



Hitachi Infrastructure Director

User Guide

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Contents

Preface.....	5
Intended Audience.....	6
Product version.....	6
Document conventions.....	6
Conventions for storage capacity values.....	7
Accessing product documentation.....	8
Getting help.....	8
Comments.....	8
1 Getting started.....	9
Overview of Infrastructure Director.....	10
Configuring block storage and file storage.....	10
Dashboard.....	11
Analyzing data in the dashboard.....	13
Inventory and resource information.....	15
Onboarding a block storage system workflow.....	16
Configuring a storage system workflow.....	16
Creating and attaching volumes to servers workflow.....	16
2 Configure block storage.....	19
Adding a block storage system.....	20
Verifying storage system initial settings.....	21
Enabling port security.....	22
Adding a fabric switch.....	22
Supported fabric switch models.....	23
Creating parity groups	24
Creating parity groups, basic method.....	25
Creating a parity groups or hot spares, advanced method.....	27
Managing free and spare disks.....	27
Parity groups inventory.....	28
Parity group details.....	29
Creating a pool.....	30
Creating a pool, basic method.....	30
Creating a pool, advanced method.....	32

Pools inventory.....	33
Pool details.....	33
Create and attach volumes to servers.....	34
Creating volumes to attach to servers.....	34
Attaching volumes to servers.....	35
Managing storage systems.....	36
Storage Systems inventory.....	36
Storage system details.....	37
Using Device Manager - Storage Navigator for advanced storage configuration	
.....	38
Accessing Device Manager - Storage Navigator.....	39
Roles.....	39
Updating a storage system.....	40
Managing servers.....	40
Adding servers.....	41
Server inventory.....	41
Server details.....	42
Updating a server.....	42
Managing volumes.....	43
Creating volumes.....	43
Attaching existing volumes to a server.....	44
Update a volume.....	45
Volumes inventory.....	45
Volume details.....	46
3 Protect data.....	47
Protecting volumes by cloning.....	49
Protecting volumes by creating snapshots.....	49
Protecting volumes by creating one or more full copies.....	50
Suspend, resume, restore, and unprotect.....	50
4 Monitor block storage.....	53
Monitoring capacity.....	54
Monitoring hardware.....	55
Monitoring data protection.....	56
Monitoring jobs.....	57
Setting up to receive SNMP alerts.....	58
5 Administer Infrastructure Director.....	61
Administering security.....	62
Adding an account domain.....	62
Assigning user roles.....	62
Backup system settings.....	64
System settings included in backup.....	64
Downloading the system log file.....	65
Index.....	67



Preface

Hitachi Infrastructure Director 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](#)
- [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 storage systems with Hitachi Infrastructure Director.

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 Infrastructure Director version 1.0.0 or later.

Document conventions

This document uses the following typographic conventions:

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click OK .
<i>Italic</i>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: <i>copy source-file target-file</i> Note: Angled brackets (< >) are also used to indicate variables.
Monospace	Indicates text that is displayed on screen or entered by the user. Example: <code>pairdisplay -g oradb</code>
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: <code>pairdisplay -g <group></code> Note: Italic font is also used to indicate variables.
[] 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 or consequences (for example, disruptive operations).
	WARNING	Warns the user of severe conditions or consequences (for example, destructive operations).

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
1 exabyte (EB)	1,000 PB or $1,000^6$ bytes

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

Logical capacity unit	Value
1 block	512 bytes
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 the Hitachi Data Systems Portal: <https://portal.hds.com>. 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 Portal](https://portal.hds.com) is the destination for technical support of your current or previously-sold storage systems, midrange and enterprise servers, and combined solution offerings. The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Support Portal for contact information: <https://portal.hds.com>.

[Hitachi Data Systems Community](https://community.hds.com) is a new global online community for HDS customers, partners, independent software vendors, employees, and prospects. It is an open discussion among these groups about the HDS portfolio of products and services. It is the destination to get answers, discover insights, and make connections. The HDS Community complements our existing Support Portal and support services by providing an area where you can get answers to non-critical issues and questions. **Join the conversation today!** Go to community.hds.com, register, and complete your profile.

Comments

Please send us your comments on this document to doc.comments@hds.com. Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Data Systems Corporation.

Thank you!



1

Getting started

Hitachi Infrastructure Director enables a simplified, unified, and extensible approach to managing storage systems.

- [Overview of Infrastructure Director](#)
- [Onboarding a block storage system workflow](#)
- [Configuring a storage system workflow](#)
- [Creating and attaching volumes to servers workflow](#)

Overview of Infrastructure Director

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

Infrastructure Director 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 Infrastructure Director to easily provision new storage capacity for business applications without requiring in-depth knowledge of the underlining 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 Infrastructure Director capabilities include:

- Simplified user experience for managing infrastructure resources. Provides visual aids to easily view and interpret 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.
- Provides common, centralized management for the midrange Hitachi Virtual Storage Platform family.
- REST-based API to provide full management programmability and control in addition to unified file-based management support.
- Infrastructure Director 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.

Configuring block storage and file storage

Infrastructure Director can be used to configure both block storage systems and file storage systems.

- Block storage systems:

In a block storage system, you create storage volumes. 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 Infrastructure Director, you can discover, register, and onboard a block storage system.

- File storage systems:

A file storage system is a centralized location for storing files and folders, and it is usually deployed on a Network Attached Storage (NAS) device. File storage systems use protocols such as SMB/CIFS (for Windows) and NFS (for Linux and VMware).

