback Snapshot copies after a successful Snapshot restore operation. Set it to off to disable this feature. The default value is on (enabled). This option is used by the recovery log file if you encounter a problem with an operation. It is best to accept the default value.
snaprestore-make-rollback=on	Set this value to either on to create a rollback Snapshot copy or off to disable this feature. The default value is on. A rollback is a copy of the data that SnapDrive makes on the storage system before it begins a Snapshot restore operation. If a problem occurs during the Snapshot restore operation, you can use the rollback Snapshot copy to restore the data to the state it was in before the operation began. If you do not want the extra security of a rollback Snapshot copy at restore time, set this option to off. If you want the rollback, but not enough for your Snapshot restore operation to fail if you cannot make one, set the variable `snaprestore-must-makerollback` to off. This variable is used by the recovery log file, which you send to technical support if you encounter a problem. It is best to accept the default value.

Variable	**Description**
snaprestore-must-make-rollback=on	Set this variable to `on` to cause a Snapshot restore operation to fail if the rollback creation fails. Set it to `off` to disable this feature. The default value is `on`. • on—SnapDrive for UNIX attempts to make a rollback copy of the data on the storage system before it begins the Snapshot restore operation. If it cannot make a rollback copy of the data, SnapDrive for UNIX halts the Snapshot restore operation. • off—Use this value if you want the extra security of a rollback Snapshot copy at restore time, but not enough for the Snapshot restore operation to fail if you cannot make one. This variable is used by the recovery log file if you encounter a problem with an operation. It is best to accept the default value.
snaprestore-snapmirror-check=on	Set this variable to `on` to enable the `snapdrive snap restore` command to check the SnapMirror destination volume. If it is set to `off`, the `snapdrive snap restore` command is unable to check the destination volume. The default value is `on`. If the value of this configuration variable is `on` and the SnapMirror relationship state is `broken-off`, the restore can still proceed.
space-reservations-enabled=on	Enables space reservation when creating LUNs. By default, this variable is set to `on`; therefore, the LUNs created by SnapDrive for UNIX have space reservation. You can use this variable to disable the space reservation for LUNs created by the `snapdrive snap connect` command and `snapdrive storage create` command. It is best to use the `-reserve` and `-noreserve` command-line options to enable or disable LUN space reservation in the `snapdrive storage create`, `snapdrive snap connect`, and `snapdrive snap restore` commands. SnapDrive for UNIX creates LUNs, resizes storage, makes Snapshot copies, and connects or restores the Snapshot copies based on the space reservation permission that is specified in this variable or by the `of-reserve` or `-noreserve` command-line options. It does not consider the storage system-side thin provisioning options before performing the preceding tasks.
trace-enabled=on	Set this variable to `on` to enable the trace log file, or to “off” to disable it. The default value is `on`. Enabling this file does not affect performance.

Variable	Description
trace-level=7	Specifies the types of messages SnapDrive for UNIX writes to the trace log file. This variable accepts the following values: • 1—Record fatal errors • 2—Record admin errors • 3—Record command errors • 4—Record warnings • 5—Record information messages • 6—Record in verbose mode • 7—Full diagnostic output The default value is `7`. **Note:** It is best not to change the default value. Setting the value to something other than 7 does not gather adequate information for a successful diagnosis.
`trace-log-file="/var/log/sd-trace.log"`	Specifies where SnapDrive for UNIX writes the trace log file. The default value varies depending on your host operating system. The path shown in this example is the default path for a Linux host.
trace-log-max-size=0	Specifies the maximum size of the trace log file in bytes. When the file reaches this size, SnapDrive for UNIX renames it and starts a new trace log. The default value is `0`. This value means that for every command, SnapDrive for UNIX creates a separate trace file. SnapDrive for UNIX never starts a new log file in the middle of an operation. The actual size of the file could vary slightly from the value specified here. **Note:** It is best to use the default value. If you change the default, remember that too many large log files can take up space on your disk and might eventually affect performance.
trace-log-save=100	Specifies how many old trace log files SnapDrive for UNIX should save. After this limit is reached, SnapDrive for UNIX discards the oldest file when it creates a new one. This variable works with the *tracelog-max-size* variable. By default, *trace-logmax-size=0* saves one command in each file, and *trace-log-save=100* retains the last `100` log files.
use-https-to-dfm=on	Specifies whether you want SnapDrive for UNIX to use SSL encryption (HTTPS) to communicate with Operations Manager. The default value is `on`.
use-https-to-filer=on	Specifies whether you want SnapDrive for UNIX to use SSL encryption (HTTPS) when it communicates with the storage system. The default value is `on`.

Variable	Description
use-https-to-viadmin=on	Specifies whether you want to use HTTP or HTTPS to communicate with Virtual Storage Console. **Note:** This variable is used for RDM LUN support.
vif-password-file=/opt/ONTAPsnapdrive/.vifpw	Specifies the location of the password file for the Virtual Storage Console. The default path for Linux is `/opt/ONTAPsnapdrive/.vifpw` **Note:** This variable is used for RDM LUN support.
virtualization-operation-timeout-secs=600	Specifies the number of seconds SnapDrive for UNIX waits for the response from IBM N series for VMware vSphere. The default value is `600` seconds. **Note:** This variable is used for RDM LUN support.
vmtype="lvm"	Specify the type of volume manager you want to use for SnapDrive for UNIX operations. The volume manager must be a type that SnapDrive for UNIX supports for your operating system. Following are the values that you can set for this variable, and the default value varies depending on the host operating systems: • Linux: `lvm` You can also specify the type of volume manager that you want to use by using the `-vmtype` option.
vol-restore	Determines whether SnapDrive for UNIX should perform volume-based snap restore (vbsr) or single-file snap restore (sfsr). The following are the possible values. • `preview`-Specifies that SnapDrive for UNIX initiates a volume-based SnapRestore preview mechanism for the given host file specification • `execute`-Specifies that SnapDrive for UNIX proceeds with volume based SnapRestore for the specified filespec. • `off` - Disables the vbsr option and enables the sfsr option. The default value is `off`. **Note:** If the variable is set to preview/execute, then you cannot override this setting by using CLI to perform SFSR operations.
volmove-cutover-retry =3	Specifies the number of times SnapDrive for UNIX retries the operation during the volume migration cut-over phase. The default value is 3.
volmove-cutover-retry-sleep =3	Specifies the number of seconds SnapDrive for UNIX waits between the volume-move-cutover-retry operation. The default value is 3.
volume-clone-retry=3	Specifies the number of times, SnapDrive for UNIX retries the operation during FlexClone creation. The default value is 3.

Variable	Description
volume-clone-retry-sleep =3	Specifies the number of seconds, SnapDrive for UNIX waits between the retries during FlexClone creation. The default value is 3.

What the SnapDrive configuration wizard does

The SnapDrive configuration wizard enables you to configure SnapDrive for UNIX, and the NFS or SAN settings depending on the NFS or SAN environment. Alternatively, you can also open up the `snapdrive.conf` file and edit your configuration variables.

SnapDrive configuration wizard

The SnapDrive configuration wizard lets you to quickly update the configuration variables in the wizard. Once the configuration information is updated, you can rerun the configuration wizard at any time to modify any changes to your SnapDrive configuration.

You can run the configuration wizard from `/opt/ontap/setup/config_wizard`

You can enter `exit` to close the configuration wizard and the changes do not get saved. Alternatively, you can modify the variables value directly in the `snapdrive.conf` file.

Related reference:

"SnapDrive for UNIX stack requirements" on page 9

SnapDrive configuration wizard in NFS, SAN, and Mixed environment

The configuration wizard allows you to configure in NFS, SAN or Mixed environment.

Steps to configure in NFS environment

About this task

The following are the steps to configure in NFS environment.

Procedure

1. Select the **NFS** profile.
2. Enable the Protection Manager Integration.
   - Select `Yes` to enable the access permission checks by using the dfm.
     - Enter the dfm server name or IP address followed by user name and password.
     - Enter the `http/https` port to communicate with the dfm. The default value is `8088.`
     - Enter the SSL server port to access the dfm. The default value is `8488.`
     - Enable the HTTPs enabled to communicate with the dfm.
   - Select `No` to enable the access permission checks by using the rbac.
3. Specify the role-based access control methods. The possible values are `native` and `dfm`.

- Select `native` to check the access permission for the host using the control file stored in `/vol/vol0/sdprbac/sdhost-name.prbac` or `/vol/vol0/sdprbac/sdgenericname.prbac`.
- Select `dfm` to check the access permission using the Operations Manager.

Note: If you select `dfm` as `rbac-method` without configuring dfm, a warning message specifying that the RBAC method is selected as DFM without enabling Protection Manager Integration is displayed.

4. Specify `https` or `http` to communicate with the storage system.
5. The final step is to save the configuration changes in the `snapdrive.conf` file, and restart the daemon.
   - If you select `Yes`, the SnapDrive daemon is restarted and the configuration changes are reflected.
   - If you select `No`, the variable values are changed in `snapdrive.conf` file, but the changes are not reflected.

Steps to configure in SAN environment

About this task

The following are the steps to configure in SAN environment.

Procedure

1. Select the SAN profile.
2. Select the required transport protocol.
   - Select `fcp` to set the default-transport.
   - Select `iscsi` to set the default-transport.
3. Select the SAN Storage Stack (combination of MPIO Solution, volume manager, file system). The options are `native`, and `none.`
4. Enable the Protection Manager Integration.
   - Select `Yes` to enable the access permission checks by using the dfm.
     - Enter the dfm server name or IP address followed by user name and password.
     - Enter the `http/https` port to communicate with the dfm. The default value is `8088.`
     - Enter the SSL server port to access the dfm. The default value is `8488.`
     - Enable the HTTPs enabled to communicate with the dfm.
   - Select `No` to enable the access permission checks by using the rbac.
5. Specify the role-based access control methods. The possible values are `native` and `dfm.`
   - Select `native` to check the access permission for the host using the control file stored in `/vol/vol0/sdprbac/sdhost-name.prbac` or `/vol/vol0/sdprbac/sdgenericname.prbac`.
   - Select `dfm` to check the access permission using the Operations Manager.

   Note: If you select `dfm` as `rbac-method` without configuring dfm, a warning message specifying that the RBAC method is selected as DFM without enabling Protection Manager Integration is displayed.
6. Enable SMVI integration to create RDM LUNs in the guest OS.
   - Select `yes` to create RDM LUNs in the guest OS. Then enter the IP address, user name and the password of the SMVI server.

- Select no to skip this option.

Note: SVMI integration is applicable only for FCP Protocol.

7. Specify https or http to communicate with the storage system.
8. The final step is to save the configuration changes in the snapdrive.conf file, and restart the daemon.
   - If you select Yes, the SnapDrive daemon is restarted and the configuration changes are reflected.
   - If you select No, the variable values are changed in snapdrive.conf file, but the changes are not reflected.

Steps to configure in Mixed SAN and NFS environment

About this task

The following are the steps to configure in Mixed SAN and NFS environment.

Procedure

1. Select the Mixed profile.
2. Select the required transport protocol.
   - Select fcp to set the default-transport.
   - Select iscsi to set the default-transport.
3. Select the SAN Storage Stack (combination of MPIO Solution, volume manager, file system). The options are native, and none.
4. Enable the Protection Manager Integration.
   - Select Yes to enable the access permission checks by using the dfm.
     - Enter the dfm server name or IP address followed by user name and password.
     - Enter the http/https port to communicate with the dfm. The default value is 8088.
     - Enter the SSL server port to access the dfm. The default value is 8488.
     - Enable the HTTPs enabled to communicate with the dfm.
   - Select No to enable the access permission checks by using the rbac.
5. Specify the role-based access control methods. The possible values are native and dfm.
   - Select native to check the access permission for the host using the control file stored in /vol/vol0/sdprbac/sdhost-name.prbac or /vol/vol0/sdprbac/sdgenericname.prbac
   - Select dfm to check the access permission using the Operations Manager.

   Note: If you select dfm as rbac-method without configuring dfm, a warning message specifying that the RBAC method is selected as DFM without enabling Protection Manager Integration is displayed.
6. Enable SMVI integration to create RDM LUNs in the guest OS.
   - Select yes to create RDM LUNs in the guest OS. Then enter the IP address, user name and the password of the SMVI server.
   - Select no to skip this option.

   Note: SVMI integration is applicable only for FCP Protocol.
7. Specify https or http to communicate with the storage system.

8. The final step is to save the configuration changes in the `snapdrive.conf` file, and restart the daemon.
   - If you select `Yes`, the SnapDrive daemon is restarted and the configuration changes are reflected.
   - If you select `No`, the variable values are changed in `snapdrive.conf` file, but the changes are not reflected.

Results

SnapDrive modifies the following variables in the `snapdrive.conf` file.

- *contact-http-dfm-port*
- *contact-ssl-dfm-port*
- *use-https-to-dfm*
- *default-transport*
- *use-https-to-filer*
- *fstype*
- *multipathing-type*
- *vmtype*
- *rbac-method*
- *rbac-cache*

Setting values in the snapdrive.conf file

You can change the values in the snapdrive.conf file or add new name-value pairs. Before you can change the `snapdrive.conf` file, ensure that you have the required permissions to complete the task.

Before you begin

You must be logged in as a root user.

Procedure

1. Back up the `snapdrive.conf` file.
2. Open the `snapdrive.conf` file in a text editor.
3. Change to the file. To add a name-value pair, use the following format:

   `config-option-name=value` *value* # optional comment

   `config-option-name` is the name of the variable you want to configure; for example, audit-log-file.

   `value` is the value you want to assign to this option.

   If you want to include a comment with the name-value pair, precede the comment with a pound sign (#).

   You should enter only one name-value pair per line.

   If the name or the value uses a string, enclose the string in either single (‘) or double (") quotation marks. You can place the quotation marks around either the entire name-value pair or the value. The following examples show how you can use quotes and comments with name-value pairs:

   ```
   "config-option-one=string with white space" # double quotes around the pair
   config-option-two="string with white space" # double quotes around the value
   config-option-2B='string with white space' # single quotes around the value
   ```

4. To modify a name-value pair, replace the current value with the new value. It is best to follow these steps so that you always have a record of the default value in the file.
   a. Comment out the line you want to modify.
   b. Copy the commented-out line.
   c. Un-comment the copied text by removing the pound (#) sign.
   d. Modify the value.

   If you want to specify a blank value (for example, to disable the audit log file), enter a pair of double quotation marks ("").
5. Save the file after you make your changes.

   SnapDrive for UNIX automatically checks this file each time it starts. Your changes take effect the next time it starts.
6. Restart the SnapDrive for UNIX daemon by using the `snapdrived restart` command. Restarting the daemon is necessary for `snapdrive.conf` file changes to take effect.

Checking the version of SnapDrive for UNIX

You can verify the version of SnapDrive for UNIX by entering the `snapdrive version` command.

Procedure

At the CLI, enter the following command:

```
snapdrive version
```

Example:

```
# snapdrive version
snapdrive Version 5.1
snapdrive Daemon Version 5.1
```

Note: The only argument this command accepts is `-v` which displays additional version details. If you include additional arguments, SnapDrive for UNIX displays a warning and then the version number.

Configuration information in SnapDrive for UNIX for guest operating system

You must configure the storage systems and Virtual Storage Console in the guest operating system for provisioning RDM LUNs.

The login information is required to communicate with the Virtual Storage Console for provisioning RDM LUN. Once the configuration is complete, SnapDrive for UNIX allows you to create RDM LUNs in the guest operating system.

For installation and configuration requirements of Virtual Storage Console, see the *IBM® System Storage N series Virtual Storage Console® for VMware® vSphere™ Installation and Administration Guide.*

Configuring Virtual Storage Console for SnapDrive for UNIX

You must configure Virtual Storage Console to access the storage system, and use the login names and passwords assigned to the storage system.

Before you begin

Ensure that Virtual Storage Console is installed in the windows system where VMware vCenter resides.

Procedure

1. In the **vCenter Home** view, under **Solutions and Applications** click **vCenter** in the **IBM N series** screen.
2. Click the **Backup and Recovery**, and then click the **Setup** to view the storage system entries.
3. If there are no storage system entries, then click **Add** to add the required storage system in the Virtual Storage Console. The **Add Storage System** dialog box appears.
4. In the **Add Storage System** window, enter the IP address, user name and password of the storage system. Then click **OK**. The storage system is now ready to communicate with the Virtual Storage Console.

Related concepts:

"VMware VMotion support in SnapDrive for UNIX" on page 136

"Configuration options and their default values" on page 59

"Limitations of RDM LUNs managed by SnapDrive for UNIX" on page 12

Related tasks:

"Verifying login information for Virtual Storage Console" on page 83

"Deleting a user login for a Virtual Storage Console" on page 83

"Considerations for provisioning RDM LUNs" on page 136

Specifying login information for Virtual Storage Console

The Virtual Storage Console must be configured in SnapDrive for UNIX for provisioning RDM LUNs in the guest operating system. However, there is a user name and password that allows SnapDrive for UNIX to access the Virtual Storage Console. The Virtual Storage Console does not authenticate these login credentials.

Before you begin

Ensure that Virtual Storage Console is configured with the vCenter.

Procedure

1. Enter the following command: `snapdrive config set -viadmin <user> <viadmin_name>`

   user is the user name of the virtual interface system.

   viadmin_name is the name or the IP address of the virtual interface system.
2. At the prompt, enter the password, if there is one.

   Note: If you have not set any password, press `Enter` (the null value) when prompted for a password.
   This example sets up a user called `sdadmin` for a virtual interface:

```
guest# snapdrive config set -viadmin sdadmin ruffleskin
Password for sdadmin:
Retype Password:
```

SnapDrive for UNIX is now ready to provision RDM LUNs in the guest operating system.

Note: If you wish to configure a new virtual interface, the existing virtual interface details are overwritten, as SnapDrive for UNIX allows you to have only one virtual interface configured to a guest operating system.

Verifying login information for Virtual Storage Console

You can verify if the virtual interface is configured in SnapDrive for UNIX using the `snapdrive config list` command.

Procedure

Enter the following command: `snapdrive config list`
This command displays the user name or virtual interface specified in SnapDrive for UNIX. This does not display the passwords for the virtual interface system.
The following example displays the user that is corresponding with a virtual interface named as ruffleskin.

```
# snapdrive config list
user name    appliance name   appliance type
------------------------------------------------
root       rumplestiltskins   StorageSystem
sdadmin    ruffleskin      VirtualInterface
```

Deleting a user login for a Virtual Storage Console

You can delete a user login of a virtual interface, by executing the `snapdrive config delete` command.

Before you begin

Ensure that you have configured the Virtual Storage Console in the vCenter.

Procedure

Enter the following command: `snapdrive config delete` *`appliance_name`*
appliance_name is the name or the IP address of the virtual interface system.
SnapDrive for UNIX removes the user name or password login information for the virtual interface you specify.

Note: To enable SnapDrive for UNIX to access the virtual interface, you must specify a new user login.

Configuration information for Vserver environment

You must configure the Vserver in SnapDrive for UNIX to perform SnapDrive operations.

In DATA ONTAP operating in Cluster-Mode to configure Vserver with SnapDrive for UNIX, ensure that the IP address of the Vserver's management logical interface

(LIF) should be mapped with the Vserver name either in the DNS or in the `/etc/hosts` file. You must also ensure that the Vserver name is configured in SnapDrive for UNIX by using the following command:

```
snapdrive config set <vsadmin> <Vserver name>
```

Related concepts:

"SnapDrive for UNIX support for Vserver" on page 5

Login information for Vserver

A user name and password allows SnapDrive for UNIX to access the Vserver. It also provides security because, in addition to being logged in as a vsadmin, you must run SnapDrive for UNIX and provide the correct user name and password whenever prompted.

Specifying login information for Vserver

You must specify the user login information for a Vserver. Depending on what you specified when you set up the Vserver, each Vserver must use the configured Vserver user name. If there is a change in your Vserver name, you must ensure that the new Vserver name is configured in SnapDrive for UNIX.

Procedure

Enter the following command: `snapdrive config set` *user_name filername* [*filername* ...]

- *user_name* is the user name that was specified for Vserver when you first set it up. The default user is vsadmin. *filername* is the name of the Vserver name.
- *filer_name* defines that you can enter multiple Vservers on one command line if they all have the same user login or password. You must enter the name of at least one Vserver name.

```
# snapdrive config set vsadmin clstr-vs2
Password for vsadmin:
Retype password:
```

Verifying login information for Vserver

You can verify if the Vserver is configured in SnapDrive for UNIX using the `snapdrive  config list` command.

Procedure

Enter the following command: `snapdrive config list`
This command displays the user name or vserver specified in SnapDrive for UNIX, and does not display the passwords for the vserver.
The following example displays the *vsadmin* as a *StorageSystem*.

```
# snapdrive config list
username    appliance name   appliance type
-------------------------------------------
vsadmin     clstr-vs2        StorageSystem
```

Deleting a user for a Vserver

You can delete login information of a Vserver by executing the `snapdrive config delete` command.

Procedure

Enter the following command: `snapdrive config delete` *`appliance_name`*
appliance_name is the name of the Vserver, which you want to delete login information.

```
# snapdrive config delete clstr-vs2
Deleted configuration for appliance: clstr-vs2
```

SnapDrive for UNIX removes the login information for the Vserver you specify.

Host preparation for adding LUNs

You need to prepare the host to add LUNs.

Checking host information

Some host systems require that you prepare them before you create new LUNs. SnapDrive for UNIX provides commands to complete these steps to prepare the host to create new LUNs.

If your operating system requires that you prepare it before you create new LUNs, you can use the `snapdrive config` command. The `snapdrive config` command allows you to check information about how many LUNs are created on a storage system that is mapped to your host.

Note: Not all host platform operating systems require that you prepare the host. Currently, these commands are necessary only on Linux hosts.

Determining how many LUNs can be created

SnapDrive for UNIX lets you determine how many LUNs can be created on the host without exceeding the limit.

You can use `snapdrive config check luns` command to determine this value.

On a Linux host, this command checks the existing /dev/sg files to determine how many are unused.

Adding host entries for new LUNs

You can create a specific number of new LUNs using SnapDrive for UNIX. SnapDrive for UNIX provides specific commands for this purpose.

About this task

Ensure that the host is ready to create specific number of new LUNs. These LUNs reside on a storage system that is mapped to the host.

Procedure

`snapdrive config prepare luns -count count`
`-count` is the number of new LUNs for which you want the host to be prepared. On Linux, this command adds a new `/dev/sg` device file for each potential LUN for which a device file is not currently available.

Note: If you have manually edited the /kernel/drv/lpfc.conf file for persistent bindings, ensure that the FC-bind-WWPN entry is after # BEGIN: LPUTIL-managed Persistent Bindings.

Audit, recovery, and trace logging in SnapDrive for UNIX

SnapDrive for UNIX helps you maintain various types of log files such as audit, recovery, and trace log files. These log files are used later for troubleshooting.

Types of logs

SnapDrive for UNIX supports various types of log files, which help you troubleshoot when something is not working as expected.

- Audit log

  SnapDrive for UNIX logs all commands and their return codes in an audit log. SnapDrive for UNIX makes an entry when you initiate a command and another when the command is complete. The later entry includes both the status of the command and the completion time.
- Recovery log

  Some SnapDrive for UNIX operations have the potential to leave the system in an inconsistent or less usable state if interrupted. This situation could occur if a user terminates the program, or if the host crashes in the middle of an operation. The recovery log contains the steps of a Snap restore operation. This documents the steps that are taken and the progress made so that technical support can assist you with the manual recovery process.
- Trace log

  SnapDrive for UNIX reports information useful for diagnosing problems. If you have a problem, technical support might request this log file.

  SnapDrive 4.0 for UNIX introduced SnapDrive for UNIX daemon service. For SnapDrive for UNIX commands to run, the daemon must be running. Daemon tracing must be carried out on for each individual command, even when commands are run in parallel. The location and name of the log file is /var/log/sd-trace.log. These trace files have only the command-specific trace entries. The trace logs for daemon execution are recorded in a different trace file /var/log/sd-daemon-trace.log.

Enabling and disabling log files

If you want to enable a log file, specify a file name as the value in the name-value pair of the log file you want to enable. If you want to disable a file, do not enter a value for the log file name parameter.

Before you begin

Ensure that you are logged in as a root user.

Procedure

1. Open the snapdrive.conf file in a text editor.
2. Choose the appropriate option to either enable or disable a log file.

If you want to...	Then...
Enable a log file	Specify a file name as the value in the name-value pair of the log file you want to enable. SnapDrive for UNIX only writes log files if it has the name of a file to write to. The default names for the log files are as follows: • Audit log: `sd-audit.log` • Recovery log: `sd-recovery.log` • Trace log: `sd-trace.log` **Note:** The path to these files might vary depending on your host operating system.
Disable a log file	Do not enter a value for the log file name parameter. If you do not supply a value, there is no file name to which SnapDrive for UNIX can write the log information. **Example** This example disables the audit log file. `audit-log-file=""`

3. Save the `snapdrive.conf` file after you make all your changes.

   SnapDrive for UNIX automatically checks this file each time it starts. You must restart the SnapDrive for UNIX daemon for the changes to take effect.

Log file rotation settings

The values you specify for the variable in the `snapdrive.conf` file affect the log file rotation.

The values you specify in the `snapdrive.conf` file enable automatic log file rotations. You can change these values, if necessary, by editing the `snapdrive.conf` variables. The following options affect log file rotation:

- `audit-log-max-size`
- `audit-log-save`
- `trace-max-size`
- `trace-log-max-save`
- `recovery-log-save`

With automatic log rotation, SnapDrive for UNIX keeps old log files until it reaches the limit specified in the `audit-log-save`, `trace-log-save`, and `recovery-log-save` variable. Then it deletes the oldest log file.

SnapDrive for UNIX tracks which file is oldest by assigning the file the number "0" when it creates the file. Each time it creates a new file, it increments by 1 the number assigned to each of the existing log files. When a log file's number reaches the save value, SnapDrive for UNIX deletes that file.

Example: This example uses the `ls` command to display information about the log files on the system.

Based on those settings, you would see the following information in log files.

```
# ls -l /var/log/sd*
-rw-r--r-- 1 root other 12247 Mar 13 13:09 /var/log/sd-audit.log
-rw-r--r-- 1 root other 20489 Mar 12 16:57 /var/log/sd-audit.log.0
-rw-r--r-- 1 root other 20536 Mar 12 03:13 /var/log/sd-audit.log.1
-rw-r--r-- 1 root other 3250 Mar 12 18:38 /var/log/sd-recovery.log.1
-rw-r--r-- 1 root other 6250 Mar 12 18:36 /var/log/sd-recovery.log.2
-rw-r--r-- 1 root other 6238 Mar 12 18:33 /var/log/sd-recovery.log.3
-rw-r--r-- 1 root other 191704 Mar 13 13:09 /var/log/sd-trace.log
-rw-r--r-- 1 root other 227929 Mar 12 16:57 /var/log/sd-trace.log.0
-rw-r--r-- 1 root other 213970 Mar 12 15:14 /var/log/sd-trace.log.1
-rw-r--r-- 1 root other 261697 Mar 12 14:16 /var/log/sd-trace.log.2
-rw-r--r-- 1 root other 232904 Mar 12 14:15 /var/log/sd-trace.log.3
-rw-r--r-- 1 root other 206905 Mar 12 14:14 /var/log/sd-trace.log.4
```

Contents of an audit log file

The audit log shows information about commands you issued with SnapDrive for UNIX.

The audit log file maintains the history of the following information:

- The commands issued.
- The return value from those commands.
- The user ID of the user who invoked the command.
- A timestamp indicating when the command started (with no return code) and another timestamp indicating when the command finished (with a return code). The audit log record shows only information about `snapdrive` use (issued commands).

An audit log file contains the following information.

Field	Description
uid	user ID
gid	group ID
msgText	message text
returnCode	return code from a command

Changing the defaults for the audit logs

You can use `snapdrive.conf` file to change the logging parameters of the audit log files such as maximum size of audit log file, and maximum number of old audit files.

The `snapdrive.conf` file enables you to set the following values for audit logging:

- The maximum size of the audit log file. The default size is 20K. After the file size reaches the value specified in the `snapdrive.conf` file, SnapDrive for UNIX renames the current audit log file by adding an arbitrary number to the name. Then, a new audit file is started using the name specified by the `audit-log-file` value.
- The maximum number of old audit files that SnapDrive for UNIX saves. The default is 2.

Example of an audit log file:

```
2501: Begin uid=0 gid=1 15:35:02 03/12/04 snapdrv snap create -dg
rdg -snapname snap_rdg1
2501: Status=0 15:35:07 03/12/04
2562: Begin uid=0 gid=1 15:35:16 03/12/04 snapdrv snap create -dg
rdg -snapname snap_rdg1
2562: FAILED Status=4 15:35:19 03/12/04
```

The first pair of lines in this example shows an operation that succeeded, as indicated by the "Status=0" line.

The second pair of lines indicates an operation that failed. The return code of "4" means “already exists.” If you look at the two command lines, you can see that the first created a Snapshot copy called `snap_rdg1`. The second line attempted to do the same, but the name already existed, so the operation failed.

Contents of the recovery log

The recovery log helps you to trace the reasons for an inconsistent system state. SnapDrive for UNIX generates this file when some operation stops working.

If you press Ctrl-C to halt SnapDrive for UNIX, or if the host or storage system fails in the middle of an operation, the system might not be able to recover automatically.

During any operation that, if interrupted, could leave the system in an inconsistent state, SnapDrive for UNIX writes information to a recovery log file. If a problem occurs, you can send this file to technical support so they can assist you in recovering the system’s state.

The recovery log utility maintains the records of the commands that are issued during the operation. Each command is marked with an operation_index (a number that uniquely identifies the operation being executed), followed by the date/time stamp and the message text).

Default values for the recovery logs

You can change the name of the recovery log file and the maximum number of old recovery log files that SnapDrive for UNIX saves.

The `snapdrive.conf` file enables you to set the following values for recovery logging:

- The name of the file containing the recovery log, such as `recovery.log`.
- The maximum number of old recovery files that SnapDrive for UNIX saves. The default is 20. SnapDrive for UNIX keeps this number of recovery logs, if the problem with the process is not identified immediately. SnapDrive for UNIX starts a new recovery log file each time it completes an operation. Then, renames the previous one by adding an arbitrary number to the name, such as `recovery.log.0`, `recovery.log.1`, and so on.

Note: The size of the recovery log file depends on the operation that is performed. Each recovery log contains information about a single operation. When that operation is complete, SnapDrive for UNIX starts a new recovery log, regardless of how large the previous file was. As a result, there is no maximum size for a recovery log file.

The following sample recovery log shows that SnapDrive for UNIX has restored two Snapshot copies before the operations halted. You could send this recovery log file to technical support for assistance in restoring the remaining Snapshot copies.

```
6719: BEGIN 15:52:21 03/09/04 snapdrive snap restore -dg jssdg -
snapname natasha:/vol/vol1:abort_snap_restore
6719: BEGIN 15:52:27 03/09/04 create rollback snapshot:
natasha:/vol/vol1:abort_snap_restore.RESTORE_ROLLBACK_03092004_155
225
6719: END 15:52:29 03/09/04 create rollback snapshot:
natasha:/vol/vol1:abort_snap_restore.RESTORE_ROLLBACK_03092004_155
225 successful
6719: BEGIN 15:52:29 03/09/04 deactivate disk group: jssdg
6719: BEGIN 15:52:29 03/09/04 stop host volume:
/dev/vx/dsk/jssdg/jvol_1
6719: END 15:52:30 03/09/04 stop host volume:
/dev/vx/dsk/jssdg/jvol_1 successful
6719: BEGIN 15:52:30 03/09/04 unmount file system: /mnt/demo_fs
6719: END 15:52:30 03/09/04 unmount file system: /mnt/demo_fs
successful
6719: BEGIN 15:52:30 03/09/04 stop host volume:
/dev/vx/dsk/jssdg/jvol_2
6719: END 15:52:30 03/09/04 stop host volume:
/dev/vx/dsk/jssdg/jvol_2 successful
6719: BEGIN 15:52:30 03/09/04 deport disk group: jssdg
6719: END 15:52:30 03/09/04 deport disk group: jssdg successful
6719: END 15:52:30 03/09/04 deactivate disk group: jssdg
successful
6719: BEGIN 15:52:31 03/09/04 SFSR of LUN: /vol/vol1/lun1 from
snapshot: abort_snap_restore
6719: END 15:52:31 03/09/04 SFSR of LUN: /vol/vol1/lun1 from
snapshot: abort_snap_restore successful
6719: BEGIN 15:52:47 03/09/04 SFSR of LUN: /vol/vol1/lun2 from
snapshot: abort_snap_restore
6719: END 15:52:47 03/09/04 SFSR of LUN: /vol/vol1/lun2 from
snapshot: abort_snap_restore successful
```

What the trace log file is

The technical support uses the trace log file to troubleshoot problems.

Enabling the trace log file does not affect system performance. By default, this file is enabled. You can disable by setting the `snapdrive.conf` `trace-enabled` variable to `off`.

Default values for the trace log files

The trace log files allow you to set various parameters and also change them. These parameters must be set in the `snapdrive.conf` file.

The following values must be set in the `snapdrive.conf` file:

- The name of the file containing the trace log.
- The maximum size of the trace log file. The default size is "0 "bytes. This value ensures that each trace log file contains only one SnapDrive for UNIX command.

  If you reset the default size to a value other than 0, when the file reaches the size you specified, SnapDrive for UNIX renames the current trace log file by adding an arbitrary number to the name. Then it starts a new trace log file using the name specified by the `trace-log-file` value.
- The maximum number of old trace files that SnapDrive for UNIX saves. The default is 100.
- The types of messages that SnapDrive for UNIX writes to the trace log file. By default, the trace log file contains fatal errors, admin errors, command errors, warnings, and information messages.

What AutoSupport is

AutoSupport allows SnapDrive for UNIX to send any operational failures that is incurred due to SnapDrive is sent to the EMS log view of the storage system in the `/etc/log/ems` file.

How SnapDrive for UNIX uses AutoSupport

AutoSupport messages are logged in the EMS log view of the storage system when the *autosupport-enabled* option is set to `on` in the `snapdrive.conf` file. By default, this option is set to *on* in the `snapdrive.conf` file. SnapDrive for UNIX sends AutoSupport messages to the storage system, where the messages are logged in the Event Management System (EMS).

An AutoSupport message is sent during any of the following scenarios:

- When any operational failure results in a halted operation, an AutoSupport message is sent to the storage system for which the operation failed.
- If multiple storage systems are connected to the host and the operational failure occurs in more than one storage system, SnapDrive for UNIX sends the AutoSupport message to a specific storage system for which the operation fails.
- When a new storage controller is added by using *snapdrive config set <username> <filername>*, SnapDrive for UNIX sends an AutoSupport message to the specified storage system.
- When the SnapDrive daemon is restarted/started, the AutoSupport message is sent to the configured storage system.
- When `snapdrive storage show -all` command is executed, the AutoSupport message is sent to all the configured storage system.
- When there is any successful snap create operation, the AutoSupport message is sent to the storage system.
- In Data ONTAP 8.1 operating in Cluster-Mode for a Vserver, the Admin Vserver must be configured by using `snapdrive config set -cserver <user_name> <cluster_name>` to log the AutoSupport message. The AutoSupport message is not sent to the Vserver in Data ONTAP 8.1 operating in Cluster-Mode, if the corresponding Admin Vserver is not configured using SnapDrive for UNIX
- In Data ONTAP operating in Cluster-Mode, the AutoSupport message is sent to any of the Vserver node in your system.
- In Data ONTAP 8.1 operating in Cluster-Mode, if there are more than one Vservers configured with SnapDrive for UNIX, you must ensure that the *suppression* flag is set as `off` in the EMS to view all the AutoSupport messages in the `/etc/log/ems` file.

Contents of AutoSupport message

AutoSupport messages contain the following information.

- Event source
- Event ID
- Version of SnapDrive for UNIX
- Message status: Log level messages, for example 1 for alert, 2 for critical, 3 for error, 4 for warning, 5 for notice, 6 for information, and 7 for debug
- Host name
- Host operating system
- Release version of the host operating system

- Name of the storage system
- Usage of Protection Manager/Role Based Access Control
- Error category
- AutoSupport Flag message entry as FALSE

The following are the additional information that is available when you execute `snapdrive storage show -all` command:

- Type of protocols (FCP/iSCSI)
- Number of connected LUNs
- Number of disk or volume groups
- Number of file specifications
- Number of host volumes

Note: When AutoSupport is enabled in SnapDrive for UNIX, upon any operation failures, the error messages are logged in the EMS storage system. If the error message contains any special characters such as (<,>,&,',", \r) garbled values are displayed in the EMS log view of the storage system.

Examples of AutoSupport messages

SnapDrive for UNIX provides examples for different scenarios. The content of an AutoSupport message in all the examples are essentially the same regardless of your operating system.

Example: Adding a new storage system

The following example is a message sent from a host named *lnx225-155*. Red Hat Linux

```
computerName="lnx225-155"
eventSource="snapdrive"
appVersion="5.1"
eventID="3"
category="10.72.225.15 configured"
subject="host_name=lnx225-155, host_os=Linux, host_os_release=#1 SMP Fri Jul 8 17:59:09 EDT
2011, host_os_version=2.6.18-274.el5PAE, No of controller=3, PM/RBAC=native"
```

Example: Restarting the Daemon

SnapDrive for UNIX sends the following AutoSupport message to the storage system when you restart the daemon.

- Red Hat Linux

```
computerName="lnx225-155"
eventSource="snapdrive"
appVersion="5.1"
eventID="2"
category="daemon restarted"
subject="host_name=lnx225-155, host_os=Linux, host_os_release=#1 SMP Tue Aug 18 15:51:48
EDT 2009, host_os_version=2.6.18-164.el5, No of controller=1, PM/RBAC=dfm"
```

Example: Operational failure

SnapDrive for UNIX sends the following AutoSupport message to the storage system when LUN create operation fails.

- Red Hat Linux

```
computerName="lnx225-155"
eventSource="snapdrive"
appVersion="5.1"
eventID="4"
category="storage create failed"
subject="host_name=lnx225-155, host_os=Linux, host_os_release=#1 SMP Tue Aug 18 15:51:48
EDT 2009, host_os_version=2.6.18-164.el5, No of controller=4, PM/RBAC=native,1360:
Failed to create LUN /vol/vol1/lun1 on filer 10.72.197.82 : No such volume"
```

Multipath access in SnapDrive for UNIX

SnapDrive for UNIX supports FC multipath access to the storage systems using the standard multipathing software solution. By using multipathing, you can configure multiple network paths between the host and storage system.

Platform	Multipathing solution
Linux	NativeMPIO [DM Multipath]

If one path fails, the FC traffic continues on the remaining paths. Multipathing is required if the host has multiple paths to a LUN, and it works by making the underlying paths transparent to the user. If the multipathing solution specified in the configuration file for SnapDrive for UNIX operations is configured and supported, SnapDrive for UNIX uses the specified multipathing solution.

Enabling multipathing

To use multipathing in SnapDrive for UNIX, you need to complete few steps like installing the HBA card and starting the HBA card. If you are using any third party multipathing solution, then you must download the software and application package from the HBA vendor's website.

Before you begin

To ensure you have the current version of the system components, see the N series interoperability matrix website (accessed and navigated as described in Websites) for FC and iSCSI products.

Support for new components is added on a continuous basis. The N series interoperability matrix website (accessed and navigated as described in Websites) contains a complete list of supported HBAs, platforms, applications, and drivers.

Procedure

1. Install the supported HBAs before you install the appropriate Host Utilities software. For more information, see the *Linux Host Utilities Setup Guide* on the N series support website (accessed and navigated as described in Websites).

   Note: SnapDrive for UNIX supports Multi-vendor HBAs.
2. Load and start the HBA service. For more information, see the *Linux Host Utilities Setup Guide*.

   If the HBA service is not running, you will get the following error on executing the SnapDrive for UNIX commands, such as, `snapdrive storage create`, `snapdrive config prepare luns`:

   ```
   0001-876 Admin error: HBA assistant not found
   ```

For multipathing configuration ensure that the required number of paths are up and running. You can verify the paths using the sanlun utility, which comes with the Host Utilities software. For example, in the FC multipathing configuration, you can use the sanlun fcp show adapter -v command. In the following example, there are two HBA ports (fcd0 and fcd1) connected to the host and are operational (port state). You can also have only one HBA or iSCSI initiator and yet configure multipathing by providing more than one path to the target LUNs.

```
# sanlun fcp show adapter -v
adapter name: fcd0
WWPN: 50060b000038c428
WWNN: 50060b000038c429
driver name: fcd
model: A6826A
model description: Fibre Channel Mass Storage Adapter
(PCI/PCI-X)
serial number: Not Available
hardware version: 3
driver version: @(#) libfcd.a HP Fibre Channel
ISP 23xx & 24xx Driver B.11.23.04
/ux/core/isu/FCD/kern/src/common/wsio/fcd_init.c:Oct 18
2005,08:19:50
firmware version: 3.3.18
Number of ports: 1 of 2
port type: Fabric
port state: Operational
supported speed: 2 GBit/sec
negotiated speed: 2 GBit/sec
OS device name: /dev/fcd0
adapter name: fcd1
WWPN: 50060b000038c42a
WWNN: 50060b000038c42b
driver name: fcd
model: A6826A
model description: Fibre Channel Mass Storage Adapter
(PCI/PCI-X)
serial number: Not Available
hardware version: 3
driver version: @(#) libfcd.a HP Fibre Channel
ISP 23xx & 24xx Driver B.11.23.04
/ux/core/isu/FCD/kern/src/common/wsio/fcd_init.c:Oct 18
2005,08:19:50
firmware version: 3.3.18
Number of ports: 2 of 2 port type: Fabric
port state: Operational
supported speed: 2 GBit/sec
negotiated speed: 2 GBit/sec
OS device name: /dev/fcd1
```

If multipathing is enabled on a host, multiple paths will be visible for the same LUN. You can use sanlun lun show all command to verify. In this example you can find multiple paths to the same LUN (fish: /vol/vol1/lun).

```
 [root@lnx221-75 ~]# sanlun lun show
filer:        lun-pathname device filename adapter protocol lun size lun state
f960-221-167: /vol/vol1/lun1 /dev/sdd host5 FCP 100m (104857600)      GOOD
f960-221-167: /vol/vol1/lun1 /dev/sdc host6 FCP 100m (104857600)      GOOD
```

3. **Conditional step:** If a third-party multipathing solution is supported by SnapDrive for UNIX or Host Utilities, you must download the HBA driver software package and applications package from the HBA vendor's website. **QLogic**: For QLogic HBAs, go to Qlogic support center. Under OEM Models, select IBM. Locate the driver version listed in the support Matrix and download it. **Emulex:** For Emulex HBAs, go to Emulex downloads. Under

Downloads, select IBM. Locate the driver version listed in the support Matrix and download it. Also download the Emulex applications package from the same location.

If you are using QLogic adapter with FC connectivity, download the QLogic rescan script from the QLogic website and copy it to the `/root` path (for example `/root/dynamic-lun-rescan.sh`). The QLogic rescan script asks for user confirmation; SnapDrive for UNIX might hang indefinitely at this confirmation stage. You can avoid this confirmation by setting the variable *QL_DISABLE_WARNING* to 1 in the script.

Earlier versions of SnapDrive for UNIX used vendor specific SCSI rescan scripts to scan LUNs over FCP, and thereby copying vendor specific script to `/root/dynamic-lun-rescan.sh`. This was made available until RHEL 5U3.

For RHEL 5U4/ SLES 10SP2 and later versions, the rescan script is currently available in the `/usr/bin` directory. In case the rescan script is not available in the directory, it is present along with the `sg3_utils` package.

Note: Ensure that the `sg3_utils` and `sg3_utils-libs` must be available for RHEL and OEL/OL versions. However, the `sg3_utils` libraries are available for SLES version in the `sg3_utils.rpm` package.

4. In an FC configuration, you must zone the host HBA ports and the target ports using the switch zoning configuration.
5. Install and set up the appropriate FC.
6. Check the SnapDrive for UNIX stack requirements.
7. Install or upgrade SnapDrive for UNIX.
8. Verify the SnapDrive for UNIX installation.
9. Locate the `snapdrive.conf` file path.
10. Configure the following configuration variables in the `snapdrive.conf` file:
    - *multipathing-type*
    - *default-transport*
    - *fstype*
    - *vmtype*

    For every host, multipathing type, transport type, file system, and volume manager type are dependent on each other. The following table describes all the possible combinations.

Host platform	default transport type	multipathing type	fstype	vmtype
Linux	iscsi	nativempio	ext4 or ext3	lvm
	iscsi	none	ext4 or ext3	lvm
	FCP	none	ext4 or ext3	lvm
	FCP	nativempio	ext4 or ext3	lvm

The above table gives the supported values of the *multipathing-type*, *default-transport*, *fstype*, and *vmtype* configuration variables.

Note: If the transport protocol is `iscsi`, and the multipath-type is set as *none*, it is recommended to stop the multipath daemon and execute SnapDrive for UNIX commands.

11. Save the `snapdrive.conf` file.

SnapDrive for UNIX automatically checks this file each time it starts. You must restart the SnapDrive for UNIX daemon for the changes to take effect.

Related concepts:

"SnapRestore and Snapconnect operations does not work in Linux after multipathing type migration" on page 225

Multipath setup

Linux MPIO works if host setup is completed. The host setup is broadly classified as HBA setup, HBA driver parameter setup, Multipath setup, LVM setup, and SnapDrive for UNIX setup.

HBA setup

HBA Setup is the process of installing an appropriate HBA Card and the supported drivers on a Linux host.

Following are the HBA Cards that are supported for a Linux MPIO Configuration:

- QLOGIC
- EMULEX

These HBA cards are supported by FC Host Utilities Linux Attach Kit 3.0 and above with RHEL4 Update 6 and above.

Setting up HBA driver parameter

To set up HBA driver for Linux MPIO, the exact sequence of steps required depends on the operating system used. The set up also depends on the HBA card used.

About this task

The following steps are required to set up the HBA driver parameter for Linux MPIO.

