



NETAPP TECHNICAL REPORT

NetApp VTL Configuration Guide

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ABSTRACT

Although the NearStore[®] VTL is easy to operate, a number of configuration options are available to the end user. This paper guides users through those options and helps them decide which features to enable and how the features can optimize disk capacity usage for their situation.

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1 OVERVIEW

1.1 INTENDED AUDIENCE

This document is intended for NetApp Professional Services engineers and systems engineers, NetApp partner and reseller PS engineers and systems engineers, and end users.

1.2 PURPOSE

This paper describes the options for properly sizing a NearStore Virtual Tape Library (VTL).

1.3 ASSUMPTION

This guide assumes that the NearStore VTL that is being configured is a new deployment.

Important: Check with NetApp® Global Services before changing the configuration in production environments!

1.4 DISCLAIMER

This guide describes general configuration options and is not intended to include every aspect of any particular user's environment. NetApp is not responsible for any incidental or consequential damages in connection with the furnishing, performance, or use of this documentation. The content of this document is subject to change without notice.

2 PHYSICAL TAPE CONFIGURATION OPTIONS

2.1 DESCRIPTION

There are two basic configurations for NearStore VTL, depending on whether the VTL or the backup application is responsible for physical tape creation. If the NearStore VTL is responsible for creating physical tapes, this feature is called Direct Tape Creation (DTC).

2.2 DECIDING WHICH CONFIGURATION TO USE

In addition to the traditional method of using the backup application software to copy images from virtual tape to physical tape, NearStore VTL also provides a Direct Tape Creation feature. Figure 1 illustrates the two methods.

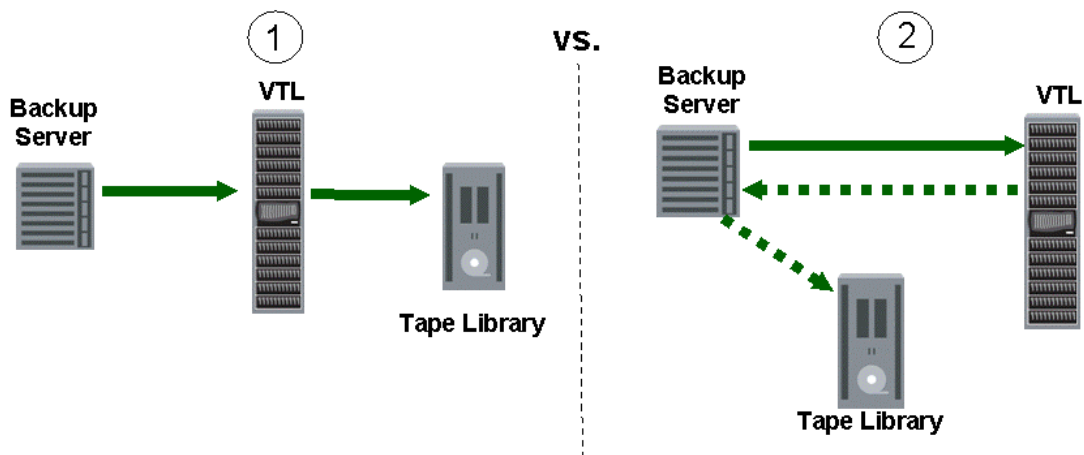


Figure 1) Physical tape creation methods.

The VTL copies to tape (Direct Tape Creation)

- ▶ Backup application manages physical tape retention policies and tracks tape locations
- ▶ Shadow Tape manages retention policy of virtual tapes on disk
- ▶ Improves efficiency for high-speed tape creation for off-site storage
- ▶ Improved restore performance and workflow with Shadow Tape

The backup application server copies images from VTL to physical tape

- ▶ Backup application manages retention policies for all media and tracks tape locations
- ▶ Performance is gated primarily by file indexing (cataloging)

2.3 USING A NEARSTORE VTL TO CREATE PHYSICAL TAPE

WHEN TO USE

If the backup environment has difficulty in creating offsite physical tapes within the backup window (meeting the service-level agreement for sending physical tapes offsite), then using DTC can yield dramatic results in physical tape performance.

BENEFITS

Because DTC avoids additional cataloging of each file, the VTL can essentially perform large-block, sequential reads from VTL into large-block, sequential writes to physical tape and avoid the shoeshining issues normally experienced with physical tape performance. DTC greatly accelerates physical tape performance.

CONCERNS

If limiting the number of physical tapes taken offsite is the customer's primary consideration, DTC may not be right for them. If the backup application performs image copies from virtual to physical tape, consolidating media is possible, thus limiting the number of physical tapes that are needed for offsite vaulting.

DTC CONFIGURATION SETTINGS

The base configuration settings for Direct Tape Creation are as follows:

1. Enable Over Allocation.¹
2. Use the virtual tape drive type² that matches physical tape drive.
3. Enable Smart Sizing.
4. Enable Cloning.
5. Enable Shadow Tape.
6. Enable EEP Options.
7. Use the Create Virtual Tapes Using Barcodes function (under Daily Tasks → Virtual Tapes) to occupy the native capacity of the VTL³.

CERTIFICATIONS

For details about which physical tape drives and libraries have been tested and certified, dl-vtl-cert is the best source of information. (Partners can use xdl-vtl-partnerhelp.) Send an e-mail detailing your configuration example to these distribution lists for current information about what is supported.

2.4 USING A NEARSTORE VTL FOR DISK-ONLY BACKUPS

WHEN TO USE

Customers who want the backup application to manage the physical tapes may not want to use the VTL to create the physical tape. A prime example for not using Direct Tape Creation is with Tivoli Storage Manager (TSM). TSM's progressive backup schema tracks versions of each file that is protected and it has a database that manages the specialized disaster recovery procedures.

¹ With Direct Tape Creation, Over-Allocation helps to get the disk space utilization, but disk space needs to be monitored carefully to ensure that the NearStore VTL does not fill up completely. The Shadow Tape pool, if sized appropriately, can offset this risk to some degree.

² The virtual tape drive type must match the physical tape drive exactly for Direct Tape Creation.

³ Do not create more virtual tapes until a full backup cycle has been performed and you know how well the backup application fills up the virtual tapes.

BENEFITS

If the customer's primary consideration is to minimize the number of physical tape cartridges taken offsite, then using the backup application to copy images from VTL to physical tape can consolidate the number of tapes needed.

CONCERNS

When the backup application server is responsible for duplicating backup images, metadata (file history) needs to be collected for the new tape. File history collection, especially for backups that contain a large number of small files, is typically a performance bottleneck.

