

Hitachi Ops Center Protector

7.4

User Guide

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Preface

This document describes how to install and use Hitachi Ops Center Protector.

Software version

This document revision applies to Ops Center Protector version 7.4. Please refer to the accompanying Release Notes for information on what's changed in this release.

Intended audience

This document is intended for system administrators, backup administrators and other users who are responsible for installing, configuring, and operating Hitachi Ops Center Protector.



Tip: If you are installing or upgrading Protector, please refer to "Installation Tasks" in User Guide or the accompanying Quick Start Guide.

The User Guide is organized into the following chapters:

- Refer section "Concepts" in User Guide that describes each feature, its purpose, theory of operation and best practices.
- Refer section "Data Protection Workflows" in User Guide that provides high level, step-by-step guides on how to set up and use Protector to protect, manage and restore your data.
- Refer section "Tasks" in User Guide that describes how lower level activities are performed step-by-step via the user interface.
- Refer section "User Interface Reference" in User Guide that details the entire graphical user interface, describing every web page, wizard and dialog. Hyperlinks are provided to enable you to navigate through the UI in a similar way to the actual product.
- Refer section "Command Line Interface Reference" in User Guide that details the command line interface, describing commonly used commands and associated options.
- Refer section "Troubleshooting" in User Guide that lists commonly encountered issues and their solutions.

Related documents

Main product guides:

- *Hitachi Ops Center Protector Software Release Notes.*
- *Hitachi Ops Center Protector Quick Start Guide.*
- *Hitachi Ops Center Protector User's Guide.*
- *Hitachi Ops Center Protector Oracle Application Guide.*
- *Hitachi Ops Center Protector VMware Application Guide.*
- *Hitachi Ops Center Protector Hyper-V Application Guide.*
- *Hitachi Ops Center Protector Microsoft SQL Application Guide*

Programming guides:

- *Hitachi Ops Center Protector REST API User Guide.*
- *Hitachi Ops Center Protector REST API Reference Guide.*
- *Hitachi Ops Center Protector REST API Change Log.*





Document conventions

This document uses the following typographic conventions:

| Convention | Description |
|---------------|--|
| Bold | <ul style="list-style-type: none"> ▪ Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click OK. ▪ Indicates emphasized words in list items. |
| <i>Italic</i> | <ul style="list-style-type: none"> ▪ Indicates a document title or emphasized words in text. ▪ Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: <pre>pairedisplay -g group</pre> (For exceptions to this convention for variables, see the entry for angle brackets.) |
| Monospace | Indicates text that is displayed on screen or entered by the user. Example: <code>pairedisplay -g oradb</code> |

| Convention | Description |
|---------------------|---|
| < > angle brackets | <p>Indicates variables in the following scenarios:</p> <ul style="list-style-type: none"> Variables are not clearly separated from the surrounding text or from other variables. Example: <pre>Status-<report-name><file-version>.csv</pre> Variables in headings. |
| [] square brackets | Indicates optional values. Example: [a b] indicates that you can choose a, b, or nothing. |
| { } braces | Indicates required or expected values. Example: { a b } indicates that you must choose either a or b. |
| vertical bar | <p>Indicates that you have a choice between two or more options or arguments. Examples:</p> <p>[a b] indicates that you can choose a, b, or nothing.</p> <p>{ a b } indicates that you must choose either a or b.</p> |

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

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

Conventions for storage capacity values

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

| Physical capacity unit | Value |
|------------------------|-----------------------------|
| 1 kilobyte (KB) | 1,000 (10^3) bytes |
| 1 megabyte (MB) | 1,000 KB or $1,000^2$ bytes |
| 1 gigabyte (GB) | 1,000 MB or $1,000^3$ bytes |
| 1 terabyte (TB) | 1,000 GB or $1,000^4$ bytes |
| 1 petabyte (PB) | 1,000 TB or $1,000^5$ bytes |
| 1 exabyte (EB) | 1,000 PB or $1,000^6$ bytes |

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

| Logical capacity unit | Value |
|-----------------------|--|
| 1 block | 512 bytes |
| 1 cylinder | Mainframe: 870 KB Open-systems: <ul style="list-style-type: none"> ▪ OPEN-V: 960 KB ▪ Others: 720 KB |
| 1 KB | 1,024 (2^{10}) bytes |
| 1 MB | 1,024 KB or $1,024^2$ bytes |
| 1 GB | 1,024 MB or $1,024^3$ bytes |
| 1 TB | 1,024 GB or $1,024^4$ bytes |
| 1 PB | 1,024 TB or $1,024^5$ bytes |
| 1 EB | 1,024 PB or $1,024^6$ bytes |

Accessing product documentation

Product user documentation is available on the Hitachi Vantara Support Website: <https://knowledge.hitachivantara.com/Documents>. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

The [Hitachi Vantara Support Website](https://support.hitachivantara.com/en_us/contact-us.html) is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to the Hitachi Vantara Support Website for contact information: https://support.hitachivantara.com/en_us/contact-us.html.

[Hitachi Vantara Community](https://community.hitachivantara.com) is a global online community for Hitachi Vantara customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to community.hitachivantara.com, register, and complete your profile.

Comments

Please send us your comments on this document to doc.comments@hitachivantara.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 Vantara LLC.

Thank you!

Chapter 1: Before you begin

Prerequisites

It is important that the following prerequisites are met before you implement any of the policies described in this guide.

To ensure that your hardware and software environment is fully supported, please refer to <https://www.hitachivantara.com/en-us/products/data-protection/ops-center-protector.html>.

For detailed information on installing the Ops Center Protector Master, and Client components, refer to the *Hitachi Ops Center Protector User's Guide*.

Hitachi Block prerequisites

The following prerequisites are mandatory if you plan to perform snapshotting and/or replication of Hitachi Block volumes. Please also refer to the Protector support matrices at <https://www.hitachivantara.com/en-us/products/data-protection/ops-center-protector.html>.

- A machine (known as an ISM) must be assigned that controls the Block storage device. This node must be a supported Windows or Linux machine with the Protector Client software installed.



Caution: ISM nodes and their associated CMDs used to control storage devices must not be shared with applications other than those forming part of the Ops Center suite.

- All primary data (paths or application data) to be snapshotted or replicated within the same data protection policy must exist on the same storage device.
- The block storage hardware must:
 - Support the data protection technologies you intend to use
 - Have the correct firmware version installed
 - Have the correct SVOS version installed
- For all replication types the P-VOLs must be setup in the host group
- In order to resize logical devices represented by the Block Host node that are part of a replication or snapshot pair the array account must have the Support Personal permission.
- For UR, journals must be set up, although for HM800 and later arrays Protector can create journals
- For GAD, the quorum disks or quorum-less disks must be provided. In most cases, one quorum device between participating storage systems is satisfactory. Please refer to the *Global-Active Device User Guide* for best practices

- For GAD, the array should be configured to allow virtualized LDEVs if they are required (where supported by the array)
- Port security must be enabled.
- Primary volumes must be set up using other Hitachi tools prior to selection in Protector
- For application consistent snapshots, the application must be installed and configured to use P-VOLs on a storage array, see the relevant application guide for details on the application configuration
- The password for authorizing a Block Device node must contain only useable CCI command characters: A-Za-z0-9'-./:@_
_
- The device must have adequate shared memory (see Provisioning and Technical Guides)
- Pools must be created using Storage Navigator prior to selecting the Target Storage in Ops Center Protector:
 - For standard mode (non-cascading) TI the TI Pools must be set up
 - For cascade mode TI the Dynamic Provisioning Pools must be set up to also be a hybrid pool, otherwise a TI pool will also be required
 - For SI, TC, UR and GAD the Dynamic Provisioning Pools must be set up
- The following licensed features may be required depending on the features being used:
 - Dynamic Provisioning
 - Storage Navigator
 - Thin Image (for TI snapshot and RTI replication scenarios)
 - ShadowImage (for SI replication scenarios)
 - TrueCopy (for TC replication scenarios)
 - Universal Replicator (for UR replication scenarios)
 - Global-Active Device (for GAD replication scenarios)
 - Remote Replication Extended (for 3DC scenarios)
- The Protector ISM node controlling the block storage device must have:
 - The correct version of Hitachi CCI installed.
If CCI is not installed in the default location there are two options:
 1. Add a symbolic link from the default location to the install directory
 2. Configure Protector to use CCI in the custom location using the following instructions:
 - a. Stop the Protector services on the ISM node
 - b. Go to the directory <Protector home>\db\config
 - c. Make the change to all files matching hitachivirtualstorageplatform*.cfg

- d. Change the <BinDirectory> value from C:/HORCM/etc to the correct installation path

```
<!-- Install directory of CCI, override to change
installation directory. -->

<BinDirectory>C:/HORCM/etc</BinDirectory>
```

- e. Ensure the change has been made to all files at per 3 including the default one.
 - f. Start the Protector services on the ISM node
- Access to a dedicated Command Device (CMD) on the storage device, set up as follows:



WARNING: When running the Analyzer probe server, API Configuration Manager, and Protector ISM Client on the same VM, all components share the same command device, but API Configuration Manager and Protector ISM Client must access the storage systems using different credentials. This means that API Configuration Manager and Protector ISM client must use different login accounts when accessing the storage system.

- Security disabled
- User authentication enabled
- Device group definition disabled
- The CMD must be visible to the host OS where the Protector proxy resides
- The CMD must be offline
- The CMD must be added to the meta_resource only.
- Multiple active command devices may be visible to a Protector proxy as long as each one represents a different block storage device. Behaviour is undefined if multiple active command devices represent the same block storage device, unless these are configured in the Protector proxy node fail-over priority list.
- Fibre channel and IP command devices are supported.
- Multipath for Command Devices is supported
- A dedicated user (specified when creating the Hitachi Block Device node) for Protector must be created on the storage device with at least the following roles:
 - Storage Administrator (Provisioning)
 - Storage Administrator (Local Copy)
 - Storage Administrator (Remote Copy)
 - Security Administrator (View & Modify).

The user must also have access to Resource Group 0 on the storage device.

- Fibre connectivity (including zoning) and pre-configured RCU paths between arrays for remote replication technologies

Generation 1 Hitachi Content Platform prerequisites

If you plan to use the Generation 1 Hitachi Content Platform (HCP) with Ops Center Protector, then the following Search Facility Settings must be selected within the Settings tab of the HCP Management Console, for the Metadata Query Engine (MQE):

- Enable indexing
- Enable indexing of custom metadata

Click Update MQE Settings to reflect the changes.

- A Protector HCP node can only be created if the Protector Master node can directly connect to the HCP web interface.
- The tenant must have Enable management through APIs turned on in the **HCP Tenant Management Console**.
- The user should have at least the following enabled in the **HCP Tenant Management Console**:
 - Roles:
 - Administrator
 - Compliance
 - Permissions:
 - Read
 - Write
 - Delete
 - Privileged
 - Search

Generation 2 Hitachi Content Platform prerequisites

If you plan to use the Generation 2 Hitachi Content Platform (HCP) with Ops Center Protector, then the following prerequisites must be met:

Configure the following system global settings:

| HCP UI Location | Setting Name | Enabled |
|-----------------|---------------------------|---------|
| Security | Enable the management API | ✓ |
| Services | <MQE service is running> | ✓ |
| Services | Enable metadata query API | ✓ |
| Services | Enable indexing | ✓ |

| HCP UI Location | Setting Name | Enabled |
|-----------------|------------------------------------|---------|
| Services | Enable indexing of custom metadata | ✓ |

- Create and configure the tenant(s)
 - The Tenants *must be manually created* by the administrator account
 - After a tenant is created the following tenant settings *must be manually configured* by the administrator account

| HCP UI Location | Setting Name | Enabled |
|---------------------------------------|--------------|---------|
| Tenants → <tenant name> → Settings | Search | ✓ |
| Tenants → <tenant name> → Settings | Versioning | ✓ |

- These settings are verified prior to creating a new namespace. If these settings are not enabled the namespace will not be created
- Configure each tenants' global settings
 - After a tenant is created the following global tenant settings *must be manually configured* by an administrator account

| HCP UI Location | Setting Name | Enabled |
|-----------------|---------------------------|---------|
| Security | Enable the management API | ✓ |

- Create the tenant accounts to be used by the HCP Cloud Connector
 - These accounts must be created from the HCP Tenant Management Console
 - Each HCP account must have, as a minimum, the following roles enabled:

| HCP Role Name | Enabled |
|---------------|---------|
| Administrator | ✓ |
| Compliance | ✓ |

Amazon S3 prerequisites

If you plan to use the Amazon S3 with Ops Center Protector, then the following prerequisites must be met:

- The Amazon S3 proxy node must have an internet connection and be able to communicate with Amazon S3
- The Protector Master must have an internet connection and be able to communicate with Amazon S3
- An AWS account with an Access Key ID and a Secret Access Key.
- The AWS account must have *AmazonS3FullAccess* and *CloudWatchReadOnlyAccess* permissions.
- Protector can only use the bucket it creates, it can not be configured to use a different bucket.

HCP Cloud Scale prerequisites

If you plan to use the HCP Cloud Scale with Ops Center Protector, then the following prerequisites must be met:

- The Cloud Scale proxy node must be able to communicate with the Cloud Scale device.
- The Protector Master must be able to communicate with the HCP Cloud Scale device

Chapter 2: Concepts

This chapter describes Ops Center Protector's functionality and features.

Before you begin

Prerequisites

It is important that the following prerequisites are met before you implement any of the policies described in this guide.

To ensure that your hardware and software environment is fully supported, please refer to <https://www.hitachivantara.com/en-us/products/data-protection/ops-center-protector.html>.

For detailed information on installing the Ops Center Protector Master, and Client components, refer to the *Hitachi Ops Center Protector User's Guide*.

Hitachi Block prerequisites

The following prerequisites are mandatory if you plan to perform snapshotting and/or replication of Hitachi Block volumes. Please also refer to the Protector support matrices at <https://www.hitachivantara.com/en-us/products/data-protection/ops-center-protector.html>.

- A machine (known as an ISM) must be assigned that controls the Block storage device. This node must be a supported Windows or Linux machine with the Protector Client software installed.



Caution: ISM nodes and their associated CMDs used to control storage devices must not be shared with applications other than those forming part of the Ops Center suite.

- All primary data (paths or application data) to be snapshotted or replicated within the same data protection policy must exist on the same storage device.
- The block storage hardware must:
 - Support the data protection technologies you intend to use
 - Have the correct firmware version installed
 - Have the correct SVOS version installed
- For all replication types the P-VOLs must be setup in the host group
- In order to resize logical devices represented by the Block Host node that are part of a replication or snapshot pair the array account must have the Support Personal permission.

- For UR, journals must be set up, although for HM800 and later arrays Protector can create journals
- For GAD, the quorum disks or quorum-less disks must be provided. In most cases, one quorum device between participating storage systems is satisfactory. Please refer to the *Global-Active Device User Guide* for best practices
- For GAD, the array should be configured to allow virtualized LDEVs if they are required (where supported by the array)
- Port security must be enabled.
- Primary volumes must be set up using other Hitachi tools prior to selection in Protector
- For application consistent snapshots, the application must be installed and configured to use P-VOLs on a storage array, see the relevant application guide for details on the application configuration
- The password for authorizing a Block Device node must contain only useable CCI command characters: A-Za-z0-9'-./: @\ _
- The device must have adequate shared memory (see Provisioning and Technical Guides)
- Pools must be created using Storage Navigator prior to selecting the Target Storage in Ops Center Protector:
 - For standard mode (non-cascading) TI the TI Pools must be set up
 - For cascade mode TI the Dynamic Provisioning Pools must be set up to also be a hybrid pool, otherwise a TI pool will also be required
 - For SI, TC, UR and GAD the Dynamic Provisioning Pools must be set up
- The following licensed features may be required depending on the features being used:
 - Dynamic Provisioning
 - Storage Navigator
 - Thin Image (for TI snapshot and RTI replication scenarios)
 - ShadowImage (for SI replication scenarios)
 - TrueCopy (for TC replication scenarios)
 - Universal Replicator (for UR replication scenarios)
 - Global-Active Device (for GAD replication scenarios)
 - Remote Replication Extended (for 3DC scenarios)
- The Protector ISM node controlling the block storage device must have:
 - The correct version of Hitachi CCI installed.

If CCI is not installed in the default location there are two options:

 1. Add a symbolic link from the default location to the install directory
 2. Configure Protector to use CCI in the custom location using the following instructions:
 - a. Stop the Protector services on the ISM node
 - b. Go to the directory <Protector home>\db\config

- c. Make the change to all files matching `hitachivirtualstorageplatform*.cfg`
- d. Change the `<BinDirectory>` value from `C:/HORCM/etc` to the correct installation path

```
<!-- Install directory of CCI, override to change
installation directory. -->
```

```
<BinDirectory>C:/HORCM/etc</BinDirectory>
```

- e. Ensure the change has been made to all files at per 3 including the default one.
 - f. Start the Protector services on the ISM node
- Access to a dedicated Command Device (CMD) on the storage device, set up as follows:



WARNING: When running the Analyzer probe server, API Configuration Manager, and Protector ISM Client on the same VM, all components share the same command device, but API Configuration Manager and Protector ISM Client must access the storage systems using different credentials. This means that API Configuration Manager and Protector ISM client must use different login accounts when accessing the storage system.

- Security disabled
 - User authentication enabled
 - Device group definition disabled
 - The CMD must be visible to the host OS where the Protector proxy resides
 - The CMD must be offline
 - The CMD must be added to the `meta_resource` only.
 - Multiple active command devices may be visible to a Protector proxy as long as each one represents a different block storage device. Behaviour is undefined if multiple active command devices represent the same block storage device, unless these are configured in the Protector proxy node fail-over priority list.
 - Fibre channel and IP command devices are supported.
 - Multipath for Command Devices is supported
- A dedicated user (specified when creating the Hitachi Block Device node) for Protector must be created on the storage device with at least the following roles:
 - Storage Administrator (Provisioning)
 - Storage Administrator (Local Copy)
 - Storage Administrator (Remote Copy)
 - Security Administrator (View & Modify).

The user must also have access to Resource Group 0 on the storage device.

- Fibre connectivity (including zoning) and pre-configured RCU paths between arrays for remote replication technologies

Generation 1 Hitachi Content Platform prerequisites

If you plan to use the Generation 1 Hitachi Content Platform (HCP) with Ops Center Protector, then the following Search Facility Settings must be selected within the Settings tab of the HCP Management Console, for the Metadata Query Engine (MQE):

- Enable indexing
- Enable indexing of custom metadata

Click Update MQE Settings to reflect the changes.

- A Protector HCP node can only be created if the Protector Master node can directly connect to the HCP web interface.
- The tenant must have Enable management through APIs turned on in the **HCP Tenant Management Console**.
- The user should have at least the following enabled in the **HCP Tenant Management Console**:
 - Roles:
 - Administrator
 - Compliance
 - Permissions:
 - Read
 - Write
 - Delete
 - Privileged
 - Search

Generation 2 Hitachi Content Platform prerequisites

If you plan to use the Generation 2 Hitachi Content Platform (HCP) with Ops Center Protector, then the following prerequisites must be met:

Configure the following system global settings:

| HCP UI Location | Setting Name | Enabled |
|-----------------|---------------------------|---------|
| Security | Enable the management API | ✓ |
| Services | <MQE service is running> | ✓ |
| Services | Enable metadata query API | ✓ |
| Services | Enable indexing | ✓ |

| HCP UI Location | Setting Name | Enabled |
|-----------------|------------------------------------|---------|
| Services | Enable indexing of custom metadata | ✓ |

- Create and configure the tenant(s)
 - The Tenants *must be manually created* by the administrator account
 - After a tenant is created the following tenant settings *must be manually configured* by the administrator account

| HCP UI Location | Setting Name | Enabled |
|---------------------------------------|--------------|---------|
| Tenants → <tenant name> → Settings | Search | ✓ |
| Tenants → <tenant name> → Settings | Versioning | ✓ |

- These settings are verified prior to creating a new namespace. If these settings are not enabled the namespace will not be created
- Configure each tenants' global settings
 - After a tenant is created the following global tenant settings *must be manually configured* by an administrator account

| HCP UI Location | Setting Name | Enabled |
|-----------------|---------------------------|---------|
| Security | Enable the management API | ✓ |

- Create the tenant accounts to be used by the HCP Cloud Connector
 - These accounts must be created from the HCP Tenant Management Console
 - Each HCP account must have, as a minimum, the following roles enabled:

| HCP Role Name | Enabled |
|---------------|---------|
| Administrator | ✓ |
| Compliance | ✓ |

Amazon S3 prerequisites

If you plan to use the Amazon S3 with Ops Center Protector, then the following prerequisites must be met:

- The Amazon S3 proxy node must have an internet connection and be able to communicate with Amazon S3
- The Protector Master must have an internet connection and be able to communicate with Amazon S3
- An AWS account with an Access Key ID and a Secret Access Key.
- The AWS account must have *AmazonS3FullAccess* and *CloudWatchReadOnlyAccess* permissions.
- Protector can only use the bucket it creates, it can not be configured to use a different bucket.

HCP Cloud Scale prerequisites

If you plan to use the HCP Cloud Scale with Ops Center Protector, then the following prerequisites must be met:

- The Cloud Scale proxy node must be able to communicate with the Cloud Scale device.
- The Protector Master must be able to communicate with the HCP Cloud Scale device

Ops Center Protector Overview

This section provides an overview of Ops Center Protector.

