Integrating NetBackup 8.0.x with SwiftStack Object Storage
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Introduction

For storage administrators looking for a more cost-efficient, reliable, scalable, and easier to use solutions for backup and recovery, object storage is an excellent destination target. Traditionally, backup applications needed disk storage to emulate tape or be locally mounted to the media server. Veritas NetBackup version 8.0.1 or later can now natively utilize object storage using cloud storage APIs (Swift and S3). This type of storage offers several unique advantages for as a backup target:

- Nearly unlimited scalability of capacity without reducing performance. No more running into hard capacity limitations of a storage silo, forcing you to recycle your backup data and/or manage it across many namespaces.
- Automatic disaster recovery protection by replicating data offsite. Cluster nodes can exist in multiple physical locations, so you do not need to worry about hauling tape media to the mountain anymore.
- Cost-efficient hardware infrastructure based on standard servers, Ethernet-based networking, and affordable disk drives rather than on more expensive proprietary solutions. That’s the advantage of software-defined storage.

This how-to guide will walk you through the specific steps you need to take to optimally configure Veritas NetBackup to utilize a SwiftStack object storage for nearline backup. If you have questions when designing, testing, or deploying SwiftStack with NetBackup, please feel free to contact us, as we are here to help.
Architecture

Architecting a SwiftStack storage cloud is easy and reference hardware examples are available. In this case, SwiftStack will be used as a direct target for NetBackup Media servers. SwiftStack storage can be deployed alongside your existing backup targets or replace existing targets such as NAS, DAS, PBBAs, or even tape.

SwiftStack clusters start with a minimum of three nodes to ensure data availability and durability. Your overall performance can also improve, as all nodes in the cluster can be directly addressed for both backups and restores. SwiftStack is a scale out storage system and all nodes share a common namespace. Having a common namespace eliminates the need for silos that comes with direct attached storage, SANs, or file servers that don’t scale. Each node in a SwiftStack cluster is active and performance scales linearly as more storage servers are added.

While not addressed in this guide, SwiftStack clusters also have the ability to span multiple sites or regions. Unlike typical storage systems, nodes at other sites are active, share the same namespace, and handle cross site replication of data automatically. This makes SwiftStack unlike any other solution on the market with it’s ability to scale out without boundaries and automatically protect your vital business data from a major disaster.
Replicas
With less than 5 nodes, SwiftStack data will always be protected using replication. Replication happens automatically. Using replicas with the 3 node solution referenced above will allow SwiftStack survive the loss of an entire node or multiple drive failures.

A replica policy means that every piece of data given to the object storage is copied multiple times and distributed across many nodes. While replicas increases the amount of raw storage a cluster must have, it has a number of important benefits.

1. Increased availability of data even if network split brain
2. Fastest read / write performance
3. Geographic distribution of data with highly latent networking
4. Lowest time to first byte

Erasure Coding
As an alternative to having full replicas of each object, erasure coding is another data protection method that is more space efficient. While similar to RAID, erasure coding protects at an object level, where RAID protects a collections of drives, whereas the loss of more than one drive can result in a complete loss of the collections or RAID group.

Erasure coding is a feature included with SwiftStack, but not necessarily a good selection for NetBackup. Erasure coding requires a minimum of 5 nodes to be enabled so it is more suited for large installations of over 1PB of data. In addition Erasure coded data can not be replicated between multiple regions/sites if that is required. Lastly, Erasure coding incurs a performance penalty when used with NetBackup's 1MB objects, cutting performance in half.
Multiple Regions

Regions are geographically distant areas connected by networking. Replicating data across multiple regions is the ultimate solution in disaster recovery. SwiftStack is able to scale out, storing copies of data in all regions or just selected regions. Data placement within regions is controlled by storage policies and replication happens automatically without the need for schedules, snapshots or other complexity. Storage policies are defined by the storage administrator, but selectable by users and applications on a per container basis.

