

Symantec NetBackup™ Replication Director Solutions Guide

UNIX, Windows, Linux

Release 7.6 Draft

Symantec NetBackup™ Replication Director Solutions Guide

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PN: xxxxxxxx

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Introducing NetBackup Replication Director

This chapter includes the following topics:

- [Component overview for Replication Director](#)
- [About Replication Director](#)
- [Configuration overview for a NetBackup environment that uses Replication Director](#)
- [About the roles of the Replication Director plug-ins](#)
- [About administrative roles in the Replication Director configuration](#)

Component overview for Replication Director

Use [Table 1-1](#) as a general checklist to make sure that the backup environment contains the necessary hardware and software to configure and run Replication Director.

For more specific information, see the following topic:

See [“OpenStorage partner requirements for a Replication Director environment”](#) on page 23.

Table 1-1 Component overview checklist

Area	Requirements
NetBackup platform support	<p>The Symantec NetBackup Hardware Compatibility List (HCL) (http://www.symantec.com/docs/TECH76495) lists the following information:</p> <ul style="list-style-type: none"> ■ The platforms on which Replication Director is supported. ■ The plug-in versions that NetBackup supports. <p>See the following topic for required NetBackup software:</p> <p>See “NetBackup requirements for snapshots and snapshot replication” on page 57.</p>
NetApp	See “ About NetApp configuration for Replication Director ” on page 27.
EMC Symmetrix	See “ About EMC Symmetrix configuration for Replication Director ” on page 41.
VMware snapshot backups	<p>VMware support allows the backup and restore of snapshots of various VMware guests.</p> <p>Reviewers for FID2988: Any general guidance to give users regarding VMware?</p> <p>Software support for Replication Director in NetBackup 7.6:</p> <ul style="list-style-type: none"> ■ Exchange databases Reviewers for FID3178: Any general guidance re. versions to give users regarding Exchange database? For more information, see the <i>NetBackup for Microsoft Exchange Server Administrator's Guide</i> ■ SQL Server Reviewers for FID3179: Any general guidance re. versions to give users regarding SQL Server? For more information, see the <i>NetBackup for Microsoft SQL Server Administrator's Guide</i> ■ VMware guests For more information, see the <i>NetBackup for VMware Administrator's Guide</i>
Oracle snapshot backups	<p>Reviewers for FID3038: If the following accurate? Other general guidance to add here?</p> <p>Oracle support allows the backup and restore of snapshots of the Oracle database. The guests can include the following software:</p> <ul style="list-style-type: none"> ■ Oracle snapshot backups that use Replication Director are supported on UNIX platforms only. ■ Current support is for NetApp SAN only. ■ To create Oracle snapshots requires the Oracle Extension. ■ The Oracle database must be installed on the NetApp disk array. <p>For more information, see the <i>NetBackup for Oracle Administrator's Guide</i>.</p>

For the latest update of all NetBackup documentation, see the [NetBackup documentation set](#).

About Replication Director

Replication Director is the implementation of NetBackup OpenStorage-managed snapshots and snapshot replication, where the snapshots are stored on the storage systems of partnering companies. OpenStorage is a Symantec API that lets NetBackup communicate with the storage implementations that conform to the API.

Replication Director uses the functions of the OpenStorage partners to perform the following tasks:

- To share disks so that multiple heterogeneous media servers can access the same disk volume concurrently.
- To balance loads and tune performance. NetBackup balances backup jobs and storage usage among the media servers and disk pools.
- To make full use of disk array capabilities, including fast storage provisioning and almost unlimited storage.
- To use as an alternative to off-site vaulting. Storage replication technology provides an efficient means to send copies of user data (files, applications, databases) to off-site storage as part of a disaster recovery plan.

NetBackup stores snapshots of client data on the volumes that are available to the storage server. In NetBackup 7.6, the storage server is either a NetApp OnCommand server or an EMC Symmetrix disk array. Snapshots represent a point-in-time of primary storage data as captured by the storage hardware. NetBackup can then instruct the storage server to replicate the snapshot from primary volumes to other volumes available to the storage server. The snapshot can be replicated to multiple volumes within the storage server, or to storage outside of the storage server, such as a tape device or other disk storage. Replication Director can accommodate an assortment of scenarios to meet the specific data protection needs of an organization.

Replication Director offers a single NetBackup interface for end-to-end data protection management for the following tasks:

- Unified policy management.
Use the **NetBackup Administration Console** as the one, centralized backup infrastructure to manage the lifecycle of all data. Multiple datacenters can replicate to one disaster recovery domain or one datacenter. Additional media servers are not needed in the remote datacenters.
- Snapshot copy management.

Use NetBackup to manage the entire lifecycle of the snapshot. Replication Director uses OpenStorage with a media server to access the storage server volumes. No image can be moved, expired, or deleted from the disk array unless NetBackup instructs the storage server to do so.

The instruction to perform the initial snapshot comes from an operation in a NetBackup storage lifecycle policy (SLP). You can create one SLP that instructs NetBackup to create the initial snapshot, to replicate the snapshot to several locations, and to indicate a different retention period for each of the replications. Additional instructions (or operations) can be included in the SLP that create a backup from the snapshot, index the snapshot, and more.

- Snapshot copy monitoring.
Use NetBackup OpsCenter to monitor the creation of each copy at each storage location. OpsCenter provides extensive reporting on the entire replication environment.
- Global search and restore.
Recovery is available from any storage device in the environment that is defined to NetBackup. This includes recovery from the primary copy or any replicated copy on disk, or from any duplicated copy on disk or tape.

Configuration overview for a NetBackup environment that uses Replication Director

Table 1-2 describes the steps that are required to configure snapshots and snapshot replication. Look at the referenced topic for details about each step.

These steps are also demonstrated in the following video:

<http://www.symantec.com/connect/videos/netbackup-75-replication-director-configuration-demo>

Reviewers for FID2988: Any additional general steps to add if using VMware?

Reviewers for FID3178: Any additional general steps to add if using Exchange database?

Reviewers for FID3179: Any additional general steps to add if using SQL Server?

Reviewers for FID3038: Any additional general steps to add if using Oracle?

Table 1-2 Configuration tasks overview

Step	Administrator	Description	Reference topic
1	NetBackup	Install or upgrade NetBackup software on the master server and media server(s).	See “NetBackup requirements for snapshots and snapshot replication” on page 57.

Table 1-2 Configuration tasks overview (*continued*)

Step	Administrator	Description	Reference topic
2	Storage	Install and configure the disk array of the OpenStorage partner.	See “OpenStorage partner requirements for a Replication Director environment” on page 23.
3	Storage and NetBackup	Discuss the allocation of storage, based on backup configuration needs.	See “About administrative roles in the Replication Director configuration” on page 20.
4	Storage	Configure the storage of the OpenStorage partner.	See “Configuring the disk array” on page 25.
5	NetBackup	<p>Run the Storage Server Configuration Wizard to configure the OpenStorage partner as a NetBackup storage server.</p> <p>For example:</p> <ul style="list-style-type: none"> ■ Configure the OnCommand server as a storage server. ■ Configure the CIM (Common Information Model) Server as a storage server. In NetBackup 7.6, this is an EMC Symmetrix disk array. <p>This wizard also configures the following:</p> <ul style="list-style-type: none"> ■ The media servers that can access the storage server. ■ A disk pool that contains the primary snapshot. ■ A storage unit for the primary disk pool. 	See “Creating a NetBackup storage server for snapshot replication” on page 63.
6	NetBackup	Create an additional disk pool for every group of disk volumes that will contain snapshot replications of the primary snapshot.	See “Creating disk pools for snapshot replication” on page 83.
7	NetBackup	Create a storage unit for any operation that will produce duplications (non-snapshot copies).	See “Creating a storage unit” on page 105.
8	NetBackup	Configure a storage lifecycle policy (SLP). Create a new operation in the SLP for each task that the SLP is to perform.	See “Creating a storage lifecycle policy for snapshots and snapshot replication” on page 132.

Table 1-2 Configuration tasks overview (continued)

Step	Administrator	Description	Reference topic
9	NetBackup	Configure a NetBackup policy to perform all of the operations that are indicated in the SLP. Note: Do not use the Policy Configuration Wizard or the Getting Started Wizard to configure policies for Replication Director.	See “Configuring a policy to use NDMP with Replication Director” on page 141. See “Configuring a policy for use with Replication Director” on page 154. See “About Oracle support for Replication Director” on page 164. See “About virtual machines and Replication Director” on page 175.

About the roles of the Replication Director plug-ins

In other OpenStorage configurations, NetBackup media servers function as data movers. The media server backs up clients and transfers the data to a storage server, after which the storage server writes the data to storage.

However, the OpenStorage use of media servers for Replication Director is different. Instead of moving the data, media servers use a software plug-in to communicate with the disk array (through the storage server) and make a request to move data. The Symantec plug-in is installed by default with NetBackup. It uses the XML-based messaging SOAP protocol to query the disk array. The OpenStorage partner also hosts a software plug-in that allows communication between NetBackup and the disk array. (See Figure 1-1.)

Table 1-3 lists the plug-ins used in NetBackup 7.6 by NetBackup and by the OpenStorage partners.

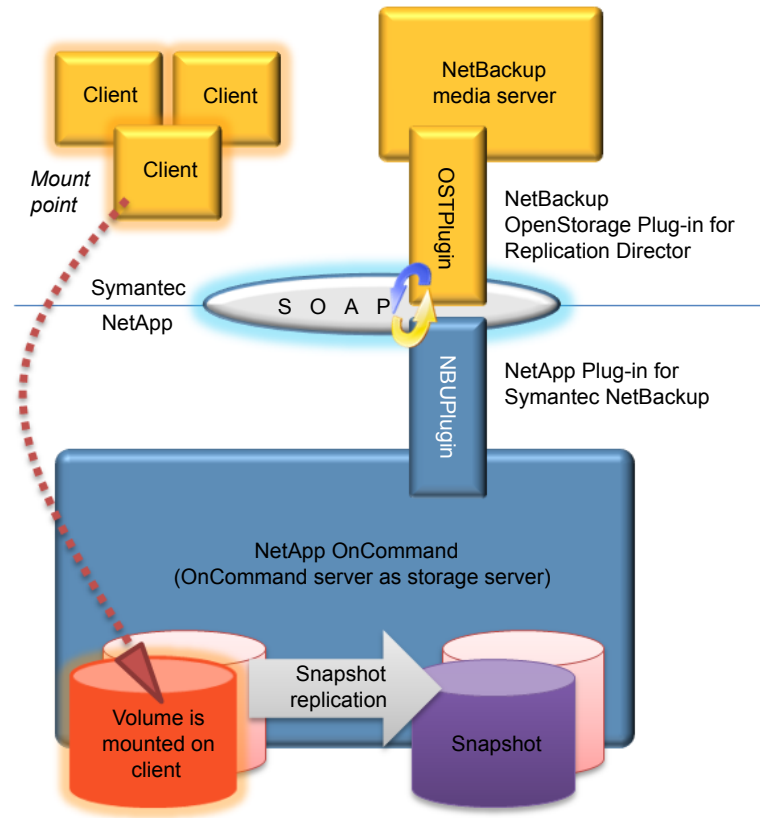
Table 1-3 Names of plug-ins used in Replication Director

Plug-in name	Installation location
OSTPlugin	Installed by default on NetBackup media servers and clients.

Table 1-3 Names of plug-ins used in Replication Director (*continued*)

Plug-in name	Installation location
NetApp Plug-in for Symantec NetBackup	<p>The plug-in is installed on the OnCommand server in the following locations.</p> <ul style="list-style-type: none"> ■ Windows: C:\Program Files\NetApp\NBUPugin ■ UNIX: /usr/NetApp/NBUPugin <p>For installation instructions, see the <i>NetApp Plug-in for Symantec NetBackup Installation and Administration Guide</i>, available from the NetApp Support Site.</p> <p>Note: In NetBackup 7.6, the default communication between the two plug-ins is to use encryption. A change can be made to the NBUPugin config file to disable encryption. The Encryption policy attribute has no impact on the encryption between the plug-ins.</p> <p>Note: By default, the NetApp Plug-in for Symantec NetBackup uses IPv4, however the system can be configured to use IPv6.</p>
SMI-S plug-in	<p>The SMI-S plug-in is used for storage array vendors that have adapted the Storage Management Initiative Specification (SMI-S). The SMI-S adaptor is installed on NetBackup media servers and clients and enables routing of various storage management requests to the EMC ECOM Server.</p> <p>In NetBackup 7.6, the SMI-S plug-in is the EMC SMI-S Provider.</p>

Figure 1-1 Communication between the OSTPlugin and the NetApp Plug-in for Symantec NetBackup



About administrative roles in the Replication Director configuration

The success of creating snapshots and snapshot replication relies on detailed, ongoing communication between two key roles in the backup environment: the role of the storage device administrator and the NetBackup administrator.

Both the storage device administrator and the NetBackup administrator must work together to determine the data security objectives of the company. Based on these objectives, both must communicate to make sure that the necessary storage is available.

Storage administrator

The storage administrator generally configures the disk array hardware and divides the storage systems into resource pools.

The storage administrator must let the NetBackup administrator know the host name that is exposed through the OpenStorage plug-in.

See [“Configuring the disk array”](#) on page 25.

See [“NetApp topologies that are not supported by Replication Director”](#) on page 32.

NetBackup administrator

The NetBackup administrator configures NetBackup to perform snapshots and snapshot replication, based on the storage that is configured by the storage administrator.

See [“NetBackup configuration for Replication Director”](#) on page 58.

Database administrator

Reviewers for FID3038: Do you see this as a separate role?

What duties does the database administrator have?

?

Reviewers: Are there other roles that should be added in 7.6?

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OpenStorage partner configuration

This chapter includes the following topics:

- [OpenStorage partner requirements for a Replication Director environment](#)
- [Updating an OpenStorage storage server to reflect plug-in updates](#)
- [Configuring the disk array](#)

OpenStorage partner requirements for a Replication Director environment

OpenStorage depends on the vendor storage that is exposed to NetBackup through a software plug-in that conforms to the Symantec OpenStorage API.

See the following link to view a NetBackup Replication Director configuration demonstration, including OpenStorage partner configuration:

<http://www.symantec.com/connect/videos/netbackup-75-replication-director-configuration-demo>

See the following topics for specific OpenStorage partner requirements:

- See [“About NetApp configuration for Replication Director”](#) on page 27.
- See [“About EMC Symmetrix configuration for Replication Director”](#) on page 41.

Updating an OpenStorage storage server to reflect plug-in updates

If an OpenStorage partner updates their plug-in, update the NetBackup storage server to reflect the new functionality of the plug-in.

For example, the NetApp plug-in used for Replication Director is the NBUPugin.

If the OpenStorage plug-in is updated on the storage server, use the following procedure to update the NetBackup storage server configuration to reflect this:

To update the NetBackup OpenStorage storage server from the NetBackup Administration Console

- 1** In the **NetBackup Administration Console**, expand **Media and Device Management > Credentials > Storage Servers**.
- 2** In the right pane, right-click the storage server.
- 3** Select **Update Storage Server Details**.
- 4** Update the existing disk pools so that each can use the new functionality. Any disk pools that were created after the storage server is updated inherit the new functionality.

See [“Updating an OpenStorage disk pool to reflect plug-in updates”](#) on page 89.

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To update the NetBackup OpenStorage storage server configuration from the command line

- ◆ Run the following command on the master server or on one of the media servers:

On Windows:

```
install_path\NetBackup\bin\admincmd\nbdevconfig -updatests  
-storage_server storage_server -stype server_type -media_server  
media_server
```

On UNIX:

```
/usr/opensv/netbackup/bin/admincmd/nbdevconfig -updatests  
-storage_server storage_server -stype server_type -media_server  
media_server
```

See the following descriptions of the options that require arguments:

<code>-storage_server</code> <code>storage_server</code>	The name of the disk appliance.
<code>-stype server_type</code>	The storage vendor provides the string that identifies the server type.
<code>-media_server</code> <code>media_server</code>	A NetBackup media server that connects to the storage server. The media server queries the storage server for its capabilities. The vendor plug-in must be installed on the media server. If the plug-in resides on more than one media server, you can specify any one of them.

Configuring the disk array

The storage administrator generally configures the volumes on the disk array. For example, the NetApp storage administrator creates the resource pools for use by the NetBackup disk pools and storage units.

The storage administrator and the NetBackup administrator must work together to determine how the storage should be apportioned to meet the company's data security objectives.

- See the *NetApp Plug-in for Symantec NetBackup Installation and Administration Guide*, available from the [NetApp Support Site](#), for details on preparing the NetApp configuration for use with Replication Director.

- See the *ECOM Deployment and Configuration Guide*, available from the [EMC Support Site](#), for details on EMC ECOM server installation and configuration.

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NetApp configuration for Replication Director

This chapter includes the following topics:

- About NetApp configuration for Replication Director
- Compatibility between Replication Director and NetApp plug-ins
- NetApp topologies that Replication Director supports
- NetApp limitations and unsupported topologies
- Necessary actions after changing the OnCommand root or administrator password
- Configuring the port use between the OnCommand server and NetBackup hosts
- Importing existing NetApp relationships for NetBackup control
- Configuring the primary NetApp device to use VSS with Replication Director
- Optimized Index From Snapshot operation

About NetApp configuration for Replication Director

The information in this topic applies to configuring NetApp for use with Replication Director.

See the following link to view a demonstration on how to configure NetApp for use with Replication Director:

<http://www.symantec.com/connect/videos/configuring-netapp-replication-director>

NetApp hardware requirements

NetApp disk arrays support:

- NAS file services (CIFS and NFS).

Use the NetApp `vol` command options to enable `convert_unicode` and `create_unicode` on all NAS storage systems:

- `convert_unicode on`

Forces the conversion of all directories to Unicode format when accessed from NFS and CIFS.

- `create_unicode on`

Forces the creation of Unicode directories by default for NFS and CIFS.

- SAN-connected storage (Fibre Channel and iSCSI) and block device support on Windows, UNIX, and Linux.

Note: For iSCSI to support block devices, make sure that no HBA cards are attached to the host. If NDMP is used, it must be enabled on both the primary and the secondary filers.

A vFiler can serve as the source for SnapMirror and SnapVault. A vFiler is not supported as a replication destination (target).

If NDMP is used, it must be enabled on both the primary and the secondary filers.

NetApp software requirements

Software support for Replication Director in NetBackup 7.6:

- Data ONTAP 7.3.6

- OnCommand Core Package 5.0.2

The package includes OnCommand server software (enabled by default) and the NetApp Management Console (install separately).

- SnapDrive

SnapDrive offers replication support to NetApp block devices on the Windows 2003 x86/x64 and Windows 2008 x86/x64 platforms.

Install SnapDrive on Windows clients only. SnapDrive is not required on Windows alternate clients. SnapDrive also installs the ONTAP VSS hardware provider as well.

The SnapDrive license can be host-based or storage array-based. Both types of licenses are supported.

- NetApp Plug-in 1.1 for Symantec NetBackup

Note: ET3063072; 1/30/13

If upgrading the plug-in, make sure that all storage lifecycle policy jobs that use the old plug-in are complete before upgrading.

Note: By default, the NetApp Plug-in for Symantec NetBackup uses IPv4, however the system can be configured to use IPv6.

Download the latest plug-in version from the [NetApp Support Site](http://support.netapp.com).

- See the *NetApp Plug-in for Symantec NetBackup Installation and Administration Guide* for the NetApp license requirements.

<http://support.netapp.com/documentation/docweb/index.html?productID=61329>

For information about the NetApp configurations that work with qualified third-party products and components, access the [NetApp Interoperability Matrix Tool](#).

Compatibility between Replication Director and NetApp plug-ins

Replication Director in NetBackup 7.6 works with any version of the NetApp Plug-in for Symantec NetBackup. See [Table 3-1](#) to determine the extent of the compatibility between the plug-ins.

Table 3-1 Version compatibility

NetBackup OSTPlugin version	NetApp NBUPugin version	Compatibility
7.6	1.1	Full compatibility for all of NetBackup 7.6 Replication Director features.
7.6	1.0.1	Compatible; allows NetBackup 7.5 Replication Director features only.
7.5	1.0.1	Compatible; allows NetBackup 7.5 Replication Director features only.
7.5	1.1	Incompatible. Does not allow NetBackup 7.5 or 7.6 Replication Director features.

Note: You must upgrade the entire NetBackup environment to 7.6 before upgrading the NBUPlugin to 1.1. Upgrade all master servers, media servers, clients, and any host which communicates with the NBUPlugin.

Upgrading the plug-in

ET3063072; 1/30/13

If upgrading the NetApp Plug-in for Symantec NetBackup, make sure that all storage lifecycle policy jobs that use the old plug-in are complete before upgrading.

To determine whether all of the jobs that are associated with a storage lifecycle policy are complete, use the following command:

On Windows: C:\Program Files\VERITAS\NetBackup\bin\admincmd>nbstlutil.exe stlilist -U

On UNIX: /usr/opensv/netbackup/bin/admincmd/nbstlutil stlilist -U

Determining the plug-in version

To determine the NBUPlugin version, look for the following version file on the OnCommand server where the NBUPlugin is installed:

On Windows: Install_path\Program Files\Netapp\NBUPlugin\version.txt

On UNIX: /usr/NetApp/NBUPlugin/version.txt

The contents of the file lists the product name, the build date, and the version of the plug-in.

NetApp topologies that Replication Director supports

Table 3-2 describes the NetApp topologies that Replication Director supports. All begin with a snapshot of the data on the primary volume.

Table 3-2 Supported NetApp snapshot replication topologies

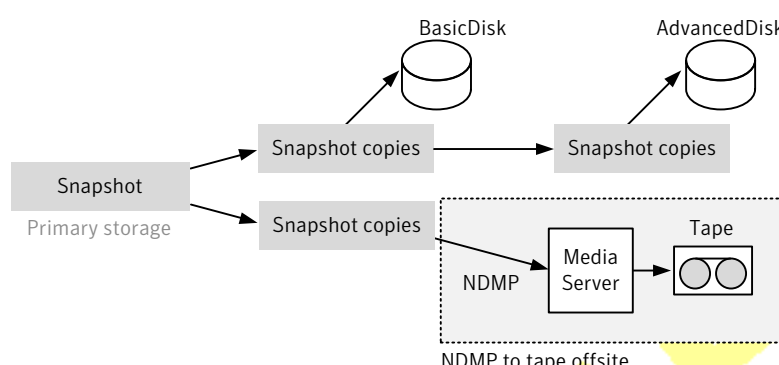
Representation	Description
<div><div>Snapshot</div><div>Primary storage</div></div> <div>→ SnapVault</div> <div><div>Snapshot copies</div><div>Secondary storage</div></div>	The snapshot can be replicated using SnapVault.
<div><div>Snapshot</div><div>Primary storage</div></div> <div>→ SnapMirror</div> <div><div>Snapshot copies</div><div>Secondary storage</div></div>	The snapshot can be replicated using SnapMirror.

Table 3-2 Supported NetApp snapshot replication topologies (*continued*)

Representation	Description
<pre> graph LR A[Snapshot Primary storage] -- SnapMirror --> B[Snapshot copies Secondary storage] B -- SnapVault --> C[Snapshot copies Tertiary storage] </pre>	The snapshot can be replicated using SnapMirror, and then replicated again using SnapVault.
<pre> graph LR A[Snapshot Primary storage] -- SnapMirror --> B[Snapshot copies Secondary storage] B -- SnapMirror --> C[Snapshot copies Tertiary storage] </pre>	The snapshot can be replicated using SnapMirror, and then replicated again using SnapMirror.
<pre> graph LR A[Snapshot Primary storage] -- SnapVault --> B[Snapshot copies Secondary storage] B -- SnapMirror --> C[Snapshot copies Tertiary storage] </pre>	The snapshot can be replicated using SnapVault, and then replicated again using SnapMirror.
<p>Two examples of many supported configurations:</p> <pre> graph LR A[Snapshot Primary storage] -- SnapVault --> B1[Snapshot copies Secondary storage] A -- SnapVault --> B2[Snapshot copies Secondary storage] B1 -- SnapMirror --> C[Snapshot copies Tertiary storage] </pre> <p>Or:</p> <pre> graph LR A[Snapshot Primary storage] -- SnapVault --> B1[Snapshot copies Secondary storage] A -- SnapMirror --> B2[Snapshot copies Secondary storage] A -- SnapMirror --> B3[Snapshot copies Secondary storage] B1 -- SnapMirror --> C1[Snapshot copies Tertiary storage] B2 -- SnapVault --> C2[Snapshot copies Tertiary storage] B3 -- SnapMirror --> C3[Snapshot copies Tertiary storage] </pre>	<p>The snapshot replications can fan out to two or three resource pools.</p> <p>(The Representation column shows two examples of many possible configurations.)</p>

Table 3-2

Supported NetApp snapshot replication topologies (continued)

Representation	Description
<p>A tar-formatted backup can be created from any snapshot by using the Backup from Snapshot operation in the storage lifecycle policy. The backup can be created on tape using NDMP or to NFS or CIFS disk.</p> <p>In the following example, a tar copy is created from each snapshot copy.</p> 	<p>Use the Backup from Snapshot SLP operation to create a backup from any snapshot.</p>

NetApp limitations and unsupported topologies

NetApp topologies that are not supported by Replication Director

Table 3-3 lists the topologies that are not supported in this release.

Table 3-3

Unsupported snapshot replication topologies

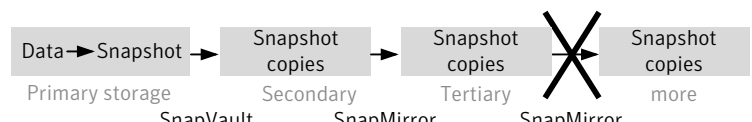
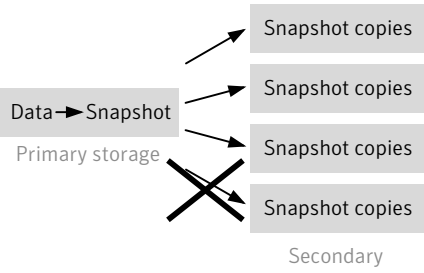
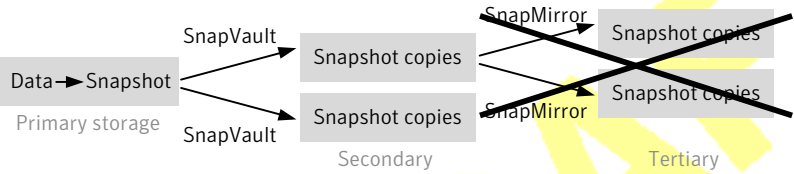
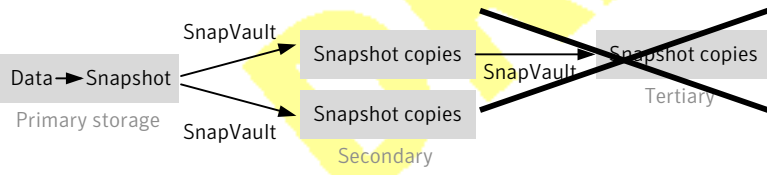
Example of an unsupported configuration	Description
<p>One example of an unsupported configuration:</p> 	<p>The snapshot can be replicated in succession, or cascaded, no more than two times.</p>

Table 3-3 Unsupported snapshot replication topologies (*continued*)

Example of an unsupported configuration	Description
<p>One example of an unsupported configuration:</p> 	<p>Snapshot replications can fan out to no more than three resource pools.</p>
<p>One example of an unsupported configuration:</p> 	<p>Snapshot replications can fan out only from the primary snapshot.</p>
<p>One example of an unsupported configuration:</p> 	<p>Snapshots in succession can accommodate any combination of SnapMirror and SnapVault, except from one SnapVault to another SnapVault.</p>

Storage lifecycle policy topology validation by NetApp

After creating a storage lifecycle policy that contains Replication Director snapshots, NetBackup asks the NetApp storage server to validate the SLP.

The following are some of the items that NetBackup validation looks for:

- A backup policy cannot contain more than 50 backup selections.
- The NetApp topology cannot contain more than three fanout levels. Each fanout cannot have more than two cascade levels. For example, the following cascade is not supported:

Primary > SnapVault > SnapVault

See [“NetApp topologies that are not supported by Replication Director”](#) on page 32.

- Validation error messages appear in English only.
- The provisioning API does not provision the destination volume. The destination volume is provisioned during the first replication request.

Necessary actions after changing the OnCommand root or administrator password

ET2929309/BURT639099; 12/10/12

ET3000671; 12/14/12

If the root or the administrator password of the OnCommand server is changed, you must also perform the following actions:

- Use the `tpconfig` command line utility to update the storage server password in NetBackup.
- Restart the NBUPugin service.

A replication job run after the password has been changed may fail with a status 83 (media open error). However, the job details may indicate that the job ran successfully.

Configuring the port use between the OnCommand server and NetBackup hosts

NetBackup communicates with the OnCommand server through SOAP plug-ins: the OSTPlugin on master servers, media servers, and clients, and the NetApp Plug-in for Symantec NetBackup (NBUPugin) on OnCommand servers.

In order for the plug-ins to communicate, the client (NetBackup) needs to know on which port the OnCommand server listens. The web service that the NBUPugin 1.1 implements, listens on port 8086 (for `Https`) by default. (In NetBackup 7.5 the NBUPugin listened on port 8085 (for `Http`) by default.)

Note: Earlier versions of the NBUPugin offer limited capability.

See [“Compatibility between Replication Director and NetApp plug-ins”](#) on page 29.

During the NBUPugin installation, the administrator is asked on which port the NBUPugin should listen. Certain firewall considerations on the OnCommand server may require that the default port be changed upon installation to allow communication between the plug-ins.

However, if the default port was not changed during NBUPugin installation and the firewall settings on the OnCommand server do not allow access to port 8086 (for `https`), the following procedure describes the necessary steps to change the port after installation

To change the port that the NetApp NBUPugin and the NetBackup OSTPlugin use for SOAP communication

- 1 Locate the following file on the OnCommand server that runs the NBUPugin:

On Windows: `Install_path\Program Files\Netapp\NBUPugin\NBUPugin.cfg`

On UNIX: `/usr/NetApp/NBUPugin/config/NBUPugin.cfg`

- 2 Locate the following setting within `NBUPugin.cfg`:

The default port for NBUPugin 1.1:

```
[NBUPugin:https_port]
```

```
Value=8086
```

The default port for NBUPugin 1.0.1:

```
[NBUPugin:port]
```

```
Value=8085
```

- 3 Change the port value from the default port to another port that accommodates the firewall. For example, 8090:

For NBUPugin 1.1, enter:

```
[NBUPugin:https_port]
```

```
Value=8090
```

For NBUPugin 1.0.1, enter:

```
[NBUPugin:port]
```

```
Value=8090
```

Save and close the file.

- 4 Shut down, then restart the NBUPugin after changing the port number.

On Windows:

```
Install_path\Program Files\Netapp\NBUPugin\ProcessManager.exe  
shutdown
```

```
Install_path\Program Files\Netapp\NBUPugin\ProcessManager.exe  
startup
```

On UNIX:

```
/usr/Netapp/NBUPugin/processmanager shutdown
```

```
/usr/Netapp/NBUPugin/processmanager startup
```

- 5 On every NetBackup host that communicates with this OnCommand server, create a file named `soapwrapper.conf` in the following location:

On Windows: `Install_path\Program Files\VERITAS\Netbackup\bin\ost-plugins\soapwrapper.conf`

On UNIX: `/usr/opensv/lib/ost-plugins/soapwrapper.conf`

- 6 Add a line with the following syntax to each `soapwrapper.conf` file:

```
OC_host_ie_storage_servername =  
http://OC_host_ie_storage_servername:Desired_port
```

Where:

- `OC_host_ie_storage_servername` is the name of the OnCommand server.
- `Desired_port` is the desired port (and not the default). This port number should match the port that was entered in step 3.

For example, if the storage server name is `OCserver1` and the desired port is 8090:

```
OCserver1 = http://OCserver1.yourdomain.com:8090
```

- 7 Create a `soapwrapper.conf` file that includes this line on every NetBackup host that communicates with this OnCommand server. That means every master server, media server, client, and alternate client that is included in a policy or in a storage lifecycle policy for Replication Director

In the environments that contain multiple storage servers that do not use the default port, use one `soapwrapper.conf` file on each NetBackup host. In the file, list each storage server and the non-default port for each.

Importing existing NetApp relationships for NetBackup control

NetApp offers an import tool to migrate OnCommand server datasets and Data ONTAP relationships into NetBackup. Once in NetBackup, the snapshot data can be managed using Replication Director.

The NetApp import tool allows the administrator to perform the following actions:

- Export the dataset configuration from the OnCommand server into an XML file.
- Edit the XML file to change the backup policies or topology.
- Import the XML file into NetBackup.

For more information on the import tool, see the *NetApp Plug-in for Symantec NetBackup Installation and Administration Guide*, available from the [NetApp Support Site](#).

Configuring the primary NetApp device to use VSS with Replication Director

For SAN (block) device support on Windows hosts, the primary NetApp disk array must be configured to use Windows Volume Shadow Services (VSS) with Replication Director.

The primary NetApp device can be configured using the SnapDrive application or without using the application. See the NetApp documentation for the most complete instructions. Procedures are listed here for ease of use.

Note: ET3068879; 2-14-2013

After configuration, make sure that the `NOSNAPDIR` option is set to off for the storage system. If it is not, the Windows Event Viewer displays a SnapDrive entry urging you to turn it off.

To configure the primary NetApp device with the SnapDrive application

- 1 Create the volume or the qtree on the disk array.
- 2 Install the SnapDrive application on the host.
- 3 In the NetApp **SnapDrive** console, select the **Create disk** action to start the **Create Disk Wizard**.

- 4 Enter the name of the disk array as the **Storage System Name**. The wizard then lists all of the volume paths that are available on the array.

The screenshot shows the 'Create Disk Wizard' dialog box with the title 'Provide a Storage System Name, LUN Path and Name'. The instruction says 'Enter the Storage System Name and LUN path information below.' Below this, it says 'Select an existing Storage System, or enter a new Storage System name and press "Add".' The 'Storage System Name' field contains 'netapp1111' and has an 'Add' button next to it. Below this is a table with two columns: 'Name' and 'Type'. The table contains one entry: 'netapp1111' under 'Name' and 'storage system' under 'Type'. Below the table are three fields: 'LUN Path' with the value '/vol/demo_vol1', 'LUN Name' with the value 'demo_lun1', and an empty 'LUN Description' field. At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

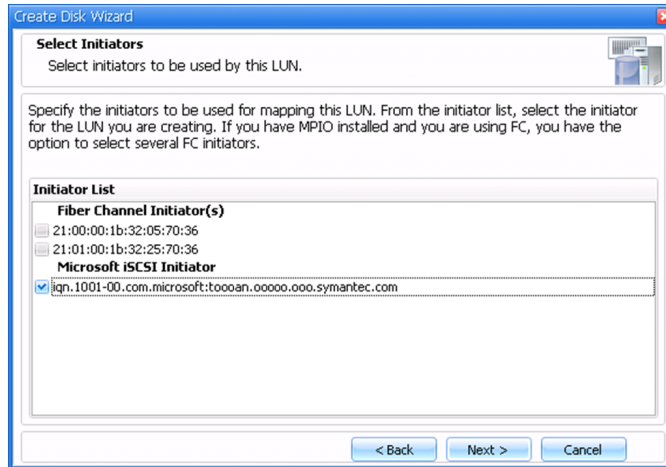
Name	Type
netapp1111	storage system

- 5 In the **LUN Path** drop-down menu, select the volume path where you want to create the LUN. Enter the **LUN Name** and click **Next**.

The screenshot shows the 'Create Disk Wizard' dialog box with the title 'Select LUN Properties'. The instruction says 'Provide the drive letter and the size of the LUN to create'. Below this is the 'Drive Parameters' section with three radio buttons: 'Assign a Drive Letter:' (selected), 'Use a Volume Mount Point:', and 'Do not assign a Drive letter or Volume Mount Point'. The 'Assign a Drive Letter:' option has a dropdown menu showing 'J'. Below this is the 'Snapshot Copies' section with the question 'Do you want to limit the maximum disk size to accommodate at least one snapshot on the volume?' and two radio buttons: 'Limit' (selected) and 'Do not limit'. Below this is the 'LUN Size' section with three fields: 'Maximum:' with the value '407 MB', 'Minimum:' with the value '64 MB', and 'LUN Size:' with a dropdown menu showing '284.0' and a unit dropdown showing 'MB'. At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

- 6 In the **Select LUN Properties** panel, select the drive letter and the LUN size that needs to be created.

- 7 In the **Select Initiators** panel, select the initiator.



- 8 Complete the remaining panels of the **Create Disk Wizard**.

To configure the primary NetApp device **without** using the SnapDrive application

- 1 Create the volume or the qtree on the disk array.
- 2 Create the LUN on the volume or the qtree.
- 3 To connect devices through the Fibre Channel, create the SAN zoning between the disk array and the client.
- 4 To connect devices through iSCSI, enable the iSCSI initiator on the client.
- 5 Create an initiator group on the disk array with the port WWN or the iSCSI initiator name of the client.
- 6 Map the LUN to this new initiator.
- 7 Rescan the devices on the host.
- 8 Create the file system on the LUN through **Disk Management**.

Optimized Index From Snapshot operation

The **Index From Snapshot** operation catalogs the contents of a snapshot for the purpose of searching and restoring snapshots. The **Index From Snapshot** operation allows the administrator to browse the contents of the snapshot, and then restore files in the snapshot using OpsCenter Operational Restore. However, indexing can be an expensive operation, depending on data quantities, change rates, and file quantity and size.

NetApp provides a set of APIs that can be used to retrieve the list of changed inodes (the delta set of files) between two snapshots for the same volume or qtree. The APIs do not require that the snapshot is mounted, which reduces the impact of indexing because it avoids mounting and traversing the file system. NetBackup automatically uses the NetApp APIs to index the snapshots on NetApp storage system.

Note: For the NetApp APIs to work correctly to facilitate optimized indexing, the NetBackup master server, media server, and client must all be at NetBackup 7.6.

See [“Index From Snapshot operation in an SLP”](#) on page 120.

Limitations of the optimized Index From Snapshot operation

The following topics describe some limitations to consider when configuring or using the optimized **Index From Snapshot** operation.

Unsupported NAS-connected storage for this operation

The optimized **Index From Snapshot** operation using NetApp does not support the following on NAS-connected storage:

- The volume lang option
- Qtree aggregation
- NDMP
- vfiler

(The optimized **Index From Snapshot** operation is supported only for NetApp NAS storage; it is not supported on SAN devices.)

Set the `no_i2p` volume option to OFF

The NetApp volume option `no_i2p` must be set to OFF. If set to ON, the iterations fail.

Allow multiple data streams policy option not supported with this operation

ET3060656/BURT651558; 1/31/13

The **Allow multiple data streams** option in the NetBackup policy Attributes tab has no effect for **Index From Snapshot** jobs. This option is used to divide a single job into separate streams (multiple child jobs) so that they can run concurrently. In this situation, the jobs are processed sequentially instead of concurrently.

EMC configuration for Replication Director

This chapter includes the following topics:

- About EMC Symmetrix configuration for Replication Director
- EMC topologies that Replication Director supports
- EMC limitations and unsupported topologies
- Prerequisites for using EMC Symmetrix
- Configuration parameters available for the SMI-S server
- Required EMC device configuration for a remote snapshot and snapshot replica
- Configuring NetBackup clients to use EMC Symmetrix
- About configuring NetBackup to access the Symmetrix array
- Preconfiguring EMC disk arrays for local snapshots and replications
- Preconfiguring EMC disk arrays for remote replications
- Preconfiguring for the import of a snapshot or replication device

About EMC Symmetrix configuration for Replication Director

Reviewers for FID3157: New topic in 7.6

In NetBackup 7.6, Replication Director includes support for storage array vendors who have implemented the Storage Management Initiative Specification (SMI-S). In NetBackup 7.6, this is EMC Symmetrix.

Table 4-1 Requirements for OpenStorage partner EMC

Partner	Description and version
EMC hardware	EMC Symmetrix disk arrays from the DMX and VMAX families offer SAN-connected (block) device support on Windows, UNIX, and Linux.
EMC hardware licenses	<p>The following additional licenses are needed on the EMC disk array to support Replication Director:</p> <ul style="list-style-type: none"> ■ SYMM_VMAX_ENGINUITY ■ SYMM_VMAX_PROSPHERE ■ SYMM_VMAX_SMC ■ SYMM_VMAX_SRDF ■ SYMM_VMAX_SRDF_A ■ SYMM_VMAX_SRDF_S ■ SYMM_VMAX_SRDF_STAR ■ SYMM_VMAX_TF_CLONE ■ SYMM_VMAX_TF_SNAP
EMC software licenses	Licenses for Symmetrix Remote Data Facility (SRDF) synchronous (SRDF/S) and asynchronous (SRDF/A) replication configurations are required. These licenses allow snapshots to be replicated on multiple disk arrays.
EMC SMI-S Provider	<p>Use the EMC SMI-S Provider version 4.4 or later.</p> <p>Download this for Windows or Linux from the EMC download site: https://support.emc.com (Additional login is necessary.)</p>
EMC software	<p>EMC Solutions Enabler</p> <p>The EMC Solutions Enabler is installed with the EMC SMI-S Provider.</p> <p>Download this from the EMC download site: https://support.emc.com (Additional login is necessary.)</p> <p>The installation also includes the EMC VSS Hardware Provider.</p> <ul style="list-style-type: none"> ■ On Windows: The EMC Solutions Enabler must be installed on both the NetBackup client and the alternate client. The EMC Solutions Enabler also installs the EMC VSS hardware provider. ■ On UNIX: The EMC Solutions Enabler is not required on the NetBackup client or the alternate client.

Table 4-1 Requirements for OpenStorage partner EMC (*continued*)

Partner	Description and version
EMC software	<p>Reviewers: This also installs the Solutions Enabler, as does the SMI-S plugin?</p> <p>Do users need to install this first?</p> <p>ECOM server</p> <p>The ECOM server can be installed on Windows and UNIX. When the ECOM server is installed on Windows, the EMC Solutions Enabler is automatically installed. The EMC Common Object Manager (ECOM) is a hub of communications and common services for applications based on EMC's Common Management Platform.</p>
Required software configuration on NetBackup Windows clients	<p>On NetBackup Windows clients you must change the following registry entry to <code>TRUE</code>. Failure to do so can lead to data loss while using Replication Director.</p> <p><code>HKEY_LOCAL_MACHINE\Software\EMC\ShadowCopy\EnforceStrictBCVPolicy=TRUE</code></p> <p>See “Required EMC device configuration for a remote snapshot and snapshot replica” on page 47.</p>

See [“Configuring a policy for Windows SAN devices to use Replication Director”](#) on page 160.

EMC topologies that Replication Director supports

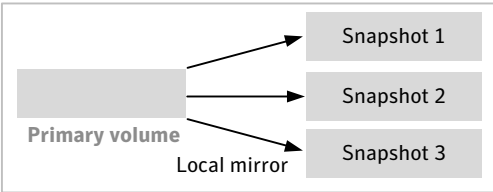
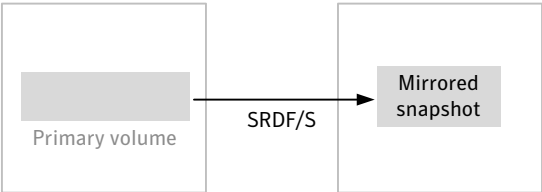
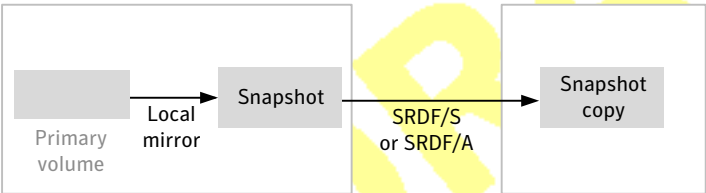
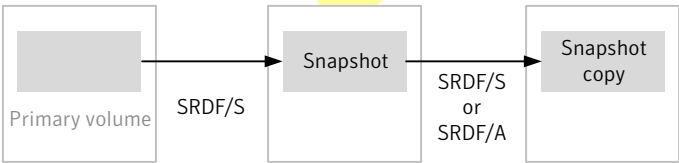
Reviewers for FID3157: Content changed to reflect support for mirror type only.

