NetBackup™ Snapshot Manager for Data Center Administrator's Guide

RHEL, SLES, Ubuntu

Release 11.1

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NetBackup™ Snapshot Manager for Data Center Administrator's Guide

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https://sort.veritas.com/data/support/SORT_Data_Sheet.pdf

Contents

Chapter 1

Introduction

This chapter includes the following topics:

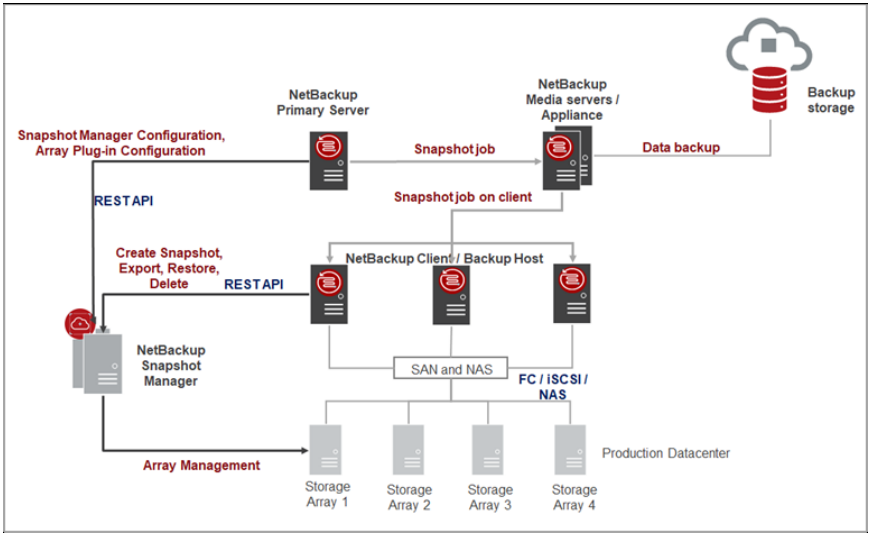
About NetBackup Snapshot Manager for Data Center

NetBackup Snapshot Manager for Data Center is developed as a micro-services-based application and uses the micro-services model of deployment. It provides a variety of snapshot-based features for NetBackup.

NetBackup Snapshot Manager for Data Center discovers devices on various storage arrays and manages snapshot lifecycle management of these devices. You can connect these devices over Fibre Channel, iSCSI networks (SANs) or as NAS devices using NFS or SMB protocol. When you use NetBackup in an on-premises environment, you can protect the workload data residing on the supported on-premises storage arrays.

Starting from NetBackup 11.1, using the same NetBackup Snapshot Manager for Data Center deployment, you can protect both on-premises NAS assets and cloud assets like VMs and databases. You can protect cloud assets using an on-premises deployment, or protect on-premises assets using a cloud-based deployment.

Following is the high-level architecture diagram for snapshot management in NetBackup using Snapshot Manager for Data Center:



Terminology

The following table describes the concepts and terms in D-NAS data protection.

Table 1-1 D-NAS terminology

Term	Definition
Backup	The process of creating a copy of user data and creating backup images of the data. Can be any of the two: ■ The process of creating a new backup image of the client's data that is tar-formatted. ■ The process of creating a snapshot of the client's data.
Backup host	The backup host acts as a proxy client where the snapshot of the NAS share is staged for reading purpose. All the backup and restore operations are run through the backup host. You can configure NetBackup media servers, clients, or a primary server as a backup host. The backup host is also used as a destination client during restores.

Table 1-1 D-NAS terminology *(continued)*

Term	Definition
Backup job	A backup job in D-NAS is a compound job. ■ The backup job runs a discovery job for getting information of the data to be backed up. ■ Child jobs are created for each backup host that performs the actual data transfer. ■ After the backup is complete, any temporary files or transient information is cleaned up and then job is marked complete.
Child job	For backup, a separate child job is created for each backup host to transfer data to the storage media.
Copy	An instance of a NetBackup image which can be standalone; it can be read or deleted without affecting any other copy.
Data mover	The mechanism that is used to copy data from storage on the production client to back up storage. Or, to duplicate, the data mover copies data from backup storage to different backup storage. 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).
Discovery of NAS shares	When a storage array plug-in is created, a discovery task starts on the Snapshot Manager for Data Center host. The discovery job communicates with the arrays and gathers information of storage array clusters, arrays, volumes, and shares. The discovery runs periodically every 4 hours in a day to refresh its asset information. NetBackup presents this asset information for user selection.

Table 1-1 D-NAS terminology *(continued)*

Term	Definition
Disk array	A disk array which exposes storage or network shares to a host server over SAN, NAS, NFS, CIFS, or iSCSI protocols.
Dynamic streaming	NetBackup Dynamic streaming is a framework that engages multiple backup and restore streams to read data in a distributed manner and send them for backup storage or the restore location.
Media server	Media servers provide additional storage by allowing NetBackup to use the storage devices that are attached to them. Media servers can also increase performance by distributing the network load. Media servers can also be referred to by using the following terms: ■ Device hosts, when tape devices are present. ■ Storage servers, when I/O is directly to disk. ■ Data movers, when data is sent to independent, external disk devices like OpenStorage appliances.
MSDP	Media Server Deduplication Storage Pool is a NetBackup deduplication technology engine to optimize backup storage.
NetBackup Accelerator	A backup technology that speeds up the backup process by reducing the amount of data sent to the media server. It can be used for full and incremental backups.
NetBackup certificate	A security certificate that is issued from the NetBackup CA.

Table 1-1 D-NAS terminology *(continued)*

Term	Definition
NetBackup Replication	The process of copying and transferring backups created in one NetBackup domain to the storage of another NetBackup domain. This process creates a duplicate set of backups at a different location. Replication is typically used for disaster recovery purposes. This function is primarily known as Auto Image Replication (AIR) within NetBackup.
NetBackup Snapshot Manager for Data Center	Undertakes on-premises storage array snapshot management and replication tasks. NetBackup Snapshot Manager for Data Center has plug-ins which integrate with REST APIs and SDK of storage array vendors for interaction with storage arrays. NetBackup also enables NetBackup Snapshot Manager for Data Center for snapshot management of Cloud offerings of Storage arrays, viz., NetApp CVO, and Azure Files.
Primary copy	The Primary copy or Copy 1 refers to the snapshot copy of the D-NAS backup job. The backup copies created from the primary snapshot copy are called Copy 2 or secondary copies.
Primary server	The primary server manages backups, archives, and restores. The primary server is responsible for media and device selection for NetBackup. Typically, the primary server contains the NetBackup catalog. The catalog contains the internal databases that contain information about NetBackup backups and configuration.
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.

Table 1-1 D-NAS terminology *(continued)*

Term	Definition
RBAC	Role-based access control. The role administrator can delegate or limit access to the NetBackup UI through the roles that are configured in RBAC.
Role	For RBAC, defines the operations that a user can perform and the NAS shares that they can access. For example, you can configure a role to manage recovery of specific NAS shares and the credentials that are needed for backups and restores. 'Default NAS Administrator' is an RBAC role tailored for NAS administrators.
Replication job	A replication operation is specified in an SLP that was added to a D-NAS policy. Generates a replication parent-child job in the Activity monitor.
Snapshot	Refers to a point-in-time copy of the NAS volume or share on the storage arrays. An image copy that is a snapshot is also considered a replica. A snapshot copy consists of one or more snapshot fragments.
Snapshot job	A NetBackup job that creates a hardware snapshot for the NAS volume or share specified in the policy. NetBackup creates a parent-child job hierarchy, where each child job represents a NAS volume or share in the backup selection.
Storage lifecycle policy (SLP)	NetBackup uses SLPs to manage the lifecycle of a backup or snapshot image. An SLP controls image migration, duplication, and replication within a single NetBackup primary server domain.
Storage server	A storage device that is configured in NetBackup. A storage server is a NetBackup component that represents a disk array.

Table 1-1 D-NAS terminology *(continued)*

Term	Definition
Storage unit	A storage unit is configured for one of two types of data: ■ 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. The replication process uses snapshot storage units in snapshot replication configurations.
Vendor Change Tracking (VCT)	Several NAS storage array vendors feature difference engines that identify the list of changed files and directories between two snapshot copies of the same volume. When VCT is enabled for a D-NAS policy, NetBackup does not perform any file system tracking for backup or index of NAS volumes. Instead, NetBackup relies solely on the change-list from the difference engine of the storage array to perform backup of files and directories. This process optimizes the backup process.

Chapter 2

Preparing for NetBackup Snapshot Manager for Data Center installation

This chapter includes the following topics:

About the deployment approach

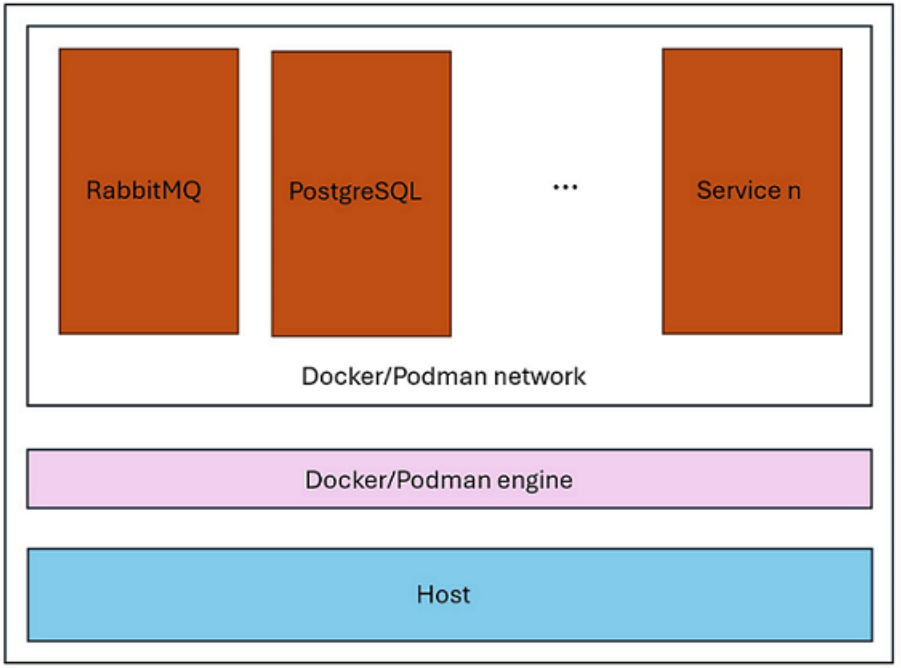
You can deploy NetBackup Snapshot Manager for Data Center in BYO, Flex, and Appliance environments. Follow the recommendations given in this chapter before you start your deployment.

NetBackup Snapshot Manager for Data Center uses a micro-services model of installation. When you load and run the Docker/Podman image, NetBackup Snapshot

Manager for Data Center installs each service as an individual container in the same Docker/Podman network. All containers securely communicate with each other using RabbitMQ.

Two key services are RabbitMQ and PostgreSQL. RabbitMQ is NetBackup Snapshot Manager for Data Center's message broker and PostgreSQL stores information on all the assets NetBackup Snapshot Manager for Data Center discovers. The following figure shows NetBackup Snapshot Manager for Data Center's micro-services model.

Figure 2-1 NetBackup Snapshot Manager for Data Center's micro-services model



This deployment approach has the following advantages:

- NetBackup Snapshot Manager for Data Center has minimal installation requirements.
- Deployment requires only a few commands.

Hosting NetBackup Snapshot Manager for Data Center

You can protect both cloud and on-premises assets using NetBackup Snapshot Manager for Data Center. To minimize costs and conserve network bandwidth, it is recommended to deploy NetBackup Snapshot Manager for Data Center in the same environment where you are protecting assets. To protect on-premises assets, deploy the NetBackup Snapshot Manager for Data Center host in the same on-premises environment. Likewise, to protect cloud assets, deploy it in the same cloud environment. This is not a limitation of Snapshot Manager for Data Center. You can protect cloud assets using an on-premises Snapshot Manager for Data Center, or protect on-premises assets using a cloud-deployed Snapshot Manager for Data Center.

You can deploy NetBackup Snapshot Manager for Data Center in a NetBackup media server, but not in a NetBackup primary server.

If you install NetBackup Snapshot Manager for Data Center on multiple hosts, we recommend that each NetBackup Snapshot Manager for Data Center instance manage separate resources. Two NetBackup Snapshot Manager for Data Center instances should not manage the same resources.

If you host the NetBackup Snapshot Manager for Data Center and media server in the same host, do the following for proper functioning of the backup from snapshot jobs:

- Assign distinct IPs and NetBackup client names to the NetBackup Snapshot Manager for Data Center and the media server so that they can obtain different NetBackup Certificates. This is required to have different NetBackup host ID certificates for communication. Use the following configuration:
  - Configure the host with two network adapters.
  - Edit the `/etc/hosts` file and enter the details as mentioned in the following example:

    ```
    <IP Address MediaServer Host1>  < MediaServer Host1>
    <IP Address NetBackup Snapshot Manager for Data Center Host2>
     <NetBackup Snapshot Manager for Data Center Host2>
    ```

  - Specify the `MediaServer Host1` parameter in the `/etc/hosts` file during the Media server installation for the media server name.
  - Similarly select the NetBackup Snapshot Manager for Data Center Host 2 from the `/etc/hosts` file during the NetBackup Snapshot Manager for Data Center installation with a non-default port other than 443.

  - Start NetBackup Snapshot Manager for Data Center and Media services and register it with NetBackup primary server.
- If the host name that you intend to use for NetBackup Snapshot Manager for Data Center is already mapped with a media server's host name, you must remove the older mapping. Refer to the *Removing host ID to host name mappings* section in the *NetBackup Security and Encryption Guide*.
- Once the NetBackup Snapshot Manager for Data Center is registered, ensure that it has a different HOST DB entry.
- Before performing the backup from snapshot jobs, perform the following optimization: DISABLE SHM and NOSHM. See: https://www.veritas.com/support/en_US/article.100016170

This ensures that NetBackup does not use shared memory to communicate among NetBackup data mover processes.

Host sizing recommendations

The NetBackup Snapshot Manager for Data Center host configuration depends primarily on the number of workloads and also the type of workloads that you want to protect. It is also dependent on the maximum number of simultaneous operations running on the NetBackup Snapshot Manager for Data Center at its peak performance capacity.

Cohesity recommends the following configurations for the NetBackup Snapshot Manager for Data Center host:

Table 2-1 Typical NetBackup Snapshot Manager for Data Center host configuration based on the number of concurrent tasks

Workload metric	NetBackup Snapshot Manager for Data Center host configuration
Up to 16 concurrent operational tasks	CPU: 2 CPUs Memory: 16 GB
Up to 32 concurrent operational tasks	CPU: 4 - 8 CPUs Memory: 32 GB or more

General considerations and guidelines:

Consider the following points while choosing a configuration for the NetBackup Snapshot Manager for Data Center host:

- On Flex, Flex Scale, and Appliance environments use a separate host for installing NetBackup Snapshot Manager for Data Center. NetBackup Snapshot Manager for Data Center cannot be installed on Flex Scale nodes.
- Depending on the number of workloads, the amount of plug-in data that is transmitted from the NetBackup Snapshot Manager for Data Center host can get very large. The network latency also plays a key role in such a case. You might see a difference in the overall performance depending on these factors.
- In cases where the number of concurrent operations is higher than what the NetBackup Snapshot Manager for Data Center host configuration capacity can handle, NetBackup Snapshot Manager for Data Center automatically puts the operations in a job queue. The jobs in the queue are picked up only after the running operations are completed.

Meeting system requirements

Table 2-2 Operating system, processor, and package requirements for NetBackup Snapshot Manager for Data Center host

Category	Requirement
Operating system	See the NetBackup Snapshot Manager Software Compatibility List (SCL) for details.
Processor architecture	See the NetBackup Snapshot Manager Software Compatibility List (SCL) for details.
Packages on NetBackup Snapshot Manager for Data Center host	Following are the operating system-specific respective required packages to be installed on the NetBackup Snapshot Manager for Data Center host: ■ **Ubuntu**: lvm2, udev ■ **SUSE**: lvm2, udev ■ **RHEL 7**: lvm2, systemd ■ **RHEL 8**: podman-plugins, lvm2, systemd-udev, udica, and policycoreutils-devel ■ **RHEL 9**: podman-plugins, lvm2, systemd-udev, udica, policycoreutils-devel

Note: The single host name or FQDN for NetBackup Snapshot Manager for Data Center has limit of 64 characters which is required at the time of installation. Snapshot Manager does not support multiple aliases. You cannot install Snapshot Manager 10.3 with NetBackup primary server 10.2 or earlier.

Table 2-3 System requirements for the NetBackup Snapshot Manager for Data Center host

Host on which NetBackup Snapshot Manager for Data Center is installed	Requirements
VMware VM	■ Virtual machine type: 64-bit with a NetBackup Snapshot Manager for Data Center supported operating system ■ vCPUs: 8 ■ RAM: 16 GB or more ■ Root disk: 64 GB with a standard persistent disk ■ Data volume: 50 GB for the snapshot asset database
Physical host *(x86_64 / AMD64)*	■ Operating system: A 64-bit NetBackup Snapshot Manager for Data Center supported operating system ■ CPUs: x86_64 (64-bit), single-socket, multi-core, with at least 8 CPU count ■ RAM: 16 GB or more ■ Boot disk: 64 GB ■ Data volume: 50 GB for the snapshot asset database

Note: NetBackup Snapshot Manager for Data Center is not fully FIPS-compliant.

Disk space requirements

NetBackup Snapshot Manager for Data Center uses the following file systems on the host to store all the container images and files during installation:

- */ (root file system)*
- `/var`

The `/var` file system is further used for container run times. Ensure that the host on which you install or upgrade NetBackup Snapshot Manager for Data Center has sufficient space for the following components.

Table 2-4 Space considerations for NetBackup Snapshot Manager for Data Center components

Component	Space requirements
NetBackup Snapshot Manager for Data Center containers	Minimum 10 GB free space (30 GB recommended).

Table 2-4 Space considerations for NetBackup Snapshot Manager for Data Center components *(continued)*

Component	Space requirements
NetBackup Snapshot Manager for Data Center agents and plug-ins	350 MB free space, for every NetBackup Snapshot Manager for Data Center plug-in and configured agent.

Additionally, NetBackup Snapshot Manager for Data Center also requires a separate volume for storing NetBackup Snapshot Manager for Data Center data. Ensure that you create and mount this volume to `/cloudpoint` on the NetBackup Snapshot Manager for Data Center host.

Table 2-5 Space consideration for NetBackup Snapshot Manager for Data Center data volume

Volume mount path	Size
`/cloudpoint`	50 GB or more

The `/cloudpoint` directory should have a minimum size of 50 GB.

When you enable the Vendor Change Tracking (VCT) option, or perform snap diff operations, additional space is required in the `/cloudpoint` directory to store the snapshot diff records. Allocate extra space based on the expected number of snapshot diff records. For every 1,000,000 snapshot diff records, approximately 2 GB of additional space is required. These records include file or directory changes such as Added, Removed, and Modified.

See "Host sizing recommendations" on page 23.

NetBackup Snapshot Manager for Data Center time zone

Ensure that the time zone settings on the host where you want to deploy NetBackup Snapshot Manager for Data Center are as per your requirement and synchronized with a public NTP server.

By default, NetBackup Snapshot Manager for Data Center uses the time zone that is set on the host where you install NetBackup Snapshot Manager for Data Center. The timestamps for all the entries in the logs are as per the clock settings of the host machine.

Proxy server requirements

If the instance on which you are deploying NetBackup Snapshot Manager for Data Center is behind a proxy server, that is, if the NetBackup Snapshot Manager for Data Center instance connects to the internet using a proxy server, you must specify

the proxy server details during the NetBackup Snapshot Manager for Data Center installation. The NetBackup Snapshot Manager for Data Center installer stores the proxy server information in a set of environment variables that are specific to the NetBackup Snapshot Manager for Data Center containers.

The following table displays the environment variables and the proxy server information that you must provide to the NetBackup Snapshot Manager for Data Center installer. Make sure that you keep this information ready; you are required to provide these details during the NetBackup Snapshot Manager for Data Center installation.

Table 2-6 Proxy server details required by NetBackup Snapshot Manager for Data Center

Environment variables created by the NetBackup Snapshot Manager for Data Center installer	Description
VX_HTTP_PROXY	Contains the HTTP proxy value to be used for all connections. For example, `"http://proxy.mycompany.com:8080/"`.
VX_HTTPS_PROXY	Contains the HTTP proxy value to be used for all connections. For example, `"http://proxy.mycompany.com:8080/"`.
VX_NO_PROXY	Contains the hosts that are allowed to bypass the proxy server. For example, `"localhost,mycompany.com,192.168.0.10:80"`.

NetBackup Snapshot Manager for Data Center services that need to communicate externally by a proxy server, use these predefined environment variables that are set during the NetBackup Snapshot Manager for Data Center installation.

Firewall port requirements for Snapshot Manager for Data Center

Following are the inbound and outbound firewall port requirements:

- The following inbound ports must be open:
  - **443**: To handle API requests from primary, media, and client. If configured with the default port else inbound must be allowed by the firewall for a custom port.
  - **5671**: For Snapshot Manager for Data Center's agents.
- The following outbound ports are required:
  - **1556**: For registration with NetBackup primary server.

D-NAS ports

The port requirements for D-NAS backup and restore are as follows:

Table 2-7 D-NAS port requirements

Source	Protocol	Port	Destination	Description
Backup host	TCP	1556	Primary server	PBX
Backup host	TCP	13724	Primary server	VNETD
Backup host	TCP	2049	Array	Required for NFS Access Version 4.
Backup host	TCP	111	Array	Required for NFS Access Versions 2 and 3.
Backup host	TCP	445	Array	SMB
Backup host	TCP	443	Snapshot Manager for Data Center	Default port to handle API requests. If you use a custom port, the firewall must allow the inbound traffic for the custom port.
Snapshot Manager for Data Center	TCP	1556	Primary server	Registration with the NetBackup primary server.

Creating an instance or preparing the host to install NetBackup Snapshot Manager for Data Center

To deploy NetBackup Snapshot Manager for Data Center on an on-premises instance, do the following:

- Install a supported Ubuntu, RHEL, or SLES operating system on a physical or a virtual x86 server.
- Add sufficient storage to the server to meet the installation requirements.

Installing container platform (Docker, Podman)

Table 2-8 Installing container platform

Platform	Description
Docker on Ubuntu	Supported version: Docker 18.09 and later For detailed instructions on installing the Docker on Ubuntu, see Install Docker Engine on Ubuntu.

Docker on RHEL 7.x	Supported version: Docker 1.13.x and later
	Use the following process to install Docker on RHEL.
	■ Enable your subscriptions:
	`# sudo subscription-manager register --auto-attach --username=<username> --password=<password>`
	`# subscription-manager repos --enable=rhel-7-server-extras-rpms`
	`# subscription-manager repos --enable=rhel-7-server-optional-rpms`
	■ Install Docker using the following command:
	`# sudo yum -y install docker`
	■ Reload the system manager configuration using the following command:
	`# sudo systemctl daemon-reload`
	■ Enable and then restart the docker service using the following commands:
	`# sudo systemctl enable docker`
	`# sudo systemctl restart docker`
	For detailed instructions on installing Docker on RHEL, see Getting Docker in RHEL 7.
	If the docker is using the default storage driver (overlay2 or overlay) on XFS backed file system, then ensure that XFS FS has the `ftype` option set to *1*. Use `xfs_info` to verify. For details, see Use the OverlayFS storage driver. Otherwise, you can use a different storage driver. For details, see Docker storage drivers.

Table 2-8 Installing container platform *(continued)*

Platform	Description

Podman on RHEL 9, 8.6 and 8.4	Supported version: Podman 4.0.2 and later
	Notes:
	■ Enable your subscriptions:
	`# sudo subscription-manager register --auto-attach --username=<username> --password=<password>`
	■ SELinux Enforcing mode is supported from Snapshot Manager for Data Center 10.4 onwards.
	Ensure that the following services are enabled and running:
	`# systemctl enable podman-restart`
	`# systemctl start podman-restart`
	`# systemctl enable podman.socket`
	`# systemctl start podman.socket`

Creating and mounting a volume to store data

Before you deploy the NetBackup Snapshot Manager for Data Center or NetBackup Snapshot Manager for Data Center extension:

- You must create and mount a volume of at least 50 GB to store NetBackup Snapshot Manager for Data Center data. The volume must be mounted to `/cloudpoint`.
- Ensure that the UUID of the volume and the mount point (`/cloudpoint`) are mentioned in the `/etc/fstab` so that the volume is auto-mounted when the host or the extension is restarted.

Note: If you start your instance without this volume attached (for example, after moving the volume to another instance), the `nofail` mount option enables the instance to start even if errors occur while mounting the volume.

Verifying that specific ports are open on the instance or physical host

Ensure that the following ports are open on the instance or physical host.

Table 2-9 Ports used by NetBackup Snapshot Manager for Data Center

Port	Description
443	The NetBackup Snapshot Manager for Data Center user interface uses this port as the default HTTPS port.
5671	The NetBackup Snapshot Manager for Data Center RabbitMQ server uses this port for communications. This port must be open to support multiple agents, extensions, backup from snapshot, and restore from backup jobs.

Note that once you configure the port when you install NetBackup Snapshot Manager for Data Center, you cannot change it when you upgrade.

Creating tokens for installation

You may need a token to install or reinstall NetBackup Snapshot Manager for Data Center. For a fresh installation, use a new token. For a re-installation, use a reissue token. Upgrade installation does not require a token.

To create a new token:

1. On the left, click **Security**, then click **Tokens**. Click **Add**.
2. In the Create Token dialog, enter a token name. In the **Maximum Uses Allowed** field, specify how many times the token can be used. Specify how the token is valid in the **Valid for** field. Optionally, enter a reason for creating the token. Click **Create** to create the token.
3. Copy the token from the **Token Created Successfully** dialog. The token also appears in the Token Management page.

To create a reissue a token:

1. On the left, click **Security**, then click **Host mappings**.
2. Click the three vertical dots in the row of the host for which you want to generate the token, click **Generate reissue token**.

3. In the Generate Reissue Token dialog, enter a token name. Specify how the token is valid in the **Valid for** field. Optionally, enter a reason for creating the token. Click **Generate**.
4. Copy the token from the **Token Created Successfully** dialog. The token also appears in the Token Management page.

Chapter 3

Deploying NetBackup Snapshot Manager for Data Center using container images

This chapter includes the following topics:

Before you begin installing NetBackup Snapshot Manager for Data Center

Ensure that you complete the following before installing NetBackup Snapshot Manager for Data Center:

- Before you install NetBackup Snapshot Manager for Data Center.
  See “Hosting NetBackup Snapshot Manager for Data Center” on page 22.

Note: If you plan to install NetBackup Snapshot Manager for Data Center on multiple hosts, read this section carefully and understand the implications of this approach.

- Ensure that your environment meets system requirements.
  See " Meeting system requirements" on page 24.
- Create the instance on which you install NetBackup Snapshot Manager for Data Center or prepare the physical host.
  See "Creating an instance or preparing the host to install NetBackup Snapshot Manager for Data Center" on page 28.
- Install a container platform.
  See "Installing container platform (Docker, Podman)" on page 29.
- Create and mount a volume to store NetBackup Snapshot Manager for Data Center data.
  See "Creating and mounting a volume to store data" on page 30.
- Verify that specific ports are open on the instance or physical host.
  See "Verifying that specific ports are open on the instance or physical host" on page 31.

Installing NetBackup Snapshot Manager for Data Center in the Docker/Podman environment

Note: When you deploy NetBackup Snapshot Manager for Data Center, you may want to copy the commands below and paste them into your command line interface. If you do, replace the information in these examples that is different from your own: the product and build version, the download directory path, and so on.

NetBackup Snapshot Manager for Data Center installation prerequisites on Podman:

- Run the following commands to install the required packages (`lvm2`, `udev`, `plugins`, `udica`, and `policycoreutils-devel`) on the hosts:

```
#yum install -y lvm2
#yum install -y lvm2-libs
#yum install -y python3-pyudev
#yum install -y systemd-udev
#yum install -y podman-plugins
```

- `#yum install -y udica`
- `#yum install -y policycoreutils-devel`

Installing NetBackup Snapshot Manager for Data Center

Perform the following appropriate steps depending on the Docker or Podman environment.

To install NetBackup Snapshot Manager for Data Center

1. Download the NetBackup Snapshot Manager for Data Center image to the system on which you want to deploy NetBackup Snapshot Manager for Data Center from the Veritas Support Portal.

   Note: You must log on to the support site to download.

   From the **Products** dropdown, select **NetBackup** and select the required version from the **Version** dropdown. Click **Explore**. Click **Base and upgrade** installers.

   The NetBackup Snapshot Manager for Data Center image name resembles the following format for Docker and Podman environment:

   `NetBackup_SnapshotManager_<version>.tar.gz`

   Note: The actual file name may vary depending on the release version.

2. Un-tar the image file and list the contents:

   ```
   # ls
   NetBackup_SnapshotManager_xx.x.x.x.xxxx.tar.gz
   netbackup-flexsnap-xx.x.x.x.xxxx.tar.gz
   flexsnap_preinstall.sh
   ```

3 Run the following command to prepare the NetBackup Snapshot Manager for Data Center host for installation:

```
# sudo ./flexsnap_preinstall.sh
```

(*For Docker on RHEL 7.9*) The output resembles as follows:

```
Validate host resources                  ...  done
Check for docker installation            ...  done
Validate docker version support          ...  done
Check for docker socket file             ...  done
Checking for required packages           ...  done
Validate required services health        ...  done
Loading Snapshot Manager service images  ...  done
Copying flexsnap_configure script        ...  done
```

(For Podman on RHEL 8.x/RHEL-9.x) The output resembles as follows:

```
Checking for disk space                  ...  done
Checking for swap space                  ...  done
Validate host resources                  ...  done
Validate SELINUX                         ...  done
Check for podman installation            ...  done
Validate podman version support          ...  done
Check for podman socket file             ...  done
Checking for required packages           ...  done
Validate required services health        ...  done
Removing deprecated services             ...  done
Loading Snapshot Manager service images  ...  done
Creating nbsvcusr user and group         ...  done
Loading CIL policy for containers        ...  done
Copying flexsnap_configure script        ...  done
```

4 Use the following command options to configure and install help:

Configure: `# flexsnap_configure -h`

```
Usage: flexsnap_configure [OPTIONS] <COMMAND> [CMD_OPTIONS]

NetBackup Snapshot Manager (10.4.x.x-xxxx) configuration script

Options:
  -h, --help
        Print this message and exit
Command:
```

```
  backup       To create backup of Snapshot Manager metadata.
  install      To install the Snapshot Manager stack on a host.
  recover      To restore from backup copy Snapshot Manager
               metadata.
  renew        To renew the Snapshot Manager certificates or
               extension.
  restart     To restart the Snapshot Manager services on a host.

  start        To start the Snapshot Manager services on a host.
  status       To get the health status of Snapshot Manager
               services.
  stop         To stop the Snapshot Manager services on a host.
  serverinfo   To get the NetBackup primary and Snapshot Manager

               servers information.
  truststore   To list and update Snapshot Manager truststore.
  uninstall    To uninstall the Snapshot Manager stack on a host.

  updatedb     To update NetBackup details in Snapshot Manager
               Database.
  verify       To verify the Snapshot Manager certificates.

Run flexsnap_configure <COMMAND> --help for more information
```

Install: `# flexsnap_configure install -h`

```
Usage: flexsnap_configure install [OPTIONS]
```

Options	Description
--http-proxy <URI>	HTTP proxy for all Snapshot Manager for Data Center connections. Example: `http://proxy.mycompany.com:8080/` Must be used with the --https-proxy and --no-proxy options.
--port <port_number>	NGINX port for Snapshot Manager for Data Center (default: 443).
--primary <IP/FQDN>	IP address, FQDN, or private hostname of the primary server. Not required when reinstalling Snapshot Manager for Data Center using the --force option.
--snapshot-manager <IP/FQDN>	IP address, FQDN, or private hostname of the Snapshot Manager for Data Center server.

Options	Description
--token <token>	Reissue or standard token. For the Snapshot Manager for Data Center extension, it acts as a workflow token. Applicable only for NetBackup CA deployment. (*Mandatory*) For interactive installation. (*Optional*) For Snapshot Manager for Data Center deployment if NetBackup primary security setting is medium or low. Not required if Snapshot Manager for Data Center is reinstalled using the --force option. See "Creating tokens for installation" on page 31.
--add-host <hostname:ip>	(*Optional*) You can add custom host to IP mapping in the container's `/etc/hosts` file. You can pass it multiple times for each *hostname:ip* combination. Use it when Snapshot Manager for Data Center stack is not able to resolve the provided primary hostname(s) using the system DNS.
--ca <ca>	(*Optional*) Absolute path of Root CA certificate file. Applicable when installing Snapshot Manager for Data Center using external CA. Must be used with the --chain and --key options.
--chain <chain>	(*Optional*) Absolute path of certificate chain. The directory must include all intermediate CAs and the server certificate, excluding the Root CA certificate. Use this when installing Snapshot Manager with an external CA. Must be used with the --ca and --key options.
--crlcheck <level>	(*Optional*) Controls how Snapshot Manager for Data Center checks certificate revocation status using CRL. Valid values: ■ 0 – Disabled ■ 1 – Leaf certificate only (default) ■ 2 – Entire certificate chain
--crlpath <directory>	(*Optional*) Absolute path of the directory containing CRL files. Use this when the Certificate Authority is not accessible from the Snapshot Manager for Data Center host.
--extension	(*Optional*) Installs the Snapshot Manager for Data Center extension. Use this for both fresh installations and upgrades. For fresh installations, must be used with the --extname and --snapshot-manager options.
--extname <name>	(*Optional*) Snapshot Manager for Data Center extension name identifier. Applicable for fresh installation of Snapshot Manager for Data Center extension.

Options	Description
--force	(*Optional*) Reinstalls Snapshot Manager for Data Center or its extension with the same version. No additional options are required, except --extension, when reinstalling the Snapshot Manager for Data Center extension.
--host names <IP/FQDN>	(*Optional*) IP address, FQDN, or private hostname of Snapshot Manager for Data Center. Default is the machine's FQDN.
--https-proxy <URI>	(*Optional*) HTTPS proxy for all Snapshot Manager for Data Center connections. Example: `http://proxy.mycompany.com:8080/`. Must be used with the --http-proxy and --no-proxy options.
-i	(*Optional*) For interactive installation or upgrade.
--key <key>	(*Optional*) Absolute path to the server certificate private key file. Required when installing Snapshot Manager for Data Center using an external CA. Must be used with the --ca and --chain options.
--no-proxy <hostnames>	(*Optional*) Hosts allowed to bypass the proxy server. Example: *localhost,mycompany.com,192.168.0.10:80*. Must be used with the --http-proxy and --https-proxy options.
--path <install_path>	(*Optional*) Absolute path of Snapshot Manager for Data Center home directory. Default is `/cloudpoint`.
--passphrase <file>	(*Optional*) Absolute path of file containing passphrase to access the keystore . Applicable when server certificate private key file is encrypted with a passphrase.
--subnet4 <string>	(*Optional*) Configure Snapshot Manager for Data Center network with a custom IPv4 subnet. The value must be in CIDR format.
--subnet6 <string>	(*Optional*) Configure Snapshot Manager for Data Center network with a custom IPv6 subnet. The value must be in CIDR format.

5 Interactive and non-interactive installation of NetBackup Snapshot Manager for Data Center:

Interactive installation of NetBackup Snapshot Manager for Data Center (NBCA/ECA)

- NetBackup Snapshot Manager for Data Center host is behind a proxy server:

```
# flexsnap_configure install -i --no-proxy <no_proxy_value>
--http-proxy <http_proxy_value> --https-proxy
<https_proxy_value>
```

- NetBackup Snapshot Manager for Data Center/Primary server is configured with a private host name:

  ```
  # flexsnap_configure install -i --add-host <nbsm_hostname>:<IP>
  --add-host <primary_hostname>:<IP>
  ```

- NetBackup Snapshot Manager for Data Center installation on custom path:

  ```
  # flexsnap_configure install -i --path <installation_path>
  ```

Note: The flexsnap_configure CLI uses the privilege flag implicitly (-u 0).

The installer displays messages similar to the following for interactive CLI (NBCA):

```
# flexsnap_configure install -i
Configuration started at time: Sat Jul 29 14:34:08 UTC 2023
Docker server version: 20.10.7
This is a fresh install of NetBackup Snapshot Manager
xx.x.x.x.xxxx

Please provide NetBackup Primary details:
NetBackup primary server IP Address or FQDN: <nbu_primary_fqdn>
Start configuring with NetBackup CA certificate.
Provide NetBackup authentication token: <security_token>
NetBackup Snapshot Manager hostname for TLS certificate (64
char FQDN limit): <snapshot_manager_fqdn>
Port (default:443):
Creating runtime CIL policy ...done
Configuration started at time: Wed Jan  3 05:33:08 UTC 2024
Podman server version: 4.2.0
This is a fresh install of NetBackup Snapshot Manager
xx.x.x-xxxx
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Creating container: flexsnap-postgresql ...done
Creating container: flexsnap-rabbitmq ...done
Creating container: flexsnap-certauth ...done
Creating container: flexsnap-api-gateway ...done
Creating container: flexsnap-coordinator ...done
Creating container: flexsnap-listener ...done
```

```
Creating container: flexsnap-agent ...done
Creating container: flexsnap-onhostagent ...done
Creating container: flexsnap-scheduler ...done
Creating container: flexsnap-policy ...done
Creating container: flexsnap-notification ...done
Creating container: flexsnap-nginx ...done
Waiting for Snapshot Manager configuration to complete (21/21)
 ...done
Configuration complete at time Wed Jan  3 05:37:54 UTC 2024!
Please register Snapshot Manager with NetBackup primary server.
```

The installer displays messages similar to the following for interactive CLI under ECA:

```
# flexsnap_configure install -i
Configuration started at time: Sat Jul 29 10:43:06 UTC 2023
Docker server version: 24.0.2
This is a fresh install of NetBackup Snapshot Manager
xx.x.x.x.xxxx

Please provide NetBackup Primary details:
NetBackup primary server IP Address or FQDN: <nbu_primary_fqdn>
Start configuring external CA certificate.
Absolute path of the root CA certificate file: <root_ca_file>
Absolute path of server private key file: <server_key_file>
Absolute path of server certificate chain: <server_chain_file>
Absolute path of key passphrase file (Press ENTER if keyfile
is non encrypted): <server_passphrase_file>
Absolute path of CRL directory (Press ENTER for CDP based CRL
 check): <crl_path>
CRL check level, Press ENTER for default 1 i.e. LEAF (0:
DISABLE, 1: LEAF and 2:CHAIN): <crl_level>
NetBackup Snapshot Manager hostname for TLS certificate (64
char FQDN limit): <snapshot_manager_fqdn>
Port (default:443): <snapshot_manager_port>
Creating runtime CIL policy ...done
Configuration started at time: Tue Jan  2 10:44:07 UTC 2024
Podman server version: 4.2.0
This is a fresh install of NetBackup Snapshot Manager
xx.x.x-xxxx
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Creating container: flexsnap-postgresql ...done
```

```
Creating container: flexsnap-rabbitmq ...done
Creating container: flexsnap-certauth ...done
Creating container: flexsnap-api-gateway ...done
Creating container: flexsnap-coordinator ...done
Creating container: flexsnap-listener ...done
Creating container: flexsnap-agent ...done
Creating container: flexsnap-onhostagent ...done
Creating container: flexsnap-scheduler ...done
Creating container: flexsnap-policy ...done
Creating container: flexsnap-notification ...done
Creating container: flexsnap-nginx ...done
Waiting for Snapshot Manager configuration to complete (21/21)
 ...done
Configuration complete at time Tue Jan  2 10:49:02 UTC 2024!
Please register Snapshot Manager with NetBackup primary server
```

Noninteractive installation of NetBackup Snapshot Manager for Data Center with NetBackup CA (NBCA)

- NetBackup primary server security level is MEDIUM or Snapshot Manager for Data Center host name is known to the primary server:

  ```
  # flexsnap_configure install --primary <primary> --hostnames
  <nbsm_ip_or_fqdn>
  ```

- NetBackup primary server security level is HIGH or VERY HIGH:

  ```
  # flexsnap_configure install --primary <primary> --token
  <standard_token> --hostnames <nbsm_ip_or_fqdn>
  ```

- NetBackup Snapshot Manager for Data Center host is behind a proxy server:

  Note: NetBackup Snapshot Manager for Data Center does not support HTTPS (TLS-enabled) proxy servers.

  ```
  # flexsnap_configure install --primary <primary> --token
  <standard_token> --hostnames <nbsm_ip_or_fqdn> --no-proxy
  <no_proxy_value> --http-proxy <http_proxy_value> --https-proxy
  <https_proxy_value>
  ```

- NetBackup Snapshot Manager for Data Center/Primary server is configured with a private host name:

```
# flexsnap_configure install --primary <primary> --token
<standard_token> --hostnames <nbsm_ip_or_fqdn> --add-host
<nbsm_hostname:IP> --add-host <primary_hostname:IP>
```

- NetBackup Snapshot Manager for Data Center installation on custom path or port:

  ```
  # flexsnap_configure install --primary <primary> --token
  <standard_token> --hostnames <nbsm_ip_or_fqdn> --path
  <installation_path> --port <port>
  ```

  The installer displays messages similar to the following for non-interactive CLI (NBCA):

  ```
  # flexsnap_configure install --primary <nbu_primary_fqdn>
  --token <security_token>  --hostnames <snapshot_manager_fqdn>

  Start configuring with NetBackup CA certificate.
  Creating runtime SELinux policy ...done
  Configuration started at time: Wed Jan 17 10:39:54 UTC 2024
  Podman server version: 4.6.1
  This is a fresh install of NetBackup Snapshot Manager
  10.4.x.x-xxxx
  Creating network: flexsnap-network ...done
  Starting container: flexsnap-fluentd ...done
  Creating container: flexsnap-postgresql ...done
  Creating container: flexsnap-rabbitmq ...done
  Creating container: flexsnap-certauth ...done
  Creating container: flexsnap-api-gateway ...done
  Creating container: flexsnap-coordinator ...done
  Creating container: flexsnap-listener ...done
  Creating container: flexsnap-agent ...done
  Creating container: flexsnap-onhostagent ...done
  Creating container: flexsnap-scheduler ...done
  Creating container: flexsnap-policy ...done
  Creating container: flexsnap-notification ...done
  Creating container: flexsnap-nginx ...done
  Waiting for Snapshot Manager configuration to complete (21/21)
   ...done
  Configuration complete at time Wed Jan 17 10:45:05 UTC 2024!
  Please register Snapshot Manager with NetBackup primary server
  ```

Non-interactive installation of NetBackup Snapshot Manager for Data Center with external CA (ECA)

- Encrypted private key:

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file>
--passphrase <file>
```

- Non-encrypted private key:

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file>
```

- With user-provided CRL path/CRL check:

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file>
--crlpath <directory> --crlcheck <level>
```

- NetBackup Snapshot Manager for Data Center host is behind a proxy server:

Note: NetBackup Snapshot Manager for Data Center does not support HTTPS (TLS-enabled) proxy servers.

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file>
--no-proxy <no_proxy_value> --http-proxy <http_proxy_value>
--https-proxy <https_proxy_value>
```

- NetBackup Snapshot Manager for Data Center/Primary server is configured with a private host name:

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file>
--add-host <nbsm_hostname:IP> --add-host <primary_hostname:IP>
```

- NetBackup Snapshot Manager for Data Center installation on custom path/port:

```
# flexsnap_configure install --primary <primary> --hostnames
<nbsm_ip_or_fqdn> --ca <path_of_root_CA> --key
<path_of_private_key_file> --chain <server_chain_file> --path
<installation_path> --port <port>
```

The installer displays messages similar to the following for non-interactive CLI (ECA):

```
# flexsnap_configure install --primary <nbu_primary_fqdn>
--hostnames <snapshot_manager_fqdn> --ca <root_ca_file> --key
 <server_key_file> --passphrase <server_passphrase_file>
--chain <server_chain_file> --crlpath <crl_path> --crlcheck
<level>
Start configuring external CA certificate.
Creating runtime CIL policy ...done
Configuration started at time: Tue Jan  2 11:35:21 UTC 2024
Podman server version: 4.2.0
This is a fresh install of NetBackup Snapshot Manager
xx.x.x.x-xxxx
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Creating container: flexsnap-postgresql ...done
Creating container: flexsnap-rabbitmq ...done
Creating container: flexsnap-certauth ...done
Creating container: flexsnap-api-gateway ...done
Creating container: flexsnap-coordinator ...done
Creating container: flexsnap-listener ...done
Creating container: flexsnap-agent ...done
Creating container: flexsnap-onhostagent ...done
Creating container: flexsnap-scheduler ...done
Creating container: flexsnap-policy ...done
Creating container: flexsnap-notification ...done
Creating container: flexsnap-nginx ...done
Waiting for Snapshot Manager configuration to complete (21/21)
 ...done
Configuration complete at time Tue Jan  2 11:40:12 UTC 2024!
Please register Snapshot Manager with NetBackup primary server
```

6 Use the following docker command to view the docker images that are loaded on the host:

- (*For Docker*) # sudo docker images
- (*For Podman*) # sudo podman images

The output resembles as follows:

```
REPOSITORY             TAG            IMAGE ID       CREATED
   SIZE
veritas/flexsnap-deploy       10.3.x.xxxxx   5260748d9eab   18
minutes ago   586MB
veritas/flexsnap-rabbitmq     10.3.x.xxxxx   cff89dc78a2f   18
minutes ago   546MB
```

```
veritas/flexsnap-postgresql   10.3.x.xxxxx   0b87fe88cf94   18
minutes ago   537MB
veritas/flexsnap-nginx        10.3.x.xxxxx   ee1cf2a3159e   18
minutes ago   649MB
veritas/flexsnap-fluentd      10.3.x.xxxxx   a384e3fc4167   19
minutes ago   681MB
veritas/flexsnap-core         10.3.x.xxxxx   2393b221bf19   20
minutes ago   916MB
veritas/flexsnap-datamover    10.3.x.xxxxx   8254c537bdb4   38
hours ago     1.18GB
```

7 Provide the following details when prompted on the command prompt:

Parameter	Description
Authorization token	If NetBackup Certificate Authority is used, the installer requires an authorization token to successfully deploy security certificates.
Host name for TLS certificate	Specify the IP address or the Fully Qualified Domain Name (FQDN) of the NetBackup Snapshot Manager for Data Center host. The specified name or IP address is added to the list of host names to use for configuring NetBackup Snapshot Manager for Data Center. The installer uses this name to generate a server certificate for the NetBackup Snapshot Manager for Data Center host.
Port	Specify the port through which the NetBackup Snapshot Manager for Data Center can communicate. The default is port 443.

The installer then displays messages similar to the following:

```
Configuring admin credentials ...done
Waiting for Snapshot Manager configuration to complete (22/22)
...done
Configuration complete at time Thu Jun 9 06:15:43 UTC 2022!
```

Note: After the deployment of NetBackup Snapshot Manager for Data Center, ensure that the IPv6 interface on the system is not disabled.

8 This concludes the NetBackup Snapshot Manager for Data Center deployment process. The next step is to register the NetBackup Snapshot Manager for Data Center with the NetBackup primary server.

Note: If you ever need to restart NetBackup Snapshot Manager for Data Center, use the `docker run` command so that your environmental data is preserved.

See "Restarting NetBackup Snapshot Manager for Data Center" on page 53.

Securing the connection to NetBackup Snapshot Manager for Data Center

- Supported scenarios:
  - Primary server and Snapshot Manager for Data Center must be with ECA or NBCA.
  - For NBCA and ECA mixed mode continue with ECA mode for NetBackup Snapshot Manager for Data Center installation.
- Unsupported scenario: Primary with NBCA and NetBackup Snapshot Manager for Data Center with ECA and vice versa.

In the NetBackup Snapshot Manager for Data Center, you can upload CRLs of the external CA at `/cloudpoint/eca/crl` file. The uploaded CRL does not work, if the `crl` directory is not present or is empty.

The following three parameters are tuneable, you can add the entry under the *eca* section in the `/cloudpoint/flexsnap.conf` file.

Table 3-1 ECA parameters

Parameter	Default	Value	Remarks
eca_crl_check	0 (Disabled)	0 (disabled) 1 (leaf) 2 (chain)	Certificate check level. Used to control the CRL/OCSP validation level for NetBackup Snapshot Manager for Data Center host connecting to On-prem/cloud workloads. ■ **0 (disabled)**: No CRL/OCSP is performed during validation. ■ **1 (leaf)**: CRL/OSCP validation is performed only for leaf. ■ **2 (chain)**: CRL/OSCP validation is performed for the whole chain.

Table 3-1 ECA parameters *(continued)*

Parameter	Default	Value	Remarks
eca_crl_refresh_hours	24	A numerical value between 0 and 4830	Time interval in hours to update the NetBackup Snapshot Manager for Data Center CRLs cache from CA through the certificate CDP URL. This option is not applicable if the `/cloudpoint/eca/crl` file is present and contains CRL files. If it is set as 0, the cache does not refresh.
eca_crl_path_sync_hours	1	A numerical value between 1 and 720	Time interval in hours to update the NetBackup Snapshot Manager for Data Center CRL cache from `/cloudpoint/eca/crl` file. This option is not applicable if the `/cloudpoint/eca/crl` file is not present or empty.

For more information, refer to the following sections of the *NetBackup™ Security and Encryption Guide*.

- About the host ID-based certificate revocation list
- When an authorization token is required during certificate deployment.

Note: Cache is not validated if any of the ECA tuneable are added or modified manually inside the `/cloudpoint/flexsnap.conf` file.

Certificate revoking for Snapshot Manager for Data Center

For detailed information on NetBackup CA and certificates, refer to the "NetBackup CA and NetBackup certificates" chapter of *NetBackup™ Security and Encryption Guide*.

The following table provides the regeneration steps to be performed for revoking the certificates in Snapshot Manager for Data Center:

Use case	Commands

CA migration	■ NBCA to ECA:
	`# flexsnap_configure renew --ca /eca2/trusted/cacerts.pem --key /eca2/private/key.pem --chain /eca2/cert_chain.pem`
	`Enrolling external CA certificates with NetBackup...`
	`Snapshot Manager certificate is renewed.`
	■ ECA to NBCA:
	`# flexsnap_configure renew --token <reissue-token>`
	`Generating new NetBackup Host-ID certificate...`
	`Snapshot Manager certificate is renewed.`

Post revoke certificate regeneration for NBCA	`# flexsnap_configure renew --token <reissue-token>`
	`Generating new NetBackup Host-ID certificate...`
	`Snapshot Manager certificate is renewed.`

Post revoke certificate regeneration for ECA	`# flexsnap_configure renew --ca /eca2/trusted/cacerts.pem --key /eca2/private/key.pem --chain /eca2/cert_chain.pem`
	`Enrolling external CA certificates with NetBackup...`
	`Snapshot Manager certificate is renewed.`

Post migration regenerated certificates for ECA/NBCA	`# flexsnap_configure renew --hostnames new-nbsm.veritas.com --token <authentication-token>`
	`Generating new NetBackup Host-ID certificate...`
	`Snapshot Manager certificate is renewed.`
	
	`Please run 'flexsnap_configure renew --internal --hostnames <nbsm_fqdn>`
	`to renew Snapshot Manager's internal CA and certificates.`

Certificate regeneration for extension	`# flexsnap_configure renew --extension --primary <nbsm_fqdn> --token <extension_token>`

Certificate rotation	`# flexsnap_configure renew --force`
	`Generating new NetBackup Host-ID certificate...`
	`Snapshot Manager certificate is renewed.`

Use case	Commands

Internal flexsnap CA certificate in case of migration, disaster recovery scenarios	`# flexsnap_configure renew --internal --hostnames <nbsm_fqdn>`
	
	`Renewed Flexsnap CA ... skip`
	`Renewed rabbitmq certificate ... done`
	`Renewed postgresql certificate ... done`
	`Renewed listener certificate ... done`
	`Renewed workflow certificate ... done`
	`Renewed scheduler certificate ... done`
	`Renewed agent certificate ... done`
	`Renewed client certificate ... done`
	`Renewed certmaster certificate ... done`
	`Renewed agent certificate ... done`
	`Renewed notification certificate ... done`
	`Renewed client certificate ... done`
	`Renewed client certificate ... done`
	`Renewed mongodb certificate ... done`
	`Renewed coordinator certificate ... done`
	`Renewed config certificate ... done`
	`Renewed idm certificate ... done`
	`Renewed agent certificate ... done`
	`Renewed client certificate ... done`
	`Renewed policy certificate ... done`
	
	`Snapshot Manager's CA and certificates are renewed.`
	`Restart the Snapshot Manager stack using 'flexsnap_configure restart' to take effect.`

Verifying that NetBackup Snapshot Manager for Data Center is installed successfully

Verify that NetBackup Snapshot Manager for Data Center is installed successfully by doing one of the following on the physical computer or the instance command line:

- Verify that a similar success message is displayed at the command prompt.

  ```
  Configuration complete at time Fri Mar 13 06:15:43 UTC 2020!
  ```

Note: If the installation of NetBackup Snapshot Manager for Data Center fails, then you must remove the stale containers and flexsnap-network by performing the uninstall steps and attempt the installation again.

See "Before you begin installing NetBackup Snapshot Manager for Data Center" on page 33.

- Run the following command and verify that the NetBackup Snapshot Manager for Data Center services are running and the status is displayed as `UP`:

  For Docker environment: `# sudo docker ps -a`

  For Podman environment: `# sudo podman ps -a`

  The command output resembles the following:

```
CONTAINER ID   IMAGE                                  COMMAND
         CREATED       STATUS                  PORTS

NAMES
b13a96fbefa1   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-w…"   4 hours ago   Up 4 hours

               flexsnap-workflow-system-0-min
a3a6c801d7aa   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-w…"   4 hours ago   Up 4 hours

               flexsnap-workflow-general-0-min
b9cd09ab7797   veritas/flexsnap-nginx:10.4.x.x-xxxxx
"/usr/sbin/nginx"        4 hours ago   Up 4 hours
0.0.0.0:443->443/tcp, :::443->443/tcp, 0.0.0.0:5671->5671/tcp,
:::5671->5671/tcp   flexsnap-nginx
7fd258cb575a   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-n…"   4 hours ago   Up 4 hours

               flexsnap-notification
9c06318b001a   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-p…"   4 hours ago   Up 4 hours

               flexsnap-policy
031f853377a5   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-s…"   4 hours ago   Up 4 hours

               flexsnap-scheduler
dfbcaeda1463   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-a…"   4 hours ago   Up 4 hours
```

```
               flexsnap-onhostagent
253e7284a945   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-a…"   4 hours ago   Up 4 hours

               flexsnap-agent
d54eed8434fe   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-l…"   4 hours ago   Up 4 hours

               flexsnap-listener
759e4ee9653b   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-c…"   4 hours ago   Up 4 hours

               flexsnap-coordinator
28c88bdc1ca2   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-g…"   4 hours ago   Up 4 hours
8472/tcp
                  flexsnap-api-gateway
dd5018d5e9f9   veritas/flexsnap-core:10.4.x.x-xxxxx
"/usr/bin/flexsnap-c…"   4 hours ago   Up 4 hours
9000/tcp
                  flexsnap-certauth
0e7555e38bb9   veritas/flexsnap-rabbitmq:10.4.x.x-xxxxx
"/opt/VRTScloudpoint…"   4 hours ago   Up 4 hours (healthy)
5671/tcp
                  flexsnap-rabbitmq
b4953f328e8d   veritas/flexsnap-postgresql:10.4.x.x-xxxxx
"/opt/VRTScloudpoint…"   4 hours ago   Up 4 hours (healthy)
13787/tcp
                  flexsnap-postgresql
cf4a731c07a6   veritas/flexsnap-deploy:10.4.x.x-xxxxx
"/opt/VRTScloudpoint…"   4 hours ago   Up 4 hours

               flexsnap-ipv6config
9407ea65a337   veritas/flexsnap-fluentd:10.4.x.x-xxxxx
"/opt/VRTScloudpoint…"   4 hours ago   Up 4 hours
0.0.0.0:24224->24224/tcp, :::24224->24224/tcp
                  flexsnap-fluentd
```

Note: The number (`10.4.x.x-xxxxx`) displayed in the image name column represents the NetBackup Snapshot Manager for Data Center version. The version may vary depending on the actual product version being installed.

The command output displayed here may be truncated to fit the view. The actual output may include additional details such as container names and ports used.

- To verify the configuration status using the **flexsnap_configure CLI**, run the following command:

  ```
  # flexsnap_configure status
  ```

  The command output resembles the following:

  ```
  { "healthy": "true", "start_time": "3 minutes ago", "uptime": "Up
   3 minutes ago", "status": "ok", "host": "localhost" }
  ```

Restarting NetBackup Snapshot Manager for Data Center

If you need to restart NetBackup Snapshot Manager for Data Center, you must restart it correctly so that your environmental data is preserved.

Run the following command to restart NetBackup Snapshot Manager for Data Center using the **flexsnap_configure** CLI:

```
# flexsnap_configure restart
```

The output resembles as follows:

```
Restarting the services
Stopping services at time: Mon Jul 31 11:43:43 UTC 2023
Stopping container: flexsnap-workflow-system-0-min ...done
Stopping container: flexsnap-workflow-general-0-min ...done
Stopping container: flexsnap-listener ...done
Stopping container: flexsnap-nginx ...done
Stopping container: flexsnap-notification ...done
Stopping container: flexsnap-policy ...done
Stopping container: flexsnap-scheduler ...done
Stopping container: flexsnap-onhostagent ...done
Stopping container: flexsnap-agent ...done
Stopping container: flexsnap-coordinator ...done
Stopping container: flexsnap-api-gateway ...done
Stopping container: flexsnap-certauth ...done
Stopping container: flexsnap-rabbitmq ...done
```

```
Stopping container: flexsnap-postgresql ...done
Stopping container: flexsnap-fluentd ...done
Stopping services completed at time: Mon Jul 31 11:44:04 UTC 2023
Starting services at time: Mon Jul 31 11:44:04 UTC 2023
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-postgresql ...done
Starting container: flexsnap-rabbitmq ...done
Starting container: flexsnap-certauth ...done
Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Starting container: flexsnap-listener ...done
Starting services completed at time: Mon Jul 31 11:44:21 UTC 2023
```

Associating NetBackup media server(s) with Snapshot Manager for Data Center

You can use a media server(s) to perform snapshot management and replication operations in your NetBackup environment. To use a media server(s), you must associate one or more media servers to the Snapshot Manager for Data Center. The media server(s) must be in an active state to run the snapshot or replication jobs. The media server that you associate with the Snapshot Manager for Data Center must be associated with your NetBackup primary server as well.

You can associate media servers with the `tpconfig` command in the CLI. Use the command:

```
tpconfig -update -snapshot_manager <snapshot_manager_server_name>
-add_media_server <media_server>
```

To enable existing associated Snapshot Manager for Data Center servers using Web UI:

1. On the left pane, select **Snapshot Manager for Data Center** under **Storage**.
2. In the **Snapshot server** tab, select the host name.

   The list of existing media servers will be displayed.

3 Select the required server and click the action button.

4 Select **Enable**.

To associate multiple media servers, you can run this command once for each server. If you do not associate a media server, the NetBackup primary server is used.

You may also associate the NetBackup media server with Snapshot Manager for Data Center using NetBackup APIs. To associate NetBackup media server using API, refer to the NetBackup API documentation: https://swagger.biztools.global/

Chapter 4

Upgrading NetBackup Snapshot Manager for Data Center

This chapter includes the following topics:

About NetBackup Snapshot Manager for Data Center upgrades

You should not use two versions of NetBackup Snapshot Manager for Data Center on two different hosts to manage the same assets.

When you upgrade NetBackup Snapshot Manager for Data Center, all the snapshot data and configuration data from your previous version are maintained in the external `/cloudpoint` data volume. Cohesity recommends that you upgrade NetBackup Snapshot Manager for Data Center on the same host or on a different host to which

the NetBackup Snapshot Manager for Data Center data volume of the previous version is attached.

Supported upgrade path

Table 4-1 NetBackup Snapshot Manager for Data Center upgrade path

Upgrade from version	Upgrade to version
11.0.0.1	11.1
11.0	11.0.0.1
10.5	11.0
10.4	10.5, 11.0, 11.0.0.1, 11.1
10.3	10.4, 10.5, 11.0, 11.0.0.1, 11.1
10.2	10.3, 10.4, 10.5, 11.0, 11.0.0.1, 11.1
10.1/10.1.1	10.2,10.3, 10.4, 10.5, 11.0, 11.0.0.1, 11.1
9.1/9.1.0.1	10.2 upgraded to 11.1 or earlier

Notes:

- Direct upgrade from versions prior to 9.1 to beyond 10.2 is not supported. We need to first upgrade 9.1 or earlier versions to 10.2 for any upgrade path.
- Upgrading NetBackup Snapshot Manager for Data Center across the OS versions is not supported. If you are using NetBackup Snapshot Manager for Data Center on a RHEL7.x host, then you can only migrate it to a RHEL 8.6 or 8.4 host. Then follow the upgrade paths mentioned in the above table for upgrading NetBackup Snapshot Manager for Data Center on a RHEL 8.6 or 8.4 host.
  See "Migrating and upgrading NetBackup Snapshot Manager for Data Center" on page 72., for more information on migrating and upgrading NetBackup Snapshot Manager for Data Center on RHEL.
- See "Upgrade scenarios" on page 57., for more information on upgrading NetBackup 8.3.x to NetBackup 10.2.

Upgrade scenarios

The following table lists the NetBackup Snapshot Manager for Data Center upgrade scenarios.

Note: For all NetBackup versions, the NetBackup (primary, media) server and NetBackup Snapshot Manager for Data Center version must be at the same level. During the upgrade, first, upgrade NetBackup Snapshot Manager for Data Center and then upgrade the NetBackup server.

Table 4-2 Upgrade scenarios

Scenario	Description	Action
Full upgrade from NetBackup 10.1, 10.2, 10.3, 10.4, 11.0.0.1 to NetBackup 11.1 or later	If you plan to upgrade NetBackup to 11.1 or later that includes upgrading all NetBackup Snapshot Manager for Data Center servers.	■ Disable NetBackup Snapshot Manager for Data Center servers. ■ Upgrade NetBackup Snapshot Manager for Data Center servers. ■ Enable NetBackup Snapshot Manager for Data Center servers. **Note:** If a certificate has not been issued for Snapshot Manager for Data Center after upgrading Snapshot Manager for Data Center using the flexsnap_configure CLI: Upgrade NetBackup primary server to version 11.1 or to continue with the current version of NetBackup, run the following command on the primary server: `tpconfig -update -snapshot_manager <snapshot_manager_name> -snapshot_manager_user_id <username> -manage_workload <workload>`
Only NetBackup Snapshot Manager for Data Center upgrades to version 11.1 or later	If you plan to upgrade only the NetBackup Snapshot Manager for Data Center servers to 11.1 or later; but do not plan to upgrade NetBackup.	Contact Veritas Support to obtain an Emergency Engineering Binary (EEB) to support the incompatibility between the NetBackup Snapshot Manager for Data Center and NetBackup versions. ■ Disable NetBackup Snapshot Manager for Data Center servers. ■ Apply the EEB patch on the NetBackup primary server and associated media servers. ■ Upgrade NetBackup primary server. ■ Then enable NetBackup Snapshot Manager for Data Center servers. See "About NetBackup Snapshot Manager for Data Center upgrades" on page 56.

Table 4-2 Upgrade scenarios *(continued)*

Scenario	Description	Action
Upgrading to NetBackup version 11.1	If your NetBackup 9.1.x server has NetBackup Snapshot Manager for Data Center, you must first upgrade NetBackup Snapshot Manager for Data Center to version 10.2. Then you can proceed to upgrade version 10.2 to version 11.1.	The process for this upgrade is: ■ Disable the NetBackup Snapshot Manager for Data Center server for maintenance in the NetBackup web UI. ■ Upgrade the NetBackup Snapshot Manager for Data Center server from NetBackup 9.1.x to NetBackup 10.2. ■ Upgrade the NetBackup Snapshot Manager for Data Center server from NetBackup 10.2 to NetBackup 11.1. ■ Enable the NetBackup Snapshot Manager for Data Center server in the NetBackup web UI.
Migrating and upgrading the NetBackup Snapshot Manager for Data Center on RHEL	If you plan to migrate and upgrade NetBackup Snapshot Manager for Data Center on RHEL 8.6 or 8.4.	See "Migrating and upgrading NetBackup Snapshot Manager for Data Center" on page 72.
Migrating and upgrading the Snapshot Manager for Data Center on RHEL8/9 SELinux enforcing.	If you plan to migrate and upgrade Snapshot Manager for Data Center on RHEL 8.8 or 9.x.	See "Migrating and upgrading NetBackup Snapshot Manager for Data Center" on page 72.

Preparing to upgrade NetBackup Snapshot Manager for Data Center

Note the following before you upgrade:

- Ensure that the NetBackup Snapshot Manager for Data Center instance or physical host meets the requirements of the NetBackup Snapshot Manager for Data Center version you are upgrading to.
  See " Meeting system requirements" on page 24.
- Ensure that the ports required by the NetBackup server meet the requirements as mentioned in the *Required Ports* section of the following chapter:
- When you upgrade NetBackup Snapshot Manager for Data Center, all the snapshot data and configuration data from your previous version are maintained in the external `/cloudpoint` data volume. This information is external to the NetBackup Snapshot Manager for Data Center container and the image and is preserved during the upgrade.

However, you can take a backup of all the data in the `/cloudpoint` volume during the upgrade process when prompted or manually, if required.
See "Backing up NetBackup Snapshot Manager for Data Center" on page 78.

- Ensure that no jobs are running on NetBackup Snapshot Manager for Data Center.
  - Disable the policies and SLPs related to NetBackup Snapshot Manager for Data Center from the NetBackup console.
  - Cancel any running jobs related to NetBackup Snapshot Manager for Data Center in the NetBackup activity monitor.
- After you upgrade NetBackup Snapshot Manager for Data Center, if required you can upgrade the NetBackup primary server. Also, you must enable the NetBackup Snapshot Manager for Data Center server from the NetBackup web UI.

Upgrading NetBackup Snapshot Manager for Data Center

The following procedures describe how to upgrade your NetBackup Snapshot Manager for Data Center deployment. During the upgrade, you replace the container that runs your current version of NetBackup Snapshot Manager for Data Center with a newer container.

To upgrade NetBackup Snapshot Manager for Data Center server in Podman/Docker environment

1. Download the NetBackup Snapshot Manager for Data Center upgrade installer.

   On the NetBackup Snapshot Manager for Data Center download page, click **Download Now** to download the NetBackup Snapshot Manager for Data Center installer.

   The NetBackup Snapshot Manager for Data Center software components are available in a package form. The file name has the following format:

   `NetBackup_SnapshotManager_<version>.tar.gz`

   Note: The actual file name may vary depending on the release version.

2. Copy the downloaded compressed image file to the computer on which you want to deploy NetBackup Snapshot Manager for Data Center.

3 Un-tar the image file and list the contents:

```
# ls
NetBackup_SnapshotManager_xx.x.x-xxxx.tar.gz
netbackup-flexsnap-10.4.x.x-xxxx.tar.gz
flexsnap_preinstall.sh
```

4 Run the following command to prepare the NetBackup Snapshot Manager for Data Center host for installation:

```
# sudo ./flexsnap_preinstall.sh
```

The output resembles the following:

For Podman

```
# ./flexsnap_preinstall.sh
Checking for disk space                  ...  done
Checking for swap space                  ...  done
Validate host resources                  ...  done
Validate SELINUX                         ...  done
Check for podman installation            ...  done
Validate podman version support          ...  done
Check for podman socket file             ...  done
Checking for required packages           ...  done
Validate required services health        ...  done
Removing deprecated services             ...  done
Loading Snapshot Manager service images  ...  done
Loading SELinux policy for containers    ...  done
Copying flexsnap_configure script        ...  done
```

For Docker

```
# ./flexsnap_preinstall.sh
Checking for disk space                  ...  done
Checking for swap space                  ...  done
Validate host resources                  ...  done
Check for docker installation            ...  done
Validate docker version support          ...  done
Check for docker socket file             ...  done
Checking for required packages           ...  done
Validate required services health        ...  done
Loading Snapshot Manager service images  ...  done
Copying flexsnap_configure script        ...  done
```

5 Verify that there are no policies with snapshot or other operations in progress and then stop NetBackup Snapshot Manager for Data Center by running the following command:

Using the flexsnap_configure CLI, run: `# flexsnap_configure stop`

The NetBackup Snapshot Manager for Data Center containers are stopped one by one. Messages similar to the following appear on the command line:

```
Stopping the services
Stopping services at time: Wed Jan  3 06:12:52 UTC 2024
Stopping container: flexsnap-workflow-system-0-min ...done
Stopping container: flexsnap-workflow-general-0-min ...done
Stopping container: flexsnap-listener ...done
Stopping container: flexsnap-nginx ...done
Stopping container: flexsnap-notification ...done
Stopping container: flexsnap-policy ...done
Stopping container: flexsnap-scheduler ...done
Stopping container: flexsnap-onhostagent ...done
Stopping container: flexsnap-agent ...done
Stopping container: flexsnap-coordinator ...done
Stopping container: flexsnap-api-gateway ...done
Stopping container: flexsnap-certauth ...done
Stopping container: flexsnap-rabbitmq ...done
Stopping container: flexsnap-postgresql ...done
Stopping container: flexsnap-fluentd ...done
Stopping services completed at time: Wed Jan  3 06:13:24 UTC 2024
```

Wait for all the NetBackup Snapshot Manager for Data Center containers to be stopped and then proceed to the next step.

6 Upgrade NetBackup Snapshot Manager for Data Center using the flexsnap_configure CLI, run: `# flexsnap_configure install`

The installer first loads the individual service images and then launches them in their respective containers.

The output resembles the following (Below is an example of the Podman environment output:

```
Stopping the services
Stopping services at time: Fri Jul 28 10:30:05 UTC 2023
Stopping container:
flexsnap-agent.12ef61207c634aeba0f37aba192a4960 ...done
Stopping container: flexsnap-listener ...done
Stopping container: flexsnap-nginx ...done
Stopping container: flexsnap-notification ...done
Stopping container: flexsnap-policy ...done
Stopping container: flexsnap-scheduler ...done
Stopping container: flexsnap-onhostagent ...done
Stopping container: flexsnap-agent ...done
Stopping container: flexsnap-coordinator ...done
Stopping container: flexsnap-api-gateway ...done
Stopping container: flexsnap-certauth ...done
Stopping container: flexsnap-rabbitmq ...done
Stopping container: flexsnap-mongodb ...done
Stopping container: flexsnap-fluentd ...done
Stopping services completed at time: Fri Jul 28 10:30:23 UTC 2023
Configuration started at time: Fri Jul 28 10:30:26 UTC 2023
Docker server version: 1.13.1
This is an upgrade to NetBackup Snapshot Manager xx.x.x.xxxx
Previous Snapshot Manager version: xx.x.x.xxxx
Removing exited container
flexsnap-agent.12ef61207c634aeba0f37aba192a4960 ...done
Removing exited container flexsnap-nginx ...done
Removing exited container flexsnap-notification ...done
Removing exited container flexsnap-policy ...done
Removing exited container flexsnap-scheduler ...done
Removing exited container flexsnap-onhostagent ...done
Removing exited container flexsnap-agent ...done
Removing exited container flexsnap-listener ...done
Removing exited container flexsnap-coordinator ...done
Removing exited container flexsnap-api-gateway ...done
Removing exited container flexsnap-certauth ...done
Removing exited container flexsnap-rabbitmq ...done
```

```
Removing exited container flexsnap-mongodb ...done
Removing exited container flexsnap-ipv6config ...done
Removing exited container flexsnap-fluentd ...done
Deleting network : flexsnap-network ...done
Taking backup of Snapshot Manager metadata...done
Backup completed successfully.
Backup file located at
/cloudpoint/backup/cloudpoint_xx.x.x.xxxx.tar.gz.
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-ipv6config ...done
Starting container: flexsnap-postgresql ...done
Waiting for flexsnap-postgresql container to move to healthy
state...Starting container: flexsnap-mongodb ...done
Waiting for flexsnap-mongodb container to move to healthy
state...Data migration required from mongo database to postgresql
 database
Data migration is successful.
Starting container: flexsnap-rabbitmq ...done
Waiting for flexsnap-rabbitmq container to move to healthy
state...Starting container: flexsnap-certauth ...done
Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-listener ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Deleteing mongo resources
flexsnap-mongodb
Upgrade finished at time: Fri Jul 28 10:35:37 UTC 2023
```

Example 2:

```
Stopping the services
Stopping services at time: Fri Aug  4 10:38:37 UTC 2023
Stopping container: flexsnap-workflow-system-0-min ...done
Stopping container: flexsnap-workflow-general-0-min ...done
Stopping container: flexsnap-listener ...done
Stopping container: flexsnap-nginx ...done
Stopping container: flexsnap-notification ...done
Stopping container: flexsnap-policy ...done
Stopping container: flexsnap-scheduler ...done
Stopping container: flexsnap-onhostagent ...done
Stopping container: flexsnap-agent ...done
Stopping container: flexsnap-coordinator ...done
Stopping container: flexsnap-api-gateway ...done
Stopping container: flexsnap-certauth ...done
Stopping container: flexsnap-rabbitmq ...done
Stopping container: flexsnap-mongodb ...done
Stopping container: flexsnap-fluentd ...done
Stopping services completed at time: Fri Aug  4 10:38:55 UTC 2023
Configuration started at time: Fri Aug  4 10:38:57 UTC 2023
Docker server version: 20.10.7

IPv6 configuration is temporarily disabled on system. Snapshot
Manager will be configured without IPv6 support.
For Snapshot Manager with IPv6 support, enable IPv6 configuration
 on the system.

This is an upgrade to NetBackup Snapshot Manager xx.x.x.xxxx
Previous Snapshot Manager version: xx.x.x.x.xxxx
Removing exited container flexsnap-nginx ...done
Removing exited container flexsnap-notification ...done
Removing exited container flexsnap-policy ...done
Removing exited container flexsnap-scheduler ...done
Removing exited container flexsnap-onhostagent ...done
Removing exited container flexsnap-agent ...done
Removing exited container flexsnap-listener ...done
Removing exited container flexsnap-coordinator ...done
Removing exited container flexsnap-api-gateway ...done
Removing exited container flexsnap-certauth ...done
Removing exited container flexsnap-rabbitmq ...done
Removing exited container flexsnap-mongodb ...done
Removing exited container flexsnap-fluentd ...done
Deleting network : flexsnap-network ...done
```

```
Taking backup of Snapshot Manager metadata...done
Backup completed successfully.
Backup file located at
/cloudpoint/backup/cloudpoint_10.1.1.0.1208.tar.gz.
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-postgresql ...done
Waiting for flexsnap-postgresql container to move to healthy
state...Starting container: flexsnap-mongodb ...done
Waiting for flexsnap-mongodb container to move to healthy
state...Data migration required from mongo database to postgresql
 database
Data migration is successful.
Starting container: flexsnap-rabbitmq ...done
Waiting for flexsnap-rabbitmq container to move to healthy
state...Starting container: flexsnap-certauth ...done
Waiting for flexsnap-certauth container to move to healthy
state...Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-listener ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Deleteing mongo resources
flexsnap-mongodb
```

7 Interactive and non-interactive upgrade of NetBackup Snapshot Manager for Data Center:

- Interactive upgrade of NetBackup Snapshot Manager for Data Center: `# flexsnap_configure install -i`

  The output resembles the following:

  ```
  Configuration started at time: Thu Jul 13 09:23:27 UTC 2023
  Docker server version: 1.13.1
  This is an upgrade to NetBackup Snapshot Manager 10.3.0.0.1008
  Previous Snapshot Manager version: 10.2.1.0.1188
  Do you want to take a backup of the Snapshot Manager metadata
   prior to upgrade? (y/n): n
  Removing exited container
  flexsnap-agent.837b51be82f5451e8eca27761d2f5b0c ...done
  ```

```
Removing exited container flexsnap-nginx ...done
Removing exited container flexsnap-notification ...done
Removing exited container flexsnap-policy ...done
Removing exited container flexsnap-scheduler ...done
Removing exited container flexsnap-onhostagent ...done
Removing exited container flexsnap-agent ...done
Removing exited container flexsnap-listener ...done
Removing exited container flexsnap-coordinator ...done
Removing exited container flexsnap-api-gateway ...done
Removing exited container flexsnap-certauth ...done
Removing exited container flexsnap-rabbitmq ...done
Removing exited container flexsnap-postgresql ...done
Removing exited container flexsnap-fluentd ...done
Deleting network : flexsnap-network ...done
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-postgresql ...done
Waiting for flexsnap-postgresql container to move to healthy
state...
Starting container: flexsnap-rabbitmq ...done
Waiting for flexsnap-rabbitmq container to move to healthy
state...
Starting container: flexsnap-certauth ...done
Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-listener ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Upgrade finished at time: Thu Jul 13 09:27:18 UTC 2023
```

- Non-interactive upgrade of NetBackup Snapshot Manager for Data Center:

  ```
  # flexsnap_configure install
  ```

  The output resembles the following:

  ```
  Configuration started at time: Thu Jul 13 09:23:27 UTC 2023
  Docker server version: 1.13.1
  This is an upgrade to NetBackup Snapshot Manager 10.3.0.0.1008
  Previous Snapshot Manager version: 10.2.1.0.1188
  Taking backup of Snapshot Manager metadata...done
  ```

```
Backup completed successfully.
Backup file located at
/cloudpoint/backup/cloudpoint_10.2.1.0.1188.tar.gz.
Removing exited container
flexsnap-agent.837b51be82f5451e8eca27761d2f5b0c ...done
Removing exited container flexsnap-nginx ...done
Removing exited container flexsnap-notification ...done
Removing exited container flexsnap-policy ...done
Removing exited container flexsnap-scheduler ...done
Removing exited container flexsnap-onhostagent ...done
Removing exited container flexsnap-agent ...done
Removing exited container flexsnap-listener ...done
Removing exited container flexsnap-coordinator ...done
Removing exited container flexsnap-api-gateway ...done
Removing exited container flexsnap-certauth ...done
Removing exited container flexsnap-rabbitmq ...done
Removing exited container flexsnap-postgresql ...done
Removing exited container flexsnap-fluentd ...done
Deleting network : flexsnap-network ...done
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-postgresql ...done
Waiting for flexsnap-postgresql container to move to healthy
state...
Starting container: flexsnap-rabbitmq ...done
Waiting for flexsnap-rabbitmq container to move to healthy
state...
Starting container: flexsnap-certauth ...done
Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-listener ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Upgrade finished at time: Thu Jul 13 09:27:18 UTC 2023
```

8 (Optional) Run the following command to remove the previous version images.

(*For Podman*) `# podman rmi -f <imagename>:<oldimage_tagid>`

(*For Docker*) `# docker rmi -f <imagename>:<oldimage_tagid>`

9 To reinstall the same version of Snapshot Manager for Data Center, use the `--force` option with the install command.

```
# flexsnap_configure install --force -i
```

The output resembles the following:

```
Configuration started at time: Tue Jan  2 11:02:32 UTC 2024
Podman server version: 4.2.0
This is an upgrade to NetBackup Snapshot Manager xx.x.xxxx
Previous Snapshot Manager version: xx.x.xxxx
Deleting network : flexsnap-network ...done
Creating network: flexsnap-network ...done
Starting container: flexsnap-fluentd ...done
Starting container: flexsnap-postgresql ...done
Waiting for flexsnap-postgresql container to move to healthy
state...Starting container: flexsnap-rabbitmq ...done
Waiting for flexsnap-rabbitmq container to move to healthy
state...Starting container: flexsnap-certauth ...done
Waiting for flexsnap-certauth container to move to healthy
state...Starting container: flexsnap-api-gateway ...done
Starting container: flexsnap-coordinator ...done
Starting container: flexsnap-listener ...done
Starting container: flexsnap-agent ...done
Starting container: flexsnap-onhostagent ...done
Starting container: flexsnap-scheduler ...done
Starting container: flexsnap-policy ...done
Starting container: flexsnap-notification ...done
Starting container: flexsnap-nginx ...done
Upgrade finished at time: Tue Jan  2 11:05:42 UTC 2024
```

10 To verify that the new NetBackup Snapshot Manager for Data Center version is installed successfully:

See “Verifying that NetBackup Snapshot Manager for Data Center is installed successfully” on page 50.

11 This concludes the upgrade process. Verify that your NetBackup Snapshot Manager for Data Center configuration settings and data are preserved as is.

Upgrading NetBackup Snapshot Manager for Data Center using patch or hotfix

You can also upgrade your current NetBackup Snapshot Manager for Data Center server using a patch or a hotfix. All the considerations and steps that apply for a normal upgrade also apply to the upgrade being done using a patch or a hotfix, except that instead of downloading a new NetBackup Snapshot Manager for Data Center image, you download the patch or hotfix binaries.

Contact Veritas Support at https://www.veritas.com/content/support/en_US/contact-us to obtain an Emergency Engineering Binary (EEB) for patch/hotfix.

Following are the brief steps explained with an example. For the detailed upgrade procedures

See "Upgrading NetBackup Snapshot Manager for Data Center" on page 60.

Consider that the currently installed version is NetBackup Snapshot Manager for Data Center `10.x.x.x` and you are upgrading to a NetBackup Snapshot Manager for Data Center patch version `10.x.x.x.xxxx` on a RHEL8.6 system in a Podman/Docker environment.

To upgrade NetBackup Snapshot Manager for Data Center using a patch or a hotfix

1. Download the NetBackup Snapshot Manager for Data Center EEB obtained from Veritas Support.

   Example: `NetBackup_SnapshotManager_<version>.tar.gz`

2. Un-tar the image file and list the contents:

   ```
   # ls
   NetBackup_SnapshotManager_xx.x.x.x.xxxx.tar.gz
   netbackup-flexsnap-10.x.x.x.xxxx.tar.gz
   flexsnap_preinstall.sh
   ```

3. Run the following command to prepare the NetBackup Snapshot Manager for Data Center host for installation:

   ```
   # sudo ./flexsnap_preinstall.sh
   ```

4. Verify that there are no protection policy snapshots or other operations in progress and then stop NetBackup Snapshot Manager for Data Center by running the following command:

   For Docker/Podman: Use the flexsnap_configure CLI:`# flexsnap_configure stop`

5 Upgrade NetBackup Snapshot Manager for Data Center by running the following command using the flexsnap_configure CLI:

flexsnap_configure install

The installer first loads the individual service images and then launches them in their respective containers.

6 (Optional) Run the following command to remove the previous version images.

(*For Podman*) `# podman rmi -f <imagename>:<oldimage_tagid>`

(*For Docker*) `# docker rmi -f <imagename>:<oldimage_tagid>`

7 To verify that the new NetBackup Snapshot Manager for Data Center version is installed successfully:

See "Verifying that NetBackup Snapshot Manager for Data Center is installed successfully" on page 50.

8 This concludes the NetBackup Snapshot Manager for Data Center upgrade process using a patch or a hotfix. Verify that your NetBackup Snapshot Manager for Data Center configuration settings and data are preserved as is.

Upgrading to NetBackup 11.1

While upgrading to NetBackup 11.1 from an earlier version, you may encounter error scenarios if the NetBackup Snapshot Manager for Data Center is unreachable or down during the upgrade. Follow the troubleshooting procedure gives in this section.

Upgrading NetBackup primary server on Linux

During the upgrade, the NetBackup primary server attempts to set the `workload type` parameter of the Snapshot Manager for Data Center to `ALL`. If Snapshot Manager for Data Center is down or unavailable, the installer displays this warning message and logs the same message in the install trace log located in the `/tmp` directory.