NON-DTC CONFIGURATION SETTINGS

The base configuration settings when Direct Tape Creation is not desired are as follows:

1. Disable Over Allocation.
2. Use the virtual tape drive type "IBM LTO with no DTC. "
3. Disable Smart Sizing.
4. Disable Cloning.
5. Disable Shadow Tape.
6. Disable EEP Options.

2.5 BASE CONFIGURATION FLOWCHART

The following flow chart gives a high-level view of the recommended settings for the two basic configuration options.

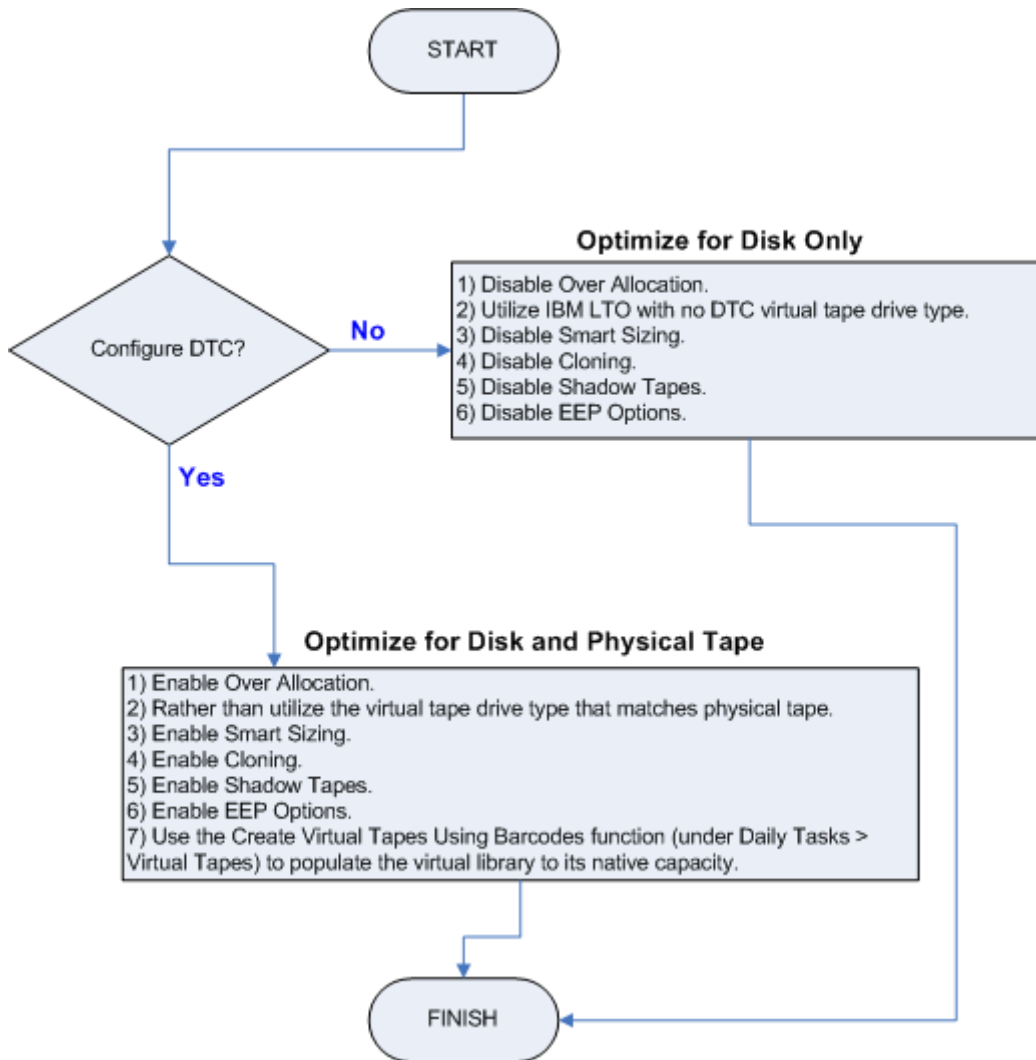


Figure 2) Basic configuration options.

Notes:

- 1) With the Optimize for Disk Only configuration, Over Allocation can be enabled to better use disk space for customers who typically do not fill up their tapes, but whose disk space needs to be monitored carefully to ensure that the NearStore VTL does not fill up completely.
- 2) With the Optimize for Disk and Physical Tape configuration, Over Allocation helps to get the best physical tape utilization, but disk space must be monitored carefully to ensure that the NearStore VTL does not fill up completely. The Shadow Tape pool, if sized appropriately, can offset this risk to some degree.

3 FEATURE INTERACTION AND DEFAULT BEHAVIOR

It is important to make good choices about configuration options, because changing them after writing data to the VTL can have undesired effects. Check with NetApp Global Services before changing configuration settings on production VTLs.

3.1 OVER ALLOCATION AND SMART SIZING

The following table shows the relationship between the Over Allocation and Smart Sizing configuration options. This table explains the interaction of the settings. For recommended configuration settings, see section 2, “Physical Tape Configuration Options.”

Table 1) Over Allocation and Smart Sizing relationships.

Feature	On	Off	Result
Over Allocation	✓		Virtual tape size is gated by the Smart Sizing algorithms.
Smart Sizing	✓		
Over Allocation	✓		Virtual tape size is gated by raw capacity.
Smart Sizing		✓	
Over Allocation		✓	Virtual tape size is gated by either the Smart Sizing algorithms or the Disk Allocation per Tape parameter, depending on which one reaches its limit first
Smart Sizing	✓		
Over Allocation		✓	Virtual tape size is gated by either raw capacity or the Disk Allocation Per Tape parameter, depending on which one reaches its limit first.
Smart Sizing		✓	

3.2 FEATURE INTERACTION DESCRIPTIONS

OVER ALLOCATION: ON; SMART SIZING: ON

The amount of data that can be stored on a virtual tape is gated by Smart Sizing in conjunction with the raw capacity of the tape, and the tape consumes an amount of disk space that depends on how well VTL disk compression can compress the received data.

For example, suppose that a virtual LTO-1 tape with 100GB raw capacity, receiving data that is computed to be 2:1 compressible by Smart Sizing, receives 200GB of data. If VTL disk compression is enabled, the tape consumes approximately 100GB of disk space, as long as VTL disk compression achieves roughly the same compression ratio with the data as LTO tape compression would. If VTL disk compression were able to achieve 3:1 compression on the same data, then the tape would consume ~67GB of disk space (200/3). If VTL disk compression is disabled, the tape consumes 200GB of disk space.

OVER ALLOCATION: ON; SMART SIZING: OFF

The amount of data that can be stored in a tape is gated by the raw capacity of the tape, and the tape consumes an amount of disk space that depends on how well VTL disk compression can compress the received data.