For further information, refer to:

- [Tasks \(on page 210\)](#)
- [User Interface Reference \(on page 275\)](#)
- [Command Line Interface Reference \(on page 815\)](#)
- [Troubleshooting \(on page 853\)](#)

About Ops Center Protector

Ops Center Protector provides a modern, holistic approach to data protection, recovery and retention. It has a unique workflow based policy engine, presented in an easy-to-use whiteboard-style user interface that helps map copy-data management processes to business priorities. A wide range of fully integrated hardware storage-based and host-based incremental-forever data capture capabilities are included that can be combined into complex work flows to automate and simplify copy-data management. With these you can:

- Choose the right technology for each workload, based on service level requirements, but manage them from one place.
- Drag-and-drop a range of protection, retention and repurposing capabilities to easily create and manage complex work flows.

- Automate and orchestrate Hitachi storage-assisted snapshots, clones and replications to eliminate backup windows.
- Automate the mounting of Hitachi storage based snapshots, clones and replications for proxy backup and repurposing.

Protector supports a wide range of data storage targets, including repository, block, and file based storage.

Features and benefits

Ops Center Protector enables you to:

- Meet operational recovery, disaster recovery and long-term recovery challenges in a single, unified platform.
- Drive the backup window, recovery point objective (RPO) and recovery time objective (RTO) to near zero.
- Employ incremental-forever data capture at the block level helping to reduce secondary storage requirements by 90% or more.
- Use intuitive, drag-and-drop workflow creation, node and policy management wizards for administrative agility.
- Use Hitachi Thin Image snapshot orchestration for your critical data and applications.
- Easily create or adopt ShadowImage, Hitachi TrueCopy[®], Universal Replicator, Global-Active Device and File Replication without scripting, on a scheduled or ad-hoc basis.
- Orchestrate application-consistent snapshot and clone management for Oracle.
- Orchestrate application-consistent snapshots and clones across other applications and file systems.
- Combine automated local snapshot and off-site replication for an end-to-end modern data protection and recovery solution.
- Automatically trigger snapshots and clones of remote replica data for secondary operations, such as test and development.
- Mount and unmount snapshots and clones automatically as part of an orchestrated policy workflow.
- Further reduce network and storage costs through source and target data deduplication.
- Protect VMware hypervisors and virtual machines.
- Support a broad range of storage types, including repositories and block storage.

Data protection terminology

The following terminology is frequently used when describing data protection in this guide:

Host based backup involves backing up data over the network to a storage device such as a repository. The backup and restore operations are implemented by Protector software processes that utilise the smallest possible amount of the computing, memory and disk resources on the node being backed up or restored to.

Repositories are data stores implemented by Protector software processes that hold backup data. Repositories utilise disk volumes mounted on the host where the repository is located. They have built-in capabilities for data reduction, such as block differentials and de-duplication, as well as the capability to record point-in-time snapshots of captured data. Backup and restore operations may utilise significant amounts of the computing, memory and disk resources of the node where the repository is located.

Proxies interface with physical storage devices and hypervisors, and assist in coordinating the backup and restore processes. Proxy nodes have Protector software installed on them and in some cases require additional third party software to interface with the devices they control. Examples of devices requiring proxy nodes include:

- Block storage arrays
- VMware vCenter servers
- VMware ESXi hosts

Block hardware storage devices use snapshotting and replication technologies implemented by the storage device itself. Proxies running Protector software orchestrate backup and restore functions on these devices but are not directly involved in capturing or transferring backup data. Examples of these devices include Hitachi Block storage arrays.

File hardware storage devices use snapshotting and replication technologies implemented by the storage device itself. Proxies running Protector software orchestrate backup and restore functions on these devices but are not directly involved in capturing or transferring backup data.

Application nodes are existing application servers or clusters that require Protector and additional third party software to be installed. Protector software discovers application data paths and coordinates backup and restore operations. Applications can be placed in the correct state to ensure consistent backup and restore processing. Example application nodes include:

- Oracle Database

Architecture

At the heart of Protector is the *Master*; a software component installed on a dedicated server that acts as a central hub, communicating with users via a REST interface and web based UI. The *Master* monitors and controls the activity of a set of *Clients*; software components installed on servers in the protected environment. Normally, the *Master* does not actively take part in data protection data flows; *Clients* do this themselves according to *rules* distributed from the *Master*.

A Protector installation thus consists of:

- A *Master* that controls the UI and the actions of all other nodes on the environment.

Master nodes can coexist on the same network, allowing multiple Protector environments to coexist.

Passive standby master nodes can be installed on a Windows failover cluster so that the standby can be brought online in the event that the active master fails.



Note: It is recommended that the *Master* server not be assigned any other roles.

- Multiple *Clients* that participate directly in data protection data flows, acting as sources of data to be protected (e.g. database servers) and destinations capable of receiving backup data (e.g. repositories).

Clients implement various different roles within a data flow and must be configured to perform these roles. This consists of ensuring the appropriate prerequisites are installed, and configuration via the UI.

Client nodes can be installed on application clusters such as Oracle RAC.

Each *Client* can only be authorized and controlled by one master.

The figure below shows a possible installation scenario where two completely independent Protector environments coexist on one network.

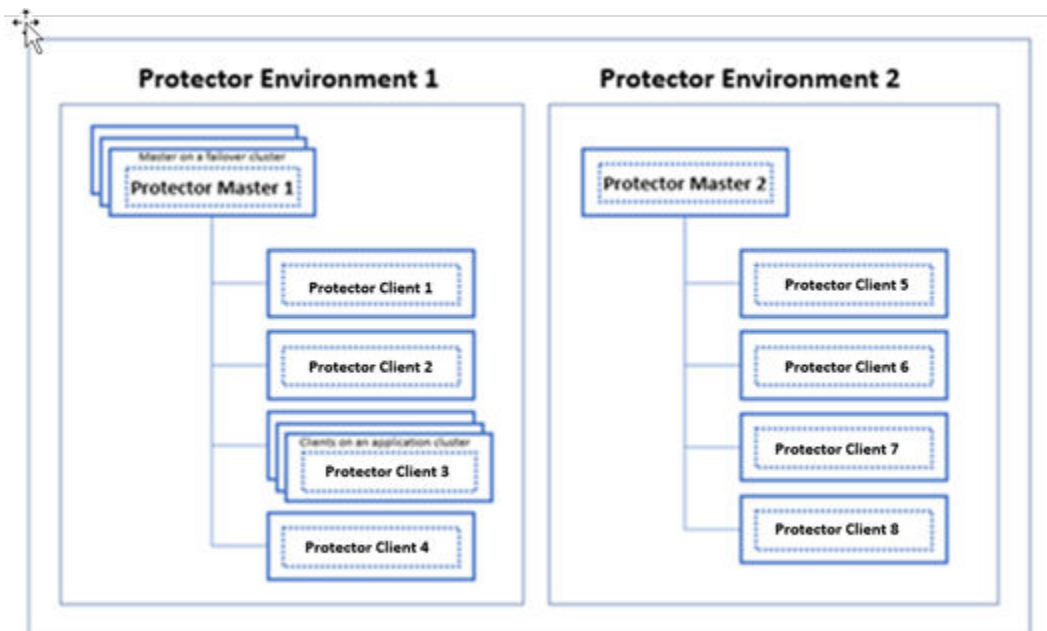


Figure 1 Possible installation scenario

Policy orientated data management

Ops Center Protector is designed to allow your site to implement a business data protection process by using policies. Policies are mapped to machines or groups, and to the data management agents that implement those policies. A large, complex environment can be configured in a matter of minutes rather than days through the application of two workflows:

- *Policy Definition* defines the business objective in terms of data classification and the associated backup operations.
- *Data Flows* define where those policies are applied and the flow of protected data, reflecting the information life cycle.

Real time monitoring

Data protection activity can be monitored via a central dashboard and mimic displays of active data flows. Data flow diagrams containing job queues, log messages, meters and status icons provide real-time visual feedback on:

- *Outgoing/Incoming Network Traffic*: The amount of data being sent/received over the network.
- *Node Status*: An alert badge indicating a node needs attention.
- *Jobs*: Currently active and recently completed data protection tasks along with their details.
- *Logs*: Information, warning and error messages logged by the various participating nodes in the data flow.

Storage hardware orchestration framework

Ops Center Protector is able to control the snapshotting and replication of data stored on Hitachi block and file storage hardware.

Ops Center Protector's hardware orchestration framework is able to create snapshots and replications in an application consistent state by interacting with production applications (including Oracle) and the storage array hardware to ensure that data is in a consistent state during snapshotting or replication; it does this with minimal disruption to the production application. The orchestration framework discovers the underlying hardware paths for application data and creates the required snapshots and replications when the policy is triggered.

The orchestration framework is extensible, allowing other managed storage technologies and applications to be integrated in future. These capabilities are all easily accessible using Ops Center Protector's intuitive, policy and data flow definition UI.

The following figure shows the Protector nodes and processes involved in replicating application data on a block storage device at the primary site to a block storage device at the secondary site, and potentially creating local and remote snapshots of that data.

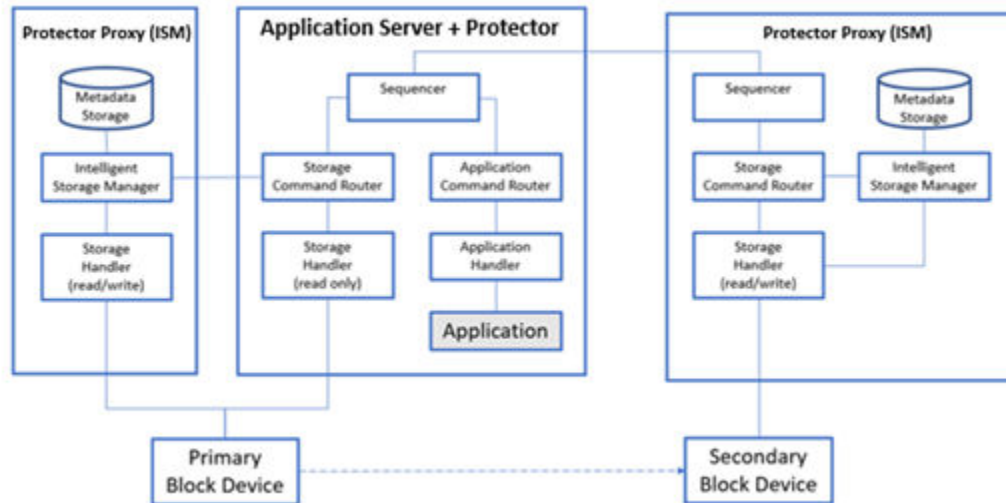


Figure 2 Hardware orchestration process model (remotely replicated block based application)

ISMs (Protector Clients with CCI software installed) are assigned to control the primary and secondary Block Storage Devices. The Application Server that is to be protected has the Protector Client software installed on it, along with any prerequisites required to enable Protector to interact with the application. Rules that define when and what application data is to be replicated/snapshotted are distributed from the Protector Master to the Application Server.

The Sequencer process on the Application Server coordinates a series of actions involving the primary and secondary ISMs when these rules are triggered. This includes:

- Querying the Application for the file system paths that comprise the application data to be replicated. A list of LUNs is then compiled based on the application data paths obtained.
- Querying the Primary Block Device to find the underlying LDEVs that represent the application's LUNs.
- Configuring the Primary and Secondary Block Devices to replicate/snapshot the application's LDEVs.
- Quiescing the Application to ensure application consistency (assuming the policy has requested it).
- Triggering and synchronizing the replication/snapshot operations between the Primary and Secondary Block Devices. For applications such as Oracle this involves multi-stage backup operations to capture databases, logs and redo-logs.

A Sequencer process on the destination ISM acts as a counterpart to the application Sequencer. It manages the destination storage sequences.

The Application Command Router process routes commands from the Sequencer to the appropriate Application Handler, enabling multiple applications to be controlled on the same node.

The Application Handler process(es) present a generic interface for each application being controlled by Protector.

The Storage Command Router process routes commands from the Sequencer to the appropriate Storage Handler, enabling multiple storage devices to be controlled from the same node.

The Storage Handler Process(es) present a generic interface for each storage device being controlled by Protector. Note that the Storage Handler on an Application node is read-only; this is a security feature that restricts modification of the storage device to authorised ISM nodes only.

The ISM process maintains a list of snapshot and replication records along with their status and manages the retention of those records.

Hitachi Remote Ops monitoring

Hitachi Remote Ops is a centralised monitoring service which tracks the operational status of Hitachi devices within a customer's site. Hitachi uses information collected by Hitachi Remote Ops for statistical analysis, diagnostics, and pre-emptive error detection. Protector collects data from each of its nodes and uploads this information, via a locally installed monitoring agent, to Hitachi Remote Ops which then interprets it. Protector includes Hitachi Remote Ops integration capabilities as standard, but the monitoring agent must be obtained and installed separately.

The Hitachi Remote Ops data centre is managed by Hitachi and cannot be accessed by customers. A single monitoring agent, connected to the Hitachi Remote Ops data centre via secure SSL/TLS link, is installed at the customer's site and the customer's Hitachi devices are manually registered with it. A bespoke data schema is collected from each device containing a *Site ID* unique to the customer site. For Protector, the *Redact* option is permanently enabled to instruct the monitoring agent to redact all sensitive data in the returned payload. Protector uses Role Based Access Control (RBAC) whereby clients must authenticate themselves before they are allowed to interact with it. The Protector *Telemetry Admin* role and *Default Telemetry* ACP exist within Protector for use with Hitachi Remote Ops. This role and associated ACP restricts what actions the monitoring agent is able to perform on Protector. The monitoring agent must login to Protector with credentials that enable the *Default Telemetry* ACP prior to requesting data.

Protector is queried daily for its current operational status by the monitoring agent and that status is uploaded to the Hitachi Remote Ops data centre. If any errors are received within Protector's status data, then the monitoring agent can increase its polling frequency to every 2.5 minutes until the errors are cleared. This behaviour is optional and a device does not have to support this higher rate reporting mechanism. The monitoring agent may also be manually triggered to request data at any time; such a request may contain additional diagnostic data which may not be sent as part of the standard request.

Data security

Ops Center Protector allows the administrator to secure the data that the system protects with encryption in a number of ways:

1. If it is known that the node will be operating over a nonsecure network, such as the Internet, then enabling the Internet connected node option is recommended. This will require the Protector 'over-the-wire' encryption licence: This will encrypt transmitted data as an extra security precaution. With the appropriate licence this uses the SHA-256 cryptographic hash function to encode data and allow the data integrity to be verified. In the non-licenced case it is used to verify the integrity of the certificate for the secure channel. Protector uses a NIST validated implementation of the SHA-256 algorithm.
2. With the appropriate 'at-rest' data encryption licence (where available) Protector uses the SHA-256 hash algorithm to encode the data that is stored on an encrypted repository. The data remains encrypted and secure even when the repository is not being used.

Unified Backup Infrastructure concept

UBI is a new infrastructure that allows applications and storage to interface to each other in a standard and uniform manner. Previously, the storage handlers needed some understanding of the data they were storing requiring dedicated logic for each supported application. This complicated and lengthened the development of both applications and storage handlers.

UBI however provides a standard way for applications and storage work together. This required the development of new UBI compliant application and storage handlers.

UBI Applications includes:

- Filesystem
- VMware
- Oracle RMAN

UBI Storage includes:

- Gen2 Repository
- Gen2 HCP
- Amazon S3

Any UBI compliant application can store data in any UBI compliant storage. UBI compliant storage can forward an instance of data to any other UBI compliant storage.

Data within UBI Storage is structured as follows:

Datastore

A Datastore is the UBI abstraction for an entire storage location (e.g. an AWS Bucket or an HCP namespace)

Store

This is a logical construct. Each instance of an application has its own store. If the application is distributed across many nodes, it would still share the same store.

Instance

This is the instance of data within the store. Each store will have a live instance and historical instances. Consider this analogous to a filesystem that you can read and write but also has snapshots. The historical instances facility is available on all UBI storage, even cloud storage such as S3 which doesn't have native snapshots. If an

instance of data is removed, data unique to that instance is also removed, thereby providing efficient automated space reclamation.

Objects

Objects are place holders for data. They can be hierarchical, and you can attach metadata to them. They do not however store data directly, data is stored in streams within the object.

Streams

Streams are what objects use to store their data. Typically, there will be a “data” stream. Applications may also use other streams to store data relevant to that object, e.g. security stream, thumbnail, etc.

The UBI standard key features:

Parallelism

To facilitate performance, the UBI standard allows a datastore to be accessed by multiple processes on the same machine and/or multiple processes across multiple machines. This allows for a clustered application to backup from multiple nodes to one store.

Recovery Point

This allows the user to see that there is a point in time recoverable data. Typically a Recovery Point maps to an *instance* within a *datastore*, but more complicated applications could in theory have multiple instances to make recoverable data. It is the application that determines whether a Recovery Point is created. Some applications, like Oracle RMAN, don't have Recovery Points as the RMAN application manages the life cycle of individual portions of a backup without using *instances*. Recovery Points are stored in a database on the storage but can be searched from the Master.

Item Index

An item index is a method to add a layer of indexing more granular than the recovery point index. It is primarily used to index large objects. A good example is a VMware backup creates an Item Index record for each VM. This allows the user to look for instances of a VM by doing a search for a VM rather than browsing Recovery Point Index. Like Recovery Point Index, these are stored on the storage.

Source Side Block Deduplication

UBI has built-in source side block deduplication as part of its standard. The infrastructure calculates the checksum of a block for a given stream of data prior to transmitting it to the storage and will not send that data if it is already on the storage. This reduces both storage and network transfer overhead.

Access Control

Many applications across many OS nodes can access the storage. Each application however can access the same storage but only their data within that storage. This includes applications that are using cloud storage. With Amazon S3, for instance, an application can only access its own data even if it's in the same Amazon Bucket as other applications.

Cloud Credential Security

The UBI infrastructure assumes that because applications servers are not under control of the backup / storage administrator, they can be compromised. So, although multiple application may access the same cloud storage node, to ensure security, an application never receives the cloud credentials.

Application aware data browsing

When performing a partial recovery of a dataset, it is required to be able to browse the contents of a Recovery Point. To do this an application specific agent on the master is used to interpret the data retained on the storage device. This ensures the recovery interface can display recovery information that is optimized for that application.

Security with Ops Center Protector

This document the built-in measures Protector employs to protect the system from an external attack and if a system is compromised either through a bad actor or hack, the way the way systems are further protected.

Protection from an external attack

An external attack is when an attempt is made to gain access or compromise the operation of the system without having OS access to the system. To protect against such eventuality Protector employs the following:

- Secure node to node communication - Communication between nodes is performed through a private protocol on a fix network port. Protector uses TLS connection between nodes on that port and utilises digital signatures that were generated during installation time for node identity verification.
- Secure REST API - All user requests are performed through the Role Based Access Control (RBAC) secured REST API to the Master Node. Making any changes to the configuration requires credentials and permissions at the right levels, no mater whether accessed via GUI or API.
- There is no concept of a default user or password. The initial user and all subsequent users must be specifically defined.
- Regular update of internal libraries to be update to date with the latest information from National Vulnerability Database (NVD).

Protection from a Compromised OS

There may be many systems that make up part of a backup ecosystem. Some of these systems include the source machines, applications and file servers that are not under the backup admin's tight control and are more prone to security breaches, whether by malware or hacks. To protect against the compromised systems:

- Regardless of the copy technology used (storage array replication or backup):
 - Nodes can only communicate with each other where a predetermined communication path has been specified by a dataflow.
 - Nodes within Protector that can communicate to each other, can only issue requests for predetermined tasks. This is done via the policy / dataflow that are compiled into rules that are propagated to both the source and destination and enforced by both nodes so that if either attempts operations outside of the rules then the operations are not permitted.
 - Source Nodes within Protector cannot delete or alter their recovery points using the internal node to node protocol.
 - Protector's Windows clients use Protector's own VSS provider. This provider has no capability to delete its own snapshots and the client does not have visibility of the backup catalog.
- For storage array replication technologies only:
 - Source Nodes within Protector do not have direct access to control a hardware array. Only Protector's storage proxy nodes require array Command Devices. Array Command Devices do not need to be allocated to source nodes. This means that a source node cannot manipulate its own or other system's storage, replications and snapshots.
 - Use of hardware Data Retention Utility (DRU) to lock down backups for a given period of time. DRU protected storage cannot be modified and is akin to be putting data in a time locked safe. This allows a company's assets to be protected for a timeframe suitable for the detection of an intrusion.
- For backups only:
 - Nodes within Protector that perform backup to cloud (Amazon S3 / HCP) do not have access to the credentials of that cloud service.
 - Backups to HCP, a WORM object store, where you can archive lock data is another suitable solution for host based backups.