Procedure

1. Uninstall the built-in drivers.
2. Install the latest drivers from the vendor's website.
3. Set the driver parameters using the vendor's CLI Configuration tool.
4. Edit the `/etc/modprobe.conf` file to set up default parameters for the HBA driver.
5. Re-generate the initrd (Ram Disk Image) with the above HBA driver parameters.
6. Reboot the host for the new HBA Driver settings to be effective.

   For more information on the exact steps for HBA Driver Parameter setup for the various HBA Cards, see the Linux Host Utilities *Setup Guide*.

Multipath configuration variables

You need to change few configuration variables in the `snapdrive.conf` file for MPIO to work with Linux.

After installing SnapDrive for UNIX on the host, edit the `/opt/Ontap/snapdrive/snapdrive.conf` file and change the following settings to the appropriate values:

```
enable-implicit-host-preparation=on  # Enable implicit host preparation for LUN creation
  default-transport="FCP"  # Transport type to use for storage provisioning, when a decision
is needed
  multipathing-type= "nativempio"  # Multipathing software to use when more than one
multipathing solution is available
```

Restart the SnapDrive daemon for the `snapdrive.conf` file changes to take effect. After SnapDrive daemon restart, SnapDrive commands start using the DM-MP stack.

Setting up multipathing

To setup multipath for Linux, you need to complete few steps.

Procedure

1. After host reboots, the multipath daemon should be running as below:

   ```
   root@lnx197-123 ~]# ps -ef | grep multipathd
   root      5713     1  0 22:44 ?        00:00:00 /sbin/multipathd
   root      5739  1783  0 22:44 pts/1    00:00:00 grep multipathd
   ```

   If the multipath daemon is not running, ensure that it runs after a reboot. You can start the multipath daemon by running the following command:

   ```
   [root@lnx197-123 ~]# chkconfig --level 345 multipathd on
   ```

2. For `/etc/multipath.conf` file, see the *Linux Host Utilities Setup Guide*.

   Note: SnapDrive for UNIX does not support the use of user friendly names or aliases in multipath environments. Ensure that *user_friendly_names=no* is set and that there are no aliases defined in the `/etc/multipath.conf`file.
3. Replace the string `1HITACHI_HUS103073FL3800_V3WTL7XA` with the output of the command `scsi_id -gus /block/<LD>`"where `LD` is the local block device name.

   Note: Sometimes, it is possible that for some local block devices the `scsi_id` command may not return any strings. In that case, the local block device needs to be blacklisted by using devnode directive.
4. Increase the number of open file descriptors that a process can open in the host. This is done by appending the following lines in `/etc/security/limits.conf` file.

   ```
   soft nofile 4096
         hard nofile 4096
   ```

5. Ensure that the Linux SG Driver is always loaded after a system reboot. You can ensure this by executing the following command:

   ```
   echo "modprobe sg" >> /etc/rc.local
   ```

6. Reboot the host to ensure that settings are active.

   Note: The lvm2-2.02.17-7.27.8 and the *filter* setting must be assigned as = `["r|/dev/.*/by-path/.*|", "r|/dev/.*/by-id/.*|", "r|/dev/cciss/.*|", "a/.*/"]` in the `lvm.conf` file in SLES10 SP2.

Thin provisioning in SnapDrive for UNIX

The thin provisioning feature in SnapDrive for UNIX allows the user to have more storage space for the hosts than is actually available on the storage system.

Within SnapDrive for UNIX, you cannot set the fractional reserve value, and there is no integration with Data ONTAP features such as autodelete and autosize. These Data ONTAP features can be safely used with SnapDrive for UNIX, however there is no awareness within SnapDrive for UNIX, if an autodelete or autosize event occurs.

Enabling thin provisioning for LUNs

You can use SnapDrive for UNIX to carry out thin provisioning on your storage system. Thin provisioning is also referred as space-reservation.

Procedure

Set the *space-reservations-enabled* configuration variable value to *on*. You can also enable thin provisioning by using the `-reserve` and `-noreserve` parameters. Parameter override the value mentioned in the *-space-reservations-enabled* variable. You could use `-reserve` and `-noreserve` with the following commands to enable or disable LUN reservation:

- `snapdrive storage create`
- `snapdrive storage resize`
- `snapdrive snap connect`
- `snapdrive snap restore`

By default, SnapDrive for UNIX enables space reservation for a fresh or new storage create operations. For snap restore and snap connect operations, it uses the space reservation present in the Snapshot copy if the *-reserve* or *-noreserve* parameters are not specified at the command line, or if the value in the configuration file is uncommented.

Enabling thin provisioning for NFS entities

You can use SnapDrive for UNIX to carry out thin provisioning for NFS entities on your storage system. Thin provisioning is referred as space-reservation.

Procedure

To enable space reservation for snap connect operations, you can enable space reservation for volumes by using the *-reserve* parameter with the commands involving NFS entities. For NFS entities, SnapDrive for UNIX uses the space reservation available in the Snapshot copy if the *-reserve* or *-noreserve* parameters are not specified in a command.

Multiple subnet configuration

Multiple subnets are useful in an environment where you want to separate management traffic and data traffic. This separation creates a more secure environment for managing network traffic. SnapDrive 4.1.1 for UNIX and later versions running on servers in such environments supports all the SnapDrive operations available in stand-alone environments and host and HA pair environments.

Data related to the management of storage systems is transmitted through the management interface. DataFabric Manager, Protection Manager, and SnapDrive for UNIX can be part of the management interface. The data interface is used for data traffic between storage systems.

To configure multiple subnets in your environment, you should use the `mgmtpath` option with the `snapdrive config set` command.

SnapDrive for UNIX does not support operations in a SAN environment where the host name of the storage system is different from the public name, but both names resolve to the same IP address. To workaround this situation, you can do one of the following:

- Assign a different IP address for the system name.
- Configure the system so that it does not reply when you try to connect to it.

Configuring management and data interfaces for a storage system

You can configure multiple data interfaces for a single management interface in an NFS environment.

Before you begin

Before you configure a management interface for a data interface, you must run the `snapdrive config set vsadmin` command for the management interface.

Procedure

1. Delete the previous interface entry for storage system communication if that entry is different from the newly selected management interface:

```
# snapdrive config list
username    appliance name   appliance type
-------------------------------------------
root        f3050-220-91     StorageSystem
root        lnx197-144       DFM
```

2. Set the configuration for the new interface:

```
# snapdrive config set root f3050-197-91
Password for root:
Retype password:
```

   The following is an example for Vserver.

```
# snapdrive config set vsadmin clstr-vs2
Password for vsadmin:
Retype password:
```

3. Configure the data interface for the new management interface:

```
# snapdrive config set -mgmtpath f3050-197-91 f3050-220-91#
```

   In the preceding command, f3050-197-191 is the management interface and f3050-220-91 is the data interface.

   The following is an example for Vserver.

```
snapdrive config set -mgmtpath clstr-vs2  clstr-vs2-2
system name   management interface   datapath interface
-------------------------------------------------------
clstr-vs2     10.72.220.203         10.72.221.155
```

In the output, 10.72.220.203 is the management interface and 10.72.221.155 is the data interface.

Viewing all the data interfaces for a management interface

You can view all the data interfaces for a management interface by using the `snapdrive config list` command in an NFS environment.

Procedure

At the CLI, enter the following command:
`snapdrive config list -mgmtpath`

```
#snapdrive config list -mgmtpath
system name        management interface   datapath interface
-------------------------------------------------------------------------------
f3050-197-91        10.72.197.91           10.72.220.91|10.72.168.91
```

The following is an example for Vserver.

```
#snapdrive config list -mgmtpath
system name   management interface   datapath interface
-------------------------------------------------------
clstr-vs2     10.72.220.203         10.72.221.155
```

Deleting a data interface entry for a management interface

You can delete a data interface entry that is associated with a specific management interface in an NFS environment by using the `snapdrive config delete -mgmtpath` command.

Procedure

At the CLI, enter the following command:
`snapdrive config delete -mgmtpath` *`data_interface`*

```
#snapdrive config delete –mgmtpath f3050-197-91
Deleted configuration for appliance: f3050-197-91
```

The following is an example for Vserver.

```
#snapdrive config delete –mgmtpath clstr-vs2
Deleted configuration for appliance: clstr-vs2
```

LUN names in SAN environment

In all the SAN operations, the format of LUN names should always be of the host name, irrespective of whether it resolves to an IP address. In a pure SAN environment, there is no concept of data path. The management interface mapping must be the same as the data path interface.

config list output in a SAN multiple subnet environment

```
#snapdrive config set -mgmtpath f3050-197-91 f3050-197-91

#snapdrive config list -mgmtpath
system name        management interface   datapath interface
-------------------------------------------------------------
bart               10.72.197.91           10.72.197.91
```

Pure NFS environment

If you configure a system for multiple subnets and one or more NFS volumes are mounted through the management interface, then you should always configure the first data interface as the management interface.

In the following example, the management interface is `10.72.221.19`, and the data interface is `10.72.220.45`.

```
# snapdrive config list
username    appliance name   appliance type
--------------------------------------------
root        10.72.221.19     StorageSystem

# snapdrive config list -mgmtpath
system name    management interface   datapath interface
---------------------------------------------------------
f2040-221-19   10.72.221.19           10.72.220.45
```

Mixed SAN and NFS environments

In mixed SAN and NFS environments, the management and data interface must be mapped so that the first data interface is the same as the management interface.

In the following example, the management interface is `10.72.197.91`, and the data interface is `10.72.220.91`.

```
#snapdrive config set -mgmtpath f3050-197-91 f3050-197-91 f3050-197-91 f3050-220-91

#snapdrive config list -mgmtpath
 system name        management interface   datapath interface
 ---------------------------------------------------------------------
 bart               10.72.197.91           10.72.197.91|10.72.220.91
```

Automatic detection of host entities

SnapDrive for UNIX automatically detects the configuration of the host entity for some commands. A few `snap storage` commands need only the name of the host entity. In these cases, you do not have to specify the type of the host entity.

The following commands are enabled for automatic detection:

- `storage delete`
- `storage resize`
- `snap create`
- `snap restore`
- `snap connect`
- `snap list`

When the host entity is already present, SnapDrive for UNIX automatically detects the type of the host entity. In this case, you only need to provide the name of the host entity; you do not have to specify the type. Also, SnapDrive snap commands and some storage commands only need the name of the host entity; you do not have to specify the type.

For SnapDrive 4.1 for UNIX and later, automatic detection of commands takes extra time because for automatic SnapDrive for UNIX collects details of all the storage resources. If you want a faster response, specify the filespec with the SnapDrive for UNIX commands.

To use the automatic detection enabled command for the storage delete operation, enter the snapdrive storage delete command.

Example 1:

```
snapdrive storage delete host_dg my_fs -full
```

In the preceding example, host_dg and my_fs are automatically detected.

Example 2:

```
snapdrive storage delete mydg -fs myfs -full
```

In the preceding example, mydg disk group is automatically detected.

To use the automatic detection enabled command for the storage resize operation, enter the snapdrive storage resize command.

For example:

```
[root@lnx197-132 ~]# snapdrive storage resize mydg23 -addlun -growby 10m
Auto detecting the type of filespec 'mydg23' in progress ... detected as disk group
        discovering filer LUNs in disk group mydg23...done
        LUN bart:/vol/voldm/mydg23-1_SdLun ... created

        mapping new lun(s) ... done
        discovering new lun(s) ... done.
        initializing LUN(s) and adding to disk group mydg23...done
Disk group mydg23 has been resized
```

To use the automatic detection enabled command for the snap create enter the snapdrive snap create command.

For example:

```
root@lnx197-132 ~]# snapdrive snap create mydg22 mydg23 /mnt/mnt12 -snapname new_snap
Auto detecting the type of filespec 'mydg22' in progress ... detected as disk group
Auto detecting the type of filespec 'mydg23' in progress ... detected as disk group
Auto detecting the type of filespec '/mnt/mnt12 ' in progress ... detected as file system

Starting snap create /dev/mapper/mydg22, /dev/mapper/mydg23, /mnt/mnt12
  WARNING:  DO NOT CONTROL-C!
            If snap create is interrupted, incomplete snapdrive
                 generated data may remain on the filer volume(s)
                 which may interfere with other snap operations.
Successfully created snapshot new_snap on bart:/vol/voldm

        snapshot new_snap contains:
        disk group mydg22
        disk group mydg23
        disk group dg121 containing host volumes
                lv121 (filesystem: /mnt/mnt12)
```

To use the automatic detection enabled command for the snap connect, enter the snapdrive snap connect command.

For example:

```
[root@lnx197-132 ~]# snapdrive snap connect mydg22 xxx mydg23 yyy -snapname bart:/vol/voldm:snap_1
Auto detecting the type of filespec 'mydg22' in progress ... detected as disk group
Auto detecting the type of filespec 'xxx' in progress ...
        xxx does not exist - Taking xxx as a destination to fspec mydg22Auto detecting
the type of filespec 'mydg23' in progress ... detected as disk group
Auto detecting the type of filespec 'yyy' in progress ...
        yyy does not exist - Taking yyy as a destination to fspec mydg23
 connecting mydg22:
        LUN copy mydg22_SdLun_0 ... created
                 (original: bart:/vol/voldm/mydg22_SdLun)

        mapping new lun(s) ... done

 connecting mydg23:
        LUN copy mydg23_SdLun_1 ... created
                 (original: bart:/vol/voldm/mydg23_SdLun)

        mapping new lun(s) ... done
        discovering new lun(s) ... done
        Importing xxx, yyy
Successfully connected to snapshot bart:/vol/voldm:snap_1
        disk group xxx
        disk group yyy
```

To use the automatic detection enabled command for the snap restore operation, enter the snapdrive snap restore command.

For example:

```
snapdrive snap restore bart:/vol/voldm/lun44 /mnt/fs3 fs5_SdDg/fs5_SdHv fs4_SdDg -snapname
bart:/vol/voldm:toi_snap
        Auto detection of file_spec(s) in progress ...
               - 'bart:/vol/voldm/lun44' detected as LUN.
               - '/mnt/fs3' detected as file system.
               - 'fs5_SdDg/fs5_SdHv' detected as logical volume.
               - 'fs4_SdDg' detected as disk group.
        Starting to restore /dev/mapper/fs4_SdDg, /mnt/fs3, /dev/mapper/fs5_SdDg-fs5_SdHv,
bart:/vol/voldm/lun44
         WARNING:  This can take several minutes.
           DO NOT CONTROL-C!
           If snap restore is interrupted, the filespecs
           being restored may have inconsistent or corrupted
           data.
       For detailed progress information, see the log file /var/log/sd-recovery.log
           Importing fs4_SdDg, fs3_SdDg, fs5_SdDg
           Successfully restored snapshot toi_snap on bart:/vol/voldm
       disk group fs4_SdDg containing host volumes
               fs4_SdHv (filesystem: /mnt/fs4)
       disk group fs3_SdDg containing host volumes
               fs3_SdHv (filesystem: /mnt/fs3)
       disk group fs5_SdDg containing host volumes
               fs5_SdHv (filesystem: /mnt/fs5)
       raw LUN: bart:/vol/voldm/lun44
```

SnapDrive does not support automatic detection for `snap connect` and `snap restore` operations for dead filespecs.

To use the automatic detection enabled command for the `snap list` operation, enter the `snapdrive snap list` command.

For example:

```
root@lnx197-132 ~]# snapdrive snap list -snapname bart:/vol/voldm:snap_1

snap name                            host                   date         snapped
--------------------------------------------------------------------------------
bart:/vol/voldm:snap_1           lnx197-132.xyz.com Apr  9 06:04 mydg22 mydg23 dg121
[root@lnx197-132 ~]# snapdrive snap list mydg23
Auto detecting the type of filespec 'mydg23' in progress ... detected as disk group

snap name                            host                   date         snapped
--------------------------------------------------------------------------------
bart:/vol/voldm:snap_1           lnx197-132.xyz.com Apr  9 06:04 mydg22 mydg23 dg121
bart:/vol/voldm:all                  lnx197-132.xyz.com Apr  9 00:16 mydg22 mydg23 fs1_SdDg
bart:/vol/voldm:you                  lnx197-132.xyz.com Apr  8 21:03 mydg22 mydg23
bart:/vol/voldm:snap_2                  lnx197-132.xyz.com Apr  8 18:05 mydg22 mydg23
```

Wizards in SnapDrive for UNIX

A wizard in SnapDrive for UNIX is a utility that helps you perform a particular SnapDrive operation in an interactive manner.

Commands executed using a wizard

SnapDrive for UNIX introduces wizards for completing some SnapDrive for UNIX operations. You can use these wizards to create storage entities and manipulate Snapshot copies in an efficient manner.

The following SnapDrive for UNIX commands have an equivalent wizard:

- `storage create`
- `storage delete`

- `snap restore`
- `snap connect`
- `snap disconnect`

Storage management operations using a wizard

You can use a SnapDrive for UNIX wizard to create storage in an interactive and efficient manner. The wizard takes you through a set of questions and helps you to create storage.

To launch the wizard for all the mentioned operations, use the `snapdrive storage wizard create` command.

The following storage managing operations can be completed using the wizards:

- Creating a LUN.
- Creating a disk group and automatically setting up the LUN.
- Creating a disk group and specifying the LUN.
- Creating a host volume and automatically setting the LUN.
- Creating a host volume and specifying the LUN.
- Creating a file system on a LUN and automatically setting up the LUN.
- Creating a file system on a LUN and specifying the LUN.
- Creating a file system on a LUN and setting up the LUN automatically with LVM and disk group specified.
- Creating a file system on a LUN and specifying the LUN with LVM and disk group specified.
- Creating a file system on a LUN and setting up the LUN automatically with LVM and host volume specified.
- Creating a file system on a LUN and specifying the LUN with Logical Volume Manager (LVM) and host volume specified.

Snapshot copy operations using a wizard

You can use a SnapDrive for UNIX wizard to manage Snapshot copy operations. This wizard takes you through a set of questions and helps you accomplish the snap connect, snap restore, and snap disconnect operations.

To launch the wizard for all the mentioned operations, use the `snapdrive snap wizard` command. The wizard helps you to perform all the snap connect, snap restore, and snap disconnect operations.

The following list of Snapshot copy operations provides the command you use to start each wizard. After the wizard launches, follow the steps in the application window.

- Snapshot restore operation

  To start the wizard, use the `snapdrive snap wizard restore` command.
- Snapshot connect operation

  To start the wizard, use the `snapdrive snap wizard connect` command.
- Snapshot connect operation for file system with storage system volume

  To start the wizard, use the `snapdrive snap wizard connect` command.
- Snapshot connect operation for disk group

  To start the wizard, use the `snapdrive snap wizard connect` command.

- Snapshot disconnect operation for LUN

  To start the wizard, use the `snapdrive snap wizard disconnect` command.
- Snapshot disconnect operation for a diskgroup

  To start the wizard, use the `snapdrive snap wizard disconnect` command.
- Snapshot disconnect operation for host volume

  To start the wizard, use the `snapdrive snap wizard disconnect` command.
- Snapshot disconnect for file system

  To start the wizard for this, use the `snapdrive snap wizard disconnect` command.

Limitations: In SnapDrive 4.1 for UNIX and later, the `snap wizard` command has the following limitations:

- Volume-based snap restore does not support with the `snap wizard restore` command.
- FlexClone volume does not support with the `snap wizard connect` command.
- Operations on dead filespecs do not support with any snap wizard command.

Delete storage using a wizard

You can use the SnapDrive for UNIX storage delete wizard, to carry out a few delete operations.

To start the wizard, use the `snapdrive storage wizard delete` command.

You can use the storage delete wizard to perform the following SnapDrive for UNIX delete operations.

- Deleting a LUN
- Deleting a disk group
- Deleting a logical volume
- Deleting a file system

Security features in SnapDrive for UNIX

Before you use SnapDrive for UNIX, you must understand its security features and learn how to access them.

What the Security features are

SnapDrive for UNIX provides certain features that allow you to work with it more securely. These features give you more control over which users can perform operations on a storage system and from which host.

The security features allow you to perform the following tasks:
- Set up access control permissions
- Specify login information for the storage systems
- Specify that SnapDrive for UNIX use HTTPS

The access control feature allows you to specify which operations a host running SnapDrive for UNIX can perform on a storage system. You set these permissions individually for each host. In addition, to allow SnapDrive for UNIX to access a storage system, you must supply the login name and password for that storage system.

The HTTPS feature lets you specify SSL encryption for all interactions with the storage system through the Manage ONTAP interface, including sending the passwords. This behavior is the default in SnapDrive 4.1 for UNIX and later releases for Linux hosts; however, you can disable SSL encryption by changing the value of the `use-https-to-filer` configuration variable to `off`.

Access control in SnapDrive for UNIX

SnapDrive for UNIX allows you to control the level of access that each host has to each storage system to which the host is connected.

The access level in SnapDrive for UNIX indicates which operations the host is allowed to perform when it targets a given storage system. Except for the show and list operations, the access control permissions can affect all Snapshot and storage operations.

What access control settings are

To determine the access control permissions, SnapDrive for UNIX checks for a permissions file in the root volume of the storage system.
- `sdhost-name.prbac` is in the directory `/vol/vol0/sdprbac` (SnapDrive permissions roles-based access control). The file name is `sdhost-name.prbac`, where host-name is the name of the host to which the permissions apply. You can have a permissions file for each host attached to the storage system. You can use the `snapdrive config access` command to display information about the permissions available for a host on a specific storage system.
- `sdgeneric.prbac` file is in the directory `/vol/vol0/sdprbac`. The filename `sdgeneric.prbac` is used as the default access settings for multiple hosts that do not have access to `sdhost-name.prbac` on the storage system.

The following are the rules defined for determining the access control permissions in SnapDrive for UNIX.

- Check if the `sdhost-name.prbac` file exists, if it does not exist, then use the `sdgeneric.prbac` to check the access permissions.
- If you do not have both `sdhost-name.prbac` and `sdgeneric.prbac`, then check the configuration variable *all-access-if-rbac-unspecified* that is defined in the `snapdrive.conf` file.

Note: If you have both `sdhost-name.prbac` and `sdgeneric.prbac` available in `/vol/vol0/sdprbac`, then use the `sdhost-name.prbac` to check the access permissions, as this overwrites the values provided for `sdgeneric.prbac`.

Setting up access control from a given host to a given vFiler unit is a manual operation. The access from a given host is controlled by a file residing in the root volume of the affected vFiler unit. The file contains the name as `/vol/<vfiler root volume>/sdprbac/sdhost-name.prbac`, where host-name is the name of the affected host, as returned by `gethostname(3)`. You should ensure that this file is readable, but not writable, from the host that can access it.

Note: To determine the name of the host, run the `hostname` command.

If the file is empty, unreadable, or has an invalid format, SnapDrive for UNIX does not grant the host access permission to any of the operations.

Setting up access control from a given host to a given Vserver unit is a manual operation. The access from a given host is controlled by a file residing in the root volume of the affected Vserver unit. This file has the name `/vol/<vserver root volume>/sdhost-name.prbac`, where host-name is the name of the affected host, as returned by `gethostname(3)`. You should ensure that this file is readable, but not writable, from the host that can access it.

Note: To mount the Vserver root volume on the host system and create `*.prbac` file(s), execute the following command

```
mount <vservername>:/ <mntpoint>
```

If the file is missing, SnapDrive for UNIX checks the configuration variable *all-access-if-rbac-unspecified* in the `snapdrive.conf` file. If the variable is set to `on` (the default), it allows the hosts complete access to all these operations on that storage system. If the variables set to `off`, SnapDrive for UNIX denies the host permission to perform any operations governed by access control on that storage system.

Available access control levels

SnapDrive for UNIX provides various access control levels to the users. These access levels are related to the Snapshot copies and storage system operations.

You can set the following access levels:

- NONE—The host has no access to the storage system.
- SNAP CREATE—The host can create Snapshot copies.
- SNAP USE—The host can delete and rename Snapshot copies.
- SNAP ALL—The host can create, restore, delete, and rename Snapshot copies.
- STORAGE CREATE DELETE—The host can create, resize, and delete storage.
- STORAGE USE—The host can connect and disconnect storage.

- STORAGE ALL—The host can create, delete, connect, and disconnect storage.
- ALL ACCESS—The host has access to all the preceding SnapDrive for UNIX operations.

Each level is distinct. If you specify permission for only certain operations, SnapDrive for UNIX can execute only those operations. For example, if you specify STORAGE USE, the host can use SnapDrive for UNIX to connect and disconnect storage, but it cannot perform any other operations governed by access control permissions.

Setting up access control permission

You can set up access control permission in SnapDrive for UNIX by creating a special directory and file in the root volume of the storage system.

Before you begin

Ensure that you are logged in as a root user.

Procedure

1. Create the directory `sdprbac` in the root volume of the target storage system. One way to make the root volume accessible is to mount the volume using NFS.
2. Create the permissions file in the `sdprbac` directory. Ensure the following statements are true:
   - The file must be named `sdhost-name.prbac` where host-name is the name of the host for which you are specifying access permissions.
   - The file must be read-only to ensure that SnapDrive for UNIX can read it, but that it cannot be modified.

   To give a host named dev-sun1 access permission, you would create the following file on the storage system: `/vol/vol1/sdprbac/sddev-sun1.prbac`
3. Set the permissions in the file for that host.

   You must use the following format for the file:
   - You can specify only one level of permissions. To give the host full access to all operations, enter the string ALL ACCESS.
   - The permission string must be the first thing in the file. The file format is invalid if the permission string is not in the first line.
   - Permission strings are case-insensitive.
   - No white space can precede the permission string.
   - No comments are allowed.

   These valid permission strings allow the following access levels:
   - NONE—The host has no access to the storage system.
   - SNAP CREATE—The host can create Snapshot copies.
   - SNAP USE—The host can delete and rename Snapshot copies.
   - SNAP ALL—The host can create, restore, delete, and rename Snapshot copies.
   - STORAGE CREATE DELETE—The host can create, resize, and delete storage.
   - STORAGE USE—The host can connect and disconnect storage.
   - STORAGE ALL—The host can create, delete, connect, and disconnect storage.
   - ALL ACCESS—The host has access to all the preceding SnapDrive for UNIX operations.

Each of these permission strings is discrete. If you specify SNAP USE, the host can delete or rename Snapshot copies, but it cannot create Snapshot copies or restore or perform any storage provisioning operations.

Regardless of the permissions you set, the host can perform show and list operations.

4. Verify the access permissions by entering the following command:

   `snapdrive config access show` *filer_name*

Viewing the access control permission

You can view the access control permissions by executing the `snapdrive config access show` command.

Procedure

Execute the `snapdrive config access show` command. This command has the following format: `snapdrive config access {show | list} filername`
You can use the same parameters regardless of whether you enter the `show` or `list` version of the command.
This command line checks the storage system toaster to determine which permissions the host has. Based on the output, the permissions for the host on this storage system are SNAP ALL.

```
# snapdrive config access show toaster
This host has the following access permission to filer, toaster:
SNAP ALL
Commands allowed:
snap create
snap restore
snap delete
snap rename
#
```

In this example, the permissions file is not on the storage system, so SnapDrive for UNIX checks the variable `all-access-if-rbac-unspecified` in the `snapdrive.conf` file to determine which permissions the host has. This variable is set to `on`, which is equivalent to creating a permissions file with the access level set to ALL ACCESS.

```
# snapdrive config access list toaster
This host has the following access permission to filer, toaster:
ALL ACCESS
Commands allowed:
snap create
snap restore
snap delete
snap rename
storage create
storage resize
snap connect
storage connect
storage delete
snap disconnect
storage disconnect
#
```

This example shows the kind of message you receive if no permissions file is on the storage system toaster, and the variable *all-access-if-rbac-unspecified* in the `snapdrive.conf` file is set to `off`.

```
# snapdrive config access list toaster
Unable to read the access permission file on filer, toaster. Verify that the
file is present.
Granting no permissions to filer, toaster.
```

Login information for storage systems

A user name or password allows SnapDrive for UNIX to access each storage system. It also provides security because, in addition to being logged in as root, the person running SnapDrive for UNIX must supply the correct user name or password when prompted for it. If a login is compromised, you can delete it and set a new user login.

You created the user login for each storage system when you set it up. For SnapDrive for UNIX to work with the storage system, you must supply it with this login information. Depending on what you specified when you set up the storage systems, each storage system could use either the same login or a unique login.

SnapDrive for UNIX stores these logins and passwords in encrypted form on each host. You can specify that SnapDrive for UNIX encrypt this information when it communicates with the storage system by setting the *snapdrive.conf* configuration variable *use-https-to-filer=on*.

Specifying login information

You must specify the user login information for a storage system. Depending on what you specified when you set up the storage system, each storage system could use either the same user name or password or a unique user name or password. If all the storage systems use the same user name or password information, you must perform the following steps once. If the storage systems use unique user names or passwords, you must repeat the following steps for each storage system.

Before you begin

Ensure that you are logged in as a root user.

Procedure

1. Enter the following command `snapdrive config set` *user_name filername* [*filername...]*

   user_name is the user name that was specified for that storage system when you first set it up.

   filername is the name of the storage system.

   [*filername...]* defines that you can enter multiple storage system names on one command line if they all have the same user login or password. You must enter the name of at least one storage system.
2. At the prompt, enter the password, if there is one.

   Note: If no password was set, press Enter (the null value) when prompted for a password.
   This example sets up a user called `root` for a storage system called toaster:

   ```
   # snapdrive config set root toaster
   Password for root:
   Retype Password:
   ```

This example sets up one user called root for three storage systems:

```
# snapdrive config set root toaster oven broiler
Password for root:
Retype Password:
```

3. If you have another storage system with a different user name or password, repeat these steps.

Verifying storage system user names associated with SnapDrive for UNIX

You can verify which user name SnapDrive for UNIX has associated with a storage system by executing the `snapdrive config list` command.

Before you begin

Ensure that you are logged in as root user.

Procedure

Enter the following command: `snapdrive config list`
This command displays the user name or storage system pairs for all systems that have users specified within SnapDrive for UNIX. It does not display the passwords for the storage systems.
This example displays the users associated with the storage systems named rapunzel and medium storage system:

```
# snapdrive config list
user name           storage system name
-----------------------------
rumplestiltskins    rapunzel
longuser            mediumstoragesystem
```

Deleting a user login for a storage system

You can delete a user login for one or more storage systems, by executing the `snapdrive config delete` command.

Before you begin

Ensure that you are logged in as a root user.

Procedure

Enter the following command: `snapdrive config delete` *`appliance_name [appliance_name]`*
appliance_name is the name of the storage system for which you want to delete the user login information.
SnapDrive for UNIX removes the user name or password login information for the storage systems you specify.

Note: To enable SnapDrive for UNIX to access the storage system, you must specify a new user login.

Setting up HTTP

You can configure SnapDrive for UNIX to use HTTP for your host platform.

Before you begin

Ensure that you are logged in as a root user.

Procedure

1. Make a backup of the `snapdrive.conf` file.
2. Open the `snapdrive.conf` file in a text editor.
3. Change the value of the *use-https-to-filer* variable to `off`. A good practice any time you modify the `snapdrive.conf` file is to perform the following steps:
   a. Comment out the line you want to modify.
   b. Copy the commented-out line.
   c. Un-comment the copied text by removing the pound (#) sign.
   d. Modify the value.
4. Save the file after you make your changes.

   SnapDrive for UNIX automatically checks this file each time it starts. You must restart the SnapDrive for UNIX daemon for the changes to take effect.

Role-Based Access Control in SnapDrive for UNIX

Role-Based Access Control (RBAC) is used for user login and role permissions. RBAC allows administrators to manage groups of users by defining roles. If you need to restrict access to the database to specific administrators, you must set up administrator accounts for them. Additionally, if you want to restrict the information, these administrators can view, and the operations they can perform, you must apply roles to the administrator accounts you create.

RBAC is used in SnapDrive for UNIX with the help of Operations Manager. Operations Manager provides granular access to storage objects such as LUNs, qtrees, volumes, aggregates, and vFiler units.

What Role-Based Access Control (RBAC) in SnapDrive for UNIX is

RBAC allows SnapDrive administrators to restrict access to a storage system for various SnapDrive operations. This limited or full access for storage operations depends on the role that is assigned to the user.

SnapDrive 4.0 for UNIX and later requires an RBAC access check for all the SnapDrive for UNIX operations. This behavior allows the storage administrators to limit the operations that SnapDrive users can perform depending on their assigned roles. RBAC is implemented using the Operations Manager infrastructure. In releases earlier than SnapDrive 4.0 for UNIX, there was limited access control and only the root user could perform SnapDrive for UNIX operations. SnapDrive 4.0 for UNIX and later provides support for nonroot local users and Network Information System (NIS) users by using the RBAC infrastructure of Operations Manager. SnapDrive for UNIX does not require the root password of the storage system; it communicates with the storage system using sd-<hostname> user.

By default, Operations Manager RBAC functionality is not used. You must turn on RBAC functionality by setting the variable *rbac-method=dfm* in the `snapdrive.conf` file and restart the SnapDrive for UNIX daemon.

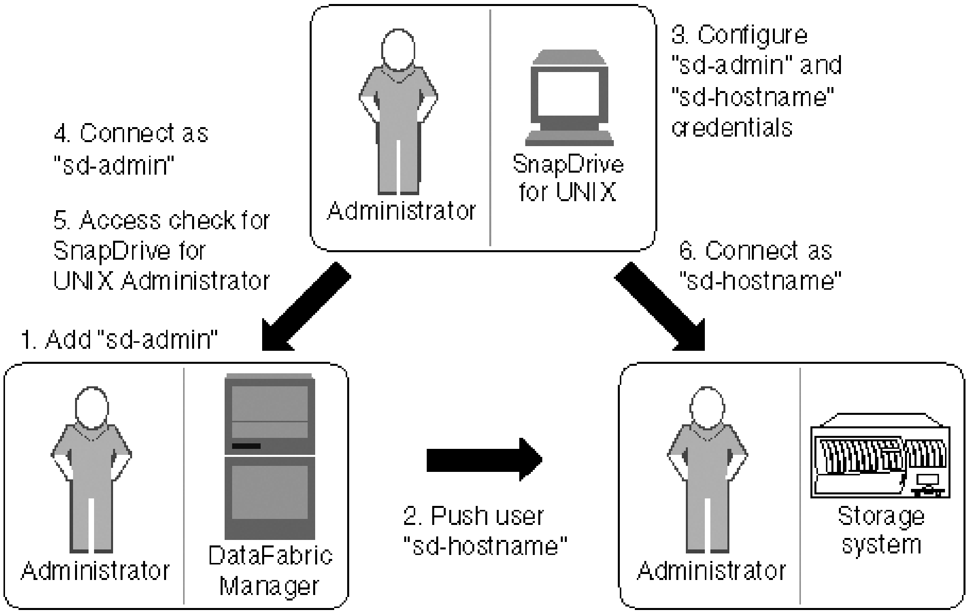
The following requirements must be fulfilled before you can use this feature:

- Operations Manager 3.7 or later.
- Operations Manager server must be present and configured in the IP network that contains the SnapDrive hosts and the storage systems.
- Operations Manager communication settings must be configured during SnapDrive installation.
- SnapDrive for UNIX daemon should be running.

SnapDrive for UNIX and Operations Manager interaction

Use of Role-Based Access Control (RBAC) depends on the Operations Manager infrastructure. The Operations Manager administrator must create user names for SnapDrive for UNIX use. All storage operation requests are first sent to Operations Manager for an access check. After Operations Manager verifies a storage operation from a specific SnapDrive user, the operation is completed.

The following diagram illustrates the entire Role-Based Access Check for storage operations.


3. Configure "sd-admin" and "sd-hostname" credentials
4. Connect as "sd-admin"
5. Access check for SnapDrive for UNIX Administrator
Administrator
SnapDrive for UNIX
6. Connect as "sd-hostname"
1. Add "sd-admin"
Administrator
DataFabric Manager
2. Push user "sd-hostname"
Administrator
Storage system

1. Operations Manager administrator adds sd-admin user on Operations Manager.
2. Operations Manager administrator creates sd-hostname user on the storage system.
3. Operations Manager administrator sends sd-admin and sd-hostname credentials to SnapDrive for UNIX administrator.
4. SnapDrive administrator configures SnapDrive with the received user credentials.
5. Operations Manager performs access check for SnapDrive for UNIX use with the user credentials added by SnapDrive administrator.
6. After the SnapDrive user is authenticated, the user can connect to the storage system.

When a SnapDrive user wants to carry out some storage operation, the user issues the corresponding command at the command line. The request is sent to Operations Manager for an access check. Operations Manager checks whether the requested user has the appropriate permissions to carry out the SnapDrive operation. The result of the access check is returned to SnapDrive. Depending on the result, the user is allowed or not allowed to carry out the storage operations on the storage system.

If the user is verified after the access check, the user connects to the storage system as sd-hostname.

Note: sd-hostname and sd-admin are the recommended user names. You can configure SnapDrive for UNIX with other user names.

Configuration of role-based access control in SnapDrive for UNIX

You must complete various tasks to configure Role-Based Access Control (RBAC) for SnapDrive for UNIX. You can use either Operations Manager or the command-line interface to perform the tasks.

Configuring sd-admin in Operations Manager

The Operations Manager administrator can create the sd-admin user.

The Operations Manager administrator creates a user named, sd-admin, with the capability to perform a core access check on global group (global `DFM.Core.AccessCheck`). After the Operations Manager administrator configures the sd-admin user, you must manually send the credential information to the SnapDrive for UNIX administrator. For more information about using Operations Manager to configure users and roles, see the *Operations Manager Administration guide* and the Online Help.

Note: You can use any name in place of sd-admin; however, it is best to use sd-admin.

To create a role in Operations Manager, select **Setup** > **Roles**. In the sd-admin configuration page, the Operations Manager administrator must assign `DFM.Database.Write` capability on the global group to sd-admin-role, so that SnapDrive for UNIX can refresh storage entities in Operations Manager.

Configuring sd-admin using command-line interface

The storage system administrator can configure sd-admin user using command-line interface.

Procedure

1. Add a user named sd-admin.

```
# useradd sd-admin
```

```
# passwd sd-admin
Changing password for sd-admin.
New password:
Re-enter new password:
Password changed
```

2. Add an administrator named sd-admin.

```
# dfm user add sd-admin
Added administrator sd-admin.
```

3. Create a role named sd-admin-role.

```
# dfm role create sd-admin-role
Created role sd-admin-role.
```

4. Add a capability to the role created in step 3.

```
# dfm role add sd-admin-role DFM.Core.AccessCheck Global
Added 1 capability to role sd-admin-role.
```

5. The Operations Manager administrator can also grant `DFM.Database.Write` capability on the global group to `<sd-admin>` to enable SnapDrive for UNIX to refresh storage system entities in Operations Manager.

```
# dfm role add sd-admin-role DFM.Database.Write Global
Added 1 capability to role sd-admin-role.
```

6. Add a sd-admin-role role to the sd-admin user.

```
# dfm user role set sd-admin sd-admin-role
Set 1 role for administrator sd-admin.
```

Adding sd-hostname to the storage system

The Operations Manager administrator can create the sd-hostname user on the storage system using Operations Manager. After the steps are completed, the Operations Manager administrator must manually send the credentials to the SnapDrive for UNIX administrator. You can use any name in place of sd-hostname; however it is best to use sd-hostname.

Procedure

1. Obtain the root password of the storage system and store the password.

   To add the password for the storage system, select **Management** > **Storage System**
2. Create a sd-hostname user for each UNIX system.
3. Assign capabilities `api-*` and `login-*` to a role, such as sd-role.
4. Include this role (sd-role) in a new usergroup, such as sd-usergroup.
5. Associate this usergroup (sd-usergroup) with the sd-hostname user on the storage system.

Adding sd- hostname to storage system using CLI

The storage system administrator can create and configure the sd-hostname user using the useradmin command.

Procedure

1. Add storage.

   ```
   # dfm host add storage_array1
   Added host storage_array1.lab.eng.btc.xyz.in
   ```

2. Set the password for the host.

   ```
   # dfm host password save -u root -p xxxxxxxx storage_array1
   Changed login for host storage_array1.lab.eng.btc.xyz.in to root.
   Changed Password for host storage_array1.lab.eng.xyz.ibm.in
   ```

3. Create a role on the host.

   ```
   # dfm host role create -h storage_array1 -c "api-*,login-*" sd-unixhost-role
   Created role sd-unixhost-role on storage_array1
   ```

4. Create a usergroup.

   ```
   # dfm host usergroup create -h storage_array1 -r sd-unixhost-role sd-unixhost-ug
   Created usergroup sd-unixhost-ug(44) on storage_array1
   ```

5. Create a local user.

   ```
   # dfm host user create -h storage_array1 -p xxxxxxxx -g sd-unixhost-ug sd-unixhost
   Created local user sd-unixhost on storage_array1
   ```

Configuring user credentials on SnapDrive for UNIX

The SnapDrive for UNIX administrator receives user credentials from Operations Manager administrator. These user credentials need to be configured on SnapDrive for UNIX for proper storage operations.

Procedure

1. Configure sd-admin on the storage system.

```
[root]#snapdrive config set -dfm sd-admin ops_mngr_server
Password for sd-admin:
Retype password:
```

2. Configure sd-hostname on the storage system.

```
[root]#snapdrive config set sd-unix_host storage_array1
Password for sd-unix_host:
Retype password:
```

3. Verify step 1 and step 2, using the `snapdrive config list` command.

```
user name       appliance name          appliance type
----------------------------------------------------
sd-admin        ops_mngr_server         DFM
sd-unix_host    storage_array1          StorageSystem
```

4. Configure SnapDrive for UNIX to use Operations Manager Role-Based Access Control (RBAC) by setting the configuration variable *rbac-method="dfm"* in the `snapdrive.conf` file.

   Note: The user credentials are encrypted and saved in the existing `.sdupw` file. The default location of the earlier file is `/opt/ontapsnapdrive/.sdupw.`

User name formats for performing access checks with Operations Manager

SnapDrive for UNIX uses the user name formats for performing access checks with Operations Manager. These formats depend on whether you are an Network Information System (NIS) or a local user.

SnapDrive for UNIX uses the following formats to check whether a user is authorized to perform certain tasks:

- If you are an NIS user running the `snapdrive` command, SnapDrive for UNIX uses the format `<nisdomain>\<username>` (for example, `ibm.com\marc`)
- If you are a local user of a UNIX host such as lnx197-141, SnapDrive for UNIX uses the format `<hostname>\<username>` format (for example, `lnx197-141\john`)
- If you are an administrator (root) of a UNIX host, SnapDrive for UNIX always treats the administrator as a local user and uses the format`lnx197-141\root`.

Configuration variables for Role-Based Access Control

You must set the various configuration variables related to role-based access control in the `snapdrive.conf` file.

Variable	Description
contact-http-dfm-port = 8088	Specifies the HTTP port to use for communicating with an Operations Manager server. The default value is 8088.

Variable	Description
contact-ssl-dfm-port = 8488	Specifies the SSL port to use for communicating with an Operations Manager server. The default value is 8488.
rbac-method=dfm	Specifies the access control methods. The possible values are `native` and `dfm`. If the value is `native`, the access control file stored in `/vol/vol0/sdprbac/sdhost-name.prbac` is used for access checks. If the value is set to `dfm`, Operations Manager is a prerequisite. In such a case, SnapDrive for UNIX sends access checks to Operations Manager.
rbac-cache=on	SnapDrive for UNIX maintains a cache of access check queries and the corresponding results. SnapDrive for UNIX uses this cache only when all the configured Operations Manager servers are down. You can set this value to either `on` to enable cache, or to `off` to disable it. The default value is `off` so that you can configure SnapDrive for UNIX to use Operations Manager and set the `rbac-method` configuration variable to `dfm`.
rbac-cache-timeout	Specifies the rbac cache timeout period and is applicable only when *rbac-cache* is enabled. The default value is `24` hrs. SnapDrive for UNIX uses this cache only when all the configured Operations Manager servers are down.
use-https-to-dfm=on	This variable lets you set SnapDrive for UNIX to use SSL encryption (HTTPS) when it communicates with Operations Manager. The default value is `on`.

SnapDrive commands and capabilities

In Role-Based Access Check (RBAC), a specific capability is required for each operation to be successful. A user must have the correct set of capabilities assigned to carry out storage operations.

The following table lists the commands and the corresponding capabilities required.

Command	Capability
`storage show`	SD.Storage.Read on volume
`storage list`	SD.Storage.Read on volume

Command	Capability
storage create	• For LUNs inside volumes: SD.Storage.Write on Volume • For LUNs inside qtrees: SD.Storage.Write on qtree
storage resize	SD.Storage.Write on LUN
storage delete	SD.Storage.Delete on LUN
snap show	SD.SnapShot.Read on volume
snap list	SD.SnapShot.Read on volume
snap delete	SD.Storage.Delete on volume
snap rename	SD.Storage.Write on volume
snap connect	• For LUN clones in volume: SD.SnapShot.Clone on volume • For LUN clones in qtree: SD.SnapShot.Clone on qtree • For traditional volume clones: SD.SnapShot.Clone on storage system • For FlexClone volume: SD.SnapShot.Clone on the parent volume • For unrestricted Flexclone volumes: SD.SnapShot.UnrestrictedClone on the parent volume
snap connect-split	• For LUN clones (LUN cloned and split in volume): SD.SnapShot.Clone on volume and SD.Storage.Write on volume • For LUN clones (LUN cloned and split in qtree): SD.SnapShot.Clone on qtree and SD.Storage.Write on qtree • For traditional volume clones which are split: SD.SnapShot.Clone on storage system and SD.Storage.Write on storage system • For Flex volume clones which are split: SD.SnapShot.Clone on the parent volume.
clone split start	• For LUN clones where the LUN resides in volume or qtree: SD.SnapShot.Clone containing volume or qtree • For volume clones: SD.SnapShot.Clone on the parent volume
snap disconnect	• For LUN clones where the LUN resides in volume or qtree: SD.SnapShot.Clone containing volume or qtree • For volume clones: SD.SnapShot.Clone on the parent volume

Command	Capability
snap disconnect-split	• For LUN clones where the LUN resides in volume or qtree: SD.SnapShot.Clone on the containing volume or qtree • For volume clones: SD.Storage.Delete on the parent volume • For deletion of unrestricted volume clones: SD.SnapShot.DestroyUnrestrictedClone on volume
snap restore	• For LUNs that exist in a volume: SD.SnapShot.Restore on volume and SD.Storage.Write on LUN • For LUNs which exists in a qtree: SD.SnapShot.Restore on qtree and SD.Storage.Write on LUN • For LUNs which are not in the volumes: SD.SnapShot.Restore on volume and SD.Storage.Write on volume • For LUNs which are not in qtree: SD.SnapShot.Restore on qtree and SD.Storage.Write on qtree • For volumes: SD.SnapShot.Restore on storage system for traditional volumes, or SD.SnapShot.Restore on aggregate for flexible volumes • For single-file snap restore in volumes: SD.SnapShot.Restore on the volume • For single-file snap restore in qtree: SD.SnapShot.Restore qtree • For overriding baseline Snapshot copies: SD.SnapShot.DisruptBaseline on the volume
host connect, host disconnect	SD.Config.Write on LUN
config access	SD.Config.Read on storage system
config prepare	SD.Config.Write on at least one storage system
config check	SD.Config.Read on at least one storage system
config show	SD.Config.Read on at least one storage system
config set	SD.Config.Write on storage system
config set -dfm, config set -mgmtpath,	SD.Config.Write on at least one storage system
config delete	SD.Config.Delete on storage system
config delete dfm_appliance, config delete -mgmtpath	SD.Config.Delete on at least one storage system
config list	SD.Config.Read on at least one storage system
config migrate set	SD.Config.Write on at least one storage system

Command	Capability
config migrate delete	SD.Config.Delete on at least one storage system
config migrate list	SD.Config.Read on at least one storage system

Note: SnapDrive for UNIX does not check any capability for administrator (root).