For example, suppose that a virtual LTO-1 tape with raw capacity of 100GB receives and stores 100GB of data, and the tape consumes an amount of disk space that depends on the compressibility of the data as achieved by VTL disk compression. If the data is 2:1 compressible by VTL disk compression, the tape consumes 50GB of disk space. If the data is 3:1 compressible, it consumes ~33GB of disk space. If VTL disk compression is disabled, it consumes 100GB of disk space.

OVER ALLOCATION: OFF: SMART SIZING: ON

A virtual tape always consumes the amount of disk space that is specified in its Disk Allocation per Tape parameter. However, the amount of data stored on the tape is gated by either Smart Sizing in conjunction with the raw capacity of the tape, or VTL disk compression (if enabled) in conjunction with Disk Allocation per Tape, depending on which limiting factor is encountered first.

Most virtual tapes in the VTL are configured with raw capacity and Disk Allocation per Tape metrics that are equal. This means that when Smart Sizing compression ratios are roughly the same as VTL disk compression ratios for a given set of backup data, each tape stores an amount of data that approximately fills its disk allocation. For example, a virtual LTO-1 with 100GB raw capacity and 100GB disk allocation receiving 2:1 compressible data stores 200GB of data that consumes its full 100GB allocation of physical disk space.

However, if Smart Sizing compression ratios and VTL disk compression ratios differ by significant amounts, then the amount of data that can be stored in a tape is gated by the lower of the ratios achieved. For example, if Smart Sizing computes that received data is 2:1 compressible, but VTL disk compression is able to compress the same data at 3:1, the virtual LTO-1 receives 200GB of data that consumes roughly only 67GB of the 100GB disk allocation, thereby "wasting" 33GB of disk. The wasted 33GB is allocated to the tape, but was not needed to store data. In the same scenario, if VTL disk compression were disabled (effectively making VTL disk compression ratios 1:1 for any data received), then the same tape would store only 100GB of data, although this data would consume the full 100GB of disk space stipulated by the Disk Allocation per Tape parameter.

OVER ALLOCATION: OFF; SMART SIZING: OFF

A virtual tape always consumes the amount of disk space that is specified in its Disk Allocation per Tape parameter. However, the amount of data that can be stored in a tape is gated by either the raw capacity of the tape or the Disk Allocation per Tape, depending on which is the lower when normalized by the compressibility of the data being stored.

For example, a virtual LTO-1 with a raw capacity of 100GB and a Disk Allocation per Tape of 100GB stores 100GB of data. If this data is 2:1 compressible by VTL disk compression, it consumes only 50GB of the 100GB disk allocation for the tape, and therefore "wastes" 50GB of disk. If the raw capacity of the virtual LTO-1 were set higher—for example, to 500GB—then the tape would accept 200GB of the 2:1 compressible data, because the disk allocation of 100GB would be filled with 200GB of data before the raw capacity was reached (that is, 500GB would not fit in 100GB when compressed at 2:1). This is why the default No DTC Template has the following parameters.

Name	Raw Capacity	Disk Allocation Per Tape	Vendor ID	Product ID	Tape Smart Sizing
IBM LTO 1 with no DTC	500.00GB	50.00GB	IBM	ULTRIUM-TD1	NONE

3.3 DISK SPACE USAGE WITH SHADOW TAPE POOL

When the NearStore VTL reaches 85%, it sends an alert and triggers an event to make some space. According to the Shadow Tape policy, it finds a tape that is the most aged compared to the other tapes that reside in the Shadow Tape pool. The oldest relative tape (compared to the others and their policies) is deleted and the algorithm rechecks to see if the VTL is now below the 85% threshold. Additional tapes are deleted from Shadow Tape until the appliance is at 75%. The 85% and 75% thresholds are not tunable at this time.

3.4 DEGRADED RAID GROUP AND DISK SPACE USAGE

If a RAID group goes into degraded mode because of a failed disk, available disk space could be adversely affected. NetApp recommends that, for VTL to function properly, there should always be at least one RAID group of disk space (or 5% of the total configured disk space) available. Allowing one RAID group to go offline without exceeding this free space is a good policy in environments with critical uptime considerations.

On smaller-capacity VTL systems, the lesser of either one RAID group of disk space or 5% of total configured space should be used.

In practice, the RAID rebuild occurs before the complete consumption of disk space, so these guidelines should be followed relative to the size of the VTL.

4 CONFIGURATION FOR VTL-TO-VTL REPLICATION VIA FIBRE CHANNEL

4.1 BASIC FC REPLICATION CONFIGURATION

With VTLOS 5.X, VTL-to-VTL replication is possible by using the export/cloning functionality that is used to create physical tape, except that the target tape library is another VTL. This method for replicating tapes from one VTL to another uses Fibre Channel infrastructure only.

Figure 3 shows that for most environments, 16 hours⁴ are typically available for replication if a 24-hour recovery point objective (RPO) is maintained.

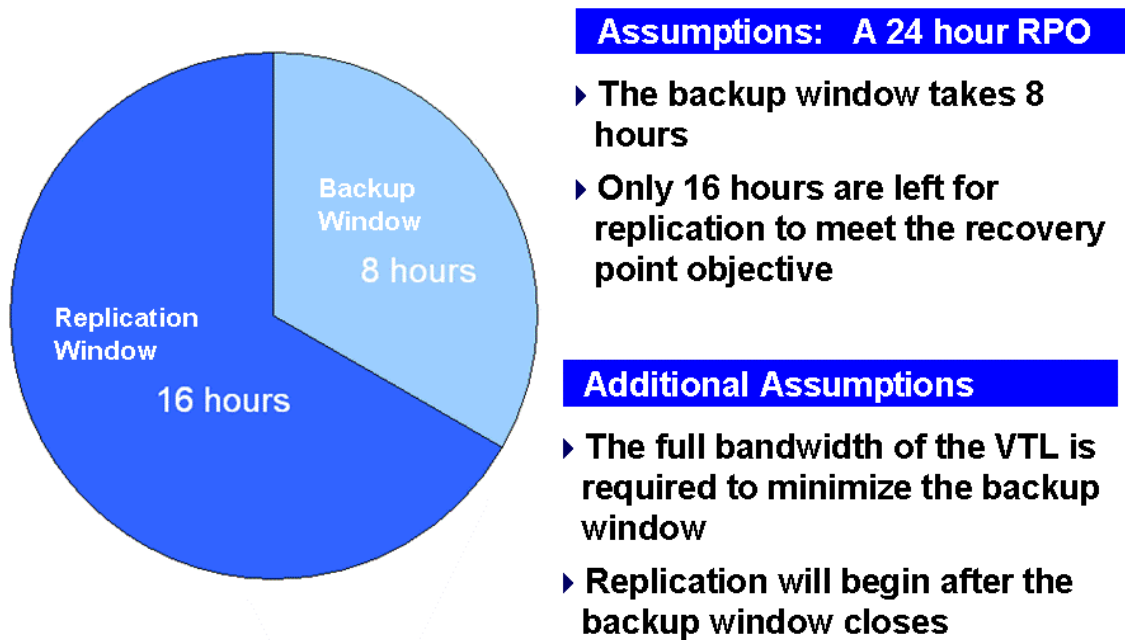


Figure 3) Typical replication window.

