Quest® NetVault® SmartDisk 11.4.5
Administrator's Guide

Legend

■ **WARNING: A WARNING icon indicates a potential for property damage, personal injury, or death.**

❗ **CAUTION: A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.**

ℹ **IMPORTANT NOTE**, **NOTE**, **TIP**, **MOBILE**, or **VIDEO:** An information icon indicates supporting information.

NetVault SmartDisk Administrator's Guide
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- NetVault SmartDisk: at a glance
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NetVault SmartDisk: at a glance

NetVault SmartDisk's disk-based backup and data-deduplication option reduces storage costs with its powerful byte-level, variable-block-based software deduplication, which packs up to 12 times more protected data into the same storage area for a 92 percent reduction in storage footprint. Hardware costs are reduced by using existing storage infrastructure instead of requiring specific drives or appliances. Integration with other Quest Data Protection products, such as NetVault® Backup and vRanger®, speeds deployment while simplified ease-of-use reduces the level of storage expertise required to perform deduplicated disk-based backups.

To shrink backup windows with no additional affect on protected-server resources, you can schedule NetVault SmartDisk's post-process deduplication option outside the backup window.

With NetVault SmartDisk, you have more choices, including the ability to deploy multiple NetVault SmartDisk Instances to improve load balancing and performance; copy or move data between NetVault SmartDisk Instances, to VTL, or to tape-based devices to place redundant backups in offsite locations for failover and disaster-recovery purposes.

Key benefits

- **Reduces storage costs**: NetVault SmartDisk reduces storage costs with its byte-level, variable-block-based deduplication option. This option packs up to 12 times more protected data into the same storage area. It accomplishes this optimization by analyzing smaller amounts of data, thus avoiding the problem that occurs when fixed blocks mask changes and store duplicate data as unique.

  NetVault SmartDisk is hardware-agnostic and works on most file systems, so hardware costs are reduced by using the existing storage infrastructure instead of requiring you to acquire specific drives or appliances. The ability to add more file-system paths to NetVault SmartDisk Storage Pools reduces costs by deferring storage expenditures into budget periods when costs are lower or budget restraints may be eased and also ensures that storage does not sit unused.

  Data stored in NetVault SmartDisk can have individual retention policies, which gives you the flexibility to store the most recent copies on disk and move older data to an offsite location or to less expensive storage. This option provides a foundation for Lifecycle Management, which further reduces costs with tiered-storage deployments.

- **Shrinks backup windows**: To shrink backup windows with no additional affect on protected-server resources, you can schedule NetVault SmartDisk's post-process deduplication option outside the backup window.

Even if you do not use the optional NetVault SmartDisk deduplication feature, you still receive all the advantages of disk-based backup. For example, you can perform more simultaneous backups with disk than you can by writing backups to tape in a serial process. Completing your backups faster ensures that the performance of the application, database, and files servers is not impacted during business hours by overrunning backup windows.

- **Maximizes flexibility**: You can deploy multiple NetVault SmartDisk Instances to distribute network, disk, and deduplication resources, which improves load balancing and performance. Shared-storage support lets you share disk-based backup storage across heterogeneous platforms, which provides a single data-protection solution.

- **Speeds restores**: NetVault SmartDisk improves restore times because the data is coming from random-access storage without having to find and mount tapes, and then search for the correct tape position. Most restore requests come in the first 14 to 30 days after backup. With disk-based backup, you can minimize downtime with shorter Recovery Time Objectives, and you can focus on other critical tasks.

Feature list

- Simplified disk-based backup

- Byte-level, variable-block software-based deduplication

- 12-to-1 deduplication ratio

- Hardware agnostic

- Post-process deduplication

- Rapid deployment with existing infrastructure

- Seamless integration with other products, such as NetVault Backup and vRanger

- Job-level deduplication

- Shared-storage support

- Easily extendible

- Retention-policy support

- Heterogeneous-platform support

- Web-based Distributed Authoring and Versioning (WebDAV)-authenticated access

Target audience

This guide is intended for backup administrators and other technical personnel who are responsible for designing and implementing a backup strategy for the organization. A good understanding of the operating system (OS) on which NetVault SmartDisk is running is assumed.

Recommended additional reading

The following documentation is also available:

- *Quest NetVault SmartDisk Installation/Upgrade Guide*: This guide describes how to install NetVault SmartDisk.

- *Quest NetVault Backup Compatibility Guide*: This guide lists the operating systems and versions supported by NetVault SmartDisk.

You can download these guides from https://support.quest.com/technical-documents.

Integrating NetVault SmartDisk with your backup product

- Integration: an overview
- Verifying that the client ports are open
- Adding devices to your software product

Integration: an overview

NetVault SmartDisk integrates with most products by adding a NetVault SmartDisk Instance to your product as a backup device—a NetVault SmartDisk Device—that you can target for backups and restores.

NetVault SmartDisk uses the transmission control protocol (TCP) to communicate with your product.

Verifying that the client ports are open

Quest recommends that you verify that the ports are open between the backup clients and the system on which NetVault SmartDisk is installed.

To verify that the ports are open, you can use a wget command, a web browser, or a different method of your choice. If the port is open, the command returns the status information.

In the following examples, replace *<port#>* with the applicable port number, and replace *<hostName>* with the IP address of the machine on which NetVault SmartDisk is installed.

Using the wget command

1 On the system on which NetVault SmartDisk is installed, type:

```
wget http://<localhost>:<port#>/proc/dedupe/stats.stnz
```

2 On each client that targets backups to the NetVault SmartDisk Device, type:

```
wget http://<hostName>:<port#>/proc/dedupe/stats.stnz
```

Using a web browser

1 On the system on which NetVault SmartDisk is installed, type:

```
http://<localhost>:<port#>/proc/dedupe/stats.stnz
```

2 On the system on which the backup server or client software is installed, type:

```
http://<hostName>:<port#>/proc/dedupe/stats.stnz
```

Adding devices to your software product

After you have installed NetVault SmartDisk, you must add it as a backup device in your software product before you can target it for backups and restores. For more information, see the documentation that came with your backup software.

> **NOTE:** NetVault SmartDisk does not support the NDMP Backup Restart Extension (BRE) Interface. If you are using NetVault Backup, NetVault Backup automatically selects a different device if BRE is selected on the **NetVault Guide Configuration** page.

Using the command-line interface (CLI)

- NetVault SmartDisk CLI: an overview
- Accessing command help
- Using CLI commands
- Processing basic shell commands

NetVault SmartDisk CLI: an overview

Configuration and administration of NetVault SmartDisk is handled primarily through the NetVault SmartDisk CLI. Using the **smartdisk.sh** shell on Linux, UNIX, and Mac OS X, or the **smartdisk.bat** shell on Windows, you can perform basic functions such as accessing help regarding the available commands, and configuring, monitoring, starting, and stopping NetVault SmartDisk. On Windows, the .bat extension is optional. To eliminate the requirement to specify the extension on Linux, UNIX, and Mac OS X, NetVault SmartDisk uses a symbolic link from **smartdisk** to **smartdisk.sh**.

The basic structure is:

```
…/foundation/bin/smartdisk <command>
```

Also, if you specify a full path on Windows, you can use forward slashes (/) instead of backward slashes (\). Otherwise, use backward slashes.

To simplify the commands and code samples shown throughout this document, forward slashes are used and the **.sh** and **.bat** extensions are not shown. Also, an ellipsis (…) represents the path to where you installed NetVault SmartDisk. Replace the ellipsis with the applicable information.

To use a Run as Administrator command prompt, perform the following steps.

1 Click **Start**, and select **Run**.

2 On the **Run** dialog box, type **cmd**, and press **Ctrl+Shift+Enter**.

3 If you receive a confirmation prompt, click **Continue**.

The **Administrator Command Prompt** is displayed.

Accessing command help

1 Initiate a terminal session, or open a command prompt.

2 Type:

```
…/foundation/bin/smartdisk help
```

NetVault SmartDisk displays a list of the available options and an explanation of how to use them.

Using CLI commands

The following table lists all the commands in alphabetical order. Unless specified otherwise, the command is available on all systems.