NetBackup can access EMC Symmetrix storage to create mirror snapshot replicas of snapshots of the primary volume.

Licenses for Symmetrix Remote Data Facility (SRDF) synchronous (SRDF/S) and asynchronous (SRDF/A) replication configurations are required to replicate snapshots on multiple arrays. The RDF mode must be set to synchronous and not adaptive copy.

[Table 4-2](#) describes the EMC Symmetrix topologies that Replication Director supports.

Table 4-2 Supported EMC Symmetrix snapshot replication topologies

Representation	Description
<p>Array 1</p> 	<p>A local snapshot:</p> <p>The primary snapshot and all snapshot copies are created on one array (Array 1).</p>
<p>Array 1 Array 2</p> 	<p>A remote snapshot:</p> <p>The primary snapshot is created on Array 2.</p>
<p>Array 1 Array 2</p> 	<p>Replicate a local snapshot:</p> <p>The primary snapshot on Array 1 is replicated to Array 2.</p>
<p>Array 1 Array 2 Array 3</p> 	<p>Replicate a remote snapshot:</p> <p>The primary snapshot on Array 2 is replicated to Array 3.</p>

EMC limitations and unsupported topologies

EMC Symmetrix disk arrays do not support Replication Director with NDMP.

Snapshots on clone and copy-on-write (COW) devices are not supported in NetBackup 7.6.

EMC SAN-connected storage limitations

These items are limitations to consider when using SAN-connected EMC Symmetrix disk arrays and Replication Director:

- Windows boot file system on SAN.
- RAW disks (on both Windows and UNIX).
- Dynamic disks on Windows.
- Point-in-time rollback restores are not supported when using SAN-connected devices.
- Using the volume GUID to indicate the backup selection.

Snapshot number limitation for EMC DMX arrays

When EMC DMX arrays are used, due to certain EMC limitations, NetBackup can retain only one remote snapshot or replica copy for a policy/client combination. (One for the policy/client combination, one copy for the remote snapshot storage unit, and one copy per each replication storage unit.)

To work with this restriction, see the following:

- To create remote snapshots, set the **Maximum snapshots** parameter to 1. Access this parameter from the backup policy dialog box. Click **Options** in the **Snapshot and Replication Director** section. Alternatively, select the **Expire after copy** retention type for the snapshot operation.
- For replica copies, use the **Expire after copy** retention type. For a **Fixed** retention, adjust the schedules and retention periods so that the existing copy is expired before the next copy is created.

This limitation does not apply to EMC VMAX arrays.

Prerequisites for using EMC Symmetrix

Note the following prerequisites:

- Your array administrator must allocate source and target devices before you create any NetBackup policies. See your array administrator for the device identifiers.

- Your array administrator must allocate a Gatekeeper device and a VCMDB (Volume Configuration Management database) for all of the NetBackup clients. A VCMDB is a virtual LUN database that keeps track of which LUNs the client can see. A Gatekeeper is a small disk that the DMX uses to pass commands between the client and the array.

Configuration parameters available for the SMI-S server

Reviewers for FID3157: Is the following accurate?

The configuration of the SMI-S server works with the default parameter settings. The parameters can be changed by creating a `smis.conf` configuration file. By default, this file does not exist.

Create the `smis.conf` file in the following directory on the client and the media server:

```
/usr/opensv/lib/ost-plugins/smis.conf
```

Each line in the file contains a *name = value* pair. For example:

Reviewers for FID3157: Could you supply a sample `smis.conf` file to display here?

If multiple SMIS storage servers are configured, the `smis.conf` file affects all of them. To change the configuration for a specific storage server, create a storage server-specific configuration file. Use the following format for the name of that configuration file:

```
smis.storage server host name.conf
```

If this file is present along with `smis.conf`, then preference is given to the storage server-specific configuration file. The other storage servers refer to `smis.conf` or the default configuration.

Note: The configuration file name must have the storage server name as it was configured in NetBackup. For example: `smis.starsiege.university.com.conf`.

Table 4-3 lists the various parameters available for the SMI-S server and a description of each.

Table 4-3 SMI-S server parameters

Parameter	Description
SMIS_SERVER_PORT	An integer parameter that represents the port number on the SMIS server for establishing a connection. Default: 5988, if the parameter is empty or absent.
SMIS_INTEROP_NAMESPACE	A string parameter that defines the interop namespace to be used on the SMIS server. Default: <code>interop</code> , if the parameter is empty or absent.
SMIS_ARRAY_NAMESPACE	A string parameter that defines the array namespace to be used on the SMIS server. Default: <code>/root/emc</code> , if the parameter is empty or absent.
TIMEOUT_INTERVAL	An integer parameter that represents the connection timeout interval in seconds. Default: 300 seconds, if the parameter is empty or absent.
MAX_RETRY_TIMEOUT_COUNT	An integer parameter that defines the number of maximum connection retries. Default: 3 retries, if the parameter is empty or absent.

Required EMC device configuration for a remote snapshot and snapshot replica

Caution: On Windows clients you must change the following registry entry to `TRUE`. Failure to do so can lead to data loss while using Replication Director.

`HKEY_LOCAL_MACHINE\Software\EMC\ShadowCopy\EnforceStrictBCVPolicy=TRUE`

Reviewers for FID3032:

Figure 4-1 Device configuration for remote snapshot

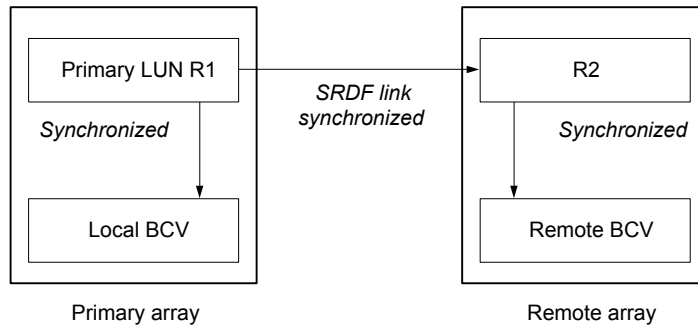
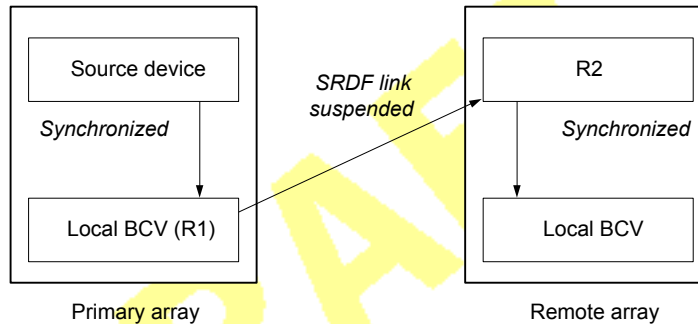


Figure 4-2 Device configuration for a replicating a snapshot



Creating a BCV R1 device

A BCV R1 device is a BCV device (business continuance volume) with the replication source attribute set. A BCV R1 device can be used as replication source in an SRDF pair.

Use the following procedure to allow a BCV device to act as an R1 device in snapshot and replication configurations.

To create a BCV R1 device

- 1 Use the `set device` command to create a command file. The file should contain the following entry:

```
set device 02C3 attribute=dyn_rdf;
```

This entry indicates the following:

- 02C3 is the device ID.
- `dyn_rdf` is the attribute that indicates that the device can act as R1 or R2.

Note: The `dyn_rdf1_only` attributes creates the R1 device and the `dyn_rdf2_only` attribute creates the R2 device.

- 2 Run the `symconfigure` command to run a syntax check on the command file:

```
./symconfigure -f command_file_name -sid array_enclosure preview
```

For example: `symconfigure -f script -sid 421 preview`

- 3 **ET3097259; 2/27/13**

Run the `symconfigure` command to ensure that the command execution will work.

```
./symconfigure -f command_file_name -sid array_enclosure prepare
```

For example: `symconfigure -f script -sid 421 prepare`

- 4 Save the changes.

```
./symconfigure -f command_file_name -sid array_enclosure commit
```

For example: `symconfigure -f script -sid 421 commit`

Configuring NetBackup clients to use EMC Symmetrix

Use the following procedure to configure NetBackup clients to use EMC Symmetrix disk arrays.

To configure NetBackup clients to use EMC Symmetrix disk arrays

- 1 Install the EMC Solutions Enabler.

You must install EMC Solutions Enabler on each NetBackup media server and client where the array is to be used. After installing the software, continue with the following steps.

- 2 Register your EMC license keys using the `symlmf` command.
- 3 Discover the HBAs in the NetBackup client, to allow the NetBackup client to perform LUN masking operations in the array.

To discover host HBAs, run the following Solutions Enabler SYMCLI command:

```
symmask discover hba -rename
```

Example output:

```
Symmetrix ID           : 000187930758
Device Masking Status : Success
```

Identifier	Type	User-generated Name
10000000c942e78a	Fibre	re11/10000000c942e78a

where `re11` is the NetBackup host name.

If no Symmetrix ID appears in the output, there is a connectivity problem.

If the command fails, you must address the problem before doing any further array configuration. This problem can be due to (but is not necessarily limited to) the following:

- The Solutions Enabler interface is not installed.
- Your NetBackup client may not be properly zoned to see the array.

For further troubleshooting information, consult your array documentation.

About configuring NetBackup to access the Symmetrix array

You do not need to configure array credentials for the Symmetrix. All communication between NetBackup and the array is done by means of SYMCLI. If multiple Symmetrix arrays are connected to a NetBackup client, NetBackup automatically sends the SYMCLI command to the correct Symmetrix.

Preconfiguring EMC disk arrays for local snapshots and replications

To pre-configure EMC disk arrays for snapshots and replication

- 1 Connect (or zone) the host or client machine to the EMC storage array.
- 2 Have the storage administrator assign the necessary virtual disks of the required size. BCV device pairs are required to create a local mirror.

To list the devices assigned to a host:

- If EMC Solutions Enabler is not installed, run the `nbfirescan` command.
 - If EMC Solutions Enabler is installed, use either the `sympd list` or `symlinq` commands.
- 3 Create a mirror relation between the devices. Prior to using the devices make sure they are not active in any other replica relation.
 - To list the mirror relations on an array:

```
symmir -sid array_id list  
symmir -sid array_id -f devices_pair_file -full establish
```

- Next, query the mirror relations created

```
symmir -sid array_id -f devices_pair_file query
```

- To split the relationship:

```
symmir -sid array_id -f devices_pair_file split
```

- To remove the relationship:

```
symmir -sid array_id -f devices_pair_file cancel
```

Preconfiguring EMC disk arrays for remote replications

To pre-configure EMC disk arrays for remote replications

- 1 Connect (or zone) the host or client machine to the EMC storage array.
- 2 Have the storage administrator assign the necessary virtual disks of the required size. BCV device pairs are required to create a local mirror.

To list the devices assigned to a host:

- If EMC Solutions Enabler is not installed, run the `nbfirescan` command.
- If EMC Solutions Enabler is installed, use either the `sympd list` or `syminq` commands.

- 3 Create a synchronous RDF pair (SRDF/S) between the source device (R1) and the SRDF target device (R2).

To create SRDF pairing relationship use the `symrdf` command with the following syntax:

```
symrdf createpair -sid array_id -f devices_pair_file -type R1|R2  
-rdfg RA_Group -rdf_mode sync establish -noprompt
```

Note: device pair file has format

```
R1DeviceID R2DeviceID
```

See [“Example: Using symrdf to create an SRDF pairing relationship”](#) on page 53.

The device relationship can be viewed using the following command:

```
symrdf -f devices_pair_file -rdfg RA_Group -sid array_id query
```

The device pair state should be in Synchronized state.

See [“Example: Using symrdf to view the device relationship”](#) on page 54.

Note: The `symrdf deletepair split` options deletes the relationship and brings the relationship in split state respectively.

- 4 Use the `symmir` command to configure the BCV (business continuance volume) device to the R2 device.

The BCV device is the snapshot device. That is, it is the snapshot that is created by splitting the relationship between the R2 device and this device.

- To list the mirror relations on an array:

```
symmir -sid array_id list
```

```
symmir -sid array_id -f devices_pair_file -full establish
```

- Next, query the mirror relations created

```
symmir -sid array_id -f devices_pair_file query
```

- To split the relationship:

```
symmir -sid array_id -f devices_pair_file split
```

- To remove the relationship:

```
symmir -sid array_id -f devices_pair_file cancel
```

- 5** The commands in this procedure are used to create the setup for local or remote snapshot replication.

In this case the R1 device mentioned in step 3 is a BCV R1 device which is associated with a primary volume. The BCV R1 device also has an SRDF relationship with an R2 device on the secondary array. Follow the steps mentioned in step 3 to create an R1 and R2 relationship.

Example: Using symrdf to create an SRDF pairing relationship

```
symrdf createpair -f /rdf_pair -sid 421 -type R1 -rdfg 1 -rdf_mode  
sync -establish -noprompt -force
```

An RDF 'Create Pair' operation execution is in progress for device file '/rdf_pair'. Please wait...

Create RDF Pair in

(0421,001).....Started.

Create RDF Pair in (0421,001).....Done.

Mark target device(s) in (0421,001) for full copy from
source....Started.

Devices: 02A6-02A6 in

(0421,001).....Marked.

Mark target device(s) in (0421,001) for full copy from source....Done.

Merge track tables between source and target in

(0421,001).....Started.

Devices: 02A6-02A6 in

(0421,001).....Merged.

Merge track tables between source and target in (0421,001).....Done.

Resume RDF link(s) for device(s) in

(0421,001).....Started.

Resume RDF link(s) for device(s) in (0421,001).....Done.

The RDF 'Create Pair' operation successfully executed for device file '/rdf_pair'.

Example: Using symrdf to view the device relationship

Figure 4-3 symrdf example output

```
# symrdf -f /pair_file -sid 421 query -rdfg 1

Symmetrix ID           : 000190300421      (Microcode Version: 5773)
Remote Symmetrix ID     : 000187910258      (Microcode Version: 5671)
RDF (RA) Group Number   : 1 (00)
```

Source (R1) View					Target (R2) View					MODES	
Standard	ST				LI	ST					
Logical	A				N	A					
Device	T	R1 Inv	R2 Inv		K	T	R1 Inv	R2 Inv		RDF Pair	
Dev	E	Tracks	Tracks		S	Dev	E	Tracks	Tracks	MDAE	STATE
N/A	00F4	RW	0		0	RW	025C	WD	0	0	S... Synchronized
Total											
Track(s)		0	0				0	0			
MB(s)		0.0	0.0				0.0	0.0			

Legend for MODES:

M(mode of Operation) : A = Async, S = Sync, E = Semi-sync, C = Adaptive Copy
D(omino) : X = Enabled, . = Disabled
A(daptive Copy) : D = Disk Mode, W = WP Mode, . = ACp off
(Consistency) E(xempt): X = Enabled, . = Disabled, M = Mixed, - = N/A

Preconfiguring for the import of a snapshot or replication device

NetBackup needs the devices to be mapped to the director ports that connect to the host HBAs.

ET3098646; 2/27/13

Gatekeeper devices do not need to be masked to all the hosts. However, the following types must be masked:

- Management hosts
- NetBackup Windows clients

EMC recommends at least 6 gatekeeper devices. In the case of Windows clients, NetBackup uses VSS to take the snapshot for Windows clients (this is different for UNIX clients).

Snapshot devices need not be masked to the host, but they need to be mapped to director ports connecting to the host HBAs.

Identifying the host HBA port name and ID

Identify the host HBA port WWN (name/id), using following commands:

- On Linux, use either of the following:
 - `cat /sys/class/scsi_host/host*/port_name`
 - `cat /sys/class/fc_host/host*/port_name`
- Solaris: `/usr/bin/fcinfo hba-info`

Verify the logical connectivity and zoning between the host HBA and array director ports using the following command:

```
symmask -sid array_id list logins
```

These commands also display the director ports that connect the host HBAs.

Symmetrix DMX Series configuration

Use the following steps to mask LUNs to a host. These steps apply for Enginuity firmware level 5874 and earlier.

- First, check if the devices are mapped to the director ports:

```
symdev list -fa director -p port
```

To map a device to director:port, find an available LUN number:

```
symcfg -sid array_id -FA director -p port_no -addr -avail
```

Then pick the available LUN number and create a command file with the following contents:

```
map dev device_id to dir director:port lunLUN_no
```

```
map dev device_id: to dir director:port lunLUN_no
```

To map the device:

```
symconfigure -sid array_id -f command_file commit
```

This maps the devices to dir:port.

- The second step masks the devices to the host HBA. This step does not need to be performed as part of snapshot device pre-configuration and is not required by NetBackup.

Once the host-side HBA ports are identified, mask (that is, expose or allow access to) the devices with the following command:

```
symmask -sid array_id -wwn hba_portwwn -dir director -p port add  
dev device_id
```

To unmask (that is, to hide or remove access to) a device:

```
symmask -sid array_id -wwn hba_portwwn -dir director -p port remove  
dev device_id
```

After masking, run the following command to update the Volume Control Database:

```
symmask -sid array_id refresh
```

Symmetrix VMAX Series configuration

For VMAX (Engenuity firmware level 5873 and later), NetBackup expects that the masking view is pre-configured for a host or host group.

VMAX uses auto-provisioning groups. First, create separate groups for the HBA(Initiator)s, Target(Director)s, and Devices. Then create a masking view that combines the three groups.

- First, create separate groups:

- To create Initiator(HBA) groups, create a file containing host HBA WWPNs as follows:

```
echo "WWN:<hba port wwpn 1>" >> "initiator_file"
echo "WWN:<hba port wwpn 2>" >> "initiator_file"
```

Run the following command to create the initiator group:

```
symaccess -sid array_id create -name initiator_group_name -type
initiator -file initiator_file
```

- Create the target port group:

```
symaccess -sid array_id create -name port_group_name -type port
-dirports director:port,director:port...
```

- Create the device group:

```
symaccess -sid array_id create -name device_group_name -type
storage -devs devices
```

- Create the masking view, which combines the newly-created groups, and will mask the devices to host HBAs through director ports. Lun numbers are automatically assigned at this point:

```
symaccess -sid array_id create view -name masking_view_name
-storgrp device_group_name -portgrp port_group_name -initgrp
initiator_group_name
```

To list the details of the masking view, enter:

```
symaccess -sid array_id show view masking_view_name
```

NetBackup configuration

This chapter includes the following topics:

- [NetBackup requirements for snapshots and snapshot replication](#)
- [NetBackup configuration for Replication Director](#)
- [SAN-connected storage limitations](#)
- [Configuring the NetBackup Client Service](#)
- [NetBackup naming conventions](#)

NetBackup requirements for snapshots and snapshot replication

OpenStorage is a Symantec API that allows NetBackup to communicate with the storage implementations that conform to the API.

The [Symantec NetBackup Hardware Compatibility List \(HCL\)](#) lists the platforms on which Replication Director is supported.

<http://www.symantec.com/docs/TECH76495>

[Table 5-1](#) describes the required software for Replication Director.

Table 5-1 NetBackup software requirements for Replication Director

Host	Software and version
Master server	<ul style="list-style-type: none">■ NetBackup 7.6 software.■ The NetBackup Replication Director option, which enables the following license key bits: Snapshot Client, OpenStorage Disk, and Replication Director.

Table 5-1

NetBackup software requirements for Replication Director

(continued)

Host	Software and version
Media server	<p>Install the following on each media server that can access the disk array:</p> <ul style="list-style-type: none">■ NetBackup 7.6 software.■ The Data Protection Optimization Option is required only if you want to perform a snapshot backup to deduplication disk.■ An NDMP license is required to perform a snapshot backup to disk or tape using NDMP. <p>Note: Replication Director and NDMP are not supported on Solaris_x86.</p> <p>Reviewers: Is this true? It was listed in the 7.5 guide.</p> <ul style="list-style-type: none">■ Reviewers for FID3038: If this info ture and complete? Oracle snapshot backups also require the following software:<ul style="list-style-type: none">■ Oracle Extension.■ NetBackup Snapshot Client. <p>Reviewers for FID3038: Is this info true and complete?</p> <p>Note: The master server and media server can reside on the same server.</p>
Client	<p>NetBackup 7.6 client software.</p> <p>Reviewers for FID2988: Are these notes true?</p> <p>Note: Virtual machines must have a NetBackup client installed.</p> <p>Note: vStorage and Hyper-V backup policies are not supported.</p>

NetBackup configuration for Replication Director

NetBackup configuration is performed by the NetBackup administrator, as described in [Table 5-2](#).

Table 5-2

NetBackup configuration tasks overview

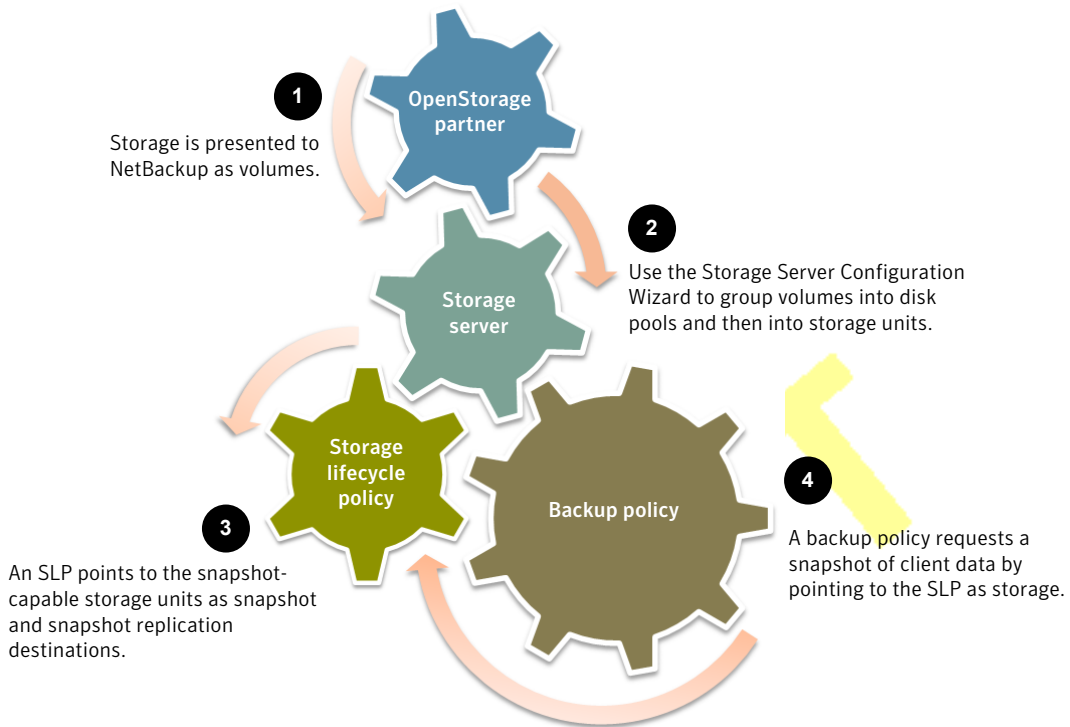
Step	Description	Reference topic
1	Install or upgrade NetBackup software on the master server and media server(s).	See “ NetBackup requirements for snapshots and snapshot replication ” on page 57.

Table 5-2 NetBackup configuration tasks overview (*continued*)

Step	Description	Reference topic
2	<p>Run the Storage Server Configuration Wizard to configure the OpenStorage partner as a NetBackup storage server.</p> <p>This wizard also configures the following:</p> <ul style="list-style-type: none"> ■ The media servers that can access the storage server. ■ A disk pool that contains the primary snapshot. ■ A storage unit for the primary disk pool. 	See “Creating a NetBackup storage server for snapshot replication” on page 63.
3	<p>Create an additional disk pool for every group of disk volumes that will contain snapshot replications of the primary snapshot.</p> <p>As part of the Disk Pool Creation Wizard, a storage unit is configured for each disk pool.</p>	See “Creating disk pools for snapshot replication” on page 83.
4	<p>Create a storage unit for any operation that will produce duplications (non-snapshot copies).</p> <p>Note: ET2949061; 12/5/12</p> <p>Storage unit groups are supported for Replication Director when used with NAS storage. Storage unit groups are not supported for Replication Director when used with SAN-connected storage.</p>	See “Creating a storage unit” on page 105.
5	<p>Configure a storage lifecycle policy. Create a new operation in the SLP for each task that the SLP is to perform.</p> <p>For example, create a Snapshot operation to perform the initial snapshot and a Replication operation to create a copy of the snapshot.</p>	See “Creating a storage lifecycle policy for snapshots and snapshot replication” on page 132.
6	<p>Configure a NetBackup backup policy to perform all of the operations indicated in the SLP.</p> <p>To do so, the Policy storage selection in the policy must indicate the SLP that is configured for snapshots and snapshot replication.</p> <p>Note: Do not use the Policy Configuration Wizard or the Getting Started Wizard to configure policies for Replication Director.</p>	<p>See “Configuring a policy for use with Replication Director” on page 154.</p> <p>See “Configuring a policy to use NDMP with Replication Director” on page 141.</p> <p>See “About Oracle support for Replication Director” on page 164.</p> <p>See “About virtual machines and Replication Director” on page 175.</p>

The following figure is an overview of how the NetBackup components fit together to perform snapshots and snapshot replication. The following sections describe how to configure each part of this process.

Figure 5-1 How NetBackup uses OpenStorage partner storage



SAN-connected storage limitations

ET2823272/BURT612443:

These items are limitations to consider when using SAN-connected storage with Replication Director:

- The following are not supported:
 - Windows boot file system on SAN.
 - RAW disks (on both Windows and UNIX).
 - Dynamic disks on Windows.
 - Fibre Channel over Ethernet (FCoE) protocol.
 - VSS LUN Resync.
 - Point-in-time rollback restores are not supported when using SAN-connected devices.

- Using the volume GUID to indicate the backup selection.
- Fibre Channel LUNs on vfiler.
- Per the SnapDrive limit, a maximum of 168 LUNs per client is allowed. This includes the LUN and volume clones.
- If the same LUN is accessible through iSCSI and Fibre Channel, Fibre Channel is used to mount the LUN.

Configuring the NetBackup Client Service

By default, the NetBackup Client Service is configured on Windows with the **Local System** account. The **Local System** account lacks sufficient rights to perform certain backup and restore operations.

For example, for NetBackup to access CIFS volumes, the account must be changed from **Local System** to an account with access to the CIFS share.

To change the NetBackup Client Service logon account on a Windows computer:

- Open the Windows Services application.
- To change the logon account, stop the NetBackup Client Service.
- Open the properties for the NetBackup Client Service.
- Provide the name and password of the account that has the necessary permissions or privileges. For example, change the logon to that of *Administrator*.
- Restart the service.

The following list contains situations in which the NetBackup Client Service logon account needs to be changed:

- To use CIFS storage as a storage unit.
- To use UNC paths, the network drives must be available to the service account that the NetBackup Client Service logs into at startup. You must change this account on each Windows client that is backed up that contains data that is shared with another computer.
- For database agents and options, configure the service with a logon account that has the necessary permission or privileges. See the documentation for your agent or option for more information.
- For the database agents that support VMware backups on a NetApp disk array, configure the logon account to one that has access to the disk array.

NetBackup naming conventions

The following set of characters can be used in user-defined names, such as disk pools and storage lifecycle policies:

- Alphabetic (A-Z a-z) (names are case sensitive)
- Numeric (0-9)
- Period (.)
- Plus (+)
- Minus (-)
Do not use a minus as the first character.
- Underscore (_)

Note: No spaces are allowed.

DRAFT

Configuring a NetBackup storage server

This chapter includes the following topics:

- [Creating a NetBackup storage server for snapshot replication](#)
- [Adding the storage server credentials to a NetBackup server](#)
- [Deleting an OpenStorage storage server](#)

Creating a NetBackup storage server for snapshot replication

A NetBackup storage server is a NetBackup entity that has exclusive access to manage snapshots on the volumes of an OpenStorage partner.

[Table 6-1](#) describes the component that is defined as the storage server in a Replication Director environment.

Table 6-1 OpenStorage partner component that is configured as a storage server

Partner	Storage server	Notes
NetApp	NetApp OnCommand server	<ul style="list-style-type: none">■ One NetBackup domain can support multiple OnCommand servers.■ Five master servers can communicate efficiently with one NBUPugin on an OnCommand server. The OnCommand server determines the number of concurrent jobs that it can run from any number of media servers.
EMC	EMC ECOM server (Symmetrix)	One NetBackup domain can support multiple ECOM servers.

Note: ET2857508; 2/8/13

The operations in a storage lifecycle policy cannot use storage that is managed by multiple storage servers

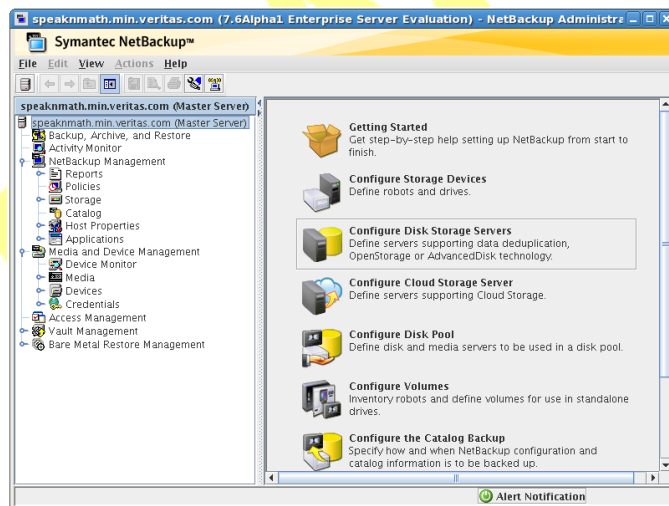
See “[Storage used in a single SLP for Replication Director must be managed by one storage server](#)” on page 75.

To gain access to the disk volumes of the OpenStorage partner, you must configure a NetBackup storage server by running the **Storage Server Configuration Wizard**.

In addition to creating a storage server, this wizard also includes steps for configuring disk pools and storage units. Both are required for snapshots and snapshot replication.

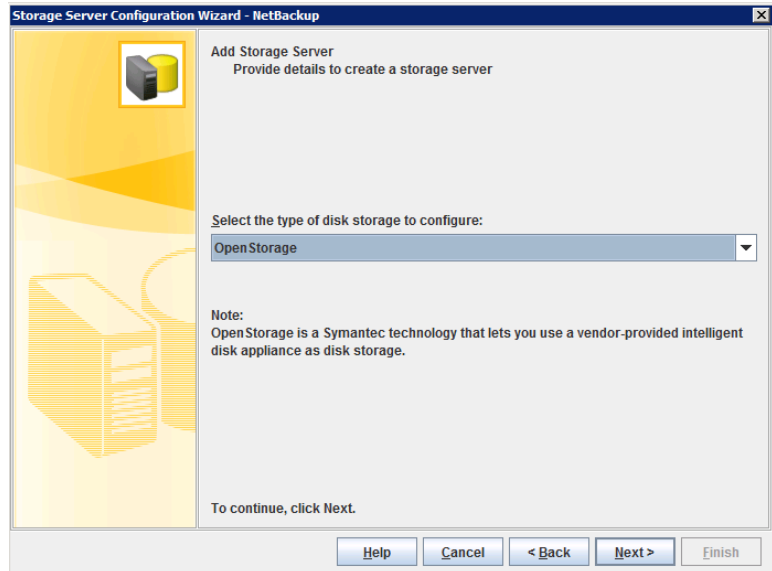
To create a storage server

- 1 Before launching the wizard, make sure that the OpenStorage partner has the necessary software installed and is online. The volumes of the disk array must also be configured.
- 2 To start the **Storage Server Configuration Wizard**, click **Configure Disk Storage Servers** in the **NetBackup Administration Console** main window.

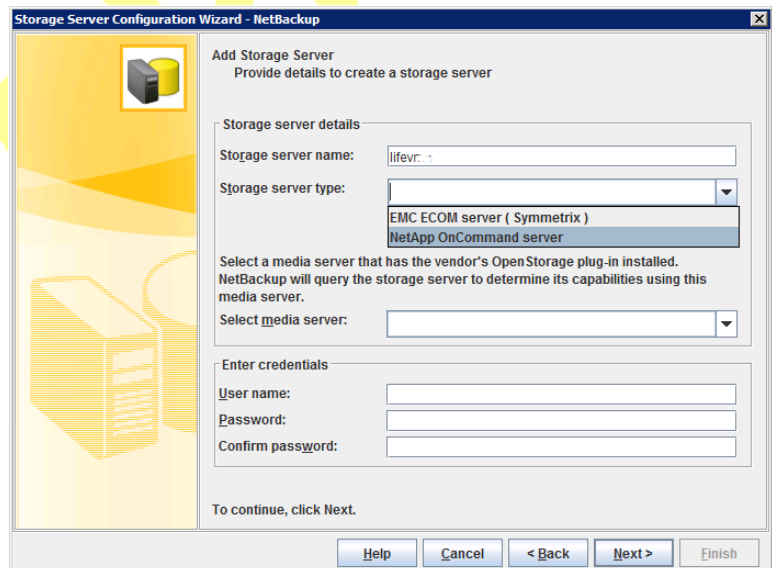


- 3 Before continuing, make sure that all necessary disk storage devices are configured in the environment and that the vendor plug-ins necessary for Replication Director are installed.

- 4 Select **OpenStorage** as the disk storage type to be configured in this wizard. Click **Next**.



- 5 Configure the details of the storage server.



Storage server name Enter the name of the storage server. You must enter the exact name of the storage server, whether a fully-qualified name or a short name. This name is either the name of the OnCommand server or the name of the EMC ECOM server.

If you do not know what name to enter, use the `bpstsinfo` command, located in the following directory, to determine the exact storage server name:

- Windows: *Install_path\NetBackup\bin\admincmd*
- UNIX: */usr/opensv/netbackup/bin/admincmd/*

Enter the `bpstsinfo` command as follows:

```
bpstsinfo -serverinfo -storage_server  
known_storage_server_name -stype storage_server_type
```

For example, to ensure that the name of the OnCommand server is *chania*, enter the following command and locate the storage server name in the output:

```
bpstsinfo -serverinfo -storage_server chania -stype  
Network_NTAP
```

Use the storage server name that is indicated in the output.

If the name entered in this dialog box does not match the actual name of the storage server, a status code 1552 results during SLP validation.

Storage server type Select the type of storage server to create:

- If using NetApp storage, select **NetApp OnCommand server** to create a storage server (for either a NAS or SAN device).
- If using EMC storage, select **EMC ECOM server (Symmetrix)** to create a storage server for the SAN device.

ET3057890; 1/30/13

By default, the storage server has 5 minutes to communicate with NetBackup before it times out and no connection is made. When creating a NetApp storage server (type NETWORK_NTAP), more time may be required. To increase the timeout, edit the `nbsl.xml` file, the configuration file that interacts with the NetBackup Service Layer process (NBSL).

Locate the `nbsl.xml` file in the following directory:

On Windows: `C:\Program`

`Files\Veritas\NetBackup\var\global\nbsl.xml`

On UNIX: `/opt/openv/var/global/nbsl.xml`

Find the entry for `TPCommandTimeout` and change the default from 300 to a greater value. For example:

```
TPCommandTimeout="600"
```

After making the change, restart the NBSL process so that the change takes effect.

Media server Select the media server to use to query the storage server. Note that all of the media servers in the configuration appear in the list, even if the OpenStorage plug-in is not installed. Select a media server where the OpenStorage plug-in is installed.

The selected media server is assigned the credentials for the storage server. Credentials allow the media server to communicate with the storage server.

- Enter the user name to log on to the storage host.
For NetApp, the credentials are used to log on to the OnCommand server.
For EMC, the credentials are used to log on to the ECOM server (storage server) where the EMC arrays are configured. The user must create a user logon for the ECOM server and those credentials have to be provided as part of storage server creation.
If the storage host does not require logon credentials, enter dummy credentials.
- Enter the password for the logon account.
- Re-enter the password to confirm the password.

For a media server to communicate with and have access to a storage server, it must be added to the Replication Director environment.

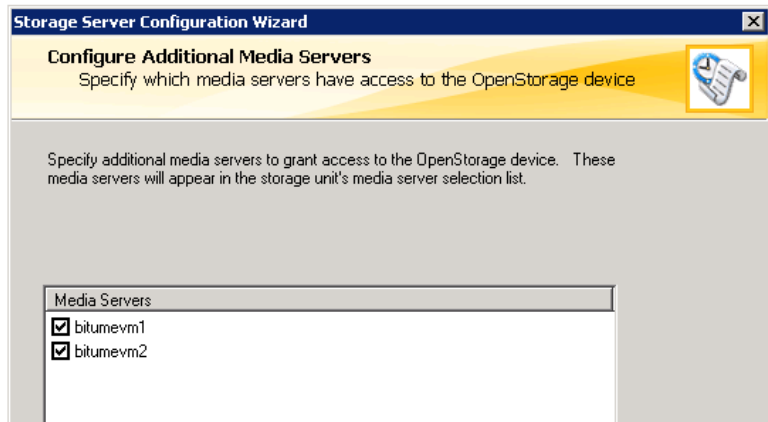
See [“Adding the storage server credentials to a NetBackup server”](#) on page 76.

Click **Next**.

6 The **Configure Additional Media Servers** panel appears in environments where there are multiple media servers or where the master server is on a different host from the media server.

- Enable the check boxes for all media servers that are to be used to access the storage server for snapshots, snapshot replication, or restores.
- Enable the check box for the computer that hosts the master server, if it appears in the list. The master server host must be enabled so that the NetBackup catalog is updated correctly for rollback and restore operations.

Note: The master server does not appear in the list if it was already selected in the **Add Storage Server** wizard pane as a media server for the **Select media server** property (Step 5).

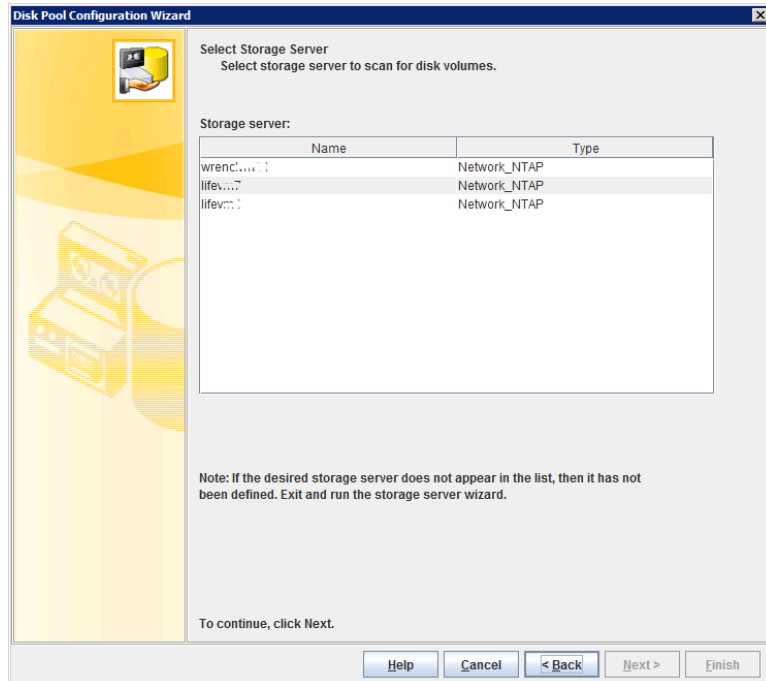


- 7 The wizard displays a summary panel that lists the configuration information that you've entered. Click **Next**.
- 8 The wizard displays a panel that contains the creation status of the storage server. Click **Next**.
- 9 The wizard declares that the storage server was successfully created. Click **Next** to launch the **Disk Pool Configuration Wizard**. A disk pool is necessary for snapshots and snapshot replication.

Note: If the **Disk Pool Configuration Wizard** does not launch automatically, click **Configure Disk Pool** in the **NetBackup Administration Console** to start the wizard manually.

- 10 In the **Disk Pool Configuration Wizard** welcome panel, click **Next**.
 Again you are asked whether all necessary disk storage devices are configured in the environment and the vendor plug-ins necessary for Replication Director are installed.
- 11 Select the type of disk pool that you want to create. If an OpenStorage partner does not appear for selection, make sure that the license has been installed and that an OpenStorage storage server has been created
 - To configure a disk pool for NetApp, select **OpenStorage(Network_NTAP)**.
 - To configure a disk pool for EMC, select **SMIS_EMC_SYMMETRIX**.

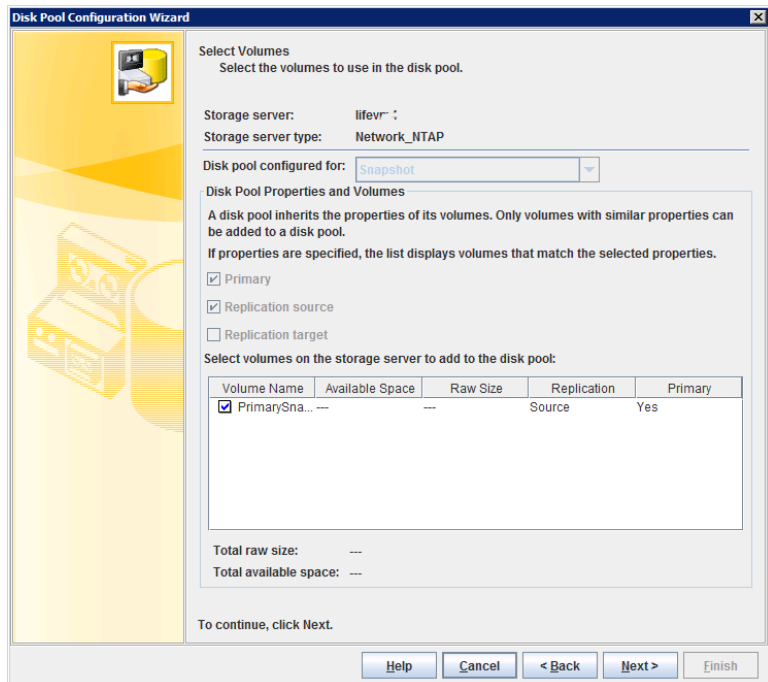
- 12** On the **Select Storage Server** panel, select the storage server that was created earlier in the wizard. Click **Next**.



- 13** The **Select Disk Pool Properties and Volumes** panel presents all of the volumes that have been configured in the storage of the OpenStorage partner by the storage administrator.

A disk pool can contain only those volumes that share similar properties. So that dissimilar volumes are not combined, NetBackup filters the volumes for selection.

Select the **Primary** property to configure this first disk pool for snapshots. The list displays all of the volumes that match the selected property.



Regarding disk pools for OnCommand storage servers:

- For OnCommand storage servers, the total sizes on the primary volume always display as 0 bytes, as indicated by a dash.
 - When the NBUPugin is installed on the OnCommand server, a NetBackup group is automatically created on the OnCommand server. On the OnCommand server, use the NetApp Operations Manager to add resource pools to the NetBackup group so that the resource pools are exposed to NetBackup. If the NetBackup group contains no resource pools, no LSUs display in the disk pool configuration wizard.
- 14 Select a primary volume in the table to be part of this first disk pool. Notice that primary volumes also have the **Source** property set as well. Snapshots on the primary volume are the source for snapshot replication. Click **Next**.

- 15** In the **Additional Disk Pool Information** panel, name the disk pool and add any comments you want to make regarding the disk pool.

See “[NetBackup naming conventions](#)” on page 62.