Infrastructure Director uses REST API services to register and onboard file storage systems.

Dashboard

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



From the Infrastructure Director 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 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.
- **Alert tiles:** At the top of the page are four alert tiles that represent various aspects of the health of your storage system. When Infrastructure Director 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.

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 to view the summary for that category in the Monitoring tab.

Resource summary

The three rings in the center of the dashboard form the information gauge, which shows information about the available storage. 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 white, middle ring indicates the sum of all pool capacity available across all storage systems. The light grey indicates the parity group capacity that is not yet allocated to pools.
If you do not have any pools created, the white 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 black, outer 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.

If volume allocation results in oversubscription, a thick line extends out to the right from the top of the ring. This extended line is a key visual indicator that helps track allocation oversubscription.

- The green, inner 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.

If you notice that the total pool capacity (white) 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 is the breakdown of data protection metrics. It includes a representation of types of protected, unprotected, and secondary capacity and gauge of the total percentage of capacity protected.

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.

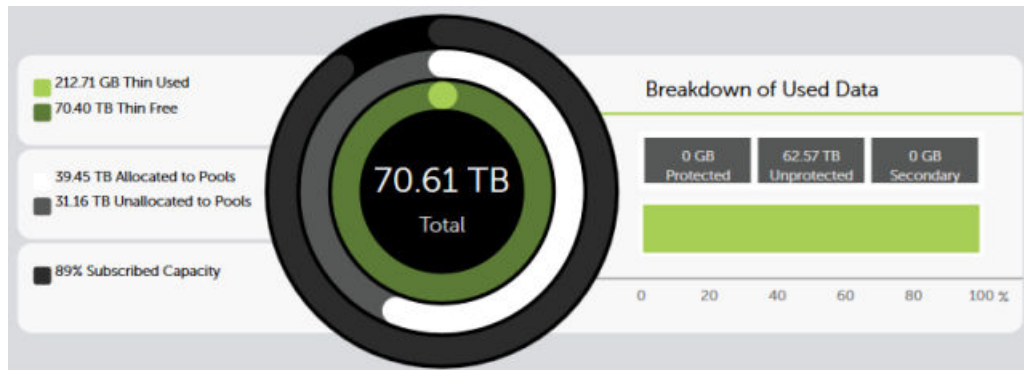
Analyzing data shown in alert tiles

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. Infrastructure Director 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 Infrastructure Director.

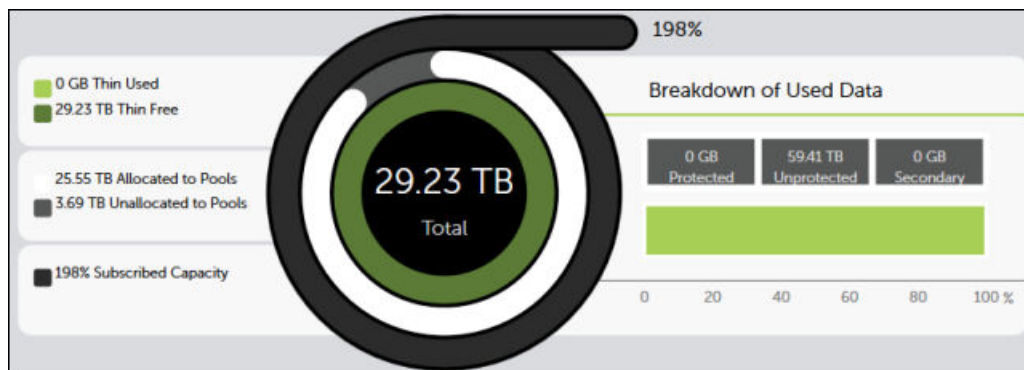


The capacity indicated in the center of the ring is the total usable capacity available via the configured parity groups. After you add a storage system and configure parity groups, the total capacity indicator will show the capacity from the newly added storage system. The Thin Used capacity (green 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 white 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 in green ring nears the total capacity (white ring) then you may run out of pool capacity soon. In such a case, expand the pool to consume more capacity.

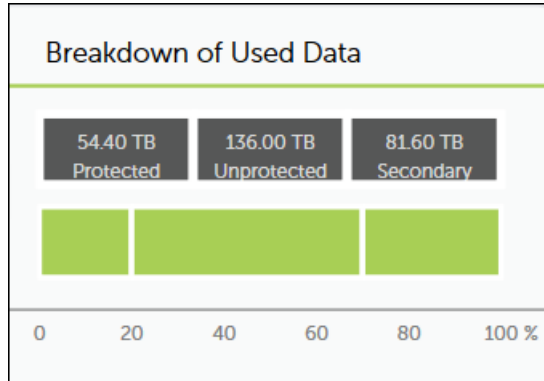
If you notice that the total pool capacity (white) and Thin used (light green) values getting closer to total capacity, you may be running out of disk capacity on one or more storage systems and would need to add disk space to increase storage capacity. Review the information gauge for each storage system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

The information gauge below is a good indicator of capacity oversubscription. Capacity subscription beyond the total available capacity should not be an issue if your 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.



