EMC Disk Library with Veritas NetBackup

Best Practices Planning

Abstract
This white paper provides specific configuration and best practices information for using the EMC® Disk Library with Veritas NetBackup.

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Executive summary
The EMC® Disk Library (DL) provides a simple and reliable disk-based backup and recovery system. The DL seamlessly integrates with your current Veritas NetBackup backup environment to enable leading-edge backup and restore operations.

Introduction
This white paper provides specific configuration and best practices information for using the EMC Disk Library with Veritas NetBackup.

Audience
This white paper is intended for EMC and Veritas customers, system engineers, partners, and members of the partners’ professional services community who are interested in configuration and best practices information for using the DL with NetBackup.

Disk Library (DL) overview
The DL combines an emulation engine and an EMC storage system in an appliance that presents virtual tape devices to a Fibre Channel storage area network (SAN). These devices are direct, plug-and-play replacements for real tape devices.

The primary advantage to using virtual (disk-based) tapes instead of physical tapes is that it allows you to complete backups during predefined backup windows and drastically improves restore performance. Disk-based data can be accessed immediately, without the delays often associated with the streaming characteristics of physical tape. Virtual devices on disk also eliminate many mechanical delays such as robotic tape picking, loading, tape fast-forwarding, and rewinding found on real tape devices. Accessing data on virtual tape (via DL) becomes much quicker.

Additionally, data is RAID-protected in the DL, which offers a significantly more reliable storage medium than magnetic tape.

Veritas NetBackup software sees the DL virtual libraries and drives as if they were physical tape libraries and drives. From a backup point of view, the devices are standard backup targets.

The DL should be deployed to address operational backup and restore. This specifically addresses the retention of onsite backup data, which is maintained in the expectation of a time-critical restore request. A typical retention period for this data is measured in days to weeks.

Longer-term retention may be better served using physical tape media because it is removable and can be stored on shelves. Tapes can be removed from a library and then taken offsite and vaulted as required, or data can be replicated electronically for remote retention.

Best practices and configuration settings
This section outlines specific processes and configuration settings that yield optimal performance with the DL in NetBackup environments.

Virtual libraries and drives
The Disk Library provides advantages beyond the constraints of a real physical library. Additional libraries can be created to address backup bottlenecks. Additional drives can be created and assigned to backup hosts exclusively, which ensures the best possible performance by removing delays inherent in shared tape drives.

Another possibility is to use a virtual tape library that has many tape drives, but only assign a few tape drives to each backup server. In some cases, this configuration is the best of both worlds; tape drives are not shared, so backups do not have to wait for other backup operations to complete, and the management of backups is simplified because there is only one library.
The system that controls the library is still a potential single source of failure.

The Disk Library emulates a wide variety of industry-standard library and drive types, which allows it to emulate physical environments as closely as possible. NetBackup supports the EMC Disk Library emulation and a number of drive types. Consult the EMC and Veritas NetBackup support matrices at the links below to determine which library/drive emulations are currently supported.


**Persistent binding**

When an operating system scans its storage (Fibre Channel or SCSI) buses for devices, it may assign a different *special file* to a device than it assigned to that device during a previous scan. Since backup software goes through a configuration process and retains information about the device names of the various tape drives in its database, this difference can impact the availability of backup devices. For example, a backup that used to go to `/dev/rmt/2` will not operate if that device name becomes `/dev/rmt/4`.

*Persistent binding* refers to the ability to assign a particular device to a particular device name. Generally, you associate a WWPN, and possibly a LUN, with a SCSI target ID. That way, the operating system always assigns the same special file to a device. Methods vary for different operating systems and fibre cards.

With NetBackup, it is important to set persistent binding for devices that are used for backup and restore operations.

**Everyone_FC SAN client**

When a virtual tape library is assigned to the Everyone_FC client, the backup servers (SAN clients) can see the library if they are zoned in the FC switch that accesses the library — regardless of the backup host WWPN. This is also how a physical fibre tape library works. The library allows many systems to share the tape drives within the library. Sharing a library among multiple NetBackup Media Servers is basic functionality in NetBackup. Sharing a physical tape drive among multiple NetBackup Media Servers requires the [Shared Storage Option (SSO)](http://ftp.support.veritas.com/pub/support/products/NetBackup_Enterprise_Server/280666.pdf) from Veritas. Sharing a virtual tape drive within a virtual library is accomplished via the Virtual Tape Library (VTL) option from Veritas.

Once you have configured a host system as a SAN client (an option with the DL console), that system no longer uses the Everyone_FC SAN client object.

*Using the Everyone_FC SAN is not the recommended practice for systems with multiple backup hosts.*

**Assigning and unassigning virtual libraries**

Until a virtual library is assigned to a SAN client, it is not enabled for use by NetBackup backup servers. When assigning and then unassigning virtual tape libraries, care should be taken to ensure correct library behavior. This is illustrated in the following example.

Assume you have a library with two tape drives and that it is the first library you have assigned to a particular SAN client. The library device will be given LUN 0 and the two drives will be LUNs 1 and 2. Now, let’s say you assign another library of the same type to the same SAN client and then you unassign the first library. At this point, your backup server (SAN client) will see the second virtual library that occupies LUNs 3 through 5. Because there is a gap in LUN numbering (no LUNs 0, 1, or 2), some operating systems may become confused.

If you want only the second library assigned to the SAN client, it is recommended that you change the LUNs so that they start at 0. In the Disk Library Console, do the following:

1. Right-click each device under its SAN client (after expanding).
2. Select *Properties*.
3. Choose the desired LUN from the list.

**Creating virtual tape cartridges for best performance**

When creating virtual tape cartridges for a virtual tape library, it is best to create all the tape cartridges you need at the same time. When you create tape cartridges, they are allocated to LUNs in a round-robin fashion. For example, assume you have 10 LUNs and need 10 virtual tape cartridges. If you create them all at once, each tape cartridge will be on a different LUN. This maximizes performance by spreading the load across all available LUNs.

If tape cartridges are created individually, the tape cartridges could potentially be allocated to the same LUN. This could result in multiple concurrent backup streams running to the same LUN, resulting in poor overall (aggregate) throughput.

The default cartridge capacity (selected upon tape creation) is slightly smaller than the physical cartridge capacity. The default cartridge size helps ensure that compressed data stored in a virtual tape will fit on a physical tape once decompressed and then recompressed by the physical tape drive.