Preconfigured roles for ease of user role configuration

Preconfigured roles simplify the task of assigning roles to users.

The following table lists the predefined roles:

Role Name	Description
GlobalSDStorage	Manage storage with SnapDrive for UNIX
GlobalSDConfig	Manage configurations with SnapDrive for UNIX
GlobalSDSnapshot	Manage Snapshot copies with SnapDrive for UNIX
GlobalSDFullControl	Full use of SnapDrive for UNIX

In the preceding table, Global refers to all the storage systems managed by an Operations Manager.

Automatic storage system update on Operations Manager

Operations Manager discovers the storage systems supported on your network. It periodically monitors data that it collects from the discovered storage systems. The data is refreshed at a set interval. The Operations Manager administrator can configure the refresh interval.

LUN monitoring Interval, qtree monitoring Interval, and vFiler monitoring interval are important fields that decide the frequency of LUN, qtree, and vFiler updates. For example, if a new LUN is created on a storage system, the new LUN is not immediately updated on Operations Manager. For this reason, and access check issued to Operations Manager for that LUN to Operations Manager fails. To avoid this situation, you can modify the LUN monitoring interval to suit your requirements.

1. Select **Setup** > **Options** in Operations Manager to change the monitoring interval.
2. The Operations Manager administrator can also forcefully refresh Operations Manager by executing `dfm host discovery filername` in the command-line interface.
3. The Operations Manager administrator can also grant `DFM.Database.Write` capability on the global group to sd-admin to enable SnapDrive for UNIX to refresh storage system entities on Operations Manager.

```
# dfm role add sd-admin-role DFM.Database.Write Global
Added 1 capability to role sd-admin-role.
```

Multiple Operations Manager servers

SnapDrive for UNIX supports multiple Operations Manager servers. This feature is required when a group of storage systems is managed by more than one Operations Manager server. SnapDrive for UNIX contacts the Operations Manager servers in the same order that the Operations Manager servers are configured in SnapDrive for UNIX. You can run the `snapdrive config list` command to obtain the configuration order.

The following example shows output for multiple Operations Manager servers:

```
# snapdrive config list
username    appliance name     appliance type
-------------------------------------------
root        storage_array1     StorageSystem
root        storage_array2     StorageSystem
sd-admin    ops_mngr_server1   DFM
sd-admin    ops_mngr_server2   DFM
```

In the preceding example, storage_array1 is managed by ops_mngr_server1 and storage_array2 is managed by ops_mngr_server2. In this example, SnapDrive for UNIX contacts ops_mngr_server1 first. If ops_mngr_server1 is not able to determine access, SnapDrive for UNIX contacts ops_mngr_server2.

SnapDrive for UNIX contacts the second Operations Manager only under the following conditions:

- When the first Operations Manager is unable to determine access. This situation might occur because the first Operations Manager is not managing the storage system.
- When the first Operations Manager is down.

Operations Manager unavailable

SnapDrive for UNIX needs Operations Manager for access checks. Sometimes Operations Manager server might not be available for various reasons.

When the RBAC method *rbac-method = dfm* is set and Operations Manager is not available, SnapDrive for UNIX displays the following error message:

```
[root]# snapdrive storage delete -lun storage_array1:/vol/vol2/qtree1/lun1
0002-333 Admin error: Unable to connect to the DFM ops_mngr_server
```

SnapDrive for UNIX can also maintain a cache of the user access check results returned by Operations Manager. This cache is valid for 24 hours and is not configurable. If Operations Manager is not available then SnapDrive for UNIX uses the cache to determine access. This cache is used only when all the configured Operations Manager servers do not respond.

For SnapDrive for UNIX to use the cache for an access check, you must turn on the *rbac-cache* configuration variable must be turned on to maintain the cache of access results. The *rbac-cache* configuration variable is `off` by default.

To use SnapDrive for UNIX even when Operations Manager is not available, the server administrator must reset the role-based access control (RBAC) method to *rbac-method = native* in the `snapdrive.conf` file. After you change the snapdrive.conf file, you must restart the SnapDrive for UNIX daemon. When *rbac-method = native* is set, only root user can use SnapDrive for UNIX.

RBAC and storage operation examples

Role-Based Access Controls allows storage operations depending on the capabilities assigned to you. You receive an error message if you do not have the right capabilities to carry out the storage operation.

Operation with a single filespec on a single storage object

SnapDrive for UNIX displays an error message when you are not an authorized user to create a filespec on a specified volume.

Filespec: Filespec can be either a file system, host volume, disk group, or LUN.

```
[john]$ snapdrive storage create -fs /mnt/testfs -filervol storage_array1:/vol/vol1 -dgsize
100m0002-332 Admin error:SD.Storage.Write access denied on volume storage_array1:/vol/vol1
for user unix_host\john on Operations Manager server ops_mngr_server
```

In this example, John is a nonroot user and is not authorized to create a filespec on the specified volume. John must ask the Operations Manager administrator to grant SD.Storage.Write access on the volume storage_array1:/vol/vol1.

Operation with a single filespec on multiple storage objects

SnapDrive for UNIX displays an error message when the administrator does not have the required permission on multiple storage objects to carry out the storage operations.

Filespec: Filespec can be anyone of file system, host volume, disk group, or LUN

```
[root]# snapdrive storage create -fs /mnt/testfs -lun storage_array1:/vol/vol1/lun2 -lun
storage_array1:/vol/vol2/lun2  -lunsize 100m
0002-332 Admin error:SD.Storage.Write access denied on volume storage_array1:/vol/vol1
for user unix_host\root on Operations Manager server ops_mngr_server
SD.Storage.Write access denied on volume storage_array1:/vol/vol2 for user unix_host\root
on Operations Manager server ops_mngr_server
```

In this example the filespec spans over two storage system volumes, vol1 and vol2. The administrator (root) of unix_host does not have SD.Storage.Write access on both volumes. Therefore, SnapDrive for UNIX shows one error message for each volume. To proceed with storage create, the administrator (root) must ask the Operations Manager administrator to grant SD.Storage.Write access on both the volumes.

Operation with multiple filespec and storage objects

The following example shows the error message you would receive when you are not an authorized user to carry out the specific operation.

```
[marc]$ snapdrive storage create -lun storage_array1:/vol/vol1/lun5 lun6 -lun
storage_array1:/vol/vol2/lun2 -lunsize 100m
0002-332 Admin error:SD.Storage.Write access denied on volume storage_array1:/vol/vol1
for user nis_domain\marc on Operations Manager server ops_mngr_server
SD.Storage.Write access denied on volume storage_array1:/vol/vol2 for user nis_domain\marc
on Operations Manager server ops_mngr_server
```

In this example, three LUNs reside on two storage system volume, vol1 and vol2. User Marc belongs to nis_domain and is not authorized to create filespec on vol1 and vol2. SnapDrive for UNIX displays the two error messages in the preceding example. The error messages show that the user must have `SD.Storage.Write` access on vol1 and vol2.

Operation with multiple storage objects

The following example shows the error message you would receive when you are not an authorized user to carry out the specific operation.

```
[john]$ snapdrive storage show —all

Connected LUNs and devices:

device filename  adapter  path  size  proto  state  clone  lun path           backing Snapshot
--------------   -------  ----  ----  -----  -----  -----  --------          ---------------
/dev/sdao        -        -     200m  iscsi  online  No    storage_array1:/
                                                           vol/vol2/passlun1    -
/dev/sda1        -        -     200m  fcp    online  No    storage_array1:/
                                                           vol/vol2/passlun2    -

Host devices and file systems:

dg: testfs1_SdDg                dgtype lvm
hostvol: /dev/mapper/testfs1_SdDg-testfs1_SdHv  state: AVAIL
fs: /dev/mapper/testfs1_SdDg-testfs1_SdHv       mount point: /mnt/testfs1 (persistent) fstype ext3

device filename   adapter  path  size  proto  state   clone  lun path             backing Snapshot
--------------    -------  ----  ----  -----  -----   -----  --------                ---------
/dev/sdn          -        P    108m   iscsi  online   No    storage_array1:/
                                                             vol/vol2/testfs1_SdLun    -
/dev/sdn1         -        P    108m   fcp    online   No    storage_array1:/
                                                             vol/vol2/testfs1_SdLun1   -

0002-719 Warning: SD.Storage.Read access denied on volume storage_array1:/vol/vol1 for user
unix_host\john on Operations Manager server ops_mngr_server
```

John is authorized to list storage entities on vol2 but not on vol1. SnapDrive for UNIX displays entities of vol1 and displays a warning message for vol2.

Note: For `storage list`, `storage show`, `snap list`, and `snap show` commands SnapDrive for UNIX displays a warning instead of error.

Operation with multiple Operations Manager servers managing storage systems

The following output shows the error message you would receive when storage systems are managed by multiple Operations Managers.

```
[root]# snapdrive storage create -lun storage_array1:/vol/vol1/lun5 lun6 -lun
storage_array2:/vol/vol1/lun2 -lunsize 100m
0002-332 Admin error:SD.Storage.Write access denied on volume storage_array1:/vol/vol1
for user unix_host\root on Operations Manager server ops_mngr_server1
SD.Storage.Write access denied on volume storage_array2:/vol/vol1 for user unix_host\root
on Operations Manager server ops_mngr_server2
```

storage_array1 is managed by ops_mngr_server1 and storage_array2 is managed by ops_mngr_server2. Administrator of unix_host is not authorized to create filespecs on storage_array1 and storage_array2. In the preceding example SnapDrive for UNIX displays the Operations Manager used to determine access.

FlexClone volumes in SnapDrive for UNIX

SnapDrive for UNIX supports FlexClone volumes, which are based on Data ONTAP FlexClone technology. A FlexClone volume is a point-in-time copy of a parent flexible volume. FlexClone volumes are faster than LUN clones, and they give you the flexibility to create multiple copies of data.

What FlexClone volumes are

A flexible volume clone, FlexClone, is a point-in-time copy of a parent flexible volume. The FlexClone volume does not inherit the changes made to the parent flexible volume after the clone is created.

Data ONTAP FlexClone technology enables instant replication of data volumes without requiring additional storage space at the time of creation. Each clone volume is a transparent, virtual copy that you can use for a wide range of operations such as product or system development testing, bug fixing, upgrade checks, and so on.

FlexClone technology provides substantial space savings with minimal overhead. Using this technology you can manage many more dataset combinations in lesser time and with less risk. FlexClone volumes do not have write reservation by default. SnapDrive 4.1 for UNIX uses FlexClone technology in NFS and SAN environments.

Note: FlexClone volumes are supported on Data ONTAP 7.1 and later, but they are not supported with vFiler units on storage systems running Data ONTAP 7.2 or earlier.

Benefits of FlexClone volumes

FlexClone volumes provide data management and performance benefits.

- Simplified data management and reduced risk.
- Flexibility and greater utilization.

  You can use FlexClone volumes to create multiple copies of data for additional users without giving them access to the original data.
- Faster than a LUN clone.

Types of FlexClone volumes

FlexClone volumes can be classified as temporary or all-purpose depending on how SnapDrive for UNIX uses them.

- **Restricted or temporary FlexClone volume**: This FlexClone volume (created during `snap connect`) is primarily used to verify data. Provisioning and Snapshot operations (except `snap disconnect`) through SnapDrive for UNIX are not allowed on this FlexClone volume.
- **Unrestricted or all-purpose FlexClone volume**: This FlexClone volume (created during `snap connect`) can be used also as a back end for provisioning and Snapshot operations, just like normal flexible volumes. You can perform all regular SnapDrive operations on this FlexClone volume.

SnapDrive for UNIX operations on FlexClone volumes

You can carry out various operations on FlexClone volumes using SnapDrive for UNIX.

Role-based access control for FlexClone volume operations

If Operations Manager is configured with the system, the Operations Manager administrator must grant you the required capabilities to carry out storage operations on FlexClone volumes.

Unrestricted FlexClone volume: You must have the following capabilities to perform storage operations on an unrestricted FlexClone volume:

- For `snap connect`, you must have `SD.SnapShot.UnrestrictedClone` capability on the parent volume.
- For `snap disconnect`, you must have `SD.SnapShot.DestroyUnrestrictedClone` capability on the FlexClone volume.

Restricted FlexClone volumes: You must have the following capabilities for storage operations on a restricted FlexClone volume:

- For `snap connect` you must have `SD.SnapShot.Clone` capability on the parent volume.
- For `snap disconnect` you must have `SD.SnapShot.Clone` capability on the parent volume.

To split the FlexClone volume during the `snap connect` operation, `SD.Storage.Write` access capability on the parent volume.

To perform storage operations on split FlexClone volumes during the `snap disconnect`, for split FlexClone volumes, you must have `SD.Storage.Delete` capability on the split volume clone.

Snap connect procedure

This section explains the procedure followed for snap connect operation.

The following steps depict the snap connect procedure:

1. SnapDrive for UNIX obtains the file spec name and the Snapshot name from the snap connect CLI. It then finds out the original storage system volume(s) where the snapshot(s) resides.
2. SnapDrive for UNIX chooses an appropriate cloning method for storage system entities based on CLI configuration options as given below:
   a. If `-clone lunclone` option is specified in the CLI or the `san-clone-method=lunclone` option in the `snapdrive.conf` file, then SnapDrive for UNIX creates a LUN clone in the same volume from the given snapshot.
   b. If `-clone unrestricted` option is specified in the CLI or the `san-clone-method=unrestricted` option in the `snapdrive.conf` file, then SnapDrive for UNIX creates or reuses all-purpose FlexClone from the given Snapshot.
   c. If `-clone optimal` option is specified in the CLI or the `san-clone-method=optimal` option in the `snapdrive.conf` file, then SnapDrive for UNIX automatically chooses between restricted FlexClone and LUN clone, based on storage system configuration.

Note: If the CLI option is specified, it always overrides the snapdrive.conf file option.

Note: The snap connect procedure is valid for Data ONTAP 7.2 or later.

Snap disconnect procedure

This section explains the procedure followed for snap disconnect.

The following steps depict the snap disconnect procedure:

1. SnapDrive for UNIX obtains host file specs from snap disconnect CLI and finds out the storage system volume.
2. After deleting host file specs and un-mapping the LUNs, SnapDrive for UNIX checks if the current volume is a clone created by SnapDrive.
3. If the FlexClone is created by SnapDrive, then SnapDrive for UNIX checks whether:
   a. There are any mapped LUNs in the clone volume
   b. There are any new LUNs in the cloned volume
   c. There are any new Snapshot copies

If all the conditions are satisfied, SnapDrive for UNIX deletes the cloned volume. For an unrestricted FlexClone, if RBAC is configured, then SnapDrive for UNIX does not perform substep 1 and substep 2 checks.

On storage systems with Data ONTAP version earlier than 7.2, restricted FlexClone volumes does not gets deleted by SnapDrive for UNIX. Storage system commands should be used to delete them. However, Unrestricted FlexClone volumes are deleted when the appropriate RBAC capability is provided to the user.

Related concepts:

"Role-Based Access Control in SnapDrive for UNIX" on page 115

Connecting to a single filespec in a LUN

You can connect to a single filespec which resides in a LUN. The following example describes how you can complete this operation.

Note: Filespec can be any one of file system, host volume, disk group, or a LUN.

For creating restricted FlexClone, you need to set the option san-clone-method =optimal in snapdrive.conf file or give -clone optimal before you can connect the filespec. This example displays the results when you want to connect a filespec /mnt/fs1 which resides in a LUN homer:/vol/vol1/lun1

The layout of the source file system /mnt/fs1 is given below:

```
# snapdrive storage show -fs /mnt/fs_1 -capabilities
raw device: /dev/sdc1 mount point: /mnt/fs_1 (persistent) fstype ext3
allowed operations: all

device filename adapter path size proto state clone lun path backing snapshot
-------------- ------- ---- ---- ----- ----- ----- -------- ----------------
/dev/sdc -  P 100m iscsi online No homer:/vol/vol1/lun1  -
```

```
# snapdrive snap connect -fs /mnt/fs_1 -snapname homer:/vol/vol1:snap1 -autorename

 connecting /mnt/fs_1:
        creating restricted volume clone homer:/vol/Snapdrive_vol1_volume_clone_from_snap1_snapshot
... success

        mapping new lun(s) ... done
        discovering new lun(s) ... done
Successfully connected to snapshot homer:/vol/vol1:snap1
        file system: /mnt/fs_1_0
```

Here, SnapDrive for UNIX automatically chose to create a restricted FlexClone `Snapdrive_vol1_0_volume_clone_from_snap1_snapshot` from snapshot snap1 and connected it to the LUN testlun1 in this FlexClone to create a cloned host file system /mnt/fs_1_0.

```
# snapdrive storage show -fs /mnt/fs_1_0 -capabilities

raw device: /dev/sde1   mount point: /mnt/fs_1_0 (persistent) fstype ext3
allowed operations: snap disconnect; snap list; snap show; storage show; storage list

device filename adapter path size  proto  state  clone  lun path backing     snapshot
--------------- ------- ---- ----- ------ ------ ------ -------- ---------   -------
/dev/sde  -  P  100m iscsi online flex-clone homer:/vol/Snapdrive_vol1
                                             _volume_clone_from_snap1_
                                             snapshot/lun1               vol1:snap1
```

SnapDrive for UNIX names the destination FlexClone with the prefix mentioned in the CLI.

If the generated FlexClone name (with prefix) is already in use, SnapDrive for UNIX gives an error message. In this case, you can use `–autorename` option along with `–prefixfv` to auto generate clone volume names.

`–prefixfv` CLI option is applicable only for SAN based filespecs. The `-destfv` CLI option is ignored by SnapDrive for UNIX for SAN based filespecs during FlexClone operation.

Note: SnapDrive for UNIX displays a warning when a Snapshot copy is locked due to LUN clones. However, SnapDrive for UNIX proceeds with the `snap connect` operation.

Connecting to multiple filespecs

You can connect to multiple filespecs that reside in a volume. The following example describes how you can complete this operation.

For creating restricted FlexClone, you need to set the `san-clone-method=unrestricted` in the `snapdrive.conf` file or give `-clone unrestricted` before you can connect to multiple filespec. This example displays the results when you want to connect to multiple filespec `/mnt/fs_1` and `/mnt/fs_2` in snap1 which reside in volume vol1.

The layout of /mnt/fs_1 and /mnt/fs_2 is given in the following:

```
 # snapdrive storage show -fs /mnt/fs_1 /mnt/fs_2 -capabilities
raw device: /dev/sdc1   mount point: /mnt/fs_1 (persistent) fstype ext3
allowed operations: all

device filename  adapter  path  size   proto   state  clone  lun path             backing snapshot
-------------   -------  ----  ------  -----   -----  -----  --------------       ----------------
/dev/sdc         -        P    100m    iscsi   online  No    homer:/vol/vol1/lun1  -

raw device: /dev/sdo1   mount point: /mnt/fs_2 (persistent) fstype ext3
allowed operations: all

device filename  adapter path  size   proto   state   clone    lun path            backing snapshot
------------    -------  ----  ----   ------  -----   -----    --------            ----------------
/dev/sdo         -        P    100m   iscsi   online   No      homer:/vol/vol1/lun2   -
```

Here the user used Snapshot snap2 which contains application consistent Snapshots of /mnt/fs1 and /mnt/fs2 for snap connect.

```
 # snapdrive snap connect -fs /mnt/fs_1 -fs /mnt/fs_2 -snapname homer:/vol/vol1:snap2
-autorename -clone unrestricted

 connecting /mnt/fs_1:
   creating unrestricted volume clone homer:/vol/Snapdrive_vol1_volume_clone_from_snap2_snapshot
... success

        mapping new lun(s) ... done

 connecting /mnt/fs_2:

        mapping new lun(s) ... done
        discovering new lun(s) ... done
Successfully connected to snapshot homer:/vol/vol1:snap2
        file system: /mnt/fs_1_0
        file system: /mnt/fs_2_0
```

Here, SnapDrive for UNIX has created a single unrestricted FlexClone Snapdrive_vol1_0_volume_clone_from_snap2_Snapshot from Snapshot snap2. This is then connected to LUN testlun1 and testlun2 to create a cloned host file system /mnt/fs1_0 and /mnt/fs2_0 respectively.

```
# snapdrive storage show -fs /mnt/fs_1_0 /mnt/fs_2_0 -capabilities
raw device: /dev/sde1   mount point: /mnt/fs_1_0 (persistent) fstype ext3
allowed operations: all

device filename adapter  path  size  proto state   clone      lun path              backing snapshot
--------------  -------  ----  ---- -----  -----   -----      --------              ----------------
/dev/sde        -        P     100m  iscsi online  flex-clone homer:/vol/Snapdrive_vol1
                                                              _volume_clone_from_snap2_
                                                              snapshot/lun1             vol1:snap2

raw device: /dev/sdac1  mount point: /mnt/fs_2_0 (persistent) fstype ext3
allowed operations: all

device filename  adapter  path  size  proto  state  clone     lun path              backing snapshot
--------------   -------  ----  ----  -----  -----  -----     --------              ----------------
/dev/sdac         -       P     100m   iscsi online flex-clone  homer:/vol/Snapdrive_vol1
                                                                _volume_clone_from_snap2_
                                                                snapshot/lun2           vol1:snap2
```

Disconnecting a filespec

You can disconnect a filespec. The following example describes how you can complete this operation.

The layout of /mnt/fs1_0 is given in the following.

```
# snapdrive storage show -fs /mnt/fs_1_0 -capabilities
raw device: /dev/sde1   mount point: /mnt/fs_1_0 (persistent) fstype ext3
allowed operations: all

device filename adapter path size proto state  clone       lun path                  backing snapshot
-------------   ------ ---- ----  ----- -----  -----      --------                  ----------------
/dev/sde        -      P    100m  iscsi online   flex-clone  homer:/vol/Snapdrive_vol1
                                                             _volume_clone_from_snap2_
                                                             snapshot/lun1              vol1:snap2
```

The following output shows how to disconnect the file system /mnt/fs_1_0:

```
#snapdrive snap disconnect -fs /mnt/fs_1_0
 delete file system /mnt/fs_1_0
- fs /mnt/fs_1_0 ... deleted
         - LUN homer:/vol/Snapdrive_vol1_volume_clone_from_snap2_snapshot/lun1 ... disconnected
         - deleting volume clone ... homer:/vol/Snapdrive_vol1_volume_clone_from_snap2_snapshot  done
```

After disconnecting the file system /mnt/fs_1_0, SnapDrive for UNIX also deletes the cloned volume Snapdrive_vol1_0_volume_clone_from_snap2_snapshot, if the following conditions are met:

- No mapped LUNs are present in the volume
- No new LUNs are present
- No new Snapshot copies are present

Deleting a FlexClone not created by SnapDrive for UNIX: SnapDrive for UNIX does not allow deletion of FlexClone not created by it.

Splitting the FlexClone volume

You can split the existing FlexClone volume using the SnapDrive for UNIX commands.

To split the FlexClone volume you need to additionally specify the -split CLI option with the snap connect command. To disconnect, you should provide the -split option with the disconnect command to disconnect the split FlexClone volume. The blocking and non-blocking modes of initiating a -split operation are valid here.

Related concepts:

"Splitting a volume clone or LUN clone" on page 188

Space reservation with a FlexClone volume

You can carry out space reservation operation on both restricted and unrestricted type of FlexClone volumes. By default FlexClone volumes do not have write reservations.

Following are the space reservation settings for the FlexClone for unrestricted and restricted FlexClone volumes:

Unrestricted FlexClone volumes: If -reserve option is given in the CLI or flexclone-writereserve-enabled = on in snapdrive.conf, the space reservation would be set to volume on the FlexClone, otherwise it is none. SnapDrive for UNIX shows an error message if the space available on the aggregate is not sufficient to adhere to this setting.

Restricted FlexClone volumes:

- The space reservation setting at volume-level is always disabled, that is the space reservation is NONE.
- If `-reserve` or `-noreserve` option is given in the CLI, then space reservation is enabled or disabled respectively on the LUNs which belong to the host file spec. Otherwise, the host file spec related LUNs in FlexClone inherit the space reservation from the parent volume LUNs.

Storage Provisioning in SnapDrive for UNIX

You can use SnapDrive for UNIX when you work with storage provisioning. SnapDrive for UNIX helps you to create storage and connect to existing storage systems or entities.

Storage operations in SnapDrive for UNIX

SnapDrive for UNIX provides end-to-end storage management. With it, you can provision storage from a host to a storage system and manage that storage with or without using the host Logical Volume Manager (LVM).

SnapDrive for UNIX enables you to perform the following tasks:

- Create storage by creating LUNs, file systems, logical volumes, and disk groups.
- Display information about storage.
- Connect to storage.
- Resize storage.
- Disconnect from the storage.
- Delete storage.

When you use the `snapdrive storage create` command, to create storage, SnapDrive for UNIX automatically performs all the tasks needed to set up LUNs, including preparing the host, performing discovery mapping, and connecting to each LUN you create. You can use the `snapdrive storage show` command to display information about the LUNs, disk groups, host volumes, file systems, or NFS directory trees that you create.

You can use the `snapdrive storage connect` command to map storage to a new location. This command lets you access existing storage from a different host than the one used to create it. The `snapdrive storage connect` command lets you make existing LUNs, file systems, disk groups, and logical volumes accessible on a new host. This operation can be useful if you want to backup a storage entity from the new host to another medium.

The `snapdrive storage resize` command lets you increase the size of your storage in the following ways:

- Specifying the target size that you want the host entity to reach.
- Entering a set number of bytes by which you want to increase the storage.

If you no longer want your storage mapped to its current location, you can use the snapdrive `storage disconnect` command. This command removes the mappings from one or more host locations to the LUNs making up the storage for that location.

You can also delete the storage. If you execute the `snapdrive storage delete` command, SnapDrive for UNIX removes all the host-side entities you specify as well as all their underlying entities and the LUNs associated with them.

Storage operations across multiple storage system volumes

SnapDrive for UNIX lets you perform many of the storage operations across multiple storage system volumes as long as the operations do not manipulate the Logical Volume Manager (LVM). This enables you to work with lists of LUNs that exist across multiple storage system volumes.

Considerations for storage operations

You must keep in mind a few considerations related to the various storage commands.

- Support is limited for volume groups spanning multiple storage system volumes or multiple storage systems. You cannot use the `snapdrive storage create` command to create volume groups that span across storage systems.

  In this case, SnapDrive for UNIX supports the following key commands:

  – `snapdrive snap create`

  – `snapdrive snap restore`

  – `snapdrive snap connect`

  – `snapdrive snap disconnect`
- The `snapdrive storage resize` command does not work with LUNs mapped directly to the host, or with the files systems that they contain.
- SnapDrive for UNIX does not provide any options to control the formatting of host volumes that it creates. SnapDrive for UNIX creates only concatenated host volumes. It does operate correctly on host volumes of other formats (such as striped volumes) that were created using other application.
- You cannot restore a portion of a disk group. SnapDrive for UNIX backs up and restores whole disk groups only.

Considerations for provisioning RDM LUNs

SnapDrive for UNIX has a few considerations for provisioning RDM LUNs.

About this task

- Verify that the configuration variable *default-transport* variable is set as *fcp* in the `snapdrive.conf` file in the guest operating system.
- Configure SnapDrive for UNIX to access the IBM N series for VMware vSphere.
- Ensure that the configuration variables for RDM LUN support are used in the `snapdrive.conf` file. The variables such as *contact-viadmin-port*, *use-https-to-viadmin*, *vif-password-file* and *virtualization-operation-timeoutsecs=600* are used for RDM LUN support.

Related concepts:

"Limitations of RDM LUNs managed by SnapDrive for UNIX" on page 12

"VMware VMotion support in SnapDrive for UNIX"

"Configuration options and their default values" on page 59

Related tasks:

"Configuring Virtual Storage Console for SnapDrive for UNIX" on page 82

VMware VMotion support in SnapDrive for UNIX

SnapDrive for UNIX enables you to disconnect and connect the RDM LUNs before and after VMware VMotion. After the VMotion operation is complete, you can perform the storage operations that are required for your storage system.

About VMware VMotion:

VMware VMotion enables you to move a guest system from one ESX server to another ESX server.

The following operations must be executed to disconnect and connect the RDM LUNs in SnapDrive for UNIX.

Before VMotion

You need to use the `snapdrive storage disconnect` command to remove the mappings for the RDM LUNs. The following syntax: `snapdrive storage disconnect -lun` *long_lun_name [lun_name...]*

After VMotion

After the VMotion is complete, you must use the `snapdrive storage connect` command to connect RDM LUNs. The following syntax: `snapdrive storage connect -lun` *long_lun_name [lun_name...]*

Related concepts:

"Limitations of RDM LUNs managed by SnapDrive for UNIX" on page 12

Related tasks:

"Configuring Virtual Storage Console for SnapDrive for UNIX" on page 82

Storage creation with SnapDrive for UNIX

You can use SnapDrive for UNIX to create LUNs, a file system directly on a LUN, disk groups, host volumes, and file systems created on LUNs.

SnapDrive for UNIX automatically handles all the tasks needed to set up LUNs associated with these entities, including preparing the host, performing discovery mapping, creating the entity, and connecting to the entity you create. You can also specify which LUNs SnapDrive for UNIX uses to provide storage for the entity you request.

You do not need to create the LUNs and the storage entity at the same time. If you create the LUNs separately, you can create the storage entity later using the existing LUNs.

Methods for creating storage

SnapDrive for UNIX provides some basic formats for the `snapdrive storage create` command to make it easier to create the storage you want. The storage create operation falls into various general categories.

- Creating LUNs—The `snapdrive storage create` command automatically creates the LUNs on the storage system but does not create any additional storage entities. SnapDrive for UNIX performs all of the tasks associated with host preparation and creating storage discovery for each LUN, as well as mapping and connecting to it.
- Creating a file system directly on a LUN and setting up the LUN automatically— SnapDrive for UNIX performs all of the actions needed to set up the file system. You do not need to specify any LUNs for it to create.
- Creating a file system directly on a LUN and specifying the LUN you want associated with it—In this case, you use the `snapdrive storage`

`create` command to specify the file system you want to set up, and the LUN you want to associate with the file system.

- Creating an LVM and setting up the LUN automatically—The `snapdrive storage create` command lets you create a file system, a logical volume, or a disk group on the host. SnapDrive for UNIX performs all the actions needed to set up the entity, including automatically creating the required disk group and LUN. You do not need to specify any LUN for it to create.
- Creating an LVM entity on the host and specifying the LUN you want associated with it—In this case, you use the `snapdrive storage create` command to specify both the entity you want to set up (file system, logical volume, or disk group) and the LUN you want associated with that entity.
- Creating a file system on a shared host in a host cluster environment—In this case, you create a file system, a logical volume, or a disk group on the shared host.

Guidelines for the storage create operation

You should follow certain guidelines when you use the `snapdrive storage create` command for the storage create operation.

- If you list LUNs from different storage system volumes with the `-lun` option, you cannot include the `-dg`, `-hostvol`, or `-fs` option at the command prompt.
- The `-nolvm` option creates a file system directly on a LUN without activating the host LVM. You cannot specify host volumes or disk groups when you use this option.
- You cannot use SnapDrive for UNIX storage provisioning commands for NFS files or directory trees.
- If you use the `snapdrive storage create` command to create a file system directly on a LUN, you cannot specify more than one LUN. SnapDrive for UNIX always creates a new LUN when you use this form of the command.
- Some operating systems have limits on how many LUNs you can create. If your host is running one of these operating systems, you might want to run the `snapdrive config check luns` commands.
- Creating a file system on a raw LUN with DMP multipathing is supported.

Information required for the storage create operation

You must supply some information when you complete the storage create operation.

The following table lists the information you need to supply when you use the `snapdrive storage create` command to create storage.

Requirement	Argument
Decide the type of storage you want to provision. Based on the command you enter, you can create any of the following: • LUNs If you create one or more LUNs, the first argument must use the long form of the LUN name, which specifies the storage system name, the volume name, and the name of the LUN within the volume. To specify additional LUNs, you can use the LUN name (short name) alone if the new LUN is on the same storage system and volume as the previous LUN. Otherwise, you can specify a new storage system name and volume name (or just a volume name) to replace the previous values. • A file system created directly on a LUN If you create a file system on a LUN, the first argument must be the *-fs* mount point. To create the file system on a LUN in a storage system and volume, use the *-filervol* argument and specify the name of the storage system and volume. To create the file system on a specific LUN, use the *-lun* argument and specify the storage system name, volume name, and LUN name. You must also include the -nolvm option to create the file system on the LUN without activating the host LVM. By default, SnapDrive for UNIX automatically performs all of the tasks associated with host preparation and discovery for the LUN, as well as mapping and connecting to it. If you create a LUN on a Linux host, SnapDrive for UNIX performs the following actions: – Creates the LUN. – Configures the LUN into one partition. **Note:** If you are using SLES10 update 2, then raw device is used to create a file system. • LVM disk groups with host volumes and file systems When you specify a disk or volume group, file system, or host or logical volume, SnapDrive for UNIX performs all the actions necessary to create the entity you specify. You can either explicitly specify the LUNs, or just supply the storage system and volume information and let SnapDrive for UNIX create the LUNs automatically. If you are creating an entity such as a file system, you do not need to supply a value for a disk or volume group. SnapDrive for UNIX automatically creates one.	
• A LUN (-lun)	**long_lun_name**
• Additional LUNs	**lun_name** (long or short form)
• Disk group (-dg **dgname**) or volume group (-vg **vgname**)	**disk** or **volume group name**
SnapDrive for UNIX creates a disk or volume group to hold the LUNs based on the value you enter with the -dg option. The name you supply for the group must not exist.	
• Host volume (-hostvol **file_spec**) or logical volume (-lvol **file_spec**)	**Host** or **logical volume name**
• File system (-fs **file_spec**)	**filesystem_name**
• -nolvm	~
Required: If you are creating a file system that resides directly on a LUN, specify the -nolvm option.	
• Lun size (-lunsize)	**size**
• Disk group size (-dgsize) • Volume group size (-vgsize)	**size**

<table>
<tr><th>Requirement</th><th>Argument</th></tr>
<tr><td colspan="2">Specify the size in bytes or some other data unit for each entity being created. The size of the LVM entity depends on the aggregated size of the LUNs you request.
To control the size of the host entity, use the `-dgsize` option to specify the size in bytes of the underlying disk group.</td></tr>
<tr><td>• Path to storage system volume (`-filervol`)</td><td>**`long_filer_path`**</td></tr>
<tr><td>• `-lun`</td><td>**`long_lun_path`**</td></tr>
<tr><td colspan="2">Specify the storage system and its volume where you want SnapDrive for UNIX to create the LUNs automatically.
• Use the `-filervol` option to specify the storage system and volume where you want the LUNs created.
Do not specify the LUN. SnapDrive for UNIX creates the LUN automatically when you use this form of the `snapdrive storage create` command. It uses system defaults to determine the LUN IDs, and the size of each LUN. It bases the names of the associated disk/volume groups on the name of the host volume or file system.
• Use the `-lun` option to name the LUNs that you want to use.</td></tr>
<tr><td>File system type (`-fstype`)</td><td>**`type`**</td></tr>
<tr><td colspan="2">If you are creating a file system, supply the string representing the file system type.
SnapDrive for UNIX accepts Linux: *ext4* or `ext3`
Note: By default, SnapDrive for UNIX supplies this value if there is only one file system type for your host platform. In that case, you do not need to enter it.</td></tr>
<tr><td>`-vmtype`</td><td>**`type`**</td></tr>
<tr><td colspan="2">**Optional:** Specifies the type of volume manager to be used for SnapDrive for UNIX operations.</td></tr>
<tr><td>• `-fsopts`</td><td>**`option name and value`**</td></tr>
<tr><td>• `-nopersist`</td><td>~</td></tr>
<tr><td>• `-reserve | -noreserve`</td><td>~</td></tr>
</table>

Requirement	Argument
Optional: If you are creating a file system, you can specify the following options: • Use `-fsopts` to specify options you want to pass to the host command used to create the file systems. For example, you might supply options that the `mkfs` command would use. The value you supply usually needs to be a quoted string and must contain the exact text to be passed to the command. • Use `-mntopts` to specify options that you want to pass to the host mount command (for example, to specify host system logging behavior). The options you specify are stored in the host file system table file. Allowed options depend on the host file system type. • The *-mntopts* argument is a file system `-type` option that is specified using the `mount` command `-o` flag. Do not include the `-o` flag in the *-mntopts* argument. For example, the sequence -mntopts tmplog passes the string `-o tmplog` to the `mount` command, and inserts the text tmplog on a new command line. **Note:** If you pass any invalid *-mntopts* options for storage and snap operations, SnapDrive for UNIX does not validate those invalid mount options. • Use `-nopersist` to create the file system without adding an entry to the file system mount table file on the host (for example, `fstab` on Linux). By default, the `snapdrive storage create` command creates persistent mounts. When you create an LVM storage entity on a Linux host, SnapDrive for UNIX automatically creates the storage, mounts the file system, and then places an entry for the file system in the host file system table. On Linux systems, SnapDrive for UNIX adds a UUID in the host file system table. • Use `-reserve | -noreserve` to create the storage with or without creating a space reservation.	
• igroup name(**`-igroup`**)	**`ig_name`**
Optional: It is recommended that you use the default igroup for your host instead of supplying an igroup name.	

Storage creation for LVM entities

If you use SnapDrive for UNIX to create a logical volume or file system using the LVM, SnapDrive for UNIX automatically creates the required disk group. SnapDrive for UNIX creates the file system based on the type that is supported by the host volume manager. For Linux, it includes Ext4 or Ext3.

Storage creation for a file system that resides on a LUN

If you use SnapDrive for UNIX to create a file system that resides directly on a LUN, SnapDrive for UNIX creates and maps the LUN, then creates and mounts the file system without involving the host LVM.

Note: SnapDrive for UNIX operations are not supported when the host's root file system has read-only permissions.

Storage partitioning scheme in Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES)

On RHEL, SnapDrive for UNIX partitions the disks to provision host storage entities. However, SnapDrive for UNIX allows to provisioning and managing SnapDrive operations for both partitioning and non-partitioning devices on SLES 11, and only non-partitioning devices on SLES 10.

The Linux 2.2 and 2.4 kernel versions could not use raw disks for creating file-systems because historically all Microsoft x86 system architecture used the Windows operating system, and always partitioned the hard disks. Since the initial kernel was written to work on top of the Windows operating systems, the kernel was also written in such a way to expect partitions on the hard disk. Further partitioning was always done to create file-systems on raw devices. Partitioning is never done for LUNs part of a disk group and/or for raw LUNs. Hence, any change with respect to the partitioning scheme is restricted to the behavior in case of file-systems on raw devices only.

Partitioning support in Red Hat Enterprise Linux and SUSE Linux Enterprise Server

SnapDrive for UNIX provides storage partitioning in Linux for multipathing and non multipathing environments.

The following guidelines are for partitioning storage devices with SnapDrive for UNIX.

Partitioning support in Red Hat Enterprise Linux

SnapDrive for UNIX supports operations on RHEL systems using partitioned devices only.

Check the N series interoperability matrix website (accessed and navigated as described in Websites). An Ext3 filesystem on raw LUN is not supported on RHEL 5.x/OEL 5.x.

Note: The preceding points are applicable to all versions of RHEL as there are no exceptions.

Partitioning support in SUSE Linux Enterprise Server

- SnapDrive 5.0 for UNIX and later versions supports SLES 10 using "NON-PARTITIONED" devices for all provisioning operations, both on multipath and non-multipath environments.
- SLES 11 is supported in SnapDrive 4.2 for UNIX and later versions, and allows provisioning operations on either partitioned or non-partitioned devices.

The following table summarizes the support of partitioned and non-partitioned devices of RHEL and SLES.

SnapDrive 5.0 for UNIX and later version...	Partition devices	Non-partition devices
RHEL	Yes	No
SLES 10	No	Yes
SLES 11	Yes	Yes

General considerations

The Snapshot copies that are created in SnapDrive 4.2 for UNIX is based on partitioned devices. These Snapshot copies can be restored, connected, and supported in SnapDrive 5.0 for UNIX and later versions.

Creating LUNs without host entities

You can use SnapDrive for UNIX commands to provision storage by creating a LUN on the storage system.

Procedure

At the command-line interface, enter the following command:

`snapdrive storage create -lun` *long_lun_name* -lunsize *[lun_name ...]* -lunsize*size* [{-reserve | -noreserve}] -igroup ig_name [ig_name ...]]*ig_name [ig_name ...]]*
SnapDrive for UNIX creates the LUNs you specify.

Example: Creating three 10 GB LUNs on a storage system

```
snapdrive storage create -lun acctfiler:/vol/vol1/lunA lunB lunC - lunsize
10g
```

Creating a file system on a LUN and setting up the LUN automatically

You can create a file system on a LUN using SnapDrive for UNIX. SnapDrive for UNIX automatically create the associated LUN.

Procedure

At the command line, enter the following command:
`snapdrive storage create -fs` *`file_spec`* `-nolvm [-fstype type] [-fsopts options] [-mntopts options] [-nopersist] -filervol` *`long_filer_path`* `-lunsize` *`size`* `[-igroup` *`ig_name [ig_name ...]]`* `[{-reserve | -noreserve }]`
SnapDrive for UNIX creates the file system you specify and creates a LUN for it on the storage system you specify. It performs all of the tasks associated with host preparation and discovery for the LUNs, as well as mapping and connecting the LUNs to the host entity.

Example

Example: Creating a 100-MB file system directly on a LUN

```
# snapdrive storage create -fs /mnt/acct1 -filervol acctfiler:/vol/vol1
-lunsize 100m -nolvm
```

Example: Creating a file system on a raw LUN without any volume manager

```
# snapdrive storage create -fs /mnt/vxfs2 -fstype vxfs -lun
snoopy:/vol/vol1/lunVxvm2 -lunsize 50m -nolvm
LUN snoopy:/vol/vol1/lunVxvm2 ... created
mapping new lun(s) ... done
discovering new lun(s) ... done
LUN to device file mappings:
- snoopy:/vol/vol1/lunVxvm2 => /dev/vx/dmp/Disk_1
file system /mnt/vxfs2 created
```

Example 2: Creating a file system on a RDM LUN without any volume manager

```
# snapdrive storage create -fs /mnt/fs -fstype ext3 -lun
lech:/vol/vol_1/lun1 -lunsize 50m -nolvm
LUN lech:/vol/vol1/lun1 ... created
exporting new lun(s) to Guest OS ... done
discovering new lun(s) ... done
LUN to device file mappings:
- lech:/vol/vol1/lun1 => /dev/sdb
file system /mnt/fs created
```

Creating a file system on a LUN and specifying the LUN

You can create a filesystem on a LUN and specify the LUNs that are created as a part of it.

Procedure

Use the following command format to complete this operation: `snapdrive storage create -fs` *file_spec* -nolvm [-fstype *type*] [-vmtype *type*] [-fsopts *options*] [-mntopts *options*] [-nopersist] -lun *long_lun_name* -lunsize *size ig_name* [*ig_name*...]] [{ -reserve | -noreserve }]
SnapDrive for UNIX creates the file system on the storage system, volume, and LUN you specify. It performs all of the tasks associated with host preparation and discovery for the LUNs, as well as mapping and connecting the LUNs to the host entity.

Example: Creating a 100 MB file system on luna in acctfiler:/vol/vol1

```
# snapdrive storage create -fs /mnt/acct1 -lun acctfiler:/vol/vol1/luna
-lunsize 100m -nolvm
```

Creating an LVM entity and setting up the LUN automatically

You can create an entity, such as a file system, logical volume, or disk group on the host and have SnapDrive for UNIX automatically create the associated LUN.

About this task

- The `host_lvm_fspec` argument lets you specify whether you want to create a file system, logical volume, or disk group. This argument has three general formats. The format you use depends on the entity you want to create.

  To create a file system, use this format:`-fs file_spec [-fstype type] [-fsopts options] [-mntopts options] [-nopersist] [ -hostvol file_spec] [ -dg dg_name]`

  To create a logical or host volume, use this format: `[-hostvol file_spec]` *file_spec* [-dg *dg_name*]

  To create a disk or volume group, use this format: `-dg` *dg_name*
- If you create a file system, you can also include the host volume specifications, the disk group specifications, or both specifications to indicate the host volume and disk group on which the file system resides. If you do not include these specifications, SnapDrive for UNIX automatically generates the names for the host volume and disk group or both.
- When you specify a host volume, SnapDrive for UNIX creates a concatenated host volume. While this is the only format SnapDrive for UNIX supports when creating host volumes, it does allow you to manipulate existing striped host volumes.