Table 1. Available commands

Command	Description	Available on
config	Displays and modifies the NetVault SmartDisk configuration. For more information, see Using the config command options.	All
dump	Places a copy of all relevant files into a compressed file. For more information, see Dumping NetVault SmartDisk-related information to a compressed file.	All
help	Displays a complete list of the NetVault SmartDisk commands supported on the NetVault SmartDisk platform.	All
license	Installs a license key. For more information, see the *Quest NetVault SmartDisk Installation/Upgrade Guide*.	All
logs	Displays the NetVault SmartDisk logs, which are used for diagnosis.	All
password	Lets you change the name or password, or both, of the nonprivileged user that was stored when you originally installed NetVault SmartDisk. If you change the nonprivileged user name or password after installation, use this command to change it in NetVault SmartDisk as well.	Windows only
restart	Stops and restarts the NetVault SmartDisk Services. Run as a Root-Level or Administrator User.	All
start	Starts the NetVault SmartDisk Services. Run as a Root-Level or Administrator User.	All
stats	Displays NetVault SmartDisk statistics that you can use to monitor NetVault SmartDisk performance. For more information, see Viewing statistics.	All
status	Indicates whether the NetVault SmartDisk Services are running.	All
stop	Stops the NetVault SmartDisk Services.	All
uninstall	Removes the NetVault SmartDisk software binaries. Run as a Root-Level or Administrator User. For more information, see the *Quest NetVault SmartDisk Installation/Upgrade Guide*.	All except Solaris and Windows
version	Displays the current version of NetVault SmartDisk that is installed.	All

Processing basic shell commands

The following sections list the common commands that you might use.

- Determining the status of services
- Starting services
- Stopping services
- Restarting services
- Viewing log files
- Dumping NetVault SmartDisk-related information to a compressed file

Determining the status of services

1 Initiate a terminal session, or open a command prompt.

2 Type:

`…/foundation/bin/smartdisk status`

If NetVault SmartDisk services are running, NetVault SmartDisk displays:

`Percolator slave is listening`

If NetVault SmartDisk Services are not running, NetVault SmartDisk displays:

`Failed to connect to percolator slave`

Starting services

1 Initiate a terminal session, or open a command prompt.

2 As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

`…/foundation/bin/smartdisk start`

NetVault SmartDisk starts the NetVault SmartDisk Services.

`Services started ok.`

> **i** | **NOTE:** On Windows, you can also start the NetVault SmartDisk Services by clicking **Start >
> Settings > Control Panel > Administrative Tools > Services** and starting **Foundation Services ID
> *<NetVaultSmartDiskInstanceID>*.**

Stopping services

1 Initiate a terminal session, or open a command prompt.

2 Type:

`…/foundation/bin/smartdisk stop`

NetVault SmartDisk stops the NetVault SmartDisk Services. You might see the following message.

`Services stopped ok.`

> **i** | **NOTE:** On Windows, you can also stop the NetVault SmartDisk Services by clicking **Start >
> Settings > Control Panel > Administrative Tools > Services** and stopping **Foundation Services
> ID *<NetVaultSmartDiskInstanceID>*.**

Restarting services

To stop and start the services automatically, perform the following steps.

1 Initiate a terminal session, or open a command prompt.

2 As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

3 Type:

`…/foundation/bin/smartdisk restart`

NetVault SmartDisk stops and restarts the NetVault SmartDisk Services.

`Services stopped ok.`
`.`

```
Services started ok.
```

Viewing log files

1   Initiate a terminal session, or open a command prompt.

2   Type:

```
…/foundation/bin/smartdisk logs
```

NetVault SmartDisk displays the NetVault SmartDisk Logs and all relevant information. When you run **logs** without any options, it displays all NetVault SmartDisk log entries.

3   To display specific information, use one of the following options:

Logs option	Description
`--file <pathToFile>`	Displays the contents of the specified file.
`--help`	Displays a list of the available options and an explanation of how to use them.
`--last-hours <x>`	Displays the records for the specified number of hours.
`--time-interval <yyyy-mm-dd-hhmmss yyyy-mm-dd-hhmmss>`	Displays the records for the specified timeframe.

You can also view logs through the applicable OS-based location.

• To view the logs in Windows, use the **Event Viewer**.

• To view the logs on Linux, UNIX, or Mac OS X, look for messages in the **/var/log** directory.

Dumping NetVault SmartDisk-related information to a compressed file

Use the **dump** command to place a copy of all relevant files in a compressed file, which you can then forward to Quest for evaluation of a case. Include release information, .cfg files, and log information in the compressed file. On Linux, UNIX, and Mac OS X, use a Root-Level or Administrator User to run this process; on Windows, use a user with administrative privileges to increase the amount of information collected.

> **i** | **NOTE:** On Windows platforms, running the **dump** command includes any installation-related logs created by the same user; therefore, if installation-related logs are required for collection, the user that runs the **dump** command must be the same user that completed the installation.

1   Initiate a terminal session, or open a command prompt.

2   As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

```
…/foundation/bin/smartdisk dump <PathAndFileName>.tar.gz
```

NetVault SmartDisk processes the dump command, copies the applicable files to the specified location, and compacts them into one compressed file.

Configuring NetVault SmartDisk

NetVault SmartDisk Configuration: an overview

You can use the NetVault SmartDisk CLI **config** command to perform tasks such as:

* Enabling deduplication.

* Enabling deduplication compression.

* Configuring the deduplication window.

* Configuring Garbage Collection.

* Extending NetVault SmartDisk Storage Pools by adding more volumes.

Using the config command options

Before using the NetVault SmartDisk CLI **config** command, note the following:

* All times are displayed in the local time for the machine where the NetVault SmartDisk Instance is installed.

* With the **--volume** and **--pool** options, the *<path>* and *<label>* strings are case-sensitive because they identify a specific NetVault SmartDisk Storage Pool or Volume.

* If a configuration-related command fails and displays a message similar to "Failed to apply configuration," Quest recommends that you use the **config** command with the **--show** option to display the current configuration. After displaying the configuration, double-check the case of the specified NetVault SmartDisk Storage Pool or Volume to ensure that the strings reflect the case-sensitivity.

* The NetVault SmartDisk Services must be running before you can use the **config** command and most of the options. To view the options that are available, you can use the **--help** option while NetVault SmartDisk Services are offline.

The NetVault SmartDisk CLI **config** command supports the following options:

Table 1. Options supported by config

Config option	Description
`--help`	Displays a list of the **config** command options and their syntax.
`--show`	Displays the current values for the NetVault SmartDisk configuration.
`--dedupe-enable` `<TRUE|FALSE>`	Enables or disables NetVault SmartDisk Deduplication. Deduplication is disabled for all backup jobs even if deduplication is enabled for the backup job and the NetVault SmartDisk Instance is licensed for the NetVault SmartDisk Deduplication Option.
`--dedupe-compression` `<TRUE|FALSE>`	Enables or disables compression of NetVault SmartDisk-unique Chunks. Disabled by default, compressing unique Chunks can reduce their storage footprint up to 50 percent. Compression is performed on the unique Chunks that result from the deduplication process. Compressing the initial Full Backup for a data set might take longer than not compressing the unique data because most of the data is considered unique. Subsequent Full Backups have fewer unique Chunks and do not experience an increase in the time it takes to complete the deduplication and compression process.
`--gc-enable <TRUE|FALSE>`	Enables or disables NetVault SmartDisk Garbage Collection. Garbage Collection is enabled unless you disable it by using this option. Disabling Garbage Collection overrides the existing Garbage Collection Window configuration. When it is disabled, it does not run even if it is required and the Deduplication Engine is available. This setting remains in effect—persists—following a NetVault SmartDisk restart.
`--add|--delete --dedupe-window` `<[Sun|Mon|Tue|Wed|Thu|Fri|Sat-]HH:MM-HH:MM>|<Never|Anytime>`	Sets the deduplication window by specifying the times that deduplication can be performed. By default, the deduplication window is set to Anytime. Available parameters include: • **Days of Week**: Specifies the days of the week on which the deduplication process runs. You can schedule it to run on multiple days, such as Monday, Wednesday, and Friday. • **HH:MM-HH:MM**: Using a 24-hour clock, specifies the times of day at which the deduplication process runs. • **Never**: Disables the deduplication window. Backups enabled for deduplication remain in the **Staging Store** in a nondeduplicated state until the deduplication window is enabled. • **Anytime**: Enables the deduplication process to be run at any time. Deduplication for a backup data stream begins after the initial 400 GB has been written to the **Staging Store**, which can provide nearly inline deduplication performance.
`--add|--delete --gc-window` `<[Sun|Mon|Tue|Wed|Thu|Fri|Sat-]HH:MM-HH:MM>|<Never|Anytime>`	Sets the Garbage Collection window by specifying the times that NetVault SmartDisk Garbage Collection has priority over deduplication. By default, the Garbage Collection window is set to 18:00 through 06:00 for every night. Available parameters include: • **Days of Week**: Specifies the days of the week on which the Garbage Collection process runs. You can schedule it to run on multiple days, such as Monday, Wednesday, and Friday. • **HH:MM-HH:MM**: Using a 24-hour clock, specifies the times of day at which the Garbage Collection process runs. • **Never**: Disables the Garbage Collection window. • **Anytime**: Enables the Garbage Collection process to be run at any time.
`--dedupe-active-limit` `<Unlimited|limit>`	Specifies the maximum number of segments that can be deduplicated simultaneously.

