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Hitachi Storage Advisor

User Guide

Hitachi Data Systems

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Preface

Hitachi Storage Advisor is an infrastructure management solution that unifies storage management solutions such as storage provisioning, data protection, and storage management; simplifies the management of large scale data centers by providing smarter software services; and is extensible to provide better programmability and better control.

- Intended Audience
- Product version
- Release notes
- Document conventions
- Conventions for storage capacity values
- Accessing product documentation
- Getting help
- Comments

Intended Audience

This document is intended for system administrators, Hitachi Data Systems representatives, and authorized service providers who configure and operate the Hitachi Virtual Storage Platform G200, G400, G600, G800, VSP G1000, VSP G1500 and VSP F400, F600, F800, F1500 storage systems with Hitachi Storage Advisor.

Readers of this document should be familiar with the following:

- RAID storage systems and their basic functions.
- Volume creation and management.
- Pool creation and management.
- Parity group creation and management.

Product version

This document revision applies to Hitachi Storage Advisor version 2.1.0 or later.

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document.

Release notes are located on Support Connect at https://knowledge.hds.com/Documents.

Document conventions

This document uses the following typographic conventions:

Convention	Description
Bold	• Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click **OK**. • Indicates emphasized words in list items.
Italic	• Indicates a document title or emphasized words in text. • Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: `pairdisplay -g group` (For exceptions to this convention for variables, see the entry for angle brackets.)

Convention	Description
`Monospace`	Indicates text that is displayed on screen or entered by the user. Example: `pairdisplay -g oradb`
< > angle brackets	Indicates variables in the following scenarios: • Variables are not clearly separated from the surrounding text or from other variables. Example: `Status-<report-name><file-version>.csv` • Variables in headings.
[ ] square brackets	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a | b] indicates that you can choose a, b, or nothing. { a | b } indicates that you must choose either a or b.

This document uses the following icons to draw attention to information:

Icon	Label	Description
	Note	Calls attention to important or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (for example, disruptive operations, data loss, or a system crash).
	WARNING	Warns the user of a hazardous situation which, if not avoided, could result in death or serious injury.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1{,}000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1{,}000^3$ bytes
1 terabyte (TB)	1,000 GB or $1{,}000^4$ bytes
1 petabyte (PB)	1,000 TB or $1{,}000^5$ bytes

Physical capacity unit	Value
1 exabyte (EB)	1,000 PB or $1{,}000^6$ bytes

Logical capacity values (for example, logical device capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 cylinder	Mainframe: 870 KB Open-systems: • OPEN-V: 960 KB • Others: 720 KB
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1{,}024^2$ bytes
1 GB	1,024 MB or $1{,}024^3$ bytes
1 TB	1,024 GB or $1{,}024^4$ bytes
1 PB	1,024 TB or $1{,}024^5$ bytes
1 EB	1,024 PB or $1{,}024^6$ bytes

Accessing product documentation

Product user documentation is available on Hitachi Data Systems Support Connect: https://knowledge.hds.com/Documents. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

Hitachi Data Systems Support Connect is the destination for technical support of products and solutions sold by Hitachi Data Systems. To contact technical support, log on to Hitachi Data Systems Support Connect for contact information: https://support.hds.com/en_us/contact-us.html.

Hitachi Data Systems Community is a global online community for HDS customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to community.hds.com, register, and complete your profile.

Comments

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Thank you!

1

Getting started

Hitachi Storage Advisor is a unified software management tool that reduces the complexity of managing storage systems by simplifying the setup, management, and maintenance of storage resources.

" Get Started with Hitachi Storage Advisor - VSP Family"

"Get Started with Hitachi Storage Advisor - VSP Gx00 with NAS modules"

"Configuring the Hitachi Storage Advisor Environment with the Virtual Appliance Manager Tool"

"Easy Provisioning with Hitachi Storage Advisor"

"Easy Pool Creation with Hitachi Storage Advisor"

These videos provide guidance to configure block and file storage by providing step-by-step workflow instructions with guided steps and UI transitions explaining each step.

You can review the following to gain an understanding of Storage Advisor concepts:

- Overview of Storage Advisor
- Onboarding a storage system workflow
- Configuring a storage system workflow
- Creating and attaching volumes to servers workflow

Overview of Storage Advisor

Hitachi Storage Advisor is a unified software management tool that reduces the complexity of managing storage systems by simplifying the setup, management, and maintenance of storage resources.

Storage Advisor reduces infrastructure management complexities and enables a new simplified approach to managing storage infrastructures. It provides intuitive graphical user interfaces and recommended configuration practices to streamline system configurations and storage management operations. You can leverage Storage Advisor to easily provision new storage capacity for business applications without requiring in-depth knowledge of the underlying infrastructure resource details. It provides centralized management while reducing the number of steps to configure, optimize, and deploy new infrastructure resources.

Some of the key Storage Advisor capabilities include:

- Simplified user experience for managing infrastructure resources. Visual aids enable easy viewing and interpretation of key management information, such as used and available capacity, and guide features to help quickly determine appropriate next steps for a given management task.
- Recommended system configurations to speed initial storage system setup and accelerate new infrastructure resource deployments.
- Integrated configuration workflows with Hitachi recommended practices to streamline storage provisioning and data protection tasks.
- Common, centralized management for supported storage systems.
- A REST-based API to provide full management programmability and control in addition to unified file-based management support.
- Storage Advisor enables automated SAN zoning during volume attach and detach. Optional auto-zoning eliminates the need for repetitive zoning tasks to be performed on the switch.

Unified management of block storage and file storage

Storage Advisor can be used to onboard and configure both block storage and file storage if NAS modules are included in the chassis of a supported storage system.

Understand block and file storage

- Block storage:
  In block storage, volumes of storage are created. A server-based operating system can connect to each block of storage and control it as an individual hard drive. Each storage block can be individually formatted with the required file system, such as NTFS or VMFS. Block storage systems are typically deployed in a Storage Area Network (SAN) environment.

From the dashboard of Storage Advisor, you can discover, register, and onboard a block storage system.

- File storage:
  Storage Advisor supports unified onboarding and configuration of file storage in the form of NAS modules.
  If a supported storage system includes NAS modules, the file storage is automatically added with the block storage. Then file pools and other file resources can be created in the Storage Advisor interface or by using the API.

Adding block and file storage together

Storage Advisor enables you to add block and file storage in a single step. The only requirements are the service processor (SVP) IP address, user name, and password. When the file storage is added, the cluster is automatically registered in Storage Advisor.

Unified configuration

Once a storage system is onboarded, all block and file resources can be configured and managed from a single Storage System page. File pool creation workflow incorporates best practices that simplify workflow and enhance usability. The file pools are used to easily create virtual file servers, file systems, and shares and exports. File system creation automatically mounts and formats the new file system.

Unified reporting

Capacity is reported for all aggregated storage systems in the dashboard.

Capacity is also displayed for each storage system in the Storage System detail page.

Three views of capacity are available: file only, block only, or a unified view of block and file.

Dashboard

Once a storage system has been onboarded to Storage Advisor, the dashboard displays as soon as you log in. The Storage Advisor dashboard provides the tools to easily configure, manage, and monitor storage systems.



From the Storage Advisor dashboard, you can access managed resources and provision storage in the context of a given storage system or server. The provided templates and configurations make it possible to quickly and easily provision a storage system, without knowing the details of the underlying hardware and software.

The top navigation menu provides access to Jobs and Monitoring pages. Links to the following settings are available, based on the user role:

- Tier Management
- Security Settings
- SNMP Settings
- Change Local Password

The dashboard has three distinct sections:

- **Resource side panel:** The left pane provides quick access to review the configuration of your storage systems, servers, and fabric switches. If the storage system includes NAS modules, virtual file servers can also be accessed.
- **Alert tiles:** Four alert tiles represent various aspects of the health of the storage system. When Storage Advisor detects a problem with a storage system environment, a number appears in the tile. The number indicates the number of alerts for that aspect of the storage system. Click the alert tile to go directly to a summary of the problems.
- **Resource summary:** The middle area, with the information gauge, provides a summary of the capacity allocated from the registered storage systems.

Resource side panel

The resource side panel enables quick access to storage systems and to servers.

- Click **Storage Systems** to view and add storage systems.
- Click **Servers** to view and add servers.
- Click **Fabric Switches** to view and add fabric switches.
- Click **Virtual File Servers** to view and add virtual file servers. Displays if the storage system includes NAS modules.

Alert tiles

Across the top of the dashboard are tiles that display alerts for storage capacity, data protection, jobs, and hardware.

If a tile includes a circled check mark, there are no alerts for that part of the storage system, and everything is functioning normally. A number in a red circle within a tile indicates one or more problems with that part of the storage system.

You can click a tile for Capacity Alerts, Data Protection Alerts, or Hardware Alerts to view the summary for the category in the Monitoring tab.

The Jobs Alert tile displays the number of jobs in the last 24 hours with a status of **Failed** or **Success with Errors**.

Resource summary

The circular information gauge, which shows information about the available storage.

- If the storage systems include file storage, you can click **Block** or **File** next to the information gauge to view a legend and capacity values for either type of storage. Click **Unified** to view a legend and capacity values for both block and file.
- For block-only storage systems, the numerical data for each capacity parameter in the ring is displayed to the left of the information gauge.
- The number in the center of the rings shows the total usable capacity of all storage systems. The total usable capacity is the capacity available from all the parity groups across all storage systems.
  If you do not have any parity groups configured on the storage system, this number is zero and all other data points in the capacity visualization are zero.
- The light grey ring indicates the sum of all pool capacity available across all storage systems. The dark grey indicates the parity group capacity that is not yet allocated to pools.
  If you do not have any pools created, the light grey ring indicates zero. As you create pools, this number increases to eventually become equal to the

total usable capacity when you have consumed all parity groups for pool creation.
- The white ring indicates the subscribed capacity, which is the sum of all volumes created on storage pools. As you start creating volumes on storage pools, the subscription starts to increase.
- The light green ring indicates the storage utilization. As you create volumes on the pools and start consuming capacity, the utilization of thin pools increases and you will notice the value in green starting to increase. If the Thin Used (light green ring) starts to increase and get closer to your total pool capacity, that indicates that the pools may be starting to fill up.
- Physical capacity allocated to file pools is indicated by medium blue in the File view and by light blue in the Unified view.
- File pool utilization is indicated by light blue in the File view and by medium blue in the Unified view.
- File over-commit capacity is represented by dark gray.

If you notice the total pool capacity (light grey) and Thin used (light green) values getting closer to total capacity, you may be running out of storage on one or more storage systems and may need to add disks to increase storage capacity. Review the information gauge for each storage system to identify which storage system needs additional capacity.

The right side of the resource summary offers alternate views:
- **Protection:** is the breakdown of data protection metrics including a representation of types of protected, unprotected, and secondary capacity and gauge of the total percentage of capacity protected.
- **Tier Breakdown:** is a visualization of the amount of each tier that is allocated to pools.

Analyzing data in the dashboard

The dashboard is a visual display of the important information needed to analyze the overall capacity utilization and health of your storage system. It provides visual indicators such as total usable capacity, current utilization, data protection summary, and monitoring alerts.

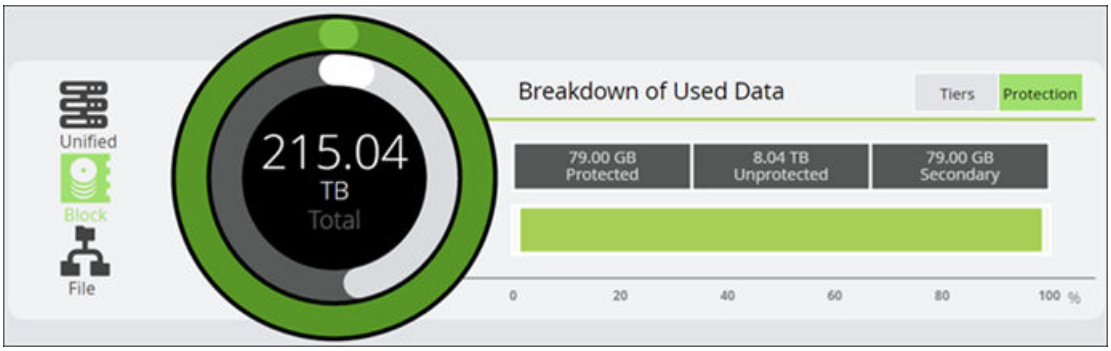
Analyzing data shown in alert tiles

The alert tiles collectively present the health of the storage system environment. In one glance you can verify that the overall health is sound if you see no alerts on the alert tiles. This means that there are no capacity or hardware issues in the environment, no failed jobs in the last 24 hours and that the data protection is working without any issues.

If there are any alerts, you can drill down to the relevant alert page to investigate the cause. Storage Advisor provides alerts for capacity utilization, hardware, data protection, and jobs status.

Analyzing data in the information gauge

The information gauge provides a visual indication of the total capacity of all storage systems managed by Storage Advisor.



The capacity indicated in the center of the ring is the total usable capacity available via the configured parity groups. After you add a storage system and configure parity groups, the total capacity indicator will show the capacity from the newly added storage system. The Thin Used capacity (light green ring) indicates the total capacity that is currently being used. If the usage is around 70-80% of the total capacity, you may receive capacity alerts based on the thresholds set by your storage administrator. The default thresholds are 70% and 80%, and can be changed during pool creation.

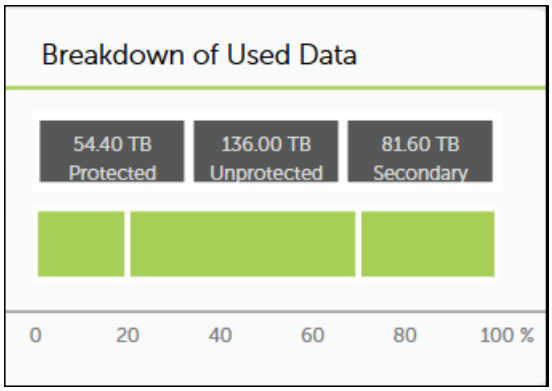
The light grey ring that provides a sum of capacities of all pools in the systems should be closer to 100% capacity. This would mean that you are using your entire parity group capacity by allocating it to pools. If the Thin Used capacity ring (light green) nears the total capacity (light grey ring) then you may run out of pool capacity soon. In such a case, expand the pool to consume more capacity.

If you notice that the total pool capacity (light grey ring) and Thin used (light green ring) values are getting closer to total capacity, you may be running out of disk capacity on one or more storage systems and would need to add disk space to increase storage capacity. Review the information gauge for each storage system to identify which storage system needs additional capacity.

Capacity subscription beyond the total available capacity should not be an issue if your thin capacity utilization is well within the total capacity.

Analyzing data protection metrics

The balance of your protected primary volumes and secondary volumes depends on the number of copies you have chosen to maintain, and also on the type of the data protection technology being used. If you choose to set aside more volumes for data protection, then the overall usable capacity may be affected. On the other hand, if you have a large amount of unprotected data, you may want to consider data protection options.



Inventory and resource information

The inventory pages display details about the storage system resources in Storage Advisor. These resources include storage systems, servers, ports, and pools, volumes, parity groups, external parity groups (if the storage system has external storage), and replication groups. If the storage system has NAS modules, resources will also include file pools, virtual file servers, file systems, and shares and exports. Common actions can be performed on the inventory pages, such as the following:

- You can select one or more resources and delete them.
  When you delete a storage system, you disassociate it from Storage Advisor. When you delete a pool or volume, the resource is de-provisioned and removed from the storage system.
- When a parity group is deleted, it is removed from the storage system and the disks used to create the parity group are no longer in use. You can delete the parity group if you want to reconfigure the storage system with some other RAID configuration or simply decommission the array. If the parity group is in use by a pool, the parity group deletion will fail.
- You can select one or more of the same type of resources and update their properties. The properties that can be updated depend on the type of resource.
- You can click a particular resource to see more details about it on its resource detail page.
  - When you delete a block pool, the parity groups used by the pool will no longer be in In Use status. The pool volumes on these parity groups will be formatted and the parity group will eventually be in Available status.
  - When you delete a volume, the pool subscription will go down. Volume deletion will fail if the volume participates in data protection or is attached to a server.
  - When you delete a file pool, the underlying related block pool is deleted.
  - When you delete a server, the server is disassociated from Storage Advisor. You will no longer be able to provision volumes to the server (or its WWNs). Server deletion will fail if it has volumes attached to it.

Related concepts

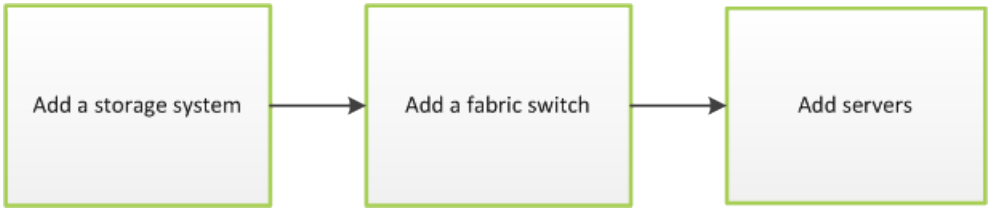
- Storage system inventory on page 51
- Parity groups inventory on page 35
- Pools inventory on page 39
- Volumes inventory on page 68

Related references

- Replication groups inventory on page 87

Onboarding a storage system workflow

When you onboard a storage system, you associate it with Storage Advisor so that you can manage it from the dashboard. Then you can add servers to which you can attach volumes. Optionally, you can add fabric switches if you want to auto-create zones during volume provisioning.



Note: If you use resource groups, make sure that the SVP username used to onboard storage systems in Storage Advisor has access to all custom resource groups and meta resource groups.

Related tasks

- Adding a fabric switch on page 26
- Adding servers on page 58

Configuring a storage system workflow

Configure a storage system in order to manage storage using Storage Advisor.

Note: Storage Advisor retrieves and displays any resources that already exist in the storage system.

Complete the following in order to configure a storage system:

- Enable port security. Post security must be enabled for a host storage domain (HSD) to be created on the port. If port security is disabled Storage Advisor will not select the port for HSD creation. If the user manually selects the port with security disabled, the host group will be created.
- Create parity groups so you can create pools.

- Create pools so you can create volumes.



Related concepts

- Creating parity groups on page 29
- Creating a pool on page 38

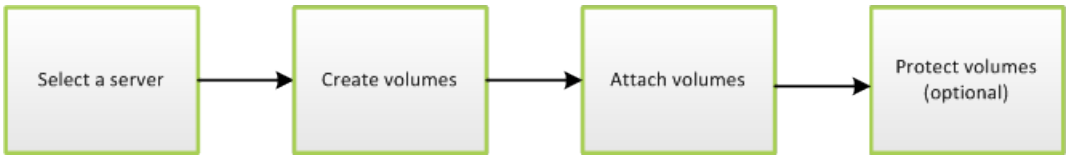
Related tasks

- Enabling or disabling port security on page 26

Creating and attaching volumes to servers workflow

Storage Advisor provides a workflow in a single page to create volumes and immediately attach them to servers. Optionally, you can protect volumes as part of the same workflow.

You begin by choosing a server where you want to create and attach volumes. As part of the workflow, Storage Advisor automatically attaches volumes to servers after you select settings. Finally, you are provided the option of immediately applying data protection.



Related concepts

- Create and attach volumes to servers on page 46

2

Adding a storage system

Onboarding a storage system is the process of associating it with Storage Advisor. After the storage system is onboarded, manage it from the Storage Advisor dashboard.

You can add multiple VSP Gx00 or VSP Fx00 storage systems at once by specifying an SVP IP address that has multiple storage systems. Storage systems with different credentials cannot be added in the same operation.