**Compression**

In order to use compression within the DL, compression must first be enabled. By default, compression is disabled. To enable compression, do the following:

1. Right-click **Virtual Tape Library Subsystem**.
2. Select **Properties**.
3. Select **Enable Compression**.

Once compression is enabled, it can be disabled selectively on a virtual tape drive basis.

The Disk Library with code version 3.01 or later for DL4X00/DL4X06 and DL210 models employs a hardware compression card. If you enable virtual tape library subsystem compression in the console, the system automatically uses the card to compress data (when backing up) and decompress data (when restoring). Hardware compression offers higher performance than the software compression that is implemented by the DL server CPUs.

When hardware compression fails, software compression is performed by software running inside the DL. A software compression algorithm is used to compress data on the fly as it is read from the backup server. This occurs before data is written to disk. Because compression is performed in software on the DL, there is a performance penalty when performing backup and restore operations.

When writing to physical tape, the physical tape device may not compress data as well as the DL does when the DL writes to virtual tape. For this reason, care must be taken to ensure that a virtual tape with compressed data by the DL will fit onto a physical tape.

Compression ratios are determined by the overall compressibility of the backup data and the compression algorithm. Highly compressible data will yield better performance; relatively uncompressible data will yield slower performance.

**Moving data from virtual tape to physical tape**

When data backed up to a DL needs to be written onto physical tape, three methods for moving the data to tape are available. The first is to have the integrated NetBackup Media Server duplicate backup images, as described in “Duplication with the integrated media server.” The second method is to use another NetBackup Media Server to duplicate backup images to a separately attached tape library on the SAN. The third method is to have the DL export the data to a direct-attached tape library.

The recommended method for duplication with the DL in NetBackup environments is to use the integrated media server. This gives NetBackup full control of the duplication at the backup image level and minimizes the traffic impact on the existing SAN infrastructure.
**NetBackup environment**

DL versions 3.0 and later feature an integrated NetBackup Media Server duplication capability. The integrated media server performs duplication under NetBackup control, either within a DL (to physical tape) or between two DLs. The NetBackup 6.5.1 Media Server is integrated into versions 3.2 and 3.3 of the DL, therefore this functionality can be used in NetBackup 6.5 environments. The integrated NBU 6.5 Media Server can also be updated with code upgrades as they become available from Symantec. The NetBackup 6.0 MP4 Media Server is integrated into version 3.1 of the DL, therefore this functionality can be used in NetBackup 6.0 environments. The integrated NBU 6.0 Media Server can also be updated with newer MPs as they become available from Symantec and can also be upgraded to NetBackup 6.5. The NetBackup 5.1 MP5 Media Server is integrated into version 3.0 of the DL, therefore this functionality can be used in NetBackup environments using NetBackup 5.1, 6.0, or 6.5 Master Server. This version may be upgraded to more recent NetBackup 5.1 MPs, but cannot be upgraded to NetBackup 6.0 or 6.5. All standard NetBackup 5.1 and 6.0 configuration rules and restrictions apply. Customers should purchase a NetBackup Tier 2 Enterprise Client license from Symantec to use the integrated media server within the DL. The SAN media server is now part of the Enterprise Client and can be used because the integrated media server is performing only duplication, not backing up other NetBackup clients.

Consolidated media management through integrated NetBackup is for image duplication and data management purposes. Backing up data directly to the integrated media server within the DL via LAN is not supported.

The integrated media server software feature is automatically started when the DL Hosted Backup Enabler license DL-MEDIAMGR (an optional license available from EMC) for NetBackup is installed. The media server software also automatically restarts after a DL reboot as long as the enabler license remains installed. If the Hosted Backup Enabler license for NetBackup license is removed, the media server software is stopped and will remain stopped upon DL reboot.

Activating the DL Hosted Backup Enabler license for NetBackup license also enables a menu option within the DL GUI that checks the status of the media server and enables starting and stopping the media server services.

**Integrated media server**

The use of the media server duplication requires the installation of multiple licenses:

- The (DL) Hosted Backup Enabler license for NetBackup license must be installed via the DL Console; this starts the media server software inside the DL.
- A unique user/password combination enables root access for properly licensed Disk Libraries; the username is **hbeadmin**. The password is **2#BackItUp** for the EDL 3.1, 3.2, 3.3, and 4.0 code bases, and the password is **backup** for EDL 3.0 code. This user will have a group ID of 0 and a unique user ID. This allows the administrator to perform the installation of NetBackup software and to apply the media server license and name. Only DL systems that are properly licensed via the Hosted Backup Enabler license for NetBackup will be able to access the unique user/password.
- An appropriate NetBackup Media Server license must be installed by logging in to the DL server using the “hbeadmin” account while installing NetBackup software.
- Stopping, starting, and restarting the NetBackup services can be performed only when the media server license is installed.

In addition, NetBackup requires the Virtual Tape Option license, based on the installed usable disk capacity, for every virtual tape library.
Installation

Single engine or dual engine with separate storage array configurations

Note: When installing DL version 4.0, please refer to the links and information below as the NetBackup software is not preloaded on the EDL as in prior releases.

Refer to the Veritas NetBackup 6.5 Installation Guide for UNIX and Linux for installation steps:
http://seer.entsupport.symantec.com/docs/290199.htm

Refer to the following sections if the installation of integrated media server is for EDL version 3.0, 3.1, 3.2, or 3.3.

NetBackup 6.5 Media Server
Upon initial setup of the DL with the integrated media server, you must install the NetBackup software. You do this by logging in as the “hbeadmin” account. Run the installics script in the /appla/NBU65/ics directory and select the Veritas Private Branch Exchange option. After ics installation is complete, run the install script from the /appla/NBU65/media directory to install the NetBackup 6.5 Media Server. This operation prompts a series of questions including the NBU Media Server license and Master Server name, and takes several minutes to complete. When the install completes, you need to install patches using the NB_Update.install script located in the /appla/NBU65/patch directory. After installing the patches, you can configure the integrated media server for use within the DL.

NetBackup 6.0 Media Server
Upon initial setup of the DL with the integrated media server, you must install the NetBackup software. You do this by logging in as the “hbeadmin” account. Run the installics script in the /appla/NBU60/ics directory and select the Veritas Private Branch Exchange option. After ics installation is complete, run the install script from the /appla/NBU60/media directory to install the NetBackup 6.0 Media Server. This operation prompts a series of questions including the NBU Media Server license and Master Server name, and takes several minutes to complete. When the install completes, you need to install patches using the Vrts_pack.install script located in the /appla/NBU60/patch directory. After installing the patches, you can configure the integrated media server for use within the DL.