Table 1. Options supported by config

Config option	Description
`--network-capacity <MBps>`	Specifies the capacity, in megabytes per second (MBps), of the network between the NetVault SmartDisk Device and the backup clients. The NetVault SmartDisk Random Access Store (RAS) Controller uses this figure when it calculates the NetVault SmartDisk Device availability score. The availability score is calculated by comparing the current throughput and comparing it to maximum capacity. The RAS Controller reports the availability score to your backup software.
`--stream-limit <limit>`	Specifies the number of data streams that can be processed simultaneously.
`--add|--update --volume <path> [Parameters]`	Extends NetVault SmartDisk Storage Pools by adding or updating existing volumes in the NetVault SmartDisk Storage Pools. For more information, see *Extending NetVault SmartDisk Storage Pools*.
`--add|--update --webdav <port> [--block-size <bytes>] [--credentials] [--preferred-address <address>]` `--add|--update --ndmp [--port <port>] [--block-size <bytes>] [--credentials] [--preferred-address <addresses>]`	Modifies the port that the NetVault SmartDisk Device uses to communicate with the backup clients or NDMP Devices. For more information, see *Modifying the data port*.
`--delete --webdav <port> [--credentials]` `--delete --ndmp --port <port>`	Used with --add, modifies the port that the NetVault SmartDisk Device uses to communicate with the backup clients or NDMP Devices. For more information, see *Modifying the data port*.
`--update --remote-port <port>`	Modifies the port that the NetVault SmartDisk Device uses to communicate with the backup software. For more information, see *Modifying the messaging port*.
`--write-md5 <Always|Never|BasedOnHttpHeader>`	Indicates when to calculate MD5 checksum for data streams written to NetVault SmartDisk.

Configuring Garbage Collection

NetVault SmartDisk must balance its time between deduplicating new backup streams and performing Garbage Collecting of unreferenced Chunks from retired backups. If you are using deduplication and Garbage Collection, Quest recommends that you use following guidelines to establish your settings:

- Using your hardware as the guideline, tune the number of deduplication processes that run in parallel:

    - For each Staging volume, cap the number of associated deduplicators to the number of disks in the corresponding RAID, making sure to exclude parity disks. For example, for a RAID 5 of eight disks, you would set the cap to 7. For more information, see the description for **--dedupe-cap** under Extending NetVault SmartDisk Storage Pools.

    - Verify that the overall limit, which is independent from volumes, is adhered to. Use the **--dedupe-active-limit** option to specify the maximum number of segments that can be simultaneously deduplicated to match the number of processor cores, up to a practical maximum of 16. For more information, see the description for **--dedupe-active-limit** under Using the config command options.

- For new and upgraded installations of NetVault SmartDisk, update the Garbage Collection window to match the backup window. You might also consider setting Garbage Collection to start approximately 30

minutes before backups start, which discourages new deduplication processes from starting and overlapping with the backup window.

- The default Chunk-page size for Garbage Collection is 256 MB. Before v1.6, the default was 64 MB. The larger Chunk page size supports faster Garbage Collection counting, due to less Chunk-page metadata input and output. The default settings of the Garbage Collection window and Chunk-page size are *not* changed during upgrades. Generally, Quest recommends that you leave the Chunk-page size at its current setting.

Additional guidelines

Quest recommends that you use the default setting of **Anytime** for the deduplication window, and that you adjust the Garbage Collection windows to match your backup windows. Starting with v1.6, the default Garbage Collection window for new installations is from 18:00 through 06:00 every night. As indicated previously, you might consider setting Garbage Collection to start 30 minutes before backups start.

To review the current settings, use the following command:

…/foundation/bin/smartdisk config --show

For example, if your backup window is 00:00-04:00, consider setting your Garbage Collection window to 23:30-04:00. First delete the current setting, and then add the new setting:

…/foundation/bin/smartdisk config --delete --gc-window Sun-18:00-06:00

…/foundation/bin/smartdisk config --add --gc-window Sun-23:30-04:00

On average, Garbage Collection needs one-third of each day, or week, which leaves the remaining two-thirds for deduplication. The Garbage Collection window indicates when Garbage Collection has *priority* over deduplication—it does not mean that Garbage Collection runs only during this time. Garbage Collection might also run outside the Garbage Collection window.

Deduplication processes are only started within the deduplication window, which is why Quest recommends that you leave this setting at Anytime. Individual deduplication processes run until they are finished, while Garbage Collection can be interrupted automatically to start deduplications. By using the per-volume **--dedupe-cap**, NetVault SmartDisk automatically schedules deduplications to start when it is not busy receiving backups. Garbage Collection is started only when it is required, and when it has priority. After retirements, Manifests have been marked for deletion, Garbage Collection is required. Starting with v1.6, NetVault SmartDisk also recognizes that Garbage Collection counting work is required after any deduplications have completed—new Manifests have been added.

After all deduplications have completed, NetVault SmartDisk waits for five minutes—the default Inactivity Timeout of 300 seconds—before starting Garbage Collection. This delay prevents Garbage Collection from starting and getting interrupted almost immediately, which would clutter the logs. However, it also means that NetVault SmartDisk is not performing work during that time, unless it is receiving backups. Therefore, it is important to the overall deduplication throughput that the Garbage Collection window is not longer than it must be.

Extending NetVault SmartDisk Storage Pools

You can extend NetVault SmartDisk physical capacity by adding or updating the volumes specified for the NetVault SmartDisk Storage Pools. To extend the NetVault SmartDisk physical capacity, use the **config --add|--update --volume <path>** command. You can also use the following additional parameters:

> **i** | **NOTE:** The NetVault SmartDisk Nonprivileged User must have access to any volumes that are added to ensure that configuration changes are successfully applied.

Table 2. Available parameters

Config volume parameters	Description
`--volume <path>`	Specifies the path for the file-system path of the volume to be used as a NetVault SmartDisk Storage Pool. You can specify local drives or Universal Naming Convention (UNC) paths for Common Internet File System (CIFS), Network File System (NFS), and Storage Area Network (SAN). If the volume is on a mounted file system, verify that the specified path is a valid subdirectory on the mounted file system, and not the mounted directory itself. This path ensures that data is not written to the local directory if the mounted location is unavailable.
`[--volume-size <%>]`	Specifies the percentage of the volume that NetVault SmartDisk *can* use; the remainder *cannot* be used by NetVault SmartDisk. The value of **((100 - X) / 100) * (total volume size)** is added to the **Last Resort Threshold** (LRT). In addition, a small amount of storage is reserved to complete Garbage Collection. These three components of reserved storage determine the total storage set aside that cannot be directly used by NetVault SmartDisk. For example, if **volume-size** is set to 30 and the volume's size is 100 GB, 70 GB is set aside—in addition to the LRT and Garbage Collection reserve space—and NetVault SmartDisk cannot use it.
`[--dedupe-cap <Unlimited|cap>]`	Specifies the maximum number of backup segments for the specific volume that can be deduplicated simultaneously. Defaults to 4.
`[--pool <label>]`	Specifies the Label assigned to the Storage Pool. Defaults to a system-generated numeric label. To add the volume to an existing Storage Pool, specify an existing Storage Pool label. To create a Storage Pool, specify a new name.
`[--reservation-size <bytes>]`	Specifies the number of bytes reserved by the processes streaming data into NetVault SmartDisk. A smaller size results in NetVault SmartDisk having to reserve space more frequently; a larger size renders more disk space temporarily unavailable. If the **Space.Available**—reported through the **show** option—is less than the **reservation-size**, the volume is considered FULL.
`[--favour <Staging|Storage|"Chunk Index"|"Disk Index"|All|None>]…`	Specifies which Storage Pool Roles the volume is available to perform. To specify multiple roles, list the **--favour** parameter multiple times. For example: `--favour Staging --favour "Disk Index"` Use with **--deny** to dedicate a volume to one or more roles.

Table 2. Available parameters

Config volume parameters	Description

`[--deny`
`<Staging|Storage|"Chunk`
`Index"|"Disk`
`Index"|All|None>]…`
	Specifies which Storage Pool Roles the volume is ***not*** available to perform. To specify multiple roles, list the **--deny** parameter multiple times.
	
	For example:
	
	`--deny Storage --favour "Chunk Index"`
	
	Use with **--favour** to dedicate a volume to one or more roles.
	
	NOTE: After NetVault SmartDisk uses a volume as a Chunk Index or Content Index, that is, data has been staged or stored, NetVault SmartDisk continues to use the volume for this purpose, even if this parameter is used to deny it.

`[--balancing` `<Space|Activity|None>]`	Instructs NetVault SmartDisk to use the volume with either the most space available or the least activity occurring. If used with **--favour** and **--deny**, **--balancing** is applied last. **NOTE:** The **--balancing** parameter provides guidance to NetVault SmartDisk; the NetVault SmartDisk Disk Manager and Deduplicator make the final decision about how to allocate space.
`[--account <UNC-path-` `account>]`	Required for Windows platform when specifying UNC paths. Specifies the user account with read and write permissions to the UNC path.
`[--password <UNC-path-` `password>]`	Required for Windows platform when specifying UNC paths. Specifies the password for the user account with read and write permissions to the UNC path. This password is case-sensitive.