Protection from a Compromised Account

It is possible that an account within the backup system could be compromised. E.g. through social engineering, a bad actor, etc. To mitigate this the following best practices can be employed:

- Protector has a very granular RBAC system. It not only defines the what roles a user can have but also roles against resources. So a user that may have complete control of certain assets within a system and may have no control or even visibility of other assets within Protector's inventory. By limiting access to the minimum level that is required for someone who has an account within Protector, it is possible to limit the scope of what that account can do if it is compromised. You can for instance give a user access to use an array within Protector but not give them administrative rights.
- Use of hardware Data Retention Utility (DRU) to lock down backups for a given period of time. DRU protected storage cannot be modified and is akin to putting data in a time locked safe. This allows a company's assets to be protected for a timeframe suitable for the detection of an intrusion.
- Backups to HCP, a WORM object store, where you can archive lock data is another suitable solution for host based backups.

Universal Tags

As the number of managed objects increases within a system, it becomes progressively more difficult to manage large lists using only the object's native metadata. Universal tags provide a method for users to add extra metadata in the form of Tags to enhance the search and filter abilities of lists.

Tag-able objects

Tags can be applied to the following objects:

- Nodes
- Node groups
- Policies
- Policy Operations
- Data Flows
- Recovery Points

Figure 3 Create Node - Oracle Database

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the Node. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes made to the settings and reverts to those used prior to opening the current page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Figure 4 Add Tags - Edit User Tags

| Control | Description |
|-----------|--|
| Edit Type | Enter the Edit Type. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes made to the settings and reverts to those used prior to opening the current page. |
| Apply | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Tag inheritance and Propagation

Jobs and recovery points are objects that are generated by the system after a backup / snapshot operation.

To assist the manageability of these, they inherit the tags from the objects that were involved in creating them. Jobs and recovery points will inherit the tags from:

- The source node they represent in the data flow
- The node group the source node is in
- The storage node that stores the recovery point
- The data flow that created the recovery point
- The policy that created the recovery point
- Custom tags that were included if manually triggered

Inherited tags are assigned at the point that the jobs or recovery points are created and stored as independent tags against those objects. The tags assigned due to inheritance persist unchanged even if the originated object's tags later change, e.g. if a recovery point has inherited the tag "Production" from the Application Node, later removing that tag from that Application Node will not affect existing recovery point.

Note also that new recovery points and jobs will also only inherit any tags changes once the affected data flow have been re-activated. So if you were to alter the tags on a node, new recovery points will not reflect those changes until you re-activate the data flow that have those nodes.

You can add and remove tags on recovery points. You can modify tags on Recovery Points by either selecting the Recovery Point on the Restore Screen and selecting the "Edit Tag" icon, or viewing the Recovery point record and selecting the "Edit Tag" icon.

Types of Tags and Format

There are two types of tags; simple tags and key value pair tags.

Simple tags are straight forward labels. You may for instance tag all your production source machines with the tag "production". You could then go to the RPO report and check the RPO only for machines that are marked "production".

There are also key value pair tags. They are in the form of *key:value*. The concept is the ability to categorise a tag. For instance you can assign nodes a location tag in the form of *location:paris* or *location:London*. If you lost connection to a data center, you would be easily see that all the nodes at a particular location are down.

Tags can only contain alphanumeric characters, underscores and spaces. The ":" in a tag will designate it to be a key value pair. Capitalisation of tags is preserved but from a search and filter point of view ignored.

Search Filter using User Tags Query box

Many inventory screens have the ability to perform filter queries using tags. On those screens you will be provided with an entry box for adding a tag to search on. The search will return results that contains any tags that are in the search query, e.g. this search is an "or" operation on the selected tags. The tag needs to be an exact match the tag or the key value of the tag. The search however is not case sensitive.

So if you had an entry tagged: "Location:London" and "production" the following is the behaviour of the searches:

- Searching for tag: "Production" will return the entry because it is a case insensitive match.
- Searching for tag: "Prod" will not return the entry as this is a partial tag
- Searching for tag: "location:" will return the entry because the key value matches. "London" is not required
- Searching for tag: "location" will return the entry because the key is treated as a simple tag as well as key value pair tag
- Searching for tag: "Location:Paris" will not return the entry as the value doesn't match

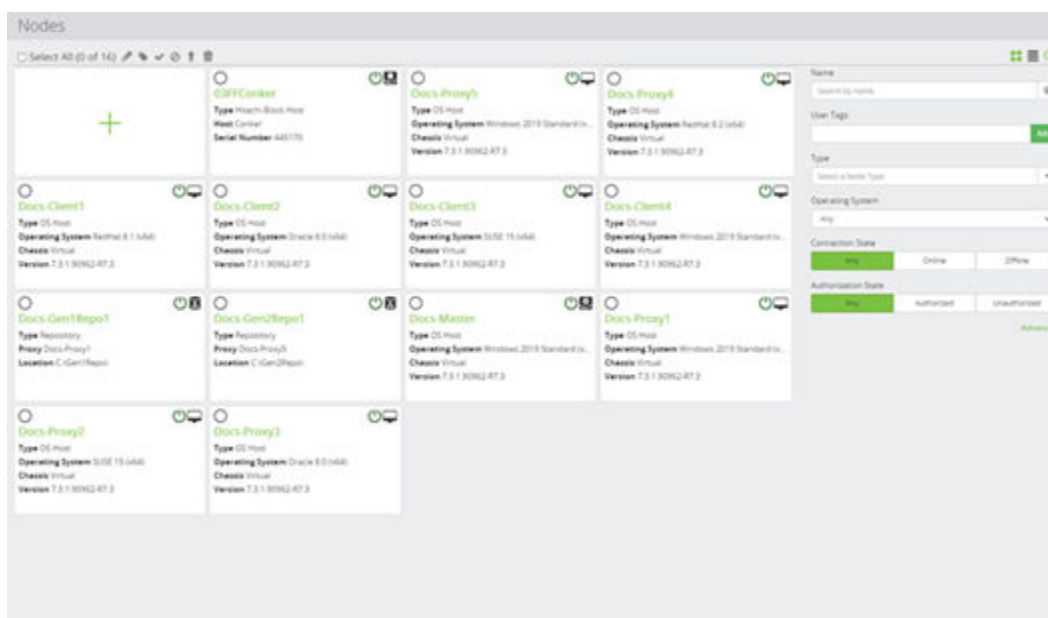















Figure 5 Nodes Inventory

| Control | Description |
|---|--|
|  Edit | Edits an existing node in the inventory. The Node Type Wizard (on page 479) is launched to enable the node's attributes to be changed. |
|  Tags | Modifies the tags of an existing object from the either the inventory screen or the details screen of the object. |
|  Authorize | <p>Enabled only if one or more unauthorized nodes is selected in the inventory. Attempts to authorize the selected nodes with the Master node. Only nodes that have been authorized by the Master node may perform Protector functions.</p> <div>  Note: If an attempt is made to authorize an inactive or unknown node, or if the master node fails to communicate with the node, an error log is generated and the node remains unauthorized. </div> |
|  Deauthorize | <p>Enabled only if one or more authorized nodes is selected in the inventory. Attempts to deauthorize the selected nodes. Nodes that have been deauthorized cannot perform Protector functions.</p> |

| Control | Description |
|---|--|
| |  Note: <ul style="list-style-type: none"> Before deauthorizing nodes that are no longer required, they must first be deleted from the current data flow definitions, then any modified active data flows must be reactivated. If any attempt is made to deauthorize a node that is implementing rules in the currently active data flows, an error message is generated for each such node and the node remains authorized. It is possible to de-authorize a node with active mounts. This should be avoided because once de-authorized it is not possible to unmount. |
|  Upgrade Clients | <p>Enabled only if one or more authorized nodes is selected in the inventory. Attempts to remotely upgrade the Protector software installed on the selected nodes. The required upgrade installer and configuration files must be present in the C:\Programs Files \Hitachi \Protector\runtime\updater folder on the Master node.</p>  Note: <ul style="list-style-type: none"> Only <i>OS Host</i> nodes can be upgraded. It is recommended to upgrade nodes in batches of 20. It is recommended to manually upgrade the master node. |
|  Delete Node | <p>Enabled only if one or more nodes is selected in the inventory. The node is deleted from the inventory.</p>  Note: If an <i>OS Host</i> node is still running the Protector hub process and is configured to use the current <i>Master</i> node, then the node will re-appear as an unauthorized node as it periodically reconnects to the <i>master</i> node. Protector should be uninstalled from the node to stop this periodic reconnection. |
|  Create a new item | <p>Adds a new node to the inventory. The Node Type Wizard (on page 479) is launched to guide you through the process.</p> |
| Existing Node(s) | <p>Nodes on which Protector has been installed are automatically detected and listed here along side those that have been added by the user. The Node Details (on page 574) is displayed to enable the node's details to be viewed and edited.</p> |

| Control | Description |
|---|---|
| |  Note: <ul style="list-style-type: none"> DHCP renewal can cause temporary disconnection of a node. If the host of a virtual machine(s) creates a Windows restore point, then the virtual machine(s) can temporarily disconnect. If a node has been assigned to another master, it will not appear in the inventory. |
|  Filter on Node Name | Filters the displayed results based on Node Name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node Type | Filters the displayed results based on Node Type. |
| Filter on Operating System | Filters the displayed results based on Operating System. |
| Filter on Connection State | Filters the displayed results based on Connection State. |
| Filter on Authorization State | Filters the displayed results based on Authorization State. |

Search Filter using advance Query

Using the Advance Query String you can get more control of how the queries work.

While the Tag Query box does an exact match of any of the tags. So in the Tag Query box you entered tags "vmware" and "location:new york" it would be equivalent to:

```
((userTagsKeys = "vmware") OR (userTags = "location:new york"))
```

There are however extra search methods available using the Advance Query. These include

| Value | Description |
|-----------------------|-------------------------|
| Exact Match Include | entry = value |
| Partial Match Include | entry ~ value |
| Boolean OR | condition OR condition |
| Boolean AND | condition AND condition |

If you wanted only to match any nodes with the string "vm" in the tag but only in location New York, you can use this custom query:

```
((userTagsKeys ~ "vm") AND (userTags = "location:new york"))
```



Figure 6 Nodes Inventory - Search Filter

Trigger Operation

Triggering Operations from the Monitor screen now have the ability to add a tag to the trigger. In a situation for instance where you wanted to create a backup of a system prior to the upgrade, you could do a trigger with a tag "Pre upgrade". It will be clear then in the restore screen the purpose of this adhoc backup and its timing.

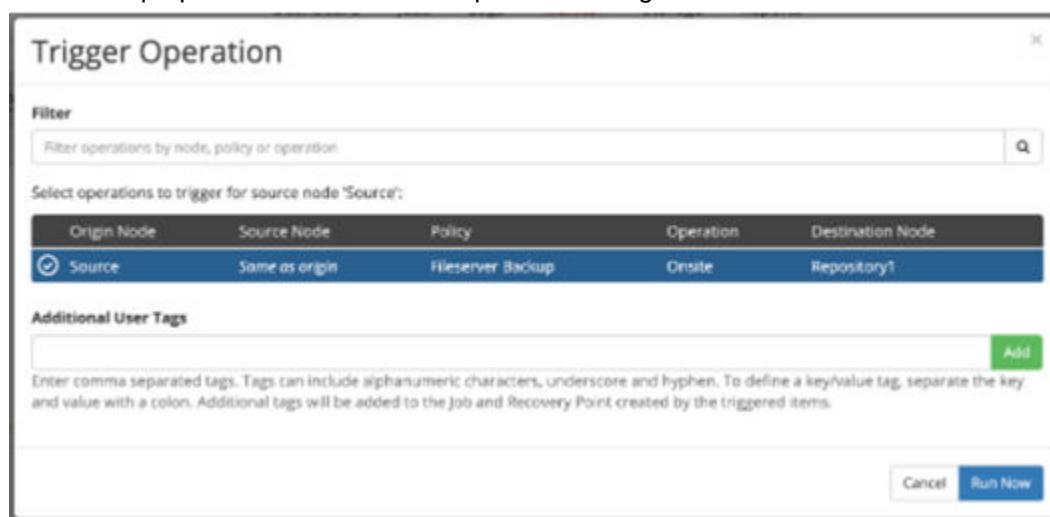


Figure 7 Trigger Operation

Permissions

If you have permission to modify an object e.g. Node, data flow, etc. as governed by the role based access rules, you will have the ability to add / remove tags. Tags belong to the object so any tags are visible to anyone who can view the object.

Tags Limitation

- There is no central inventory of existing tags. So currently there is no pick list or hint that a tag is in use.
- Generation 1 of the Repository does not fully support tags.

Node Concepts

This section describes Ops Center Protector's node management features.

For further information, refer to:

- [Node Tasks \(on page 257\)](#)
- [Nodes UI Reference \(on page 476\)](#)
- [Node Groups UI Reference \(on page 471\)](#)

About nodes

The figure below shows how nodes created within the Protector UI are implemented by the Protector *Client* software installed on servers in the protected environment (see [Installation Tasks \(on page 231\)](#)). These servers communicate directly with physical hardware storage devices and hypervisors that are to be protected or used as backup destinations. One Protector *Client* can communicate with more than one storage device, however when doing this, many factors must be considered, including hardware performance and system availability.

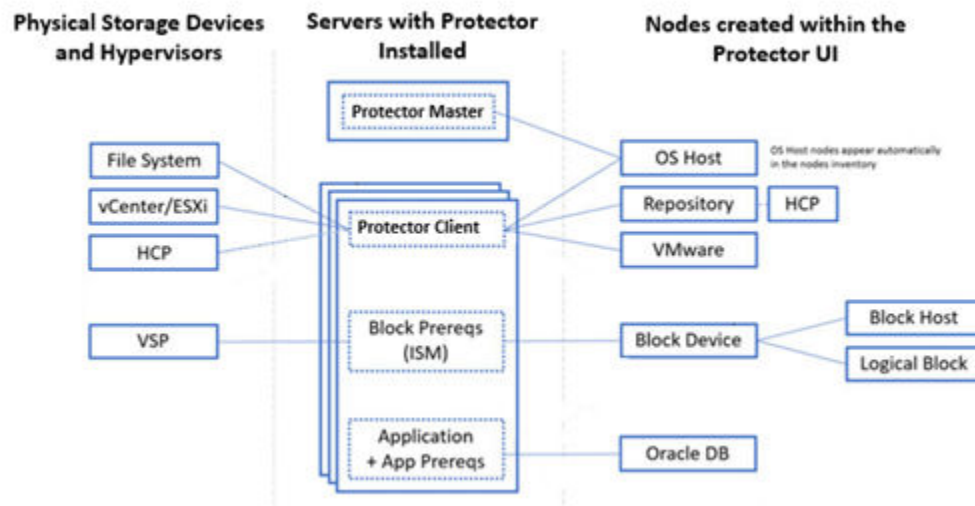


Figure 8 Hardware device nodes, server nodes and logical nodes in a Protector environment

Protector *Client* software must be installed on each server participating in the data protection environment. One server has the Protector *Master* software installed on it and acts as the central controller and the connection point for the web based user interface. Active data protection policies will continue to function with or without the Master being available, because the participating Clients operate autonomously using rules distributed from the Master.

Physical storage devices and hypervisors interface with Protector via servers having Protector *Client* software installed on them. One Protector *Client* can be used to communicate with more than one storage device, however when doing this, many factors must be considered, including server hardware performance and the impact on system availability should that server go down.

The physical environment is represented within Protector as nodes created within the [Nodes Inventory \(on page 476\)](#), these represent data sources and destinations as follows:

- *OS Host* nodes are automatically added to the inventory. These represent every server that has Protector Master or Client software installed on it. A basic OS Host node can only be used as a file system data source on a data flow and can only support path and disk type classifications.
- *Repository* nodes require a Protector Client with access to suitable disk storage capacity to act as a host. Repository nodes act as data destinations on data flows performing backup and continuous data protection operations. Repositories are implemented entirely by software processes within the Protector Client. Depending on the backup data change rate and number of policies, servers that host repositories can be subject heavy network, processor and disk I/O loading, so it is important to specify the correct hardware and monitor performance (see [About Repositories \(on page 116\)](#) for further guidance).
 - HCP nodes do not require a Protector Client to be specified. They act as data destinations on data flows, but must be accessed via a *Repository* acting as a cache when performing tiering operations.
- *VMware* nodes require a Protector Client with network access to the vCenter or ESXi host. These nodes act as data sources on data flows, enabling users to specify VMware specific policies and backup operations to repository or block storage destination nodes.
- *Block Device* nodes require a Protector Client with block prerequisites installed to act as an ISM (see [Hitachi Block prerequisites \(on page 20\)](#)). Block Device nodes act as both data sources and destinations on data flows, enabling users to specify block specific policies with snapshot and replication operations to other Block Device nodes. Note that Block Host and Logical Block nodes can only be used as data sources.
 - *Block Host* and *Logical Block* nodes can only be created by specifying a *Block Device* node upon which they are based. These nodes represent a subset of the resources available on the *Block Device* node upon which they are based.
- *Oracle DB* node requires a Protector Client to be installed on the application server. Appropriate prerequisites (detailed in the relevant Protector Application Guide) must also be installed to enable Protector to interact with the application. These nodes act as data sources on data flows, enabling users to specify application specific policies and backup operations to repository or block storage destination nodes.



WARNING: Do not decommission hardware or virtual machines before removing the nodes representing them.

Removing a node from Protector may require access to the entity that it represents. For example, removing a Block Device node from Protector requires access to the storage system it represents. Therefore, it is not recommended to decommission an entity from the environment until all nodes representing it have been removed from Protector. Removing the nodes from Protector without the hardware may require manual intervention from support.

About node groups

Ops Center Protector allows you to assign machines to groups. A machine can belong to more than one group.

Policies can be assigned to individual machines or to a node group. This feature provides an easy method to manage large sets of machines, eliminating the need to create and assign policies for individual machines.

Once policies have been assigned to a node group on a data flow and activated, the whole group can be monitored easily. You can expand a group to see activity within that group.

About multi-tenancy for Hitachi block storage

Ops Center Protector implements multi-tenancy by limiting which resources each tenant has access to on a block storage device that it shares with other tenants. Each tenant operates within its own environment that is defined using RBAC Resource Groups and their associated Source and Logical Block nodes. Nodes within each tenant's environment are unable to be seen or accessed by other tenants, despite the fact that they share a common block storage device.

Each tenant accesses the common block storage device using its own Logical Block Device node and the associated RBAC Access Control Profiles control which resources are available to each tenant. Configuration of the Logical Block Device nodes is performed by the storage administrator having jurisdiction over that device, using the [Hitachi Logical Block Device Node Wizard \(on page 539\)](#). These Logical Block Device nodes are then used by the backup administrator for each tenant to gain access to the resources allocated to them on the block storage device. The master node is thus able to present only those block storage device resources that it is authorized to use when constructing data flows and policies.

Data Flow Concepts

This section describes Ops Center Protector's data flow management features.

For further information, refer to:

- [Data Flow Tasks \(on page 225\)](#)
- [Data Flows UI Reference \(on page 350\)](#)

About data flows

A *Data Flow* is a diagrammatic representation of the nodes involved in a data protection scenario where each node is represented by an icon. Data flow diagrams identify both physical and logical entities and the connections between them. The data that is to be protected flows from a *Source Node* to a *Destination Node* during the data protection process by way of a *Mover*; the direction of movement being indicated by an arrow on the connector between nodes. Data is transferred in scheduled batches indicated by a solid *Batch* mover. For host based backups, data transmitted across a network can be compressed to reduce bandwidth utilization and bandwidth throttling schedules can be applied to movers, to ensure that data protection activity does not degrade normal network performance.

Node Groups can be placed on data flows so that multiple nodes having common properties can be treated as one entity.

Each node in a data flow plays a part in implementing the data protection scenario by having a *Policy* assigned to it (see [About policies \(on page 92\)](#)). Once a data flow is constructed, it must be *Activated* before it becomes operational. An active data flow can be *Deactivated* to stop that data protection process.



Note: Deactivating a hardware storage dataflow marks replications within it as eligible for being torn down. The actual teardown process must be initiated by the user via the user interface. See [About two-step teardown \(on page 54\)](#).

The process of compiling a data flow performs validity checks on the data flow and assigned policies, then generates a set of rules for each node in the data flow. The compiled rules are distributed to the affected nodes and activated; the participating nodes use these rules to act autonomously. The operation of a data flow can be monitored in real-time using the same data flow diagram rendered as a mimic display (see [About monitoring \(on page 109\)](#)).

Data flow topologies generally fall into one of the following groups (although combinations of these are also possible):

- One-to-one - data from a single source is backed up to a single destination.
- Many-to-one - data from multiple sources is backed up to a single destination.
- One-to-many - data from a single source is backed up to multiple destinations.
- Many-to-many - data from multiple sources is backed up to multiple destinations.
- Cascaded - data from a source is backed up to one destination then forwarded on to a second destination.

About two-step teardown

Two-step teardown reduces the possibility of inadvertently tearing down Block Storage replications due to accidental deactivation of a dataflow, or activation of an erroneous dataflow.

With two-step teardown, on deactivation of a dataflow in which a replication operation appears, or reactivation of a data flow where a replication operation has been removed, the replication is now flagged as being eligible for teardown in the **Restore** and **Storage** inventories. When a replication operation is deactivated, the underlying replication on the hardware will continue to operate as normal, except that any further batch resynchronizations will not be scheduled.

The final teardown operation must be explicitly initiated by the user, via the **Storage** inventory.