If a supported storage system includes NAS modules, the file storage will be added automatically along with the block storage.

Storage Advisor also supports onboarding of 4-node clusters, which is a requirement for GAD Enhanced for NAS. GAD Enhanced for NAS takes advantage of global-active device to cluster two VSP Gx00 models systems with NAS modules across two sites.

Before you begin

Storage Advisor requires access to all resources groups on the storage system so that the workflows function correctly. Verify that the service processor (SVP) user name used to onboard a storage system in Storage Advisor has access to all custom resource groups and meta resource groups.

The user must be a member of the Administration Users Group. If the storage system includes NAS modules, the user must also be a member of the Support Personnel Group.

Procedure

1. On the Storage Advisor dashboard, click **Storage Systems** on the left pane.
2. Click the plus sign (**+**) to add a storage system.
3. Enter values for the following parameters on the **Add Storage System** page.
   - **SVP IP Address:** Enter the IP address of the external service processor for the storage system you want to discover.

- **User name and password:** Log in as a user that has administrator privileges on this storage system. For example, you can log in as the user `maintenance`.

4. Click **Submit**.

Result

The Jobs tab is updated with the job called `Create Storage System`. If multiple storage systems are being added, there will be a job for each one.

Wait a while for the storage system to be added. Refresh the Jobs tab to verify that storage system is onboarded.

The dashboard shows the displayed number of storage systems has been incremented by one. Additionally, when you click Storage Systems, you are redirected to the storage system inventory where you can see the newly added storage system.

When a storage system is onboarded, Storage Advisor goes through an initialization process where it gathers the information about the current configuration of the storage system. During this time you will see that the ports, volumes, pools, and parity groups in the storage system are "Not accessible". Once the initialization is complete, you can see the port, pool, volume, and parity group information in the storage system details.

If you successfully add a 4-node cluster, a message will display, requesting that you ensure both storage systems in the global-active device pair are added before performing operations.

Next steps

1. In the parity group inventory for the storage system, create parity groups to convert the raw disk capacity into usable capacity.
2. From the settings menu, access the tier definitions before creating pools.

3

Configure block storage

Use Storage Advisor to configure the block storage.

- ☐ Enabling or disabling port security
- ☐ Adding a fabric switch
- ☐ Creating parity groups
- ☐ Creating a pool
- ☐ Create and attach volumes to servers
- ☐ Managing storage systems
- ☐ Managing servers
- ☐ Managing volumes

Enabling or disabling port security

Before a host storage domain (HSD) can be created on a port, port security must be enabled. By default, security is disabled on supported storage systems. If port security is disabled Storage Advisor will not select the port for HSD creation. If you select a port that has security disabled, you are limited to the default host group. If the user manually selects the port with security disabled, the host group will be created.

Procedure

1. On the Storage Advisor dashboard, click **Storage Systems** to see the inventory of storage systems and capacity information.
2. Click a storage system to see its configuration of pools, ports, volumes, and parity groups.
3. Click **Ports** to see the configured storage ports for the storage system.
4. Select one or more ports and click **Enable/Disable Security** to open the **Update Storage Port** page.
5. For a VSP G1000, VSP G1500, or VSP F1500 storage system, you can update port attributes by selecting one of the following:
   - **Target**: Fibre target port
   - **Initiator**: MCU initiator port
   - **RCU Target**: RCU target port
   - **External**: External initiator port
6. Click **Enable Security** or **Disable Security** and then click **OK**.
   A job is started to update the port security.

Modifying port attributes in Storage Navigator

You can open the Ports inventory page in Storage Navigator by clicking Open the Ports/Hosts Groups/iSCSI Targets page in Storage Navigator to view and modify port attributes.

For more information, refer to the Storage Navigator online help.



Note: Any changes you make in Storage Navigator may not be reflected in Storage Advisor for a few minutes.

Adding a fabric switch

You can add a fabric switch after onboarding a storage system. Add, update, and delete fabric switches in the Storage Advisor interface.

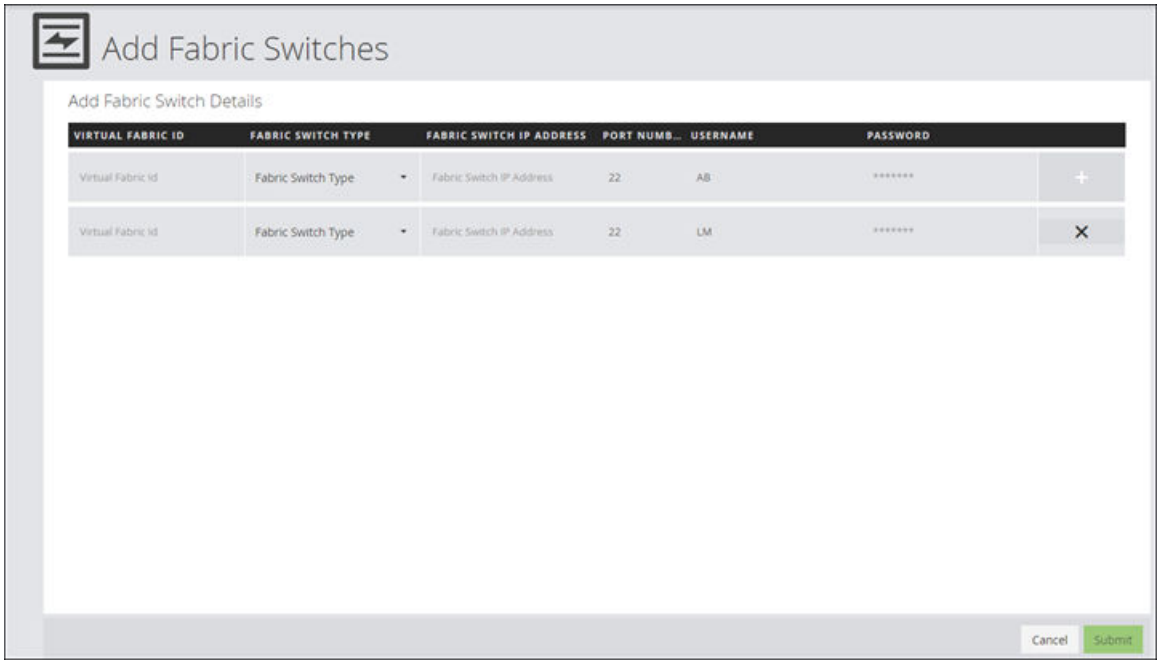
After a fabric switch is added, you can choose to auto-create zones during volume provisioning. A fabric switch is required for any operations that use auto-select, such as host group creation and auto-selection of ports while attaching volumes to servers.

Before you begin

- Verify that servers and ports are connected according to the manufacturer's instructions.
- Verify that there is an active zone set with at least one dummy zone available.
- The Storage Advisor server is connected to the same IP network and has access to SNMP broadcast of Fibre Channel switches.
- Verify the required information about the fabric switch: Virtual Fabric ID (required only for Cisco switches), Fabric Switch Type, Fabric Switch IP Address, Port Number, Username, and Password.
- Verify that you have the Admin role for the fabric switch.

Procedure

1. On the Storage Advisor dashboard, select **Fabric Switches** to open the **Fabric Switches** page.
2. Click the plus sign (**+**) to open the **Add Fabric Switches** page.



3. Enter the following information from the configuration of the switch you are adding:
   - **Virtual Fabric ID**: For Cisco switches, the VSAN ID. Not applicable to Brocade switches.
   - **Fabric Switch Type**: Select **Brocade** or **Cisco**.
   - **Fabric Switch IP Address**

To add or update a core switch, use the Management IP address of the switch or the Active CP IP address.

- **Port Number**
- **Username**
- **Password**

4. Click **Submit**.

Result

A job is created to add the fabric switch.

Supported fabric switch models

Storage Advisor supports a variety of Brocade® and Cisco® fabric switches.

System requirements for Brocade switches

Model	Fiber OS version	Type
300	7.0 7.1 7.2	71
5300	7.0 7.1 7.2	64
6505	7.0 7.1 7.2	118
6510	7.0 7.1 7.2	109
6520	7.0 7.1 7.2	133
7800	7.0 7.1 7.2	83
DCX 8510-4	7.0 7.1 7.2	121
DCX 8510-8 with firmware v6.4	7.0 7.1 7.2	120

System requirements for Cisco switches

Storage Advisor supports the Cisco MDS 9000 Series of switches.

Cisco MDS NX-OS Release 6.2(9) or later is required.

Creating parity groups

Parity groups are the basic units of storage capacity. Creating parity groups converts the raw disk capacity in your storage system into usable capacity.

Storage Advisor parity group concepts

Storage Advisor provides a simple one-click method of parity group creation that is based on best practices applicable to the disks in the storage system.

An advanced method of parity group creation is also available. You can choose to use the advanced method if there is not a need to rely on best practices.

Note: Parity groups on VSP G1000, VSP G1500, or VSP F1500 storage systems cannot be created in Storage Advisor. They are created by an authorized service representative. They can be initialized in Storage Advisor. Encryption can be enabled in Device Manager - Storage Navigator.

Creating parity groups in Storage Advisor also creates LDEVs that can be consumed for pool creation.

Encryption can be enabled during parity group creation if prerequisites are met, including a storage system with an Encryption Disk Board.

Normal practice is to use all available disk capacity when creating parity groups to ensure that all of the storage system capacity is usable. There can be exceptions to this practice; for example:

- If the entire capacity of the storage system is not needed.
- If there is a need to create fewer parity groups in order to reserve more disks as spares.

Viewing parity groups

Access the Parity Groups page by clicking Storage Systems on the dashboard and then clicking a storage system tile. Click the Parity Groups tile.

A summary of parity groups includes disk type, number of parity groups, capacity, and available spares, all sorted by disk type.

- You can click Manage Spare Disks to open the **Disk Management** page and set free disks as spare disks, or spares as free disks.

Note: Not available for VSP G1000, VSP G1500, or VSP F1500.

- Click any parity group tile to view its details.
- Click the plus sign (+) to open the **Create Parity Groups** page.
  When you open the **Create Parity Groups** page, the basic method is selected by default. Encryption can be enabled using either method.
  - Basic option: Creating a parity group using the basic option requires no input, but you can change the RAID type or the number of parity groups. Storage Advisor applies recommended best practices for creating these parity groups.
  - Advanced option: The advanced option allows the user to fully configure the RAID layout of the parity group by selecting the specific disks to assign for parity group creation.

Enabling parity group encryption in Storage Navigator

Click Open the Parity Groups page in Storage Navigator to enable parity group encryption.

For more information, refer to the Storage Navigator online help.

Note: Any changes you make in Storage Navigator may not be reflected in Storage Advisor for a few minutes.

Related concepts

- Creating a pool on page 38

Creating parity groups, basic method

The following procedure describes the basic option for creating a parity group and enabling encryption.

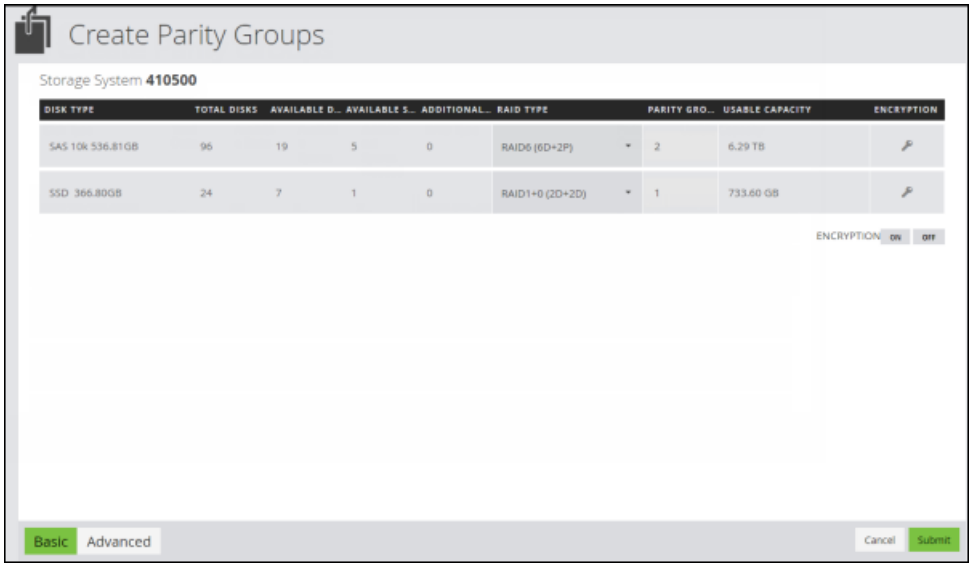
Note: Parity group creation on VSP G1000, VSP G1500, and VSP F1500 storage systems is performed outside Storage Advisor by an authorized service representative. Encryption can be enabled (if prerequisites are met) in Device Manager - Storage Navigator.

Before you begin

- Register the storage system.
- Identify the target storage system name.
- Identify the total capacity that you expect to use. Plan to use all of the available disks in the system when you create parity groups.

Procedure

1. On the Storage Advisor dashboard, select **Storage Systems** in the resource side panel to see the inventory of registered storage systems.
2. Click a storage system to create and configure the parity groups for it.
3. Click **Parity Groups** to see the inventory of all parity groups in the storage system.
4. Click the plus sign (**+**). In the **Create Parity Groups** window, review the list of unused disk types in the storage system. This information is grouped by disk type, disk speed, and disk capacity, and includes the following details:
   - Number of available disks.
   - Available spares detected for each disk type, disk speed, and capacity.
   - Number of new or additional spares to reserve. This calculation is based on the total spares needed based on recommended best practices, and the number of existing spares in the system.
   - The recommended RAID configuration for the disk type.
   - The number of parity groups that can be created.
   - The total usable capacity that is available based on the number of parity groups and the RAID configuration.



5. Decide if the recommended RAID configuration for each disk type is acceptable. Choose one of the following options:
   - Accept the recommended RAID configuration, which uses the full capacity of the installed drives.
   - Change the recommended RAID configuration or create fewer parity groups. Storage Advisor shows the number of parity groups that can be created for the new RAID configuration and the corresponding usable capacity.
6. (Optional) Click Encryption **ON** if you want to use encryption.

   Prerequisites for enabling encryption:

- The storage system must have an Encryption Disk Board.
- Encryption License Key must be installed.
- The Key Management Server must be configured on the SVP.

Note: Encryption cannot be disabled in Storage Advisor.

7. Click **Submit**.

Result

A job is started to create the parity group for the storage system. This job includes the following tasks:

- Identifies the appropriate number and position for the spare disk.
- Assigns a spare disk.
- Creates the required number of parity groups for the requested RAID layout.
- Creates and quick formats the necessary volumes on the parity group so that it is ready for pool creation.
- The job may create sub-jobs when multiple parity groups are being created. Each sub-job will show the status of the parity groups being created.

Next steps

- Check the status of the parity group creation job by clicking Jobs.

Note: Parity group creation may take a long time.

Related tasks

- Creating parity groups or hot spares, advanced method on page 32
- Managing free and spare disks on page 34

Creating parity groups or hot spares, advanced method

The advanced option enables users to configure parity groups that are not based on the provided best practices.

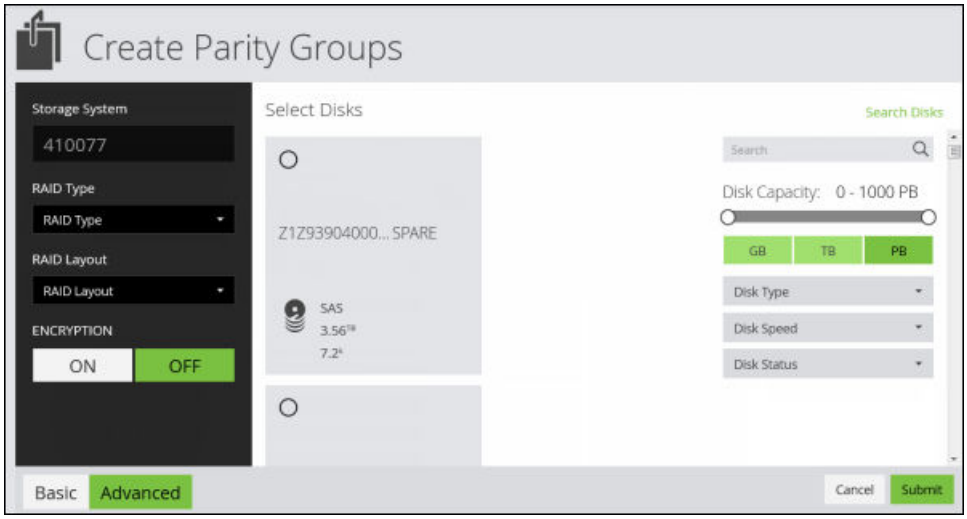
The advanced option allows you to fully configure the RAID layout of the parity group by selecting the specific disks and hot spares to assign for parity group creation.

Note: Parity groups on VSP G1000, VSP G1500, and VSP F1500 storage systems cannot be created in Storage Advisor. They are created by an

authorized service representative. They can be initialized in Storage Advisor. Encryption can be enabled in Device Manager - Storage Navigator.

Procedure

1. On the dashboard, click **Storage Systems** and click a storage system tile.
2. Click **Parity Groups** to open the **Parity Groups** page and click the plus sign to open the **Create Parity Groups** page.
3. Click **Advanced**.



4. Select a **RAID Type** and a **RAID Layout**.

RAID Type	RAID Layout
RAID5	3D+1P, 4D+1P, 6D+1P, 7D+1P
RAID6	6D+2P, 12D+2P, 14D+2P
RAID1+0	2D+2D

5. (Optional) Click Encryption **ON** if you want to use encryption.
   Prerequisites for enabling encryption:
   - The storage system must have an Encryption Disk Board.
   - Encryption License Key must be installed.
   - The Key Management Server must be configured on the SVP.

   Note: Encryption cannot be disabled in Storage Advisor.

6. Choose available disks. Select enough disks to match the RAID Layout.
7. Click **Submit**.

Result

A job is started to create the parity group for the storage system.

Next steps

- Check the status of the job by clicking Jobs.

  Note: Parity group creation may take time.

- Create a pool.

Related concepts

- Creating a pool on page 38

Related tasks

- Monitoring jobs on page 97
- Creating parity groups, basic method on page 30
- Managing free and spare disks on page 34

Managing free and spare disks

You can set free disks to spare and spare to free.

Note: Disk management is not available for VSP G1000, VSP G1500, and VSP F1500 storage systems.

If you choose to use the basic method to create parity groups, Storage Advisor will automatically review the available spare disks and allocate more spare disks if needed.

If you choose to create parity groups using the advanced method, you should review the number of spare disks in the parity groups inventory summary. If you want to assign more or fewer spare disks, use disk management.

Procedure

1. On the dashboard, click **Storage Systems**.
2. Click a storage system tile and click **Parity Groups**.
3. Click **Manage Spare Disk** to open the **Disk Management** page and view disks not being used in any parity group.
4. Click **Disks to Set to Free** or **Disks to Set to Spare** and select one or more disks. Selecting Disks to Set to Spare will reserve the disks as a spare disks and they cannot be used for parity group creation. Selecting Disks to Set to Free will unallocate the spare disks and return then to the pool of available disks.
5. Click **Submit**.