Adding a volume

- To add a volume that is used for all roles, enter the following command:

```
…/foundation/bin/smartdisk config --add --volume
   \mnt /<newNetVaultSmartDiskVolume>
```

The NetVault SmartDisk configuration is updated.

```
Configuration applied
```

- To add a volume dedicated to the **Chunk Store**, enter the following command:

```
…/foundation/bin/smartdisk config --add --volume c:/SDStoragePools2/Store
   --favour Storage --deny Staging --deny "Chunk Index" --deny "Disk Index"
```

The NetVault SmartDisk configuration is updated.

```
Configuration applied
```

Adding a CIFS share

The method of adding a CIFS share depends on what OS you are using.

- On Windows, NetVault SmartDisk manages the mount process and is able to work with the UNC path and account information.

- On Linux, UNIX, and Mac OS X, use the OS-based mount command—see Adding a volume—for the applicable OS to access the share, and then instruct NetVault SmartDisk what local directory to use. The owner and group for all files on the mount must be the NetVault SmartDisk nonprivileged user and group; however, if applicable, you can use a different user and password to connect to the share, as long as the files are presented as owned by the NetVault SmartDisk nonprivileged user and group.

To add a CIFS share for a Windows-based server, enter the following command:

```
…/foundation/bin/smartdisk config --add --volume
//<IPaddress>/<NetVaultSmartDiskVolume> --account <nonpriviledgedUser> --password
<nonprivilegedUserPassword>
```

The NetVault SmartDisk configuration is updated.

Updating port configuration for communication with your software

By default, NetVault SmartDisk uses port **37452** to communicate with the NetVault Backup Media Manager and **37453** to communicate with the backup clients that are streaming data to the NetVault SmartDisk Device. It also uses port **37451** for Inter Process Communication (IPC) on the loopback interface, but not for remote connections.

> **i** | **NOTE:** If you intend to use different ports, for example, you use a different product, such as NetVault Backup, Quest recommends that you make the applicable change to the port that communicates with the Media Manager *before* you add the NetVault SmartDisk Device to your software; otherwise, you must remove the NetVault SmartDisk Device from your software and add it back in again. You can update the port that communicates with your software at any time.

If you use Network Data Management Protocol (NDMP) with NetVault SmartDisk, the default range of communication ports is **37454–38453**. NetVault SmartDisk only monitors these ports when media for an NDMP transfer is requested. If more than one NDMP port is provided, NetVault SmartDisk first attempts to listen to the first port that you set; if that port is busy, that is, it is already in use for a different NDMP transfer, NetVault SmartDisk checks the next port in the list. The number of NDMP ports determines how many NDMP transfers can occur simultaneously. After an NDMP transfer finishes, NetVault SmartDisk stops listening to the applicable port.

If you use NDMP, the *<port>* variable can contain any of the following:

- One port number; for example, 37454
- A list of port numbers; for example, 37454, 37455, 37456
- A range of port numbers; for example, 37454-37456
- A combination of the preceding options; for example, 37454, 37460, 37470-37479

> **i** | **NOTE:** If you use any option other than the individual port number, use quotation marks to specify the ports in the command line, for example, --port "37454, 37460, 37470-37479".

Modifying the messaging port

If you want to use a different port, complete the following steps.

1 Initiate a terminal session, or open a command prompt.

2 As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

```
…/foundation/bin/smartdisk config
```

NetVault SmartDisk displays the list of options and parameters that you can use, including the section for configuring the remote port.

3 To use a different port, type:

```
…/foundation/bin/smartdisk config --update --remote-port <port>
```

Replace *<port#>* with the port that you want to use.

Modifying the data port

If you want to use a different port to communicate with the clients—including NDMP Devices—that stream data to the NetVault SmartDisk Device, complete the following steps.

> **IMPORTANT:** You cannot add a port that exists. If you try to add an existing port, you see a "Failed to apply configuration" message. Before attempting to add a port, use the **config --show** command option to view existing information.

1   Initiate a terminal session, or open a command prompt.

2   As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

```
…/foundation/bin/smartdisk config
```

NetVault SmartDisk displays the list of options and parameters that you can use, including the sections for configuring the ports:

```
config --add|--update --webdav <port> [--block-size <bytes>]
[--preferred-address <address>] [--credentials] [--authlifetime
  = <ValueInSeconds>]
```

```
config --add|--update --ndmp [--port <port>] [--block-size <bytes>]
[--preferred-address <address>] [--credentials]
```

You can use **--block-size** to define the block size used to read and write blocks when streaming data to the **Staging Store**. You can use **--preferred-address** to define the primary IP address that clients should use when communicating with the NetVault SmartDisk Device. You can use **--credentials** to enable authentication and define the authorized user and password. You can use **--authlifetime** to specify a lifetime value for nonce reuse, which allows credentials to be reused across multiple connections— NetVault SmartDisk implements a new nonce for every connection if the value is 0 or is blank.

3   If you are modifying port information for a non-NDMP device, complete any of the following:

- To add a port, type:

  ```
  …/foundation/bin/smartdisk config --add --webdav <port#>
  ```

  Replace ***<port#>*** with the port that you want to use.

- To remove the original port, the following uses the default, type:

  ```
  …/foundation/bin/smartdisk config --delete --webdav 37453
  ```

4   If you are modifying port information for an NDMP Device, complete any of the following:

- To add new ports, type:

  ```
  …/foundation/bin/smartdisk config --add --ndmp --port <port#>
  ```

  > **NOTE:** Before using the --add option, delete the existing NDMP ports.

  Replace ***<port#>*** with the port that you want to use. The *--port <port#> segment* can contain any of the following:

    - A single port number:

      ```
      …/foundation/bin/smartdisk config --add --ndmp --port 37454
      ```

    - A list of port numbers:

      ```
      …/foundation/bin/smartdisk config --add --ndmp --port "37454, 37455"
      ```

    - A range of port numbers:

      ```
      …/foundation/bin/smartdisk config --add --ndmp --port "37460-37469"
      ```

    - A combination of the preceding options:

      ```
      …/foundation/bin/smartdisk config --add --ndmp --port "37454,
          37455, 37460-37469"
      ```

> **NOTE:** To specify more than one port, enclose the port numbers in quotation marks.

- To remove the original port for an NDMP Device, type:

  ```
  …/foundation/bin/smartdisk config --delete --ndmp
  ```

5 To verify that the new port has been added and the original has been removed, type:

```
…/foundation/bin/smartdisk config --show
```

NetVault SmartDisk displays results similar to the following example for a non-NDMP device:

```
[Interface:Data]
Block Size = <blockSize>
Credentials = <Name:MaskedPassword>
Port = <NewPort#, NewPort#>
Authorization Lifetime = <ValueInSeconds>]
Type = WebDAV
```

NetVault SmartDisk displays results similar to the following example for an NDMP Device:

```
[Interface:Data]
Port = <NewPort#>
Preferred Contract Address =
Block Size = <blockSize>
Type = NDMP
```

Enabling or updating authentication for WebDAV access

If you want to enable authentication for WebDAV access of NetVault SmartDisk for the data port, complete the following steps to specify the credentials. NetVault SmartDisk uses digest-access authentication, specifically RFC 2069. You can also use this same procedure to update existing credentials.

> **NOTE:** For the user name in the WebDAV credentials, NetVault SmartDisk currently supports the use of any ASCII characters except the quotation mark ("), comma (,), and colon (:). The are no restrictions for the corresponding password.
>
> If you intend to use the NetVault Backup **Use optimised replication between devices that support this feature** option, available for NetVault Backup Data Copy and Duplicate operations, WebDAV authentication fails if the configured credentials are different on the source and destination NetVault SmartDisk Servers. Successful replication requires that either authentication is disabled on both instances, is enabled only on the source, or uses identical credentials on the source and destination NetVault SmartDisk Instances.

1 Initiate a terminal session, or open a command prompt.

2 As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

```
…/foundation/bin/smartdisk config
```

NetVault SmartDisk displays the list of options and parameters that you can use, including the section for configuring authentication:

```
config --add|--update --webdav <port> [--block-size <bytes>]
   [--preferred-address <address>] [--credentials]
   [--authlifetime = <ValueInSeconds>]
```

3 To define the credentials, type:

```
…/foundation/bin/smartdisk config --update
--webdav <port#> --credentials
```

Replace ***<port#>*** with the port that you are using.

4   When the **Username** prompt is displayed, enter the user name that should be used for access, and press **Enter**.

5   When the **Password** prompt is displayed, enter the password associated with the specified user name, press **Enter**, enter the password again when the **Confirm Password** prompt is displayed, and press **Enter** again.