Procedure

At the command line, enter the following command:

`snapdrive storage create` *host_vxvm_fspec* -filervol *long_filer_path* -dgsize size [-igroup *ig_name [ig_name ...]]* [{ -reserve | -noreserve }]
SnapDrive for UNIX creates the host entity you specify and creates LUNs for it on the storage system you specify. It performs all of the tasks associated with host

preparation and discovery for each of the LUNs, as well as mapping and connecting the LUNs to the host entity.

Creating an LVM entity and specifying the LUN

You can create a host entity such as a file system, logical volume, or disk group and specify the LUN that is created as part of it.

Procedure

At the command line, enter the following command:

`snapdrive storage create` *-host_lvm_fspec* -lun *long_lun_name* [*lun_name*...] -lunsize *size* [-igroup *ig_name* [*ig_name*...]] [{ -reserve | -noreserve }]
This example creates the file system /mnt/acctfs with file system depending on your host. It sets up three LUNs on the storage system acctfiler. Each LUN is 10 GB:`# snapdrive storage create -fs /mnt/acctfs -fstype jfs2 -lun acctfiler:/vol/vol1/lunA lunB lunC -lunsize 10g`

```
LUN acctfiler:/vol/vol1/lunA ... created
LUN acctfiler:/vol/vol1/lunB ... created
LUN acctfiler:/vol/vol1/lunC ... created
mapping new lun(s) ... done
discovering new lun(s) ... done
LUN to device file mappings:
- acctfiler:/vol/vol1/lunA => hdisk2
- acctfiler:/vol/vol1/lunB => hdisk3
- acctfiler:/vol/vol1/lunC => hdisk4
disk group acctfs_SdDg created
host volume acctfs_SdHv created
file system /mnt/acctfs created
```

```
LUN acctfiler:/vol/vol1/lunA ... created
LUN acctfiler:/vol/vol1/lunB ... created
LUN acctfiler:/vol/vol1/lunC ... created
mapping new lun(s) ... done
discovering new lun(s) ... done
LUN to device file mappings:
- acctfiler:/vol/vol1/lunA => /dev/vx/rdmp/c4t0d3s2
- acctfiler:/vol/vol1/lunB => /dev/vx/rdmp/c4t0d7s2
- acctfiler:/vol/vol1/lunC => /dev/vx/rdmp/c4t0d8s2
disk group acctfsvg created
host volume acctfshv created
file system /mnt/acctfs created
```

Command to use to display available storage

The `snapdrive storage show` or `snapdrive storage list` show LUNs or NFS directory trees underlying one or more storage entities. You can use the `snapdrive storage show` command to learn and know what is in a Snapshot copy of a disk group, host volume, file system, or NFS directory tree.

You can use these commands to display the following information:

- LUNs available for specific storage systems or storage system volumes
- LUNs associated with file systems, host volumes, or disk groups
- NFS mount points and directory trees
- LUNs known to a specific host, and any LVM entities that the LUNs include
- Devices known to a specific host
- Resources on the shared and dedicated hosts

Note: You can use either `snapdrive storage show` or `snapdrive storage list` at the command line.

Methods for displaying storage information

To make it easier to display information about storage, SnapDrive for UNIX provides several formats for the `snapdrive storage show` command.

Storage show operations fall into the following general categories:

- Displaying information about a specific LUN.
- Listing information about LUNs available for specific storage systems or storage system volumes.
- Displaying information about LUNs associated with the arguments you specify.

  These arguments can include NFS entities, file systems, host volumes, or disk groups. If you use the `-verbose` option at the command prompt, SnapDrive for UNIX provides detailed output, such as showing the storage hierarchy including the backing LUNs.
- Displaying information about the devices known to the host.
- Displaying information about all devices and LVM entities known to the host.
- Displaying the status of a resource as shared or dedicated.

Increase in storage size using SnapDrive for UNIX

SnapDrive for UNIX lets you increase the size of the storage system volume group or disk group. You use the `snapdrive storage resize` command to do this.

Note: This command does not let you resize host volumes or file systems. For example, you can not use the resize command to change the size of a file system on a LUN. You need to use the LVM commands to resize host volumes and file systems after you have resized the underlying disk group.

You can put the storage resize operations into the following general categories:

- Setting a target size in bytes to which you want to increase the storage
- Specifying a number of bytes by which you want to increase the storage

SnapDrive for UNIX adds a system-generated LUN. If you specify an amount by which you want to increase the storage, such as 50 MB, it makes the LUN 50 MB. If you specify a target size for the storage, it calculates the difference between the current size and the target size. The difference becomes the size of the LUN it then creates.

Guidelines for the storage resize command

You need to follow few guidelines when you use the `snapdrive storage resize` command.

- The storage resize operation can only increase the size of storage. You cannot use it to decrease the size of an entity.
- All LUNs must reside in the same storage system volume.
- The resize operation does not support directly on logical host volumes, or on file systems that reside on logical host volumes or on LUNs. In those cases, you must use the LVM commands to resize the storage.
- You cannot resize a LUN; you must use the `-addlun` option to add a new LUN.

Information required for using the snapdrive storage resize command

There is some information that you need to supply before you can use the `snapdrive storage resize` command. This information helps you in using the command correctly.

Requirement	Argument
Decide whether you want to increase the size of a disk or volume group and enter that entity's name with the appropriate argument.	
Disk group (-dg file_spec) or volume group (-vg file_spec)	*name of the disk or volume group*
Decide how you want to increase the storage size. Remember the following when you use this command: • Use the `-growby` option to increase the entity size by the bytes specified in the size argument. • Use the `-growto` option to increase the entity size so that the new total size is the number of bytes specified in the *size* argument. • Use the `-addlun` option to increase the entity size by adding a new, internally-generated LUN to the underlying disk group. If you do not use this argument, SnapDrive for UNIX increases the size of the last LUN in the disk group to meet the byte size specified in either the `-growby` option or the `-growto` option.	
Specify the number of bytes by which you want to increase the storage (`-growby` *size*)	*number_of_bytes*
Specify the size in bytes that you want the storage to reach (`-growto` *size*)	*number_of_bytes*
Tell SnapDrive for UNIX to increase the size by adding a new LUN to the disk group (`-addlun`)	-
Tell SnapDrive for UNIX to increase the size with or without creating a space reservation `-reserve | -noreserve`	-
Optional: It is recommended that you use the default igroup for your host instead of supplying an igroup name.	
Igroup name (`-igroup`)	*ig_name*
`-fstype`	*type*
`-vmtype`	*type*
Optional: Specifies the type of file system and volume manager to be used for SnapDrive for UNIX operations.	

Command syntax to increase the size of the storage

To increase the size of the storage, you should know the correct syntax to be used.

`snapdrive storage resize -dg` *file_spec* { `-growby | -growto` } `size [-addlun [-igroup` *ig_name* [*ig_name* ...]]] [{ `-reserve | - noreserve`}]] [`-fstype` *type*] [`-vmtype` *type*]

Note: You cannot use the `snapdrive storage resize` command to reduce the size of an entity. You can only increase the size using this command.

The `snapdrive storage resize` command does not support directly on logical volumes or file systems. For example, you can not use the `snapdrive storage resize` command to resize a file system on a LUN.

Result: This command increases the size of the storage entity (logical volume or disk group) by either of the following:

- Adding bytes to storage (`-growby`).
- Increasing the size to the byte size you specify (`-growto`).

Host volumes and file system resize operation

The `snapdrive storage resize` command applies only to storage system disk groups and volume groups. If you want to increase the size of your host volume or file system, you must use LVM commands.

The following table summarizes the LVM commands you can use on the different platforms. For more information about these commands, see their man pages.

Host	Volume manager	Host volume	File systems
Linux	LVM	`lvextend`	`resize2fs`

The storage connect command

The `snapdrive storage connect` command connects storage entities to the host. Using this command you can connect LUNs and storage entities to the host

Use the `snapdrive storage connect` command to connect to:

- LUNs
- A file system created directly on a LUN
- Disk groups, host volumes, and file systems created on LUNs

When you enter the `snapdrive storage connect` command to connect LUNs to the host, SnapDrive for UNIX performs the necessary discovery and mapping. It does not modify LUN contents.

Guidelines for the storage connect command

You need to follow few guidelines to use the `snapdrive storage connect` command.

Storage that includes LVM entities has special requirements. To use the `snapdrive storage connect` command to connect LVM entities, you must create the storage so that each entity in the storage hierarchy has exactly one instance of the next entity. For example, you can use the `snapdrive storage connect` command to connect a storage hierarchy that has one disk group (dg1) with one host volume (hostvol1) and one file system (fs1). However, you cannot use the `snapdrive storage connect` command to connect a hierarchy that has one disk group (dg1) with two host volumes (hostvol1 and hostvol2) and two file systems (fs1 and fs2).

On Linux hosts, the `snapdrive storage connect` command connects a file system created directly on a LUN only when the underlying LUN is partitioned.

Note: With SLES10 update 2, SnapDrive for UNIX `snapdrive storage connect` and `snapdrive storage create` command creates a file system directly on a LUN. SnapDrive for UNIX creates a file system on the raw device and then mounts it.

Information required for using the snapdrive storage connect command

There is some information that you need to supply when you use the `snapdrive storage connect` command. This information helps you to use the command correctly.

Requirement	Argument
Specify the LUNs, the file system created directly on a LUN, or the LVM entity that you want to connect to the host. • If you connect one or more LUNs, the first argument must use the long form of the LUN name, which specifies the storage system name, the volume name, and the name of the LUN within the volume. To specify additional LUNs, you can use the LUN name alone if the new LUN is on the same storage system and volume as the previous LUN. Otherwise, you can specify a new storage system name and volume name (or just a volume name) to replace the previous values. • If you connect a file system created directly on a LUN, you must include the long form of the LUN name, and also the `-nolvm` option. • If you connect a LUN with a disk group, host volume, and file system, you must use the `-fs` and `-hostvol` options to specify the file system and host volume. The host volume must include the name of the disk group.	
A LUN (`-lun`)	*long_lun_name*
The first value you supply with the `-lun` option must include the storage system name, volume, and LUN name. To connect multiple LUNs on the same volume, you can use relative path names for the `-lun` option after you supply the complete information in the first path name. When SnapDrive for UNIX encounters a relative path name, it looks for the LUN on the same volume as the previous LUN. To connect additional LUNs that are not on the same volume, enter the full path name to each LUN.	
Additional LUNs	*lun_name* (long or short form)
The *file_spec* given to `-fs` is the name of the file system mountpoint when connecting a file system created directly on a LUN.	
A file system (`-fs file-spec`)	*filesystem_name*
To connect a file system that is created on a LUN without activating the host LVM.	
`-nolvm`	
To connect a file system on a host volume: The `-fs` *file_spec* and `-hostvol` *file_spec* you supply identify the LVM file system, disk group, and host volumes that you want to connect to a new host. The storage hierarchy that you connect must contain a disk group, host volume, and file system. You must specify a value for `-fs` and `-hostvol`. The `-hostvol` value must include the name of the disk group.	
Host volume (`-hostvol file-spec`)	*disk_group_name* and *host_volume_name*
Optional: Use the `-nopersist` option to connect the storage to a new location without creating an entry in the host file system table (for example, fstab on Linux). By default the storage connect command creates persistent mounts. This means that when you create an LVM storage entity on a Linux host, SnapDrive for UNIX automatically creates the storage, mounts the file system and then places an entry for the file system in the host file system table.	
`-nopersist`	~
Optional: It is recommended that you use the default igroup for your host instead of supplying an igroup name.	

Requirement	Argument
Igroup name (-igroup)	*ig_name*
-fstype	*type*
vmtype	*type*
Optional: Specifies the type of file system and volume manager to be used for SnapDrive for UNIX operations.	
-mntopts	~
Optional: If you are creating a file system, you can specify the following options: • Use -mntopts to specify options that you want to pass to the host mount command (for example, to specify host system logging behavior). The options you specify are stored in the host file system table file. Allowed options depend on the host file system type. • The *-mntopts* argument is a file system -type option that is specified using the mount command -o flag. Do not include the -o flag in the *-mntopts* argument. For example, the sequence -mntopts tmplog passes the string -o tmplog to the mount command, and inserts the text tmplog on a new command line. **Note:** If you pass any invalid *-mntopts* options for storage and snap operations, SnapDrive for UNIX does not validate those invalid mount options.	

Connecting LUNs with disk groups, host volumes, and file systems

To use the snapdrive storage connect command to connect LUNs that have disk groups, host volumes and file systems, you need to follow a syntax.

Enter the following command:

snapdrive storage connect -fs *file_spec* -hostvol *file_spec* -lun *long_lun_name* [*lun_name*...] [-igroup *ig_name* [*ig_name*...]] [-nopersist] [-mntopts *options*] [-fstype *type*] [-vmtype *type*]

Example: Connecting a file system created on a LUN

```
# snapdrive storage connect -fs /mnt/fs -lun f270-221-189:/vol/vol0/lun111 -nolvm
mapping lun(s) ... done
discovering lun(s) ... done
LUN f270-221-189:/vol/vol0/lun111 connected
- device filename(s): /dev/vx/dmp/fas2700_939
```

Example: Connecting a file system created on a RDM LUN

```
# snapdrive storage connect -fs /mnt/fs -lun lech:/vol/vol1/lun1 -nolvm
exporting new lun(s) to Guest OS ... done
discovering lun(s) ... done
LUN lech:/vol/vol1/lun1 connected
- device filename(s): /dev/sdb
```

Connecting existing LUNs with shared resources

If a new node is added to the host cluster configuration that uses a shared disk group or file system, you need to follow a different syntax.

snapdrive storage connect -fs *file_spec* -lun *long_lun_name* [lun_name...] [-mntopts options]

The storage disconnect command

The `storage disconnect` operation removes the LUNs, or the LUNs and storage entities that were mapped to the host using the `snapdrive storage create` or `snapdrive storage connect` command.

Use the `snapdrive storage disconnect` command to disconnect:

- LUNs
- A file system created directly on a LUN
- Disk groups, host volumes, and file systems created on LUNs

When SnapDrive for UNIX removes the LUN mappings, it exports the disk groups or file systems that the LUNs contain. This action, which marks the disk and file system as exported, is the only change that disconnecting the mappings has on the contents of the LUNs.

Methods for disconnecting storage

To make it easier to disconnect the storage, SnapDrive for UNIX provides several formats for the `snapdrive storage disconnect` command.

This is because the disconnect operations fall into the following general categories:

- Specifying the LUNs that you want to disconnect from the host.
- Specifying a file system that is created directly on a LUN that you want to disconnect from the host.

  SnapDrive for UNIX disconnects both the file system and LUN.
- Specifying a disk group, host volume, or file system that resides on LUNs you want to disconnect from the host.

  SnapDrive for UNIX disconnects all the LUNs associated with that entity, and also removes mappings for the file system, host volume, and disk group that comprise the entity you disconnected.

Guidelines for the snapdrive storage disconnect command

Follow these guidelines when using the `snapdrive storage disconnect` command:

- When you disconnect a file system, SnapDrive for UNIX always removes the mountpoint.

  Linux hosts allow you to attach multiple file systems to a single mountpoint. However, SnapDrive for UNIX requires an unique mountpoint for each file system. The `snapdrive storage disconnect` command fails if you use it to disconnect file systems that are attached to a single mountpoint.
- If you use the `-lun` option to specify the name of a LUN that is a member of either a host disk group, or a file system, the `snapdrive storage disconnect` command fails.
- If you use `-lun` option to specify the name of the LUN that is not discovered by multipathing software on the host, the `snapdrive storage disconnect` command fails.

Tips for using the storage disconnect command

When you use the `snapdrive storage disconnect` command on some operating systems, you lose information such as the host volume names, the file system mountpoint, the storage system volume names, and the names of the LUNs. Without this information, you can connect again to the storage at a later point in time is difficult.

About this task

To avoid losing information, you should first create a Snapshot copy of the storage using the `snapdrive snap create` command before you execute the `snapdrive storage disconnect` command.

That way, if you want to reconnect the storage later, you can use the following workaround:

Procedure

1. Execute the following command: `snapdrive snap restore filespec -snapname long_snap_name`

   Include the full path to the Snapshot copy in this command.
2. Optionally, remove the Snapshot copy by executing the `snapdrive snap delete` command.

Information required for using the snapdrive storage disconnect command

The following table gives the information you need to supply when you use the `snapdrive storage disconnect` command:

Requirement	Argument
Based on the command you enter, you can remove mappings from any of the following: • LUNs If you disconnect one or more LUNs, the first argument must use the long form of the LUN name, which specifies the storage system name, the volume name, and the name of the LUN within the volume. To specify additional LUNs, you can use the LUN name alone if the new LUN is on the same storage system and volume as the previous LUN. Otherwise, you can specify a new storage system name and volume name (or just a volume name) to replace the previous values. • File systems on LUNs The *file_spec* given to `-fs` is the name of the file system mountpoint. SnapDrive for UNIX automatically locates and disconnects the LUN that is associated with the file system you specify. • Disk or volume groups • File systems on disk or volume groups • Host or logical volumes The value you enter for the file_spec argument must identify the storage entity you are disconnecting.	
A LUN (`-lun`)	*lun_name* (long or short form)
Disk group (`-dg` *file_spec*) or volume group (`-vg` *file_spec*	name of the disk or volume group
File system (`-fs` *file_spec*)	*filesystem_nam*e
Host volume (`-hostvol` *file_spec*) or logical volume (`-lvol` *file_spec*)	name of the host or logical volume

Requirement	Argument
If you want SnapDrive for UNIX to disconnect the storage you specify even if you include at the command prompt a host-side entity that has other entities (such as a disk group that has one or more host volumes), include the `-full` option at the command prompt. If you do not include this option, you must specify only empty host-side entities.	
`-full`	~
If you want to disable a node or a host cluster from sharing a file system	
`-fstype`	*type*
`-vmtype`	*type*
Optional: Specifies the type of file system and volume manager to be used for SnapDrive for UNIX operations.	

Command syntax for disconnecting LUNs from the host

To use the `snapdrive storage disconnect` command to remove the mappings for the LUNs you specify, use the following syntax:

```
snapdrive storage disconnect -lun long_lun_name [lun_name...]
```

Command syntax for disconnecting a file system created on a LUN from the host

To use the `snapdrive storage disconnect` command to remove a file system created directly on a LUN, use the following syntax:

```
snapdrive storage disconnect -fs file_spec [-fstype type] [-vmtype type]
```

Example: Disconnecting a file system created on a RDM LUN

```
#snapdrive storage disconnect -fs /mnt/fs
disconnect file system /mnt/fs
  - fs /mnt/fs ... disconnected
  deporting lun(s) from Guest OS ... done
   - LUN lech:/vol/vol1/lun1 ... disconnected
0001-669 Warning:
      Please save information provided by this command.
      You will need it to re-connect disconnected filespecs.
```

Command syntax for disconnecting LUNs and storage entities from the host

To use the `snapdrive storage disconnect` command to remove the mappings for the LUNs with storage entities, use the following syntax:

`snapdrive storage disconnect { -dg | -fs | -hostvol }` *file_spec* [*file_spec*...] [{ -dg | -fs | -hostvol } *file_spec* [*file_spec*...] ...] [-full] [-fstype *type*] [-vmtype *type*]

The storage delete command

The `snapdrive storage delete` command removes the storage entities on the host in addition to all underlying host side entities and storage system LUNs backing them.

Attention: This command deletes data.

Guidelines for using the storage delete command

The `snapdrive storage delete` command has the following restrictions in SnapDrive for UNIX:

- When you delete a file system, SnapDrive for UNIX always removes the file system's mountpoint.

  Linux hosts allow you to attach multiple file systems to a single mountpoint. However, SnapDrive for UNIX requires a unique mountpoint for each file system. The snapdrive storage delete command fails if you use it to delete file systems that are attached to a single mountpoint.
- If you use the `-lun` option to specify the name of a LUN that is a member of either a host disk group or a file system, the snapdrive storage delete command fails.
- If you use `-lun` option to specify the name of the LUN that is not discovered by multipathing software on the host, the `snapdrive storage delete` command fails.

Information required for using the snapdrive storage delete command

There is some information that you need to supply before you can use the `snapdrive storage delete` command. This information helps you in using the command correctly.

Requirement	Argument
Based on the command you enter, you can delete any of the following types of storage: • LUNs Specify one or more LUNs that you want to delete from the storage system. If you delete one or more LUNs, the first argument must use the long form of the LUN name, which specifies the storage system name, the volume name, and the name of the LUN within the volume. To specify additional LUNs, you can use the LUN name alone if the new LUN is on the same storage system and volume as the previous LUN. Otherwise, you can specify a new storage system name and volume name (or just a volume name) to replace the previous values. • A file system created directly on a LUNs • Disk or volume groups • File systems on disk, or volume groups • Host or logical volumes The value you enter for the file_spec argument must identify the storage entity you are deleting.	
A LUN (`-lun`)	*long_lun_name*
Additional LUNs	*lun_name* (long or short form)
Disk group (`-dg` *file_spec*) or volume group (-`vg` *file_spec*)	name of the disk group or volume group
File system (`-fs` *file_spec*)	*filesystem_name*
Host volume (`-hostvol` *file_spec*) or logical volume (`-lvol` *file_spec*)	name of the host volume or logical volume **Note:** You must supply both the requested volume and the disk group containing it; for example, `- hostvol dg3/acct_volume`.

Requirement	**Argument**
If you want SnapDrive for UNIX to delete the storage you specify even if you include at the command prompt a host-side entity that has other entities (such as a disk group that has one or more host volumes), include the `-full` option at the command prompt. If you do not include this option, you must specify only empty host-side entities.	
`-full`	~
To specify the shared host entity for which you want to delete the storage.	
`-fstype`	*type*
`-vmtype`	*type*
Optional: Specifies the type of file system and volume manager to be used for SnapDrive for UNIX operations.	

Creating and using Snapshot copies in SnapDrive for UNIX

SnapDrive for UNIX enables you to take Snapshot copies of host data.

What Snapshot operations are in SnapDrive for UNIX

SnapDrive for UNIX enables you to use Data ONTAP Snapshot technology to make an image (Snapshot copy) of host data that is stored on a storage system.

This Snapshot copy provides you with a copy of that data, which you can restore later. The data in the Snapshot copy can exist on one storage system or span multiple storage systems and their volumes. These storage systems can be in HA pair or node-local file systems or disk groups or LUNs in a host cluster environment. On a nonclustered UNIX host with SnapDrive for UNIX installed, you can create a Snapshot copy of one or more volume groups on a storage system.

The Snapshot copy can contain file systems, logical volumes, disk groups, LUNs, and NFS directory trees. After you create a Snapshot copy, you can rename, restore, or delete. You can also connect to a different location on the same host or to a different host. After you connect, you can view and modify the content of the Snapshot copy, or you can disconnect the Snapshot copy. In addition, SnapDrive for UNIX enables you to display information about Snapshot copies that you created. On a clustered UNIX host with SnapDrive for UNIX installed, you can conduct Snapshot operations on host cluster nodes that include disk groups and file systems. The Snapshot operations include create, rename, restore, connect, disconnect, display, and delete.

Considerations when working with Snapshot copies

There are certain considerations while using a Snapshot copy, such as, SnapDrive for UNIX works only with Snapshot copies that it creates, the Snapshot copies are automatically replicated from the storage system to the host, and so on.

When working with Snapshot operations, consider the following:

- SnapDrive for UNIX works only with Snapshot copies that it creates. It cannot restore Snapshot copies that it did not create.
- When you create a Snapshot copy on a destination storage system, the Snapshot copy is automatically replicated, from the source storage system on which it is created to the destination storage system. SnapDrive for UNIX allows you to restore the Snapshot copy on the destination storage system as well.
- Connecting to the originating host occurs when you use the `snapdrive snap connect` command to connect to a Snapshot copy at a new location on the same host where it was last connected (or is still connected).
- On Linux hosts, SnapDrive 3.0 for UNIX and later supports Snapshot connect operation on the originating host, unless the LUN or a LUN with a file system is part of the Linux LVM1 volume manager.
- In Data ONTAP operating in 7-Mode, SnapDrive supports symbolic links that reside inside a mount point.
- Snapshot support for storage entities spanning multiple storage system volumes or multiple storage systems is limited on configurations that do not allow a freeze operation in the software stack.

- When you export the volume through the NFS protocol, set the Anonymous User ID option to "0" for the SnapDrive for UNIX commands to work.

Snapshot copy operations

You can create Snapshot copies by using the `snapdrive snap create` command.

Crash-consistent Snapshot copies

SnapDrive for UNIX creates Snapshot copies that contains the image of all the storage system volumes specified in the entity.

When you create a Snapshot copy of a storage entity, such as a file system or disk group, SnapDrive for UNIX creates a Snapshot copy that contains the image of all the storage system volumes that comprise the entity you specified using a `file_spec` argument. The `file_spec` argument specifies the storage entity, such as the file system, LUN, or NFS directory tree, that SnapDrive for UNIX uses to create the Snapshot copy.

SnapDrive for UNIX makes consistent storage components that comprise the entity you requested in the Snapshot copy. This means that LUNs or directories being used outside those specified by the `snapdrive snap create` command's `file_spec` argument might not have consistent images in the Snapshot copy. SnapDrive for UNIX enables you to restore only the entities specified by the `file_spec` argument that are consistent in the Snapshot copy.

Snapshot copies of entities contained on a single storage system volume are always crash-consistent. SnapDrive for UNIX takes special steps to ensure that Snapshot copies that span multiple storage systems or storage system volumes are also crash-consistent. The method that SnapDrive for UNIX uses to ensure crash consistency depends on the Data ONTAP version where the storage entities in your Snapshot copy reside.

Crash consistency with Data ONTAP 7.2 and later

SnapDrive for UNIX uses the support for consistency groups provided by Data ONTAP 7.2 and later versions, such that all Snapshot copies that span multiple volumes are crash consistent.

Data ONTAP versions 7.2 and greater provides support for consistency groups and storage system fencing. SnapDrive for UNIX uses these features to ensure that all Snapshot copies that span multiple volumes are crash consistent.

To create a crash consistent Snapshot copy across multiple volumes, SnapDrive for UNIX does the following:

- Fences (freezes) I/O to every volume that contains a storage entity.
- Takes a Snapshot copy of each volume.

The time it takes to fence the volume and create the Snapshot copy is limited, and is controlled by Data ONTAP.

The **`snapcreate-cg-timeout`** parameter in the `snapdrive.conf` file specifies the amount of time, within Data ONTAP limitations, that you wish to allow for storage system fencing. You can specify an interval that is urgent, medium, or relaxed. If the storage system requires more time than allowed to complete the fencing operation, SnapDrive for UNIX creates the Snapshot copy using the consistency methodology for previous Data ONTAP 7.2 versions. You can also specify this methodology by using the `-nofilerfence` option when you create the Snapshot copy.

If you request a Snapshot copy for a storage entity that spans storage systems with both Data ONTAP 7.2 and previous Data ONTAP versions, SnapDrive for UNIX also creates the Snapshot copy using the consistency method for Data ONTAP versions before 7.2.

Application-consistent Snapshot copies

To make an application-consistent Snapshot copy, you should halt the application before the Snapshot operation.

To ensure that a Snapshot copy is application-consistent, you might need to stop or perform the necessary steps to quiesce the application before taking the Snapshot copy. Note that database hot backup facilities depend on the methods used by the DBMS, and do not always quiesce I/O to database files.

If the application has not completed its transactions and written data to the storage system, the resulting Snapshot copy might not be application-consistent.

Note: If your application can recover from a crash-consistent Snapshot copy, you do not need to stop it. Consult the documentation for your application. For more information about taking application-consistent Snapshot copies.

You should take a new Snapshot copy whenever you add or remove a host volume, LUN, or NFS directory tree, or resize host volumes or file systems. This ensures that you have a consistent copy of the newly configured disk group that you can use if you need to restore the disk group.

Snapshot copies that span storage systems or volumes

SnapDrive for UNIX enables you to take Snapshot copies that reside in multiple storage system volumes on the same or different storage systems.

SnapDrive for UNIX allows you to take Snapshot copies that span across multiple storage system volumes or multiple storage systems. These volumes can reside on the same storage system or different storage systems. Although the `snapdrive snap create` command creates a Snapshot copy of all the volumes that comprise the entity you request, SnapDrive for UNIX restores only the entities that you specify in the `snapdrive snap create` command.

When you use the `snapdrive snap create` command to make a Snapshot copy that spans multiple volumes, you do not need to name the volumes on the command prompt. SnapDrive for UNIX gets this information from the `file_spec` argument that you specify.

- If the `file_spec` you enter requests a disk group, or a file system or host volume that resides on a disk group, SnapDrive for UNIX automatically creates a Snapshot copy that includes all the storage system volumes for the disk group, volume, or file system you specified.
- If the `file_spec` you enter requests a LUN, SnapDrive for UNIX takes a Snapshot copy of the storage system volume that contains the LUN.
- If the `file_spec` you enter requests a file system that resides directly on a LUN, SnapDrive for UNIX takes a Snapshot copy of the storage system volume that contains the LUN and file system that you specified.

- If the file_spec you enter requests an NFS directory, SnapDrive for UNIX creates a Snapshot copy of the volume that contains the NFS directory tree.

In addition to using a file_spec argument that is built on entities from multiple storage systems and storage system volumes, you can also use a combination of file_spec arguments where each value is based on single storage system or storage system volume. For example, suppose you have a setup where the disk group dg1 spans the storage systems storage system2 and storage system3, dg2 is on storage system2, and dg3 is on storage system3. In this case, any of the following command lines would be correct:

```
snapdrive snap create -dg dg1 -snapname snapdg1

snapdrive snap create -dg dg2 dg3 -snapname snapdg23

snapdrive snap create -dg dg1 dg2 dg3 -snapname snapdg123
```

Something to keep in mind when creating Snapshot copies that span storage systems and volumes is that SnapDrive for UNIX creates the Snapshot copy on each storage systems volume using a short name. It does not include the full path name in the name, even if the volumes are on different storage system. This means that if you later rename the Snapshot copy, you must go to each storage system and volume and rename it there as well.

Creating Snapshot copies of unrelated entities

SnapDrive for UNIX creates Snapshot copies of unrelated entities by maintaining individual crash-consistent Snapshot copies.

Unless you specify otherwise, SnapDrive for UNIX assumes that all entities that you specify on a particular snapdrive snap create command line are related; in other words the validity of updates to one entity can depend on updates to the other entities specified. When storage entities have dependent writes in this way, SnapDrive for UNIX takes steps to create a Snapshot copy that is crash consistent for all storage entities as a group.

The following example shows how SnapDrive for UNIX creates a Snapshot copy of storage entities that may have dependent writes. In the following example, the snapdrive snap create command specifies a file system on a LUN and also a disk group. The disk group consists of LUNs residing on a single storage system (see Creating a Snapshot copy). The file system on a LUN resides on a different storage system and storage system volume. As a group, the file system and the disk group span multiple storage system volumes; individually they do not.

The following command specifies a Snapshot copy that contains both the file system /mnt/fs1 and the disk group dg1:

```
snapdrive snap create -fs /mnt/fs1 -dg dg1 -snapname fs1_dg1
```

Because these storage entities can have dependent writes, SnapDrive for UNIX attempts to create a crash-consistent Snapshot copy, and treats the file system /mnt/fs1 and the disk group dg1 as a group. This means SnapDrive for UNIX is required to freeze I/O operations to the storage system volumes before creating the Snapshot copy.

Creating crash-consistent Snapshot copies for multiple storage entities across volumes takes extra time, and is not always possible if SnapDrive for UNIX cannot freeze I/O operations. Because this is so, SnapDrive for UNIX allows you to create Snapshot copies of unrelated storage entities. Unrelated storage entities are entities that you can specify that have no dependent writes when the Snapshot copy is taken. Because the entities have no dependent writes, SnapDrive for UNIX does not take steps to make the entities consistent as a group. Instead, SnapDrive for UNIX creates a Snapshot copy in which each of the individual storage entities is crash-consistent.

The following command specifies a Snapshot copy of the file system on a LUN and the disk group described previously. Because the -unrelated option is specified, SnapDrive for UNIX creates a Snapshot copy in which the file system /mnt/fs1 and the disk group dg1 are crash-consistent as individual storage entities, but are not treated as a group. The following command does not require SnapDrive for UNIX to freeze I/O operations on the storage system volumes:

```
snapdrive snap create -fs /mnt/fs1 -dg dg1 -unrelated -snapname fs1_dg1
```

Related tasks:

“Creating a Snapshot copy” on page 163

Guidelines for Snapshot copy creation

Consider the following while creating Snapshot copies using SnapDrive for UNIX: you can keep maximum 255 Snapshot copies per volume, SnapDrive for UNIX supports only the Snapshot copies that it creates, you cannot create Snapshot copies of root disk groups, and boot device or swap device, and SnapDrive for UNIX requires a freeze operation to maintain crash-consistency.

Follow these guidelines when you enter commands that create Snapshot copies:

- You can keep a maximum of 255 Snapshot copies per storage system volume. This limit is set by the storage system. The total number can vary depending on whether other tools use these Snapshot copies.

  When the number of Snapshot copies has reached the maximum limit, the Snapshot create operation fails. You must delete some of the old Snapshot copies before you can use SnapDrive for UNIX to take anymore.
- SnapDrive for UNIX does not support Snapshot copies that it does not create. For example, it does not support Snapshot copies that are created from the storage system console, because such a practice can lead to inconsistencies within the file system.
- You cannot use SnapDrive for UNIX to create Snapshot copies of the following:
  - Root disk groups

    The Snapshot create operation fails when you try to take a Snapshot copy of a root disk group for an LVM.
  - Boot device or swap device

    SnapDrive for UNIX does not take a Snapshot copy of a system boot device or a system swap device.
- When a Snapshot copy spans multiple storage systems or storage system volumes, SnapDrive for UNIX requires a freeze operation to guarantee crash-consistency. For information about creating Snapshot copies on configurations for which a freeze operation is not provided.

Information required for using the snapdrive snap create command

To create a Snapshot copy, determine the storage entity that you want to capture, and specify a name of the Snapshot copy.

The following table gives the information you need to supply when you use the `snapdrive snap create` command.

<table>
<tr><th>Requirement/Options</th><th>Argument</th></tr>
<tr><td colspan="2">Determine the type of storage entity you want to capture in the Snapshot copy. You can specify NFS entities, LUNs, file systems created directly on LUNs, and LVM entities on a single command line.
Supply that entity's name with the appropriate argument. This is the value for the `file_spec` argument.
• If you specify a disk group that has a host volume or file specification, the argument translates into a set of disk groups on the storage system. SnapDrive for UNIX creates the entire disk group containing the entity, even if the entity is a host volume or file system.
• If you specify a file specification that is an NFS mountpoint, the argument translates to the directory tree on the storage system volume.
• If you specify a LUN, or a LUN that has a file system, the argument translates to the LUN, or to the LUN that has the file system.
Note: You cannot specify special characters with the storage entities such as `-vg`, `-dg`, `-fs`, `-lvol`, and `- hostvol`. As an exceptional one, forward slash (/) is allowed for storage entities such as `-fs`, `-lvol`, and- `hostvol`.</td></tr>
<tr><td>LUN (`-lun file_spec`)</td><td>name of the LUN
You must include the name of the storage system, volume, and LUN</td></tr>
<tr><td>Disk group (`-dg file_spec`) or volume group (`-vg file_spec`)</td><td>name of the disk or volume group</td></tr>
<tr><td>File system (`-fs file_spec`)</td><td>filesystem_name</td></tr>
<tr><td>Host volume (`-hostvol file_spec`) or logical volume (`-lvol file_spec`)</td><td>name of the host or logical volume
Note: You must supply both the requested volume and the disk group containing it; for example, `-hostvol dg3/acct_volume`.</td></tr>
<tr><td>Snapshot copy name (`-snapname snap_name`)</td><td>Snapshot copy_name</td></tr>
<tr><td colspan="2">Specify the name for the Snapshot copy. This can be either the long version of the name that includes the storage system and volume with the Snapshot copy name or the short version that is the Snapshot copy name.</td></tr>
<tr><td>`-unrelated`</td><td>~</td></tr>
<tr><td colspan="2">Optional: Decide if you want to create a Snapshot copy of storage entities that have no dependent writes when the Snapshot copy is taken. Because the entities have no dependent writes, SnapDrive for UNIX creates a crash-consistent Snapshot copy of the individual storage entities, but does not take steps to make the entities consistent with each other.</td></tr>
<tr><td>`-force`</td><td>~</td></tr>
<tr><td>`-noprompt`</td><td>~</td></tr>
</table>

Requirement/Options	Argument
Optional: Decide if you want to overwrite an existing Snapshot copy. Without this option, this operation halts if you supply the name of an existing Snapshot copy. When you supply this option and specify the name of an existing Snapshot copy, the command prompts you to confirm that you want to overwrite the Snapshot copy. To prevent SnapDrive for UNIX from displaying the prompt, include the `-noprompt` option also. (You must always include the `-force` option if you want to use the `-noprompt` option.)	
`-fstype`	*type*
`-vmtype`	*type*
Optional: Specify the type of file system and volume manager to be used for SnapDrive for UNIX operations.	

Creating a Snapshot copy

To create a Snapshot copy, run the `snapdrive snap create` command.

Before you begin

Before you execute this syntax, you must understand the options, keywords, and arguments mentioned in this command.

Procedure

Enter the following command syntax to create a Snapshot copy: `snapdrive snap create` {`-lun` | `-dg` | `-fs` | `-hostvol` } *file_spec[file_spec ...]* [{-lun |-dg | -fs | -hostvol } *file_spec* [*file_spec*...]] -snapname *snap_name* [-force [-noprompt]][-unrelated] [-nofilerfence] [-fstype *type*][-vmtype *type*]

Results

The `file_spec` arguments represent a set of storage entities on one or more storage systems. The Snapshot create operation takes a Snapshot copy of the storage system volume containing those entities and gives it the name specified in the `snap_name` argument.

Example

This example creates a multivolume Snapshot copy for a Linux host. The Snapshot copy contains the disk group vgmultivol, which include the host volumes lvol1 and lvol2:

```
# snapdrive snap create -vg vgmultivol -snapname snapmultivol
Successfully created snapshot snapmultivol on 2 filer volumes:
toaster:/vol/vol1
toaster:/vol/vol2
snapshot snapmultivol contains:
disk group vgmultivol containing host volumes
lvol1
lvol2
```

Snapshot copies information display

You can display Snapshot copies for a storage system, a storage system volume, LUNs, and other storage entities. Use the command `snapdrive snap show` (or `list`) to display a SnapShot copy.

Command to use to display Snapshot copy information

Use the snapdrive snap show (or list) command to display information about the Snapshot copies.

You can use the snapdrive snap show (or list) command to display information about each Snapshot copy that is created by SnapDrive for UNIX. You can use this command to display information about the following:

- Storage systems
- Volumes on storage systems
- Storage entities such as NFS files and directory trees, volume groups, disk groups, file systems, logical volumes, and host volumes
- Snapshot copies

Note: The show and list forms of this command are synonymous. For SnapDrive 2.0 for UNIX and later, you must use the long form of the Snapshot copy name when you display information about Snapshot copies.

Guidelines for displaying Snapshot copies

You can use wildcards to display the Snapshot copies. You can display all the Snapshot copies present in a specific object.

About this task

Keep the following points in mind, before working with Snapshot copies:

- You can use the wildcard (*) character in Snapshot copy names. The Snapshot show operation lets you use the wildcard character to show all Snapshot copy names that match a certain pattern or all Snapshot copy names on a particular volume. The following rules apply while using wildcard in Snapshot copy names:
  - You can use a wildcard at the end of the name only. You cannot use the wildcard at the beginning or the middle of a Snapshot copy name.
  - You cannot use the wildcard in the storage system or storage system volume fields of a Snapshot copy name.
- You can also use this command to list all of the Snapshot copies on specific objects, including storage systems and their volumes, disk groups, host volume groups, file systems, host volumes, and logical volumes.
- If you enter a snapdrive snap show command and SnapDrive for UNIX does not locate any Snapshot copies, it displays the message “no matching Snapshot copies.” If you specify arguments on the command line, and some portions of them do not exist, SnapDrive for UNIX returns a partial listing of those for which Snapshot copies are found. It also lists the arguments that were invalid.
- If the snapdrive snap create command is abruptly aborted, an incomplete .stoc.xmlfile is stored in the volume on the storage system. Due to this, all scheduled Snapshot copies made by the storage system will have a copy of the incomplete .stoc.xml file. For the snapdrive snap list command to work successfully, complete the following steps:

Procedure

1. Delete the incomplete .stoc.xml file in the volume.
2. Delete the scheduled Snapshot copies made by the storage system containing the incomplete .stoc.xml file.

Information required for using the snapdrive snap show or list commands

You can use the command `snapdrive snap show` or `list` to display information about storage systems, storage system volumes, disks, or volume groups, file system, Snapshot copies, and so on.

The following table gives the information you need to supply when you use the `snapdrive snap show | list` command.

Note: You can use the same arguments regardless of whether you enter `snapdrive snap show` or `snapdrive snap list` as the command. These commands are synonyms.

Requirement/Option	Argument
Based on the command you enter, you can display information about any of the following: • Storage systems • Storage system volumes • Disk or volume groups • File systems • Host or logical volumes • Snapshot copies The value you enter for the `file_spec` argument must identify the storage entity about which you want to display information. The command assumes the entities are on the current host.	
Storage system (`-filer`)	*filername*
A volume on the storage system (`-filervol`)	*filervol*
Disk group (`-dg` *file_spec*) or volume group (`-vg` *file_spec*)	*name of the disk or volume group*
File system (`-fs` *file_spec*)	*filesystem_name*
Host volume (`-hostvol` *file_spec*) or logical volume (`-lvol` *file_spec*)	*name of the host or logical volume*
Snapshot copy name (`-snapname` *long_snap_name*)	*long_snap_name*
Additional Snapshot copy names	*snap_name* (long or short version)
If you want to display information about a Snapshot copy, specify the name for the Snapshot copy. For the first Snapshot copy, *long_snap_name*, enter the long version of the name, which includes the storage system name, volume, and Snapshot copy name. You can use the short version of the Snapshot copy name if it is on the same storage system and volume.	
`-verbose`	~
To display additional information, include the `-verbose` option.	

Displaying Snapshot copies residing on a storage system

You can use the SnapDrive command to display Snapshot copies on a storage system.

To display information about Snapshot copies residing on a storage system, use the following syntax:

```
snapdrive snap show -filer filername [filername...] [-verbose]
```

Displaying Snapshot copies of a storage system volume

You can use the SnapDrive command to display Snapshot copies on a storage system volume.

To display information about Snapshot copies of a storage system volume, use the following syntax:

```
snapdrive snap show -filervol filervol [filervol...] [-verbose]
```

Displaying a Snapshot copy

The command `snapdrive snap show` or `list` displays the name of the storage system where the Snapshot copy is created, the host name, date and time, and so on.

Procedure

Enter the following command syntax to display a Snapshot copy: `snapdrive snap show [-snapname]` *`long_snap_name`* `[`*`snap_name`*`...] [-verbose]`

Results

This operation displays, at a minimum, the following information about the Snapshot copy:

- The name of the storage system where the Snapshot copy is created
- The name of the host that took the Snapshot copy
- The path to the LUNs on the storage system
- The date and time the Snapshot copy was created
- The name of the Snapshot copy
- The names of the disk groups included in the Snapshot copy

Example

Example: The following are examples of `snapdrive snap show` commands:

```
# snapdrive snap show -snapname toaster:/vol/vol2:snapA snapX snapY

# snapdrive snap show -verbose toaster:/vol/vol2:snapA /vol/vol3:snapB snapC

# snapdrive snap show toaster:/vol/vol2:snapA

# snapdrive snap list -dg dg1 dg2
```

Example: This example uses a wildcard to display information about the available Snapshot copies on a particular volume:

```
# snapdrive snap show toaster:/vol/vol1:*
snap name host date
snapped
------------------------------------------------------------------
-------------
toaster:/vol/vol1:sss1 DBserver Mar 12
16:19 dg1
toaster:/vol/vol1:testdg DBserver Mar 12
15:35 dg1
toaster:/vol/vol1:t1 DBserver Mar 10
18:06 dg1
toaster:/vol/vol1:hp_1 HPserver Mar 8
19:01 vg01
toaster:/vol/vol1:r3 DBserver Mar 8
13:39 rdg1
toaster:/vol/vol1:r1 DBserver Mar 8
13:20 rdg1
toaster:/vol/vol1:snap2 DBserver Mar 8
11:51 rdg1toaster:/vol/vol1:snap_p1 DBserver
Mar 8 10:18 rdg1
```

Example: This example shows a Snapshot copy of an NFS-mounted directory tree on a Linux host using the snapdrive snap list command with the - `verbose` option:

```
# snapdrive snap list -fs /mnt/acctfs1 -v
snap name host date
snapped
------------------------------------------------------------------
----------
besser:/vol/vol1:acctfs-s1 childs Aug 8 18:58
/mnt/acctfs1
host OS: Linux 2.4.21-9.ELsmp #1 SMP Thu Jan 8 17:08:56 EST 2004
snapshot name: acctfs-s1 file system: type: nfs mountpoint:
/mnt/acctfs1
filer dir: besser:/vol/vol1
```

Example: This example executes the snapdrive snap show command on a Linux host:

```
# snapdrive snap show -snapname surf:/vol/vol1:swzldg5snapped
snap name host date
snapped
------------------------------------------------------------------
-------------
surf:/vol/vol1:bagel5snapped pons Aug 18
20:06 dg5
#
# ./linux/ix86/snapdrive snap show -v -snapname
surf:/vol/vol1:bagel5snapped >
snap name host date
snapped
------------------------------------------------------------------
-------------
surf:/vol/vol1:bagel5snapped pons Aug 18
20:06 dg5
host OS: Linux 2.4.21-9.ELsmp #1 SMP Thu Jan 8 17:08:56 EST 2004
snapshot name: bagel5snapped
Volume Manager: linuxlvm 1.0.3
disk group: dg5
host volume: vol1
host volume: vol2
host volume: vol3
lun path dev paths
-------------------------------------------------------
surf:/vol/vol1/glk19 /dev/sdu
```

Example: The following examples use wildcard:

```
# snapdrive snap show toaster:/vol/volX:*
# snapdrive snap show -v toaster:/vol/volX:DB1*
filer1:/vol/volY:DB2*
# snapdrive snap show toaster:/vol/vol2:mysnap* /vol/vol2:yoursnap*
hersnap*
# snapdrive snap show toaster:/vol/volX:*
```

Example: In this example use of a wildcard is invalid because the wildcard is in the middle of the name instead of being placed at the end:

```
# snap show toaster:/vol/vol1:my*snap
```

Other ways to get Snapshot copy names

Use the `snapdrive snap list` command to display the Snapshot copy name.