NetBackup 5.1 Media Server
Upon initial setup of the DL with the integrated media server, you must install the NetBackup software. You do this by logging in as the “hbeadmin” account and running the install script from the /appla/NBU directory. This operation prompts a series of questions including the NBU Media Server license and Master Server name, and takes several minutes to complete. If the install process stalls at this point, do not abort the process; instead press CTRL+C to continue. (This issue is addressed in follow-on versions of NetBackup.) When the install completes, you need to install patches using the Vrts_pack.install script located in the /appla/NBU directory. After installing the patches, you can configure the integrated media server for use within the DL.

Dual engine with single storage array configuration

Note: When installing EDL version 4.0, please refer to the links and information below as the NetBackup software is not preloaded on the EDL as in prior releases.

Refer to the Veritas NetBackup 6.5 Installation Guide for UNIX and Linux for installation steps:
http://seer.entsupport.symantec.com/docs/290199.htm

Refer to the following sections if the installation of integrated media server is for EDL version 3.0, 3.1, 3.2, or 3.3.

NetBackup 6.5
Two different directories are used to install NetBackup software with a dual engine/single array DL configuration. Engine A uses the /appla/NBU65 directory as described previously. Engine B uses the /applb/NBU65 directory for both the initial install and the patch install, using the steps described previously.
NetBackup 6.0
Two different directories are used to install NetBackup software with a dual engine/single array DL configuration. Engine A uses the /appla/NBU60 directory as described previously. Engine B uses the /applb/NBU60 directory for both the initial install and the patch install, using the steps described previously.

NetBackup 5.1
Two different directories are used to install NetBackup software with a dual engine/single array DL configuration. Engine A uses the /appla/NBU directory as described previously. Engine B uses the /applb/NBU directory for both the initial install and the patch install, using the steps described previously.

Internal media server software status
The DL console does not detect the media server until after the devices are added and recognized by the master server. To see the active services before the master server recognizes the devices, you must log in to the DL server (with the username and password account defined for NetBackup), and type the following standard NBU command into the CLI:

```
/usr/openv/netbackup/bin/bpps -a
```

Duplication with the integrated media server
The integrated media server feature supports all standard NetBackup duplication operations. These include the following use cases (operations):

- Duplicating backup images from virtual tape within the DL-to-FC connected physical tape on the back end of DL
  Here, the DL integrated media server reads backup image(s) from the virtual tape libraries used by any NetBackup Media Server, and writes to physical tape devices attached to the back-end FC port(s) of the DL. In this scenario, a different retention policy can be applied to the duplicated copy of the image. Setting different retention policies could enable the copy on the virtual media to be retained for a relatively short period of time (for example, one week) whereas a longer retention policy could be applied to the duplicated copy on tape for longer-term storage.

- Duplicating backup images from virtual tape to a second FC-connected DL on the back end of DL
  This has the advantage of maintaining a second copy of data on disk, while freeing up space on the primary backup target.

- Duplicating backup images from virtual tape to a remote DL via extended back-end FC SAN connectivity
  This allows electronic duplication of a backup image over distance, where the remote virtual tape device is written to by the local DL media server. Recovery of the backup image can also be accomplished over that same distance when and if it is necessary.

- Duplicating backup images from virtual tape to a second DL with an integrated media server over IP
  This provides the ability to duplicate over a relatively low cost infrastructure (one that may already be in place), and still keep the remote data on DL disk. This is particularly useful when a limited amount of data needs to be moved (1 TB to 2 TB per day depending on the distance). Performance limitations of the existing IP infrastructure will impact the amount of data that can be duplicated with this solution.

- Duplicating backup images from virtual tape to a different/separate NetBackup Media Server over IP
  This provides the ability to duplicate over a relatively low cost infrastructure (one that may already be in place) without requiring a second DL at the remote site. This is particularly useful when a limited amount of data needs to be moved (1 TB to 2 TB per day depending on distance). Performance limitations of the existing IP infrastructure will impact the amount of data that can be duplicated with this solution.

In these scenarios, one or more virtual tape libraries are created within the DL management console and assigned to NetBackup Media Servers. These virtual tape libraries can be used by one or more than one...
media server as well as the integrated media server. For the integrated media server to access these virtual
tape libraries for duplication operations, these virtual tape libraries must also be assigned within the DL
management console to the “Internal Backup Software” SAN client. This is accomplished by selecting the
“internal backup software” object within the “SAN clients” option of the DL console. Additionally, an
alternate read host must be configured within NetBackup. This allows the integrated media server to read
from the virtual tapes created by any media server, and write to either virtual or physical tape devices
attached to the DL or to a second local or remote media server.

NetBackup allows two or more media servers to share a tape library and its associated tape drives using any
of the following scenarios:

- With the Shared Storage Option (SSO), where one or more of the physical tape drives in a physical
tape library are shared by two or more media servers.
- Without SSO, where one or more of the tape drives within a physical library are dedicated (not shared)
to a media server
- With the Virtual Tape (VTL) Option, where one or more virtual tape drives in a virtual tape library are
shared by two or more media servers.

**Media server assignment**

Ensure that all virtual tape devices to be used for duplication operations within the DL are not mounted to any
media server before starting a duplication operation.

In environments with multiple media servers, it is very important to ensure that NetBackup directs the
integrated media server to perform the duplication operation(s).

**Media server configuration**

From the master server, launch the NBU administrator console. Select **Configure Storage Devices** to open
the Device Configuration Wizard (Figure 1). The integrated media server can be added using standard
NBU processes. Perform a standard NetBackup scan and configure operation. This provides a listing of all
available virtual tape devices within the DL.
Backup image duplication

There are three methods that can be used to perform duplication of backup images on virtual tape with an integrated NetBackup Media Server. One method is to use the command line interface (CLI), as explained in the section “CLI (bpduplicate)”. This requires duplications to be performed either manually via the CLI or writing a script that runs at a specific time and generates a file listing all backup IDs that need to be duplicated and runs the appropriate NetBackup command to perform the duplication of those backup IDs.