NetVault SmartDisk displays results similar to the following example:

```
./smartdisk config --update --webdav 37453 --credentials
Username: NetVault SmartDiskuser
Password:
Confirm Password:
Configuration applied
```

6   In your backup software, configure the same credentials for backups and restores to the NetVault SmartDisk Instance.

If you are using NetVault Backup, authentication is not required to add NetVault SmartDisk, but it is required for performing backups and restores that use NetVault SmartDisk as the target. For more information about configuring credentials in NetVault Backup, see the *Quest NetVault Backup Administrator's Guide*.

Disabling WebDAV authentication

1   Verify that no backup or restore jobs are currently active.

2   Initiate a terminal session, or open a command prompt.

3   As the root user or using sudo on Linux, UNIX, or Mac OS X, or as an administrator on Windows, type:

```
…/foundation/bin/smartdisk config --delete --webdav <port> --credentials
```

4   When the prompt is displayed that asks for the current WebDAV credentials, enter the applicable name and password.

5   To verify that the port has been defined correctly, type:

```
…/foundation/bin/smartdisk config --show
```

NetVault SmartDisk displays results similar to the following example:

```
[Interface:Data]
Block Size = 32768, B
Port = 37453
Authorization Lifetime = 0
Type = WebDAV
```

Changing a user name or password (Windows only)

To change the name or case-sensitive password, or both, of the nonprivileged user on Windows platforms, complete the following steps:

> **i** | **IMPORTANT:** Changing the nonprivileged user affects the number of people who have read- and write-access to the Windows Application log. For more information, see the **Authentication requirements** topic in the *Quest NetVault SmartDisk Installation/Upgrade Guide*.
> The password is case-sensitive.

1   If you are changing a user name, stop the NetVault SmartDisk Services.

For more information, see Stopping services.

2   Initiate a terminal session, or open a command prompt.

3   As an administrator on Windows, type the following:

    …/foundation/bin/smartdisk password *<userName> <password>*

    For example:

    …/foundation/bin/smartdisk password NetVault SmartDiskUser NewPassword

4   If you changed the user name, start the NetVault SmartDisk Services.

    For more information, see Starting services.

Reviewing the existing configuration

To review the NetVault SmartDisk configuration, enter the following command:

…/foundation/bin/smartdisk config --show

The NetVault SmartDisk configuration is displayed, including the following details on the Storage Pool volumes:

```
[SmartDisk:Volume]
Storage Pool = Store
Location = c:\SDStoragePools2\Store
Disk Manager Index = TRUE
Space.Limit = 100, %
Space.Reservation Size = 1073741824, B
Favour = Storage, Chunk Index, Disk Index
Deny = Staging
Balancing = Activity
Space.OS.Available = 17928032256, B
Space.Available = 15175759872, B
Space.Staging.Status = Not Configured
Space.Staging.Available = 0, B
Space.Staging.Reserved = 0, B
Space.Last Resort = 2752272384, B
Data.Staged = 0, B
Deduplication Activity Cap = 4
Active Operations = 0

[SmartDisk:Volume]
Storage Pool = Staging Pool
Location = c:\SDStoragePools2\Stage
Disk Manager Index = FALSE
Space.Limit = 100, %
Space.Reservation Size = 1073741824, B
Favour = Staging
Deny = Storage, Chunk Index, Disk Index
Balancing = Activity
Space.OS.Available = 3681370112, B
Space.Available = 2607628288, B
Space.Staging.Status = Available
Space.Staging.Available = 2607628288, B
Space.Staging.Reserved = 0, B
Space.Last Resort = 1073741824, B
Data.Staged = 0, B
Deduplication Activity Cap = 4
Active Operations = 0
```

Monitoring performance

- • Performance monitoring: an overview
- • Viewing statistics
- • Calculating the Deduplication Ratio
- • Calculating the reduction in the storage footprint
- • Monitoring activity on configured volumes

Performance monitoring: an overview

NetVault SmartDisk lets you monitor its performance and to calculate the following statistics:

- • Deduplication Ratio
- • Disk Space Savings

Viewing statistics

You can view NetVault SmartDisk statistics from a terminal session, command prompt, or browser.

Viewing statistics in a terminal session or command prompt

1 Initiate a terminal session, or open a command prompt.

2 Type:

```
…/foundation/bin/smartdisk stats
```

NetVault SmartDisk displays the statistics described under Reviewing the list of statistics.

Viewing statistics in a browser

In a browser, enter the following URL:
http://*<NetVaultSmartDisk_Instance_Hostname>*:*<Backup_Software_Client_Port>*/proc/stats.stnz

For example: http://10.1.0.0:37453/proc/stats.stnz

NetVault SmartDisk displays the statistics in XML format in the browser. For a description of the statistics, see Reviewing the list of statistics.

Reviewing the list of statistics

When reviewing the following list of statistics, a backup job is divided into a minimum of two segments: Segments contain either data or metadata and are smaller than 400 GB. For example, if the backup data stream is 1200 GB, the backup job has three data segments. One NetVault SmartDisk element is equivalent to one backup segment.

> **i** | **NOTE:** The status of the **Chunk Store Daemon (CSD)** affects the list of statistics displayed for the Dedupe:StatusSubsys segment.

Table 1. Statistics

Stat entry	Description
[SmartDisk:Deduplication Scheduler]	**Statistics for the process that schedules deduplication activity.**
`Elements.Queued = <No.>`	Number of segments awaiting deduplication.
`Data.Queued = <No.>, B`	Number of bytes awaiting deduplication.
`Elements.Deduplicating = <No.>`	Number of elements or backup segments currently deduplicating.
`Data.Deduplicating = <No.>, B`	Total size of elements or backup segments currently deduplicating. After all current deduplication completes, the equivalent amount of data is removed from the **Staging Store**.
`Deduplication Available = TRUE`	Displays TRUE or FALSE depending on whether the CSD is available for deduplication tasks.
`Deduplication Enabled = TRUE`	Displays TRUE or FALSE depending on whether the data-deduplication option is licensed and enabled.
`GC Enabled = TRUE`	Displays TRUE or FALSE depending on whether Garbage Collection is enabled. Disabling Garbage Collection overrides the existing Garbage Collection Window configuration. If disabled, it does not run even if it is required and the Deduplication Engine is available.
`GC Required = FALSE`	Displays TRUE or FALSE depending on whether Garbage Collection is needed. Garbage Collection is required after data has been deduplicated or retired from storage.
`GC Active = FALSE`	Indicates whether Garbage Collection is active.
`GC Start In = <No.>`	Current number of seconds remaining before Garbage Collection might start. This statistic is only displayed if **GC Required = TRUE**. Also, even if the field displays **0**, it indicates that collection can start at the next permitted opportunity; it does not indicate that it will.
[SmartDisk:RAS Controller]	**Statistics for the process that interacts with your backup software.**
`Availability Score = <No.>`	Indicates how available a backup server should consider this NetVault SmartDisk Device to be. The lower the number, the less available the NetVault SmartDisk Device is. Given a choice of two NetVault SmartDisk Devices to target a backup job to, your backup software might choose the one with the higher Availability Score. The score takes the following into account: • Number of data streams NetVault SmartDisk is receiving in or retrieving from the **Staging Store**. • Percentage of available network bandwidth that these data streams are using.

Table 1. Statistics

Stat entry	Description
Sent MBps = *<No.>*	Total megabytes per second (MBps) across all streams being sent out from NetVault SmartDisk to your backup software; that is, when a restore job is being performed.
Received MBps = *<No.>*	Total MBps across all streams being sent to NetVault SmartDisk; that is, when a backup job is targeted to a NetVault SmartDisk Device.
Machine ID = *<3-XXXX-XXX>*	Machine ID of the NetVault SmartDisk Instance that is used to obtain a permanent license key.
Soft stream limit = *<No.>*	Current maximum number of data streams or backups that your backup software can target to this NetVault SmartDisk Device simultaneously.
Version = *<NetVaultSmartDiskVersion>*	NetVault SmartDisk version
Build Level = *<NetVaultSmartDiskBuild>*	NetVault SmartDisk build
[SmartDisk:Service Manager]	**Statistics for the NetVault SmartDisk Task Manager.**
Active = 0	Total number of active NetVault SmartDisk operations.
Active.Read = *<No.>*	Current number of backup segments being read.
Active.Write = *<No.>*	Current number of backup segments being written.
Active.Delete = *<No.>*	Current number of backup segments being deleted.
Active.MkDir = *<No.>*	Not currently used.
Active.Move = *<No.>*	Not currently used.
Active.Read Properties= *<No.>*	Not currently used.
Active.Read Options= *<No.>*	Not currently used.
Active.Delete Staging= *<No.>*	Not currently used.
Active.Delete Rollback= *<No.>*	Not currently used.
Active.Rollback Element= *<No.>*	Not currently used.
[Dedupe:StatSubsys]	**Statistics for the NetVault SmartDisk Deduplication Processes.**
pages = *<No.>*	Current number of Chunk pages stored on disk. Chunks are organized into pages of Chunks. The default size of a Chunk page is a maximum of 256 MB.
chunks = *<No.>*	Total number of unique Chunks stored in the **Chunk Store** of this NetVault SmartDisk Device.
index_bytes = *<No.>*	Total number of bytes on disk used by the **Chunk Index**.