The next sections describe special considerations when configuring either VTL-to-VTL or VTL-to-VTL-to-PTL (Physical Tape Library) cloning.

Note: Using Direct Tape Creation for replication is incompatible with TSM. It is best to replicate data from a local to a remote TSM server so that the TSM server can maintain complete control over the process.

⁴ This model assumes that no replication is performed during the backup window to maximize write throughput to the back-end disk array.

VTL-TO-VTL CONFIGURATION

Using the IBM LTO with no DTC drive type allows for the best disk utilization, and enabling Over Allocation on the back-end virtual library allows for any disk boundary variations that might otherwise cause the destination tape to fill prematurely.

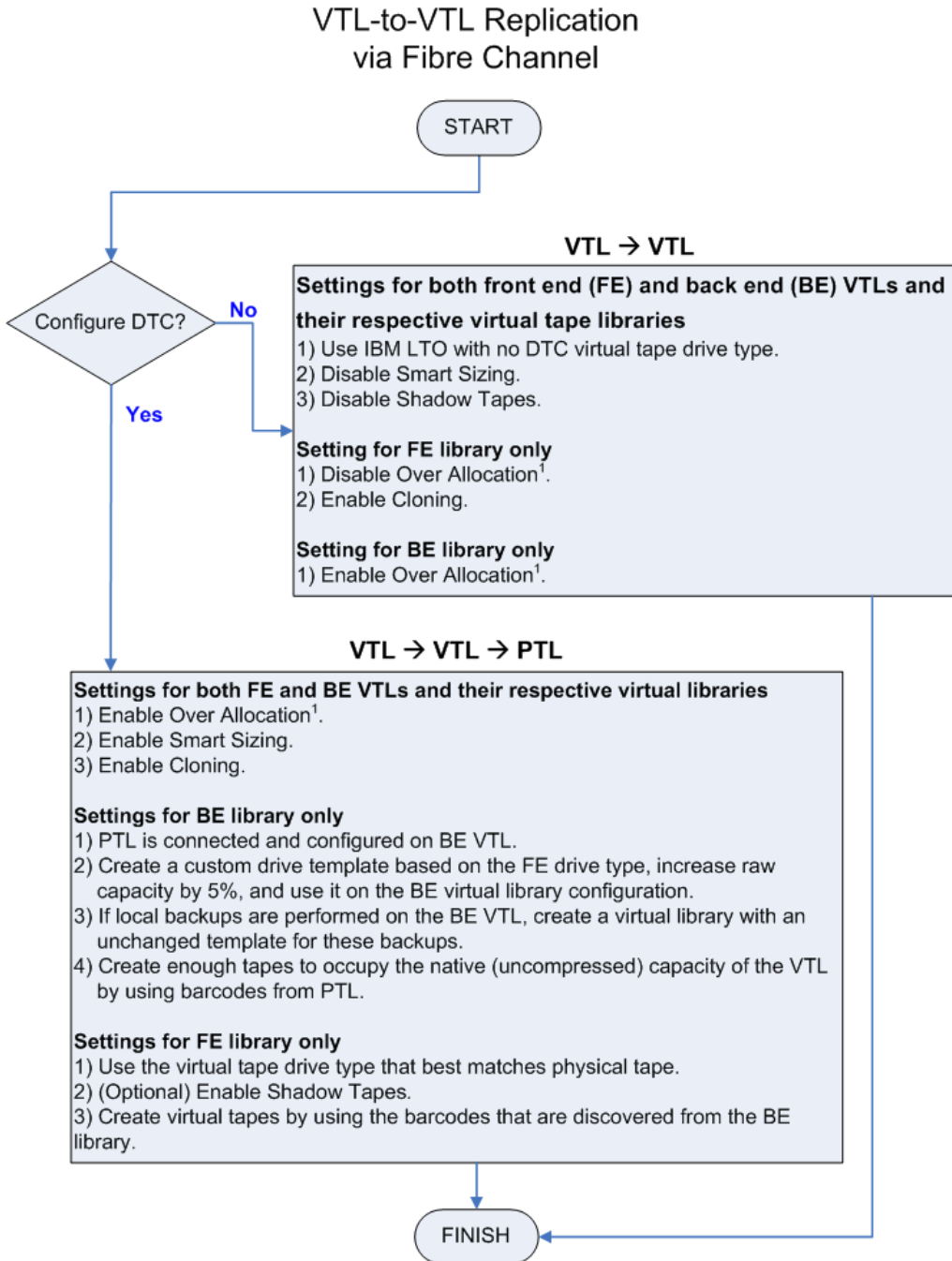
VTL-TO-VTL-TO-PTL CONFIGURATION

The virtual tape drive template of the target (destination) VTL must be configured with 5% more capacity than the source. The original and target copies of the virtual tape take up the same amount of physical disk space, because with Over Allocation enabled the destination VTL can handle any specific virtual tape sizing and disk boundary variances. The template changes are needed only to allow for variations in the way that space bookkeeping is internally handled by the VTLs.

Additionally, a one-to-one barcode relationship must be maintained, so daisy-chaining VTL to VTL to PTL is supported; however you cannot clone from one barcode to two identical target barcodes directly. To create two target barcodes (one virtual and one physical), you must first clone to the target VTL and then have the target VTL create the physical tape.

FC-BASED REPLICATION CONFIGURATION OPTIONS FLOWCHART

Figure 4 shows the basic configuration options for FC-based replication.



¹ Over Allocation can be enabled to better use disk space for customers who typically do not fill up their tapes, but disk space needs to be monitored carefully to ensure that the NearStore VTL does not fill up completely. Over Allocation also needs to be enabled for VTL to VTL replication to allow for variances in Smart Sizing for individual virtual tapes.

Figure 4) Fibre Channel replication configuration options.

4.2 CREATE A VIRTUAL DRIVE TEMPLATE FOR THE REMOTE VTL

The virtual drive template for the destination virtual library will always need to be 5% larger than the source virtual library's virtual drive template and it will need to have the same vendor and product ID fields.

DEFINE NEW VIRTUAL DRIVE TYPE

Based on the physical tape drive type, create a virtual tape drive template with 5% more raw capacity.