All regions are active, able to distribute data and consume data with no region needing to be read only. The same namespace is common to all regions. This allows media servers in all regions to perform backups and restores locally, thus reducing complexity. A backup done in region 1 can be restored in region 2 by a different media server. This media server will address the local SwiftStack storage and the restore will proceed. If all of the data has not replicated over the wire, the local region will pull the data as needed.

Account / Container Services

Account / Container Services in SwiftStack provide listing information for containers (also known as containers). Each container has its own database to keep track of object listings. Container performance drops as large numbers of objects are stored in a single container. For this reason SwiftStack recommends assigning backup policies to Storage Unit Groups or to separate Storage Units if use of Accelerator is required.

Account / Container Services should always be assigned to SSDs and not to HDDs for optimal performance.

Storage Unit Sizing

As noted in the previous header the amount of data stored in a Storage Unit should be limited to ensure Container performance. The recommended amount of data to be stored per Storage Unit is 50TB or less. The number of objects in a Container running on SSD will still be quite performant at 50TB.

Calculating number of objects in a storage unit

Since NetBackup objects are 1MB in size, 50TB of data equates to just over 50 million objects. As noted in Account / Container Services, performance drops with the increase in number of objects in a
container. With 50 million objects in a container, that container has been tested to ingest data at 200MB/sec.

**Certification**

SwiftStack Object Storage is tested and certified by Veritas for NetBackup versions 7.7.1 and above and is integrated into NetBackup 8.0. The official Hardware Compatibility Lists (HCL) for NetBackup can be found at the following link:


### SwiftStack - Support with Windows / Linux

<table>
<thead>
<tr>
<th>Cloud Storage Solution</th>
<th>NetBackup Version Containing Plug-in or Vendor-Supplied Plug-in Version</th>
<th>Supported OpenStorage Functionality</th>
<th>Windows Server 2008 x64</th>
<th>Windows Server 2012 x64</th>
<th>Red Hat Enterprise Linux on x86-64</th>
<th>SUSE Linux Enterprise Server on x86-64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Storage [1][2][3]</td>
<td>NetBackup 7.7.1 and later</td>
<td>Accelerator, Accel_VMware, KMS, Opt_Synth</td>
<td>Enterprise Edition</td>
<td>Datacenter</td>
<td>6, 7</td>
<td>11, 12</td>
</tr>
</tbody>
</table>

1. Creating a disk volume via the NetBackup Admin Console or CLI is not supported with this solution. Create the bucket outside of NetBackup using the cloud provider's interface.
2. Requires Cloud Configuration Package version 2.1.2 or later.
3. This is an S3 API-compatible solution.

### SwiftStack - Support with UNIX

<table>
<thead>
<tr>
<th>Cloud Storage Solution</th>
<th>NetBackup Version Containing Plug-in or Vendor-Supplied Plug-in Version</th>
<th>Supported OpenStorage Functionality</th>
<th>AIX on POWER</th>
<th>HP-UX on IA64</th>
<th>Solaris on SPARC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Storage [1][2][3]</td>
<td>NetBackup 7.7.1 and later</td>
<td>Accelerator, Accel_VMware, KMS, Opt_Synth</td>
<td>6.1, 7.1</td>
<td>11.31</td>
<td>10, 11</td>
</tr>
</tbody>
</table>

1. Creating a disk volume via the NetBackup Admin Console or CLI is not supported with this solution. Create the bucket outside of NetBackup using the cloud provider's interface.
2. Requires Cloud Configuration Package version 2.1.2 or later.
3. This is an S3 API-compatible solution.
Configuring Storage Units

NetBackup stores data in storage units which can be created in the three step process described below.

Cloud Storage Wizard

Netbackup has a wizard that will lead the administrator through the same three steps as defined below. This can be used to setup the first Storage Unit, but subsequent Storage Units show be added by defining additional Disk Pools.