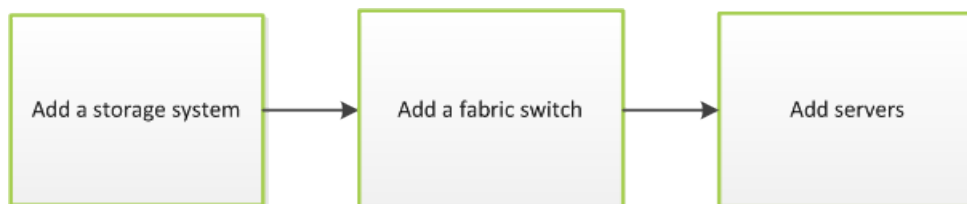
Inventory and resource information

The inventory pages display details about the storage system resources in Infrastructure Director. These resources include storage systems, servers, pools, volumes, parity groups, and ports. Common actions can be performed on the inventory pages, such as the following:

- You can select one or more resource and delete it.
 - When you delete a storage system, you disassociate it from Infrastructure Director. 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 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 click a particular resource to see more details about it on its resource detail page.
 - When you delete a 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 server, the server is disassociated from Infrastructure Director. 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.

Onboarding a block storage system workflow

When you onboard a storage system, you associate it with Infrastructure Director 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 Infrastructure Director has access to all custom resource groups and meta resource groups.

Configuring a storage system workflow

Configure a storage system in order to manage storage using Infrastructure Director. Complete the following in order to configure a storage system:

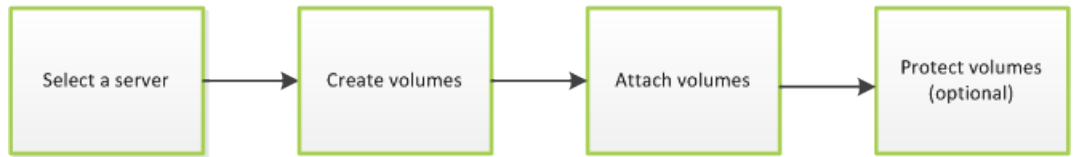
- Create parity groups so you can create pools.
- Create pools so you can create volumes.
- Enable port security. Port security must be enabled for a host storage domain (HSD) to be created on the port. If port security is disabled Infrastructure Director will not select the port for HSD creation. In that case, if the user selects the port, they are limited to the default host group.



Creating and attaching volumes to servers workflow

Infrastructure Director provides a workflow 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. After creating volumes, you are automatically directed to attach them. Finally, you are provided the option of immediately applying data protection.



Configure block storage

Use Infrastructure Director to add a storage system and then configure it.

- [Adding a block storage system](#)
- [Verifying storage system initial settings](#)
- [Enabling 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](#)

Adding a block storage system

Onboarding a block storage system is the process of associating it with Infrastructure Director. After the block storage system is onboarded, manage it from the Infrastructure Director dashboard.

Prerequisites

Infrastructure Director requires access to all resources groups on the storage system so that the workflows function correctly. Verify that the SVP user name used to onboard a storage system in Infrastructure Director has access to all custom resource groups and meta resource groups.

Procedure

1. On the Infrastructure Director 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 or server name 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`.

Wait a while for the storage system to be onboarded. 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 in the inventory.

When a storage system is onboarded, Infrastructure Director 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.

Next steps:

1. In the storage system details page, review the settings in the Initial Setup Wizard. This will show you the completed storage system settings.



Note: Do not change any of the initial setup information. The setup of a discovered Virtual Storage Platform G200, G400, G600 storage system has been completed by a Hitachi Data Systems representative or authorized service provider.

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

Verifying storage system initial settings

Look through the initial storage system setup to verify the settings for the storage system, which includes network configuration, date, time, and license keys.



Note: Do not change any of the initial setup information. The setup of a discovered Virtual Storage Platform G200, G400, G600 storage system has been completed by a Hitachi Data Systems representative or authorized service provider.

Prerequisites

Initial setup is complete.

Procedure

1. From the **Dashboard**, click **Storage Systems** from the resource side panel.
2. Click on a storage system.
3. In the top right of the page, click the settings icon (⚙️) and select **Initial Setup Wizard (Settings)**.
4. On the **Common** page, verify the information provided.
 - The name of the storage system
 - The contact name for the storage system
 - The location of the storage system

Click **Next**.

5. On the **Time-Zone** page, verify the information provided, then click **Next**.
 - Time zone
 - Current date and time on the storage system
 - NTP servers
6. On the **Licenses** page, verify the list of product licenses and its information, then click **Next**.
 - Product name
 - License status
 - Information that specifies the type of the license and the used capacity
7. On the **Notification** page, verify the information in the list shown.
 - The email address of the sender of the alerts
 - The email addresses of the recipients of the SNMP alerts for the selected storage system
 - The IP address of the mail server
 - The mail server user name and password
 - The SNMP community type and IP address
8. Click **Submit** to close the initial setup wizard.

Enabling 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 Hitachi Virtual Storage Platform G200, G400, G600 storage systems. If port security is disabled Infrastructure Director 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.

Procedure

1. On the Infrastructure Director 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 enable or disable security.

Adding a fabric switch

Adding a fabric switch is an optional step after onboarding a storage system. You can add, update, and delete fabric switches in the Infrastructure Director interface.

After a fabric switch is added, you can choose to auto-create zones during volume provisioning.

Prerequisites

- The Infrastructure Director storage system is connected to the same IP network and has access to SNMP broadcast of Fibre Channel switches.
- You have the required information about the fabric switch: Fabric Name, Fabric Switch IP Address, Principal Switch WWN, Username and Password.
- You have the Admin role for the fabric switch.