Configuration Tasks → Advanced → Virtual Tape Drive Types → Define New Virtual Tape Drive Type

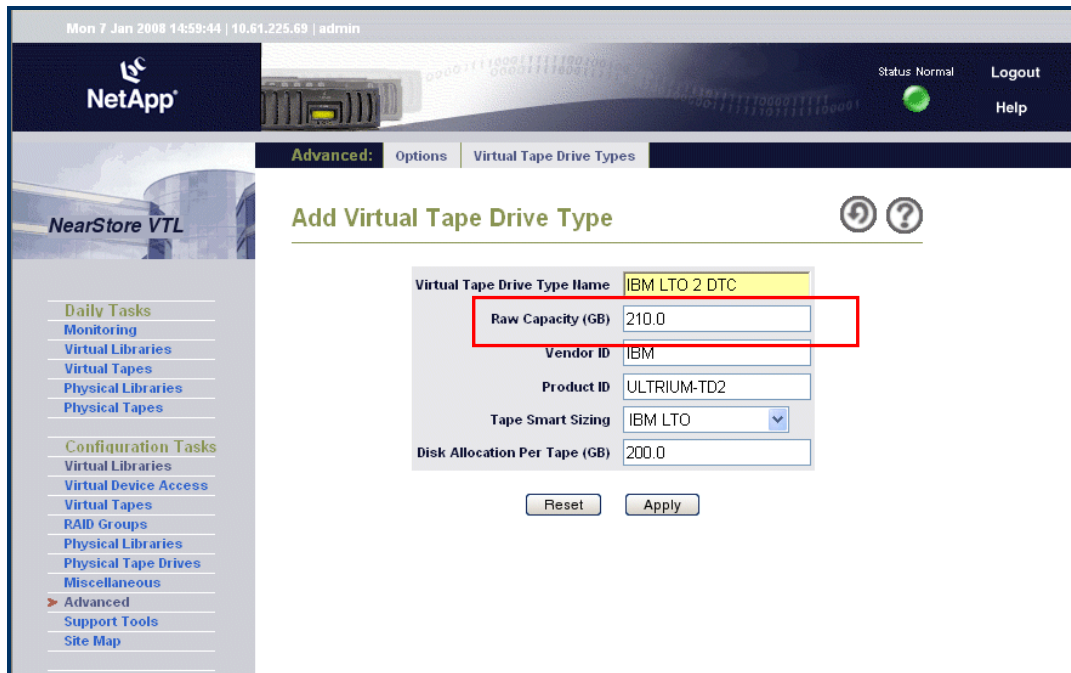
The screenshot shows the NetApp VTL configuration interface in a Microsoft Internet Explorer browser window. The browser address bar shows <http://10.61.225.69/index.html>. The page title is "NearStore VTL - Microsoft Internet Explorer". The interface includes a navigation menu on the left with sections for "Daily Tasks" (Monitoring, Virtual Libraries, Virtual Tapes, Physical Libraries, Physical Tapes) and "Configuration Tasks" (Virtual Libraries, Virtual Device Access, Virtual Tapes, RAID Groups, Physical Libraries, Physical Tape Drives, Miscellaneous). The "Advanced" section is expanded, showing "Support Tools" and "Site Map". The main content area displays a table of virtual tape drive types. At the bottom of the table, there are two links: "Define New Virtual Tape Drive Type" (circled in red) and "Delete Virtual Tape Drive Type".

Virtual Tape Drive Type	Raw Capacity	Formatted Capacity	Vendor	Product ID	Library
HP LTO 2	200.00 GB	200.00 GB	HP	Ultrium 2-SCSI	ALDC
HP LTO 3	400.00 GB	400.00 GB	HP	Ultrium 3-SCSI	ALDC
IBM 3590	20.00 GB	20.00 GB	IBM	03590E1A	LZS
IBM 3592	300.00 GB	300.00 GB	IBM	03592H1A	LZS
IBM LTO	100.00 GB	100.00 GB	IBM	ULTRIUM-TD1	IBM LTO
IBM LTO 1 with no DTC	500.00 GB	50.00 GB	IBM	ULTRIUM-TD1	NONE
IBM LTO 2	200.00 GB	200.00 GB	IBM	ULTRIUM-TD2	IBM LTO
IBM LTO 3	400.00 GB	400.00 GB	IBM	ULTRIUM-TD3	IBM LTO
SDLT	160.00 GB	160.00 GB	QUANTUM	SDLT320	LZS
STK 9840A	20.00 GB	20.00 GB	STK	9840	LZS
STK 9840B	20.00 GB	20.00 GB	STK	T9840B	LZS
STK 9840C	40.00 GB	40.00 GB	STK	T9840C	LZS
STK 9940A	60.00 GB	60.00 GB	STK	T9940A	LZS
STK 9940B	200.00 GB	200.00 GB	STK	T9940B	LZS
STK T10000A	500.00 GB	500.00 GB	STK	T10000A	LZS

Figure 5) Define new virtual tape drive type.

ADD VIRTUAL TAPE DRIVE TYPE

Define a new tape drive type with appropriate vendor and product IDs. Increase the raw capacity by 5%.



The screenshot shows the NetApp VTL configuration interface. The top navigation bar includes the NetApp logo, a status indicator (Normal), and links for Logout and Help. The main content area is titled 'Add Virtual Tape Drive Type' and contains a form with the following fields:

Virtual Tape Drive Type Name	IBM LTO 2 DTC
Raw Capacity (GB)	210.0
Vendor ID	IBM
Product ID	ULTRIUM-TD2
Tape Smart Sizing	IBM LTO
Disk Allocation Per Tape (GB)	200.0

Below the form are 'Reset' and 'Apply' buttons. A red box highlights the 'Raw Capacity (GB)' field, which is set to 210.0.

Figure 6) Add virtual tape drive type.

4.3 BIDIRECTIONAL REPLICATION WITH FAILOVER AND FAILBACK

Figure 7 shows a topology that includes failover and failback for disaster recovery configurations.