If a user initiated teardown operation fails, it is not automatically retried, so needs to be re-initiated by the user. Teardown failure may occur in the case of GAD 3DC dataflows, where teardowns must be performed in a specific order. Prior to the introduction of two-step teardown, automatic retries were performed indefinitely until successful.



Note: A dataflow that is deactivated and then subsequently reactivated without the replication operation having been removed, re-instantiated or manually torn down before reactivation will, in effect, be re-adopted. This re-adoption removes the *eligible for teardown* flag from the replication, as if the dataflow had never been deactivated.

It is possible to disable two-step teardown on a per ISM basis via a configuration file, so different teardown policies can be implemented within the same environment.

About data flow implementation

Data flows drawn in the Protector UI are abstractions that hide the underlying hardware and software implementation. Before a data flow can be constructed, Protector Client software must be installed on the physical nodes connected to the storage devices, and the equivalent nodes must be created in the Nodes Inventory. The relationship between storage devices, Clients and nodes appearing in the Nodes Inventory is described in [About nodes \(on page 50\)](#).

As an example of how a data flow is implemented, consider the backup of a file path on a server to a repository. In this case, the source and destination storage devices are file system volumes mounted on separate servers. Protector Client software must be installed on both servers. These Protector Clients are automatically detected by the Protector Master and appear in the Nodes Inventory as *OS Hosts*. The source *OS Host* can be used 'as-is' to identify the volume and file path in the backup policy. The *Repository* node is created via the UI; the destination *OS Host* node being selected as the proxy when configuring the node. When the rules for this data flow are activated, the source server will transmit the files identified in the policy over the network to the repository on the destination server. The figure below shows the data flow as it appears on the UI with the underlying implementation shown beneath.

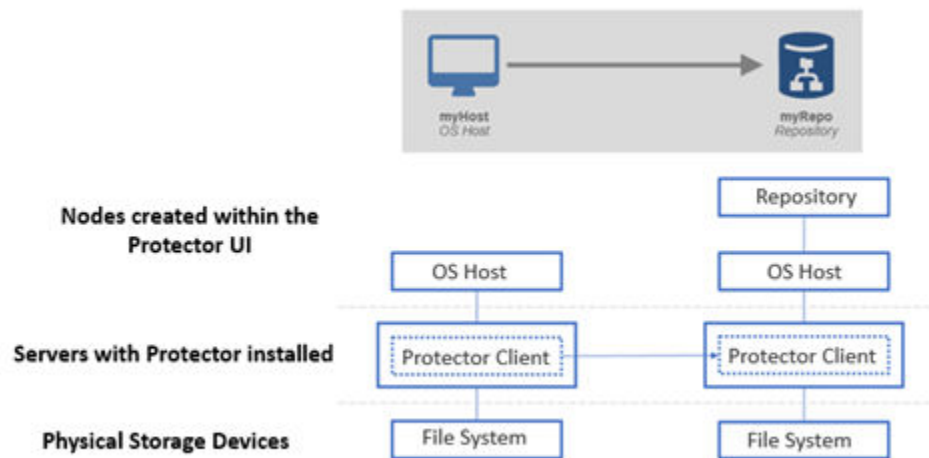


Figure 9 Files on a server backed up to a repository

A more complex example is a data flow representing application data, stored on a source block storage device, being replicated to a destination block storage device. The source block device has LDEVs mounted to an application server machine that are being used to store the application data. Protector Client software must be installed on the application server and on servers at the source and destination sites that are designated to control the block devices. The application server must have prerequisites installed to enable Protector to interact with the application software. The servers (ISMs) at the source and destination sites must have prerequisites installed to enable Protector to interact with the block devices. All three Protector Clients will be automatically detected by the Protector Master and appear in the Nodes Inventory as *OS Hosts*. Source and destination *Block Device* nodes are created via the UI; the source and destination *OS Host* nodes representing the ISMs being selected as proxies when configuring the nodes. When the rules for this data flow are activated, the source (VSP 1) will replicate the LDEVs identified in the policy over the data link to the destination (VSP 2). The figure below shows the data flow as it appears on the UI with the underlying implementation shown beneath. Note that the source *Block Device* node is required by Protector to control the replication, but does not appear on the data flow.

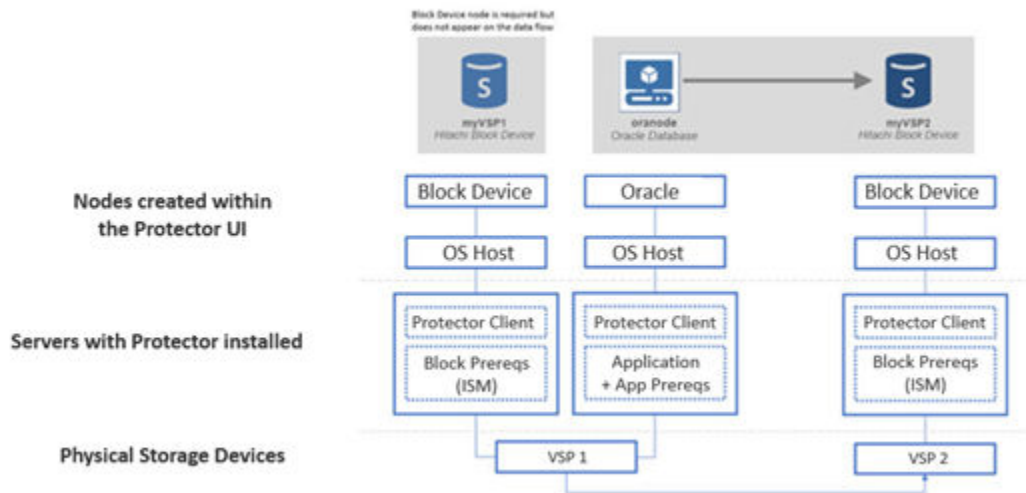


Figure 10 Block based application replication

About many-to-one data flow topologies

Many-to-one topologies should be used only where absolutely necessary. These topologies allow data from multiple nodes to be stored on a single destination node. For example, two or more source nodes replicate to a common backup server.

Consider whether the source nodes should be treated as a cohesive *node group* rather than individually.

If the source nodes are not functionally related then consider drawing separate data flows for each one; this will allow rules activation/deactivation for each flow to be decoupled.



Note: Many-to-one policies preclude the use of the *Mount* operation (for proxy back-up or re-purpose) on a destination Hitachi Block device. A *Mount* operation is only valid when one replication is applied to the destination node.

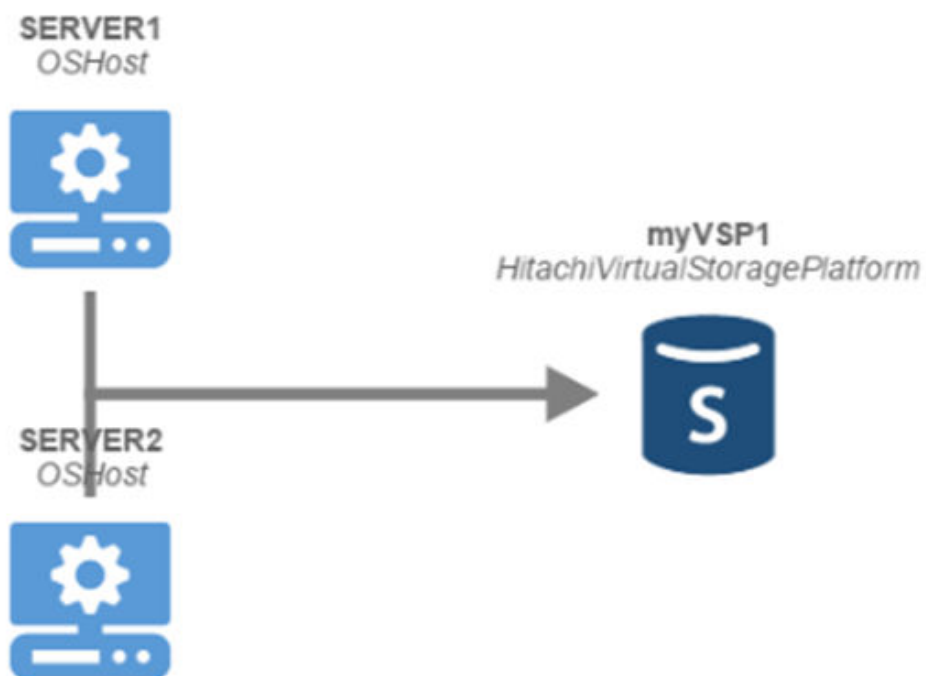


Figure 11 Many-to-one data flow

About one-to-many data flows

One-to-many topologies are one of the standard building blocks for creating complex data flows. These topologies allow data from one node to be stored on multiple destination nodes. For example, one source node replicates to a DR server and a repurposing server. A policy is applied to the source node and all destination nodes.

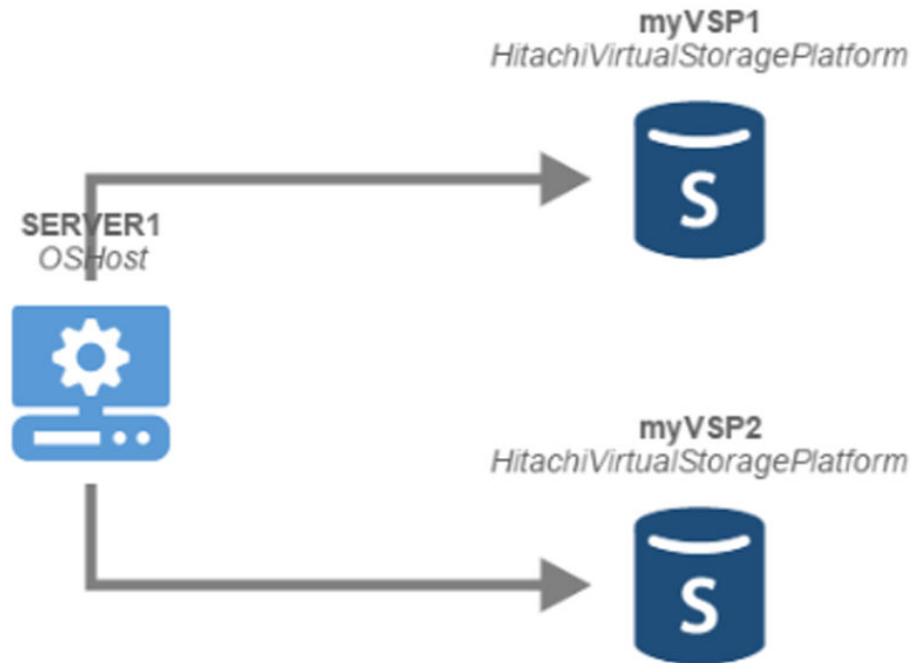


Figure 12 One-to-many data flow

About cascading data flows

In a cascading topology, a source node sends data to a primary destination node and then on to a secondary destination node. The primary use case is to copy the data to an intermediary site and then onto a remote site. The secondary use case is for local repurposing, where multiple copies of the same data can be mounted to different servers and used by different sets of users. The primary and secondary destination nodes both store the data. By sending all data to local and remote sites, the disaster recovery options are improved. A policy is applied to the source node, the local and the remote destination nodes.



Figure 13 Cascading data flow

About parallel versus serial data flows

Ops Center Protector is designed to allow data to be filtered according to defined policies, and for data to be either sent directly to a node or routed through one or more intermediate nodes.

Typically, a set of policies can be implemented by using parallel or serial data flows with different tradeoffs. Consider a scenario where the following backup policies are required:

- The entire contents of a source machine need to be backed up to a destination machine for disaster recovery purposes.
- Only databases from that same source machine need to be backed up to a different destination machine for testing purposes.

About the parallel data flow solution

For the parallel solution the source node has two policies assigned; one for the whole machine (replicating all attached logical devices to myVSP1) and one for the databases (replicating only a subset of those logical devices to myVSP2). Because there are two movers in parallel, data that is common to both policies must be transmitted by the source node twice. This could be considered wasteful as it doubles the computing load and network bandwidth usage. However:

- This topology is more fault tolerant since one destination node does not depend on the other destination node to implement its policy.
- For *Host based* data flows, very fine grain data classification filters, separate bandwidth throttling and/or scheduling windows can be applied to each branch of the data flow.

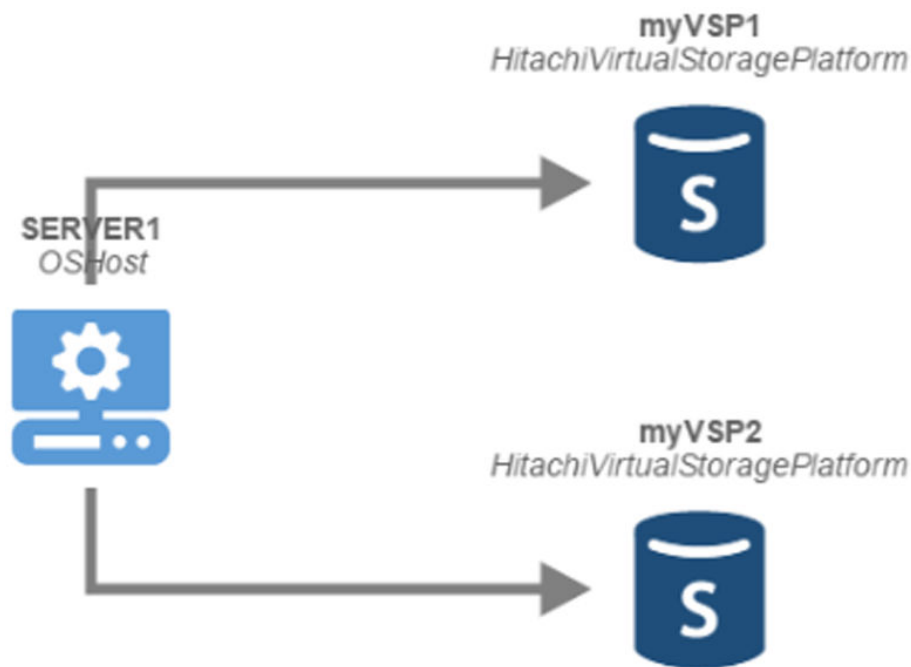


Figure 14 Parallel solution

About the serial data flow solution

For the serial solution the same policies are applied as in the parallel solution, the difference is that the data going to the second destination node is routed through the first destination node. This reduces the data traffic on the source node since it only has to transmit it once. However the policy on the second destination node now requires the first destination to be running and available on the network.



Figure 15 Serial solution

About best practices for drawing data flows

It is important to create data flows that are well formed, understandable, manageable and maintainable. To achieve these goals it is advisable to adhere to a number of guidelines when constructing them.

The [Data Flow Wizard \(on page 356\)](#) has an intentionally small workspace area. This is done to dissuade users from drawing overly complex data flows. It is possible to pan and zoom the workspace to aid working on lower resolution displays. This feature should not be used to create a large drawing area.

Data flows should always be drawn with data flowing in the reading direction appropriate for the locale. The general convention for such diagrams is left to right. Although top to bottom data flows can be drawn, mover labels will not be displayed in this format.

Position nodes on diagrams so that adequate space is left between them for the operation name, operation type and mover label to be drawn below the movers.

Make full use of the ability to name and describe nodes, node groups, policies, operations, data flows, movers and schedules. Use consistent naming conventions and descriptions that convey intent; this will greatly enhance understanding of the purpose of a data flow for other users and will aid ongoing maintenance. Devise and adhere to a common naming convention based on the guidelines described in [About best practices for naming objects \(on page 62\)](#).

A central principle for determining which nodes and policies should be placed on each data flow is to consider the granularity with which you want to be able to activate and deactivate individual data protection policies. If you combine too many flows and policies into a single diagram, then it will not be possible to deactivate a single policy without deactivating many others. For this reason it is recommended that you:

- Consider how you may want to activate and deactivate separate policies.
- Aim, wherever possible, to have only one flow and one policy per diagram.
- Only place related nodes⁽¹⁾ and policies on the same data flow. Note that a policy can contain multiple operations, and for hardware orchestration data flows, all operations on a PVOL should be contained within the same data flow.
- Separate unrelated policies sharing the same data flow into separate diagrams.
- Only use one-to-many topologies if all the participating nodes and policies are related.
- Consider placing multiple instances of the same node on one diagram to improve presentation.
- Use node groups for source nodes that share identical policies.
- Use separate data flows in place of many-to-one topologies, unless absolutely necessary.

1. Related nodes and policies typically form part of the same business process.

About best practices for naming objects

Providing meaningful names for the objects you create in Protector is one of the best ways to ensure that your data protection strategy is understandable, manageable and maintainable. The following guidelines will help you achieve this:

- Adopt a naming convention that results in similar concepts being listed together when sorted alphabetically. For example `VSPCorporate` and `VSPUKOffice` are preferable to `CorpVSP` and `UKOfficeVSP`.

- In general, Protector names should use nouns to describe objects and verbs to describe operations that are specific to the business processes in which they are used rather than Protector terminology.

- Names should be unique enough so as to avoid misunderstanding and confusion.

For example: `Site1Broadstone` and `Site11London` are preferable to `Site1` and `Site11`.

- *Node* names should describe the node's role in the organization and possibly its location. Avoid describing its type or other generic attributes that can be determined from the [Node Details \(on page 574\)](#).

For example: `VSPTexasSalesCorp` is preferable to `PrimaryVSPG400`.

- *Node Group* names should describe the node group's role in the organization and possibly its location. Avoid describing its type or other generic attributes that can be determined from the [Node Group Details \(on page 475\)](#).

For example: `ClusterDbLegal` is preferable to `OracleRAC`.

- *Policy* names should describe what the policy does, specifically in the context of the organization's data protection strategy. Avoid describing its classifications, filters, operations, scheduling or other generic attributes that can be determined from the [Policy Details \(on page 658\)](#).

For example: `OracleDRMajorHeadOffice` is preferable to `UniversalRepOraclePolicy`.

- *Operation* names should describe what the operation does, specifically within the context of the policy in which it is used. Avoid describing its type, scheduling or other generic attributes that can be determined from the [Policy Operation Details \(on page 660\)](#).

For example: `ReplicateLocal` and `ReplicateOffsite` are preferable to `Replicate1` and `Replicate2`.

- *Data Flow* names should describe the data protection policy that is being implemented, specifically within the context of the organization's data protection strategy. Avoid describing attributes that can be determined from the [Data Flows Inventory \(on page 350\)](#), [Data Flow Details \(on page 439\)](#) or [Monitor Details \(on page 460\)](#).

For example: `OracleFailOverToSubOffice` is preferable to `ReplicateOracleDataFlow`.

- *Mover* labels should describe the purpose of the mover and/or the association between the nodes it connects. Avoid describing the operation name or operation type since these already appear in the [Data Flow Details \(on page 439\)](#).

For example: `Fine Grain Protection` is preferable to `Weekly backup`.

- *Schedule* names should describe the purpose of the schedule. If the schedule is related to a specific policy then name it after that policy. Avoid describing its type or other attributes that can be determined from the [Schedule Details \(on page 755\)](#).

For example: `BackupWindowOvernight` is preferable to `Weekdays10PMTto6AM`.



Note: The naming conventions used elsewhere in this guide are designed to aid understanding of Protector concepts, tasks and workflows. They do not represent good naming conventions when using the product in a production environment.

About Repository and HCP based backups

Repository-based backups are created by replicating data to a disk-based store. Restore point snapshots are created in the repository as required. The repository snapshot is assigned a retention period and is available for full or partial restore until it is retired (deleted from the store). A Generation 1 repository store contents, created using a batch mover, can also be tiered to HCP for long term retention. For Generation 2 HCP, there is no need for a repository between the source node and HCP, backups can go straight from the source node to HCP. However, tiering is not supported on Generation 2 HCP.

The concept of Generation 1 and Generation 2 HCP nodes applies to Protector only and differentiates between an older HCP interface implementation and the current one. Generation 1 HCP is deprecated and should not be used for new configurations. In addition, you cannot upgrade Generation 1 implementations to Generation 2. There is difference between a backups to Generation 2 HCP and to HCP Cloudscale.

The concept of Generation 1 and Generation 2 repositories is also a Protector concept. Again. Generation 1 repositories are deprecated and should not be used for new configurations and cannot be upgraded to Generation 2 repositories. Generation 2 repositories have many advantages over Generation 1 repositories especially around parallelism.

About Repository based batch backup

The repository is updated periodically using scheduled resynchronizations. This method involves a scan of the source machine's file system. With batch resynchronization, the changed blocks are transferred. By default, the block size that is transferred is 2 MB; it is 16 KB if fine change detection is configured in the store template for Gen 1 repositories or in the Policy definition for Gen 2 repositories. An entire file is transferred if it is less than one block. Batch backup is useful for data that does not change often, such as data contained on the operating system disk.

Fine change detection should be used with the batch mover if there are frequent, widely distributed changes to files. Typically however, content on file servers does not benefit from fine change detection, because Microsoft Office documents are automatically compressed by the applications. This means that the smallest of modification causes a completely different file to be created, negating any benefit from detecting changed blocks.

Host based granular file I/O data capture

The data capture system is highly granular, with the option to tightly define the type of data that is transferred within the policy classification. Unlike systems that replicate all contents on the volume, Ops Center Protector's *Host Based* data protection technologies replicate only specified data, thereby saving bandwidth and storage space.