The available size that is listed is the total amount of space available in the pool. The raw size is the total raw, unformatted size of the storage in the disk pool. For OnCommand storage servers, the sizes on the primary volume always display as 0 bytes, as indicated by a dash.

Enable **Limit I/O streams** to limit the number of read and write streams (jobs) for each volume in the disk pool. Select the number of read and write streams to allow per volume. When the limit is reached, NetBackup chooses another volume for write operations, if available. If not available, NetBackup queues jobs until a volume is available.

Click **Next**.

Disk Pool Configuration Wizard

Disk Pool Properties
Provide additional details and verify the information to create a disk pool

Storage server: lifev

Storage server type: Network_NTAP

Disk pool configured for: Snapshot

Disk Pool Size:

Total raw size: ---

Total available space: ---

Disk Pool name: Primary1

Comments: SnapMirror

Maximum I/O Streams

Concurrent read and write jobs affect disk performance.
Limit I/O streams to prevent disk overload.

☒ Limit I/O streams: 2 per volume

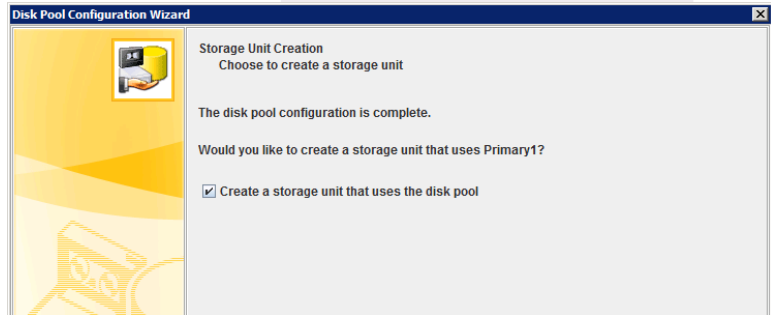
To begin, click Next. For assistance, click Help.

Help Cancel < Back Next > Finish

- 16** The disk pool summary panel displays the storage server configuration up to this point. Click **Next** to configure the disk pool.
- 17** The wizard announces the successful creation of the disk pool. Click **Next**.

- 18 After the disk pool creation completes, create a storage unit that uses the new disk pool. A storage unit that uses this disk pool is necessary for snapshots.

Select **Create a storage unit that uses *New disk pool name*** and click **Next**.



19 In the **Storage Unit Creation** panel, name the storage unit.

See “[NetBackup naming conventions](#)” on page 62.

Select the media server(s) that can use the storage unit.

Use any available media server to transport data.

NetBackup selects any media server to access the storage unit.

Use only the selected media servers.

NetBackup uses only the media server that is specified to access the storage unit.

Only media servers that have the OpenStorage plug-in installed appear in this list. For a media server to communicate with and have access to a storage server, it must be added to the Replication Director environment.

See “[Adding the storage server credentials to a NetBackup server](#)” on page 76.

Note: A storage unit can represent many physical devices. When a storage unit is a replication target, NetBackup lets the plug-in select which device to use within the storage unit. For replication jobs, storage units and storage unit groups ignore the **Maximum concurrent jobs** setting. NetBackup does not attempt to throttle the parameters.

The screenshot shows the 'Storage Unit Creation' panel of the 'Disk Pool Configuration Wizard'. The panel has a title bar with the text 'Disk Pool Configuration Wizard' and a close button. The main content area is titled 'Storage Unit Creation' and 'Enter details to create storage unit'. It contains the following fields and controls:

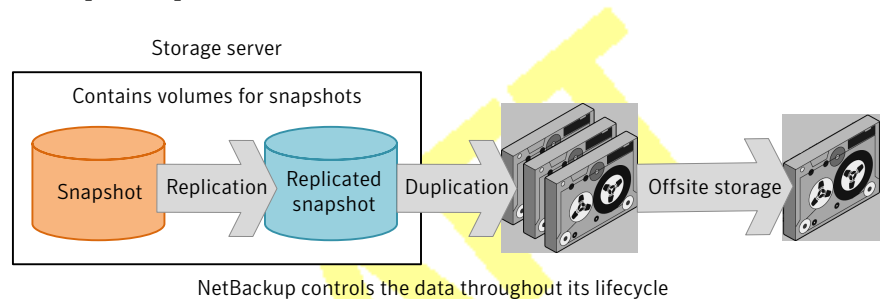
- Disk pool:** Primary1
- Storage server type:** Network_NTAP
- Storage unit name:** Primary1_STU
- Media Server:**
 - ☐ Use any available media server
 - ☒ Only use the selected media servers:
- Media Servers:** A list box containing 'lifexpool' with a checked checkbox.
- Maximum concurrent jobs:** A dropdown menu set to '1'.
- Maximum fragment size:** A text box containing '524288' and a label 'Megabytes'.
- Click 'Next' to create storage unit.**
- Buttons:** Help, Close, < Back, Next >, and Finish.

20 Click **Next**. The final wizard panel displays, announcing that the wizard has been completed.

You've just configured a storage server, a disk pool, and a storage unit to contain the primary snapshots. Configure additional disk pools (and storage units) for every group of disk volumes that will contain snapshot replications of the primary snapshots.

For example, in the following figure, two disk pools are necessary:

- One disk pool that contains volumes to hold primary snapshots and act as a source for other replications, and
- a second disk pool that contains volumes that are replication targets for snapshot replications.



See the following [topic](#) for more information about creating more disk pools and storage units.

See [“Creating disk pools for snapshot replication”](#) on page 83.

Storage used in a single SLP for Replication Director must be managed by one storage server

ET2857508; 2/8/13

The operations in a storage lifecycle policy cannot use storage that is managed by multiple storage servers. Do not mix storage in one SLP from multiple OnCommand storage servers or multiple ECOM storage servers.

For example, to configure replication between two EMC disk arrays, each array must be managed by the same ECOM storage server.

Adding the storage server credentials to a NetBackup server

Use the following procedure to add the storage server credentials to a NetBackup server in a Replication Director environment.

Note: If you add or change credentials, make sure that the computer that hosts the master server is always selected.

To add OpenStorage server credentials

- 1 In the **NetBackup Administration Console**, expand **Media and Device Management > Credentials > Storage Servers**.
- 2 Select the storage server, then select **Edit > Change**.
- 3 Select the **Media Servers** tab.
- 4 Select the server you want to add. Also make sure that any servers already credentialed are selected.
- 5 Enter the credentials.
- 6 Click **Set** and then click **OK**.

Deleting an OpenStorage storage server

If you delete a storage server, NetBackup removes it from your configuration.

Warning: Do not delete a storage server if the storage that it manages contains unexpired NetBackup images.

To delete an OpenStorage storage server

- 1 If the storage server currently manages volumes, perform the following tasks:
 - Expire the the images on the volumes.

Warning: If unexpired images are deleted, data loss may occur.

- Delete the storage units that comprise the disk pools.

- Delete the disk pools.
- 2 In the **NetBackup Administration Console**, in the left pane, expand **Media and Device Management > Credentials > Storage Servers**
- 3 Select the storage server that you want to delete.
- 4 On the **Edit** menu, select **Delete**.
- 5 Click **Yes** in the confirmation dialog box.

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Configuring disk pools for snapshot and replication

This chapter includes the following topics:

- [About disk pools for snapshots and snapshot replication](#)
- [Creating disk pools for snapshot replication](#)
- [Updating disk pools after volumes are added, are deleted, or are changed](#)
- [Updating an OpenStorage disk pool to reflect plug-in updates](#)
- [How to resolve snapshot disk volume changes](#)
- [Using bpstinfo to view the replication topology of the device](#)

About disk pools for snapshots and snapshot replication

An OpenStorage disk pool represents the disk storage that is exposed to NetBackup through the OpenStorage API. A disk pool can represent one or more volumes. Disk pools inherit their properties from the volumes that comprise the disk pools.

Snapshot and snapshot replication disk pools differ from other NetBackup disk pool types as follows:

- Only one storage unit can access a snapshot or a snapshot replication disk pool.
- Snapshot and snapshot replication disk pools observe no high and no low water marks.

One disk pool to be used for snapshots can be configured as part of the **Storage Server Configuration Wizard**. At least one additional disk pool is necessary for snapshot replication. The **Disk Pool Configuration Wizard** can also be launched independently.

See [“Creating disk pools for snapshot replication”](#) on page 83.

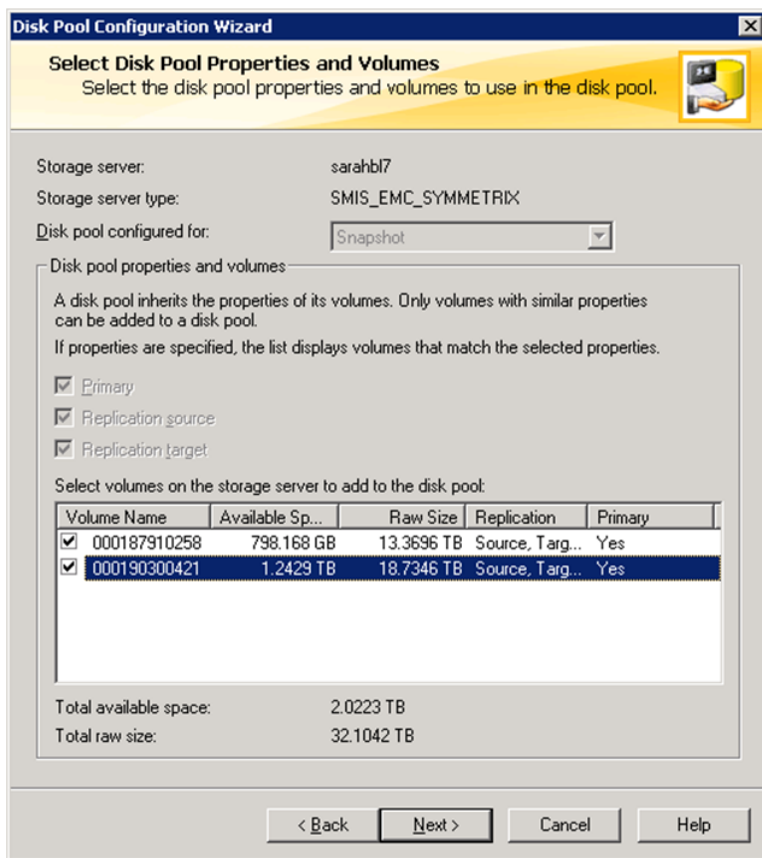
The NetBackup administrator creates multiple disk pools to serve specific purposes in a replication configuration. The volumes in a disk pool must have the properties that match their intended purpose.

For example, the following disk pools are necessary to create a snapshot volume and replicate it to target volumes:

- A disk pool that contains a volume where the initial snapshot can be created. The volume must have the **Snapshot** and **Primary** attributes set.
See [“Primary + Replication source snapshot storage unit”](#) on page 116.
- A disk pool that contains a volume with the **Snapshot** and the **Replication target** properties set to serve as the target for a replica snapshot.
See [“Replication target snapshot storage unit”](#) on page 118.

For storage servers of type **SMIS_EMC_SYMMETRIX**, the **Disk Pool Configuration Wizard** displays the enclosure ID of the disk array in the volume list instead of an actual volume. In [Figure 7-1](#), two EMC disk arrays are registered to the storage server. The volume list displays the enclosure ID of each the disk array.

Figure 7-1 Disk Pool Configuration Wizard displays EMC enclosure IDs, not volumes



The following topic describes the roles that disk pools and storage units can serve in a Replication Director configuration:

See [“About configuring storage lifecycle policies for snapshots and snapshot replication”](#) on page 111.

About disk volumes for snapshots and snapshot replication

For snapshots and snapshot replication, all of the volumes in a disk pool must be homogeneous; that is, they must have the same properties. The NetBackup **Disk Pool Configuration Wizard** enforces compliance, as does the **Change Disk Pool** dialog box.

The storage administrator defines the properties and the replication topology of the disk volumes. The NetBackup administrator creates disk pools, based on the properties of the volumes.

- The volume properties define in what capacity the volumes can be used:

Snapshot	The default property. All volumes that are used for snapshots or snapshot replication must have this property.
Primary	The volume can be used for snapshot creation.
Replication source	The volume can be used as a source for replicating snapshots.
Replication target	The volume can be used as a target for snapshot replication.
Mirror	The volume is a mirror for snapshots. Mirror snapshots have the same life span as the original snapshot.

- The replication topology defines the source and the target volumes for replication. For example, volume S1 replicates to T1, volume S2 replicates to T2, and so on.

When you configure your NetBackup disk pools, add the source volumes (*S_n*) to the disk pool you use for snapshot creation. Then, add the target volumes (*T_n*) to the disk pool that is the target of the replication.

- The **Disk Pool Configuration Wizard** may not display all of the properties, depending on the underlying volumes.
- For example, if a SnapMirror relationship is not defined at the volume layer, then the **Mirror** property does not appear in the wizard panel for selection.

[Table 7-1](#) shows the properties that are required for snapshots and snapshot replication volumes, depending on their intended purpose in the NetBackup snapshot and snapshot replication process.

Table 7-1 Purpose of volume and required volume properties

Purpose of volume	Snapshot property	Primary property	Replication source property	Replication target property	Mirror property
A volume to contain the initial snapshots of primary data.	X	X	X A primary volume is always a replication source as well.		

Table 7-1 Purpose of volume and required volume properties (*continued*)

Purpose of volume	Snapshot property	Primary property	Replication source property	Replication target property	Mirror property
A volume to serve as a replication source or a replication target.	X		X The Source property allows the volume to serve as a source for snapshot copies.	X The Target property allows the volume to contain copies of snapshots.	X A target volume may have the Mirror property enabled or be Independent .

Creating disk pools for snapshot replication

One disk pool can be configured as part of the **Storage Server Configuration Wizard** to contain primary snapshots. Additional disk pools are necessary for snapshot replication.

Run the **Disk Pool Configuration Wizard** after running the `bpstsinfo` command. The output from the command is necessary to view the replication properties of the volumes and understand which volumes to include in the various disk pools.

See “[Using bpstsinfo to view the replication topology of the device](#)” on page 96.

To create a disk pool

- 1 Select **Media and Device Management**. In the right pane, click **Configure Disk Pool**.
- 2 In the **Disk Pool Configuration Wizard** welcome panel, click **Next**.
- 3 Select the type of disk pool that you want to create. For example, to configure an OpenStorage disk pool for NetApp, select **OpenStorage (Network_NTAP)**. To configure an OpenStorage disk pool for EMC, select **OpenStorage (SMIS)**.
- 4 On the **Select Storage Server** panel, select the storage server. Click **Next**.

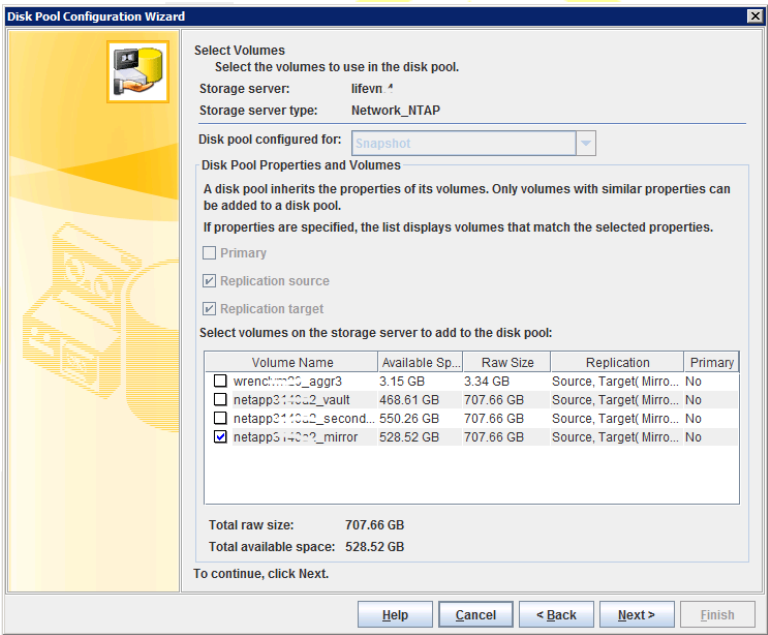
5 The **Select Disk Pool Properties and Volumes** panel presents all of the volumes that have been configured in the storage of the OpenStorage partner by the storage administrator.

You've already created one disk pool as part of the **Storage Server Configuration Wizard** to contain the primary snapshots that can serve as a source for replication. Now create a disk pool that can serve as a replication target.

To create a disk pool that is a target for replication, select **Replication target**. NetBackup filters the volumes for selection so that dissimilar volumes are not combined.

Note that in the **Replication** column, all the volumes have both **Source** and **Target** properties. That means that the volume can serve as both a target for replications as well as a source for another replication.

Expand the column to display other properties of the volume. For example, whether the volume is configured to be a mirror.



Another method to filter the volumes is to first clear the **Primary**, **Replication source**, and **Replication target** properties. Then, click on a specific volume. The wizard panel filters the volumes, displaying only those volumes that match the properties of the selected volume.

Note: When the NBUPlugin is installed on the OnCommand server, a NetBackup group is automatically created on the OnCommand server. On the OnCommand server, use the NetApp Operations Manager to add resource pools to the NetBackup group so that the resource pools are exposed to NetBackup. If the NetBackup group contains no resource pools, no LSUs display in the disk pool configuration wizard.

- 6 Select the volume(s) to be part of this disk pool. Click **Next**.
- 7 In the **Additional Disk Pool Information** panel, name the disk pool.
See “[NetBackup naming conventions](#)” on page 62.

The available size that is listed is the total amount of space available in the pool. The raw size is the total raw, unformatted size of the storage in the disk pool. Click **Next**.

- 8 The disk pool summary panel displays the storage server configuration up to this point.
Click **Next** to configure the disk pool.
- 9 The wizard announces the successful creation of the disk pool. Click **OK**.

- 10** After the disk pool creation completes, create a storage unit that uses the new disk pool. A storage unit that uses this disk pool is necessary for snapshot replication.

Select **Create a storage unit that uses *New disk pool name*** and click **Next**.

- 11** In the **Storage Unit Creation** panel, name the storage unit.

Select the media server(s) that can use the storage unit.

Use any available media server to transport data.

NetBackup selects any media server to access the storage unit.

Use only the selected media servers.

NetBackup uses only the media server that is specified to access the storage unit.

Only media servers that have the OpenStorage plug-in installed appear in this list. For a media server to communicate with and have access to a storage server, it must be added to the Replication Director environment.

- 12** After the disk pool creation completes, create a storage unit that uses the new disk pool. Select **Create a storage unit that uses *New disk pool name*** and click **Next**.

Configure additional disk pools (and storage units) for every group of disk volumes that will contain snapshot replications of the primary snapshots.

Updating disk pools after volumes are added, are deleted, or are changed

The storage administrator may change the properties of the volumes in a way that affects the topology of the volumes. If these volumes are used in a Replication Director environment, the changes may affect the capabilities of the disk pool. For example, a volume change may make a volume in the disk pool no longer usable by NetBackup.

If volume properties change, you must update the disk pools to which those volumes belong. Depending on the volume changes, you may also have to change storage units, storage unit groups, and storage lifecycle policies.

Note: If an OpenStorage partner updates the plug-in on a disk-array, update the NetBackup storage server and the disk pools to reflect the new functionality of the plug-in.

See [“Updating an OpenStorage storage server to reflect plug-in updates”](#) on page 23.

See [“Updating an OpenStorage disk pool to reflect plug-in updates”](#) on page 89.

To update the volumes in a disk pool after the storage changes

- 1 In the **NetBackup Administration Console**, in the left pane, expand **Media and Device Management > Devices > Disk Pools**.
- 2 In the right pane, select the disk pool you want to update.
- 3 Click **Edit > Change**.

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- 4 In the **Change Disk Pool** dialog box, click **Refresh** to query the disk array for new, deleted, or changed volumes.

Change Disk Pool

Disk pool name: Target_DP
Storage server: flappyvm4
Disk pool configured for: Snapshot

Disk Pool Properties and Volumes
A disk pool inherits the properties of its volumes. Only volumes with similar properties can be added to a disk pool.

☐ Primary
☒ Replication source
☒ Replication target

Select any additional volumes from this list to add to this disk pool:

Volume Name	Available Sp...	Raw Size	Replication	Primary
<input checked="" type="checkbox"/> Flexible1	28.7359 GB	38.6451 GB	Source, Targ...	No
<input type="checkbox"/> Flexible2	28.7359 GB	38.6451 GB	Source, Targ...	No

Find storage changes and available volumes **Refresh**

Total available space: 28.7359 GB
Total raw size: 38.6451 GB

Comments:

Maximum I/O streams
Concurrent read and write jobs affect disk performance.
Limit I/O streams to prevent disk overload.

☒ Limit I/O streams per volume

OK Cancel Help

- 5 NetBackup communicates volume changes in the following manner:
 - If a new volume was added, the volume appears in the list. It may be eligible to be added to the disk pool.
 - If volumes have been deleted, or changed, or are no longer homogenous, see the following topic:
See [“How to resolve snapshot disk volume changes”](#) on page 89.

Updating an OpenStorage disk pool to reflect plug-in updates

If an OpenStorage partner updates their plug-in, update the existing disk pools to reflect the new functionality of the plug-in after you update the NetBackup storage server.

Any disk pools that are created after the storage server is updated inherit the new functionality.

To update an OpenStorage disk pool to reflect plug-in updates

- ◆ Run the following command on the master server:

On Windows:

```
install_path\NetBackup\bin\admincmd\nbdevconfig -changedp -dp  
disk_pool_name -stype server_type -setattribute attribute
```

On UNIX:

```
/usr/opensv/netbackup/bin/admincmd/nbdevconfig -changedp -dp  
disk_pool_name -stype server_type -setattribute attribute
```

See the following descriptions of the options that require arguments:

<code>-changedp</code>	The name of the disk pool.
<code>disk_pool_name</code>	
<code>-stype server_type</code>	The storage vendor provides the string that identifies the server type.
<code>-setattribute</code>	The <i>attribute</i> is the name of the argument that represents the new functionality.
<code>attribute</code>	
	For example, OptimizedImage specifies that the environment supports the optimized synthetic backup. SpanImages specifies that backup images can span across volumes on the disk appliance.

How to resolve snapshot disk volume changes

Symantec recommends that you take the following actions when volume properties or topology change:

- Discuss the changes with the storage administrator. You need to understand the changes so you can change your disk pools (if required) so that NetBackup can continue to use them.
- If the changes were unplanned, request that the changes be reverted so that NetBackup functions correctly again.

NetBackup can process changes to the following volume properties:

- Primary
- Replication Source
- Replication Target

If these volume properties change, NetBackup can update the disk pool to match the changes. NetBackup can continue to use the disk pool, although the disk pool may no longer match the storage unit or storage lifecycle purpose.

When you open the **Change Disk Pool** dialog box, NetBackup loads the disk pool properties from the catalog. NetBackup only queries the storage server for changes when you click the **Refresh** in the **Change Disk Pool** dialog box.

Table 7-2 describes the possible outcomes and describes how to resolve them.

Table 7-2 Refresh outcomes

Outcome	Description
No changes are discovered.	No changes are required.
NetBackup discovers the new volumes that match the disk pool properties.	The new volumes appear in the Change Disk Pool dialog box. Text in the dialog box changes to indicate that you can add the new volumes to the disk pool.

Table 7-2 Refresh outcomes (*continued*)

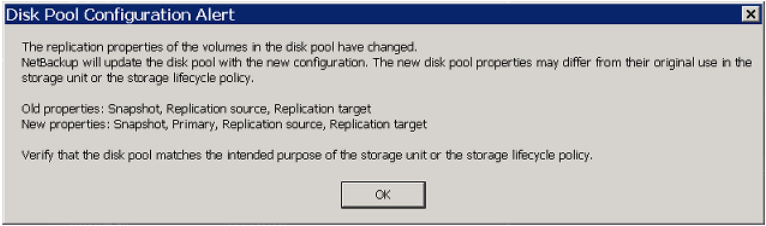
Outcome	Description
The replication properties of all of the volumes changed, but they are still consistent.	<p>A Disk Pool Configuration Alert pop-up box notifies you that the properties of all of the volumes in the disk pool changed, but they are all the same (homogeneous).</p>  <p>You must click OK in the alert box, after which the disk pool properties in the Change Disk Pool dialog box are updated to match the new volume properties.</p> <p>If new volumes are available that match the new properties, NetBackup displays those volumes in the Change Disk Pool dialog box. You can add those new volumes to the disk pool.</p> <p>In the Change Disk Pool dialog box, select one of the following two choices:</p> <ul style="list-style-type: none"> ■ OK. To accept the disk pool changes, click OK in the Change Disk Pool dialog box. NetBackup saves the new properties of the disk pool. NetBackup can use the disk pool, but it may no longer match the intended purpose of the storage unit or storage lifecycle policy. Change the storage lifecycle policy definitions to ensure that the replication operations use the correct source and target disk pools, storage units, and storage unit groups. ■ Cancel. To discard the changes, click Cancel in the Change Disk Pool dialog box. NetBackup does not save the new disk pool properties. NetBackup can use the disk pool, but it may no longer match the intended use of the storage unit or storage lifecycle policy.

Table 7-2 Refresh outcomes (continued)

Outcome	Description
The replication properties of the volumes changed, and they are now inconsistent.	<p>A Disk Pool Configuration Error pop-up box notifies you that the replication properties of some of the volumes in the disk pool changed. The properties of the volumes in the disk pool are not homogeneous.</p> <div><div>Disk Pool Configuration Error</div><div><div></div><div><div>The replication properties of the volumes in the disk pool have changed and the existing volumes in the disk pool have inconsistent properties.</div><div>NetBackup cannot use the disk pool until the storage configuration is fixed. Change the volume properties on the storage server to match the disk pool properties or ensure that all volumes in the disk pool have similar properties.</div><div>Click on 'Refresh' button to update the storage properties in this disk pool.</div></div><div>OK</div></div></div> <p>You must click OK in the alert box.</p> <p>In the Change Disk Pool dialog box, the properties of the disk pool are unchanged, and you cannot select them (that is, they are dimmed). However, the properties of the individual volumes are updated.</p> <p>Because the volume properties are not homogeneous, NetBackup cannot use the disk pool until the storage configuration is fixed.</p> <p>NetBackup does not display new volumes (if available) because the volumes already in the disk pool are not homogeneous.</p> <p>To determine what has changed, compare the disk pool properties to the volume properties. Work with your storage administrator to change the volume properties back to their original values.</p> <p>The disk pool remains unusable until the properties of the volumes in the disk pool are homogenous.</p> <p>In the Change Disk Pool dialog box, click OK or Cancel to exit the Change Disk Pool dialog box.</p>

Table 7-2 Refresh outcomes (continued)

Outcome	Description
The snapshot properties changed.	<p>A Disk Pool Configuration Error pop-up box notifies you that the snapshot properties of some of the volumes in the disk pool changed.</p> <div><div>Disk Pool Configuration Error</div><div><div></div><div><div>The snapshot property of one or more volumes in the disk pool has changed. This property cannot be changed after initial configuration. NetBackup cannot use the disk pool until the storage configuration is fixed.</div><div>Change the volume's snapshot property on the storage server to match the disk pool properties. Click on 'Refresh' button to update the storage properties in this disk pool.</div></div><div>OK</div></div></div> <p>You must click OK in the alert box.</p> <p>In the Change Disk Pool dialog box, the properties of the disk pool are unchanged, and you cannot select them (that is, they are dimmed). However, the properties of the individual volumes are updated.</p> <p>Because the volume properties are not homogeneous, NetBackup cannot use the disk pool until the storage configuration is fixed.</p> <p>NetBackup does not display new volumes (if available) because the volumes already in the disk pool are not homogeneous.</p> <p>To determine what has changed, compare the disk pool properties to the volume properties. Work with your storage administrator to change the volume properties back to their original values.</p> <p>The disk pool remains unusable until the properties of the volumes in the disk pool are homogenous.</p> <p>Click OK or Cancel to exit the Change Disk Pool dialog box.</p>

Table 7-2 Refresh outcomes (continued)

Outcome	Description
The replication topology changed.	<p>A Disk Pool Configuration Alert pop-up box notifies you that the replication topology changed.</p> <div><div>Disk Pool Configuration Alert</div><div><div>The replication topology of existing volumes has changed.</div><div>The changed disk pool may differ from its original use in the storage unit or the storage lifecycle policy.</div><div>Verify that the disk pool matches the intended purpose of the storage unit or the storage lifecycle policy.</div></div><div><div>OK</div></div></div> <p>You must click OK in the alert box.</p> <p>If NetBackup also discovers the new volumes that match the replication properties, they are displayed in the dialog box. You can add those new volumes to the disk pool.</p> <p>Work with your storage administrator to understand the topology changes. Alternatively, use the <code>bpstsinfo -lsuinfo</code> command to discover the current topology. Compare the new topology to the previous topology.</p> <p>See “Using <code>bpstsinfo</code> to view the replication topology of the device” on page 96.</p> <p>In the Change Disk Pool dialog box, select one of the following two choices:</p> <ul style="list-style-type: none">■ OK. To accept the disk pool changes, click OK in the Change Disk Pool dialog box. NetBackup saves the new properties of the disk pool. <p>NetBackup can use the disk pool, but it may no longer match the intended purpose of the storage unit or storage lifecycle policy. Change the storage lifecycle policy definitions to ensure that the replication operations use the correct source and target disk pools, storage units, and storage unit groups.</p> <ul style="list-style-type: none">■ Cancel. To discard the changes, click Cancel in the Change Disk Pool dialog box. NetBackup does not save the new disk pool properties. NetBackup can use the disk pool, but it may no longer match the intended use of the storage unit or storage lifecycle policy.

Table 7-2 Refresh outcomes (continued)

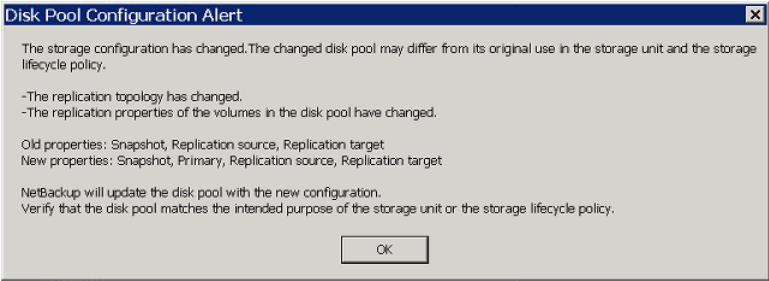

Outcome	Description
The replication topology changed and the replication properties of the volumes in the disk pool changed.	<p>A Disk Pool Configuration Alert pop-up box notifies you that the replication topology changed and all of the replication properties of all of the volumes in the disk pool changed. The new properties are all the same (homogeneous).</p>  <p>You must click OK in the alert box.</p> <p>In the Change Disk Pool dialog box, the properties of the disk pool are updated to show the new properties. You cannot select the properties (that is, they are dimmed).</p> <p>If new volumes are available that match the new properties, NetBackup displays those properties in the Change Disk Pool dialog box. You can add those new volumes to the disk pool.</p> <p>Work with your storage administrator to understand the topology changes. Alternatively, use the <code>bpstsinfo -lsuinfo</code> command to discover the current topology. Compare the new topology to the previous topology.</p> <p>See “Using bpstsinfo to view the replication topology of the device” on page 96.</p> <p>In the Change Disk Pool dialog box, select one of the following two choices:</p> <ul style="list-style-type: none"> ■ OK. To accept the disk pool changes, click OK in the Change Disk Pool dialog box. NetBackup saves the new properties of the disk pool. NetBackup can use the disk pool, but it may no longer match the intended purpose of the storage unit or storage lifecycle policy. Change the storage lifecycle policy definitions to ensure that the replication operations use the correct source and target disk pools, storage units, and storage unit groups. ■ Cancel. To discard the changes, click Cancel in the Change Disk Pool dialog box. NetBackup does not save the new disk pool properties. NetBackup can use the disk pool, but it may no longer match the intended use of the storage unit or storage lifecycle policy.

Table 7-2 Refresh outcomes (continued)

Outcome	Description
NetBackup cannot find a volume or volumes that were in the disk pool.	<p>A Disk Pool Configuration Alert pop-up box notifies you that an existing volume or volumes was deleted from the storage device:</p> <div><div>Disk Pool Configuration Alert</div><div> An existing volume in this disk pool cannot be found on the storage device and is no longer available to NetBackup. The volume might be offline or deleted. If deleted, any data on that volume is lost.</div><div>Volume(s) deleted: SnapVaultB</div><div>Refer to documentation for information on how to resolve this issue.</div><div>OK</div></div>

Using bpstsinfo to view the replication topology of the device

For a replication operation to succeed, a volume which is a source of replication must have a replication partner which is the target of replication. The replication relationship between volumes is provided to NetBackup by the storage device using the OpenStorage APIs.

To understand the replication topology of the storage server, run the `bpstsinfo` command, specifying the storage server name and the OpenStorage server type. For example:

```
bpstsinfo -lsuinfo -storage_server storage_server_name -stype storage_type
```

The command is located in the following directory:

- Windows:
`Install_path\NetBackup\bin\admincmd\`

■ UNIX:

`/usr/openv/netbackup/bin/admincmd/`

The output from the `bpstsinfo` command displays the following information:

- The name of the storage server (Server Name). The storage server name here must be the same as the storage server name used in the **Storage Server Configuration Wizard**.
- The name of the volume (LSU Name).
- The properties of the volume (Media, Save As).
- The replication sources of the volume (Replication Sources).
- The replication targets of the volume (Replication Targets).

Save the output to a file so that you can compare the current topology with the previous topology to determine what has changed.

NetApp storage server sample `bpstsinfo` output

The following examples show sample output from the `bpstsinfo` command for a NetApp storage server named `plinko` which contains four LSUs. The generic syntax for the command is as follows:

```
bpstsinfo -lsuinfo -storage_server storage_server_name -stype
storage_type
```

The following is an example of the command, run on the NetBackup media server, for storage server `plinko`:

```
bpstsinfo -lsuinfo -storage_server plinko -stype Network_NTAP
```

Output for first LSU:

Reviewers: Has anything been added to the output that would change this example?

LSU Info:

```
Server Name: Network_NTAP:plinko
LSU Name: PrimarySnapshot
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_NONE
Description:
Configuration:
Media: (STS_LSUF_REP_ENABLED | STS_LSUF_REP_SOURCE)
Save As : (STS_SA_PRIMARY | STS_SA_SNAPSHOT)
Replication Sources: 0 ( )
```

```
Replication Targets: 3 ( Network_NTAP:plinko:Netapp3140a2_SnapVault
Network_NTAP:plinko:Netapp3140a2_SnapMirror
Network_NTAP:plinko:Netapp3140a2_SecondSnapMirror )
.
.
.
```

The `bpstsinfo` output provides the following information about the volume:

Storage server name (Server Name).	plinko The name preceding the server name is the storage server type. For example, <code>Network_NTAP</code> .
Volume name (LSU Name).	PrimarySnapshot
Volume properties (Media, Save As).	The volume has the following properties: <ul style="list-style-type: none"> ■ Primary ■ Snapshot ■ Replication Source
Replication sources of the volume (Replication Sources).	The volume has no replication sources. It cannot receive replication from any other volume.
Replication targets of the volume (Replication Targets).	The volume has three replication targets. It can replicate to the following volumes: <ul style="list-style-type: none"> ■ Netapp3140a2_SnapVault ■ Netapp3140a2_SnapMirror ■ Netapp3140a2_SecondSnapMirror

Output for second LSU:

```
LSU Info:
Server Name: Network_NTAP:plinko
LSU Name: Netapp3140a2_SnapVault
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_NONE
Description:
Configuration:
Media: (STS_LSUF_REP_ENABLED | STS_LSUF_REP_SOURCE |
      STS_LSUF_REP_TARGET | STS_LSUF_MIRROR_FLEXIBLE)
Save As : (STS_SA_SNAPSHOT | STS_SA_MIRROR)
Replication Sources: 3 ( Network_NTAP:plinko:PrimarySnapshot
Network_NTAP:plinko:Netapp3140a2_SnapMirror
Network_NTAP:plinko:Netapp3140a2_SecondSnapMirror )
```

```
Replication Targets: 2 ( Network_NTAP:plinko:Netapp3140a2_SnapMirror
Network_NTAP:plinko:Netapp3140a2_SecondSnapMirror )
.
.
.
```

The `bpstsinfo` output provides the following information about the volume:

Storage server name (Server Name).	plinko
	The name preceding the server name is the storage server type.
Volume name (LSU Name).	Netapp3140a2_SnapVault
Volume properties (Media, Save As).	<p>The volume has the following properties:</p> <ul style="list-style-type: none"> ■ Snapshot ■ ReplicationSource ■ ReplicationTarget ■ Mirror ■ MirrorFlexible <p>Since the LSU is MirrorFlexible, it can be configured as Mirror-capable or not Mirror-capable as specified by the user.</p>
Replication sources of the volume (Replication Sources).	<p>The volume has three replication sources.</p> <p>It can receive replications from the following three volumes:</p> <ul style="list-style-type: none"> ■ PrimarySnapshot ■ Netapp3140a2_SnapMirror ■ Netapp3140a2_SecondSnapMirror
Replication targets of the volume (Replication Targets).	<p>The volume has two replication targets.</p> <p>It can replicate to the following two volumes:</p> <ul style="list-style-type: none"> ■ Netapp3140a2_SnapMirror ■ Netapp3140a2_SecondSnapMirror

Output for third LSU:

```
LSU Info:
Server Name: Network_NTAP:plinko
LSU Name: Netapp3140a2_SnapMirror
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_NONE
```

```
Description:
Configuration:
Media: (STS_LSUF_REP_ENABLED | STS_LSUF_REP_SOURCE |
       STS_LSUF_REP_TARGET | STS_LSUF_MIRROR_FLEXIBLE)
Save As : (STS_SA_SNAPSHOT | STS_SA_MIRROR)
Replication Sources: 3 ( Network_NTAP:plinko:PrimarySnapshot
Network_NTAP:plinko:Netapp3140a2_SnapVault
Network_NTAP:plinko:Netapp3140a2_SecondSnapMirror )
Replication Targets: 2 ( Network_NTAP:plinko:Netapp3140a2_SnapVault
Network_NTAP:plinko:Netapp3140a2_SecondSnapMirror )
.
.
.
```

Output for fourth LSU:

```
LSU Info:
Server Name: Network_NTAP:plinko
LSU Name: Netapp3140a2_SecondSnapMirror
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_NONE
Description:
Configuration:
Media: (STS_LSUF_REP_ENABLED | STS_LSUF_REP_SOURCE |
       STS_LSUF_REP_TARGET | STS_LSUF_MIRROR_FLEXIBLE)
Save As : (STS_SA_SNAPSHOT | STS_SA_MIRROR)
Replication Sources: 3 ( Network_NTAP:plinko:PrimarySnapshot
Network_NTAP:plinko:Netapp3140a2_SnapVault
Network_NTAP:plinko:Netapp3140a2_SnapMirror )
Replication Targets: 2 ( Network_NTAP:plinko:Netapp3140a2_SnapVault
Network_NTAP:plinko:Netapp3140a2_SnapMirror )
.
.
.
```

EMC CIM storage server sample bpstsinfo output

The following examples show sample output from the bpstsinfo command for an EMC CIM storage server named SMIS:mars.min.university.com.

The bpstsinfo output for the first LSU:

```
LSU Info:
Server Name: SMIS:mars.min.university.com
```

```
LSU Name: 000187910258
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_BLOCK
Description: LSU
Configuration:
Media: (STS_LSUF_DISK | STS_LSUF_GROUP_SNAP | STS_LSUF_ACTIVE |
STS_LSUF_STORAGE_UNDEFINED | STS_LSUF_GROUP_SNAP |
STS_LSUF_REP_ENABLED | STS_LSUF_REP_SOURCE |
STS_LSUF_REP_TARGET)
Save As : (STS_SA_PRIMARY | STS_SA_SNAPSHOT)
Replication Sources: 1 ( SMIS:mars.min.university.com:000190300421 )
Replication Targets: 1 ( SMIS:mars.min.university.com:000190300421 )
.
.
.
```

The bpstsinfo output provides the following information about the disk array:

Storage server name (Server Name).	SMIS:mars.min.univeristy.com
LSU name.	000196119848
	The serial number of the disk array.
Volume properties (Media, Save As).	All the LSUs are considered as STS_SA_PRIMARY since as any enclosure can be configured to hold the snapshot.
Replication sources of the volume (Replication Sources).	The volume has one replication source: the disk array of serial number 000190300461.
Replication targets of the volume (Replication Targets).	The volume has one replication target: the disk array of serial number 000190300461.

The bpstsinfo output for the second LSU:

```
LSU Info:
Server Name: SMIS:mars.min.university.com
LSU Name: 000190300421
Allocation : STS_LSU_AT_STATIC
Storage: STS_LSU_ST_BLOCK
Description: LSU
Configuration:
Media: (STS_LSUF_DISK | STS_LSUF_GROUP_SNAP | STS_LSUF_ACTIVE | STS_LSUF
Save As : (STS_SA_PRIMARY | STS_SA_SNAPSHOT)
Replication Sources: 1 ( SMIS:mars.min.university.com:000187910258 )
Replication Targets: 1 ( SMIS:mars.min.university.com:000187910258 )
```

.
.
.

The bpstsinfo output provides the following information about the disk array:

Storage server name (Server Name).	SMIS:mars.min.univeristy.com
LSU name.	000190300421
	The serial number of the disk array.
Volume properties (Media, Save As).	All the LSUs are considered as STS_SA_PRIMARY since as any enclosure can be configured to hold the snapshot.
Replication sources of the volume (Replication Sources).	The volume has one replication source: the disk array of serial number 000187910258.
Replication targets of the volume (Replication Targets).	The volume has one replication target: the disk array of serial number 000187910258.

Configuring storage units and storage unit groups for snapshots and snapshot replication

This chapter includes the following topics:

- [Creating storage units for snapshots and snapshot replication](#)
- [Creating a storage unit](#)
- [Creating storage unit groups for snapshots](#)

Creating storage units for snapshots and snapshot replication

A storage unit is a label that NetBackup associates with physical storage. For snapshots and snapshot replication, a storage unit is configured to contain one snapshot disk pool.

Storage unit creation is part of several other wizards. However, a storage unit can be created directly from the **Storage** utility in the **NetBackup Administration Console**.

To create a storage unit for snapshots or snapshot replication

- 1 In the **NetBackup Administration Console**, select the **Storage** utility.
- 2 Select **Actions > New > New Storage Unit**.

3 Enter a **Storage unit name**.

See “[NetBackup naming conventions](#)” on page 62.

4 Select the **Storage unit type**. For snapshots and snapshot replication, select **Disk**.

5 Select a **Disk type**.

The **Disk type** identifies the type of storage unit. To configure snapshots and snapshot replication, select **OpenStorage (Vendor name)**.

For example, select **OpenStorage (Network_NTAP)** for NetApp or **OpenStorage (SMIS)** for EMC.

6 A storage unit can contain either snapshot images or non-snapshot backup images, but it cannot contain both. In the **Storage unit configured for** drop-down list, indicate what the storage unit is to contain:

■ **Backup storage unit**

Upon selection, only those disk pools that can contain non-snapshot backups are displayed in the dialog box.

■ **Snapshot storage unit**

To configure snapshots and snapshot replication, select **Snapshot**.

Upon selection, only those disk pools that can contain snapshots are displayed in the dialog box. Once a storage unit contains snapshots, it cannot contain non-snapshot backups.

7 Specify the properties that are required for the storage unit. Selecting a property filters the disk pools and displays only those that have the property selected.

For example, select **Replication source** and **Replication target** to display the disk pools that are configured to be both replication sources and targets for other replications. If no properties are selected, all disk pools appear.

(If you already know the name of the disk pool that has the properties that you want, select the disk pool from the **Select disk pool** drop-down menu. In that case, no filtering is necessary.)