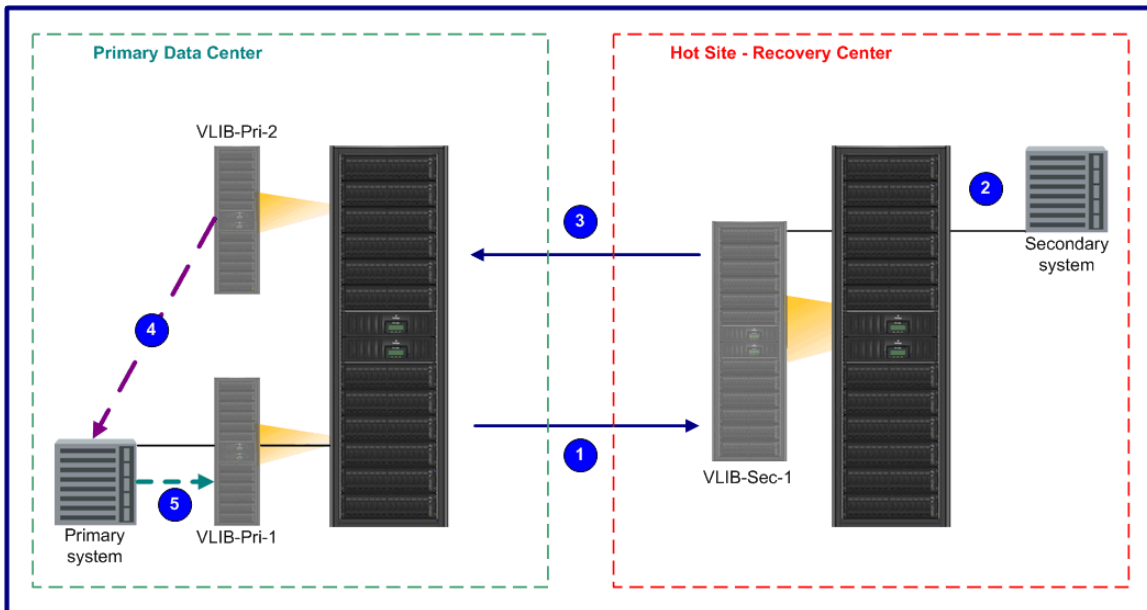


Figure 7: Bidirectional replication with failover and failback.

1 Normal Operations:

- Clone or export to VLIB-Sec-1 at remote site.

2 Failover:

- Import catalog into secondary backup system and perform DR testing.
Because VTL-to-VTL replication is asynchronous, the backup catalog may not be quite in sync with the replicated virtual tapes. NetApp recommends performing a backup application “audit” to bring backup catalogs into sync with virtual tape contents.
- Write new backups on the remote side to VLIB-Sec-1.

3 Failback:

- Clone or export virtual tapes from VLIB-Sec-1 to VLIB-Pri-2 (original barcode on the primary system, VLIB-Pri-1, must not exist).

Normalized Operations Workflow:

- 4 Use VLIB-Pri-2 for restores only.
- 5 All backups write to VLIB-Pri-1.
- 1 Resume Normal Operations

Sizing:

- VLIB-Sec-1 template is 5% larger than VLIB-Pri-1.
- VLIB-Pri-2 template is 5% larger than VLIB-Sec-1 (to accommodate new backups that may be created during a failover event).

Note: It is possible to use the backup application to copy images on virtual tapes from VLIB-Pri2 to VLIB-Pri-1.

4.4 PHYSICAL CONNECTIONS

Depending on the PCI-E cards installed and the customer configuration, there are typically from 1 to 3 FC ports available for replication. FC port 0d is configurable as either an initiator or a target.

Figure 8 details a base configuration that is used in the following configuration cabling example.

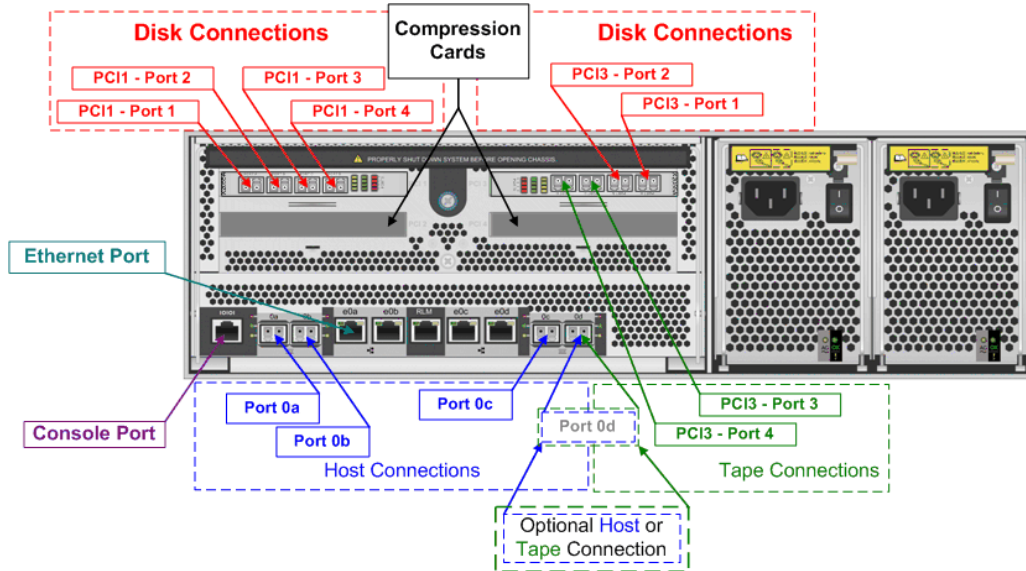


Figure 8: Base configuration and locations details.

4.5 FC-BASED, BIDIRECTIONAL REPLICATION CABLING EXAMPLE

The example in Figure 9 assumes that port 0d is configured as a target on the remote systems and is available for FC-based replication. This example does not include physical tape.