The second method for duplicating backup images is to use the NetBackup Vault option, which is explained in the section “Vault” on page 14. Not only does the Vault option allow you to schedule and automate the duplication process, it also tracks the media that is removed from the library for offsite vaulting.

The third method, available only in NetBackup 6.5 and later, is to use Storage Lifecycle Policies (SLP). SLP allows for configuring a policy that specifies how a backup image is managed throughout its lifecycle. The policy can be configured to back up an image to the DL, then use the integrated NetBackup 6.5 Media Server to duplicate the image to physical tape or another DL. This automates the duplication process although the current SLP implementation will kick off the duplication shortly after the backup completes.

So, although it’s automated, it does not allow scheduling of when the duplication occurs, which the Vault option does allow. See the section “Storage Lifecycle Policies” on page 18 for more information.

CLI (bpduplicate)

The NetBackup command that is used for duplication is bpduplicate. You can run this command from either the master server or the integrated media server.

The command syntax is explained in detail in the Veritas NetBackup 6.5 Commands for UNIX and Linux manual available at the following URL:
The command syntax is explained in detail in the *Veritas NetBackup 6.0 Commands for UNIX* manual available at the following URL:


The command syntax is explained in detail in the *Veritas NetBackup 5.1 Commands for UNIX* manual available at the following URL:


Because the NetBackup Media Server in the DL does not perform the original backup, an alternate read host for the duplication operation must be specified.

When using `bpduplicate`, searches can be performed to find backup IDs to be duplicated based on:

- Client name
- Policy name
- Policy type
- Backups written by a specific server
- Schedule type

There are numerous ways to specify which backups should be duplicated. These include:

- Backup IDs may be specified individually.
- A file can list all backup IDs to be duplicated.
- Start and end times may be used to specify the range of dates and times that include all backups to be duplicated.

Among other things that may be specified within the `bpduplicate` command are the volume pool, the destination storage, unit and the retention period for the copies. Below is the command line and options for `bpduplicate`:

```
/usr/openv/netbackup/bin/admincmd/bpduplicate [-number_copies number]  
[-dstunit destination_storage_unit_label[,copy2,...,copyn] [-dp destination_pool_name[,copy2,...,copyn] [-p | -pb | -PD | -PM] 
```

For UNIX systems:

```
usr/openv/netbackup/bin/admincmd/bpduplicate -backupid 
backup_id -dstunit destination_storage_unit_label -dp destination_pool_name -altreadhost hostname
```

Example:

```
usr/openv/netbackup/bin/admincmd/bpduplicate -backupid 
External_1165117855 -dstunit Internal-hcart-robot-tld-1 -dp NetBackup -altreadhost Internal
```
For Windows systems:

```bash
install_path\NetBackup\bin\admincmd\bpduplicate -backupid
   backup_id -dstunit destination_storage_unit_label -dp
   destination_pool_name -altreadhost hostname
```

Example:

```
C:\Program_Files\VERITAS\NetBackup\bin\admincmd\bpduplicate.exe-backup External_1165117835 -dstunit Internal-hcart-robot-tld-1 -dp NetBackup -altreadhost Internal
```

Vault

The second method for duplicating backup images is to use the NetBackup Vault option. The Vault option provides the ability to schedule and automate the duplication process, and it tracks the media that is removed from the library for offsite vaulting.

More detailed information about using Vault can be found in the *Veritas NetBackup Vault 6.5 System Administrator’s Guide for UNIX and Windows*, which is available at the following URL:


More detailed information about using Vault can be found in the *Veritas NetBackup Vault 6.0 System Administrator’s Guide for UNIX and Windows*, which is available at the following URL:


More detailed information about using Vault can be found in the *Veritas NetBackup Vault 5.1 System Administrator’s Guide for UNIX and Windows*, which is available at the following URL:


Vault configuration is accomplished through the NetBackup Administration Console as shown in Figure 2.

![NetBackup Administration Console](image)

**Figure 2. NetBackup Administration Console**
Because an alternate media server must be used for the duplication of the backup images, alternate media server names must be specified in the Vault Properties dialog box shown in Figure 3.

![Vault Properties dialog box](image)

**Figure 3. Vault Properties dialog box**

Robots within the DL, a physical tape library, and/or another DL that are to be used with Vault must be configured. This is done using the New Vault Robot dialog box shown in Figure 4.

![New Vault Robot dialog box](image)

**Figure 4. New Vault Robot dialog box**
After configuring robots, vaults are created and configured. A vault is a logical entity that refers to a collection of removable media drives (usually tape drives) within a robot. The New Vault dialog box is shown in Figure 5.

**Figure 5. New Vault dialog box**

Once vaults are created, profiles can be created and configured. A Vault profile is a template for a vault job; it contains the rules for selecting, duplicating, and ejecting media.

The Duplication tab within the New Profile dialog box in Figure 6 shows the selection of an alternate read server.

**Figure 6. New Profile dialog box**
Figure 7 shows the Duplication tab with **Alternate read server** selected. This screen is also used to select the internal media server storage unit. The volume pool and retention level can also be selected from this screen. Pages 61-81 of the *Veritas NetBackup Vault System Administrator’s Guide* provide additional detail.

![New Profile dialog box, Duplication tab](image)

**Figure 7. New Profile dialog box, Duplication tab**

A Vault policy must also be created. A Vault policy is a NetBackup policy that is configured to run Vault jobs; a Vault policy does *not* back up client systems. The policy includes the schedule for when the Vault session should run (day or date and time window) and the command to run a Vault profile.

Setting up a Vault policy differs from setting up a regular policy in NetBackup. First, Vault must be specified as the policy type. Second, NetBackup clients are not specified for Vault policies. Third, rather than specifying files to back up on the Backup Selections tab, you specify the `vltrun` command to be used to run a vault session and the Vault profile to be used as shown in Figure 8.
Storage Lifecycle Policies

A third method for duplicating backup images is to use Storage Lifecycle Policies (SLP). This allows configuring a policy that specifies how a backup image is managed throughout its lifecycle. The policy can be configured to back up an image to the DL, then use the integrated NetBackup 6.5 Media Server to duplicate the image to physical tape or another DL. This automates the duplication process although the current SLP implementation will kick-off the duplication shortly after the backup completes.

More detailed information about using SLP can be found in the Veritas NetBackup 6.5 System Administrator’s Guide, Volume 1 for UNIX and Linux, which is available at the following URL:


SLP configuration is accomplished through the NetBackup Administration Console.