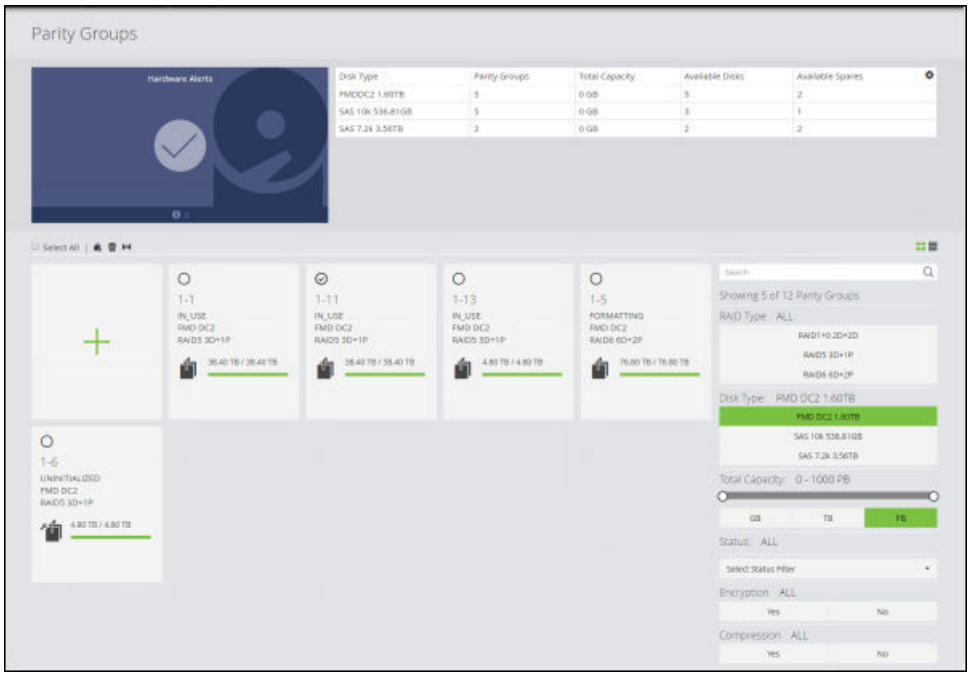
Related tasks

- Creating parity groups, basic method on page 30
- Creating parity groups or hot spares, advanced method on page 32

Parity groups inventory

After parity groups are created, they are displayed for each storage system.

To view parity groups for a storage system, click Storage Systems on the dashboard and click a storage system tile to view the associated parity groups, pools, volumes, and ports. Click Parity Groups to open the Parity Groups page.



You can perform the following actions on this page:

- If there are hardware alerts related to the parity groups, you can click the Hardware Alerts tile to view details for different types of components on the Monitoring page for the storage system.
- To assign free and spare disks, click Manage Spare Disks to open the Disk Management page.

> **Note:** Disk management is not available for VSP G1000, VSP G1500, or VSP F1500 storage systems.

- Select one or more parity groups and do one of the following:
  - To initialize parity groups, click Initialize Parity Groups.
    You can create and initialize pool volumes on a parity group if pool volumes have not been created. You can also format any pool volumes that are in blocked state. You can initialize parity groups in the following conditions:
  - – When the parity group either does not have any pool volumes or at least one of the pool volumes is in Blocked state. In this case, you will notice that the parity group status is Uninitialized.

– When the pool volumes on the parity group do not account for the entire parity group capacity and there are unused partitions on the parity group. In this case you will notice that the parity group status is Available but the available capacity is much less than the total capacity. This is supported only when the parity group status is Available or Uninitialized.

○ To delete the parity group, click Delete. When you delete a parity group, it is removed from the storage system and the disks used to create the parity group are no longer in use. You can delete the parity group if you want to reconfigure the storage system with some other RAID configuration or simply decommission the array.

Note: The following parity groups cannot be deleted:
- Parity groups on VSP G1000, VSP G1500, or VSP F1500 storage systems.
- Parity groups that contain NAS boot volumes.

○ To enable compression on parity groups, click Enable Compression on Parity Groups. Compression can be enabled for parity groups on FMD DC2 disks in Available state.
After compression is enabled, the status of the parity group is AVAILABLE_PHYSICAL.

Note: Parity groups that contain NAS boot volumes cannot be compressed.

- Click the plus sign (+) to create a new parity group.

Note: Parity groups on a VSP G1000, VSP G1500, or VSP F1500 storage systems are created outside Storage Advisor by an authorized service representative.

- Use the filters to view the status of parity groups. Click a filter to apply it and click it again to remove it.
  ○ AVAILABLE: Parity group is not being used for any storage pools. It is available for pool creation.
  ○ AVAILABLE_PHYSICAL: Parity group is not being used for any storage pools. Compression is enabled on the parity group and physical capacity of the parity group is available for pool creation. Not applicable to parity groups that are not enabled for compression.
  ○ FORMATTED: At least one of the pool volumes in the parity group is being formatted. The full format takes longer than a quick format because the service processor fully scans the hard drive.

- QUICK_FORMATTING: At least one of the pool volumes in the parity group is being formatted using the quick format method. To make the formatting process quick, the drive is not fully checked, the files are still there, and the volume could be re-built to gain access to the files again.
- IN_USE: Parity group is being used by a storage pool.
- UNINITIALIZED: The parity group either has no volumes or at least one of the pool volumes is in Blocked status, or one or more partitions is uninitialized and has a size greater than 16,787,456 blocks.
- UNSUPPORTED_ATTACHED: At least one of the pool volumes has a path to a storage port.
- UNSUPPORTED_INACCESSIBLE_RESOURCE_GROUP: Parity group and at least one of its pool volumes are in different resource groups and user does not have access to one of the resource groups.

External parity groups inventory

External parity groups are parity groups in a storage system that is connected to a storage system that has been onboarded in Storage Advisor.

You can display a list of external parity groups in a storage system that has been registered with Device Manager - Storage Navigator.

You can access the External Parity Groups page by clicking the External Parity Groups tile on the detail page for a storage system. If the storage system has no external parity groups, the tile does not display.

External parity groups are not available for deletion, initialization, or compression.

If external parity groups have been used to create a pool (outsideStorage Advisor), you can use their capacity to create volumes in Storage Advisor.

Enabling accelerated compression in Storage Advisor

Accelerated compression can be enabled for parity groups on FMD DC2 drives that are part of VSP Gx00 models, VSP Fx00 models and VSP G1000, VSP G1500, or VSP F1500 storage systems. It enable users to realize more virtual capacity than the actual usable capacity.

Note: Accelerated compression is not compatible with encryption. If a parity group is encrypted when created, the data cannot be compressed.

Storage Advisor only uses the physical capacity of the FMD DC2 parity groups for which write is assured.

Accelerated compression can be enabled in the in the Parity Groups inventory page.

When you create pools, you can select capacity from compression-enabled parity groups by selecting the AVAILABLE_PHYSICAL status.

After creating a pool with capacity from a parity group that is enabled for accelerated compression, you can view the following in the detail page for the pool:

- **Expansion Rate:** The ratio of the total capacity of FMD DC2 pool volumes with respect to the total capacity of FMD DC2 pool volumes assured for writing.
- **Compression rate:** The ratio of data size compression.
- **Savings %:** Displays the percentage of the capacity reduced by data compression with respect to the used capacity before the data compression. This will not display a value until data is compressed.

If the savings percentage for a pool is not high enough, you can provision additional pool volumes to the pool from the parity groups using FMD DC2 drives.

Related references

- Pool details on page 45

Creating a pool

Use the basic option to take advantage of tiers that are based on best practices.

If you want more flexibility and do not need to take advantage of best practices, you can use the advanced option to select specific parity groups.

You cannot create pools on external parity groups. They must be created outside Storage Advisor.

The following types of pools are identical:

- Thin = HDP (Dynamic Provisioning), which is functionality that allocates virtual volumes to a host and uses the physical capacity that is necessary according to the data write request.
- Tiered = HDT (Dynamic Tiering), which is used with Dynamic Provisioning and places data in a hardware tier according to the I/O load. For example, a data area that has a high I/O load is placed in a high-speed hardware tier, and a data area that has a low I/O load is placed in a low-speed hardware tier.
- Snap = HTI (Thin Image), which stores snapshot data in pools. A pool consists of multiple pool-VOLs. The pool-VOLs contain the snapshot data. A pool can contain up to 1,024 pool-VOLs.

Related concepts

- Create and attach volumes to servers on page 46

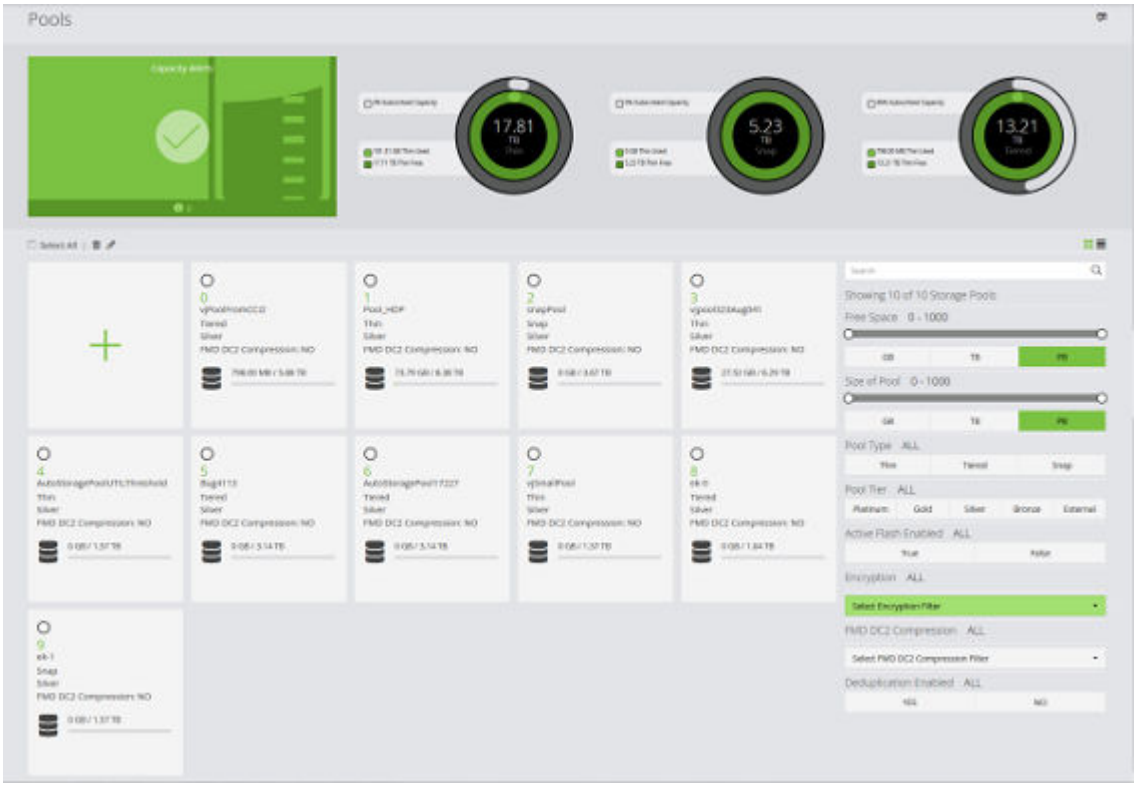
Pools inventory

Access the Pools page to add, update, and delete pools.

From the dashboard, click Storage Systems and then click a storage system tile to view parity groups, pools, volumes, and ports.

Click Pools to view the inventory of pools.

Note: If there are external pools (on external storage), they display in Pools inventory, but they cannot be added, updated, or deleted.



View pool details in either a tile view or a list view. Capacity utilization is represented by a color bar:

- Green Below 70%.
- Orange From 70% to 80%.
- Red Over 80%.

A key in a tile or row indicates that the pool is encrypted.

You can filter the volumes as follows:

- Pool Type--Filter by the pool type: Thin, Tiered, or Snap.
- Pool Tier--Filter by the pool tier: Platinum, Gold, Silver, Bronze, or External.
- Active Flash Enabled--Filter by whether Active Flash is enabled.

- Encryption--Filter by whether encryption is used. Select YES, NO, PARTIAL, or UNKNOWN.
- FMD DC2 Compression--Filter by whether a pool is using a parity group that is enabled for accelerated compression. Select YES, NO, PARTIAL, or UNKNOWN.
- Deduplication Enabled--Select YES or NO.

The following actions are available on this page:
- Click Open the Pools page in Storage Navigator to open the Pools page of Storage Navigator in a separate browser window.
- Select a pool and click Edit to update it in the Update Storage Pool page.
- Select one or more pools and click Delete to delete the pools. Deleted pools are de-provisioned and removed from the storage system.
- Click the plus sign (+) to add a pool in the Create Pool page.

Opening the Pools inventory page in Storage Navigator

Click Open the Pools page in Storage Navigator to:
- Shrink or restore a HDP/HDT pool
- View the Tier properties of the HDT Pool
- Update the Monitoring Mode of the HDT pool (if Tier management is set to Manual)
- Start or stop the monitoring of the HDT pool (if Tier management is set to Manual)
- Start or stop tier relocation on the HDT pool (if Tier management is set to Manual)

For more information, refer to the Storage Navigator online help.



Note: Any changes you make in Storage Navigator may not be reflected in Storage Advisor for a few minutes.

Creating a pool, basic method

Use the basic method of pool creation to create pools based on best practices.

Before you begin

Create and configure parity groups on the storage system.

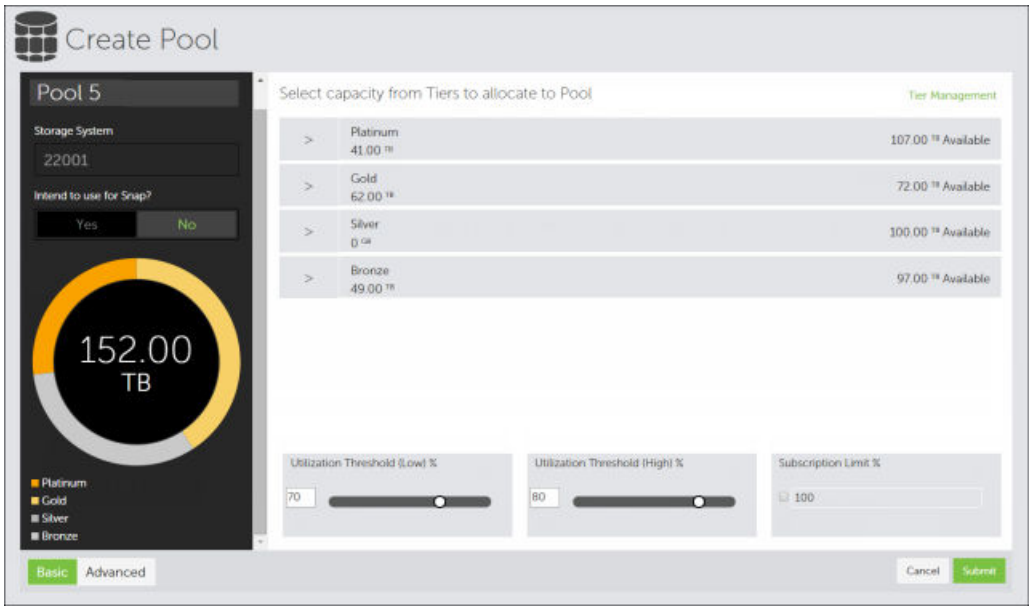
You need a minimum of four parity groups of the Bronze, Silver, or Gold tiers, or one parity group of the Platinum tier to create a pool using the basic method. Otherwise, you can use the advanced method of pool creation.

License requirements:
- For a Tiered pool: Dynamic Tiering
- For a Thin pool: Dynamic Provisioning

- For a Snap pool: Thin Image
- For active flash: active flash

Procedure

1. On the Storage Advisor dashboard, click **Storage Systems** to see the inventory of registered storage systems.
2. Click a storage system to create a pool for it.
3. Click **Pools**.
4. Click the plus sign (**+**) to open the **Create Pool** page.
   By default, the **Basic** option is selected.



5. Enter a **Pool Label**.
   Pool labels can contain only alphanumeric characters, hyphens, and underscores. Initial hyphens are not allowed.
6. In the **Select capacity from Tiers to Allocate to Pool** pane, you can choose storage from 1, 2, or a maximum of 3 tiers (**Platinum**, **Gold**, **Silver**, or **Bronze**).
   - If you select only one tier, you can use the **Intend to use for Snap?** toggle to decide whether to use Snap pools.
     - Click **Yes** to create Snap pools.

       Note: Use this option if you want to use data protection to create snapshots. You can also create a pool for snapshots later by returning to the Create Pool page.

     - Click **No** to create Thin pools.
   - If you select two or three tiers, the system creates Tiered pools.

Table 1 Tier Definitions

Pool Tier	Description
Platinum	SSD, FMD, and FMD DC2
Gold	SAS 15 k
Silver	SAS 10 k
Bronze	SAS 7.2 k

7. Click a selected tier to view the available storage capacity and select a capacity size.
8. Click **Tier Management** to see the disk type, capacity, and speed of each pool category.
9. Review the high and low pool utilization thresholds and the subscription limit. The thresholds will serve as the Warning and Critical thresholds for monitoring capacity. Adjust the thresholds if needed. Select the **Subscription Limit %** checkbox to set the limit to Unlimited.



Note: Subscription Limit % is not applicable to Snap pools.

10. Click **Submit.**

Result

A job is started to allocate the storage capacity and create the pool.

Next steps

- Check the status of the pool creation job by clicking Jobs.
- Create a volume.

Related concepts

- Creating parity groups on page 29
- How Storage Advisor calculates pool sizes for the basic method of pool creation on page 42

Related tasks

- Creating a pool, advanced method on page 43
- Creating volumes to attach to servers on page 46

How Storage Advisor calculates pool sizes for the basic method of pool creation

Storage Advisor incorporates best practices to calculate the best pool sizes based on the media available in the storage system. When the basic pool creation option is used, pool size is determined as follows:

- Storage Advisor identifies all the parity groups of the same disk type, disk capacity, disk speed, RAID type and layout and determines the available capacity of their usable LDEVs. Only parity groups in the Available and

Quick Formatting states are eligible for pool creating using the basic method.

- Storage Advisor then uses combinations of these parity groups where four or more parity groups of the Bronze, Silver, or Gold tiers can be added together, or there is a parity group of the Platinum tier, to compute various possible pool sizes that can be created for the combination of disk type, disk capacity, disk speed, RAID type and layout.

Note: If your parity groups do not meet these requirements, you can only use the advanced method of pool creation.

- Based on the Storage System model, Storage Advisor determines the maximum pool size.
- Storage Advisor then displays the pools in increasing order of pool size.

Creating a pool, advanced method

You can use the advanced method of pool creation to select parity groups filtered by disk type, speed, layout, and RAID level. This method does not employ best practices.

Note: Mixing different disk types in a Thin pool is not recommended. If you choose to create such a pool, Storage Advisor identifies the tier in this pool as "mixed".

Before you begin

Create and configure parity groups on the storage system.

License requirements:

- For a Tiered pool: Dynamic Tiering
- For a Thin pool: Dynamic Provisioning
- For a Snap pool: Thin image
- For active flash: active flash

Procedure

1. On the Storage Advisor dashboard, click **Storage Systems** to see the inventory of registered storage systems.
2. Click a storage system to create a pool for it.
3. Click **Pools**.

4. Click the plus sign (**+**) to open the **Create Pool** page and click **Advanced**.



5. Enter a **Pool Label**.

   Pool labels can contain only alphanumeric characters, hyphens, and underscores. Initial hyphens are not allowed.

6. Click the **Type** list and choose one of the following; **Thin**, **Tiered**, or **Snap**.
7. Choose whether to enable active flash. Active flash enablement requires capacity from the Platinum tier.
8. Click **Tier Management** to see the definitions of disk type, capacity, and speed of each pool category.
9. Select one or more parity groups to use to create the pool. You can scroll through the parity groups to use search and filter functions.
   - For a Snap pool, select one or more parity groups with identical disk types.
   - For a Thin pool, select one or more parity groups with identical disk types.
   - For a Tiered pool, select one or more parity groups with two or three disk types.