About Repository based source side deduplication

Source side deduplication is a mechanism within Protector that improves network bandwidth utilization by avoiding sending the same data multiple times.

In simple terms, as soon a block on the source machine is detected as changed during post-scan in a batch policy, those blocks are transferred to the repository. Source side deduplication uses Single Instance Store (SIS), a one-by-one method of scanning/transferring data from source to repository during initial synchronization and subsequent resynchronizations. If, for example, twenty 5TB source nodes (each having much of the data duplicated across them) are backed up, the repository will ingest data from the first source node, go to the second source node and compare its data with what is already ingested, then transfer only non-duplicate data. This process is repeated with the remaining source nodes.

Even if some duplicate files get through, with source side dedupe enabled, SIS post processing will remove those duplicates. SIS post processing is applied to the dataset once per day during repository cleanup.

The changed block transfer method is far more efficient and has less impact than traditional backup systems.

About Repository to Repository backup



Note: Repository to Repository backups are only supported within the same generation of repository i.e. Generation 1 to Generation 1 or Generation 2 to Generation 2.

Ops Center Protector has the ability to replicate data being sent to an on-site repository, to an off-site repository without needing to gather the data from the source machine(s) again. This minimises the load on the source machines and quickly and efficiently transfers the data off-site.

Using Smart Repository Sync, the secondary repository creates backups from the primary repository by taking the incremental changes required to create a new snapshot; the source node is not involved in this process. The secondary repository has the following capabilities:

- The user selects which backups are sent to the secondary repository. You may choose to only send a subset of the primary.
- You do not have to use the same schedule. You may for instance back up to the primary repository every hour but to the secondary once a day.
- You can have different retention. You may for example keep backups on the first repository for a week and on the secondary repository for 6 months.

Repository to repository backups should be scheduled such that the secondary (off-site) repository takes the latest completed backup from the primary (on-site) repository. The secondary repository backup is therefore scheduled to run on completion of the primary's backup.

When the policy is first triggered, the on-site repository will be resynchronised with the source. The empty off-site repository will then be synchronised with the on-site repository. Depending the amount of backup data and the bandwidth of the network between the on-site and off-site repositories, this initial synchronisation process can take a considerable time (many hours) to complete. To overcome this, a technique called 'repository seeding' (see [How to seed an offsite repository \(on page 152\)](#)) may be used for efficiently setting up an off-site data store, reducing the time and bandwidth required to load the initial backup into the secondary repository. Once seeded, the amount of data transferred between the on-site and off-site repositories is much reduced and dependent only on the data change rate of the source machine(s).



Note: If the on-site repository contains large amounts of non-critical or legacy data that does not require additional off-site protection, then it is recommended that you review your local backup policies and repository architecture prior to replicating data to the off-site repository. This will allow you to identify and replicate only your critical data to the off-site location.

About tiering Gen1 Repositories to HCP



Caution: Data that is tiered from an encrypted repository will not be encrypted on HCP. The use of encrypted repositories for tiering is not recommended.



Note: Tiering file system data to HCP is backwards compatible with Protector 5.x. However the following features are not yet supported in Protector:

- Tiering from a live data store (only batch data stores are supported).
- Stubbing and removing data from the source.
- Setting retention on HCP objects.

Setting DPL (Data Protection Level) on HCP namespaces is no longer done through Protector. This is now done at the tenant level via HCP's Tenant Management Console.

File system data from any supported OS, that is backed up to a Protector repository using a batch mover, can be tiered to HCP cloud storage platform. A repository store is tiered to an associated HCP namespace. Each tiered repository stream (a file can consist of one or more streams) is saved as an HCP object within its related namespace, along with metadata that enables it to be restored back to the original source node. If a previously tiered repository stream is modified, then the entire stream is tiered to HCP again. Once a stream is tiered to HCP it is removed from the repository.

Repository ingestion rate throttling helps to constrain repository data store size growth. If a repository's tiering queue gets too large, the repository will stop receiving data from the source until the tiering queue length reduces. High and low watermarks control the growth of a repository, allowing newly ingested files to occupy the space that tiered files previously occupied. By default up to 50 streams can be tiered concurrently to HCP, with another 50 queued awaiting tiering, before repository ingestion is paused. If performance outweighs repository growth in your environment, please contact Protector product support to adjust the throttling behaviour.

Protector does not set a retention on HCP objects. When a tiered stream is no longer referenced by any repository snapshots, the corresponding object will be deleted from HCP. A repository must be present in an active data flow and configured to tier to the HCP to be able to delete objects. When a repository store is deleted, the corresponding namespace for that store will be deleted from HCP.

Deleting a repository node will not remove the repository streams or the data tiered to HCP. To remove all Protector's data tiered to HCP after deleting a repository node, use the `HCPDM` utility provided by HCP.



Tip:

Protector repository stores are mapped to HCP namespaces, with the UUID of the Protector store being used as the HCP namespace name.

NTFS files typically consist of at least two streams containing data and security information respectively. Each repository stream is mapped to an HCP object, with an incremental hexadecimal number being assigned by Protector as the object name. Objects are stored in HCP in their native format, so it possible to view them in HCP. Object naming is designed to distribute the load optimally across HCP cluster nodes.

Repository stream objects are described by an HCP content class to enable them to be indexed and subsequently searched using the HDIM Content Class and its associated properties in an HCP Structured Query. Notice the use of the legacy product name HDIM here for backward compatibility; Protector was once named HDIM.

Protector communicates with HCP using the native REST API over HTTPS by default. HTTP can also be used to increase tiering speed if performance needs outweigh security.

About Hitachi Block based backup technologies

Ops Center Protector supports the following Hitachi Block based snapshot and replication technologies, allowing data flows to be constructed graphically without the user needing to construct HORCM files:

- Thin Image (TI)
- ShadowImage (SI)
- TrueCopy (TC)
- Universal Replicator (UR)
- Global-Active Device (GAD)

These technologies can be combined in numerous ways to create complex, block based, data protection and repurposing scenarios.

Ops Center Protector is used to create these data protection policies and manage them after replications and snapshots are created. It offers the ability to view the current state of replications and control their activities. It fully manages the lifecycle of snapshots, keeping an index of their existence and removing them from the system once the user designated retention has been reached.



Tip: When Protector creates fully provisioned snapshots and replications, it does so in S-VOLs mapped into one or more host groups that it creates on a port, so that these S-VOLs can have LUNs assigned. For GAD replications, the user is additionally able to specify one or more host groups that will have a LUN assigned for the S-VOL.



Caution: Anything created by or imported into Protector is managed by Protector and should not be modified or deleted without doing so through Protector. If a replication is removed in Protector then it will be removed from the hardware storage device too.

About mover types used with Hitachi Block operations

When constructing a data flow containing Hitachi Block based storage devices, it is necessary to use the correct combination of mover type (*Batch* or *Live/Continuous*) in conjunction with a given snapshot or replication technology (Thin Image, Refreshed Thin Image, ShadowImage, TrueCopy, Universal Replicator or Global-Active Device).

The term *Differential Snapshot* means that a new target volume(s) is created each time the operation is triggered. The target volume(s) remain suspended after creation. The target records the deltas so the source is also required to reconstruct the full data set.

The term *Refreshed Snapshot* means that a new static target volume(s) is created the first time the operation is triggered. The same target volume(s) is refreshed with new deltas from the source on subsequent triggers. The target volume(s) remain suspended after creation. The target records the deltas and thus the source is also required to reconstruct the full data set.

The term *Batch Replication* means a static target volume(s) is created the first time the operation is triggered. After initial synchronization, the replication is suspended. Subsequent triggers result in a resynchronization from the source, after which the target volume(s) are suspended.

The term *Live Replication* means a static target volume(s) is created the first time the operation is triggered. The source and target volume(s) are continuously kept in sync (paired) either by copy-on-write (COW) or copy-after-write (CAW) data transfer mechanisms. The replication prices can be paused and resumed as required.

The following table lists typical block based data flow scenarios along with the move types that can be used.

Table 1 Hitachi Block based scenarios and associated mover types

| Scenario | Mover | Description |
|---|---|--|
| Thin Image Snapshot (TI) | Batch | About Thin Image differential and refreshed snapshots (on page 69) |
| ShadowImage Replication (SI) | Batch or Live | About ShadowImage replication (on page 72) |
| TrueCopy Replication (TC) | Live | About TrueCopy replication (on page 76) |
| Universal Replicator (UR) | Live | About Universal Replicator (on page 77) |
| Global-Active Device (GAD) | Live | About Global-Active Device replication (on page 78) |
| Three Data Centre Cascade (TC+UR) | Live TC + Live UR | About three datacentre cascade (3DC) (on page 80) |
| Three Data Centre Multi Target (TC+UR) | Live TC + Live UR | About three datacentre multi-target (on page 81) |
| Clones of a Clone (SI+SI) | Batch SI ⁽¹⁾ + Batch SI | About static clones of a clone (on page 83) |
| Clone with Replication (SI +GAD) | Batch SI ⁽¹⁾ + Live GAD | About clone with replication (on page 83) |
| Snapshot with Replication (TI+GAD) | Batch TI + Live GAD | About snapshot with replication (on page 84) |
| Snapshot of a Clone (SI+TI) | Batch SI ⁽¹⁾ + Batch TI | About snapshot of a clone (on page 85) |
| Replication of a Clone (SI +TC or SI+UR) | Batch SI ⁽²⁾ + Batch TC or UR | About replication of a clone (on page 85) |
| Remote Snapshot (TC+TI or UR+TI) | Live TC or UR + Batch TI | About remote snapshot (on page 86) |
| Local and Remote Snapshots (TC+TI/TI, UR +TI/TI or GAD+TI/TI) | Live TC, UR or GAD + Batch TI | About local and remote snapshots (on page 86) |
| Remote Clone (TC+SI or UR +SI or GAD+SI) | Live TC, UR or GAD | About remote clone (on page 87) |

| Scenario | Mover | Description |
|--|---|--|
| | Batch SI ⁽¹⁾ | |
| Local and Remote Clones (TC+SI/SI or UR+SI/SI or GAD+SI/SI) | Live TC, UR or GAD Batch SI ⁽¹⁾ | About local & remote clones (on page 88) |
| Local Snapshot and Remote Clones (TC+TI/SI or UR+TI/SI or GAD+TI/SI) | Live TC, UR or GAD + Batch TI + Batch SI ⁽¹⁾ | About local snapshot and remote clones (on page 88) |
| Remote Snapshot and Local Clones (TC+SI/TI or UR+SI/TI or GAD+SI/TI) | Live TC, UR or GAD + Batch SI ⁽¹⁾ + Batch TI | About local snapshot and remote clones (on page 88) (reversed) |

(1) Continuous SI can also be used in these topologies to vary the use case.

(2) Continuous SI cannot be used in these topologies since it is not possible to chain a remote replication from Continuous SI.

About Thin Image differential and refreshed snapshots

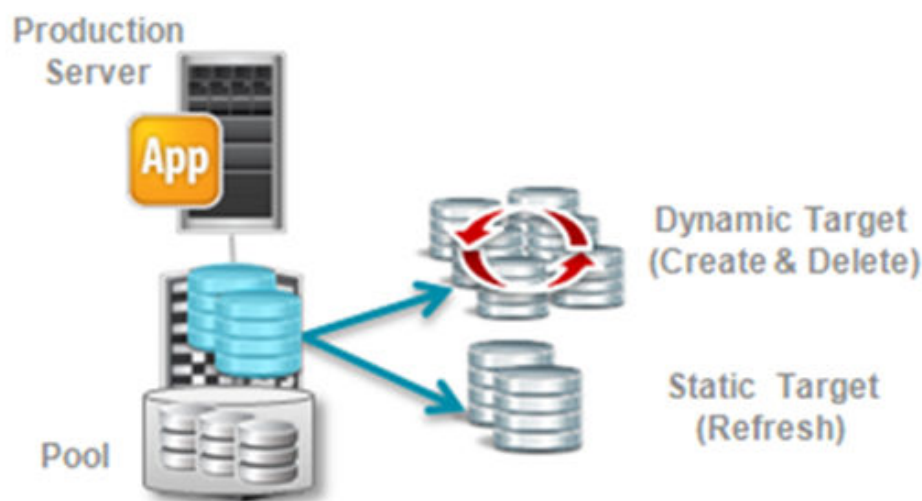


Figure 16 Differential and Refreshed Thin Image Snapshot

Thin Image enables rapid creation of in-system, space efficient, read/write, volume-consistent snapshots and subsequent rollback of entire volumes.

Snapshots of a volume in the storage system are stored in a dedicated area called the Thin Image pool. For floating snapshots, where no LDEV is assigned until it is mounted, no data movement occurs and thus creation of a snapshot is near instantaneous. For non-floating snapshots, the auxiliary tasks of creating an LDEV and a LUN will take some time.

Once a snapshot is created, subsequent updates to the primary data causes the storage system to move the data blocks being updated to the TI pool. TI pool usage thus increases as the primary data changes and snapshots are retained.



Caution:

Filling a Thin Image pool to capacity will invalidate all snapshot data contained within that pool. All snapshots in the pool will have to be deleted before snapshotting can be resumed.

When accessing a snapshot, the storage system presents the virtualized contents by merging the primary volume with its differentials held in the TI pool.

When deleting a snapshot, the storage system releases the differentials held in the TI pool. When multiple snapshots are involved, the delete operation may take some time. The differentials are reference counted and will only be deleted when no remaining snapshot requires them.



Note: Once snapshots have been released back into the pool, that space can only be reused by the same primary volume. This hardware limitation means that this space cannot be used by a different volume. The only way to completely free the space to the pool for any volume is to delete all the snapshots on that primary volume.

When handling multiple primary volumes, the storage system takes a snapshot of each volume sequentially. This means that a slight difference can be seen across the snapshot timestamps. If exactly the same timestamp is required among the snapshot set (for crash-consistent backup), the snapshot set should be created using Consistency Groups (CTGs).

When taking a snapshot, there are two options for the target volumes:

- **Differential Snapshot:** Creates a new snapshot for each backup and deletes it when the retention time expires. This simplifies the management of numerous snapshots and is suitable for backup operations. Data Retention Utility (DRU) protection can be applied to the snapshot's LDEV so that it can be used as a read-only volume or to protect it against both read and write operations.
- **Refreshed Snapshot:** Creates a new snapshot for the first backup, and then resynchronizes it on the following backups. This enables static target volumes (Port, Host Group and LUN, although the LUN may not remain constant depending on the mount host OS) and is suitable for repurpose operations.

Floating Device is an improved snapshot capability, used in conjunction with Thin Image, that simplifies snapshot management. With this capability snapshots can be created without creating target volumes upfront. This means that the limit on the number of snapshots in the entire storage system is increased (the number of snapshots of a specific primary volume is 1024). To revert the snapshot it is only necessary to select the required timestamp. To mount the snapshot for re-purposing, it must be mapped to a specific LDEV/LUN. After the snapshot is un-mounted, the volumes will be deleted by Protector as part of the unmount process.

**Note:**

- When using a snapshot, intensive read/write access to the snapshot may impact the performance of the primary volume, due to the way the snapshot volume is virtualised. If this is of concern then consider using ShadowImage or ShadowImage-Thin Image in cascade, where the Thin Image primary volume becomes the ShadowImage secondary volume instead of the original source.
- Long-term retention increases the number of differentials held in the TI pool once writes are distributed across all data blocks. Thus, for long-term backups, it is recommended to use ShadowImage.
- Thin Image requires the primary data in order to present a virtualised snapshot volume. This means that snapshots will be lost if a disk failure occurs on the primary volumes. To protect the data from such hardware failure use ShadowImage to create a clone and take snapshots of the clone instead.

About cascaded Thin Image snapshots

Thin Image snapshots of a P-VOL can be cascaded, the first layer being referred to as L1 S-VOLs. Cascading can be recursive so as to form a snapshot tree to a depth of up to 64 layers (L64 S-VOLs), consisting of the *root* P-VOL, intermediate *node* S-VOLs and terminal *leaf* S-VOLs. The total number of S-VOLs in a tree is limited to 1024.

To create cascadable snapshots, the L1 snapshot volumes must be created in cascade mode as a floating device or fully provisioned. Cascade mode snapshots must be provisioned, either at creation or mount time from a dynamic pool. From Protector 6.5 onwards, L1 snapshots are created in cascade mode by default, and are dynamically provisioned, although standard mode can still be specified if the storage device does not support cascading.

Protector uses a number of different pools for cascade mode snapshots as follows:

- *Snapshot Pool* - a Thin Image or hybrid pool where the P-VOL/L1 and L1/L2 snapshot pair data is held. If a hybrid pool is specified then Protector may also create the snapshot S-VOLs here.
- *Cascade Pool* - a dynamic or hybrid pool where Protector creates snapshot S-VOLs if they are fully provisioned.
- *Mount Pool* - a dynamic pool where Protector creates the snapshot S-VOLs if the *Snapshot Pool* is a Thin Image pool or if a floating device was specified for the snapshot operation. If a *Mount Pool* is specified as an option then it will be used in preference.

Both standard and cascade mode snapshots require a *Snapshot Pool* to be specified regardless of the mode. If fully provisioned cascade mode is selected then a *Cascade Pool* must be specified when configuring the operation.

When mounting a cascade mode snapshot, Protector provides the option to mount the original (L1) or a duplicate (L2) snapshot. The duplicate (L2) snapshot can be modified without changing the original (L1) snapshot's data. When the duplicate (L2) snapshot is unmounted, it is deleted and any changes made to it are lost. Original and duplicate mount modes for cascade mode snapshots may or may not require a *Mount Pool* to be specified, as per the following table:

| Snapshot Pool Type | Provisioning Type | Mount Mode | Specify Mount Pool? |
|--------------------|-------------------|----------------|---------------------|
| Thin Image | Floating Device | Original (L1) | Required |
| Thin Image | Floating Device | Duplicate (L2) | Required |
| Thin Image | Fully Provisioned | Original (L1) | N/A |
| Thin Image | Fully Provisioned | Duplicate (L2) | Optional |
| Hybrid | Floating Device | Original (L1) | Optional |
| Hybrid | Floating Device | Duplicate (L2) | Optional |
| Hybrid | Fully Provisioned | Original (L1) | N/A |
| Hybrid | Fully Provisioned | Duplicate (L2) | Optional |

About ShadowImage replication

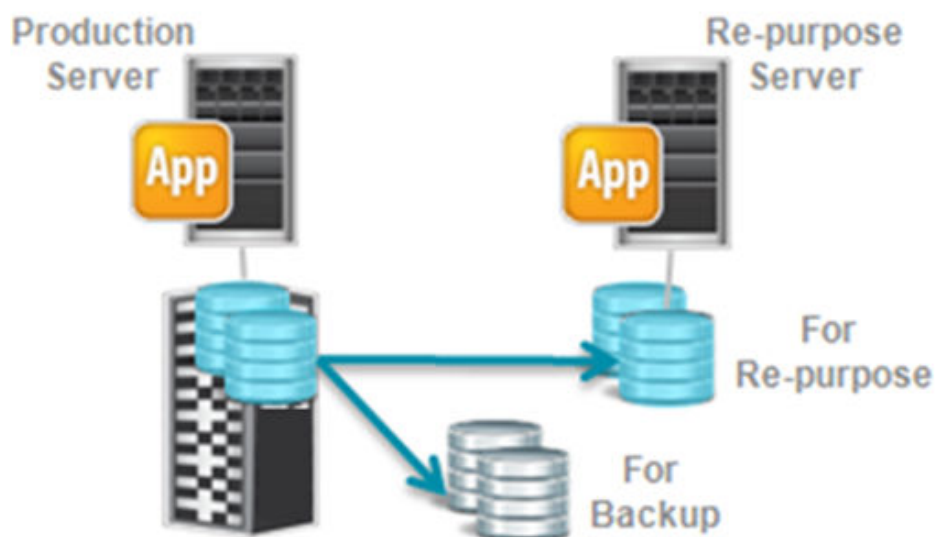


Figure 17 Full clone using batch mode ShadowImage

ShadowImage enables the creation of in-system, RAID-protected, read/write, volume-consistent, full clones.

As with TI snapshots, consistent clones can be created using Consistency Groups (CTGs).



Note: ShadowImage has a limitation on the maximum number of clones that can be created at one time. There can be up to three 1st level (L1) clones and then two L2 clones per L1 clone, giving a potential total of six L2 clones. Including the L1 clones, the potential total is nine clones. If more copies are required beyond this then use Refreshed Thin Image snapshots.

When taking a clone of a primary volume the storage system copies all of the data to the secondary volume. The point at which this is done depends on the split type selected:

- *Quick Split* - copying from primary to secondary is performed in the background so that the secondary is immediately available for reading/writing. The performance of the primary may be affected if access the secondary references data that has not yet been copied from the primary. In this case, on-demand copying of that data from the primary is required.
- *Steady Split* - copying from primary to secondary is performed in the foreground before the secondary is made available for reading/writing. The creation of the secondary takes time depending on volume size.

If using Dynamic Provisioning (DP) volumes for both primary and secondary volumes, the copy is applied only for the allocated area; the unallocated area is ignored.