Create a Storage Lifecycle Policy

1. In the NetBackup Administration Console, select NetBackup Management > Storage > Storage Lifecycle Policies.

2. Click Actions > New > New Storage Life Cycle Policy. TN_EDL_SLP is the new SLP name as shown in that field in Figure 9.
Figure 9. Create a new Storage Lifecycle Policy

Adding a storage destination to a lifecycle policy
Open the TN_EDL_SLP Storage Lifecycle Policy dialog box created in Figure 9 and click Add. Select the storage unit of any SAN client defined on the EDL GUI for backups over a SAN as shown in Figure 10. Refer to the EMC Disk Library Online Help for SAN client definition. The Alternate Read Server should not be selected.

Figure 10. Storage unit defined for the SAN client on the EDL GUI

Adding a storage destination for duplication
Click the Add button on the New Storage Lifecycle Policy dialog box. Complete the New Destination dialog box with the Duplication radio button selected and specify the storage unit of the media server.
where the data is to be duplicated as shown in Figure 11. Because an alternate media server must be used for the duplication of the backup images, alternate media server names must be specified in the **Alternate read server** drop-down. This is shown in Figure 12.

![Figure 11. New storage destination for duplication](image1)

![Figure 12. Alternate read server is the EDL internal media server](image2)
The storage destination created as part of the backup and duplication as shown in Figure 10 and Figure 11, respectively, is displayed in the Storage destination list as shown in Figure 13.

![Change Storage Lifecycle Policy](image)

Figure 13. SLP with backup and duplication defined

Select a Storage Lifecycle Policy using the TN_EDL_SLP policy that was created earlier. This is shown in Figure 14. The policy has to be activated and run manually or scheduled.
While any of the three methods (CLI, Vault option, or SLP) discussed may be used for duplication, the automation provided by the NetBackup Vault option or SLP simplifies the task of making copies of virtual tape on physical tape. In addition the NetBackup Vault option allows scheduling when the duplication occurs.

Integrated media server duplication provides the following advantages and disadvantages:

**Advantages**
- Enables duplication from the DL under NetBackup control, with different retention policies for different duplicated copies of data.
- Enables duplication at the backup image level.
- Enables copying from one tape type (for example, virtual LTO) to another tape type (for example, physical T9840C).
- Enables copying multiple virtual tapes to a single physical tape (for example, LTO to LTO3).
• Enables copying a single virtual tape to multiple physical tapes (for example, LTO2 to T9940B).
• Does not consume an external media server’s cycles/resources (CPU cycles, I/O bandwidth, memory, and so on).
• Eliminates the need to maintain additional front-end SAN infrastructure for connections to a physical tape library as well as the virtual tape library (DL).
• Does not consume SAN bandwidth – data is duplicated internally to the DL from virtual tape over back-end FC ports or IP to physical tape.

Disadvantages
• Requires the appropriate DL license and NetBackup Tier 2 Enterprise Client license from Symantec.

**DL export to physical tape**

The DL export function allows entire virtual tapes to be copied under DL control. DL’s export functionality creates physical tapes in two ways: automatically and manually:

- **Automatically** — DL creates the backup tape when the backup application issues a tape export command. In this case, the DL copies or moves the contents of the virtual tape to direct-attached physical tape. If this feature is used, the following must be true:
  - The physical library needs to have a physical tape with a barcode that matches the barcode of the virtual tape being exported.
  - The drive type in the DL and physical library should match. This ensures that NetBackup will recognize the stand-alone physical tape as a valid NetBackup tape, and the data will fit on the tape.
- **Manually** — DL creates the backup tape using the DL Console program. Here again, the drive type of the DL and physical library should match. This ensures that NetBackup will recognize the stand-alone physical tape as a valid NetBackup tape, and the data will fit on the tape.

Virtual tape data can either be moved or copied to the physical tape. Whether data is copied or moved, the contents of the virtual tape are sent first to the DL virtual vault and then to physical tape. If data is copied, the DL retains the virtual tape in the virtual vault after the data is transferred. If data is moved, the virtual tape is removed from the virtual vault after the data transfer is completed. Data can be maintained in the virtual vault for a period of time, depending on retention policies that have been set within the DL console.

The virtual vault is a temporary tape storage area within the DL that is not associated with a specific virtual tape library. Virtual tape(s) can be exported only via the virtual vault.

Regardless of whether the copy or move method is used, the virtual tape is removed from the virtual library and is placed in the DL virtual vault. NetBackup will no longer see the tape in the library – it will be the same as if a tape were exported from a physical tape library.

To restore from a virtual tape that has been copied to a physical tape, the DL Console must be used to import the tape from the physical drive back to the DL. The DL then needs to be rescanned to make NetBackup aware that the tape has returned. The restore can then be performed.

To restore from a virtual tape that has been moved, the DL Console import function can do one of the following:

- Copy the contents of a physical tape to a virtual tape.
- Directly access a physical tape without copying the entire tape to the DL.
- Recycle a physical tape.

After the import function completes, the DL needs to be rescanned to make NetBackup aware that the tape has returned. The restore can then be performed. This process occurs within the control of the DL and, as such, means a two-step process of restore.

Finally, it is possible to restore from the physical tape by loading it into a NetBackup-controlled tape device of the same type that was used when the physical tape was written. The DL writes to physical tapes.
by performing a byte-for-byte copy of the virtual tape. As a result, tapes created by the DL can be directly
restored by NetBackup without having to go through the DL.

This option may be useful with older versions of the DL that do not have the integrated media server
duplication capability and whose tape creation requirements do not exceed 2 TB to 3 TB per night. A single
fibre port or SCSI port is available on the DL to write to physical tape, which fixes a maximum rate of
about 160 MB/s when exporting tapes. (The actual rate depends on the type and number of physical tape
drives.) This method supports copying the contents of entire tapes, not individual backup images. If only
one backup image is to be copied (certain backups, but not the entire tape) for long-term retention purposes,
it will be necessary to use a copy option where NetBackup controls the process.

Note: DL export is not recommended when the integrated media server duplication capability is available.

The advantages and disadvantages of this method are listed next:

**Advantages**
- Permits physical tape creation when NetBackup duplication is not available.
- Does not consume backup server cycles/resources (CPU cycles, I/O bandwidth, memory, and so on).
- Eliminates the need to maintain additional front-end SAN infrastructure for connections to physical
tape devices as well as the virtual tape library (DL).
- Does not consume SAN bandwidth.