8 In the **Select disk pool** drop-down list, select the disk pool that this storage unit is to contain. A storage unit can contain only one disk pool.

Click **View Properties** to display the properties of the selected disk pool.

- Select the media server(s) that can use the storage unit.

Use any available media server to transport data	NetBackup selects any media server to access the storage unit.
Use only the following media servers	NetBackup uses only the media server(s) that are specified to access the storage unit.

Only the media servers that have the OpenStorage plug-in installed appear in this list. For a media server to communicate with and have access to a storage server, it must be added to the Replication Director environment.

See [“Adding the storage server credentials to a NetBackup server”](#) on page 76.

Note: A storage unit can represent many physical devices. When a storage unit is a replication target, NetBackup lets the plug-in select which device to use within the storage unit. For replication jobs, storage units and storage unit groups ignore the **Maximum concurrent jobs** setting. NetBackup does not attempt to throttle the parameters.

- Click **OK** to save the storage unit configuration.

Creating a storage unit

A storage unit is a label that NetBackup associates with physical storage. The label can identify a robot, a path to a volume, or a disk pool. Storage unit creation is part of several other wizards. However, a storage unit can be created directly from the **Storage** utility in the **NetBackup Administration Console**.

For more information about the storage unit settings, see the online Help or the *NetBackup Administrator's Guide, Volume I*.

To create a storage unit

- In the **NetBackup Administration Console**, select the **Storage** utility.
- Select **Actions > New > New Storage Unit**.
- Enter a **Storage unit name**.
See [“NetBackup naming conventions”](#) on page 62.
- Select the **Storage unit type**. The selection specifies the type of storage that the storage unit uses: **Media Manager**, **Disk**, or **NDMP**.
- For disk storage units:

- Select a disk type from the **Disk type** drop-down menu.
 The **Disk type** identifies the type of storage unit destination:

AdvancedDisk storage unit The destination is a disk pool.

BasicDisk storage unit The destination is a path to a volume on a host.

Cloud Storage storage unit The destination is a disk pool of the type that includes a **VendorName** string. **VendorName** can be the name of a cloud storage provider.

Possible values include **Amazon**, **AT&T**, **Nirvanix**, and **Rackspace**.

These values also can contain a **_crypt** or **_SureScale** suffix (for example, **Amazon_crypt** or **Nirvanix_SureScale**).

The **_crypt** suffix indicates encrypted storage; the **_SureScale** suffix indicates SureScale deduplication disk pool storage.

NDMP storage unit The destination is an NDMP host. The NDMP protocol is used to perform backups and recoveries.

OpenStorage storage unit The destination is a disk pool of the type that includes a **VendorName** string.

StorageName can be one of the following:

- Symantec-provided storage, such as a SureScale deduplication disk pool on a NetBackup appliance. Possible values are **SureScale** (unencrypted storage) and **SureScale_crypt** (encrypted storage).
- Third-party disk appliance storage. The vendor supplies the **StorageName** string.

To configure snapshots and snapshot replication with Replication Director, select **OpenStorage (storage type)**.

For example, select **OpenStorage (Network_NTAP)** for NetApp or **OpenStorage (SMIS)** for EMC.

PureDisk storage unit The destination is a disk pool.
 See the *NetBackup Deduplication Guide*.

storage unit The destination is a disk pool, either on a NetBackup appliance or on cloud storage.

See the *NetBackup SureScale Solutions Guide*.

- Select a media server in the **Media server** drop-down menu. The selection indicates that the media server has permission to write to the storage unit.
 - **Absolute pathname to directory** or **Absolute pathname to volume setting**. Specifies the absolute path to a file system or a volume available for backups to disk.
 - **Maximum concurrent jobs**
Specifies the maximum number of jobs that NetBackup can send to a disk storage unit at one time.
 - **Reduce fragment size**
Adjust the fragment size to specify the largest fragment size that NetBackup can create to store backups.
 - **High water mark**
This setting applies to BasicDisk and disk pools. This value is a threshold that, when reached, causes NetBackup to consider the disk full and begin actions to reduce the data on the volume.
 - **Low water mark**
This setting has no effect unless backups are written through a storage lifecycle policy, using the capacity-managed retention type.
 - **Enable block sharing**
Allows the sharing of data blocks that have not changed from one backup to the next.
 - **Enable Temporary staging area**
Allows this storage unit to be used as a temporary staging area for basic disk staging.
- 6 For Media Manager storage units, data is written to tape robots and stand-alone tape drives:
- Select a storage device from the **Storage Device** drop-down menu.
 - Select a media server in the **Media server** drop-down menu. The selection indicates that the media server has permission to write to the storage unit.
 - **Maximum concurrent write drives**
Specifies the number of tape drives that NetBackup can use at one time for jobs to this storage unit.
 - **Enable multiplexing**
Allows multiple backups to multiplex onto a single drive in a storage unit.
 - **Reduce fragment size**

Adjust the fragment size to specify the largest fragment size that NetBackup can create to store backups.

- 7 Click **OK** to save the storage unit configuration.

Creating storage unit groups for snapshots

Creating storage unit groups is optional.

A snapshot storage unit group must be comprised of storage units that have matching properties.

ET2949061; 12/5/12

Storage unit groups are supported for Replication Director when used with NAS storage. Storage unit groups are not supported for Replication Director when used with SAN-connected storage.

The following procedure describes how to create a storage unit group that consists of the storage units that can contain snapshots.

To create a snapshot storage unit group

- 1 In the **NetBackup Administration Console**, expand **NetBackup Management > Storage**.
- 2 Right-click **Storage Unit Groups** and select **New Storage Unit Group**.
- 3 Enter a storage unit group name for the new storage unit group. The storage unit group name is case-sensitive.
See “[NetBackup naming conventions](#)” on page 62.
- 4 For the storage unit group to contain snapshots, select **Snapshot** in the drop-down menu.
- 5 A storage unit group can contain only those storage units that share similar properties. NetBackup filters the storage units for selection so that dissimilar storage units are not combined in one storage unit group.

Note: The properties of the underlying storage units are read-only. You cannot change the storage unit properties from this dialog box.

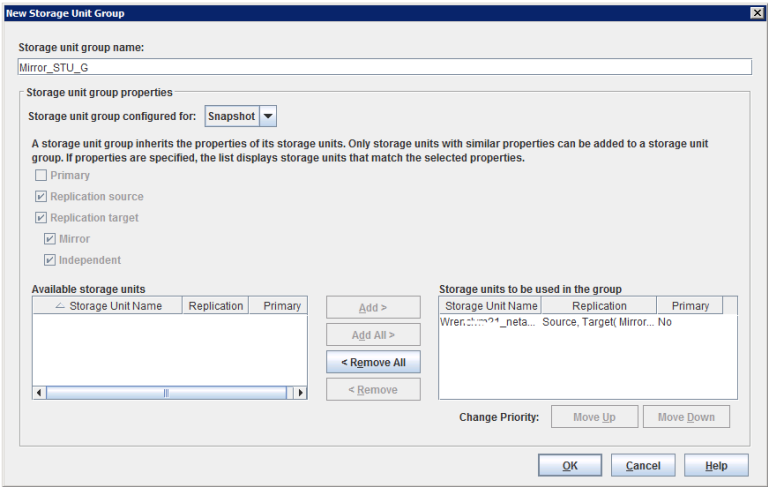
Select one or more properties to filter the storage units in the list. Only those storage units that have the selected properties are displayed. For example, select **Replication source** and **Replication target** to display only those storage units that are configured to act as both replication sources and replication targets.

Filter the storage units on the following properties:

- **Primary**
 Enable **Primary** to display the storage units that can contain the initial snapshot of primary data.
- **Replication source**
 Enable **Replication source** to display the storage units that can serve as a source for a replicated snapshot.
- **Replication target**
 Enable **Replication target** to display the storage units that can receive replicated snapshots from a replication source.
- **Mirror**
 Optionally, enable **Mirror** to display the storage units that can serve as a mirrored replication target. (For example, NetApp SnapMirror.)
- **Independent**
 Optionally, enable **Independent** to display the storage units that can act as either a **Mirror** replication target (SnapMirror) or a non-mirror replication target (SnapVault).

- 6 Add or remove storage units from the group:
 - To add storage units to the group, select the storage units from the **Available storage units** list and click **Add**.
 - To remove storage units from the group, select the storage units from the **Storage units to be used in the group** list and click **Remove**.
 - On Windows:
 To change the priority of a storage unit, select the storage unit and click **Move Up** or **Move Down**. The units at the top of the list have the highest priority in the group.
 - On UNIX:
 To change the priority of a storage unit, select the storage unit and click **Increase Priority** or **Decrease Priority**. The units at the top of the list have the highest priority in the group.
- 7 Click **OK** to save and close the dialog box.

Figure 8-1 Snapshot storage unit group configuration dialog box



Configuring storage lifecycle policies for snapshots and snapshot replication

This chapter includes the following topics:

- [About configuring storage lifecycle policies for snapshots and snapshot replication](#)
- [Operation types in a storage lifecycle policy](#)
- [Retention types for storage lifecycle policy operations](#)
- [Creating a storage lifecycle policy for snapshots and snapshot replication](#)

About configuring storage lifecycle policies for snapshots and snapshot replication

A storage lifecycle policy (SLP) contains instructions in the form of storage operations, to be applied to the data. Operations are added to the SLP that determine how the data is stored and copied or replicated. For example, the NetBackup administrator creates an operation that determines where the data exists as a snapshot, as a replication, or as a duplication. The administrator also determines the retention of the data at each storage unit or storage unit group.

After the SLP is configured for different operations, the NetBackup administrator configures a backup policy that points to the snapshot SLP.

Storage operations that are defined in the SLP use storage units that represent disk pools.

An SLP that is configured for snapshots or snapshot replication must contain a specific, hierarchical combination of operations.

The following figure represents an SLP for a replication scenario. In the example, the following operations are used:

- A **Snapshot** operation creates a snapshot.
- A **Replication** operation replicates the snapshot to another volume.
- A **Backup From Snapshot** operation creates a tar-formatted backup from the snapshot.
- A **Duplication** operation copies the backup to tape.

Table 9-1 describes the four types of operations that are required in this example replication scenario.

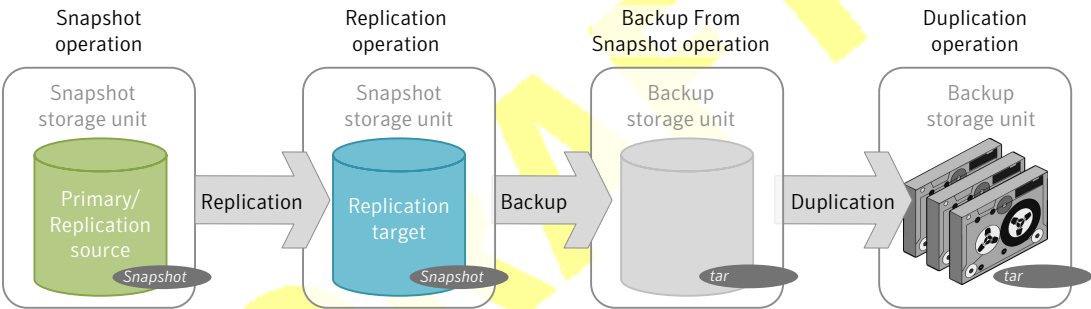


Table 9-1 Example of a storage lifecycle policy configured for snapshots and snapshot replication

Operation order in SLP	Operation	Description
1	Snapshot	<p>Operation 1 creates a snapshot in the primary storage. The snapshot serves as the source for the other operations in the SLP.</p> <ul style="list-style-type: none">■ The operation must be a Snapshot operation.■ The storage must be a snapshot storage unit that has the following properties set: Primary and Replication source. <p>Note: Only one operation to a Primary storage unit is permitted in an SLP.</p>

Table 9-1 Example of a storage lifecycle policy configured for snapshots and snapshot replication (*continued*)

Operation order in SLP	Operation	Description
2 (Child to operation 1)	Replication	<p>Operation 2 replicates the snapshot created by the first operation.</p> <ul style="list-style-type: none"> ■ The operation must be a Replication operation and it must be the replication partner to the source storage unit. ■ The retention type determines what replication method is used. For example, if retention type Fixed or Expire after copy is selected, the SnapVault replication method is used. ■ The storage must be a snapshot storage unit that has the Replication target property set. Since no other replica is created from this operation in this example, it does not need to have the Replication source property set.
3 (Child to operation 2)	Backup From Snapshot	<p>Operation 3 creates a tar-formatted backup copy of the snapshot.</p> <ul style="list-style-type: none"> ■ The operation must be a Backup From Snapshot operation. This operation creates a backup image from the snapshot. ■ The storage must be a backup storage unit.
4 (Child to operation 3)	Duplication	<p>Operation 4 makes a duplicate copy from the tar backup copy. In this example, the copy is duplicated to tape media.</p> <ul style="list-style-type: none"> ■ The operation must be a Duplication operation. This operation creates a backup copy of the tar-formatted image. ■ The storage must be a backup storage unit.

Operation types in a storage lifecycle policy

The **Operation** selections are the instructions for the storage lifecycle policy. A storage operation can be configured for the following purposes:

- See “[Snapshot operation in an SLP](#)” on page 114.
- See “[Replication operation in an SLP](#)” on page 119.
- See “[Index From Snapshot operation in an SLP](#)” on page 120.
- **Backup** operation. When a **Backup** operation appears in an SLP, it must be the first operation. In an SLP that is configured for Replication Director, the first operation must be a **Snapshot** operation. Since this guide concentrates on Replication Director, the **Backup** operation is not described here. See the *NetBackup Administrator's Guide, Volume I*.
- See “[Backup From Snapshot operation in an SLP](#)” on page 123.

- See [“Duplication operation in an SLP”](#) on page 125.
- **Import** operation. An **Import** operation is used in Auto Image Replication, in which an SLP is used to import a backup into a target NetBackup domain. Since this guide concentrates on snapshots, the **Import** operation is not described here.

All operations are described in the *NetBackup Administrator's Guide, Volume I* or the online Help in the **NetBackup Administration Console**.

Note: ET2857508; 2/8/13

The operations in an SLP that is configured for Replication Director cannot indicate storage from multiple storage servers.

See [“Storage used in a single SLP for Replication Director must be managed by one storage server”](#) on page 75.

Snapshot operation in an SLP

A **Snapshot** operation creates a point-in-time, read-only, disk-based copy of a client volume. NetBackup provides several types of snapshots, depending on the device where the snapshot occurs.

Use a **Snapshot** operation as the first operation in a storage lifecycle policy for a NetBackup Replication Director configuration.

Figure 9-1 Snapshot operation in the New Storage Operation dialog box

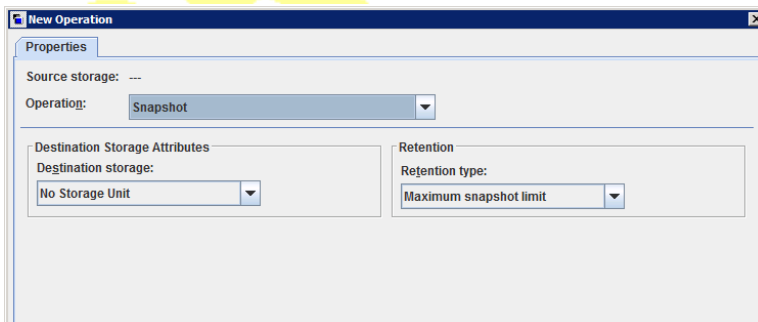


Table 9-2 Snapshot operation characteristics

Characteristic	Description
Storage unit selection	<p>The following topics describe types of snapshot storage units that can be used as the storage for a snapshot operation:</p> <ul style="list-style-type: none"> ■ See “Primary snapshot storage unit” on page 116. ■ See “Primary + Replication source snapshot storage unit” on page 116. ■ See “Replication source + Replication target snapshot storage unit” on page 117. ■ See “Replication target snapshot storage unit” on page 118. ■ See “Replication source + Replication target + Mirror snapshot storage unit” on page 118. ■ See “Replication source + Replication target + Mirror snapshot storage unit” on page 118. <p>A Storage unit selection is necessary in the following situations:</p> <ul style="list-style-type: none"> ■ If the Snapshot is to be used by a subsequent Replication operation. The storage unit that is specified for the Snapshot operation must be a snapshot-capable storage unit that represents the primary storage. ■ If the SLP contains only one operation and that is a Snapshot operation, specify a storage unit. NetBackup uses that storage unit to determine which media server to use to launch the snapshot job. <p>If neither situation applies to the SLP, the administrator may select No storage unit or may simply make no selection. NetBackup uses the storage unit that is selected for the Backup From Snapshot operation.</p>
Child of	A Snapshot operation cannot be the child of another operation.
Source for	<p>A Snapshot operation can be the source for the following operations:</p> <ul style="list-style-type: none"> ■ Backup From Snapshot ■ Index From Snapshot ■ Replication operation
Hierarchy notes	<p>If a Snapshot operation appears in an SLP, it must be first in the operations list.</p> <p>An SLP can contain a maximum of four Snapshot operations.</p>
Job type	A Snapshot operation generates a Snapshot job in the Activity Monitor.
Window	Snapshot operations do not offer the option to create an SLP window.

See [“About configuring storage lifecycle policies for snapshots and snapshot replication”](#) on page 111.

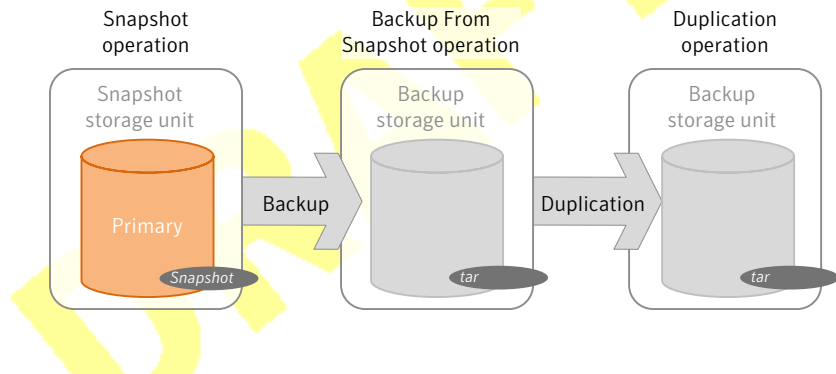
Primary snapshot storage unit

A snapshot operation can use a **Primary** snapshot storage unit. That is, the storage unit represents a disk pool that contains the volumes that have only the **Primary** property set.

Note: In the case of EMC Symmetrix disk arrays, the concept of a primary resource pool or primary storage unit does not exist. Therefore, any valid snapshot storage unit that adheres to the actual device configuration can be specified.

Figure 9-2 shows an SLP that contains one primary-only **Snapshot** operation, one **Backup From Snapshot** operation, and one **Duplication** operation. The **Backup From Snapshot** operation is used to create a backup from the snapshot on the primary-only **Snapshot** operation. After the backup is created, it is duplicated to a **Duplication** operation.

Figure 9-2 SLP that contains a Snapshot operation, a Backup From Snapshot operation, and a Duplication operation



An SLP that contains only one **Snapshot** operation cannot perform replication for the following reasons:

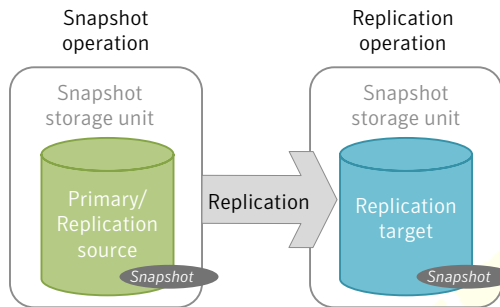
- The primary-only operation does not have the source property set so that it can act as a source for replication.
- The SLP does not contain a **Replication target** for a replica.

Primary + Replication source snapshot storage unit

An SLP operation can use a **Primary + Replication source** snapshot storage unit. That is, the storage unit represents a disk pool that contains volumes that have both the **Primary** property and the **Replication source** property set.

Figure 9-3 shows an SLP that contains a **Primary + Replication source** snapshot storage unit as one operation and one **Replication target** snapshot storage unit as another operation. The **Primary + Replication source** storage unit can replicate to the **Replication target** storage unit.

Figure 9-3 SLP that contains a Snapshot operation and a Replication operation

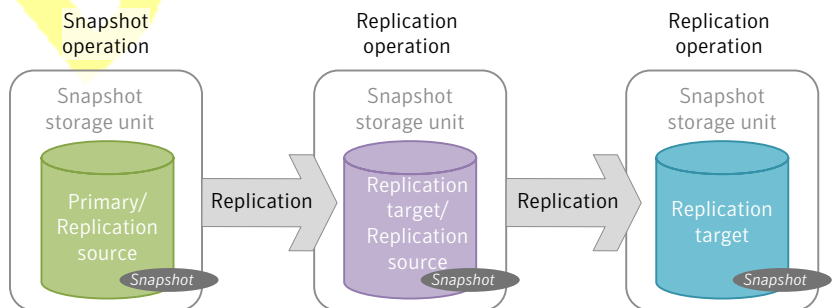


Replication source + Replication target snapshot storage unit

An SLP operation can use a snapshot storage unit that represents a disk pool that contains volumes that have the following properties: **Replication source** and **Replication target**.

A snapshot storage unit with these properties can serve as both the **Replication source** for another operation in the SLP, and as the **Replication target** for another operation in the SLP.

Figure 9-4 SLP that contains a Snapshot operation and two Replication operations

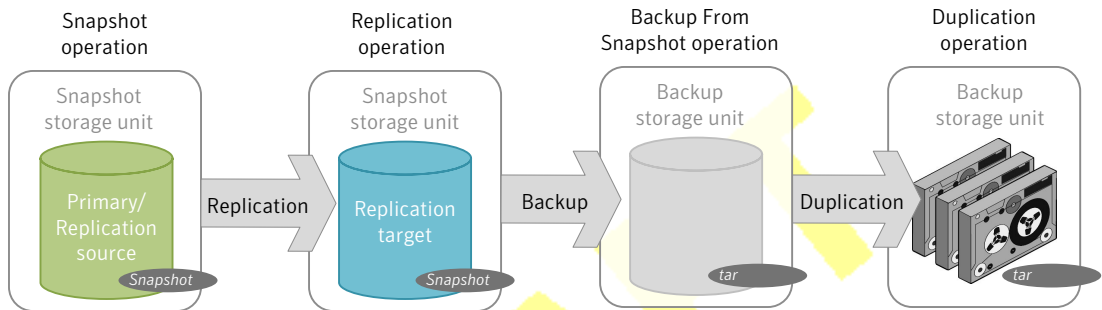


Replication target snapshot storage unit

An SLP operation can use a snapshot storage unit that represents a disk pool that contains volumes that have only the **Replication target** property set.

An operation with this property can serve only as a **Replication target** for another operation in the SLP. It cannot serve as source for a replica, but it can serve as the source for a **Duplication** operation.

Figure 9-5 SLP that contains a Snapshot operation, a Replication operation, a Backup From Snapshot operation, and a Duplication operation



Replication source + Replication target + Mirror snapshot storage unit

An SLP can use a snapshot storage unit that represents a disk pool that contains volumes that have the following properties: **Replication source**, **Replication target**, and **Mirror**.

An operation with these properties can serve as both:

- A **Replication source** in a cascading configuration.
- A mirrored **Replication target** in a cascading configuration. A mirrored **Replication target** must have a forced **Mirror** retention type.

Replication target + Mirror snapshot storage unit

An SLP can use a snapshot storage unit that represented a disk pool that contains volumes that have the following properties: **Replication target** and **Mirror**.

A mirrored **Replication target** must have a forced **Mirror** retention type.

Replication operation in an SLP

Use the **Replication** operation to create a copy of a snapshot. Use a **Replication** operation in a storage lifecycle policy for a NetBackup Replication Director configuration.

Figure 9-6 Replication operation in the New Storage Operation dialog box

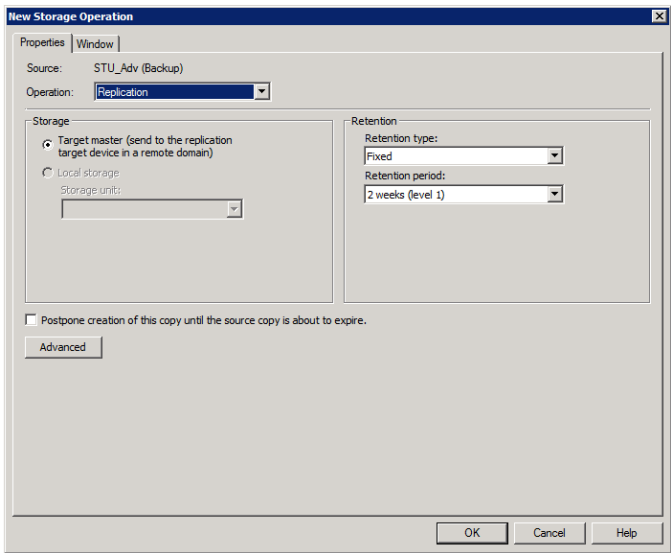


Table 9-3 Replication operation characteristics

Characteristic	Description
Storage unit selection	<p>Under Local storage, select the Storage unit that is configured to contain replicated snapshots. The Target master option is used for Auto Image Replication and is not selectable in a Replication Director configuration.</p> <p>A Replication operation must have the same type of storage unit as its source operation.</p> <p>For snapshot replication with Replication Director, the source operation must be a snapshot storage unit or a snapshot storage unit group.</p>
Child of	A Replication operation can be the child of a Snapshot operation or another Replication operation.

Table 9-3 Replication operation characteristics (*continued*)

Characteristic	Description
Source for	A Replication operation can be the source for the following operations: <ul style="list-style-type: none">■ Replication■ Backup From Snapshot See “ Backup From Snapshot operation in an SLP ” on page 123.
Job type	A Replication operation generates a Replication job in the Activity Monitor.
Window	The only SLP window that a Replication operation can use is the Default_24x7_Window .

Index From Snapshot operation in an SLP

Use the **Index From Snapshot** operation to index (that is, to catalog) snapshots. Indexing a snapshot creates an image .*f* file for the snapshot in the NetBackup catalog. With the image .*f* file in place, the administrator can browse and restore files and directories from any copy of that snapshot, even those in long-term storage.

The administrator can restore the files by using the NetBackup **Backup, Archive, and Restore** client interface or the **Restore** operation in OpsCenter (OpsCenter Operational Restore). Use the `bplist` command to view the contents of the .*f* file.

NetApp automatically allows for an optimized **Index From Snapshot** operation that does not require mounting the snapshot.

See “[Optimized Index From Snapshot operation](#)” on page 39.

Table 9-4 Index From Snapshot operation characteristics

Characteristic	Description
Storage unit selection	Select the same storage unit that is selected for the Snapshot operation. A storage unit selection is not required for this operation because nothing is written to storage. A storage unit selection associates a media server with this operation.
Child of	When an Index From Snapshot operation appears in an SLP, it must be the child of a Snapshot or Replication operation.
Source for	While an Index From Snapshot operation cannot be the source for any operation, a Replication operation can follow it.
Hierarchy notes	See “ Determining where and when the Index From Snapshot operation occurs ” on page 121.

Table 9-4 Index From Snapshot operation characteristics (*continued*)

Characteristic	Description
Job type	An Index From Snapshot operation generates an Index From Snapshot job in the Activity Monitor.
Window	An SLP window can be created for an Index From Snapshot operation.

Keep in mind the following items before using the **Index From Snapshot** operation:

- The **Index From Snapshot** operation is supported only in a Replication Director configuration.
- **Standard** and **MS-Windows** backup policy types support the use of storage lifecycle policies that contain the **Index From Snapshot** operation.
Reviewers for FID3207: Per Kamal Subramani (9/24/12), support for NDMP will begin at 7.6.0.1.
The **Index From Snapshot** operation is **not** supported for any policy that uses NDMP. (For example, an **NDMP** policy, or a **Standard** or **MS-Windows** policy with NDMP **Data Mover** enabled.)
- The **Index From Snapshot** operation can run from a full or an incremental schedule. The file entries that are added to the .*ef* file for either schedule are the full set of files since all files can be restored from that snapshot. To do so allows for the most efficient restore, however, more space is consumed in the NetBackup catalog by the .*ef* file.
- The **Index From Snapshot** operation differs from other operations in that it does not create a copy of a snapshot or backup. Even though this operation does not create a copy, the existence of the operation in the SLP counts toward the number indicated by the **Maximum backup copies**. The **Maximum backup copies** property in the **Global Attributes** host properties specifies the total number of backup copies that can exist in the NetBackup catalog.

Determining where and when the Index From Snapshot operation occurs

The **Index From Snapshot** operation requires some planning considerations as the operation can consume system resources and require additional time to perform. For example, to perform the operation can require that a snapshot be mounted or that NetBackup gather content details from the file system to populate the catalog.

To help mitigate the extra resource and time that the operation may take, the system administrator can control when and where the **Index From Snapshot** operation runs:

- Use the storage lifecycle policy **Window** tab to schedule when the **Index From Snapshot** operation can run. Schedule the operation to run when it is least likely to interfere with other jobs.
See “[Window tab of the Storage Operation dialog box](#)” on page 134.
- Use the following points to determine where to position the **Index From Snapshot** operation in the SLP operations list:
 - Each NetBackup environment needs to determine where the operation works best in a specific SLP. To place the **Index From Snapshot** operation too early (toward the top of the operations list), may consume time when the restore capabilities are not needed. To place the operation toward the end of the operations list may cause the administrator to delay a restore until earlier snapshots or replications complete.
 - Use the **Index From Snapshot** operation in an SLP only once. A restore can be performed from any snapshot after one image . ϵ file is created.
 - An **Index From Snapshot** operation cannot have any dependents. An SLP cannot validate an **Index From Snapshot** operation with children. [Figure 9-7](#) shows an SLP with a valid configuration.
[Figure 9-8](#) is also a valid configuration. A **Replication** operation follows the **Index From Snapshot** operation, but it is not indented. The **Replication** operation is a child of the **Snapshot** operation, not a child of the **Index From Snapshot** operation.
To add a **Replication** operation after an **Index From Snapshot** operation, click on the **Snapshot** operation, and then click **Add**.
 - Any operations list that includes a **Backup** operation does not need an **Index From Snapshot** operation. The **Backup** operation creates an image . ϵ file.
The only exception is if the index is needed for restores before the **Backup** operation occurs.

Figure 9-7 Example 1 of a valid placement of the Index From Snapshot operation

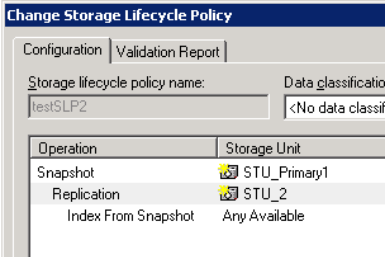
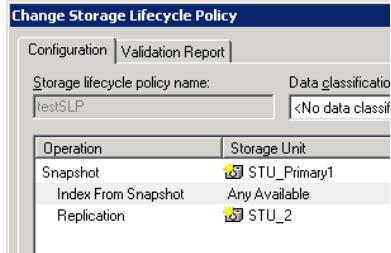


Figure 9-8 Example 2 of a valid placement of the Index From Snapshot operation



Backup From Snapshot operation in an SLP

Use the **Backup From Snapshot** operation to create a tar-formatted copy of the snapshot. The new copy is a backup copy. The process is sometimes referred to as a snapdupe job.

Figure 9-9 Backup From Snapshot operation in the New Storage Operation dialog box

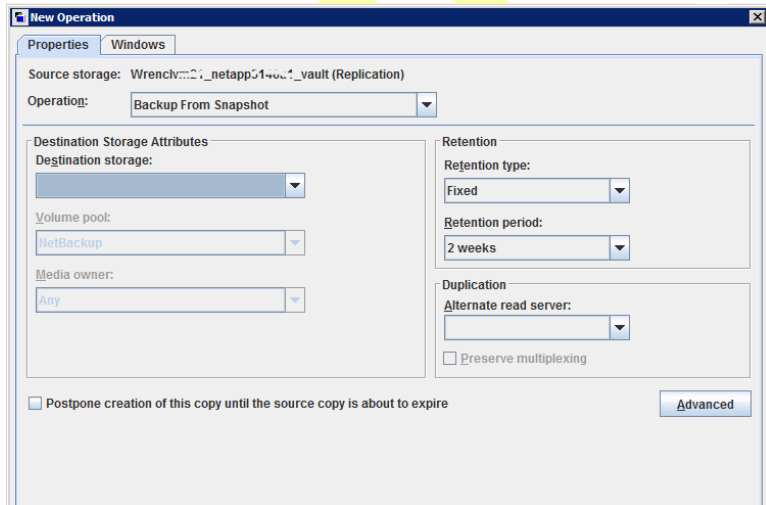
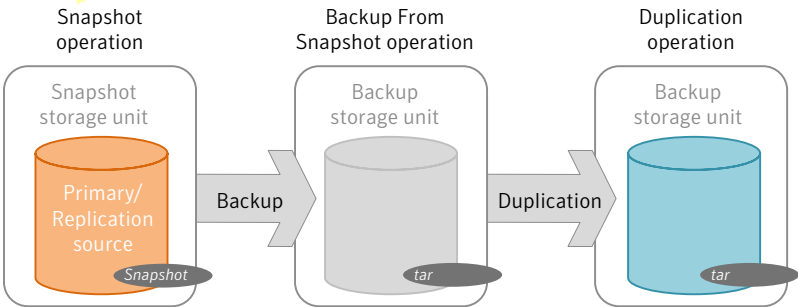


Table 9-5 Backup From Snapshot operation characteristics

Characteristic	Description
Storage unit selection	The selection must be a backup storage unit or a backup storage unit group. The selection cannot be a snapshot storage unit or a snapshot storage unit group.
Child of	A Backup From Snapshot operation must use a Snapshot operation as its source.
Source for	A Backup From Snapshot operation can be the source for a Duplication operation. (See Figure 9-10 .)
Hierarchy notes	An SLP may contain more than one Backup From Snapshot operation. If the first Backup From Snapshot operation fails with an unrecoverable error, NetBackup does not attempt the second one. Note: If the SLP is to be used by an NDMP policy (or a Standard or MS-Windows policy with NDMP Data Mover enabled) the SLP may contain only one Backup From Snapshot .
Job type	A Backup From Snapshot operation generates a Backup job in the Activity Monitor. The Backup job that results from the Backup From Snapshot operation is under the control of the SLP and the Duplication Manager. The Duplication Manager decides when to run the backup job, which may be outside of the backup window as defined in the backup policy. Users may experience a slight degradation in performance on the client or the client storage device while NetBackup accesses the snapshot.
Window	An SLP window can be created for a Backup From Snapshot operation.

Figure 9-10 SLP that contains a Backup From Snapshot operation



Duplication operation in an SLP

Use the **Duplication** operation to create a copy of a **Backup**, a **Backup from Snapshot**, or another **Duplication** operation. A media server performs the operation and writes the copy.

Note: Use the **Replication** operation to create a copy of a **Snapshot** operation. See “[Replication operation in an SLP](#)” on page 119.

Figure 9-11 Duplication operation in the New Storage Operation dialog box

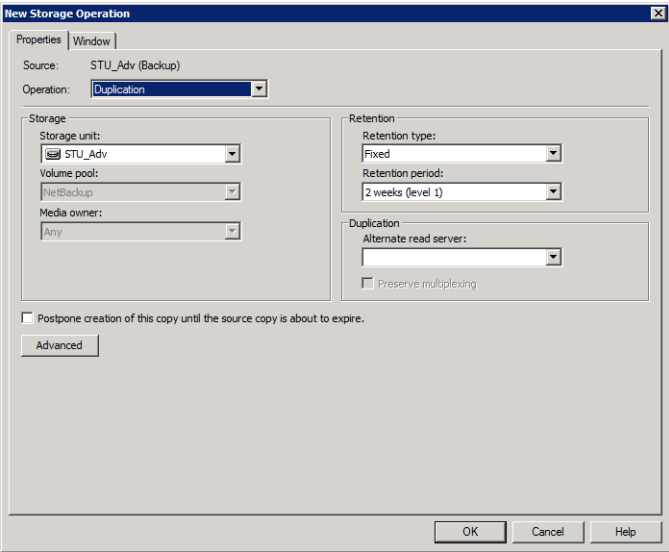


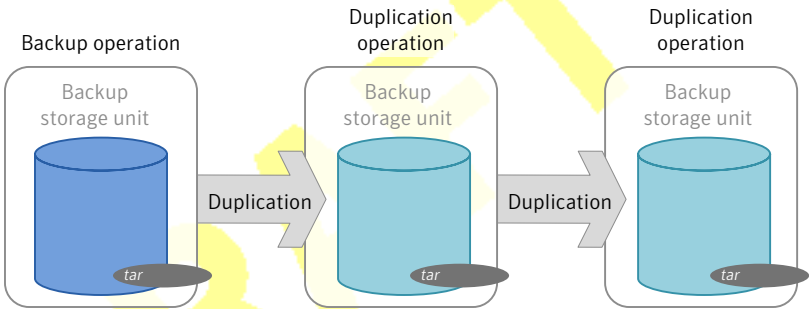
Table 9-6 Duplication operation characteristics

Characteristic	Description
Storage unit selection	<p>The selection must be a backup storage unit or a backup storage unit group.</p> <p>The selection cannot be a snapshot storage unit or a snapshot storage unit group.</p>
Child of	<p>A Duplication operation can be the child of the following operations:</p> <ul style="list-style-type: none"> ■ Backup operation ■ Backup From Snapshot operation ■ A Duplication operation

Table 9-6 Duplication operation characteristics (continued)

Characteristic	Description
Source for	A Duplication operation can be the source for a Duplication operation. (See Figure 9-12.)
Hierarchy notes	When a Duplication operation appears in an SLP, it cannot be the first operation.
Job type	A Duplication operation generates a Duplication job in the Activity Monitor.
Window	An SLP window can be created for a Duplication operation.

Figure 9-12 SLP that contains one Backup operation and two Duplication operations



Retention types for storage lifecycle policy operations

The **Retention type** for an operation in a storage lifecycle policy determines how long the data is kept on that storage media.

Table 9-7 describes which retention types are valid selections for the various operations.

Table 9-7 Operation and retention type configurations

Retention type	Backup operation	Snapshot operation	Replication operation	Backup From Snapshot operation	Duplication operation
Fixed	Valid	Valid	Valid	Valid	Valid

Table 9-7 Operation and retention type configurations (*continued*)

Retention type	Backup operation	Snapshot operation	Replication operation	Backup From Snapshot operation	Duplication operation
Expire after copy	Valid	Valid	Invalid	Valid	Valid
Maximum Snapshot limit	Invalid	Valid; SLP honors the policy setting.	Invalid	Invalid	Invalid
Mirror	Invalid	Invalid	Valid for snapshot storage only	Invalid	Valid for snapshot storage only
Target retention	Invalid	Invalid	Valid if the first operation in the SLP is an Import and if the storage is of the backup type.	Invalid	Valid if the first operation in the SLP is an Import.
Capacity managed	Valid; AdvancedDisk default; set on the storage server.	Invalid	Invalid	Invalid	Valid; AdvancedDisk default; set on the storage server.

Note: The **Mirror** retention is not available on EMC disk arrays.

Note: No retention is associated with the **Index From Snapshot** operation because the operation does not create any copy.

Capacity managed retention type for SLP operations

A **Capacity managed** operation means that NetBackup automatically manages the space on the storage, based on the **High water mark** setting for each volume. **Capacity managed** is not available to tape storage units since tape capacity is considered to be infinite.

The **High water mark** and **Low water mark** settings on the disk storage unit or disk pool determine how the space is managed.

An image copy with a **Capacity Managed** retention is not eligible for expiration until its dependent copies have been created.

If space is needed for new images, NetBackup removes expired backup images from a capacity managed disk volume in two passes, as follows:

Pass one NetBackup removes any backup images that are past the **Desired cache period** setting. NetBackup removes images until the low water mark is reached or all images that are past the **Desired cache period** are removed.

Pass two Pass two processing is initiated if the outcome of the pass one processing is one of the following:

- The disk pool remains over the high water mark.
- The number of volumes in the disk pool under the high water mark is less than the number of media servers that access the disk pool.

NetBackup removes images until the low water mark is reached or all images that are not past the **Desired cache period** are removed.

An image may be deleted if it has not been duplicated for all operations in a storage lifecycle policy. If the operating system time is past the date that matches the longest retention period for an image, the image is eligible for deletion.

To see exactly when the storage reaches the low water mark value is difficult. A backup can occur at the same time as the expiration process occurs. After the backup is complete, the low water mark may be slightly greater than its lowest possible value.

The retention period for capacity managed storage is not assured as it is for a fixed retention period. The **Desired cache period** becomes a target that NetBackup tries to maintain. If the space is not required, the backup data could remain on the storage longer than the **Desired cache period** indicates.

Rules and recommendations for using the Capacity Managed retention type

Use the following recommendations and rules when configuring storage operations or when selecting the storage location for a policy:

- Symantec does not recommend allowing **Capacity Managed** images and **Fixed** retention images to be written to the same volume in a disk storage unit. The volume may fill with fixed-retention images and not allow the space management logic to operate as expected.
- All SLPs that write to a volume in a disk storage unit should write images of the same retention type: **Fixed** or **Capacity Managed**.

- Do not write images both to a volume in a disk storage unit within a storage lifecycle policy and to the same volume (by the storage unit) directly from a policy.
- Mark all disk storage units that are used with SLPs as **On demand only**.
- Check any storage unit groups to make sure that fixed and capacity-managed images cannot be written to the same volume in a disk storage unit.

Expire after copy retention type for SLP operations

The **Expire after copy** retention indicates that after all direct (child) copies of an image are successfully duplicated to other storage, the data on this storage is expired. The last operation in the SLP cannot use the **Expire after copy** retention type because no subsequent copy is configured. Therefore, an operation with this retention type must have a child.

Symantec recommends that you not enable **Expire after copy** retention for any storage units that are to be used with SLPs with either of the following: Accelerator or synthetic backups. The **Expire after copy** retention can cause images to expire while the backup runs. To synthesize a new full backup, the SLP backup needs the previous backup image. If the previous image expires during the backup, the backup fails.

If a policy is configured to back up to an SLP, the retention that is indicated in the SLP is the value that is used. The **Retention** attribute in the schedule is not used.

An image copy with an **Expire after copy** retention is expired as soon as all of its direct child copies have been successfully created. Any mirrored children must also be eligible for expiration.

Fixed retention type for SLP operations

The **Fixed** retention indicates that the data on the storage is retained for the specified length of time, after which the backups or snapshots are expired.

An image copy with a **Fixed** retention is eligible for expiration when all of the following criteria are met:

- The **Fixed** retention period for the copy has expired.
- All child copies have been created.
- All child copies that are mirror copies are eligible for expiration.

The **Fixed** retention period is always marked from the original backup time of the image. For example, if a tape device is down, causing a 2-day delay in creating a duplicate tape copy, the expiration time of the duplicate copy is not different due to the 2-day delay. The expiration time of the duplicate copy is still x days from

the time that the original backup was completed. It does not matter when the copy was created.

Maximum snapshot limit retention type for SLP operations

The **Maximum snapshot limit** determines the maximum number of snapshots that can be stored for a particular policy and client pair. After that limit is reached, the oldest snapshots are deleted to make room for the most recent snapshots. The practice is referred to as *rotation*. This retention type applies only to snapshots, and not to backups.