Procedure

1. On the Infrastructure Director 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:
 - **Fabric Name**
Any Unicode character is allowed except " or \ or control-characters:
\" \ / \b \f \n \r \t \u.
 - **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.
 - **Principal Switch WWN**
 - **Username**
 - **Password**
4. Click the plus sign (+) to add a row for the switch and click **Submit**.

Result

A job is created to add the fabric switch.

Supported fabric switch models

Infrastructure Director supports a variety of Brocade® fabric switches.

Model	Fiber OS version	Type
300	7.0 7.1 7.2	71
5300	7.0 7.1 7.2	64

Model	Fiber OS version	Type
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

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.

Infrastructure Director parity group concepts

Infrastructure Director 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.

Creating parity groups in Infrastructure Director also creates LDEVs that can be consumed for pool creation.

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 Disk** to open the Disk Management page and set free disks as spare disks, or spares as free disks.

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.

- Basic option: Creating a parity group using the basic option requires one input: the count of the disk type, speed, and capacity for the parity group. Infrastructure Director 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 and hot spares to assign for parity group creation.

Related concepts

- [Creating a pool](#) on page 30

Creating parity groups, basic method

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

Prerequisites

- 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 Infrastructure Director 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. Infrastructure Director shows the number of parity groups that can be created for the new RAID configuration and the corresponding usable capacity.
6. 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.

Creating a 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.

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
RAID 5	3D+1P, 4D+1P, 6D+1P, 7D+1P, 8D+1P
RAID 6	6D+2P, 12D+2P, 14D+2P
RAID 1+0	2D+2D

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

Result

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

Nest steps:

- Check the status of the job by clicking Jobs.



Note: Parity group creation may take time.

- Create a pool.

Managing free and spare disks

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

If you choose to use the basic method to create parity groups, Infrastructure Director 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. Select one or more disks and click **Disks to Set to Free** or **Disks to Set to Spare**. 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 them to the pool of available disks.
5. Click **Submit**.

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:

- Click **Manage Spare Disks** to open the Disk Management page and assign free and spare disks.
- Select one or more parity groups and do one of the following:
 - Click **Initialize Parity Groups** to 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.
 - Click **Delete** to delete the parity group. 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.

- 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.
- Click the plus sign (+) to create a new parity group.
- 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.
 - **Formatting:** At least one of the pool volumes in the parity group is being formatted.
 - **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.
 - **Unsupported Attached:** At least one of the pool volumes has a path to a storage port.
 - **Unsupported MixedResourceGroup:** 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.

Parity group details

To access details for a parity group, on the dashboard click Storage Systems and then click a storage system tile. Click Parity Groups and then click a parity group tile to open the Parity group <ID> page.

The following actions are available on this page:

- Click **Delete** to delete a parity group. 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
- Click **Initialize** to initialize the parity group.

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.

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.

How Infrastructure Director calculates pool sizes for the basic method

Infrastructure Director 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:

- Infrastructure Director 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.
- Infrastructure Director then uses combinations of these parity groups where 4 or more parity groups can be added together, 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, Infrastructure Director determines the maximum pool size.
- Infrastructure Director then displays the pools in increasing order of pool size.

Related concepts

- [Create and attach volumes to servers](#) on page 34

Creating a pool, basic method

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



Note: The following pool types are identical:

- HDP (Hitachi Dynamic Provisioning) = Thin
 - HDT (Hitachi Dynamic Tiering) = Tiered
 - HTI (Hitachi Thin Image) = Snap
-

Prerequisites

Create and configure parity groups on the storage system.

You need a minimum of 4 parity groups to create a pool using the basic method. Otherwise, you can use the advanced method of pool creation.

Procedure

1. On the Infrastructure Director 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**.
6. In the **Choose Storage from Tier 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 Snaps?** 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 2 or 3 tiers, the system creates Tiered pools.

Table 1 Tier Definitions

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

7. Click a selected tier to view the available storage capacity and select a capacity size.
8. Click **Review Pool Categories** to see the disk type, capacity, and speed of each pool category.
9. Review the high and low pool utilization thresholds, for watermarks or warnings, and the subscription limit. The thresholds will serve as the Warning and Critical thresholds for monitoring capacity. Adjust the thresholds if needed.



Note: Subscription limits are 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.

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 an HDP or Thin pool is not recommended. If you choose to create such a pool, Infrastructure Director identifies the tier in this pool as "mixed".

Prerequisites

Create and configure parity groups on the storage system.

Procedure

1. On the Infrastructure Director 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. Click the **Pool Type**, either **Thin**, **Tiered**, or **Snap**, and enter a name for the pool.
6. Click **Review Pool Categories** to see the definitions of disk type, capacity, and speed of each pool category.
7. Select one or more parity groups to use to create the pool.
 - 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.

Infrastructure Director shows the total size of the pool using the selected parity groups.

8. Set the utilization thresholds, or use the default threshold settings. The subscription limit can be set above %100.

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

9. 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.

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.

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%.

The following actions are available on this page:

- 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.

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

- View the attributes of 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. To expand the pool basic and advanced options, similar to pool creation, are available. The basic option shows you choices for a new/expanded pool size based on 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. With the advanced option you can add more parity groups to the pool and increase capacity.