Once the clone is created, the storage system updates the bitmap for the primary, which records which blocks have been modified. Pair resynchronization can be performed in one of the following ways:

- *Quick Resync* - resynchronization is performed in the background and on-demand. The secondary is briefly made read only (for less than 1 second), after which it becomes available for reading/writing (i.e it enters the PAIR state in less than 1 second). The performance of the primary may be affected if access to the secondary requires on-demand resyncing from the primary.
- *Normal Copy* - the secondary is made unavailable while the resynchronization is performed. The resync takes time depending on the size of differentials between the primary and secondary.

When the secondary is accessed, behaviour depends on the mode of operation as follows:

- *Steady Split* and *Normal Copy* - the storage system presents the actual contents of the secondary volume. This is in contrast to TI snapshots, where a merging process is required between the primary and secondary volumes to reconstruct the data.
- *Quick Split* and *Quick Resync* - the storage system presents the actual contents of the secondary volume. However a merging process may be required between the primary and secondary volumes to reconstruct the accessed block of data, if the background copy of that block has not yet been performed.

The following table shows how *Quick Split* and *Quick Resync* (indicated by the suffix q) are affected by upstream and downstream operations in an SI data flow:

| Data Flow | Behaviour |
|---|---|
| SIq | The SI is performed using quick operations. The SI secondary is immediately available for manually mounting. |
| SIq with auto-mount of secondary | The SI is performed using quick operations. The SI secondary is auto-mounted immediately. |
| SIq with downstream replications/snapshots | SI is performed using quick operations. However: <ul style="list-style-type: none"> ▪ The downstream replications/snapshots will wait until the SI secondary has been completely copied. ▪ The SI secondary will only be available for manually mounting once it is completely copied. See note below. |
| SIq with auto-mount and downstream replications/snapshots | SI is performed using quick operations. However: <ul style="list-style-type: none"> ▪ The downstream replication/snapshot will wait until the SI secondary has been completely copied. ▪ The SI secondary will only be auto-mounted once it is completely copied. See note below. |
| Upstream replications with downstream SIq | SI is performed using quick operations. The SI secondary is immediately available for manually mounting. There is no impact on upstream replications. |



Note: In cases where the SI replication must be fully evaluated, *Quick Resync* and *Quick Split* will take as long as *Normal Copy* and *Steady Split*. However the use of *Quick Resync* will have a beneficial affect on when and for how long the production application is quiesced.

When the clone is deleted the storage system releases the bitmap.

Protector supports *Steady Split/Normal Copy* and *Quick Split/Quick Resync*.



Figure 18 Full clone using continuous ShadowImage with protected, isolated, multiple TI snapshots

Continuous ShadowImage can be used to:

- Protect access to local TI snapshots if the production volumes fail.
- Isolate production volumes from performance impacts caused by heavy I/O on local TI snapshots.
- Allow multiple scheduled mount operations (beyond the limits imposed by SI mirror counts) without affecting the original backup, through the use of Refreshed TI.



Note:

Continuous SI can be combined with all hardware operations (i.e. TI, RTI, SI, TC, UR or GAD), with the exception that a continuous SI S-VOL cannot also be the P-VOL of a remote replication (i.e. TC, Universal Replicator or GAD).

i.e. It is not possible to chain a remote replication from a continuous SI target.

The typical use cases for continuous ShadowImage include:

- Repurpose on Demand - using continuous SI, keeps a close copy of the primary volume and allows pause and mount for repurposing.
- Protected Backup - using continuous SI to TI snapshots, retains snapshots in the event that the primary volume fails.
- DRU Protected Backup - using continuous SI to TI snapshots with DRU, retains snapshots with DRU lock in the event that the primary volume fails.
- Repurposing (TI) - using continuous SI to RTI snapshots, provides multiple repurposing copies, possibly in excess of the SI limit.
- Repurposing (SI) - using continuous SI to batch SI, provides a repurposing copy.
- Repurposing (SI) with Backup - using continuous SI to batch SI to TI snapshots, provides a repurposing copy with snapshots for protection.
- Repurposing (SI) with DRU Backup - using continuous SI to batch SI to TI snapshots with DRU, provides a repurposing copy with snapshots for protection with DRU lock.

About TrueCopy replication

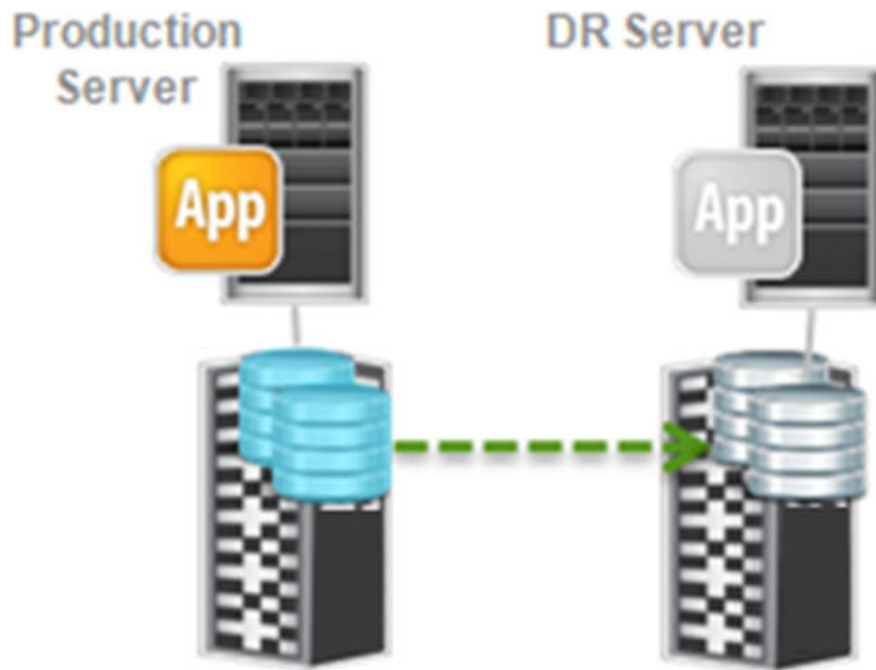


Figure 19 TrueCopy Replication

TrueCopy provides remote, volume consistent, synchronous replication.

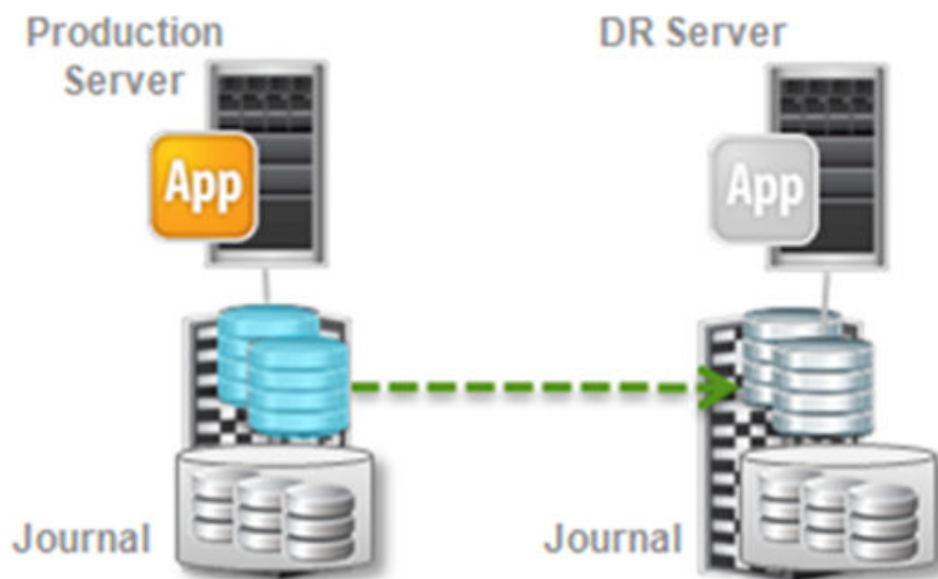
When establishing a replication between primary and secondary volumes, the storage system copies all the data from the primary to the secondary volume. Depending on the volume size, the creation of replicas takes time. As with ShadowImage, data copy can be optimized by using DP volumes.

After creation of the replicas, the storage system maintains the replica on the secondary volume by synchronously transferring each write made to the primary. In synchronous (copy on write) mode, the storage system signals write I/O completion only when it has been transferred to the secondary volume. The write order is completely guaranteed so that the secondary volume is crash-consistent at any point in time.

In the *COPY* state, no read/write operation is permitted to the secondary volume. To access the secondary volume, the replication must be paused (i.e. the pair is placed in the suspended state). As with ShadowImage, a bitmap is maintained for later pair synchronization. When the replication is deleted the storage system releases the bitmap.

**Note:**

- Fence Level determines behaviour when an update to the secondary volume fails. This option should be set based on the business priority (i.e. keeping replications consistent versus keeping production data available):
 - Data – prevents writes to the primary volume if updates to the secondary volume fail. This setting is appropriate for volumes that are critical to recovery.
 - Status – prevents writes to the primary volume if the secondary volume's status cannot be set to 'suspended' in the event of a failure. This setting enables rapid resynchronisation once a failure is resolved.
 - Never – allows continued writes to the primary volume even if updates to the secondary volume fails. This setting is appropriate for volumes that must remain available.
- To maintain synchronised data transfer, sufficient bandwidth must be provided for the remote link, otherwise performance problems may be encountered on the production volume. When a replication is required over remote links with poor bandwidth or over long distances, use Universal Replicator.

About Universal Replicator**Figure 20 Universal Replicator**

Universal Replicator performs volume consistent, asynchronous replication.

When establishing a replication to a target secondary volume, the storage system copies all the data to the secondary volume. Depending on the volume size, the creation of the replica takes time. As with TrueCopy, the copying can be optimized using DP volumes.

After the replication is created, the storage system maintains the replica on the secondary volume, transferring each write to the secondary volume. In asynchronous mode, the storage system signals each write completion as soon as it is performed on the primary volume, it then transfers it to the secondary volume (copy after write). Journalling ensures the write order is completely guaranteed so that the secondary volume is crash-recoverable at any point in time.

In the replicating state, no read/write operations are permitted to the secondary volume. To access to the secondary volume, the replication must be paused (placed in the suspended state). Universal Replicator maintains a journal of the primary volume for later pair synchronization. In contrast to TrueCopy, long duration pausing can be tolerated by configuring sufficiently large UR journals. When the replication is deleted the storage system releases the UR journals.

The use of Consistency Groups (CTGs) is mandatory for Universal Replicator.



Note: Long duration pausing, with sufficiently large UR journals, may cause service level violation with increased RPO. To avoid this, RPOs must be monitored to ensure that they are satisfying the SLA.

About Global-Active Device replication

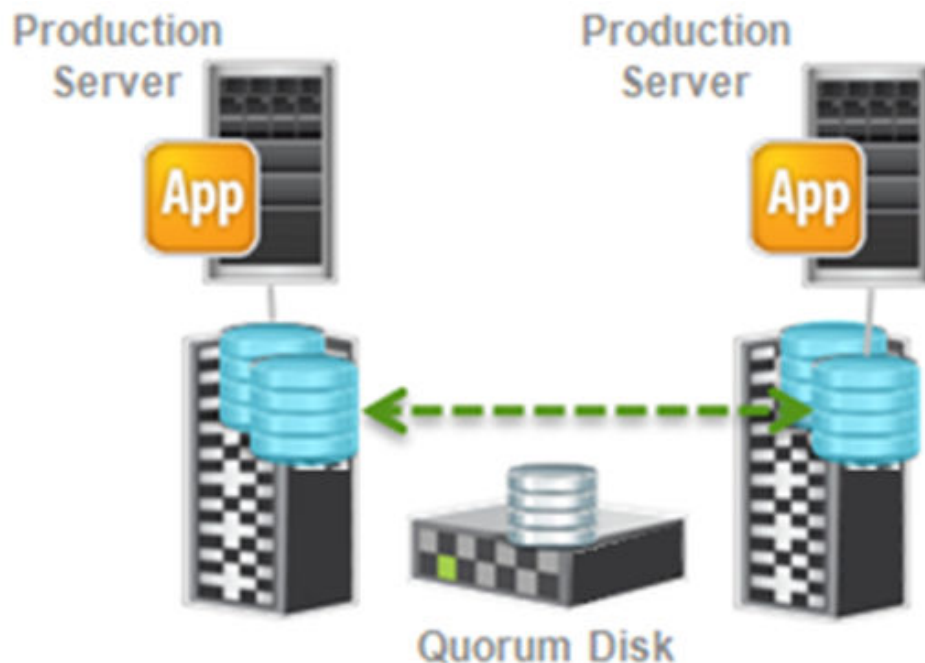


Figure 21 Global-Active Device Replication

Global-Active Device allows volume consistent, remote, active-active replication.

When establishing a replication, the storage system copies all the data to the secondary volume. Depending on the volume size, the creation of the replica takes time. As with TrueCopy, you can optimize the process using DP volumes.

After creating the replication, the storage system maintains the replica on the secondary volume. The copy mechanism and data consistency is the same as for TrueCopy.

Unlike TrueCopy, read/write operations are permitted on both the primary and secondary volume even in the replicating state, hence both sides of the replication pair are said to be active. All updates to the secondary volume are also transferred back to the primary volume. When the replication is paused (i.e. placed in the suspended state), the storage system determines the owner volume using the quorum disk and prohibits any read/write access to the non-owner volume.

As with TrueCopy, a bitmap is maintained for pair re-synchronization. When the replication is deleted, the storage system releases the bitmap.



Note: To fully handle a failure scenario, it is recommended that the quorum disk is located at a secure third site.

Protector is not be able to operate any dataflow containing a GAD replication if the primary and secondary have been swapped externally, since path resolution will see the original secondaries as the new primaries. The swap must be reversed externally to its normal direction.

About Global-Active Device Cross Path



Figure 22 Fully Redundant GAD Cross-Path and Multi-Path Scenario

In a GAD cross-path and multi-path environment, the application servers may have one or more LUN paths to the PVOL, and also one or more LUN paths to the S-VOL. The GAD pair may also have one or more LUN paths between them.

Protector is capable of configuring and adopting hardware path, file system path and application replications for GAD cross-path and multi-path scenarios.

In situations where the *Application Host* or *OS Host* has a LUN path to a GAD P-VOL and also has a LUN path to the S-VOL of that replication, Protector will resolve application paths including that P-VOL when the host has one or more LUN paths to both volumes involved in the replication.

Protector can:

- Adopt the replication
- Re-evaluate the replication if it already exists in Protector
- Create a snapshot of the replication's P-VOL
- Swap the replication

This feature requires **raidscan** (version 01-41-03/03 or later), which, when issued against the secondary volumes of a remote replication, includes the serial number of the array hosting the primary volumes.

This feature only considers cross paths to the primary application. Failover support for secondary applications is not supported.

About three datacentre cascade (3DC)

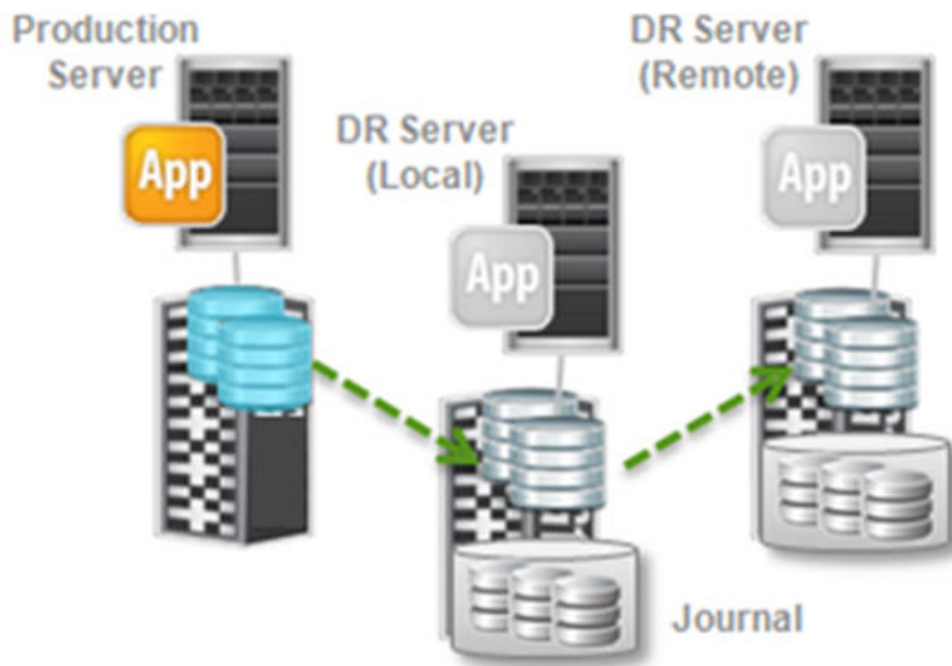


Figure 23 Three datacentre cascade

Three datacentre (3DC) cascade using TrueCopy and Universal Replicator provides the maximum level of data protection by combining synchronous replication between the primary and local secondary site, cascaded with asynchronous replication between the local secondary and remote tertiary site.

If a component failure or power failure occurs at the primary site, production can be handed over to the local site with no data loss.

If a site failure or localised natural disaster occurs, both the primary and local site may be lost. In this case production can be handed over to the remote site with minimal data loss.

Consider the following when using 3DC cascade:

- Due to the cascading topology, a failure at the local site will prevent both the synchronous asynchronous replications, leaving the primary site unprotected. To avoid this situation, it is recommended to use the 3DC multi-target configuration instead.

About three datacentre multi-target

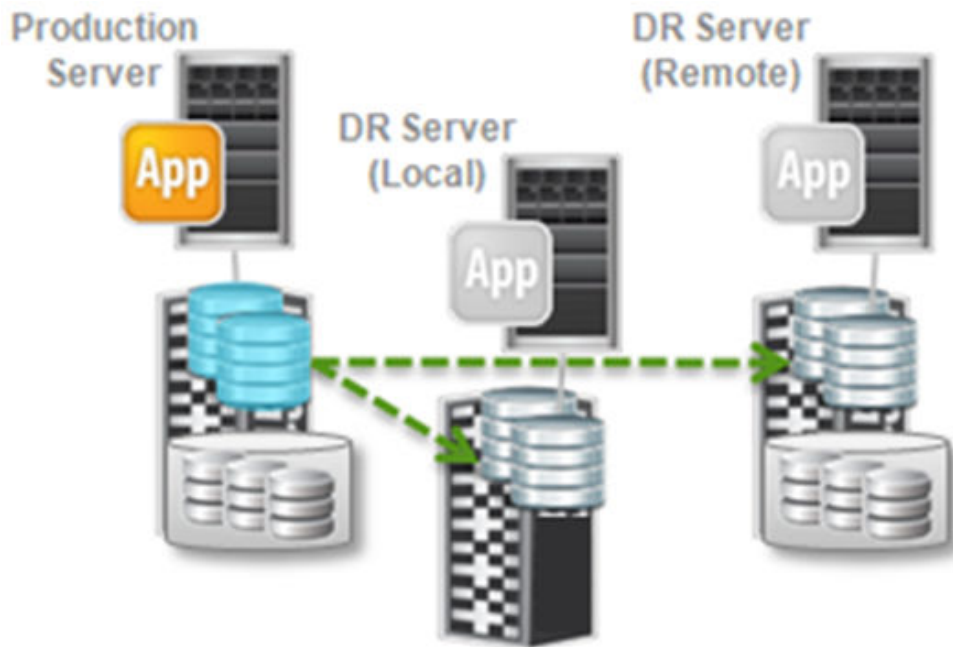


Figure 24 Three datacentre multi-target

Three datacentre (3DC) multi-target using Global-Active Device, TrueCopy and Universal Replicator provides the same level of data protection, equivalent to 3DC cascade, but improves upon it by solving the issue of local secondary site failure leaving the primary site unprotected. If the local secondary site fails, replication between the primary and remote secondary site can continue uninterrupted.

3DC multi-target may also be configured using Universal Replicator instead of TrueCopy. Symmetric configuration and operation simplifies component failure and site failure since both are handled with a single set of operations. Consider this option if simplicity of operation is the first priority.

About three datacentre multi-target with delta

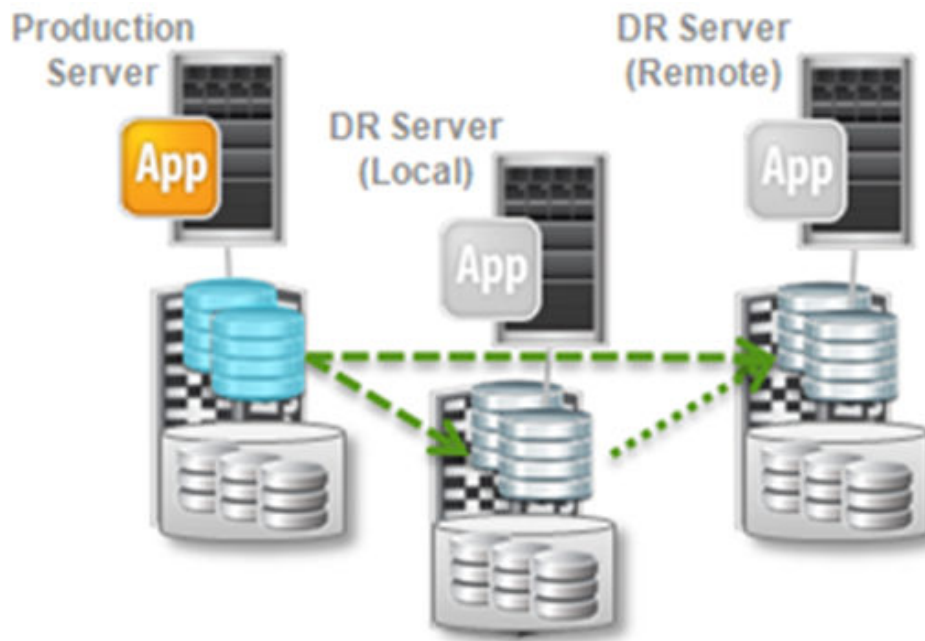


Figure 25 Three datacentre multi-target with delta

Three datacentre (3DC) multi-target with delta is an improvement on 3DC multi-target that provides on-going protection even in the event of a failure at the primary site.