```
Reason: Failed to get version for Snapshot Manager
```

To work around the issue, follow these steps:

- Ensure that the Snapshot Manager for Data Center is accessible from the NetBackup primary server.
- Verify that Snapshot Manager for Data Center is enabled in the NetBackup UI.
- Ensure the all the Snapshot Manager for Data Center services are running.
- Ensure that all the containers are in healthy state.

Upgrading NetBackup primary server on Windows

During the upgrade, the NetBackup primary server attempts to set the `workload type` parameter of the Snapshot Manager for Data Center to `ALL`. If Snapshot Manager for Data Center is down or unavailable, the installer logs a warning message in the `Successful_PrimaryServer_Upgrade_<version>.txt` file. This file is located in the following location:

`<install drive>\ProgramData\Cohesity\NetBackup \InstallLogs\Successful_PrimaryServer_Upgrade_<version>.`

Look for this warning message:

```
Unsupported API version of Snapshot Manager. Operation failed.
```

To verify that the NetBackup Snapshot Manager for Data Center has the workload set to `ALL`, run the following command:

```
/usr/openv/volmgr/bin/tpconfig -dsnapshotmanagers
```

If the `workload type` parameter is not set to `All`, follow these steps:

- Ensure that the Snapshot Manager for Data Center is accessible from the NetBackup primary server.
- Verify that Snapshot Manager for Data Center is enabled in the NetBackup UI.
- Ensure the all the Snapshot Manager for Data Center services are running.
- Ensure that all the containers are in healthy state.

Migrating and upgrading NetBackup Snapshot Manager for Data Center

This section describes the procedure for migrating and upgrading the NetBackup Snapshot Manager for Data Center on RHEL.

Before you begin migrating NetBackup Snapshot Manager for Data Center

Ensure that you complete the following before installing NetBackup Snapshot Manager for Data Center:

- Ensure that your environment meets system requirements.
  See " Meeting system requirements" on page 24.
- Create the instance on which you install NetBackup Snapshot Manager for Data Center or prepare the physical host.

See "Verifying that specific ports are open on the instance or physical host" on page 31.
See "Creating an instance or preparing the host to install NetBackup Snapshot Manager for Data Center" on page 28.

- Prepare a RHEL 8.6 or 8.4 host for installation. You can either upgrade your existing RHEL 7.x OS to RHEL 8.6 or 8.4 OS, or create a new system with RHEL 8.6 or 8.4.
  - For upgrading the system from RHEL 7.x to RHEL 8.6 or 8.4, follow the Red Hat documentation.
  - For creating a new system with RHEL 8.6 or 8.4, configure a Podman container platform.
    See "Installing container platform (Docker, Podman)" on page 29.
    The brief steps include:
    - Enable your subscriptions:
      ```
      # sudo subscription-manager register --auto-attach
      --username=<username> --password=<password>
      ```
    - Install Podman if required:
      ```
      # sudo yum install -y podman
      ```
    - SELinux Enforcing mode is supported for RHEL 8/9.
- Run the following commands to install the required packages (`lvm2`, `udev` , `dnsmaq`, `udica`, and `policycoreutils-devel`) on the hosts:
  ```
  #yum install -y lvm2-<version>
  #yum install -y lvm2-libs-<version>
  #yum install -y systemd-udev-<version>
  #yum install -y podman-plugins
  # yum install -y udica
  # yum install -y policycoreutils-devel
  ```
- Run the following commands to lock the Podman and Conmon versions to the supported versions, so that they do not get updated with the *yum* update:
  ```
  sudo yum install -y podman-4.0.2-7.module+el8.3.1+9857+68fb1526
  sudo yum install -y python3-dnf-plugin-versionlock
  ```
- Verify that specific ports are open on the instance or physical host.
  See "Verifying that specific ports are open on the instance or physical host" on page 31.

Next, migrate NetBackup Snapshot Manager for Data Center from the RHEL 7.x host to the newly prepared RHEL 8.6 or 8.4 host.

See "Migrate and upgrade NetBackup Snapshot Manager for Data Center on RHEL 8.6 or 8.4" on page 74.

Migrate and upgrade NetBackup Snapshot Manager for Data Center on RHEL 8.6 or 8.4

Perform the following steps to migrate NetBackup Snapshot Manager for Data Center 10.0 or 10.0.0.1 from your RHEL 7.x host to the new RHEL 8.6 or 8.4 host.

To upgrade NetBackup Snapshot Manager for Data Center

1. Download the NetBackup Snapshot Manager for Data Center upgrade installer.

   Example: `NetBackup_SnapshotManager_<version>.tar.gz`

2. Un-tar the image file and list the contents:

   ```
   # ls
   NetBackup_SnapshotManager_xx.x.x.x-xxxx.tar.gz
   netbackup-flexsnap-10.4.x.x-xxxx.tar.gz
   flexsnap_preinstall.sh
   ```

3. Run the following command to prepare the NetBackup Snapshot Manager for Data Center host for installation:

   ```
   # sudo ./flexsnap_preinstall.sh
   ```

4. For an unattended upgrade installation, use the following command in flexsnap_configure CLI:

   ```
   # flexsnap_configure install
   ```

   The installer first loads the individual service images and then launches them in their respective containers.

5. (Optional) Run the following command to remove the previous version images.

   For Podman:

   ```
   # podman rmi -f <imagename>:<oldimage_tagid>
   ```

   For Docker:

   ```
   # docker rmi -f <imagename>:<oldimage_tagid>
   ```

6. To verify that the new NetBackup Snapshot Manager for Data Center version is installed successfully:

   See "Verifying that NetBackup Snapshot Manager for Data Center is installed successfully" on page 50.

To migrate NetBackup Snapshot Manager for Data Center

1. Run the following command in the flexsnap_configure CLI:

   ```
   # flexsnap_configure stop
   ```

   The NetBackup Snapshot Manager for Data Center containers are stopped one by one. Messages similar to the following appear on the command line:

   ```
   Stopping the services
   Stopping services at time: Wed Jan  3 06:12:52 UTC 2024
   Stopping container: flexsnap-workflow-system-0-min ...done
   Stopping container: flexsnap-workflow-general-0-min ...done
   Stopping container: flexsnap-listener ...done
   Stopping container: flexsnap-nginx ...done
   Stopping container: flexsnap-notification ...done
   Stopping container: flexsnap-policy ...done
   Stopping container: flexsnap-scheduler ...done
   Stopping container: flexsnap-onhostagent ...done
   Stopping container: flexsnap-agent ...done
   Stopping container: flexsnap-coordinator ...done
   Stopping container: flexsnap-api-gateway ...done
   Stopping container: flexsnap-certauth ...done
   Stopping container: flexsnap-rabbitmq ...done
   Stopping container: flexsnap-postgresql ...done
   Stopping container: flexsnap-fluentd ...done
   Stopping services completed at time: Wed Jan  3 06:13:24 UTC 2024
   ```

   Wait for all the NetBackup Snapshot Manager for Data Center containers to be stopped and then proceed to the next step.

2. Migrate the NetBackup Snapshot Manager for Data Center configuration data to the RHEL 8.6 or 8.4 host:

   - If you have created a new system with RHEL 8.6 or 8.4:
     - Run the following command to unmount `/cloudpoint` from the current host.

       ```
       # umount /cloudpoint
       ```

     - Detach the data disk that was mounted on `/cloudpoint` mount point.

       Note: For detailed instructions to detach or attach the data disks, follow the documentation provided by your cloud or storage vendor.

- On the RHEL8.6 or 8.4 host, run the following commands to create and mount the disk:

  ```
  # mkdir /cloudpoint
  # mount /dev/<diskname> /cloudpoint
  ```

  For vendor-specific details
  See "Creating and mounting a volume to store data" on page 30.

- If you have upgraded from RHEL 7.x to RHEL 8.6 or 8.4, copy the `/cloudpoint` mount point data from the RHEL 7.x system and move it to the RHEL8.6 or 8.4 system under `/cloudpoint` folder.

This concludes the NetBackup Snapshot Manager for Data Center migration process.

After migrating NetBackup Snapshot Manager for Data Center to a RHEL 8.6 or 8.4 host, perform the following steps to upgrade NetBackup Snapshot Manager for Data Center. See "Upgrading NetBackup Snapshot Manager for Data Center" on page 60.

3. During migration process, if NetBackup Snapshot Manager for Data Center is migrated to another system or IP address is changed, then regenerate the certificates as follows:

   Using flexsnap_configure CLI

   - Stop the NetBackup Snapshot Manager for Data Center services using the following command:

     ```
     # flexsnap_configure stop
     ```

   - Regenerate the certificates using the following command:

     ```
     # flexsnap_configure renew --help
     ```

   - Start the NetBackup Snapshot Manager for Data Center services using the following command:

     ```
     # flexsnap_configure start
     ```

4. After migrating NetBackup Snapshot Manager for Data Center to a RHEL 8.6 or 8.4 host, perform the following steps to upgrade NetBackup Snapshot Manager for Data Center to 10.3.

   See "About NetBackup Snapshot Manager for Data Center upgrades" on page 56.

5. This concludes the migration and upgrade process for NetBackup Snapshot Manager for Data Center. Verify that your NetBackup Snapshot Manager for Data Center configuration settings and data are preserved as is.

Chapter 5

Uninstalling NetBackup Snapshot Manager for Data Center

This chapter includes the following topics:

Preparing to uninstall NetBackup Snapshot Manager for Data Center

Note the following before you uninstall NetBackup Snapshot Manager for Data Center:

- Ensure that there are no active NetBackup Snapshot Manager for Data Center operations in progress. For example, if there are any snapshot, replication, restore, or indexing jobs running, wait for them to complete.
  If you have configured policies, ensure that you stop the scheduled policy runs. You may even want to delete those policies.
- Ensure that you disable the NetBackup Snapshot Manager for Data Center server from NetBackup. Depending on how you have set up your NetBackup Snapshot Manager for Data Center server, you can disable the NetBackup Snapshot Manager for Data Center server from the NetBackup web UI.

- All the snapshot data and configuration data from your existing installation is maintained in the external `/cloudpoint` data volume. This information is external to the NetBackup Snapshot Manager for Data Center containers and images and is deleted after the uninstallation.
  You can take a backup of all the data in the `/cloudpoint` volume, if desired.
  See "Backing up NetBackup Snapshot Manager for Data Center" on page 78.

Backing up NetBackup Snapshot Manager for Data Center

To backup NetBackup Snapshot Manager for Data Center when it is deployed on-premises

1. Stop NetBackup Snapshot Manager for Data Center services.

   (*For Docker/Podman*)

   ```
   flexsnap_configure stop
   ```

2. Ensure that all NetBackup Snapshot Manager for Data Center containers are stopped. This step is important because all activity and connections to and from NetBackup Snapshot Manager for Data Center must be stopped to get a consistent NetBackup Snapshot Manager for Data Center backup.

   Enter the following:

   (*For Docker*) `# sudo docker ps | grep veritas`

   (*For Podman*) `# sudo podman ps | grep veritas`

   This command should not return any actively running NetBackup Snapshot Manager for Data Center containers.

3 (Optional) If you still see any active containers, repeat this step 2. If that does not work, run the following command on each active container:

(*For Docker*) `# sudo docker kill container_name`

(*For Podman*) `# sudo podman kill container_name`

For example, the following is the command for the docker environment:

```
# sudo docker kill flexsnap-api
```

4 Back up the folder `/cloudpoint`. Use any backup method you prefer.

For example:

```
# tar -czvf cloudpoint_dr.tar.gz /cloudpoint
```

This command creates a compressed archive file named `cloudpoint_dr.tar.gz` that contains the data in the `/cloudpoint` directory.

Removing NetBackup Snapshot Manager for Data Center from a standalone Docker host environment

The process for uninstalling NetBackup Snapshot Manager for Data Center is the same as that followed for installation. The only difference is that you specify `"uninstall"` in the command, which tells the installer to remove the components from the host.

During uninstallation, the installer performs the following tasks on the NetBackup Snapshot Manager for Data Center host:

- Stops all the NetBackup Snapshot Manager for Data Center containers that are running.
- Removes the NetBackup Snapshot Manager for Data Center containers.
- Unloads and removes the NetBackup Snapshot Manager for Data Center images.

To uninstall NetBackup Snapshot Manager for Data Center

1. Verify that there are no protection policy snapshots or other operations in progress, and then uninstall NetBackup Snapshot Manager for Data Center by running the following command on the host:

   (*For Docker/Podman*)

   ```
   flexsnap_configure uninstall
   ```

The installer begins to unload the relevant NetBackup Snapshot Manager for Data Center container packages from the host. Messages similar to the following indicate the progress status:

```
Uninstalling NetBackup Snapshot Manager for Data Center
-------------------------------------------
Stopping flexsnap-mongodb ... done
Stopping flexsnap-rabbitmq ... done
Stopping flexsnap-auth ... done
Stopping flexsnap-core ... done
Removing flexsnap-mongodb ... done
Removing flexsnap-rabbitmq ... done
Removing flexsnap-auth ... done
Removing flexsnap-core ... done
Unloading flexsnap-mongodb ... done
Unloading flexsnap-rabbitmq ... done
Unloading flexsnap-auth ... done
Unloading flexsnap-core ... done
```

2. Confirm that the NetBackup Snapshot Manager for Data Center containers are removed.

   Use the following docker command:

   (*For Docker*) `# sudo docker ps -a`

   (*For Podman*) `# sudo podman ps -a`

3. If desired, remove the NetBackup Snapshot Manager for Data Center container images from the host.

   Use the following docker command to view the docker images that are loaded on the host:

   - (*For Docker*) `# sudo docker images -a`
   - (*For Podman*) `# sudo podman images -a`

   Use the following respective commands to remove the NetBackup Snapshot Manager for Data Center container images from the host:

   - (*For Docker*) `# sudo docker rmi` *<image ID>*
   - (*For Podman*) `# sudo podman rmi` *<image ID>*

4. This completes the NetBackup Snapshot Manager for Data Center uninstallation on the host.

   A possible next step is to re-deploy NetBackup Snapshot Manager for Data Center.

See " Installing NetBackup Snapshot Manager for Data Center in the Docker/Podman environment" on page 34.

Restoring NetBackup Snapshot Manager for Data Center

You can restore NetBackup Snapshot Manager for Data Center using any of the following methods using a backup located on-premises.

To recover NetBackup Snapshot Manager for Data Center

1. Copy the existing NetBackup Snapshot Manager for Data Center backup to the new NetBackup Snapshot Manager for Data Center server and extract it to the NetBackup Snapshot Manager for Data Center installation directory.

   In the following example, because `/cloudpoint` was backed up, the command creates a new `/cloudpoint` directory.

   ```
   # tar -zxf cloudpoint_dr.tar.gz -C /cloudpoint/
   ```

2. Download or copy the NetBackup Snapshot Manager for Data Center installer binary to the new server.

3. Install NetBackup Snapshot Manager for Data Center.

   Use the following command in the flexsnap_configure CLI:

   ```
   # flexsnap_configure install
   ```

4. When the installation completes, you can resume working with NetBackup Snapshot Manager for Data Center using your existing credentials.

Chapter 6

Snapshot Manager for Data Center catalog backup and recovery

This chapter includes the following topics:

About using script

If the `/cloudpoint` folder is corrupted or the NetBackup Snapshot Manager for Data Center VM is destroyed then NetBackup Snapshot Manager for Data Center can be recovered using the `flexsnap_configure backup/recover` command.

How to use the command:

- Run the following command to take backup of NetBackup Snapshot Manager for Data Center metadata:

  ```
  # flexsnap_configure backup
  ```

- Run the following command to recover NetBackup Snapshot Manager for Data Center metadata post Snapshot Manager for Data Center fresh installation:

  ```
  # flexsnap_configure recover --backup-file <path_of_backup_file>
  ```

NetBackup Snapshot Manager for Data Center data backup

NetBackup Snapshot Manager for Data Center data backup using script

1. Provide the user with the root privileges for running the `flexsnap_configure backup` command.
2. After execution of the command, a tar file is created.
3. Save the created tar file in a location other than the NetBackup Snapshot Manager for Data Center VM. This is required during recovery.
4. Run the command after the addition of the cloud provider.

Note: The plug-in is disabled after recovery in NetBackup web UI if a new storage array configuration is added after backup.

NetBackup Snapshot Manager for Data Center data recovery

NetBackup Snapshot Manager for Data Center data recovery using script

1. While recovering NetBackup Snapshot Manager for Data Center metadata using the tar file, reinstall the NetBackup Snapshot Manager for Data Center and use the tar file using recover option.

   For example, `flexsnap_configure recover --backup-file <tar file>`
2. Ensure that you use the same host name (FQDN) while reinstalling the NetBackup Snapshot Manager for Data Center after disaster recovery.
3. While reinstalling, provide the reissue token generated from the NetBackup web UI for the host and ensure that you use the same port number which was used earlier.
4. All the configuration steps (such as adding host entries in `/cloudpoint/openv/etc/hosts`) must run again on the new NetBackup Snapshot Manager for Data Center VM.

5 (*Required only if NetBackup primary server version is other than 10.4 or later*) NetBackup Snapshot Manager for Data Center must be registered again using re-issue token in NetBackup.

6 (Optional) If the backups fail, restart NetBackup Snapshot Manager for Data Center, run the command:

```
flexsnap-configure restart
```

After following the recovery steps, NetBackup Snapshot Manager for Data Center operates normally. You can also recover assets using earlier snapshots or backup copies.

Chapter 7

Configure NetBackup Snapshot Manager for Data Center

This chapter includes the following topics:

Configuring Snapshot Manager for Data Center storage array plug-ins

Snapshot Manager for Data Center plug-ins are software modules that enable the discovery of your assets in the on-premises or cloud environments. After registering the Snapshot Manager for Data Center server with the NetBackup primary server, you must configure the storage array plug-ins to be able to protect your workloads using NetBackup.

Deploy the Snapshot Manager for Data Center server either on-premises or in the cloud, depending on where you need to protect assets. You can use the NetBackup UI to configure the storage array plug-ins. The overall steps to configure different storage array plug-ins are similar, only the configuration parameters vary.See

"Configure the storage array plug-ins for Snapshot Manager for Data Center" on page 98. for configuration parameters for each storage array plug-in.

Configuring Snapshot Manager

Before using the Snapshot Manager for Data Center to perform snapshot management operations, you need to configure the Snapshot Manager for Data Center component in NetBackup.

Starting with NetBackup version 11.1, a NAS administrator can use an existing Snapshot Manager configured by a cloud administrator. To reduce network usage and costs, deploy Snapshot Manager in the cloud to protect cloud assets, or on-premises to protect on-premises assets.

To add a Snapshot Manager for Data Center:

1. On the left, click **Snapshot Manager**, under **Storage**.
2. Click **Add**.
3. Enter a host name for the Snapshot Manager server, and a port. The default port is 443. Click **Validate** to verify the connectivity to the server.

You can see the added server in the **Snapshot servers** tab.

See "Securing the connection to NetBackup Snapshot Manager for Data Center" on page 47. for details of Certificate revoking for snapshot manager.

Adding a plug-in

Snapshot Manager for Data Center plug-ins are software modules that discover your assets in the on-premises or cloud storage array environment. After configuring the Snapshot Manager for Data Center server with the NetBackup primary server, you must configure the Snapshot Manager for Data Center storage array plug-ins to be able to protect your workloads using NetBackup.

You can use NetBackup web UI to configure the storage array plug-ins. The steps to configure different storage array plug-ins are similar; only the configuration parameters differ. See "Configuring Snapshot Manager for Data Center storage array plug-ins" on page 85. for configuration parameters for each storage array plug-in

---

Note: After upgrading from Java UI, the discovery statuses of the storage array plug-ins appear blank in the web UI. You can re-initiate the configured plug-in discovery, to view the correct discovery data.

To add a plug-in

1. On the left, click **Snapshot Manager**, under **Storage**. You can see the configured plug-ins in the **Plug-ins** tab. Click **Add**.
2. Select a snapshot server from the dropdown. Select the required plug-in from the **Select product** list.
3. (Optional) If required change the plug-in display name.
4. Click **Next**.
5. Enter the FQDN or IP address of the array. Enter the username and password.
6. If available for the array, enter the discovery interval at which you want to discover new assets.
7. Click **Next**. On the Review page, review the configuration that you have entered, and click **Finish**.

You may also add storage array plug-ins in the Snapshot Manager for Data Center using NetBackup APIs. Refer to the NetBackup API documentation for details.

To update credentials for a plug-in

1. Click the ellipsis menu (three dots) in the row of the plug-in for which you want to edit the credentials.
2. Click **Update credentials**. Update the credentials and click **Save**.

Verify storage array certificate

NetBackup version 10.3.0.1 and later lets you verify the storage array certificate for any communication between NetBackup Snapshot Manager for Data Center and the storage array. For successful verification, the root certificate of the storage array must be maintained in the trust store of NetBackup Snapshot Manager for Data Center.

You must manually download the storage array certificate and add it to the NetBackup Snapshot Manager for Data Center trust store. Once the certificate is added to the trust store; during the plug-in configuration or plug-in update operations, select the Verify Certificate option to enable certificate verification.

To add and list certificates to the NetBackup Snapshot Manager for Data Center trust store:

1. Sign on to the host NetBackup Snapshot Manager for Data Center .
2. Using the mechanism provided by the storage array, download the root certificate of the storage array.

3 Run this command to add a certificate to NetBackup Snapshot Manager for Data Center:

```
flexsnap_configure truststore --ca <PATH TO STORAGE ARRAY CERT>
```

4 Run this command to list the certificates added in the truststore:

```
flexsnap_configure truststore
```

Here is an example configuration:

```
root@r7515-112v26:/root/Downloads# flexsnap_configure truststore
 --ca dspure09.pem
CN=dspure09,O=Pure Storage,L=Default City,ST=MN,C=US ... done
root@r7515-112v26:/root/Downloads# flexsnap_configure truststore
CN=VeritasStorageArrayRootCA,O=Veritas,OU=NetBackup        ...
ok
CN=r7515-088v01.<domainName>.com,O=Isilon,ST=Some-State,C=AU ...
 ok
CN=StorageArrayRootCA,O=Veritas,OU=NetBackup               ...
ok
CN=dspure09,O=Pure Storage,L=Default City,ST=MN,C=US
... ok
```

To add storage array certificates using the tpconfig utility

1 Run the command:

```
modify_plugin -snapshot_manager
```

2 Run the command:

```
add_plugin --snapshot_manager
```

In the tpconfig utility, enter *true* or *false* manually for the option **Enter Verify Certificate**, depending on whether the certificate needs to be verified or not.

In the web UI, use the **Verify certificate** option in the Plug-in configuration page or the Edit credentials dialog.

Considerations and limitations for the Verify certificate feature

- By default, the Verify Certificate feature is inactive for the existing plug-ins after a NetBackup Snapshot Manager for Data Center upgrade. To enable this option for the existing plug-ins, you must add the root certificate to the NetBackup Snapshot Manager for Data Center trust store after the upgrade.
- The Verify Certificate feature is not supported for Qumulo and NetApp storage arrays if configured using ZAPI.

SELinux enabled plug-in configuration for custom ports

NetBackup version 10.4 and later support SELinux on NetBackup Snapshot Manager for Data Center hosts to communicate between the Snapshot Manager and the storage arrays.

For successful plug-in configuration, the port used for REST API communication in the plug-in configuration must have an entry in the CIL.

To enable the communication port:

1. Run the command:

   ```
   # flexsnap_configure updatecil -i
   ```

   You can see the following output:

   ```
   Following SElinux updates detected for Snapshot Manager.
       allow VRTSflexsnap.process reserved_port_t:tcp_socket
   name_connect;
   Do you want to update Snapshot Manager's SELinux policy? (y/n):
   y
   Updating runtime SELinux policy ...done
   ```

   Note: If the custom port tag is not reflected in the output of this command, then the port is non-communicable for some other reasons.

2. For changes to take effect, run:

   ```
   flexsnap_configure restart
   ```

Plug-in Discovery

Plug-in discovery functionality is available for all the supported storage arrays. As a part of the discovery operation, the Snapshot Manager for Data Center discovers all the assets: disks, LUNs, volumes, replication relationships, and so on, from the storage array. These assets are persisted in the Snapshot Manager for Data Center database and are further used for snapshot and replication operations.

Whenever a new storage array plug-in is configured, NetBackup initiates a discovery operation to retrieve the assets from the storage array. Snapshot Manager for Data Center automatically schedules the plug-in discovery after every 4 hours. This discovery interval can be configured using the NetBackup API.

You can monitor the status of discovery in the **Status** column of the Storage array plug-in, inside the **Snapshot Manager for Data Center Plugin** pane.

Also, you can manually initiate the discovery operation for a specific storage array plug-in.

To manually initiate a discovery operation:

1. Right-click the storage array plug-in for which you want to initiate discovery in the **Snapshot Manager for Data Center Plugins** pane.
2. Click **Discover Assets**.

   This changes the **Status** column of the added storage plug-in to **Discovering.**

You may also initiate the plug-in discovery by NetBackup API. To perform discovery using the NetBackup APIs, refer to the NetBackup API documentation: https://swagger.javaws.kubert.vrts.io/

Chapter 8

Storage array replication

This chapter includes the following topics:

About Snapshot Manager for Data Center replication

Snapshot Manager for Data Center can leverage the replication capabilities of storage array vendors by replicating the snapshots. NetBackup discovers the replication infrastructure and the topology configured in the storage array. Using NetBackup, you can replicate the snapshots to a specific replication destination (target) of your choice or you can let NetBackup identify the destination for replicating the snapshots.

Replication is supported for both NAS and SAN storage. Snapshots represent a point-in-time of primary storage data as captured by the storage array. NetBackup communicates with the storage array to replicate the snapshot from the primary volume to other volumes configured for replication. The snapshot can be replicated to multiple volumes within the same storage array or cluster. The snapshots can also be replicated to volumes on other storage arrays or clusters of the same type as the source array.

The replication feature offers a single NetBackup interface for end-to-end data protection management for the following tasks:

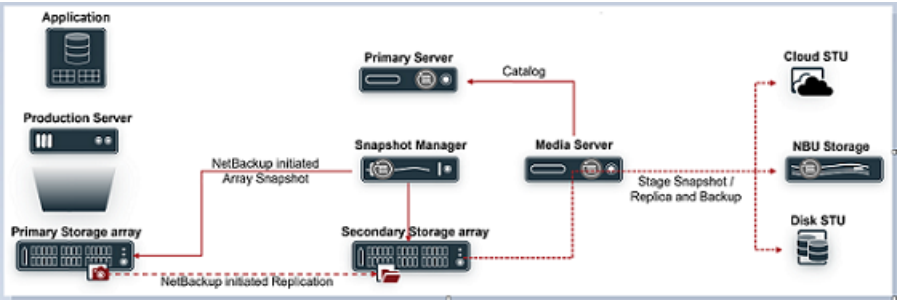
- Unified policy management.

Use the NetBackup web UI as the one, centralized backup infrastructure to manage the entire lifecycle of your data.

- Snapshot copy management.
  Use NetBackup to manage the entire lifecycle of the snapshot. Replication uses storage array plug-ins on the Snapshot Manager for Data Center to perform operations on the assets (volumes, LUNs) residing on the storage array. NetBackup can initiate operations to move, expire, or delete images from the storage array.
  The instruction to perform the initial snapshot comes from an operation in a NetBackup Storage Lifecycle Policy (SLP). You can create a single SLP that 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 activity monitor to view each snapshot copy at the storage array location.
- Restore.
  Recovery is available from any storage device in the environment that is defined to NetBackup. This includes recovery from the primary copy (initial snapshot) or any replicated snapshot on the storage array or from any NetBackup created copy residing on de-duped storage.

Deployment and architecture

The replication feature is supported for the snapshots created for both NAS and SAN storage.



Prerequisites

- You must establish the replication relationship between the source and destination.

- Complete the management host/console setup to manage the storage arrays.
- Configure the required user for admin activities with necessary permissions as required by NetBackup. Refer to the individual storage array section in the *Supported storage arrays in data center* chapter.

Software requirements for replication

For all the supported software versions of Snapshot Manager for Data Center, primary server, media server, and clients refer to the *Snapshot Manager for Data Center* section, in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.

Specifying the replication destination in NetBackup

Snapshot Manager for Data Center discovers the replication infrastructure and the replication destinations (targets) for all storage arrays for which it supports snapshot replication. This information is discovered as a part of the storage array plug-in discovery operation. For the list of all the storage arrays for which NetBackup supports snapshot replication, refer to the *Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.

The lifecycle of the snapshot and replica copy is managed using Storage Lifecycle Policy. You can select the required replication destination (target) as a part of the replication operation in SLP.

See the *NAS Administrator Guide* for details of SLPs.

The following table describes the supported values for replication destination.

Table 8-1 Replication destination in SLP

Replication destination	Description
`Auto`	NetBackup automatically identifies the replication destination.
`<Vendor>_<ReplicationType>` For example: `<Vendor>_<Replication>` `= NetApp_SnapMirror`	See "Configure the storage array plug-ins for Snapshot Manager for Data Center" on page 98. For the supported replication types for individual storage array.

Configure NetBackup for replication

Perform the steps given in the table in the exact order to configure replication for NetBackup.

Table 8-2 Replication configuration tasks overview

Step	Description	Reference topic
1.	Install or upgrade the required NetBackup software.	See "Deployment and architecture " on page 92.
2.	Configure the storage array plug-in. If source and destination volume reside on different arrays, configure a separate storage array plug-in for source and destination.	See "Configure the storage array plug-ins for Snapshot Manager for Data Center" on page 98.
3.	Create a storage unit for any operation that produces non-snapshot copies.	See the *NetBackup Administrator's Guide, Volume I.*
4.	Configure an SLP. Create a new operation in the SLP for each task that the SLP is configured to perform. For example, create a snapshot operation to perform the initial snapshot and a replication operation to create a copy of the snapshot. **Note:** Only those SLPs created using web UI or API support Replication.	See the *NAS Administrator's Guide* for details of SLPs.

Table 8-2 Replication configuration tasks overview *(continued)*

Step	Description	Reference topic
5.	Configure a NetBackup backup policy to perform all of the operations indicated in the SLP. To do so, the Policy storage selection configuration in the policy must indicate the SLP that is configured for snapshots and snapshot replication.	See the *Replication using D-NAS policy* chapter in the *NAS Administrator's Guide*. See *Protecting VMs using hardware snapshot and replication* in the *NetBackup for VMware Administrator's Guide*.

Chapter 9

Storage array plug-ins for Snapshot Manager for Data Center

This chapter includes the following topics:

- HPE Alletra 9000 SAN array
- HPE Alletra 6000 SAN array
- HPE GreenLake for Block Storage array
- HPE GreenLake for File Storage (VAST) array
- Hitachi NAS array
- Hitachi SAN array
- IBM Storwize SAN V7000 plug-in
- IBM FlashSystem plug-in
- IBM SAN Volume Controller plug-in
- InfiniBox SAN array
- InfiniBox NAS array
- Lenovo DM 5000 series array
- NetApp storage array
- NetApp Cloud Volumes ONTAP (CVO)
- Amazon FSx for NetApp ONTAP Plug-in
- NetApp E-Series array
- Nutanix Files array
- Pure Storage FlashArray SAN
- Pure Storage Flash Array files services (NAS)
- Pure Storage FlashBlade plug-in configuration notes
- PowerMax eNAS array
- Qumulo NAS array
- VMware vSAN File Services plug-in

Configure the storage array plug-ins for Snapshot Manager for Data Center

This chapter describes various storage arrays supported by NetBackup Snapshot Manager for Data Center. It also describes the configuration parameters required for configuring different storage array plug-ins. The snapshot management operations supported by each of these storage array plug-in are also mentioned in detail.

Required ports for different arrays

Depending on the storage device plug-ins configured in your environment, additional network ports must be open for the NetBackup Snapshot Manager for Data Center.

Table 9-1 Ports for different array vendors

Destination	Port	Description
Dell EMC PowerMax or VMax	8443	DELL EMC Unisphere APIs
Dell EMC PowerFlex	443	REST API SDK
Dell EMC PowerScale (Isilon)	9021	REST API SDK
Dell EMC PowerStore	443	Python SDK from Dell EMC: Python-Powerstore (1.4.0)
Dell EMC XtremIO	443	REST API
Unisphere managing the Dell EMC Unity	443	Storops SDK python library
Fujitsu Eternus AF/DX	443	REST API
Fujitsu Eternus AB/HB or proxy server managing the array	443	WSAPI
HPE RMC	443	REST API
HPE XP Configuration Manager REST server	443	REST API
HPE Alletra 9000	443	WSAPI
HPE Alletra 6000	443	REST API
HPE GreenLake for Block Storage	443	WSAPI

Table 9-1 Ports for different array vendors *(continued)*

Destination	Port	Description
Hitachi NAS	8444	REST API
Hitachi SAN	8444	REST API
IBM Storwize SAN V7000	7443	REST API
IBM FlashSystem	7443	REST API
IBM SAN Volume Controller	7443	REST API
InfiniBox SAN	443	InfiniSDK
InfiniBox NAS	443	REST API
Lenovo DM 5000	443	ZAPI or REST API
NetApp FAS	443	ZAPI or REST API
NetApp Cloud Volumes ONTAP (CVO)	443	REST API
Amazon FSx for NetApp ONTAP	443	REST API
NetApp E-Series or proxy server managing the array	8443	WSAPI
Nutanix Files File Server	9440	REST API
Pure Storage FlashArray	443	Pure Storage SDK
Pure Storage FlashBlade	443	Pure Storage SDK
PowerMax eNAS	443	XML API
Qumulo NAS, any management interface	443	REST API

Azure NetApp Files plug-in

NetBackup Snapshot Manager for Data Center Azure NetApp Files plug-in allows you to create, delete, export, and deport snapshots of the Azure NetApp Files volume assets on the Azure NetApp Files deployment.

- It uses Azure SDKs to connect with Azure NetApp Files.
- It utilizes the latest Azure SDK version.
- The connection is established to the Azure NetApp Files through Azure SDK.

- It uses the Microsoft.NetApp permissions to discover volumes and create snapshots that must be backed up.

Supported Snapshot Manager for Data Center Operation on Azure NetApp Files

You can perform the following Snapshot Manager for Data Center operations supported on the Azure NetApp Files:

Table 9-2 Snapshot Manager for Data Center operations on the Azure NetApp Files

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the volumes and snapshots. Volumes are primary assets, each contains the associated snapshots and asset IDs.
Create snapshot	Snapshot Manager for Data Centertakes a snapshot of Azure NetApp Files volume. Snapshot Manager for Data Centertriggers a POST API call on the volume to create a snapshot. A snapshot created with the following naming convention: NB<unique_21digit_number>
Delete snapshot	To delete a volume or consistency group snapshot, Snapshot Manager for Data Center initiates a DELETE Rest API call with the required snapshot details. Snapshot Manager for Data Center deletes a snapshot. When the delete snapshot operation is triggered, Snapshot Manager for Data Center deletes the snapshot corresponding to the source volume.
Restore snapshot	Restore is not supported on Azure NetApp Files.
Export snapshot	When a snapshot export operation is triggered, Snapshot Manager for Data Center does the following operation based on the protocol of the volume ■ NFS - NetBackup Snapshot Manager for Data Center create (or modifies) the export policy rule of the source volume and add NBU clients with read only access. ■ SMB - NetBackup Snapshot Manager for Data Center relies on the user configured with NetBackup services to have read access to the source volume snapshot.

Table 9-2 Snapshot Manager for Data Center operations on the Azure NetApp Files *(continued)*

Snapshot Manager for Data Center operations	Description
Deport snapshot	When a snapshot deport operation is triggered, Snapshot Manager for Data Center deletes the NBU clients added to the export policy rules. It is the revert of the export operation.

Azure NetApp Files plug-in configuration prerequisites

Before you configure the Azure NetApp Files plug-in, verify the following:

- If Snapshot Manager for Data Center is deployed on-prem, you must ensure to have the Application Services Principal credentials.
- Ensure to have either System Managed Identity / User Managed Identity / Application Services Principal present with you.
- Get a list of regions where Azure NetApp Files are deployed and choose them while configuring the plug-in.

Azure NetApp Files plug-in configuration parameters

The following parameters are required for configuring the Azure NetApp Files plug-in:

If NetBackup Snapshot Manager for Data Center is deployed on-prem, then the configuration will be done via Application Service Principal.

Table 9-3 Azure NetApp Files plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Tenant ID	Tenant ID for Azure NetApp Files.
Client ID	Client ID for Azure NetApp Files.
Secret key	Secret key for Azure NetApp Files.
Regions	List of regions supported. Select only those where Azure NetApp Files are deployed.

If NetBackup Snapshot Manager for Data Center is deployed on Azure, then the configuration can be done via Application Service Principal, System Managed Identity or User Managed Identity.

Table 9-4 Azure NetApp Files plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Credential Type	Credential type which will be used for plug-in configuration. Select either Application Service Principal, System Managed Identity or User Managed Identity.
Tenant ID	If Application Service Principal is selected then, tenant id of that service principal.
Client ID	If Application Service Principal is selected then, client id of that service principal.
Secret key	If Application Service Principal is selected then, secret key of that service principal.
Client ID (User Managed Identity)	If User Managed Identity is selected then client ID of that User Managed Identity.
Regions	List of regions supported. Select only those where Azure NetApp Files are deployed.

Roles and privileges on Azure NetApp Files

To allow Snapshot Manager for Data Center to perform snapshot management operations, ensure that the credentials for plug-in configuration have the following mentioned roles and privileges assigned on the Azure:

- Microsoft.Resources/*/read
- Microsoft.NetApp/netAppAccounts/read
- Microsoft.NetApp/netAppAccounts/capacityPools/read
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/read
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/write
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/snapshots/read
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/snapshots/write
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/snapshots/delete
- Microsoft.NetApp/netAppAccounts/capacityPools/volumes/mountTargets/read

Azure NetApp Files plug-in considerations and limitations

- Replication is not supported on Azure NetApp Files plug-in.
- If all the export rules for the volume are exhausted (NetApp Volume supports at most 5 rules) then NetBackup Snapshot Manager for Data Center updates the 5th rule of the volume and honor the permissions assigned to the rule.
- For SMB, the user must provide permissions to the volume as mentioned in the following web site :https://learn.microsoft.com/en-us/azure/azure-netapp-files/

Azure Files plug-in

The NetBackup Snapshot Manager for Data Center Azure Files plug-in enables you to create, delete, export, and deport snapshots of Azure Files Shares assets within the Azure Files deployment.

This plug-in uses the Azure SDKs to connect with Azure Files, leveraging the latest Azure SDK version. It establishes connections to Azure Files through Azure SDK, using Microsoft.Storage permissions to discover volumes and create snapshots for backup purposes.

Azure Files plug-in configuration parameters

The following parameters are required for configuring the Azure Files plug-in:

If NetBackup Snapshot Manager for Data Center is deployed on-premises, the configuration will be performed using Application Service Principal.

Table 9-5 Azure Files plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Tenant ID	Tenant ID for Azure Files.
Client ID	Client ID for Azure Files.
Secret key	Secret key for Azure Files.
Regions	List of supported regions. Select only those regions where Azure Files are deployed.

If NetBackup Snapshot Manager for Data Center is deployed on Azure, configuration can be accomplished using Application Service Principal, System Managed Identity, or User Managed Identity.

Table 9-6 Azure Files plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Credential Type	Select the credential type to be used for plug-in configuration: either Application Service Principal, System Managed Identity, or User Managed Identity.
Tenant ID	If Application Service Principal is selected then, tenant ID of that service principal.
Client ID	If Application Service Principal is selected then, client ID of that service principal.
Secret key	If Application Service Principal is selected then, secret key of that service principal.
Client ID (User Managed Identity)	If User Managed Identity is selected then client ID of that User Managed Identity.
Regions	List of supported regions. Select only those regions where Azure Files are deployed.

Roles and privileges on Azure Files

To enable Snapshot Manager for Data Center to perform snapshot management operations, ensure that the credentials used for configuring the plug-in have the required roles and privileges assigned within Azure:

Table 9-7 Roles and privileges on Azure Files

Feature	Required permissions	Task/Operation
Discovery of Azure Files	Microsoft.Resources/subscriptions/resourceGroups/read	To retrieve a list of Resource Groups in a Subscription to search for Storage Accounts.
	Microsoft.Storage/storageAccounts/read	To list Storage Accounts in a resource group.
	Microsoft.Storage/storageAccounts/listkeys/action	To retrieve the connection Key for the Storage Account to read its contents to look for Azure file shares.
	Microsoft.Storage/storageAccounts/fileServices/shares/read	To read Azure files in a storage account.
Plug-in configuration for Azure Files	Microsoft.Compute/virtualMachines/read	Required for identity-based authentication method used in plug-in configuration, when the Snapshot Manager for Data Center is deployed on a VM.
	Microsoft.Compute/virtualMachineScaleSets/read	Required for identity-based authentication method used in plug-in configuration, when the Snapshot Manager for Data Center is deployed on a Virtual Machine Scale Set.

Supported Snapshot Manager for Data Center Operation on Azure Files

You can perform the following Snapshot Manager for Data Center operations supported on the Azure Files:

Table 9-8 Snapshot Manager for Data Center operations on the Azure Files

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center identifies all volumes and their snapshots. Shares are primary assets, each containing associated snapshots and asset IDs.
Create snapshot	Snapshot Manager for Data Centertakes a snapshot of Azure Files volume. Snapshot Manager for Data Centerinitiates a POST API call on the volume to create a snapshot. As the Azure Files shares' snapshots do not support specific naming and are timestamp-based, Snapshot Manager for Data Center adds a comment to that snapshot using the following convention. A snapshot created with the following naming convention: NB<unique_21digit_number>
Delete snapshot	WhenSnapshot Manager for Data Center initiates a snapshot deletion operation, it removes the snapshot associated with the source volume.
Restore snapshot	Point-in-time (PIT) restore is not supported on Azure Files.
Export snapshot	When a snapshot export operation is initiated, Snapshot Manager for Data Center sends the snapshot path and the data LIF from which the snapshot can be accessed. All share-level permissions must be managed by the share administrator.
Deport snapshot	This operation is disabled. AsSnapshot Manager for Data Center does not grant specific permissions to the share for snapshot deport.
Restore to the original SMB volume	You can restore backed-up data along with metadata such as ACLs to the original Azure Files SMB volume. For details see the *Restoring from D-NAS backups* chapter in the *NetBackup™ NAS Administrator's Guide*.

Azure Files plug-in considerations and limitations

- Replication is not supported on Azure Files plug-in.

- The NetBackup Backup Host must have access to the snapshot directory of the share, and communication between the Backup Host and Azure Files must be established in advance.
- The Azure Files plug-in does not support point-in-time (PIT) rollback restore of shares using snapshots.

Dell EMC PowerMax and VMax array

The NetBackup Snapshot Manager for Data Center plug-in for Dell EMC PowerMax and VMax lets you discover the SAN volumes on the PowerMax / Vmax array. You can create, delete, export, deport, and restore storage snapshots of a supported Dell EMC PowerMax / VMax that is registered with Dell EMC Unisphere. The plug-in supports the copy-on-write (COW) snapshot type. You must configure this plug-in on the NetBackup primary server.

NetBackup Snapshot Manager for Data Center uses the REST API SDK provided by PowerMax/VMax (PyU4V) to communicate with the PowerMax/ VMax assets using the DELL EMC Unisphere APIs. NetBackup Snapshot Manager for Data Center establishes a connection with the Dell EMC Unisphere on which the PowerMax / VMax array is managed. You can register NetBackup Snapshot Manager for Data Center as a backup application and use the API endpoints to discover the SAN volumes and the snapshots to back up.

Dell EMC PowerMax and VMax plug-in configuration prerequisites

Before you configure the plug-in, ensure that the following requirements are fulfilled:

- The minimum Unisphere version required is 9.2.0.1 of the Unisphere Management console.
- Array Model supported PowerMax, VMAX-3, VMAX-AFA.
- Array uCode must be above 5978.669.669 for PowerMax OS, and HyperMax OS to support 'SnapSet Id'.
- For a list of all the supported versions of Dell EMC PowerMax and VMax, refer to the NetBackup Snapshot Manager for Data Center section in the NetBackup Hardware and Cloud Storage Compatibility List (HCL).
- A user account exists that has the permissions to invoke the Dell EMC Unisphere for PowerMax and VMax APIs.

Supported Snapshot Manager for Data Center operations on Dell EMC PowerMax and VMax

NetBackup Snapshot Manager for Data Center performs the following management operations on the Dell EMC PowerMax and VMax:

Table 9-9 Snapshot Manager for Data Center operations on Dell EMC PowerMax/ VMax plug-in

Snapshot Manager for Data Center operation	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the volumes, Storage groups, and Storage group snapshots.
Create snapshot	Dell EMC Unisphere for PowerMax and Unipshere for VMax allows snapshot creation for entire storage group. The storage group snapshot contains a single Point-in-time copy of all the volumes in the storage group at that time. To create a snapshot on the storage group, NetBackup Snapshot Manager for Data Center initiates a POST REST API call on the Storage group that contains the volumes. A snapshot name is also provided. The API returns the details of the snapshot. To create a snapshot on the volume part of a storage group, NetBackup Snapshot Manager for Data Center creates a POST REST API call on the storage group that contains the specific volume. A snapshot name is also provided. The API returns the details of the snapshot. A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: NB<unique_21digit_number> **Note:** Snapshots are created in the storage group. The only way to distinguish the snapshots is based on which asset the operation was created. If the snapshot is created on a volume, then the snapshot is mapped to the volume. If created on a storage group, the snapshot is mapped to the storage group asset.
Delete snapshot	To delete a snapshot, Snapshot Manager for Data Center initiates a DELETE REST API call with the required snapshot details and confirms that the snapshot has been deleted successfully on the array.

Table 9-9 Snapshot Manager for Data Center operations on Dell EMC PowerMax/ VMax plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Restore snapshot	Snapshot Manager for Data Center uses the storage group snapshot restore API from Unisphere. To restore a snapshot to the point-in-time image on the volume. **1** Create an empty temporary storage group. **2** Add a volume that is to be restored in the storage group. **3** Restore the temporary storage group. **4** Delete the temporary storage group. While restoring a snapshot to the point-in-time image on the storage group, all the volumes that were part of the storage group at the time of snapshot creation, are restored to the storage group snapshot state.
Export snapshot	When a snapshot export operation is initiated: Perform the following steps: ■ For volume export perform the following steps: ■ Fetch the initiators on which you want to perform the export. ■ Create an empty temporary storage group. ■ Add a source volume whose snapshot is to be exported in the storage group. ■ Now, considering temporary storage as the source storage group, create an export storage group from the snapshot and link the snapshot to the exported storage group. ■ Fetch the Host ID and Port group ID. ■ Using the export storage group, Host ID and Port group ID, create a masking view group that attaches the exported storage group to the host. ■ For storage group export, all the volumes that are a part of the storage group snapshot are added to the new the storage group, and attached to the host. ■ All the steps performed in volume export are same for storage group export for all the volumes.
Deport snapshot	When a snapshot deport operation is initiated, the exported storage group, and the volume(s) inside it, and the temporary storage group used as a source for the snapshot, are all deleted. It is a revert or clean-up of the export snapshot.

DELL EMC PowerMax and VMax plug-in configuration parameters

The following parameters are required for configuring the DELL EMC PowerMax and VMax plug-in.

Parameter	Description
Unisphere address	The Unisphere Management console allows you to manage all the arrays. You can add any management IP address or the FQDN of the Unipshere Management console.
Unisphere port	An Unisphere Management port through which you can access the console. DELL EMC recommends port 8443. The port is configurable; you can provide any port through which you have access to the Unisphere console.
Array ID	Array ID is the 12-digit unique ID of the array that you want to protect.
User name	Unisphere console user account that has permission to perform snapshots, create storage group, and link the snapshot to all these operations on the PowerMax/VMax array.
Password	The password of the Unisphere user account.

Roles and privileges on Dell EMC Unisphere for PowerMax and VMax

To allow NetBackup to perform snapshot management operations, ensure that the Dell EMC Unisphere user account used for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

RBAC is managed using Unisphere for VMAX, Unisphere for PowerMax, or the Solutions Enabler CLI symauth command. Using symauth, a user or group of users, may be mapped to a specific access role, which defines the operations that these users are permitted to perform on the entire VMAX array.

There are currently seven users-defined roles that are available with RBAC: **None, Monitor, PerfMonitor, StorageAdmin, SecurityAdmin, Admin,** and **Auditor**. The following are the base capabilities of these current roles:

- **None**: No capabilities.
- **Monitor**: Performs read-only operations on an array, excluding the ability to read the audit log or access control definitions.
- **PerfMonitor**: Includes **Monitor** role permissions and grants additional privileges within the performance component of Unisphere for the VMAX application to set up various alerts and update thresholds to monitor array performance.
- **StorageAdmin**: Perform all management and control functions. See the specific permissions pertaining to this role:
  - SecurityAdmin Performs security operations (symaudit, symacl, symauth) on an array in addition to all monitor operations. Users or groups assigned the SecurityAdmin or Admin roles can create or delete component-specific authorization rules. The SecurityAdmin also has all Auditor rights.
  - **Admin**: Performs all operations on an array, including security operations and monitor operations. The Admin also has StorageAdmin rights, SecurityAdmin rights, and application performance monitoring privileges.
- **Auditor**: Grants the ability to view, but not modify, security settings for an array (including reading the audit log, symacl list, and symauth) in addition to all monitor operations. This is the minimum role required to view the array audit log.

It is important to clarify that your Storage_Admin role remains your ssuper user, and keeps sole control of provisioning storage on the array.

Dell EMC XtremIO plug-in considerations and limitations

The following considerations and limitations are applicable:

- All the snapshots taken for any volume are read-only. A new re-purpose copy is cloned from the snapshot volume and used for data backup.
- The re-purpose clone copy is made only during export. This copy is deleted based on the scheduled deport from NetBackup or a manually run expire operation. This is a thin-provisioned type copy.
- The limit for any volume name is 128 characters on the array. In case of a re-purpose copy, the maximum length of the volume name is 128 - (23(NB<unique_21digit_number>) - 9(Repurpose) - 2(Dot notations)) = 94. It is a strict requirement to limit the volume name to 94 characters for successful backup.
- We do not recommend to write data to the re-purpose copy created by NetBackup by manually mapping the copy to a host. You can consider using the re-purpose copies created as an individual volume in NetBackup. You are not recommended

to use the copies starting with the name `volume_name.NB<unique_21digit_number>.repurpose`.

- Don't refresh the re-purpose copy as this changes the data on the copy by refreshing from the parent volume. For example, if you create a snapshot of volume V1, the protection copy is made using `V1.NB<unique_21digit_number>` and the export re-purpose copy is made with the name `V1.NB<unique_21digit_number>.repurpose`. Refreshing a re-purpose copy affects backup and restore.

Dell EMC PowerFlex array

NetBackup provides a robust data protection solution for the volumes that are set up on the storage array. NetBackup extends the SDS support and lets you protect the mounted volumes. These volumes are hosted on a Dell EMC PowerFlex array environment. You can configure Snapshot Manager for Data Center to discover data, perform backups, and restore operations.

Dell EMC PowerFlex contains the functional logic that enables NetBackup to discover the volumes on the Dell EMC PowerFlex array. Then it initiates the snapshot to create, export, deport, and delete operations for the exports. You must configure this plug-in on the NetBackup primary server.

Snapshot Manager for Data Center uses the SDK supported by the Dell EMC PowerFlex family to communicate with the Dell EMC PowerFlex assets. Snapshot Manager for Data Center establishes a connection with the Dell EMC PowerFlex array by using REST client. Then uses the SDK methods to discover the volumes and their snapshots that need to be backed up.

Supported Snapshot Manager for Data Center operations on Dell EMC PowerFlex models

You can perform the following Snapshot Manager for Data Center operations supported on the Dell EMC PowerFlex models:

Table 9-10 Snapshot Manager for Data Center operations on the Dell EMC PowerFlex array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the array volumes and snapshots inside the snapshot group flexsnap_snap_group with some metadata. The volumes which have 'CMD' in the attributes without mapping are not discovered.
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates an SDK method with the required snapshot details. The API returns the details of the snapshot. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: NB<unique_21digit_number>.
Delete snapshot	To delete a snapshot, Snapshot Manager for Data Center initiates an SDK method call with the required snapshot details. Then it confirms that the snapshot is deleted successfully from the array.
Restore snapshot	Snapshot Manager for Data Center offers the ability to restore the snapshots using an SDK method with different restore paths.
Export snapshot	Snapshot Manager for Data Center supports export of snapshots over the SDC that is mapped to the parent volume.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the SDC mapping created between the host and the volume.

Dell EMC PowerFlex plug-in configuration parameters

Specify the following parameters when you configure the Dell EMC PowerFlex plug-in:

Table 9-11 Dell EMC PowerFlex plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.

Table 9-11 Dell EMC PowerFlex plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
FQDN/ IP address	The array's IP address, in IPV4 / FQDN format.
Username	A user account that has permissions to perform snapshot operations on the Dell EMC PowerFlex array.
Password	Provide a password for the user account.

Dell EMC PowerFlex plug-in considerations and limitations

The following considerations and limitations are applicable:

1. This is a software-defined storage, which requires to install the SDC (Storage Data Client) on the host where NetBackup will be configured.
2. The mapping between the volumes and SDC is completed with the help of the SDC ID in the Snapshot Manager for Data Center.
3. The WWN (World Wide Name) is considered for mapping. It is developed using the $system_id$volume_id manner because it's not available directly on the array.

Dell EMC PowerScale (Isilon)

The NetBackup Snapshot Manager for Data Center DELL EMC PowerScale / Isilon plug-in allows you to create, delete, restore, export, and deport snapshots of the following assets on the DELL EMC PowerScale / Isilon Cluster:

- DELL EMC PowerScale / Isilon NFS exports in a NAS environment.
- DELL EMC PowerScale / Isilon SMB shares in a NAS environment.

The DELL EMC PowerScale / Isilon plug-in uses the REST API SDK provided by DELL EMC PowerScale / Isilon (isilon_sdk_python) to communicate with the DELL EMC PowerScale / Isilon assets.

Supported NetBackup Snapshot Manager for Data Center Operation on DELL EMC PowerScale (Isilon)

Snapshot Manager for Data Center performs the following management operations on the Dell EMC PowerScale (Isilon):

Table 9-12 Snapshot Manager for Data Center operations on Dell EMC PowerScale (Isilon) plug-in

Snapshot Manager for Data Center operation	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the NFS exports, SMB shares, and their snapshots along with some of their directory metadata from all the Access Zones the user has privileges to access or view. By default, a DELL PowerScale cluster has a Single access zone known as the System Access Zone and unless you have additional Access Zones, all the NFS export and SMB Shares are in this default Access Zone. The multiple access zone can be mapped to the same or different Groupnet (Groupnet -> Subnet -> Pool). During discovery, the Snapshot Manager for Data Center also associates the relevant SmartConnect of a pool to its NFS export or SMB share. NetBackup Snapshot Manager for Data Center also discovers all the nested NFS exports and SMB shares irrespective of the depth at which they are created. Mentioned below are a few examples of nested shares discovered by Snapshot Manager for Data Center: ["/ifs/test_fs1", "/ifs/test_fs1/test_fs2", "/ifs/test_fs1/test_data/test_fs3", "/ifs/smb_03/test_data/dir01"] The discovered NFS export and SMB shares must have valid underlying filesystem paths. The filesystem directory path must be shared by NFS export, and SMB shares.
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates a POST REST API call on the nfs_export with the required information and the snapshot name. The API returns the details of the snapshot. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: `SnapNB-NB<unique_21digit_number>`
Delete snapshot or replicated snapshot	To delete a snapshot, NetBackup Snapshot Manager for Data Center calls the REST API with the required snapshot details. You can see a confirmation when the snapshot is deleted successfully on the array.

Table 9-12 Snapshot Manager for Data Center operations on Dell EMC PowerScale (Isilon) plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Restore snapshot	Snapshot Manager for Data Center uses the JobAPI to revert a snapshot. To revert a snapshot that contains a directory, it is recommended that you create a SnapRevert domain for a directory. To revert a snapshot, perform the following steps: **1** Create a SnapRevert domain for the directory. **2** Create a snapshot revert job.
Export snapshot or replicate snapshot	■ When a snapshot export operation is initiated for NFS, a new export is created over the snapshot path: `("/ifs/test_fs/.snapshot/NB15985918570166499611/")` with the backup host added as a Root Clients with read-only permissions. ■ When a snapshot export operation is initiated for SMB, a new share is created over the snapshot path: `("/ifs/test_fs/.snapshot/NB15985918570166499611/")` The user and the domain provided while exporting the snapshot is added with privileges to access the SMB share created. The user must be in the domain specified.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center deletes the NFS export or SMB share created over the snapshot path at the time of the export operations.

Table 9-12 Snapshot Manager for Data Center operations on Dell EMC PowerScale (Isilon) plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Create snapshot diff	Snapshot Manager for Data Center uses the JobAPI to create a change list between snapshots. To create a change list, perform the following steps: **1** Use `JobAPI` to create a job for creating a change list between snapshots. **2** Use `get_changelist_entries` API to fetch change list entries between snapshots **Note:** The following important points: ■ The get_changelist_entries API is available for OneFS version 8.2.1 and above only. ■ As for creating a change list we make use of `JobAPI`. The job engine allows 3 different jobs to run simultaneously. There is a way to allow multiple instances of the ChangelistCreate job to run simultaneously if needed. The job engine still limits the number of jobs to 3 and some care must be taken so this does not adversely affect the cluster. To allow multiple instances of the change list run the following commands in the CLI: ■ isi_gconfig -t job-config jobs.types.changelistcreate.allow_multiple_instances=true' (the default is false) ■ isi_gconfig -t job-config jobs.types.changelistcreate.allow_multiple_instances'
Replicate snapshot	NetBackup Snapshot Manager for Data Center creates, and replicates snapshots based on the backup selections in the policy. For these backup selections, you need to set up a SyncIQ policy on the DELL EMC PowerScale (Isilon). NetBackup only supports synchronize action for the SyncIQ policy.

DELL EMC PowerScale (Isilon) plug-in configuration prerequisites

- Ensure that the SnapshotIQ license is activated on the storage array. This is required to perform snapshot operations.

- Ensure that the SmartConnectIQ license is activated on the storage array. This enables Snapshot Manager for Data Center to use the load-balancing and failover capabilities of the Isilon cluster.
- For the list of all the supported Data OneFS versions, refer to the `NetBackup Snapshot Manager for Data Center` section in the `NetBackup Hardware and Cloud Storage Compatibility List (HCL)`.
- Ensure that the SyncIQ license is activated on the Dell EMC PowerScale (Isilon) and SyncIQ service is on. This is required to initiate a replication operation.
- For replication operation, both source and target Dell EMC PowerScale (Isilon) array plug-ins must be registered with NetBackup.

Dell EMC PowerScale (Isilon) plug-in configuration parameters

The following parameters are required for configuring the Dell EMC PowerScale / Isilon.

Parameter	Description
Cluster FQDN / IP address	An Isilon cluster consists of three or more hardware nodes. The FQDN or Management IP refers to the range of External IP addresses assigned to the Cluster or an individual node. This can be found by browsing the PowerScale web console as Cluster Management → Network Configuration → groupnet → subnet → pool → Pool Interface members. You can also provide the SmartConnect FQDN.
Username	A user account that has the permissions to perform the snapshot operations on the PowerScale cluster.
Password	The password of the PowerScale (Isilon) user account.

Using SmartConnect with Snapshot Manager for Data Center

SmartConnect is a module that specifies how Isilon Cluster handles connection requests from clients. It balances connection loads to the Isilon cluster and handles connection failover. With SmartConnect, all Isilon servers use a single FQDN for data access. Using this network name provides load balancing when the connection to the cluster is made. This ensures optimal resource utilization and performance during backup operations.

SmartConnect DNS Zone name is smart connect configuration and it can be located by browsing the PowerScale web Console as Cluster Management → Network Configuration → groupnet → subnet → pool → SmartConnect Basic/ Advanced

Even if the plug-in is configured with the FQDN or IP which is not a SmartConnect FQDN, NetBackup Snapshot Manager for Data Center would still export the snapshots using the SmartConnect FQDN.

Roles and privileges on Dell EMC PowerScale (Isilon)

This section describes the privilege required by the Dell EMC PowerScale / Isilon user account, used for plug-in configuration, on the storage array. Privileges in OneFS are assigned through role membership; not directly to the user. You can create a custom role with the required privileges and assign it to the user.

Table 9-13 Permissions required by the Isilon user account on the array

Platform API	Read-only
Namespace access	Read-only
Namespace Traverse	Read-only
Network	Read-only
Snapshot	Read/Write
NFS	Read/Write
SMB	Read/Write
SyncIQ	Read-only

Snapshot replication for Dell EMC PowerScale (Isilon)

The replication feature lets you replicate snapshots on a DELL EMC PowerScale (Isilon) array. DELL EMC PowerScale (Isilon) array provides two different types of replication policies:

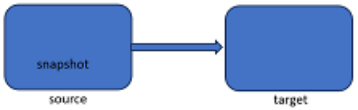
- Copy
- Synchronize

Snapshot Manager for Data Center supports only Synchronize Isilon SyncIQ policy. The supported policy is represented as Isilon_SyncIQ_Sync replication type in NetBackup SLP. You can choose this replication type as the replication destination in SLP to replicate snapshots to the desired replication destination.

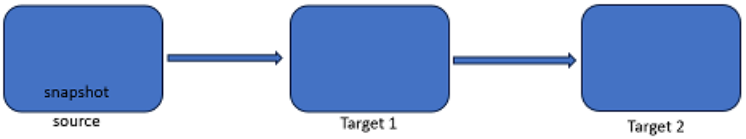
Supported Dell EMC PowerScale (Isilon) replication topologies

The following scenarios describe the Dell EMC PowerScale (Isilon) replication topologies that Snapshot Manager for Data Center supports. All topologies begin with a snapshot of the data on the primary volume.

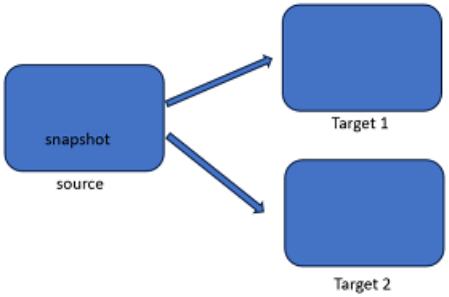
The snapshot can be replicated when you have a single target as the destination.



The snapshot can be replicated in a cascaded configuration.



The snapshots can be replicated when you have multiple targets configured as destination.



Consideration for Dell EMC PowerScale (Isilon)

The following considerations and limitations are applicable:

- Recommend limit for the snapshot of directory is 1024 and the cluster-wide Snapshot limit is 20000.
  See: https://www.delltechnologies.com/asset/en-us/products/storage/industry-market/h16857-wp-onefs-best-practices.pdf

- Avoid creating snapshot directories that are already referenced by other snapshots. For example, if you create 500 snapshots of /ifs/test_fs1 and 500 snapshots of /ifs/test_fs1/test_fs2, you have created 1000 snapshots of /ifs/test_fs1/test_fs2.
- For replication, set the SyncIQ policy for the backup selection as `synchronize` on the Dell EMC PowerScale (Isilon array).

Dell EMC PowerStore SAN and NAS plug-in

NetBackup provides a robust data protection solution for volumes, volume groups, file system NFS exports, and SMB shares on NAS and SAN storage hosts. You can protect mounted iSCSI/FC volumes in a SAN environment and NFS exports or SMB shares in a NAS environment that are hosted in a PowerStore environment.

Snapshot Manager for Data Center EMC PowerStore plug-in allows you to create, delete, restore, export, and deport snapshots of the following assets on the Dell EMC PowerStore storage arrays:

- Volumes in a SAN environment
- Volume group in a SAN environment
- NFS exports in a NAS environment
- SMB shares in a NAS environment

The Dell EMC PowerStore plug-in uses the Python SDK from Dell EMC: Python-Powerstore (1.4.0) to communicate with the arrays.

Supported NetBackup operation on Dell EMC PowerStore array

NetBackup performs the following snapshot management operations on the Dell EMC PowerStore arrays.

Table 9-14 Snapshot Manager for Data Center operations on EMC PowerStore arrays

Snapshot Manager for Data Center operation	Description
Discover assets	In a SAN environment, NetBackup discovers all the Dell EMC PowerStore primary volumes and volume snapshots present on the array. NetBackup discovers only primary type volumes and skips the clone type volumes. For volume snapshots only the snapshot type volumes are discovered. In a NAS environment, NetBackup discovers all the Dell EMC PowerStore NAS servers, file systems, primary NFS exports, and SMB shares along with the file-system snapshots and some of their directory metadata. NetBackup also discovers the nested NFS exports and SMB shares irrespective of the depth.
Create snapshot	In a SAN environment, to create a snapshot, NetBackup calls the REST API with the required information and snapshot name. At the time of volume snapshot creation, a new volume having type (snapshot) is created on the array. In a NAS environment, to create a snapshot, NetBackup calls a REST API with the required information and snapshot name. Dell EMC PowerStore supports two types of snapshots—protocol and snapshot type. NetBackup initiates the protocol-type snapshots and the retention period is not set on the array for these snapshots. All these snapshots are at a file-system level. A typical snapshot created by NetBackup has the following naming convention: NB<unique_21digit_number>
Delete snapshot	In a SAN environment, to delete a volume snapshot, NetBackup calls the REST API using the SDK method with the required volume snapshot details. A subsequent API call confirms the deletion. In a NAS environment, to delete a file system snapshot, NetBackup calls a REST API using the SDK method, with the required file system snapshot details. A subsequent API call confirms the deletion.
Restore snapshot	In a SAN environment, NetBackup offers the capability for the PIT rollback, and you can use the created snapshot to restore the primary volume. For restoring the `.snapshot` type volume is used. In NAS environment, NetBackup does not support PIT restore operation on the array. You can perform a normal restore on any specified location.

Table 9-14 Snapshot Manager for Data Center operations on EMC PowerStore arrays *(continued)*

Snapshot Manager for Data Center operation	Description
Export snapshot	In a SAN environment, NetBackup can export using the snapshots created for volumes. When a NetBackup initiates an export call, a new clone-type volume is created from the snapshot and used for backup purposes. A host is added to this clone based on the details that are sent by the NetBackup client. In a NAS environment, NetBackup supports export operations using the NFS and SMB protocols. When NetBackup initiates a snapshot export operation, based on the selected protocol, a new NFS export or SMB share is created using a snapshot and parent export or share local path. The newly created export or share name is the same as the snapshot name. Also, the host access configurations are added as read-only on a particular export or share.
Deport snapshot	In a SAN environment, the deport snapshot operation removes the hosts added for the cloned volume created during the export call. NetBackup deletes all the hosts that are available on the volume. The newly cloned volume is also deleted during the deportation operation.

Dell EMC PowerStore plug-in configuration prerequisites

Before you configure the Dell EMC PowerStore plug-in, ensure the following:

- Ensure that a supported version of Dell EMC PowerStore is installed on the arrays.
- For the list of all the supported versions of Dell EMC PowerStore, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List(HCL)*.
- A user account with the permissions to invoke the Dell EMC PowerStore REST APIs and perform all snapshot operations on the array. For plug-in registration with NetBackup you can use an administrator or storage-administrator user account based on the specific role you want for the owner of backup support.
- To configure the array in NetBackup, use the IP/ FQDN of the array. The current support only provides the ability to configure IPV4. For IPV4 access, provide the management IP. For FQDN, the management FQDN address is:
  `https://powerstore-management-company-dell.com`.

Dell EMC PowerStore plug-in configuration parameters

The following parameters are required for configuring the Dell EMC PowerStore plug-in:

Parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN / IP address	The array's management IP address, in either IPv4 or The Fully Qualified Domain Name (FQDN).
User name	The Dell EMC PowerStore user account that has the permissions to invoke the PowerStore REST APIs to perform all snapshot operations on the array.
Password	The password of the PowerStore NAS user account.

Volume group support in Dell EMC PowerStore plug-in

Snapshot Manager for Data Center comes with the capability of discovering all the volume groups and their snapshots. Three types of volume groups are available in PowerStore: Primary, Clone, and Snapshot; but we fetch only the Primary volume groups. Volumes and volume groups are primary assets, and each primary asset contains the associated snapshots. The volumes that are selected in the NetBackup policy, those volumes become the members of a volume group on the PowerStore array. When a snapshot operation runs, the snapshot set of a volume group is created.

During export, NetBackup creates clone volumes for each volume present in the volume group, and maps all the cloned volumes to the host.

Domain user permissions on the Dell EMC PowerStore array

In a NAS environment, the domain user that you use to perform the NAS share backup, must have privileges for the PowerStore array. This allows NetBackup to perform a backup of the NAS share ACLs.

Considerations and limitations for Dell EMC PowerStore plug-in

The following considerations and limitations are applicable:

In a SAN environment:

- The Snapshot Manager for Data Center does not discover the cloned volumes during discovery.

- The cloned volumes never expire. You can manually delete the cloned volumes from NetBackup during deport and delete operations.
- Volumes from multiple appliances are not allowed within the same volume group. All Volumes must reside on the same appliance.
- If a protection policy is assigned with a volume group, you cannot assign a protection policy to an individual resource within the group.
- The volume groups do not support mapping and unmapping, the workaround is to attach and detach the host with each volume in the volume group separately.
- Single volume restore operations are only allowed when write order consistency is disabled on the volume group.
- Before restoring a snapshot, you must shut down the application and unmount the file system that is running on the production host. Also, delete the host cache to prevent data corruption during the restore operation.

In a NAS environment:

- All snapshots are captured at the file system level and the snapshots are in read-only mode.
- The limit for the file system name is 255 characters. NFS export or SMB share name is 80 characters on the array. For a snapshot name, the maximum length must be 255 characters.
- Dell EMC PowerStore plug-in does not support point-in-time (PIT) rollback restore of shares using snapshots.

Dell EMC XtremIO SAN array

NetBackup provides a robust data protection solution for volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup allows you to protect mounted iSCSI/FC volumes configured on the XtremIO SAN array.

The NetBackup Snapshot Manager for Data Center plug-in for Dell EMC XtremIO SAN contains the necessary functional logic that enables NetBackup to discover the SAN volumes on the Dell EMC XtremIO SAN array. It also creates snapshots and performs export, deport, and delete operations for the volumes. You must configure this plug-in on the NetBackup primary server to discover the volumes, and perform backup and restore operations.

NetBackup Snapshot Manager for Data Center uses the REST APIs exposed by the Dell EMC XtremIO SAN family to communicate with the SAN assets.

Supported NetBackup Snapshot Manager for Data Center operations on Dell EMC XtremIO

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on Dell EMC XtremIO.

Table 9-15 Snapshot Manager for Data Center operations on the Dell EMC XtremIO SAN array

Snapshot Manager for Data Center operations	Description
Discover assets	The XtremIO array has three types of volumes: Primary, Re-purpose copy, and Protection-copy. You can create the primary volumes manually and they can be of any size based on the limit of the associated volume. A re-purpose copy is a thin-provisioned volume created from the protection copy during the snapshot creation process. NetBackup Snapshot Manager for Data Center discovers the primary volumes and re-purpose copy volumes which have an NAA identifier associated as a volume asset, and a protection-copy as a snapshot asset. For a volume to be discovered, map it to the host.
Create snapshot	To create a snapshot, NetBackup calls a REST API method with the required snapshot details. The API returns the details of the snapshot. The protection-copy snapshot is read-only. A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>`
Delete snapshot	To delete a snapshot, NetBackup Snapshot Manager for Data Center calls a REST API method with the required snapshot details. You can confirm that the snapshot is deleted successfully on the array, by making another call with the same snapshot. If the snapshot is attached to any host, then all the mappings are deleted forcefully as a mandatory requirement. This process also deletes the mappings that do not belong to the NetBackup host.

Table 9-15 Snapshot Manager for Data Center operations on the Dell EMC XtremIO SAN array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	NetBackup Snapshot Manager for Data Center offers the ability to restore the snapshots using a Put REST API. You can restore the source volume only with the protection-copy type snapshot. Any PIT rollback uses the snapshot associated with the source volume. You cannot restore a snapshot to a different source volume to which it does not belong. By default, whenever you do a PIT rollback on any source volume, the array creates a re-purpose copy for the same to back up the volume. But NetBackup Snapshot Manager for Data Center does not create this default re-purpose copy, when the restore is initiated from the console. You can restore any snapshot of any PIT on the volume. Every protection copy acts as an individual asset and has no dependency on the other snapshot copies.
Export snapshot	NetBackup Snapshot Manager for Data Center supports export of snapshots over the iSCSI and FC protocols. When a snapshot export operation is initiated, firstly a re-purpose copy is created using the protection copy which was created in the create snapshot operation. Once this re-purpose copy is completed, a host is attached to the same. Do the SAN zoning between the host and array that you want to attach with the snapshot.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center deletes the export mapping created between the host and the re-purpose copy volumes.

Dell EMC XtremIO SAN plug-in configuration pre-requisites

Before you configure the plug-in, verify the following:

- For the list of all the supported versions of Dell EMC XtremIO, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List*.
- A user account with the permission to call the Dell EMC XtremIO APIs.

Dell EMC XtremIO SAN plug-in configuration parameters

The following parameters are required for configuring the Dell EMC XtremIO SAN plug-in:

Table 9-16 Dell EMC XtremIO SAN plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP Address	The array's IP address, in IPV4 / FQDN format.
User name	A user account that has permissions to perform snapshot operations.
Password	Provide a password to the user account.

Roles and privileges on Dell EMC XtremIO

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the Dell EMC XtremIO user account used for plug-in configuration has the following roles and privileges assigned:

- Create Snapshot
- Export Snapshot
- Restore Snapshot
- Delete Snapshot

There are four predefined user roles in Dell EMC XtremIO:

- Tech - For support people
- Admin - To attach LUN's and so on.
- Configuration - To provision storage
- Read Only - Can perform only read-only task

Users with the Admin role assigned can perform all the NetBackup Snapshot Manager for Data Center's snapshot management operations.

Dell EMC XtremIO plug-in considerations and limitations

The following considerations and limitations are applicable:

- All the snapshots taken for any volume are read-only. A new re-purpose copy, cloned from the snapshot volume, is used for data backup.
- The limit for any volume name is 128 characters on the array. For a repurpose copy, the maximum length of the volume name is 128 - (23(NB<unique_21digit_number>) - 9(Repurpose) - 2(Dot notations)) = 94. It is a strict requirement to limit the volume name to 94 characters for a successful snapshot.
- Do not write data to the repurpose copy created by NetBackup by manually mapping it to a host. You can consider the re-purpose copies created by them as an individual volume in NetBackup. Do not use the copies starting with volume_name.NB<unique_21digit_number>.repurpose.
- Do not refresh the repurpose copy, as this changes the data on the image by refreshing from the parent volume. This affects backup and restore.

Dell EMC Unity Array

The NetBackup Snapshot Manager for Data Center Dell EMC Unity plug-in allows you to create, delete, restore, export, and deport snapshots on the Dell EMC Unity storage arrays. The following assets are supported:

- Dell EMC Unity volumes in a SAN environment
- Dell EMC Unity consistency group in a SAN environment
- Dell EMC Unity file system in a NAS environment
- Dell EMC Unity NFS exports in a NAS environment
- Dell EMC Unity SMB shares in a NAS environment

The Dell EMC Unity NAS plug-in uses the Storops SDK python library to communicate with the Dell EMC Unity array for NAS and SAN environment. The connection is established to the Dell EMC Unity array through the Storops SDK to discover the above-mentioned assets.

Supported Snapshot Manager for Data Center operations on the Dell EMC Unity array

NetBackup Snapshot Manager for Data Center performs the following operations on the Dell EMC Unity.

Table 9-17 Snapshot Manager for Data Center operations on Dell EMC Unity array

Snapshot Manager for Data Center operation	Description
Discover assets	In a NAS environment, NetBackup Snapshot Manager for Data Center discovers all the NAS servers, NFS exports, SMB shares, NAS file system, and file system snapshots as assets. NetBackup Snapshot Manager for Data Center calls an SDK method that internally calls the array's API to retrieve the assets mentioned in the list. For NAS discovery, NetBackup Snapshot Manager for Data Center doesn't skip any assets. For example, if the current file system shares NFS and SMB in total are 100, and the snapshot count is 21, then you can find 100 directories and 21 file systems in the NetBackup. In a SAN environment, NetBackup Snapshot Manager for Data Center discovers all the volumes, consistency groups, and their corresponding snapshots as assets. **Note:** NetBackup Snapshot Manager for Data Center discovers all snapshots in a NAS and SAN environment, but it can operate on only those snapshots that it creates itself.
Create snapshot	In a NAS environment, NetBackup Snapshot Manager for Data Center calls an SDK method to create a snapshot of a file system. When a snapshot is initiated, a redirect-on-write (ROW) snapshot of the entire file system is created. The API returns the snapshot details. In a SAN environment, NetBackup Snapshot Manager for Data Center creates a snapshot of a volume and consistency group using the SDK. When a snapshot is initiated, a redirect-on-write (ROW) snapshot of the volume or the consistency group is created. The snapshot name and retention period are not set on the array for these snapshots. A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>` No other entity apart from this snapshot is created on the array as a snapshot-related activity.

Table 9-17 Snapshot Manager for Data Center operations on Dell EMC Unity array *(continued)*

Snapshot Manager for Data Center operation	Description
Delete snapshot	In a NAS environment, when a snapshot is deleted, Snapshot Manager for Data Center calls the SDK with the required snapshot details and deletes the file system snapshot. In a SAN environment, when a snapshot is deleted, Snapshot Manager for Data Center calls the SDK with the required snapshot details and deletes the volume or consistency group snapshot.
Restore snapshot	For NAS, NetBackup Snapshot Manager for Data Center does not support PIT restore on file system, NFS share, and SMB Share. For SAN: ■ PIT restores for volume snapshot restores the volume to the snapshot state. ■ PIT restores for a volume inside the consistency group is restored to the PIT snapshot state. **Note:** The latest snapshot is not required for PIT. You can perform the restore operation with old snapshots related to the file system.

Table 9-17 Snapshot Manager for Data Center operations on Dell EMC Unity array *(continued)*

Snapshot Manager for Data Center operation	Description
Export snapshot	In a NAS environment, when a snapshot export is initiated: ■ For NFS share snapshot, NetBackup Snapshot Manager for Data Center creates a new NFS share from the file system snapshot and adds host permission for accessing the exported NFS share. The target host is assigned read-only root permissions on the exported NFS snapshot share. NetBackup Snapshot Manager for Data Center also prepares a path to the share level. For NFS shares, the export path is created with: `<NAS-server-ip>:<share_name>`. The rules for the hosts are added as a read-only root on a particular share. **Note:** Host access is added for a list of hosts present as target in read-only root mode. ■ For SMB share snapshot, NetBackup Snapshot Manager for Data Center creates a new SMB share from the file system snapshot and adds user permission and domain for accessing the exported SMB share. Users are assigned read-only permissions on the exported SMB snapshot share. NetBackup Snapshot Manager for Data Center also prepares a path up to the share level. For SMB shares, the shares are created using the path `\\<NAS-server-ip>\<share_name>\` and backup is performed. **Note:** User permissions are added for a particular SMB share in read-only mode. In a SAN environment, when a snapshot export is initiated: ■ The volume and consistency group snapshots are directly attached to the target host. ■ The export operation is supported using the following the Fibre Channel (FC) protocol.

Table 9-17 Snapshot Manager for Data Center operations on Dell EMC Unity array *(continued)*

Snapshot Manager for Data Center operation	Description
Deport snapshot	In a NAS environment, when a snapshot is deported: ■ For NFS share, NetBackup Snapshot Manager for Data Center removes host permissions added to the NFS share and deletes the NFS share created. ■ For SMB share, NetBackup Snapshot Manager for Data Center removes user permissions added to the SMB share and deletes the SMB share created. In a SAN environment, when a snapshot is deported: ■ For volume snapshots, NetBackup Snapshot Manager for Data Center detaches the volume snapshot from the host. ■ For consistency group snapshots, NetBackup Snapshot Manager for Data Center detaches the consistency group snapshot from the host.

Dell EMC Unity plug-in configuration prerequisites

Ensure the following:

- Ensure that the supported version of Dell EMC Unity Unisphere is installed on the DELL EMC Unity arrays. For the list of all the supported versions of Dell EMC Unity Unisphere, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists with the permissions to call the Dell EMC Unity Storops SDK methods and all snapshot operations on the array.

Dell EMC Unity plug-in configuration parameters

The following parameters are required for configuring the Dell EMC Unity plug-in:

Table 9-18 Dell EMC Unity array plug-in configuration parameters

NetBackup configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.

Table 9-18 Dell EMC Unity array plug-in configuration parameters *(continued)*

NetBackup configuration parameter	Description
Dell EMC Unisphere IP	Unisphere IP is the management interface that accepts IPv4, IPv6 and FQDN. Unisphere is mapped to the Unity array and performs storage management actions.
Username	A user account that has permission to perform snapshot operations on the Dell EMC Unity array.
Password	The password of the EMC Unity array user account.

Roles and privileges on Dell EMC Unity array

To allow NetBackup to perform snapshot management operations, ensure that the Dell EMC Unity user account you use for plug-in configuration has the Storage administrator role assigned, with the privileges mentioned.

The required privileges for the Storage admin role are:

- Add, delete, or modify hosts.
- Create storage
- Delete storage
- Add storage objects, such as LUNs, shares, and storage groups to a storage resource.
- View storage configuration and status.
- View Unisphere user accounts.
- View current software or license status.
- Manage backup operations with encryption.
- Establish VASA connections.

Considerations and limitations

The following considerations and limitations are applicable:

- All snapshots captured for the file system are in read-only mode. The host is appended as per the existing rules for a particular share.
- The limit for any file system name is 128 characters on the array. For a snapshot copy, the maximum length for the volume name is 128 -

23(NB<unique_21digit_number>) = 103. Limit the volume name to 94 characters for successful snapshot capture.

Fujitsu Eternus AF/DX SAN array

Snapshot Manager for Data Center provides a robust data protection solution for mapped FC/iSCSI volumes that are set up on SAN storage hosts. You can protect volumes that are mapped via FC/iSCSI in a Fujitsu AF/DX environment.

Snapshot Manager for Data Center discovers the SAN volumes on the array and performs create, export, deport, and delete snapshot operations for volumes. Snapshot Manager for Data Center uses the REST API of the array to establish a connection and perform all the operations.

Supported Snapshot Manager for Data Center operations on Fujitsu Eternus AF/DX SAN models

You can perform the following management operations supported on the Fujitsu AF/DX SAN array:

Table 9-19 Snapshot Manager for Data Center operations on Fujitsu Eternus AF/DX SAN array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup discovers all the volumes and their snapshots. Volumes are primary assets; each contains the associated snapshots and asset IDs.
Create snapshot	To create a snapshot (snapOPCPlus), NetBackup initiates a POST API call on the volume. The snapshot volume is created on the same appliance as the source volume. A typical snapshot created by NetBackup has the following naming convention: NB<unique_21digit_number>
Delete snapshot	Before deleting a snapshot, Snapshot Manager for Data Center performs the following operations: ■ Detach/ snapshot volume from the host (Delete the host connection for that snapshot volume) ■ Delete copy session of it. NetBackup calls the REST API with the required snapshot details to delete a snapshot. Then confirms that the snapshot is deleted successfully on the array.

Table 9-19 Snapshot Manager for Data Center operations on Fujitsu Eternus AF/DX SAN array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	NetBackup uses the volume snapshot restore API to restore volume snapshots to the point-in-time image on the volume.
Export snapshot	When a snapshot export operation is initiated, NetBackup attaches the snapshot volume to the host. These are the steps for snapshot export: **1** Fetch initiators on which you want to perform the export. **2** Based on the port and initiator, retrieve the host ID. **3** Create a new host LUN to map the snapshot volume. **4** Map the snapshot volume to the host.
Deport snapshot	During snapshot export, NetBackup deletes the copy session of the source volume, host connection of snapshot volume, and exported snapshot volume. It is a revert of the export snapshot operation.

Fujitsu Eternus AF/DX plug-in configuration prerequisites

Before you configure the Fujitsu Eternus AF/DX AF/DX plug-in, ensure the following:

- Create one thin provision pool that has a "flexsnap_pool" prefix to store snapshots.
- Ensure that a supported version of the Fujitsu Eternus AF/DX plug-in is installed on the Fujitsu Eternus AF/DX arrays.
- For the list of all the supported versions of Fujitsu Eternus AF/DX, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account that has the permission to call the Fujitsu Eternus AF/DX APIs and perform all snapshot operations on the array.

Fujitsu Eternus AF/DX SAN plug-in configuration parameters

- Role-based access control rights allow users to have different privileges. This provides a means to segregate administration roles to align better with skill sets and responsibilities. There are five types of access for users: Admin, Storage Admin, Security Admin, Account Admin, and Maintainer. You can also have a customized user that performs all the snapshot management operations.

- To allow NetBackup to perform snapshot management operations, ensure that the Fujitsu Eternus AF/DX user account used for plug-in configuration has the following roles and privileges assigned on the storage array: Create, Delete, Attach, Detach, and Restore.
- Users with the Admin user role assigned can perform all the NetBackup snapshot management operations.

Roles and privileges on Fujitsu AF/DX storage array

Role-based access control rights allow users to have different privileges. This provides a means to segregate administration roles to align better with skill sets and responsibilities. There are five types of access for users: Admin, Storage Admin, Security Admin, Account Admin, and Maintainer. You can also have a customized user that can perform all the snapshot management operations.

The Fujitsu AF/DX user account used for plug-in configuration must have the following roles and privileges assigned on the storage array: Create, Delete, Attach, Detach, and Restore.

A user with an Admin user role assigned can perform all NetBackup's snapshot management operations.

Consideration and limitations

For create snapshot operation:

- You must have a thin provision pool.
- Source volume types are Standard, TPV, FTV, and WSV (except for the system volume).
- The destination volume type is TPV only.
- The maximum number of snapshots (SnapOPC+ Sessions) that can be created per volume is 512.

For host connection (mapping)

- Available HLUNs are between 0 and 255.
- If you want to use 256 or more HLUNs/Volumes to the host, change the LUN address of the host response to "Host Response" (flat space address) or you can enable the "LUN Expand Mode" option.
  Then you can use HLUN up to 4096.

Fujitsu Eternus AB/HB SAN array

Snapshot Manager for Data Center provides a robust data protection solution for volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup extends SAN support and now allows you to protect mounted iSCSI/FC volumes that are hosted on a Fujitsu AB/HB Environment.

NetBackup Snapshot Manager for Data Center plug-in for Fujitsu AB/HB has the functional logic that enables NetBackup to discover the SAN volumes on the arrays. It also can trigger snapshot create, export, deport, and delete operations for volumes.

You must configure this plug-in on the NetBackup primary server to discover the volumes, and perform backup and restore operations.

NetBackup Snapshot Manager for Data Center uses Fujitsu AB/HB provided WSAPIs to communicate with the assets.

Supported Snapshot Manager for Data Center operations on Fujitsu Eternus AB/HB SAN models

You can perform the following management operations supported on the Fujitsu AB/HB array:

Table 9-20 Snapshot Manager for Data Center operations on Fujitsu AB/HB array

Snapshot Manager for Data Center operations	Description
Discover snapshot	NetBackup Snapshot Manager for Data Center discovers all the Fujitsu AB/HB volumes and their snapshots.

Table 9-20 Snapshot Manager for Data Center operations on Fujitsu AB/HB array *(continued)*

Snapshot Manager for Data Center operations	Description
Create assets	For each volume, NetBackup creates a snapshot group with the following naming convention: NBSG<volume_name> The snapshot group is created with 40% capacity of the base volume. All snapshots on that volume are created inside this Snapshot Group. When the reserved capacity for a snapshot group is full, it will reject any new writes to the base volume. Fujitsu AB/HB Volume has a limitation of 32 snapshots per volume, post which the create snapshot operation results in an error. To create a snapshot, NetBackup Snapshot Manager for Data Center triggers a Post Rest API method with the required information. The API returns the details of the snapshot. Snapshots created by NetBackup Snapshot Manager for Data Center have the description: :vrtscp: <Parent Volume Name>. Using this suffix in the description, NetBackup Snapshot Manager for Data Center decides that this Snapshot has been created by NetBackup. It is then allowed to delete the same.
Export snapshot	NetBackup Snapshot Manager for Data Center supports export snapshots over the iSCSI and FC protocols. When a snapshot export operation is triggered, a new Snapshot Volume is created using the Snapshot. The Snapshot Volume has the following naming convention: SV_snap_seq_no<snapshot sequence no> Once this SV is created, then a host is attached to the same. The SAN zoning should be done between the host and the array that is required to be attached to the snapshot. **Note:** The discovery for the Snapshot Volume created in the export operation will be skipped.

Table 9-20 Snapshot Manager for Data Center operations on Fujitsu AB/HB array *(continued)*

Snapshot Manager for Data Center operations	Description
Delete snapshot	To delete a Snapshot, NetBackup Snapshot Manager for Data Center triggers a Delete Rest API method call with the required snapshot details. NetBackup Snapshot Manager for Data Center checks for suffix (:vrtscp:) only when this suffix is there, Snapshot will be allowed for deletion. For Fujitsu AB/HB, only the oldest snapshot can be deleted any time. If any delete operation other than this is triggered, it results in an error. If a snapshot must be deleted, then all snapshots taken before that snapshot must be deleted.
Restore snapshot	To restore a Snapshot, NetBackup Snapshot Manager for Data Center triggers a Post Rest API method call with the required snapshot details.
Deport snapshot	When a snapshot deport operation is triggered, NetBackup Snapshot Manager for Data Center deletes the export mapping created between the host and the Snapshot volume, and it deletes the intermediate Snapshot Volume once it is detached from the host.

Fujitsu Eternus AB/HB SAN plug-in configuration prerequisites

Before you configure the Fujitsu AB/HB plug-in, ensure the following:

- Refer to the *NetBackup Snapshot Manager* section, in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)* to view all the supported versions of Fujitsu AB/HB.
- A user account with permissions to invoke the Fujitsu AB/HB APIs.

Fujitsu Eternus AB/HB SAN plug-in configuration parameters

Specify the following details when you configure the Fujitsu AB/HB:

Table 9-21 Fujitsu AB/HB plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plugin ID	Provide a name for the plugin.
Proxy/Array IP Address	IP address of the machine where Fujitsu AB/HB is installed or proxy server address on which array is added.
Port	Port number of the REST API server.
Username	User account that has permissions to perform snapshot operations on the Fujitsu AB/HB.
Password	A password for the user account.
Storage array WWN	WWN of the array

You can find the storage array WWN in the array details.

To get the array details, use the following API:

https://<array / proxy IP>:<port no>/devmgr/v2/storage-systems

Roles and privileges on Fujitsu Eternus AB/HB SAN

To allow NetBackup Snapshot Manager to perform snapshot management operations, ensure that the Fujitsu AB/HB user account used for plug-in configuration has the below-mentioned roles and privileges assigned:

Ensure that the Fujitsu AB/HB user account has the privileges to perform the following operations:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

The RBAC (role-based access control) capabilities include pre-defined users with one or more roles mapped to them. Each role includes permissions for accessing tasks in **Unified Manager** or **System Manager**.

The roles provide user access to tasks, as follows:

Table 9-22 Fujitsu AB/HB roles and responsibilities

Role	Responsibilities
Storage admin	Full read/write access to storage objects on the arrays, but no access to the security configuration.
Security admin	Access to the security configuration in Access Management and Certificate Management.
Support admin	Access to all hardware resources on storage arrays, failure data, and MEL events. No access to storage objects or the security configuration.
Monitor	Read-only access to all storage objects, but no access to the security configuration.

Fujitsu AX/HX Series plug-in

NetBackup provides a robust data protection solution for volumes that are set up on the storage array. NetBackup extends REST support for SAN, and NAS volumes and allows you to protect the mounted iSCSI/FC volumes that are hosted on a Fujitsu AX/HX array environment. You can configure NetBackup Snapshot Manager for Data Center to discover volumes and LUNs, to perform backup and restore operations.

The NetBackup Snapshot Manager for Data Center plug-in for Fujitsu AX/HX contains the functional logic that enables NetBackup to discover the SAN, NAS volumes, and LUNs on the Fujitsu AX/HX array. Then initiates snapshot to create, export, deport, and delete operations for those entities. You must configure this plug-in on the NetBackup primary server.

NetBackup Snapshot Manager for Data Center uses the NMSDK and netapp-ontap python library which internally consumes the ZAPI and REST API respectively as the array is NetApp OEM. NetBackup Snapshot Manager for Data Center establishes a connection with the Fujitsu AX/HX array using the NMSDK or netapp-ontap SDK. Then uses the SDK methods to discover the NAS and SAN volumes and the snapshots for backup.

- Fujitsu AX/HX Volumes: ONTAP serves data to clients and hosts from the logical containers called FlexVol volumes.
- Fujitsu AX/HX NFS or SMB volumes in the NAS environment
- Fujitsu AX/HX Storage Virtual Machines (SVM) allows NAS clients to access storage using NFS.

  - SVMs contain data volumes and one or more LIFs through which they serve data to the clients.
  - SVMs provide file-level data access using NFS and CIFS protocols for NAS clients.
- Fujitsu AX/HX Logical Unit Number (LUNs) storage units in a SAN environment.
- Protocol configured with Fujitsu AX/HX SVM: ISCSI, FC/FCoE, CIFS, NFs

Supported Snapshot Manager for Data Center Operation on Fujitsu AX/HX array

You can perform the following Snapshot Manager for Data Center operations supported on Fujitsu AX/HX array:

Note: In the case of Fujitsu AX/HX, a LUN is part of a volume and the action performed on a single LUN is performed on its entire parent volume internally. Therefore, a volume acts as a consistency group.

Table 9-23 Snapshot Manager for Data Center operations on the Fujitsu AX/HX array

Snapshot Manager for Data Center operations	Description
Discover assets	■ NetBackup Snapshot Manager for Data Center discovers the volume, LUNs that are created from storage volumes. ■ LUNs that have an online status and read-write operations are enabled can be discovered. ■ During the discovery of assets, the plug-in creates a mapping between volumes and LUNs. ■ Only online volumes are discovered. ■ Snapshot Manager for Data Center discovers all the NAS volumes that are online and using the active junction path on the Fujitsu AX/HX storage. Junction-Path specifies the access protocol for either NFS or SMB.

Table 9-23 Snapshot Manager for Data Center operations on the Fujitsu AX/HX array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	Snapshot Manager for Data Centertakes a snapshot of the Fujitsu AX/HX volumes and LUNs ■ To create a LUN snapshot on the Fujitsu AX/HX storage, the array internally initiates a Redirect-on-Write (ROW) snapshot of the entire volume to which the LUN belongs. If the volume contains multiple LUNs, the snapshot includes data from the LUNs that reside on the associated volume. ■ When a volume snapshot is initiated on the Fujitsu AX/HX storage, creates a ROW snapshot of the entire volume and returns the snapshot data of the volume. ■ Snapshot Manager for Data Center takes a snapshot of the Fujitsu AX/HX NFS and SMB share using volume. ■ A snapshot created with the following naming convention: : NB<unique_21digit_number>
Delete snapshot	When a delete snapshot operation is initiated for the following: ■ LUN snapshot - NetBackup Snapshot Manager for Data Center internally deletes the snapshot of one or more volumes to which the LUN is associated. ■ Volume snapshot - NetBackup Snapshot Manager for Data Center deletes the snapshot corresponding to the volume. ■ Snapshot Manager for Data Center deletes the snapshot of the NAS volume.
Deport snapshot	When a deport snapshot operation is initiated for the following: ■ LUN Deport - Snapshot Manager for Data Center removes the LUN mapping from the target host and then deletes the LUN clone. ■ Volume deport - Snapshot Manager for Data Center removes the mapping from the LUN hosts associated with the volume and then deletes the volume clone. ■ When a snapshot deport operation is initiated for SMB, Snapshot Manager for Data Center deletes the shares created during the export call. For NFS, no action is performed.

Table 9-23 Snapshot Manager for Data Center operations on the Fujitsu AX/HX array *(continued)*

Snapshot Manager for Data Center operations	Description

Export snapshot	■ When a snapshot export operation initiates for a LUN Snapshot Object, Snapshot Manager for Data Center creates a LUN clone from the snapshot and attaches it to the target.
	■ When a snapshot export operation initiates for a Volume Snapshot Object, Snapshot Manager for Data Center creates a volume clone from the snapshot and attaches all the LUNs associated with the volume to the target.
	■ The target host is assigned with the read-write privileges on the exported entity (Volume/ LUN).
	■ The export operation is supported using the following protocols:
	  ■ Fiber Channel (FC)
	  ■ Internet Small Computer Systems Interface (iSCSI)
	■ When a snapshot export operation is initiated, for NFS, export policy rules are checked for source volume.
	  ■ If the export rules match the client (selected in the policy) which includes protocol as NFS or SMB or both with superuser access. Then the backup is performed directly on the client.
	  ■ If no export rule match is found then a new rule with NFS protocol, read-only with superuser access is created in the export policy and is assigned to the export snapshot.
	■ For SMB protocol, a new share is created with read permission which includes the path of the snapshot. This share name is created with the snapshot name prefix.
	Example: NB<unique_21digit_number>-432464523

Table 9-23 Snapshot Manager for Data Center operations on the Fujitsu AX/HX array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	■ When you restore a LUN from a snapshot, Snapshot Manager for Data Center restores the entire Volume of the LUN where the restore is triggered. ■ The LUN snapshot is a ROW snapshot of the underlying volume and that volume can contain multiple LUN. Even if the restore is triggered for a single LUN, the restore is performed on the entire volume. Data on the other LUNs remains unchanged. ■ The volume snapshot restores a snapshot copy to the read-write volume. If the current working copy of the volume is replaced with the snapshot copy. Then it results in loss of all changes made since the snapshot copy was created. **Note:** If the restore operation is performed on older snapshots. Then, all the latest snapshots captured are deleted as a part of Fujitsu AX/HX behavior and the latest snapshots cannot be restored.

Fujitsu AX/HX plug-in Configuration prerequisites

- FQDN/ IP Address: It uses the array GUI access to configure the array in NetBackup. Both IPv4 and IPv6 address types are supported.
- Before you configure the Fujitsu AX/HX plug-in, verify the following:
  - Ensure that the Fujitsu AX/HX storage arrays have the necessary licenses required to perform the snapshot operation.
  - Ensure that a supported ONTAP version is installed on the Fujitsu AX/HX arrays. NetBackup Snapshot Manager for Data Center supports the following:
    - The minimum supported ONTAP version for REST is 9.10
    - The minimum supported ONTAP version for SnapDiff is 9.4 for Fujitsu AX/HX NAS Volume snapshots.
  - For NAS-based storage deployments, ensure that the Fujitsu AX/HX shares are configured using an active junction path.
  - Ensure that the Fujitsu AX/HX user account to configure the plug-in has the privileges to perform the following operations on the Fujitsu AX/HX array:

- Create snapshot
- Delete snapshot
- Restore snapshot

- Ensure that the Fujitsu AX/HX user account to configure the plug-in is configured with HTTP and ontapi access.
- Ensure that the Fujitsu AX/HX user account to configure the plug-in have the following roles assigned:
  - Default: read-only
  - LUN: all
  - Volume snapshot: all
  - vserver export-policy: all
- Ensure that the export policy of the NAS share must not be 'default'. There must be a policy that has the host configuration of either NFS or SMB or both.

Fujitsu AX/HX plug-in configuration parameters

The following parameters are required for configuring the Fujitsu AX/HX plug-in:

Table 9-24 Fujitsu AX/HX plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plugin ID	Provide a name for the plugin.
FQDN/ IP address	The cluster management IP address or the Fully Qualified Domain Name (FQDN) of the Fujitsu AX/HX storage array or filer.
Username	A user account that have permissions to perform snapshot operations on the Fujitsu AX/HX array.
Password	The password of the Fujitsu AX/HX user account.

Configuring a dedicated LIF for NetBackup access

Fujitsu AX/HX NAS-based volume snapshots are exposed to NetBackup over NAS protocols. NetBackup reads these snapshots using any available Data LIF on the respective SVM. If required, you can configure a Data LIF that is dedicated to the NetBackup access.

While configuring a Data LIF, use the prefix nbu_nas_ in the interface name of the SVM. If a Data LIF exists, NetBackup automatically uses only that LIF for accessing the snapshots.

Note: This is an optional step, if you configure the Data LIF, the backup reads are restricted via the dedicated LIF.

If not configured, volume snapshots are accessed via any available DATA LIF of the corresponding SVM.

Fujitsu AX/HX SnapDiff configuration prerequisites

On the clustered Data ONTAP SnapDiff RPC API V2 is supported from ONTAP release 9.4 onwards till ONTAP 9.9.

You must enable the SnapDiff RPC service on the SVM. Follow the steps:

controller> `vserver snapdiff-rpc-server on <svm_name>`

For more information on the latest and accurate methods to enable **snapdiff-rpc-server** refer to the Fujitsu AX/HX documentation.

- To improve performance while fetching the SnapDiff data between two snapshots, max_diffs and max_sessions must be set on the filer.
- By default, SnapDiff RPC API V2 max_diff is set to 256 and max_sessions are set to 16.
- The max limit for max_diff is 4096 and max_sessions is 64.
- Procedure:
  - Set max_diff limit to 4096
    controller> `node run -node * options replication.spinnp.snapdiff.max_diffs 4096`
  - Set max_session limit to 64
    controller> `node run -node * options replication.spinnp.snapdiff.max_sessions 64`

For more information on the latest and accurate methods to set max_diffs/max_sessions, refer to the Fujitsu AX/HX documentation.

ACL configuration on Fujitsu AX/HX array

To configure ACL on Fujitsu AX/HX array

1. Log onto the OnCommand System Manager.
2. Go to the respective SVM where the SMB volume is created and click the SVM setting .
3. On the left, click**Host Users and Groups**> **Windows**.

   The **Groups and Users** tabs are displayed.
4. Click **Groups** > **BUILTIN\Backup Operators** and select the **Edit** option.
5. Click **Members**>**Modify**> add a domain user and select the privileges **SetBackupPrivilege**, **SetRestorePrivilege**, and **SetSecurityPrivilege**.

Discovery

In the Fujitsu AX/HX array, NetBackup discovers the volumes, and LUNs that are created on the storage array. It also discovers the snapshots of the following assets.

- All the NFS and SMB shares using volumes NAS path on the Fujitsu AX/HX storage.
- The Fujitsu AX/HX Storage Virtual Machines (SVMs) from which the NFS and SMB shares are created to mount.

Note: NetBackup will only discover the volumes that are online.

Fujitsu AX/HX plug-in considerations and limitations

Following considerations and limitations are applicable in a Fujitsu AX/HX series environment:

- If an old snapshot is selected during restore (PIT), all new snapshots created after that snapshot get deleted automatically from the array.
- A single LUN can be part of only one volume at a time.
- The host on which the snapshot is exported must be zoned and added to the Storage Virtual Machine (SVM).
- A snapshot cannot be exported to multiple hosts.
- An exported snapshot cannot be deleted.
- The export operation fails if the volume is attached only to the default export policy on Fujitsu AX/HX. You must assign the NAS volume to a non-default export policy

Fujitsu AX/HX plug-in supports

- The minimum supported ONTAP version for ZAPI is 8.3.
- The minimum supported ONTAP version is for REST 9.10.
- The minimum supported ONTAP version for SnapDiff is 9.4 for Fujitsu AX/HX NAS Volume snapshots till ONTAP 9.9.

HPE RMC plug-in

NetBackup provides a robust data protection solution for volumes that are set up on a SAN storage host. You can also protect mounted iSCSI/FC volumes that are hosted on 3PAR, Nimble, and Primera array environments which are configured on RMC.

The Snapshot Manager for Data Center plug-in for HPE RMC contains the necessary functional logic to discover the SAN volumes on the arrays that are configured on RMC. It also can initiate snapshot create, export, deport, and delete operations for volumes. You must configure the plug-in on the NetBackup primary server to discover the volumes, and perform backup and restore operations.

Snapshot Manager for Data Center uses the REST APIs provided by HPE RMC to communicate with the assets.

Supported Snapshot Manager for Data Center operations on HPE storage arrays

Snapshot Manager for Data Center performs the following snapshot management operations on HPE RMC.

Table 9-25 Snapshot Manager for Data Center operations on assets managed by HPE RMC

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers all the HPE RMC volume sets and their snapshot sets.

Table 9-25 Snapshot Manager for Data Center operations on assets managed by HPE RMC *(continued)*

Snapshot Manager for Data Center operation	Description
Create snapshot	HPE RMC allows you to take snapshots of the entire volume set at once. The result of a create snapshot operation is a snapshot set that contains snapshots of every volume in the volume set. To create a snapshot, Snapshot Manager for Data Center calls a Post REST API method with the required information and snapshot name. The API returns the details of the snapshot. A snapshot created by Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>` Snapshots created by Snapshot Manager for Data Center have the description: `:vrtscp: <Parent Volume Set Name>`.
Delete snapshot	To delete a snapshot set, Snapshot Manager for Data Center calls a REST API method with the required snapshot details. Snapshot Manager for Data Center deletes only those snapshots that it creates itself.
Restore snapshot	To restore a snapshot set, Snapshot Manager for Data Center calls a Post REST API method with the required snapshot details. If the base volume is in an attached state, it is detached and then restore is tried. After the restore, the volume is re-attached to the same host. With the RMC APIs you can restore a single snapshot from a snapshot set, you can restore any volume from a snapshot set.
Export snapshot	Snapshot Manager for Data Center supports the export of snapshots over the iSCSI and FC protocols. When a snapshot export operation is initiated, a new clone volume set is created using the snapshot set. Once this clone is created, then a host is attached to the same. It is recommended to do a SAN zoning between the host and array that is required to be attached to the snapshot. **Note:** NetBackup does not discover the cloned volume set created in the export operation.

Table 9-25 Snapshot Manager for Data Center operations on assets managed by HPE RMC *(continued)*

Snapshot Manager for Data Center operation	Description
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the export mapping created between the host and the clone volume set. The intermediate clone volume set is also deleted, once it is detached from the host.

HPE RMC plug-in configuration prerequisites

Before you configure the plug-in, verify the following:

- For the list of all the supported versions of HPE RMC, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists that has the permissions to call the HPE RMC APIs.

RMC plug-in configuration parameters

The following parameters are required for configuring the Snapshot Manager for Data Center plug-in:

Table 9-26 HPE RMC plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	IP address of the computer where RMC is installed.
User name	A user account that has permissions to perform snapshot operations on the HPE RMC.
Password	The password of the HPE RMC user account.

Roles and privileges on HPE RMC

To allow NetBackup to perform snapshot management operations, ensure that the HPE RMC user account used for plug-in configuration has these roles and privileges:

- Create snapshot

- Export snapshot
- Report snapshot
- Delete snapshot

There are two predefined user roles in HPE RMC:

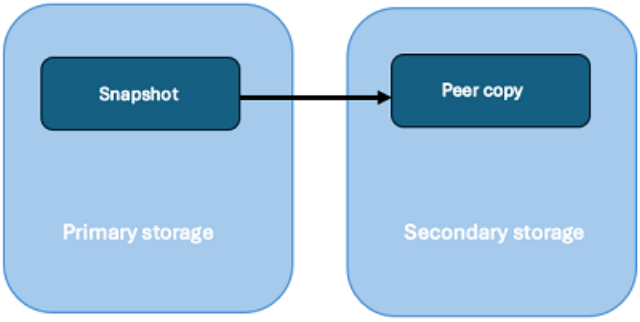
- Admin: Admin has all the required privileges to perform all the supported operations provided by RMC.
- Member: Members have only view privileges and cannot perform any tasks.

Users with the Admin role assigned can perform all the snapshot management operations.

Snapshot Replication For SAN environment

The following scenario outlines the topology that NetBackup Snapshot Manager for Data Center Replication supports with HPE RMC plug-ins.

The topology starts with a snapshot of data on the primary volume set, which can then be replicated to a destination volume set. The supported replication type is currently 'Peer Copy'. You can select this replication type as the destination in SLP to replicate the snapshots to their desired destination.



HPE XP plug-in

Snapshot Manager for Data Center provides a robust data protection solutions for volumes that are set up on a SAN storage host. NetBackup extends SAN support and allows you to protect mounted iSCSI/FC volumes that are hosted on an HPE XP array.

The Snapshot Manager for Data Center plug-in for HPE XP contains the necessary functional logic that enables NetBackup to discover the SAN volumes on the array, and create, export, deport, and delete snapshots for volumes. Configure this plug-in on the NetBackup primary server to discover the volumes, and perform backup and restore operations.

Snapshot Manager for Data Center establishes a connection with HPE XP storage array by creating sessions in HPE XP Configuration Manager and uses the REST APIs to discover the SAN volumes and their snapshots that need to be backed up.

Supported Snapshot Manager for Data Center operations on HPE XP

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on HPE XP.

Table 9-27 Snapshot Manager for Data Center operations on assets managed by HPE XP

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers the Logical Devices (LDEV) created on the storage array and snapshots inside the snapshot group named similar to `flexsnap_snap_group` along with some of their metadata. The LDEVs that have "CMD" in their attributes and those without any logical unit number (LUN) mapped are not discovered.
Create snapshot	For snapshots, Snapshot Manager for Data Center uses HPE XP Fast Snap Pairs and initiates a sequence of REST API requests with the required information and snapshot name. The API returns the details of the snapshot. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>`
Delete snapshot	To delete a snapshot, Snapshot Manager for Data Center initiates a sequence of REST API requests with the required snapshot details and confirms that the snapshot has been deleted successfully on the cluster.
Restore snapshot	To restore a snapshot, Snapshot Manager for Data Center initiates a REST API request where the fast snap is restored to the parent volume.

Table 9-27 Snapshot Manager for Data Center operations on assets managed by HPE XP *(continued)*

Snapshot Manager for Data Center operation	Description
Export snapshot	Snapshot Manager for Data Center supports export over iSCSI and FC protocols, using REST API to set the LUN path of the snapshot.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the export created over the snapshot path at the time of Export operations. It essentially reverts the Export operation.

HPE XP plug-in configuration prerequisites

Before you configure the plug-in, ensure the following:

- One pool with a name starting with `flexsnap_pool` needs to be created to store snapshots. The pool must be large enough to fulfill all snapshot needs.
- For the list of all the supported versions of HPE XP, refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists that has the permissions to access the HPE XP APIs.

HPE XP plug-in configuration parameters

Specify the following details when you configure the HPE XP plug-in.

Table 9-28 HPE XP plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
HPE XP Configuration Manager Server IP	IP of the HPE XP Configuration Manager REST server, which is configured with the storage array to be used.
HPE XP Configuration Manager Server Port	Port on which the HPE XP Configuration Manager REST server is hosted.
Array user name	HPE XP storage array user account which has permissions for snapshot operations.

Table 9-28 HPE XP plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
Array Password	The password associated with the array username.
Array Storage Device ID	Storage device ID of the array that is already registered with the HPE XP Configuration Manager.

Roles and privileges on HPE XP

To allow NetBackup to perform snapshot management operations, ensure that the HPE XP user account used for plug-in configuration has the below-mentioned roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

HPE Alletra 9000 SAN array

NetBackup Snapshot Manager for Data Center NetApp plug-in allows you to create, delete, restore, export, and deport snapshots of the following assets on the HPE storage arrays:

- HPE Volume
- HPE Snapshot Volume

Snapshot Manager for Data Center uses HPE Alletra provided WSAPI's to communicate with HPE Alletra assets. It utilizes the latest WSAPI version. The connection is established to the HPE Alletra 9000 array through WSAPI. Then uses the WSAPI endpoints to discover the SAN volumes and the snapshots for backup.

HPE Alletra 9000 SAN plug-in configuration parameters

Before you configure the HPE Alletra 9000 plug-in, verify the following:

- Ensure that a supported version of HPE Alletra 9000 is installed on the HPE Alletra array.

- To view the list of all supported versions of HPE Alletra 9000, refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.

Specify the following details when you configure the HPE Alletra 9000 SAN array:

Table 9-29 HPE Alletra 9000 SAN plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	HPE Alletra 9000 array IP address.
Username	User account which has permission to perform snapshot operations on the HPE Alletra 9000 array.
Password	A password for the user account.

Roles and privileges on HPE 9000 storage array

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the HPE Alletra plug-in user account configuration has the following roles and privileges assigned on the storage array:

- Create snapshots
- Delete snapshots
- Attach snapshots
- Detach snapshots
- Restore snapshots

Considerations and limitations

- All snapshots are captured at a volume level and those snapshots are in read-only mode.
- Create snapshot operation: We do not support clone snapshots as HPE Alletra doesn't allow us to export clone snapshot volume.
- The limit for any volume name is up to 31 characters.

Supported Snapshot Manager for Data Center operations on HPE Alletra 9000 SAN models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the HPE Alletra 9000 SAN array:

Table 9-30 NetBackup Snapshot Manager for Data Center operations on the HPE Alletra 9000 SAN array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the volumes (except clone volumes and system volumes) and snapshots. Volumes are primary assets, each contains the associated snapshots and asset IDs.
Create snapshot	NetBackup Snapshot Manager for Data Center takes a snapshot of HPE volume. To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST API call on the volume. A typical snapshot has the following naming convention: NB<unique_21digit_number>
Delete snapshot	NetBackup Snapshot Manager for Data Center deletes a snapshot volume. When the delete snapshot operation is initiated, NetBackup Snapshot Manager for Data Center for Data center deletes the snapshot volume corresponding to the source volume.
Restore snapshot	NetBackup Snapshot Manager for Data Center restores the parent volume, when you restore a volume from a volume snapshot. When a snapshot restore operation is initiated, NetBackup Snapshot Manager for Data Center unmaps the source volume and snapshot volume from all the host and host sets. A snapshot volume cannot be restored when it is exported to a host or host set and if the parent volume is exported to hosts or host sets. After completion of the restore operation, NetBackup Snapshot Manager for Data Center again maps the parent volume and the snapshot volume to all the host and host sets

Table 9-30 NetBackup Snapshot Manager for Data Center operations on the HPE Alletra 9000 SAN array *(continued)*

Snapshot Manager for Data Center operations	Description
Export snapshot	When a snapshot export operation is initiated, NetBackup Snapshot Manager for Data Center attaches a snapshot of the volume to the host. NetBackup Snapshot Manager for Data Center fetches the initiators where you want to perform the export operations based on the port. The initiator fetches the host ID and then NetBackup Snapshot Manager for Data Center attaches the snapshot volume to the host.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center removes the host mapping of the exported snapshot volume. It is a revert of the export snapshot operation.

HPE Alletra 6000 SAN array

NetBackup provides a robust data protection solution for the volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup extends SAN support that allows you to protect mounted iSCSI/FC volumes that are hosted on HPE Alletra 6000 Environment.

NetBackup Snapshot Manager for Data Center plug-in for HPE Alletra 6000 enables NetBackup to discover the SAN volumes and their snapshots on the arrays. It also can trigger snapshot create, export, deport, and delete operations for volumes.

You must configure this plug-in on the NetBackup primary server to discover the volumes, and perform backup and restore operations. NetBackup Snapshot Manager for Data Center uses HPE-provided REST APIs to communicate with the assets.

HPE Alletra 6000 SAN plug-in configuration parameters

Before you configure the HPE Alletra 6000 plug-in, verify the following:

Ensure that a supported version of HPE Alletra 6000 is installed on the HPE Alletra array.

To view the list of all supported versions of HPE Alletra 6000, refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.

A user account with permissions to invoke the HPE Alletra 6000 APIs.

Specify the following details when you configure the HPE Alletra 6000 SAN array:

Table 9-31 HPE Alletra 6000 SAN plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	HPE Alletra 6000 array IP address.
Port	Port number of the REST API server.
Username	User account(s) with have permission to perform snapshot operations on the HPE Alletra 6000 array.
Password	A password for the user account.

Roles and privileges on HPE 6000 storage array

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the HPE Alletra 6000 plug-in user account configuration has the following roles and privileges assigned on the storage array:

Table 9-32 User roles and permissions

Use roles	Access permissions
Administrator	All actions.
Power user	All actions except user management, inactivity timeout, array setup, and array reset up.
Operator	Management actions except to delete or remove data.
Guest	View information and choose VMware subnets.

Ensure that the HPE Alletra 6000 user account has the privileges to perform the following operations:

- Create snapshots
- Export Snapshots
- Restore Snapshots
- Delete Snapshots

Considerations for HPE SAN 9000 plug-in

- A maximum of 1000 snapshots per volume are allowed.

- All snapshots are captured at a volume level and those snapshots are in read-write mode.
- Prior restore a volume snapshot is created storing the present state of the volume.
- The limit for any volume name is 215 characters.

Supported Snapshot Manager for Data Center operations on HPE Alletra 6000 SAN models

Table 9-33 NetBackup Snapshot Manager for Data Center operations on the HPE Alletra 6000 SAN array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the HPE Alletra volumes and their snapshots.
Create snapshot	To create a snapshot, NetBackup Snapshot Manager for Data Center triggers a Post Rest API method with the required information. Then the API returns with the details of the snapshot. Snapshots created have the following description: :vrtscp: <Parent Volume Name> Using this suffix in the description, NetBackup Snapshot Manager for Data Center decides that this Snapshot is created by NetBackup, and it can be allowed for delete operation. **Note:** By default, the snapshot is created in offline state.
Export Snapshot	NetBackup Snapshot Manager for Data Center supports exporting snapshots over the iSCSI and FC protocols. The SAN zoning must be performed between the host and array, which are required to be attached to the snapshot. If the initiator group does not have access to the snapshot, an access control record is added to the parent volume. Results in providing the host access to the volume snapshots.

Table 9-33 NetBackup Snapshot Manager for Data Center operations on the HPE Alletra 6000 SAN array *(continued)*

Snapshot Manager for Data Center operations	Description
Deport snapshot	When a snapshot deport operation is triggered, NetBackup Snapshot Manager for Data Center deletes the export mapping created between the host and the snapshot. If any access control record is added to the parent volume while export, it is also deleted.
Delete snapshot	To delete a Snapshot, NetBackup Snapshot Manager for Data Center triggers a Delete Rest API method call with the required snapshot details. NetBackup Snapshot Manager for Data Center checks for suffix (:vrtscp:) only when this suffix is present, the snapshot is allowed for deletion. In HPE Alletra 6000, only offline snapshots can be deleted. Thus, during the delete operation the snapshot state is changed to offline, and then it is deleted.
Restore snapshot	To restore a Snapshot, NetBackup Snapshot Manager for Data Centertriggers a Post Rest API method call with the required snapshot details. In HPE Alletra 6000, the volume must be in an offline state to restore a volume from the snapshot. Thus, during the restore operation, the volume state is changed to offline and then the restore operation is performed.

HPE GreenLake for Block Storage array

NetBackup Snapshot Manager for Data Center HPE GreenLake plug-in lets you create, delete, restore, export, and deport snapshots of the following assets on the HPE GreenLake block storage arrays:

- HPE Volume
- HPE Snapshot volume

NetBackup version 11.1 onwards, supports replication for HPE GreenLake arrays with the SYNC replication configuration.

Snapshot Manager for Data Center uses the HPE-provided HPE GreenLake Web Services API (WSAPI) to communicate with the HPE GreenLake array, using the V1 APIs. The connection is established to the HPE GreenLake array through WSAPI,

and using the API endpoints, discovers the SAN volumes and the snapshots for backup.

HPE GreenLake for Block Storage plug-in configuration parameters

Before you configure the HPE GreenLake for Block Storage plug-in, verify the following:

- Ensure that a supported version of HPE GreenLake for Block Storage is installed on the HPE GreenLake array.
- To view the list of all supported versions of HPE GreenLake for Block Storage, refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- An existing user account that has the permissions to invoke the HPE GreenLake APIs and all snapshot operations on the array.

Specify the following details when you configure the HPE GreenLake for Block Storage array:

Table 9-34 HPE GreenLake for Block Storage plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	HPE GreenLake for Block Storage array IP address.
Username	User accounts that have permission to perform snapshot operations on the HPE GreenLake for Block Storage array.
Password	A password for the user account.

Roles and privileges on HPE GreenLake for Block Storage array

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the HPE GreenLake plug-in user account has the following roles and privileges assigned on the storage array:

- Create snapshots
- Delete snapshots
- Attach snapshots
- Detach snapshots

- Restore snapshots

Considerations and limitations

- All snapshots are captured at the volume level. However, all the snapshots are not in the read-write mode, only the local snapshots taken by the SLP, without replication, are in the read-write mode. If replication is configured, both the local and replica snapshots are in read-only mode.
- NetBackup does not support clone snapshots as HPE GreenLake does not let you export clone snapshot volume.
- The limit for any volume name is up to 31 characters.
- For replication, consider the following:
  - Only SYNC-based replication is supported.
  - Add both source and target arrays for discovery to establish replication relationships.
  - Local snapshots are taken if the SLP is configured without replication, and the snapshots are in read-write mode.
  - If replication is configured in the SLP, then coordinated snapshots are taken as read-only copies in both source and target arrays.
  - Backups from replica snapshots of LVM-based volumes are not supported. This limitation is from the HPE GreenLake array.

Supported Snapshot Manager for Data Center operations on HPE GreenLake for Block Storage models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the HPE GreenLake for the block storage array:

Table 9-35 NetBackup Snapshot Manager for Data Center operations on the HPE GreenLake for Block Storage array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers GreenLake storage volumes (except clone volumes and system volumes) and snapshots. Volumes are primary assets, each contains the associated snapshots and asset IDs. NetBackup Snapshot Manager for Data Center also discovers the replication configuration of volumes and snapshots, including the target array, remote copy group, replication mode, and other related settings.
Create snapshot	NetBackup Snapshot Manager for Data Center takes a snapshot of HPE volume. To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST API call on the volume. A typical snapshot created has the following naming convention: NB<unique_21digit_number>
Delete snapshot	NetBackup Snapshot Manager for Data Center can delete snapshots. When you delete a snapshot, NetBackup Snapshot Manager for Data Center deletes the snapshot corresponding to the source volume.
Replicate snapshot	Only SYNC-based replication is supported. If replication is configured in the NetBackup SLP, a coordinated snapshot is taken. This is a simultaneous snapshot of both the source and target volumes on the source and target arrays. This coordinated snapshot is a read-only snapshot. As a step in the replication process, NetBackup retrieves the snapshot from the target array, for further processing.

Table 9-35 NetBackup Snapshot Manager for Data Center operations on the HPE GreenLake for Block Storage array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	NetBackup Snapshot Manager for Data Center restores the parent volume, when you restore a volume from a volume snapshot. When a snapshot restore operation is initiated, NetBackup Snapshot Manager for Data Center unmaps the source volume and snapshot volume from all the host and host sets. A snapshot volume cannot be restored when it is exported to a host or host set and if the parent volume is exported to hosts or host sets. After completion of the restore operation, NetBackup Snapshot Manager for Data Center again maps the parent volume and the snapshot volume to all the host and host sets. PIT rollback restore is not supported if the volume has replication configured for it. You cannot rollback volumes that are configured for replication.
Export snapshot	When a snapshot export operation is initiated, NetBackup Snapshot Manager for Data Center attaches a snapshot of the volume to the host. NetBackup Snapshot Manager for Data Center fetches the initiators where you want to perform the export operations based on the port. The initiator retrieves the host ID, and then NetBackup Snapshot Manager for Data Center attaches the snapshot volume to the host.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center removes the host mapping of the exported snapshot volume. It is a revert of the export snapshot operation.

HPE GreenLake for File Storage (VAST) array

NetBackup Snapshot Manager for Data Center HPE GreenLake for the file storage plug-in allows you to create, delete, restore, export, and deport snapshots of the following assets on the HPE GreenLake for file storage cluster:

- HPE GreenLake for file storage (VAST) NFS exports in a NAS environment.

- HPE GreenLake for file storage (VAST) SMB shares in a NAS environment.

The HPE GreenLake for file storage (VAST) plug-in uses the REST APIs provided by VAST to communicate with the HPE GreenLake for file storage assets.

HPE GreenLake for File Storage (VAST) plug-in configuration parameters

Before you configure the HPE GreenLake for File Storage (VAST) plug-in, verify the following:

- Ensure that the node pool's IP address is resolvable on the backup host so that snapshot exports can be performed.
- To view the list of all supported versions of HPE GreenLake for File Storage (VAST), refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- An existing user account that has the permissions to invoke the HPE GreenLake APIs and all snapshot operations on the array.

Specify the following details when you configure the HPE GreenLake for File Storage (VAST) array:

Table 9-36 HPE GreenLake for File Storage (VAST) plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
HPE GreenLake for file storage VMS (array) FQDN/IP address	VMS (Vast Management Console) IP address of the array. It is the IP address with which the array's portal can be accessed.
Username	User accounts that have permission to perform snapshot operations on the HPE GreenLake for file storage array.
Password	A password for the user account.

Roles and privileges on HPE GreenLake for file storage array

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the HPE GreenLake for file storage (VAST) plug-in user account configuration has the following roles and privileges assigned on the storage array:

Privileges	Access
Settings (Realm)	View
Logical (Realm)	Create, view, edit, delete
Hardware (Realm)	View

Supported Snapshot Manager for Data Center operations on HPE GreenLake for File Storage (VAST)

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the HPE GreenLake for the file storage (VAST) array:

Table 9-37 NetBackup Snapshot Manager for Data Center operations on the HPE GreenLake for file storage (VAST) array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the volumes (except clone volumes and system volumes) and snapshots. Volumes are primary assets, each contains the associated snapshots and asset IDs. NetBackup Snapshot Manager for Data Center discovers all the nested NFS and SMB views irrespective of the depth at which they are created. Following are the examples of nested shares discovered by Snapshot Manager for Data Center: ["/test_fs1", "/test_fs1/test_fs2", "/test_fs1/test_data/test_fs3", "/smb_03/test_data/dir01"]
Create snapshot	NetBackup Snapshot Manager for Data Center takes a snapshot of HPE volume. To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST REST API call on the array with the required information and snapshot name. The API returns the details of the snapshot. A typical snapshot created has the following naming convention: NB<unique_21digit_number>
Delete snapshot	To delete a snapshot, the NetBackup Snapshot Manager for Data Center initiates a DELETE REST API call with the necessary snapshot details and confirms that the snapshot has been successfully deleted from the cluster.

Table 9-37 NetBackup Snapshot Manager for Data Center operations on the HPE GreenLake for file storage (VAST) array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	Point-in-time (PIT) restores are not supported by NetBackup; however, individual files or folders can be restored from a snapshot. For rollback or PIT restores, use the HPE GreenLake for File Storage portal or APIs.
Export snapshot	When a snapshot export operation is initiated: ■ For NFS, a new view is created over the snapshot path ("/test_fs/.snapshot/NB15985918570166499611/"), with the backup host added as a client and granted read-only NFS access to the view policy. ■ For SMB, a new share is created over the snapshot path ("/test_fs/.snapshot/NB15985918570166499611/"). The user and domain specified during the export are granted access to the SMB share. The user must belong to the specified domain. **Note:** Modifications to the view policy are made only if the required permissions for the backup host to access the view are missing.
Deport snapshot	When a snapshot deport operation is initiated, the NetBackup Snapshot Manager for Data Center deletes the NFS export or SMB share that was created over the snapshot path during the export operation.

Hitachi NAS array

The Hitachi NAS plug-in lets you create, delete, restore, export, and deport snapshots of the following assets on the Hitachi NAS storage arrays:

- Hitachi NAS NFS exports in a NAS environment.
- Hitachi NAS SMB shares in a NAS environment.

The Hitachi NAS plug-in uses the REST APIs exposed by Hitachi NAS family to communicate with Hitachi NAS array. It uses the latest API version V7 which supports Hitachi NAS platform 13.5 or later arrays. A firmware lower than the version 13.5, cannot protect the assets from NetBackup. The connection is established to the Hitachi NAS array through REST API. Then NetBackup uses the API endpoints to discover the NFS exports, SMB shares, and file system snapshots that need to be backed up.

Supported NetBackup Snapshot Manager for Data Center operations on Hitachi NAS array

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the Hitachi NAS arrays.

Table 9-38 Snapshot Manager for Data Center operations on Hitachi NAS plug-in

Snapshot Manager for Data Center operation	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the Hitachi NAS EVS servers, NFS export, SMB shares, and their file system snapshots along with some of their directory metadata. NetBackup Snapshot Manager for Data Center also discovers all the nested NFS exports and SMB shares, irrespective of the depth at which they are created.
Create snapshot	To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST REST API method with the required information and snapshot name. The API returns the details of the snapshot. All these snapshots are at a file system level. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>` SnapNB is an application-specific filter ID to speed up searching for future retrieval. This is a mandatory field needed to add in payload while snapshot creation using REST API. The snapshots created using REST API are not visible directly on the array GUI, you must select the filter named By Application.
Delete snapshot	To delete a snapshot, NetBackup Snapshot Manager for Data Center calls the `DELETE` REST API using SDK method, with the required snapshot details. The API confirms that the snapshot has been deleted successfully on the array.
Restore snapshot	NetBackup Snapshot Manager for Data Center does not support PIT restore operation on the array. Instead, we can perform Normal restore on specified locations.

Table 9-38 Snapshot Manager for Data Center operations on Hitachi NAS plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Export snapshot	NetBackup Snapshot Manager for Data Center supports export operations using the NFS and SMB protocol. When a snapshot export operation is initiated, an export path is created using the snapshot directory and snapshot name. For NFS exports, the host access configurations are added as read-only on a particular export or share. For SMB shares, the user and domain provided while exporting the snapshot are added with privileges to access the SMB share created. ■ NFS: `<EVS-server-ip>:<share_name>/.snapshot/<snapshot_name>` ■ SMB: `\\<EVS-server-ip>\<share_name>\@UTC_for_snapshot`
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center makes a PUT REST API call to the Hitachi NAS array, and does the following: ■ For NFS, it removes the host access configurations entry that was added during the export operation. ■ For SMB, it removes the privileges provided to the user to access the SMB share created.

Hitachi NAS plug-in configuration prerequisites

Before you configure the Hitachi NAS plug-in, verify the following:

- Ensure that a supported version of the HNAS System Management Unit is installed on the Hitachi NAS arrays.
- For the list of all the supported versions of the HNAS System Management Unit, refer to the NetBackup Snapshot Manager for Data Center section in the NetBackup Hardware and Cloud Storage Compatibility List HCL).
- A user account exists which has the permissions to invoke the Hitachi NAS REST APIs and all snapshot operations on the array.

Hitachi NAS plug-in configuration parameters

The following parameters are required for configuring the Hitachi NAS plug-in.

Parameter	Description
Plug-in ID	Provide a name for the plug-in.
NAS Manager Server IP / FQDN	The array's NAS Manager Server or REST Server IP address, in either IPV4 or The Fully Qualified Domain Name (FQDN).
Port	Port number of the REST API server.
User name	The Hitachi user account that has the permissions to invoke the Hitachi NAS REST APIs to perform all snapshot operations on the array.
Password	The password of the Hitachi NAS REST API user account.

Domain user permissions for Hitachi NAS array

The domain user which you use to perform the NAS share backup, must have privileges for the Hitachi NAS array, to allow NetBackup to perform backup of the NAS share ACLs.

Limitations and considerations for Hitachi NAS plug-in

The following considerations and limitations are applicable in a Hitachi NAS environment.

- All snapshots are captured at a file system level, and those snapshots are in read-only mode.
- The limit for any file system name is 255 characters, NFS export/SMB share name is 80 characters on the array. In the case of a snapshot name, the maximum length must be 256 characters.
- Sometimes backup from snapshot and normal restore jobs are shown as partial success on the NetBackup activity monitor due to the NDMP file access permissions.
- A file system of selected NFS export/SMB share must be in the Mounted state on the array, as Not mounted state file system affects the snapshot operations.
- Hitachi NAS plug-in does not support point-in-time (PIT) rollback restore of shares using snapshots.
- To upgrade NetBackup Snapshot Manager for Data Center from version 10.1 to later versions, you must expire all snapshots before starting the upgrade process.

Hitachi SAN array

The Snapshot Manager for Data Center plug-in for Hitachi lets you create, delete, export, deport, and restore storage snapshots of a supported Hitachi storage array that is registered with Hitachi Configuration Manager (HCM) or Hitachi Platform (PF) RestAPI supported storage array. The plug-in supports the Thin Image (HTI) and Thin Image Advanced snapshot types. You must configure this plug-in on the NetBackup primary server.

Snapshot Manager for Data Center uses the REST API hosted on Hitachi Configuration Manager or Hitachi Platform (PF) Rest Storage to communicate with the Hitachi Storage arrays. Snapshot Manager for Data Center establishes a connection with the Hitachi Storage array by creating sessions in Hitachi Configuration Manager. It also uses the REST APIs to discover the SAN volumes and their snapshots that need backup.

Supported NetBackup Snapshot Manager for Data Center operations on Hitachi SAN array

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the Hitachi SAN arrays.

Table 9-39 Snapshot Manager for Data Center operations on Hitachi SAN plug-in

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers all the Logical Devices (LDEV) created on the storage array. The primary LDEV objects appear as disk assets. The secondary LDEV objects that are part of a Thin Image (TI) pair appear under snapshots. One or more LDEV objects are grouped in a logical entity called pool. For the Snapshot Manager for Data Center Hitachi plug-in to work, you must create a pool named `flexsnap_pool` on the storage array. The LDEVs that have "CMD" in their attributes and those without any logical unit number (LUN) mapped are not discovered. **Note:** In a PF Rest environment, the VSP One Block model does not support snapshots on non-DRS volumes, so Snapshot Manager for Data Center discovers only DRS volumes to support HTIA on VSP One Block.

Table 9-39 Snapshot Manager for Data Center operations on Hitachi SAN plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Create snapshot	NetBackup takes a snapshot of all the LDEV objects that are attached to a hostgroup. When Snapshot Manager for Data Center takes a snapshot, it performs the following actions: In a HCM Rest environment: ■ Creates a new LDEV object of the same size as the original (base) LDEV. ■ Puts the base LDEV and the new LDEV into a Thin Image (TI) pair. The base LDEV is the primary LDEV and the new LDEV is the secondary LDEV. ■ Splits the TI pair to create a point-in-time snapshot of the base LDEV and then updates the snapshot LUN path to point to the secondary LDEV. ■ Attaches the snapshot to the same hostgroup where the base LDEV is attached. In a PF Rest environment: ■ Creates a new LDEV object (S-VOL) that is in the same pool and has the same size as the original LDEV (P-VOL). ■ Creates a thin image (TI) pair in the specified snapshot group (flexsnap_group_HTIA for DRS VOL and flexsnap_group_HTI for non-DRS VOL). ■ Splits the TI pair to create a point-in-time snapshot of the base LDEV (P-VOL) and point to the secondary LDEV (S-VOL). A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>`
Delete snapshot	When Snapshot Manager for Data Center deletes a snapshot, it performs the following actions: ■ Deletes the snapshot. ■ Removes the LUN path to the secondary LDEV associated with the snapshot. ■ Deletes the secondary thin LDEV.