   Storage Advisor shows the total size of the pool using the selected parity groups.

10. Set the utilization thresholds, or use the default threshold settings. The subscription limit can be set above 100%. Select the **Subscription Limit %** checkbox to set the limit to Unlimited.

    The thresholds are used as the Warning and Critical thresholds for Capacity Monitoring.

11. Click **Submit.**

Result

A job is started to allocate the storage capacity and create the pool.

Next steps

- Check the status of the pool-creation job by clicking Jobs.
- Create volumes.

Related concepts

- Creating parity groups on page 29

Related tasks

- Creating a pool, basic method on page 40
- Creating volumes to attach to servers on page 46

Pool details

To access pool details, click Storage Systems. Then click a storage system to view all resources. Click Pools and then click a pool tile.

Note: A External pool cannot be edited or deleted.

On the pool details page, you can do the following:

- View the attributes of the pool.
- View a graph of utilization and thresholds.
- If the pool is based on a parity group using accelerated compression ("FMD DC2 Compression"), you can also view compression details, including expansion ratio and compression ratio.
- View tier information for the pool.
  You can view:
  - Tier management status
    This is set to Automatic when the pool is created in Storage Advisor. To change this mode to Manual you must edit the pool using the SVP.
  - Monitoring mode
    Displays the monitoring mode set for the HDT Pool. This is set to Continuous when the pool is created in Storage Advisor. To change the mode to Periodic, you must edit the pool using the SVP.
  - Tier usage information
    Displays the HDT Pool tier usage for the pools supported on the storage system. Storage Advisor supports Bronze, Silver, Gold, and Platinum tiers.
    For each tier, you can display statistics for used capacity, performance utilization, and buffer space.
- View volumes carved from the pool and perform operations on them. Operations available include deletion, updating, attaching and detaching to and from servers, protecting, unprotecting, and restoring. Click a volume in tile or list view to open the detail page for the volume.
  The Provisioning Status can be any of the following:
  - Attached: the volume is attached to a server.

- Unattached: the volume is not attached to a server.
- Unmanaged: the volume has only a LUN path associated. For example, a volume may be attached to a server that is not known to Storage Advisor.

The Data Protection can be any of the following:
- Protected: the volume is protected.
- Unprotected: the volume is not protected.
- Secondary: the volume is a snapshot or clone of another volume.

- If the volume uses compression or deduplication and compression, you can view the compression ratio and deduplication ratio.
- Delete the pool.
- Edit the pool configuration by clicking the pencil icon to open the Update Storage Pool page.
  Once a pool is created, you can edit the pool label or expand the pool. Basic and advanced options, similar to those for pool creation, are available for pool expansion. The basic option includes choices for a new/expanded pool size based on the current set of parity groups in the pool. You can choose to expand an existing tier in the pool or add a new tier to the pool. If you add a tier to a thin pool, it will be expanded and converted into a tiered pool. Using the advanced option enables you to add more parity groups to the pool and increase capacity.

Note: To expand a Thin pool, you must add a parity group of the same RAID layout, the same disk type, the same RAID level, and the same disk speed.

Click Submit to update the window and start a job that will update the pool.

Related concepts

- Enabling accelerated compression in Storage Advisor on page 37

Create and attach volumes to servers

You can create volumes and attach them to servers and then apply data protection in a single workflow by first selecting a server.

Creating volumes to attach to servers

Start the create-and-attach workflow by selecting a server and creating volumes.

When you create volumes in Storage Advisor you can:
- Create multiple volumes of the same size or different sizes at the same time.

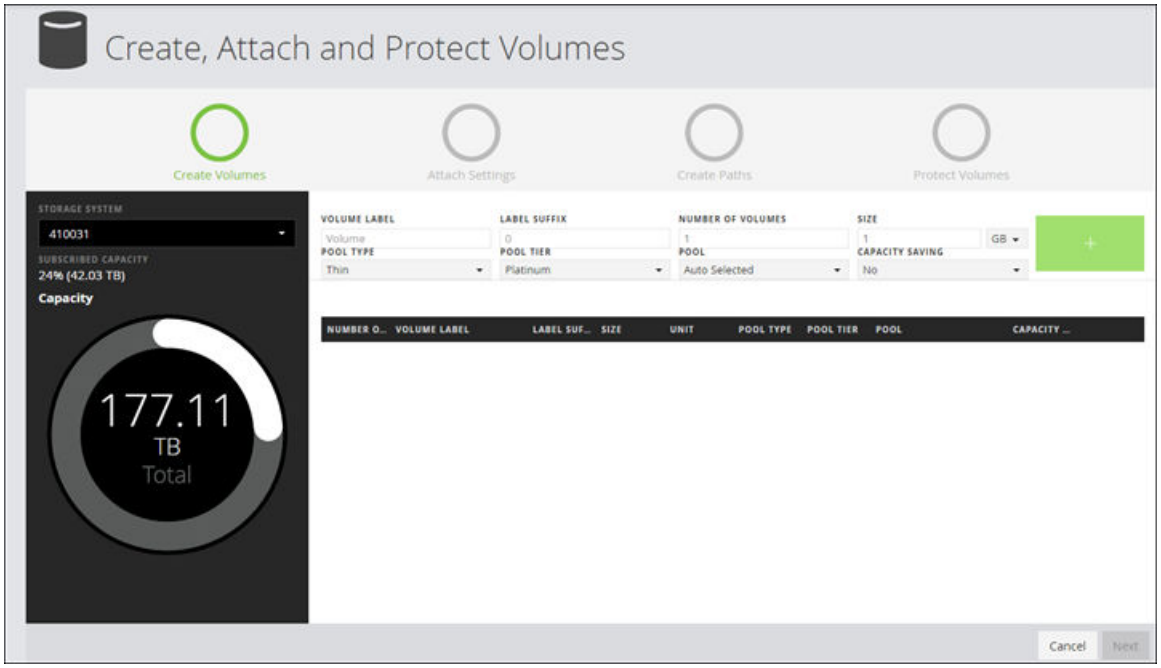
- Select the specific pool for volume creation or let Storage Advisor automatically select the best pool based on utilization.
- Specify a common label and starting label suffix for identical volumes that are the same size and have the same pool requirement.

Before you begin

- Create parity groups.
- Create pools.
- Add servers.

Procedure

1. On the Storage Advisor dashboard, click **Servers** to see the inventory of servers.
2. Do one of the following to open the **Create, Attach and Protect Volumes** page:
   - Select a server, click **Attach Volumes**, and select **Create, Attach, and Protect Volumes**.
   - Click a server tile to open the **Server <*ID*>** details page. Click the cylinder icon ( ) in the upper right area and select **Create and Attach Volumes**.



3. Configure volumes for the specified storage system.

   You can switch to another storage system by using the drop-down **Storage System** list.

   a. Select the number of volumes.
   b. Enter the volume label and select a suffix for it.
   c. Select the size.

d. Select the volume unit: **GB**, **TB**, or **PB**.
e. Select the pool type: **Thin** or **Tiered**.
f. For a Thin pool, select the tier: **Platinum**, **Gold**, **Silver**, or **Bronze**.
   If the storage system has available capacity from external storage, you can also select the **External** tier.
g. (Optional) Select the pool from the list of available pools. The default selection is **Auto Selected**, which means that Storage Advisor selects the best pool for provisioning the volume based on utilization and tier requirements.

4. If desired, select a type of **Capacity Saving**: **Compression** or **Deduplication and Compression**.
5. When you have made your choices, click the plus sign (**+**) to add volume row to the list of volumes that will be created. Add more rows as needed.
6. Click **Next** to be directed to attach volumes to the selected servers.

Related concepts

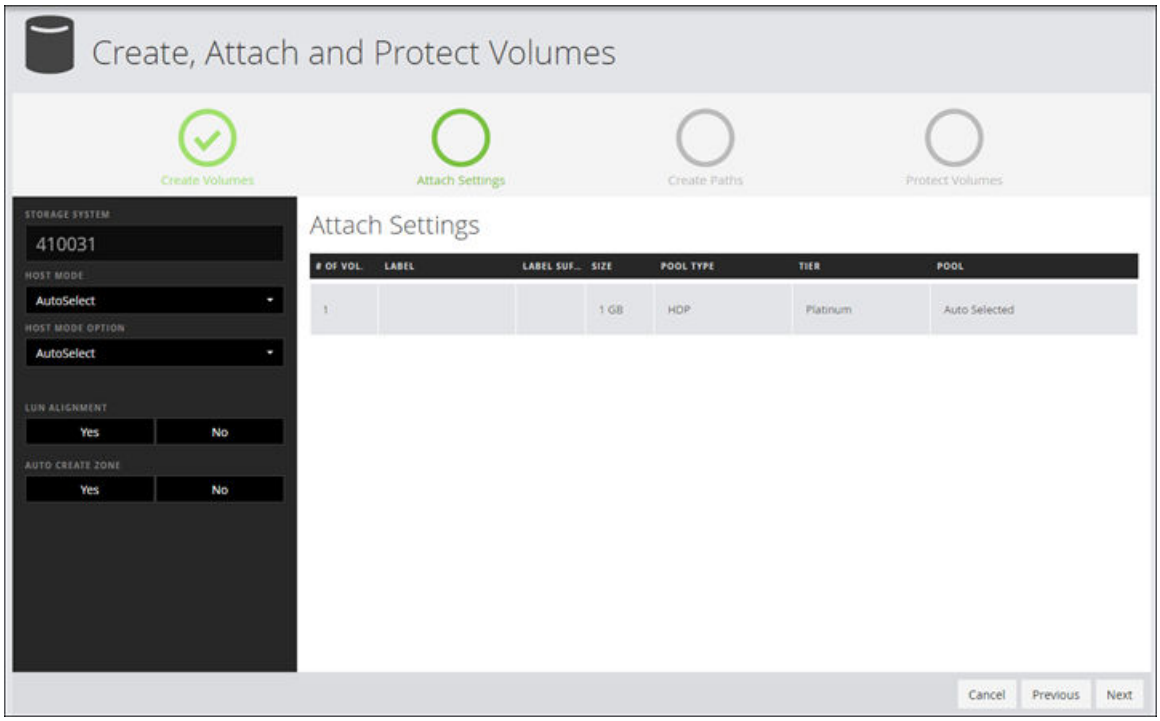
- Creating parity groups on page 29
- Creating a pool on page 38

Related tasks

- Adding servers on page 58
- Monitoring jobs on page 97
- Attaching existing volumes to a server on page 65

Attaching newly-created volumes to servers

Storage Advisor provides options as part of the attachment of the new volumes to a single server or multiple servers.



Procedure

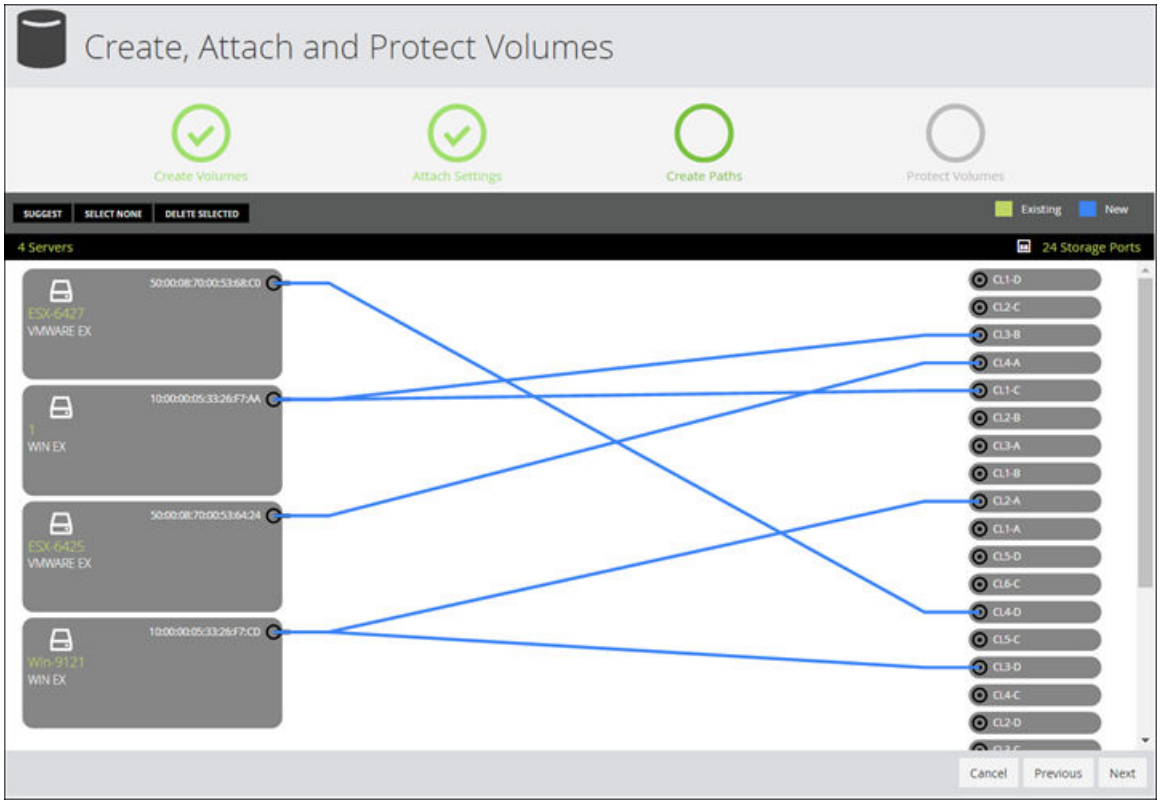
1. The **Host Mode** is set by default to the server operating system. You can make a selection if needed.

   The server OS Type is provided when the server is added to Storage Advisor.
2. The prepopulated **Host Mode Option** will depend on the **Host Mode** selection. The default Host Mode Option can be changed manually.

   Default values are set only for **VMWARE EX** and **WIN EX** host modes. The default for all other Host Modes is none.

   Storage Advisor identifies all host groups containing any of the server WWNs. If all of those host groups have the same host mode and host mode options, those settings are prepopulated with the same settings in the host groups.
3. Select the **LUN Alignment**.

   By default, Storage Advisor uses the LUN number that is common to the servers. If attachment is to only one server, this setting has no effect.
4. The **Auto Create Zone** is set to **No** by default. You can set it to **Yes** to automatically create zones.
5. Click **Next** to view options for creating and editing LUN paths.



6. In the **Create Paths** panel, you can view servers and their WWNs, along with ports on the storage system. Storage Advisor will scan for existing host groups on the storage array and attempt to reuse them by default.

   The following options are available for managing LUN paths:

   - Existing paths are populated as follows: all existing host groups with one or more server WWN and the exact same host mode and host mode options selected on the Attach Settings panel are populated as paths.

     To prevent the volume from being added to an existing path, click the path to highlight it and click **Delete Selected**.
   - Click **Suggest** to populate automatically selected paths. By default, the least-used ports are selected. Suggest paths requires that both server and storage ports be logged into the fabric switches in the Storage Advisor inventory.
   - To manually create a path, click a WWN and a port to connect them with a blue connector line. Click the connector again and then click **Delete Selected** to delete the connection.

7. When you are satisfied with the paths, click **Next** to view options for protecting volumes.

Related concepts

- Data protection on page 83

Managing storage systems

Access the storage system details page for an overview of registered storage systems. If you need to configure the storage system, you will need to access the service processor with Device Manager - Storage Navigator.

Storage system inventory

From the dashboard, click Storage Systems to access the Storage Systems page for an overview of registered storage systems.



The Storage Systems page includes a summary section identical to the summary on the dashboard. This includes monitoring tiles, capacity summary and data protection summary.

You can search for a specific storage system by searching for its serial number in the search box. You can also use various filters to find a specific storage systems.

From the storage systems page you can view and manage individual storage systems.

View storage system details in either a tile view or a list view. Capacity utilization is represented by a color bar:

- Green: Below 70%.
- Orange: From 70% to 80%.
- Red: Over 80%.

The following actions are available:

- Click a storage system to view details in the Storage System *<serial number>* page, where you can also access and manage the associated parity groups, pools, volumes, and ports.
- To delete a storage system, select it and click Delete.

- To edit the user name and password for a storage system, select it and click Edit to open the Update Storage System *<serial number>* page.

Storage system details

View details about a storage system and access resources.

On the dashboard, click Storage Systems and then click a Storage System <serial number> tile.



On a storage system detail page, you can do the following:

- Click Delete to delete the storage system. This action is available only to users with the SystemAdministrator role.
- Click Edit to update the storage system user name and password. This action is available only to users with the SystemAdministrator role.
- Click Settings in the upper-right corner to launch either of the following:
  - Device Manager - Storage Navigator to perform any advanced storage management operations that are not available in Storage Advisor.
  - Configure storage system encryption using Storage Navigator.
  - If the storage system includes optional NAS modules, you can launch NAS Manager to perform operations that are not available in Storage Advisor.
- Review the information gauge regarding available capacity in storage system.
- Use the Alerts tiles to access alerts related to the storage system.
- Click Review Tiered Categories to open the Tier Management page to view and edit tier categories.
- View attributes about the storage system, including information that Storage Advisor discovered about the system, such as model, serial number, and SVP IP address.

Field	Description
Model	Model name of the storage system.
S/N	Storage system serial number.
FW Version	Firmware version.
HORCM Version	01-33-03/06 A data replication component residing on the server.
Cache Capacity	Total cache capacity configured on the storage system.
Unused Disks	Disks that are not assigned as hot spares or used to create parity groups.
Unused Disk Capacity	Total unused capacity of all disks.
SVP IP Address	Address of the service processor on the storage system.
Maintenance Utility IP Addresses 1 and 2	Configured automatically when the storage system is onboarded.

- If you notice that the number of unused disks and unused disk capacity is too high, it implies that you have additional raw capacity in the system that can be converted into usable capacity by creating parity groups. Click Create Parity Groups to configure unused disks into parity groups.
- View the total and unused disk capacity for the different pool tiers.

- Click Review Tiered Categories to open the Tier Management page, where you can view the tier definitions and edit their names.
- Click a tile in the lower portion of the page to display the details for parity groups, pools, volumes, or ports for the storage system.

Related concepts

- Tier management on page 57

Using Device Manager - Storage Navigator for advanced storage configuration

Device Manager - Storage Navigator is the element manager for a supported storage system block module. It is a factory-installed application running on the SVP, which is directly connected to the storage system. You can access Device Manager - Storage Navigator from the Storage System details page for advanced configuration options while performing management operations such as remote replication, volume migration, and resource group management with Storage Advisor.



Note: If you use Device Manager - Storage Navigator to manage resource groups, make sure that the user who adds storage systems in Storage Advisor has access to all custom resource groups and meta resource groups.

Use the Device Manager - Storage Navigator online help to obtain procedure information for advanced storage configuration tasks.

Accessing Device Manager - Storage Navigator

Launch Device Manager - Storage Navigator or from the Settings menu available in the Storage System details page. In the login dialog, use the user account assigned to you by your security administrator. The tasks that you can do on the system depend on the user role assigned to the user groups to which you belong.

In the login dialog, use the user account assigned to you by your security administrator. The tasks that you can do on the system depend on the user role assigned to the user groups to which you belong. Security administrators with view and modify privileges are responsible for setting up user accounts in Device Manager - Storage Navigator.

Refer to the Roles table for roles that are available for use in Device Manager - Storage Navigator and the permissions that each role provides to the users.

Roles

The following table shows all the roles that are available for use and the permissions that each role provides to the users. You cannot create a custom role.