**Disadvantages**
- NetBackup has no knowledge of the physical tape and is not able to manage multiple retention
policies. One barcode is used first for short-term operational backup data. The same cartridge is taken
out of the library for longer-term offsite retention.
- Backup images that span multiple virtual tapes will not be duplicated in their entirety as DL export is
done at the tape level – and not the image level.
- Physical tapes may not be completely full. This may result in an increased number of tapes going
offssite.
- Inability to copy to a different type of tape medium. (The virtual drive type should match the physical
drive type for tapes that will be exported.)
- Limited bandwidth to physical tape drives. (Dedicated FC ports are either a 2 GB fibre or one SCSI
bus).

**Creating tapes using a back-end library**
To create a relationship between physical back-end tapes and virtual tape when attempting to export under
DL control, Auto Archive must be enabled on the DL. The following requirements must be met:
- A physical library is connected to the Disk Library.
- The physical library has a barcode reader.
- The virtual tape is the same capacity (or smaller) as the physical tape.

After enabling the advanced tape creation method (from the DL Console, select Console Options), you can
create virtual tapes whose barcodes match those of your physical tapes. The physical library must be
inventoried before creating the virtual tape cartridges.

**NetBackup considerations**
NetBackup will inventory the DL and discover tapes identified by their barcodes. Using the normal backup
process, NetBackup places backup data on the virtual tapes. The backup administrator can then request
NetBackup to eject a tape from the DL. The DL interprets this command as a request to export the data on
the virtual tape to the physical tape with the matching barcode. Upon successful completion of the export
with move mode, the virtual tape is destroyed and the storage is returned to the storage pool.
Failed exports due to faulty physical media or dedicated library failures are recorded in the disk library error log. SNMP traps are also sent if tape creation fails. The virtual tape is not destroyed until the successful creation of a physical tape is confirmed.

The ejection process can be initiated from the backup console using the NetBackup GUI or using the NetBackup Vault product, or the backup administrator can use a script that calls the appropriate backup software command.

**Importing physical tapes**

Physical tape media containing backup information can be imported into the disk library. This may be data created prior to acquisition of the DL or data that was exported for long-term storage. Imports are initiated via the Disk Library Console. There are two methods of tape import:

- **Copy import**
  
  Copy import copies the entire contents of the physical tape onto a virtual tape. This process may take several hours, depending on the physical tape drive technology and the amount of data residing on the tape. Use this method if you want to retain a local disk-based copy of the tape data.

- **Direct-access import**
  
  Direct-access import is used to restore a file quickly. This process creates a direct path from the backup software to the data on the physical tape media. NetBackup can then restore at the same speed as if the tape was in a local physical tape drive. Throughput characteristics of the physical tape drive determine the speed of restore. This is the fastest method for recovering data from a physical tape using the library attached to the dedicated DL port. The advantage is that the entire tape does not need to be imported. Restores of individual files are faster with this method.

  This method does not create a virtual copy of the physical tape. Future restores will require the physical media. This method may take only a few minutes to restore a single small file.

The DL also has the capability to recycle physical tapes after their retention policy has expired without having to import the entire contents of the tape into the DL. This capability is referred to as recycle import. When this feature is used, only the tape label is read from the physical tape and stored on virtual tape. The tape label is sufficient for the backup software to recognize the tape and recycle it; therefore, the entire tape does not need to be imported. Recycle mode is useful when retrieving a physical tape from offsite storage because much time is saved by not having to import the entire physical tape into the DL.

**Physical tape libraries**

Both the DL software and the integrated media server software can make use of physical tape devices attached to the DL. However, it is important to understand that even though the DL software and the integrated media server software execute in the same DL appliance, they don’t arbitrate access to the Fibre Channel ports of the DL.

All configured back-end physical tape devices must be assigned to either the DL software or the integrated media server software – but not both. This will eliminate any possibility of overwriting data by either of the applications.

The DL supports the connection of multiple physical tape libraries or stand-alone tape drives. However, in the case where more than one physical tape library or drive is connected, each must be configured with either the DL or the media server software – but not both. The DL software can control all, some, or none of the back-end connected tape devices that are not controlled by the media server software. Likewise, the media server software can be configured to control some, all, or none of the back-end tape devices as long as the tape devices to be controlled are not already assigned to the DL software.

For example, if two physical tape libraries are directly connected to the DL (each on a separate FC port), the following configurations are possible:

- Both libraries are dedicated to the DL software, and none are dedicated to the media server software.
Both libraries are dedicated to the media server software, and none are dedicated to the DL software.

One library is dedicated to the DL software, and one library is dedicated to the media server software.

Ensure that each physically attached back-end tape library or drive is assigned to either the DL application or the media server software application – but not both. This eliminates any possibility of overwriting data by either of the applications.

**Tape stacking**

Multiple virtual tapes on DL can be duplicated to a single physical tape under NetBackup control. This has the benefit of providing improved performance when the physical tape is used for a restore. This also consolidates backup images from a larger number of lower-capacity tapes to a smaller number of higher-capacity tapes.

**Tape conversion**

Data on one virtual tape type can be duplicated to a different tape type when a different physical tape type is required. Additionally, a large virtual tape can be duplicated to multiple smaller physical tape types. NetBackup manages the tape spanning process to physical tape.

Also, data on physical tape can be converted to a different tape type (physical) by using the integrated media server to move data between tape devices connected to the back-end FC ports on the DL.

**Data Domain interoperability**

In order to interoperate the Disk Library with the Data Domain system, initiator ports on the DL need to connect to the target ports on the Data Domain system through a Fibre Channel SAN. To do this, two ports on the DL should connect to two connections on the Data Domain system to assure best performance and availability. On the Data Domain system, EMC recommends using two Fibre Channel HBAs and splitting the connections between the two. EMC also recommends evenly distributing the Data Domain virtual tape drives between the two connections.

For example, port 4 (initiator port) on the DL is zoned to port 5A (target port) on a Data Domain DD880 system. Port 8 (initiator port) on the DL is zoned to port 6A (target port) on the Data Domain DD880 system for the second connection. A virtual library is created on the Data Domain system that contains 10 tape drives. Five of these drives are assigned to port 4 on the DL, and the other five drives are assigned to port 8 on the DL. Splitting these drives across two ports will assure that the best performance is possible.

