

Virtual Storage Scale Out (VSSO) Management with Ops Center

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Virtual Storage Scale Out (VSSO) is, at its core, clustering pools of resources to enable customers' growth without introducing complexity.

VSSO is a loosely coupled cluster storage system that can be seamlessly managed and monitored by the Ops Center Products.

- VSSO Management - Ops Center Administrator can be used to create and manage a VSSO cluster.
- VSSO Performance Monitoring - Ops Center Analyzer can be used to monitor components of VSSO.
- VSSO Workload Migration - Ops Center Automator supports VSSO such as GAD-based non-disruptive migration.
- VSSO Data Protection - Ops Center Protector provides enterprise-level data protection in a VSSO environment.

In this document, we explore the features of the products for a unified VSSO management.

Ops Center Administrator - VSSO Management Capabilities

Ops Center **Administrator** is well equipped with the following functionalities to manage VSSO and underlying VSMs effectively.

- **View**

existing virtual storage machines created in the VSSO.

- **Create**

virtual storage machines, which will be a part of the VSSO cluster.

- **Move**

defined volumes to a virtual storage machine that can be used for a VSSO cluster.

- **Add**

- undefined volumes to a virtual storage machine to be used for VSSO.
- resources to a virtual storage machine required for setting up VSSO.
- undefined host groups to a virtual storage machine that can be used for VSSO.
- storage systems to a virtual storage machine that can be used by the VSSO cluster.

- **Manage and view**

underlying physical storage system details used for VSSO.

- **Remove**

- storage systems from a virtual machine that are a part of VSSO.
- defined volumes from a virtual storage machine used in the VSSO cluster.
- undefined volumes from a virtual storage machine used for a VSSO cluster.
- undefined resources from a virtual storage machine used for a VSSO cluster.
- host groups from a virtual storage machine used for the VSSO.

Ops Center Analyzer - VSSO Monitoring Capabilities

Ops Center Analyzer helps you retrieve VSSO related information in a report format. VSSO, Non-Disruptive Migration (NDM), and Global-active device (GAD) are all consumers of virtual storage machines (VSMs). Analyzer has reports related to these VSM uses that are beneficial to VSSO users.

The following lists the built-in functionalities for VSM in Analyzer, which enables you to monitor the VSSO cluster.

- **Search volumes** related to NDM by VSM information from 'Analytics Tab'.
 - You can search volumes by targeting both the "Volume Name" and "Virtual Volume Name" as a keyword in the 'Analytics Users Tab'.
- **End-to-End (E2E) view** reflects both the source and target volume for NDM.
 - The details of the source volume and target volume are mentioned. Additionally, a "tooltip" text appears on the Target Volume to show the details.
 - The performance trend of the source and target volumes can be compared from a sparkline view.
- From the Dashboard, you can **detect GAD volume performance**.
 - In the E2E view, both GAD pair volumes are reflected, and if one gets selected, the other is automatically highlighted.
 - The GAD volume is marked with a 'C' icon to show copy pair information in the E2E view.
 - The volume used for GAD in the VSSO cluster is listed in the Analyzer detail view server along with the details.
- **VSM information** of the selected volume is shown as "VSM Information."
- **Pair information** in the E2E view shows the physical and virtual information of the GAD pair volume related to the selected volume.
- **The Volume list** in the Search tab shows the "Copy Type," "Virtual Volume Name," and "Virtual Storage System".
 - In addition, you can search volumes by using the keywords "Virtual Volume Name" and "Virtual Storage System".
 - "Copy Type" information specifies whether the volume is GAD or not.

Ops Center Automator – Support for VSSO Migration

You can use the Automator services listed for GAD/NDM based migrations in VSSO.

- **Global-Active Device service template:**

This service template enables you to automate portions of the GAD setup process. This service creates virtual storage machines, assigns Quorum Disk IDs, creates remote paths, and allocates command devices to create global-active devices.

- **Online migration with Configuration Manager service template:**

The Online Migration with Configuration Manager service template enables you to migrate a host in an online state using Configuration Manager, access the switch management server to obtain existing fabric configuration and zoning information when allocating new volumes to the host, and update the zoning information.

- **Migrate Data for Online Migration Pair service template:**

This service runs from the swap of copy pairs to the deletion of source volumes for online host migration through Configuration Manager. You can run this service after the 'Online migration with Configuration Manager service'.

****Note** - Data mobility service templates were not tested in lab environment; however, you have the flexibility to use them if it suits the requirements.

Ops Center Protector – Data Protection in VSSO

Ops Centre Protector is a key component for protecting data in a VSSO cluster by implementing various replication technologies such as HUR, GAD, and Thin Image.