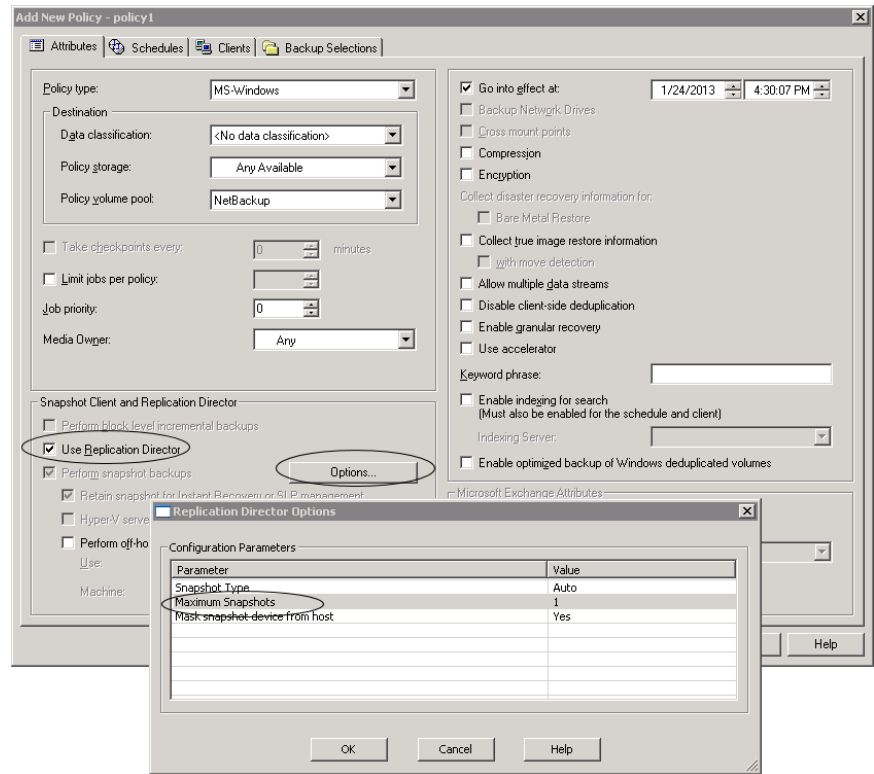
Note: ET3098724; 2/27/13

Rotation is not supported in the case of remote snapshots using EMC disk arrays.

For example, Policy P1 contains two clients: C1 and C2. After the policy runs four times, it creates four snapshot images for C1 and four images for C2. If the **Maximum snapshot limit** is set to four, when the policy runs for the fifth time, NetBackup deletes the first snapshot that was created for both C1 and C2 to accommodate the fifth snapshot.

The maximum number of snapshots is defined by the **Maximum Snapshots** parameter in the **Replication Director Options** dialog box. To access the dialog box, click **Options** in the backup policy.

Figure 9-13 Replication Director Options dialog box



Mirror retention type for SLP operations

A mirror replica of a snapshot is eligible for expiration as soon as:

- All immediate child copies are successfully created.
- All immediate child copies that are mirrors are eligible for expiration.

Note: The **Mirror** retention is not available on EMC disk arrays.

The selection of the **Mirror** retention indicates that NetApp volume SnapMirror is to be used as the replication method. If any non-mirror retention type such as **Fixed** or **Expire after copy** is selected for the **Replication** operation, the SnapVault replication method is used.

In mirror replication, the replica copy is dependent on the existence of the source. (The source can be the original snapshot or another replica.) Therefore, the

retention of the replica depends on the retention of the source. If the source is deleted, the mirror is automatically deleted. If the mirror is deleted first, it is automatically recreated to maintain its mirror status.

In non-mirror replication, the replica is independent of the source and can have an independent retention. If the source is deleted, the non-mirror replica is not affected and can be used longer than the source. Or, if the replica is deleted first, it is not recreated and the source can be kept longer than the replica.

Target retention type for SLP operations

This setting is used in Auto Image Replication in an Import storage lifecycle policy. Every Import SLP must have at least one operation with a **Target retention**.

The **Target retention** is enforced at the target domain, but the actual retention for the data is specified by the administrator at the source domain.

Target retention indicates that the data at the target master shall use the expiration date that was imported with the image. The date is fixed because the copy must have a fixed retention.

Similar to the **Fixed** retention, an image copy with a **Target retention** retention is eligible for expiration when all of the following criteria are met:

- The **Fixed** retention period for the copy has expired.
- All child copies have been created.
- All child copies that are mirror copies are eligible for expiration.

Creating a storage lifecycle policy for snapshots and snapshot replication

Use the following procedure to configure a storage lifecycle policy that creates snapshots and snapshot replications with Replication Director:

To configure a storage lifecycle policy to create snapshots and snapshot replication

- 1 In the **NetBackup Administration Console**, expand **NetBackup Management**, and then expand **Storage**. Select **Storage Lifecycle Policies**.
- 2 Click **Actions > New > New Storage Lifecycle Policy** (Windows) or **Actions > New > Storage Lifecycle Policy** (UNIX).
- 3 In the **New Storage Lifecycle Policy** dialog box, enter a **Storage lifecycle policy name**.

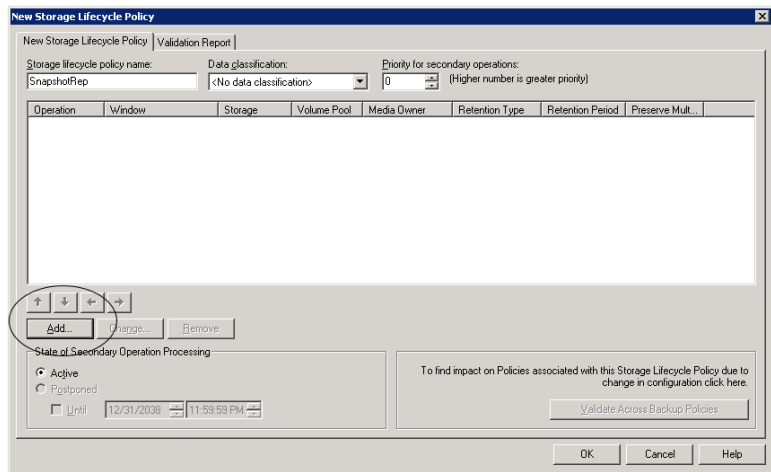
See [“NetBackup naming conventions”](#) on page 62.

4 Select a **Data classification**. (Optional.)

5 Select the **Duplication job priority**. (Optional.)

This number represents the priority that duplication jobs have in relationship to all other jobs. In duplication jobs, NetBackup duplicates data from a backup storage unit to a duplication storage unit.

6 Click **Add** to add operations to the SLP. The operations are the instructions for the SLP to follow and apply to the data that is specified in the backup policy.



7 In the **Properties** tab of the **New Storage Operation** dialog box, select **Snapshot** from the **Operation** drop-down menu.

This **Snapshot** operation creates a snapshot of the primary data and serves as the source for other operations in the SLP. For example:

- A **Replication** operation.

See [“Replication operation in an SLP”](#) on page 119.

- A **Backup From Snapshot** operation.

See [“Backup From Snapshot operation in an SLP”](#) on page 123.

- An **Index From Snapshot** operation.

See [“Index From Snapshot operation in an SLP”](#) on page 120.

8 In the **Storage unit** drop-down menu, select the storage unit that is configured to contain primary snapshots.

- 9 Select the **Retention type** and the **Retention period** for the data in this storage unit. The **Retention period** option does not appear for all **Retention type** selections. Click **OK**.
- 10 To replicate the primary snapshot, create a replication operation that is based on the snapshot operation. Click on the first operation and then select **Add**. The **New Storage Operation** dialog box appears.
- 11 In the **Operation** drop-down menu, select **Replication**. This **Replication** operation creates a replication of the primary snapshot.
- 12 Under **Storage**, select the **Storage unit** that is configured to contain replicated snapshots.
- 13 Select the **Retention type** and the **Retention period** for the data in this storage unit.

The selection of the **Mirror** retention indicates that NetApp volume SnapMirror is to be used as the replication method. If any non-mirror retention type such as **Fixed** or **Expire after copy** is selected for the **Replication** operation, the SnapVault replication method is used.

Note: The **Mirror** retention is not available to the volumes of an EMC disk array.

Optionally, indicate an **Alternate read server** that is allowed to read a snapshot that was originally written by a different media server. Click **OK**.

- 14 The **Window** tab displays for the following operation types: **Backup From Snapshot**, **Duplication**, **Import**, **Index From Snapshot**, and **Replication**.

Create a window during which secondary operations can run.

See “[Window tab of the Storage Operation dialog box](#)” on page 134.

- 15 Click **OK** to create the storage operation.

Continue to create operations, depending on the needs of your environment.

To cascade storage operations in the SLP, make sure to select the correct parent operation as the source for the child operation. If the correct operation is not selected, you unintentionally perform an operation on an incorrect source.

Window tab of the Storage Operation dialog box

Reviewers for FID2815: Please review this topic.

The **Window** tab displays for the following operation types: **Backup From Snapshot**, **Duplication**, **Import**, **Index From Snapshot**, and **Replication**.

Creating a window for an operation is optional. However, a window can better define when the job for an operation can run. In this way, the job from a secondary operation does not interfere with jobs of a higher priority, such as backup jobs. Without a window defined, the job for an operation can run at any time, on any day.

Table 9-8 Window tab of the Storage Operation dialog box

Setting	Description
Select from saved windows	<p>You can either assign an existing window to the operation or create a new window for the operation.</p> <p>To use an existing window, select this option and then select a window from the drop-down menu.</p>
Create new	Select this option to create a new window for this operation to use.
Window name	Enter a name for the new window.
View Impact Report button	This button generates an Impact Report which lists the names of the storage lifecycle policies that currently use the window. The Impact Report also lists the operation that uses the window, and the source and destination storage for the operation.
Start Window tab	<p>The Start Window grid is grayed out and cannot be modified if the Default_24x7_Window is selected.</p> <p>The Start Window grid is active if a saved window is selected or when a new window is created.</p> <p>If the Start Window grid is changed for a saved window, the dialog box displays information about other operations in other SLPs that use the window.</p> <p>See “Creating a new window for a storage lifecycle policy operation” on page 135.</p>
Exclude Days tab	<p>Use the Exclude Days tab to exclude specific dates from a window.</p> <p>See “Excluding days from a window for a storage lifecycle policy operation” on page 137.</p>

Creating a new window for a storage lifecycle policy operation

To create a new window for SLP operations

- 1 In the **Window** tab, enable **Create new**.
- 2 Select the **Start Window** tab.

- 3 The days of the week appear along the left side of the grid. The time of day appears along the top of the grid in 24-hour time. The **Time at cursor** field specifies the day and time that corresponds to the current position of the cursor.

To change the increments available for selecting start times or end times, change the value in the **Resolution** field.

- 4 Indicate the opening and closing times of the window for each day. The following lists several methods to do so:
 - Drag the cursor along the Start Window grid on each day you want the window to open and close. (Available only in the **NetBackup Administration Console** on Windows.)
To move a window of time, click and drag the **time bar** to a new position.
 - Use the drop-down menus to select a **Start day** and an **End day**. Then select a **Start time** and an **End time**.
 - Use the drop-down menu to select a **Start day** and the **Duration** of the window for that day in hours and minutes. Adjust the **Start time** for your environment.

To create multiple time windows do one of the following:

To add windows on successive days

- With the cursor over the chosen start time, press and hold the **Shift** Key.
- Click and drag the cursor to the time when you want to the time window to close.
- Continue holding the **Shift** Key, and drag the cursor down to the last day of the week you want to include.
Duplicates of the time window appear for successive days.

To copy windows

- Create one window.
- Click **Duplicate**.
The window is duplicated to any days without existing schedules. Duplication stops when it reaches a day that already contains a window.
- On days that you do not want the time window to be open, select the window and click **Delete**.

- 5 Use the buttons under the Start Window grid to do the following:

To change the start time or end time	<ul style="list-style-type: none"> ■ Adjust the Start time or End time. ■ Click and drag the end of the time window bar to a new position.
To delete a time window	Select a time window and click Delete .
To delete all the time windows	Click Clear .
To erase the last action	Click Undo .

- 6 Click **OK** to save the window and the operation.

Excluding days from a window for a storage lifecycle policy operation

Use the **Exclude Days** tab to exclude specific days from a window. If a day is excluded from a window, jobs do not run on that day. The tab displays a calendar of three consecutive months. Use the lists at the top of the calendar to change the first month or year displayed.

To exclude a day from the storage lifecycle policy window

- 1 In the **Window** tab, select the name of an existing window from the drop-down menu.
- 2 Select the **Exclude Days** tab.
- 3 Use one or more methods to indicate the days to exclude:
 - Select the day(s) on the 3-month calendar that you want to exclude. Use the drop-down lists at the top of the calendar to change the months or year.
 - To indicate **Recurring Week Days**:
 - Click **Select All** to select all of the days in every month for every year.
 - Click **Deselect All** to remove all existing selections.
 - Check a box in the matrix to select a specific day to exclude for every month.
 - Click the column head of a day of the week to exclude that day every month.
 - Click the **1st**, **2nd**, **3rd**, **4th**, or **Last** row label to exclude that week every month.
 - To indicate **Recurring Days of the Month**:
 - Click **Select All** to select all of the days in every month.

- Click **Deselect All** to remove all existing selections.
 - Check a box in the matrix to select that day to exclude each month.
 - Click **Last Day** to exclude the last day of every month.
 - To indicate **Specific Dates**:
 - Click **New**. Enter the month, day, and year in the **Date Selection** dialog box. Click **OK**.
The date appears in the **Specific Dates** list.
 - To delete a date, select the date in the list. Click **Delete**.
- 4 Add additional dates as necessary, then click **OK** to save the window and the operation.

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Configuring backup policies to create snapshots and snapshot replication

This chapter includes the following topics:

- [Create a snapshot of an NDMP host to avoid mounting each client](#)
- [About NDMP support for Replication Director](#)
- [Configuring a policy for use with Replication Director](#)
- [Configuring a policy for Windows SAN devices to use Replication Director](#)
- [About Oracle support for Replication Director](#)
- [About virtual machines and Replication Director](#)

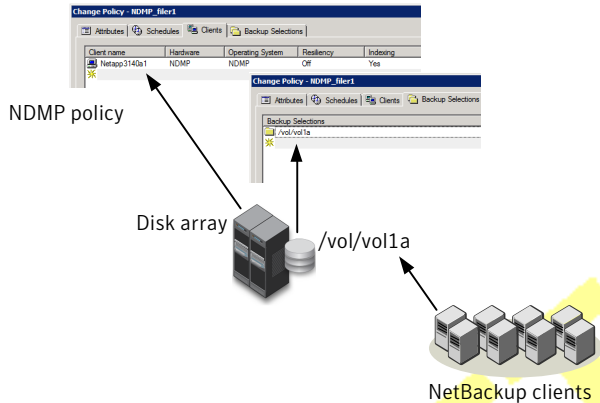
Create a snapshot of an NDMP host to avoid mounting each client

In many **environments**, individual NetBackup production clients store data on a disk array that is also an NDMP host. By configuring an NDMP policy that lists the array as the client, NetBackup can create a snapshot of the data without mounting each client.

[Figure 10-1](#) shows a disk array (*Netapp3140a1*) that many NetBackup clients access to store data. Only the array name is listed in the **Clients** tab of the NetBackup policy, not each individual production client. The volume on the array (*/vol/vol1a*) that the clients use is listed in the **Backup Selections** tab of the policy.

Note: EMC Symmetrix disk arrays do not support Replication Director with NDMP.

Figure 10-1 Snapshot the volume to avoid mounting each client



About NDMP support for Replication Director

Replication Director enables NetBackup to use NDMP to perform the following operations:

- Restore from snapshot backups.
- Perform a live browse of snapshots.
- Restore from snapshots for the copy back method.

Support for all of the operations is provided for replicated snapshots as well.

Consider the following items before configuring NDMP to be used with Replication Director:

- To use the Point-in-time rollback restore method, select the **Skip verification and force rollback** operation in the **Restore Marked Files** dialog.
- To restore from backups for a Standard or Windows client:
 - All destinations must be mounted and shared from a compatible filer. All destinations must be on the same filer.
 - Do not mix backup selections. Do not combine selections created from a policy with NDMP **Data Mover** enabled and selections from a policy without NDMP **Data Mover** enabled.

- User restores can be directed to any volume that the user can NFS or CIFS mount. Denying NFS or CIFS write access does not prevent the restore because the filer performs an NDMP restore.

Replication Director and NDMP do not support the following items:

- The Solaris_x86 operating system is not supported.
- EMC Symmetrix disk arrays do not support Replication Director with NDMP.
- The **Multiple copies** NetBackup policy option is not supported for image copies in the NDMP data format.
- The **Restore the file using a temporary filename** restore option is not supported on Windows clients.
- Restores to a local file system are not supported with an **MS-Windows** or a **Standard** policy that has the NDMP **Data Mover** enabled.
- Do not create a **MS-Windows** or **Standard** policy that contains backup selections that are on different filers. However, backup selections on different filers are supported if multistreaming is configured so that each backup selection is backed up in a separate job.
- Volume snapshot replication of qtree and non-qtrees in one policy is not supported.
- Only one NDMP backup of a snapshot per backupid is allowed.

Configuring a policy to use NDMP with Replication Director

To create snapshots, NetBackup must run a backup policy that is configured to create snapshots. The following procedure describes how to create an NDMP policy to create snapshots.

Note: Use an NDMP policy to create a snapshot of production client data without mounting each client. See the following topic for information:

See [“Create a snapshot of an NDMP host to avoid mounting each client”](#) on page 139.

Note: EMC Symmetrix disk arrays do not support Replication Director with NDMP.

Only those policy options that are necessary to configure Replication Director are listed in the following procedure.

To create an NDMP policy for use with Replication Director

- 1 Before NetBackup can perform NDMP backups, it must have access to the NDMP host. Make sure that you've added the NDMP host credentials so NetBackup can access the NDMP host.
See [“Authorizing NetBackup access to the NDMP host”](#) on page 146.
- 2 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 3 On the **Actions** menu, click **New > New Policy**.
- 4 Type a unique name for the new policy in the **Add a New Policy** dialog box.
See [“NetBackup naming conventions”](#) on page 62.
- 5 Clear the **Use Policy Configuration Wizard** check box.

Note: Do not use the Policy Configuration Wizard or the Getting Started Wizard to configure a policy for Replication Director.

- 6 Click **OK**.
- 7 Configure the options on the policy **Attributes** tab. The following items are specific to creating a policy for Replication Director:
 - **Policy type**
For NetBackup to perform NDMP backups, select **Standard**, **MS-Windows**, or **NDMP**.
 - **Policy storage**
Select the SLP that you want to use that has been configured for snapshot replication.
Replication Director provides the ability to duplicate a NAS snapshot when the **Backup From Snapshot** operation is included in the SLP.
See [“Backup From Snapshot operation in an SLP”](#) on page 123.

Note: The **Index From Snapshot** operation is not supported for any policy that uses NDMP. (For example, an **NDMP** policy, or a **Standard** or **MS-Windows** policy with NDMP **Data Mover** enabled.)

See [“Index From Snapshot operation in an SLP”](#) on page 120.

- **Use Replication Director**
Enable **Use Replication Director** to automatically select other options that Replication Director requires:

- **Perform snapshot backups**

Ensures that the policy creates snapshots of the disk array.

- **Retain snapshots for Instant Recovery or SLP management**

Ensures that the policy retains the snapshot after the backup completes.

- **Perform off-host backup**

This option is selected automatically for an NDMP policy, along with the following selections:

- To use **Data Mover**

- NDMP as the **Machine** selection.

See [Figure 10-2](#) on page 146.

- **Replication Director Options**

Click the **Options** button to see the **Replication Director Options** dialog box and the default **Configuration Parameters** as follows:

- | | |
|----------------------|--|
| Snapshot Type | <ul style="list-style-type: none"> ■ Auto (default): The OpenStorage partner uses the best snapshot technology available to that partner to create the snapshot. ■ Differential: The OpenStorage partner creates a snapshot that is completely dependent on the source. This parameter is based on copy-on-write technology. The device creates a cache object to maintain the original blocks of the snapshot when the blocks are modified. ■ Plex: The OpenStorage Partner creates a snapshot that is completely independent of the source snapshot. This option is based on mirror-break-off technology. When a mirror device is attached to the source, the contents of the mirror device is exactly the same as the source device. When the relationship is broken between the two, the mirror device is separated from the source. The mirror device acts as a point-in-time copy. ■ Clone: The OpenStorage Partner creates an independent copy of the volume. The copy process can take some time as the entire copy must be complete. The snapshot that is created is independent of the source. |
|----------------------|--|

Maximum Snapshots Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: the next snapshot causes the oldest to be deleted.

Managed by SLP retention is automatically selected if the **Fixed** or the **Expire after Copy** retention is currently selected in the SLP.

- Mask snapshot device from host** Indicates whether the target device is masked on the client or the alternate client:
- **Yes** indicates that the device is not visible (masked) to the mount host (default) after snapshot deletion or deport.
 - **No** indicates that the device is visible to the mount host even after snapshot deletion or deport.

For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help.

- 8 Select the **Schedules** tab and configure the schedules as you would for any other policy.

See the *NetBackup Administrator's Guide, Volume I* or the online Help.

- 9 Select the **Clients** tab and specify the client or the array.

See [“Create a snapshot of an NDMP host to avoid mounting each client”](#) on page 139.

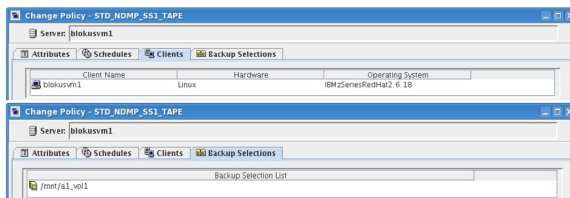
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- 10 Select the **Backup Selections** tab to indicate the path to the array. The format is vendor-specific.

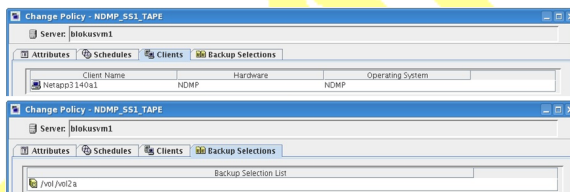
Note: ET2970430; 10/31/12

Backup selections for both SAN devices and NAS volumes are not supported in a single backup policy.

The following is a client entry and backup selection from the viewpoint of the client:



The following is a client entry and backup selection from the viewpoint of the array:



- 11 When the policy configuration is complete, click **OK**.
- 12 To **ensure** that the backup policy can run successfully, NetBackup checks the policy.

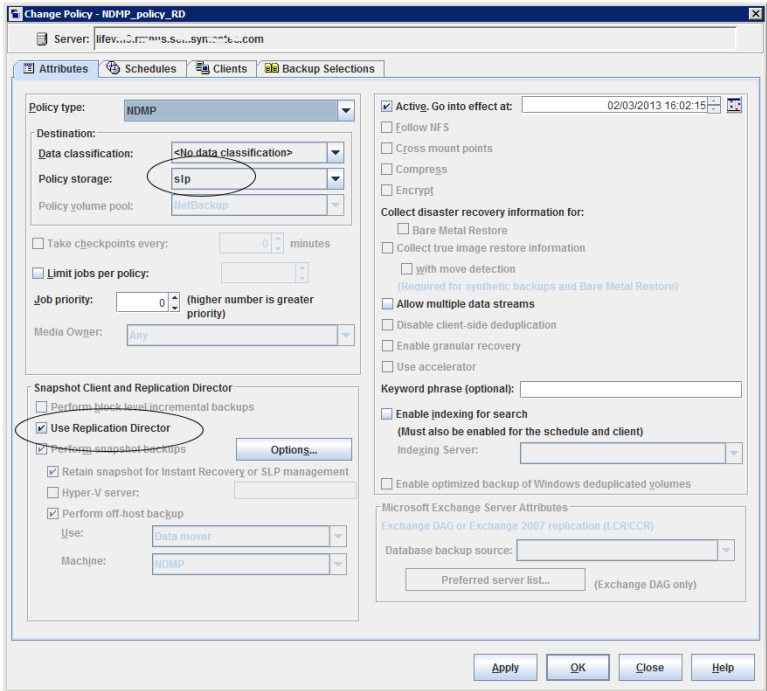
Select the kind of policy check you want NetBackup to perform:

- **Comprehensive (Recommended)**
 The **Comprehensive** level also checks the configuration of the backup policy and the SLP with the underlying storage configuration, but in more detail. This level is recommended.
- **Intermediate**
 The **Intermediate** level quickly checks the configuration of the backup policy and the SLP with the underlying storage configuration.
- **Basic**

The **Basic** level is selected by default. All policies are checked to ensure that the client can perform a snapshot of the data that is indicated in the **Backup Selections** list.

If the validation finds no problems, the policy saves and closes.

Figure 10-2 Policy configuration for NDMP snapshots



Authorizing NetBackup access to the NDMP host

Before NetBackup can perform backups, it must have access to the NDMP host.

Note: Perform the following procedure on the master server (not media server) if you plan to create snapshots using the Snapshot Client NAS_Snapshot method.

To authorize NetBackup access to the NDMP host

- 1 On the NetBackup server **NetBackup Administration Console**, expand **Media and Device Management > Credentials > NDMP Hosts**.
- 2 Under the **Actions** menu, select **New > New NDMP Host**.

- 3 In the **Add NDMP Host** dialog box, enter the name of the NDMP server for NetBackup to back up.

The NDMP host name is case-sensitive. Whenever this host name is used, the name must match the name entered here. (For example, when you configure tape drives and storage units for this host.)

Note: Be careful when you add an NDMP host. If you add NDMP host credentials using the fully qualified domain name (FQDN), you must also indicate the fully qualified domain name on the client for lookups. That is, the server list in the Backup, Archive, and Restore administration console must list the NDMP host by the FQDN as well.

If you add NDMP host credentials using a short name, you can use either the short name or the FQDN in the client server list.

- 4 Click **OK**.
- 5 In the **New NDMP Host** dialog box, specify the following:
(The term credentials refer to the user name and password that NetBackup uses to access the NDMP host.)

Use global NDMP credentials for this NDMP host

Enables all NetBackup media servers under the master server to access this NDMP host using a predefined global NDMP logon.

To create this logon, click **Host Properties > Master Server > Properties > NDMP** in the **NDMP Global Credentials** dialog box.

Use the following credentials for this NDMP host on all media servers

Enables all NetBackup media servers that are connected to the NDMP host to access the NDMP host using the logon you specify:

- **User name:** The user name under which NetBackup accesses the NDMP server. This user must have permission to run NDMP commands. You can find out whether your NDMP host vendor requires a particular user name or access level.

- **Password and Confirm Password:** Enter the password for this user.

To add a NetApp vFiler as an NDMP host, the encrypted vFiler password is required.

To retrieve the encrypted password, log on to the vFiler and run the following command:

```
ndmp password user
```

The following example shows the command and response to retrieve the encrypted password for the `root` user:

```
ndmp password root
password hFlNXOXjpHpNXXOG
```

Use different credentials for this NDMP host on each media server

Specifies NDMP logons for particular NetBackup servers. Then click **Advanced Configuration**.

- In the **Advanced NDMP Credentials** dialog box, click **Add**.
- In the **Add Credentials** dialog box, select a NetBackup server and specify the user name and password it uses to access the NDMP host.
- Click **OK**. NetBackup validates the user name and password.
- The NetBackup server and user name appear in the **Advanced NDMP Credentials** dialog box.
- If necessary, click **Add** again to specify other servers and user

6 Repeat this procedure for each NDMP host that NetBackup backs up.

Wildcard characters in backup selections for an NDMP policy

With NetBackup 7.6 or later, you can use wildcard characters in regular expressions or the directive `ALL_FILESYSTEMS` to specify path names in NDMP policy backup selections.

Note: Wildcard characters are not supported in releases of NetBackup before Version 7.6. To use wildcard characters in NDMP policy backup selections, both your master server and the media servers on which NetBackup for NDMP is installed must run NetBackup 7.6 or later.

Wildcard characters in regular expressions or directives are valid for streaming and non-streaming NDMP backups.

Note: Directory-level expansion is not supported for some NDMP servers. Some NDMP file vendors do not have the APIs that Symantec uses to support wildcard characters lower than the volume level. For example, `/fs1/dir*` is not a supported backup selection specification on EMC filers.

If you specify a backup selection using wildcard characters lower than the volume level for these filers, status code 106 is generated. The following message is displayed: **Invalid file pathname found, cannot process request.**

Currently, only NetApp filers support wildcard characters for backup selections lower than the volume level.

You cannot use any wildcard characters that also match file names. For example, a backup selection might include `/vol/vol_archive_01/autoit*`. This specification might match a path name such as `/vol/vol_archive_01/autoit_01/`. However, if this specification also matches a file name like `/vol/vol_archive_01/autoit-v1-setup.exe`, the backup job fails with status code 99 because wildcards can specify only path names. The following message is displayed: **NDMP backup failure (99).**

Table 10-1 Valid wildcard characters for NDMP policy backup selections

Wildcard character	Description
*	<p>Specifies a string match. For example:</p> <pre>/vol/vol_archive_*</pre> <p>This form of the path specification matches all paths that begin with the literal characters <code>/vol/vol_archive_</code> and end with any characters.</p> <p>The string match wildcard can also specify multiple variable characters between literal characters as in the following examples:</p> <pre>/vol/ora_*archive or /vol/ora_*archive* /vol/ora_vol/qtrees_*archive or /vol/ora_vol/qtrees_*archive*</pre>

Table 10-1 Valid wildcard characters for NDMP policy backup selections
(continued)

Wildcard character	Description
?	<p>Specifies a single-character match.</p> <p>/fs?</p> <p>This path specification matches all paths that begin with the literal characters /fs and end with any single character. For example, /fs1,/fs3,/fsa,/fsd and so on match the specified pattern /fs?.</p>

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Table 10-1 Valid wildcard characters for NDMP policy backup selections
(continued)

Wildcard character	Description
[...]	<p>Specifies an alphanumeric pattern match. For example:</p> <pre>/fs[1-9]</pre> <p>This path specification matches all paths that begin with the literal characters <code>/fs</code> and end with any single numeric character from 1 through 9. For example, <code>/fs1</code>, <code>/fs2</code>, and so on up to <code>/fs9</code> match the specified pattern <code>/fs[1-9]</code>. However, <code>/fs0</code> and <code>/fsa</code> do not match the specified pattern; 0 is out of the specified numeric range, and <code>a</code> is a non-numeric character.</p> <p>The pattern match wildcard can also specify alphanumeric patterns such as <code>/fs[1-5a]</code>. This specification matches <code>/fs1</code>, <code>/fs2</code>, and so on up to <code>/fs5</code> as well as <code>/fsa</code>.</p> <p>Similarly, the pattern match wildcard can also specify patterns like <code>/fs[a-p4]</code>. This specification matches <code>/fsa</code>, <code>/fsb</code>, and so on up to <code>/fsp</code> as well as <code>/fs4</code>.</p> <p>You must use multiple backup selection specifications if the pattern can match more than 10 volume names in a numeric series. For example, you may want to back up 110 volumes that begin with the literal characters <code>/vol/ndmp</code> and are numbered 1 through 110. To include these volumes in a backup selection with wildcards, specify three backup selections with the following wildcard patterns:</p> <ul style="list-style-type: none"> ■ <code>/vol/ndmp[0-9]</code> This pattern matches any volume name that begins with <code>/vol/ndmp</code> and ends with a single numeric character 0 through 9. ■ <code>/vol/ndmp[0-9][0-9]</code> This pattern matches any volume name that begins with <code>/vol/ndmp</code> and ends with two-digit numeric characters 10 through 99. ■ <code>/vol/ndmp[0-9][0-9][0-9]</code> This pattern matches any volume name that begins with <code>/vol/ndmp</code> and ends with three-digit numeric characters 100 through 999. <p>Do not specify <code>/vol/ndmp[1-110]</code> in this example. This pattern produces inconsistent results.</p>

Note: Symantec recommends that you do not use a single forward-slash character (/) in an NDMP policy backup selection. This method of including all the volumes on an NDMP filer in the selection is not supported. Instead, use the

`ALL_FILESYSTEMS` directive:

See [“ALL_FILESYSTEMS and VOLUME_EXCLUDE_LIST directives”](#) on page 152.

Note: Symantec recommends that you do not nest wildcard expressions. Nested wildcard expressions can result in recursive path name expansion operations that can impede performance. For example, do not use a wildcard expression such as the following:

```
/vol/fome06/*/*private
```

ALL_FILESYSTEMS and VOLUME_EXCLUDE_LIST directives

The `ALL_FILESYSTEMS` directive provides a method to include all file systems and volumes on an NDMP filer in an NDMP backup policy.

You can exclude specific volumes from an `ALL_FILESYSTEMS` backup selection if you do not want to back up every volume on an NDMP filer. Use the `VOLUME_EXCLUDE_LIST` directive for this purpose. You may use valid wildcard characters in the `VOLUME_EXCLUDE_LIST` statement. More information about wildcard characters is available:

See [“Wildcard characters in backup selections for an NDMP policy”](#) on page 148.

The `VOLUME_EXCLUDE_LIST` statements must precede `ALL_FILESYSTEMS` statement. For example:

```
VOLUME_EXCLUDE_LIST=/vol/Hr_allfiles_vol01  
ALL_FILESYSTEMS
```

or

```
VOLUME_EXCLUDE_LIST=/vol/testvol*  
ALL_FILESYSTEMS
```

To specify multiple values in a `VOLUME_EXCLUDE_LIST` statement, separate the values with a comma. For example:

```
VOLUME_EXCLUDE_LIST=/vol/Hr_allfiles_vol01,/vol/testvol*  
ALL_FILESYSTEMS
```

You can also specify more than one `VOLUME_EXCLUDE_LIST` statement with an `ALL_FILESYSTEMS` directive. For example:

```
VOLUME_EXCLUDE_LIST=/vol/Hr_allfiles_vol01  
VOLUME_EXCLUDE_LIST=/vol/testvol*  
ALL_FILESYSTEMS
```

A `VOLUME_EXCLUDE_LIST` statement may include a maximum of 256 characters. Create multiple `VOLUME_EXCLUDE_LIST` statements if necessary to avoid exceeding the limit of 256 characters. If you specify more than 256 characters, the volume list is truncated. A truncated statement may result in a backup job failure, and the error message `Invalid command parameter(20)` is displayed.

If the backup selection includes read-only volumes or full volumes, an NDMP backup job fails with the status code 20 (`Invalid command parameter(20)`). If you encounter a similar NDMP backup job error, review the `ostfi` logs to identify the volumes for which the failure occurred. You can use `VOLUME_EXCLUDE_LIST` statements with the `ALL_FILESYSTEMS` statement to exclude the read-only volumes and the volumes with insufficient space.

In a NetBackup Replication Director environment where snapshots are replicated to a secondary filer, Symantec recommends that you use storage lifecycle policies (SLPs) to control backups on the secondary filer.

- Do not use `ALL_FILESYSTEMS` to backup all volumes on a secondary filer. Inconsistencies may occur when automatically created NetApp FlexClone volumes are backed up or restored. Such volumes are temporary and used as virtual copies or pointers to actual volumes and as such do not need to be backed up.
- If you must back up all volumes on a secondary filer, Symantec recommends that you exclude the FlexClone volumes. For example:

```
VOLUME_EXCLUDE_LIST=/vol/Clone_*  
ALL_FILESYSTEMS
```

This example assumes all FlexClone volumes and only FlexClone volumes begin with `/vol/Clone_`. Adjust the volume specification appropriately for your environment.

Configuring an NDMP policy for Replication Director in a multi-network environment

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In an environment where NetApp storage systems are connected to multiple networks, the NDMP policy for Replication Director can be configured to use a specific network for the NDMP backup traffic. To do this, use the **Backup From Snapshot** operation in the storage lifecycle parameter.

If the backup is from the primary storage system (that is, a **Snapshot** operation plus a **Backup From Snapshot** operation in one SLP), then the host name associated with the network to use should be entered in the **Clients** tab of the policy.

For cases where the snapshot is replicated, the default primary name of the secondary storage system is used. To use a different network, set the `ndmpd.preferred_interface` options on the storage system to the interface that is connected to that network.

For example, in a setup where the secondary storage system is connected to a private network on the `e0b` interface, connect to the storage system and set the `ndmpd.preferred_interface` to `e0b`, as follows:

```
Netapp3140a2> options ndmpd.preferred_interface e0b  
  
ndmpd.preferred_interface e0b
```

In this way, the NDMP backup of all the snapshots that are replicated to that storage system will use the private network

Configuring a policy for use with Replication Director

To create snapshots, NetBackup must run a backup policy that is configured to create snapshots. Use this procedure to configure a backup policy to use with Replication Director. This procedure applies to the backup policies that are not NDMP policies, not Oracle policies, or not VMware policies.

See the following topics for more information about creating specific policy types:

- See [“Configuring a policy to use NDMP with Replication Director”](#) on page 141.
- See [“Configuring a policy for Windows SAN devices to use Replication Director”](#) on page 160.
- See [“Configuring an Oracle Intelligent Policy”](#) on page 165.
- See [“Configuring a script- or template-based Oracle policy”](#) on page 170.
- See [“Configuring a policy for Replication Director and virtual machines”](#) on page 179.

Only those policy options that are necessary to configure Replication Director are listed in the following procedure.

To create a policy for use with Replication Director (that is not an NDMP, Oracle, or VMware policy)

Note: This procedure requires that each client is mounted to create the snapshot.

- 1 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 2 On the **Actions** menu, click **New > New Policy**.
- 3 Type a unique name for the new policy in the **Add a New Policy** dialog box. See [“NetBackup naming conventions”](#) on page 62.
- 4 Clear the **Use Policy Configuration Wizard** check box.

Note: Do not use the Policy Configuration Wizard or the Getting Started Wizard to configure a policy for Replication Director.

- 5 Click **OK**.
- 6 Configure the options on the policy **Attributes** tab. The following items are specific to creating a policy for Replication Director:
 - **Policy type**
Select **Standard** or **MS-Windows**.
 - **Policy storage**
Select the SLP that you want to use that has been configured for snapshot replication.
Replication Director provides the ability to duplicate a NAS snapshot when the **Backup From Snapshot** operation is included in the SLP.
See [“Backup From Snapshot operation in an SLP”](#) on page 123.
 - **Use Replication Director**
Enable **Use Replication Director** to automatically select other options that Replication Director requires:
 - **Perform snapshot backups:** Ensures that the policy creates snapshots of the disk array.
 - **Retain snapshots for Instant Recovery or SLP management:** Ensures that the policy retains the snapshot after the backup completes.
 - **Replication Director Options**
Click the **Options** button to see the **Replication Director Options** dialog box and the default **Configuration Parameters** as follows:

- Snapshot Type**
- **Auto** (default): The OpenStorage partner uses the best snapshot technology available to that partner to create the snapshot.
 - **Differential**: The OpenStorage partner creates a snapshot that is completely dependent on the source. This parameter is based on copy-on-write technology. The device creates a cache object to maintain the original blocks of the snapshot when the blocks are modified.
 - **Plex**: The OpenStorage Partner creates a snapshot that is completely independent of the source snapshot. This option is based on mirror-break-off technology. When a mirror device is attached to the source, the contents of the mirror device is exactly the same as the source device. When the relationship is broken between the two, the mirror device is separated from the source. The mirror device acts as a point-in-time copy.
 If using EMC Symmetrix disk arrays, select **2**, which indicates the mirror snapshot type.
 - **Clone**: The OpenStorage Partner creates an independent copy of the volume. The copy process can take some time as the entire copy must be complete. The snapshot that is created is independent of the source.
- Maximum Snapshots** Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: The next snapshot causes the oldest to be deleted.
 If configuring remote snapshots using EMC Symmetrix disk arrays, the value cannot exceed **1**.
- Managed by SLP retention** is automatically selected if the **Fixed** or the **Expire after Copy** retention is currently selected in the SLP.
- Mask snapshot device from host**
- Indicates whether the target device is masked on the client or the alternate client:
 - **Yes** indicates that the device is not visible (masked) to the mount host (default) after snapshot deletion or deport.
 - **No** indicates that the device is visible to the mount host even after snapshot deletion or deport.

For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help.

- 7** Select the **Schedules** tab and configure the schedules as you would for any other policy.

See the *NetBackup Administrator's Guide, Volume I* or the online Help.

- 8 Select the **Clients** tab and specify the local mount point on the production client.

To create snapshots and snapshot replications with Replication Director, clients must have NetBackup 7.5 (or later) client software installed.

Make sure that the client can reach the storage server of the OpenStorage partner and the data volume to be backed up. For example, for NetApp, the client must be able to contact the volumes of the NetApp OnCommand server. For EMC, the client must be able to contact the Symmetrix disk array.

To test the connectivity, run the `ping` command from the client for the storage server. It must be reachable from the client using the DNS name.

```
ping storage_server_dnsname
```

Also, make sure that the data volume from the storage system is properly mounted on the client.

To test, run the `mount` command or use the `df -k` command on the client.

Note: To avoid creating multiple snapshots of the same share, do not include multiple clients in one policy that access the same share. Instead, add only one of the clients to the policy so that the share is backed up once. Or, create an NDMP policy to back up the share.

ET3076188/BURT669758; 2/8/13

Similarly, do not protect the same share in multiple policies.

See [“Create a snapshot of an NDMP host to avoid mounting each client”](#) on page 139.

- 9 Select the **Backup Selections** tab to indicate the client data to be backed up as part of the snapshot.

Note: ET2970430; 10/31/12

Backup selections for both SAN devices and NAS volumes are not supported in a single backup policy.

- Windows path names must use the Universal Naming Convention (UNC), in the form `\\server_name\share_name`.
- All paths must be valid for a client.
- For client data that resides on a NAS host: The data must be mounted on the client by means of NFS on UNIX or shared by means of CIFS on

Windows. For NFS mounts, the data must be manually mounted by means of the `mount` command, not auto-mounted.

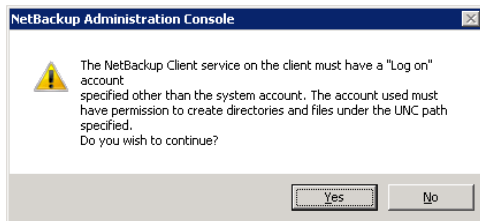
- The mount point listed in the backup selection cannot contain any spaces or XML markup.
- Use the `nosharecache` option to mount qtrees that are under the same volume. For example:

```
mount -o vers=3,nosharecache filer:/vol/volume1/qtree1 /mnt1
```

- **ET3054856; BURT660724 2/12/13**

If including a qtree in the backup selection, do not mount the volume. That is, do not include the volume in the backup selection path. For example, to back up a qtree, enter `\\filer\q1`. The following entry is incorrect and creates a snapshot of the entire volume: `\\filer\volume1\q1`.

- In the backup selections list for a **Standard** policy that uses the **OST_FIM** snapshot method, do not include non-NFS directories. Policy validation fails if non-NFS directories are included. If both NFS and non-NFS directories are included in the backup selections list, policy validation fails for the non-NFS backup selections.
- Specify the mount point for the directories, volumes, or files from the client perspective.
 - **UNIX example:** The data resides in `/vol/vol1` on the NDMP host `nas1`. The data is NFS-mounted to `/mnt2/home` on the UNIX client. Specify `/mnt2/home` in the **Backup Selections** list.
 - **Windows example:** The data resides in `/vol/vol1` on the NDMP host `nas1`. The data is shared by means of CIFS as `vol1` on the Windows client. Specify `\\nas1\vol1` in the **Backup Selections** list. For the NetBackup Client Service to write to the CIFS volume, it must have permission to do so. When a backup policy is saved, a message displays stating that this permission is necessary. By default, NetBackup is installed as a local system account and may not have the necessary CIFS permissions. Change the logon property of the NetBackup Client Service to an account with access to the CIFS share. See “[Configuring the NetBackup Client Service](#)” on page 61.