Role	Capabilities
Security Administrator (View Only)	• Viewing information about user accounts and encryption settings • Viewing information about the encryption key in the key SVP
Security Administrator (View & Modify)	• Configuring user accounts • Creating encryption keys and configuring encryption settings • Viewing and switching where encryption keys are generated • Backing up and restoring encryption keys • Deleting encryption keys backed up in the key SVP • Viewing and changing the password policy for backing up encryption keys on the management client • Connection to the external server • Backing up and restoring connection configuration to the external server • Configuring the certificate used for the SSL communication • Configuring the fibre channel authentication (FC-SP) • Configuring resource groups • Editing virtual management settings • Setting reserved attributes for global-active device
Audit Log Administrator (View Only)	• Viewing audit log information and downloading audit logs
Audit Log Administrator (View & Modify)	• Configuring audit log settings and downloading audit logs
Storage Administrator (View Only)	• Viewing storage system information
Storage Administrator (Initial Configuration)	• Configuring settings for storage systems • Configuring settings for SNMP • Configuring settings for e-mail notification • Configuring settings for license keys • Viewing, deleting, and downloading storage configuration reports • Acquiring all the information about the storage system and updating Device Manager - Storage Navigator window by clicking Refresh All
Storage Administrator (System Resource Management)	• Configuring settings for CLPR • Configuring settings for MP unit • Deleting tasks and releasing exclusive locks of resources • Configuring LUN security • Configuring Server Priority Manager • Configuring tiering policies
Storage Administrator (Provisioning)	• Configuring caches • Configuring volumes, pools, and virtual volumes • Formatting and shredding volumes • Configuring external volumes • Configuring Dynamic Provisioning • Configuring host groups, paths, and WWN • Configuring Volume Migration except splitting Volume Migration pairs when using CCI • Configuring access attributes for volumes • Configuring LUN security • Creating and deleting quorum disk used with global-active device • Creating and deleting global-active device pairs
Storage Administrator (Performance Management)	• Configuring monitoring • Starting and stopping monitoring

Role	Capabilities
Storage Administrator (Local Copy)	• Performing pair operations for local copy • Configuring environmental settings for local copy • Splitting Volume Migration pairs when using CCI
Storage Administrator (Remote Copy)	• Remote copy operations in general • Operating global-active device pairs (except for creation and deletion)
Support Personnel (Vendor Only)	Configuring the SVP • Normally, this role is for service representatives.
Support Personnel (User)	• Viewing storage system status • Installing OS security patches • Updating operating systems • Performing basic maintenance

Using NAS Manager for advanced file storage configuration

NAS Manager is the element manager for NAS modules. It is a factory-installed application running on the NAS modules. You can access NAS Manager from the Storage System details page for advanced configuration options while performing management operations such as data protection, server settings and network configuration.

Use the NAS Manager online help to obtain procedure information for advanced file storage configuration tasks.

Accessing NAS Manager

Launch NAS Manager from the Settings menu available in the Storage System details page. In the login dialog, use the user account assigned to you by your administrator. The tasks that you can do on the system depend on your user role.

Refer to the Administrator types and responsibilities list for roles that are available for use in NAS Manager and the permissions that each role provides to the users.

Administrator types and responsibilities

This section describes the types of NAS storage system administrators and defines their expected roles in managing the system and the associated storage subsystems.

- **Global Administrators** can manage everything in the system: file systems, file services, or file system related features and functions, storage devices and their components. Also, the Global Administrator creates and manages SMU user profiles (Server Administrators, Storage Administrators, Server+Storage Administrators, and other Global Administrators). Global Administrators also control what servers and storage devices each administrator can access.

- **Storage Administrators** manage storage devices, as specified in the administrator profile created by the Global Administrator.
  Storage Administrators can manage only storage devices and their components (racks, physical disks, SDs, and storage pools). Storage Administrators cannot manage file systems, file services, or file system related features and functions, and they cannot manage users.
- **Server Administrators** manage servers and clusters, as specified in the administrator profile created by the Global Administrator. Server Administrators cannot manage storage devices.
  Server Administrators can manage file systems and file services such as CIFS Shares, NFS Exports, and they can manage file system related features and functions such as snapshots, quotas, and migration policies and schedules.
- **Server+Storage Administrators** manage servers, clusters, and storage devices, as specified in the administrator profile created by the Global Administrator.
  Server+Storage administrators can manage everything Server Administrators and Storage Administrators can manage: file systems, file services, or file system related features and functions, and they can also manage storage devices and their components.

All administrators can connect to the NAS storage system through NAS Manager, the browser-based management utility provided by the system management unit (SMU). Additionally, Global Administrators can connect to the SMU command line interface (CLI).

Note: Server Administrators, Storage Administrators, and Server+Storage Administrators are not able to access all of the NAS Manager pages that a Global Administrator can access.

Tier management

The Tier Management page displays the tier definitions. You can edit the tier names (Platinum, Gold, Silver, Bronze, and External).

Access the Tier Management page in one of these ways:

- Click **Settings** and select **Tier Management**.
- In the detail page for a storage system, click **Tier Management**.

Updating a storage system

Update the user name and password for a storage system. This action requires the SystemAdministrator role be assigned to the user.

Procedure

1. Access the **Update Storage System *<serial number>*** page one of these ways:

- On the **Storage Systems** page, select a storage system and click **Edit**.
- On the **Storage System <*serial number*>** page, click **Edit**.

2. Edit the **Username** or **Password** and click **Submit**.

Managing servers

Storage Advisor supports provisioning storage to a group of server WWNs by allowing logical servers to be managed by Storage Advisor. Once servers are onboarded in Storage Advisor, storage volumes can be provisioned to the servers by creating Host Storage Domains and optionally creating zones to provide a path between the storage volume and server.

Adding servers

Add servers so you can attach volumes. You can add multiple server parameters from a file, or add one server at a time.

There are two methods of adding servers:

- Manually add information for one server at a time.
- Import a CSV (comma-separated values) file with information for one server in each row.
  The CSV file must have the following headings, in the order specified: Name, Description, IPAddress, OSType, WWNs (comma separated list of WWNs). All fields are required except Description and IPAddress. Valid OSType values are as follows:
  - AIX
  - HP_UX
  - LINUX
  - NETWARE
  - OVMS
  - SOLARIS
  - TRU64
  - VMWARE
  - VMWARE_EX
  - WIN
  - WIN_EX

Procedure

1. On the Storage Advisor dashboard, click **Servers**. Then click the plus sign (**+**) to open the **Add Server** page.
2. On the **Add Server** page, do one of the following:
   - Click the upper plus sign (**+**) to browse for the CSV file or drag the file to the plus sign. The values from the file will populate the page.
     Example:

```
Name,Description,IPAddress,OSType,WWNS
Esxi,ESXI HOST,10.30.90.200,VMWARE_EX,
10:00:00:05:33:26:f7:21
Win,WINDOWS HOST,
10.30.91.80,WIN_EX,"10:00:00:05:33:26:f7:37,10:00:00:05:33:
26:f7:36"
ESXi_Cisco_1,ESXi HOST connected to Cisco
Fabric,,VMWARE_EX,"10:00:00:05:33:26:e0:fc,
10:00:00:05:33:26:e0:fd"
ESXi_Cisco_2,ESXi HOST connected to Cisco
Fabric,,VMWARE_EX,"100000053326df1a,100000053326df1b"
```

- Click the plus sign (**+**) in the table to add a row and enter a **Name**, **Description** (optional), **IP Address** (optional), **OS Type**, and **WWN**. You can add more servers by clicking the plus sign.

3. Click **Submit** to add the servers.

Result

A job is started to add the servers.

Next steps

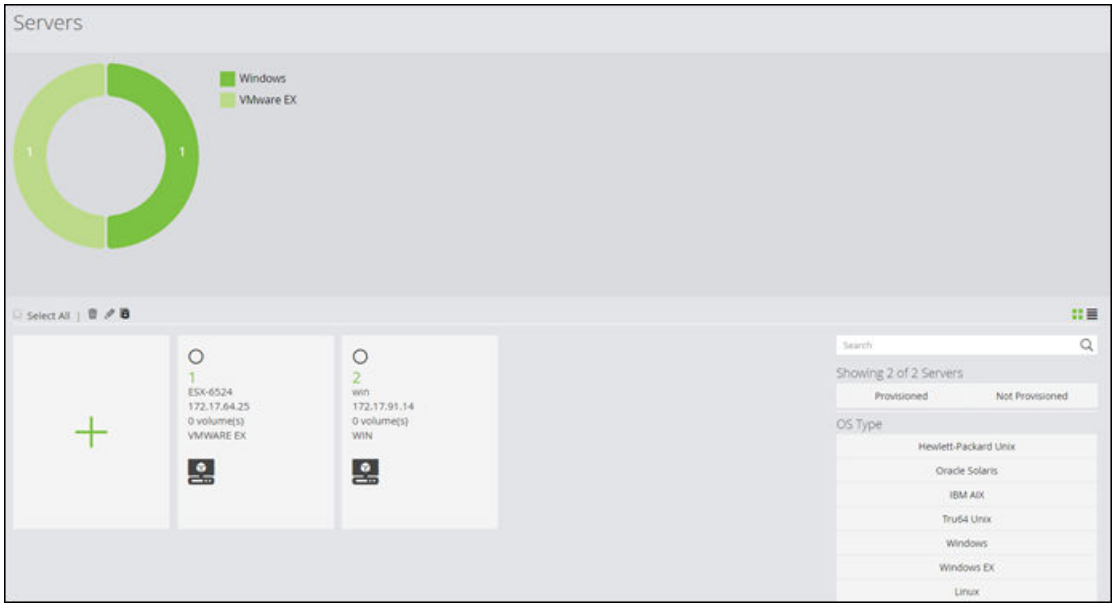
Create volumes and attach them to the server.

Related concepts

- Server inventory on page 59
- Create and attach volumes to servers on page 46

Server inventory

The Servers page displays all servers and includes a graphic summary based on operating systems.



To find the server you are looking for, you can either search by server ID or narrow down the list of servers using filters available.

You can click server tiles on this page to access details of individual servers and manage their volumes.

The following actions are available on this page:

- To add a server, click the plus sign (+) to open the Add Servers page.
- You can select one or more servers and perform the following actions:
  - Click Delete to delete the server.
  - Click Edit to update server parameters.
  - Click Create and Attach Volumes to use the provided workflow to create new volumes, attach them to the server, and optionally, protect the volumes.
  - Click Attach Existing Volumes to attach existing volumes to the server.

Related tasks

- Adding servers on page 58

Related references

- Server details on page 60

Server details

The Server details page provides you all the details about the server as well as a list of volumes, if any, attached to the server.

This page also shows path details for every volume attached to the server, including the storage ports and server WWNs used to create HSDs as well as the host mode options set up on the HSD.

You can perform server actions such as removing the server, editing the server or provisioning volumes to server by attaching existing volumes or creating and attaching new volumes.

You can perform volume operations such protecting or detaching volumes.

On the dashboard, click Servers to open the Servers inventory page. Then click a server tile to open the Server <*ID*> detail page for the selected server.

You can perform the following actions at the server level:

- Click Delete to remove the server.
- Click Edit to update server parameters.
- Click the cylinder icon ( ) and select one of the following:
  - Attach Existing Volumes to attach volumes to the server.
  - Create and Attach Volumes to create volumes and attach them to the server.

The following actions are available for volumes:

- If there is a Data Protection Failed alert, you can click it to see failed data protection jobs on the Data Protection Monitoring page.
- Click Edit to rename a volume on the Update Volume page. If the volume is unprotected, you can also update the size.
- Click Edit LUN Path to open the Edit Paths page where you can update LUN paths.
- Click Detach Volumes to detach volumes from the server.
  Before confirming, you can choose whether to remove SAN zones.
- Click Protect Volumes to protect volumes using Storage Advisor data protection technologies.
- Click Unprotect Volumes to remove data protection applied to volumes.
- Click Restore Volumes to restore from a backup.

Related concepts

- Data protection on page 83

Related tasks

- Creating volumes to attach to servers on page 46
- Attaching existing volumes to a server on page 65
- Update a volume on page 68

Updating a server

You can change the parameters for an existing server.

Procedure

1. Access the Update Server page in one of these ways:
   - From the dashboard, click **Servers** to open the inventory of servers. Select a server and click **Edit**.
   - On the detail page for a server, click the pencil icon.
2. Edit the parameters and click **Submit**.
3. Edit any of the following for the server:
   - **Server Name**
   - **Description**
   - **IP Address**
   - **OS Type**
   - **Existing WWNs**
4. If needed, add new WWNs and click the plus sign to add them to the list of WWNs to be added.
5. Click **Apply changes to attached volumes** to make the following changes:
   - If a WWN has been updated, all host groups with the old WWN are updated with the new one. All zones created in Storage Advisor have the old WWN removed and new address populated.

- If a WWN is deleted, it will be removed from any host group that has it. If the host group is left with no WWNs, the entire host group is deleted. All zones created in Storage Advisor have the deleted WWN removed.
- If a WWN is added, no host groups or zones are edited. You can use Storage Advisor to add paths using the new LUN.
- Changes to name, description, IP address, or OS type do not impact host groups.

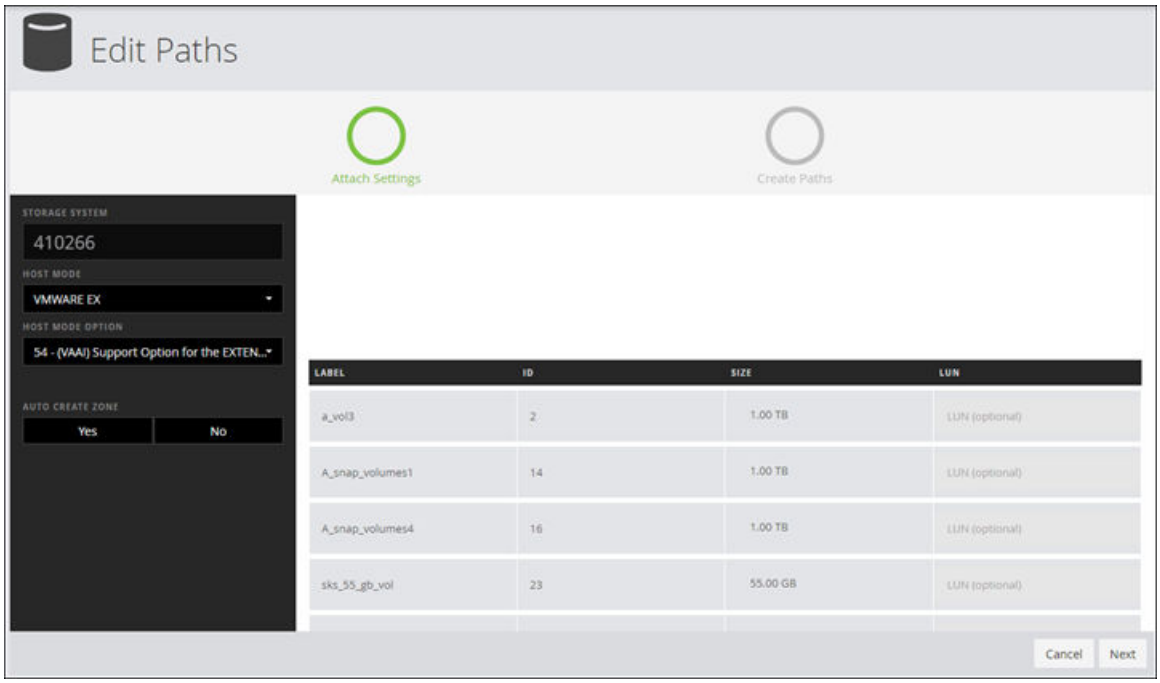
Edit LUN paths

Update LUN paths for volumes that are attached to a server.

If LUN paths become outdated, you can update them through the detail page for the server.

Procedure

1. On the dashboard, click **Servers** and click the server that needs to be updated to open the detail page for the server.
2. Select one or more volumes for which you want to edit LUN paths and click **Edit LUN Path** to open the **Edit Paths** page.



3. The **Host Mode** is set by default to the server operating system. You can make a selection if needed.

   The server OS Type is provided when the server is added to Storage Advisor.
4. The prepopulated **Host Mode Option** will depend on the **Host Mode** selection. The default Host Mode Option can be changed manually.

Default values are set only for **VMWARE EX** and **WIN EX** host modes. The default for all other Host Modes is none.

Storage Advisor identifies all host groups containing any of the server WWNs. If all of those host groups have the same host mode and host mode options, those settings are prepopulated with the same settings in the host groups.

5. **Auto Create Zone** is set to No by default. You can set it to Yes to automatically create zones.
6. Click **Next.**
7. In the **Edit Paths** page, you can view servers and their WWNs, along with ports on the storage system.

   Storage Advisor will scan for existing host groups on the storage system and attempt to reuse them by default. The following options are available for managing LUN paths:
   - Existing paths are populated as follows: all existing host groups with one or more server WWNs and the exact same host mode and host mode options selected on the **Attach Settings** panel are populated as paths.
   - To prevent the volume from being added to an existing path, click the path to highlight it and click **Delete Selected**.
   - To manually create a path, click a WWN and a port to connect them with a blue connector line. Click the connector again and then click **Delete Selected** to delete the connection.
8. When you are satisfied with the paths, click **Submit**.

Managing volumes

A volume is a single accessible storage area, created in a pool within a parity group on a storage system. Create a volume and manage its properties with Storage Advisor

About capacity saving

Capacity saving reduces the used capacity of volumes.

Hitachi Storage Advisor allows you to use capacity saving when you create or update a volume.

A capacity saving volume is a dynamically provisioned volume (DP-Vol) that is capable of compression or both deduplication and compression.

Storage Advisor offers the following capacity saving options:

- Compression
  Compression allows you to reduce the used capacity of your volume.
- Deduplication and compression
  Deduplication identifies duplicate data blocks in order to remove redundancy and is done in addition to data compression.

- No
  No data compression or deduplication is done.

Related tasks

- Creating volumes on page 64

Creating volumes

Create volumes for a registered storage system so you can attach them to a server.

When you create volumes in Storage Advisor you can:

- Create multiple volumes of the same size or different sizes at the same time.
- Select the specific pool for volume creation or let Storage Advisor automatically select the best pool based on utilization.
- Specify a common label and starting label suffix for identical volumes that are the same size and have the same pool requirement.
- Set up compression, or deduplication and compression for the volume.

Before you begin

- Create parity groups.
- Create pools.
- Add servers (optional).

Procedure

1. On the Storage Advisor dashboard, click **Storage Systems** to see the inventory of storage systems and capacity information.
2. Click a storage system to see its configuration of servers, pools, ports, volumes, and parity groups.
3. Click **Volumes** to see the inventory of configured volumes for the storage system.
4. Click the plus sign (**+**) to open the **Create Volumes** page.
5. Configure volumes for the specified storage system.
   a. Enter the volume label (required) and select a suffix for it.
   b. Select the number of volumes.
   c. Select the size.
   d. Select the volume unit: **GB**, **TB**, or **PB**.
   e. Select the pool type: **Tiered** or **Thin**.
   f. For a Thin pool, select the **Tier**.
      If the storage system has available capacity from external storage, you can also select the **External** tier.
   g. If you select Thin pools, you can select **Compression**, **Deduplication and Compression**, or **No** from the **Capacity Saving** drop down list.

h. (Optional) Select the pool from the list of available pools. The default selection is **Auto Selected**, which means that Storage Advisor selects the best pool for provisioning the volume based on utilization and tier requirements.

6. Click the plus sign to move the configured volume to the lower portion of the **Create Volumes** page.

   A blank row appears at the top of the page where you can create more volumes.

7. Click **Submit**.

Result

A job is started to create the volumes and add them to the volume inventory for the storage system.

Next steps

- Check the status of the volume-creation job by clicking Jobs.
- Attach volumes to a server.