*Note:* If a DD690 or DD880 system is configured with two Fibre Channel HBAs (four Fibre Channel ports) then the system will have only two 1 Gb Ethernet network ports for replication and management, as it won’t be possible to add in the 10 Gb Ethernet option.

In order to properly size the Disk Library when configured with the Data Domain system, retention requirements must be thoroughly reviewed and changed to accommodate the longer retention times possible with deduplication technology. Each system must be sized separately according to the retention scheme desired and data access needs to be anticipated to take full advantage of the features of that system and may require backup policies to be re-evaluated. Storage capacity must be sized to adequately handle the amount of data expected to be retained in both native and deduplicated format. Please contact your EMC representatives to properly size the environment in which this interoperability will be used.

**Multi-node and failover**

The DL family includes a number of dual-engine models. These systems provide an active-active mode of operation, where both engines provide virtual tape device resources when the system is in a normal state. Should a failure occur on one engine, the surviving engine will provide its own virtual tape device resources and those of the failed engine.

The integrated media server can be used in either one or both of the engines in dual-engine DLs. However, it is important to understand that the DL does not provide a “clustering” or failover capability for the
NetBackup Media Server software. In a dual-engine DL configuration, each of the DL engines is a separate, stand-alone computing environment as far as NetBackup is concerned, and a SAN media server license is required for each engine that will write data to physical tape.

In a standard DL server grouping configuration, there is no service IP address. However, if failover setup is configured on the DL, care must be taken when setting up the service IP address to ensure proper media server operation during failover.

**Embedded media server duplication setup**

Should a DL engine failure occur, the management IP addresses and the Fibre Channel World Wide Name (WWN) values of the failed DL engine are added to the surviving DL engine. In addition, all virtual tape devices that were controlled by the failed DL engine are also added to the surviving engine. When this occurs, the virtual tape devices on the failed DL engine that were assigned to the embedded media server software are no longer available to the embedded media server software. Additionally, all media server services are stopped for the media server that was running on the failed engine. This prevents other NetBackup servers from trying to communicate with the failed system. The NetBackup Media Server that was running in the failed DL engine is not able to execute on the surviving DL engine.

To ensure proper media server operation in both normal and a failover states, the following steps should be followed at the initial setup:

1. Use the DL hostname and its service IP address when DNS entries are created for the DL server
2. Set up forward and reverse DNS lookup on the service IP address *

   * Do not use the management IP address

The setup defined here will enable the NetBackup Master Server and other media servers to communicate with the embedded media server software through the service IP address – ensuring that all packets of data being sent to and from the embedded media server software are sent over the service IP address. If a DL engine failover occurs, the master server and all other media servers that were communicating with the media server on the failed DL engine will not contact the remaining DL engine. This is because the service IP address is not transferred over to the surviving engine, and the embedded media server software on the failed engine is stopped.

When a failback or reboot of the failed DL engine occurs, the NetBackup Media Server services will be restarted.

**Remote copy setup with embedded media server**

If you plan to use remote copy on the DL, when you configure to support embedded media server duplication (as described previously), remote copies must be directed to the management IP address of the target DL engine – and not the hostname or service IP address. You can enter the management IP address in the Remote Copy Setup wizard from the DL console. In the event of a DL engine failover, remote copy will send the data using the management IP address, which will have been failed over to the surviving DL engine.

An alternative to using the management IP address for remote copy operations is to register a separate and different “remote copy hostname” in DNS that is associated with the management IP address of the DL. In this case, all remote copy jobs directed to the Remote_copy_hostname will be sent to the Management IP address of the DL.

**Recovery of NetBackup Media Server**

To ensure recovery of the NetBackup Media Server, Symantec recommends that catalog backups be taken periodically. The *Veritas NetBackup 5.1 System Administrator’s Guide Volume 1* has more detail.
Discovering the NetBackup version number

The following procedure checks the version number of the NetBackup Media Server software running inside the DL.

1. In the NetBackup Administration Console, select:
   Host Properties > media servers > DL_nodename
2. The NetBackup version is displayed in one of the tabs for the DL media server.

DL media server replacement and credentials

If the NetBackup Media Server inside the DL is configured into a NetBackup environment and subsequently replaced (either with a DL upgrade or as a result of a DL system replacement), the NetBackup Media Server credentials are not maintained and the NetBackup Master Server will report that the media server is already seen on the network. To configure a rebuilt integrated media server, the NetBackup Administration Console (jnBSA) can be used to delete the original DL media server credentials. Once deleted, the NetBackup Master Server and DL media server can create a new set of credentials.

Credentials for all other media servers will also need to be deleted and re-created.

Device drivers

A number of different driver types can be involved when backing up to a DL or any physical tape library or drive. This is dependent on the type of hardware and software platform used for the backup server(s).

Following are recommendations on how to set up those drivers for best results when backing up to the DL. (These suggestions are also relevant if you use real tape libraries.)

Fibre Channel port drivers

As noted earlier, persistent binding is a best practice. Persistent binding is performed at the Fibre Channel HBA driver level. Procedures are vendor-specific and also vary by operating system. Refer to your Fibre Channel card vendor’s documentation for instructions on how to do this.

If persistent binding is improperly configured, the operating system may provide a device with multiple names—giving a device one device name after a boot, but giving it a different name on a subsequent boot. In the case of nonpersistent binding, NetBackup must be reconfigured to use the new device special filenames.

Tape drivers

NetBackup requires special drivers or driver settings. The user sets up tape drivers directly in the operating system for the virtual tape drives within the virtual libraries. The user then installs NetBackup tape drivers (Windows) or Sg driver (UNIX) for these tape devices.

If you create DL virtual libraries that have the same type of tape drives that you have been using in your backup environment, you will probably continue using the same NetBackup driver. This is preferable since proper operation has most likely already been verified. However, you may decide to use a different type of tape drive. Or, if implementing a different backup scheme than previously configured, you may have to set up device drivers for the virtual tape drives.

Windows drivers

Select System Management > Device Manager to see whether the NetBackup device drivers have been installed. If tape drives are in the Other Devices category, you must update the NetBackup driver.