Another way to get a Snapshot copy name is to log in to the storage system and use the `snapdrive snap list` command there. This command displays the names of the Snapshot copies.

Note: The `snapdrive snap show` command is equivalent to the storage system `snapdrive snap list` command.

Snapshot copy rename

You can change the name of a Snapshot copy by using the `snapshot snap rename` command. A Snapshot copy that is across multiple storage systems or storage system volumes can also be renamed.

Command to use to rename a Snapshot copy

Use the `snapshot snap rename` command to rename a Snapshot copy.

Renaming a Snapshot copy that spans storage systems or volumes

For Snapshot copies that cross multiple storage systems or storage system volumes, rename all the related Snapshot copies.

You can also use this command to rename a Snapshot copy that is across multiple storage systems or multiple storage system volumes.

If you rename one of these Snapshot copies, you must also rename all the related Snapshot copies using the same name. This is because SnapDrive for UNIX uses a short name when it creates the Snapshot copy, even though it spans multiple storage systems or volumes. The rename command changes the name of the current Snapshot copy but it does not change the name of the related Snapshot copies in the other locations.

Guidelines for renaming Snapshot copies

While renaming Snapshot copies, ensure that the two Snapshot copies do not have the same name.

Follow these guidelines when you use the `snapdrive snap rename` command:

- An error message occurs if you try to rename a Snapshot copy to a different storage system volume.
- An error message occurs if the new name for the Snapshot copy already exists. You can use the `-force` option to force SnapDrive for UNIX to change the name without generating an error message.

Changing a Snapshot copy name

You can change the name of a Snapshot copy by using the `snapdrive snap rename` command. The Snapshot rename operation changes the name of the source Snapshot copy to the name specified by the target argument.

Before you begin

Before you execute this syntax, you must understand the options, keywords, and arguments mentioned in this command.

Procedure

Enter the following command to change the Snapshot copy name: `snapdrive snap rename [-snapname]` *old_long_snap_name new_snap_name* [-force [-noprompt]]

Example

The following are examples of the `snapdrive snap rename` command. The first command line includes the `-force` option because a Snapshot copy named `new snapshot` copy already exists. In the second example, both Snapshot copy names use the long form of the name, but they both resolve to the same storage system volume.

```
snapdrive snap rename -force filer1:/vol/vol1:oldsnap new snapshot
```

```
snapdrive snap rename filer1:/vol/vol1:FridaySnap filer1:/vol/vol1:Snap040130
```

Restoring a Snapshot copy

You can restore a Snapshot copy of a single storage entity or multiple storage entities.

Command to use to restore Snapshot copies

Use the command `snapdrive snap restore` to restore a Snapshot copy.

The `snapdrive snap restore` command restores data from the Snapshot copy you specify at the command prompt to the storage system. This operation replaces the contents of the `file_spec` arguments (for example disk groups, NFS files, NFS directory trees, file systems created directly on LUNs) that you specified on the `snapdrive snap restore` command with the contents of the `file_spec` arguments located in the specified Snapshot copy.

You can also restore Snapshot copies for non-existent `file_spec` arguments. This happens when the value you specify no longer exists on the host, but existed when you took the Snapshot copy. For example, it might be a file system that you have now unmounted or a disk group that you have removed.

Normally, you restore Snapshot copies from the host where you took the Snapshot copies (in other words, the originating host).

Note:

- In a NFS entity, when the same volume is mounted on two different IPs, snap restore operations can be performed only for one file specification at a time for these volumes.
- If you are a non-root user then, from SnapDrive 4.1 for UNIX, you should have storage write capability on global in addition to GlobalSDSnapshot capability for Snapshot restore to work.

Restoring Snapshot copies on a destination storage system

You can restore Snapshot copies on the storage system from which it is created.

When you create a Snapshot copy on a destination storage system, the Snapshot copy is automatically replicated, from the source system, where it is created to the destination storage system. SnapDrive for UNIX allows you to restore the Snapshot copy on the source storage system. You can also restore the Snapshot copy on the destination storage system.

If you are performing a single file snap restore in a SnapMirror relationship, then the source and destination volume names should not be the same. SnapDrive for UNIX displays the following error message if the source and destination volume name are the same:

```
0001-636 Command error: Snapdrive cannot restore LUNs on SnapMirror
destination filer volumes: <filer-vol-name>
```

In SnapDrive 4.0 for UNIX and later, if Role Based Access Control is enabled, then you can perform snap restore on vFiler unit only when you have the Snapshot Restore capability on the vFiler unit.

Related concepts:

"Role-Based Access Control in SnapDrive for UNIX" on page 115

Restoring multiple storage entities

You can restore a Snapshot copy that contains multiple storage entities.

To restore a Snapshot copy that contains storage entities that reside on multiple destination storage systems, you must meet the following requirements:

- The storage entities you specify at the command prompt must reside on a single storage system, or on a HA pair.
- The name of the volume of the source storage system must match the name of the volume of the destination storage system.
- You must set the `snapmirror-dest-multiple-filervolumes-enabled` argument in the `snapdrive.conf` file to `on`.

You can use one command to restore storage entities that reside on a single storage system or on a HA pair.

Considerations for restoring a Snapshot copy

Before restoring Snapshot copies, ensure that you are not using the file system, and that you do not interrupt the restore process.

Before restoring a Snapshot copy, consider the following important information:

- Ensure you are not in any directory on a file system that you want to restore. You can perform the `snapdrive snap restore` command from any directory except the one on a file system to which you want to restore the information.
- When exporting the NFS entities to a volume, set the Anonymous User ID option to "0" for the `snapdrive snap restore` command to work successfully.

Information required for using the snapdrive snap restore command

To restore a Snapshot copy, determine which storage entity you want to restore, specify the name of the Snapshot copy, and so on.

The following table gives the information you need to supply when you use the `snapdrive snap restore` command.

Requirement/Option	Argument
Decide the type of storage entity that you wish to restore and enter that entity's name with the appropriate argument. • If you specify a host volume or file system to be restored, the argument you give is translated to the disk group containing it. SnapDrive for UNIX then restores the entire disk group. SnapDrive for UNIX freezes any file systems in host volumes in those disk groups and takes a Snapshot copy of all storage system volumes containing LUNs in those disk groups. • If you specify a file specification that is an NFS mountpoint, the argument translates to a directory tree. SnapDrive for UNIX restores only the NFS directory tree or file. Within the directory tree, SnapDrive for UNIX deletes any new NFS files or directories that you created after you created the Snapshot copy. This ensures that the state of the restored directory tree will be the same as when the Snapshot copy of the tree was made. • If you restore a LUN, SnapDrive for UNIX restores the LUN you specify. • If you restore a file system that is created directly on a LUN, SnapDrive for UNIX restores the LUN and the file system. • If the Snapshot copy contains storage entities that span multiple storage system volumes, you can restore any of the entities in that Snapshot copy.	
LUN (`-lun` *file_spec*)	*name of the LUN. You must include the name of the storage system, volume, and LUN.*
Disk group (`-dg` *file_spec* c) or volume group (`-vg` *file_spec*)	*name of the disk or volume group*
File system (`-fs` *file_spec*)	*name of the file system*
File (`-file` *file_spec*)	*name of the NFS file*
Host volume (`-hostvol` *file_spec*) or logical volume (`-lvol` *file_spec*)	*name of the host or logical volume. You must supply both the requested volume and the disk group containing it; for example, - hostvol dg3/acct_volume.*

Requirement/Option	Argument
Specify the name for the Snapshot copy. If any of the *file_spec* arguments you supply at the command prompt currently exist on the local host, you can use a short form of the Snapshot copy name. If none of the *file_spec* arguments exist on the host, you must use a long form of the Snapshot copy name where you enter the storage system name, volume, and Snapshot copy name. If you use a long name for the Snapshot copy and the path name does not match the storage system and/or storage volume information at the command prompt, SnapDrive for UNIX fails. The following is an example of a long Snapshot copy name: `big_filer:/vol/account_vol:snap_20031115` Sometimes, the value supplied with the *file_spec* argument might not exist on the host. For example, if you had unmounted a file system or removed a disk group by exporting, deporting, or destroying, that file system or disk group could still be a value for the *file_spec* argument. It would, however, be considered a non-existent value. SnapDrive for UNIX can restore Snapshot copies for such a non-existent *file_spec*, but you must use the long Snapshot copy name. When you restore Snapshot copies that span multiple storage systems and volumes, and contain a nonexistent *file_spec* argument, SnapDrive for UNIX permits an inconsistency in the command line. It does not allow for existing *file_spec* arguments. If you want to restore only one storage entity from a multiple storage system Snapshot copy, the Snapshot copy you specify does not need to be on the same storage system as the storage system containing the storage entity. The short form of the same Snapshot copy name would omit the storage system and storage system volume name, so it would appear as: *snap_20031115*	
Snapshot copy name (`-snapname`)	*snap_name*
It can be either a short name, such as *mysnap1,* or a long name that includes the storage system name, volume, and Snapshot copy name. Generally, It is recommended that you use the short name. If the *file_spec* argument is non-existent: that is, it no longer exists on the host; see the explanation of the *file_spec* argument. Then you must use the long name for the Snapshot copy.	
`-reserve | -noreserve`	
Optional: If you want SnapDrive for UNIX to create a space reservation when you restore the Snapshot copy.	
`-force`	~
`-noprompt`	~
Optional: Decide if you want to overwrite an existing Snapshot copy. Without this option, this operation halts if you supply the name of an existing Snapshot copy. When you supply this option and specify the name of an existing Snapshot copy, it prompts you to confirm that you want to overwrite the Snapshot copy. To prevent SnapDrive for UNIX from displaying the prompt, include the `-noprompt` option also. (You must always include the `-force` option if you want to use the -noprompt option.) You must include the `-force` option at the command prompt if you attempt to restore a disk group where the configuration has changed since the last Snapshot copy. For example, if you changed the way data is striped on the disks since you took a Snapshot copy, you would need to include the `-force` option. Without the `-force` option, this operation fails. This option asks you to confirm that you want to continue the operation unless you include the `-noprompt` option with it. **Note:** If you added or deleted a LUN, the restore operation fails, even if you include the `-force` option.	
`mntopts`	~

Requirement/Option	Argument
Optional: If you are creating a file system, you can specify the following options: • Use `-mntopts` to specify options that you want to pass to the host mount command (for example, to specify host system logging behavior). The options you specify are stored in the host file system table file. Allowed options depend on the host file system type. • The *-mntopts* argument is a file system `-type` option that is specified using the `mount` command `-o` flag. Do not include the `-o` flag in the *-mntopts* argument. For example, the sequence -mntopts tmplog passes the string `-o tmplog` to the `mount` command, and inserts the text tmplog on a new command line. **Note:** If you pass any invalid *-mntopts* options for storage and snap operations, SnapDrive for UNIX does not validate those invalid mount options.	

Restoring a Snapshot copy

You can restore a Snapshot copy by using the `snapdrive snap restore` command. The restore operation can take several minutes, depending on the type, and amount of data being restored.

Procedure

Enter the following command to restore a Snapshot copy:

`snapdrive snap restore -snapname` *snap_name* {-lun |-dg |-fs | - hostvol |-file }*file_spec* [*file_spec*...] [{ -lun | -dg | -fs |-hostvol |-file } *file_spec* [*file_spec* ...] [-force [-noprompt]] [-mntopts *options*]][{-reserve |-noreserve}]

Results

SnapDrive for UNIX replaces the contents of the LUNs you specify in the `snapdrive snap restore` command line with the contents of the LUNs in the Snapshot copy you specify. This operation can take several minutes. When the operation is complete, SnapDrive for UNIX displays a message similar to the following: `snap restore <filespec list> succeeded`

Example

In the following example, file system 1 (fs1) resides on storage system1, and file system 2 (fs2) resides on storage system1 and also on storage system 2, which is the partner storage system. File system 3 (fs3) resides on storage system1, partner storage system 2, and storage system3, which is not part of the HA pair . An additional file system, fs4, resides entirely on storage system 4.

The following command creates a Snapshot copy of `fs1`, `fs2`, `fs3`, and, `fs4`:

```
# snapdrive snap create -fs /mnt/fs1 /mnt/fs2 /mnt/fs3 /mnt/fs4
-snapname fs_all_snap
```

The next command restores fs1 and fs2 on the destination storage system. Both fs1 and fs2 reside on a HA pair , so you can restore them with one command:

```
# snapdrive snap restore -fs /mnt/fs1 /mt/fs2 -snapname fs_all_snap
```

The following command restores fs4:

```
snapdrive snap restore -fs /mnt/fs4 -snapname fs_all_snap
```

SnapDrive for UNIX cannot restore fs3 on the destination storage system, because this file system resides on storage system1, storage system 2, and storage system 3.

Restoring a Snapshot copy from a different host

Use the `snapdrive snap restore` command to restore a Snapshot copy from a different host.

Usually, you can restore a Snapshot copy from the host where you took the Snapshot copy. Occasionally, you might need to restore a Snapshot copy using a different or non-originating host. To restore a Snapshot copy using a non-originating host, use the same `snapdrive snap restore` command that you would normally use. If the Snapshot copy you restore contains NFS entities, the non-originating host must have permission to access the NFS directory.

Volume-based SnapRestore

SnapDrive 4.0 for UNIX and later provides Snapshot restore capability at a volume level. This explains the various storage operations you can carry out using volume-based Snapshot restore.

What volume-based SnapRestore is

Volume-based SnapRestore (VBSR) restores the volume with all its storage objects. The volume-based restore is faster than each storage object restored individually. VBSR also works with FlexClone volumes and vFiler configurations. VBSR for vFiler is available for Data ONTAP 7.3 and later.

SnapDrive 3.0 for UNIX and earlier can restore LUNs for a host-side entity like file system, disk groups, and host volumes, or normal files created over NFS from an application consistent snapshot. SnapDrive for UNIX uses Single File Snap Restore SFSR implemented in Data ONTAP. SFSR works as following:

- For normal files while the SFSR is proceeding, any operation which tries to change the file is suspended until SFSR is complete.
- For LUNs, when SFSR is proceeding the LUN is available and I/Os (both reads and writes) are allowed. SFSR for normal files as well as LUNs may take a long time depending on the size of the LUN or the file being restored.

Therefore, for some environments SFSR is an obstruction.

SnapDrive 4.0 for UNIX and later enables you to take volume-based Snapshot copies. VBSR is much faster and requires less CPU and storage resources. It restores all the data on the active file system. This functionality can be used if a user wants to restore all LUNs or normal files on a volume from the same Snapshot copy.

Volume-based Snapshot copy should be used with caution because all Snapshot copies taken after volume Snapshot copy that is used for the restore operation are deleted. All the new files and new LUNs created on this volume must be deleted.

Considerations for using volume-based SnapRestore

You can use volume-based SnapRestore (VBSR) with keeping few points in mind. Keeping these points in mind helps you to use the VBSR feature safely.

You must keep the following points in mind:

- VBSR reverts the entire volume to the state of the time when the Snapshot copy is created, which is used for VBSR. VBSR includes the following:
  - All the files and LUNs for the specified host filespec during `snap create` operation.
  - All the files and LUNs that are part of the application consistent Snapshot copy during `snap create` operation.
- VBSR removes all the newer files and LUNs created on the current volume after the Snapshot copy used for restore.
- VBSR removes all the newer Snapshot copies that are taken after the Snapshot copy which is being used for restore.
- It is recommended that you run `-vbsr preview` command before using `-vbsr execute` command.

Mandatory checks for volume-based SnapRestore

Before volume based SnapRestore is carried out, SnapDrive for UNIX does some mandatory checks with the system. These checks are required so that volume based SnapRestore is used safely. The mandatory checks cannot be over-ridden by the user.

The following are the mandatory checks which SnapDrive for UNIX makes before implementing volume-based SnapRestore:

- Volume-based SnapRestore works only with Snapshots which are created using SnapDrive for UNIX.
- The volume in volume-based SnapRestore should not be a storage system's root volume.
- SnapDrive for UNIX checks for volume clones. It does not allow the volume restore operation if there are any volume clones from new Snapshot copies. This is a limitation imposed by Data ONTAP.
- The volume in volume-based SnapRestore should not have any mapped LUNs apart from the LUNs specified (raw LUN or LUNs present in file system, disk group or host volume) for restore.
- SnapDrive for UNIX checks whether the volume exists in a SnapMirror relationship.
- SnapDrive for UNIX checks whether the volume exists in a SnapVault relationship.

The SnapMirror and SnapVault checks can be overridden if SnapDrive for UNIX is using Operations Manager for RBAC and user has SD.SnapShot.DisruptBaseline capability on volume. For more information about the specific RBAC capability for user to override these checks, you can see Role Based Access Control in SnapDrive for UNIX.

Related concepts:

"Role-Based Access Control in SnapDrive for UNIX" on page 115

Checks that can be overridden by the user

Before volume-based SnapRestore is carried out, SnapDrive for UNIX performs some checks that a user can override using `-force` option. These checks are required so that volume-based SnapRestore is used safely.

It is recommended that you follow the various checks that the system performs, but you can override these checks by using the `-force` option.

You can override the following SnapDrive for UNIX for volume-based SnapRestore checks:

- SnapDrive for UNIX checks for LUNs in the Snapshot copy which are not crash consistent. If it finds an application inconsistent LUN in the Snapshot copy, it warns you about it.
- SnapDrive for UNIX checks whether there are additional LUNs in the active volume which were created after the Snapshot copy was taken. If SnapDrive for UNIX finds additional LUNs, it warns you that those additional LUNs in the active volume is lost.
- SnapDrive for UNIX checks for new Snapshot copies. These new Snapshot copies do not get restored and are lost.
- SnapDrive for UNIX checks for normal file (files that are visible from the local host) in a volume.
- SnapDrive for UNIX checks for NFS exports.
- SnapDrive for UNIX checks for CIFS shares.

If Snapshot copies were created using SnapDrive 3.0 for UNIX or earlier, volume-based SnapRestore preview is not able to perform the first two checks in the earlier mentioned list. If you have provided `-force` option, then during volume-based SnapRestore execute, a prompt message is displayed to over-ride these checks and proceed.

Volume-based SnapRestore command

This section describes the commands and the options to use volume based SnapRestore.

`-vbsr` option is added in snap restore CLI to select volume based SnapRestore. Use the following command syntax to perform restore using volume based SnapRestore:

```
snapdrive snap restore {-lun | -dg | -vg | -hostvol |
-lvol | -fs |-file} file_spec [file_spec ...] [{-lun | -dg |
-vg | -hostvol | -lvol | -fs -file} file_spec [file_spec ...]
...] -snapname snap_name [-force [-noprompt]][{-reserve |
-noreserve}]
[-vbsr [execute | preview]]
```

If no argument is supplied with the `-vbsr`, the default output is that of the `preview` option. A `–verbose` option is used which enables detailed output of all the mandatory checks that can be over-ridden by the user. The default output when `-verbose` option is not provided displays the results of the checks that is failed.

If you do not want any confirmation message to prompt, while executing volume based SnapRestore, you can use `-noprompt` and `-force` option with `snap restore -vbsr execute` command. The following table describes SnapDrive for UNIX behavior depending on the options provided by you.

S.N.	-vbsr execute	-force	-noprompt	Result
1.	No	NA	NA	Preview mode is the default mode. All the checks are done and report for each check is generated.

S.N.	-vbsr execute	-force	-noprompt	Result
2.	Yes	No	No	All checks are done. If any mandatory checks that a user can override fails, SnapDrive for UNIX displays an error message.
3.	Yes	Yes	No	All the checks are done. If any mandatory checks fail, SnapDrive for UNIX displays an error message. If any check that a user can override fails, SnapDrive for UNIX prompts you.
4.	Yes	Yes	Yes	All the checks are done. If any mandatory checks fail, SnapDrive for UNIX displays an error message. If any check that a user can override fails, SnapDrive for UNIX does not prompt you.

Information about LUNs mapped to local or remote hosts

The only mapping information available from the volume to SnapDrive for UNIX during volume based SnapRestore is the initiator group information for a LUN. If the initiator groups used by you are always created by SnapDrive for UNIX, then the fully qualified domain name of the host is part of the initiator group name.

If SnapDrive for UNIX administrator specifies the `–igroup` CLI option or if you use manually created initiator groups, then the `igroup` name need not necessarily have the host name. For all the earlier reasons, SnapDrive for UNIX cannot reliably detect local or remote bindings for a LUN. Therefore, SnapDrive for UNIX displays the full LUN initiator group and initiator information as part of the volume based SnapRestore.

Host filespec information for a particular volume

SnapDrive for UNIX as part of volume restore preview report displays the LUN mapping information. This displayed information is relevant for the checks and the normal files are reverted. Finding out all the host filespecs based on LUNs on a particular volume is a time consuming process and slows down the volume restore process.

If you want to know that the host filespec information for the local host mapped to a particular storage system volume, you can use `snapdrive storage show -filervol <full-volume-name>`. An example of this is shown in the following.

```
#snapdrive storage show -filervol bart:/vol/volusecase2

Connected LUNs and devices:

 device filename   adapter  path  size   proto  state   clone  lun path          backing snapshot
----------------  -------   ----  ---- -----    -----   -----  --------           ----------------
/dev/sdg             -       P    100m  iscsi   online   No    bart:/vol/volusecase2/lun5     -

Host devices and file systems:

dg: vbsrfs_1_SdDg               dgtype lvm
hostvol: /dev/mapper/vbsrfs_1_SdDg-vbsrfs_1_SdHv        state: AVAIL
fs: /dev/mapper/vbsrfs_1_SdDg-vbsrfs_1_SdHv     mount point: /mnt/vbsrfs_1 (persistent) fstype ext3

 device filename  adapter  path  size   proto  state  clone  lun path           backing snapshot
----------------   ------- ----  ----  -----   -----  -----  --------           ----------------
/dev/sdbe          -       P     100m   iscsi  online  No    bart:/vol/volusecase1/lun9_0     -
/dev/sdbf         -        P     100m   iscsi  online  No    bart:/vol/volusecase2/lun4_0     -

raw device: /dev/sdbr1  mount point: /mnt/fs11 (persistent) fstype ext3

 device filename  adapter path  size  proto  state  clone  lun path             backing snapshot
----------------  ------- ---- ----   -----  -----  -----  --------              ----------------
/dev/sdbr          -      P    200m   iscsi  online  No    bart:/vol/volusecase2/fs11_SdLun    -

NFS device: bart:/vol/volusecase1        mount point: /mnt/volusecase1 (non-persistent)

LUNs not connected to this host:

 lun path                                    size   state
 -----------------------------               ------ ------
 bart:/vol/volusecase2/lunotherhost 20m   online
```

Volume-based SnapRestore for space reservation

For space reservation with volume based snap reserve you need to set *space-reservations-volume-enabled* option in the `snapdrive.conf` file.

The *space-reservations-volume-enabled* option is used to set space guarantee policy on volume and can take the following three values.

- **Snapshot**: This is the default value. Space guarantee on the volume does not change.
- **volume**: Space guarantee on the volume is at the volume level.
- **none**: Space guarantee is set as none.

Following table describes the behavior of volume-based snap reserve for space reservation.

No space reserve CLI option used; `-vbsr execute` is specified	space-reservations-volume-enabled=	Result
none	snapshot	Space guarantee on the volume does not change.
none	none	Attempt to set space guarantee as “none” for the volumes.
`-reserve`	configuration value is over-ridden	Attempt to set space guarantee for volumes as "volume"
`-noreserve`	configuration value is over-ridden	Attempt to set space guarantee for volumes as "none"

No space reserve CLI option used; `-vbsr execute` is specified	space-reservations-volume-enabled=	Result
none	volume	Attempt to set space guarantee for volumes as "volume"

Note: `–vbsr preview` does not check for any of the space reservation options.

Connecting to a Snapshot copy

You can connect a Snapshot copy from one host to a different host.

SnapDrive for UNIX lets you connect a host to a Snapshot copy from a different location on a host. This new location can be on the host where you took the Snapshot copy (the originating host) or on a different host (the non-originating host).

Being able to set up the Snapshot copies in a new location means you can backup a Snapshot copy to another medium, perform maintenance on a disk group, or access the Snapshot copy data without disrupting the original copy of the data.

With this command, you can connect a host to a Snapshot copy that contains any of the following:

- LUNs
- A file system created directly on a LUN
- Disk groups, host volumes, and file systems created on LUNs
- NFS directory trees
- Disk groups, host volumes, and file systems on shared storage system

How the snapdrive snap connect command works

When you use the `snapdrive snap connect` command, it clones the storage for the entity you specify and imports it to the host:

- If you specify a Snapshot copy that contains a LUN (`-lun`), SnapDrive for UNIX maps a new copy of the LUN to the host. You cannot use the `snapdrive snap connect` command to specify a LUN on the same command line with other storage entities (`-vg`, `-dg`, `-fs`, `-lvol`, or `- hostvol`).
- If you specify a file system that resides directly on a LUN, SnapDrive for UNIX maps the LUN to the host and mounts the file system.
- If the source mount point is specified as the relative pathname in the `snap connect` command, SnapDrive for UNIX ignores the destination mount point specified in CLI and uses internal naming convention of the format `source_mount_point_<N>` to name the destination mount point.
- If you specify a Snapshot copy that contains a disk group, or a host volume or file system that is part of a disk group, the `snapdrive snap connect` command connects the entire target disk group. To make the connection, SnapDrive for UNIX re-activates all of the logical volumes for the target disk group and mounts all the file systems on the logical volumes.
- If you specify `autorename` option with the `snap connect` command, host volumes and file systems are always renamed. The disk groups are renamed only if they already exist on the host.

- If you specify a Snapshot copy that contains an NFS directory tree, SnapDrive for UNIX creates a clone of the FlexVol volume that contains the NFS directory tree. SnapDrive for UNIX then connects the volume to the host and mounts the NFS file system. Within the directory tree, SnapDrive for UNIX deletes any new NFS files or directories that you create after you created the Snapshot copy. SnapDrive for UNIX deletes any files or directories from the FlexVol volume that are outside the NFS directories that you connect, if the `snapconnect-nfs-removedirectories` configuration option is set to `on`.
- If you connect a Snapshot copy that contains NFS directory trees using the `-readonly` option, SnapDrive for UNIX mounts the Snapshot copy of the directory directly without creating a clone. You cannot use the `snapdrive snap connect` command to specify NFS mountpoints on the same command line as non-NFS entities; that is, using the options `-vg`, `-dg`, `-fs`, `-lvol`, or `- hostvol`.

Note: The `snap connect` operations with `-split` option in vFiler environment are supported with Data ONTAP 7.3 and later.

Connecting Snapshot copies on mirrored storage systems

In the case of a Snapshot copy on a mirrored storage system, you can connect the Snapshot copy on the source storage system and the destination system.

When you create a Snapshot copy on a mirrored storage system, the Snapshot copy is automatically replicated, from the source system where it is created, to the destination (mirrored) storage system. SnapDrive for UNIX allows you to connect the Snapshot copy on the source storage system. You can also connect the Snapshot copy on the destination storage system.

Connecting multiple storage entities

You can connect a Snapshot copy containing multiple storage entities.

To connect a Snapshot copy that contains storage entities that reside on multiple destination storage systems you must meet the following requirements:

- The storage entities you specify at the command prompt must reside on a single storage system, or on a HA pair.
- The name of the volume of the source storage system must match the name of the volume of the destination storage system.
- You must set the *snapmirror-dest-multiple-filervolumes-enabled* variable in the snapdrive.conf file to “on”.

You can use one command to connect storage entities that reside on a single storage system or on a HA pair.

Snapshot connect and Snapshot restore operations

Snapshot copy clones the information when you connect to the Snapshot copy.

Unlike the Snapshot restore operation, the Snapshot connect operation does not replace the existing contents of the LUNs that make up the host entity with the Snapshot copy contents. It clones the information.

After the connection is established, both Snapshot connect and Snapshot restore operations perform similar activities:

- The Snapshot connect operation activates logical volumes for the storage entity, mounts file systems, and optionally adds an entry to the host file system table.

- The Snapshot restore operation activates the logical volumes for the storage entity, mounts the file systems, and applies the host file system mount entries that were preserved in the Snapshot copy.

Guidelines for connecting Snapshot copies

Follow the guidelines when connecting to Snapshot copies.

- The `snapdrive snap connect` command works only with Snapshot copies created in SnapDrive 4.2 for UNIX.
- On a non-originating host, SnapDrive 4.1 for UNIX supports the Snapshot connect operation using Linux LVM1 or LVM2. However, it does not support the Snapshot connect operation on the originating host, if the LUN is part of the Linux LVM1 volume manager.
- On an originating host, SnapDrive for UNIX supports connecting and restoring Snapshot copies that are created by previous versions of SnapDrive for UNIX.

  Note: On a Linux originating host, the Snapshot connect operation works only with Linux LVM2, and Snapshot copies created by SnapDrive for UNIX.
- On Linux hosts, the `snapdrive snap connect` command is supported if the Snapshot copy you connect contains a LUN, or a LUN with a file system, that was created without activating the Linux LVM1. SnapDrive for UNIX does not support the `snapdrive snap connect` command for Linux entities that are created using the Linux LVM1.

  The `snapdrive snap connect` command does not allow you to rename the disk group on a Linux host. For example, the following command is not supported:

  ```
  snapdrive snap connect -dg dg1 dg1copy -snapname toaster:/vol/
  vol1:dg1snapshot
  ```
- For read and write access to NFS directory trees, the `snapdrive snap connect` command uses the Data ONTAP FlexVol volume feature, and therefore requires Data ONTAP 7.3 or later. Configurations with Data ONTAP 7.1 can connect NFS files or directory trees, but are provided with read-only access.
- If you set the *enable-split-clone* configuration variable value to “on” or “sync” during the Snapshot connect operation and “off” during the Snapshot disconnect operation, SnapDrive for UNIX does not delete the original volume or LUN that is present in the Snapshot copy.
- You have to set the value of Data ONTAP 7.2.2 configuration option vfiler.`vol_clone_zapi_allow` to “on” to connect to a Snapshot copy of a volume or LUN in a vFiler unit.
- The Snapshot connect operation is not supported on the hosts having different host configurations.
- The `snapdrive snap connect` command used to connect to a root volume of a physical storage system or a vFiler unit fails because Data ONTAP does not allow cloning of a root volume.

Information required for using the snapdrive snap connect command

To connect to a Snapshot copy, determine the type of storage entity, connect a Snapshot copy with the NFS directory tree to Data ONTAP 7.3 configurations, and so on.

The following table gives the information you need to supply when you use the `snapdrive snap connect` command.

Requirement/Option	Argument
Decide the type of storage entity that you want to use to attach the Snapshot copy and supply that entity's name with the appropriate argument. This is the value for the *src_fspec* argument. • If you connect a Snapshot copy of a LUN, SnapDrive for UNIX connects the LUN you specify. You cannot use the `-lun` option on the same command line with the `-vg`, `-dg`, `-fs`, `-lvol`, or `-hostvol` options. You can specify the short name of the LUN in the lun_name or qtree_name/lun_name format. • If you connect a Snapshot copy of a file system that is created directly on a LUN, SnapDrive for UNIX connects the LUN that has the file system. • If you connect a Snapshot copy of a disk group that has a host volume or file specification, the argument translates into a set of disk groups on the storage system. SnapDrive for UNIX connects the entire disk group containing the entity, even if the entity is a host volume or file system. • If you connect a Snapshot copy of an NFS file system, the argument translates to the NFS directory tree. SnapDrive for UNIX creates a FlexClone of the volume, removes directory trees that are not specified in the Snapshot copy, and then connects and mounts the NFS directory tree. If you specify an NFS mount point, you cannot specify non-NFS entities (`-vg`, `-dg`, `-fs`, `-lvol`, or `-hostvol`) on the same command line. **Note:** SnapDrive for UNIX does not support symbolic links at the mount point level.	
LUN (`-lun` *file_spec*)	*short name of the LUN.*
The *s_lun_name* specifies a LUN that exists in the `-snapname` *long_snap_name*. The short lun_name is required. You cannot include a storage system or storage system volume name. The *d_lun_name* specifies the name at which the LUN is connected. The short *lun_name* is required. You cannot include a storage system or storage system volume name. You must specify a *d_lun_name*	
Disk group (`-dg` *file_spec*) or volume group (`-vg` *file_spec*)	*name of the disk or volume group*
File system (`-fs` *file_spec*)	*name of the file system*
Host volume (`-hostvol` *file_spec*) or logical volume (`-lvol` *file_spec*)	*name of the host or logical volume*
Connect a Snapshot copy with an NFS directory tree to Data ONTAP 7.3 configurations. • If your configuration uses Data ONTAP 7.3 or a later version of Data ONTAP with traditional (not FlexVol) volumes, you must specify this option to connect the Snapshot copy with readonly access (required). • If your configuration uses Data ONTAP 7.3 and later and FlexVol volumes, SnapDrive for UNIX automatically provides read-write access. Specify this option only if you want to restrict access to read-only (optional).	
-readonly	*set read only permission*
Optional: Supply a name by which the target entity is accessible after the storage entity is connected. SnapDrive for UNIX uses this name to connect the destination entity. This is the *dest_file_spec* argument. If you omit this name, the `snap connect` command uses the value you supplied for *src_fspec*.	
Name of target entity	*dest_file_spec*

Requirement/Option	Argument
Optional: Specify the names for the destination storage entities. If you included this information as part of the *dest_fspec/src_fspec* pair, you do not need to enter it here. You can use the `-destxx` options to specify names for destination storage entities if this information is not part of the *dest_fspec/src_fspec* pair. For example, the `-fs` option names only a destination mount point so you can use the `-destdg` option to specify the destination disk group. If you do not specify the name needed to connect an entity in the destination disk group, the `snapdrive snap connect` command takes the name from the source disk group. If you do not specify the name needed to connect an entity in the destination disk group, the `snap connect command` takes the name from the source disk group. If it cannot use that name, the operation fails, unless you included `-autorename` at the command prompt.	
Destination disk group (`-destdg`) or destination volume group (`-destvg`)	*dgname*
Destination logical volume (`-destlv`) or destination host volume (`-desthv`)	*lvname*
Specify the name for the Snapshot copy. Use the long form of the name where you enter the storage system name, volume, and Snapshot copy name.	
Snapshot copy name (`-snapname`)	*long_snap_name*
`-nopersist`	~
Optional: Connect the Snapshot copy to a new location without creating an entry in the host file system table. • The `-nopersist` option allows you to connect a Snapshot copy to a new location without creating an entry in the host file system table. (for example, `fstab` on Linux) By default SnapDrive for UNIX creates persistent mounts. This means that: – When you connect a Snapshot copy on a host, SnapDrive for UNIX mounts the file system and then places an entry for the LUNs that comprise the file system in the host's file system table. – When you connect a Snapshot copy on a Linux host, SnapDrive for UNIX mounts the file system, resets the file system universal unique identifier (UUID) and label, and places the UUID and mount point in the host's file system table. – You cannot use `-nopersist` to connect a Snapshot copy that contains an NFS directory tree.	
`-reserve | -noreserve`	~
Optional: Connect the Snapshot copy to a new location with or without creating a space reservation.	
Igroup name (`-igroup`)	*ig_name*
Optional: It is recommended that you use the default igroup for your host instead of supplying an igroup name.	
`-autoexpand`	~

Requirement/Option	Argument
To shorten the amount of information you must supply when connecting to a volume group, include the `-autoexpand` option at the command prompt. This option lets you name only a subset of the logical volumes or file systems in the volume group. It then expands the connection to the rest of the logical volumes or file systems in the disk group. In this manner, you do not need to specify each logical volume or file system. SnapDrive for UNIX uses this information to generate the name of the destination entity. This option applies to each disk group specified at the command prompt and all host LVM entities within the group. Without the `-autoexpand` option (default), you must specify all affected host volumes and file systems contained in that disk group to connect the entire disk group. **Note:** If the value you enter is a disk group, you do not need to enter all the host volumes or file systems because SnapDrive for UNIX knows what the disk group is connecting to. It is recommended that, if you include this option, you should also include the `-autorename` option. If the `-autoexpand` option needs to connect the destination copy of an LVM entity, but the name is already in use, the command fails unless the `-autorename` option is at the command prompt.	
The command fails if you do not include -autoexpand and you do not specify all the LVM host volumes in all the disk groups that is referred at the command prompt (either by specifying the host volume itself or the file system).	
`-autorename`	~
When you use the `-autoexpand` option without the `-autorename` option, the `snap connect` command fails if the default name for the destination copy of an LVM entity is in use. If you include the `-autorename` option, SnapDrive for UNIX renames the entity when the default name is in use. This means that with the `-autorename` option at the command prompt, the Snapshot connect operation continues regardless of whether all the necessary names are available. This option applies to all host-side entities specified at the command prompt. If you include the `-autorename` option at the command prompt, it implies the -autoexpand option, even if you do not include that option.	
`-split`	~
Enables to split the cloned volumes or LUNs during Snapshot connect and Snapshot disconnect operations.	
`mntopts`	~
Optional: If you are creating a file system, you can specify the following options: • Use `-mntopts` to specify options that you want to pass to the host mount command (for example, to specify host system logging behavior). The options you specify are stored in the host file system table file. Allowed options depend on the host file system type. • The *-mntopts* argument is a file system `-type` option that is specified using the `mount` command `-o` flag. Do not include the `-o` flag in the *-mntopts* argument. For example, the sequence -mntopts tmplog passes the string `-o tmplog` to the `mount` command, and inserts the text tmplog on a new command line. **Note:** If you pass any invalid *-mntopts* options for storage and snap operations, SnapDrive for UNIX does not validate those invalid mount options.	

Connecting to a Snapshot copy that contains LUNs

You can connect to a Snapshot copy that contains LUNs by using the `snapdrive snap connect` command.

Procedure

Enter the following command syntax to connect to a Snapshot copy that contains LUNs: `snapdrive snap connect -lun` *s_lun_name d_lun_name* [[-lun] *s_lun_name d_lun_name*... -snapname *long_snap_name* [-igroup *ig_name* [*ig_name*...]] [-split]

Note: The *s_lun_name* and *d_lun_name* should be in the format lun_name or qtree_name/lun_name.

Results

SnapDrive for UNIX clones the LUNs you specify and connects them to a new location.

Example

The following example connects the LUN mylun1, in hornet/vol/vol1/tuesdaysnapshot to mylun1copy:

```
# ./snapdrive snap connect -lun mylun1 mylun1copy -snapname
hornet:/vol/vol1:tuesdaysnapshot
connecting hornet:/vol/vol1/mylun1:
LUN copy mylun1copy ... created
(original: hornet:/vol/vol1/mylun1) mapping new lun(s) ... done
discovering new lun(s) ... done
```

The following example connects two LUNs, mylun1 and mylun2, to mylun1copy and mylun2copy, respectively:

```
# ./snapdrive snap connect -lun mylun1 mylun1copy -lun mylun2
mylun2copy -snapname hornet:/vol/vol1:tuesdaysnapshot
connecting hornet:/vol/vol1/mylun1:
LUN copy mylun1copy ... created
(original: hornet:/vol/vol1/mylun1)
mapping new lun(s) ... done
connecting hornet:/vol/vol1/mylun2:
LUN copy mylun2copy ... created
(original: hornet:/vol/vol1/mylun2)
mapping new lun(s) ... done
discovering new lun(s) ... done
```

The following example connects the LUN lun1_0 to snapshot lech:/vol/vol1:rrt:

```
snapdrive snap connect -fs /mnt/fs /mnt/fs1  -snapname lech:/vol/vol1:rrt
connecting /mnt/fs:
   LUN copy lun1_0 ... created
     (original: lech:/vol/vol1/lun1)
   exporting new lun(s) to Guest OS ... done
   discovering new lun(s) ... done
Successfully connected to snapshot lech:/vol/vol1:rrt
        file system: /mnt/fs1
```

Connecting to a Snapshot copy of storage entities other than LUNs

You can use the `snapdrive snap connect` command for connecting to a Snapshot copy that contains storage entities other than LUNs. This command cannot be used when destination names you provide are currently in use or, there is a file system name that is used as a mountpoint.

Procedure

Enter the following command:

`snapdrive snap connect -snapname` fspec_set [*fspec_set*...] -snapname *long_snap_name* [-igroup *ig_name* [*ig_name*...]] [-autoexpand] [-autorename] [-nopersist] [{-reserve | -noreserve}] [-readonly] [-split]
In the preceding usage, *fspec_set* has the following format:
`{-dg | -fs | -hostvol}` *src_file_spec* [*dest_file_spec*] [{-destdg | -destvg} *dgname*] [{-destlv | -desthv} lvname]
This command must always start with the name of the storage entity you want to connect (for example, `-dg`, `-hostvol`, or `-fs`). If you specify an NFS mountpoint, you cannot specify non-NFS entities (`-vg`, `-dg`, `-fs`, `-lvol` or `-hostvol`) on the same command line.

Note: On Linux hosts, SnapDrive for UNIX supports the Snapshot connect operation on the originating host, unless the LUN is part of the Linux LVM1 volume manager.

Results

SnapDrive for UNIX clones the LUNs you specify and connects them to a new location.

Example

The following command line connects a disk group and uses the default names as the destination names (that is, it creates them from the source names):

```
# snapdrive snap connect -vg vg1 -snapname
filer1:/vol/vol1:vg1snapshot
connecting vg1:
LUN copy vg1_lun1_0 ... created
(original: filer1:/vol/vol1/vg1_lun1)
mapping new lun(s) ... done
discovering new lun(s) ... done
Importing vg1
```

The following command line connects a disk group with a single host volume. It also specifies a name for the destination host volume and disk group:

```
# snapdrive snap connect -lvol vg1/vol1 vg1copy/vol1copy -snapname
filer1:/vol/vol1:vg1snapshot
connecting vg1:
LUN copy vg1_lun1_0 ... created
(original: filer1:/vol/vol1/vg1_lun1)
mapping new lun(s) ... done
discovering new lun(s) ... done
Importing vg1copy
```

The following command line connects a disk group with two LUNs and two file systems. It specifies a destination name for each of the file systems, the host volume for one of the file systems, and the disk groups for both file systems:

```
# snapdrive snap connect -fs mnt/fs1 /mnt/fs1copy -destvg vg1copy \
-fs /mnt/fs2 /mnt/fs2copy -destlv vg1copy/vol2copy -destvg vg1copy
\ -snapname filer1:/vol/vol1:vg1snapshot
connecting vg1:
LUN copy vg1_lun1_0 ... created
(original: filer1:/vol/vol1/vg1_lun1)
LUN copy vg1_lun2_0 ... created
(original: filer1:/vol/vol1/vg1_lun2)
mapping new lun(s) ... done
discovering new lun(s) ... done
Importing vg1copy
```

The following command line includes the -autoexpand option as it connects a disk group with two file systems. It uses the default names as the destination names (that is, it creates them from the source names):

```
# snapdrive snap connect -lvol mnt/fs1 -snapname
filer1:/vol/vol1:vg1snapshot \
-autoexpand
connecting vg1:
LUN copy vg1_lun1_0 ... created
(original: filer1:/vol/vol1/vg1_lun1)
LUN copy vg1_lun2_0 ... created
(original: filer1:/vol/vol1/vg1_lun2)
mapping new lun(s) ... done
discovering new lun(s) ... done
Importing vg1
```

The following command line includes the `-autorename` option as it connects a disk group with two file systems and two LUNs:

```
# snapdrive snap connect -fs mnt/fs1 -snapname
filer1:/vol/vol1:vg1snapshot \
-autorename
connecting vg1:
LUN copy vg1_lun1_0 ... created
(original: filer1:/vol/vol1/vg1_lun1)
LUN copy vg1_lun2_0 ... created
(original: filer1:/vol/vol1/vg1_lun2)
mapping new lun(s) ... done
discovering new lun(s) ... done
Importing vg1_0
```

In the following example, file system 1 (fs1) resides on storage system1, and file system 2 (fs2) resides on storage system1 and also on storage system2, which is the partner storage system. File system 3 (fs3) resides on storage system1, partner storage system 2, and storage system 3, which is not part of the HA pair . An additional file system, fs4, resides entirely on storage system 4.

The following command creates a Snapshot copy of fs1, fs2, fs3, and fs4:

```
snapdrive snap create -fs /mnt/fs1 /mnt/fs2 /mnt/fs3 /mnt/fs4
-snapname fs_all_snap
```

The next command connect fs1 and fs2 on the destination storage system. Both fs1 and fs2 reside on a HA pair , so you can restore them with one command:

```
snapdrive snap connect -fs /mnt/fs1 /mt/fs2 -snapname fs_all_snap
```

The following command restores fs4:

```
snapdrive snap connect -fs /mnt/fs4 -snapname fs_all_snap
```

SnapDrive for UNIX cannot connect fs3 on the destination storage system, because this file system resides on storage system1, storage system 2, and storage system 3.

Connecting to Snapshot copies of shared storage entities other than LUNs

You can use the `snapdrive snap connect` command to connect to a Snapshot copy of shared storage entities other than LUNs.

Procedure

Enter the following command: `snapdrive snap connect` *fspec_set* [*fspec_set*...] -snapname *long_snap_name* *`fspec_set`* [*`fspec_set`*...] `-snapname` *`long_snap_name`* `[-devicetype shared] [-split]`
In this syntax, *fspec_set* is: {`-dg` | `-fs`} *src_file_spec* [*dest_file_spec*] [-destdg *dgname*]

Splitting a volume clone or LUN clone

SnapDrive for UNIX enables you to split a volume clone or LUN clone. After the clone split is complete, the relationship between the parent volume and the clone is destroyed, and both the entities are independent of each other, and have their own individual storage space.

The following are the clone split operations:

- Estimate the disk space (in MB) for a volume clone or LUN clone.
- Split a volume clone or LUN clone.
- Stop the volume clone or LUN clone split.
- View the status of the clone split that is in progress, completed, or failed.