Table 1. Statistics

Stat entry	Description
`num.pages = `*`<No.>`* `num.lcp = `*`<No.>`* `num.chunks = `*`<No.>`* `num.pages_max = `*`<No.>`* `num.lcp_max = `*`<No.>`* `num.chunks_max = `*`<No.>`* `num.hits = `*`<No.>`* `num.misses = `*`<No.>`* `num.store_misses = `*`<No.>`* `num.added_pages = `*`<No.>`* `num.added_lcp = `*`<No.>`* `num.evicted_pages = `*`<No.>`* `num.evicted_lcp = `*`<No.>`* `num.cache_memory = `*`<No.>`* `csd.gc_page =`*`<No.>`* `csd.gc_pages = `*`<No.>`* `csd.gc_index_ops_done = `*`<No.>`*	For use by Quest, if necessary.
`streams = `*`<No.>`*	Total number of elements or backup segments that have been deduplicated.
`catalog_bytes = `*`<No.>`*	Total number of bytes used by a volume's catalog.
`ondisk_bytes = `*`<No.>`*	Total number of bytes on disk used by deduplicated data. Includes the bytes consumed by the **Chunk Store**, **Chunk Index,** and **Manifests**.
`gc_reserve_bytes = `*`<No.>`*	Number of bytes that NetVault SmartDisk must keep available on a file system to guarantee that Garbage Collection can take place. Increases as the size of the **Chunk Store** increases.
`stream_bytes = `*`<No.>`*	Total number of bytes submitted for deduplication.
`csd.stream_bytes = `*`<No.>`*	Total number of bytes submitted for deduplication since the NetVault SmartDisk Services were started. When a backup is retired, the size of the backups is not deleted from csd.stream_bytes.
`csd.chunk_bytes = `*`<No.>`*	Total number of bytes of unique Chunks stored since the NetVault SmartDisk Services were started.
`in_gc = `*`<No.>`*	Indicates whether Garbage Collection is happening.
`csd.gc_state = Not in GC`	The phase of Garbage Collection that is occurring.
`csd.last_successful_gc = `*`<TimeStamp>`*	Date and time stamp that indicates when Garbage Collection was last completed successfully. Displays None if collection has not yet completed.
`csd.last_stopped_gc = `*`<TimeStamp>`*	Date and time stamp that indicates when Garbage Collection was last interrupted, for example, by the deduplication process. Displays None if collection has not been interrupted.
`csd.last_failed_gc = `*`<TimeStamp>`*	Date and time stamp that indicates when Garbage Collection last failed to complete because an error occurred. Displays None if collection has not failed.

Table 1. Statistics

Stat entry	Description
`status = <currentStatus>`	Status reported by the CSD; includes Available, Unavailable, and NotConfigured. Used to determine whether the CSD is available for deduplication tasks and whether space is available.
`available_bytes = <No.>`	Total number of bytes available for storage of deduplicated data.
[SmartDisk:Disk Storage]	**Statistics for NetVault SmartDisk Disk Storage.**
`Index.Location = <…/store>`	Location of the **Staging Store** volume used for the Content Index.
`Index.Fixed = TRUE`	Displays TRUE or FALSE depending on whether the location is fixed (TRUE) or can be moved to a different location (FALSE) by using the **--favour** and **--deny** options. For more information about the **favour** and **deny** options, see Extending NetVault SmartDisk Storage Pools.
`Elements = <No.>`	Number of elements or backup segments currently residing in the Storage Pools.
`Data = <No.>, B`	Amount of data, in bytes, currently residing in the Storage Pools.
`Data.Committed = <No.>, B`	Amount of data, in bytes, that has completed the write-to-disk process.
`Space.Licensed = Unlimited`	Maximum number of front-end terabytes (TBs) that this NetVault SmartDisk Instance is licensed to protect. This information is presented in GBs. For more information about the licensing model, see the *Quest NetVault SmartDisk Installation/Upgrade Guide*. This number is the maximum amount of data a single instance of NetVault SmartDisk stores; it is not the amount of license capacity purchased.
`License.Type = <No.>`	Displays **1** for node-tied, **7** for floating, or **18** for evaluation.
`License.Expiration = <No.>`	Displays **-1** for a permanent license, or displays the number of days remaining for the existing license.
`License.Dedupe = <No.>`	Displays **1** if deduplication is licensed; otherwise, displays **0**.
`Space.OS.Available = <No.>, B`	Number of bytes available across all configured NetVault SmartDisk Storage Pools; reported by the OS.
`Space.Available = <No.>, B`	Number of bytes available across all configured NetVault SmartDisk Storage Pools. For more information about space allocation, see the applicable topic in the *Quest NetVault SmartDisk Installation/Upgrade Guide*.
`Space.Staging.Status = <CurrentStatus>`	Status of NetVault SmartDisk **Staging Store**; includes Available, Full, Unlicensed, and License Exceeded.
`Space.Staging.Available = <No.>, B`	Number of bytes available for **Staging Store** across all configured NetVault SmartDisk Storage Pools.
`Elements.Staged = <No.>`	Number of elements or backup segments currently residing in the **Staging Store**.
`Data.Staged = <No.>, B`	Amount of data, in bytes, currently residing in the **Staging Store**.
`Elements.Accumulative = <No.>`	Number of elements or backup segments processed by NetVault SmartDisk since its implementation.

Table 1. Statistics

Stat entry	Description
`Data.Accumulative = <No.>, B`	Total amount of data, in bytes, processed by NetVault SmartDisk since NetVault SmartDisk was installed.
`Data.Committed.Accumulative = <No.>, B`	Total amount of data, in bytes, that has completed the NetVault SmartDisk write-to-disk process since NetVault SmartDisk was installed.

Calculating the Deduplication Ratio

Use the following calculation to determine the NetVault SmartDisk Deduplication Ratio for the data that has been protected by NetVault SmartDisk:

```
stream_bytes / ondisk_bytes = NetVault SmartDisk Deduplication Ratio
```

Use the following calculation to determine the NetVault SmartDisk Deduplication Ratio for the data that has been protected by NetVault SmartDisk since the NetVault SmartDisk Services were started:

```
csd.stream_bytes / csd.chunk_bytes = NetVault SmartDisk Deduplication Ratio since
NetVault SmartDisk were started
```

For information about viewing NetVault SmartDisk statistics in your backup software, see the documentation that came with your product.

Calculating the reduction in the storage footprint

The NetVault SmartDisk Deduplication Option reduces the storage footprint required to store the protected data. To calculate the reduction in the storage footprint that NetVault SmartDisk is providing for protected data, use the following calculation:

```
(ondisk.bytes / stream.bytes) * 100 = NetVault SmartDisk Reduction in Storage
Footprint
```

Monitoring activity on configured volumes

You can check the current activity level for volumes that are currently configured for use with NetVault SmartDisk. For example, you might check the activity to understand why NetVault SmartDisk is not processing data that you believe is ready for deduplication. By monitoring the current activity, you can determine whether a significant number of backups are being written to the volume, which delays deduplication activity. Data remains queued for deduplication, and then begins after backup activity is reduced.

To check the activity level, view NetVault SmartDisk statistics by using either the **config --show** command and option—for more information, see Using the config command options—or by using the **http://<localhost>:<port#>/proc/diskmanager/diskstorage/stats.stnz** command in your web browser.

In the output that is displayed, review the information in the **[SmartDisk:Volume]** section to determine the level of activity.

For example:

```
[SmartDisk:Volume]
Storage Pool = Staging Pool
Location = /usr/smartdisk/diskmanager/stage
…
Favour = Staging
Deny = Storage, Chunk Index, Disk Index
…
Deduplication Activity Cap = 4
Active Operations = 4
```

The **Active Operations** value shows the number of NetVault SmartDisk disk-access operations occurring on the applicable volume. In the preceding example, there are four active operations on the Staging volume, **/usr/smartdisk/diskmanager/stage**, and the **Deduplication Activity Cap** is set to **4**. This means that deduplication of data staged on this volume starts when the number of active operations on that volume is fewer than four.

The Deduplication Activity Cap minimizes the amount of disk thrashing that occurs when performing simultaneous access activities of the Staging volume. If deduplication of staged data is not taking place on a NetVault SmartDisk Instance during the deduplication window, you can check the Deduplication Activity Cap and Active Operations information for each configured Staging volume to determine if activity is preventing deduplication. If so, you might want to adjust the backup or deduplication window to eliminate overlaps.

You can set an activity cap for a volume by using the **--dedupe-cap** option with the **config --add|--update --volume <*path*>** command. For more information, see Extending NetVault SmartDisk Storage Pools.