Solaris drivers

The Solaris tape driver is st. To get it to properly support the correct type of tape drive (real or virtual), you must edit st.conf. You must make two types of edits to this file:
• Type of tape drive and low-level characteristics
• Tape drive target ID and LUN

The tape drive type is specified by a string of characters, which is the drive’s SCSI Inquiry information. The second line tells the tape driver characteristics of the tape drive.

For instance: To add proper support for LTO tape drives to a Solaris 8 system, add the following lines to st.conf:

```
"IBM", "IBM Ulterium", "CLASS_LTO1",
... CLASS_LTO1  = 1, 0x24, 0, 0x45863d, 2, 0x00, 0x01, 0;
```

You must also specify the tape drive target ID and LUN.

It’s often not known what target ID Solaris will assign to a particular tape drive.

To determine the LUNs, check the Disk Library Console by expanding the library under SAN clients to find the LUNs that the disk library has assigned to each of the virtual devices. The st.conf file must contain an entry for each of the LUNs. It may also be necessary to identify the target ID that Solaris gives to the tape device.

When you find the correct ID, remove the others. Solaris takes longer to boot if it has to check for more devices.

If persistent binding is set up, you will know the target ID.

Run sgscan to verify that the operating system and NetBackup can see all the virtual tape devices. Usually on UNIX systems, you must properly install and configure an sg driver. It is not sufficient for the UNIX system to have properly configured tape devices (such as /dev/rmt/0, /dev/rmt/1, and so on); you must also ensure that the sg driver has been configured to handle the highest target ID and LUN. Otherwise, sgscan will not list the devices.

In UNIX media servers, NetBackup uses the SGSCAN command to discover the tape and robotic devices to be used by NetBackup. This command and NBU use the SCSI Generic (SG) device drivers to communicate with the devices recognized by the operating system.

After installing the software, the SG drivers must be installed.

You can run the sg.build command to build the device files and to edit the entries in the st.conf, sg.conf, and sg.links files. The command `/usr/openv/volmgr/bin/sg.build all -mt 15 -ml 6` builds the files in `/usr/openv/volmgr/bin/driver` containing 15 targets with 16 possible LUNs for each.

Install the drivers using the following commands:

```
cp /kernel/drv/sg.conf  /kernel/drv/sg.conf.DATE
rm -f /kernel/drv/sg.conf
/usr/openv/volmgr/bin/drivers/sg.install
```

The sg.install command replaces the sg.conf file just removed with a copy of the file built by the sg.build command. It also replaces the sg.links file and adds the required entries to the st.conf file. You can now run `/usr/openv/volmgr/bin/sgscan all`. This command polls the SCSI chain looking for devices to use. If done properly and in the correct order, all of the devices should be located and ready to be configured into NBU.

NetBackup documentation describes how to set up the sg driver using scripts sg.build and sg.install.

NetBackup media and device manager can be configured through the GUI or command line. The command line command is tpconfig; the Device Management GUI will use the device manager configuration wizard.
Refer to the *Veritas NetBackup Media Manager Device Configuration Guide* for configuring tape devices. Configuring tape devices requires configuring the ovpass driver (AIX) and sctl/schgr driver (HP-UX).

**Scanning devices**

The operating system can scan for new devices. If all devices are not detected, a gap may exist in the LUN numbering.

The NetBackup scan command located in `/usr/openv/volmgr/bin/goodies/scan` can be used to ensure that all virtual tape libraries and their drives are visible to the operating system.

Run **Configure Storage Devices** from the NetBackup Administration Console to scan, detect, and configure new storage devices.

**Performance**

Changing the default NetBackup settings can help to obtain optimal performance — especially on UNIX systems. Increasing the size of backup buffers and their quantity has a profound effect on performance. The greatest improvement is obtained by setting **SIZE_DATA_BUFFERS** to 256 KB (262144) and **NUMBER_DATA_BUFFERS** to 32. Defaults are 64 KB and 8 KB, respectively.

Refer to Veritas NetBackup documentation for precise details. Go to the Symantec website and search for *performance* in the knowledge base or support site. There are different documents for UNIX and Windows systems.

On Solaris systems, it may be necessary to add a line to the `/etc/system` file similar to:

```
set shmsys:shminfo_shmmax=XXXXXXX
```

where **XXXXXXX** is the maximum amount of memory to allocate to shared memory. This will eliminate potential system call errors.

It is not always possible to change these settings in all environments. These are global settings that affect all tape drives — not just virtual tape drives. You cannot implement a tape-drive type-specific setting. It is not advisable to change the block size when using the Shared Storage Option. If you do so, care must be taken to ensure the same changes are implemented on all systems running NetBackup to eliminate possible system restore errors across systems. If this is not done, restores across systems may fail. Increasing the size of the buffers increases the amount of memory NetBackup reserves, which in turn reduces the amount of memory available for other processes. This may negatively impact the performance of other applications that are run at the same time as backups.

Depending on the version of NetBackup, it may be possible to set **AVRD_SCAN_DELAY** in `vm.conf` to minimize tape mount times. Without this entry present, a mount request may be delayed by an average of 7 seconds. Additional information is available in the *Veritas NetBackup Media Manager System Administrator's Guide*.

Duplication and backup operations can be performed simultaneously as the impact to DL CPU resources during duplication operations is typically not significant. However, there are also other factors that can impact performance — including resources outside the DL. To ensure optimum performance and minimal impact to “backup” operations, the following guidelines are recommended.

- Schedule/perform duplication operations at times during the day when primary backup operations do not heavily burden the DL.
- Limit the simultaneous duplication operations to 4 or 5.
Conclusion

The configuration settings and best practices outlined in this white paper are intended to assist in maximizing performance of the Disk Library in the majority of NetBackup backup environments. However, no two backup environments are exactly the same. Because of this, individual parameter and configuration settings may need to be varied to meet each specific environment’s requirements.

References

The following are available on EMC Powerlink®:

- *EMC Disk Library Online Help*
- *EMC Disk Library Automated Tape Caching Feature — A Detailed Review* (white paper)
- *EMC Disk Library with EMC Data Domain Deployment Scenario — Best Practices Planning* (white paper)

The following Veritas documents may also be helpful:

- *Veritas NetBackup Media Manager Device Configuration Guide*
- Various *Veritas NetBackup 5.1 System Administrator’s Guides*
- Various *Veritas NetBackup 6.0 System Administrator’s Guides*
- Various *Veritas NetBackup 6.5 System Administrator’s Guides*