Note:

- If a volume clone is split, all Snapshot copies in the cloned volume are deleted.
- It is mandatory to run the clone split estimate command before splitting the file specification to determine, if there are any Snapshot copies taken in the cloned volume.
- For all clone split commands, only long LUN name must be specified with `-lun` option. You cannot specify `-lun` option on the same command line along with other storage entities (-vg, -dg, -fs, - lvol, or -hostvol options).
- It is always mandatory to use the absolute pathname for the file specifications with clone split commands.
- The LUN clone split estimation using Snapshot is available only for Snapshot copies that are created from SnapDrive 4.2 for UNIX and later.

Estimating the storage space to split a volume clone

The clone split estimation helps you to estimate the required storage space (in MB) to split a volume clone. Depending on the clone split estimation provided by SnapDrive for UNIX, you can determine the space availability to split a volume clone.

Procedure

Enter the following command to estimate the required storage space to split a volume clone. `snapdrive clone split estimate [-lun]` *long_lun_name* [long*_lun_name*...] | [{-dg | -vg | -fs | -hostvol | -lvol} *file_spec* [*file_spec*...]] | [-snapname *long_snap_name*] {-volclone|-lunclone}] [-v | -verbose] [-dump | -dumpall]
This operation displays the following information:

- Resource name
- Container - Aggregate for a FlexClone
- Required Space - space required to split the volume clone
- Available space - space available on the container
- Storage Status - indicates the space availability for a volume clone split
- Owned Space - space occupied by the volume clone
- Shared space - space occupied by the volume clone along with the parent

The `Owned Space` and `Shared Space` is displayed when you use `-verbose` option.

Example

The following example estimates the storage space to split a volume clone.

```
# snapdrive clone split estimate -fs /mnt/my_mnt1 -fs /mnt/my_mnt2
Resource     Container  Required Available  Storage
                        Space(MB) Space(MB) Status
/mnt/my_mnt1  f3050-220  400      61500    AVAILABLE
              -111:aggr0
/mnt/my_mnt2  f3050-220  3292     1129     NOT AVAILABLE
              -112:aggr1
```

For every file specification, SnapDrive for UNIX determines the required space that is available in the storage system to split a volume clone. Here, the `/mnt/my_mnt1` file specification has the required space to split, and thus the storage status displays as AVAILABLE. Whereas, the `/mnt/my_mnt2` file specification does not have the required space to split, and so the storage status displays as NOT AVAILABLE.

The following is an example of using the `-verbose` option. Alternatively, you can use `-v` option.

```
# snapdrive clone split estimate -fs /mnt/my_mnt1 -verbose
Resource    Container Owned    Shared   Required Available Storage
                      Space(MB)Space(MB)Space(MB)Space(MB) Status
/mnt/my_mnt1 f3050-220 32365  403       403     55875 AVAILABLE
             -111:aggr0
```

Estimating the storage space to split a LUN clone

The clone split estimation helps you to estimate the required storage space (in MB) to split a LUN clone. Depending on the clone split estimation provided by SnapDrive for UNIX, you can determine the space availability to split a LUN clone.

Procedure

Enter the following command to estimate the required storage space to split a LUN clone:

snapdrive clone split estimate [-lun]*long_lun_name* [*long_lun_name*...] | [{-dg | -vg | -fs | -hostvol | -lvol}*file_spec* [*file_spec*...]] | [-snapname *long_snap_name*] {-volclone|-lunclone}] [-v | -verbose]
This operation displays the following information:

- Resource name
- Container- Volume for a LUN clone
- Required Space - space required to split a LUN clone
- Available space - space available on the container
- Storage Status - indicates the space availability for a LUN clone split
- Owned Space - space occupied by the LUN clone
- Shared Space - space occupied by the LUN clone along with the parent

The `Owned Space` and `Shared Space` is displayed when you use `-verbose` option.

Example

The following example estimates the storage space to split a LUN clone.

```
# snapdrive clone split estimate -fs /mnt/my_mnt1
Resource     Container Required Available Storage
                       Space(MB)Space(MB) Status
/mnt/my_mnt1 f3050-220  5120    9986    AVAILABLE
             -112:/vol/vol_1
```

The following is an example of using the `-verbose` option. Alternatively, you can use `-v` option.

```
# snapdrive clone split estimate -fs /mnt/my_mnt1 -verbose
Resource    Container  Owned    Shared   Required Available Storage
                       Space(MB)Space(MB)Space(MB)Space(MB) Status
/mnt/my_mnt1 f3050-220  365   403      5120     9986 AVAILABLE
             -112:/vol/vol_1
```

Estimating the storage space using a Snapshot copy

The clone split estimation helps you to estimate the required storage space (in MB) using a Snapshot copy, when there is no clone available for a Snapshot copy in the storage system.

Procedure

Enter the following command to estimate the required storage space:
`snapdrive clone split estimate -snapname [`*`long_snap_name`*`]`
`{-volclone|-lunclone}] [-v | -verbose]`

Example

The following example estimates the storage space to split a LUN clone using a Snapshot copy.

```
snapdrive clone split estimate -snapname f3050-220-112:/vol/vol_1:snap_1 -lunclone
Resource      Container  Required  Available Storage
                        Space(MB) Space(MB) Status
f3050-220-112: f3050-220  5120      14078    AVAILABLE
/vol/vol_1:snap_1 -112:/vol/vol_1
```

The following example estimates the storage space to split a LUN clone using a Snapshot copy with the `-fs` option.

```
# snapdrive clone split estimate -fs /mnt/my_mnt1 -snapname f3050-220-112:/vol/vol_1:snap_1 -lunclone
Resource         Container Required  Available Storage
                           Space(MB) Space(MB) Status
f3050-220-112:   f3050-220  4120     14078  AVAILABLE
/vol/vol_1:snap_1 -112:/vol/vol_1
```

The following example estimates the storage space to split a volume clone using a Snapshot copy with the `-fs` option.

```
# snapdrive clone split estimate -fs /mnt/fs1 -snapname f3050-220-112:/vol/vol_1:snap_1 -volclone
Resource      Container   Required  Available Storage
                          Space(MB) Space(MB) Status
f3050-220-112:  f3050-220 54019     54517     AVAILABLE
/vol/vol0:snap_1 112:aggr0
```

The following example estimates the storage space to split a volume clone using a Snapshot copy.

```
# snapdrive clone split estimate -snapname f3050-220-112:/vol/vol_1:snap_1 -volclone
Resource      Container   Required Available Storage
                          Space(MB)Space(MB) Status
f3050-220-112:  f3050-220 54019    54517    AVAILABLE
/vol/vol0:snap_1 112:aggr0
```

Note:

- The "Resource" field contains the Snapshot copy name, if the clone split estimate is done for a Snapshot copy.
- If you provide any dead file specification along with the Snapshot copy with `-lunclone` option, the "Required Space" shows as `0`.
- The LUN clone split estimation using Snapshot is available only for Snapshot copies that are created from SnapDrive 4.2 for UNIX and later.

Starting the volume clone or LUN clone split

You can start a volume clone or LUN clone split operation.

Procedure

Enter the following command to start a volume clone or LUN clone split.`# snapdrive clone split start [-lun]` *long_lun_name* [*long_lun_name*...] | [{-dg | -vg | -fs | -hostvol | -lvol} *file_spec* [*file_spec* ...]] [-force][-noprompt] [-dump | -dumpall] The following options can be used when the storage status displays as NOT AVAILABLE.

- You can use the *-force* option to forcibly start the clone split operation with the confirmation message.
- You can use the *-noprompt* along with *-force* option to start the clone split start operation without any confirmation message.

Example

The following example displays how to split a volume clone.

```
# snapdrive clone split start -fs /mnt/my_mnt4_0 /mnt/my_mnt3_0
Resource    Container  Required Available Storage
                       Space(MB)Space(MB) Status
--------------------------------------------------
/mnt/my_mnt4_0 f3050-220 3295   66033 AVAILABLE
             -111:aggr0
/mnt/my_mnt3_0 f3050-220  293   37707 AVAILABLE
             -112:aggr1

Job ID: B265Dbv8gh
Clone-Split for "/mnt/my_mnt4_0" is started
Clone-Split for "/mnt/my_mnt3_0" is started
```

The following example displays how to split a clone using the *-force* option.

```
# snapdrive clone split start -fs /mnt/my_mnt5 /mnt/my_mnt6 -force
Resource    Container Required  Available Storage
                      Space(MB) Space(MB) Status
----------------------------------------------------
/mnt/my_mnt5 f3050-220 1198   20033   AVAILABLE
             -111:aggr0
/mnt/my_mnt6 f3050-220  3294  2196  NOT AVAILABLE
             -112:aggr1
Not enough space available for Clone-Split.  Do you want to continue (y/n)?y
Clone-Split for "/mnt/my_mnt5" is started
Clone-Split for "/mnt/my_mnt6" is started
```

The following example directly starts to split a clone using the *-noprompt* option, and thus there is no confirmation message.

```
# snapdrive clone split start -fs /mnt/my_mnt5 /mnt/my_mnt6 -force -noprompt
Resource    Container  Required  Available Storage
                       Space(MB) Space(MB) Status
-----------------------------------------------------
/mnt/my_mnt5 f3050-220  1198     20033   AVAILABLE
             -111:aggr0
/mnt/my_mnt6 f3050-220  3294     2196  NOT AVAILABLE
             -112:aggr1
Clone-Split for "/mnt/my_mnt5" is started
Clone-Split for "/mnt/my_mnt6" is started
```

Viewing the status of a volume clone or LUN clone split

You can query the clone split status using a job ID or file specification. SnapDrive for UNIX displays the current status of the clone split such as progress, failed, or complete.

Procedure

Enter the following command to query the clone split status using a job ID or file specification.

`snapdrive clone split status [-lun]` *long_lun_name* [*long_lun_name*...] [{-dg | -vg | -fs | -hostvol | -lvol} *file_spec* [*file_spec* ...]][-job <*jobid*>] [-all]

Example

The following example shows the clone split status using a job ID.

```
# snapdrive clone split status -job SVE2oxKXzH
Clone-Split-Status for /fs1-1_3 is 1% Complete
Clone-Split-Status for /fs1_0 is 73% Complete
Clone-Split-Status for /fs1_1 is 73% Complete
Clone-Split-Status for /fs1_2 is 74% Complete
Clone-Split-Status for /fs1_3 is 1% Complete
```

Note: You can check the status of clone split progress in any of the following ways:

- You can verify the clone by using the `snapdrive storage show -fs /mnt/my_mnt` or `snapdrive storage show -lun` *long_lun_pathname* command. In any of these cases, the clone type is displayed as a FlexClone or LUN clone, if the split has not been completed.
- You can verify the clone split progress state by logging into the storage system by using the following commands in the storage system CLI

  `vol clone split status` *`vol_name`* `lun clone split status` *`lun_name`*

The following example shows the clone split status using the file specification.

```
# snapdrive clone split status -fs /mnt/my_mnt3 -fs /mnt/my_mnt4
Clone-Split-Status for /mnt/my_mnt3 is 14% Complete
Clone-Split-Status for /mnt/my_mnt4 is 17% Complete
```

The following example shows the clone split status that are running.

```
# snapdrive clone split status -all
Job ID: SVE2oxKXzH:
Clone-Split-Status for /fs1-1_3 is 100% Complete
Clone-Split-Status for /fs1_0 is 100% Complete
Clone-Split-Status for /fs1_1 is 100% Complete
Clone-Split-Status for /fs1_2 is 100% Complete
Clone-Split-Status for /fs1_3 is 100% Complete
```

Note:

- When a job is removed from the job set, and you try to query the status of a clone split status using file specification, SnapDrive for UNIX displays the error message as "No split is currently in progress for the given resource".
- When a job is removed from the job set, and you try to query the status of a clone split using a job ID, SnapDrive for UNIX displays the error message as "Job ID is not valid".
- When all the file specifications are removed from the job, and you try to query the status of a clone split using the Job ID, SnapDrive for UNIX displays as "Job ID is not valid" because the job is removed from the job set.
- If any of the file specifications fail due to insufficient space in the storage system, the job still continues to split for the remaining file specification. Therefore, the job is not deleted from the job queue, and the job status is retained until the overall job result is queried.
- After you execute the clone split start command, if the SnapDrive daemon is restarted or host is rebooted, you cannot query the status of the clone split operation. However, the status of the clone split can be viewed only in the storage system.

Stopping the volume clone or LUN clone split operation

You can stop the clone split for a volume clone or LUN clone using the job ID or file specification.

Procedure

Enter the following command: `snapdrive clone split stop [-lun]` *long_lun_name* [*long_lun_name*...] |[{-dg | -vg | -fs | -hostvol | -lvol} *file_spec* [*file_spec*...]] | [-job <*jobid*>]
SnapDrive for UNIX stops the clone split stop operation that is in progress.

Example

The following example shows the clone split operation that is stopped by using the file specification.

```
# snapdrive clone split stop -fs /mnt/my_mnt4 /mnt/my_mnt3
Clone-Split for "/mnt/my_mnt4" is 0% Completed and Stopped.
Clone-Split for "/mnt/my_mnt3" is 0% Completed and Stopped.
```

The following example shows the clone split operation that is stopped by using the job ID.

```
# snapdrive clone split stop -job B265Dbv8gh
Clone-Split for "/mnt/my_mnt3" is 14% Completed and Stopped.
Clone-Split for "/mnt/my_mnt4" is 17% Completed and Stopped.
```

The following example is a typical output that shows the clone split stop operation for a file specification that is already stopped.

```
# snapdrive clone split stop -fs /mnt/my_mnt4 /mnt/my_mnt3
Clone-Split for "/mnt/my_mnt3" is not stopped : No split is in progress for this resource
Clone-Split for "/mnt/my_mnt4" is not stopped : No split is in progress for this resource
```

Note:

- If the clone split is stopped for a particular file specification in the job id and the clone split stop is successful, then file specification is removed from the job.
- If the clone split is stopped for a job, and the clone split stop is successful for all the file specification in the job, the job is removed from the job set.

Viewing the result of a clone split operation using job ID or file specification

You can view the result of the completed clone split operation using job ID or file specification.

Procedure

Enter the following command to view the clone split result using a file specification:

`snapdrive clone split result [-lun]` *long_lun_name* [*long_lun_name*...] |[{-dg | -vg | -fs | -hostvol | -lvol} *file_spec* [*file_spec*...]] | [-job <*jobid*>]

SnapDrive for UNIX displays the result of the clone split that is completed, or failed for a file specification, and then removes the file specification from the job, and removes the job from the job queue.

Example

The following example shows the clone split result for a job ID that is completed successfully.

```
# snapdrive clone split result -job VT1ov6Q8vU
Clone-Split for "/mnt/my_mnt3" is 100% completed and succeeded
Clone-Split for "/mnt/my_mnt4" is 100% completed and succeeded
```

If there are two file specifications, and out of which one of the file specification fails due to insufficient space in the storage system, then the result of the clone split operation shows as one file specification failed and another file specification was completed successfully.

The following example shows the clone split result for a file specification that is completed successfully.

```
# snapdrive clone split result -fs /mnt/my_mnt3 /mnt/my_mnt4
Clone-Split for "/mnt/my_mnt3" is 100% completed and succeeded
Clone-Split for "/mnt/my_mnt4" is 100% completed and succeeded
```

The following example shows the clone split result when the clone split operation is still in progress and not yet completed.

```
# snapdrive clone split result -job R57aCzUaeG
Clone-Split for "/mnt/my_mnt3" is 0% completed and Split in progress
```

The following example shows a job that is permanently removed from the job set, and when you try to view the result using file specification, SnapDrive for UNIX encounters an error message as "does not belong to any job."

```
# snapdrive clone split result -fs /mnt/my_mnt2
Storage resource /mnt/my_mnt2 does not belong to any job
```

The following example shows a job that is permanently removed from the job set, and when you try to view the result using job ID, SnapDrive for UNIX encounters an error message as "Job ID is not valid".

```
# snapdrive clone split result -job T59aCzUaeG
Job ID is not valid
```

The following example displays the clone split result in which one of the clone split is in progress and another has failed.

```
# snapdrive clone split result -job qJrG8U59mg
Clone-Split for "/mnt/my_mnt4" is 100% completed and succeeded
Clone-Split for "/mnt/my_mnt5" is 0% completed and split failed
```

Deleting a Snapshot copy

You can delete a Snapshot copy on a storage system by using the `snapdrive snap delete` command.

Command to use to delete Snapshot copies

Use the `snapdrive snap delete` command to delete a Snapshot copy.

The `snapdrive snap delete` command removes the Snapshot copies you specify from a storage system. This command does not perform any operations on the host. It only removes the Snapshot copy from a storage system, if you have permission to do so. (If you want to keep the LUNs and mappings.)

Reasons to delete Snapshot copies

Delete older Snapshot copies to free space on the storage system volume, or to keep fewer Snapshot copies.

You might delete older Snapshot copies for the following reasons:

- To keep fewer stored Snapshot copies than the hard limit of 255 on a storage system volume. Once it reaches the limit, attempts to create new Snapshot copies fail.
- To free space on the storage system volume. Even before the Snapshot copy reaches the limit, a Snapshot copy fails if the disk does not have enough reserved space for it.
- You can also use the wildcard (*) character in Snapshot copy names. The Snapshot show operation enables you to use the wildcard character to show all Snapshot copy names that match a certain pattern. The following rules apply to using wildcard in Snapshot copy names:
  - You can use a wildcard at the end of the name only. You cannot use the wildcard at the beginning or the middle of a Snapshot copy name.
  - You cannot use the wildcard in the storage system or storage system volume fields of a Snapshot copy name.

Guidelines for deleting Snapshot copies

You cannot delete a Snapshot copy that is in use, or if the Snapshot copy is across multiple storage system volumes.

Follow these guidelines when you use the `snapdrive snap delete` command:

- The Snapshot delete operation fails if any of the Snapshot copies you want to delete are in use, or not created by SnapDrive for UNIX. You can override this behavior by including the `-force` option with the `snapdrive snap delete` command.
- If you have a Snapshot copy that spans multiple storage system volumes, you must manually delete the Snapshot copy on each volume.

Information required for using the snapdrive snap delete command

To delete a Snapshot copy, specify the name of the Snapshot copy to be deleted. Using the `snapdrive snap delete` command you can view the list of Snapshot copies that are deleted.

The following table gives the information about the `snapdrive snap delete` command.

Requirement/Option	**Argument**
Specify the name for the Snapshot copy. Use the long form of the Snapshot copy name where you enter the storage system name, volume, and Snapshot copy name. The following is an example of a long Snapshot copy name: `big_filer:/vol/account_vol:snap_20031115` If you want to specify additional Snapshot copies, you can use the short form of the name if they are on the same storage system and volume as the first Snapshot copy. Otherwise, use the long form of the name again.	
Snapshot copy name (`-snapname`)	*long_Snapshot copy_name*
Additional Snapshot copies	*Snapshot copy_name* (either long or short form)
`-verbose`	~
To display a list of the Snapshot copies that is deleted, include the -verbose option. This option fills in the missing storage system and volume information in case where you used the short form of the Snapshot copy name.	
`-force`	~
`-noprompt`	~
Optional: Decide if you want to overwrite an existing Snapshot copy. Without this option, this operation halts if you supply the name of an existing Snapshot copy. When you supply this option and specify the name of an existing Snapshot copy, it prompts you to confirm that you want to overwrite the Snapshot copy. To prevent SnapDrive for UNIX from displaying the prompt, include the `-noprompt` option also. (You must always include the `-force` option if you want to use the `-noprompt` option.)	

Deleting a Snapshot copy

You can use the `snapdrive snap delete` command to delete a Snapshot copy.

Procedure

Enter the following command: `snapdrive snap delete [-snapname]` *long_snap_name* [*snap_name*...] [-verbose] [-force [-noprompt]]

Note: If the Snapshot copy you specify is in use, this operation fails. SnapDrive for UNIX reports that this operation has completed successfully only, if all the Snapshot copies are removed.

Results

SnapDrive for UNIX deletes the existing contents of the LUNs you specify in the `snap delete` command line and replaces them with the contents of the LUNs in the Snapshot copy you specify.

Example

This example displays a list of what is being deleted:

```
# snapdrive snap delete -v filer1:/vol/vol1/snap1 snap2 snap3
snapdrive: deleting
filer1:/vol/vol1/snap1
filer1:/vol/vol1/snap2
filer1:/vol/vol1/snap3
```

Disconnecting a Snapshot copy

You can disconnect a Snapshot copy from a LUN, a file system on a LUN, disk groups, NFS directories, or shared disk groups, host volumes, and file systems on a LUN.

Note: You can disconnect the split clone volumes from SnapDrive for UNIX 4.2 and later versions.

Using the Snapshot disconnect operation

Use the `snapdrive snap disconnect` command to disconnect a Snapshot copy that is across multiple storage systems or storage system volumes.

You use the `snapdrive snap disconnect` command to remove the mappings for LUNs, or for storage entities and the underlying LUNs, or for NFS directories in the Snapshot copy.

You can use this command to disconnect Snapshot copies that span multiple storage system volumes or multiple storage systems. The storage entities and volumes can reside on the same storage system or different storage systems.

Use this command to disconnect any of the following:

- LUNs
- A file system created directly on a LUN
- Disk groups, host volumes, and file systems created on LUNs
- NFS directory trees
- Shared disk groups, host volumes, and file systems created on LUNs

The disconnect operation does not modify the connected Snapshot copy. However, by default, the operation does delete any temporary LUNs or clones created by the corresponding connect operation.

Note: For LUNs, file systems on LUNs, and LVM entities, this command is equivalent to `snapdrive storage delete`.

Guidelines for disconnecting Snapshot copies

The following are the guidelines to disconnect a Snapshot copy for LUNs, storage entities, or NFS directories.

- When you disconnect a file system, SnapDrive for UNIX always removes the mountpoint.
- Linux hosts allow you to attach multiple file systems to a single mountpoint. However, SnapDrive for UNIX requires a unique mountpoint for each file system. The `snapdrive snap disconnect` command fails if you use it to disconnect file systems that are attached to a single mountpoint.

- To undo the effects of the Snapshot connect operation, use the Snapshot disconnect command.
- If you set the *enable-split-clone* configuration variable value to `on` or `sync` during the Snapshot connect operation and `off` during the Snapshot disconnect operation, SnapDrive for UNIX does not delete the original volume or LUN that is present in the Snapshot copy.

Guidelines for disconnecting Snapshot copies for NFS entities

The disconnect operation for a Snapshot copy can be executed from any node in a host cluster environment. Use command options to disconnect a storage entity from a specific node.

Follow these guidelines when disconnecting Snapshot copies that contain NFS entities:

- If you disconnect an NFS directory tree that you connected with read-only permission, SnapDrive for UNIX performs the following actions:
  - Unmounts the file system.
  - Removes the mount entry in the file system table file.
  - Removes the mountpoint.
  - Does not remove the export rules of the Snapshot copy directory, which was created while connecting NFS filespec from the secondary host (the host that does not have export permission on the parent volume).
- If you disconnect an NFS directory tree that you connected with read-write permission, SnapDrive for UNIX performs the following actions:
  - Unmounts the file system.
  - Removes the mount entry in the file system table file.
  - Deletes the NFS directory tree that corresponds to the file system in the FlexVol volume clone.
  - Destroys the underlying FlexVol volume clone (if it is empty).
  - Removes the mountpoint.

Information required for using the snapdrive snap disconnect command

To disconnect a Snapshot copy, specify the type of storage entity to be used, such as, LUN, disk groups, file systems, or host volume.

The following table gives the information you need to supply when you use the `snapdrive snap disconnect` command.

Requirement/Option	Argument
LUN (-lun *file_spec*)	*name of the LUN. Include the name of the filer, volume and LUN.*
Disk group (-dg *file_spec*) or volume group (-vg *file_spec*)	*name of the disk or volume group*
File system (-fs *file_spec*)	*filesystem_name*
Host volume (-hostvol *file_spec*) or logical volume (-lvol *file_spec*)	*name of the host or logical volume*
Specify the type of storage entity that you want to use to disconnect the Snapshot copy and supply that entity's name with the appropriate argument. This is the value for the *file_spec* argument.	

Requirement/Option	Argument
`-full`	~
Include the -full option on the command line if you want SnapDrive for UNIX to disconnect the objects from the Snapshot copy even if a host-side entity on the command line has other entities (such as a disk group that has one or more host volumes). If you do not include this option, you must specify only empty host-side entities.	
`-fstype`	*type*
`-vmtype`	*type*
Optional: Specify the type of file system and volume manager to be used.	
`-split`	~
Enables to split the cloned volumes or LUNs during Snapshot connect and Snapshot disconnect operations.	

Disconnecting Snapshot copy with LUNs and no storage entities

You can use the `snapdrive snap disconnect` command to disconnect a Snapshot copy that contains LUNs having no storage entities.

Procedure

Enter the following command syntax:

`snapdrive snap disconnect -lun` *long_lun_name* [*lun_name*...]

Results

SnapDrive for UNIX removes the mappings for the storage entities specified in the command line.

Example

The following command removes the mappings to luna and lunb on the storage system toaster:

```
# snapdrive snap disconnect -lun toaster:/vol/vol1/luna lunb
```

Disconnecting Snapshot copy with storage entities

You can use the `snapdrive snap disconnect` command to disconnect a Snapshot copy that contains storage entities.

Procedure

Enter the following command: `snapdrive snap disconnect {-dg | -fs | -hostvol}` *file_spec* [*file_spec*...]{-dg | -fs | -hostvol} *file_spec* [*file_spec*...]] [-full] [-fstype type] [-vmtype type] [-split]
This command must always start with the storage entity, for example, `-lun`, `-dg`, `-hostvol`, or `-fs`.

- If you specify a LUN (`-lun`), you must enter the long LUN name. You cannot specify a LUN with the `-lun` option on the same command line as other storage entities (`-vg`, `-dg`, `-fs`, `-lvol`, or `-hostvol` options).

- If you specify an RDM LUN (`-lun`), you must enter the long RDM LUN name. You cannot specify an RDM LUN with the `-lun` option on the same command line as other storage entities (`-vg, -dg, -fs, -lvol,` or `-hostvol` options).
- If you specify an NFS mountpoint, you cannot specify non-NFS entities (`-vg`, `-dg`, `-fs`, `-lvol`, or `-hostvol`) on the same command line. You must use a separate command to specify the NFS mountpoint.

Note: An error message occurs if the host entity is using LUNs that are not part of the Snapshot copy. An error also occurs if you specify a subset of the host volumes and/or file systems contained in each target disk group.

Results

SnapDrive for UNIX removes the mappings for the storage entities specified in the command line.

Example

This command line removes the mappings to all the LUNs underlying the host volume dg5/myvolume. It removes any temporary LUNs that gets created with a Snapshot connect operation:

```
# snapdrive snap disconnect -hostvol dg5/myvolume
```

This command line removes the mappings to all the LUNs underlying the host volume dg5/myvolume. It removes any temporary LUNs that gets created with a Snapshot connect operation:

```
# snapdrive snap disconnect -hostvol dg5/myvolume
```

This command disconnects the mapping to disk group 1 (dg1) and to the underlying LUN. It also removes any temporary LUNs that gets created with the Snapshot connect operation:

```
# snapdrive snap disconnect -lun toaster:/vol/vol1/luna -dg dg1
```

This command line removes the mapping to the file system fs1, and to the RDM LUN that underlies it. It also removes any temporary RDM LUNs that gets created with the Snapshot connect operation:

```
# snapdrive snap disconnect -fs mnt/RDMNew
```

This command line removes the mapping to the file system fs1, and to the LUN that underlies it. It also removes any temporary LUNs that gets created with the Snapshot connect operation:

```
# snapdrive snap disconnect -fs mnt/fs1
```

This command line removes the mappings for disk groups dg1, dg2, and dg3. It removes any temporary LUNs that gets created with the Snapshot connect operation:

```
# snapdrive snap disconnect -dg dg1 dg2 dg3
```

This example disconnects a Snapshot copy with file system, disk group on LVM stack:

```
# snapdrive snap disconnect -fs /mnt/fs1_clone -fstype ext3
delete file system /mnt/fs1_clone
- fs /mnt/fs1_clone ... deleted
- hostvol lvm1_0/fs1_SdHv_0 ... deleted
- dg lvm1_0 ... deleted
- LUN snoopy:/vol/vol1/lunLvm1_0 ... deleted
```

This example disconnects a Snapshot copy with file system:

```
# snapdrive snap disconnect -fs /mnt/fs1
delete file system /mnt/fs1
- fs /mnt/fs1 ... deleted
- LUN lech:/vol/vol1/lun1_0 ... deleted
```

Disconnecting Snapshot copies with shared storage entities

You can use the `snapdrive snap disconnect` command to disconnect a Snapshot copy that contains shared storage entities.

Procedure

Enter the following command syntax: `snapdrive snap disconnect {-dg | -fs}` *file_spec* [*file_spec* ...] {-dg | -fs} *file_spec* [*file_spec* ...]...] *long_snap_name* [-full] [-fstype *type*] [-vmtype *type*] [-split]

Example

This example disconnects shared file system:

```
# snapdrive snap disconnect -fs /mnt/oracle
```

Data collection utility

SnapDrive Data collection utility is a troubleshooting tool that gathers information to diagnose the problems.

SnapDrive for UNIX provides a data collection utility (snapdrive.dc) that collects diagnostic information about SnapDrive for UNIX and your system setup.

About the data collection utility

SnapDrive for UNIX provides a data collection utility (`snapdrive.dc`) that collects diagnostic information about SnapDrive for UNIX and your system setup.

It does this by running diagnostic utilities and copying SnapDrive for UNIX log files to a special directory. Then it creates a compressed file containing this information that you can send to technical support for analysis.

In SnapDrive 5.0 for UNIX, the `-dump` and `-dumpall` options are implemented. The `-dump` option collects the first log of the SnapDrive command, and the `-dumpall` option collects all the logs of the SnapDrive command. When you perform the SnapDrive operations using the `-dump` or `-dumpall` option, `snapdrive.dc` is generated and lists the compressed file location. The tar file collects all the log information of the SnapDrive commands, you can untar, and retrieve the file from the respective location.

The `-dump` or `-dumpall` option is implemented for SnapDrive commands such as `snapdrive storage show`, `snapdrive storage create`, `snapdrive storage delete`, `snapdrive snap create`, `snapdrive snap connect`, `snapdrive snap disconnect`, `snapdrive snap restore`, `snapdrive clone split estimate`, and `snapdrive clone split start` operations.

Note: It does not copy the file containing login information for the storage systems. It also does not make any configuration changes.

Tasks performed by snapdrive.dc

The data collection utility runs the diagnostic utilities, copies SnapDrive for UNIX log files, and creates a compressed file that is used for analysis.

The `snapdrive.dc` utility performs the following tasks:

- Runs the `host_info` and `filer_info` utilities to collect information about the host and the storage systems connected to the host, and saves this information to a compressed file. The `host_info` utility and `filer_info` utility comes along with SnapDrive for UNIX installation package.

  For example, on Linux, it is the `linux_info` utility.
- Creates a directory called /tmp/ontap/ontap_snapdrive_name. (the directory path name can vary depending on the host; see the *Linux Host Utilities Setup Guide* for more information about this path name). The tool places copies of the following files in the directory:
  - SnapDrive for UNIX version, as indicated by running the snapdrive version command

  - The `snapdrive.conf` file
  - The audit log files
  - The trace log files
  - The recovery log files
  - The files created by the host_info utility
- Creates a compressed file of the directory contents and displays a message stating you send this file to technical support.

Executing the data collection utility

You need to complete few steps to run the data collection utility.

Before you begin

Ensure that you are logged in as a root user.

Procedure

1. Change to the SnapDrive for UNIX diagnostic directory. The path is: `install_directory/diag` `install_directory` is the SnapDrive for UNIX installation directory for your host operating system. This directory can vary depending on your host operating system.
2. At the command prompt, enter the following command:

   `snapdrive.dc [-d directory] [-n file_name] [-f]`

   `-d directory` specifies the location for the compressed file that this utility creates. The default location is `/tmp/ontap`.

   `-n file_name` specifies a string to be included in the name for the directory and compressed output file. If you supply a value for this argument, the `snapdrive.dc` utility creates a directory called `ontap_snapdrive_name` and a file name called `ontap_snapdrive_name.tar.Z`. The default path name is `/tmp/ontap_snapdrive_info.tar.Z.`
3. Send the `directory/ontap_snapdrive_name.tar.Z` file to technical support for analysis.

Examples of using snapdrive.dc

This is an example of the data collection command.

This example uses the command-line options to specify a directory and a name for the resulting file.

```
# snapdrive.dc -d . -n mysystem
...
     Compressed file is ./ontap_snapdrive_mysystem.tar.Z.
     Please send this file to technical support for analysis.
```

Troubleshooting

There is a troubleshooting tool available with SnapDrive for UNIX. This tool is used to gather information in addition to solving problems.

At the time of this release, there were some known issues and limitations for SnapDrive for UNIX. While some issues affect all SnapDrive for UNIX host platforms, others affect only a specific host platform. To locate information about known issues and troubleshooting tips, see the *SnapDrive for UNIX Release Notes.*

Understanding error messages

SnapDrive for UNIX provides information about error messages, which appear at different locations and in various formats.

Error message locations

SnapDrive for UNIX provides information about error messages as command output and in various log files.

SnapDrive for UNIX provides information about error messages in the following places:

- The command output

  It displays all messages to the standard error output of the SnapDrive for UNIX command.
- The system log

  SnapDrive for UNIX logs all errors that have a severity level of Fatal and Admin error to the system log using the syslog(3) mechanism.
- The audit log file

  The audit log records the following information for each SnapDrive for UNIX command:
  - Who issued it
  - When it was issued
  - What its exit status was.

    This is very useful in determining what actually happened on a system.
- The trace log file

  The trace log records more detailed information about any errors that occur. Technical support uses this log when diagnosing problems.

Error message format

The format of the error message helps you determine the cause of the error.

SnapDrive for UNIX returns the standard error code information, which provides a more specific description of what caused the initial error condition. SnapDrive for UNIX error messages conform to the following format: `return code message-ID error type: message text`

- *return code* — SnapDrive for UNIX error message ID that is linked to an exit status value which indicates the basic cause of the error condition.

- *message-ID* — A unique identifier used by technical support to locate the specific code that produced the error. If you need to call p technical support, It is recommended that you record the message ID that accompanied the error message.
- *error type* — Specifies the type of error that SnapDrive for UNIX encountered. Return values include the following:
  - *Warning* — SnapDrive for UNIX executed the command but issued a warning about conditions that might require your attention.
  - *Command* — SnapDrive for UNIX failed to execute the command due to an error in the command line. Check the command line format and variables to ensure they are correct.
  - *Admin* — SnapDrive for UNIX failed to execute the command due to incompatibilities in the system configuration. Contact your System Administrator to review your configuration parameters.
  - *Fatal* — SnapDrive for UNIX failed to execute the command due to an unexpected condition. Fatal errors are rare. If a fatal error occurs and you have problems resolving it, contact technical support for assistance.
- *message text*—Information that explains the error. This text might include information from another component to provide more detail about the error. For example, if a command-line argument such as a disk group is missing, the error message tells you what is missing. Or the Manage ONTAP APIs that SnapDrive for UNIX uses to control the storage system might supply additional text to help explain the error. In this case, the text follows the basic SnapDrive for UNIX error message.

Sample error message

This is an error message in SnapDrive for UNIX.

The following message indicates a problem at the command prompt. The message-ID is 0001-377.

```
Return Code: 43

0001-377 Command error: Disk group name dg2 is already in use or
conflicts with another entity.
```

Common error messages

SnapDrive for UNIX has some common error messages. View the list of the common error messages.

Operating system limits on open files

SnapDrive for UNIX checks for the number of files opened simultaneously. If it crosses the limit, SnapDrive for UNIX throws an error.

SnapDrive for UNIX checks for operating system limitations on the number of files opened by a process.

Note: The default limit for the number of file handles opened simultaneously by one process varies based on your operating system. Check your operating system documentation to determine the limit.

If the number of open LUNs for one operation exceeds the operating system limit on the number of file handles opened simultaneously by one process, SnapDrive for UNIX exits with the following error message: `0001-001 Admin error: Unable to open device path-to-device`

Error message values

SnapDrive for UNIX throws error messages, which are common. View the table for detailed information.

The following table gives you detailed information about the most common errors that you can encounter when using SnapDrive for UNIX.

Error code	Return code	Type	Description	Solution
0000-001	NA	Admin	`Datapath has been configured for the storage system <STORAGE-SYSTEM-NAME>. Please delete it using snapdrive config delete -mgmtpath command and retry.`	Before deleting the storage system, ensure you delete the management path configured for the storage system using `snapdrive config delete -mgmtpath` command.
0001-242	NA	Admin	`Unable to connect using https to storage system: 10.72.197.213. Ensure that 10.72.197.213 is a valid storage system name/address, and if the storage system that you configure is running on a Data ONTAP operating in 7-Mode, add the host to the trusted hosts (options trusted.hosts) and enable SSL on the storage system 10.72.197.213 or modify the snapdrive.conf to use http for communication and restart the snapdrive daemon. If the storage system that you configure is running on a Data ONTAP operating in Cluster-Mode, ensure that the Vserver name is mapped to IP address of the Vserver's management LIF.`	Execute to check the following conditions: • Ensure that the storage system you are connected is a valid storage system. • If the storage system that you are trying to configure is running on a Data ONTAP operating in 7-Mode, add the same to the trusted hosts, and enable SSL on the storage system or modify the `snapdrive.conf` file to use http for communication, and then restart the snapdrive daemon. • If the storage system that you are trying to configure is running on a Data ONTAP operating in Cluster-Mode, ensure that the Vserver name is mapped to the IP address of the Vserver’s management logical interface (LIF).
0003- 004	NA	Admin	`Failed to deport LUN <LUN-NAME> on storage system <STORAGE-SYSTEM-NAME> from the Guest OS. Reason: No mapping device information populated from CoreOS`	This happens when you execute `snapdrive snap disconnect` operation in the guest operating system. Check if there is any RDM LUN mapping in the ESX server or stale RDM entry in the ESX server. Delete the RDM mapping manually in the ESX server as well as in the guest operating system.

Error code	Return code	Type	Description	Solution
0001- 019	3	Command	`invalid command line -- duplicate filespecs: <dg1/vol2 and dg1/vol2>`	This happens when the command executed has multiple host entities on the same host volume. For example, the command explicitly specified the host volume and the file system on the same host volume. What to do: Complete the following steps: 1. Remove all the duplicate instances of the host entities. 2. Execute the command again.
0001-023	11	Admin	`Unable to discover all LUNs in Disk Group dg1.Devices not responding: dg1 Please check the LUN status on the storage system and bring the LUN online if necessary or add the host to the trusted hosts (options trusted.hosts) and enable SSL on the storage system or retry after changing snapdrive.conf to use (http/https) for storage system communication and restarting snapdrive daemon.`	This happens when a SCSI inquiry on the device fails. A SCSI inquiry on the device can fail for multiple reasons. What to do: Execute the following steps in the same order if the preceding step does not solve the issue: 1. Set the device-retries configuration variable to a higher value. For example, set it to "10" (the default value is "3") and execute the command again. 2. Use `snapdrive storage show` command with the `-all` option to get information about the device. 3. Check if the FC or iSCSI service is up and running on the storage system. If not, contact the storage administrator to bring the storage system online. 4. Check if the FC or iSCSI service is up on the host. If the preceding solutions do not solve the issue, contact technical support to identify the issue in your environment.
0001-395	NA	Admin	`No HBAs on this host!`	This occurs If you have a large number of LUNs connected to your host system. Check if the variable *enable-fcp-cache* is set to `on` in the `snapdrive.conf` file.
0001-389	NA	Admin	`Cannot get HBA type for HBA assistant linuxfcp`	This occurs if you have a large number of LUNs connected to your host system. Check if the variable *enable-fcp-cache* is set to `on` in the `snapdrive.conf` file.

Error code	Return code	Type	Description	Solution
`0001-389`	NA	Admin	`Cannot get HBA type for HBA assistant vmwarefcp`	The following conditions to be checked: • Before you create a storage, ensure if you have configured the virtual interface using the command: `snapdrive config set` *-viadmin <user> <virtual_interface_IP or name>* • Check if the storage system exists for a virtual interface and still you encounter the same error message, then restart SnapDrive for UNIX for the storage create operation to be successful. • Check if you meet the configuration requirements of Virtual Storage Console, as documented in the *IBM® System Storage N series Virtual Storage Console® for VMware® vSphere™ Installation and Administration Guide.*
`0001-682`	NA	Admin	`Host preparation for new LUNs failed: This functionality checkControllers is not supported.`	Execute the command again for the SnapDrive operation to be successful.
`0001-859`	NA	Admin	`None of the host's interfaces have NFS permissions to access directory <directory name> on storage system <storage system name>`	In the `snapdrive.conf` file, ensure that the *check-export-permission-nfs-clone* configuration variable is set to `off`.
`0002-253`		Admin	`Flex clone creation failed`	It is a storage system side error. Please collect the sd-trace.log and storage system logs to troubleshoot it.
`0002-264`		Admin	`FlexClone is not supported on filer <filer name>`	FlexClone is not supported with the current Data ONTAP version of the storage system. Upgrade storage system's Data ONTAP version to 7.1 or later and then retry the command.
`0002-265`		Admin	`Unable to check flex_clone license on filer <filername>`	It is a storage system side error. Collect the sd-trace.log and storage system logs to troubleshoot it.
`0002-266`	NA	Admin	`FlexClone is not licensed on filer <filername>`	FlexClone is not licensed on the storage system. Retry the command after adding FlexClone license on the storage system.
`0002-267`	NA	Admin	`FlexClone is not supported on root volume <volume-name>`	FlexClones cannot be created for root volumes.
`0002-270`	NA	Admin	`The free space on the aggregate <aggregate-name> is less than <size> MB(megabytes) required for diskgroup/flexclone metadata`	1. For connecting to raw LUNs using FlexClones, 2 MB free space on the aggregate is required. 2. Free some space on the aggregate as per steps 1 and 2, and then retry the command.

Error code	Return code	Type	Description	Solution
0002-332	NA	Admin	`SD.SnapShot.Restore access denied on qtree storage_array1:/vol/vol1/qtree1 for user lnx197-142\john`	Contact Operations Manager administrator to grant the required capability to the user.
0002-364	NA	Admin	`Unable to contact DFM: lnx197-146, please change user name and/or password.`	Verify and correct the user name and password of sd-admin user.
0002-268	NA	Admin	`<volume-Name> is not a flexible volume`	FlexClones cannot be created for traditional volumes.
0003-003		Admin	`1. Failed to export LUN <LUN_NAME> on storage system <STORAGE_NAME> to the Guest OS.` or	• Check if there is any RDM LUN mapping in the ESX server (or) stale RDM entry in the ESX server. • Delete the RDM mapping manually in the ESX server as well as in the guest operating system.
0003-012		Admin	`Virtual Interface Server win2k3-225-238 is not reachable.`	NIS is not configured on for the host/guest OS. You must provide the name and IP mapping in the file located at `/etc/hosts` For example: `# cat /etc/hosts 10.72.225.238 win2k3-225-238.eng.org.com win2k3-225-238`
0001-552	NA	Command	`Not a valid Volume-clone or LUN-clone`	Clone-split cannot be created for traditional volumes.
0001-553	NA	Command	`Unable to split "FS-Name" due to insufficient storage space in <Filer- Name>`	Clone-split continues the splitting process and suddenly, the clone split stops due to insufficient storage space not available in the storage system.
0003-002		Command	`No more LUN's can be exported to the guest OS.`	As the number of devices supported by the ESX server for a controller has reached the maximum limit, you must add more controllers for the guest operating system. **Note:** The ESX server limits the maximum controller per guest operating system to 4.
9000- 023	1	Command	`No arguments for keyword -lun`	This error occurs when the command with the `-lun` keyword does not have the *lun_name* argument. What to do: Do either of the following; 1. Specify the *lun_name* argument for the command with the `-lun` keyword. 2. Check the SnapDrive for UNIX help message

Error code	Return code	Type	Description	Solution
0001-028	1	Command	File system </mnt/qa/dg4/vol1> is of a type (hfs) not managed by snapdrive. Please resubmit your request, leaving out the file system <mnt/qa/dg4/vol1>	This error occurs when a non-supported file system type is part of a command. What to do: Exclude or update the file system type and then use the command again. For the latest software compatibility information, see the interoperability matrix at: www.ibm.com/systems/storage/network/interophome.html.
9000-030	1	Command	-lun may not be combined with other keywords	This error occurs when you combine the -lun keyword with the -fs or -dg keyword. This is a syntax error and indicates invalid usage of command. What to do: Execute the command again only with the -lun keyword.
0001-034	1	Command	mount failed: mount: <device name> is not a valid block device"	This error occurs only when the cloned LUN is already connected to the same filespec present in Snapshot copy and then you try to execute the snapdrive snap restore command. The command fails because the iSCSI daemon remaps the device entry for the restored LUN when you delete the cloned LUN. What to do: Do either of the following: 1. Execute the snapdrive snap restore command again. 2. Delete the connected LUN (if it is mounted on the same filespec as in Snapshot copy) before trying to restore a Snapshot copy of an original LUN.
0001-046 and 0001-047	1	Command	Invalid snapshot name: </vol/vol1/NO_FILER_PRE FIX> or Invalid snapshot name: NO_LONG_FILERNAME - filer volume name is missing	This is a syntax error which indicates invalid use of command, where a Snapshot operation is attempted with an invalid Snapshot name. What to do: Complete the following steps: 1. Use the snapdrive snap list -filer <filer-volume-name> command to get a list of Snapshot copies. 2. Execute the command with the long_snap_name argument.