- Disk type
- Layout
- RAID level
- Speed
- Utilization thresholds and subscription limits

The high and low utilization thresholds set the Warning and Critical thresholds for Capacity Monitoring.



Note: To expand an HDP 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.

Create and attach volumes to servers

You can create volumes and attach them to servers in a single workflow by first selecting a server. Optionally, you can protect volumes as part of the same workflow.

Creating volumes to attach to servers

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

When you create volumes in Infrastructure Director 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 Infrastructure Director 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.

Prerequisites

- Create parity groups.

- Create pools.
- Create servers.

Procedure

1. On the Infrastructure Director dashboard, click **Servers** to see the inventory of servers.
2. Do one of the following to open the **Create Volumes** page:
 - Select a server checkbox, click the cylinder icon and select **Create New Volumes**.
 - Click a server tile to open the **Server <ID>** details page. Click the cylinder icon  and select **Create New Volumes**.
3. Configure volumes for the specified storage system.
 - 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 an HDP pool type, select the tier: **Gold**, **Silver**, or **Bronze**.
 - g. (Optional) Select the pool from the list of available pools. The default selection is **Auto Select**, which means that Infrastructure Director selects the best pool for provisioning the volume based on utilization and tier requirements.
4. 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.
5. Click **Next** to be directed to attach volumes to the selected server(s).

Attaching volumes to servers

The second step of the create and attach workflow attaches the new volumes to a single server or multiple servers.

Prerequisites

Enable security on ports.

Create servers.

Select a server and create volumes.

Procedure

1. The **Host Mode** is set by default to the server operating system. You can make a selection if needed.
2. By default, the **Host Mode Option** will depend on the **Host Mode** selection. You can make a selection if needed.

3. Select the **LUN Alignment**, if applicable.
LUN Alignment is available if the volume will be attached to more than one server. By default, Infrastructure Director uses the common LUN number.
4. The **Auto Create Zone** is set to **Yes** by default if a fabric switch has been added. Use the default setting to automatically create zones on the switch. You can set it to **No** if you need to manually set up zones on the fabric switch.
5. Optionally, select one or more **Ports** and one or more **WWNs**. Make sure that the WWNs are valid in the environment and visible to the storage system. If the WWN-port pairs selected do not exist, Infrastructure Director creates it.
6. Click **Submit**.

Next steps:

You have the option of immediately applying data protection to the volumes that were just attached.

Related concepts

- [Protect data](#) on page 47

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 SVP with Device Manager - Storage Navigator.

Storage Systems 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 Infrastructure Director.
 - **Initial Setup Wizard (Settings)** to view storage system settings.



Note: Do not change any of the information you see on these pages. The initial setup of any discovered Virtual Storage Platform G200, G400, G600 storage system has already been completed by a Hitachi Data Systems representative or authorized service provider.

- 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 Infrastructure Director discovered about the system, such as model, serial number, and SVP IP address.

Field	Description
Model	Model name of the storage system.

Field	Description
S/N	Storage system serial number.
FW Version	Firmware version.
HORCM Version	01-33-03/06 Hitachi Open Remote Copy Manager is 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.

Using Device Manager - Storage Navigator for advanced storage configuration

Device Manager - Storage Navigator is the element manager for Virtual Storage Platform G200, G400, G600 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 Infrastructure Director.



Note: If you use Device Manager - Storage Navigator to manage resource groups, make sure that the user who onboards storage systems in Infrastructure Director 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 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. 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 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)	<ul style="list-style-type: none"> Viewing information about user accounts and encryption settings Viewing information about the encryption key in the key service processor
Security Administrator (View & Modify)	<ul style="list-style-type: none"> 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 service processor 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
Audit Log Administrator (View Only)	<ul style="list-style-type: none"> Viewing audit log information and downloading audit logs
Audit Log Administrator (View & Modify)	<ul style="list-style-type: none"> Configuring audit log settings and downloading audit logs
Storage Administrator (View Only)	<ul style="list-style-type: none"> Viewing storage system information
Storage Administrator (Initial Configuration)	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> Configuring settings for CLPR Configuring settings for MP unit Deleting tasks and releasing exclusive locks of resources

Role	Capabilities
	<ul style="list-style-type: none"> Configuring LUN security Configuring Server Priority Manager
Storage Administrator (Provisioning)	<ul style="list-style-type: none"> 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
Storage Administrator (Performance Management)	<ul style="list-style-type: none"> Configuring monitoring Starting and stopping monitoring
Storage Administrator (Local Copy)	<ul style="list-style-type: none"> Performing pair operations for local copy Configuring environmental settings for local copy Splitting Volume Migration pairs when using CCI
Storage Administrator (Remote Copy)	<ul style="list-style-type: none"> Remote copy operations in general
Support Personnel (Vendor Only)	Allows maintenance of the storage system. This role is for the exclusive use of service representatives.

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

Infrastructure Director supports provisioning storage to a group of server WWNs by allowing logical servers to be managed by Infrastructure Director. Once servers are onboarded in Infrastructure Director, 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.

Procedure

1. On the Infrastructure Director 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 open a csv (comma-separated values) file and select the headings for the types of values you want to include. A minimum of one server name and one WWN are required. Click **Import** to add the server values from the file.
 - Click the plus sign (+) in the table to add a row and enter a **Server Name**, **OS Type**, **WWN**, and **WWN Nickname**.
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.