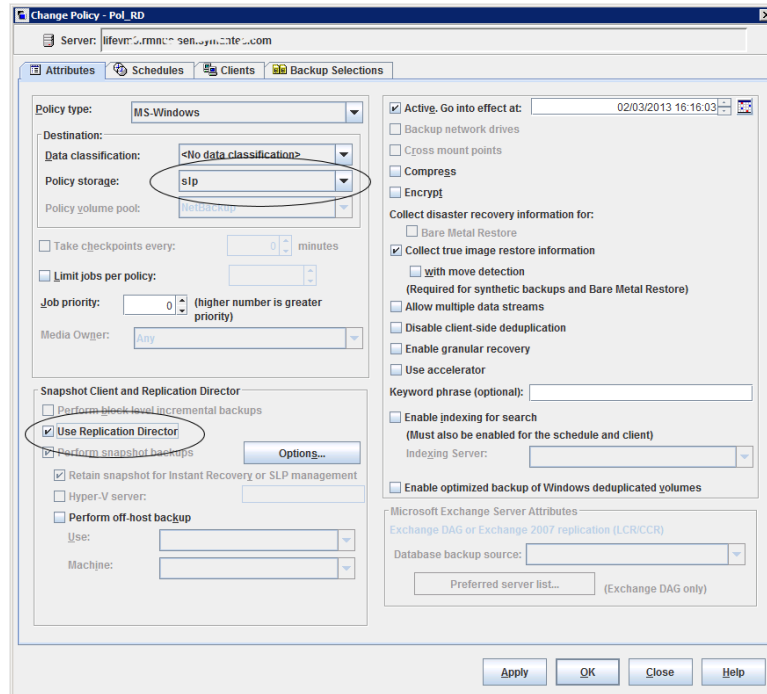
- 10 When the policy configuration is complete, click **OK**.
- 11 To ensure that the backup policy can run successfully, NetBackup checks the policy.

Select the kind of policy check you want NetBackup to perform:

- **Comprehensive (Recommended)**
The **Comprehensive** level also checks the configuration of the backup policy and the SLP with the underlying storage configuration, but in more detail. This level is recommended.
- **Intermediate**
The **Intermediate** level quickly checks the configuration of the backup policy and the SLP with the underlying storage configuration.
- **Basic**
The **Basic** level is selected by default. All policies are checked to ensure that the client can perform a snapshot of the data that is indicated in the **Backup Selections** list.

If the validation finds no problems, the policy saves and closes.

Figure 10-3 Policy configuration for non-NDMP Replication Director snapshots



Configuring a policy for Windows SAN devices to use Replication Director

Reviewers for FID3032: Updates made 10/24/12 per comments received.

The following procedure describes how to create a policy that uses Replication Director for SAN (block) device support on a Windows host, using the Windows Volume Shadow Services (VSS) framework.

This procedure assumes that the necessary software is installed:

If NetApp disk arrays are used:

See [“About NetApp configuration for Replication Director”](#) on page 27.

See [“Configuring the primary NetApp device to use VSS with Replication Director”](#) on page 37.

If EMC Symmetrix disk arrays are used:

See [“About EMC Symmetrix configuration for Replication Director”](#) on page 41.

Multipathing software

Install multipathing software on the mount host: either the client or the alternate client.

For example: native multipathing, EMC PowerPath, or Microsoft Multipath I/O.

Only those policy options that are necessary to configure Replication Director are listed in the following procedure.

To create a policy for Windows SAN devices to use Replication Director

- 1 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 2 On the **Actions** menu, click **New > New Policy**.
- 3 Type a unique name for the new policy in the **Add a New Policy** dialog box. See [“NetBackup naming conventions”](#) on page 62.
- 4 Clear the **Use Policy Configuration Wizard** check box.

Note: Do not use the Policy Configuration Wizard or the Getting Started Wizard to configure a policy for Replication Director.

- 5 Click **OK**.
- 6 Configure the options on the policy **Attributes** tab:
 - **Policy type**
Select **MS-Windows**.
 - **Data classification**
(Optional for Replication Director.) The data classification of the policy must match the data classification of the SLP selected for the backup.
 - **Policy storage**
Select the SLP that you want to use that has been configured for snapshot replication.
 - **Use Replication Director**
Enable **Use Replication Director** to automatically select other options that Replication Director requires:
 - **Perform snapshot backups:** Ensures that the policy creates snapshots of the disk array.
 - **Retain snapshots for Instant Recovery or SLP management:** Ensures that the policy retains the snapshot after the backup completes.

■ Replication Director Options

- | | |
|---------------------------------------|---|
| Snapshot Type | <ul style="list-style-type: none"> ■ Auto (default): The OpenStorage partner uses the best snapshot technology available to that partner to create the snapshot. By default, Differential is selected for this snapshot. ■ Differential: If selected, NetBackup instructs the VSS vendor hardware provider to create a shadow copy using a differential or copy-on-write implementation. If the VSS vendor hardware provider that is installed on the system doesn't support the requested attributes, snapshot creation fails with an error VSS_E_VOLUME_NOT_SUPPORTED. ■ Plex: If selected, NetBackup instructs the VSS vendor hardware provider to create a shadow copy using a plex implementation. If the VSS vendor hardware provider that is installed on the system doesn't support the requested attributes, snapshot creation fails with an error VSS_E_VOLUME_NOT_SUPPORTED.

 Note: If using EMC Symmetrix disk arrays, only Plex is supported. ■ Clone: Clone is not supported for Windows SAN devices. If selected, the policy validation and snapshot creation fail with status code 4201 (incorrect configuration for snapshot).

 Note: NetApp disk arrays do not support Clone. |
| Maximum Snapshots | <p>Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: The next snapshot causes the oldest to be deleted.</p> <p>If configuring remote snapshots using EMC Symmetrix disk arrays, the value cannot exceed 1.</p> <p>Managed by SLP retention is automatically selected if the Fixed or the Expire after Copy retention is currently selected in the SLP.</p> |
| Mask snapshot device from host | <p>Indicates whether the target device is masked on the client or the alternate client:</p> <ul style="list-style-type: none"> ■ Yes indicates that the device is not visible (masked) to the mount host (default) after snapshot deletion or deport. ■ No indicates that the device is visible to the mount host even after snapshot deletion or deport. |

For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help.

- 7 Select the **Schedules** tab and configure the schedules as you would for any other policy.
- 8 Select the **Clients** tab and specify the client.
- 9 Select the **Backup Selections** tab to indicate the path on the client to be backed up.

Note: ET2970430; 10/31/12

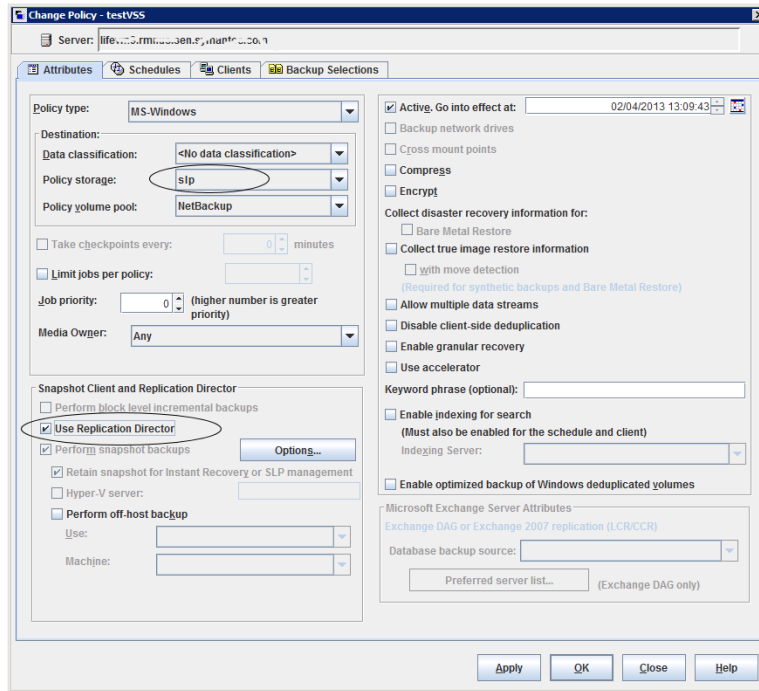
Backup selections for both SAN devices and NAS volumes are not supported in a single backup policy.

The **Backup Selections** list may contain any combination of the following:

- Drive letters
 - Folder mounts
 - A directory on a drive
 - A single file on a drive or in a directory
- 10 When the policy configuration is complete, click **OK**.
 - 11 To ensure that the backup policy can run successfully, NetBackup checks the policy.
Select the kind of policy check you want NetBackup to perform:
 - **Comprehensive (Recommended)**
The **Comprehensive** level also checks the configuration of the backup policy and the SLP with the underlying storage configuration, but in more detail. This level is recommended.
 - **Intermediate**
The **Intermediate** level quickly checks the configuration of the backup policy and the SLP with the underlying storage configuration.
 - **Basic**
The **Basic** level is selected by default. All policies are checked to ensure that the client can perform a snapshot of the data that is indicated in the **Backup Selections** list.

If the validation finds no problems, the policy saves and closes.

Figure 10-4 Policy configuration to use VSS with Replication Director



About Oracle support for Replication Director

Reviewers for FID3038: New section in 7.6.

In NetBackup 7.6, Replication Director can be used to create snapshots of the Oracle database and replicate the snapshots to other NetApp disk arrays. To use Replication Director, the Oracle database must exist on a NetApp NAS disk array. (It is not supported on SAN storage at this time.)

Oracle snapshot backups that use Replication Director are supported on UNIX platforms only.

The administrator can create an Oracle policy to use Replication Director by using either the following methods:

- The Oracle Intelligent Policy (recommended).
See [“Configuring an Oracle Intelligent Policy”](#) on page 165.
- Create a script- or template-based Oracle policy.
See [“Configuring a script- or template-based Oracle policy”](#) on page 170.

Table 10-2 describes the differences between the two methods:

Table 10-2 Differences in Oracle snapshot policy setup

Configuration	Oracle Intelligent Policy	Script- or template-based Oracle policy
Scripts	<ul style="list-style-type: none"> ■ All scripts that are necessary to protect all parts of the database are automatically generated at run-time. ■ The administrator does not need to know how to configure RMAN scripts. ■ The retention levels for the different parts of the database are automatically assigned 	<ul style="list-style-type: none"> ■ NetBackup can continue to use custom scripts to perform database backups. ■ The administrator must know how to configure RMAN scripts. ■ The administrator must set the retention levels for the different parts of the database correctly. ■ The administrator must ensure that a snapshot of the proxy data is created.
Schedules	<p>The administrator configures only one schedule that backs up all parts of the database and sets the correct retention automatically.</p> <p>The Archived Redo Log schedule is not supported with a snapshot backup.</p>	<p>The administrator must configure two schedules with two retentions:</p> <ul style="list-style-type: none"> ■ One Full Backup schedule to back up the snapshot (proxy) data part of the database. ■ One Application Backup schedule to back up the stream-based part of the Oracle database. <p>The Archived Redo Log schedule is available with a configured script.</p>
Backups	User-directed backups are not supported. To attempt a user-directed backup (results in a status 240 (no schedules of the correct type exist in this policy)).	User-directed backups are supported.
Load balancing	RAC load balancing is not supported.	RAC load balancing is supported.

Configuring an Oracle Intelligent Policy

Reviewers for FID3038: New section in 7.6.

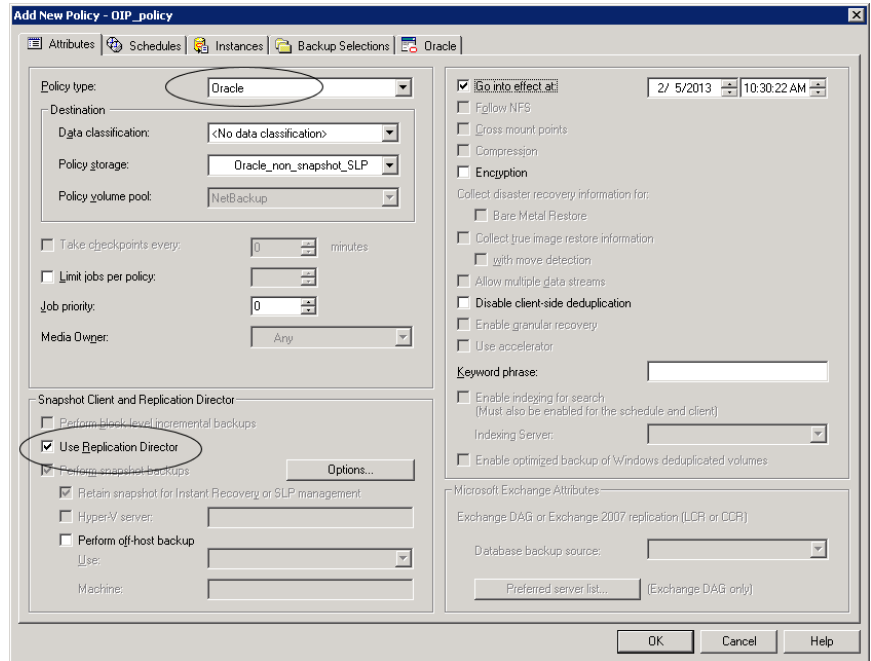
Use the following procedure to configure an Oracle snapshot policy that uses Replication Director. This procedure uses the Oracle Intelligent Policy, which makes configuration easier.

Only those policy options that are necessary to configure Replication Director are listed in the following procedure. For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help. For Oracle-specific information, see the *NetBackup for Oracle Administrator's Guide*.

To create an Oracle Intelligent Policy

- 1 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 2 On the **Actions** menu, click **New > New Policy**.
- 3 Type a unique name for the new policy in the **Add a New Policy** dialog box. See “[NetBackup naming conventions](#)” on page 62.
- 4 Clear the **Use Policy Configuration Wizard** check box and click **OK**.
- 5 Select the **Attributes** tab. The following items are specific to creating an Oracle policy for snapshots with Replication Director:
 - **Policy type**
For NetBackup to perform Oracle backups, select **Oracle**. An **Oracle** tab appears.
 - **Policy storage**
Oracle combines snapshots (proxy) and stream-based backups as part of the same backup. The storage indicated here is used for the stream-based part of the Replication Director backup.
Select a storage lifecycle policy that is configured to contain the stream-based (non-snapshot) part of the database backup. The storage must use a storage lifecycle policy that is configured for non-snapshot backups.
 - **Use Replication Director**
Enable **Use Replication Director** to automatically select other options that Replication Director requires:
 - **Perform snapshot backups**: Ensures that the policy creates snapshots of the disk array.
 - **Retain snapshots for Instant Recovery or SLP management**: Ensures that the policy retains the snapshot after the backup completes.
 - **Replication Director Options**

- Snapshot Type**
- **Auto** (default): The OpenStorage partner uses the best snapshot technology available to that partner to create the snapshot.
 - **Differential**: The OpenStorage partner creates a snapshot that is completely dependent on the source. This parameter is based on copy-on-write technology. The device creates a cache object to maintain the original blocks of the snapshot when the blocks are modified.
 - **Plex**: The OpenStorage Partner creates a snapshot that is completely independent of the source snapshot. This option is based on mirror-break-off technology. When a mirror device is attached to the source, the contents of the mirror device is exactly the same as the source device. When the relationship is broken between the two, the mirror device is separated from the source. The mirror device acts as a point-in-time copy.
 If using EMC Symmetrix disk arrays, select **2**, which indicates the mirror snapshot type.
 - **Clone**: The OpenStorage Partner creates an independent copy of the volume. The copy process can take some time as the entire copy must be complete. The snapshot that is created is independent of the source.
- Maximum Snapshots** Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: the next snapshot causes the oldest to be deleted.
 If configuring remote snapshots using EMC Symmetrix disk arrays, the value cannot exceed **1**.
- Managed by SLP retention** is automatically selected if the **Fixed** or the **Expire after Copy** retention is currently selected in the SLP.
- Mask snapshot device from host** Indicates whether the target device is masked on the client or the alternate client:
- **Yes** indicates that the device is not visible (masked) to the mount host (default) after snapshot deletion or deport.
 - **No** indicates that the device is visible to the mount host even after snapshot deletion or deport.



6 Select the **Schedules** tab. Create one schedule:

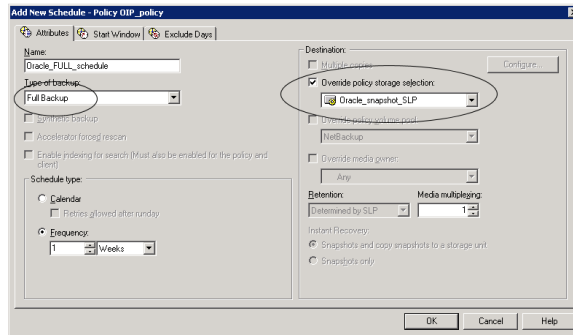
- **Type of backup:** Select **Full Backup**. The **Full Backup** is used for both the snapshot (proxy) part of the database and the non-snapshot (stream-based) part of the Oracle database.
The Oracle Intelligent Policy does not support the snapshot of an **Archived Redo Log Backup**. To take a snapshot of the archived redo logs, use the script- or template-based Oracle policy method.

Note: Unless creating Block Level Incremental (BLI) backups, always select **Full Backup** to create snapshots of the Oracle database.

- **Override policy storage selection:** Enable and select the SLP that is configured for snapshot replication. (A snapshot SLP is one in which the first operation is a snapshot operation.) This option must be enabled so that the schedule storage overrides the policy storage with a snapshot SLP.
- **Retention:** The retention for the streamed data is based on the non-snapshot SLP that was indicated as the **Policy storage** in Step 5.

- The non-snapshot SLP specified on the policy storage in Step 5 determines the retention for the streamed data.
- The snapshot SLP that is specified as the schedule storage (**Override policy storage selection**) determines the retention for the snapshot data.

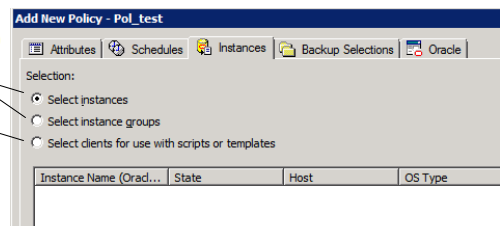
Click **OK** to save the schedule.



- 7 Select the **Instances** tab and specify the instances to back up. The policy must include at least one instance. To continue to use the Oracle Intelligent Policy method, select either **Select instances** or **Select instance groups**.

Oracle Intelligent Policy method

Script- or template-based
Oracle policy method



- 8 Select the **Backup Selections** tab. Select the parts of the database to back up. Note that the selection applies to all listed instances.

The following can be selected for the policies that use Replication Director:

- **Whole database:** Backs up the entire database (default).
- **Partial database - Tablespaces:** Backs up the tablespaces.
- **Partial database - Datafiles:** Backs up the data files.
- **Fast Recovery Area - FRA:** Do not select for a policy that uses Replication Director.

Note: If you back up the partial database, and later want to perform a Point-in-time rollback restore, make sure that you select all of the tablespaces or datafiles from a partition in the **Backup Selections**.

For copy-back restores, this is not a requirement.

- 9 Select the **Oracle** tab to configure Oracle RMAN properties.
 For descriptions of the RMAN properties, see the *NetBackup for Oracle Administrator's Guide*.
- 10 When the policy configuration is complete, click **OK**.

Configuring a script- or template-based Oracle policy

Reviewers for FID3038: New section in 7.6.

Use the following procedure to configure an Oracle snapshot policy that uses Replication Director. This procedure uses an Oracle policy type, but does not automatically generate the necessary scripts. It allows the administrator to use custom scripts and templates.

Only those policy options that are necessary to configure Replication Director are listed in the following procedure. For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help. For Oracle-specific information, see the *NetBackup for Oracle Administrator's Guide*.

To create a script- or template-based Oracle policy

- 1 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 2 On the **Actions** menu, click **New > New Policy**.
- 3 Type a unique name for the new policy in the **Add a New Policy** dialog box.
 See [“NetBackup naming conventions”](#) on page 62.
- 4 Clear the **Use Policy Configuration Wizard** check box and click **OK**.
- 5 Select the **Attributes** tab. The following items are specific to creating an Oracle policy for snapshots with Replication Director:
 - **Policy type**
 For NetBackup to perform Oracle backups, select **Oracle**. An **Oracle** tab appears.
 - **Policy storage**

Oracle combines snapshots (proxy) and stream-based backups as part of the same backup. The storage that is indicated here is used for the stream-based part of the Replication Director backup.

Select the storage that is configured to contain the stream-based (non-snapshot) part of the database backup. The storage can be either a storage lifecycle policy that is configured for non-snapshot backups, or a disk or Media Manager unit.

■ Use Replication Director

Enable **Use Replication Director** to automatically select other options that Replication Director requires:

- **Perform snapshot backups:** Ensures that the policy creates snapshots of the disk array.
- **Retain snapshots for Instant Recovery or SLP management:** Ensures that the policy retains the snapshot after the backup completes.
- **Replication Director Options**

Snapshot Type

- **Auto** (default): The OpenStorage partner uses the best snapshot technology available to that partner to create the snapshot.
- **Differential:** The OpenStorage partner creates a snapshot that is completely dependent on the source. This parameter is based on copy-on-write technology. The device creates a cache object to maintain the original blocks of the snapshot when the blocks are modified.
- **Plex:** The OpenStorage Partner creates a snapshot that is completely independent of the source snapshot. This option is based on mirror-break-off technology. When a mirror device is attached to the source, the contents of the mirror device is exactly the same as the source device. When the relationship is broken between the two, the mirror device is separated from the source. The mirror device acts as a point-in-time copy.
If using EMC Symmetrix disk arrays, select **2**, which indicates the mirror snapshot type.
- **Clone:** The OpenStorage Partner creates an independent copy of the volume. The copy process can take some time as the entire copy must be complete. The snapshot that is created is independent of the source.

Maximum Snapshots Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: The next snapshot causes the oldest to be deleted.

If configuring remote snapshots using EMC Symmetrix disk arrays, the value cannot exceed 1.

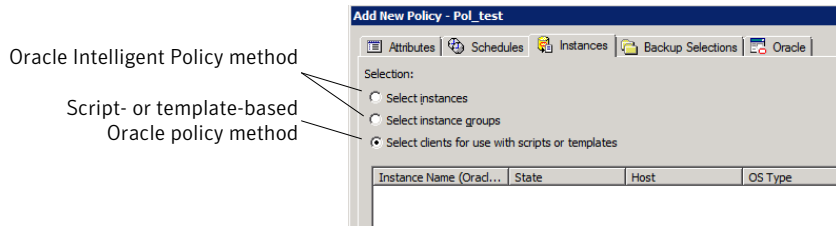
Managed by SLP retention is automatically selected if the **Fixed** or the **Expire after Copy** retention is currently selected in the SLP.

Mask snapshot device from host Indicates whether the target device is masked on the client or the alternate client:

- **Yes** indicates that the device is not visible (masked) to the mount host (default) after snapshot deletion or deport.
- **No** indicates that the device is **visible** to the mount host even after snapshot deletion or deport.

The screenshot shows the 'Add New Policy - Oracle_legacy' dialog box. The 'Policy type' is set to 'Oracle'. The 'Data classification' is '<No data classification>'. The 'Policy storage' is 'Oracle_non_snapshot_SLP'. The 'Policy volume pool' is 'NetBackup'. The 'Snapshot Client and Replication Director' section has 'Use Replication Director' checked. The 'Go into effect at' date is '2/ 5/2013' and time is '11:04:33 AM'. The 'Keyword phrase' is empty. The 'Microsoft Exchange Attributes' section is also visible.

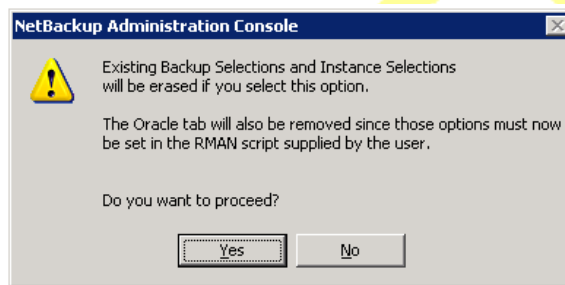
- 6 Select the **Instances** tab and specify the instances to back up. Select **Select clients for use with scripts and templates**. If either of the other two are selected, the Oracle Intelligent Policy is used and the scripts are created automatically.



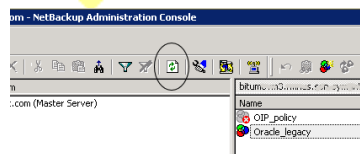
After selecting the **Select clients for use with scripts and templates** option, a message appears that describes the effect of this choice:

- Existing selections (if any) for this policy are erased.
- The **Oracle** tab is removed from this policy.
- Another effect is that the **Selections** tab turns into the **Clients** tab.

Click **Yes** to continue Oracle policy configuration.



- 7 Click **Yes** to save and close the entire policy.
- 8 In the **NetBackup Administration Console**, select the policy and click the refresh button in the toolbar.

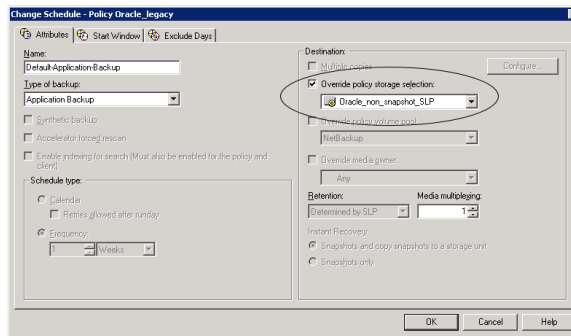


- 9 Re-open the policy and select the **Schedules** tab. Modify the **Default-Application-Backup** schedule:
 - **Override policy storage selection:** Enable and select a non-snapshot storage unit or a non-snapshot SLP. This is most likely the storage unit

that is specified on the **Attributes** tab. Indicating it here makes the selection explicit.

- **Retention:** The policy or SLP indicates the retention for the backup:
 - When the storage is an SLP, the SLP determines the retention and no selection is possible here.
 - When the storage is not an SLP, the schedule determines the retention and a selection is possible here.

Click **OK** to save the schedule.

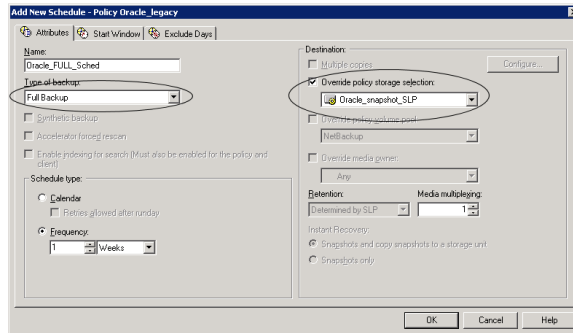


Create one **Full Backup** schedule:

- Name the schedule.
- **Type of backup:** Select **Full Backup**.

Note: Unless creating Block Level Incremental (BLI) backups, always select **Full Backup** to create snapshots of the Oracle database.

- **Override policy storage selection:** Enable and select the SLP that is configured for snapshot replication.
- **Retention:** The SLP indicates the retention for the backup.



- 10 Configure the schedule in the **Start Window** tab and the **Exclude Days** tab.
Click **OK** to save and close the schedule.
- 11 Select the **Clients** tab. By default, the **Select clients for use with scripts or templates** option is selected for this script- or template-based Oracle policy.
- 12 Add the client name(s) that contain the Oracle database and indicate the operating system of each.
- 13 Select the **Backup Selections** tab. Specify the script or the template that NetBackup should use. Indicate only one script or one template.
- 14 When the policy configuration is complete, click **OK**.

About virtual machines and Replication Director

Replication Director for NetBackup for VMware includes the following features for protecting virtual machines in a snapshot and replication environment:

- Creates an instantaneous hardware snapshot of virtual machines.
- Backs up virtual machines from the snapshots at primary locations and from replicated snapshots at remote locations.
- Restores a virtual machine from its VMDK files that are in a snapshot.
- Restores individual files from the VMDK files in a snapshot.
- Supports storage lifecycle policies and browsing of virtual machine snapshots, as well as the features of Replication Director for physical computers.

Table 10-3 describes usage scenarios for virtual machine protection with Replication Director.

Table 10-3 Examples of virtual machine protection with Replication Director

Operation	Description and notes
Make array-based snapshots of virtual machines on NFS datastores	<p>Configure a storage lifecycle policy (SLP) and a backup policy to create array snapshots of virtual machines. The snapshots remain on the array or filer (NetBackup storage server) and are not backed up to a NetBackup media server storage unit. This type of backup is the foundation for the other Replication Director operations.</p> <p>Note the following:</p> <ul style="list-style-type: none"> ■ The snapshots are created on NFS datastores only. ■ The virtual machine or its individual files can be restored directly from the snapshots on the storage server. The snapshots can also be replicated to other locations. ■ For faster browsing of files to restore, include the Index From Snapshot option in the SLP. This option catalogs the metadata of the virtual machine. <p>Note: With the Index From Snapshot option, the backup may require additional time to complete.</p>
Back up quiesced virtual machines from a snapshot (or snapshot replica) that is on an NFS datastore	<p>Configure a SLP and a backup policy to make a backup image from the virtual machine snapshot. NetBackup backs up only the virtual machines that were quiesced before the snapshot occurred.</p> <p>The backup image is written to a NetBackup storage unit. The image is retained according to the policy's retention period.</p> <p>Note: The Application consistent snapshot option in the policy must be enabled (under Options > Snapshot Client Options).</p>
Restore a virtual machine from a snapshot (or snapshot replica) that is on an NFS datastore	<p>Use the Backup, Archive, and Restore interface to restore the virtual machine. Supported restore destinations are the original NFS datastore or an alternate NFS datastore.</p> <p>Note the following:</p> <ul style="list-style-type: none"> ■ All VMDK files for the virtual machine must be restored to a single datastore. The working directory for the virtual machine must also be restored to the same datastore. ■ To restore to an alternate NFS datastore: the Application consistent snapshot option in the policy must have been disabled (under Options > Snapshot Client Options).

Table 10-3 Examples of virtual machine protection with Replication Director
(continued)

Operation	Description and notes
Restore individual files from a snapshot (or snapshot replica) that is on an NFS datastore	<p>Use the Backup, Archive, and Restore interface to restore the files.</p> <p>Note the following:</p> <ul style="list-style-type: none"> ■ To restore files from a replica of the snapshot, the replica must exist in the same NetBackup domain as the snapshot. ■ To restore files to the original virtual machine, a NetBackup client must be installed on the original virtual machine. ■ As an alternative, you can use an alternate client to restore to a shared UNC location. You must manually copy the files back to the original location. See the topic on restoring individual files in the <i>NetBackup for VMware Guide</i>. ■ To restore multiple directories that have named streams, the Windows NetBackup client on the destination virtual machine must be at 7.6 or later.

The initial steps for setting up Replication Director for virtual machines are the same as Replication Director for physical computers:

- Verify that your backup environment contains the necessary hardware and software to configure and run Replication Director.

Note: NDMP is not required for Replication Director and virtual machines.

- Install or upgrade NetBackup.
- Configure the following:
 - The disk array storage of the OpenStorage partner.
 - The NetBackup storage server.
 - The disk pool(s).
 - The NetBackup storage lifecycle policy (SLP).
Create a new operation in the SLP for each task that the SLP is to perform. For example, create a snapshot operation to perform the snapshot and a replication operation to copy the snapshot.

More information is available on all the procedures for configuring a NetBackup environment that uses Replication Director:

See [“Configuration overview for a NetBackup environment that uses Replication Director”](#) on page 16.

The following table lists the additional steps that are required for Replication Director and virtual machines.

Table 10-4 Replication Director for virtual machines: Configuration tasks overview

Step	Description	Reference topic
1	Configure the virtual machine NFS datastores on the OpenStorage storage server. Replication Director makes the snapshots on these NFS datastores.	See the <i>NetBackup for VMware Guide</i> .
2	Add the VMware backup host to your NetBackup configuration.	See the topic on adding the VMware backup host to NetBackup, in the <i>NetBackup for VMware Guide</i> .
3	Configure NetBackup access credentials for the VMware vCenter server or ESX server.	See the topic on adding NetBackup credentials for VMware, in the <i>NetBackup for VMware Guide</i> .
4	Configure a NetBackup policy (VMware policy type) to perform the operations that are specified in the SLP.	See “ Configuring a policy for Replication Director and virtual machines ” on page 179.

Notes on Replication Director for virtual machines

Note the following about Replication Director for virtual machines:

- For supported vCenter versions and datastores and other support details, see the following Symantec tech note:
[Support for NetBackup 7.x in virtual environments](#)
- Although applicable to Replication Director for physical computers, NDMP backup does not apply to Replication Director for virtual machines.
- Replication Director supports virtual machines on NetApp NFS datastores only.
- To create virtual machines on the NFS datastore, enter `anon=0` in the `/etc/exportsNetApp` file on the NetBackup storage server. The `anon=0` entry is the equivalent of the `no_root_squash` option. See the following VMware document for more information on the `anon=0` entry:
[Best Practices for running VMware vSphere on Network Attached Storage](#)
- If the NetBackup master and media server are UNIX and the backup host is Windows, the backup host must be defined with a fully qualified domain name. Otherwise, the backup fails.
- You must have a valid NFS export (share) for each qtrees that is mounted as an NFS datastore.
- Supports restore of virtual machines and of individual files in virtual machines. Does not support volume-level rollback restore. (In the *Replication Director Solutions Guide*, references to rollback restore do not apply to virtual machines.)

- If the datastore name contains special characters, the datastore name in the backup image contains @ followed by the value of the special character. For example, a datastore that has the name “NFS datastore1” (with a space) appears in the NetBackup catalog as NFS@20datastore1.
- When restoring from Replication Director backups, note the following:
 - If you select more than one image in the Backup, Archive, and Restore interface, it may take longer than expected to display the contents of the images. NetBackup performs a separate browsing operation for each selected image. It is best to select one image at a time when browsing for restore.
 - Do not select files or folders from two different images. The NetBackup BAR and OpsCenter interfaces do not support restoring data from two different images in the same restore job. Restore from one image at a time.
 - When you use the Backup, Archive, and Restore interface to browse for an image to restore, only the primary copy is made available for restore. In the NetBackup Administration Console, you can use the **Catalog** node to select a different copy (such as a replica or backup image) as the primary copy.

Note: NetBackup automatically selects the correct hardware (datastore) snapshot to restore, based on the virtual machine snapshot that is designated as the primary copy. Make sure the virtual machine snapshot that you want to restore is set as the primary.

See “[About jobs in the Activity Monitor with Replication Director for virtual machines](#)” on page 183.

Configuring a policy for Replication Director and virtual machines

For descriptions of all policy options, see the *NetBackup Administrator's Guide, Volume I* or the online Help. For VMware-specific information, see the *NetBackup for VMware Administrator's Guide*.

To create a policy to use virtual machines with Replication Director

- 1 In the **NetBackup Administration Console**, in the left pane, expand **NetBackup Management > Policies**.
- 2 On the **Actions** menu, click **New > New Policy**.
- 3 Type a unique name for the new policy in the **Add a New Policy** dialog box.
See “[NetBackup naming conventions](#)” on page 62.
- 4 Click **OK**.

- 5 Select the **Attributes** tab. The following items are specific to creating a VMware policy for snapshots with Replication Director:
 - **Policy type**

To create a policy to back up virtual machines, select **VMware**.
 - **Policy storage**

To use Replication Director, the storage selection must be a SLP that is configured for snapshots.
 - **Use Replication Director**

Enable **Use Replication Director** to automatically select other options that Replication Director requires:
 - **Perform snapshot backups**

Ensures that the policy creates snapshots of the disk array.
 - **Retain snapshot for Instant Recovery or SLP management**

Ensures that the policy retains the snapshot after the backup completes.
 - **Replication Director Options**

Maximum Snapshots parameter	Sets the maximum number of Instant Recovery snapshots to be retained at one time. When the maximum is reached, snapshot rotation occurs: The next snapshot causes the oldest to be deleted.
	If configuring remote snapshots using EMC Symmetrix disk arrays, the value cannot exceed 1.
	Managed by SLP retention is automatically selected if the Fixed or the Expire after Copy retention is currently selected in the SLP.

Application Consistent Snapshot This option is enabled by default. In most cases, Symantec recommends that you keep this option enabled.

If this option is disabled (0), data in the virtual machine may not be in a consistent state when the snapshot occurs. The snapshot may not capture all the data in the virtual machine.

Note the following:

- To allow the SLP to create a backup image from the snapshot, this option must be enabled.
- To restore the virtual machine from this backup to a different NFS datastore, this option must be disabled.
- If this option is disabled, only two of the **Advanced** parameters on the **VMware** tab are applicable:
 - Multiple organizations per policy
 - VMware server list

All the other **Advanced** parameters are ignored.

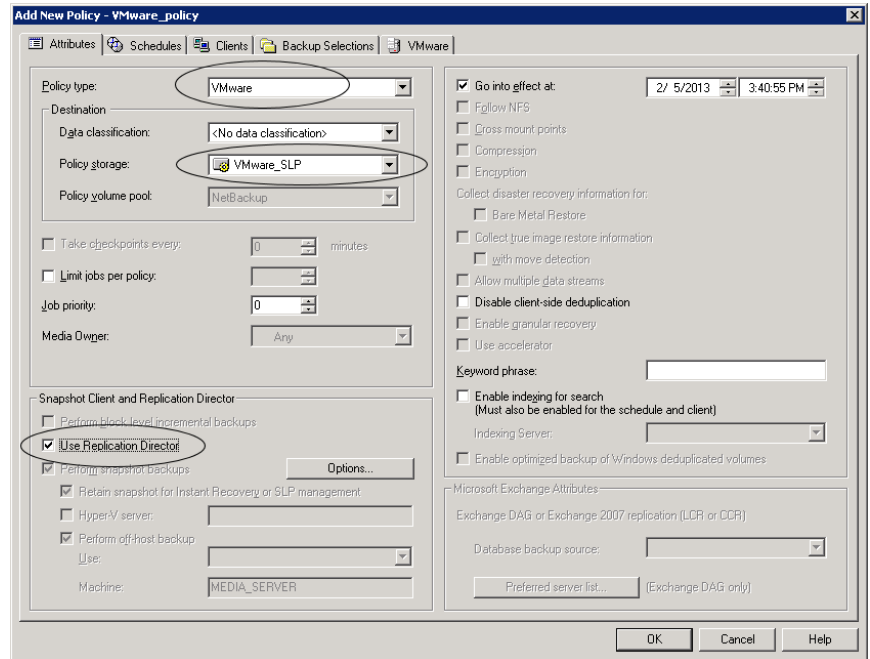
■ **Perform off-host backup**

This option is automatically selected when you select **VMware** as the policy type.

This option is selected automatically for a **VMware** policy, along with **MEDIA_SERVER** as the machine selection.

■ **Disable client-side deduplication**

**TBD...



- 6 Use the **Schedule** tab to create a schedule.
- 7 Use the **Clients** tab to create a query for the automatic selection of virtual machines.

Select automatically through query is pre-selected. Manual selection of virtual machines is not supported.

For instructions on creating a query, see the topics about configuring the automatic selection of virtual machines for backup in the *NetBackup for VMware Administrator's Guide*.

- 8 Use the **VMware** tab to select virtual machine backup options.

Note the following:

- The **Enable file recovery from VM backup** option is pre-selected and cannot be disabled.
- The **Enable block-level incremental backup** option is not supported and is disabled.
- The **Transport modes** are not supported and are disabled. NetBackup uses the VMware file transport mode to move the data between the backup host and the storage volumes.

- Under the options for **Application Protection**, only Exchange and SQL are supported.
- If the **Application Consistent Snapshot** option is disabled under **Replication Director Options**, only two of the **Advanced** parameters on the **VMware** tab are applicable:
Multiple organizations per policy
VMware server list
The other **Advanced** parameters are ignored.
- All other options on the **VMware** tab are supported for Replication Director. These options are described in the *NetBackup for VMware Administrator's Guide*.

9 When the policy configuration is complete, click **OK**.

About jobs in the Activity Monitor with Replication Director for virtual machines

You can use the NetBackup Activity Monitor to keep track of virtual machines backups as they occur. The number of jobs that appear in the Activity Monitor depends on the policy's **Application Consistent Snapshot** option.

Note: The **Application Consistent Snapshot** option is enabled by default. In most cases, Symantec recommends that you keep this option enabled. If this option is disabled, data in the virtual machine may not be in a consistent state when the snapshot occurs.

Table 10-5 describes the Activity Monitor jobs that appear in each configuration: with the **Application Consistent Snapshot** option enabled or disabled.

Table 10-5 Job flow in Activity Monitor with Replication Director for virtual machines

Application Consistent Snapshot option	Job flow in Activity Monitor
Enabled	<p>The first job discovers the virtual machines. This job is labeled Backup. The Backup job starts the following:</p> <ul style="list-style-type: none"> ■ A Snapshot job for each virtual machine. ■ A Snapshot job for each datastore.

Table 10-5 Job flow in Activity Monitor with Replication Director for virtual machines (*continued*)

Application Consistent Snapshot option	Job flow in Activity Monitor
Disabled	<p>The first job discovers the virtual machines. This job is labeled Backup. The Backup job starts the following:</p> <ul style="list-style-type: none"> ■ A Snapshot job to collect all the virtual machines' configuration data. ■ A Snapshot job for each datastore.

Example 1: Virtual machine jobs with the **Application Consistent Snapshot** option enabled.

Job ID	Parent Job ID	Type	Job State	Job Policy	Client
105	99	Snapshot	Done	AppConsistent_VMwareRD	wauk_c3
104	99	Snapshot	Done	AppConsistent_VMwareRD	wauk_c2
103	99	Snapshot	Done	AppConsistent_VMwareRD	wauk_c1
102	99	Snapshot	Done	AppConsistent_VMwareRD	waukvm15....
101	99	Snapshot	Done	AppConsistent_VMwareRD	waukvm14....
100	99	Snapshot	Done	AppConsistent_VMwareRD	waukvm13....
99		Backup	Done	AppConsistent_VMwareRD	bwarevm1....

The jobs occurred as follows:

- The discovery (parent) Backup job for virtual machine discovery is ID 99.
- Jobs 100, 101, and 102 made VMware snapshots of the virtual machines waukvm13, 14, and 15.
- Jobs 103, 104, and 105 made snapshots of datastores wauk_c1, c2, and c3.

Example 2: Virtual machine jobs with the **Application Consistent Snapshot** option disabled.

Job ID	Parent Job ID	Type	Job State	Job Policy	Client
110	106	Snapshot	Done	AppConsistentDisabled_VMwareRD	wauk_c3
109	106	Snapshot	Done	AppConsistentDisabled_VMwareRD	wauk_c2
108	106	Snapshot	Done	AppConsistentDisabled_VMwareRD	wauk_c1
107	106	Snapshot	Done	AppConsistentDisabled_VMwareRD	bwarevm1....
106		Backup	Done	AppConsistentDisabled_VMwareRD	bwarevm1....

The jobs occurred as follows:

- The discovery (parent) Backup job for virtual machine discovery is ID 106.
- Job 107 collected the virtual machines' configuration data.
- Jobs 108, 109, and 110 made snapshots of the virtual machines' datastores: wauk_c1, c2, and c3.

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Restoring from a snapshot

This chapter includes the following topics:

- [About restores from array-based snapshots](#)
- [Restoring files and folders from an array-based snapshot](#)
- [About restores from array-based snapshots of virtual machines](#)
- [Using OpsCenter to restore from array-based snapshots](#)
- [How NetApp performs a volume-level rollback restore](#)
- [Restoring \(rolling back\) from an array-based snapshot](#)

About restores from array-based snapshots

NetBackup manages array-based snapshot creation and replication. NetBackup also can create backup images from those snapshots.

See [“About configuring storage lifecycle policies for snapshots and snapshot replication”](#) on page 111.

In this release of NetBackup, you can do the following restore operations from an array-based snapshot:

File-level restore from the snapshot

NetBackup directs the storage device to restore individual files or folders from the snapshot. The storage device moves the data on the storage device.