Error code	Return code	Type	Description	Solution
9000-047	1	Command	More than one -snapname argument given	SnapDrive for UNIX cannot accept more than one Snapshot name in the command line for performing any Snapshot operations. What to do: Execute the command again, with only one Snapshot name.
9000-049	1	Command	-dg and -vg may not be combined	This error occurs when you combine the -dg and -vg keywords. This is a syntax error and indicates invalid usage of commands. What to do: Execute the command either with the -dg or -vg keyword.
9000-050	1	Command	-lvol and -hostvol may not be combined	This error occurs when you combine the -lvol and -hostvol keywords. This is a syntax error and indicates invalid usage of commands. What to do: Complete the following steps: 1. Change the -lvol option to - hostvol option or vice-versa in the command line. 2. Execute the command.
9000-057	1	Command	Missing required -snapname argument	This is a syntax error that indicates an invalid usage of command, where a Snapshot operation is attempted without providing the snap_name argument. What to do: Execute the command with an appropriate Snapshot name.
0001-067	6	Command	Snapshot hourly.0 was not created by snapdrive.	These are the automatic hourly Snapshot copies created by Data ONTAP.
0001-092	6	Command	snapshot <non_existent_24965> doesn't exist on a filervol exocet: </vol/vol1>	The specified Snapshot copy was not found on the storage system. What to do: Use the snapdrive snap list command to find the Snapshot copies that exist in the storage system.

Error code	Return code	Type	Description	Solution
0001- 099	10	Admin	`Invalid snapshot name: <exocet:/vol2/dbvol:New SnapName> doesn't match filer volume name <exocet:/vol/vol1>`	This is a syntax error that indicates invalid use of commands, where a Snapshot operation is attempted with an invalid Snapshot name. What to do: Complete the following steps: 1. Use the `snapdrive snap list -filer` *<filer-volume-name>* command to get a list of Snapshot copies. 2. Execute the command with the correct format of the Snapshot name that is qualified by SnapDrive for UNIX. The qualified formats are: *long_snap_name* and *short_snap_name*.
0001-122	6	Admin	`Failed to get snapshot list on filer <exocet>: The specified volume does not exist.`	This error occurs when the specified storage system (filer) volume does not exist. What to do: Complete the following steps: 1. Contact the storage administrator to get the list of valid storage system volumes. 2. Execute the command with a valid storage system volume name.
0001-124	111	Admin	`Failed to removesnapshot <snap_delete_multi_inuse_24374> on filer <exocet>: LUN clone`	The `Snapshot delete` operation failed for the specified Snapshot copy because the LUN clone was present. What to do: Complete the following steps: 1. Use the snapdrive storage show command with the `-all` option to find the LUN clone for the Snapshot copy (part of the backing Snapshot copy output). 2. Contact the storage administrator to split the LUN from the clone. 3. Execute the command again.
0001-155	4	Command	`Snapshot <dup_snapname23980> already exists on <exocet: /vol/vol1>. Please use -f (force) flag to overwrite existing snapshot`	This error occurs if the Snapshot copy name used in the command already exists. What to do: Do either of the following: 1. Execute the command again with a different Snapshot name. 2. Execute the command again with the `-f` (force) flag to overwrite the existing Snapshot copy.

Error code	Return code	Type	Description	Solution
0001-158	84	Command	diskgroup configuration has changed since <snapshotexocet:/vol/vo l1:overwrite_noforce_25 078> was taken. removed hostvol </dev/dg3/vol4> Please use '-f' (force) flag to override warning and complete restore	The disk group can contain multiple LUNs and when the disk group configuration changes, you encounter this error. For example, when creating a Snapshot copy, the disk group consisted of X number of LUNs and after making the copy, the disk group can have X+Y number of LUNs. What to do: Use the command again with the -f (force) flag.
0001-185	NA	Command	storage show failed: no ONTAP devices to show or enable SSL on the filers or retry after changing snapdrive.conf to use http for filer communication.	This problem can occur for the following reasons: If the iSCSI daemon or the FC service on the host has stopped or is malfunction, the snapdrive storage show -all command fails, even if there are configured LUNs on the host. What to do: See the *Linux Host Utilities Setup Guide* to resolve the malfunctioning iSCSI or FC service. The storage system on which the LUNs are configured is down or is undergoing a reboot. What to do: Wait until the LUNs are up. The value set for the *usehttps- to-filer* configuration variable might not be a supported configuration. What to do: Complete the following steps: 1. Use the sanlun lun show all command to check if there are any LUNs mapped to the host. 2. If there are any LUNs mapped to the host, follow the instructions mentioned in the error message. Change the value of the *usehttps- to-filer* configuration variable (to "on" if the value is "off"; to "off' if the value is "on").
0001-226	3	Command	'snap create' requires all filespecs to be accessible Please verify the following inaccessible filespec(s): File System: </mnt/qa/dg1/vol3>	This error occurs when the specified host entity does not exist. What to do: Use the snapdrive storage show command again with the -all option to find the host entities which exist on the host.

Error code	Return code	Type	Description	Solution
0001- 242	18	Admin	`Unable to connect to filer: <filername>`	SnapDrive for UNIX attempts to connect to a storage system through the secure HTTP protocol. The error can occur when the host is unable to connect to the storage system. What to do: Complete the following steps: 1. Network problems: a. Use the nslookup command to check the DNS name resolution for the storage system that works through the host. b. Add the storage system to the DNS server if it does not exist. You can also use an IP address instead of a host name to connect to the storage system. 2. Storage system Configuration: a. For SnapDrive for UNIX to work, you must have the license key for the secure HTTP access. b. After the license key is set up, check if you can access the storage system through a Web browser. 3. Execute the command after performing either Step 1 or Step 2 or both.
0001- 243	10	Command	`Invalid dg name: <SDU_dg1>`	This error occurs when the disk group is not present in the host and subsequently the command fails. For example, *SDU_dg1* is not present in the host. What to do: Complete the following steps: 1. Use the `snapdrive storage show` -all command to get all the disk group names. 2. Execute the command again, with the correct disk group name.
0001- 246	10	Command	`Invalid hostvolume name: </mnt/qa/dg2/BADFS>, the valid format is <vgname/hostvolname>, i.e. <mygroup/vol2>`	What to do: Execute the command again, with the following appropriate format for the host volume name: `vgname/hostvolname`

Error code	Return code	Type	Description	Solution
0001- 360	34	Admin	Failed to create LUN </vol/badvol1/nanehp13_ unnewDg_fve_SdLun> on filer <exocet>: No such volume	This error occurs when the specified path includes a storage system volume which does not exist. What to do: Contact your storage administrator to get the list of storage system volumes which are available for use.
0001- 372	58	Command	Bad lun name:: </vol/vol1/sce_lun2a> - format not recognized	This error occurs if the LUN names that are specified in the command do not adhere to the pre-defined format that SnapDrive for UNIX supports. SnapDrive for UNIX requires LUN names to be specified in the following pre-defined format: <filer-name: /vol/<volname>/<lun-name> What to do: Complete the following steps: 1. Use the snapdrive help command to know the pre-defined format for LUN names that SnapDrive for UNIX supports. 2. Execute the command again.
0001- 373	6	Command	The following required 1 LUN(s) not found: exocet:</vol/vol1/ NotARealLun>	This error occurs when the specified LUN is not found on the storage system. What to do: Do either of the following: 1. To see the LUNs connected to the host, use the snapdrive storage show -dev command or snapdrive storage show -all command. 2. To see the entire list of LUNs on the storage system, contact the storage administrator to get the output of the lun show command from the storage system.
0001- 377	43	Command	Disk group name <name> is already in use or conflicts with another entity.	This error occurs when the disk group name is already in use or conflicts with another entity. What to do: Do either of the following: Execute the command with the -autorename option Use the snapdrive storage show command with the -all option to find the names that the host is using. Execute the command specifying another name that the host is not using.

Error code	Return code	Type	Description	Solution
0001- 380	43	Command	Host volume name <dg3/vol1> is already in use or conflicts with another entity.	This error occurs when the host volume name is already in use or conflicts with another entity What to do: Do either of the following: 1. Execute the command with the -autorename option. 2. Use the snapdrive storage show command with the -all option to find the names that the host is using. Execute the command specifying another name that the host is not using.
0001- 417	51	Command	The following names are already in use: <mydg1>. Please specify other names.	What to do: Do either of the following: 1. Execute the command again with the -autorename option. 2. Use snapdrive storage show - all command to find the names that exists on the host. Execute the command again to explicitly specify another name that the host is not using.
0001- 430	51	Command	You cannot specify both -dg/vg dg and - lvol/hostvol dg/vol	This is a syntax error which indicates an invalid usage of commands. The command line can accept either -dg/vg keyword or the -lvol/hostvol keyword, but not both. What to do: Execute the command with only the -dg/vg or - lvol/hostvol keyword.
0001- 434	6	Command	snapshot exocet:/vol/vol1:NOT_EIST doesn't exist on a storage volume exocet:/vol/vol1	This error occurs when the specified Snapshot copy is not found on the storage system. What to do: Use the snapdrive snap list command to find the Snapshot copies that exist in the storage system.
0001- 435	3	Command	You must specify all host volumes and/or all file systems on the command line or give the -autoexpand option. The following names were missing on the command line but were found in snapshot <snap2_5VG_SINGLELUN_REMOTE>: Host Volumes: <dg3/vol2> File Systems: </mnt/qa/dg3/vol2>	The specified disk group has multiple host volumes or file system, but the complete set is not mentioned in the command. What to do: Do either of the following: 1. Re-issue the command with the -autoexpand option. 2. Use the snapdrive snap show command to find the entire list of host volumes and file systems. Execute the command specifying all the host volumes or file systems.

Error code	Return code	Type	Description	Solution
0001- 440	6	Command	`snapshot snap2_5VG_SINGLELUN_ REMOTE does not contain disk group 'dgBAD'`	This error occurs when the specified disk group is not part of the specified Snapshot copy. What to do: To find if there is any Snapshot copy for the specified disk group, do either of the following: 1. Use the `snapdrive snap list` command to find the Snapshot copies in the storage system. 2. Use the `snapdrive snap show` command to find the disk groups, host volumes, file systems, or LUNs that are present in the Snapshot copy. 3. If a Snapshot copy exists for the disk group, execute the command with the Snapshot name.
0001- 442	1	Command	`More than one destination - <dis> and <dis1> specified for a single snap connect source <src>. Please retry using separate commands.`	What to do: Execute a separate `snapdrive snap connect` command, so that the new destination disk group name (which is part of the `snap connect` command) is not the same as what is already part of the other disk group units of the same `snapdrive snap connect` command.
0001- 465	1	Command	`The following filespecs do not exist and cannot be deleted: Disk Group: <nanehp13_ dg1>`	The specified disk group does not exist on the host, therefore the deletion operation for the specified disk group failed. What to do: See the list of entities on the host by using the `snapdrive storage show` command with the `-all` option.

Error code	Return code	Type	Description	Solution
`0001- 476`	NA	Admin	`Unable to discover the device associated with <long lun name> If multipathing in use, there may be a possible multipathing configuration error. Please verify the configuration and then retry.`	There can be many reasons for this failure. - Invalid host configuration: The iSCSI, FC, or the multipathing solution is not properly setup. - Invalid network or switch configuration: The IP network is not setup with the proper forwarding rules or filters for iSCSI traffic, or the FC switches are not configured with the recommended zoning configuration. The preceding issues are very difficult to diagnose in an algorithmic or sequential manner. What to do: recommended that before you use SnapDrive for UNIX, you follow the steps recommended in the Host Utilities Setup Guide (for the specific operating system) for discovering LUNs manually. After you discover LUNs, use the SnapDrive for UNIX commands.
`0001- 486`	12	Admin	`LUN(s) in use, unable to delete. Please note it is dangerous to remove LUNs that are under Volume Manager control without properly removing them from Volume Manager control first.`	SnapDrive for UNIX cannot delete a LUN that is part of a volume group. What to do: Complete the following steps: 1. Delete the disk group using the command `snapdrive storage delete -dg` *<dgname>*. 2. Delete the LUN.
`0001- 494`	12	Command	`Snapdrive cannot delete <mydg1>, because 1 host volumes still remain on it. Use -full flag to delete all file systems and host volumes associated with <mydg1>`	SnapDrive for UNIX cannot delete a disk group until all the host volumes on the disk group are explicitly requested to be deleted. What to do: Do either of the following: 1. Specify the `-full` flag in the command. 2. Complete the following steps: a. Use the `snapdrive storage show -all` command to get the list of host volumes that are on the disk group. b. Mention each of them explicitly in the SnapDrive for UNIX command.

Error code	Return code	Type	Description	Solution
0001- 541	65	Command	`Insufficient access permission to create a LUN on filer, <exocet>.`	SnapDrive for UNIX uses the `sdhostname.prbac` or `sdgeneric.prbac` file on the root storage system (filer) volume for its pseudo access control mechanism. What to do: Do either of the following: 1. Modify the `sd-hostname.prbac` or `sdgeneric. prbac` file in the storage system to include the following requisite permissions (can be one or many): a. NONE b. SNAP CREATE c. SNAP USE d. SNAP ALL e. STORAGE CREATE DELETE f. STORAGE USE g. STORAGE ALL h. ALL ACCESS **Note:** • If you do not have `sd-hostname.prbac` file, then modify the `sdgeneric.prbac` file in the storage system. • If you have both `sd-hostname.prbac` and `sdgeneric.prbac` file, then modify the settings only in `sdhostname.prbac` file in the storage system.
				2. In the `snapdrive.conf` file, ensure that the *all-access-if-rbacunspecified* configuration variable is set to "on".
0001- 570	6	Command	`Disk group <dg1> does not exist and hence cannot be resized`	This error occurs when the disk group is not present in the host and subsequently the command fails. What to do: Complete the following steps: 1. Use the `snapdrive storage show` -all command to get all the disk group names. 2. Execute the command with the correct disk group name.

Error code	Return code	Type	Description	Solution
0001- 574	1	Command	`<VmAssistant> lvm does not support resizing LUNs in disk groups`	This error occurs when the volume manager that is used to perform this task does not support LUN resizing. SnapDrive for UNIX depends on the volume manager solution to support the LUN resizing, if the LUN is part of a disk group. What to do: Check if the volume manager that you are using supports LUN resizing.
0001- 616	6	Command	`1 snapshot(s) NOT found on filer: exocet:/vol/vol1:MySnapName>`	SnapDrive for UNIX cannot accept more than one Snapshot name in the command line for performing any Snapshot operations. To rectify this error, re-issue the command with one Snapshot name. This is a syntax error which indicates invalid use of command, where a Snapshot operation is attempted with an invalid Snapshot name. To rectify this error, complete the following steps: 1. Use the `snapdrive snap list -filer <filer-volume-name>` command to get a list of Snapshot copies. 2. Execute the command with the **`long_snap_name`** argument.
0001- 640	1	Command	`Root file system / is not managed by snapdrive`	This error occurs when the root file system on the host is not supported by SnapDrive for UNIX. This is an invalid request to SnapDrive for UNIX.
0001- 684	45	Admin	`Mount point <fs_spec> already exists in mount table`	What to do: Do either of the following: 1. Execute the SnapDrive for UNIX command with a different mountpoint. 2. Check that the mountpoint is not in use and then manually (using any editor) delete the entry from the following files: Linux: /etc/fstab

Error code	Return code	Type	Description	Solution
`0001- 796 and 0001- 767`	3	Command	`0001-796 and 0001-767`	SnapDrive for UNIX does not support more than one LUN in the same command with the `-nolvm` option. What to do: Do either of the following: 1. Use the command again to specify only one LUN with the `-nolvm` option. 2. Use the command without the `-nolvm` option. This will use the supported volume manager present in the host, if any.
`0001- 876`	NA	Admin	`HBA assistant not found`	The error might occur during any of the following conditions: a. If the HBA service is not running, you will get this error on executing the SnapDrive for UNIX commands, such as, `snapdrive storage create`, `snapdrive config prepare luns`. Workaround: Check the status of the FC or iSCSI service. If it is not running, start the service and execute the SnapDrive for UNIX command. b. When the 32 bit libnl libraries found missing in 64 bit versions of operating systems. Workaround: 1. Execute the command in the host to check the libraries `ls /usr/lib/libnl*`. 2. Check if the libnl files are missing in this location, and if it is available in `/usr/lib64` location. 3. If the 32-bit libraries are found missing, then install the 32-bit libnl libraries from the operating system distribution media or server. 4. Now, re-install the HBA anywhere software.
`2715`	NA	NA	`Volume restore zephyr not available for the filer <filename>Please proceed with lun restore`	For older ONTAP versions, volume restore zapi is not available. Reissue the command with SFSR.
`2278`	NA	NA	`SnapShots created after <snapname> do not have volume clones ... FAILED`	Split or delete the clones
`2280`	NA	NA	`LUNs mapped and not in active or SnapShot <filespec-name> FAILED`	Un-map/ storage disconnect the host entities

Error code	Return code	Type	Description	Solution
2282	NA	NA	No SnapMirror relationships exist ... FAILED	1. Either Delete the relationships, or 2. If SnapDrive for UNIX RBAC with Operations Manager is configured, ask the Operations Manager administrator to grant SD.Snapshot.DisruptBaseline capability to the user.
2286	NA	NA	LUNs not owned by <fsname> are application consistent in snapshotted volume ... FAILED. Snapshot luns not owned by <fsname> which may be application inconsistent	Verify that the LUNs mentioned in the check results are not in use. Only after that, use the –force option.
2289	NA	NA	No new LUNs created after snapshot <snapname> ... FAILED	Verify that the LUNs mentioned in the check results are not in use. Only after that, use the –force option.
2290	NA	NA	Could not perform inconsistent and newer Luns check. Snapshot version is prior to SDU 4.0	This happens with SnapDrive 3.0 for UNIX Snapshots when used with –vbsr. Manually check that any newer LUNs created will not be used anymore and then proceed with –force option.
2292	NA	NA	No new SnapShots exist... FAILED. SnapShots created will be lost.	Check that snapshots mentioned in the check results will no longer be used. And if so, then proceed with –force option.
2297	NA	NA	Both normal files) and LUN(s) exist ... FAILED	Ensure that the files and LUNs mentioned in the check results will not be used anymore. And if so, then proceed with –force option.
2302	NA	NA	NFS export list does not have foreign hosts ... FAILED	Contact storage administrator to remove the foreign hosts from the export list or ensure that the foreign hosts are not using the volumes through NFS.
9000-305	NA	Command	Could not detect type of the entity /mnt/my_fs. Provide a specific option (-lun, -dg, -fs or -lvol) if you know the type of the entity	Verify the entity if it already exists in the host. If you know the type of the entity provide the file-spec type.
9000-303	NA	Command	Multiple entities with the same name - /mnt/my_fs exist on this host. Provide a specific option (-lun, -dg, -fs or -lvol) for the entity you have specified.	User has multiple entities with the same name. In this case user has to provide the file-spec type explicitly.
9000-304	NA	Command	/mnt/my_fs is detected as keyword of type file system, which is not supported with this command.	Operation on the auto detected file_spec is not supported with this command. Verify with the respective help for the operation.
9000-301	NA	Command	Internal error in auto defection	Auto detection engine error. Provide the trace and daemon log for further analysis.

Error code	Return code	Type	Description	Solution
NA	NA	Command	snapdrive.dc tool unable to compress data on RHEL 5Ux environment	Compression utility is not installed by default. You must install the compression utility ncompress, for example ncompress-4.2.4-47.i386.rpm. To install the compression utility, enter the following command: rpm -ivh ncompress-4.2.4-47.i386.rpm
NA	NA	Command	Invalid filespec	This error occurs when the specified host entity does not exist or inaccessible.
NA	NA	Command	Job Id is not valid	This message is displayed for the clone split status, result, or stop operation if the specified job ID is invalid job or the result of the job is already queried. You must specify a valid or available job ID and retry this operation.
NA	NA	Command	Split is already in progress	This message is displayed when: • Clone split is already in progress for the given volume clone or LUN clone. • Clone split is completed but the job is not removed.
NA	NA	Command	Not a valid Volume-Clone or LUN-Clone	Specified filespec or LUN pathname is not a valid volume clone or LUN clone.
NA	NA	Command	No space to split volume	The error message is due to the required storage space is not available to split the volume. Free enough space in the aggregate to split the volume clone.

If a volume is deleted on the Vserver without unmounting the volume on the host system snapdrive storage show command show the incorrect actual path

If a volume is deleted on the Vserver without unmounting the volume on the host system, and when you execute snapdrive storage show -v command, the actual path is incorrect.

You might also experience the same when the volume is unjunctioned on the Vserver. The following example shows the incorrect actual path.

```
# snapdrive storage show -fs /mnt /file1 -v
NFS device: vs1:/vol_test1 mount point: /mnt
(non-persistent)
Protocol: NFS Actual Path:
vs1:/vol/roovol1/vol_test1
```

Snap management operation fails in RHEL/OEL 5.x due to an issue with umount command

Snap management operation fails in RHEL/OEL 5.x due to an issue with the `umount` command. To overcome this, ensure that the NFS entity is mounted using `-o vers=3` in the command line interface.

Snap restore operation fails when you have nfsv3 and nfsv4 versions enabled in the host and storage system

Snap restore operation fails when there are nfsv3 and nfsv4 versions enabled in the host and storage system.

If you have nfsv3 and nfsv4 versions enabled in the host and storage system, and mount the volume on the host without `-o vers` option, then `nobody:nobody` ownership is set for files and directories.

Workaround

It is recommended to use `-o vers` option while mounting the nfs volume or check the nfs default options to an appropriate value on the host.

Snap disconnect operation fails to delete cloned volume

In some cases, `snapdrive snap disconnect` operation fails to delete cloned volume and the error message `does not look SnapDrive-generated` appears.

About this task

The workaround for the problem is to revert to the original name of the Snapshot copy, and ensure that the *bypass-snapdrive-clone-generated-check* is set to `on` in the `snapdrive.conf` file.

SnapRestore and Snapconnect operations does not work in Linux after multipathing type migration

The SnapRestore and SnapConnect operations does not work if the multipathing type is migrated.

If you have an existing multipathing type set as *None*, and later you tend to change the multipathing type as *NativeMPIO*, when you execute Snapconnect and SnapRestore operations for the existing Snapshot copies, you might encounter an error message as `"Unable to find multipathing software linuxnull as present in the snapshot"`.

Example for SnapRestore operation

```
snapdrive snap restore -fs /mnt/tstmp -snapname withoutmpio
0002-105 Command error: Unable to find multipathing software linuxnull as present
in the snapshot
```

Example for Snapconnect operation

```
snapdrive snap connect -fs /mnt/tstmp -snapname
f3020-225-54:/vol/vol1:withoutmpio -autorename
0002-105 Command error: Unable to find multipathing software
linuxnull as present in the snapshot
```

SnapDrive for UNIX reports an error if iSCSI is not running

SnapDrive for UNIX running on a Linux host returns an error message as “`HBA assistant not found`”.

This happens after one of the following situations occurs:

- An iSCSI stop was issued.
- A takeover has happened and the iSCSI service has not started yet.
- A giveback is happening and the iSCSI service has not started yet.

For SnapDrive for UNIX to execute, the iSCSI service must be running. If the service is halted, SnapDrive for UNIX returns an error message. For example, if you execute the `snapdrive storage show` command when the iSCSI service is not running, you might view the output similar to the following: `# snapdrive storage show -dg toaster1 0001-877 Admin error: HBA assistant not found. Commands involving LUNs should fail.`

Workaround

Ensure the iSCSI service is running. If the storage system is in the process of a takeover or giveback, wait until it starts the iSCSI service. If the storage system is in normal running mode, restart the iSCSI service and then restart the SnapDrive for UNIX daemon by running the `snapdrived restart` command. After the service is running, reissue the `snapdrive storage show` command. This time you should see output similar to the following:

```
# snapdrive storage show -dg toaster1
dg: toaster1 dgtype lvm
hostvol: /dev/mapper/toaster1-lvol1 state: AVAIL
hostvol: /dev/mapper/toaster1-lvol2 state: AVAIL
fs: /dev/mapper/toaster1-lvol1 mount point: /mnt/um1 (nonpersistent)
fstype ext3
fs: /dev/mapper/toaster1-lvol2 mount point: NOT MOUNTED
device filename adapter path size proto state clone lun path backing snapshot
/dev/sde - P 64m iscsi online No gin:/vol/vol1/Lun1
/dev/sdf - P 64m iscsi online No gin:/vol/vol1/Lun2
```

Discrepancy in the error code message

If you execute `the snapdrive storage delete` command when both the FC and iSCSI services are up or when they are down, SnapDrive for UNIX displays a wrong error message. The following table gives more details.

Transport protocol	Message displayed (The incorrect message)	Message that should be displayed instead (The correct message)

FCP and iSCSI both are configured	0002-181 Command error: Could not select appropriate File System. Please check the value of fstype in config file, and ensure proper file system is configured in the system.	0002-143 Admin error: Coexistence of linuxiscsi linuxfcp drivers is not supported. Please ensure only one of the drivers is loaded in the host and retry.
FCP and iSCSI both are not configured	0001-465 Command error: The following filespecs do not exist and cannot be deleted.	0001-877 Admin error: HBA assistant not found. Commands involving LUNs should fail.

Data disappears when you add LUNs to a volume group

Data on the LUN disappears, when you add an existing LUN to a volume group.

If you add an existing LUN to a volume group that is managed by the LVM, and then execute a `pvcreate` command, the data is overwritten.

Workaround

If you need data that is on an existing LUN, you must migrate that data to a LUN that you create using the LVM. Complete the following steps.

1. Create new LUNs.
2. Place the LUNs under LVM control by using the `pvcreate`, the `vgcreate`, and the `lvcreate` commands.
3. Copy data from the existing LUNs to the LUNs you created and placed under LVM control.

SnapDrive command fails when the transport protocol connectivity fails

SnapDrive command fails when the iSCSI or FC connection between the host and storage system fails, or if iSCSI or FC on the storage system fails.

Workaround

To successfully use SnapDrive for UNIX commands, you must first restore the iSCSI or FC service.

Autodetection does not work with MPIO setup for an FS created over a raw LUN

Autodetection does not work with the file system on raw LUN on a Linux MPIO setup with SnapDrive for UNIX.

Workaround

Use the option `-fs` with all the SnapDrive operations.

Connecting to a Snapshot copy fails

SnapDrive for UNIX fails to connect to a Snapshot copy when a Linux host reboots during the SnapDrive for UNIX operation.

This happens on Linux LVM2 during a snap connect operation on an originating host that reboots during the SnapDrive for UNIX operation.

```
Volume manager configuration file has tags that are added by SnapDrive for UNIX.
Clean the file manually.
```

Workaround

1. Ensure that the LUN clones of devices associated to the disk groups are not mapped to the host. If they are mapped to the host, then unmap and delete them. They might have been present from a previously failed SnapDrive operation.
2. Edit the `lvm.config` file (located at `/etc/lvm/`) in the following manner:
   a. Remove all lines with suffix `##SDUTEMP`.
   b. Restore all lines that are preceded by the comment tag `#SDUEXISTING`.

   If any of the above does not work, contact technical support.

Deleting LUNs with exported disk groups on Linux LVM2 fails

SnapDrive for UNIX does not delete LUNs with exported disk groups on Linux LVM2.

If you export a disk group (dg) on Linux LVM2 and try to delete the LUN, the delete operation fails.

Workaround

You have to use *vgimport <dgname>* to import the disk group and then use the following command to delete the disk group and LUN: `# snapdrive storage delete - dg <dgname> [-full]`

LUN discovery fails due to iSCSI daemon limitation

SnapDrive for UNIX commands fail to discover the LUNs after continuous multiple iterations.

You may see the following error message.

```
0000-001 Admin error: iscsi transport protocol has dropped sessions in the host.
Please ensure the connection and the service in the storage system.
```

This happens because of the iSCSI daemon limitation in the following hosts:

- Red Hat Enterprise Linux 4.0
- Oracle Enterprise Linux 4.0

Workaround

`Before modifying the following system parameters, contact the OS vendor.`

1. Add the **`fs.file-max`** parameter to the/`etc/sysctl.conf` file.

   The following is an example in the command-line.

   ```
   # sysctl -w fs.file-max=65536
   ```

Note: We recommend to set the parameter value to `65536`, but you can also set the value depending on the applications on your host.

2. Assign `65536` to the **`fs.file-max`** parameter.
3. Update the default shell `start-up` file for the root user's UNIX account.
   - For the Bourne, Bash, or Korn shell, add the following lines to the `/etc/profile` file by running the following command:

     ```
     cat >> /etc/profile <<EOF
     if [ \$USER = "root" ]; then
     if [ \$SHELL = "/bin/ksh" ]; then
     ulimit -p 16384
     ulimit -n 65536
     else
     ulimit -u 16384 -n 65536
     fi
     umask 022
     fi
     EOF
     ```
   - For the C shell (csh or tcsh), add the following lines to the `/etc/csh.login` file by running the following command:

     ```
     cat >> /etc/csh.login <<EOF
     if ( \$USER == "root" ) then
     limit maxproc 16384
     limit descriptors 65536
     endif
     EOF
     ```
4. Add the following parameters to the `/etc/security/limits.conf` file by running the following command:

   ```
   root soft nofile 65536
   root hard nofile 65536
   ```
5. Activate all the kernel parameters for the system by executing the following command: `sysctl -p`

Commands appear blocked

The SnapDrive for UNIX commands are blocked for more than 10 minutes.

This behavior occurs in rare cases when VxVM/DMP needs time to manage the volume configuration daemon. Triggers for this behavior include the following:

- A storage system that has recovered from a panic.
- A storage system target adapter that has transitioned from offline to online.

Workaround

Wait for the command to complete. The Veritas configuration daemon needs several minutes to run and discover the current state of the devices.

After each reboot snap connect yields "0001-680 Admin error: Host OS requires an update to internal data"

On Red Hat Enterprise Linux 4 and Oracle Enterprise Linux 4 hosts, after every reboot the Snapshot connect and storage create operations encounters an error message.

The following error message occurs because the `sg driver` deletes all the inactive device in `/dev/sgXX` file after a reboot.

Workaround

1. Check the value of the configuration variable *enable-implicithost- preparation* in the `/opt/Ontap/snapdrive/snapdrive.conf` file. It should be set to *on*.

   After rebooting the host and before using SnapDrive for UNIX, complete the following steps.
2. Verify that the sg and iSCSI services are loaded by entering the following command:

   ```
   lsmod
   ```
3. If the sg and iSCSI (if iSCSI setup is used) services are not loaded, enter the following commands:
   - `modprobe sg`
   - `service iscsi start`

   Note: If you do not want to perform steps 2 and 3 manually, add the `modprobe sg` and `service iscsi start` commands in the `host startup script`.

SnapDrive errors out if libgcc_s.so.1 is not installed

SnapDrive for UNIX errors out if the `/lib/libgcc_s.so.1` path is not installed on 64-bit Red Hat Enterprise Linux 4 and Oracle Enterprise Linux 4 hosts.

If the path `/lib/libgcc_s.so.1` is not installed on a 64-bit Red Hat Enterprise Linux 4 and Oracle Enterprise Linux 4 hosts, SnapDrive for UNIX displays the following error message:

```
libgcc_s.so.1 must be installed for pthread_cancel to work
```

Error loading the /usr/lib/libqlsdm.so in HBA_LoadLibrary

On all updates of Red Hat Enterprise Linux 4 and Oracle Enterprise Linux 4 hosts with iSCSI setup, all SnapDrive for UNIX commands error out.

During unloading or uninstalling the QLogic driver, the `libHBAAPI` library remains in the `/usr/lib` file and is not removed by the `QLogic ./install` scripts. The following error message appears as

```
HBA_LoadLibrary: Encountered and error loading: /usr/lib/libqlsdm.so
```

Workaround

Rename or move (mv) the *libqlsdm.so* library. For example, `mv /usr/lib/libqlsdm.so /usr/lib/libqlsdm.so.old.`

Restoring a file system from a Snapshot copy fails

After migration from Red Hat Enterprise Linux 3 updates to Red Hat Enterprise Linux 4 updates, that is, from LVM1 to LVM2, restoring a file system from a Snapshot copy fails.

During restoring a file system (that is taken on LVM1) from a Snapshot copy using LVM2, the `snapdrive snap restore -fs` command does not mount the file system. However, it successfully restores the disk group and host volume associated with it.

For example, the host volume created by LVM1 has a device file in `/dev/Mydg_SDDg/Mydg_Sdhv`; and the host volume created by LVM2 has a device file in `/dev/mapper/Mydg_SdDg-Mydg_Sdhv`

This happens because Red Hat Enterprise Linux 4 update 3 hosts use LVM2, which uses a device mapper to interface with the kernel, whereas Red Hat Enterprise Linux 3 update 5 hosts use LVM1, which does not use a device mapper.

Snapshot restore operation fails to restore file system on raw LUN

The Snapshot restore operation of the file system on raw LUN fails after performing a Snapshot connect operation on a non-originating host.

When the cloned LUN is connected to the same filespec in a Snapshot copy and then you try to execute the `snapdrive snap restore` command, the following error message appears.

```
"0001-034 Command error: mount failed: mount: <device name> is not
a valid block device"
```

The command fails because the iSCSI daemon remaps the device entry for the restored LUN when you delete the cloned LUN.

Workaround

You can do any of the following:

- Execute the `snapdrive snap restore` command again.
- Delete the connected LUN (if it is mounted on the same filespec as in Snapshot copy) before trying to restore a Snapshot copy of an original LUN.

Snap connect operation fails

The Snap connect operation fails and the original volume group does not load after rebooting the host.

On a Linux host, the Snapshot connect operation fails on an originating host if SnapDrive for UNIX is interrupted, either by rebooting the host or by using `Ctrl-C`. The interruption results in the *#SDUTEMP* tag added to the `/etc/lvm/lvm.conf` file; any subsequent SnapDrive for UNIX operations fail with the following error message:

```
0001-945 Admin error: Volume Manager's configuration file contains
tags from previous SDU operation. Please cleanup the cloned lun(s),
if any, existing from a previous unsuccessful operation and cleanup
the configuration file before proceeding.
```

Workaround

1. Remove any cloned LUNs from the storage system that might exist from a previously failed or interrupted Snapshot connect operation.

   Note: You can use the `snapdrive storage show` command with the `-all` option to verify.
2.

   Check if the LUN has been removed from the host by entering the following command:

   - For iSCSI, enter the command `/etc/init.d/iscsi reload`

Note: /etc/init.d/iscsi reload option is applicable for versions RHEL 4 update 6 and prior.

- For RHEL 5 and later, if you are using iSCSI you have to remove LUNs manually. Also, you have to perform host rescan manually.

  If you are using multipathing solution, then perform rescan for multipathing also manually. You can do so by running the command multipath

  Note: If you are using FC, then the above process applies to all the versions prior to RHEL 4 update 6 and RHEL 5 and later.

3. Remove the volume group from the /etc/lvm/lvm.conffile.

   After removing the cloned LUNs from the /etc/lvm/lvm.conffile, the file might look as follows:

   ```
   #SDUEXISTING volume_list = [ "vgX" , "vgY" ] volume_list = [ "vgX" ]
   #SDUTEMP
   ```

4. Delete the entire line containing the #SDUTEMP tag at the end. If a line exists that begins with the #SDUEXISTING tag, remove the tag only, and retain the line.
5. Run the vgscan command to retain the changes made in the configuration file.
6. Enter the vgchange -a y command to retain the original volume group.
7. Execute the appropriate mount command to mount the logical volume group after reviewing the /etc/fstab file in the host to remount the file system.

Standard exit status values

Error messages IDs in SnapDrive for UNIX have exit status values associated with them. You can use the exit status value to determine the success or failure of a SnapDrive for UNIX command.

Understanding exit status values of error messages

Each SnapDrive for UNIX error message is associated with an exit status value. The exit status value contains cause of the error, and its type-Warning, Command, Admin, or Fatal.

Each SnapDrive error message ID is linked to an exit status value. Exit status values contain the following information:

- Exit status value—indicates the basic cause of the error condition.
- Type—indicates the type of error. The level of seriousness depends on the message, not the value. The following are the possible values:
  - Warning—SnapDrive for UNIX executed the command but issued a warning about conditions that might require your attention.
  - Command—SnapDrive for UNIX failed to execute the command due to an error in the command line. Check the command line format to ensure they are correct.
  - Admin—SnapDrive for UNIX failed to execute the command due to incompatibilities in the system configuration. Contact your System Administrator to review your configuration parameters.
  - Fatal—SnapDrive for UNIX failed to execute the command due to an unexpected condition. Fatal errors are rare. If a fatal error occurs and you have problems resolving it, contact technical support for assistance in determining the steps you need to take to recover correctly and fix any error condition.

Using exit status values

Exit status values are used in scripts to determine the success or failure of a SnapDrive for UNIX command.

- A value of zero indicates that the command completed successfully.
- A value other than zero indicates that the command did not complete, and provides information about the cause and severity of the error condition.

Script example

This is an example of a script that uses exit status values.

The following script uses SnapDrive for UNIX exit status values:

```
#!/bin/sh
# This script demonstrates a SnapDrive
# script that uses exit codes.

RET=0;
#The above statement initializes RET and sets it to 0

snapdrive snap create -dg vg22 -snapname vg22_snap1;
# The above statement executes the snapdrive command

RET=$?;
#The above statement captures the return code.
#If the operation worked, print
#success message. If the operation failed, print
#failure message and exit.

if [ $RET -eq 0 ]; then
echo "snapshot created successfully"
else
echo "snapshot creation failed, snapdrive exit code was $RET"
exit 1
fi
exit 0;
```

If RET=0, the command executed successfully and the script outputs the following:

```
# ./tst_script
snap create: snapshot vg22_snap1 contains:
disk group vg22 containing host volumes
lvol1
snap create: created snapshot betty:/vol/vol2:vg22_snap1
snapshot created successfully
```

If RET= a value other than zero, the command did not execute successfully. The following example shows typical output:

```
# ./tst_script
0001-185 Command error: snapshot betty:/vol/vol2:vg22_snap1 already
exists on betty:/vol/vol2.
Please use -f (force) flag to overwrite existing snapshot
snapshot creation failed, snapdrive exit code was 4
```

Exit status values

Each exit status value has an error name, and the type associated with it. View the table to learn about the exit status value, error name, the type, and the description.

The following table contains information about exit status values. The exit status values are numbered sequentially. If SnapDrive for UNIX does not currently implement an error, that exit status value is not included in the table. As a result, there can be some gaps in the numbers.

Exit value	Error name	Type	Description
1	Not supported	Command error	A function was invoked that is not supported in this version of SnapDrive for UNIX.
2	No memory	Fatal	The system has run out of memory. SnapDrive for UNIX cannot proceed until you free enough memory for it to work. Check other applications running to verify that they are not consuming excessive memory.
3	Invalid command	Command error	You issued an invalid command; this is likely to be a syntax error in the text of the command you entered.
4	Already exists	Command error	You requested that something be created that already exists. Usually, this error refers to a Snapshot copy name, which must not exist on the storage system volume where you are taking the Snapshot copy.
5	Create thread failed	Admin error	SnapDrive for UNIX could not create a process thread. Check the other processes running on the system to make sure that enough thread resources are available.
6	Not found	Command error	You included a file, data group, host volume, file system, or other argument on the SnapDrive for UNIX command line that does not exist.

7	Not a mounted file system	Command error	The file system you want to access either is not a valid file system or is not mounted.
9	Volume manager error	Command error	An error was returned when accessing the volume manager. See the specific error message to get details of which error, and why.
10	Invalid name	Command error	You supplied a name on the command line that was not correctly formatted. For example, a storage system volume was not specified as `filer:/vol/vol_name`. This message also occurs when an invalid character is given in either a storage system or a volume manager based name.
11	Device not found	Admin error	SnapDrive for UNIX cannot access a LUN in the disk group that you want to take a Snapshot copy of. Check the status of all LUNs, both on the host and on the storage system. Also check that the storage system volume is online, and that the storage system is up and connected to the host.

12	Busy	Command error	The LUN device, file, directory, disk group, host volume, or other entity is busy. This is generally a nonfatal error that goes away when you retry the command. It sometimes indicates that a resource or process is hung, causing the object to be busy and unavailable for SnapDrive for UNIX to use. It could also indicate you are trying to make a Snapshot copy during a period when the I/O traffic is too heavy for the Snapshot copy to be made successfully.
13	Unable to initialize	Fatal	SnapDrive for UNIX could not initialize third-party material that it needs. This can refer to file systems, volume managers, host cluster software, multipathing software, and so on.

14	SnapDrive busy	SnapDrive busy	Another user or process is performing an operation on the same hosts or storage systems at the same time that you asked SnapDrive for UNIX to perform an operation. Retry your operation. Occasionally this message means that the other process is hung and you must kill it. **Note:** The Snapshot restore operation can take a long time under some circumstances. Be sure that the process you think is hung is not just waiting for a Snapshot restore operation to be completed.
15	Config file error	Fatal	The snapdrive.conf file has invalid, inadequate, or inconsistent entries. See the specific error message for details. You must correct this file before SnapDrive for UNIX can continue.
17	Bad permissions	Command error	You do not have permission to execute this command. You must be logged in as root to run SnapDrive for UNIX.
18	No filer	Admin error	SnapDrive for UNIX cannot contact the storage system needed for this command. Check the connectivity to the storage system indicated in the error message.
19	Bad filer login	Admin error	SnapDrive for UNIX cannot log in to the storage system using the login information you supplied.

20	Bad license	Admin error	A service SnapDrive for UNIX requires is not licensed to run on this storage system.
22	Cannot freeze fs	Admin error	A Snapshot create operation failed because SnapDrive for UNIX could not freeze the file systems specified in order to make the Snapshot copy. Confirm that the system I/O traffic is light enough to freeze the file system and then retry the command.
27	Inconsistent Snapshot copy	Admin error	The Snapshot restore operation failed because you requested a restore from a Snapshot copy with inconsistent images of the disk group. Inconsistent images can occur in the following cases: • You did not make the Snapshot copy using SnapDrive for UNIX. • The Snapshot create operation was interrupted before it set consistent bits, and thus, could not clean up (as in the case of a catastrophic system failure). • Some type of data problem occurred with the Snapshot copy after it was made.
28	HBA failure	Admin error	SnapDrive for UNIX encountered an error while trying to retrieve information from the HBA.

29	Bad metadata	Admin error	SnapDrive for UNIX encountered an error in the Snapshot copy metadata that it wrote when it created the Snapshot copy.
30	No Snapshot copy metadata	Admin error	SnapDrive for UNIX cannot perform a Snapshot restore operation because the metadata does not contain all requested disk groups.
31	Bad password file	Admin error	The password file has a bad entry. Use the `snapdrive config delete` command to delete the login entry for this storage system. Then reenter the login information using the `snapdrive config set` *user_name* command.
33	No password file entry	Admin error	The password file has no entry for this storage system. Run the `snapdrive config set` *username filername* command for every storage system on which you need to run SnapDrive for UNIX. Then try this operation again.
34	Not a LUN	Admin error	A SnapDrive for UNIX command encountered a LUN that is not on a storage system.
35	User aborted	Admin error	The system displayed a prompt asking you to confirm an operation and you indicated that you did not want the operation performed.

36	I/O stream error	Admin error	The system input or system output routines returned an error that SnapDrive for UNIX did not understand. Run snapdrive.dc and send that information to technical support so that they can help you determine which steps to perform to complete the recovery.
37	File system full	Admin error	An attempt to write a file failed because there was insufficient space on the file system. SnapDrive for UNIX can proceed when you free enough space on the appropriate file system.
38	File error	Admin error	An I/O error occurred when SnapDrive for UNIX was reading or writing a system configuration file or a temporary file.
39	Duplicate diskgroup	Command error	SnapDrive for UNIX got a duplicate minor node number when trying to activate a disk group.
40	File system thaw failed.	Admin error	A snap create command failed due to system activity on the file system. This usually occurs when the SnapDrive for UNIX file system freeze, required for the Snapshot copy, times out before the Snapshot copy is complete.

43	Name already in use	Command error	SnapDrive for UNIX attempted to create a disk group, host volume, file system or LUN but the name was already in use. To correct, select a name that is not in use, and re-enter the SnapDrive for UNIX command.
44	File system manager error	Fatal	SnapDrive for UNIX encountered an unexpected error from the file system when: • attempting to create the file system • making an entry in the file system mount table to automatically mount the file system at boot. The text of the error message displayed with this code describes the error that the file system encountered. Record the message, and send it to technical support so that they can help you determine which steps to perform to complete the recovery.
45	Mountpoint error	Admin error	The file system mountpoint appeared in the system mount table file. To correct, select a mountpoint that is not in use or listed in the mount table, and re-enter the SnapDrive for UNIX command.

46	LUN not found	Command error	A SnapDrive for UNIX command attempted to access a LUN that did not exist on the storage system. To correct, check that the LUN exists and that the name of the LUN is entered correctly.
47	Initiator group not found	Admin error	A storage system initiator group could not be accessed as expected. As a result, SnapDrive for UNIX cannot complete the current operation. The specific error message describes the problem and the steps you need to perform to resolve it. Fix the problem and then repeat the command.
48	Object offline	Admin error	SnapDrive for UNIX attempted to access an object (such as a volume) but failed because the object was offline.
49	Conflicting entity	Command error	SnapDrive for UNIX attempted to create an igroup, but encountered an igroup of the same name.
50	Cleanup error	Fatal	SnapDrive for UNIX encountered an item that should be removed but is still there.

51	Disk group ID conflict	Command error	A `snapdrive snap connect` command requested a disk group ID that conflicts with an existing disk group. This usually means that a `snapdrive snap connect` command on an originating host is being attempted on a system that does not support it. To fix this problem, attempt the operation from a different host.
52	LUN not mapped to any host	Admin error	A LUN is not mapped to any host. In other words, it does not belong to a storage system initiator group. To be accessible, the LUN must be mapped to the current host outside SnapDrive for UNIX.
53	LUN not mapped to local host	Admin error	A LUN is not mapped to the current host. In other words, it does not belong to a storage system initiator group that includes initiators from the current host. To be accessible, the LUN must be mapped to the current host outside SnapDrive for UNIX.

54	LUN is mapped using foreign igroup	Admin error	A LUN is mapped using a foreign storage system initiator group. In other words, it belongs to a storage system igroup containing only initiators not found on the local host. As a result, SnapDrive for UNIX cannot delete the LUN. To use SnapDrive for UNIX to delete a LUN, the LUN must belong only to local igroups; that is, igroups containing only initiators found on the local host.
55	LUN is mapped using mixed igroup	Admin error	A LUN is mapped using a mixed storage system initiator group. In other words, it belongs to a storage system igroup containing both initiators found on the local host and initiators not found there. As a result, SnapDrive for UNIX cannot disconnect the LUN. To use SnapDrive for UNIX to disconnect a LUN, the LUN must belong only to local igroups or foreign igroups; not mixed igroups. (Local igroups contain only initiators found on the local host; foreign igroups contain initiators not found on the local host.)