Server inventory

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

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 on the right side.

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 New Volumes** to use the provided workflow to create new volumes, attach them to the server, and optionally, protect the volumes.
 - Click **Attach Volumes** to attach existing volumes to the server.

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 you 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.

For the volumes already attached to this server, 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 host level:

- Click **Delete** to remove the server.
- Click **Edit** to update server parameters.
- Click **Create and Attach Volumes** to create volumes and attach them to the server.

The following actions are available after selecting one or more volumes:

- Click **Edit** to rename a volume on the Update Volume page. If the volume is unprotected, you can also update the size.
- Click **Detach Volumes** to detach volumes from the server.
- Click **Protect Volumes** to protect volumes using Infrastructure Director data protection technologies.
- Click **Unprotect Volumes** to remove data protection applied to volumes.
- Click **Suspend Volumes** to suspend data protection.
- Click **Resume** to resume data protection.
- Click **Restore Volumes** to restore from a backup.

Updating a server

You can change the parameters for an existing server.

Prerequisites

Detach all volumes from the server. If you want to remove a WWN, detach all volumes using the WWN.

Procedure

1. From the dashboard, click **Servers** to open the inventory of servers.
2. Click the tile for the server you want to update.

3. Edit the parameters and click **Submit**.

Managing volumes

A volume is a single accessible storage area, consisting of a pool within a parity group on a storage system. Create a volume and manage its properties with Infrastructure Director

Creating volumes

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

When you create volumes in Infrastructure Director 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 Infrastructure Director 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.

Prerequisites

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

Procedure

1. On the Infrastructure Director 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. 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: **HDT** or **HDP**.
 - f. For an HDP pool type, select the tier: **Gold**, **Silver**, or **Bronze**.
 - g. (Optional) Select the pool from the list of available pools. The default selection is **Auto Select**, which means that Infrastructure Director 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 and deploy the workload.

Related concepts

- [Creating parity groups](#) on page 24
- [Creating a pool](#) on page 30

Related tasks

- [Adding servers](#) on page 41

Attaching existing volumes to a server

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

Prerequisites

Enable security on ports.

Add servers.

Create volumes.

Procedure

1. To select one or more volumes to attach, click **Storage Systems** and then click a storage system tile for the storage system where you want to attach volumes.
2. Click **Volumes** to view the inventory of all volumes.
3. Select one or more volumes:
 - Select volumes that you want to attach to servers.
 - To attach a specific volume, click it to open the **Volume <ID>** page.
4. Click **Attach Volumes**.
5. On the **Attach Volumes** page, select a server and click **Next**.

6. The **Host Mode** is set by default to the server operating system. You can make a selection if needed.
7. By default, the **Host Mode Option** will depend on the **Host Mode** selection.
8. Select the **LUN Alignment**.
LUN Alignment is available if the volume will be attached to more than one server. By default, Infrastructure Director uses the LUN number that is common to the servers.
9. The **Auto Create Zone** is set to **Yes** by default if a fabric switch has been added. You can set it to **No** if you need to set up a zone on the fabric switch.
10. Optionally, select one or more **Ports** and one or more **WWNs**. Make sure that the WWNs are valid in the environment and visible to the storage system. If the WWN-port pairs selected do not exist, Infrastructure Director creates them.
11. Click **Submit**.

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.
3. You can rename the volume, and if it is unprotected, you can enter an **Update Size** and 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%.

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:
 - Click **Delete** to delete volumes. When you delete a volume, it is de-provisioned and removed from the storage system.
 - Click **Attach Volumes** to attach existing volumes to one or more servers on the Attach Volumes page.
 - Click **Protect Volumes** to apply data protection on the Protect Volumes page.
 - Click **Suspend** to suspend data protection.
 - Click **Resume** to resume data protection following suspension.
 - Click **Restore** to restore a backup.

Volume details

Access volume details 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 tile

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

- View the attributes of the volume.
- Attach the volume to a server by clicking **Attach Volume**.
- Edit the volume configuration by clicking **Edit** to open the Update Volume window.

If the 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.

- Delete the volume.

Protect data

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

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

Infrastructure Director provides the following methods of protecting data:

- The Clone Now method creates a copy of a volume at a point in time. This method creates a full copy of a primary volume at that point in time and automatically suspends the copy operation. Any further R/W operations on primary volume will not be updated to secondary volumes.
- The Snapshot method takes incremental snapshots of volumes based on a user-created schedule. The maximum number of snapshots is 1024.
- The Full Copy method creates one or more full copies. This method creates a copy and then keeps it continuously updated. The maximum number of copies is 9.

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.

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.
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 protection; Clone Now, Snapshot, or Full Copy.

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

- [Protecting volumes by cloning](#)
- [Protecting volumes by creating snapshots](#)
- [Protecting volumes by creating one or more full copies](#)
- [Suspend, resume, restore, and unprotect](#)

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 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.

Procedure

1. In the **Protect Volumes** page, select the volumes you want to protect and click **Clone Now**.
2. Select a copy group from the options in the **Copy Group Name** list or enter a new name.
3. Click **Submit** to clone the volumes.

Result

A job is created and a summary message displays.

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.

Procedure

1. In the **Protect Volumes** page, select the volumes you want to protect and click **Snapshot**.
2. You can enable **Consistency Group** to perform data protection on all pairs in the group simultaneously.
3. Select a **Copy Group** for each volume or enter a new **Copy Group** name.