Several methods exist for file-level restore from a snapshot, a replica, or a backup, as follows:

- The **Backup, Archive, and Restore** interface.
See [“Restoring files and folders from an array-based snapshot”](#) on page 188.
- The NetBackup `bprestore` command.
See the *NetBackup Commands Reference Guide*.
- The Symantec OpsCenter interface.
See [“Using OpsCenter to restore from array-based snapshots”](#) on page 194.

Volume-level rollback restore from the snapshot (copy one)

NetBackup directs the storage device to replace the volume with the snapshot of the volume. The storage device may be able to restore the volume without moving data.

See [“How NetApp performs a volume-level rollback restore”](#) on page 195.

See [“Restoring \(rolling back\) from an array-based snapshot”](#) on page 196.

Note: Reviewers: Is this note true in 7.6 also?

The NetBackup 7.5 release supports snapshot restore of copy one only to the primary site. To restore at a remote site, use file-level restore.

Only a system administrator can perform an array-based restore.

Note: To restore from Replication Director backups: If you select more than one image in the **Backup, Archive, and Restore** interface, it may take longer than expected to display the contents of the images. NetBackup performs a separate browsing operation for each selected image. For faster restores, select one image at a time.

Restoring files and folders from an array-based snapshot

This topic describes how to restore individual items from array-based snapshots.

The **Backup, Archive, and Restore** client interface displays the files and folders from the primary backup copy.

See “[About restores from array-based snapshots](#)” on page 187.

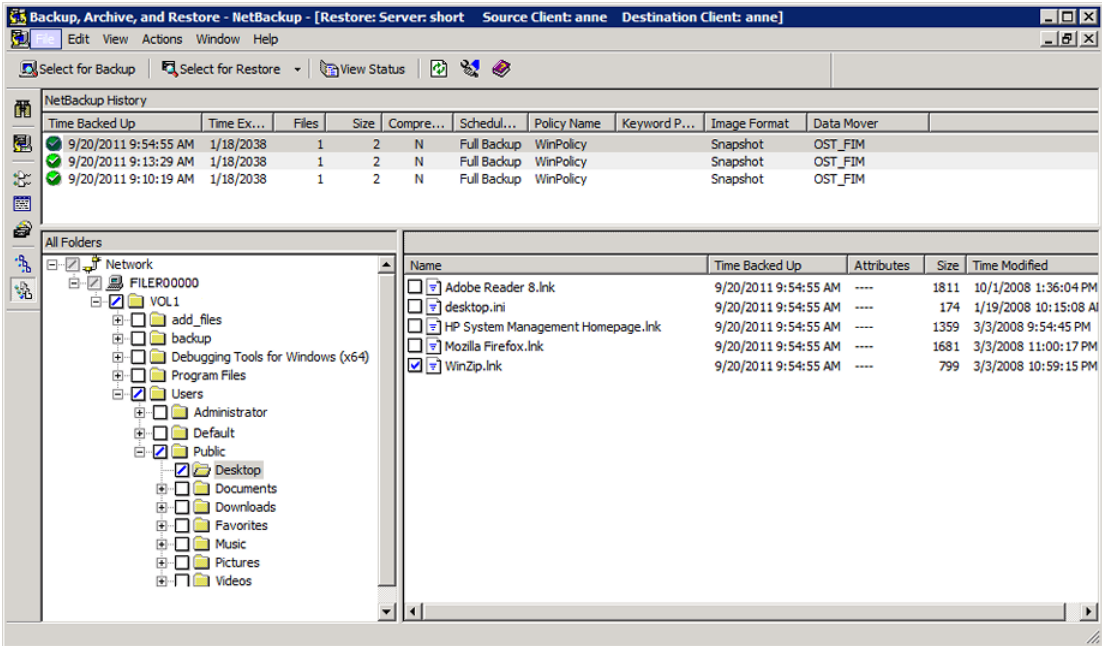
To restore files and folders from an array-based snapshot

- 1 Start the restore, as follows:

Windows	<p>In the Windows Backup, Archive, and Restore client interface:</p> <ul style="list-style-type: none">■ Click File > Select Files and Folders to Restore, and then select from Normal Backup.
UNIX	<p>In the Java-based Backup, Archive, and Restore client interface:</p> <ul style="list-style-type: none">■ Click the Restore Files tab.■ In the Restore type drop-down list, select Normal Backups.■ Click View > Refresh.

The following is an example of the restore window on a Windows computer:

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2 Select a snapshot as follows:

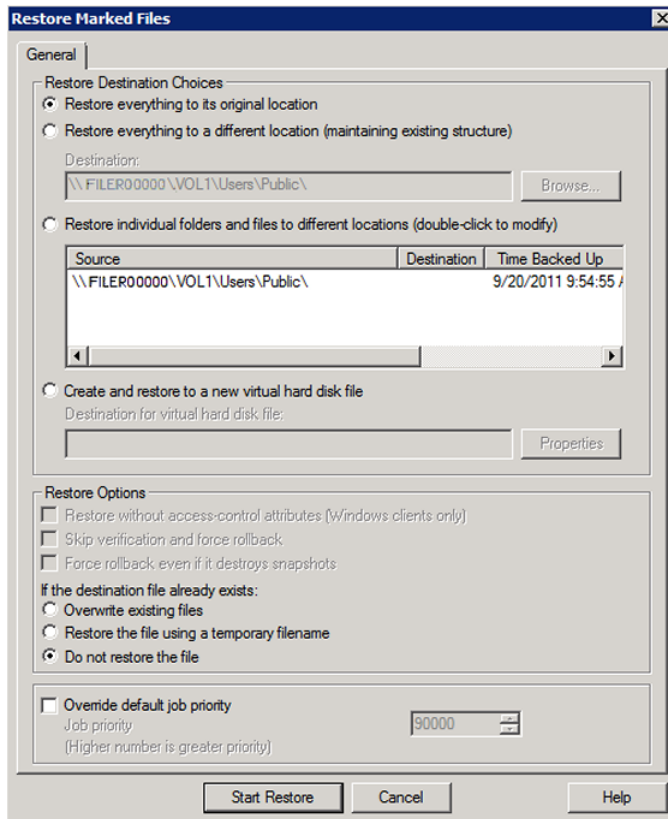
- Windows** In the **NetBackup History** pane, select the snapshot to restore. The snapshot appears in the **All Folders** pane.
- UNIX** Open the **Date Range** or the **Backup History** to select a snapshot to restore. Select a snapshot from the list and click **OK**. The snapshot contents appear in the **Directory Structure** pane.

3 Expand the directory tree and click the check box next to the items that you want to restore.

4 To set up how to restore the selected items, do the following:

- On Windows, click **Actions > Restore**.
- On UNIX, click **Restore**.

The following is an example of the **Restore Marked Files** dialog box on a Windows computer:



- 5 In the **Restore Marked Files** dialog box, select from the following options to meet the requirements for the restore.

For details about each option, see the **Backup, Archive, and Restore** online Help.

Restore Destination Choices

Select one of the following destination options:

- **Restore everything to its original location** (default)
- **Restore everything to a different location (maintaining existing structure)**
- **Restore individual folders and files to different locations** or **Restore individual directories and files to different locations**
- **Create and restore to a new virtual hard disk file**

Restore Options Select from the following restore options in the Windows **Backup, Archive, and Restore** interface:

- **Restore without access control attributes (Windows clients only)**
- **Skip verification and force rollback**
- **Force rollback even if it destroys later snapshots**
- If the destination file already exists, indicate what NetBackup should do:
 - **Overwrite existing files**
 - **Restore the file using a temporary file name**
 - **Do not restore the file**

Select from the following restore options in the Java-based **Backup, Archive, and Restore** interface:

- **Overwrite existing files**
- **Restore directories without crossing mount points**
- **Restore without access control attributes (Windows clients only)**
- **Rename hard links**
- **Rename soft links**
- **Force rollback even if it destroys later snapshots**

Job Priority To change the priority of this restore, click the **Override default priority** and then set a priority number.

The default is 90000. The available range is 0 to 99999. Higher numbers are higher priority.

Use default progress log filename

By default, progress log messages are written to the following location on the UNIX client:

`/usr/opensv/netbackup/logs/user_ops/loginID/logs`

To change the location and the name of the progress log file for this backup, take the following actions:

- Click this check box to remove the check mark.
- In the **Progress log filename** field, enter a new path and file name.

- 6 Click **Start Restore**.
- 7 To view the restore progress, click **Yes** in the **View Status** or the **View Progress** dialog box.

The restore may take a few minutes to complete. After you start a restore operation, you can close **Backup, Archive, and Restore** and perform other tasks. NetBackup continues the operation in the background.

About restores from array-based snapshots of virtual machines

From a Replication Director snapshot of a virtual machine, you can restore the following:

- The entire virtual machine.
See the topic on restoring the full VMware virtual machine in the *NetBackup for VMware Guide*.
- Individual files in virtual machines.
To restore virtual machine files, refer to the following topic.

Restoring files from array-based snapshots of virtual machines

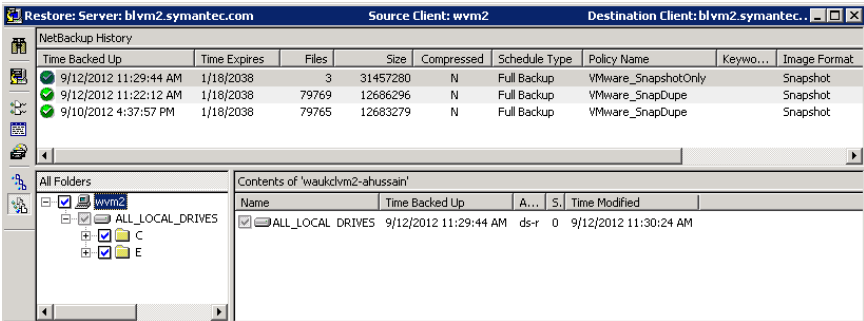
Note: When you browse files to restore, the Backup, Archive, and Restore interface displays the files and folders from the primary backup copy. A storage lifecycle policy however can create several images or copies from one job. To restore files from a different copy, set that copy as the primary. See the topic on how to promote a backup copy to a primary copy in the *NetBackup Administrator's Guide, Volume I*.

The initial steps for restoring individual files are described in the *NetBackup for VMware Guide*.

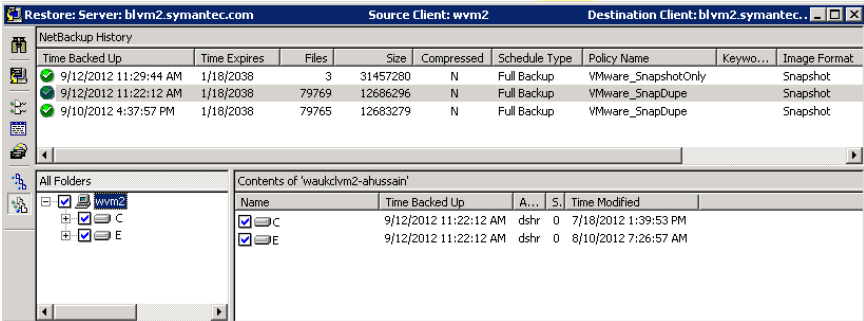
Note the following when restoring files from Replication Director snapshots:

In the Backup, Archive, and Restore interface, under **Files > Specify NetBackup Machines and Policy Type**, select **VMware** for the policy type.

If the SLP was not configured to index the virtual machine (or indexing is not complete), the BAR interface browses the files directly from the hardware snapshot. The **All Folders** pane displays an `ALL_LOCAL_DRIVES` node at the top level:



If the SLP was configured to index the virtual machine, the folders appear as follows when indexing is complete:



Note: If you select an indexed snapshot and a non-indexed snapshot for the same virtual machine, the folders appear twice under **All Folders**. Do not select files to restore from two different images: the restore fails.

Using OpsCenter to restore from array-based snapshots

Replication Director enables administrators to use the Restore operation in OpsCenter to browse and restore files and directories from any copy of a snapshot that is created as part of a storage lifecycle policy, even those in long-term storage. The Restore operation in OpsCenter also offers greater flexibility with the advanced search capabilities.

To use the Restore operation in OpsCenter requires that the **Index From Snapshot** operation was used in the SLP that generated the snapshots and replications.

See [“Index From Snapshot operation in an SLP”](#) on page 120.

For more information about Operational Restore using OpsCenter, see the *Symantec OpsCenter Administrator's Guide*.

How NetApp performs a volume-level rollback restore

ET2984630; 11/30/12

ET3030346; 1/10/13

NetBackup directs the array or storage device to do a rollback restore of the snapshot. The device determines how to accomplish the restore.

Several factors affect how the array accomplishes the restore, as follows:

- Whether the rollback is from the most recent snapshot or not.
- The NetBackup restore option: **Force rollback even if it invalidates later snapshots restore.**
- Whether the mount point from backup selection is a volume or qtree/folder in the volume.

Table 11-1 describes the interaction between the various factors.

Table 11-1 Volume-level rollback restore factors

From the most recent or an older snapshot	Force rollback even if it invalidates later snapshots restore option	Backup selection mount point*	Description
From the most recent snapshot	Either selection	Volume	The device performs a rollback restore of the volume. Because it is a rollback restore, the restore occurs almost immediately.
From the most recent snapshot	Either selection	Qtree or folder	The device performs a file-level restore of the backup selection mount point* rather than a volume-level rollback restore. Such a restore is much slower than a volume-level rollback restore in which no data moves.
From an older snapshot	Checked	Volume	The device performs a rollback restore of the volume. Because it is a rollback restore, the restore occurs almost immediately. Because the rollback restore replaces the current volume with the older snapshot, more recent snapshots are lost.

Table 11-1 Volume-level rollback restore factors (*continued*)

From the most recent or an older snapshot	Force rollback even if it invalidates later snapshots restore option	Backup selection mount point*	Description
From an older snapshot	Either selection	Qtree or folder	The device performs a file-level restore of the backup selection mount point* rather than a volume-level rollback restore. Such a restore is much slower than a volume-level rollback restore in which no data moves. Unlike a volume-level rollback restore, this type of restore does not destroy more recent snapshots.
From an older snapshot	Unchecked	Volume	The restore fails.

* For NDMP backups the entire backup selection is considered and not just the part that is mounted.

Restoring (rolling back) from an array-based snapshot

The following procedure describes how to perform a volume-level rollback restore (point-in-time restore) from a snapshot that NetBackup Replication Director manages. The storage device replaces the protected volume with the snapshot of the volume.

ET2905077; 2/21/13

In NetBackup 7.6, point-in-time rollback restores are supported for only NAS devices and only for copy one. Point-in-time rollback restores are not supported for SAN devices on Windows or UNIX.

Note: ET3088843; 2/21/13

Do not perform a point-in-time rollback restore on a volume which is shared across multiple policies because it retains the stale catalog entries for another policy or policies.

See [“About restores from array-based snapshots”](#) on page 187.

See [“How NetApp performs a volume-level rollback restore”](#) on page 195.

To restore from an array-based snapshot

1 Begin the restore procedure as follows:

Windows

Click **File > Select Files and Folders to Restore > from Point in Time Rollback**.

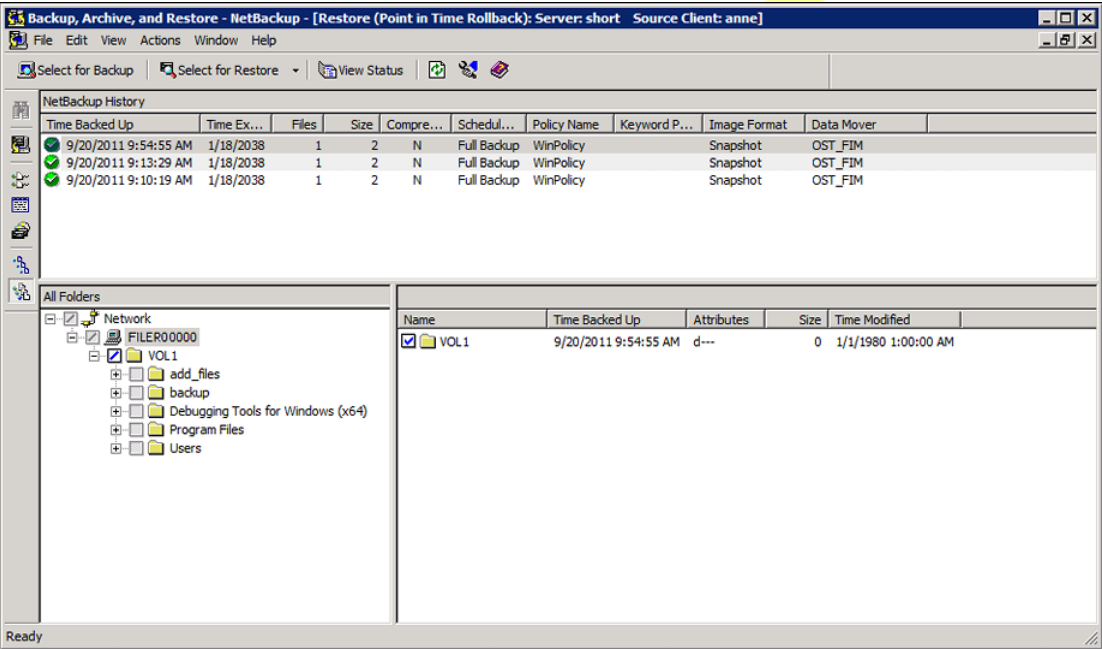
The **NetBackup History** pane shows the available snapshots from which you can restore.

UNIX

Click the **Restore Files** tab, then select **Point in Time Rollback** for the **Restore Type**.

The **Date Range** dialog box appears.

The following is an example of the restore window on a Windows computer:



2 Select a snapshot as follows:

Windows	In the NetBackup History pane, select the snapshot to restore. The snapshot appears in the All Folders pane.
UNIX	In the Date Range dialog box, select a snapshot from the list and click OK . The snapshot contents appear in the Directory Structure pane.

3 Select the volume, as follows:

Windows	In the All Folders pane, expand the directory tree to find the volume mount point (if necessary) and then click the check box next to the mount point for the volume.
UNIX	In the Directory Structure pane, expand the directory tree to find the volume mount point (if necessary) and then click the check box next to the mount point for the volume.

4 Begin the restore, as follows:

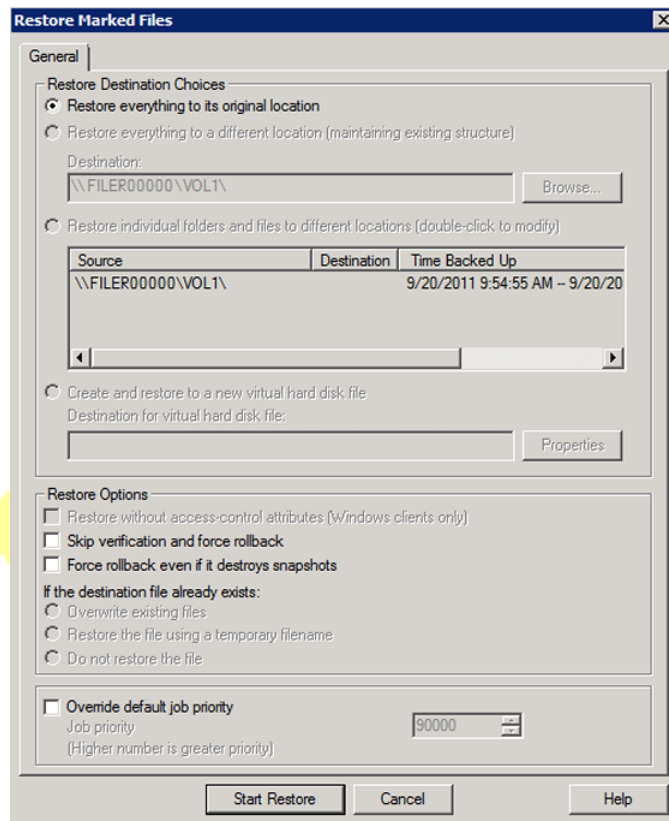
Windows Click **Actions > Restore....**

UNIX Click **Restore.**

The **Restore Marked Files** dialog box appears.

Most options are selected by default and cannot be changed.

The following is an example of the **Restore Marked Files** dialog box on a Microsoft Windows computer:



5 In the **Restore Marked Files** dialog box, select from the following options to meet the requirements for the restore:

Restore Options ■ **Skip verification and force rollback**

By default, NetBackup performs several checks on the file system during the restore. If the checks fail, the restore stops. Select this option to skip verification.

Warning: Select this option only if you are sure that you want to replace all of the files in the original location with the snapshot. Rollback deletes all files that were created after the creation-date of the snapshot from which you restore.

■ **Force rollback even if it invalidates later snapshots**

This option applies only if you restore from a snapshot other than the most recent one.

Warning: Select this option only if you are sure that you want to replace the original volume with the snapshot. If more recent snapshots that have been replicated exist and you do not select this option, the rollback restore fails.

See [“How NetApp performs a volume-level rollback restore”](#) on page 195.

Job Priority

To change the priority of this restore, click **Override default priority** and then set a priority number.

The default is 90000. The available range is 0 to 99999.

Use default progress log file name

UNIX systems only.

By default, progress log messages are written to the following location on the UNIX client:

`/usr/opensv/netbackup/logs/user_ops/loginID/logs`

To change the location and the name of the progress log file for this restore, do the following:

- Click this check box to remove the check mark.
- In the **Progress log filename** field, enter a new path and file name.

6 Click Start Restore.

7 In the dialog box that appears, click Yes to view the restore status.

If file verification fails, a message appears in the **View Status** dialog box (Windows) or **Task Progress** tab (UNIX) that indicates the restore was not performed.

After a restore operation begins, you can close **Backup, Archive, and Restore** to perform other tasks on your computer. NetBackup continues the restore operation in the background.

OpsCenter reporting

This chapter includes the following topics:

- [Symantec OpsCenter reporting](#)
- [Configuring alerts for OpenStorage events](#)
- [Storage lifecycle policy reporting](#)
- [Disk pool monitoring](#)
- [Monitoring snapshot replication jobs](#)
- [Reporting on storage units, storage unit groups, and storage lifecycle policies](#)

Symantec OpsCenter reporting

Use Symantec OpsCenter to provide unified reporting on Replication Director-related activity. This includes monitoring the lifecycle of the snapshot copies at the various storage locations. Administrators can use this information to help make retention-related decisions.

Symantec OpsCenter offers the following reports:

- Storage space utilization
- Capacity planning reports that display forecasted and historical views.

Configuring alerts for OpenStorage events

The administrator can configure OpsCenter to send alerts based on OpenStorage events:

- The OnCommand server can generate threshold or **Volume Almost Full** alarms.

- The OnCommand server can generate alerts about **FlexVol Autogrow** or **Dataset member resized**.

- Alerts based on the auto-discovery of unprotected NAS file services data.

As with other OpsCenter alerts, the administrator can configure the following aspects of the alerts:

- Whether the event is an error, an informational notification, or a warning.
- Who receives an email about the alert.
- The severity of the alert.
- For which master servers the alert configuration applies.

See the *Symantec OpsCenter Administrator's Guide* for information about configuring alerts.

Storage lifecycle policy reporting

The **Storage Lifecycle Policy** status report provides a summary of the SLPs of a selected master server.

Many columns in the report contain data that links to additional reports:

- **SLP Status by SLP**
- **SLP Status by Client**
- **SLP Status by Image**
- **SLP Status by Image Copy**

The **SLP Status by Image Copy** report displays the details of any snapshot copy that is a part of a SLP.

Disk pool monitoring

To view disk pool details, select the **Monitor** tab, and then the **Devices** subtab.

Select the **Disk Pools** tab above the table. Disk pool monitoring is divided into three tabs:

General tab The **General** tab (Figure 12-1) contains information about the selected disk pool, including the used and available space in the selected disk pool and whether the images in the disk pool have been imported.

The table also contains the following columns that pertain to snapshot replication:

- **Configured for Snapshots**
Identifies whether the disk pool is configured to contain snapshots, making it eligible for snapshot replication.
- **Mirror**
- **Primary**
- **Replication**

Disk Volume tab The **Disk Volume** tab contains information about the selected disk pool, including the location or path to the volume, and whether the volume is configured for snapshots.

Storage Server tab The **Storage Server** tab (Figure 12-2) contains information about the selected disk pool, including the server type and the number of active jobs for the storage server.

The table also contains a **Configured for Snapshots** column, which identifies whether the storage server is configured to contain snapshots.

Figure 12-1 Disk Pool General tab

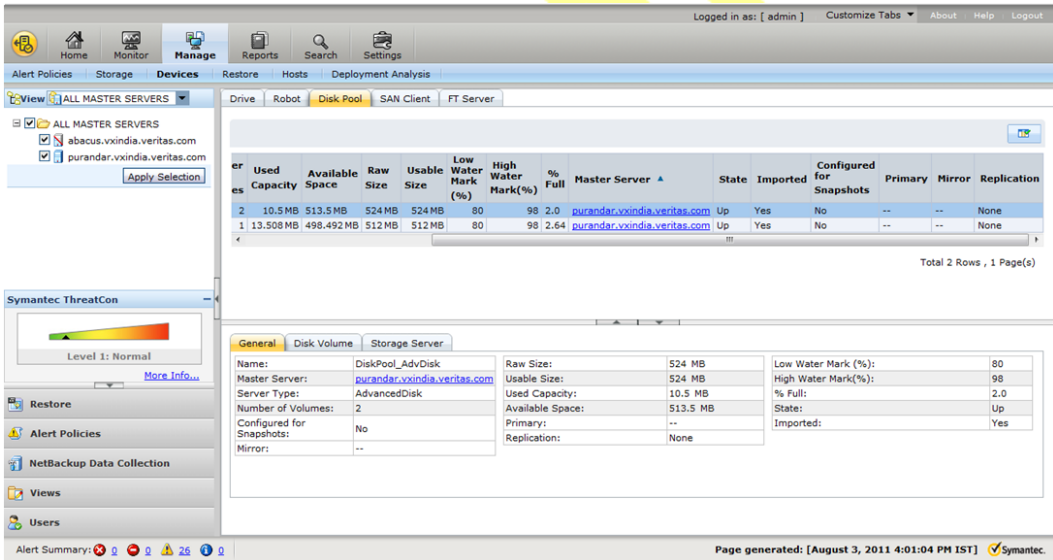
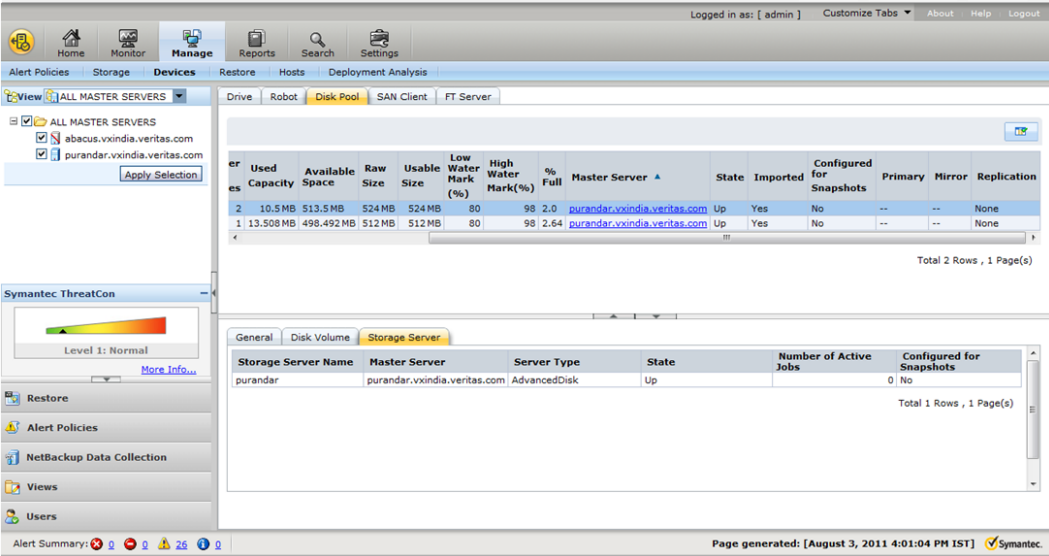


Figure 12-2 Disk Pool Storage Server tab



Monitoring snapshot replication jobs

To view the details of snapshot replication jobs, select the **Monitor** tab, and then the **Jobs** subtab.

From the drop-down **Filter** menu, select **Snapshot Replication** (Figure 12-3) to display only those jobs generated from snapshot replication.

The **General** tab displays details about the selected job, including the duplication method (**Method**) used to create the backup and the data transferred for each job (**Job Size**).

Figure 12-3 Snapshot Replication filter in Jobs subtab

Dec 14, 2010 6:11:22 PM to Jan 12, 2011 6:11:22 PM (PREVIOUS 29 Day(s))

Last 24 Hours

Last 48 Hours

Last 72 Hours

Customize

List View

Filter: Snapshot Replication

Cancel

Restart

Resume

Suspend

More

<input type="checkbox"/>	Job ID	Master Server	Type	State	Status	Policy	Client	Start Time	Elapsed Time	End Time	Files	Job Size	% Complete	Method
<input checked="" type="checkbox"/>	4	rtpqe18.vxindia.veritas.com	Backup	Done	0	sms-dm	rtpqe4-	Jan 4, 2011 3:20:25 PM	00:00:22	Jan 4, 2011 3:20:47 PM	0	0B	<div></div>	Snapshot Replication
<input checked="" type="checkbox"/>	1	rtpqe18.vxindia.veritas.com	Backup	Done	0	sms-tar	rtpqe4-	Jan 4, 2011 3:10:10 PM	00:00:37	Jan 4, 2011 3:10:47 PM	0	0B	<div></div>	Snapshot Replication

General

Attempts

File List

Job ID:	4	Job Size:	0 B	Data Movement:	Instant Recovery Disk and Tape
Master Server:	rtpqe18.vxindia.veritas.com	KB per Sec:	0	SessionID:	0
Client:	rtpqe44	Attempt:	1	Source Media Server:	
Media Server:	rtpqe18.vxindia.veritas.com	Schedule:	full	Destination Media Server:	rtpqe18.vxindia.veritas.com
Type:	Backup	Schedule Type:	Full	Destination Storage Unit:	
Backup Type:	Immediate	Policy:	sms_dm	Parent:	4
Method:	Snapshot Replication	Policy Type:	Standard	PID:	0
State:	Done	Owner:	root		
Status:	0	% Complete:	100		

Reporting on storage units, storage unit groups, and storage lifecycle policies

To view the details of storage units, storage unit groups, and storage lifecycle policies, select the **Manage** tab, and then the **Storage** subtab.

Select the **Storage Unit** tab above the table to display storage unit details, including whether the storage unit is enabled for snapshots and the name of the disk pool to which the storage unit belongs.

Storage Unit tab

The **General** tab (Figure 12-4) contains information about the selected storage unit.

The table also contains the following columns that pertain to snapshot replication:

- **Configured for Snapshots**

Identifies whether the storage unit is configured to contain snapshots, making it eligible for snapshot replication.

- Mirror
- Primary
- Replication

Storage Unit Group tab

The **Storage Unit Group** tab contains information about the selected storage unit group.

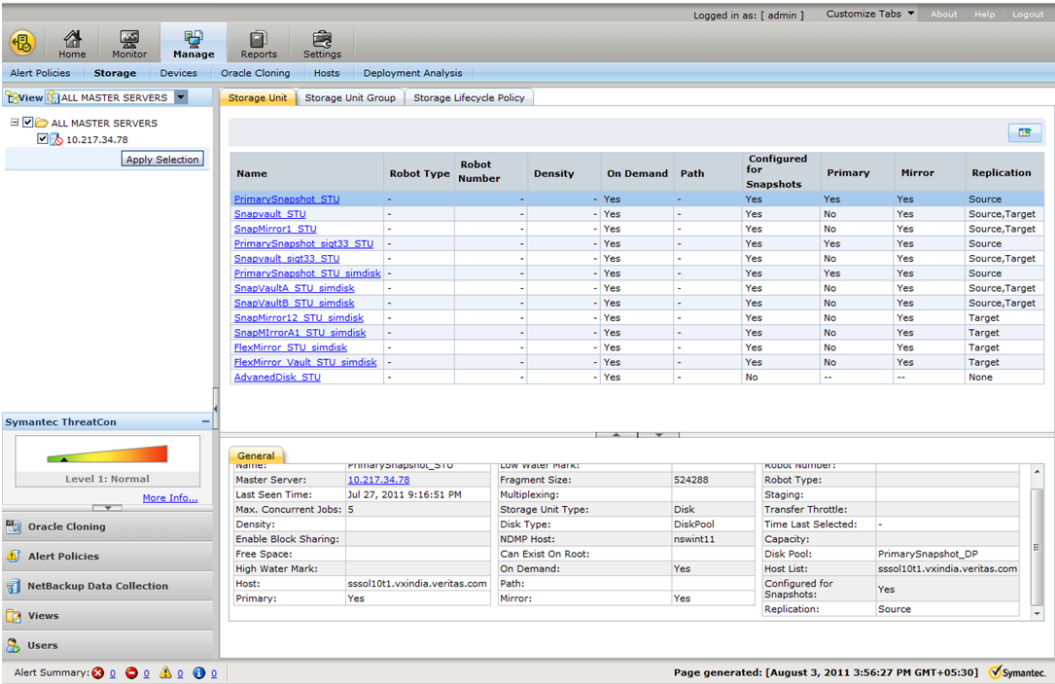
The table contains a **Configured for Snapshots** column which identifies whether the storage unit group can contain snapshots.

Storage Lifecycle Policy tab

The **Storage Lifecycle Policy** tab contains two subtabs:

- **General**
Displays SLP details, including whether the SLP is configured to preserve multiplexing, and the data classification on the SLP.
- **Operations**
Displays the operation type and storage unit that is assigned to each operation in the SLP.

Figure 12-4 Storage Unit General tab



Terminology

This chapter includes the following topics:

- [Replication terminology](#)

Replication terminology

Use the following table as a reference for understanding many terms that are used frequently when describing replication processes.

Table 13-1 Replication terms

Term	Definition
Backup	<p>The process of creating a copy of user data and creating backup or snapshot images of the data.</p> <ul style="list-style-type: none"> ■ The process of creating a new backup (tar) image of the client's data. ■ The process of creating a snapshot of the client's data.
CIM server	CIM (Common Information Model) server acts as a storage server with snapshot method type SMIS.
Copy	An instance of a NetBackup image which can stand alone; it can be read or deleted without affecting any other copy.
Data movement	A copy operation as performed by a third-party copy device or NetBackup media server.
Data mover	<p>The mechanism that is used to move data from storage on the production client to backup storage. Or, to duplicate, the data mover moves data from backup storage to different backup storage.</p> <p>Traditionally, NetBackup functions as the data mover and data travels through clients and media servers. Storage devices can provide more efficient mechanisms to move the data, such as NDMP, built-in replication, or OST (as in Optimized Duplication).</p>

Table 13-1 Replication terms (*continued*)

Term	Definition
Device	A general term for any of the following: LUN, logical volume, appliance, or disk array.
Disk array	A disk array which exposes LUNs (block device) or network shares (file system) to a host server over SAN, NFS, CIFS, or iSCSI protocols.
Domain	See NetBackup domain.
Duplication	NetBackup creates a copy by using a media server to move the data or by using the optimized duplication method.
EMC Symmetrix disk arrays	These arrays have adapted the Storage Management Initiative Specification (SMI-S) using the EMC SMI-S Provider.
FIM	Frozen Image Method. See OST_FIM.
Image	See backup image.
Instant recovery	Sometimes called Persistent Frozen Image (PFI).
Local domain	The domain in which the storage device resides and in which it is configured.
Mirror	<p>This term can mean either of the following:</p> <ul style="list-style-type: none"> ■ A disk that maintains an exact copy (duplicate or replica) of another disk. A mirror disk is often called a secondary, and the source disk is called the primary. All writes to the primary disk are also made to the mirror disk. ■ A type of snapshot that is captured on a mirror disk. At the appropriate moment, all further writes to the primary disk are held back from the mirror, which splits the mirror from the primary. As a result of the split, the mirror becomes a snapshot of the primary. The snapshot can then be backed up.
Mount host	<p>The host on which NetBackup mounts a snapshot when NetBackup needs to access the snapshot for any reason. Typically, NetBackup accesses the mount host to browse or to restore backups, or to perform either an Index From Snapshot or a Backup From Snapshot operation in a storage lifecycle policy.</p> <p>To mount a snapshot on a host other than the production client is generally more efficient because it avoids a negative impact on the performance of the production client. Media servers make excellent mount hosts because the media server is both a client and a media server (data mover). As such, NetBackup can often avoid an additional network hop. If no compatible media servers exist, dedicated clients are the next best choice.</p> <p>Note: The mount host and the production client must run the same operating system for the mount host to access the production client. The mount host must be at the same OS version or later. See the <i>NetBackup Snapshot Client Administrator's Guide</i> in the NetBackup documentation set for more details.</p>

Table 13-1 Replication terms (*continued*)

Term	Definition
NetApp Plug-in for Symantec NetBackup	Also referred to as the NBUPugin, this plug-in communicates with the OSTPlugin, using the XML-based messaging SOAP protocol to query the OnCommand server. The <i>NetApp Plug-in for Symantec NetBackup Installation and Administration Guide</i> is available from the NetApp Support Site .
NetBackup domain	A NetBackup installation with one master server and one or more media servers and clients. A single NetBackup domain may span more than one site or location. That is, the media servers and clients of a single NetBackup master server may not all be at same site where the master server resides.
NetBackup OpenStorage Plug-in for Replication Director	Also referred to as the OSTPlugin, this plug-in from NetBackup communicates with the NBUPugin, using the XML-based messaging SOAP protocol to query the OnCommand server.
OST_FIM	The name of the snapshot method that is selected in a policy that is configured for snapshot replication using Replication Director. The name represents OpenStorage Frozen Image Method.
OST device	A storage server that has implemented the OST plug-in interface.
Point-in-time rollback	A snapshot is a point-in-time, disk based copy of a file system or volume. A restore from a snapshot rolls the entire file system or volume back to a specific point in time. Therefore, a snapshot restore is called restoring from a Point-in-time rollback. All of the data in the snapshot is restored. Any data changes or snapshots that were made after that point-in-time are lost.
Primary volume	A unit of storage space that a disk array exposes to a host in the form of a network share (NFS or CIFS) or LUN block device. Primary volumes store an application's active data.
Replica	A replica is a bit-by-bit block copy of the snapshot.
Replication	The process of replicating a snapshot onto a separate disk array using NetBackup Replication Director.
Replication Director	A Symantec NetBackup product that is used to manage snapshot replication as a disaster recovery solution.
Replication source	A NetBackup-configured disk pool and storage unit that contains the volumes that serve as the source for subsequent replications.
Replication target	A NetBackup-configured disk pool and storage unit that can receive or accept replications from a replication source.

Table 13-1 Replication terms (*continued*)

Term	Definition
SMI-S adaptor or plug-in	The SMI-S plug-in is used for storage array vendors that have adapted the Storage Management Initiative Specification (SMI-S). The SMI-S adaptor is installed on NetBackup media servers and clients and enables routing of various storage management requests to the CIM Server. In NetBackup 7.6, the CIM Server is a storage server.
Snapshot	<p>A point-in-time, read-only, disk-based copy of a client volume or of a filer. A snapshot is created with minimal impact on other applications. NetBackup provides several types of snapshots, depending on the device where the snapshot occurs.</p> <p>An image copy that is a snapshot is also considered a replica. A snapshot copy consists of one or more snapshot fragments.</p>
Snapshot method	A set of routines for creating a snapshot. The NetBackup administrator can select the method, or let NetBackup select it when the snapshot begins (auto method).
Snapshot mirror	A disk mirror that is an exact replica of a primary volume at a particular moment, reproduced on a physically separate device.
Snapshot source	The production data (file system, raw partition, or logical volume) to which a snapshot method is applied. NetBackup automatically selects the snapshot source according to the entries in the Backup Selections list of the snapshot policy.
Storage device	See Disk Array.
Storage lifecycle policy (SLP)	NetBackup uses storage lifecycle policies to manage the lifecycle of a backup or snapshot image. An SLP controls the image migration, duplication, and replication within a single NetBackup master server domain.
Storage unit	<p>A storage unit is configured for one of two types of data:</p> <ul style="list-style-type: none"> ■ Backup storage units contain backup images. A backup storage unit cannot contain snapshots. ■ Snapshot storage units contain snapshots. A snapshot storage unit cannot contain backups. Replication Director uses snapshot storage units in snapshot replication configurations.
Storage server	A storage device that is configured in NetBackup. A storage server is a NetBackup entity that represents a disk array.

Troubleshooting

This chapter includes the following topics:

- [Logging for Replication Director](#)
- [Throttling Replication Director operations with NetBackup](#)
- [Standard policy restore error \(2800\)](#)
- [Problems due to the use of an unsupported topology](#)
- [Status 156 errors](#)
- [Policy and storage lifecycle policy issues](#)
- [Snapshot issues](#)
- [Import issues](#)
- [Replication issues](#)
- [Duplication issues](#)
- [Restore issues](#)
- [Assorted issues](#)

Logging for Replication Director

The following topics concern various aspects of logging for Replication Director.

Configuring the logging level in the NetBackup Administration Console

To view the information that is related to snapshots and snapshot replication, increase the verbose level of the logs to generate more detailed logs.

The `bpfis` directory contains both the `bpfis` log and the OSTPlugin logs for OpenStorage partners:

`NBU_INSTALL_PATH/logs/bpfis`

To configure the logging level in the NetBackup Administration Console

- 1 In the **NetBackup Administration Console**, select **NetBackup Management > Host Properties > Master Servers**.
- 2 Double-click on the master server name. In the **Master Server Properties** dialog box, select **Logging**.
- 3 Select **5** in the **Global logging level** drop-down menu for maximum logging.

Note: To configure logging for OST_FIM, the logging level must be set to 9 using the command line. Additional configuration is also required.

- 4 Click **OK** to save the setting.

Also check the logs of the OpenStorage partner for more information.

Configuring logging for the OST_FIM

By default, log entries for the OST_FIM do not appear in the `bpfis` log or directory. Perform the following steps to log information about OST_FIM.

To configure logging for the OST_FIM

- 1 The `ostfi.conf` file must appear in the following location:

- On Windows:

`C:\Program Files\Common Files\Symantec Shared\VxFI`

- On UNIX:

`/usr/opensv/lib/vxfi/configfiles/`

If the `ostfi.conf` file is not present, create it and add the following contents:

```
[DEBUG_TRACE_INFO]

"TRACERUNTIMEUPDATE"=dword:00000000

"TRACEFILE"="ostfi.log"

"TRACESTDOUT"=dword:00000000

"TRACEDIR"="/usr/opensv/netbackup/logs/bpfis/"

"TRACELEVEL"=dword:00000009
```

Note: If the `ostfi.conf` file is present, make sure that the `TRACELEVEL` is set to `00000009`.

- 2 Use the command line to change the logging level to 9. Information about the `OST_FIM` is not logged when the **Global logging level** is set to **5** in the **NetBackup Administration Console**.

First use the `bpgetconfig` command to obtain a list of configuration entries. Then use `bpsetconfig` to change the entries as needed.

For example:

```
echo VERBOSE=9 | bpsetconfig
```

For information about `bpgetconfig` and `bpsetconfig`, see the *NetBackup Commands Reference Guide*.

When the `OST_FIM` is configured to generate logs, the information appears in the `ostfi.log` log directory in addition to the `bpfis` log.

Configuring logging for VSS on Windows

Check the VSS-related event logs in the Microsoft Windows Event Viewer to help determine the failures that are related to VSS.

To generate logs in a specified file in the registry for the Windows Volume Shadow Services (VSS), use the following Microsoft Windows procedure:

[http://msdn.microsoft.com/en-us/library/windows/desktop/dd765233\(v=vs.85\).aspx#using_vsstrace](http://msdn.microsoft.com/en-us/library/windows/desktop/dd765233(v=vs.85).aspx#using_vsstrace)

Configuring logging for NetBackup VSS providers

Change the `TRACELEVEL` in the following file to 6.

```
VXFI_ROOT\configfiles\vss.conf
```

The logs are available in `VXFI_ROOT\logs` directory.