Troubleshooting

Managing trace files

Because system performance can be affected when either the number of trace files in a directory or the combined size of trace files becomes significant, you can configure trace management and circular tracing to control these issues. NetVault SmartDisk includes two features for managing trace files, both of which are enabled by default:

- **resourcemanager:** This process manages the combined number and size of all trace files by periodically deleting inactive files. It runs as a persistent, "start-of-day" process, along with others such as **logd** and **superserver**.

- **Circular tracing**: This feature lets you control the number and size of trace files generated by NetVault SmartDisk processes.

Using resource management

Based on how you configure it, the resourcemanager can check the trace files every minute after NetVault SmartDisk starts. The resourcemanager reads the configured values at the start of *every* repeat cycle, for example, every minute, which ensures that it reads configuration changes that are made while the process is running.

Using the **Modules** section in the **/foundation/etc/resourcemanager.cfg** file and the **ResourceManagement:TraceDelete** section in each module's **/etc/trace.cfg** file, you can specify which modules you want the resourcemanager to monitor and manage.

In the following example, the resourcemanager is set to manage the **diskmanager**, **dedupe**, and **foundation** modules.

```
[Trace:Delete]
Modules = diskmanager, dedupe, foundation
```

NetVault SmartDisk creates several types of trace file, *.trc, *.buffer, *monitorrecent*.txt, and *monitortrace*.txt, but only certain ones are eligible for deletion by the resourcemanager. Understanding the naming convention applied to these files is critical, because it is key to how the resourcemanager determines what to include or exclude from its eligible list. The following table identifies the naming convention used for the different files and the different platforms.

Table 1. Naming convention for file types

File type	Naming convention
*.trc	*\<processName\>.\<processID\>.\<threadID\>.\<sequenceNumber\>*.trc
*.buffer	*\<processName\>.\<processID\>.\<threadID\>*.buffer
monitorrecent.txt	On Linux, UNIX, and Mac OS X: monitorrecent.*\<processID\>.\<sequenceNumber\>*.txt Windows: monitorrecent.*\<sequenceNumber\>*.txt
monitortrace.txt	On Linux, UNIX, and Mac OS X: monitortrace.*\<processID\>.\<sequenceNumber\>*.txt Windows: monitortrace.*\<sequenceNumber\>*.txt

The resourcemanager only considers trace files as contributing to the totals it compares against the start and stop thresholds if it identifies them as inactive; if the files are inactive, it indicates that they are *not* associated with a process that is running. It determines this state by comparing the process ID in the trace filename with the list of IDs for processes that are running on the system at the start of each repeat cycle. Because the process ID is not used in the filename on all operating systems, the resourcemanager can delete ***.trc**, ***.buffer**, **monitorrecent***, and m**onitortrace*** files on Linux, UNIX, and Mac OS X, but it can only delete ***.trc** and ***.buffer** files on Windows, as shown in the preceding table.

Specifying which modules to manage

1. Initiate a terminal session, or open a command prompt.

2. Using a text editor, open the **resourcemanager.cfg** file:

   This file is at: **…/foundation/etc/resourcemanager.cfg**

3. Locate the **[Trace:Delete]** section.

4. In the **Modules =** line, enter the applicable modules.

   For example:

   ```
   [Trace:Delete]
   Modules = diskmanager, dedupe, foundation
   ```

   > **NOTE:** You can specify any module. The resourcemanager only applies trace deletion to the specified modules if it locates them in the directory in which NetVault SmartDisk is installed. If it cannot locate a specified module, it generates its own error-level trace message, but continues to function normally.

Configuring the Trace-Delete option in specific modules

To limit the overall number or size, or both, of trace files in an installed module's **trace** directory, you can configure the resourcemanager to delete them between start and stop number and size thresholds. You can set these thresholds through the **ResourceManagement:TraceDelete** section of a module's **etc/trace.cfg** file. If that section is not present or is invalid, hard-coded defaults are used.

The **ResourceManagement:TraceDelete** section in the **\<moduleName\>/etc/trace.cfg** file lets the resourcemanager determine which trace-delete parameters to apply in the specified module. The defaults are:

```
[ResourceManagement:TraceDelete]
Enabled = TRUE
Number Start Threshold = 100
Number Stop Threshold  = 10
Size Start Threshold   = 1,GB
```

```
Size Stop Threshold    = 1,MB
```

If you change the values and inadvertently render them unacceptable, not present or invalid, the hard-coded defaults are used instead.

In the preceding example, which shows the defaults, the Trace-Delete functionality is enabled, and the resourcemanager starts deleting the trace files, oldest first, that exist in the specified module's **/trace** directory when their combined number becomes equal to or greater than 100 or their combined size becomes equal to or greater than 1 GB. The files continue to be deleted until their combined number is reduced to 10 or their combined size reaches or exceeds 1 MB.

To modify the values, perform the following steps.

1   Initiate a terminal session, or open a command prompt.

2   Using a text editor, open the **trace.cfg** file for the applicable module:

    This file is at: **…/<moduleName>/etc/trace.cfg**

3   Locate the **[ResourceManagement:TraceDelete]** section.

4   Change the values for the **Number Start Threshold**, **Number Stop Threshold**, **Size Start Threshold**, and **Size Stop Threshold** values as appropriate.

    The following ranges are acceptable:

Threshold segment	Minimum	Maximum
Number Start Threshold	1	2147483647
Number Stop Threshold	0	2147483647
Size Start Threshold	1	2147483647
Size Stop Threshold	0	2147483647

For both types of threshold, Number and Size, the **start** threshold *must* be greater than the **stop** threshold.

The **Size** threshold entries must use the form **<number>,<byteUnit>**. The following byte units are acceptable:

Byte unit entry	Represents
B	Bytes
KB	Kilobytes
MB	Megabytes
GB	Gigabytes
TB	Terabytes

Disabling trace deletion

You can disable trace deletion for all modules or on an individual basis.

*   To disable it for the NetVault SmartDisk Instance, complete the following steps:

    1   Initiate a terminal session, or open a command prompt.

    2   Using a text editor, open the **resourcemanager.cfg** file.

        This file is at: **…/foundation/etc/resourcemanager.cfg**

    3   In the **[Trace:Delete]** section, delete the value for the **Modules =** segment; that is, verify that it is blank:

        ```
        [Trace:Delete]
        Modules =
        ```

        To re-enable resource management, enter the applicable module names.

- To disable it for a specific module, complete the following steps:

    1 Initiate a terminal session, or open a command prompt.

    2 Using a text editor, open the **trace.cfg** file for the applicable module:

    This file is at: **…/<moduleName>/etc/trace.cfg**

    3 In the **[ResourceManagement:TraceDelete]** section, change the value for the **Enabled** segment to **FALSE**:

    ```
    [ResourceManagement:TraceDelete]
    Enabled = FALSE
    ```

    To re-enable resource management, change the value to **TRUE**.

Managing circular tracing

NetVault SmartDisk uses circular tracing to control the number and size of trace files generated by NetVault SmartDisk-related processes. Circular tracing, which is based on the maximum number of messages per file and the maximum number of files per thread, is enabled by default for *all* **.trc** and **monitortrace.*.txt** files. The following lists the defaults that are used:

```
CircularTracingEnabled = TRUE
MaxMessagesPerFile = 500000
MaxFilesToKeep = 10
```

While the defaults that control tracing are hard-coded in NetVault SmartDisk, you can modify some of the settings through the **trace.cfg** file.

You can identify trace files generated by a single thread using the information in the filename. In general, the filename uses the following format:

```
<processRelatedName>.<processID>.<threadID>.
<zeroBasedFileSequenceNumber>.<fileExtension>
```

> **i** | **NOTE:** The monitorrecent and monitortext files do not contain a thread ID on all platforms, nor do they contain a process ID on Windows.
>
> Even if you disable circular tracing, the filename contains a sequence number of 0.

The following table lists the types of trace files that NetVault SmartDisk uses:

Table 2. Trace files

Type	Configurable	Description
.buffer	No	The processes that generate these files use values that ensure there is only one file per thread with a maximum size of 1 MB.
monitorrecent*.txt	No	These files, which are generated by the percolatormonitor, use values that ensure there are no more than two files present and neither file exceeds 5,000 messages.
monitortrace.*.txt	No	These files, also generated by the percolatormonitor, use values that ensure there are no more than two files present and neither file exceeds 5,000 messages.
.trc	Yes	The processes that generate these files use configurable values. The default allows up to 500,000 messages per file and a maximum of 10 files can be present at any time. If you enter an invalid value, the hard-coded defaults are used instead.