Defining Storage Server Credentials

In order to start using SwiftStack Object Storage, the credentials for the user account to be used to store data must be defined. Multiple accounts can be added to NetBackup if needed.

1. Expand Media and Device Management.
   Expand Credentials.
   Right click on Storage Servers.
   Click on New Cloud Storage Server.
2. Click **Next** on the first screen.  
   On the “Add Storage Server” screen either find **SwiftStack** at the bottom of the list or type **SwiftStack** into the search field. New to NetBackup 8.0 there is a native SwiftStack (Swift) as well as SwiftStack (S3) options. Under normal circumstances, “SwiftStack (Swift)” should be the default option.
   
   a. SwiftStack options in NetBackup 8.x (Swift option preferred).

<table>
<thead>
<tr>
<th>Cloud storage providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>SwiftStack</td>
</tr>
<tr>
<td><strong>SwiftStack (S3)</strong></td>
</tr>
<tr>
<td>SwiftStack Object Storage</td>
</tr>
<tr>
<td><strong>SwiftStack (Swift)</strong></td>
</tr>
<tr>
<td>SwiftStack Swift Object Storage</td>
</tr>
</tbody>
</table>

3. If this is the first time adding SwiftStack Storage the Service host selection will be empty. Click **Add Cloud Storage** to add your SwiftStack cluster.
4. **SwiftStack (Swift) option:**
   Give a unique, identifiable name for **Cloud storage name**.
   Set **Authentication version** to V1.
   Input **Authentication URL**.

![Add Cloud Storage](image-url)
5. Setup Cloud Storage for NetBackup 8.x.
   a. After adding/selecting the **Cloud storage name**, the account username and password must be entered.

   **Username** is the SwiftStack account name which can be found by logging into the SwiftStack controller and clicking on User & Accounts.

   The **password** is the password that was entered for the SwiftStack account.

   Note: Multiple SwiftStack accounts can be used by rerunning this process, selecting the Cloud Storage name, entering a new Storage Server Name, username, and password.
b. Once all settings are complete click **Next** to input a **Storage server name** for this configuration.

Add Storage Server

Select the storage region and verify the storage URL to be used to create a cloud storage server. Specify a storage server name and select a media server to proceed.

To be listed below in the media server drop-down list a security certificate must be deployed and NetBackup must be running including the NetBackup CloudStore Service Container (nbcssc).

<table>
<thead>
<tr>
<th>Storage server name:</th>
<th>SAC-SS-NB8-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media server name:</td>
<td>sac-win2k12-net</td>
</tr>
</tbody>
</table>

c. Once all settings are complete click **Next** to move to the Compression/Encryption selection screen. Compression is optional to save storage space. Setup of NetBackup Encryption is beyond the scope of this manual, however, NetBackup AES-256 encryption is done server side and supported by SwiftStack.

Add Storage Server

Specify compression and encryption settings

**Compression**

- [ ] Compress data before writing to cloud storage

**Encryption**

- [ ] Encrypt data using AES-256 before writing to cloud storage

d. Select Next, and review settings displayed. If satisfied with options, select Next to complete the process. If all goes well, the following screen will appear similar to the following indicating success:

**Storage Server Creation Status**

Monitor storage server creation

Monitor the status of the tasks in the storage server creation process.

<table>
<thead>
<tr>
<th>Status</th>
<th>Performing tasks...</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>Creating storage server SAC-SS-NB8-2</td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>Adding credentials for server sac-win2k12-net</td>
<td></td>
</tr>
</tbody>
</table>
Creating Disk Pools

Disk Pools map NetBackup storage to a container in SwiftStack. If a storage policy other than the system default is desired, the NetBackup administrator should precreate said containers. A disk pool can then be mapped to an existing container, and the storage policy in SwiftStack governing data replication, erasure coding, disk tier or geolocation will be obeyed.

1. Expand **Media and Device Management**.
   Expand **Devices**.
   Right click **Disk Pools**.
   Click on **New Disk Pool**.