Related tasks

- Creating parity groups on page 29
- Creating a pool on page 38
- Adding servers on page 58

Related references

- Volume details on page 90

Attaching existing volumes to a server

If there are volumes that have not been attached to servers, you can use this procedure to attach them.

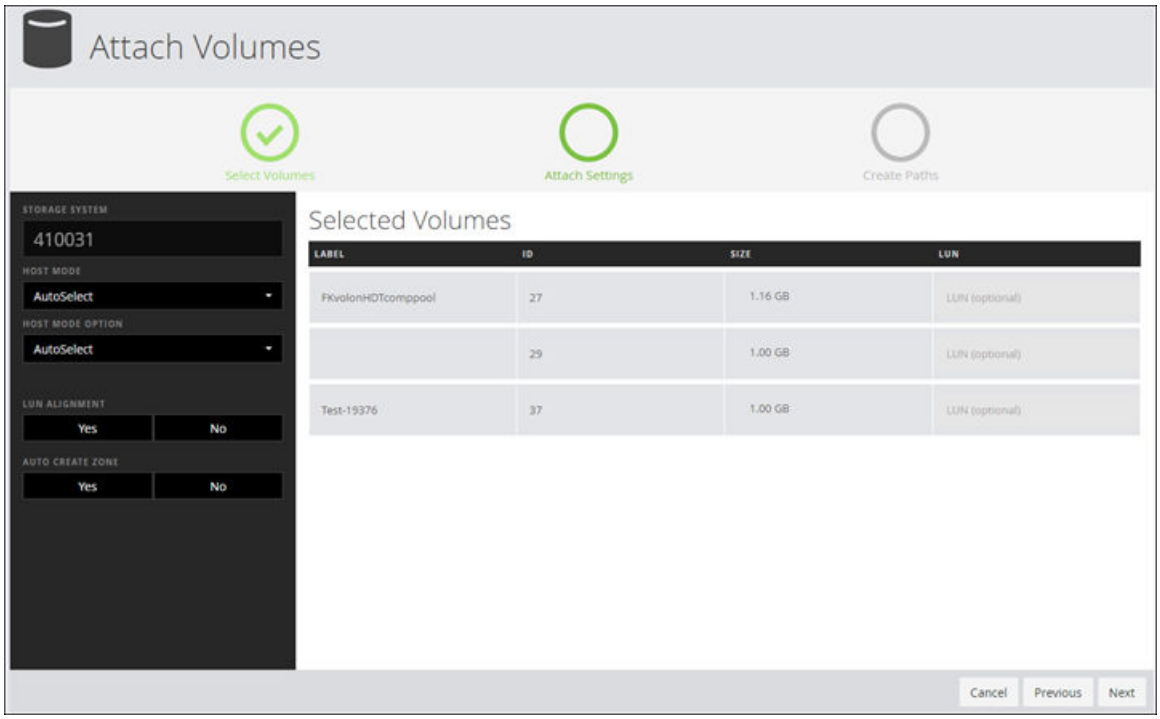
Before you begin

- Enable security on ports.
- Add servers.
- Create volumes.

Procedure

1. To select volumes and servers, do one of the following:
   - On the **Volumes** inventory page for a storage system, select one or more volumes and click **Attach Volumes** to select servers on the **Attach Volumes** page.
   - On the **Servers** inventory page, select one or more servers and click **Attach Volumes** to select volumes on the **Attach Volumes** page.
   - On the detail page for a pool, select one or more volumes and click **Attach Volumes** to select servers on the **Attach Volumes** page.

2. Click **Next** to view options for attaching existing volumes.



3. The **Host Mode** is set by default to the server operating system. You can make a selection if needed.

   The server OS Type is provided when the server is added to Storage Advisor.

4. The prepopulated **Host Mode Option** will depend on the **Host Mode** selection. The default Host Mode Option can be changed manually.

   Storage Advisor identifies all host groups containing any of the server WWNs. If all of those host groups have the same host mode and host mode options, those settings are prepopulated with the same settings in the host groups.

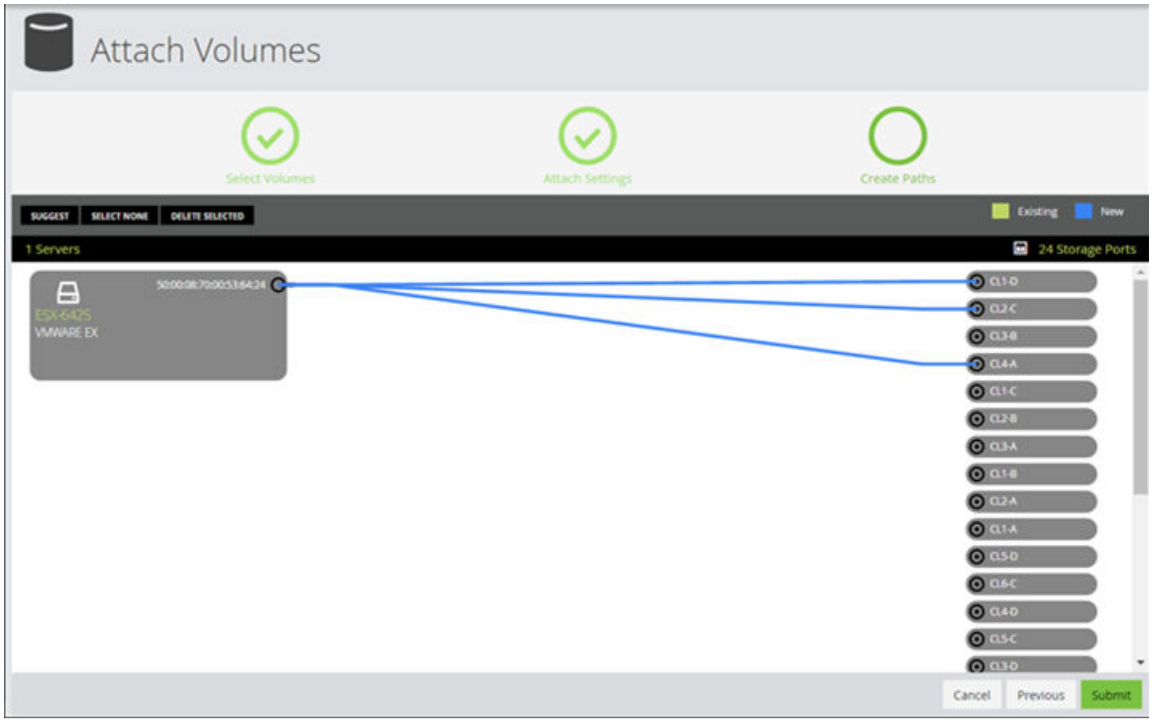
   Default values are set only for **VMWARE EX** and **WIN EX** host modes. The default for all other Host Modes is none.

5. Select the **LUN Alignment**.

   By default, Storage Advisor uses the LUN number that is common to the servers. If attachment is to only one server, this setting has no effect.

6. The **Auto Create Zone** is set to **No** by default. You can set it to **Yes** to automatically create zones.

7. Click **Next** to view options for creating and editing LUN paths.



8. In the **Create Paths** panel, you can view servers and their WWNs, along with ports on the storage system. The following options are available for managing LUN paths:

   Storage Advisor will scan for existing host groups on the storage array and attempt to reuse them by default. The following options are available for managing LUN paths:

   - Existing paths are populated as follows: all existing host groups with one or more server WWN and the exact same host mode and host mode options selected on the Attach Settings panel are populated as paths.

     To prevent the volume from being added to an existing path, click the path to highlight it and click **Delete Selected**.
   - Click **Suggest** to populate automatically selected paths. By default, the least-used ports are selected.
   - To manually create a path, click a WWN and a port to connect them with a blue connector line. Click the connector again and then click **Delete Selected** to delete the connection. Suggest paths requires that both server and storage ports be logged into the fabric switches in the Storage Advisor inventory.
9. When you are satisfied with the paths, click **Submit**.

Related tasks

- Enabling or disabling port security on page 26
- Adding servers on page 58
- Creating volumes on page 64

Update a volume

You can expand an unprotected volume and rename any volume.

Procedure

1. Navigate to details for a single volume in one of these ways:
   - From the dashboard, click **Storage Systems** and then click a storage system tile to view its resources. Click **Volumes** and then click the volume tile for the volume you want to update.
   - From the dashboard, click **Servers** and then click a server tile to view its volumes. Click a volume tile for the volume you want to expand.
2. On the **Volume <*ID*>** page click **Edit** to open the **Update Volume** page.

   Note: To reset a volume to the default settings, click **Reset**.

3. You can rename the volume, and if it is unprotected, you can change the size by clicking the up and down arrows next to the volume size.
4. Select **Compression**, **Deduplication and Compression**, or **No** to change the capacity saving type.
5. Click **Submit**.

Result

A job is started to update the volume.

Volumes inventory

The Volumes page enables you to filter, sort, and edit volumes for a single storage system, and to select volumes for data protection.

Access the inventory of volumes for a storage system to gain insight into volume size, data protection and utilization. You can also create volumes, attach existing volumes and perform data protection operations.

View volume details in either a tile view or a list view. Capacity utilization is represented by a color bar:

- Green: Below 70%.
- Orange: From 70% to 80%.
- Red: Over 80%.

Note: Volumes labeled HSA-reserved are created automatically when file pools are created and no operations can be performed on them in Storage Advisor.

The following actions are available on this page:

- If there are Data Protection Alerts, click the tile to view the alerts in the Monitoring tab.
- Click the plus sign (+) to add volumes on the Create Volumes page.
- Click a volume to view details and attach, update or delete the volume.
- Select a volume and click Edit to update the volume by editing the name. If the volume is unprotected you can also expand the capacity.
- Select one or more volumes to perform one of the following actions:
  - To delete volumes, click Delete. When you delete a volume, it is de-provisioned and removed from the storage system.
  - To attach existing volumes to one or more servers on the Attach Volumes page, click Attach Volumes.
  - To apply data protection on the Protect Volumes page, click Protect Volumes.
  - To suspend data protection, click Suspend.
  - To resume data protection following suspension, click Resume.
  - To unprotect a volume, select it and click Unprotect.

    Note: A volume in an "External" replication group cannot be unprotected.

  - To restore a secondary volume to the primary volume, click Restore to open the Restore Volume page.

Opening the Volumes inventory page in Storage Navigator

Click Open the Logical Devices page in Storage Navigator to open the Volumes inventory page and:

- Create a Command Device from a volume
- Restore a blocked volume
- Migrate a volume from one pool to another

For more information, refer to the Storage Navigator online help.

Note: Any changes you make in Storage Navigator may not be reflected in Storage Advisor for a few minutes.

Related references

- Volume details on page 90

4

Configure file storage

To configure file storage, begin by creating file pools and virtual file servers. You need both to create file systems.

Then create file systems and use them to create shares and exports that you can use to offer storage to users.

- Managing file pools
- Managing virtual file servers
- Managing file systems
- Managing shares and exports

Managing file pools

Storage Advisor employs the following best practices in file pool creation:

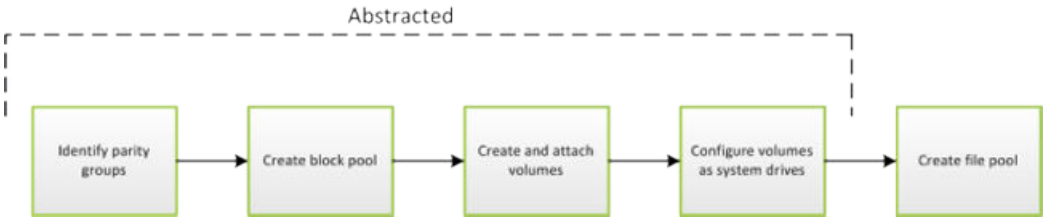
- For creation of the related block pool, use of RAID6 with a minimum of four parity groups for SAS or one parity group for SSD, FMD, or FMD DC2.

> **Note:** This best practice is highly recommended. If capacity is chosen from non-conforming parity groups during file pool creation, a warning displays.

- Creation of a Thin pool that comprises each selected tier (either one or two).
- Minimum disk requirements for file pool creation:
  - 24 disks for SAS 10K, 15K
  - 48 disks for SAS 7.2K
  - 8 disks for FMD, FMD DC2, SSD

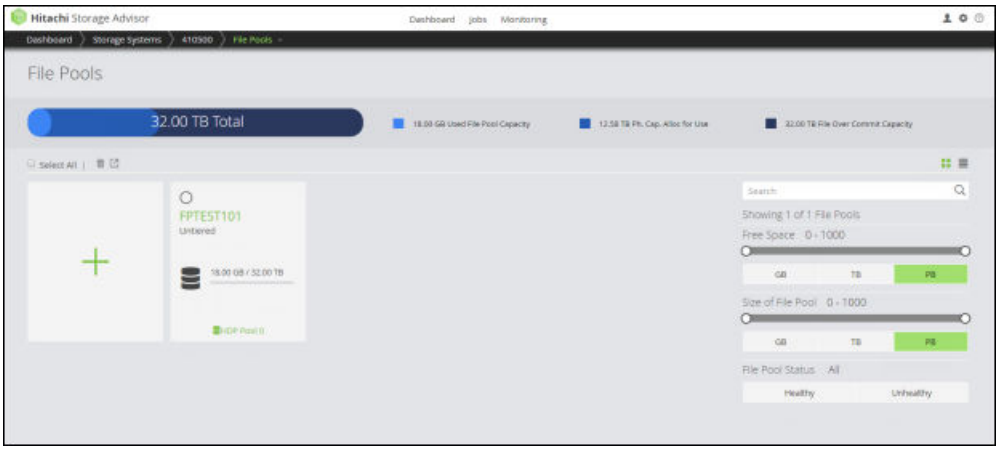
When a user creates a file pool in Storage Advisor, the system automatically performs the following operations:

1. Identifies parity groups.
2. Creates a block pool.
3. Creates volumes and attaches them to NAS modules.
4. Configures volumes as system drives.
5. Creates a file pool.



File pool inventory

Access the File Pools page from the detail page for a storage system.



Use this page to view file pool information in a tile or list view, and to delete or expand existing pools, as well as to create new pools.

The colored bars display used capacity, physical capacity allocated for use on the underlying block storage, and the file over-commit capacity. The over-commit capacity reflects the amount by which the file pool is over-subscribed.

Each tile or list row shows whether the file pool is tiered, it's File Pool Label, and capacity utilization.

The following actions are available:

- Create a new file pool by clicking the plus (+) sign to open the Create File Pool page.
- Delete one or more file pools by selecting them and clicking Delete.
- Add capacity by selecting a file pool and clicking Expand to open the Expand File Pool page.
- Open the File Pool detail page for the file pool by clicking a File Pool Label.
- Click a HDP Pool [ID] link in a tile to open the detail page for the underlying block storage pool.

Creating file pools

Create file pools to create file systems.

Before you begin

The minimum disk requirements are:

- 24 disks for SAS 10K, 15K
- 48 disks for SAS 7.2K
- 8 disks for FMD, FMD DC2, SSD

Onboard a storage system and create parity groups.

Note: Parity groups are created by a service representative.

Procedure

1. On the **File Pools** page, click the plus (**+**) sign to open the **Create File Pool** page.
2. Enter a label for the file pool.
3. In the **Select Capacity for New File Pool** pane, choose storage from one or two tiers. For a tiered pool, select Platinum and one other tier.

   Note: Best practices suggest that file over-commit capacity should be an estimated 200%. Best practices also include using RAID 6, with a minimum of four parity groups for SAS drives or one parity group for SSD, FMD, or FMD DC2 drives. If another RAID layout is selected, a warning displays.

   The information gauge displays the total capacity, with the physical block capacity and estimated over-commit capacity also detailed.

   The **Estimated Max Potential:** in IOPS displays after each type of capacity is selected.

Table 2 Tier Definitions

Pool Tier	Description
Platinum	SSD, FMD, FMD DC2
Gold	SAS 15 k
Silver	SAS 10 k
Bronze	SAS 7.2 k

4. (Optional) Adjust the Utilization Thresholds.
5. Click **Submit**.
   A job is added to create the file pool.

File pool details

Access the File Pool details page by clicking a **File Pool Label** in the File Pools page.

Use this page to view details about a file pool and to manage file systems in the pool.

You can search for a specific file system by searching for its File System Label in the search box. You can also use the Free Space and File Systems Size filters to find specific file systems, or filter by virtual file server.

View file system information in either a tile view or a list view, including capacity utilization and whether or not the file system is mounted.

Capacity utilization is represented by a color bar in each tile.

The following actions are available:

- Delete the file pool by clicking Delete.
- Expand the file pool by clicking Expand to open the Expand File Pool page.
- View details of an underlying block pool by clicking an HDP pool link in the file pool tile.
- Add a file system by clicking the plus (+) sign to open the Create File System page.
- Delete one or more file systems by selecting them and clicking Delete.
- Edit a file system by selecting it and clicking Edit to open the Update File System page where you can change the label or expand the file system.
- Select a file system and mount or unmount it.

Expanding a file pool

File pool capacity may need to be expanded when the used capacity approaches the capacity of the underlying block pool.

You can also relabel a file pool or change utilization thresholds.

To access the Expand File Pool page do one of the following:

- In the File Pools page, select a file pool and click Expand.
- In any file pool detail page, click Expand.

Procedure

1. To expand the file pool, select capacity from one of the tiers.
   An untiered file pool cannot be expanded into a tiered file pool.
2. If you want to change the file pool label, enter it in the **File Pool Label** field.
3. If you want to change utilization thresholds, use the sliders.
4. Click **Submit**.
   The job is added to the **Jobs** page.

Managing virtual file servers

Virtual file server inventory

Access the Virtual File Servers page from the dashboard or from the detail page for a storage system.

Use this page to view information about virtual file servers in a tile or list view. Use the filters to show only offline or online virtual file servers, or filter by blade number.

The following actions are available:

- Open the Create Virtual File Server page by clicking the plus (+) sign.
- Open the Virtual File Server detail page, where you can delete, edit, and enable or disable the virtual file server by clicking the virtual file server label in any tile or list row.
- Open the storage system detail page by clicking the Storage System [ID] link in any tile or list row.
- Delete one or more virtual file servers by selecting them and clicking Delete.
- Change the label for a virtual file server by selecting it and clicking Edit to access the Update Virtual File Server page.
- You can also Delete, Enable, or Disable by selecting a virtual file server and clicking the applicable icon.

Creating a virtual file server

Create virtual file servers so you can create file systems.

Before you begin

- Configure ports.
- Obtain the required IP address and subnet mask information for the virtual file server.

Procedure

1. On the **Virtual File Servers** page, click the plus sign (**+**) to open the **Create Virtual File Server** page.
2. Enter a label for the virtual file server.
3. Enter the IP address (ipv4 or ipv6) for the virtual file server.
4. Enter the subnet mask for the virtual file server.
5. Select the cluster node Gigabit Ethernet port to which the IP address for the virtual file server is assigned.
6. Click **Submit**.
   A job is added on the **Jobs** page to create the virtual file server.

Virtual file server details

Access the Virtual File Server detail page from the Virtual File Servers page.

Use this page to manage a virtual file server's file systems.

The following actions are available:

- Open the storage system detail page by clicking a Storage System [ID].

- Select a file system in either the list or tile view and do one of the following:
  - Delete the file system by clicking Delete.
  - Expand a file system or change the label on the Update File System page by clicking Edit.
  - Click Mount or Unmount to mount or unmount the file system.
  - Open the File System detail page by clicking a file system.
  - Open the detail page for the underlying file pool by clicking the File Pool link in a tile.

Managing file systems

File system inventory

Access the File Systems page from the detail page for a storage system. Use this page to view information about file systems in a list or tile view, and to manage file systems.