The following lists the important functionalities in Protector related to VSSO:

- **Configure Virtual LDEV Range** for each VSM in the VSSO cluster during the creation of the Hitachi block device for replication (excluding GAD) and snapshots.
- **'Configure Resource Group'** feature specifies the resource group to be used for secondary volumes (S-VOLs), in order to support snapshots and replication from VSM volumes in the VSSO cluster.
- **'Automated Resource Group Selection'** feature automatically allows Protector to select a resource group.
- You can **see replicated pair information** for all types of replication (GAD/HUR/TI) in VSSO through Protector.
- Through Ops Centre Protector, we can **Pause or Resume replicated pair** for VSM in a VSSO.

The following are the considerations for using Administrator for VSSO (VSM) applications:

- You must be aware that physical resources such as ports and parity groups are managed in the meta resource group and only the virtual resources such as Host groups and LDEVs can be added to VSM for a VSSO through Administrator.
- The list of attributes associated with the resource group is not available in the Administrator UI. Therefore, those attributes are not visible in the VSSO either.
- Resource Group details (Parity Groups, DP Pools, LDEV IDs, Storage Port, and Host Group or iSCSI target numbers) cannot be found from the Administrator UI; therefore, they cannot be managed from the VSSO.

The following are the considerations for using Analyzer for VSSO applications:

- An overview of all the VSSO containing the VSMs (and Resource Groups) is unavailable in Analyzer. Whereas in Storage Navigator, all Resource Groups are listed, and a summary is given alongside underlying resources in each resource group.
- The ability to drill down into each component resource group residing in a VSSO cluster (such as Parity Group, Port, or LDEV) exists in Storage Navigator (or Command suite). This feature is missing in Analyzer.

There is a single consideration in Protector with respect to VSSO:

The underlying VSM or Resource Group associated with a paired volume [P-VOL / S-VOL] is not visible in Protector. This is inconvenient for the end-user as they must use other tools such as Administrator to identify the relationship between a paired volume and the corresponding VSM (or Resource group).

Learnings in a Lab Environment - Deployment

The following VSSO cluster was deployed in a lab environment:

<https://www.hitachivantara.com/en-us/video/introduction-virtual-storage-scale-out.html>

Learnings from the lab environment are as follows:

- Ops Center Administrator helps you create a VSSO cluster with multiple storages by creating a VSM. It helps you name your VSM as per your requirement. In our lab, the naming convention was “11111-VSP”.
- You can define the volumes and volume range [Hex format] to be used in your VSM.
- Apart from defining the volumes, you can also determine the number of host groups used in the VSM for a particular port.
- Ops Center Administrator can also be used for scaling up the VSSO cluster by adding more resources (storage nodes, LDEVs, and host groups) to accommodate any future growth in the customer environment.

Learnings in a Lab Environment - Workload Migration

Workload migration in VSSO through Ops Center was carried out in a lab environment:

<https://www.hitachivantara.com/en-us/video/workload-management-with-virtual-storage-scale-out-using-hitachi-ops-center.html>

Learnings from the lab environment are as follows:

- Ops Center Analyzer plays a vital role in deciding the node utilization. As shown in the video, to provision a new application, the user checks the utilization reports to decide on the least used storage system.
 - When adding additional volumes to an application, best practice is to use the same node as the existing storage, so Analyzer is only used for *new* applications or when migrating.
- Ops Center Analyzer assists you in reports related to performance and capacity metrics. Accordingly, you can decide when to Scale up or Scale out the existing VSSO cluster using Ops Center Administrator.
- Upon adding the third storage system in the VSSO cluster, you can migrate the volumes to the new storage system to reduce the workload using Hitachi's proven migration technology (Non-Destructive migration/Global-active device). Ops Center Automator software can be used for migrations as it has built-in templates and migration services.
 - Analyzer is used in this use-case to select applications to move, and in a large environment it will show both "to" and "from" migration source/targets.
- While performing the migration, you must select the "Virtual-Virtual" option in VSM and keep the same name for the resource group for both storage systems.
- The resource group should be the same while performing the GAD setup in the Automator for the VSSO cluster. In the VSM option in Automator for VSSO GAD, you must select the 'Virtual -Virtual' option.

Virtual Storage Scale Out (VSSO) support for Data Protection (HUR) was carried out in a lab environment:

<https://www.hitachivantara.com/en-us/video/data-protection-with-virtual-storage-scale-out-using-hitachi-ops-center.html>

Learnings from the lab environment are as follows:

- Ops Center Protector helps to implement a replication policy that determines how and when the replication must occur.
- For kicking off the replication, Protector helps to create a Data flow. After the Data Flow gets activated, replication can be started between the primary and secondary sites.
- During the Hitachi block device node creation in the secondary storage system, you must be careful in specifying the range in 'Specify Ldev Range for VSM' section. This option facilitates the automatic selection of the secondary volume.

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