2. Select Cloud Storage (swiftstack_raw).
   Click **Next** button.
3. If multiple SwiftStack clusters or Accounts have been defined select the desired Storage Server.

4. If the container for backups has been pre-configured skip to step 6. Otherwise, click Add New Volume to create a container.
   Note: If a pre-created container is not listed ensure it follows NetBackup naming conventions.
5. In this step one or more containers can be created. Input a container name ensuring it meets with the NetBackup naming convention. Click **Add** until all container are listed in the Cloud Volume Name listing. Then click **Create**.
6. Select only one container. Containers can not be aggravated at the Disk Pool level. And do not use a single container for multiple Disk Pools or Storage Units. Click Next to continue.

7. Enter a **Disk Pool name**. The high and low watermarks do not matter as each Disk Pool is listed at 8 Petabytes of available storage. Click Next to continue.
8. NetBackup will now create the Disk Pool. Once completed the option to continue on to creating a storage unit for this disk pool is presented. It is recommended to continue on to this step.
Creating a Storage Unit from Disk Pool Wizard

Continuing from the Disk Pool Wizard, the creation of a storage unit is straightforward and simple. The screens vary slightly from the manual process. If the manual process is desired, please continue with the next section - Creating a Storage Unit.

1. Continuing from the Disk Pool Wizard, a **Storage unit name** is automatically populated. This can be altered as desired, however the default is to append “-stu” to the Disk Pool Name. Media servers allowed to use this disk pool can be chosen. **Maximum concurrent jobs** is defaulted to 1. Object Storage handles hundreds of connections easily. This number should be increased to support a number of simultaneous backup streams. Starting with **100** will allow proper testing. **Maximum fragment size** has no affect on object storage and should be ignored. Clicking **Next** will complete the wizard.
Creating a Storage Unit

A Storage Unit is the base unit for which backups are targeted. While it is possible to point multiple storage units to the same cloud disk pool, this is not recommended. A storage unit should be mapped to a disk pool on a one to one basis.

1. Expand NetBackup Management.
   Expand Storage.
   Right click Storage Unit.
   Click New Storage Unit.
2. Enter a **Storage Unit Name**.
   Select **Disk Type** of **Cloud Storage (swiftstack_raw)**.
   Select the **Disk Pool** to be used.
   Increase **Maximum concurrent jobs**, start with **10**, max at **100**.
   **Maximum fragment size** has no affect on object storage and should be ignored.
   Click **OK** to finish.
Creating Storage Unit Groups

Creating Storage Unit Groups allows for the pooling of Storage Units into a single larger structure. While a Storage Unit list in NetBackup as having 8 petabytes of storage space in actuality the amount of data that should be stored in a single storage unit is much smaller. Please see Storage Unit Sizing under Architecture for further details.

While grouping Storage Units increases the amount of storage available to a backup policy the trade-off is that NetBackup Accelerator is not compatible with Storage Unit Groups configured in a round robin fashion. If Accelerator is to be used those policies must be connected to an ungrouped storage unit. For more on Accelerator please see Accelerator under Architecture.

1. Expand NetBackup Management.
   Expand Storage.
   Right click Storage Unit Groups.
   Click New Storage Unit Group...
2. Enter a **Storage unit group name**. 
   Add multiple Storage Units to comprise the group. 
   Select **Round Robin** so that the storage units are filled evenly. 
   Note: Prioritized & Failover make little sense for use with a SwiftStack cluster. 
   Click **OK** to complete group creation.

![New Storage Unit Group](image)
Tuning

Performance of backups is governed by the speed of the object storage system, the number and capability of media servers, network speed, and a number of other factors. Following best practices for NetBackup and SwiftStack will optimize performance.

Backup Concurrency

Object Storage excels with an increase of simultaneous backup streams. Where traditional filers drop dramatically in performance with each connection, object storage can scale linearly with proper equipment and load balancing (which is integrated into SwiftStack).