You can search for a specific file system by searching for its file system label in the search box. You can also use the Free Space and File Systems Size filters to find specific file systems, or filter by virtual file server.

View file system details in either a tile view or a list view, including capacity utilization and whether or not the file system is mounted.

Capacity utilization is represented by a color bar in each tile.

The following actions are available:

- View details of a file system by clicking the file system label in a tile or row to open the File System detail page.
- Add a file system by clicking the plus (+) sign to open the Create File System page.
- Delete one or more file systems by selecting them and clicking Delete.
- Edit a file system by selecting it and clicking Edit to open the Update File System page.
- Select a file system and Mount or Unmount it.
- View details of the underlying pool by clicking a File Pool label in a tile.
- View details of the related virtual file server by clicking the VFS label in a tile.

Creating file systems

Create file systems so that you can create shares on Windows and exports on Linux.

Before you begin

Create file pools and virtual file servers.

Procedure

1. Click the plus sign (**+**) on the **File Systems** page to open the **Create File System** page.
2. Select a virtual file server.
   a. Enter a label up to 255 alphanumeric characters.
   b. Select a format:
      - **4K**: This choice is best for small block random applications (Virtual Server / Virtual Desktops / Databases).
      - **32K**: This choice is best for large block sequential applications (Video, Media, Images) or when the file system is hosted on NL-SAS drives.
3. Enter capacity up to 1PB.
4. Select a pool and click **Submit**.
   A job is added to the **Jobs** page to create the file system.

File system details

Access the File System detail page from the File Systems page.

Use this page to create and manage shares and exports. You can also view information about a file system and access the associated file pool and virtual file server.

The following actions are available:

- Delete the file system by clicking Delete.
- Update label and capacity by clicking Edit to open the Update File System page.
- Mount or Unmount the file system by clicking Mount or Unmount.
- Access the file pool where the file system was created by clicking the File Pool [ID] link in the tile.
- Access the virtual file server where the file system was created by clicking the virtual file server label in the tile.
- Create a share or export by clicking the plus sign (+) to open the Create Shares/Exports page.
- Delete a share or export by selecting it and clicking Delete.
- Update a share or export by selecting it and clicking Edit to open the Update Share or Update Export page.

Updating a file system

Update a file system to re-label or expand it.

Procedure

1. On the **File Systems** page, select a file system and click **Edit** to open the **Update File System** page.
2. You can change the file system label, the capacity, or both.
   - To edit the label, enter changes in the label field.
   - To change the capacity, enter it and select a new unit of measure, if necessary.
3. Click **Submit**.
   The new job is added to the **Jobs** page.

Managing shares and exports

Shares enable file sharing in Windows and exports enable file sharing in Linux.

Shares and exports inventory

Access the inventory of shares and exports in the detail page for a storage system to view information about existing shares and exports in a tile or list view.

Use this page to add, edit, and delete shares and exports. You can also access related resources.

The following actions are available:

- To add a share or export, click the plus sign (+) to open the Create Shares/Exports page.
- To delete a share or export, select a tile and click Delete.
- To edit a share or export, select a tile and click Edit to open the Update Export page or the Update Share page.
- Click File System label in a tile to open the detail page for the file system where the share or export was created.
- Click VFS label in a tile to open the Virtual File Server detail page where the file system was created.

Creating shares and exports

Create shares and exports to offer storage capacity to users.

Procedure

1. Access the **Create Shares/Exports** page by clicking the plus sign (**+**) on the **Shares/Exports** page.
2. Enter a **File System Path** and a **Share/Export Label**.
3. Select a **File System**.

4. Create a share by selecting **Windows** or create an export by selecting **Linux**.
5. Click **Submit**.
   A job to create the share or export is added to the **Jobs** page.

Export details

Access the detail page for an export to review internal and external paths and to edit the export.

The following controls are available:

- Delete the export by clicking Delete.
- Edit the export by clicking Edit to open the Update Export page.
- Access the file system where the export was created by clicking File System.
- Access the virtual file server where the file system was created by clicking VFS.

Updating an export

You can update an export to change the file system path and access configuration.

Procedure

1. Access the **Update Export** page by clicking **Edit** in an Export detail page.
2. (Optional) Enter a new path in the **File System Path** field.
3. (Optional) In the **Access Configuration** field, enter IP addresses, host names, or the NIS netgroups of the clients who are allowed to access the NFS export (up to 5957 characters).

   If the system has been set up to work with a name server, you can enter the NIS netgroup to which the clients belong, or the client's computer name rather than its IP address (not case sensitive).

   You can also specify the required flavors of NFS security in a colon-separated list using the option (sec=<list>).

   The supported flavors are:
   - none - Connect as a null user
   - sys - The traditional security flavor used by NFS, users are not authenticated by the server
   - krb5 - Kerberos authentication
   - krb5i - Kerberos authentication with per-messaging integrity
   - krb5p - Kerberos authentication with per-message privacy

   For example: 10.1.*.*(sec=sys:krb5:krb5i)

See the mount-point-access-configuration man page for further information.

4. Click **Submit** to save any changes.
   A job is added to the **Jobs** page to update the export.

Share details

Access the detail page for an share to review internal and external paths and to edit the export.

The following controls are available:

- Delete the share by clicking Delete.
- Edit the share clicking Edit to open the Update Share page.
- Access the file system where the export was created by clicking the File System label.
- Access the virtual file server where the file system was created by clicking the VFS label.
- Add an existing Account Domain user group to the share by clicking the plus sign (+) to open the Create Groups page.

Adding existing account domain groups to a share

You can add an existing account domain group to a share. This enables you to change users permissions when they access the share.

Before you begin

The account domain group and CIFS setup must already exist.

Procedure

1. On the detail page for a share, click the plus sign (**+**) to open the **Create Groups** page.
2. In the **Group Name** field, type in a user group name from the account domain.
3. Choose permissions; **Full Control**, **Change**, or **Read**.
4. Click **Submit**.
   A job is started to add the group to the share.

Updating a share

You can update a share to change the file system path, permissions, and access configuration.

Procedure

1. Access the **Update Share** page by clicking **Edit** in a Share detail page.
2. (Optional) Enter a new path in the **Modify File System Path** field.

3. (Optional) In the **Access Configuration** field, enter IP addresses of the clients who can access the share (up to 5,957 characters allowed in this field).

What to type	Means	Example
Blank or * Partial addresses using wildcards.	All clients can access the share.	10.168.*.* Clients with matching addresses can access the share.
Specific addresses	Only clients with the specified IP address can access the share.	10.168.20.2
Specific address range	Only clients with an IP address within the specified IP address range (10.168.20.0 to 10.168.20.255) can access the share.	10.168.20.0/16
Partial addresses using wildcards	Clients with matching addresses can access the share.	10.168.*.*
Permisssions		
What to type	**Permissions granted**	
(rw)	read-write	
(ro)	read only	

Note: The order in which you specify the entries is important. Take the following two lines:

- *(ro)
- 10.1.2.38(rw)

The first grants read-only access to all clients, whereas the second grants read/write access to the specified client. The second line is redundant, however, as the first line matches all clients. You must transpose the lines to grant write access to 10.1.2.38. Examples:

- 10.1.2.38(ro) grants read-only access to the client whose IP address is 10.1.2.38.
- 10.1.2.0/24(ro) grants read-only access to all clients with an IP address in the range 10.1.2.0 to 10.1.2.255
- 10.1.*.*(rw) grants read-write access to all the matching clients.

4. (Optional) Select the supplied **Everyone** group and select permissions.
5. Click **Submit** to save any changes.
   A job is added to the **Jobs** page to update the share.

5

Data protection

Data protection refers to replication of volumes. Use data protection to ensure that you have copies of your data.

- ☐ Data protection concepts
- ☐ Selecting volumes to protect
- ☐ Protecting volumes by cloning
- ☐ Protecting volumes by creating snapshots
- ☐ Viewing replication groups
- ☐ Global-active device

Data protection concepts

You can protect volumes locally on the same storage system and choose to protect a single volume, a group of volumes, or all volumes attached to a server.

- The Clone Now method creates a copy of a volume in a point in time. This method creates a full copy of a primary volume and automatically suspends the copy operation. Any further read-write operations of the primary volume will not be updated to the secondary volumes.
- The Snap method takes incremental snapshots of volumes based on a user-created schedule. The retention policy (maximum number of snapshots) is from 1 to 1024, based on user input. Once the retention policy is exceeded, the oldest snapshots are deleted when newer snapshots are created.

Note: When a user removes a storage system and adds it again, all the protected volumes using Clone Now will remain untouched, but any snapshot schedules will be suspended. The user will need to resume scheduling after adding the storage system.

- Snap on Snap is a snapshot that is capable of being cascaded.
- Snap Clone is a full copy of a snapshot (P-VOL) and creates a real volume.

Note: You cannot create the Snap on Snap and Snap Clone replication types using Storage Advisor.

Snap on Snap and Snap Clone replication types are supported in VSP G1000, VSP G1500, and VSP F1500 storage systems.

Selecting volumes to protect

You can select a server, create volumes and attach them to the server, and then (optionally) protect the volumes.

As an alternative, you can create volumes separately and attach them to servers at a later time. After attaching volumes to servers, you can select volumes to protect.

Procedure

1. To select volumes to protect, do one of the following:
   - Select a server, create volumes for the server and attach the volumes to the server.

- Select a server to view volumes already attached to the server. You can filter for unprotected volumes.
- On the dashboard, click **Storage Systems**, then click a storage system tile and click **Volumes** to open the **Volumes** page.
- Open the detail page for any volume that is attached to a server.

2. Select volumes and then click **Protect** to open the **Protect Volumes** page with the list of selected volumes displayed.
3. Choose a type of data replication, **Clone Now** or **Snapshot**.

Note: The Clone Now method is available for volumes that are already existing and attached to a server. It is not available when the create-and-attach workflow is used to create, attach, and protect volumes in a single page.

If you use the workflow provided to create, attach, and protect volumes, you can choose **None** as a data replication type to avoid protecting volumes.

Protecting volumes by cloning

After creating and attaching volumes, you can implement data protection by creating a clone.

The Clone now method can be useful if maintenance or testing of a volume is needed. You can clone the primary volume and perform testing when the clone is complete. If any data is lost, you can retrieve it from the secondary volume.

You can create up to three clones for a volume. Using Storage Advisor, you can do this performing the cloning operation on a set of volumes three times.

Note: The Clone Now method is available for volumes that exist and are attached to a server. It is not available when the create-and-attach workflow is used to create, attach, and protect volumes in a single page.

Procedure

1. In the **Protect Volumes** page, select the volumes you want to protect and click **Clone Now**.
2. Choose whether to use **Consistency**.

   Using Consistency means that copy operations will run on all pairs in the group simultaneously. Consistency, schedule and retention policy are all filters for replication groups, so your choices may affect the availability of replication groups.
3. Select a replication group from the options in the **Replication Group Name** list or enter a new name.

Up to 26 alphanumeric characters, and also hyphens (-) and underscores (_), are allowed. Spaces are not allowed.

4. Click **Submit** to clone the volumes.

Result

A job is created and a summary message displays.

Related tasks

- Protecting volumes by creating snapshots on page 86
- Creating volumes to attach to servers on page 46
- Attaching existing volumes to a server on page 65

Protecting volumes by creating snapshots

After creating and attaching volumes, you can implement data protection by creating incremental snapshots.

You can use the Snapshot method if you don't need continuous copying but want to schedule the copy depending on expected changes in the data.

The snapshot creation process creates the secondary volume on a snap pool. If there is more than one snap pool, the least-utilized snap pool is used.

Note: If you want to create snapshots outside of Storage Advisor for a volume that is in Storage Advisor, use a new snapshot group.

Procedure

1. In the **Protect Volumes** page, select the volumes you want to protect and click **Snapshot**.
2. Enter a number from 1 to 1024 in the **Snapshot Retention Policy (Max 1024)** field to specify the number of snapshots to be created.

   When the specified number of snapshots is reached, older snapshots will be deleted as new ones are added. The maximum number of snapshots that can be retained is 1024.
3. You can enable **Consistency** to perform data protection on all pairs in the group simultaneously.

   Consistency acts a filter for replication groups, so your choice may affect the availability of replication groups.
4. Select a **Replication Group** for each volume or enter a new **Replication Group** name. Up to 26 alphanumeric characters, also hyphens (-) and underscores (_), are allowed. Spaces are not allowed.
5. Set an hourly, daily, weekly, or monthly schedule and click **Submit**. A volume cannot have more than one schedule. The schedule is based on UTC time.

- **Hourly**: Select a start time in minutes after the hour, and the number of hours between snapshots to start creating snapshots at the selected time and interval.
- **Daily**: Select a start time, available in five minutes increments, to start a snapshot every day at the selected time.
- **Weekly**: Select a start time and a day to create a snapshot every week at the selected date and time. You can select more than one day to create more than one weekly snapshot.
- **Monthly**: Select a start time and the day of the month (from 1 to 31) to create a snapshot once a month at the selected day and time.

Result

A summary message is displayed and snapshots are created according to the schedule. The replication group can be viewed on the Replication Groups page.

Related tasks

- Creating volumes to attach to servers on page 46
- Attaching existing volumes to a server on page 65
- Protecting volumes by cloning on page 85

Viewing replication groups

Storage Advisor enables you to view all replication groups in a single page.

You can also access replication details for a volume to view and manage all replication group membership and volume pairs.

Storage Advisor detects and displays all volume pairs, whether or not they were created in Storage Advisor.

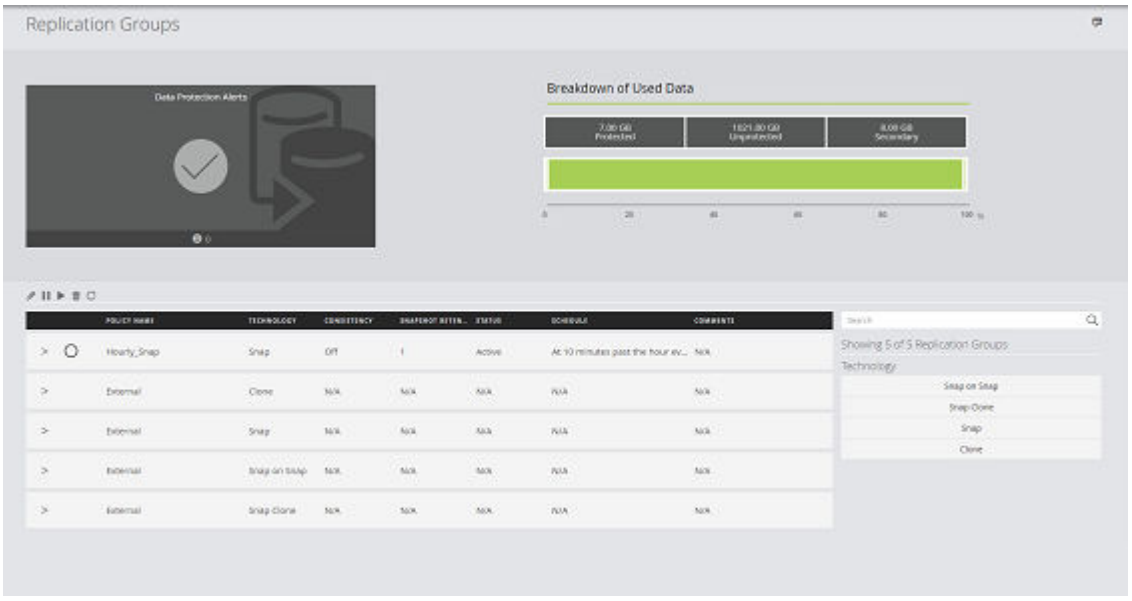
Replication groups apply the policies that control how volumes are replicated. Their parameters include:

- Type of technology:
  - Snap on Snap
  - Snap Clone
  - Snap
  - Clone
- Whether consistency is used
- Snapshot schedule
- Snapshot retention

Replication groups are created when volumes are replicated.

Replication groups inventory

Access the inventory of replication groups from the detail page for a storage system.



This page enables you to view all replication groups, sorted by technology:

- Snap on Snap
- Snap Clone
- Snap
- Clone

Replication groups created outside Storage Advisor are listed as External.

You can view all volume pairs, including those created outside of Storage Advisor.

Note: Replication group operations other than Restore are not available for External replication groups.

Use this page to:

- View replication policies applicable to a volume and all S-VOL details.
- View all replication policies and all volume pair details.
- Suspend or resume a snapshot schedule.
  Data replication can be suspended and resumed. Data will be missing for the period of suspension.
- Suspend or resume a clone.
  Data replication can be resumed to update cloned data and then suspended to keep a point-in-time full copy.
- Remove a volume from a replication policy. Delete a replication group to remove the policy from all volumes in the group.
- Restore a volume pair by restoring a secondary volume to a primary volume.

The following actions are available after selecting a replication group:

- Edit the replication group by clicking Edit to open the Edit Replication Group page and edit the label or remove volumes from the replication group.
- Suspend the replication group by clicking Suspend Replication Group. You cannot suspend a replication group that is in COPY status.
- Resume the replication group by clicking Resume Replication Group.
- Delete the replication group by clicking Delete.

To view volume pair details, expand one or more replication groups.

- Access detail pages for each P-VOL and each S-VOL by clicking a P-VOL ID or an S-VOL ID in the expanded view of a replication group.
- Before using the Restore function, stop all I/O activity to the volume. To restore a volume pair, select it and click Restore Volume Pair.

WARNING: The Restore function will overwrite the volume with backup data. The data on current volume will be destroyed.

Opening the Local Replication page in Storage Navigator

Click Open the Local Replication page in Storage Navigator to view the replication groups information for clones and snapshots.

For more information, refer to the Storage Navigator online help.

Note: Any changes you make in Storage Navigator may not be reflected in Storage Advisor for a few minutes.

Editing replication groups

You can edit a replication group to adjust the schedule for snapshots or to remove volumes from the replication group.

Note: External replication groups cannot be edited. These include volume pairs that are created outside Storage Advisor.

Procedure

1. Access the **Edit Replication Group** page from the **Replication Groups** page.
2. You can edit the following:
   - Name.
   - Comments.
   - For snapshots, the schedule and number of snapshots. The schedule is based on UTC time.

3. To remove a primary volume from the replication group, select the corresponding row. You can choose whether or not to remove the corresponding secondary volume.
4. Click **Submit**.
   A job is added to the Jobs page to apply the changes to the replication group.

Volume details

Access volume details in one of these ways:

- From the dashboard by clicking Storage Systems, and then click a storage system tile. Click Volumes to open the Volumes page and then click a volume in the list or tile view.
- On the detail page for a pool, click a volume in the list or tile view.

The Volume detail page exposes pool details including Pool ID, type and tier of the pool.

The Provisioning Status can be any of the following:

- Attached: the volume is attached to a server.
- Unattached: the volume is not attached to a server.
- Unmanaged: the volume has only a LUN path associated. For example, a volume may be attached to a server that is not known to Storage Advisor.

Details for protected volumes also include details of all replication groups to which the volumes belong.

On a volume detail page, you can do the following:

- Attach the volume to a server by clicking Attach Volumes.
- Edit the volume configuration by clicking Edit to open the Update Volume window.
  If a primary volume is unprotected, you can expand the capacity. When you click Submit, a notification informs you that a job has started to expand the volume. Secondary volumes cannot be expanded.
- Delete the volume.
- Protect the volume by clicking Protect Volumes to open the Protect Volumes page.
- Unprotect a volume by clicking Unprotect Volumes.
- Expand any or all replication groups to which the volume belongs and view details of the volume pairs. In the table, you can click an S-Vol ID to open the detail page for the secondary volume.
- Restore a secondary volume to a primary volume by selecting the pair and clicking Restore Volume Pair.
- Perform the following operations on a replication group:
  - Edit the replication group by clicking Edit.
  - Suspend the replication group by clicking Suspend Replication Group.
  - Resume the replication group by clicking Resume Replication Group.
  - Delete the replication group by clicking Delete.