A replication from the production site to the local secondary site is configured using Universal Replicator. A replication from the production site to the remote secondary site is configured using Global-Active Device or TrueCopy. Additionally, a suspended, asynchronous Universal Replicator (delta-UR) replication is established between the local and remote secondary sites. The local and remote secondary sites will be near identical once pairing with the primary site is complete. Differences that appear between the secondary sites over time, due to a number of factors, are tracked by the suspended delta-UR replication.

Failure of the local or remote secondary site is handled in the same way as for 3DC multi-target, in that the primary site remains protected by the surviving secondary site.

In the event that the production site fails, the local secondary site can take over. The local secondary site is then rapidly brought under the protection of the remote secondary site by resuming the suspended delta-UR replication. Because only the deltas between the local and remote secondary sites need to be resynchronized, this pairing takes only a short time to achieve, meaning that the local site only remains unprotected for a brief period. Without the pre-existing, suspended delta UR between the local and remote secondary sites, it could take hours or even days to establish a replication between the secondary sites, leaving the local secondary site vulnerable for an extended period while this takes place.

About static clones of a clone

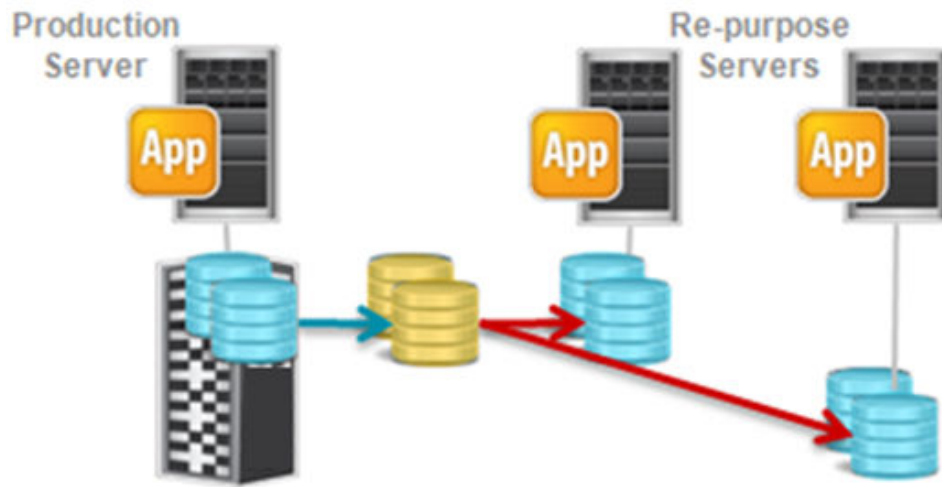


Figure 26 Static clones of a clone

Static clones of a clone enables multiple repurposing with heavy workloads (read/write I/O).

A 1st level clone (golden image) is created based on a schedule. The golden image can then be manually replicated as 2nd level clones for repurposing. The 2nd level of clones need to be static because the re-purpose servers require static access points (Port, Host Group and LUN although the LUN may not remain constant, depending on the mount host OS) for mounting the volumes.

If re-purposing beyond the ShadowImage limitation of two 2nd level clones is required, use Thin Image on the 2nd level.

About clone with replication

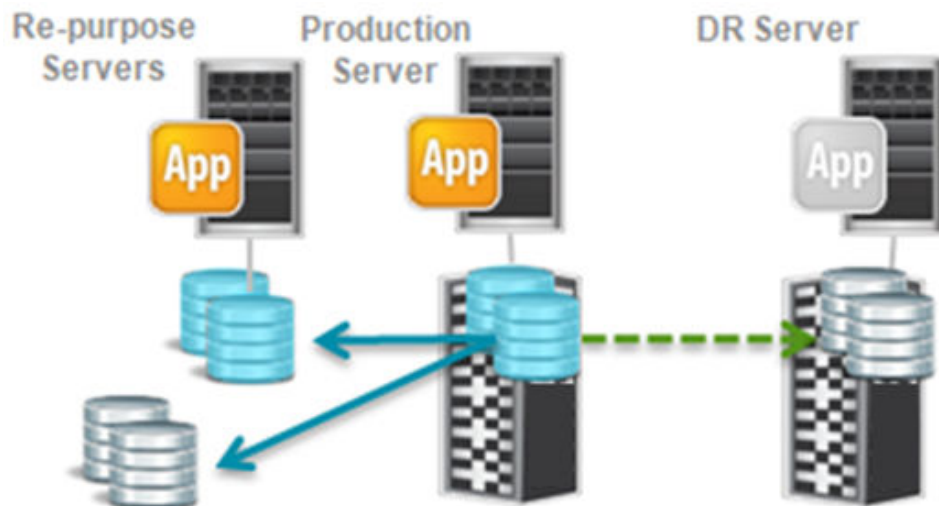


Figure 27 Clone with replication

Clone with replication enables disaster recovery and local backup and/or local re-purposing.

A replica of the production data is maintained on the remote site using TrueCopy, Universal Replicator or Global-Active Device. The remote replication is used for disaster recovery.

Local clones are created based on a schedule using ShadowImage. These clones can be used for fast operational recovery or repurposing.

About snapshot with replication



Figure 28 Snapshot with replication

Snapshot with replication enables disaster recovery and local backup.

A replica of the production data is maintained on the remote site using TrueCopy, Universal Replicator or Global-Active Device. The remote replication is used for disaster recovery.

Local snapshots are created based on a schedule using Thin Image. These clones can be used for fast operational recovery.

About snapshot of a clone

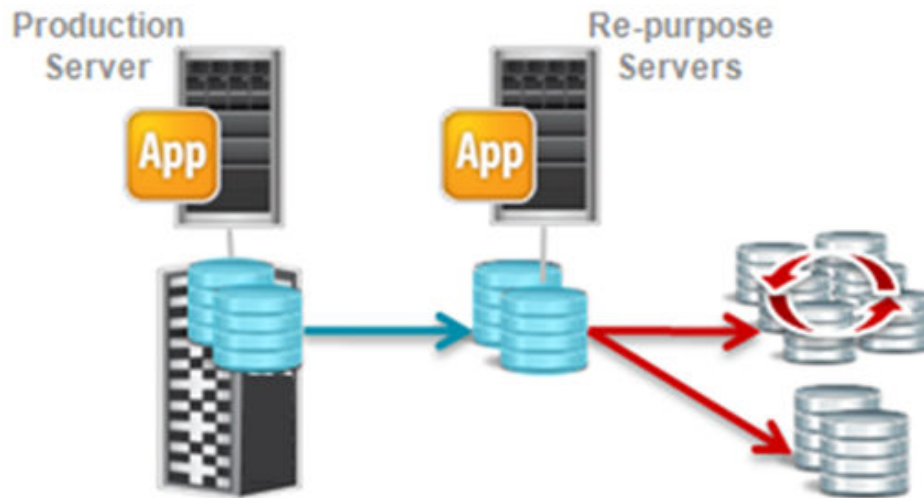


Figure 29 Snapshot of a clone

Snapshot of a clone enables ad-hoc backup for repurposing.

A clone is created using batch or continuous ShadowImage and is made available for repurposing.

A snapshot is taken so that the clone can be reverted quickly if required. Reversion may be needed when performing recurrent testing or configuration change/patching (that may fail) on the repurposed clone.

About replication of a clone

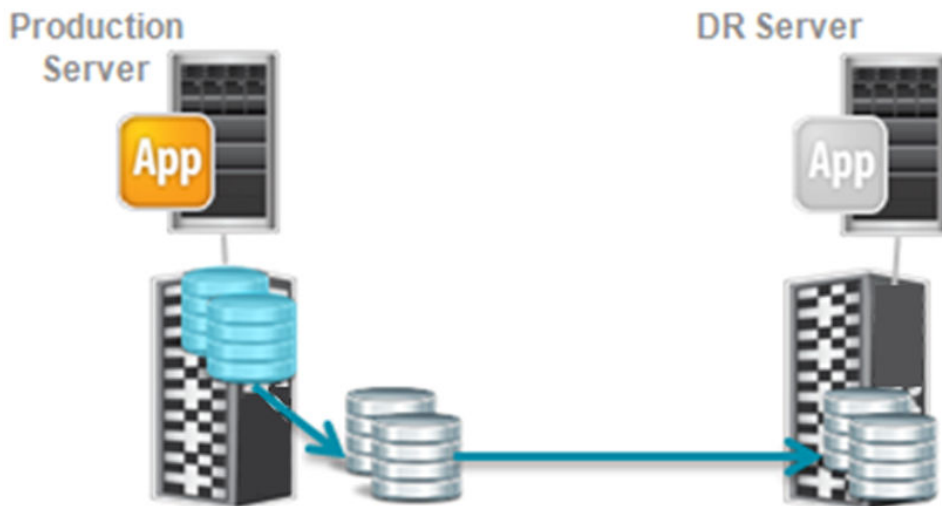


Figure 30 Replication of a clone

Replication of a clone enables remote backup without DR.

An in-system clone is created using ShadowImage based on a schedule. The cloned point-in-time image is then replicated using TrueCopy or Universal Replicator. Having an intermediate clone means that the replication process does not have any impact to the production volume. The replication is performed as a batch copy, so limited RPO is achievable (typically a few hours). For this reason, this technique is not common for high end storage systems.

About remote snapshot

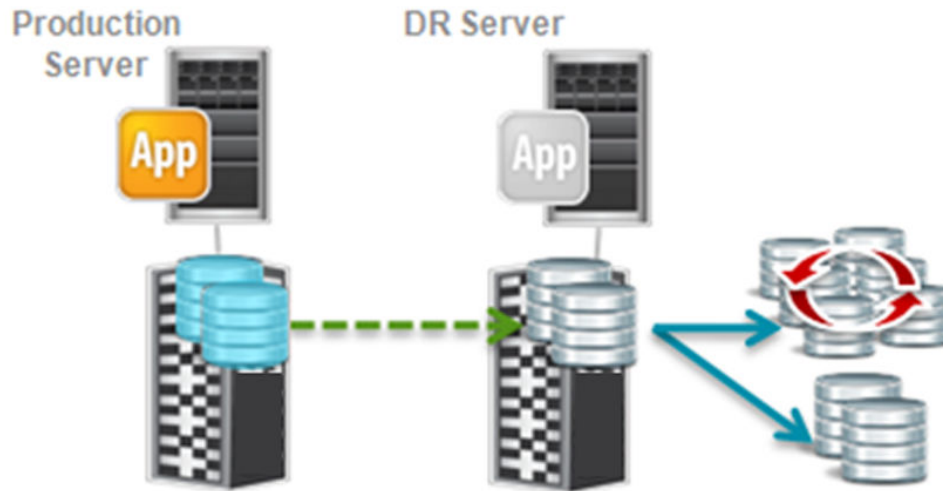


Figure 31 Remote snapshot

Remote snapshot enables disaster recovery with remote backup.

A replication is created using TrueCopy, Universal Replicator or Global-Active Device to maintain a replica image of production data on the remote site.

A snapshot is created from the remote replica based on a schedule.

This achieves a high level of disaster recovery, while remote site snapshots enable quick operational recovery even during disaster recovery.

About local and remote snapshots

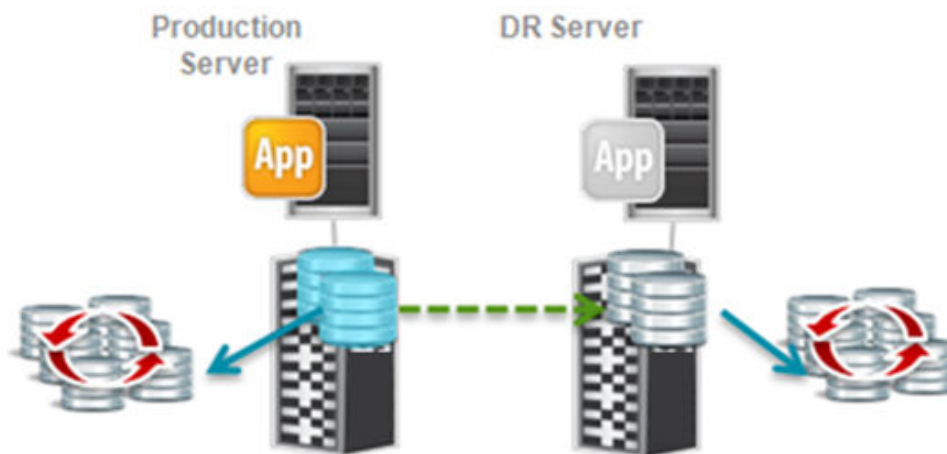


Figure 32 Local and remote snapshots

Local and remote snapshots enable disaster recovery with backups.

A replication is created using TrueCopy, Universal Replicator or Global-Active Device to keep a replica image of production data on the remote site.

Snapshots of the local production data and remote replica are created based on the same schedule.

This keeps the data consistent on the both sites, simplifying the process of operational recovery during site failover, contributing to a better RTO.

About remote clone

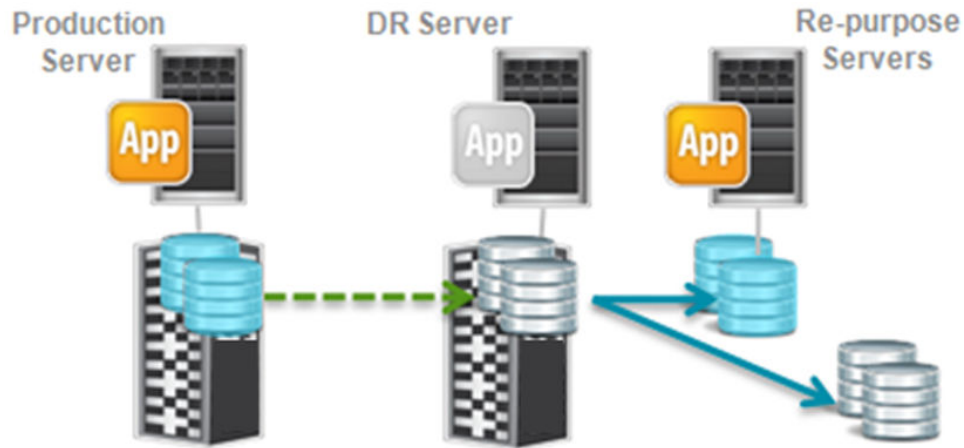


Figure 33 Remote clone

Remote clone enables disaster recovery with remote backup and/or remote repurposing.

A replication is created using TrueCopy, Universal Replicator or Global-Active Device to maintain the replica of production data on the remote site.

Clones of the remote replica are created using ShadowImage based on a schedule.

Replication achieves the highest level of disaster recovery, while remote snapshots/clones enable quick operational recovery even during disaster recovery. Also, repurposing with remote snapshots/clones avoids any performance impact to the production site.

About local & remote clones

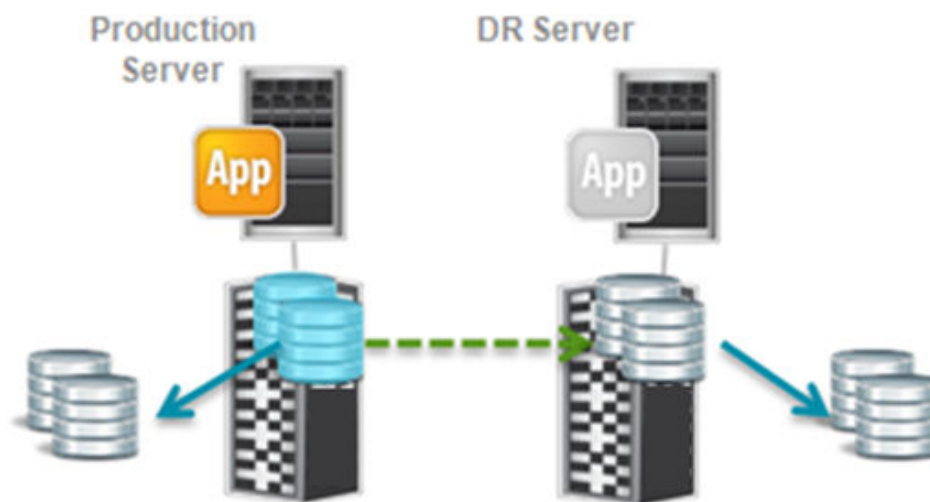


Figure 34 Local & remote clones

Local and remote clones offer the same benefits as local and remote snapshots, with the additional benefit of protecting the data from physical failure of the production or replica volumes.

Note the local and remote clones do not allow the user to recover to a point-in-time. The clone is completely refreshed so that it is equal to the primary or secondary volume. Operational recovery is therefore more limited as a result.

About local snapshot and remote clones

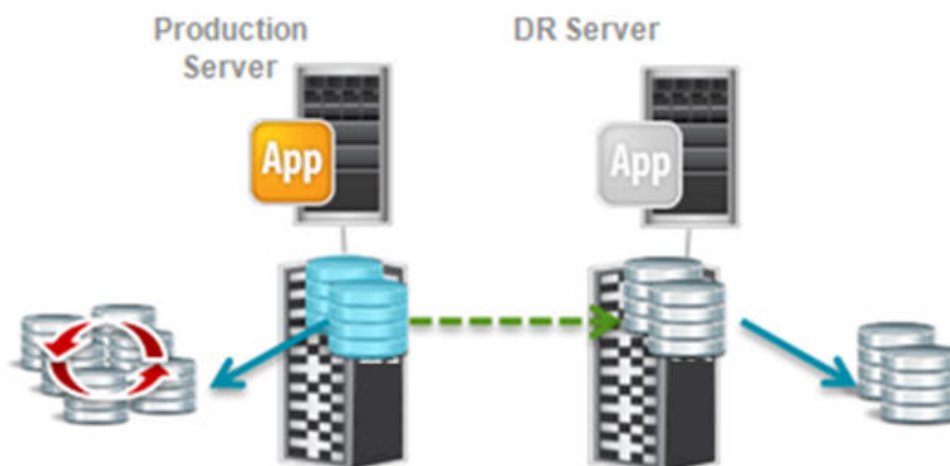


Figure 35 Local snapshot and remote clones

Local snapshot and remote clones enables disaster recovery with tiered backup.

A replication is created using TrueCopy, Universal Replicator or Global-Active Device to keep a replica image of production data on the remote site.

Local snapshots of the production data and remote clones of the replica are created using Thin Image and ShadowImage respectively, based on different schedules.

Keeping different data on each site enables quick recovery on the production site, while satisfying the long-term protection on the remote site.

This scenario can be flipped (i.e. local clone and remote snapshot) so that the clone is maintained at the local site and the snapshots at the remote site. Protector also supports snapshots and clones on the local and remote site concurrently.

About Hitachi Block replication adoption

Ops Center Protector can adopt and manage ShadowImage, TrueCopy, Universal Replicator and Global-Active Device replications that already exist on Hitachi Block storage hardware. An adopted replication can then be managed via the GUI.

To adopt a replication, the user must specify a replication policy that identifies the required source LDEV(s) or Host Group, draw an appropriate data flow that identifies the source and destination storage devices, replication type (and mirror number for SI and UR), mark the policy for adoption and then activate the rules.



Note: Any classification can be used to specify the source LDEV(s), including *Application* and Filesystem *Path*. Protector will attempt to resolve and adopt them. This is subject to existing limitations.

Adopted replications can be augmented with user defined replication and snapshot operations.

A replication can be dissociated from Ops Center Protector without being removed from the storage hardware.



Caution: Be aware of the difference in semantics between dissociating and removing replications from data flows:

- Dissociating a replication will leave that replication intact on the hardware.
- Removing a replication from a data flow and redistributing the rules will cause that replication to be torn down on the hardware.




Note: The following apply when adopting replications:

- Replications can be adopted from any supported block storage systems.
- In-system, 2DC and 3DC replications are supported.
- All valid replication data flows including cascades and multi target are supported.
- The user must understand and create the data flow prior to adopting.
- The user needs to know the type of replication that is to be adopted in addition to the Mirror Unit Number. The remaining properties will be discovered from storage.
- At least one existing replication pair must exist on the selected mirror.
- The replication being adopted must be in the in the same direction as the one defined in the data flow, i.e. it cannot be in the reversed flow state.
- Refreshed Thin Image replications cannot be adopted.
- The source and destination journals specified must match those of the Universal Replicator replication being adopted.
- Primary volumes replicating on different mirror unit numbers are not supported.
- Adopting by copy groups or device groups is not supported.
- There is no check for attempting to adopt the same hardware pairs on multiple, active, coexisting data flows.
- Limitations for other features still apply if they are relevant to the adopted replication.