A single backup job may proceed at 20MB/s, since NetBackup uses only a single connection per backup job. A second backup job will also progress at 20MB/s, but the aggregate for the two jobs is 40MB/s. In order to achieve minimal backup windows, many jobs should run concurrently. Fifty simultaneous jobs on a single media server can max a 10Gb network link. Just be sure to back off if primary storage is affecting application performance during backups.

In order to allow a media server to run more than one concurrent jobs, please make the configuration changes in the next section.

Media Servers

In order for media servers to support multiple backup streams the following changes must be configured. Otherwise media servers will restrict throughput to a single backup by default.

The following must be completed for each media server that intends to backup to a cloud storage unit.

1. Expand **NetBackup Management**.
   Expand **Host Properties**.
   Expand **Media Servers**.
   Right click on the desired Media Server.
   Select **Properties**.
2. Select **Scalable Storage** from the left panel.
   Increase the **Total available bandwidth** to the full network bandwidth of the media server. In our case with 10Gb networking, the value was adjusted from 102400 (default) to 10240000.
   Increase the **Maximum concurrent jobs** from 1 to 10, the max should be 100. This will allow the media server to take full advantage of the concurrency of object storage. Tune this setting as needed to meet the ability of the media server to handle client backup streams.
   Click **OK** when finished.

![Scalable Storage settings](image)

**Master Servers**

In order for media servers to support multiple backup streams from within a job the following changes must be configure. This will allow an agent to backup multiple drives within a target machine at the same time. Reducing the time per agent and improving throughput.
1. Expand **NetBackup Management**.
   Expand **Host Properties**.
   Click on **Master Server**.
   Right click the master server, choose **Properties**.
2. Select **Global Attributes** from the left panel.
   Increase **Maximum jobs per client**. Start with 5 and increase up to a max of 10.
Migrating from existing storage pools to SwiftStack

Migrating data from existing existing Storage Units to new Cloud based Storage Units is a simple process. This can be useful in a number of scenarios:

- Aging data from expensive disk pools to economical Cloud Storage
- Duplicating data from Cloud Storage to Tape for DR compliance
- Restoring data from Offsite tape to Cloud Storage

All of the above scenarios will follow the same process outlined below:

Duplicating Backups

The following assumes that the backup is currently loaded into the NetBackup Catalog. If this is not the case please follow the article below to import an expired backup back into the catalog

Import Expired Media to Catalog
1. Expand **NetBackup Management**.
   Click on **Catalog**.

![NetBackup Management tree view](image)

2. Select **Action** "Duplicate".
   Select the current location of the backups under **Media**.
   Select the **Date Range**.
   Select **Search Now**.
   Results will populate below.

![Backup search results](image)

3. Highlight the desired backups to duplicate.
   Right click and select **Duplicate**.
4. If only one copy of the data is desired, leave **Copies** at 1. Check the checkbox of **Copy 1** if it is to be made the new primary copy. Choose the cloud **Storage unit** to store the backup in. If desired, change the **Retention** time. **Preserve multiplexing** is not required. It is for tape to tape transfers.

5. Confirm your request to proceed. Click **OK**.
6. The job can be monitored in the Results Tab or the Activity Monitor.

7. Once the job is complete, the original backup can age out according to the original retention policy or can be expired immediately. To expire immediately:
   Select the backups to **Expire...**
   Right Click the backups.
   Click on **Expire**.
   Select **Yes** on the next screen.
Increasing Duplicate Job Size

By default NetBackup limits the size of a duplication job to 100GB. This may be too small for most duplication jobs involving LTO tape. To change this valve perform the following:

1. Expand **NetBackup Management**.
2. Expand **Host Properties**.
3. Click on **Master Servers**.
4. Right Click the master server, choose **Properties**.

![NetBackup Management Tree and Properties Window](image)
2. In the left panel select **SLP Parameters**. Change the **Maximum size per duplication job** from 100GB to the required value for the environment.