56	Snapshot copy restore failed	Admin error	SnapDrive for UNIX attempted a Snapshot restore operation, but it failed without restoring any LUNs in the Snapshot copy. The specific error message describes the problem and the steps you need to perform to resolve it. Fix the problem and then repeat the command.
58	Host reboot needed	Admin error	The host operating system requires a reboot in order to update internal data. SnapDrive for UNIX has prepared the host for this update, but cannot complete the current operation. Reboot the host and then re-enter the SnapDrive for UNIX command line that caused this message to appear. After the reboot, the operation will be able to complete.

59	Host, LUN preparation needed	Admin error	The host operating system requires an update to internal data in order to complete the current operation. This update is required to allow a new LUN to be created. SnapDrive for UNIX cannot perform the update, because automatic host preparation for provisioning has been disabled because the `snapdrive.conf` variable *enable-implicit-host-preparation* is set to "off". With automatic host preparation disabled, you should use either the snapdrive config prepare luns command to prepare the host to provision LUNs or perform the preparation steps manually. To avoid this error message, set the *enable-implicit-host-preparation* value to "on" in the `snapdrive.conf` file.
62	Not empty	Command error	An error occurred because SnapDrive for UNIX could not remove a storage system volume or directory. This may happen when another user or another process creates a file at exactly the same time and in the same directory that SnapDrive tries to delete. To avoid this error, make sure that only one user works with the storage system volume at the time.

63	Timeout expired	Command error	An error occurred because SnapDrive for UNIX could not restore a LUN within the time-out period of 50 minutes. Record the message, and send it to technical support so that they can help you determine which steps to perform to complete the recovery.
64	Service not running	Admin error	An error occurred because a SnapDrive for UNIX command specified an NFS entity and the storage system was not running the NFS service.
126	Unknown error	Admin error	An unknown error occurred that might be serious. Run the `snapdrive.dc` utility and send its results to technical support for analysis.
127	Internal error	Fatal	A SnapDrive for UNIX internal error occurred. Run the `snapdrive.dc` and send its results to technical support for analysis.

Cleaning up the mapped RDM LUNs in the guest operating system and ESX server

You must clean up the RDM LUNs in the guest operating system as well as in ESX server.

Cleaning up the mapped RDM LUNs in the guest operating system

The following steps must be done in the guest operating system.

Procedure

1. From the **vCenter** navigation pane, select the Virtual Machine in which the RDM mapping is done.
2. Right-click the virtual machine and turn off your guest operating system.
3. Right-click the virtual machine and select **Edit settings**. The **virtual machine properties** dialog box appears.

4. In the **virtual machine properties** dialog box, select the **Hardware** tab. You will find the entire RDM mapped entry as *Mapped RAW LUN* for every RDM entry.
5. Select the RDM mapped entry and click **Remove**. The **Removal Options** appears in the right pane.
6. In the **Removal Options**, select **Remove from virtual machine and delete files from disk**.
7. Click **OK**. All the RDM mapped entries are removed from the guest operating system.

   After you remove RDM LUN entries from the guest operating system, you need to remove them from the ESX server.

Cleaning up the mapped RDM LUNs in the ESX server

The following steps must be done only by the ESX server administrator for a complete cleaning up of all RDM LUN entries in the ESX server.

Before you begin

Turn off your virtual machine before working on the virtual machine directory.

Procedure

1. Go to the virtual machine directory.
2. Change to the directory `cd /vmfs/volumes/ Data store path`.

   ```
   # ls -l
   total 1024
   drwxr-xr-t 1 root root 1540 Apr 19 23:54 4bc702de-fa7ec190-992b-001a6496f353
   lrwxr-xr-x 1 root root   35 May 11 07:56 local_storage (1) -> 4bc702de-fa7ec190-992b-
   001a6496f353
   ```

   All the files and directories are listed here.
3. Select the appropriate data store in which the virtual machines resides.
4. Change the directory to data store. The virtual machine directory is displayed here.
5. Change the directory to virtual machine in which you want to clean up RDM LUN mapping. All the files are listed in the virtual machine directory.
6. Delete all `vmdk` files, which has SMVI string embedded. Alternatively, you can also identify the `vmdk` file using LUN name. Alternatively, you can also identify the `vmdk` file using LUN name. If you have a `vmdk` file of the LUN name as *rdm1*, delete only *rhel4u8-141-232_SMVI_vol_esx3u5_rdm1-rdmp.vmdk* and *rhel4u8-141-232_SMVI_vol_esx3u5_rdm1.vmdk* file. Delete *vmlnx5U4-197-23_SMVI_10.72.197.93_C4koV4XzK2HT_22-rdmp.vmdk* and *vmlnx5U4-197-23_SMVI_10.72.197.93_C4koV4XzK2HT_22.vmdk* *vmlnx5U4-197-23_SMVI_10.72.197.93_C4koV4YG4NuD_53-rdmp.vmdk* file
7. Remove the `vmdk` file entries from the virtual machine configuration file (`vmx`) as well. The following is an example of removing `vmdk` file entries from the `vmx` file.

Name	Description
rhel4u8-141-232	Name of the virtual machine

SMVI	Indicates that this vmdk file is created by SnapManager for Virtual Infrastructure server
vol_esx3u5	Name of the volume where the LUN is created
rdm1	Name of the LUN
rdmp	Signifies that this is physically compatible RDM LUN
vmdk	Virtual Machine Disk File

```
[root@ rhel4u8-141-232]# vi rhel4u8-141-232.vmx
  :
  :
scsi3:1.fileName = "rhel4u8-141-232_SMVI__vol_esx3u5_rdm1.vmdk"
scsi3:1.mode = "independent-persistent"
scsi3:1.ctkEnabled = "FALSE"
scsi3:1.deviceType = "scsi-hardDisk"
scsi3:1.present = "TRUE"
scsi3:1.redo = ""
```

8. Delete the entries as specified in the preceding example, including quotes and commas except for the *scsi3:1.present* entry, which you should change to *FALSE* from *TRUE*.
9. Save and quit the file.
10. Turn on the virtual machine.

Volume-based SnapRestore check fails

Volume-based SnapRestore (Vbsr) check fails, (when NFS tries to export the list that does not have foreign hosts) in the client machine (SLES 11) that has two different IPs for a host name in the `/etc/hosts` file.

To resolve the problem, you must ensure to have only one IP for a host name in the `/etc/hosts` file.

Snapshot create and delete operation fails

The Snapshot create and delete operation fails to remove Snapshot copies on the storage system because the LUNs are busy.

The following error message appears:

```
0001-124 Admin error: Failed to remove snapshot <snap-name> on
filer <filer-name>: LUN clone
```

You might encounter this error and might not be able to directly delete a Snapshot copy if the following are true:

- A disk group spans across multiple storage systems.
- The following SnapDrive commands are executed in a loop for more than 50 iterations (the number of iterations depends on the host operating system):
  - `snapdrive storage create`
  - `snapdrive snap create`
  - `snapdrive storage delete`
  - `snapdrive snap restore`
  - `snapdrive snap connect`

- `snapdrive storage delete`
- `snapdrive snap delete`

At this point, the Snapshot copy status on the storage system shows **`LUNs-Busy`**, and this status prolongs for a few hours.

Workaround

If...	Then...
There are cloned LUNs in a Snapshot copy that are not connected to a host.	You can do one of the following to delete the Snapshot copy: • Split the cloned LUNs from the storage system by using the `filer split clone` command. • Delete the cloned LUNs.
There are cloned LUNs in a Snapshot copy that are not connected to a host.	Do the following steps: 1. Disconnect the cloned LUNs from the host by using the `snapdrive snap disconnect` command. 2. Delete the cloned LUNs. 3. Delete the Snapshot copy.

There are any of the following:
• Cloned LUNs in a Snapshot copy that is also present in other Snapshot copies
• Backup cloned LUNs
	Complete the following steps:
	1. Run the following command in the storage system command prompt:
	`lun snap usage -s <volumename><snap-name>`
	This lists the name of the Snapshot copies that contain the Snapshot copies of the cloned LUNs, as shown in the following example:
	`tonic*> lun snap usage vol1`
	`james_lun (filer view)`
	`mpiotest2:`
	`LUN:`
	`/vol/vol1/.snapshot/mpiotest2/dhilip_0`
	`Backed By:`
	`/vol/vol1/.snapshot/dhilip_lun/james`
	2. Delete the Snapshot copies from the storage system in the same order as they are listed in the lun snap usage command output, as shown in the following example.
	`snap delete vol1 mpiotest2`
	Note: Ensure that the Snapshot copy you are deleting is not used by any other host. If it is being accessed, you cannot delete.

There are no cloned LUNs	Wait until the `LUNs-Busy` status of the Snapshot copy on the storage system disappears.

Unable to create a Snapshot copy

There are few conditions that affect the `snapdrive snap create` command's ability to create a Snapshot copy.

- The `snapdrive snap create` command must be able to perform the following tasks:
  - Query all disk groups for a list of LUNs.
  - Query all LUNs through SCSI commands.
- The LUNs in the disk group must be online and mapped to the disk group before you take the Snapshot copy. If any of the LUNs are offline or unmapped, the create operation fails.

  Make sure that all the LUNs are online and mapped to the host before you attempt to take a Snapshot copy.
- The access permissions do not allow the host to create a Snapshot copy of information on that storage system.

  In addition, because it works with LVM entries, you must be logged on to the host with sufficient permission for it to manipulate the LVM entries.

Unable to restore a Snapshot copy

There are few conditions that affect the `snapdrive snap restore` command's ability to restore a Snapshot copy.

- The `snapdrive snap restore` command must be able to perform the following tasks:
  - Query all disk groups for a list of LUNs.
  - Query all LUNs via SCSI command.

  The host volumes and file systems do not need to be available and mounted for the `snapdrive snap restore` command to succeed.
- The access permissions must allow the host to create and restore a Snapshot copy of information on that storage system.
- The NFS mounted directory must be exported correctly to the host, so that it can be mounted.

Note: You should always take another Snapshot copy after you add a LUN to or remove a LUN from a disk group.

- If you add a host volume or file systems to a disk group after taking a Snapshot copy and then try to restore the Snapshot copy, you receive an error message. You must include the `force` option (`-f`) on the command-line for the restore operation to succeed in this situation.

  Note: Host volumes and file systems that you add after taking a Snapshot copy are no longer accessible when you create and restore the Snapshot copy.
- If you rename a host volume or a file system or change the mountpoint after taking a Snapshot copy and then try to restore it, the restore operation fails. You must include the `force` option (`-f`) on the command-line for the restore operation to succeed in this situation.

  Note: Use the `-f` option with great care to make sure you do not accidentally overwrite something that you did not intend to overwrite.
- If you rename a LUN after taking a Snapshot copy and then try to restore that Snapshot copy, the restore operation fails. After you rename a LUN, you should take a new Snapshot copy.

Note: After you start a Snapshot restore operation, do not halt it. Halting this operation might leave the system in an inconsistent state. You might then need to perform a manual recovery.

Unable to restart the daemon-host cannot communicate to the storage system

The daemon cannot be started when the host is not able to communicate to any configured storage system.

During this condition, when you try to restart the daemon, the daemon does not start and the following error message is encountered.

```
Unable to start daemon...check daemon log file for more details
```

Primarily, you need to ensure if the host is communicating to the storage system by executing the ping command to the storage system. If the host is still not able to communicate to the storage system, then try to use the following options:

- Delete the storage system that is not communicating to the host, and then try to restart the daemon.
- In case, you do not want to delete the storage system that is configured to the host, then disable the option *autosupport-enabled* to *off* in the `snapdrive.conf` file to suppress the error message.

Unable to start the daemon

The daemon cannot be started when the daemon finds few stale entries in the snapdrive process.

The following error message appears when the daemon is started or restarted.

```
Starting snapdrive daemon: snapdrive daemon port 4094 is in use ...
snapdrive daemon port 4094 is in use ...
snapdrive daemon port 4094 is in use ...
snapdrive daemon port 4094 is in use ...
Unable to start daemon...check daemon log file for more details
```

During the daemon restart/start operation, you can encounter staled snapdrive process entries, which results the daemon to fail.

The workaround for this problem is to execute the following:

- Manually delete the stale entries in the snapdrive process.
- Find the free ports that are available in the host. Then, in the `snapdrive.conf` file, specify the port in the option *contact-http-port-sdu-daemon*.

snapdrived start command fails

In some conditions `snapdrived start` command may fail. There are a few troubleshooting steps to resolve this.

- Check whether daemon port specified in `snapdrive.conf` file is already in use by other application.
- Check whether an earlier instance of daemon is stopped properly.

- Check whether system-wide semaphore limit is reached, in which case daemon start does not work.
- Check whether any of the services like iSCSI, VxVM is not running on the machine.
- If HTTPS is set to `on`, check whether self signed certificate is installed in the specified directory.

SnapDrive commands sometimes result in mounting or unmounting file systems and modify system files

Certain SnapDrive for UNIX commands can cause file systems to be mounted or unmounted. When a command performs an operation that mounts a file system, SnapDrive for UNIX adds the file system’s name to the standard system file for your host platform. If an operation unmounts a file system, SnapDrive for UNIX removes the name from the system file. This should not pose a problem; however, it is useful to know when system files are modified.

The name of the system file varies depending on your host platform. The following table lists the host platforms and their system files.

Host	**System file**
Linux	`etc/fstab`

Any of the following commands can mount file systems:

- `snapdrive snap restore`
- `snapdrive snap connect`
- `snapdrive storage create`
- `snapdrive host connect`
- `snapdrive storage connect`

The following commands perform operations that can unmount a file system:

- `snapdrive snap restore`
- `snapdrive snap disconnect`
- `snapdrive storage disconnect`
- `snapdrive storage delete`
- `snapdrive host disconnect`

Unable to select a storage stack

You cannot select a storage stack due to inappropriate values specified in the `snapdrive.conf` file.

The following warning message appears.

```
WARNING!!! Unable to find a SAN storage stack. Please verify that the appropriate transport
protocol, volume manager, file system and multipathing type are installed and configured in
the system. If NFS is being used, this warning message can be ignored.
```

- If you are using an NFS environment, ignore the warning message and continue to use SnapDrive operations on your host system.

- If you are using SAN environment, ensure that the appropriate acceptable values are specified in the snapdrive.conf file as provided in the Linux matrix stack. Then, restart the daemon.

Related reference:

"SnapDrive for UNIX stack requirements" on page 9

snapdrived stop or snapdrived start command hangs

snapdrived stop or snapdrived start command might hang in some cases.

To resolve this problem, run the snapdrived status to check how many commands are in execution and at what time they started. snapdrived stop command waits for all commands in execution to complete. If you believe that any command hangs, issue snapdrived -force stop or snapdrived -force restart command.

Attention: The -force option kills all running commands and daemon stops. This can have side effects on system state like stale device entries and future daemon starts.

SnapDrive for UNIX command displays could not check access error

SnapDrive for UNIX may display error when it does have proper write access on the storage object.

It displays the following error message:

```
0002-332 Admin error: Could not check SD.Storage.Write access on LUN
storage_array1:/vol/vol1/lun1for user unix-host\root on Operations Manager server(s)
ops-mngr-server1 reason: Invalid resource specified.
Unable to find its Id on Operations Manager server ops-mngr-server1
```

The solution for this problem is to:

1. Verify that the storage resource is refreshed on Operations Manager. If storage resource is not refreshed on Operations Manager, then
   - Manually execute dfm host discover <storage-system>.
   - Assign {Global, DFM.Database.Write} capability to sd-admin

     In this case, SnapDrive for UNIX automatically refresh Operations Manager and reissue access check.

The default refresh interval used by SnapDrive for UNIX is 15 seconds (*dfm-rbac-retry-sleep-secs*) and the default number of retries used by SnapDrive for UNIX is 12 (*dfm-rbac-retries*). If you still receive the above error message, then increase the value of *dfm-rbac-retries* configuration variable to 14, 16, 18... and so on to match your environment. The refresh interval required by Operations Manager depends on the number of LUNs and volumes you have in your storage system.

Mounting a FlexVol volume fails in NFS environment

When you mount a FlexVol volume, an entry is added in the /etc/exports file. In NFS environment, SnapDrive for UNIX fails, and an error message is generated.

About this task

The error message is

```
0001-034 Command error: mount failed: nfs mount:
dub12137:/vol/vn_dub12137_testprisredo_0: Permission denied.
```

SnapDrive for UNIX might encounter the error message due to the option `nfs.export.auto-update` set to `off`. The option `nfs.export.auto-update` controls whether the automatic updates are performed on the `/etc/exports` file.

Note: The AutoSupport does not send the message to the storage system when the FlexVol volume fails in NFS environment.

Procedure

Set the `nfs.export.auto-update` option `on` so that the `/etc/exports` file is updated automatically. SnapDrive for UNIX can now mount the FlexVol volume.

What to do next

In an HA pair, ensure you set the NFS exports option `on` for both the storage systems.

Receiving error iscsi64 snapdrive: 0001-666 FATAL error

If your `snapdrive snap connect` command fails with `iscsi64 snapdrive: 0001-666 FATAL error:`, following is the workaround described.

Procedure

1. Add `filter = [ "r|/dev/cciss/.*|" ]` as the first filter to `/etc/lvm/lvm.conf` file, if the filter is not specified already.
2. Remove `/etc/lvm/.cache` and issue `pvscan` to confirm that none of the `/dev/cciss/*` entries show.

Command reference

SnapDrive for UNIX supports various commands. These command references helps you in learning about the commands, their options, keywords, and arguments.

Collecting information needed by SnapDrive for UNIX commands

This chapter provides information about the SnapDrive for UNIX commands, the format, option, keywords, and examples.

Collecting information needed by commands

SnapDrive for UNIX commands follow a format and have keywords associated with them. The commands have options and arguments, and require values to be entered by the user.

The checklists helps the user to quickly execute SnapDrive for UNIX. For each command, it supplies the following:

- Recommended formats
- Information about the keywords, options, and arguments available with the commands and the values you should supply
- Examples of the commands

General notes about the commands

SnapDrive for UNIX commands have options such as `-dg`, `-vg`, `-lvol` and `-hostvol`.

Some general notes about the command follow:

- The `-dg` and `-vg` options are synonyms that reflect the fact that some operating systems refer to disk groups and others refer to volume groups. This guide uses `-dg` to refer to both disk groups and volume groups.
- The `-lvol` and `-hostvol` options are synonyms that reflect the fact that some operating systems refer to logical volumes and others refer to host volumes. This guide uses `-hostvol` to refer to both logical volumes and host volumes.
- It is better to use the default igroup and not specify an igroup explicitly by including the `-igroup` option.

Summary of the SnapDrive for UNIX commands

SnapDrive for UNIX commands are used for configuration, storage provisioning, host-side management, and Snapshot operation.

Command summary

SnapDrive for UNIX supports the different command lines, such as, configuration, storage provisioning, host-side management, and Snapshot operation.

Configuration command lines

SnapDrive for UNIX commands are used for configuration operations.

The following command-line options are used for configuration operations.

- snapdrive config access {show | list}*filername*
- snapdrive config check luns
- snapdrive config delete *appliance_name [appliance_name ...]*
- snapdrive config list
- snapdrive config set[-dfm]*user_name* appliance_name [appliance_name ...]
- snapdrive config set[-viadmin]*user_name viadmin_name*
- snapdrive config show *[host_file_name]*
- snapdrive config check cluster
- snapdrive config prepare luns -count count
- snapdrive config migrate set *storage_system_name new_storage_system_name*
- snapdrive config migrate delete *new_storage_system_name [new_storage_system_name...]*
- snapdrive config migrate list
- snapdrive portset add portset_name filername [filername ...]
- snapdrive portset delete filername [filername ...]
- snapdrive portset list
- snapdrive igroup add igroup_name filername [filername ...]
- snapdrive igroup delete filername [filername ...]
- snapdrive igroup list

Storage provisioning command lines

Some SnapDrive for UNIX commands are used for storage provisioning.

The following command-line options for storage provisioning operations.

Operation	Command-line option
Create	snapdrive storage create -lun *long_lun_name* [*lun_name* ...] -lunsize *size* [{ -dg | -vg } *dg_name*] [-igroup *ig_name* [*ig_name* ...]] [{ -reserve | -noreserve }][-fstype *type*] [-vmtype *type*]
	snapdrive storage create {-lvol | -hostvol} *file_spec* [{-dg | -vg} *dg_name*]{-dgsize | -vgsize} *size*-filervol *long_filer_path* [{-noreserve | -reserve}] [-fstype *type*] [-vmtype *type*]
	snapdrive storage create -fs *file_spec* -nolvm [-fsopts options] [-mntopts options] [-nopersist] { -lun *long_lun_name* | -filervol *long_filer_path* } -lunsize *size* [-igroup *ig_name* [*ig_name* ...]] [{ -reserve | -noreserve }] [-fstype *type*] [-vmtype *type*]
	snapdrive storage create *host_lvm_fspec* -filervol *long_filer_path* -dgsize *size* [-igroup *ig_name* [*ig_name* ...]] [{ -reserve | -noreserve }]
	snapdrive storage create *host_lvm_fspec* -lun *long_lun_name* [*lun_name* ...] -lunsize *size* [-igroup *ig_name* [*ig_name* ...]] [{ -reserve | -noreserve }]

Operation	Command-line option
	Note: You can use any one of the format for the `-file_spec` argument, depending on the type of storage you want to create. (Remember that `-dg` is a synonym for `-vg`, and `-hostvol` is a synonym for `-lvol`.) To create a file system directly on a LUN, use this format: `-fs` *file_spec* [`-nolvm -fs` *type*] [`-fsops` *options*] [`-mntopts` *options*] [`-vmtype` *type*] To create a file system that uses a disk group or host volume, use this format:`-fs` *file_spec* [`-fstype` *type*] [`-fsopts` *options*] [`-mntops` *options*] [`-hostvol` *file_spec*] [`-dg` *dg_name*] [`-vmtype` *type*] To create a logical or host volume, use this format: [`-hostvol` *file_spec*] [`-dg` *dg_name*] [`-fstype` *type*] [`-vmtype` *type*] To create a disk group, use this format:`-dg` *dg_name* [`-fstype` *type*] [`-vmtype` *type*]
Connect	`snapdrive storage connect -fs` *file_spec* *-nolvm* `-lun` *long_lun_name* [`-igroup` *ig_name* [*ig_name* ...]] [`-nopersist`] [`-mntopts options`] [`-fstype` *type*] [`-vmtype` *type*]
	`snapdrive storage connect -fs` *file_spec* `-hostvol` *file_spec* `-lun` *long_lun_name* [*lun_name* ...] [`-igroup` *ig_name* [*ig_name* ...]][`-nopersist`] [`-mntopts options`] [`-fstype` *type*] [`-vmtype` *type*]
	`snapdrive storage connect -lun` *long_lun_name* [*lun_name* ...][`-igroup` *ig_name* [*ig_name* ...]][`-vmtype` *type*]
	`snapdrive storage connect -lun` *long_lun_name* [*lun_name...*][`-vmtype` *type*]
	`snapdrive storage connect -fs` *file_spec* {`-hostvol | -lvol`} *file_spec* `-lun` *long_lun_name* [*lun_name...*] [`-nopersist`] [`-mntopts options`] [`-fstype` *type*] [`-vmtype` *type*]
Disconnect	`snapdrive storage disconnect -lun` *long_lun_name* [*lun_name...*] [`-vmtype` *type*]
	`snapdrive storage disconnect` {`-vg | -dg | -fs | -lvol | -hostvol`} *file_spec* [*file_spec* ...] [{`-vg | -dg | -fs | -lvol | -hostvol`} *file_spec* ...] ...] [`-full`] [`-fstype` *type*] [`-vmtype` *type*]
Resize	`snapdrive storage resize` {`-dg | -vg`} *file_spec* [*file_spec* ...]{`-growby | -growto`} *size* [-*addlun* [`-igroup` *ig_name* [*ig_name* ...]]] [{ `-reserve | -noreserve` }]] [`-fstype` *type*] [`-vmtype` *type*]

Operation	Command-line option
Show/List	snapdrive storage { show | list } -filer *filername* [*filername* ...] [-verbose] [-quiet] [-capabilities]
	snapdrive storage { show | list } -filervol *long_filer_path* [*filer_path...*][-verbose] [-quiet] [-capabilities]
	snapdrive storage { show | list } {-all | device} [-capabilities]
	snapdrive storage show [-verbose] {-filer *filername* [*filername...*] | -filervol *volname* [*volname...*]} [-capabilities]
	snapdrive storage { show | list } -lun *long_lun_name* [*lun_name* ...] [-verbose] [-quiet] [-status] [-capabilities]
	snapdrive storage { show | list } { -vg | -dg | -fs | -lvol |-hostvol } *file_spec* [*file_spec* ...] [{ -vg | -dg | -fs | -lvol | -hostvol } *file_spec* [*file_spec* ...]] [-verbose] [-quiet [-fstype *type*] [-vmtype *type*] [-status] [-capabilities]
	snapdrive storage { show | list } { -filer *filer_name* [*filer_name* ...] | -filervol *long_filer_path* [*filer_path* ...] } [-verbose] [-capabilities] [-quiet]
	snapdrive storage { show | list } -lun *long_lun_name* [*lun_name* ...] [-verbose] [-status] [-fstype type] [-vmtype type] [-capabilities] [-quiet]
Delete	snapdrive storage delete [-lun] *long_lun_name* [lun_name...] [-fstype type] [-vmtype type]
	snapdrive storage delete [-vg | -dg | -fs | -lvol | -hostvol] *file_spec* [file_spec ...] [{-vg | -dg | -fs | -lvol | -hostvol} *file_spec* [file_spec ...] ...] [-full]] [-fstype type] [-vmtype type]

Related reference:

"Command-line arguments" on page 269

Host-side command lines

SnapDrive for UNIX commands are used for host-side operations.

The following table gives various command-line options for host-side operations.

Operation	Command-line option
Host connect	snapdrive host connect -lun *long_lun_name* [*lun_name* ...] [-vmtype *type*]
	snapdrive host connect -fs *file_spec* -nolvm -lun *long_lun_name* [-nopersist][-mntopts options] [-fstype *type*] [-vmtype *type*]
	snapdrive host connect -fs *file_spec* -hostvol *file_spec* -lun *long_lun_name* [*lun_name*][-nopersist] [-mntopts *options*][-vmtype *type*]
Host disconnect	snapdrive host disconnect-lun *long_lun_name* [*lun_name...*] [-vmtype *type*]
	snapdrive host disconnect {-vg | -dg | -fs | -lvol | -hostvol} *file_spec*[*file_spec ...*][{-vg | -dg | -fs | -lvol | -hostvol} *file_spec* [*file_spec ...*]...] [-full] [-fstype *type*] [-vmtype *type*]

Snapshot operation command lines

SnapDrive for UNIX commands are used for Snapshot operations.

The following table gives various command-line options for Snapshot operations.

Operation	Command-line options
Create	snapdrive snap create [-lun | -dg | -vg | -hostvol | -lvol | -fs] *file_spec* [file_spec ...] [{-lun | -dg | -vg | -hostvol | -lvol | -fs} *file_spec* [file_spec ...] ...] -snapname *snap_name* [-force [-noprompt]] [-unrelated] [-fstype type] [-vmtype type]
Show/List	snapdrive snap { show | list } -filervol *filervol* [*filervol...*][-verbose]
	snapdrive snap { show | list } [-verbose] {-vg | -dg | -fs | -lvol | -hostvol} *file_spec* [file_spec...] [-fstype type] [-vmtype type]
	snapdrive snap [-verbose] [-snapname] *long_snap_name* [snap_name ...]
	snapdrive snap {show| list} [-verbose] [-lun | -vg | -dg | -fs | -lvol | -hostvol] *file_spec* [file_spec...]

Operation	Command-line options
Connect	snapdrive snap connect -lun *s_lun_name d_lun_name* [[-lun] *s_lun_name d_lun_name* ...] -snapname *long_snap_name* [-split] [-clone {lunclone | optimal | unrestricted}] [-prefixfv prefixstr] [-verbose] **Note:** In a snapdrive snap connect command, the LUN name should be in the format lun_name or qtree_name/lun_name.
	snapdrive snap connect *fspec_set* [*fspec_set*...] -snapname *long_snap_name* [-autoexpand] [-autorename] [-nopersist] [-mntopts options] [{-reserve | -noreserve}] [-readonly] [-split] [-clone {lunclone | optimal | unrestricted}] [-prefixfv prefixstr] [-verbose] **Note:** The fspec_set argument has the following format: [-vg | -dg | -fs | -lvol | -hostvol] *src_file_spec*[*dest_file_spec*] [{-destdg | -destvg} dgname] [{-destlv | -desthv} lvname]
Rename	snapdrive snap rename -[snapname]*old_long_snap_name new_snap_name* [-force [-noprompt]]
Restore	snapdrive snap restore [-lun | -dg | -vg | -hostvol | -lvol | -fs | -file] *file_spec* [file_spec ...] [{-lun | -dg | -vg | -hostvol | -lvol | -fs | -file} *file_spec* [file_spec ...] ...] -snapname *snap_name* [-force [-noprompt]] [-mntopts options][{-reserve | -noreserve}] [-vbsr [preview|execute]]
Disconnect	snapdrive snap disconnect -lun *long_lun_name* [*lun_name*...] [-fstype type] [-vmtype type][-split]
	snapdrive snap disconnect {-dg | -vg | -hostvol | -lvol | -fs} *file_spec* [file_spec ...] [{-dg | -vg | -hostvol | -lvol | -fs} *file_spec* [file_spec ...] ...] [-full] [-fstype type] [-vmtype type] [-split]
Delete	snapdrive snap delete [-snapname] *long_snap_name* [*snap_name*...][-verbose] [-force [-noprompt]]

SnapDrive for UNIX options, keywords, and arguments

SnapDrive for UNIX commands has options, keywords, and arguments associated with them.

Command-line options

There are various options that are used with SnapDrive for UNIX commands.

SnapDrive for UNIX enables you to include the following options as appropriate with its commands. In certain cases, you can abbreviate these options. For example, you can use -h instead of -help.

Option	Description
-addlun	Tells SnapDrive for UNIX to add a new, internally-generated LUN to a storage entity in order to increase its size.
-all	Used with the snapdrive storage {show | list} command to display all devices and LVM entities known to the host.
-autoexpand	Used with the snapdrive snap connect command to enable you to request that a disk group be connected when you supply a subset of the logical volumes or file systems in the disk group.
-autorename	Used with the snapdrive snap connect command to enable the command to rename any newly-connected LVM entities for which the default name is already in use.
-clone type	Clone-method to be used during snap connect operation. Here type refers to lunclone (creates lun clone(s)), Optimal (SnapDrive automatically chooses between Restricted FlexClone(s) and LUN clone depending on the storage configuration) and Unrestricted (creates FlexClone(s) which can be used for provisioning and SnapShot operations, just like normal flexible volumes).
-capabilities	used with snapdrive storage show command to know the allowed operations on the host file specs.
-devices or -dev	Used with the storage {show | list} command to display all devices known to the host.
-dgsize or -vgsize	Used with the snapdrive storage create command to specify the size in bytes of the disk group you want to create.
-force (or -f)	Causes operations to be attempted that SnapDrive for UNIX would not undertake ordinarily. SnapDrive for UNIX prompts you to ask for confirmation before it executes the operation.
-fsopts	The options you want passed to the host operation that creates the new file system. Depending on your host operating system, this host operation might be a command such as the mkfs command. The argument you supply with this option usually needs to be specified as a quoted string and must contain the exact text to be passed to the command. For example, you might enter -o largefiles as the option you want passed to the host operation.

Option	Description
`-fstype`	The type of file system you want to use for the SnapDrive for UNIX operations. The file system must be a type that SnapDrive for UNIX supports for your operating system. Current values that you can set for this variable is "ext3 or ext4" You can also specify the type of file system that you want to use by using the `-fstype` configuration variable.
`-full`	Allows operations on a specified host-side entity to be performed even if the entity is not empty (for example, the entity might be a volume group containing one or more logical volumes).
`-growby`	The number of bytes you want to add to a LUN or disk group in order to increase its size.
`-growto`	The target size in bytes for a LUN, disk group, or volume group. SnapDrive for UNIX automatically calculates the number of bytes necessary to reach the target size and increases the size of the object by that number of bytes.
`-help`	Prints out the usage message for the command and operation. Enter this option by itself without other options. Following are the examples of possible command lines.
`-lunsize`	The size of the LUN in bytes to be created by a given command.
`-mntopts`	Specifies options that you want passed to the host mount command (for example, to specify file system logging behavior). Options are also stored in the host file system table file. The options allowed depend on the host file system type. The `-mntopts` argument that you supply is a file system-type option that is specified using the `mount` command "- *o*" flag. Do not include the "- *o*" flag in the `-mntopts` argument. For example, the sequence `-mntopts` *tmplog* passes the string *-o tmplog* to the mount command line, and inserts the text "*tmplog*" on a new command line.
`-nofilerfence`	Suppresses the use of the Data ONTAP consistency group feature in creating Snapshot copies that span multiple filer volumes. In Data ONTAP 7.2 or above, you can suspend access to an entire filer volume. By using the `-nofilerfence` option, you can freeze access to an individual LUN.

Option	Description
`-nolvm`	Connects or creates a file system directly on a LUN without involving the host LVM. All commands that take this option for connecting or creating a file system directly on a LUN will not accept it for host cluster or shared resources. This option is allowed only for local resources.
`-nopersist`	Connects or creates a file system, or a Snapshot copy that has a file system, without adding an entry in the host's persistent mount entry file.
`-prefixfv`	prefix to be used while generating cloned volume name. The format of the name of the new volume would be `<prefix>_<original_volume_name>`.
`-reserve - noreserve`	Used with the `snapdrive storage create`, `snapdrive snap connect` or `snapdrive snap restore` commands to specify whether or not SnapDrive for UNIX creates a space reservation. By default, SnapDrive for UNIX creates reservation for storage create, resize, and Snapshot create operations, and does not create reservation for Snapshot connect operation.
`-noprompt`	Suppresses prompting during command execution. By default, any operation that might have dangerous or non-intuitive side effects prompts you to confirm that SnapDrive for UNIX should be attempted. This option overrides that prompt; when combined with the `-force` option, SnapDrive for UNIX performs the operation without asking for confirmation.
`-quiet` (or `-q`)	Suppresses the reporting of errors and warnings, regardless of whether they are normal or diagnostic. It returns zero (success) or non-zero status. The `-quiet` option overrides the `-verbose` option. This option will be ignored for `snapdrive storage show`, `snapdrive snap show`, and `snapdrive config show` commands.
`-readonly`	Required for configurations with Data ONTAP 7.1 or any configuration that uses traditional volumes. Connects the NFS file or directory with read-only access. Optional for configurations with Data ONTAP that use FlexVol volumes. Connects the NFS file or directory tree with read-only access. (Default is read/write).

Option	Description
-split	Enables to split the cloned volumes or LUNs during Snapshot connect and Snapshot disconnect operations. You can also split the cloned volumes or LUNs by using the *enable-split-clone* configuration variable.
-status	Used with the snapdrive storage show command to know if the volume or LUN is cloned.
-unrelated	Creates a Snapshot copy of *file_spec* entities that have no dependent writes when the Snapshot copy is taken. Because the entities have no dependent writes, SnapDrive for UNIX creates a crash-consistent Snapshot copy of the individual storage entities, but does not take steps to make the entities consistent with each other.
-verbose (or -v)	Displays detailed output, wherever appropriate. All commands and operations accept this option, although some might ignore it.
-vgsize or -dgsize	Used with the storage create command to specify the size in bytes of the volume group you want to create.
-vmtype	The type of volume manager you want to use for the SnapDrive for UNIX operations. If the user specifies the -vmtype option in the command line explicitly, SnapDrive for UNIX uses the value specified in the option irrespective of the value specified in the vmtype configuration variable. If the -vmtype option is not specified in the command-line option, SnapDrive for UNIX uses the volume manager that is in the configuration file. The volume manager must be a type that SnapDrive for UNIX supports for your operating system. Current values that you can set for this variable as lvm You can also specify the type of volume manager that you want to use by using the vmtype configuration variable.
-vbsr {preview|execute}	The preview option initiates a volume based SnapRestore preview mechanism for the given host filespec. With the execute option, SnapDrive for UNIX proceeds with volume based SnapRestore for the specified filespec.

Rules for keywords

SnapDrive for UNIX uses keywords to specify the target of the SnapDrive for UNIX operations.

SnapDrive for UNIX uses keywords to specify sequences of strings corresponding to the host and storage system objects with which you are working. The following rules apply to SnapDrive for UNIX keywords:

- Precede each keyword with a hyphen (-).
- Do not concatenate keywords.
- Enter the entire keyword and hyphen, not an abbreviation.

Command-line keywords

The SnapDrive for UNIX uses keywords to specify the name of host disk group, the destination group, volume, or FlexClone, the NFS file, the storage system, and so on.

Here are the keywords you can use with the SnapDrive for UNIX commands. You use them to specify the targets of the SnapDrive for UNIX operations. These keywords can take one or more arguments.

Note: Some LVMs refer to disk groups and some refer to volume groups. In SnapDrive for UNIX, these terms are treated as synonyms. Moreover, some LVMs refer to logical volumes and some refer to volumes. SnapDrive for UNIX treats the term host volume (which was created to avoid confusing host logical volumes with storage system volumes) and the term logical volume as synonymous.

Keyword	Argument used with this keyword
`-dg` (synonymous with `-vg`)	The name of the host disk group. You can enter the name of either a disk group or a volume group with this option.

`-destdg`
`-desthv`
`-destlv`
`-destvg`
	The destination group or volume.

`-destfv`	The name of the FlexClone volume specified on the command line for volume clones created by SnapDrive for UNIX during the NFS Snapshot connect operation. **Note:** This argument supports NFS volumes only and not NFS directories.
`-file`	The name of a NFS file.
`-filer`	The name of a storage system.
`-filervol`	The name of the storage system and a volume on it.
`-fs`	The name of a file system on the host. The name used is the directory where the file system is currently mounted or is to be mounted (the mountpoint).
`-hostvol` or `-lvol`	The host volume name, including the disk group that contains it. For example, you might enter `large_vg/accounting_lvol`.

Keyword	Argument used with this keyword
`-igroup`	The name of an initiator group (igroup). It is strongly recommended that you use the default igroup that SnapDrive for UNIX creates instead of specifying an igroup on the target storage system. The default igroup is hostname_protocol_SdIg. • *hostname* is the local (non-domain qualified) name of the current host. • *protocol* is either **FCP** or **iSCSI**, depending on the protocol the host is using. If the igroup hostname_protocol_SdIg does not exist, SnapDrive for UNIX creates it and places all the initiators for the host in it. If it exists and has the correct initiators, SnapDrive for UNIX uses the existing igroup. If the igroup exists, but does not contain the initiators for this host, SnapDrive for UNIX creates a new igroup with a different name and uses that igroup in the current operation. To avoid using the same name, SnapDrive for UNIX includes a unique number when it creates the new name. In this case, the name format is hostname-number_protocol_SdIg. If you supply your own igroup name, SnapDrive for UNIX does not validate the contents of the igroup. This is because it cannot always determine which igroups corresponding to the host are present on the storage system. All commands that take this option for specifying initiator groups cannot accept it with shared disk groups and file systems. This option is allowed only for local resources. The SnapDrive for UNIX command fails if any foreign igroups are involved in the command line. Ensure that all the igroups specified in the command line contain initiators from the local host.

Keyword	Argument used with this keyword
-lun	The name of a LUN on a storage system. For the first LUN name you supply with this keyword, you must supply the full path name (storage system name, volume name, and LUN name). For additional LUN names, you can specify either only the names within their volume (if the volume stays unchanged) or a path to indicate a new storage system name or a new volume name (if you just want to switch volumes). **Note:** In a snapdrive snap connect command, the *lun_name* should be in the lun_name or tree_name/lun_name format.
-lvol or - hostvol	The logical volume name, including the volume group that contains it. For example, you might enter large_vg/accounting_lvol as the logical volume name.
-snapname	The name of a Snapshot copy.
-vgor -dg	The name of the volume group. You can enter the name of either a disk group or a volume group with this option.

Command-line arguments

The SnapDrive for UNIX takes arguments in a specific format.

The following table describes the arguments you can specify with the keywords.

Use the format snapdrive type_name operation_name [<*keyword/option*> <*arguments*>]; for example, if you wanted to create a Snapshot copy called *snap_hr* from the host file system /mnt/dir, you would enter the following command line:

snapdrive snap create -fs /mnt/dir -snapname *snap_hr*.

Argument	Description
dest_fspec	The name by which the target entity will be accessible after its disk groups or LUNs are connected.
dgname	The name of a disk group or volume group.
d_lun_name	Allows you to specify a destination name that SnapDrive for UNIX uses to make the LUN available in the newly-connected copy of the Snapshot copy.
filername	The name of a storage system.
filer_path	A path name to a storage system object. This name can contain the storage system name and volume, but it does not have to if SnapDrive for UNIX can use default values for the missing components based on values supplied in the previous arguments. The following are examples of path names: • test_filer:/vol/vol3/qtree_2 • /vol/vol3/qtree_2 • qtree_2

Argument	**Description**

file_spec	The name of a storage entity, such as a host volume, LUN, disk or volume group, file system, or NFS directory tree.
	In general, you use the file_spec argument as one of the following:
	• An object you want SnapDrive for UNIX to make a Snapshot copy of or to restore from a Snapshot copy
	• An object that you want to either create or use when provisioning storage
	The objects do not have to be all of the same type. If you supply multiple host volumes, they must all belong to the same volume manager.
	If you supply values for this argument that resolve to redundant disk groups or host volumes, the command fails.
	Example of incorrect usage: This example assumes dg1 has host volumes hv1 and hv2, with file systems fs1 and fs2. As a result, the following arguments would fail because they involve redundant disk groups or host volumes.
	`-dg` *dg1* `-hostvol dg1/hv1-dg` *dg1*
	`-fs /fs1`
	`-hostvol dg1/hv1 -fs /fs1`
	Example of correct usage: This example shows the correct usage for this argument.
	`-hostvol dg1/hv1 dg1/hv2`
	`-fs /fs1 /fs2`
	`-hostvol dg1/hv1 -fs /fs2`

fspec_set	Used with the snap connect command to identify: • A host LVM entity • A file system contained on a LUN The argument also lets you specify a set of destination names that SnapDrive for UNIX uses when it makes the entity available in the newly connected copy of the Snapshot copy. The format for fspec_set is: { `-vg | -dg | -fs | -lvol | -hostvol` } *src_fspec* [*dest_fspec*] [{ `-destdg | -destvg` } *dg_name*] [{ `- destlv | -desthv` } *lv_name*]

Argument	**Description**
host_lvm_fspec	Lets you specify whether you want to create a file system, logical volume, or disk group when you are executing the storage create command. This argument might have any of the three formats as described in the following. The format you use depends on the entity you want to create. **Note:** The `-dg` and `-vg` options are synonyms that reflect the fact that some operating systems refer to disk groups and others refer to volume groups. In addition, `-lvol` and `-hostvol` are also synonyms. This guide uses `-dg` to refer to both disk groups and volume groups and `-hostvol` to refer to both logical volumes and host volumes.
	To create a file system, use this format: -fs file_spec [`-fstype` *type*] [`-fsopts` *options]* [`-hostvol` *file_spec*] [`-dg` *dg_name*] To create a logical or host volume, use this format: [`-hostvol` *file_spec*] [`-dg` *dg_name*] `|` `-hostvol` To create a disk or volume group, use this format: file_spec [`-dg` *dg_name*] `|` `-dg` *dg_name* You must name the top-level entity that you are creating. You do not need to supply names for any underlying entities. If you do not supply names for the underlying entities, SnapDrive for UNIX creates them with internally generated names. If you specify that SnapDrive for UNIX create a file system, you must specify a type that SnapDrive for UNIX supports with the host LVM. These types include `ext4` or `ext3` The option `-fsopts` is used to specify options to be passed to the host operation that creates the new file system; for example, `mkfs`.
ig_name	The name of an initiator group.

long_filer_path	A path name that includes the storage system name, volume name, and possibly other directory and file elements within that volume. The following are examples of long path names:
	`test_filer:/vol/vol3/qtree_2`
	`10.10.10.1:/vol/vol4/lun_21`

long_lun_name	A name that includes the storage system name, volume, and LUN name. The following is an example of a long LUN name: `test_filer:/vol/vol1/lunA`

Argument	**Description**

long_snap_name	A name that includes the storage system name, volume, and Snapshot copy name. The following is an example of a long Snapshot copy name: `test_filer:/vol/account_vol:snap_20040202`
	With the `snapdrive snap show` and `snapdrive snap delete` commands, you can use the asterisk (*) character as a wildcard to match any part of a Snapshot copy name. If you use a wildcard character, you must place it at the end of the Snapshot copy name. SnapDrive for UNIX displays an error message if you use a wildcard at any other point in a name.
	Example: This example uses wildcards with both the `snap show` command and the `snap delete` command: `snap show myfiler:/vol/vol2:mysnap*`
	`myfiler:/vol/vol2:/yoursnap* snap show myfiler:/vol/vol1/qtree1:qtree_snap* snap delete 10.10.10.10:/vol/vol2:mysnap* 10.10.10.11:/vol/vol3:yoursnap* hersnap`
	Limitation for wildcards: You cannot enter a wildcard in the middle of a Snapshot copy name. For example, the following command line produces an error message because the wildcard is in the middle of the Snapshot copy name:
	`banana:/vol/vol1:my*snap`

lun_name	The name of a LUN. This name does not include the storage system and volume where the LUN is located. The following is an example of a LUN name: *lunA*
path	Any path name.
prefix_string	prefix used in the volume clone's name generation
s_lun_name	Indicates a LUN entity that is captured in the Snapshot copy specified by *long_snap_name*.

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