Note: Replication group operations are not available for "External" replication groups. These are volume pairs that were created outside Storage Advisor.

Global-active device

Storage Advisor supports the display of global-active device as a replication technology when the following conditions are met:

- GAD has been configured on the storage system.
- GAD pairs have been created on the storage system.

GAD pairs may display in Virtual Storage Machines, Volumes inventory, and Volume detail pages.

The following volume operations are not available for GAD pairs.

- Attachment to or detaching from a server.
- Expanding a volume.
- Deleting a volume.

Global-active device (GAD) enables you to create and maintain synchronous, remote copies of data volumes. You can use Hitachi Command Suite to set up global-active device.

To set up global-active device a virtual storage machine is configured in the primary and secondary storage systems using the actual information of the primary storage system, and the global-active device primary and secondary volumes are assigned the same virtual LDEV number in the virtual storage machine. This enables the host to see the pair volumes as a single volume on a single storage system, and both volumes receive the same data from the host.

Virtual storage machines

View the virtual storage machines (VSMs) in the GAD configuration to check details and view any alerts.

Access the **Virtual Storage Machines** page from the Storage Advisor dashboard.

To view details for a virtual storage machine, click a tile on the **Virtual Storage Machines** page.

The **Virtual Storage Machine** detail page includes P-VOLs and S-VOLs in each pair, as well as the pair status and the storage systems for each pair.


Virtual storage machine 410501VSPG400-600
Data Protection Alerts
0
410500
2
410209
ALERTS
P-VOL ID
S-VOL ID
P-VOL STATUS
S-VOL STATUS
P-VOL STORAGE SYSTEM ID
S-VOL STORAGE SYSTEM ID
Search
22
7
PAIR
PAIR
410500
410209
8
30
PAIR
PAIR
410209
410500

6

Monitor block storage

Hitachi Storage Advisor supports monitoring of capacity, data protection, jobs, and hardware.

- ☐ Monitoring capacity
- ☐ Monitoring hardware
- ☐ Monitoring data protection
- ☐ Monitoring jobs
- ☐ Setting up to receive SNMP alerts

Monitoring capacity

Monitor the capacity of block storage pools.

You can use Storage Advisor to monitor block storage capacity so you can tell when physical capacity usage is exceeding thresholds set for your pools.

Note: Capacity alerts for Snap (HTI) pools are not supported.

Alerts are represented by the number in the Capacity tile. If there is a checkmark, there are no alerts. A red circle represents an Error and a yellow triangle represents a Warning. Only the highest level of alert is shown, so a red circle can include Errors and Warnings if there is more than one level of alert. The Error threshold is set in the "Utilization Threshold (High)" field when the pool is created and the Warning threshold is set in the "Utilization Threshold (Low)" field.

Capacity Alerts for all storage systems are shown on the dashboard and on the Monitoring tab. Click the Capacity tile on the Monitoring tab to view the pools that have alerts. In the expanded carousel, click Pools to view alert details. The number of Capacity Alerts cannot be more than 1 because Storage Advisor monitors at the component level, which is pools.

The alert clearance process runs every 20 minutes for each storage system that has pools with errors. Alerts are only cleared when all pools with errors in the storage system return to normal state. For example, if there are 5 pools with errors in one storage system, then all alerts will display until all the pool alerts are cleared.

Procedure

1. Monitoring alerts display for the following resources:
   - All storage systems: If **Capacity Alerts** on the dashboard has a red circle or a yellow triangle, click it to open the **Monitoring** tab with the number of **Pool** alerts exposed in the **Capacity** carousel. Alternatively, you can click the **Monitoring** tab and then click the **Capacity** tile.
   - Storage systems inventory: This option also displays all capacity alerts. Click **Storage Systems** on the dashboard and if the **Capacity Alerts** tile has a red circle or a yellow triangle, click it to open the carousel in the **Monitoring** tab.
   - Storage system detail: In the storage systems inventory, click a storage system tile. If the **Capacity Alerts** tile has a red circle or yellow triangle, click it to open the tile in the **Monitoring** tab and display the **Pool** alerts for the selected storage system.

- Pool inventory: On the storage system inventory page, click a storage system tile to view resources for the storage system. Click **Pools**. Then click the **Capacity Alerts** tile to open the alerts carousel for the storage system pools in the **Monitoring** tab.

2. In the **Capacity** alerts carousel, click **Pools** to populate the table with details of the alerts.

Note: Ref Code mapping to trap descriptions is available in a file included with the ISO image.

Next steps

If there are pools with alerts displaying the "Error" status, you can expand the pools to increase their capacity.

Related concepts

- Creating a pool on page 38

Monitoring hardware

Monitor hardware devices to view and investigate warnings and critical alerts.

Storage Advisor monitors components in your storage systems and displays alerts on resource and storage system pages. You can also see how many components are in normal status.

Alerts are represented by a number in the Hardware tile or the Hardware Alerts tile. A red circle represents a critical alert and a yellow triangle represents a warning. Only critical alerts are shown unless there are no critical alerts, in which case warning alerts are displayed.

The alerts are received from the storage array. There is one alert per component type, for a maximum of eight.

The alert clearance process runs every 20 minutes for each storage system that has components with errors. Alerts are only cleared when all components of a given type with errors in the storage system return to normal state. The exception is disks, each of which can have alerts cleared, even if other disks remain in error. Alerts for ports and processors are cleared together, so alerts are cleared only when all ports and all processors are normal.

For example, if there are five fans with alerts in one storage system, they will be cleared only when each and every fan alert is cleared. However, for disks, each alert is cleared as and when disk alert clearance is available.

Storage Advisor monitors the following components:

- Disks

- Fans
- Batteries
- Cache
- Processors
- Power supplies
- Ports
- Shared memory

Procedure

1. Hardware alerts display in the following pages. Alerts are displayed by type of component.
   - Dashboard: Click the **Hardware Alerts** tile or the **Monitoring** tab and click the **Hardware** tile to display the types of components.
   - Storage system inventory: Includes all hardware alerts.
   - Storage system detail: Click a storage system tile and click the **Hardware Alerts** tile to view hardware alerts for the selected storage system in the **Monitoring** tab.
   - Parity Group inventory: Click a storage system tile and then click **Parity Groups** to open the inventory. Click the **Hardware Alerts** tile to view alerts for disks where parity groups are located.

   Note: Ref Code mapping to trap descriptions is available in a file included with the installation media.

2. Click a component type to display details in the table. Review the details in order to resolve the issue.

Monitoring data protection

Data protection monitoring enables you to monitor the status of each data protection task.

You can view jobs alerts for your data protections tasks in a single page. Data protection alerts can be viewed by storage system and by server, and are available for the aggregated storage systems.

Alerts for the following operations are available:

- Failed Clone Now operations
- Failed Snapshot operations

A red circle with a number in a Data Protection alerts tile indicates the number of primary volumes and servers on which data protection tasks have failed. You can click the tile to investigate failed tasks.

Procedure

1. View data protection alerts for the following resources:
   - All data protection alerts:
     - From the dashboard, click **Monitoring** or **Data Protection Alerts** to open the **Monitoring** tab.
     - Click **Storage Systems** on the dashboard and then click **Data Protection Alerts** to open the **Monitoring** tab.
   - A single storage system: Click **Storage Systems** and then click a storage system tile. Click the **Data Protection Alerts** tile to open the **Monitoring** tab.
   - Volumes attached to a single server: Click **Servers** from the dashboard and click a **Server** tile. Then click **Data Protection Alerts** to open the **Monitoring** tab.

     The volumes inventory for a server includes failed tasks marked by an exclamation point. Click an exclamation point to view all volumes with failed tasks in the **Monitoring** tab.

2. Click the **Data Protection** tile in the **Monitoring** tab to open the carousel and then click **Volumes** to display details that can help you identify the issue. You can click the exclamation point for any failed task to view details for the volume.

Monitoring jobs

View the Jobs page to get an update on the status of a task or to view the errors associated with a job.

Procedure

1. If there is a red circle with a number in the **Jobs Alert** tile, it reflects the number of failed jobs and jobs that succeeded with errors. Access the Jobs page in one of these ways:
   - From the dashboard, click **Jobs Alerts** to open the **Jobs** page, or click the **Jobs** tab.
   - On the dashboard, click **Storage Systems** to open the storage systems inventory. If the **Jobs Alert** tile has a red circle with a number, click it to view the Jobs page.
   - In the storage systems inventory, click a storage system tile. If the **Jobs Alert** tile has a red circle with a number, click it to view the inventory of jobs associated with the storage system.
2. The **Total Jobs** bar provides a graphical view of the relative number of jobs in each status. To filter jobs by status, click on the corresponding color in the Total Jobs bar.
3. View the status of jobs.

   You can use the **Search** function to search by keyword. Common search terms include:

- Volume
- Pool
- Storage
- Create
- Provision
- Expand
- Delete

The **Status** column displays the job status.

Icon	Description
success	The job completed successfully.
success with errors	The job completed successfully, but there were errors.
in progress	The job is still in progress.
failed	The job failed.

4. Click a job to open the Job Details page where you can view any child jobs and reports associated with each job. Reports are the messages that the Storage Advisor service returns regarding the progress of each job. Child jobs serve to track jobs that launch multiple, smaller tasks (such as creating multiple volumes).

Next steps

- If the job failed, review the job reports to determine the cause of the failure.
- If the job completed successfully with errors, click the job to view the error message.

Setting up to receive SNMP alerts

If you are using external management software, you can add an SNMP (Simple Network Management Protocol) manager to enable alerts about devices in registered storage systems. This option is not required to monitor hardware in Hitachi Storage Advisor.

When an SNMP manager is added, it collects information from SNMP agents that are installed in components of registered storage systems. The storage systems send traps to Storage Advisor using SNMP v3.

Note: Storage Advisor manages such alerts automatically, for processors, memory, disks, power supplies, batteries, ports, caches, pools, and fans.

Storage Advisor uses SNMP v3 to send traps to external management software as soon as they are received. The structure of the traps is defined in a MIB file and Storage Advisor uses its own MIB file to add information to traps received so that the trap is easier to understand. It is important to

import the Storage Advisor file to access the additional information. The Storage Advisor MIB file is included in the product installation media.

The SNMP manager enables you to do the following in the external software:
- Determine whether there are any problems with storage system components or whether the status is normal.
- Identify the specific component that in warning or critical status.

The following types of components can be monitored:
- Processor
- Memory
- Power supply
- Battery
- Fan
- Physical drive or disk
- Port
- Cache
- Pool

Before you begin

SNMP management requires:
- External management software capable of receiving SNMP alerts.
- SNMP agents must be configured in the storage environment.
- The Storage Advisor MIB file has been imported to the SNMP manager.

Procedure

1. Click **Settings** and select **SNMP Settings** to open the **SNMP** page. Click the plus sign (**+**) to open the **SNMP Manager Management** page.
2. Enter the following details:
   - **Name**: up to 32 characters.

     Note: If you are editing an existing SNMP manager, Name cannot be edited.

   - **Username** of the SNMP manager
   - **IP Address**: of the SNMP manager.
   - **Port**: Positive integers from 0 to 65535. are allowed.
   - (Optional) **Privacy Protocol**: You can choose from the following:
     - **NO_PRIV**: No privacy protocol.
     - **DES**: Data Encryption Standard.
     - **TRIPLE_DES**: Triple Data Encryption Algorithm
     - **AES-128**: Advanced Encryption Standard.
   - **Privacy Password**: If you choose a privacy protocol, you must enter a password.

- **Auth Protocol**: If you choose a privacy protocol, you must also select an authentication protocol. The choices are **MD5**, **SHA**, or **NO_AUTH**.
- **Auth Password**: If you are using an authentication protocol, you must enter a password.

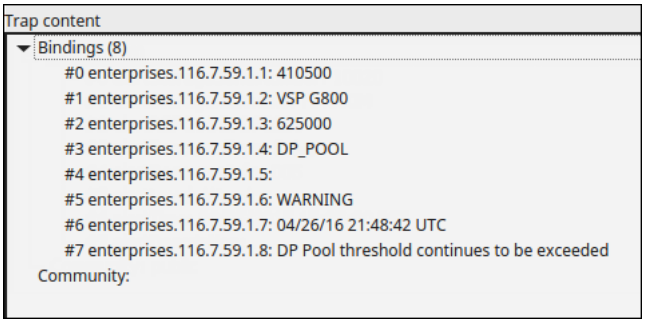
3. Click **Submit**.

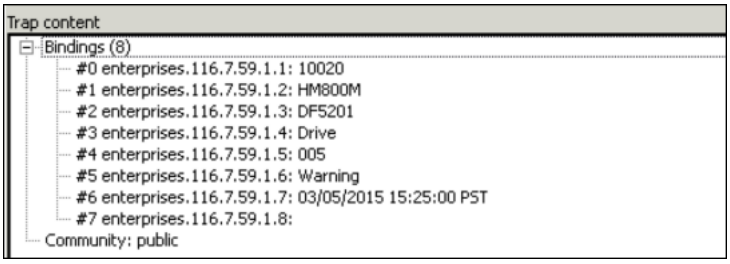
Result

A job is created to add or update an SNMP manager.

Example

The following images show the difference between a trap with the MIB file imported and a trap without the MIB file in use.





7

Administer Storage Advisor

Access Storage Advisor administration tasks in Virtual Appliance Manager or through the Settings icon (⚙) in the top navigation menu.

- ☐ Administering security
- ☐ Backup and restore system settings
- ☐ Download the system log file

Administering security

Storage Advisor comes with a default local user that has permissions for all operations in Storage Advisor.

On a regular basis, you can change the password of the local user by accessing Change Local Password in Settings in the top navigation menu.

If you want to provide more granular control to your users, you can use role-based access to control the operations that can be managed by different users. To do so, you must first add your LDAP server as the source of authentication. Storage Advisor supports adding one external LDAP server.

You can then assign Storage Advisor roles to user groups that exist in the Active Directory account domain. Members of the user groups will use the assigned user roles, and therefore, only the privileges attached to those user roles.

Privileges and roles

Access to the storage system is restricted by roles. Roles determine what a user can and cannot do. The security administrator can grant access to users by assigning users roles with privileges that are attached to those specific roles.

Roles	Privileges
System administrator	• Addition, administration, and deletion of servers, storage system, and fabric switches, SNMP manager, and tier management. • Addition, administration, and deletion of parity groups and port configurations. • Addition, administration, and deletion of virtual file server resource groups. • Read-only privileges to monitor everything in Storage Advisor.
Storage administrator	• Addition, administration, and deletion of pools. • Addition, administration, and deletion of volumes, including creating, attaching to hosts, and data protection. • Read-only privileges to monitor everything in Storage Advisor.
Security administrator	• Addition, administration and deletion of remote account domains. • User role assignment to groups. • Read-only privileges to monitor everything in Storage Advisor.

Adding an account domain

Add an account domain so you can assign roles to user groups.

Note: Once a fully qualified domain for a current active directory server is added, you can change the credentials on an ongoing basis and save the changes. To update the fully qualified AD domain name, remove the existing Account Domain and add a new one.

Procedure

1. Click **Settings** and select **Security** to open the **Security** page.
2. In the **Account Domain** field, enter the fully qualified domain name for the active AD server.
3. Enter the Active Directory server **Username** and **Password**. Storage Advisor uses these credentials to connect to the external domain and get the list of user groups in the Active Directory source. You can assign Storage Advisor roles to these user groups. Storage Advisor does not modify the user groups in the Active Directory source.
4. Click **Submit**.
   Changes take effect immediately.

Next steps

When the job is complete, you can assign user roles.

Related tasks

- Assigning user roles on page 103

Assigning user roles

After adding an external LDAP source to Storage Advisor, you can assign Storage Advisor roles to user groups.

More than one role can be assigned to a user group. In this case the user will have permissions for multiple roles.

Once a role is assigned to a user group, you can change the role assignment and save it.

Before you begin

Add an account domain.

Procedure

1. Access the **Security** page by opening the settings menu and then selecting **Security Settings**.
2. In the **Group Name** field, type in a user group name from the account domain. Partial matches automatically populate the field.
3. In the **User Role** field, select an Storage Advisor user role:

- **SecurityAdministrator**: Includes privileges needed for the following:
  - Addition, administration, and deletion of remote account domains.
  - User role assignment to groups.
  - Read-only privileges to monitor everything in Storage Advisor.
- **SystemAdministrator**: Includes privileges needed for the following:
  - Addition, administration, and deletion of servers, storage, and fabric switches, onboarding of storage (block storage with or without NAS modules), SNMP manager, and tier management.
  - Addition, administration, and deletion of parity groups and port configurations.
  - Addition, administration, and deletion of virtual file server resource groups.
  - Read-only privileges to monitor everything in Storage Advisor.
- **StorageAdministrator**: Includes privileges needed for storage provisioning and data protection:
  - Addition, administration, and deletion of pools.
  - Addition, administration, and deletion of volumes, including creating, attaching to servers, and data protection.
  - Read-only privileges to monitor everything in Storage Advisor.

4. Click the plus sign (**+**).
5. Click **Submit**.
   The changes take effect immediately.

Example

For example, there might be a user group named "IT" in the account domain, whose members need to perform security functions in Storage Advisor. Assigning the User Role "SecurityAdministrator" to the Group Name "IT" would give security administration privileges to all members of "IT".

Related tasks

- Adding an account domain on page 102

Backup and restore system settings

Use Virtual Appliance Manager to backup system settings before moving Storage Advisor to another instance.

The settings include configuration files, an email template file and an SQL file.

Procedure

1. Open a browser and enter https://*ip-address*/vam/ to access the Virtual Appliance Manager and adjust the settings for your server environment.

- User name: service
- Password: Chang3Me!

2. Click **Backup** to download a tar.gz file containing system settings.
3. When you are ready to restore, log in to Virtual Appliance Manager
4. Click **Restore** and either drag and drop the backup file or click the plus sign (**+**).
5. Click **Submit**.

System elements preserved during backup

The following system elements are preserved as part of the backup:

- Element inventories: Storage Systems, Servers, and Fabric Switch inventories are preserved.
- SNMP Managers: Locations for forwarding SNMP traps are preserved.
- Jobs: All jobs on the system are preserved.
- Alerts: Monitoring alerts are preserved.
- Tier Names: Tier names for HDT pools are preserved.
- Security information: Local usernames and passwords, as well as integrated Active Directories are preserved.
- Replication groups: All copy groups and replication groups and their associated snapshot schedules are preserved.
- Virtual Appliance Manager settings: Connected NTP servers, log level settings, SSL certificate and service settings are preserved. Host settings are not preserved.

Download the system log file

Procedure

1. Open a browser and enter `https://ip-address/vam` in the address bar.

   User name: `service`
   Password: `Chang3Me!`
2. Click the **Download Logs** icon in the left menu.
   It may take a couple of minutes for the system to respond as it compiles the logs.
3. Open the zip file that contains the system logs.

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Hitachi Data Systems

Corporate Headquarters
2845 Lafayette Street
Santa Clara, California 95050-2639
U.S.A.
www.hds.com

Regional Contact Information

Americas
+1 408 970 1000
info@hds.com

Europe, Middle East, and Africa
+44 (0) 1753 618000
info.emea@hds.com

Asia Pacific
+852 3189 7900
hds.marketing.apac@hds.com

Contact Us
www.hds.com/en-us/contact.html

Hitachi Data Systems

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