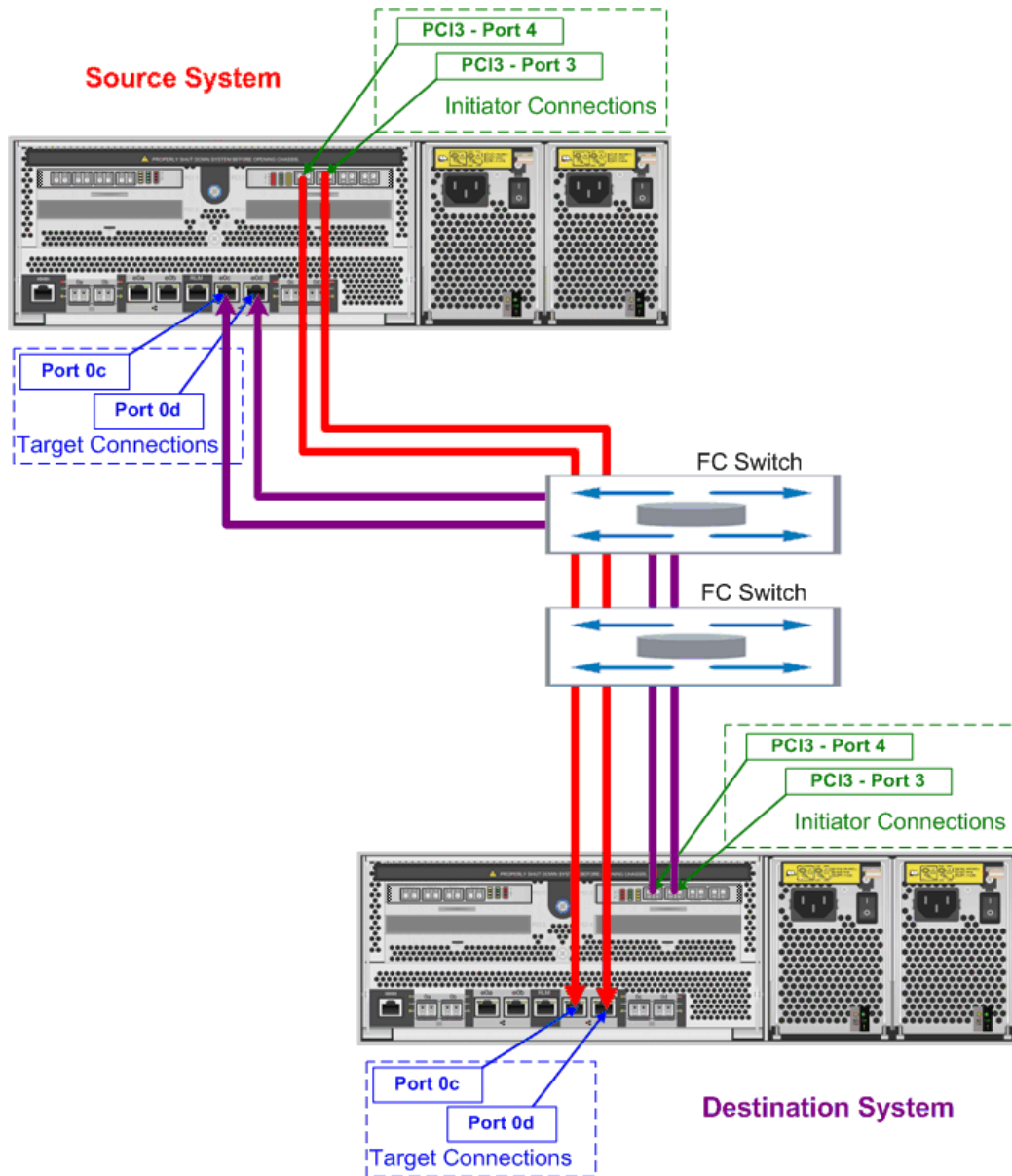


Figure 9) Bidirectional FC replication cabling example.

Note: With the configuration shown in Figure 9 (initiator ports PCI3 Ports 3 and 4 being used for FC-based replication), the disk configuration must be limited to 18 disk shelves, because two HW compression cards are also configured. There is a limit of 6 shelves per dual-disk loop (6 shelves x 3 dual-disk loops = 18 max total shelves). Additionally, only 2 FC ports are available as backup application host targets (ports 0a and 0b) to the backup application server. For the VTL-to-VTL-to-PTL setup, the destination system needs BE ports to connect to the physical tape drives, so you must have either a single link between the 2 VTLs, only 1 compression card, or only 2 disk loops.

5 CONCLUSION

NetApp VTL supports heterogeneous data protection environments and is very flexible in the configuration options that are available. This flexibility allows the VTL to adapt to differing customer requirements so as to optimize their data protection solution. Although the VTL is flexible, it is difficult to change some configuration settings once it has been placed into production, so upfront planning is very important.

6 APPENDIX

6.1 EXPLANATION OF TERMS

DIRECT TAPE CREATION

The NearStore VTL can export data to physical tapes directly by copying virtual tapes to a physical tape library connected to its back end (Direct Tape Creation). The physical tapes are written in native backup application format, so when virtual tapes are exported to physical tape there is a 100% match between the two. This means that any virtual tape stored on the NearStore VTL and then written to physical tape can be restored from any standard tape drive that is supported by the backup server.

EXPORT

Each virtual tape has an export status that shows whether there is a need to copy this virtual tape to a physical tape. The export status can be:

- **Needs export.** A virtual tape contains data and has been ejected from a virtual tape drive or virtual library.
- **Does not need export.** A virtual tape is empty or has already been copied to a physical tape.

TAPE EXPORTS ARE TRIGGERED WHEN:

- **Virtual tape is ejected from the virtual library.** The backup application ejects a tape from the virtual library and the NearStore VTL recognizes the event (virtual tape moved to the virtual EEP), locates the corresponding physical tape, and initiates the copy.
- **Tape export is manually triggered.** The export status of a tape can be manually changed. This can be useful to recreate missing or failed physical tapes.

After the tape export is done, the virtual tape is deleted (unless Shadow Tape is enabled).

CLONING

Once you enable the cloning feature for a virtual library, the NearStore VTL copies the data from a virtual tape to its corresponding physical tape each time that the backup application sends data to the virtual tape and the virtual tape is ejected from the virtual tape drive.

Cloning is different from export because cloning causes the virtual tape to continue to exist in the virtual library. Another difference is that an export is triggered by ejection of a virtual tape from a virtual library (typically done from the backup application) and a clone is triggered by a dismount of a virtual tape from a virtual tape drive. With cloning, the virtual tape remains in the virtual library until the backup application ejects it.

Note: The backup application sees only the virtual tape that is in the virtual library that the backup application is managing.

When the backup application ejects a cloned virtual tape from the virtual library, the VTL export process would be triggered. However, the export process is instantaneous because the copy of the virtual tape data has already occurred to the physical tape. At this point the virtual tape is located in the Shadow Tape pool and retained according to defined policy and disk space considerations. Because there might be times when you do not want to clone (during your backup window, for example), you can specify times during which the NearStore VTL does not clone. This is an advanced option that you can enable from Configuration Tasks > Advance > Options. Select Enable Differed Cloning and set the times during which you do not want the NearStore VTL to clone.

SHADOW TAPE

After a successful export of a virtual tape, the NearStore VTL can store the virtual tape in the Shadow Tape pool. The backup application continues to manage the physical tape, and the shadow pool virtual tape is invisible to the backup application because it is not in the virtual library that the backup application is managing.

A Shadow Tape can be moved into a virtual library so that it becomes available to the backup application to be used for a restoration.

Shadow Tape is assigned a retention period.

When a backup application is writing to the NearStore VTL, if the VTL needs additional space for an existing virtual tape, it reclaims Shadow Tape space. Space is reclaimed first from expired Shadow Tape, but if more space is still needed after reclaiming expired tapes, space is reclaimed from unexpired Shadow Tape.