Table 9-39 Snapshot Manager for Data Center operations on Hitachi SAN plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Restore snapshot	Snapshot Manager for Data Center performs a restore operation on a thin image snapshot of LDEV. All the data in the primary LDEV is overwritten by the data from the secondary LDEV.
Export snapshot	When NetBackup exports a snapshot, Snapshot Manager for Data Center searches for the target host based on the World Wide Name (WWN) or the iSCSI Qualified Name (IQN) specified in the export request. After the host is identified on the storage array, Snapshot Manager for Data Center updates the path attribute of the secondary LDEV with the target host, where the snapshot is to be exported. Once the target host is added to the secondary LDEV host ports, the exported snapshot is immediately visible on the target host.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center removes the target host from the secondary LDEV path attribute. Once the target host entry is removed from the secondary LDEV host ports, the exported snapshot is no longer visible on the target host and the deport operation is complete.

Hitachi SAN plug-in configuration prerequisites

Before you configure the Hitachi SAN plug-in, verify the following:

- Ensure that you create a pool named *flexsnap_pool* on the Hitachi storage array. This is required for the Snapshot Manager for Data Center plug-in to work.
- Create a snapshot groups on the storage array. For example, group name for HCM REST: **flexsnap_snap_group** and for PF REST: **flexsnap_group_HTIA** and **flexsnap_group_HTI**. If you do not create these snapshot groups, the plug-in automatically creates them during the configuration.
- Ensure that the Hitachi storage arrays are registered with Hitachi Configuration Manager (HCM) or PF REST storage environments. Snapshot Manager for Data Center uses the HCM or PF REST APIs to communicate with the storage arrays.
- Ensure that the Hitachi storage array has the necessary licenses that are required to perform snapshot operations.
- Ensure that the user account that you provide to the Snapshot Manager for Data Center has general read permissions, as well as the permissions to create, delete, export, deport and restore snapshots on the storage array.

- For the list of all the supported versions of Hitachi Storage arrays, refer to the NetBackup Snapshot Manager for Data Center section in the NetBackup Hardware and Cloud Storage Compatibility List (HCL).

Hitachi SAN plug-in configuration parameters

The following parameters are required for configuring the Hitachi SAN plug-in.

Parameter	Description
Plug-in ID	Provide a name for the plug-in.
Hitachi Configuration Manager Server IP	IP of the HCM REST server or PF REST storage server, which is configured with the storage array. The URL has the following format: `protocol://host-name:port-number/ConfigurationManager`
Hitachi Configuration Manager Server port	Port on which Hitachi Configuration Manager REST server is hosted. or Port for Hitachi PF rest storage: the default port is 443.
Array User name	The name of the user account that has access to the Hitachi storage array. In addition to general read permissions, the user account must have the permissions to create, delete, export, deport and restore snapshots on the storage array.
Array Password	The password for the user account that is used to access the Hitachi storage array.
Array Storage Device ID	ID of the storage array device that is already registered with the Hitachi Configuration Manager or PF Rest storage environments.

Roles and privileges on Hitachi Storage Array

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the Hitachi storage array user account used for plug-in configuration has the below-mentioned roles and privileges assigned on the storage array:

- Create snapshots
- Delete snapshots

- Attach snapshots
- Detach snapshots
- Restore snapshots

Limitations and considerations for Hitachi SAN plug-in

The following considerations and limitations are applicable in a Hitachi SAN environment.

- The export operation is supported using the following protocols:
  - Fibre Channel (FC)
  - Internet Small Computer Systems Interface (iSCSI)
- Snapshot Manager for Data Center uses a snapshot group while creating snapshots, so the maximum number of snapshots in the Snapshot Manager for Data Center for an array is 8192 per pool.
- The Thin Image Pool must be large enough to accommodate all snapshot needs.
- The VSP One Block model does not support non-DRS volume snapshot, as it has only HTIA support using DRS volume.

IBM Storwize SAN V7000 plug-in

NetBackup lets you protect mounted iSCSI/FC volumes hosted on an IBM Storwize array.

The Snapshot Manager for Data Center plug-in for IBM Storwize can discover the SAN volumes and consistency groups on the array. Additionally, the plug-in can create, export, deport, and delete snapshot operations for volumes and consistency groups. You must configure this plug-in on the NetBackup primary server to perform these operations.

Snapshot Manager for Data Center uses the REST API supported by the IBM Storwize family to communicate with the protected assets.

Supported NetBackup operations on IBM Storwize array

You can perform the following Snapshot Manager for Data Center operations supported on the IBM Storwize SAN models:

Table 9-40 Snapshot Manager for Data Center operations on the IBM Storwize array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the volumes, consistency groups, volume snapshots, and consistency group snapshot present on the array. Snapshot Manager for Data Center discovers only the snapshots created by NetBackup. **Note:** The snapshot volume is also considered a volume asset, created while creating a snapshot. Snapshot Manager for Data Center discovers the FlashCopy mappings present on the array where the target volume of mapping is considered a snapshot.

Table 9-40 Snapshot Manager for Data Center operations on the IBM Storwize array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates a Post Rest API method with the required snapshot details. The API returns with the snapshot details. A snapshot is created with the following naming convention: NB<unique_21digit_number> When Snapshot Manager for Data Center calls the REST API for a volume, the following process takes place: **1** A new thin-provisioned volume is created on the array. **2** A FlashCopy mapping with snapshot property is created between the source volume (the volume selected in the NetBackup policy) and the target volume created by the snapshot manager. This new volume is considered as the snapshot volume for the source volume. **3** After creating a mapping, the start operation is initiated on the array for the mapping and copies data from the source volume to the snapshot volume. For creating consistency group snapshots, here is the process: **1** A new consistency group is created with the NetBackup-generated snapshot name. **2** New thin provisioned volumes are created for every source volume which is a part of the consistency group. **3** Mappings are created between the newly created volumes and the source volumes under the new consistency group. **4** After creating a mapping, the start operation is initiated on the array for the mapping to copy data from the source consistency group to the snapshot group. You can specify the volumes that are included in a source volume in a consistency group in the NetBackup policy. In the IBM Storwize array, when the snapshot operation is initiated, the snapshot of that entire consistency group is taken.

Table 9-40 Snapshot Manager for Data Center operations on the IBM Storwize array *(continued)*

Snapshot Manager for Data Center operations	Description
Delete snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the export mapping created between the host and the volume(s) created during the export operation.
Restore snapshot	To restore a volume snapshot or consistency group snapshot, Snapshot Manager for Data Center calls a PUT REST API method. When a restore is initiated, a new FlashCopy mapping is created where the snapshot volume acts as the source volume and the source volume acts as the target volume. Then the mapping is started as a restore operation. **Note:** The mappings created during the restore operation are deleted automatically after the restore is complete.
Export snapshot	Snapshot Manager for Data Center supports export snapshot over the iSCSI and FC protocols. When a snapshot export operation is initiated, the snapshot volume is attached to the host on the array. Snapshot Manager for Data Center uses the same process for consistency group snapshots. SAN zoning must be done between the host and the array that is required to be attached to the snapshot.
Deport snapshot	To delete a volume or consistency group snapshot, Snapshot Manager for Data Center calls the REST API.

IBM Storwize plug-in configuration prerequisites

Before you configure the plug-in, ensure the following:

- For the list of all the supported versions of IBM Storwize, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists that has the permissions to call the IBM Storwize APIs.
- The port with which the IBM Storwize array is configured is also used for the REST API calls. The default port is 7443.

IBM Storwize plug-in configuration parameters

The following parameters are required for configuring the IBM Storwize plug-in:

Table 9-41 IBM Storwize plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP address	The array's IP address, in IP / FQDN format.
Port	Port on which IBM Storwize is configured.
User name	A user account that has permissions to perform snapshot operations on the IBM Storwize array.
Password	Provide a password to the user account.

Roles and privileges on IBM Storwize

To allow Snapshot Manager for Data Center to perform snapshot management operations, ensure that the IBM Storwize user account used for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

Here are the predefined user roles in IBM Storwize:

- Security Administrator—can manage all the Storwize V7000 Unified features and functions.
- Administrator—can manage everything in the system except creating, changing, or removing users or user groups, changing the user group assignment of users, or assigning roles to user groups.
- Export Administrator—can manage the share and export definitions for all supported protocols.
- Storage Administrator—can manage storage, pools, disks, file systems, and file sets.
- Snapshot Administrator—can manage snapshots for file systems, file sets, and peer snapshots.
- System Administrator—can manage the network, system, file modules, tasks, system and alert logs, traces, dumps, performance center, and authentication.

- Copy Operator—can manage all FlashCopy®, Metro Mirror, and Global Mirror relationships, Tivoli® Storage Manager and Tivoli Storage Manager for Space Management integration, NDMP, asynchronous replication, and remote caching.
- Monitor—can only list management information.
- Privileged—can submit native Linux commands with Linux root privilege in addition to all other user role-authorized functions.
- Data Access—can clone files.

Users with Security Administrator, Administrator, and Privileged role assigned can perform all the snapshot management operations in NetBackup.

IBM Storwize plug-in considerations and limitations

The following considerations and limitations are applicable:

- NetBackup disables vDisk protection to perform the Deport and Delete operations on the array. When these operations are initiated, NetBackup reverts to the original state. These operations do not interfere with any existing mapping or I/O operations on the array.
- NetBackup overrides the standard warnings on the array regarding FlashCopy mappings. The restore is completed with the warnings.
- The array does not support IPv6 configuration from NetBackup and can only use IPv4/FQDN for all the operations.
- Do not delete the mappings created between the source volume and target volumes. Without these mappings, the snapshot becomes invalid and NetBackup aborts operations.
- Do not delete the mappings between the source volumes and the target volumes. NetBackup cannot restore the snapshot without these mappings.
- Do not interrupt any copying operation of FlashCopy mapping.
- Do not delete the mapping between the source and target volume in the consistency group snapshot. If you delete any mapping between the source volume and target volume, NetBackup cannot restore that source volume.

IBM FlashSystem plug-in

NetBackup provides a robust data protection solution for volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup extends SAN support and lets you protect mounted iSCSI/FC volumes that are hosted on an IBM FlashSystem array.

The Snapshot Manager for Data Center plug-in for IBM FlashSystem contains the functional logic that enables NetBackup to discover SAN volumes and consistency groups on the array. It can also initiate snapshot to create, export, deport, and delete operations for volumes and consistency groups. You must configure this plug-in on the NetBackup primary server to discover the volumes and consistency groups, and perform backup and restore operations.

Snapshot Manager for Data Center uses the REST API supported by the IBM FlashSystem family to communicate with the IBM FlashSystem assets.

Supported Snapshot Manager for Data Center Operation on IBM FlashSystem array

You can perform the following Snapshot Manager for Data Center operations supported on the IBM FlashSystem models:

Table 9-42 Snapshot Manager for Data Center operations on the IBM FlashSystem array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the volumes, consistency groups, volume snapshots, and consistency group snapshot present on the array. Snapshot Manager for Data Center discovers only the snapshots created by NetBackup. **Note:** The snapshot volume is also considered as the volume asset which while creating a snapshot. Snapshot Manager for Data Center discovers the FlashCopy mappings present on the array, where the target volume of mapping is considered as a snapshot.

Table 9-42 Snapshot Manager for Data Center operations on the IBM FlashSystem array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates the Rest API method with the required snapshot details. The API returns with the snapshot details. The snapshot is then taken for the volume selected in the NetBackup policy. A snapshot is created with the following naming convention: NB<unique_21digit_number> When Snapshot Manager for Data Center calls the REST API for a volume, the following process takes place: **1** A new thin-provisioned volume is created on the array. **2** A FlashCopy mapping with snapshot property is created between the source (the volume selected in the NetBackup policy) and target volume created by the snapshot manager. This new volume is considered as the snapshot volume for the source volume. **3** After creating a mapping, the start operation is initiated on the array for the mapping and copies data from the source volume to the snapshot volume. For creating consistency group snapshots, here is the process: **1** A new consistency group is created with the NetBackup-generated snapshot name. **2** New thin provisioned volumes are created for every source volume which is a part of the consistency group. **3** Mappings are created between the newly created volumes and the source volumes under the new consistency group. **4** After creating a mapping, the start operation is initiated on the array for the mapping to copy data from the source consistency group to the snapshot group. You can specify the volumes that are included in a source volume in a consistency group in the NetBackup policy. In the IBM FlashSystem array, when the snapshot operation is initiated, the snapshot of that entire consistency group is taken.

Table 9-42 Snapshot Manager for Data Center operations on the IBM FlashSystem array *(continued)*

Snapshot Manager for Data Center operations	Description
Delete snapshot	To delete a volume or consistency group snapshot, the Snapshot Manager for Data Center initiates a DELETE Rest API call with the required snapshot details.
Restore snapshot	To restore a volume snapshot or consistency group snapshot, Snapshot Manager for Data Center calls a PUT REST API method call with the required snapshot details. When a restore is initiated, a new FlashCopy mapping is created where the snapshot volume acts as the source volume and the source volume acts as the target volume. Then the mapping is started as a restore operation. **Note:** The mappings created during the restore operation are deleted automatically after the restore is complete.
Export snapshot	Snapshot Manager for Data Center supports export snapshot over the iSCSI and FC protocols. When a snapshot export operation is initiated, the snapshot volume gets attached to the host on the array. Snapshot Manager for Data Center uses the same process for consistency group snapshots. SAN zoning must be done between the host and the array, which is required to attach with the snapshot.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the export mapping created between the host and the volume(s) created during the export operation.

IBM FlashSystem plug-in configuration prerequisites

Before you configure the plug-in, ensure the following:

- For the list of all the supported versions of IBM FlashSystem, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*
- A user account that has the permissions to call the IBM FlashSystem APIs.
- The port is configured with IBM FlashSystem array, which is also used for the REST API calls. The default port is 7443.

IBM FlashSystem plug-in configuration parameters

The following parameters are required for configuring the IBM FlashSystem plug-in:

Table 9-43 IBM FlashSystem plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP address	The array's IP address, in IP / FQDN format.
Port	Port on which IBM FlashSystem is configured.
User name	A user account that has permissions to perform snapshot operations on the IBM FlashSystem array.
Password	Provide a password to the user account.

Roles and privileges on IBM FlashSystem

To allow Snapshot Manager for Data Center to perform snapshot management operations, ensure that the IBM FlashSystem user account used for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

Here are the predefined user roles in IBM FlashSystem

- Security administrator - The security administrator can manage all the FlashSystem Unified features and functions.
- Administrator - The administrator can manage everything in the system except creating, changing, or removing users or user groups, changing the user group assignment of users, or assigning roles to user groups.
- Copy operator - Users can start and stop all existing FlashCopy®, Metro Mirror, and Global Mirror relationships. Copy-operator-role users can run the system commands that administrator-role users can run that deal with FlashCopy, Metro Mirror, and Global Mirror relationships.

- Service - Users can set the time and date on the system, delete dump files, add and delete nodes, apply service, and shut down the system. Users can also complete the same tasks as users in the monitor role.
- Monitor - The operator role can only list management information.
- Restricted administrator - Users can perform the same task as the administrator-role user and can run most of the commands. However, they cannot remove volumes, host mappings, hosts, or pools. Support personnel can be assigned to this role to help resolve errors and solve problems.

Users with security administrator, and administrator roles assigned can perform all the NetBackup Snapshot Manager for Data Center's management operations.

IBM FlashSystem plug-in considerations and limitations

The following considerations and limitations are applicable:

- NetBackup disables vDisk protection to perform the deport and delete operations on the array when these operations are initiated, then it revert to the original state. These operations don't have impact on any existing mapping or I/O operations performed on the array.
- During restore, the standard warning shown on the array regarding FlashCopy mappings is considered as a warning. NetBackup restores the volume irrespective of the warning, as similar behavior is observed on the array side.
- Do not delete the mappings created between the source and target volumes. If any mapping between the source and target volume is deleted, then the snapshot becomes invalid and NetBackup operations are not performed.
- Do not delete the mappings between the source and the target volumes because the snapshot is not restored on the source volume.
- The copying operation of any FlashCopy mapping must not be interrupted in any case.
- The mapping between the source and target volume in the consistency group snapshot should not be deleted. If any mapping between the source and target volume is deleted, that source volume is not restored as it is not the part consistency group snapshot.

IBM SAN Volume Controller plug-in

NetBackup provides a robust data protection solution for volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup extends SAN support and lets you protect mounted iSCSI/FC volumes that are hosted on an IBM SVC array.

The Snapshot Manager for Data Center plug-in for IBM SVC contains the functional logic that enables NetBackup to discover SAN volumes and consistency groups on the array. It can also initiate snapshot to create, export, deport, and delete operations for volumes and consistency groups. You must configure this plug-in on the NetBackup primary server to discover the volumes and consistency groups, and perform backup and restore operations.

Snapshot Manager for Data Center uses the REST API supported by the IBM SVC family to communicate with the IBM SVC assets.

Supported Snapshot Manager for Data Center Operation on IBM SAN Volume Controller array

You can perform the following Snapshot Manager for Data Center operations supported on the IBM SVC models:

Table 9-44 Snapshot Manager for Data Center operations on the IBM SVC array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the volumes, consistency groups, volume snapshots, and consistency group snapshot present on the array. Snapshot Manager for Data Center discovers only the snapshots created by NetBackup. **Note:** The snapshot volume is also considered as the volume asset while creating a snapshot. Snapshot Manager for Data Center discovers the FlashCopy mappings present on the array, where the target volume of mapping is considered as a snapshot.

Table 9-44 Snapshot Manager for Data Center operations on the IBM SVC array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates the Rest API method with the required snapshot details. The API returns with the snapshot details. The snapshot is then taken for the volume selected in the NetBackup policy. A snapshot is created with the following naming convention: NB<unique_21digit_number> When Snapshot Manager for Data Center calls the REST API for a volume, the following process takes place: **1** A new thin-provisioned volume is created on the array. **2** A FlashCopy mapping with snapshot property is created between the source (the volume selected in the NetBackup policy) and target volume created by snapshot manager. This new volume is considered as the snapshot volume for the source volume. **3** After creating a mapping, the start operation is initiated on the array for the mapping and copies data from the source volume to the snapshot volume. For creating consistency group snapshots, here is the process: **1** A new consistency group is created with the NetBackup-generated snapshot name. **2** New thin provisioned volumes are created for every source volume which is a part of the consistency group. **3** Mappings are created between the newly created volumes and the source volumes under the new consistency group. **4** After creating a mapping, the start operation is initiated on the array for the mapping to copy data from the source consistency group to the snapshot group. You can specify the volumes that are included in a source volume in a consistency group in the NetBackup policy. In the IBM SVC array, when the snapshot operation is initiated, the snapshot of that entire consistency group is taken.

Table 9-44 Snapshot Manager for Data Center operations on the IBM SVC array *(continued)*

Snapshot Manager for Data Center operations	Description
Delete snapshot	To delete a volume or consistency group snapshot, Snapshot Manager for Data Center initiates a DELETE Rest API call with the required snapshot details.
Restore snapshot	To restore a volume snapshot or consistency group snapshot, Snapshot Manager for Data Center calls a PUT REST API method call with the required snapshot details. When a restore is initiated, a new FlashCopy mapping is created where the snapshot volume acts as the source volume and the source volume acts as the target volume. Then the mapping is started as a restore operation. **Note:** The mappings created during the restore operation are deleted automatically after the restore is complete.
Export snapshot	Snapshot Manager for Data Center supports export snapshot over the iSCSI and FC protocols. When a snapshot export operation is initiated, the snapshot volume gets attached to the host on the array. Snapshot Manager for Data Center uses the same process for consistency group snapshots. SAN zoning must be done between the host and the array, which is required to attach with the snapshot.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the export mapping created between the host and the volume(s) created during the export operation.

IBM SAN Volume Controller plug-in configuration prerequisites

Before you configure the plug-in, ensure the following:

- For the list of all the supported versions of IBM SVC, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*
- A user account that has the permissions to call the IBM SVC APIs.
- The port is configured with an IBM SVC array, which is also used for the REST API calls. The default port is 7443.

IBM SAN Volume Controller plug-in configuration parameters

The following parameters are required for configuring the IBM SVC plug-in:

Table 9-45 IBM SVC plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP address	The array's IP address, in IP / FQDN format.
Port	Port on which IBM SVC is configured.
User name	A user account that has permissions to perform snapshot operations on the IBM SVC array.
Password	Provide a password to the user account.

Roles and privileges on IBM SAN Volume Controller

To allow Snapshot Manager for Data Center to perform snapshot management operations, ensure that the IBM SVC user account used for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

Here are the predefined user roles in IBM FlashSystem

- Security administrator - The security administrator can manage all the SVC Unified features and functions.
- Administrator - The administrator can manage everything in the system except creating, changing, or removing users or user groups, changing the user group assignment of users, or assigning roles to user groups.
- Copy operator - Users can start and stop all existing FlashCopy®, Metro Mirror, and Global Mirror relationships. Copy-operator-role users can run the system commands that administrator-role users can run that deal with FlashCopy, Metro Mirror, and Global Mirror relationships.

- Service - Users can set the time and date on the system, delete dump files, add and delete nodes, apply service, and shut down the system. Users can also complete the same tasks as users in the monitor role.
- Monitor - The operator role can only list management information.
- Restricted administrator - Users can perform the same task as of the administrator-role user and can run most of the commands. However, they cannot remove volumes, host mappings, hosts, or pools. Support personnel can be assigned to this role to help resolve errors and solve problems.

Users with security administrator, and administrator roles assigned can perform all the NetBackup Snapshot Manager for Data Center's management operations.

IBM SAN Volume Controller plug-in considerations and limitations

The following considerations and limitations are applicable:

- NetBackup disables vDisk protection to perform the deport and delete operations on the array when these operations are initiated, and then it reverts to the original state. These operations do not have any impact on any existing mapping or I/O operations performed on the array.
- During restore the standard warning shown on the array regarding FlashCopy mappings is considered as a warning. NetBackup restores the volume irrespective of the warning, as similar behavior is observed on the array side.
- Do not delete the mappings created between the source and target volumes. If any mapping between the source and target volume is deleted, then the snapshot becomes invalid and NetBackup operations are not performed.
- Do not delete the mappings between the source and the target volumes because the snapshot is not restored on the source volume.
- The copying operation of any FlashCopy mapping must not be interrupted in any case.
- The mapping between the source and target volume in the consistency group snapshot should not be deleted. If any mapping between the source and target volume is deleted, that source volume is not restored as it is not the part consistency group snapshot.

InfiniBox SAN array

The Snapshot Manager for Data Center plug-in for InfiniBox lets you create, delete, restore, export, and deport snapshots of the SAN volumes (virtual disks) that are part of storage pools on the INFINIDAT InfiniBox storage arrays.

Snapshot Manager for Data Center supports all the InfiniBox storage arrays that are compatible with InfiniSDK.

InfiniBox plug-in configuration prerequisites

Before you configure the InfiniBox plug-in, perform the following steps on the storage system:

- Ensure that the InfiniBox storage arrays have the necessary licenses that are required to perform snapshot operations.
- Ensure that the user account that you provide to Snapshot Manager for Data Center has administrative privileges to all the storage pools that you wish to protect using Snapshot Manager for Data Center.

See “InifiniBox SAN plug-in configuration parameters” on page 196.

See “Supported Snapshot Manager for Data Center operations on InfiniBox SAN models” on page 193.

Supported Snapshot Manager for Data Center operations on InfiniBox SAN models

Snapshot Manager for Data Center supports the following operations on the InfiniBox SAN storage array:

Table 9-46 Supported Snapshot Manager for Data Center operations on the InfiniBox SAN array

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers all the SAN volumes (virtual disks) that are part of storage pools that are created on the InfiniBox storage array. The plug-in sends a request to the array to return a list of all the volumes that have the type set to `PRIMARY`. Such volumes are considered base volumes and appear as disk assets. To discover snapshot objects, the plug-in sends a request to the array to return a list of all the volumes that have the type set as `SNAPSHOT` and the depth attribute set as 1. Such volumes are considered snapshots. InfiniBox arrays support creating a snapshot of a snapshot. The depth attribute identifies the snapshot type. A snapshot depth value greater than 1 indicates that it is a snapshot of an existing snapshot. Snapshot Manager for Data Center does not support discovery or operations on snapshot volumes that have a depth value other than 1.
Create snapshot	Snapshot Manager for Data Center takes a snapshot of all the SAN volumes that are part of a storage pool. When a snapshot is created, the Snapshot Manager for Data Center plug-in uses InfiniSDK to send a `create_snapshot` method request on the selected volume and passes a snapshot name as an argument in that request. The InifiniBox array creates a snapshot volume, sets the type as `SNAPSHOT` and the depth attribute value as 1, and returns that information to Snapshot Manager for Data Center.
Delete snapshot	When a snapshot is deleted, the Snapshot Manager for Data Center plug-in sends a `delete_snapshot` method request on the parent volume that is associated with the snapshot and passes the snapshot volume name as an argument in that request. The InfiniBox array deletes the specified snapshot associated with the parent volume.

Table 9-46 Supported Snapshot Manager for Data Center operations on the InfiniBox SAN array *(continued)*

Snapshot Manager for Data Center operation	Description
Restore snapshot	When a snapshot restore operation is initiated, Snapshot Manager for Data Center first gets details about the parent volume that is associated with the snapshot that is being restored. The Snapshot Manager for Data Center plug-in then sends the `restore_snapshot` method request to the parent volume and passes the selected snapshot as an argument in that request. The array uses the selected snapshot to perform the restore on the parent volume. All the data in the parent volume is overwritten by the data in the snapshot volume.
Export snapshot	When a snapshot export operation is initiated, Snapshot Manager for Data Center searches for the target host based on the world wide name (WWN) or the iSCSI Qualified Name (IQN) specified in the export request. After the host is identified, the Snapshot Manager for Data Center plug-in sends a `map_volume` method request on the target host and passes the selected snapshot ID as an argument in that request. The InfiniBox array returns a LUN ID as a response to the restore request. Snapshot Manager for Data Center stores the LUN ID and the target host ID mapping information internally in the Snapshot Manager for Data Center database. The export operation also creates a new virtual asset of type `disk:snapshot:export` and that is saved in the Snapshot Manager for Data Center database.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center first gets the target host ID from the database. The Snapshot Manager for Data Center plug-in then sends an `unmap_volume` method request to the target host and passes the selected snapshot ID as an argument in that request. The InfiniBox array removes the snapshot volume mapping from the specified target host.

InfiniBox plug-in and snapshot-related requirements and limitations

Consider the following when you configure the InfiniBox plug-in:

- The InfiniBox plug-in supports discovery and snapshot operations only on volume snapshots that have the depth attribute value set to 1. Volume snapshots that have a depth attribute value other than 1 are not supported.
- All parent volume objects and snapshot objects on an InfiniBox array are unique. While creating a snapshot of a volume, if an object with the same name already exists on the array, the create operation fails. You must ensure that the snapshot names are unique.
- When you delete snapshots using Snapshot Manager for Data Center, only the snapshots that are managed by Snapshot Manager for Data Center are available for deletion. You cannot use Snapshot Manager for Data Center to delete snapshots that are not created using Snapshot Manager for Data Center.
- The snapshot export operation is supported using the following protocols:
  - Fibre Channel (FC)
  - Internet Small Computer Systems Interface (iSCSI)

InifiniBox SAN plug-in configuration parameters

The following parameters are required for configuring the Snapshot Manager for Data Center InfiniBox SAN array:

Table 9-47 InfiniBox SAN plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
InfiniBox System IP Address	The IP address of the InfiniBox storage array.
Username	The name of the user account that has access to the InfiniBox storage array. The user account must have administrative privileges (`POOL_ADMIN` role) to the storage pools on the array.
Password	The password of the user account that is used to access the InfiniBox storage array.

InfiniBox NAS array

NetBackup provides a robust data protection solution for shares that are set up on the Network Attached Storage (NAS) storage host. NetBackup extends NAS support to let you protect the NFS exports and SMB Shares that are hosted on InfiniBox

environment. You can configure Snapshot Manager for Data Center to discover and then perform backup operations on NFS exports and SMB Shares.

Snapshot Manager for Data Center plug-in for InfiniBox has the functional logic that enables NetBackup to discover the NFS exports and SMB Shares on the InfiniBox system. Then initiates snapshot create, export, deport, and delete operations for the exports.

You must configure this plug-in on the NetBackup primary server.

1. Snapshot Manager for Data Center uses the REST APIs to communicate with the InfinBox assets.
2. Snapshot Manager for Data Center establishes a connection with InfiniBox to discover the NFS exports, SMB Shares and its snapshots for backup.

Supported Snapshot Manager for Data Center operations on InfiniBox NAS models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the InfiniBox NAS array:

Table 9-48 NetBackup Snapshot Manager for Data Center operations on the InfiniBox NAS array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the NFS export, SMB shares, file systems, and snapshots. MASTER and SNAPSHOT are the two types of data sets for file systems. NetBackup Snapshot Manager for Data Center discovers all the file systems of type MASTER and its' snapshots type SNAPSHOT and snapshot depth is one. NetBackup Snapshot Manager for Data Center also discovers all NFS export and SMB shares of all file systems of type MASTER.
Create snapshot	To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST Rest API with the required information and snapshot name. The API returns the details of the snapshot. All these snapshots are created at a file system level. A typical snapshot created has the following naming convention: NB<unique_30digit_number>

Table 9-48 NetBackup Snapshot Manager for Data Center operations on the InfiniBox NAS array *(continued)*

Snapshot Manager for Data Center operations	Description
Export snapshot	When a snapshot export operation is initiated, a new NFS export or SMB share is created over the same file system snapshot. The file system path where the backup hosts are added as clients with read-only permissions.
Restore snapshot	Snapshot Manager for Data Center does not support restore operation.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center deletes the NFS export or SMB share that is created over the snapshot path at the time of the export operation.
Delete snapshot	To delete a snapshot, NetBackupSnapshot Manager for Data Center initiates a Delete Rest API call with the required snapshot details. Then Snapshot Manager for Data Center confirms that the snapshot has been deleted successfully.

InfiniBox NAS plug-in configuration parameters

Before you configure the plug-in, verify the following:

- To view all the supported versions of InfiniDat InfiniBox, refer to the *NetBackup Snapshot Manager* section, in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists which has the permissions to invoke the InfiniBox APIs on the system.

Specify the following details when you configure the InfiniBox array:

Table 9-49 InfiniBox NAS plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	InfiniBox NAS array IP address.

Table 9-49 InfiniBox NAS plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
Username	User account that has permission to perform snapshot operations on the InfiniBox NAS array.
Password	Password for the user account.

Roles and privileges on InfiniBox NAS array

Do the following to allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations.

- Ensure that the InfiniBox user account has the privileges to perform the following operations on the InfiniBox array:
  - Create snapshot
  - Export snapshot
  - Delete snapshot
- Following are the five predefined user roles in InfiniBox:
  - READ_ONLY: A read-only user can only make queries for information. Users with this role cannot make any changes to the system.
  - TECHNICIAN: The technician role has permissions to InfiniBox hardware on the customer premises. The technician role has permissions like the read-only user, with added access rights to hardware-only related API, CLI, and GUI commands.
  - INFINIDAT: The Infinidat role is specifically for Infinidat level 3 support engineers. This account is used for customer support only. The Infinidat user has the joint permissions of the admin and technician users, with added access to internal commands.
  - POOL_ADMIN: The pool admin has admin rights for specific pools. Within the pool (or pools), the pool admin can provision data sets, map them to hosts, and take snapshots.
  - ADMIN: The admin (system administrator) role has permissions to all InfiniBox software functionality. It also includes network administration, provisioning pools and entities, and creating other users.

Note: Users with POOL_ADMIN, ADMIN, or INFINIDAT can perform all the NetBackup Snapshot Manager for Data Center's snapshot management operations.

Domain user permissions on the InfiniBox NAS

Follow the steps to add user permissions to the InfiniBox NAS Active Directory domain:

1. Log on to the InfiniBox web UI.
2. Click **Settings** on the left toolbar and then click the **SMB** tab.
3. Click **Join Domain**.
4. In the **Join Active Directory Domain** window:
   - Enter the FQDN of the Active Directory domain.
   - Enter IP address for each domain controller that is used for InfiniBox communication, and then, click **Add**.
   - The IP address is added to the controllers box.
   - Enter the user name and password of an administrator account in the Active Directory domain.
5. Click **Join Domain** to add InfiniBox to the Active Directory domain.

Considerations and limitations for the InfiniBox NAS plug-in

Following considerations and limitations are applicable to the InfiniBox NAS environment:

- All snapshots at the file system level are captured and write-protected.
- InfiniBox plug-in does not support mixed-type NAS protocol.
- The limit for a file system name is 65 characters, NFS export name is 255 characters, and SMB share name is 65 characters on the array.
- InfiniBox NAS plug-in does not support point-in-time (PIT) rollback restore using snapshots.
- NetBackup Snapshot Manager for Data Center discovers only a snapshot of depth one.
- NetBackup Snapshot Manager for Data Center captures all the network space IPs of NAS service type for the snapshot export operations.

Lenovo DM 5000 series array

The NetBackup Snapshot Manager for Data Center Lenovo DM plug-in allows you to create, replicate, delete, restore, export, and deport snapshots of the following assets on the Lenovo DM storage arrays:

- Lenovo DM Logical Unit Number (LUNs) storage units in a SAN environment.
- Lenovo DM Volumes ONTAP serves data to clients and hosts from logical containers called FlexVol volumes.
- Lenovo DM NFS volumes in a NAS environment.
- Lenovo DM SMB shares in a NAS environment.

For Data ONTAP 9.10 and later versions, this plug-in uses the Lenovo DM SDK which internally consumes the Lenovo DM ZAPI interface to communicate with the array.

Lenovo DM family-supported REST API interface is used to communicate with the Lenovo DM series array.

Note: At present, this solution supports only the snapshots that are created for NAS storage.

Lenovo DM 5000 plug-in configuration notes

Veritas NetBackup provides a robust data protection solution for the volumes that are set up on the storage array. NetBackup extends REST support for SAN and NAS volumes and lets you protect the mounted iSCSI/FC volumes that are hosted on a Lenovo DM array environment. You can configure Snapshot Manager for Data Center to discover volumes and LUNs, and perform backup and restore operations.

The Snapshot Manager for Data Center plug-in for Lenovo DM contains the functional logic that enables NetBackup to discover the SAN, NAS volumes, and LUNs on the Lenovo DM array. Then triggers snapshot create, export, deport, and delete operations for those exports. You must configure this plug-in on the NetBackup primary server.

Snapshot Manager for Data Center uses the Lenovo DM SDK and Lenovo DM-ontap python library which internally consumes the Lenovo DM ZAPI and REST API respectively. Lenovo DM family helps to communicate with the Lenovo DM array. Snapshot Manager for Data Center establishes a connection with the Lenovo DM array using the NMSDK or Lenovo DM-ontap SDK. Then, it uses the SDK methods to discover the NAS volume, SAN volume, and its snapshots for backup.

- Lenovo DM Volumes: ONTAP serves data to clients and hosts from the logical containers called FlexVol volumes.
- Lenovo DM NFS or SMB volumes in the NAS environment.
- Lenovo DM Storage Virtual Machines (SVM) allow NAS clients to access storage using NFS.
  - SVMs contain data volumes and one or more LIFs through which they serve data to the clients.
  - SVMs provide file-level data access using NFS and CIFS protocols for NAS clients.
- Lenovo DM Logical Unit Number (LUNs) storage units in a SAN environment.
- Protocol which is configured with Lenovo DM SVM: ISCSI, FC/FCoE, CIFS, NFS.

Lenovo DM 5000 plug-in configuration parameters

FQDN/ IP Address: It uses the array GUI access to configure the array in NetBackup. Both IPv4 and IPv6 address types are supported.

Before you configure the Lenovo DM plug-in, verify the following:

- Ensure that the Lenovo DM storage arrays have the necessary Lenovo DM licenses required to perform the snapshot operation.
- Ensure that a supported ONTAP version is installed on the Lenovo DM arrays. CloudPoint supports the following:
  - Minimum supported ONTAP version for rest is 9.10
  - Minimum supported ONTAP version for SnapDiff is 9.4 for Lenovo DM NAS Volume snapshots.
- For NAS-based storage deployments, ensure that the Lenovo DM shares are configured using an active junction path.
- Ensure that the Lenovo DM user account to configure the plug-in have the privileges to perform the following operations on the Lenovo DM array:
  - Create snapshot
  - Delete snapshot
  - Restore snapshot
- Ensure that the Lenovo DM user account to configure the plug-in is configured with http and ONTAPI access.

- Ensure that the Lenovo DM user account to configure the plug-in has the following roles assigned:
  - Default: read-only
  - LUN: all
  - Volume snapshot: all
  - vserver export-policy: all
- Ensure that the export policy of the NAS share must not be the default. There must be a policy which has the host configuration of either NFS or SMB or both.

To view the list of all supported versions of Lenovo DM, refer to the *NetBackup Snapshot Manager for Data Center* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.

Specify the following details when you configure the Lenovo DM array:

Table 9-50 Lenovo DM plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/IP address	The cluster management IP address or the Fully Qualified Domain Name (FQDN) of the Lenovo DM storage array or filer.
Username	User account that has permission to perform snapshot operations on the Lenovo DM array.
Password	A password for the user account.
Interface type	Provide the API type with which all operations are to be performed.

The following screen is displayed when you configure the plug-in using the NetBackup administration console:

- REST support starts from array version 9.6. But this support is partial. In ONTAP 9.10, full support required for SAN proliferations is provided.
- While registering the plug-in, it selects the APIs based on the user input. In the upgrade scenario NetBackup uses the REST APIs for Lenovo DM ONTAP array version 9.10 or later and for version less than 9.10, it uses the ZAPI.
- Lenovo DM NMSDK supports only the existing functionalities of current versions. But it does not support any new functionalities from array version 9.8 onwards.

Configuring a dedicated LIF for NetBackup access

Lenovo DM NAS-based volume snapshots are exposed to NetBackup over NAS protocols. NetBackup reads these snapshots using any available Data LIF on the respective SVM. If required, you can configure a Data LIF that is dedicated to NetBackup access.

While configuring a Data LIF, use the prefix nbu_nas_ in the interface name of the SVM. If a Data LIF exists, NetBackup automatically uses only that LIF for accessing the snapshots.

Note: This is an optional step. If you configure the Data LIF, the backup reads are restricted via the dedicated LIF. If not configured, volume snapshots are accessed via any available DATA LIF of the corresponding SVM.

Supported Snapshot Manager for Data Center operations on Lenovo DM 5000 models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the Lenovo DM array:

Note: In the case of Lenovo DM, a LUN is part of a volume and the action performed on a single LUN is performed on it's entire parent volume internally. Therefore, a volume acts as a consistency group.

Table 9-51 NetBackup Snapshot Manager for Data Center operations on the Lenovo DM array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers the volume, LUNs that are created from storage volumes. ■ LUNs that have an online status and read-write operations enabled can be discovered. ■ During the discovery of assets, the plug-in creates a mapping between volumes and LUNs. ■ Only online volumes are discovered ■ NetBackup Snapshot Manager for Data Center discovers all the NAS volumes that are online and using the active junction path on the Lenovo DM storage. Junction-Path specifies the access protocol for either NFS or SMB.

Table 9-51 NetBackup Snapshot Manager for Data Center operations on the Lenovo DM array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	NetBackup Snapshot Manager for Data Center takes a snapshot of the Lenovo DM volumes and LUNs ■ When a LUN snapshot is triggered on the Lenovo DM storage, it internally triggers a redirect-on-write (ROW) snapshot of the entire volume to which the LUN belongs. If the volume contains multiple LUNs, the snapshot includes data from the LUNs that reside on the associated volume. ■ When a volume snapshot is triggered on the Lenovo DM storage, it creates a redirect-on-write (ROW) snapshot of the entire volume and returns the snapshot data of the volume. ■ Snapshot Manager for Data Center takes a snapshot of the Lenovo DM NFS and SMB share using volume. ■ To create a snapshot, Data Center initiates a POST API call on the volume. A typical snapshot created has the following naming convention: NB<unique_21digit_number>

Table 9-51 NetBackup Snapshot Manager for Data Center operations on the Lenovo DM array *(continued)*

Snapshot Manager for Data Center operations	Description
Export snapshot	When a snapshot export operation triggers for a LUN Snapshot Object, NetBackup Snapshot Manager for Data Center creates a LUN clone from the snapshot and attaches it to the target. When a snapshot export operation triggers for a Volume Snapshot Object, NetBackup Snapshot Manager for Data Center creates a volume clone from the snapshot and attaches all the LUNs associated with the volume to the target. The target host is assigned with the read-write privileges on the exported entity (Volume/ LUN). The export operation is supported using the following protocols: ■ Fiber Channel (FC) ■ Internet Small Computer Systems Interface (iSCSI) When a snapshot export operation is triggered, for NFS, export policy rules are checked for source volume. If the export rules match the client (selected in the policy) which includes protocols as NFS or SMB or both with superuser access. Then the backup is performed directly on the client. If no export rule match is found, then a new rule with the NFS protocol, read-only with superuser access, is created in the export policy and assigned to the export snapshot. For the SMB protocol, a new share is created with read permission, which includes the path of the snapshot. This share name is created with a name, and a snapshot name prefix. Example: NB<unique_21digit_number>-432464523

Table 9-51 NetBackup Snapshot Manager for Data Center operations on the Lenovo DM array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	■ When you restore a LUN from a snapshot, NetBackup Snapshot Manager for Data Center restores the entire volume of the LUN where the restore is triggered. ■ The LUN snapshot is a ROW snapshot of the underlying volume, and that volume can contain multiple LUN. Even if the restore is triggered for a single LUN, the restore is performed on the entire volume. Data on the other LUNs remains unchanged. ■ The volume snapshot restores a snapshot copy to the read-write volume. If the current working copy of the volume is replaced with the snapshot copy. Then it results in the loss of all changes made since the snapshot copy was created. **Note:** If a restore operation is performed on the older snapshots, then all the latest snapshots captured are deleted as a part of Lenovo DM behavior, and the latest snapshot cannot be restored.
Delete snapshot	When the delete snapshot operation is triggered for the following: ■ LUN snapshot - NetBackup Snapshot Manager for Data Center internally deletes the snapshot of one or more volumes to which the LUN is associated. ■ Volume snapshot - NetBackup Snapshot Manager for Data Center deletes the snapshot corresponding to the volume. ■ NetBackup Snapshot Manager for Data Center deletes the snapshot of the NAS volume.

Table 9-51 NetBackup Snapshot Manager for Data Center operations on the Lenovo DM array *(continued)*

Snapshot Manager for Data Center operations	Description
Deport snapshot	When a deport snapshot operation is triggered for the following, ■ LUN Deport - NetBackup Snapshot Manager for Data Center removes the LUN mapping from the target host and then deletes the LUN clone. ■ Volume deport - NetBackup Snapshot Manager for Data Center removes the mapping from the LUN hosts associated with the volume and then deletes the volume clone. ■ When a snapshot deport operation is triggered, for SMB NetBackupSnapshot Manager for Data Center deletes the shares created during the export call. For NFS, no action is performed.

Pre-requisites for Lenovo DM 5000 SnapDiff

On clustered data, ONTAP SnapDiff RPC API V2 is supported from ONTAP release 9.4 onwards till ONTAP 9.9.

You must enable the SnapDiff RPC service on the SVM. Follow the steps:

controller> vserver snapdiff-rpc-server on <svm_name>

For more information, refer to the Lenovo DM documentation for the latest and most accurate methods to enable snapdiff-rpc-server.

- To improve performance while fetching the SnapDiff data between two snapshots, max_diffs and max_sessions must be set on the filer.
- By default, SnapDiff RPC API V2 max_diff is set to 256 and max_sessions are set to 16.
- Max limit for max_diff is 4096 and max_sessions is 64.
- Procedure
  - Set max_diff limit to 4096
  - controller> node run -node * options replication.spinnp.snapdiff.max_diffs 4096
  - Set max_session limit to 64

- controller> node run -node * options replication.spinnp.snapdiff.max_sessions 64

For more information on the latest and most accurate methods to set max_diffs/max_sessionsto, refer to the Lenovo DM documentation.

ACL configuration on the Lenovo DM array

To configure ACL on Lenovo DM array, follow the steps:

1. Log on to the **On Command System Manager**.
2. Navigate to the respective SVM where the SMB volume is created.
3. Click the SVM setting.
4. On the left, click the **Windows** under **Host Users and Groups**. The **Groups** and **Users** tabs are displayed.
5. In the **Groups** tab, click the **BUILTIN\Backup Operators** and select the **Edit** option.
6. In the **Modify** dialog, under the **Members** section, add the domain user and select the SetBackupPrivilege, SetRestorePrivilege, and SetSecurityPrivilege privileges.

Discovery

In the Lenovo DM array, NetBackup discovers the volumes, and LUNs that are created on the storage array. It also discovers snapshots of these assets.

- NetBackup discovers all the NFS and SMB shares using volumes NAS path on the Lenovo DM storage.
- Discovers the Lenovo DM Storage Virtual Machines (SVMs) from which the NFS and SMB shares are created to mount.
- It will only discover volumes that are online.

Considerations and limitations:

- If the old snapshot is selected during restore (PIT), all new snapshots created after that snapshot get deleted automatically from the array.
- A single LUN can be part of only one volume at a time.
- The host on which the snapshot is exported must be zoned and added to the Storage Virtual Machine (SVM).
- A snapshot cannot be exported to multiple hosts.
- An exported snapshot cannot be deleted.

- The export operation fails if the volume is attached only to the Default export policy on Lenovo DM. You must assign the NAS volume to a non-default export policy.

Support

- Minimum supported ONTAP version for ZAPI is 8.3
- Minimum supported ONTAP version is for REST 9.10
- Minimum supported ONTAP version for SnapDiff is 9.4 for Lenovo DM NAS Volume snapshots till ONTAP 9.9.

NetApp storage array

The NetBackup Snapshot Manager for Data Center NetApp plug-in allows you to create, replicate, delete, restore, export, and deport snapshots of the following assets on the NetApp storage arrays:

- NetApp Logical Unit Number (LUNs) storage units in a SAN environment.
- NetApp Volumes ONTAP serves data to clients and hosts from logical containers called FlexVol volumes.
- NetApp NFS volumes in a NAS environment.
- NetApp SMB shares in a NAS environment.
- NetApp FlexGroup volumes in NAS environment.

All snapshot operations supported on FlexGroup volumes are the same as NAS share snapshots.

The NetApp plug-in uses NetApp Manageability SDK (NMSDK) which internally consumes the NetApp ZAPI interface supported by the NetApp family to communicate with the NetApp array. For Data ONTAP version 9.10 and above, the NetApp plug-in uses the REST API interface supported by the NetApp family to communicate with the NetApp array.

Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the NetApp storage arrays:

Table 9-52 Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage

NetBackup Snapshot Manager for Data Center operation	Description
Discover assets	■ In a SAN environment, NetBackup Snapshot Manager for Data Center for Data Center discovers the Volumes and LUNs that are created from storage volumes, as well as replication relationships of Volumes. Only LUNs whose status is online, read-write operations are enabled, and the Snapshot auto delete parameter is set to false, are discoverable. `["state":"online","vol_type":"rw","is_snapshot_auto_delete_enabled": "false"]` **Note:** In a SAN environment, NetBackup can discover only the snapshots that are created using Snapshot Manager for Data Center, the volumes having "CMD" in their attributes, and the volumes without host mappings discovered. ■ In a NAS environment, NetBackup Snapshot Manager for Data Center discovers all the NFS shares and volumes with security style UNIX and mixed mode on the NetApp storage. It also discovers SMB shares with Windows security style. The shares must have an active `junction_path` configured so that NetBackup Snapshot Manager for Data Center can discover them. ■ In a NAS environment, NetBackup Snapshot Manager for Data Center discovers all the Data Protection volumes with NFS shares, volumes with security style UNIX as well as mixed mode, and SMB shares with Windows security style. ■ In a NAS environment, NetBackup discovers FlexGroup volumes. NetApp provides supports FlexGroup volumes as NAS shares. FlexGroup volume is a scale-out NAS container that provides high performance along with automatic load distribution and scalability.

Table 9-52 Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage *(continued)*

NetBackup Snapshot Manager for Data Center operation	Description
Create snapshot	■ In a SAN environment, NetBackup Snapshot Manager for Data Center takes a snapshot of the NetApp volumes and LUNs. When NetBackup Snapshot Manager for Data Center initiates a LUN snapshot on the NetApp storage, it internally initiates a redirect-on-write (ROW) snapshot of the entire volume to which the LUN belongs. If the volume contains multiple LUNs, the snapshot includes data from all the LUNs that reside on that volume. When a volume Snapshot is initiated on the NetApp Storage, it creates a redirect-on-write (ROW) snapshot of the entire volume and returns the snapshot data of that volume. A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>` ■ In a NAS environment, NetBackup Snapshot Manager for Data Center takes a snapshot of the NetApp NFS as well as SMB shares.
Delete snapshot / Delete replicated snapshot	■ In a SAN environment, when you delete a LUN snapshot, NetBackup Snapshot Manager for Data Center internally deletes the snapshot of one or more volumes to which the LUN belongs. When you delete a volume snapshot, NetBackup Snapshot Manager for Data Center for Data Center deletes the snapshot corresponding to the volume. ■ In a NAS environment, NetBackup Snapshot Manager for Data Center deletes the snapshot of the share.

Table 9-52 Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage *(continued)*

NetBackup Snapshot Manager for Data Center operation	Description
Restore snapshot	■ In a SAN environment, when you restore a LUN from a snapshot, NetBackup Snapshot Manager for Data Center only restores the particular LUN on which the restore is initiated. The LUN snapshot is a ROW snapshot of the underlying volume, and that volume can contain multiple additional LUNs. Even if the snapshot contains data from multiple LUNs, the restore is performed only for the selected LUN. The data on the other LUNs remains unchanged. ■ When you restore a volume from a volume snapshot, NetBackup Snapshot Manager for Data Center restores the snapshot copy to the read-write volume. Replacing the current working copy of the volume that is all underlying LUNs of the volume with snapshot. This changes the volume state to that of the snapshot copy. ■ In a NAS environment, NetBackup Snapshot Manager for Data Center restores the volume using the specified snapshot.

Table 9-52 Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage *(continued)*

NetBackup Snapshot Manager for Data Center operation	Description
Export snapshot / Export replicated snapshot	■ In a SAN environment, when a NetBackup snapshot export operation is initiated, NetBackup Snapshot Manager for Data Center creates a LUN from the snapshot and attaches it to the target host. The target host is assigned read-write privileges on the exported LUN. ■ When a snapshot export operation is initiated for a Volume snapshot, NetBackup Snapshot Manager for Data Center creates a volume from the snapshot and attaches all the LUNs associated with the volume to the target. The export operation is supported using the following protocols: ■ Fiber Channel (FC) ■ Internet Small Computer Systems Interface (iSCSI) ■ In a NAS environment, when a snapshot export operation is initiated, ■ For the NFS Share snapshot, a new rule is created in the export policy and assigned to the exported snapshot that is available as a network share. The target host is assigned read-only privileges on the exported snapshot share. ■ For the SMB Share snapshot, a new share is created from the snapshot, and the user and domain privileges to access the SMB Share created. The specified user must be within the domain provided. ■ In a NAS environment, the export operation is supported using the NFS and SMB protocol. **Note:** You must enable access to a volume's Snapshot copy directory by editing the volume settings, or by editing the volume's share settings. Run the following command in the CLI: `volume modify -vserver <SVM_name> -volume <vol_name> -snapdir-access true`

Table 9-52 Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage *(continued)*

NetBackup Snapshot Manager for Data Center operation	Description

Deport snapshot / Deport replicated snapshot	■ In a SAN environment, when a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center removes the LUN mapping from the target host and then deletes the LUN.
	■ In a NAS environment, when a snapshot deport operation is initiated.
	  ■ For NFS Share snapshots, Snapshot Manager for Data Center deletes the new rule created in the export policy when the snapshot was exported.
	  ■ For SMB Share snapshots, Snapshot Manager for Data Center deletes the SMB share created from the snapshot.

Replicate snapshot	■ In a NAS environment, NetBackup Snapshot Manager for Data Center replicates a snapshot of the NetApp NFS and SMB shares to a destination target array. ■ A typical replica snapshot created by NetBackup Snapshot Manager for Data Center has the name as that of the source snapshot name and naming convention:`NB<unique_21digit_number>` ■ In a SAN environment, NetBackup Snapshot Manager replicates a snapshot of the NetApp volumes, associated to LUNs to respective destination volumes of array.
Restore replica snapshot	NetBackup Snapshot Manager for Data Center (Point-In-Time) PIT restores for the replica snapshots are not supported for NAS and SAN environment.

NetApp plug-in configuration prerequisites

Before you configure the NetApp plug-in, verify the following:

- Ensure that the NetApp storage arrays have the necessary NetApp licenses that are required to perform snapshot operations.
- For SnapDiff V3 to work, install the SnapMirror and SnapMirror Cloud licenses on the cluster.
- For replication, ensure SnapMirror and SnapVault license are enabled on the storage array.

- For the list of all the supported Data ONTAP versions, refer to the NetBackup Snapshot Manager for Data Center section in the NetBackup Hardware and Cloud Storage Compatibility List (HCL).
- For the NAS environment, ensure that the NetApp shares are configured using an active `junction_path`.
- In NAS replication, the data-protection volume must include the active `junction_path` configuration, whereas this requirement is not mandatory in a SAN environment.

NetApp plug-in configuration parameters

The following parameters are required for configuring the NetApp NAS and SAN plug-in:

Table 9-53 NetApp plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Array IP address or FQDN	The cluster management IP address or the Fully Qualified Domain Name (FQDN) of the NetApp storage array, or filer.
Username	A NetApp user account that has permissions to perform snapshot operations on the NetApp storage array or filer.
Password	The password of the NetApp user account.

Configurable parameter in the `flexsnap.conf` file

Optionally, configure these parameters in the *NetApp* section of the `/cloudpoint/flexsnap.conf` file to optimize NetApp protection.

You must perform a discovery after modifying the `flexsnap.conf` file parameters to ensure that the changes are applied.

Table 9-54 The `flexsnap.conf`configuration file parameters

Parameter	Description

GET_SNAPSHOT_TIMEOUT	Time-out period in minutes, specifying how long NetBackup Snapshot Manager for Data Center should wait to retrieve snapshot details from the NetApp array, after the snapshot is created. If this time-out occurs, NetBackup Snapshot Manager for Data Center deletes the snapshot and the snapshot creation job fails.
	The default is 5 minutes, if left unconfigured.
	Example:
	`[netapp]`
	`get_snapshot_timeout = 10`

MODIFY_NETAPP_EXPORT	Enables or disables modifications to the NetApp export policy. The default is *true*, if left unconfigured.
	Example:
	`[netapp]`
	`modify_netapp_export = false`

SNAPMIRROR_TIMEOUT	Time-out period in minutes, for snapshot replication tasks to complete. The default is 60 minutes, if left unconfigured.
	Example:
	`[netapp]`
	`netapp_replication_job_timeout = 90`

Roles and privileges on NetApp storage array for the ZAPI interface

To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the NetApp user account used for plug-in configuration has the below-mentioned roles and privileges assigned to the storage array:

- Ensure that the NetApp user account has the privileges to perform the following operations on the NetApp array:
  - Create snapshot
  - Delete snapshot

- Restore snapshot

- Ensure that the NetApp user account is configured with `http` and `ontapi` access methods.
- Ensure that the NetApp user account has the following roles assigned:
  - Default: readonly
  - lun: all
  - volume snapshot: all
  - vserver export-policy: all
  - vserver cifs: all (required for SMB protocol only)
  - snapmirror: all (required privileges in role to perform replication operations)

Refer to NetApp documentation for instructions on how to create users and roles and assign permissions.

Roles and privileges on NetApp storage array for REST interface

For Data ONTAP version 9.10 and above, the NetApp plug-in uses the REST API to communicate with NetApp array. To allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations, ensure that the NetApp user account used for plug-in configuration has the mentioned roles and privileges assigned on the storage array.

API	Access level
/api/cluster	Read-only
/api/cluster/peers	Read/Write
/api/network/ip/interfaces	Read-Only
/api/protocols/cifs/shares	Read/Write
/api/protocols/nfs/export-policies	Read/Write
/api/protocols/san/igroups	Read-only
/api/protocols/san/lun-maps	Read/Write
/api/snapmirror/relationships	Read/Write
/api/storage/luns	Read-only
/api/storage/volumes	Read/Write

API	Access level
/api/svm/svms	Read-only

Refer to NetApp documentation for instructions on how to create users and roles and assign permissions.

Domain user permissions on the NetApp array

The domain user which you use to perform the NAS share backup, must have privileges for the NetApp array, to allow NetBackup to perform backups of the NAS share ACLs.

To assign privileges on the NetApp array:

1. Log in to the OnCommand System Manager console.
2. Navigate to the respective SVM where you are creating the SMB volumes or shares.
3. Click the SVM setting in the right pane.
4. Click **Windows** under **Host Users and Groups** in the left navigation pane. The **Groups** and **Users** tab opens in the right pane.
5. In the **Groups** tab click **BUILTIN\Backup Operators** and select the **Edit** option at the top.
6. In the **Modify** dialog, in the **Members** frame, add your domain user and select the following Privileges:

   `SetBackupPrivilege`, `SetRestorePrivilege`, `setcbprivilege`, and `SetSecurityPrivilege`.

Configuring a dedicated LIF for NetBackup operation

NetApp NAS-based volume snapshots are exposed to NetBackup over NAS protocols. NetBackup reads these snapshots using any available Data LIF on the respective Storage Virtual Machines (SVM). If required, you can configure a Data LIF that is dedicated to NetBackup access.

While configuring a data LIF, use the prefix "**nbu_nas_**" in the interface name for the SVM. If such a data LIF exists, NetBackup automatically uses only that LIF for accessing the snapshots.

Note: This is an optional step. If configured, the backup reads are restricted via the dedicated LIF. If not configured, volume snapshots are accessed via any available data LIF of the corresponding SVM.

Snapshot Replication

NetBackup Snapshot Manager for Data Center Replication can replicate snapshots on a NetApp cluster mode array. Clustered Data ONTAP (cDOT) is used to replicate snapshots between storage virtual machines (SVMs or vServers) and between cDOT clusters.

Both NAS and SAN are supported for replication. The NetBackup Snapshot Manager for Data Center supports NetApp synchronous as well as asynchronous replication. For synchronous replication, Sync and StrictSync policies are supported. For asynchronous replication, policies like DPDefault, MirrorAllSnapshots, MirrorAndVault, MirrorLatest, Unified7year and XDPDefault are supported.

The supported policies are represented as 'NetApp_SnapMirror' and 'NetApp_SnapVault' replication types within NetBackup. Users can choose these replication types as the replication destination in SLP to replicate the snapshots to the desired replication destination.

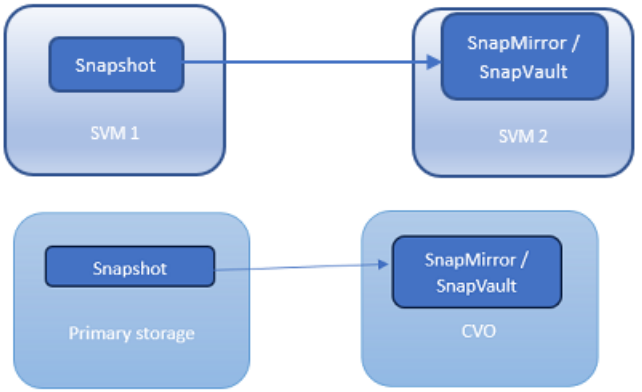
The following table depicts the differentiation of various policies under NetApp_SnapMirror and NetApp_SnapVault.

Policy type	Policy name	Replication type
Asynchronous	DPDefault	NetApp_SnapMirror
	MirrorAllSnapshots	
	MirrorLatest	
	MirrorAndVault	NetApp_SnapVault
	XDPDefault	
	Unified7Years	
Synchronous	Sync	NetApp_SnapMirror
	StrictSync	

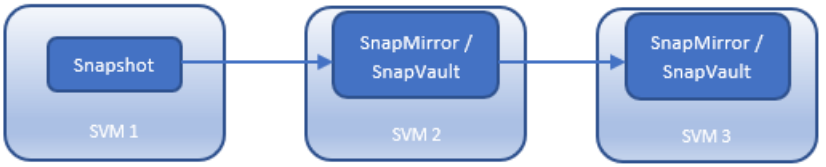
Supported NetApp replication topologies

The following scenarios describe the NetApp topologies that NetBackup Snapshot Manager for Data Center Replication supports. All begin with a snapshot of the data on the primary volume.

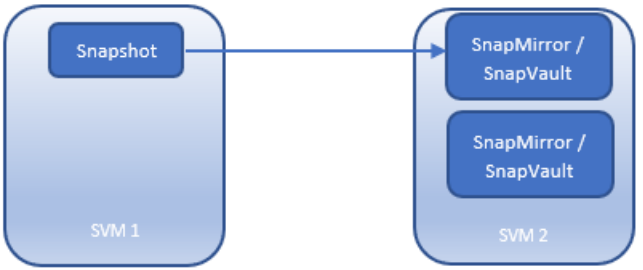
The snapshot can be replicated when you have a single target or CVO as the destination.



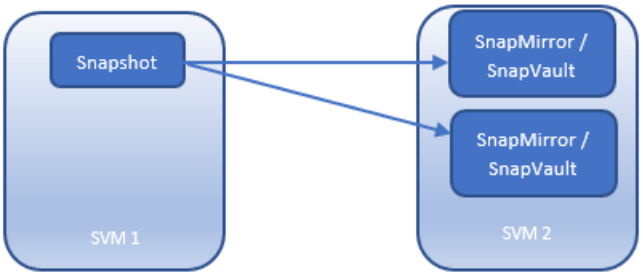
The snapshot can be replicated in a cascaded configuration. Note that NetApp CVO and Amazon FSx for NetApp ONTAP do not support cascaded relationships.

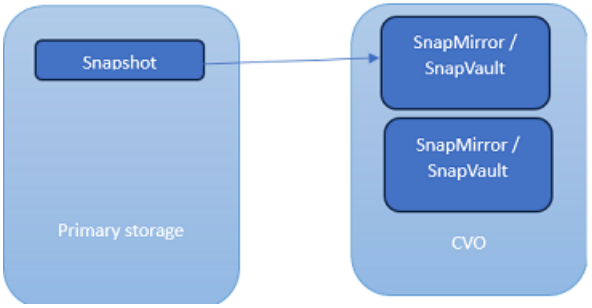


The snapshot can be replicated when you have multiple targets of the same or different type configured on the array.

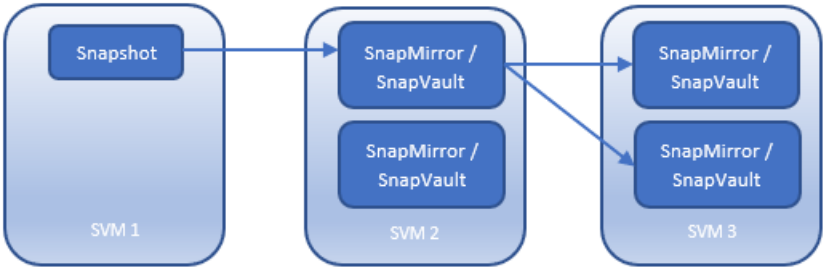


The snapshot can be replicated in a fanout configuration. You can have a maximum of eight fan-out relationships from a single source volume.

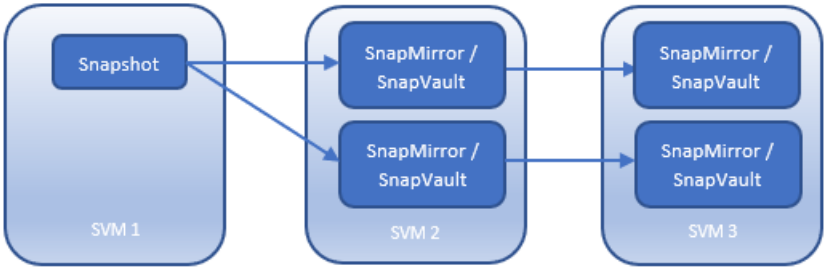




The snapshot can be replicated once and then further replicated in a fan-out configuration.



The snapshot replications can fan out first and later cascade further.



Considerations for NetApp plug-in

The following requirements and limitations are applicable in a NetApp environment:

- For NAS environment, the NetBackup Snapshot Manager's snapshot export operation will fail for shares assigned with the default array export policy. Ensure you assign a different export policy (other than the default) to the shares before initiating the export operation.
- For SAN environment, default array export policy can be assigned to NetApp volumes.
- For all NAS and SAN NetApp Flex volumes, auto-delete option must be disabled: volume snapshot autodelete modify -`vserver <vserverName> -volume <Volume Name> -enabled false –trigger volume`
- If an old snapshot is selected during PIT rollback, all new snapshots created after that snapshot are deleted automatically from the array.
- Fan out of replication topology is not supported with synchronous replication.
- You can have a maximum of eight fan out relationships from a single source volume.
- If you create any new replication relationship between source and destination apart from the ones mentioned in the Policy Name, Policy Type, and Replication Type table, then the new relationship is considered as NetApp_SnapMirror.
    - For SAN environment, if destination LUNs are on different SVM than source LUNs, then the NetBackup client should have FC zoning with destination SVM, in case of FC; iscsi session with destination SVM, in case of iscsi.

NetApp Cloud Volumes ONTAP (CVO)

The NetBackup Snapshot Manager for Data Center NetApp CVO plug-in lets you create, delete, restore, export, and deport snapshots of the following assets on the NetApp CVO:

- NetApp Logical Unit Number (LUNs) storage units in a SAN environment by iSCSI.
- NetApp NFS volumes in a NAS environment.
- NetApp SMB volumes in a NAS environment.

You can use the NetApp CVO as a replication target for the NetApp storage array as well.

See "Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage" on page 210. This section, and the subsequent sections, provide details related to operations, configuration, and prerequisites.

If your primary server is on-premises and the media server and backup hosts are in the cloud, for the firewall ports requirements, see:

https://www.veritas.com/support/en_US/article.100002391

To establish bi-directional connectivity between the backup hosts and CVO, use inbound rules. See:

https://docs.netapp.com/us-en/bluexp-cloud-volumes-ontap/reference-security-groups.html

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Note: It is recommended to keep the backup host and the CVO in the same region, and preferably in the same VPC to reduce cloud networking costs during backup.

Considerations for NetApp CVO plug-in

Cascaded replication relationships are not supported for NetApp CVO.

Amazon FSx for NetApp ONTAP Plug-in

The NetBackup Snapshot Manager for Data Center Amazon FSx for NetApp ONTAP plug-in lets you create, delete, restore, export, and deport snapshots of the following assets on the Amazon FSx for NetApp ONTAP:

- NetApp Logical Unit Number (LUNs) storage units in a SAN environment by iSCSI.
- NetApp NFS volumes in a NAS environment.
- NetApp SMB volumes in a NAS environment.

See "Supported NetBackup Snapshot Manager for Data Center operations on NetApp storage" on page 210. This section, and the subsequent sections, provide details related to operations, configuration, and prerequisites.

Considerations for Amazon FSx for NetApp ONTAP plug-in

- Amazon FSx for NetApp ONTAP does not support cascaded relationships.
- For plug-in registration, provide the **Management IP Address** of the file system along with the **FS User** and **FS Password**.

NetApp E-Series array

NetBackup provides a robust data protection solution for volumes that are set up on a Storage Area Network (SAN) storage host. NetBackup extends SAN support to let you protect mounted iSCSI/FC volumes that are hosted on the NetApp E-series environment.

NetBackup Snapshot Manager for Data Center plug-in for NetApp E-series has the functional logic that enables NetBackup to discover the SAN volumes on the arrays. Then it initiates snapshot create, export, deport, and delete operations for the volumes. You must configure this plug-in on the NetBackup primary server to discover the volumes, perform backups, and restore operations.

NetBackup Snapshot Manager for Data Center uses NetApp-provided WSAPIs to communicate with the assets.

Supported Snapshot Manager for Data Center operations on NetApp E-Series models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the NetApp E-Series array:

Table 9-55 NetBackup Snapshot Manager for Data Center operations on the NetApp E-series array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the NetApp E-Series volumes and the snapshots.

Table 9-55 NetBackup Snapshot Manager for Data Center operations on the NetApp E-series array *(continued)*

Snapshot Manager for Data Center operations	Description
Create snapshot	To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a Post Rest API method with the required information. Then, the API returns the details of the snapshot. NetBackup Snapshot Manager for Data Center creates a snapshot with the following description: :vrtscp: <Parent Volume Name> The suffix in the descriptions helps NetBackup Snapshot Manager for Data Center to perform the delete operations. For each volume, NetBackup creates a snapshot group with the following naming convention: NBSG <volume_name> The snapshot group is created with 40% capacity of the base volume. All snapshots on that volume are created inside this Snapshot Group. When the reserved capacity for a snapshot group is full, it rejects any new writes to the base volume. NetApp E-series volumes have a limitation of 32 snapshots per volume, post which a create snapshot operation results in an error.
Export snapshot	NetBackup Snapshot Manager for Data Center exports a snapshot over the iSCSI and FC protocols. When a snapshot export operation initiates, a new snapshot volume is created using the snapshot. The snapshot volume has the following naming convention: SV_snap_seq_no<snapshot sequence no> Once the snapshot volume is created, then a host is attached to it. The SAN zoning must be done between the host and array, which is required to attach the snapshot. **Note:** The discovery of a snapshot volume that is created in the export operation is skipped.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup Snapshot Manager for Data Center deletes the export mapping that is created between the host and the snapshot volume. Then, it deletes the intermediate snapshot volume once it is detached from the host.

Table 9-55 NetBackup Snapshot Manager for Data Center operations on the NetApp E-series array *(continued)*

Snapshot Manager for Data Center operations	Description
Delete snapshot	To delete a snapshot, NetBackup Snapshot Manager for Data Center initiates a Delete Rest API method call with the required snapshot details. NetBackup Snapshot Manager for Data Center verifies if the suffix (:vrtscp:) is present, then only a snapshot is allowed to be deleted. For NetApp E-Series, only the oldest snapshot can be deleted at any point of time. If a snapshot is required to be deleted, then all snapshots that are created before the chosen snapshot must be deleted first.
Restore snapshot	To restore a snapshot, NetBackup Snapshot Manager for Data Center initiates a Post Rest API method call with the required snapshot details.

NetApp E-Series plug-in configuration parameters

Before you configure the plug-in, verify the following:

- To view all the supported versions of NetApp E-Series, refer to the *NetBackup Snapshot Manager* section, in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account which has the permissions to invoke the NetApp E-Series APIs on the system.

Specify the following details when you configure the NetApp E-Series array:

Table 9-56 NetApp E-Series plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
Proxy/Array IP address	IP address of the computer where NetApp E-series is installed or proxy server address to which the array is added.
Port	Port number of the REST API server.

Table 9-56 NetApp E-Series plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
Username	User account that has permission to perform snapshot operations on the NetApp E-Series array.
Password	Password for the user account.
Storage array WWN	WWN of the array

- You can find the storage array WWN in the array details.
- To get the array details, use the following API:
  https://<array / proxy IP>:<port no>/devmgr/v2/storage-systems

Roles and privileges on NetApp E-Series

Do the following to allow NetBackup Snapshot Manager for Data Center to perform snapshot management operations.

Ensure that the NetApp E-Series user account that is used for plug-in configuration has the privileges to perform the following operations:

- Create snapshot
- Export snapshot
- Delete snapshot

The RBAC (role-based access control) capabilities include predefined users with one or more roles that are mapped to the user accounts. Each role includes permissions for accessing tasks in Unified Manager or system manager.

Following are the roles defined with access rights to perform tasks:

- Storage admin: Full read or write access to storage objects on the arrays, but no access to the security configuration.
- Security admin: Access to the security configuration in Access Management and Certificate Management.
- Support admin: Access to all hardware resources on the storage arrays, failure data, and MEL events. No access to the storage objects or security configuration.
- Monitor: Read-only access to all storage objects, but no access to the security configuration.

Nutanix Files array

NetBackup provides a robust data protection solution for shares that are set up on a Network Attached Storage (NAS) storage host. NetBackup extends this NAS support and allows you to protect file services that are hosted in a Nutanix Files environment. You can configure Snapshot Manager for Data Center to discover and then perform backup and restore operations on Nutanix Files shares that are exposed as Network File System (NFS) exports.

The Snapshot Manager for Data Center plug-in for Nutanix Files contains the necessary functional logic that enables NetBackup to discover the shares on the Nutanix Files server and then initiate snapshot create, export, deport, and delete operations for those shares. You must configure this plug-in on the NetBackup primary server. Snapshot Manager for Data Center uses the Nutanix REST APIs to communicate with the Nutanix Files File Server. Snapshot Manager for Data Center establishes a connection with Nutanix Files File Server by registering itself as a backup application and then uses the API endpoints to discover the shares and their snapshots that need to be backed up.

Supported Snapshot Manager for Data Center operations on Nutanix Files File Server

Snapshot Manager for Data Center performs the following management operations on the Nutanix Files File Server:

Table 9-57 Snapshot Manager for Data Center operations on Nutanix Files File Server

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers all the shares and their snapshots, along with some of their metadata. Shares that have CFT_BACKUP capabilities are eligible for snapshot-diff based incremental backups. **Note:** Snapshot operations are not supported for nested shares on the Nutanix Files File Server.

Table 9-57 Snapshot Manager for Data Center operations on Nutanix Files File Server *(continued)*

Snapshot Manager for Data Center operation	Description
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates a POST REST API call on the `/mount_targets` API with the required share information and snapshot name. The API returns the details of the snapshot (also referred to as the mount target snapshot). Snapshot Manager for Data Center keeps polling the snapshot details until the snapshot state changes to successful (or error in case of failure). A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: `NB<unique_21digit_number>`
Delete snapshot	To delete a snapshot, Snapshot Manager for Data Center initiates a DELETE REST API call with the required snapshot details in the following format: `/mount_target_snapshot/:snapshot_uuid` Snapshot Manager for Data Center keeps polling the snapshot UUID until it returns a 404 Not Found error code. This code confirms that the snapshot has been deleted successfully.
Restore snapshot	Snapshot Manager for Data Center does not support this operation.
Export snapshot	When a snapshot export operation is initiated, the backup host is added to the partner server that is registered during the plug-in configuration. A PUT REST API call is made to the partner server with the required mount target details. The Snapshot Manager for Data Center keeps polling the partner server to confirm the success of the operation.
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center makes a PUT REST API call to the partner server to remove the mount target entry that was added during the export operation. The Snapshot Manager for Data Center keeps polling the partner server to confirm the success of the operation.

Table 9-57 Snapshot Manager for Data Center operations on Nutanix Files File Server *(continued)*

Snapshot Manager for Data Center operation	Description
Create snapshot diff	Nutanix Files provides an API that allows you to create a diff between two snapshots of a share. This process is called Changed File Tracking (CFT). When a request to create a snapshot diff is made, Snapshot Manager for Data Center makes a REST API call to generate the CFT between two snapshots, and then retrieves and stores the CFT data on the Snapshot Manager for Data Center server. CFT-based backups are supported only for top-level shares. Nested shares are not supported.

Nutanix Files plug-in configuration prerequisites

Before you configure the plug-in, do the following:

- Ensure that a supported version of Nutanix Files is installed on the Nutanix arrays.
- For a list of all the supported versions of Nutanix Files, refer to the NetBackup Snapshot Manager for Data Center section in the NetBackup Hardware and Cloud Storage Compatibility List(HCL).
- A user account exists which has the permissions to invoke the Nutanix Files REST APIs on the File Server.

Nutanix Plug-in configuration parameters

Specify the following details when you configure the Nutanix Files array:

Parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP Address	The Fully Qualified Domain Name (FQDN) of the Nutanix Files File Server.
User name	The user account that has the permissions to invoke the Nutanix Files REST APIs on the File Server.
Password	The password of the Nutanix REST API user account.

Domain user permissions on the Nutanix Files array

The domain user that you use to perform NAS share backup, must have the required privileges for the Nutanix array. These privileges allow NetBackup to perform a backup of the NAS share ACLs.

To assign privileges on the Nutanix array:

1. Log on to the Prism console.
2. Open the file servers list, and click the file server where you want to create your SMB shares.
3. Select **User Mapping** in the **Protocol Management** link in the right corner.
4. Click **Next** multiple times until the **Explicit Mapping** dialog appears.
5. Click **Add One to One Mapping** and add your domain user and add NFS ID, save and click **Next**.

   You must add one domain user to the default mapping. Save the details.
6. Click **Manage Roles** in the right pane for the selected file server.
7. Add your domain user in the **Add Admins** section and select **Role** as *Backup admin: Backup access only.*
8. Save and close the dialog.

Nutanix Files plug-in considerations and limitations

The following considerations and limitations are applicable:

- Snapshot operations are not supported for nested shares on Nutanix Files File Server. A nested share is a share that is itself a subdirectory in an existing file share. NetBackup does not support snapshot creation for such nested shares.
- Nutanix Files File Server does not support point-in-time (PIT) rollback restore of shares using snapshots. You can use NetBackup assisted restore of shares' data.
- The maximum snapshot limit for a Nutanix Files share is 20. The maximum snapshot limit defines the maximum number of policy-initiated snapshots that are retained for the specified share. When the maximum count is reached, the oldest snapshot is deleted, when the policy creates the next snapshot. You may want to consider the policy schedule and retention for NetBackup's policy protecting Nutanix File shares.
- Nested shares do not have Changed File Tracking (CFT) based backup support.
- Snapshot operations on nested shares are disabled.

- The same file server must not be configured on two separate NSM instances. If such a configuration is done, then there are chances of image import and cleanup failing.

Pure Storage FlashArray SAN

NetBackup lets you protect mounted iSCSI/FC volumes present on the Pure Storage SAN array. The Snapshot Manager for Data Center plug-in for Pure Storage FlashArray can discover the SAN volumes and protection groups on the array and perform create, export, deport, and delete snapshot operations for volumes and protection groups. You must configure this plug-in on the NetBackup primary server to perform backup and restore operations.

Snapshot Manager for Data Center uses an SDK supported by the Pure Storage FlashArray family to communicate with the Pure Storage FlashArray assets.

Supported Snapshot Manager for Data Center operations on Pure Storage SAN array models

Snapshot Manager for Data Center performs the following snapshot management operations on the Pure Storage SAN arrays:

Table 9-58 Snapshot Manager for Data Center operations on the Pure Storage SAN arrays

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the volumes, protection groups, protection group snapshots, and volume snapshots.
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates a REST API method with the required snapshot details. A snapshot is created with the following naming convention: NB<unique_21digit_number> NetBackup takes a snapshot of the entire protection group of the volumes, as selected in the NetBackup policy.
Delete snapshot	To delete a volume or protection group snapshot, Snapshot Manager for Data Center initiates a REST API call with the required snapshot details.

Table 9-58 Snapshot Manager for Data Center operations on the Pure Storage SAN arrays *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	To restore a volume snapshot or protection group snapshot, Snapshot Manager for Data Center initiates a REST API method with the required snapshot details. **Note:** Restore of a protection group snapshot restores all the volumes that were part of the protection group at the time of taking the snapshots. You cannot restore a single volume when the snapshot is taken on the protection group.
Export snapshot	Snapshot Manager for Data Center can perform FC/iSCSI based exports. When a snapshot export operation initiates, a new clone volume is created from the snapshot, and attached to the host. For protection group snapshots too, the clone volumes are created and attached to the host. The SAN zoning must be done between the host and array to be attached to the snapshot.
Deport snapshot	Snapshot Manager for Data Center deletes the export mapping created between the host and the cloned volume(s) created from the volume snapshot or the protection group snapshot.

Pure Storage SAN plug-in configuration pre-requisites

Before you configure the plug-in, ensure the following:

- For a list of all the supported versions of Pure Storage FlashArray, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account that has the permissions to call the Pure Storage FlashArray APIs.

Pure Storage SAN plug-in configuration parameters

The following parameters are required for configuring the Pure Storage SAN plug-in:

Table 9-59 Pure Storage Flash array plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address / FQDN	The array's management IP address, in IPV4/ FQDN format.
User name	A user account that has permissions to perform snapshot operations.
Password	The password for the user account.

Roles and privileges on Pure Storage FlashArray

To allow NetBackup to perform snapshot management operations, ensure that the Pure Storage FlashArray user account you use for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

There are four predefined user roles in Pure Storage FlashArray:

- **readonly**—can perform operations that convey the state of the array. These users cannot alter the state of the array.
- **ops_admin**—can perform the same operations as the **readonly** users, and additionally, enable and disable remote assistance sessions. Ops admin users cannot alter the state of the array.
- **storage_admin** —can perform storage-related operations, such as administering volumes, hosts, and host groups. Storage admin users cannot perform operations that deal with global and system configurations.
- **array_admin**—can perform the same operations as **storage_admin** users plus array-wide changes dealing with global and system configurations.

Users with the **storage_admin** and **array_admin** roles assigned, can perform all the NetBackup snapshot management operations.

Pure Storage FlashArray plug-in considerations and limitations

The following considerations and limitations apply:

- Do not delete a volume from the array or remove it from the protection group after taking the backup operation. This might cause the restore to fail.
- During the delete operation, if the array has safe mode enabled, the snapshot is not removed completely from the array. NetBackup destroys the snapshot but does not eradicate it.

Pure Storage Flash Array files services (NAS)

The NetBackup Snapshot Manager for Data Center Pure Storage Flash Array Files services (NAS) plug-in lets you create, delete, restore, export, and deport managed directory snapshots of the following assets on the Pure Storage Flash Array Cluster:

- Pure Storage Flash Array Files services (NAS) NFS-managed directories in a NAS environment.
- Pure Storage Flash Array Files services (NAS) SMB-managed directories in a NAS environment.

The Pure Storage Flash Array Files services (NAS) plug-in uses the Unified Python SDK APIs provided by Pure Storage py-pure-client to communicate with the Pure Storage Flash Array Cluster assets.

Supported Snapshot Manager for Data Center operations on Pure Storage Flash Array files services (NAS)

Snapshot Manager for Data Center performs the following management operations on the Pure Storage Flash Array Files services (NAS) array.

Table 9-60 Snapshot Manager for Data Center operations on Pure Storage Flash Array Files services (NAS) array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the managed directories and its associated NFS and SMB directory exports for protection, along with their managed directory snapshots. Snapshot Manager for Data Center also discovers all the nested managed directories, along with the associated NFS and SMB directory exports. NetBackup discovers assets to the maximum depth to which the managed directories are created on the Pure Storage Flash array cluster. The managed directories must have an NFS or SMB directory export created, so that Snapshot Manager for Data Center can discover them for protection. Examples of nested shares discovered by Snapshot Manager for Data Center: *["/test_manage_dir1", "/test_1/test_manage_dir2", "/test_manage_dir1/test_data/test_manage_dir3", "/smb_03/test_data/dir01"]*
Create snapshot	To create a managed directory snapshot, Snapshot Manager for Data Center runs a POST REST API call on the array with the required information and the snapshot name. The API returns the details of the managed directory snapshot. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: *NB.NB<unique_21digit_number>*
Delete snapshot	To delete a managed directory snapshot, Snapshot Manager for Data Center runs a PATCH and DELETE REST API call with the required managed directory snapshot details. The PATCH REST API updates the directory snapshot with "destroyed": True, and then performs a DELETE REST API process on the managed directory snapshot. **Note:** Deleting a snapshot only removes the directory snapshot, without permanently eradicating the snapshot from the Pure Storage Flash Array cluster. Snapshot eradication occurs based on the eradication configuration set on the cluster. If safe mode is enabled on the cluster, eradication takes place after the minimum retention period specified for snapshot deletion.

Table 9-60 Snapshot Manager for Data Center operations on Pure Storage Flash Array Files services (NAS) array *(continued)*

Snapshot Manager for Data Center operations	Description
Restore snapshot	Point-in-time restore is not supported by the Pure Storage Flash Array Files Services (NAS). So, NetBackup cannot perform any PIT restore operation.
Export snapshot	When a managed directory snapshot export operation is run: ■ For a managed directory having an NFS directory export, the snapshot export path is created. The backup hosts are added as a client rule in the existing NFS policy applied to the managed directory. For example: `/test_manage_dir1/.snapshot/NB.NB15985918570166499611/` ■ For a managed directory having an SMB directory export, the snapshot export path is created. The backup hosts are added as a client rule in the existing SMB policy applied to the managed directory. For example: `/test_manage_dir1/.snapshot/NB.NB15985918570166499611/` To make changes in the NFS or SMB export directory and perform backup from snapshot, required access permissions must be set for the backup host. If the backup host is already added to the NFS or SMB directory export policies, then the policy modifications are not required. **Note:** On Box, ShareACL is not available on FA Files. Pure's recommendation is to use an Windows or MMC to set up the share access controls, after exporting the SMB shares. The logged on user must be in the specified domain.
Deport snapshot	When a managed directory snapshot deport operation is run, Snapshot Manager for Data Center does not remove the host client rule from the NFS or SMB Policy. The host client rule is added to provide access over the snapshot path at the time of Export. This action prevents disruption to any ongoing backup from snapshot operations associated with the directory export associated with the policy.

PureStorage Flash array NAS plug-in configuration pre-requisites

Before you configure the plug-in, ensure the following:

- For the list of all the supported versions of PureStorage Flash NAS array, refer to the NetBackup Snapshot Manager section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- IP address: You can use the management IP/FQDN of the array to configure the array in NetBackup. For IP access, provide the management IP. For example, if the management IP is **10.221.xxx.xx**; you can register the array with NetBackup using the IP **10.221.xxx.xx**. For FQDN, if the management FQDN address is: **https://purestorage-flasharray.com**, then register NetBackup using the same.
- A user account must exist with the permissions to access the PureStorage Flash array files services APIs.
- For registration from NetBackup an Active Directory user having an API Token is required for the following:
  - Create a managed directory snapshot.
  - Delete a managed directory snapshot.
  - Update the managed directory exports policy with clients and access from a backup host.
- Ensure that the Data_lifs associated with the Pure Flash array cluster is accessible from the clients for NFS mounts and SMB shares to perform backup from snapshots operations.
- Data_lifs are identified using Pure Storage Network APIs:
  `self.pure_client.get_network_interfaces()`

Pure Storage Flash NAS array plug-in configuration parameters

The following parameters are required for configuring the Pure Storage NAS plug-in:

Table 9-61 Pure Storage Flash array plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address / FQDN	The array's management IP address, in IPV4/ FQDN format.
User API Token	A user API token with permissions to perform snapshot operations on the Pure Storage Flash NAS array.

Roles and privileges on Pure Storage Flash NAS array

To allow NetBackup to perform snapshot management operations, ensure that the Pure Storage Flash NAS array user account you use for plug-in configuration has the following roles and privileges assigned:

- Discover networks and identify Data Lif IPs or FQDN associated to the array.
- Discover managed directories, directory exports, and directory snapshots.
- Create managed directory snapshot
- Export managed directory snapshot
- Restore managed directory snapshot
- Delete managed directory snapshot

There are four predefined user roles in Pure Storage Flash NAS array:

- **readonly**—can perform operations that convey the state of the array. These users cannot alter the state of the array.
- **ops_admin**—can perform the same operations as the **readonly** users, and additionally, enable and disable remote assistance sessions. Ops admin users cannot alter the state of the array.
- **storage_admin** —can perform storage-related operations, such as administering volumes, hosts, and host groups. Storage admin users cannot perform operations that deal with global and system configurations.
- **array_admin**—can perform the same operations as **storage_admin** users plus array-wide changes dealing with global and system configurations.

Users with the **storage_admin** and **array_admin** roles assigned, can perform all the NetBackup snapshot management operations.

Pure Storage FlashBlade plug-in configuration notes

Snapshot Manager for Data Center lets you protect NFS and SMB protocol-based file systems that are hosted in a Pure Storage FlashBlade array.

Snapshot Manager for Data Center discovers assets in the Pure Storage FlashBlade array and performs create, export, deport, and delete snapshot operations. You must configure the plug-in on the NetBackup primary server before performing these operations.

Snapshot Manager for Data Center uses the Pure Storage SDK called purity-fb (1.12.2). Purity-fb calls the Pure Storage FlashBlade family APIs to communicate with and protect the Pure Storage FlashBlade assets.

Supported Snapshot Manager for Data Center operations on Pure Storage FlashBlade models

Supported Snapshot Manager for Data Center operations on Pure Storage FlashBlade models:

Table 9-62 Snapshot Manager for Data Center operations on the Pure Storage FlashBlade array

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all the Pure Storage FlashBlade file system assets and their snapshots. NetBackup calls the array's API to retrieve the assets mentioned in the list.
Create snapshot	To create a snapshot, Snapshot Manager for Data Center calls the SDK with the required snapshot name and details. A snapshot is created with the following naming convention: `NB <unique_21digit_number>`. Snapshots created by Snapshot Manager for Data Center have the description: *:vrtscp: <Parent Volume Set Name>* The field name `source_id` indicates the source file system of the created snapshots on the array. In snapshots, you can only provide a suffix to the snapshot name, and the prefix is the file system name by default and cannot be changed.
Delete snapshot	To delete a snapshot set, NetBackup calls the SDK with the required snapshot details.
Restore snapshot	Snapshot Manager for Data Center restores snapshots using the SDK methods with different restore paths. The latest snapshot is required for PIT. You cannot perform a PIT restore with old snapshots.

Table 9-62 Snapshot Manager for Data Center operations on the Pure Storage FlashBlade array *(continued)*

Snapshot Manager for Data Center operations	Description
Export snapshot	You can export snapshots using SMB and NFS-based exports. When a snapshot export is initiated, a new rule is added for the host as read-only. An export path is generated using the VLAN interface available on the array, and this path is shared with NetBackup for mounting.
Deport snapshot	When a snapshot deport operation is initiated, NetBackup removes the export rules added previously for the host.

Pure Storage FlashBlade plug-in configuration prerequisites

Before you configure the plug-in, ensure the following:

- You can use the management IP or FQDN of the array through NetBackup to configure the array. The current support provides the ability to configure IPV4 for the array. For IPV4 access, provide the management IP. For FQDN, the management FQDN address is: `https://purestorage-flashblade.com`. You can register NetBackup using this FQDN.
- For registration from NetBackup, an Active Directory user with an API token is required, who can create, delete, and restore snapshots; and attach or detach the file system with hosts.
- You cannot create shares within the Pure Storage FlashBlade array, but you can create file systems.

Pure Storage FlashBlade plug-in configuration parameters

Specify the following details when you configure the Pure Storage FlashBlade plug-in:

Table 9-63 Pure Storage FlashBlade plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
IP address	The array's IP address, in IPV4 format.

Table 9-63 Pure Storage FlashBlade plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
User name	A user account that has permissions to perform snapshot operations on the Pure Storage FlashBlade.
Password	The password for the Pure Storage FlashBlade user account.

Roles and privileges for Pure Storage FlashBlade plug-in

To allow NetBackup to perform snapshot management operations, ensure that the Pure Storage FlashBlade user account used for plug-in configuration has the following roles and privileges assigned:

- Create snapshot
- Export snapshot
- Restore snapshot
- Delete snapshot

PowerMax eNAS array

NetBackup provides a robust data protection solution for shares that are set up on a Network Attached Storage (NAS) storage host. NetBackup allows you to protect NFS exports and SMB shares hosted in PowerMax eNAS environment. You can configure Snapshot Manager for Data Center to discover and then perform backup operations on NFS exports and SMB shares.

Snapshot Manager for Data Center plug-in for PowerMax eNAS contains the functional logic that enables NetBackup to discover the NFS exports and SMB shares on the PowerMax eNAS system. Then it initiates the snapshot to create, export, deport, and delete operations for the exports.

You must configure this plug-in on the NetBackup primary server.

- Snapshot Manager for Data Center uses the XML APIs to communicate with the PowerMax eNAS assets.
- Snapshot Manager for Data Center establishes a connection with PowerMax eNAS to discover the NFS exports, SMB shares, and its snapshots for backup.

Supported Snapshot Manager for Data Center operations on PowerMax eNAS models

NetBackup Snapshot Manager for Data Center performs the following snapshot management operations on the PowerMax eNAS array:

Table 9-64 NetBackup Snapshot Manager for Data Center operations on the PowerMax eNAS array

Snapshot Manager for Data Center operations	Description
Discover assets	NetBackup Snapshot Manager for Data Center discovers all the PowerMax Data movers, NFS exports, SMB shares, and their file system snapshots. NetBackup Snapshot Manager for Data Center also discovers all the nested NFS exports and SMB shares, irrespective of the depth at which they are created.
Create snapshot.	To create a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST XML API method with the required information and snapshot name. The API returns the details of the snapshot. All these snapshots are at the file system level. A typical snapshot created by NetBackup Snapshot Manager for Data Center has the following naming convention: NB<unique_21digit_number>
Restore snapshot	NetBackup Snapshot Manager for Data Center does not support PIT restore operations on the array. Instead, we can perform the normal restore on the specified location.
Export snapshot	NetBackup Snapshot Manager for Data Center supports export operations using the NFS and SMB protocols. When a snapshot export operation is initiated based on the NFS export or SMB, the share export path is created using the snapshot name, and then the details are sent to NetBackup. Then, the host access configuration is added as read-only on the newly created export/share. Following are the snapshot export paths: ■ NFS: <server-ip>:/<snapshot_name>/ ■ SMB: \\<server-ip>\<snapshot_name>\

Table 9-64 NetBackup Snapshot Manager for Data Center operations on the PowerMax eNAS array *(continued)*

Snapshot Manager for Data Center operations	Description
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center makes a POST XML API call to the PowerMax eNAS array to remove the host access configurations entry that was added during the export operation.
Delete snapshot	To delete a snapshot, NetBackup Snapshot Manager for Data Center initiates a POST XML API call with the required snapshot details. Then, it confirms that the snapshot was successfully deleted from the array.

PowerMax eNAS plug-in configuration parameters

Before you configure the plug-in, verify the following:

- Ensure that a supported version of the PowerMax eNAS System Management Unit is installed on the PowerMax eNAS array.
- To view all the supported versions of PowerMax eNAS, refer to the *NetBackup Snapshot Manager* section, in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists that has permissions to invoke the PowerMax eNAS XML APIs and all snapshot operations on the array.

Specify the following details when you configure the PowerMax eNAS array:

Table 9-65 PowerMax eNAS plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plug-in ID	Provide a name for the plug-in.
Proxy/Array IP address	PowerMax eNAS array's management IP address, in either IPv4 or The Fully Qualified Domain Name (FQDN).
Username	PowerMax eNAS user account that has permission to invoke the eNAS XML APIs to perform all snapshot operations on the array.

Table 9-65 PowerMax eNAS plug-in configuration parameters *(continued)*

Snapshot Manager for Data Center configuration parameter	Description
Password	Password of the PowerMax eNAS XML API user account.

Domain user permissions on the PowerMax eNAS array

The domain user must have privileges on the PowerMax eNAS array, to allow NetBackup to perform the backup of NAS share ACLs.

Considerations and limitations for PowerMax eNAS plug-in

The following considerations and limitations are applicable in a PowerMax eNAS environment:

- All snapshots are captured at the file system level, and the snapshots are in read-only mode.
- The following are the character limitations on the array:
  - Any file system name is 240 characters.
  - NFS export path maximum length is 1024 characters.
  - SMB shares name length is 80 characters.
- You can enable the Unicode to change the limitations. In case of a snapshot name, the maximum length must be 240 characters.
- PowerMax eNAS plug-in does not support point-in-time (PIT) rollback restore of shares using snapshots.
- Following are the assets that the PowerMax eNAS array does not discover:
  - The shares and exports that are created from the snapshot.
  - The shares that don’t have the CIFS server linked.

Qumulo NAS array

NetBackup provides a robust data protection solution for the shares that are set up on a Network Attached Storage (NAS) storage host. NetBackup extends this NAS support and lets you protect NFS exports that are hosted in a Qumulo environment. You can configure Snapshot Manager for Data Center to discover and then perform back up and restore operations on Network File System (NFS) exports.

The Snapshot Manager for Data Center plug-in for Qumulo contains the necessary functional logic that enables NetBackup to discover the NFS exports on the Qumulo

cluster. NetBackup then creates, exports, deports, and deletes snapshot operations for those exports. You must configure this plug-in on the NetBackup primary server.

Snapshot Manager for Data Center uses the REST API SDK Qumulo (qumulo-api) provides to communicate with the Qumulo assets. Snapshot Manager for Data Center establishes a connection with Qumulo by using the RestClient library exposed by SDK. NetBackup, then uses the SDK methods to discover the NFS exports and their snapshots that need to be backed up.

Supported Snapshot Manager for Data Center operations on Qumulo plug-in

Snapshot Manager for Data Center performs the following management operations on the Qumulo plug-in:

Table 9-66 Snapshot Manager for Data Center operations on Qumulo plug-in

Snapshot Manager for Data Center operation	Description
Discover assets	Snapshot Manager for Data Center discovers all the Qumulo file system paths and their snapshots, along with some of their metadata. Single-depth discovery is supported. For example, if the file system directories are [/home, /home/user1, /home/user2, /user1], then the discovered file system is [/home, /user1].
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates an SDK method with the required information and snapshot name. The API returns the details of the snapshot. A typical snapshot created by Snapshot Manager for Data Center has the following naming convention: NB<unique_21digit_number>
Delete snapshot	To delete a snapshot, Snapshot Manager for Data Center initiates an SDK method call with the required snapshot details. Then Snapshot Manager for Data Center confirms that the snapshot has been deleted successfully on the cluster.
Restore snapshot	Snapshot Manager for Data Center does not support this operation.
Export snapshot	When NetBackup exports a snapshot, a new NFS export is created over the same file system path on which the backup host is added as a client with read-only permission.

Table 9-66 Snapshot Manager for Data Center operations on Qumulo plug-in *(continued)*

Snapshot Manager for Data Center operation	Description
Deport snapshot	When a snapshot deport operation is initiated, Snapshot Manager for Data Center deletes the NFS export created over the snapshot path at the time of the export operation.
Create snapshot diff	Snapshot Manager for Data Center does not support this operation.

Qumulo plug-in configuration prerequisites

Before you configure the plug-in, verify the following:

- Ensure that the Qumulo Core version is supported.
- For the list of all the supported versions of Qumulo, refer to the NetBackup Snapshot Manager for Data Center section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL).*
- A user account that has the permissions to call the Qumulo APIs on the Cluster.
- Use port 8000 for REST API calls.

Qumulo plug-in configuration parameters

Specify the following details when you configure the Qumulo cluster.

Parameter	Description
Plug-in ID	Provide a name for the plug-in.
FQDN/ IP address	You can add any management IP address or the Fully Qualified Domain Name (FQDN) of the node. You can also use Qumulo DNS round-robin FQDN here.
Username	A user account that has permissions to perform snapshot operations on the Qumulo cluster.
Password	The password of the Qumulo user account.

Permissions and privileges on the Qumulo cluster

To allow NetBackup to perform snapshot management operations, ensure that the Qumulo user account used for plug-in configuration has the appropriate roles and privileges assigned to the storage array.

The NetApp user account must have the privileges to perform the following operations on the NetApp array:

- Create snapshot
- Export Snapshot
- Delete snapshot

There are three predefined user roles in Qumulo

- Administrators - Full access and control of the cluster.
- Data-Administrators - Full access and control of data and files on the cluster including: SMB/NFS, snapshots, quotas, file system, and file system permissions. Does not include access to the web UI.
- Observers - Read-only access for all APIs and UI on the cluster

Users with administrators or Data-administrators role assigned can perform all the NetBackup snapshot management operations.

These are the Custom User Role Permissions required to perform all the NetBackup snapshot management operations.

Permissions

CLUSTER_READ

FILE_FULL_ACCESS

NFS_EXPORT_READ

NFS_EXPORT_WRITE

SMB_SHARE_READ

SMB_SHARE_WRITE

SNAPSHOT_READ

SNAPSHOT_WRITE

Domain user permissions on the Qumulo cluster

To create domain user permissions:

1. Log on to the Qumulo Core web UI.
2. Select the **Cluster** menu and click **Active Directory** under **Authentication and Authorization**.
3. Configure the following mandatory fields:
   - **Domain Name**: Name of your domain. Example: `ad.example.com`.
   - **Domain Username**: The user account or service account you use to authenticate against the domain.
   - **Domain Password**: The password for the user account or service account.
4. Optionally, configure the following two optional fields:
   - **NetBIOS name**: If your domain's NetBIOS name is different from your domain name, then enter the domain's NetBIOS name in this field.

     Note: If you attempt to join the domain and get an error message similar to this: "Sorry, the NetBIOS name (QUMULO) is incorrect". Your domain's NetBIOS is different from your domain name.

   - **Organizational Unit (OU)**: Obtain this information from your systems administrator. If unknown, leave it blank, and Qumulo attempts to join the domain without an OU specified.
5. Click **Yes** to use your AD as your primary time server.
6. Select the option to use Active Directory for POSIX attributes.
   - Use in environments where 'user objects' in Active Directory are assigned an UNIX UID, and the GID attributes to allow the cluster to properly enforce permissions, regardless of the protocol used to access the data.
   - For additional details, see the Using Active Directory for POSIX attributes article.
7. If desired, enter your Base DN(s) in the field provided.
8. Click **Join**.

Configuring a dedicated VLAN for NetBackup access

Qumulo NAS-based volume snapshots are exposed to NetBackup over NAS protocols. NetBackup reads these snapshots using any available network.

In Qumulo, you can create multiple VLANs. If required, you can configure a VLAN that is dedicated to NetBackup access. While configuring a VLAN, use "nbu_nas" as the name of the network. If such a VLAN exists, NetBackup uses that VLAN route for accessing the snapshots.

Qumulo plug-in considerations and limitations

The following considerations and limitations are applicable:

- Qumulo file servers do not support point-in-time (PIT) rollback restore of shares using snapshots. You can use NetBackup to restore the share's data.

Upgrade considerations from older versions to Snapshot Manager for Data Center 10.3

- Expire all the earlier snapshots before starting the upgrade for Snapshot Manager for Data Center 10.3.
- To retain the older snapshots, first configure a new Snapshot Manager for Data Center 10.3 for the new snapshots and backup image management. Use the earlier Snapshot Manager for Data Center for the earlier images. Once the older snapshots become obsolete, remove the older Snapshot Manager for Data Center.

VMware vSAN File Services plug-in

NetBackup provides a robust data protection solution for VMware vSAN file shares that are set up on a Network Attached Storage (NAS) storage host. NetBackup supports NAS and allows you to protect file shares that are hosted on VMware vSAN File Services environment.

Snapshot Manager for Data Center plug-in for VMware vSAN File Services contains the functional logic that enables NetBackup to discover the vSAN clusters and file shares on the VMware vCenter server then initiate snapshot create, export, deport, and delete operations for those shares. You must configure this plug-in on NetBackup primary server.

Snapshot Manager for Data Centeruses the pyVmomi SDK and its extension for vSAN managed objects provided by VMware to communicate with the VMware vSAN File Services to discover the vSAN clusters, file shares, and the snapshots to back up.

Supported Snapshot Manager for Data Center Operation on VMware vSAN cluster

You can perform the following Snapshot Manager for Data Center operations supported on the VMware vSAN cluster:

Table 9-67 Snapshot Manager for Data Center operations on the VMware vSAN cluster

Snapshot Manager for Data Center operations	Description
Discover assets	Snapshot Manager for Data Center discovers all VMware vSAN clusters, NFS, and SMB file shares and the snapshots with its metadata.
Create snapshot	To create a snapshot, Snapshot Manager for Data Center initiates a POST REST API method with the required information and snapshot name. The API returns the details of the snapshot. All these snapshots are at a file share level. A snapshot created with the following naming convention: NB<unique_21digit_number>
Delete snapshot	To delete a file share snapshot, Snapshot Manager for Data Center initiates a DELETE Rest API call with the required snapshot details. Snapshot Manager for Data Center confirms that the snapshot is deleted successfully on the vSAN cluster.
Restore snapshot	Snapshot Manager for Data Center does not support file share-level PIT restore operations on the vSAN cluster. Instead, you can perform a normal restore at a specified location.

Table 9-67 Snapshot Manager for Data Center operations on the VMware vSAN cluster *(continued)*

Snapshot Manager for Data Center operations	Description
Export snapshot	Snapshot Manager for Data Centersupports export operation using the NFS and SMB protocol. When a snapshot export operation is initiated based on NFS or SMB share export path is created using `.vdfs/snapshot/` directory and snapshot name and then the details are sent to NetBackup. Also the host access configuration are added as read-only on a particular file share. Snapshot export path as follows: ■ NFS: <file-server-primary-host>:/vsanfs/<share_name> /.vdfs/snapshot/<snapshot_name> ■ SMB: \\<file-server-primary-host>\\vsanfs\\<share_name> \\.vdfs\\snapshot\\<snapshot_name>
Deport snapshot	When a snapshot deport operation is initiated,Snapshot Manager for Data Center makes a PUT REST API call to the vSAN cluster to remove host access configurations entry that was added during the export operation.

VMware vSAN File Services plug-in configuration prerequisites

Before you configure the VMware vSAN File Services plug-in, verify the following:

- Ensure that a supported version of vSAN is installed on the vCenter server.
- For the list of all the supported versions of vSAN, refer to the *NetBackup Snapshot Manager* section in the *NetBackup Hardware and Cloud Storage Compatibility List (HCL)*.
- A user account exists which has the permissions to invoke the vSAN REST APIs and all snapshot operations on the vCenter server.
- File services and file domains must be configured on the vSAN cluster.

VMware vSAN File Services plug-in configuration parameters

The following parameters are required for configuring the VMware vSAN File Services plug-in:

Table 9-68 VMware vSAN File Services plug-in configuration parameters

Snapshot Manager for Data Center configuration parameter	Description
Plugin ID	Provide a name for the plugin.
vCenter Host	The vCenter Server IP address, in either IPV4 or the Fully Qualified Domain Name (FQDN).
vCenter Username	The vCenter user account that has the permissions to invoke the vSAN REST APIs to perform all snapshot operations on the vCenter server.
vCenter Password	Password of the vCenter server user account.

Domain user permissions on the VMware vSAN Cluster

To allow Snapshot Manager for Data Center to perform snapshot management operations, ensure to configure domain permissions for users on the VMware vSAN cluster:

To configure domain permissions for users

1. Log on to the vCenter server through the web UI.
2. Navigate to the vSAN cluster and click **Configure** > **vSAN** > **Services** > **Configure Domain**.
3. On the **File service domain** page, enter the unique namespace and click **Next**.
4. On the **Networking** page, enter the protocol, DNS servers, subnet mask, gateway, and IP pool, and click **Next**.
5. On the **Directory service** page, enter the following information to join an active directory and click **Next**.
   - **AD domain**: fully qualified domain name.
   - **Preferred AD Server** (Optional): Enter the comma-separated IP address of the preferred AD server.
   - **Organizational unit** (Optional): Both distinguished names and organizational unit names are accepted.
   - **AD username** User name used for connecting and configuring the active directory service.
6. Review the settings and click **Finish**.

VMware vSAN File Services plug-in considerations and limitations

Following considerations and limitations are applicable in a VMware vSAN File Services environment:

- All snapshots are captured at the file share level, and those snapshots are in read-only mode.
- The limit for any file share name is 80 characters on the vSAN cluster. In the case of a snapshot name, the maximum length is 100 characters.
- You can create a maximum of 32 snapshots per file share on the vSAN cluster.
- You cannot delete the latest file share snapshot present on the vSAN cluster. Therefore, during the delete operation, NetBackup marks those snapshots, and deletes them in the next cleanup job.
- The VMware vSAN File Services plug-in does not support point-in-time (PIT) rollback restore of shares using snapshots.

Chapter 10

NetBackup Snapshot Manager logging

This chapter includes the following topics:

About NetBackup Snapshot Manager logging mechanism

NetBackup Snapshot Manager uses the Fluentd-based logging framework for log data collection and consolidation. Fluentd is an open source data collector that provides a unified logging layer for structured log data collection and consumption.

For more information on Fluentd, refer to the Fluentd website.

All the NetBackup Snapshot Manager container services generate and publish service logs to the configured Docker logging driver. The logging driver is the fluentd framework that is running as a separate `flexsnap-fluentd` container on the NetBackup Snapshot Manager host. With the Fluentd framework, these individual

service logs are now structured and routed to the Fluentd data collector from where they are sent to the configured output plug-ins. The flexsnap-fluentd container log is the output plug-in that is configured by default.

Using Fluentd-based logging provides several benefits including the following:

- A persistent structured repository that stores the logs of all the NetBackup Snapshot Manager services
- A single stream of all NetBackup Snapshot Manager logs (vs disparate individual log files) makes it easy to trail and monitor specific logs
- Metadata associated with the logs allow for a federated search that speeds up troubleshooting
- Ability to integrate and push NetBackup Snapshot Manager logs to a third-party tool for analytics and automation

How Fluentd-based NetBackup Snapshot Manager logging works

When you install or upgrade NetBackup Snapshot Manager, the following changes occur on the NetBackup Snapshot Manager host:

- A new container service named `flexsnap-fluentd` is started on the NetBackup Snapshot Manager host. This service is started before all the other NetBackup Snapshot Manager container services. The `flexsnap-fluentd` service serves as the `fluentd` daemon on the host.
- All the NetBackup Snapshot Manager container services are then started with `fluentd` as the Docker logging driver.
- A `fluentd` configuration file is created at `/cloudpoint/fluent/fluent.conf`. This file contains the output plug-in definitions that are used to determine where the NetBackup Snapshot Manager logs are redirected for consumption.

Once all the infrastructure components are ready, each of the NetBackup Snapshot Manager services begin to send their respective log messages to the configured Docker `fluentd` logging driver. The `fluentd` daemon then redirects the structured logs to the output plug-ins configured in the `fluentd` configuration file. These logs are then sent to the `/cloudpoint/logs/flexsnap.log` file on the NetBackup Snapshot Manager host.

Note that the `flexsnap.log` file gets rotated after the file size reaches a maximum of 100 MB. A total of 30 generations (rotated files) of the `flexsnap.log` file are maintained. These conditions are applicable because of the new log file rotate

(`log-rotate-age`) and log size (`log-rotate-size`) command options that are introduced in the `fluentd` command.

Steps to configure log file rotate and log size command options

1. In `/cloudpoint/flexsnap.conf` file, enter the `log_rotate_age` and `log_rotate_size` values under logging section and then restart the `flexsnap-fluentd` container for changes to take effect.

   Sample `flexsnap.conf` file:

   ```
   [logging]
   log_rotate_age = 7
   log_rotate_size = 20000
   ```

   - log_rotate_age: Specifies the generations to keep rotated log files (the total number of files that can be accumulated before rotation), the default value is 30.
   - log_rotate_size: Specifies the log file size (in bytes) after which a single log file will be rotated, the default value is 100000000 bytes.

2. After changing the `flexsnap.conf` file, restart the `flexsnap-fluentd` container:
   - For docker environment: `# sudo docker restart flexsnap-fluentd`
   - For podman environment:

     ```
     # sudo podman stop flexsnap-fluentd
     # sudo podman start flexsnap-fluentd
     ```

About the NetBackup Snapshot Manager fluentd configuration file

Fluentd uses a configuration file that defines the source of the log messages, the set of rules and filters to use for selecting the logs, and the target destinations for delivering those log messages.

The `fluentd` daemon running on the NetBackup Snapshot Manager host is responsible for sending the NetBackup Snapshot Manager logs to various destinations. These target destinations, along with the other details such as input data sources and required fluentd parameters are defined in the plug-in configuration file. For NetBackup Snapshot Manager, these plug-in configurations are stored in a `fluentd` configuration file that is located at `/cloudpoint/fluent/fluent.conf` on the NetBackup Snapshot Manager host. The fluentd daemon reads the output

plug-in definition from this configuration file to determine where to send the NetBackup Snapshot Manager log messages.

The following output plug-in definition is added to the configuration file by default:

`STDOUT`: This is used to send the NetBackup Snapshot Manager log messages to `/cloudpoint/logs/flexsnap.log`.

The plug-in is defined as follows:

```
# Send to fluentd docker logs
<store>
@type stdout
</store>
```

Additionally, the NetBackup Snapshot Manager fluentd configuration file includes plug-in definitions for the following destinations:

- Splunk
- ElasticSearch

These plug-in definitions are provided as a template and are commented out in the file. To configure an actual Splunk, or ElasticSearch target, you can uncomment these definitions and replace the parameter values as required.

Modifying the fluentd configuration file

Modify the `fluent.conf` configuration file if you want to modify the existing plug-in definitions.

To modify the fluent.conf file

1. On the NetBackup Snapshot Manager host, open the `/cloudpoint/fluent/fluent.conf` configuration file in a text editor of your choice and then edit the contents to add or remove a plug-in definition.
2. Save all the changes to the file.
3. Restart the `flexsnap-fluentd` container service using the following command:

   ```
   # sudo docker restart flexsnap-fluentd
   ```

Note that the changes take effect immediately and apply only to the newer log messages that get generated after the change. The file changes do not apply to the older logs that were generated before the configuration file was updated.

Viewing NetBackup Snapshot Manager logs

NetBackup Snapshot Manager provides a MongoDB client helper utility (`flexsnap-log`) that is located within the `flexsnap-coordinator` service. This utility allows you to access the MongoDB logs collection.

The general command syntax for using the `flexsnap-log` utility is as follows:

```
# sudo docker exec flexsnap-coordinator flexsnap-log <options>
```

Table 10-1 Flexsnap-log command options

Command option	Description
`<service>`	The NetBackup Snapshot Manager service name. The command displays the logs of the specified service.
`- h | --help`	Displays the command syntax and a description of the available options.
`-n <N> | --limit <N>`	Displays the last "N" number of log messages. For example, to view the last 50 log messages, specify the following: `-n 50`
`-t | --tail`	Use this option to follow and monitor the log messages in real-time.
`-F <format> | --format <format>`	Displays the log messages in the specified output format. For example, `-F {container_name}: {log}`.
`-v | --verbose`	Displays the command output in a verbose mode.
`-j | --json`	Displays the logs in a JavaScript Object Notation (JSON) format.
`-d <days> | --days <days>`	Displays the logs for the last "DAYS" number of days. For example, to view the logs for the last seven days, specify the following: `-d 7`

Table 10-1 Flexsnap-log command options *(continued)*

Command option	Description
`-f <filename> | --file <filename>`	Dumps the logs to the file specified in `<filename>`.

You can view the NetBackup Snapshot Manager logs using any of the following commands on the NetBackup Snapshot Manager host:

- To obtain all the NetBackup Snapshot Manager service logs, run the following command:

  ```
  # sudo docker exec flexsnap-coordinator flexsnap-log
  ```

- To obtain logs of a specific NetBackup Snapshot Manager container service, run the following command:

  ```
  # sudo docker exec flexsnap-coordinator flexsnap-log
  <flexsnap-service name>
  ```

- To tail or follow log messages, run the following command:

  ```
  # sudo docker exec flexsnap-coordinator flexsnap-log -t
  ```

- To obtain the last "N" number of log messages, run the following command:

  ```
  # sudo docker exec flexsnap-coordinator flexsnap-log -n <N>
  ```

- You can also combine these options to achieve a specific output. For example, to obtain the last 10 log messages for the `flexsnap-agent` service, run the following command:

  ```
  # sudo docker exec flexsnap-coordinator flexsnap-log -n 10
  flexsnap-agent
  ```

  The command output displays messages similar to the following:

```
flexsnap-agent: flexsnap-agent-offhost[1] flexsnap.updates: INFO - find_files:netapp.zip
flexsnap-agent: flexsnap-agent-offhost[1] flexsnap.updates: INFO - find_files:nutanix.zip
flexsnap-agent: flexsnap-agent-offhost[1] flexsnap.updates: INFO - find_files:oracle.zip
flexsnap-agent: flexsnap-agent-offhost[1] flexsnap.updates: INFO - find_files:purestg.zip
flexsnap-agent: flexsnap-agent-offhost[1] flexsnap.updates: INFO - find_files:windows.zip
flexsnap-agent: flexsnap-agent-offhost[1] INFO - Beginning registration with coordinator
flexsnap-agent: flexsnap-agent-offhost[1] INFO - loaded plugin, sending configId status: {}
flexsnap-agent: flexsnap-agent-offhost[1] INFO - Sending list of sources
flexsnap-agent: flexsnap-agent-offhost[1] INFO  Registration complete
```

The most recent NetBackup Snapshot Manager logs are also available in the `flexsnap-fluentd` container logs. You can use standard Docker commands to obtain the logs.

Run the following command:

```
# sudo docker logs flexsnap-fluentd | grep flexsnap-agent | head -10
```

The command output displays messages similar to the following:

```
flexsnap-agent: {"container_name":"flexsnap-agent","source":"stdout","log":
"Mar 04 09:10:20 f5d1ae1c4808 flexsnap-agent-offhost[1] MainThread agent:
INFO - Not generating certificate. Join token not passed for role agent"}

flexsnap-agent: {"container_name":"flexsnap-agent","source":"stdout","log":
"Mar 04 09:10:20 f5d1ae1c4808 flexsnap-agent-offhost[1] MainThread
flexsnap.ca: INFO - Loading /opt/VRTScloudpoint/keys/agent.6c5c9.cert.pem
/opt/VRTScloudpoint/keys/cacert.pem"}

flexsnap-agent: {"container_name":"flexsnap-agent","source":"stdout","log":
"Mar 04 09:10:20 f5d1ae1c4808 flexsnap-agent-offhost[1] MainThread
flexsnap.connectors.rabbitmq: INFO - Starting service"}
```

To view the flexsnap-fluentd container logs in real time, run the following command:

```
# sudo docker logs flexsnap-fluentd -f | grep <flexsnap-service-name>
```

Fluentd-based logging requirements and considerations

- If you are attempting a real-time analysis of the logs, then you might see a noticeable delay when using the NetBackup Snapshot Manager plug-in for the MongoDB collection. This happens because the plug-in performs a periodic data flush in to the MongoDB database. The default flush rate is set to 10 seconds and is defined in the `/cloudpoint/fluent/fluent.conf` configuration file on the NetBackup Snapshot Manager host.

  Note: This is applicable only if the NetBackup Snapshot Manager plug-in for MongoDB is enabled.

- An alternative approach is to use the `STDOUT` plug-in for such requirements. The logs appear as the logs of the `flexsnap-fluentd` container and can be obtained using Docker commands.

NetBackup Snapshot Manager logs

NetBackup Snapshot Manager maintains the following logs that you can use to monitor NetBackup Snapshot Manager activity and troubleshoot issues, if any. The logs are stored at `<install_path>/cloudpoint/logs` on the NetBackup Snapshot Manager host.

Table 10-2 NetBackup Snapshot Manager log files

Log	Description
`/cloudpoint/logs/flexsnap.log`	This log file contains all the product logs.
`/cloudpoint/logs/flexsnap-cloudpoint.log`	This log file contains all the NetBackup Snapshot Manager installation and configuration logs (flexsnap_configure).
`/cloudpoint/logs/flexsnap-ipv6config.log`	This log file contains all the IPv6 related logs.

Logs for backup from snapshot and restore from backup jobs.

Navigate to: `/cloudpoint/openv/dm/datamover.<id>`

Here, logs can be found in the following directories: `logs`, `opt` and the `netbackup`.

- `nbpxyhelper` and `nbsubscriber` logs can be found inside the `logs` directory
- `VRTSpbx` logs can be found inside the `opt` directory
- `bpbkar, bpcd, bpclntcmd, nbcert, vnetd, vxms` and all other services logs can be found inside `netbackup` directory

To increase logging verbosity, `bp.conf` and `nblog.conf` files can be updated on NetBackup Snapshot Manager at `/cloudpoint/openv/netbackup`. See *NetBackup Logging Reference Guide*

Changes to the `bp.conf` and `nblog.conf` files come to effect when the next backup from snapshot or restore job runs.

Log retention

The default configuration for datamover logs is as follows:

- Log retention maximum period is 30 days. Logs older than 30 days are deleted.
- The default configuration for high and low water marks for datamover logs is 70% and 30% of the size of "/cloudpoint" mount point. For example, if the usable size of the `/cloudpoint` folder is 30 GB, then the high water mark is 21 GB

(70%) and low water mark is 9GB (30%). In case, the logs directory (`/cloudpoint/openv/dm/`) size reaches to high water mark, older logs for which the datamover containers are cleaned up and no longer running are considered for deletion. The logs are deleted for such datamover containers until low water mark is reached or no logs are remaining for the datamover containers cleaned up or no longer running.

Modifying the default configuration:

You can modify the default configuration for log retention by adding such a section in the `flexsnap.conf` on the primary NetBackup Snapshot Manager. Open the `flexsnap.conf` file from the path `/cloudpoint/flexsnap.conf` and add the following section:

```
[datamover]
high_water_mark = 50
low_water_mark = 20
log_retention_in_days = 60
```

In case of NetBackup Snapshot Manager extensions, the configuration from the primary NetBackup Snapshot Manager are used. Once the configuration is changed in primary, the configuration is updated on each Snapshot Manager extension within one hour. It is not possible to have separate custom configurations for primary NetBackup Snapshot Manager or the NetBackup Snapshot Manager extensions and configurations should only be changed in the primary NetBackup Snapshot Manager. Though the configuration is same for primary NetBackup Snapshot Manager and NetBackup Snapshot Manager extensions, the high water mark and low water mark for log size are calculated based on the `/cloudpoint` directory mounted on each primary NetBackup Snapshot Manager or NetBackup Snapshot Manager extensions.

NetBackup Snapshot Manager extension logs

Each NetBackup Snapshot Manager extension maintains the logs under its own `/cloudpoint/logs` location.

- VM-based extension logs: Under the `/cloudpoint/logs` directory on extension VM.
- Managed Kubernetes cluster-based extension logs: Need to access and exec into the Kubernetes extension pods and look for `/cloudpoint/logs` directory which belongs to a file share.

Agentless and On-host agent logs

Agentless logs

Logs for agentless connection to cloud instance(s) are present on the cloud instance at following locations based on the platform:

- **Linux**: `/opt/VRTScloudpoint/.agent/`
- **Windows**: `C:\ProgramData\Veritas\CloudPoint\logs\`

On-host agent logs

Logs for on-host agent connection to cloud instance(s) are present on the cloud instance at following locations based on the platform:

- **Linux**: `/var/log/flexsnap/`
- **Windows**: `C:\ProgramData\Veritas\CloudPoint\logs\`

Chapter 11

Troubleshooting

This chapter includes the following topics:

Troubleshooting NetBackup Snapshot Manager for Data Center

Refer to the following troubleshooting scenarios:

- **Disaster recovery when DR package is lost or passphrase is lost.**
  This issue may occur if the DR package is lost or the passphrase is lost.
  In the case of Catalog backup, two backup packages are created:
  - DR package which contains all the certs.
  - Catalog package which contains the database.

  The DR package contains the NetBackup UUID cert and Catalog DB also has the UUID. When you perform disaster recovery using the DR package followed by catalog recovery, both the UUID cert and the UUID are restored. This allows NetBackup to communicate with NetBackup Snapshot Manager for Data Center since the UUID is not changed.

However if the DR package is lost or the Passphrase is lost the DR operation cannot be completed. You can only recover the catalog without the DR package after you reinstall NetBackup. In this case, a new UUID is created for NetBackup which is not recognized by NetBackup Snapshot Manager for Data Center. The one-to-one mapping of NetBackup and NetBackup Snapshot Manager for Data Center is lost.

Workaround:

To resolve this issue, you must update the new NetBackup UUID and version number after NetBackup primary is created.

- The NetBackup administrator must be logged on to the NetBackup web Management Service to perform this task. Use the following command to log on:

  ```
  /usr/openv/netbackup/bin/bpnbat -login -loginType WEB
  ```

- Run the following command on the primary server to get the NetBackup UUID:

  ```
  /usr/openv/netbackup/bin/admincmd/nbhostmgmt -list -host
  <primary server host name> | grep "Host ID"
  ```

- Run the following command to get the version number:

  ```
  /usr/openv/netbackup/bin/admincmd/bpgetconfig -g <primary Ssrver
  host name> -L
  ```

After you get the NetBackup UUID and Version number, run the following command on the NetBackup Snapshot Manager for Data Center host to update the mapping:

```
/cloudpoint/scripts/cp_update_nbuuid.sh -i <NBU UUID> -v <Version
Number>
```

- **When NetBackup Snapshot Manager for Data Center is deployed in private subnet (without internet) NetBackup Snapshot Manager for Data Center function fails**

  This issue occurs when NetBackup Snapshot Manager for Data Center is deployed in a private network where a firewall is enabled or public IP which is disabled. The customer's information security team would not allow full internet access to the virtual machine's.

  Workaround:

  Enable the ports from the firewall command line using the following commands:

  ```
  firewall-cmd --add-port=22/tcp
  firewall-cmd --add-port=5671/tcp
  firewall-cmd --add-port=443/tcp
  ```

- **After starting the start/stop services, NetBackup Snapshot Manager for Data Center, RabbitMQ and MongoDB containers are still in the starting state**

  It was observed that flexsnap-mongodb and flexsnap-rabbitmq containers did not go into a healthy state. Following is the state of the flexsnap-mongodb container:

```
[ec2-user@ip-172-31-23-60 log]$ sudo podman container inspect
--format='{{json .Config.Healthcheck}}'
flexsnap-mongodb {"Test":["CMD-SHELL","echo 'db.runCommand({ping:
 1}).ok'
| mongo --ssl --sslCAFile /cloudpoint/keys/cacert.pem
--sslPEMKeyFile /cloudpoint/keys/mongodb.pem
flexsnap-mongodb:27017/zenbrain --quiet"],
"Interval":60,"Timeout":30000000000,"Retries":3}
[ec2-user@ip-172-31-23-60 log]$ sudo podman container inspect
--format='
{{json .State.Healthcheck}}' flexsnap-mongodb
{"Status":"starting","FailingStreak":0,"Log":null}
[ec2-user@ip-172-31-23-60 log]$
```

  Workaround:

  Run the following #podman CLI(s) command:

```
[ec2-user@ip-172-31-23-60 log]$ sudo podman healthcheck run
flexsnap-mongodb

[ec2-user@ip-172-31-23-60 log]$ sudo podman ps -a

CONTAINER ID   IMAGE                          COMMAND
           CREATED      STATUS                  PORTS
               NAMES

fe8cf001032b  localhost/veritas/   flexsnap-fluentd:10.0.0.0.9817
         2 days ago    Up 45 hours ago
0.0.0.0:24224->24224/tcp        flexsnap-fluentd

2c00500c1ac6  localhost/veritas/   flexsnap-mongodb:10.0.0.0.9817
         2 days ago    Up 45 hours ago (healthy)
           flexsnap-mongodb

7ab3e248024a  localhost/veritas/   flexsnap-rabbitmq:10.0.0.0.9817
        2 days ago    Up 45 hours ago (starting)
          flexsnap-rabbitmq
```

```
[ec2-user@ip-172-31-23-60 log]$ sudo podman healthcheck run
flexsnap-rabbitmq

[ec2-user@ip-172-31-23-60 log]$ sudo podman ps -a

CONTAINER ID   IMAGE                          COMMAND
          CREATED       STATUS                        PORTS
                 NAMES

fe8cf001032b  localhost/veritas/    flexsnap-fluentd:10.0.0.0.9817
        2 days ago    Up 45 hours ago
0.0.0.0:24224->24224/tcp     flexsnap-fluentd

2c00500c1ac6  localhost/veritas/    flexsnap-mongodb:10.0.0.0.9817
        2 days ago    Up 45 hours ago (healthy)
           flexsnap-mongodb

7ab3e248024a  localhost/veritas/    flexsnap-rabbitmq:10.0.0.0.9817
       2 days ago    Up 45 hours ago (healthy)
          flexsnap-rabbitmq

 [ec2-user@ip-172-31-23-60 log]$ sudo podman container inspect
--format='{{json .State.Healthcheck}}' flexsnap-mongodb

{"Status":"healthy","FailingStreak":0,"Log":[{"Start":"2022-02-14T07:32:13.0515042Z","End":"2022-02-14T07:32:13.4456429Z","ExitCode":0,"Output":""}]}

[ec2-user@ip-172-31-23-60 log]$ sudo podman container inspect
--format='{{json .State.Healthcheck}}' flexsnap-rabbitmq

{"Status":"healthy","FailingStreak":0,"Log":[{"Start":"2022-02-14T07:32:46.5780402Z","End":"2022-02-14T07:32:47.2365742Z","ExitCode":0,"Output":""}]}

[ec2-user@ip-172-31-23-60 log]$
```

- **Certificate generation would fail while registering NetBackup Snapshot Manager for Data Center with NetBackup**

  Starting NetBackup Snapshot Manager for Data Center release 9.1.2, NetBackup generates the certificates synchronously with registration in the register API of NetBackup Snapshot Manager for Data Center. Hence, any failure in certificate generation causes failure while registering NetBackup Snapshot Manager for Data Center with NetBackup, that is adding or editing the NetBackup Snapshot Manager for Data Center entry from web UI. These certificates are used for datamover which is launched for operations like backup from snapshot, restore

from backup, indexing (VxMS based), and so on. Hence, if certificate generation fails, these jobs cannot be performed. Hence NetBackup Snapshot Manager for Data Center on cloud VMs cannot connect to NetBackup on lab VMs, hence the registration will fail, and hence NetBackup Snapshot Manager for Data Center cannot be added to NetBackup.

Workaround:

To add NetBackup Snapshot Manager for Data Center in such a scenario requires to skip certificate generation on NetBackup Snapshot Manager for Data Center by adding the following entry in the `/cloudpoint/flexsnap.conf` file:

```
[client_registration] skip_certificate_generation = yes
```

- **Plugin information is duplicated, if NetBackup Snapshot Manager for Data Center registration has failed in previous attempts**

  This occurs only when NetBackup Snapshot Manager for Data Center has been deployed using the MarketPlace Deployment Mechanism. This issue is observed when the plug-in information is added before the registration. This issue creates duplicate plug-in information in the **CloudPoint_plugin.conf** file.

  Workaround:

  Manually delete the duplicated plug-in information from the **CloudPoint_plugin.conf** file.

  For example, consider the following example where the duplicate entry for GCP plug-in config is visible (in bold) in the **CloudPoint_plugin.conf** file:

```
{
    "CPServer1": [
      {
        "Plugin_ID": "test",
        "Plugin_Type": "aws",
        "Config_ID": "aws.8dda1bf5-5ead-4d05-912a-71bdc13f55c4",
        "Plugin_Category": "Cloud",
        "Disabled": false
      }
    ]
  },
  {
    "CPServer2": [
      {
        "Plugin_ID": "gcp.2080179d-c149-498a-bf1f-4c9d9a76d4dd",
        "Plugin_Type": "gcp",
        "Config_ID": "gcp.2080179d-c149-498a-bf1f-4c9d9a76d4dd",
        "Plugin_Category": "Cloud",
        "Disabled": false
      },
```

```
      {
        "Plugin_ID": "gcp.2080179d-c149-498a-bf1f-4c9d9a76d4dd",
        "Plugin_Type": "gcp",
        "Config_ID": "gcp.2080179d-c149-498a-bf1f-4c9d9a76d4dd",
        "Plugin_Category": "Cloud",
        "Disabled": false
      }
    ]
  }
```

- **Plugin information is duplicated, if cloned NetBackup Snapshot Manager for Data Center is added into NetBackup**

  This occurs only when cloned NetBackup Snapshot Manager for Data Center is added into NetBackup during migration of NetBackup Snapshot Manager for Data Center to RHEL 8.6 VM. Cloning of NetBackup Snapshot Manager for Data Center uses existing NetBackup Snapshot Manager for Data Center volume to create new NetBackup Snapshot Manager for Data Center. This creates a duplicate entry into the **CloudPoint_plugin.conf** file.

  Workaround:

  Manually edit and delete the duplicated plug-in information from the **CloudPoint_plugin.conf** file.

  For example, consider the following example where the duplicate entry for Azure plug-in config is visible (in bold) in the **CloudPoint_plugin.conf** file:

```
{
    "CPServer1": [
      {
        "Plugin_ID": "config10",
        "Plugin_Type": "azure",
       "Config_ID": "azure.327ec7fc-7a2d-4e94-90a4-02769a2ba521",

        "Plugin_Category": "Cloud",
        "Disabled": false
      }
    ]
  },
  {
    "CPServer2": [
      {
       "Plugin_ID": "azure.327ec7fc-7a2d-4e94-90a4-02769a2ba521",

        "Plugin_Type": "azure",
```

```
        "Config_ID": "azure.327ec7fc-7a2d-4e94-90a4-02769a2ba521",

        "Plugin_Category": "Cloud",
        "Disabled": false
      },
       {
    "cpserver101.yogesh.joshi2-dns-zone": [
      {
       "Plugin_ID": "azure.327ec7fc-7a2d-4e94-90a4-02769a2ba521",

        "Plugin_Type": "azure",
       "Config_ID": "azure.327ec7fc-7a2d-4e94-90a4-02769a2ba521",

        "Plugin_Category": "Cloud",
        "Disabled": false
      },
      {
        "Plugin_ID": "AZURE_PLUGIN",
        "Plugin_Type": "azure",
       "Config_ID": "azure.4400a00a-8d2b-4985-854a-74f48cd4567e",

        "Plugin_Category": "Cloud",
        "Disabled": false
      }
    ]
  }
 ]
}
```


Backup from snapshot job fails with time out error

Due to reduced availability of resources on NetBackup Snapshot Manager for Data Center server, backup from snapshot job fails as the jobs are in continuous search of memory. Some other services may also fail with the time-out error. This issue may be due to multiple backup jobs running together beyond the capacity of the host.

Workaround:

To resolve this issue, manually configure the host as follows using the `/cloudpoint/flexsnap.conf` to set the maximum backup jobs that can run on the host at a time:

```
[capability_limit]
max_jobs = <num>
```

Where, <num> is the maximum number of backup jobs that can run at a time.

In the case of multiple backups from snapshot jobs running in parallel, if any service fails due to non-availability of resources, then reduce the number of parallel backups from snapshot jobs that can be performed on the provided node type.

(SELinux) Storage array plug-in configuration failure for custom port

Explanation:

NetBackup version 10.4 and later support SELinux on NetBackup Snapshot Manager for Data Center hosts to communicate between the Snapshot Manager for Data Center and the storage arrays.

For successful plug-in configuration, the port used for REST API communication in the plug-in configuration must have an entry in the CIL.

For Custom port configuration, add the Port entry in the CIL before the Storage array plug-in configuration.

Workaround:

1. To confirm if there any custom ports to be allowed, run:

   ```
   ausearch --start today -m avc -se VRTSflexsnap.process |
   audit2allow
   ```

   Error log:

   ```
   #============= VRTSflexsnap.process ==============
   allow VRTSflexsnap.process reserved_port_t:tcp_socket
   name_connect;
   ```

2. Run the command:

   ```
   # flexsnap_configure updatecil -i
   ```

   You can see the following output:

   ```
   Following SElinux updates detected for Snapshot Manager.
       allow VRTSflexsnap.process reserved_port_t:tcp_socket
   name_connect;
   ```

```
Do you want to update Snapshot Manager's SELinux policy? (y/n):
y
Updating runtime SELinux policy ...done
```

3. To confirm if all the port denials are allowed, run:

   ```
   flexsnap_configure updatecil
   ```

   Permission denials are covered by the runtime policy
4. For changes to take effect, run:

   ```
   flexsnap_configure restart
   ```

Execution fails for the flexsnap_preinstall.sh command.

Explanation:

Can be because of any of the two reasons:

- Any of the required packages are not installed.
- Any of the required services are not running.

Workaround:

- For a list of the required packages: See " Meeting system requirements" on page 24.
- For a list of the required services: See "Installing container platform (Docker, Podman)" on page 29.

For NetApp SAN volumes, failure to create snapshot of a volume

For NetApp SAN volumes, if autodelete snapshot policy trigger is set to "snap_reserve", then snapshot creation will fail with the following error:

"flexsnap.OperationFailed: Failed to create snapshot of volume <VolumeName>.Error: Autodelete snapshot policy is enabled for volume, auto_delete trigger is set to snap_reserve"

To ensure autodelete snapshot policy trigger is set "snap_reserve" the following command can be used on NetApp array.

1. volume snapshot autodelete show -vserver <SvmName> -volume <VolumeName>

To avoid this failure, update the volume snapshot auto delete trigger to “volume” from “snap_reserve”.

2. volume snapshot autodelete modify -vserver <SvmName> -volume <VolumeName> -trigger volume

D-NAS backup fails with the error: The file system crawler process timed-out waiting for streams to attach with shared memory. (3003)

Explanation:

The job fails after 20 minutes of waiting for the resources to be allocated, as the crawler is configured to time-out after 1200 seconds.

Workaround:

To resolve the issue, increase the Maximum concurrent jobs for the storage unit.

1 On the left, click **Storage units**, under **Storage**.

2 Click the storage unit that you want to edit.

3 Under **Basic properties**, click **Edit**. Enter a new value for the **Maximum concurrent jobs** parameter.

Isilon backup from snapshot failed with the Snapshot cannot be mounted error.

Explanation:

The required privileges are not assigned to the domain user for the SMB share backup.

Workaround:

To add privileges to the user:

1 Log on to the Windows host.

2 To open the local security policy settings, click Start, and enter: `secpol.msc`.

3 Add the service account (domain\username) to the following:

- Act as part of the operating system
- Adjust memory quotas for a process
- Replace a process level token

4. Add the service account (domain\username) to the local administrators group.
5. Restart the NetBackup Legacy Network Service.