Copy groups are a way of organizing the groups of copy pairs. Each copy pair is made up of a "primary volume", and its copy, which is called the "secondary volume".

4. Set a daily, weekly, or monthly schedule and click **Next**.

Result

A summary message is displayed and snapshots are created according to the schedule.

Protecting volumes by creating one or more full copies

One option for data protection is to create up to nine full copies of volumes.

You can use the Full Copy method if you want the copy operation to continue until a suspend operation is performed manually.

Procedure

1. In the **Protect Volumes** page, select the volumes you want to protect and click **Full Copy**.
2. You can enable **Consistency Group** to perform data protection on all pairs in the group simultaneously.
3. Select a **Copy Group** for each volume or enter a new **Copy Group** name.

Copy groups are a way of organizing the groups of copy pairs. Each copy pair is made up of a primary volume, and its copy, which is called the secondary volume. The copy groups available match the Number of Copies entered and the Consistency Group field.

4. Select volumes and click **Protect**.
5. In the **Protect Volumes** page, select the volumes you want to protect and click **Full Copy**.
6. Enter the **Number of Copies** you want to create, up to nine.
7. You can click **Consistency Group** to perform data protection on all pairs in the group simultaneously.
8. Select copy groups from the options in the **Copy Group Name** list or enter a new name.
9. Click **Next** to create the full copies.

Result

A summary message is displayed and the copies are created. A job is started to create the copies.

Suspend, resume, restore, and unprotect

Suspend data protection, and then resume or create a new copy. Restore a volume from a copy.

You may need to suspend data protection during maintenance, and then resume or create a new copy. You can also restore a backup from a copy to a primary volume. Suspend, resume, and restore all operate on an entire copy group.

You can also unprotect volumes by selecting them and clicking Unprotect Volumes.

The effect of suspension depends on the type of data protection used:

- Snapshot or Full Copy: Data protection can be suspended and resumed. Data will be missing for the period of suspension.
- Clone Now: Copying is already suspended. Data protection can be resumed.

Procedure

1. Select volumes to suspend, resume or restore in one of these ways:
 - On the dashboard, click **Servers**, and click a server tile to open details.
 - Select volumes for a single storage system:
 1. On the dashboard, click **Storage Systems** and click a storage system tile to open details.
 2. Click **Servers**, and click a server tile to open details.

You can filter volumes to view only those that are protected, or by protection type. Select volumes to suspend, resume, or restore.

2. Choose the operation to perform by clicking **Suspend**, **Resume**, or **Restore** to open the **Affected Volumes** page, where you can view all affected volumes sorted by copy group.
3. Click **Yes** to confirm the operation and then click **Submit**.

Monitor block storage

Hitachi Infrastructure Director 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 Infrastructure Director to monitor block storage capacity so you can tell when physical capacity usage is exceeding thresholds set for your pools.

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 Infrastructure Director 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.

Next steps:

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

Monitoring hardware

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

Infrastructure Director 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 8.

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 5 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.

Infrastructure Director 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.
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 Full Copy operations
- Failed Clone Now operations
- Failed Snapshot operations

Prerequisites

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

Many jobs can be expanded to display child jobs in the table, each with an associated report. Reports are the messages that the Infrastructure Director 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 Manager Protocol) manager to enable alerts about devices in registered storage systems. This option is not required in order to monitor hardware in Hitachi Infrastructure Director.

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 Infrastructure Director using SNMP v1.



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

Infrastructure Director uses SNMP v2c 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 Infrastructure Director 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 Infrastructure Director file to access the additional information. The Infrastructure Director 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

Prerequisites

SNMP management requires:

- Management software capable of receiving SNMP alerts.
- SNMP agents must be configured in the storage environment.
- The Infrastructure Director has been imported to the SNMP manager.

Procedure

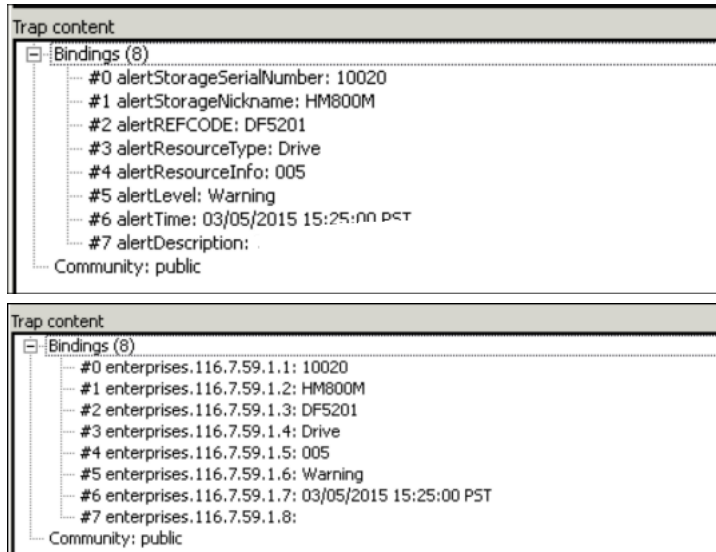
1. Click **Settings** and select **SNMP Settings**. Click **Add SNMP Manager** to open the **SNMP Management** page.
2. Enter the following details:
 - **Name:** up to 32 characters.
 - **IP Address:** of the SNMP manager.
 - **Community String:** registered in the external management software. Enter up to 180 characters. Characters not allowed are: \ , / ; : * ? " < > | .
 - **Port:** Positive integers from 0 to 65535. are allowed.
3. Click the plus sign (+) to add the row and then click **Submit**.