Configuring logging for EMC VSS

To generate the EMC VSS hardware provider debug logs, set the value of the following registry key to `debug`:

```
HKEY_LOCAL_MACHINE\SOFTWARE\emc\ShadowCopy\LogLevel
```

The logs will be available at `C:\Program Files\EMC\SYMAPI\log`

Throttling Replication Director operations with NetBackup

NetBackup offers three parameters to control or to throttle Replication Director operations.

- The disk pool **Limit I/O streams** setting.
The **Limit I/O streams** setting appears in the **New** or **Change Disk Pool** dialog box. The setting controls the number of NetBackup jobs that can use a disk pool concurrently.

By default, the **Limit I/O streams** check box is clear (not enabled), so there is no limit to the jobs that use a disk pool concurrently. Note that the **Limit I/O streams** setting must be expressed in increments of two because a single replication job requires two I/O resources.

For example, consider a situation in which the **Limit I/O streams** is set to 4 for the disk pool that contains the *PrimarySnapshot* LSU. This means that two concurrent replication jobs can be active in NetBackup, assuming that no batching is occurring. If a third replication job starts, it is queued until one of the first two replication jobs is complete. The NetBackup Job Manager queues the third job until one of the two running jobs is complete.

Batching can cause many replications to occur within a single NetBackup job. For this reason, another setting may be required in tandem with **Limit I/O streams**, as described here:

- The **Storage Lifecycle Parameters** host properties.
Change the **Maximum size per snapshot replication** parameter. This parameter applies only to the snapshot replication jobs that are batched together. By default, the value is 50.

Batching combines replications for multiple backup IDs (spanning policies and clients) whenever:

- The source and the target storage units are the same.
- The replication types are the same (mirror or non-mirror).
- The copy numbers are the same.

The scalability issue this can cause is that the NetBackup media manager can send a large number of nearly simultaneous snapshot replication requests to the NetApp Plug-in for Symantec NetBackup which can overwhelm either the plug-in or the OnCommand server.

This parameter can control how many NetBackup backup IDs can be batched together into a single replication job.

Based on the previous example of setting the disk pool **Limit I/O streams** limit, change the **Maximum size per snapshot replication** parameter in the **Storage Lifecycle Parameters** host properties.

- Disk pool **Limit I/O streams** is set to 4 for the disk pool containing the *PrimarySnapshot* LSU.
- Change the **Maximum size per snapshot replication** parameter to 10:
- Suppose that a duplication session starts and 25 backup IDs are pending replication for copy number 2.
 - Two replication jobs start, each for replicating 10 BIDs.
 - The Job Manager queues a third job: A replication job (for the remaining 5 BIDs). The job waits until one of the first two jobs completes.

For additional information about the **Storage Lifecycle Parameters** host properties, see the *NetBackup Administrator's Guide, Volume I* or the online Help.

- `bpdm` touchfile to control the `asyncWaitSnap` interval
During a batched replication job, `bpdm` calls `asyncWait` on all snapshots for all BIDs in succession. It then sleeps for a `timeout` value that is specified by the vendor as a return value to the `asyncWaitSnap` API before it makes another round of wait calls.

Because of the `timeout`, it can take up to 60 seconds for NetBackup to discover that a replication has completed. To increase job throughput at the expense of the OnCommand server load, this timeout value can be adjusted by creating the following file:

```
/usr/openv/netbackup/db/config/RPL_ASYNC_WAIT_SLEEP
```

The file should contain one line with a number that represents the number of seconds to use for this interval. The default value for the NetApp Plug-in for Symantec NetBackup is 60 seconds.

The setting takes effect the next time `bpdm` starts as part of a replication job.

- By default a snapshot creation job consumes one (1) I/O stream on the primary disk pool. Another setting can cause snapshot creation to consume zero I/O resources:
Add the following to the `bp.conf` file:

```
REQUEST_STU_RESOURCE_FOR_SNAPSHOT_JOBS = NO
```


Then, restart services.
- A snapshot replication job consumes two (2) I/O streams on the source disk pool and zero (0) on the target.

Standard policy restore error (2800)

The following table describes the restore problems that can result in a status code 2800 and possible solutions:

Standard policy restore error (2800).

Table 14-1 Solutions for the problems that can cause status code 2800

Problem or cause	Solution
<p>The administrator attempts to restore a backup to its original location. However, the NetApp volume fails with a status code 2800.</p> <p>The progress log displays the message:</p> <p>No space left on device.</p>	<p>The NetApp volume on which the snapshot resides must have enough free space for the restore to succeed. Even if the Overwrite existing files option is selected, the free space must equal more than the original backup size.</p> <p>The size requirement exists because the data blocks that correspond to the old file cannot be deleted while the snapshot refers to them.</p>
<p>The restore fails with a permission denied error while copying files to the primary volume.</p>	<p>The time on the NetBackup servers, the OnCommand server, and the filer must be synchronized or have a difference of less than 5 minutes.</p>
<p>The restore from a snapshot fails with status code 2800.</p> <p>The progress log displays the message:</p> <p>no files matched in the given data range</p>	<p>The restore fails if you select a different path other than what is listed in the Backup Selections tab of the policy.</p> <p>For example, vol6 and vol7 are volumes mounted on /mnt/vol6 and /mnt/vol7 respectively. These mount points are specified in the Backup Selections tab.</p> <p>During a restore, if you select only /mnt, (the parent directory of the path that is listed in the Backup Selections tab), the restore fails with status code 2800.</p> <p>To successfully restore from the snapshot copy, select the original path that is listed in the Backup Selections tab.</p> <p>In this example, specify /mnt/vol6 and /mnt/vol7 or the subdirectory or file.</p> <p>For more information on restoring snapshots, see the <i>NetBackup Snapshot Client Administrator's Guide</i>.</p>

Table 14-1 Solutions for the problems that can cause status code 2800
(continued)

Problem or cause	Solution
Snapshot-based backups and restores fail if the backup selection that is listed in the NetBackup policy contains any spaces either in the mount points or mount devices.	<ul style="list-style-type: none"> ■ No spaces in mount points Block device example: /dev/dg/vol is mounted on /mnt point NFS example: Filer:/vol/datavol is mounted on /nfs mnt ■ No spaces in mount devices Block device example: /dev/dg/vol data is mounted on /mntpoint NFS example: Filer:/vol/data vol is mounted on /nfsmnt

Problems due to the use of an unsupported topology

Snapshot replication supports many possible permutations of NetApp and EMC topologies.

See [“NetApp topologies that Replication Director supports”](#) on page 30.

See [“EMC topologies that Replication Director supports”](#) on page 43.

Using unsupported topologies can lead to snapshot backup and restore failures.

See [“NetApp topologies that are not supported by Replication Director”](#) on page 32.

Status 84 errors

Jobs that result from an unsupported topology fail with an error 84 (media write error) status code. For a status 84, examine the logs of the NetApp Plug-in for Symantec NetBackup on the OnCommand server.

■ On Windows:

Install_path/Program Files/NetApp/NBUPlugin/trace/

■ On UNIX:

/usr/NetApp/NBUPlugin/trace/NBUPlugintimestamp.log

The following log example describes an invalid topology in a replicated snapshot:

```
2 REPLICAT:6152 12 0 222230 2012/03/30 17:22:30
check_topology : BEGIN

0 REPLICAT:6152 211 0 222230 2012/03/30 17:22:30
```

```

ntap_dfm_replicate_snapshot : Unable to find the topology

1 STRWIDE :6152      1    0 222230 LFB:
Need 39 chars to store wide copy of UTF8 'Invalid topology in
replicate snapshot'

1 NALOG      :6152  494    0 222230 2012/03/30 17:22:30
Logging message to NT System Event Viewer

0 REPLICAT:6152  219    0 222230 2012/03/30 17:22:30
ntap_dfm_replicate_snapshot : END

```

Status 156 errors

The following situations can cause Status 156 errors:

Table 14-2 Solutions for the problems that can cause status code 156

Problem or cause	Solution
The snapshot job and the restore jobs from both the snapshot and the replicated snapshot fail with a Status 156.	<p>A NetBackup client (and every mount host used for snapshots of the client) must be able to contact the NetApp storage server using the DNS name. If the client (or mount host) cannot contact the NetApp storage server using the DNS name, the snapshot job and the restore jobs from both the snapshot and the replicated snapshot fail with a Status 156</p> <p>From the NetBackup client (or mount host), make sure that you can ping the NetApp storage server as follows:</p> <pre>ping <storage_server_dnsname></pre>
Alternate client backups and restores fail for a Windows client when logged into the NetBackup Client Service as the Local system account instead of as the Administrator account.	<p>To perform alternate client backups and restores for a Windows client, log into the NetBackup Client Service as the Administrator account, not as the Local system account. If the Local system account is selected, the backup fails with status 156.</p> <p>See “Configuring the NetBackup Client Service” on page 61.</p>
A live browse restore from the mirror copy fails.	<p>Before creating any snapshots, perform the following on the volume on which the NFS or CIFS share is created:</p> <ul style="list-style-type: none"> ■ Create the volume. Then, use the NetApp <code>vol</code> command options to enable the following: <ul style="list-style-type: none"> ■ Set <code>convert_unicode</code> on ■ Set <code>create_unicode</code> on ■ Begin to use the volume using CIFS or NFS to create snapshots.

Table 14-2 Solutions for the problems that can cause status code 156
(continued)

Problem or cause	Solution
Multiple snapshot jobs that were started at a high frequency fail with code 156 or 1541.	<p>Regarding snapshot the jobs that end with status code 156 or 1541 or other error.</p> <p>These errors may occur in the following situation: An administrator manually (or by using a script), starts multiple snapshot jobs at a high frequency. (For example, one snapshot job every 5 seconds.)</p> <p>At the same time, multiple rotation processes begin. The processes operate on the same catalog information, which includes information about existing snapshots. Because the processes work on the same information at the same time, a problem of inconsistency can occur. Some of the processes delete the snapshots and update the catalog while other processes continue to refer to the obsolete information. The result is that the snapshot jobs can end with status codes 156 (snapshot error encountered), 1541 (snapshot creation failed), or other unpredictable errors.</p> <p>This behavior does not occur for scheduled snapshot jobs, as NetBackup controls the job execution.</p>
Snapshot jobs fail with code 156 for the backup selections that contain dynamic disks.	<p>If using Veritas Storage Foundation for Windows for disk groups, dynamic volumes are not supported:</p> <ul style="list-style-type: none"> ■ Volume Shadow Copy Service (VSS) does not allow a dynamic volume snapshot to be imported on the same host. ■ VSS does not allow the importing of two snapshot devices of the same source dynamic volumes. <p>Replication Director cannot support the replication of dynamic volumes, since it is impossible to import snapshots and replicate snapshots onto same client.</p>

Table 14-2 Solutions for the problems that can cause status code 156
(continued)

Problem or cause	Solution
ET3050862; 1/31/13 Snapshot jobs fail with code 156 under the following conditions: <ul style="list-style-type: none"> ■ The operating system is Windows. ■ An EMC DMX array is used. ■ The BCV relationships were created with the clone emulation flag set to TRUE. 	Given this situation, snapshots may fail if the <code>EnableCloneEmulation</code> Windows registry entry is not set to TRUE. For snapshots to succeed, set the entry to TRUE. This registry entry is found in the following location: <code>HKEY_LOCAL_MACHINE\Software\EMC\ShadowCopy</code> Registry details: <ul style="list-style-type: none"> ■ Name: <code>EnableCloneEmulation</code> ■ Type: <code>REG_SZ</code> Possible values include: <ul style="list-style-type: none"> ■ TRUE: Enables Symmetrix array clone emulation. ■ FALSE: Disables Symmetrix array clone emulation.
ET2814488; 2/8/13 Snapshot jobs fail when using an EMC disk array and the backup selection in the policy contains multiple backup selections.	Make sure that the configuration does not contain a combination of emulation devices and non-emulation devices.

Policy and storage lifecycle policy issues

The following tables describe various causes for policy and storage lifecycle policy configuration and validation failures and possible solutions:

Table 14-3 Policy issues

Problem or cause	Solution
The volume is not visible in the Operations Manager. That means that the OnCommand server is not aware of the volume that was created on the filer.	Enable the SSH on filer. Restart the OnCommand server or refresh the connection. The volume should be visible in Operations Manager on the OnCommand server.
The filer and the OnCommand server are in different domains.	Make sure the <code>/etc/hosts</code> file on both the filer and the OnCommand server have entries for one another. Or, install the filer in the same domain.
The host credentials that are required to access a CIFS share are not set for the NetBackup Client Service (bpccd).	Set the credentials that are required to access a CIFS share in the NetBackup Client Service and restart the service.

Table 14-3 Policy issues (*continued*)

Problem or cause	Solution
<p>The SLP that contains Backup From Snapshot or Index From Snapshot operations fails with status 130.</p> <p>The backup policy that uses the SLP contains multiple backup selections that include a mix of native multi-pathing and vxddmp. (Veritas Dynamic Multi-Pathing (DMP) supports Veritas Volume Manager (VxVM) volumes on DMP metadevices, and Veritas File System (VxFS) file systems on those volumes.)</p>	<p>Do not use two types of multi-pathing software on the same device.</p> <p>http://www.symantec.com/docs/TECH75913</p>
<p>An NDMP policy that is configured for Replication Director fails.</p>	<p>Check to see if a schedule for the NDMP policy has the Override policy storage selection option enabled.</p> <p>If the override is an SLP that contains an Index From Snapshot operation, the Index From Snapshot operation is not supported in the NDMP policies that are configured for Replication Director.</p> <p>The SLP validation process does not detect the unsupported configuration because it does not check whether the Override policy storage selection option is enabled in the policy schedules.</p> <p>See “Index From Snapshot operation in an SLP” on page 120.</p>

Table 14-4 Policy and SLP validation issues

Problem or cause	Solution
<p>ET2798848; 1/6/13</p> <p>Storage lifecycle policy validation cannot be completed because the request times out.</p>	<p>SLPs that contain replication operations can take more than 60 seconds to validate. If the connectivity between NetBackup and the NetApp OnCommand server or the SMI-S server exceeds 60 seconds, the SLP may not validate.</p> <p>To increase the timeout to account for the latency in connectivity, perform one of the following tasks, depending on which NetBackup Administration Console you're using:</p> <ul style="list-style-type: none"> ■ For the NetBackup Administration Console on Windows: Increase the GUI connect timeout. To access the timeout option, select View > Options. Then select the Administration Console tab. Increase the GUI connect timeout value. ■ For the NetBackup-Java Administration Console or the Java Windows Administration Console: Increase the value for the <code>NBJAVA_CORBA_DEFAULT_TIMEOUT</code> option in the <code>nbj.conf</code> configuration file on UNIX or the <code>setconf.bat</code> file on Windows. The default is 60 seconds.

Table 14-4 Policy and SLP validation issues (*continued*)

Problem or cause	Solution
ET2942132; 12/14/12 Policy validation fails with status 14 (file write failed).	Policy validation fails with status 14 if the storage server name is 232 characters or more.
Policy validation fails for a policy to back up a Windows client. The <code>bpfis</code> log on the NetBackup client contains exit status 71 (none of the files in the file list exist).	The NetBackup Client Service is using the Local System Account. For Windows clients accessing a CIFS share on a NetApp storage system using a UNC path, the account used to run the NetBackup Client Service must be a non-system account After adding the correct credentials to access the CIFS share, restart the NetBackup Client Service on the client. See “Configuring the NetBackup Client Service” on page 61.
Policy validation fails with status 223 (an invalid entry was encountered).	Make sure the data volume on the filer to back up is mounted on the client that is listed in the NetBackup policy.
Policy validation fails due to a problem with a specified volume.	Make sure that a volume or <code>qtree</code> in the backup selection of the policy is not offline. ET3067841; 2/8/13 Also note that snapshot, indexing, and backup jobs remain in an active state if a volume or <code>qtree</code> in the backup selection is offline.
ET3085467/BURT679105; 2/21/13 When using NetApp storage, policy validation can take a very long time to complete in some situations.	When the first replication job in an SLP is in progress, then any concurrent validation or snapshot jobs for the same policy wait until the replication job completes. This situation can arise in the case of large volumes where the base replication can take a significant amount of time to complete.
Per Rahul spreadsheet: 10/25/12 Policy validation fails when using EMC disk array.	Ensure that the topology is valid for the source device (the attached BCV device.) Establish a mirror relationship for the source LUN.

Table 14-4 Policy and SLP validation issues (*continued*)

Problem or cause	Solution
ET3040402: 1/10/13 Policy validation fails when using EMC disk array.	<p>Check that the following registry key is set to <code>TRUE</code>:</p> <p><code>HKEY_LOCAL_MACHINE\SOFTWARE\emc\ShadowCopy\EnforceStrictBCVPolicy</code></p> <p>Policy validation fails if this registry key is set to <code>FALSE</code>.</p> <p>See “Required EMC device configuration for a remote snapshot and snapshot replica” on page 47.</p> <p>The EMC VSS hardware provider randomly selects any attached BCV device for snapshot creation. Even though a snapshot has been created on a particular BCV device, it could be picked by the EMC VSS hardware provider for creation of the snapshot.</p> <p>This can lead to a data loss situation because the earlier snapshot may be overwritten.</p> <p>When this registry key is set to <code>TRUE</code>, it ensures that the EMC VSS hardware provider does not pick the BCV device on which the VSS snapshot has been created:</p> <p>When the registry key is created and set to <code>TRUE</code>, the EMC VSS hardware provider selects the BCV pair relationship for VSS snapshot creation. A pair in one of the following states is selected:</p> <ol style="list-style-type: none"> 1. Synchronized 2. Sync In Progress 3. Split + BCV device state (<i>Not ready</i>) <p>If this key is not available in the registry, NetBackup creates it automatically and sets it to <code>TRUE</code> for this use case.</p>
ET2823272 Policy validation fails when SAN-connected storage is used.	<p>If either a Fibre Channel or an iSCSI license is installed on a storage system, make sure that the service is running.</p> <p>Policy validation fails if the license for either is present on the storage system and the service is not running.</p>

Snapshot issues

The following table describes various causes for snapshot failures and possible solutions:

Table 14-5 Snapshot issues

Problem or cause	Solution
Snapshot creation fails if the maximum snapshot limit is reached and no catalog image is marked as SLP-complete. In this case, rotation of snapshot fails.	The SLP is marked as complete sometime after the job completes. To manually mark the SLP as complete, use the <code>nbstlutil new_session</code> , located here: <code>NBUPlugin_INSTALL_PATH/bin/admincmd</code>
Per Rahul spreadsheet: 10/25/12 Snapshot creation fails when using an EMC disk array.	<ul style="list-style-type: none"> ■ Make sure that a mirror relationship is established for the source LUN. ■ Make sure that an EMC SYMAPI license is present. If not, add the SYMPAI license on the host.
Per Rahul spreadsheet: 10/25/12 Snapshot creation fails with offhost backup when using an EMC disk array.	Make sure that the snapshot LUN is visible to the alternate client.
Per Rahul spreadsheet: 10/25/12 Remote snapshot creation fails when using an EMC disk array.	Make sure that the topology configuration is correct.
Per Rahul spreadsheet: 10/25/12 In case of multiple volumes on a single LUN when using EMC: only one drive is visible in the Backup, Archive, and Restore interface after the Backup From Snapshot operation.	<p>The tar-formatted copy has data about only one drive.</p> <p>During a live browse, data is not displayed for all of the volumes or drives.</p> <p>EMC does not support multiple volumes or drives on a single LUN or device. A LUN should consist of a single volume or drive.</p>
When using EMC devices, experiencing intermittent failures in snapshot creation, snapshot import, or snapshot deletion.	Make sure that the gatekeeper (source or target (BCV)) that is attached to the client or alternate client is not shared with other hosts.
Per Rahul spreadsheet: 10/25/12; is this internal only? (Solution refers to the MWS) Snapshot creation fails when using a NetApp disk array.	Check that the <code>Import_snap_by_name</code> capability is available on the storage server. Add the <code>Import_snap_by_name</code> capability to the MWS configuration file.
ET2650359/BURT558998 Problems running snapshot jobs using a NetApp disk array.	NetApp recommends that the administrator does not cancel snapshot jobs that are running.

Table 14-5 Snapshot issues (*continued*)

Problem or cause	Solution
<p>Snapshot creation fails when using a NetApp disk array.</p> <p>The NetBackup_create_import_timestamp dataset may have been deleted.</p> <p>Check the log of the NetApp Plug-in for Symantec NetBackup for a message that includes the following information:</p> <pre>Import snap failed.</pre> <p>For example:</p> <pre>0 IMGINFO :-245482608 98 0 154918 2011/10/17 10:49:18 Import snap failed There is no dataset named '2718'. : 22255</pre>	<p>To clear the failure, restart the NBUPugin.</p> <pre>/etc/init.d/NBUPugin stop /etc/init.d/NBUPugin start</pre>
<p>ET3068879; 2-14-2013</p> <p>Snapshots and snapshot replications fail. The Windows Event Viewer displays the following SnapDrive entry in the Event log:</p> <pre>NOSNAPDIR option is currently turned ON in storage system 'system_name', Please turn this to OFF for snap shot creation to succeed</pre>	<p>Use the following command to turn the NOSNAPDIR option off for the storage system:</p> <pre>vol options vol_name nosnapdir off</pre>
<p>ET2884849/BURT609120</p> <p>Snapshot fails with status 20 (Invalid Command Parameter).</p> <p>A NetApp volume is deleted and then recreated with the same name. However, the same case was not used for the recreated volume.</p>	<p>The names of volumes are case-sensitive. If a volume is deleted and then recreated, the name of the new volume must be identical, with letters in the same case.</p> <p>For example, if volume <i>abc_vol</i> is deleted, do not recreate it as <i>Abc_Vol</i>.</p> <p>NetApp provides a solution for this situation in the NetApp Plug-in for Symantec NetBackup Installation and Administration Guide.</p> <p>ET3079652/BURT676105</p> <p>Similarly, policy validation and snapshot creation can fail if two volumes have the same name but in different cases. The cause is that different object IDs reference the same OnCommand server, which is case-insensitive.</p>

Table 14-5 Snapshot issues (*continued*)

Problem or cause	Solution
<p>ET2919001 - FID3032</p> <p>When using EMC Symmetrix SAN devices: Snapshots fail if the backup selections list contains the devices that are configured for local snapshots as well as devices that are configured for remote snapshots. (Fails with status code 4201.)</p> <p>NetBackup cannot create local as well as remote snapshots even if the underlying disk arrays are configured properly.</p>	<p>Create separate policies: one backup selection list can contain local snapshots and one can contain the remote snapshots.</p>
<p>Delays in snapshot processing on Windows for SAN devices.</p>	<p>Only one shadow copy can be created, imported, or deleted at a time. The VSS snapshot-related operation can fail when multiple VSS operations are performed simultaneously.</p> <p>The Windows VSS API requestor is responsible for serializing the shadow copy operations. (The serialization can be observed by using Windows VShadow or DiskShadow utilities.)</p> <p>Two registry keys can facilitate the serialization for NetBackup clients. Table 14-6 describes the details of the keys and the settings that allow for serialized and quicker snapshots.</p>
<p>ET2850034; 2/13/13</p> <p>Snapshots fail for a policy of type MS-Windows, yet the policy passes policy validation. The policy uses Volume Shadow Copy Service (VSS) with Replication Director and the storage lifecycle policy contains only snapshots in a SAN topology.</p>	<p>The vendor has the responsibility to provide certain policy validation checks. In this situation, where the policy is of type MS-Windows, NetBackup tries to validate the policy through the VSS framework. However, the VSS framework cannot provide the necessary validation.</p> <p>For a policy of the Standard type, NetBackup validates successfully by using the SMI-S plug-in.</p> <p>The following are two examples of problems that the NetBackup policy validation cannot detect:</p> <ul style="list-style-type: none"> ■ It cannot detect whether pairing between devices is available or not on EMC Symmetrix arrays. ■ It cannot detect whether mandatory licenses for snapshot and replication operations (such as SnapRestore) are available or not on NetApp arrays.

Table 14-6 Registry keys and settings to facilitate snapshot serialization

Key name	Possible values	Default type	Comment
HKEY_LOCAL_MACHINE\SOFTWARE\VERITAS\NetBackup\CurrentVersion\Config\VSS_SERIALISE_OPERATIONS	0 or 1	1	0: Disable VSS snapshot operation serialization. 1: Enable VSS snapshot operation serialization. By default, the serialization of VSS snapshot creation is enabled.
HKEY_LOCAL_MACHINE\SOFTWARE\VERITAS\NetBackup\CurrentVersion\Config\VssOperationMutexLockTimeout	An integer value.	36000	The timeout is indicated in microseconds.

Import issues

The following table describes various causes for import failures and possible solutions.

Table 14-7 Import issues

Problem or cause	Solution
The snapshot import has failed. The NetApp Plug-in for Symantec NetBackup failed to export the snapshot volume.	Perform the following steps on the source volume: <ul style="list-style-type: none"> ■ Create the volume and enable <code>convert_unicode</code> on and <code>create_unicode</code> on using <code>vol options</code> commands. ■ Begin to use the volume using CIFS or NFS and create snapshots.
<p>Per Rahul spreadsheet: 10/25/12</p> <p>When using NetApp storage:</p> <p>The iSCSI management session is not visible in the SnapDrive window.</p>	<p>Not sure what is being said here:</p> <pre>cd C:\Windows\system32\wbem mofcomp iscsidsc.mof mofcomp iscsiprf.mof mofcomp iscsihba.mof</pre> <p>Restart the SnapDrive service.</p> <p>Refresh the storage, SnapDrive, and local server.</p>

Table 14-7 Import issues (*continued*)

Problem or cause	Solution
Per Rahul spreadsheet: 10/25/12 When using NetApp storage: The snapshot import fails for iSCSI devices.	If a Fibre Channel is attached to the host, NetBackup expects the LUN to arrive on Fibre Channel. If the zoning is not in place, the device does not arrive on the host and the import fails. Have the Fibre Channel zoning between the disk array and the host if a Fibre Channel card is used.
Per Rahul spreadsheet: 10/25/12 When using NetApp storage: The snapshot or replica import fails for NetApp SAN devices.	The device is not visible on the mount host. The <code>bpfis</code> log reports: <code>UDID NOT FOUND</code> <ul style="list-style-type: none"> ■ For Fibre Channel devices: Check that zoning is available between the disk array and the mount host. ■ For iSCSI devices: Establish an iSCSI session between the mount host and the disk array.
Per Rahul spreadsheet: 10/25/12 The replica import fails on Windows.	Multiple paths may exist for the same target devices. Install multipathing software on the host.

Cleaning up snapshot devices after leak from import

Per ET2984672

A backup policy (**MS-Windows** type) that uses Replication Director VSS snapshots for SAN devices on Windows may fail due to an import failure. While the snapshot operation on the storage device is successful, the import fails, causing the job to fail. However, the snapshot being taken on the storage device causes a storage device leak.

In this situation, the **Activity Monitor** displays the job failure with one of the following NetBackup status codes:

- 4201: Incorrect snapshot method selected or snapshot method configured incorrectly.
- 58: Cannot connect to the client machine.

The import failure may occur if the alternate client services are not accessible in the event of an offhost backup or a VSS failure. If this is the case, the `bpfis` log on the primary client contains the following message:

```
In case of snapshot creation using vendor VSS hardware provider,
snapshot devices may get leaked due to incomplete import operation.
VSS framework does not allow to delete un-imported snapshot. The
leaked snapshot devices can be recovered using Microsoft Vshadow
```

utility. Please use the xml file *[xml file location]* created on client *[primary client name]* to import and delete the snapshot manually using Vshadow utility on alternate client *[alternate client name]*. Please refer event viewer and Hardware VSS provider logs for more details. Delete the file manually after cleanup.

Use the following procedure to clean up the snapshot devices after the leak:

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To clean up leaked snapshot devices

- 1 Use the Microsoft Windows Vshadow utility to manually import and delete the unimported snapshot. In case of offhost backup, copy the xml file from the primary client to the alternate client.
- 2 Use the xml file to import the snapshot:

```
C:\>vshadow.exe -i=  
C:\Program Files\Veritas\NetBackup\temp\  
bpfis.fim.rtpqe07.12345.1.0.xml  
  
VSHADOW.EXE 3.0 - Volume Shadow Copy sample client.  
Copyright (C) 2005 Microsoft Corporation. All rights reserved.  
  
(Option: Import shadow copy set from file  
'C:\Program Files\Veritas\NetBackup\temp\  
bpfis.fim.rtpqe07.12345.1.0.xml')  
Reading the file C:\Program Files\Veritas\NetBackup\temp\  
bpfis.fim.rtpqe07.12345.1.0.xml'  
...  
- Setting the VSS context to: 0xffffffff  
Importing the transportable snapshot set...  
(Waiting for the asynchronous operation to finish...)  
Shadow copy set successfully imported.
```

- 3 Use the snapshot ID from the xml file to delete the snapshot.

The following is an example of the snapshot ID content from the xml file:

```
<SNAPSHOT_DESCRIPTION snapshotId=  
"566a7cb3-4ca4-4a8b-b8b0-707911a5e234"  
C:\>vshadow.exe -ds={566a7cb3-4ca4-4a8b-b8b0-707911a5e234}  
  
VSHADOW.EXE 3.0 - Volume Shadow Copy sample client.  
Copyright (C) 2005 Microsoft Corporation. All rights reserved.  
  
(Option: Delete a shadow copy)  
- Setting the VSS context to: 0xffffffff  
- Deleting shadow copy {566a7cb3-4ca4-4a8b-b8b0-707911a5e234} ...
```

Replication issues

The following table describes various causes for replication failures and possible solutions:

Table 14-8 Replication issues

Problem or cause	Solution
The OnCommand licenses are not installed.	Install all of the licenses on the OnCommand server for Operations Manager, Provisioning Manager, and Protection Manager.
Entries for backup volumes exist in the OnCommand server which have been deleted from filer.	Delete the stale entries from the OnCommand server using the Operation Manager.
SnapVault and SnapMirror options are not configured to access the vault and mirror from the target filer.	Configure the SnapVault and SnapMirror options on the source filer to access the vault and mirror from the target filer.
Incorrect OnCommand server configuration. (See the following.)	(See the following.)

To check the OnCommand server configuration, run the following commands on the OnCommand server. The output from each command should look like the following:

```
$ dfm option list pmUseSDUCompatibleSnapshotNames
```

```
Option Value
```

```
-----
pmUseSDUCompatibleSnapshotNames Yes
```

```
$ dfm option list pmCustomNameUseQtreetList
```

```
Option Value
```

```
-----
pmCustomNameUseQtreetList No
```

```
$ dfm option list pmCustomNameUseRetentionType
```

```
Option Value
```

```
-----
pmCustomNameUseRetentionType No
```

If the output differs from the output that is shown here, run the following commands to correctly set it:

```
$ dfm option set
```

```
pmCustomNameUseRetentionType=No
```

```
$ dfm option set
pmCustomNameUseQtreeList=No

$ dfm option set
pmUseSDUCompatibleSnapshotNames=yes
```

Duplication issues

The following table describes various causes for duplication of backup (tar) image failures and possible solutions:

Table 14-9 Duplication issues

Problem or cause	Solution
The credentials that are required to access a CIFS share are not set for the NetBackup Client Service (bpccd).	Set the credentials that are required to access a CIFS share in the NetBackup Client Service and restart the service.
A space [] appears in one of the backup selections.	Rename the backup selection, omitting the space.

Restore issues

The following table describes problems and possible solutions for restore issues.

Table 14-10 Restore issues

Problem or cause	Solution
Unable to browse to client data that resides on a CIFS share on NetApp storage. Browse produces the following error in the Backup, Archive, and Restore client interface: Permission denied by client during rcmd.	Run the NetBackup Client Service on the NetBackup client or alternate client with a non-system account that has credentials to enable access to the CIFS share on the NetApp storage. If the NetApp appliance is not running with valid credentials to the CIFS share, NetBackup fails to access the content of the snapshot and returns an error. After adding the correct credentials, restart the NetBackup Client Service on the client or alternate client. See “Configuring the NetBackup Client Service” on page 61.

Table 14-10 Restore issues (*continued*)

Problem or cause	Solution
<p>On a Windows-based client, a live browse operation, a Backup From Snapshot operation, or an Index From Snapshot fails.</p> <ul style="list-style-type: none"> ■ The Backup, Archive, and Restore client interface displays no content. ■ The Backup From Snapshot or Index From Snapshot operation fails with status 71 (none of the files in the file list exist) ■ The following error appears on the NetApp console when accessing the share from Windows Explorer: Unable to acquire filer credentials: (0x96c73a25) Filer and domain time differ by more than 5 minutes. 	<p>The time on the Windows domain controller and the filer must be synchronized or have a difference of less than 5 minutes. If the difference is greater than 5 minutes, the filer does not give the Windows client CIFS share access, resulting in error on the filer console.</p> <p>Use the date command to set the time on the NetApp storage.</p>
<p>ET2778877; 2/7/13</p> <p>Unable to browse the snapshot contents for restore even after the snapshot job was done successfully.</p>	<p>Check the Backup Selections tab of the backup policy to make sure that different storage stacks are not protected by a single policy.</p> <p>Specifying multiple volumes of different storage stacks in a single policy is not supported.</p> <p>Applies to both NetApp and EMC disk arrays.</p>
<p>Unable to browse to the snapshot for an alternate client restore.</p> <p>Also, a Backup From Snapshot operation fails with the status code 4213.</p>	<p>To successfully perform an alternate client restore from a snapshot, the Veritas Volume Manager (VxVM) versions must be the same on both the client and the alternate client.</p> <p>The different versions of VxVM can also cause a Backup From Snapshot operation to fail with status code 4213.</p> <p>Upgrade the NetBackup clients to the same version of VxVM.</p>
<p>Unable to browse to the snapshot for restore.</p> <p>A browse operation can fail when the NBUPugin is hosted on a SUSE 11 Linux computer with a kernel version later than 2.6.</p>	<p>Revert to the kernel 2.6 version and perform the snapshot.</p>

Table 14-10 Restore issues (continued)

Problem or cause	Solution
Restores or Backup from Snapshot operations do not work properly. Back up and restore problems exist if the operating system that is used is RHEL 5.3 with kernel version 2.6.18-128.el5. Specifically, a problem exists with <code>kobject_add</code> .	NetBackup 7.6 does not support this kernel version. A request for a kernel fix has been opened with RHEL.

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Table 14-10 Restore issues (*continued*)

Problem or cause	Solution
<p>Using EMC PowerPath on Solaris 10, the snapshot or the snapshot replica device mount fails. The result is the failure to perform a live browse, a backup, an Index From Snapshot operation or copy back restore from the snapshot or the snapshot replica</p> <p>The failures occur because the <code>mount</code> command fails to mount the snapshot device. When the <code>mount</code> command is run on the shell, it reports error messages similar to those in Figure 14-1.</p> <p>LUNs were removed from the host but were not cleaned up on the operating system.</p> <p>The job details display a status code 4213 (Snapshot import failed) for this problem. The <code>bpfis</code> log displays messages similar to those in Figure 14-2.</p>	<p>The devices that display <code>drive not available</code> must be removed from the operating system. Use the following steps to ensure that no more jobs fail because of this issue.</p> <p>(For the failed job, the snapshot device can still be mounted from other hosts and can be used for recovery outside of NetBackup.)</p> <ol style="list-style-type: none"> Perform this step if using Storage Foundation: <p>Stop <code>vxesd</code> (the Volume Manager Event Source Daemon). <code>vxesd</code> may pick up disks again after you remove them with <code>vxdisk rm</code>:</p> <pre># vxddladm stop eventsource # ps -ef grep vxesd</pre> Perform this step if using Storage Foundation: <p>Remove the device from <code>vxvm</code>:</p> <pre>vxvg -g <dg> rmdisk <disk>, vxdiskunsetup -C <disk></pre> Perform this step if using Storage Foundation: <p>Remove the device from DMP:</p> <pre>rm /dev/vx/*dmp/<device>*</pre> <p>Note: Make sure to choose only the devices that you intend to remove and not devices with similar names.</p> Remove the device from PowerPath: <pre>powermt remove dev=<device></pre> <p>Note: By default, <code>powermt</code> removes all devices: Specify the device by name.</p> Unconfigure the device from the operating system using <code>cfgadm</code> or <code>luxadm</code>. Run <code>devfsadm -Cv</code> after the disks have been unrepresented from storage.

Table 14-10 Restore issues (*continued*)

Problem or cause	Solution
ET2823272/BURT611248 Browse of snapshots from Backup, Archive, and Restore client interface fails.	Browse problems can arise if the exported LUN uses Fibre Channel for the mounted volume and the volume is protected with iSCSI. This can occur in the case where a NetBackup client is configured for both Fibre Channel and iSCSI.

Figure 14-1 Mount command failures

```
44. c6t5006048AD5F04161d100 &lt;drive not available&gt;
    /pci@500/pci@0/pci@d/QLGC,qlc@0/fp@0,0/ssd@w5006048ad5f04161,64
45. c6t5006048AD5F04161d102 &lt;drive not available&gt;
    /pci@500/pci@0/pci@d/QLGC,qlc@0/fp@0,0/ssd@w5006048ad5f04161,66
46. c6t5006048AD5F04161d103 &lt;drive not available&gt;
    /pci@500/pci@0/pci@d/QLGC,qlc@0/fp@0,0/ssd@w5006048ad5f04161,67
47. c6t5006048AD5F04161d104 <drive not available>
    /pci@500/pci@0/pci@d/QLGC,qlc@0/fp@0,0/ssd@w5006048ad5f04161,68
48. c6t5006048AD5F04161d105 <drive not available>
```

Figure 14-2 bpfis log with status code 4215

```
07:26:37.842 [26308] <2> onlfi_vfms_logf: INF - snapshot services: gfspfi:Tue
Jul 17 2012 07:26:37.842533 <Thread id - 1> GFSP::importTreeNode - command
[/sbin/mount -o
ro "/dev/dsk/emcpower47g" "/tmp/_vrts_frzn_img_vishnul_vishnul1_11224_1"]
failed with message 'mount: I/O error
07:26:37.846 [26308] <2> onlfi_vfms_logf: INF - snapshot services: devicefi:
Caught unhandled execution pipe exception VFI_EXEC_PIPE_CMD_FAILED
at /sbin/mount -o
ro "/dev/dsk/emcpower47g" "/tmp/_vrts_frzn_img_vishnul_vishnul1_11224_1", ../gf
sp_plugin.cpp, 1299
```

Assorted issues

The following table describes various problems and possible solutions:

Table 14-11 Assorted troubleshooting issues

Problem	Cause	Solution
Problems with policy validation, snapshot creation, and duplication.	The NetApp Plug-in for Symantec NetBackup is not installed properly.	<ul style="list-style-type: none"> Check the installation logs of the NetApp Plug-in for Symantec NetBackup for errors and warnings. The log should contain no errors. Generally, if licenses are not installed on the OnCommand server, the plug-in has not been installed properly. Before installing the plug-in, install the required licenses on the OnCommand server. The install logs are available in the following location: <code>NBUPlugin_INSTALL_PATH\NBUPlugin_install.log</code> Make sure that the three plug-in processes are running: nadapter_32, processmanager, and commnmanager. Check the following directory: <code>NBUPlugin_INSTALL_PATH/processmanager status</code> Check the plug-in logs available in the following file: <code>NBUPlugin_INSTALL_PATH\trace\NBUPlugin*.log</code>
Job fails with PFI rotation error 13.	Some operations may take longer to complete due to network connectivity, causing jobs to time out and fail.	<p>Consider increasing the <code>REQUEST_DELIVERY_TIMEOUT</code> configuration option from the default of 300 (5 minutes) to 900 (15 minutes).</p> <p>For example:</p> <pre>REQUEST_DELIVERY_TIMEOUT = 900</pre> <p>This option does not appear in the NetBackup Administration Console host properties. See the <i>NetBackup Commands Reference Guide</i> for information about using the <code>bpgetconfig</code> and the <code>bpsetconfig</code> commands to change the configuration option in the <code>bp.conf</code> file (UNIX) or the registry (Windows).</p>
Expiration of catalog image fails.	A space [] appears in one of the backup selections.	Rename the backup selection, omitting the space.
ET3012871; 2/6/13 An Index From Snapshot job fails with status code 4213 where the client is Windows 2003.	For Windows 2003 clients only, the Fibre Channel Information Tool (fcinfo) must be installed on the system.	<p>For Windows 2003 systems, verify that the Fibre Channel Information Tool (fcinfo), is installed on the system. See the following link for more information:</p> <p>http://www.microsoft.com/en-us/download/details.aspx?id=17530</p>

Table 14-11 Assorted troubleshooting issues (*continued*)

Problem	Cause	Solution
An Index From Snapshot job fails with status code 4213 or 13 (upon retry).	Stale disk groups on an off-host client can cause an Index From Snapshot job to fail.	The stale devices can be caused when part of an earlier import job failed and the deport did not conduct a proper cleanup of the devices. Delete stale disk groups on the off-host client and retry the job.
A Backup From Snapshot job or an Index From Snapshot job fails with status code 55 (permission denied by client during rcmd). The <code>bpcd</code> log on the NetBackup client contains exit status 55.	The NetBackup Client Service on the NetBackup client or alternate client must have valid credentials to access the CIFS share on the NetApp storage system.	For Windows clients accessing a CIFS share on a NetApp storage system, the account used to run the NetBackup Client Service must be a non-system account After adding the correct credentials to access the CIFS share, restart the NetBackup Client Service on the client. See “ Configuring the NetBackup Client Service ” on page 61.
ET2822069/BURT612119 Backup From Snapshot or Index From Snapshot jobs fail with status code 4213 for replica copies.	The <code>bpfis</code> import job fails with status code 4213 and the devices are not visible or available online.	<ul style="list-style-type: none"> ■ Check that the SAN zoning has completed between the disk arrays and the client. ■ For NetApp iSCSI devices, establish an iSCSI session between the client and the disk arrays on which the replica is created. <p>Note: For iSCSI to support block devices, make sure that no HBA cards are attached to the host. If NDMP is used, it must be enabled on both the primary and the secondary filers.</p> <p>ET3047876; 1/29/13</p> <p>The following error displays in the <code>bpfis</code> logs when snapshot import fails with error 4213 due to an iSCSI establishment error:</p> <p><i>For host with HBA card, verify correct zoning and mapping exist between host and target array. For host without HBA card, verify iSCSI session is established between host and target array.</i></p>
ET2962365; 1/10/13 Backup From Snapshot or Index From Snapshot jobs fail with status code 4213.	If using a GNOME system configuration, check to see if automount is enabled.	Disable the automount in the GNOME system configuration and reboot the server.

Table 14-11 Assorted troubleshooting issues (*continued*)

Problem	Cause	Solution
When configuring a disk pool for a NetApp OnCommand storage server, no LSUs display for selection in the Disk Pool Configuration Wizard.	The default NetBackup group on the OnCommand server does not contain and resource pools.	When the NBUPlugin is installed on the OnCommand server, a NetBackup group is automatically created on the OnCommand server. On the OnCommand server, use the NetApp Operations Manager to add resource pools to the NetBackup group so that the resource pools are exposed to NetBackup. If the NetBackup group contains no resource pools, no LSUs display in the Disk Pool Configuration Wizard.
ET3060862; 1/31/13 A Backup From Snapshot job or a snapshot import fails with status code 4213 (Snapshot import failed) when using iSCSI NetApp LUNs.	The Windows version must be at Windows 2008 R2 and not Windows 2008 SP2 so that the state of the snapshot device can be properly detected.	Make sure that the Windows version is at Windows 2008 R2.
ET2919709; 2/7/13 A Backup From Snapshot is partially successful where the policy contains multiple clients.	The Backup From Snapshot may be partially successful for a client where all of the backup selections are not present on that client.	This is expected behavior.

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