Shadow Tape is integrated with the following backup applications for automatic import when a restore action results in a pending mount request:

- NetBackup™ 6.0 MP5 and 6.5.1 or greater
- CommVault v7.2
- NetWorker

OVER ALLOCATION

If Over Allocation is not enabled, the NearStore VTL automatically reserves enough disk space for any virtual tapes that you create. For example, if you create a virtual tape with 40GB capacity, the NearStore VTL reserves 40GB of space for that virtual tape from a storage pool. For every virtual tape you create, you need at least the tape's capacity of available disk space.

Enabling Over Allocation provides the best disk and tape utilization, but increases the chance of running out of space. Although the VTL generates actions when available space is low, and if Shadow Tape is in use it tries to recover space, close monitoring is required to prevent low available space. If the disk capacity reaches 85%, an alert is generated and any further attempts to write data result in failures that affect the backup application.

If Over Allocation is used, problems such as a disk failure are more likely to cause the appliance to run out of available space.

DISK COMPRESSION

VTL disk compression reduces the size of the data stored on the disk drives. Disk compression can be enabled or disabled separately for each virtual tape. By default, disk compression is enabled on a VTL300/700/1400 and disabled for VTL600/1200 models. Disk compression can be set separately for each virtual library when the library is created.

Disk compression is independent of Tape Smart Sizing. Smart Sizing optimizes the use of physical tape media, while disk compression minimizes the space used on disk by the VTL. Smart Sizing and disk compression can be used at the same time on the same NearStore VTL appliance.

SMART SIZING

All data is compressible at different ratios. Each time the backup application writes data to physical tape, the actual amount of data that the physical tape drive writes depends on the compressibility of the data. Because the NearStore VTL must be able to export virtual tapes to physical tape, it is crucial that the amount of data on the virtual tape can fit on the physical tape. If the data from a virtual tape cannot fit on a physical tape, you cannot export or clone it.

Tape Smart Sizing monitors the data stream to determine the compressibility of the data as it would occur on a physical tape. The VTL determines the appropriate size to make the virtual tape so that when it is exported, its contents fit on the corresponding physical tape.

There is no performance impact when using Smart Sizing.

Smart Sizing is independent of disk compression. Smart Sizing optimizes the use of physical tape media, while disk compression minimizes the space used on disk by the VTL. Smart Sizing and disk compression can be used at the same time on the same NearStore VTL appliance.

SIMULTANEOUS BACKUP STREAMS PER CONTROLLER

Although a NearStore VTL appliance can support ~90⁵ simultaneous backup streams, because of variation in resource use by different backup configurations, operation can be significantly affected even with fewer simultaneous backup streams.

In this context, a backup stream is a stream of data from the backup application server to a VTL virtual tape drive; it is not a stream of data from a backup application client to a backup application server. A backup application server can multiplex streams of data from several backup clients and produce a single stream to the VTL.

When determining the number of backup streams needed, some non-backup activities count against this total:

A loaded virtual drive, even if inactive, counts as one backup stream.

Each simultaneous export or clone to tape reduces the available total by one.

Each simultaneous import from tape reduces the available total by one.⁶

SELF -TUNING

The NearStore VTL continuously balances backup streams across available disk resources to deliver optimal performance for all storage capacities and backup application workloads; no manual tuning is required. As data loads change, backup streams are automatically directed to the least loaded disks. If additional capacity is added, the NearStore VTL automatically allocates I/O across the new disks to achieve the best possible performance.

The NearStore VTL can also instantly adjust to the variable data transfer rates of typical backup streams without sacrificing performance. Unlike tape drives, the NearStore VTL does not require data to be written within specific throughput ranges to achieve optimal performance; the VTL writes each backup stream at the maximum rate at which it can be delivered by most enterprise-class backup servers.

RAW CAPACITY

Raw capacity is the native size of the virtual tape. This is unrelated to physical disk space consumed by the virtual tape and it is related to the corresponding physical tape type.

DISK ALLOCATION PER TAPE

Disk Allocation per Tape provides the maximum disk space (GB) reserved for this virtual tape drive type.

⁵ 90 streams is the limit for VTLOS 5.5 and above (64 streams is the limit for versions for VTLOS 5.2.X and below).

⁶ For VTLOS 5.2.X and below, each simultaneous import from tape reduces the available total by two.

6.2 VIRTUAL TAPE DRIVE TYPE LIST EXAMPLE

Table 2) Virtual drive type.

VTLOS 5.2.2 - Virtual Tape Drive Type List					
(Configuration Tasks > Advanced > Virtual Tape Drive Types)					
Name	Raw Capacity	Disk Allocation Per Tape	Vendor ID	Product ID	Tape Smart Sizing
AIT 1	35.00 GB	35.00 GB	SONY	SDX-400C	ALDC
AIT 2	50.00 GB	50.00 GB	SONY	SDX-500C	ALDC
AIT 3	100.00 GB	100.00 GB	SONY	SDX-700C	ALDC
DLT 7000	35.00 GB	35.00 GB	QUANTUM	DLT7000	LZS Conservative
DLT 8000	40.00 GB	40.00 GB	QUANTUM	DLT8000	LZS
DLT-S4	800.00 GB	800.00 GB	QUANTUM	DLT-S4	LZS
HP LTO	100.00 GB	100.00 GB	HP	Ultrium-SCSI	ALDC
HP LTO 2	200.00 GB	200.00 GB	HP	Ultrium 2-SCSI	ALDC
HP LTO 3	400.00 GB	400.00 GB	HP	Ultrium 3-SCSI	ALDC
IBM 3590	20.00 GB	20.00 GB	IBM	03590E1A	LZS
IBM 3592	300.00 GB	300.00 GB	IBM	03592J1A	LZS
IBM LTO	100.00 GB	100.00 GB	IBM	ULTRIUM-TD1	IBM LTO
IBM LTO 1 with no DTC	500.00 GB	50.00 GB	IBM	ULTRIUM-TD1	NONE
IBM LTO 2	200.00 GB	200.00 GB	IBM	ULTRIUM-TD2	IBM LTO
IBM LTO 3	400.00 GB	400.00 GB	IBM	ULTRIUM-TD3	IBM LTO
SDLT	160.00 GB	160.00 GB	QUANTUM	SDLT320	LZS
STK 9840A	20.00 GB	20.00 GB	STK	9840	LZS
STK 9840B	20.00 GB	20.00 GB	STK	T9840B	LZS
STK 9840C	40.00 GB	40.00 GB	STK	T9840C	LZS
STK 9940A	60.00 GB	60.00 GB	STK	T9940A	LZS
STK 9940B	200.00 GB	200.00 GB	STK	T9940B	LZS
STK T10000A	500.00 GB	500.00 GB	STK	T10000A	LZS