Result

A job is created to add 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.



Administer Infrastructure Director

Infrastructure Director administration tasks are done in Virtual Appliance Manager or through the settings icon (⚙️) in the top right.

- [Administering security](#)
- [Backup system settings](#)
- [Downloading the system log file](#)

Administering security

Infrastructure Director comes with a default local user that has permissions for all operations in Infrastructure Director.

On a regular basis, you can change the password of the local user by accessing Change Local Password.

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. Infrastructure Director supports adding one external LDAP server.

You can then assign Infrastructure Director 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.

Adding an account domain

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



Note: Once an active directory server is added, you can change the credentials on an ongoing basis and save the changes. To add a new Active Directory server, remove the existing Active Directory server 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 Active Directory server.
3. Enter the Active Directory server **Username** and **Password**.
Infrastructure Director uses these credentials to connect to the external domain and get the list of user groups in the Active Directory source. You can assign Infrastructure Director roles to these user groups.
Infrastructure Director does not modify the user groups in the Active Directory source.
4. Click **Save**.

Assigning user roles

After adding an external LDAP source to Infrastructure Director, you can assign Infrastructure Director 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.

Prerequisites

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 Infrastructure Director 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 Infrastructure Director.
 - **SystemAdministrator**: Includes privileges needed for the following:
 - Addition, administration, and deletion of servers, storage, and fabric switches, onboarding of HNAS and SNMP manager, and tier management.
 - Updating of Initial Setup Wizard settings.
 - Addition, administration, and deletion of parity groups and port configurations.
 - Addition, administration, and deletion of EVS cluster resource groups.
 - Read-only privileges to monitor everything in Infrastructure Director.
 - **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 Infrastructure Director.

Example

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

Backup system settings

Use Hitachi Virtual Appliance Manager to backup system settings before moving Infrastructure Director to another instance or before upgrading.

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.
2. Click **Backup** to download a ZIP file containing system settings.

System settings included in backup

The following settings are included in the backup file:

File name	Description
cinder.conf	Cinder configuration file located on the deployed VM at <code>/opt/rainier/etc/cinder/cinder.conf</code>
FabricSupport.txt	Cinder fabric support located on the deployed VM at <code>/opt/rainier/etc/cinder/FabricSupport.txt</code>
rainierBackup.sql	Infrastructure Director backup file.
hostnametimezone.conf	Can be used to specify a time zone for a server or host using time settings from VAM.
ifcfg-eth0	Changes related to DHCP settings, including which device to use, how the IP address should be assigned (DHCP or static), and whether DHCP should be turned on when the system is initialized.
log4j2-vam.xml	Configuration file for logging services.
resolv.conf	Generated by NetworkManager and includes domain, search, and nameserver resolutions.
ntp.conf	Network settings that can be edited in VAM.
rsyslog.conf	Configurations for processing logs.
smtp.conf	SMTP configuration that can be change in VAM if SMTP is supported in VAM.
vam	Information about VAM logs.
email.template	Email template for use with SMTP. Not currently supported.

Downloading 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.



Index

A

- account domain
 - adding 62
- Active Directory 62
- administration 61
- alerts 53

B

- backup 64
 - settings 64
- block storage systems
 - configuring 10

C

- capacity
 - monitoring 54

D

- dashboard 11
 - analyzing data 13
- data protecting
 - monitoring 56
- data protection 47
 - restore 50
 - resume 50
 - suspend 50
 - unprotect 50
- Device Manager - Storage Navigator
 - accessing 39
 - using 38
- devices
 - monitoring 55

F

- fabric switches
 - adding 22
 - supported models 23
- file storage systems
 - configuring 10

G

- getting started 9

H

- hosts
 - updating 42

I

- inventory 15

J

- job status 57
- jobs
 - monitoring 57

M

- monitoring 53
 - capacity 54
 - data protecting 56
 - hardware 55
 - jobs 57

O

- onboarding 16
- overview
 - Hitachi Infrastructure Director 10

P

- parity group
 - creating 24
- parity groups
 - details 29
 - inventory 28
- parity groups, creating
 - advanced method 27
 - basic method 25

- pools
 - creating 30
 - creating with advanced method 32
 - expanding 33
 - inventory 33
 - updating 33
 - viewing details 33
- pools, creating 30
- ports
 - enabling security 22

R

- replication 47
- resources 15
- Roles 39

S

- security
 - administering 62
- server
 - inventory 41
- servers
 - adding 41
 - details 42
- SNMP alerts
 - enabling 58
- SNMP manager
 - adding 58
- spares
 - managing 27
- storage system
 - adding 20
 - configuration workflow 16
 - details 37
 - editing 40
 - updating 40
- storage systems
 - inventory 36
 - managing 36
- system log
 - downloading 65

U

- User groups
 - roles 39
- user roles 62
 - assigning 62

V

- verify, storage system 21
- volumes 49
 - attaching 35, 44
 - cloning 49
 - create and attach 34

- create and attach to servers 16
- details 46
- expanding 45
- inventory 45
- protecting, full copy 50
- updating 45
- volumes, creating 34, 43

W

- workflow
 - configuring a storage system 16

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