Configuration information is read once, when NetVault SmartDisk starts. Unlike the settings for the resourcemanager, changes to the circular-tracing configuration are only applied after the processes are restarted. The information is identified in the trace.cfg file for the relevant module. For example, the trace.cfg file for the **diskmanager** module contains information similar to the following:

```
[TraceToFile:deduplicator]
Level = ERROR
Buffer = ALL
CircularTracingEnabled = TRUE
MaxMessagesPerFile = 2000000
MaxFilesToKeep = 5

[TraceToFile:superserver]
Level = ERROR
Buffer = ALL

[TraceToFile:Fallback]
Level = ERROR
Buffer = ALL
```

The preceding configuration would result in the following circular-tracing behavior:

- Each **Deduplicator** process thread uses circular tracing with up to 2,000,000 messages per file and allows a maximum of five files to be present at any time.

- Each **superserver** process thread uses circular tracing with up to 500,000 messages per file and allows a maximum of 10 files to be present at any time.

- Each **storageservice** process thread, and any other unlisted **diskmanager** module process, uses circular tracing with the configured Fallback settings. These settings are intentionally excluded in this example, which means that the example uses the hard-coded defaults of allowing up to 500,000 messages per file and a maximum of 10 files to be present at any time.

The trace.cfg file for the **foundation** module might look like the following:

```
[TraceToFile:Fallback]
Level = ERROR
Buffer = ALL
CircularTracingEnabled = TRUE
MaxMessagesPerFile = 1000000
MaxFilesToKeep = 4

[TraceToFile:ServiceTool]
Level = ERROR
Buffer = ALL

[TraceToFile:PercolatorSlave]
Level = ERROR
Buffer = ALL

[TraceToFile:logd]
Level = ERROR
Buffer = ALL
CircularTracingEnabled = FALSE
```

The preceding configuration would result in the following circular-tracing behavior:

- Each **servicetool**, **percolatorslave**, and any other unlisted **foundation** module process thread uses circular tracing with the configured Fallback settings. In this case, the settings allow up to 1,000,000 messages per file and a maximum of four files to be present at any time.

- Each **logd** process thread traces to a single file without any limitation, instead of using circular tracing.

Modifying values for circular tracing

As described earlier, circular-tracing information is read once, when NetVault SmartDisk starts, so changes to the circular-tracing configuration are only applied after the processes are restarted.

1. Initiate a terminal session, or open a command prompt.

2. Using a text editor, open the applicable **trace.cfg** file.

3. In the applicable section, change the values for the **MaxMessagesPerFile** and **MaxFilesToKeep** values as appropriate.

   The following ranges are acceptable:

   ```
   1 <= MaxMessagesPerFile <= 2147483647
   1 <= MaxFilesToKeep <= 2147483647
   ```

Disabling Circular Tracing

1. Initiate a terminal session, or open a command prompt.

2. Using a text editor, open the applicable **trace.cfg** file.

3. In the applicable section, change the value for the **CircularTracingEnabled** segment to **FALSE**:

   ```
   CircularTracingEnabled = FALSE
   ```

   To re-enable tracing, change the value to **TRUE**.

Installation on Windows succeeds but the Percolator fails to connect

If you install NetVault SmartDisk on Windows and the utility indicates that installation completed successfully, but invoking the **smartdisk status** command results in a message that indicates that it failed to connect to the percolator slave, it might be because you created a nonprivileged user whose password had to be changed before the installation was attempted.

When you create a nonprivileged user, the **User must change password at next login** check box is selected by default in some instances; it depends on what method you use to access the feature that lets you create a user. If you forget to clear the check box or if you forget to change the password before installing NetVault SmartDisk, installation appears to succeed.

When this issue occurs, remove NetVault SmartDisk and then reinstall it *after* completing either of the following options:

• Creating a different nonprivileged user.

• Deleting and adding the original nonprivileged user again.

ⓘ | **NOTE:** Logging in as the nonprivileged user and changing its password after you *have* installed NetVault SmartDisk does not clear this issue.

Another reason this issue might occur is because you entered the wrong user name or password. To update the user name or password after installation, use the **smartdisk password** command.

Backup stalls while writing to NetVault Backup-related media

When a backup job stalls, it indicates either that the product is not licensed or that NetVault SmartDisk has exceeded the licensed capacity. You know that a stall has occurred when the **Job Status** page indicates that the backup job is "Running: (Stalled) Writing to media" or "Running: (Stalled) Storing backup index." You can also check the status by locating the applicable NetVault SmartDisk Instance on the **Manage Devices** page and clicking the corresponding **Manage Device** icon; doing so displays a status of either "UNLICENSED" or "LICENSE EXCEEDED" for the selected instance.

If the product is not licensed, request the applicable license; for more information, see the *Quest NetVault SmartDisk Installation/Upgrade Guide*. If the instance is full, review the following information.

At the start of a write, the NetVault SmartDisk Disk Manager verifies that there is still sufficient NetVault SmartDisk Licensed Capacity to proceed, that is, that the Licensed Capacity exceeds the current amount of protected data. If there is Licensed Capacity available, the write continues to completion. Writes to NetVault SmartDisk are performed in **X-sized units**, where **X** is equal to the **reservation-size** parameter described in Extending NetVault SmartDisk Storage Pools. During the write, the Disk Manager performs a verify after each X byte is written to determine whether there is enough usable space available to reserve an additional X byte. A write stalls if there is no Licensed Capacity at the start of the write, or if at any point during the write there is not enough available space to reserve X bytes.

For information about increasing the NetVault SmartDisk Licensed Capacity, see the *Quest NetVault SmartDisk Installation/Upgrade Guide*.

NetVault SmartDisk compatibility with McAfee VirusScan

If you install NetVault SmartDisk on a Windows system that also runs McAfee VirusScan Enterprise, problems might occur during data transfers between your backup software and NetVault SmartDisk. For example, you might see a "Failed SQL insert into log table" or "2570 0 disk I/O error" message.

If problems do occur, Quest recommends that you implement one of the following workarounds:

- Configure McAfee VirusScan to ignore the NetVault SmartDisk installation directory.
- Configure McAfee VirusScan to scan only the executable files located in the NetVault SmartDisk installation directory.
- Disable McAfee VirusScan, and use an alternative form of virus protection.

CSD stops responding and backups fail on Windows 32-bit systems

The NetVault SmartDisk CSD supports a Chunk Store of between 1.8 TB and 2.5 TB on Windows 32-bit systems, depending on the version of Windows. If this limit is reached, that is, the system runs out of memory, an assert occurs and NetVault SmartDisk is shut down. To allow NetVault SmartDisk to restart, backups to be retired, and Garbage Collection to make space available in the Chunk Store, edit the **smartdisk.cfg** file to disable deduplication, and enable it again after sufficient space has been cleared in the Chunk Store.

1. Initiate a terminal session, or open a command prompt.
2. Using a text editor, open the **smartdisk.cfg** file.

This file is at: **…/diskmanager/etc/smartdisk.cfg**

3   To stop deduplication, change the value for the following segment to **FALSE**:

```
[Deduplication:Enable]
Value = FALSE
```

4   After space has been made available, enable duplication.

> **ⓘ** | **IMPORTANT:** If you intend to use deduplication, Quest recommends that you use the 64-bit (Pure64) versions of NetVault SmartDisk instead of the 32-bit or Hybrid versions whenever possible. Deduplication is memory-intensive; 32-bit memory allocation is limited, and capacity varies by OS and by usage.

Backups fail with "Stream has gone down" Message on Windows systems

If the **Store volume path** and **Staging volume path** that you specify for NetVault SmartDisk are network shares, you might encounter an error similar to the following if a significant load is placed on the share:

```
Error 2012/02/02 00:48:05 166 <name> Stream has gone down
```

To avoid this error, adjust the timeout value of the SessTimeout parameter in the Windows Registry. Modify the following registry key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\
lanmanworkstation\parameters
```

```
SessTimeout=dword:0000012c
```

Set the timeout value to 300 seconds (5 minutes).

For more information, see the following:

- http://support.microsoft.com/kb/102067

- http://technet.microsoft.com/en-us/library/cc938292.aspx

Garbage Collection fails repeatedly or conflicts with other operations

If you have reviewed and processed the guidelines provided in Configuring Garbage Collection and Garbage Collection continues to fail repeatedly or conflict with a different operation, you can disable it. For more information about disabling the feature, see the description for the **--gc-enable** option in Using the config command options.

About us

Quest provides software solutions for the rapidly-changing world of enterprise IT. We help simplify the challenges caused by data explosion, cloud expansion, hybrid datacenters, security threats, and regulatory requirements. We are a global provider to 130,000 companies across 100 countries, including 95% of the Fortune 500 and 90% of the Global 1000. Since 1987, we have built a portfolio of solutions that now includes database management, data protection, identity and access management, Microsoft platform management, and unified endpoint management. With Quest, organizations spend less time on IT administration and more time on business innovation. For more information, visit www.quest.com.

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Technical support is available to Quest customers with a valid maintenance contract and customers who have trial versions. You can access the Quest Support Portal at https://support.quest.com.

The Support Portal provides self-help tools you can use to solve problems quickly and independently, 24 hours a day, 365 days a year. The Support Portal enables you to:

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- View services to assist you with your product.