When adopting replications Ops Center Protector will behave in the following ways depending on the policy and data flow attributes supplied by the user when attempting to perform the adoption process:

| Replication Policy and Data flow Configuration | Ops Center Protector's Behaviour |
|--|---|
| Any | <ol style="list-style-type: none"> 1. Primary volumes that are not being replicated on the specified mirror will have a secondary volume provisioned and that pair is added to the replication set while respecting the replication type, journal, CTG, and fence level options. |

| Replication Policy and Data flow Configuration | Ops Center Protector's Behaviour |
|--|--|
| | <ol style="list-style-type: none"> Adopted replications are flagged as such in the hardware resource information along with their CTG ID, journals, mirror unit numbers, and fence levels. |
| Any | <ul style="list-style-type: none"> If the replication is found to be in PAIR and the Protector mover type is <i>Batch</i> then the replication will be suspended. If the replication is found to be in PSUS/SSUS and the Protector mover type is <i>Continuous</i> then the replication will be resumed. |
| The user does not select a pool, but does select a mirror unit number | <ol style="list-style-type: none"> If the mirror unit is assigned, adopt the replication pairs on the mirror. If the mirror unit is assigned but there are one or more P-VOLs not replicating on that mirror, create S-VOLs for those P-VOLs, in the pool used by the existing S-VOLs (or error if the S-VOLs exist in more than one pool). If the mirror unit is unassigned, log the error "Cannot provision, no pool selected". |
| <p>The user selects a mirror number that is not supported for the selected replication type. Valid mirrors numbers are:</p> <ul style="list-style-type: none"> ShadowImage: 0, 1 or 2 TrueCopy: 0 only Universal Replicator: 0, h1, h2 or h3 Global-Active Device: 0 or h1 | <p>Log the error "Could not determine pool/journal/quorum to use. Ensure that there is at least one existing pair of matching replication type"</p> <div>  Note: When Protector attempts to adopt a TC or GAD replication, it will detect UR pairs on mirror number 0 and, if present, log the error: <pre>Handler 'HitachiVirtualStoragePlatform' call failed: [TrueCopy GAD] mirror for one or more adopted pairs already in use by UR.</pre> <p>See above for more limitations relating to mirror unit and replication type combinations.</p> </div> |
| The user changes the mirror number after initial data flow activation | <p>The user will be warned via the GUI that the following actions will be taken before they reactivate the rules:</p> <ol style="list-style-type: none"> Volumes and relationships that have been adopted will be unadopted Volumes and relationships that have been created by the user will be destroyed |

| Replication Policy and Data flow Configuration | Ops Center Protector's Behaviour |
|--|---|
| | 3. Replications will be re-adopted and created based on the new mirror number |

Policy Concepts

This section describes Ops Center Protector's policy management features.

For further information, refer to:

- [Policy Tasks \(on page 264\)](#)
- [Policies UI Reference \(on page 594\)](#)

About policies

A *Policy* consists of *Classifications* that specify what data is to be protected and *Operations* that specify how that data is to be protected.

Physical classifications specify the data by directly naming the path, logical device/volume or disk type to be protected, whereas *Application classifications* specify the data indirectly by naming the application instance such as databases or virtual machines to be protected, Ops Center Protector then discovers the volumes that the application's data resides on. The following table shows which classifications can be used in conjunction with a particular type of source node.

Table 2 Classifications vs. Source Node Types

| Source Node Type | Policy Classifications | | | | |
|--|---|-------------|-----------|-------|------|
| | Oracle Database | Oracle RMAN | Disk Type | Block | Path |
| OS Host | | | Yes | | Yes |
| Oracle | Yes | Yes | | | |
| VMware | | Yes | | | |
| Hitachi Block Device | | | | Yes | |
| Hitachi Logical Block Device | | | | | |
| Hitachi Block Host | | | | Yes | |
| Generation 1 Repository | A Generation 1 Repository can act as a source node in a cascaded data flow, where one generation 1 repository is backed up to another generation 1 repository. The policy classification is effectively the same as the one applied to the original data source in the cascade. | | | | |
| Generation 2 storage nodes (HCP, Amazon S3 and Repository) | Can act as a source node in a cascaded data flow, where one generation 2 node is backed up to another generation 2 node. The policy classification is effectively the same as the one applied to the original data source in the cascade | | | | |

The *Operations* in a policy define the methods to be used to create backups of the primary data. Operations can be implemented using Protector software methods (e.g. Backup), or by orchestrating the hardware storage devices (e.g. Hitachi Block) to implement operations in hardware (e.g. Thin Image and Universal Replicator). The following table shows which operations can be used in conjunction with a particular type of source or destination node.

For example: from the table below we can see that an *OS Host* node can act as the *Source (S)* for a *H/W* based *Replicate* operation, and that a *Block Device* node can act as the *Destination (D)*.

Table 3 Node Types vs. Operation Types. (Key: S=Source node for the operation, D=Destination node for the operation)

| Node Type | Policy Operations | | | | | | |
|------------------------------|--|--------|--------------------|--------|--------------------|--------------------|-------|
| | Backup | Access | Replicate | | Snapshot | | Mount |
| | S/W | S/W | S/W ⁽¹⁾ | H/W | S/W ⁽²⁾ | H/W ⁽³⁾ | H/W |
| OS Host | S | | | S | | S | D |
| Oracle | | S | | S | | S | D |
| VMware | S | | | S | | S | |
| Hitachi Block Device | | | | S or D | | S | |
| Hitachi Logical Block Device | | | | S or D | | S | |
| Hitachi Block Host | | | | S | | S | |
| Repository | S or D | | | | | | |
| HCP | S or D | | | | | | |
| Amazon S3 | S or D | | | | | | |
| (1) | (2) Software Replication is not currently supported. (3) Software Snapshot is not currently supported. (4) Snapshots are local operations, so the source is always the same as the destination on a data flow. | | | | | | |

Operations defined in a *Policy* work in conjunction with *Movers* placed on a *Data Flow*. When a policy is assigned to a source node, all the operations in that policy are assigned to that node. The policy is then routed by a mover and the contained operations assigned to one or more destination nodes. The following table shows which operations can be used in conjunction with a particular type of mover:

Table 4 Operation Types vs. Mover Types

| Policy Operation | Implementation | Batch Mover | Continuous Mover |
|------------------|----------------|--|---|
| Backup | Software | Scheduled or on-demand incremental backups are created on a repository HCP or Amazon S3 node, based on RPO. | N/A |
| Replicate | Software | Not supported. | N/A. |
| | Hardware | Hitachi Block: Scheduled or on-demand replicas of the P-VOL are created on an S-VOL using Refreshed Thin Image, ShadowImage, TrueCopy or Universal Replicator. | Hitachi Block: Live changes to the P-VOL are replicated to an S-VOL using ShadowImage, Universal Replicator or Global-Active Device. |
| Snapshot | Software | Windows: Not currently supported. | N/A |
| | | Linux/AIX: Not currently supported. | |
| | Hardware | Hitachi Block: Scheduled or on-demand local snapshots are created using Thin Image. The batch mover is implied but not shown on the data flow since the operation is local to the storage device. | N/A |
| Mount | Hardware | Automatically mounts a Hitachi Block LDEV based on a schedule. The mounted LDEV can then be used for repurposing or proxy backup. | N/A |

About policy classifications

A Classification specifies what data is to be protected either by directly identifying files or volumes, or indirectly by specifying application level objects such as databases or datastores.

Protector resolves a classification down to a unit of data appropriate to the underlying storage device type.

- For a host based backup, the classification is resolved down to disk data blocks where the data being protected resides and it is changed disk data blocks that are recorded in the repository.
- For block storage based backup, the classification is resolved down to LDEVs and it is entire LDEVs that are replicated or snapshotted.

A classification is resolved when a data flow that implements a policy is first activated, when it is re-activated while currently active and possibly when re-triggered. It is important to understand the behaviour when classification resolution results in changes to the set of underlying data units being backed up.

For a classification that is applied to a host based backup operation, when resolution alters the files included in the backup then:

- Any files that remain in the backup are unaffected and continue to be backed up as before.
- Any files that are newly included are added to the backup.
- Any files that are no longer included remain in the backup, but changes to them are no longer recorded in the repository.

For a classification that is applied to a block storage device backup operation (snapshot or replication), when resolution alters the LDEVs included in the backup set then:

- Any LDEVs that remain in the backup set are unaffected and continue to be backed up as before.
- Any LDEVs that are newly included are added to the backup set, pairings are created with the respective S-VOLs.
- Any LDEVs that are no longer included are removed from the backup set, their pairings are torn down and the respective S-VOLs are deleted.



Note: This behaviour differs from the case when deactivating a data flow, where the entire backup set is torn down but the S-VOLs are left in place as static copies.



Note: For Global-Active Device, when a Thin Image snapshot, Refreshed Thin Image, ShadowImage or Universal Replicator replication is taken from the GAD S-VOL, the GAD S-VOL cannot be deleted.

About VMware policy classifications

When items are added to the inclusion or exclusion lists displayed in the [VMware Classification Wizard \(on page 622\)](#), the [VMware Resource Selection Wizard \(on page 623\)](#) is launched. This wizard enables virtual machines and templates to be selected based on the VMware inventories in which they appear in vSphere, or by pattern matching of VMware container object name, virtual machine name or template name. The list of VMs and templates included in the classification is evaluated at different times depending on how they are specified:

- Evaluation is done only once (i.e. when the data flow implementing the policy is compiled), if VMs and templates are:
 - Explicitly selected from a list or inventory tree.
 - Specified using their full name (i.e. without using wildcards, e.g. `Sales_SQLServer`).
- Evaluation is done every time the operation is triggered, if VMs and templates are:
 - Implicitly selected using a container object (folder, host, cluster, datastore, resource pool, datacenter, or vApp).
 - Selected using a tag defined in vSphere.
 - Specified using a name pattern (i.e. using wildcards, e.g. `Sales_Client*`).



Tip: With this method of classification, VMs will be automatically added to the backup (without reactivating the data flow) when they are added to a container, assigned the appropriate tag or given a name that matches the defined pattern. For continuous replications it will be necessary to trigger the relevant operation to cause re-evaluation.

Every VMware object selected in the classification is resolved to a list of VMs and templates. For example, when selecting a datastore, all the VMs and templates that are in that datastore are selected. If any included VMs and templates reference VMDKs located in another datastore, these will be selected too. This ensures that VMs and templates that are backed up can be fully restored.

Backup behaviour differs depending on the type of operation the VMware classification is combined with in a policy.

For host based *Backup* operations, the VMware files that record each selected VM's state (system configuration, virtual hard disk configuration and virtual hard disk data) are backed up as dictated by the policy's operation(s). If a VM contains RDM storage then:

- Physical compatibility mode RDM disks are not backed up because they are not included in a VMware snapshot.
- Virtual compatibility mode RDM disks are backed up.

For block based *Snapshot* and *Replicate* operations, the datastores that contain the selected VMs are identified. Those datastores that reside on Hitachi Block storage are then resolved down to their underlying LDEVs and are snapshotted/replicated as dictated by the policy's operation(s).

- If the VM contains physical or virtual compatibility mode RDM storage, the backup operation will continue without backing up the RDM storage and the following warning will be logged:

VM: <VM_NAME>. Contains a RawDiskMapping (RDM). This RDM storage won't be backed up.

- If the VM contains Passthrough storage, the backup operation will continue without backing up the passthrough storage and the following warning will be logged:

VM: <VM_NAME>. Contains <TYPE> Passthrough storage. This Passthrough storage won't be backed up.

- If the VM has a dependency on a non-VMFS datastore (i.e. one that is not located on a block storage device), then:
 - If no VMDKs for the VM are present in the non-VMFS datastore, the backup operation will continue and the following warning will be logged:

VM contains non-VMFS datastore '<DATASTORE_NAME>', which won't be backed up.

- If VMDKs for the VM are present in the non-VMFS datastore, the backup operation will be aborted and the following error will be logged:

The following non-VMFS datastores contain VM disks which won't be backed up: <LIST OF NON-VMFS DATASTORE NAMES WITH VMDKS>.



Tip: Any RDM storage that cannot be protected by a *VMware* classification can be backed up using a separate *Physical* classification if appropriate.

About Hyper-V policy classifications

The Hyper-V policy classification defines which virtual machines will be protected to which level of consistency as part of a policy.

When items are added to the inclusion or exclusion lists displayed in the [Hyper-V Classification Wizard \(on page 614\)](#), the [Hyper-V Resource Selection Wizard \(on page 616\)](#) is launched. This wizard enables virtual machines to be selected based via browsing, or by pattern matching of virtual machine name, configuration path or host running the VM.

The list of VMs included in the classification is evaluated at different times depending on how they are specified:

Evaluation is only performed once, when browsing and selecting the virtual machine directly.

Evaluation is done every time the operation is triggered if VMs are:

- Implicitly selected using a virtual machine location (path) or virtual machine host (hypervisor)
- Specified using a name pattern (i.e. using wildcards, e.g. Sales*)



Tip: With this method of classification, VMs will be automatically added to the backup (without reactivating the data flow) when they are added to a selected path or host or given a name that matches the defined pattern. For continuous replications it will be necessary to trigger the relevant operation to cause re-evaluation

Every Hyper-V object selected in the classification is resolved to a list of VMs. For example, when selecting a virtual machine location, all VMs with configurations in that location are selected. If any included VMs utilize additional paths, these will be added too. This ensures that backed up virtual machines can be fully restored.



Tip: Use the preview selection functionality of the [Hyper-V Classification Wizard \(on page 614\)](#) to preview which VMs will be included for a given Hyper-V Node based on the provided inclusion and exclusion lists.

Virtual machine consistency

The consistency of virtual machine backups differs based on the consistency level chosen in the policy. Before the block-based backup is performed Protector will create a checkpoint for every virtual machine.

Application consistent checkpoints will use Hyper-V integration services to quiesce the data inside the VM. In case of Windows VMs, Protector will utilize VSS within the virtual machine to save application and filesystem data to disk. For Linux, the Hyper-V integration will request a quiesce, however usually this will only cause the filesystem buffers to be saved to disk. If an application consistent VM checkpoint cannot be created, Protector will create a crash consistent checkpoint instead.

Crash consistent checkpoints will create a checkpoint of the virtual disks as they are.

About Microsoft SQL Server Policy Classifications

The Microsoft SQL Server policy classification defines which databases will be protected and with what impact to the differential base.

Adding the classification starts the [Microsoft SQL Server Classification Wizard \(on page 602\)](#). Once the source Microsoft SQL node has been selected, databases can be added using the [Microsoft SQL Server Database Selection Wizard \(on page 604\)](#).

The Backup mode selection defines if the snapshot or clone will be recognized as a full backup by the SQL Server or if it should just be a copy which does not affect the differential base. In both cases, Protector will protect the complete database as well as the current log files and will represent the database at the point in time of the snapshot or clone creation.

It is not possible to backup only the transaction logs. Use the “BACKUP LOG” SQL command or a 3rd party tool to protect your transaction logs. Protector’s file system backups can help to store the files safely in the datacenter or cloud.



Tip: Keep in mind Microsoft SQL Server requires that at least a single full backup before transaction log backups can be performed.

About path macros

Path macros are used to define paths when constructing a policy.

There are occasions where it is desirable to define paths logically when constructing a policy, knowing that only the source machines that will receive the policy can actually determine where those paths should really be on the local system. For example, all the fixed drives or the Exchange directory, as these can differ from machine to machine.

Ops Center Protector facilitates this requirement by allowing the use of macros when defining paths. These macros are placed in a path name using the syntax `$(MACRO_NAME)`, and are resolved during initial data flow activation and on-going rules updates on each source machine. They are resolved by looking up the macro name in a `macros.cfg` file stored on each source machine in `C:\Program Files\Hitachi\Protector\db\config\`.

Entries within `macros.cfg` are given in the form:

```
keyword=path
```

For example:

```
files=c:\files
```

To use this macro, `$(files)` would be entered in either the Include or Exclude list for a *Path* classification. Note that macros can be combined with normal text, so that `$(files)\subdirectory` would be a valid entry. If the macro is defined with a trailing slash, ensure it is not combined with another slash when combining it with plain text.



Caution: Macro substitution is case sensitive. Ensure the case of macros in each `macros.cfg` file matches the case of macros when used to define a policy.

Multiple paths can be assigned to a single macro by delimiting each path with a semi-colon (;), as so:

```
keyword=path_1;path_2;path_3
```

About application quiescing

Ordinarily, when a backup is performed, the state of the backup consists of the exact state of the file system at the point in time at which it was triggered. This can be problematic when the backup is eventually restored, since some applications that were running at the time cannot, for example, have flushed all their in-memory file buffers, and their data files on disk could therefore be in an inconsistent state.

To resolve this, it is possible to request certain applications to quiesce into a safe state prior to a backup being triggered, and then to restore their previous active state after the backup is triggered. This ensures their state during the backup is consistent and that they can run as expected if the backup is restored. The quiesce option applies to classifications containing:

- File system data - where those policies are implemented on Windows source nodes.
- Applications - where the application type is supported by Protector.
- VMware VMs - where those virtual machines are running Windows, are online and running VMware tools.

If an application cannot be quiesced then a snapshot of its files is said to be in a crash-consistent state, as if the application had crashed while running. Crash consistent backups can, depending on the application, be used to restore state to some point prior to the backup.

Ops Center Protector includes built-in classifications that enable specific application types to quiesce into a consistent state prior to a Ops Center Protector Backup being triggered. This is done by selecting the Quiesce configured applications before backup check box in the backup operation's attributes. When a backup is triggered in a data flow that makes use of this policy, the resulting backup will contain a quiesced version of the application's files.

If other applications, not directly supported by Protector, need to put themselves into a certain state prior to a backup operation, pre and post scripts can be run during the backup cycle. This is done by selecting the Pre script and Post script check boxes in the backup operation's attributes, and then supplying the names of appropriate script files. This script file must be present on the source node that implements the policy and must be placed in the Protector scripts directory (C:\Program Files\Hitachi\Protector\scripts is the Windows default).

About synchronization groups

The purpose of synchronization groups is to ensure that, if required, multiple hardware snapshots or batch hardware replications of source data can be created on multiple nodes using the same schedule and yet remain consistent with each other and with the source data.

To this end any two operations in the same policy using the same schedule name will be placed in the same synchronization group. When a hardware snapshot/replication data flow is created, any nodes implementing operations using that synchronization group will be scheduled all as one.



Note:

The RPO of all hardware snapshot operations in the same synchronization group must be identical. The rules compiler checks the RPO settings and if inconsistent generates error 10356: `Policy policy contains multiple hardware snapshot operations with different RPO settings but all use schedule schedule`

In a simple case of a cascaded batch data flow (i.e. Node A --> Node B --> Node C), where Nodes B and C both implement a hardware replication operation within the policy, then if both those operations share the same schedule name, they will both be part of the same synchronization group and be scheduled as one. This ensures that the replica of Node B that is created on Node C is created only when the replica of Node A created on Node B has been completed and so the replicas on Nodes B and C remain identical.

When mixing live and batch data flows or implementing different synchronization groups (schedules) at different points of the data flow, then the basic rule for these is that any operation is traced back towards the source, and if an operation sharing the same synchronization group is implemented on an immediately preceding node, then they will be scheduled together by the first preceding node that does not use that synchronization group. Note that live replications are considered to be in all synchronization groups since they should always match the source.

Where synchronization groups are not in use, replicate operations are scheduled on the sending node and snapshot operations are scheduled on the destination node.

About the automated Mount operation

The automated *Mount* policy operation provides a mechanism for mounting a Hitachi Block based snapshot or replication to a host machine so that the mounted volume can be used for *repurposing* or *proxy backup* to another medium (e.g. a Protector repository). The mount operation can be scheduled to occur at the desired phase relative to other operations in the policy. The computing load of repurposing or backup processing is offloaded to the host where the volume is mounted. The sequencing of the mount operation is dependent on the type of mount selected when the policy is assigned on the data flow:

- Repurpose - the volume remains mounted but is periodically unmounted, re-evaluated, then remounted. See [About the repurposing mount sequence \(on page 102\)](#).
- Proxy Backup - the volume remains unmounted but is periodically mounted, the backup process run, then the volume is unmounted. See [About the proxy backup mount sequence \(on page 103\)](#).

About the repurposing mount sequence



Note: Repurposing is not valid for continuous replications.

In this scenario the replication destination remains mounted on the mount host and is available to the repurposing application. The replication is, depending on the schedule, periodically unmounted, re-evaluated then remounted. The actual sequence is as follows:

1. The Before Unmount script (specified in the [Mount Operation Wizard \(on page 642\)](#)) is invoked on the mount host. The script would typically stop any applications from accessing the repurposed volumes while they are being re-evaluated.
2. The replicated volumes are unmounted from mount host.
3. The replication is resumed, re-evaluated and then paused again.
4. The updated volumes are remounted to the mount host.
5. The After Mount script is invoked on the mount host. The script would typically restart any applications accessing the repurposed volumes.

When repurposed volumes are subsequently unmounted by the user, the replication operation is automatically resumed.

About the proxy backup mount sequence

Proxy backup is valid for live and batch backup. In this scenario the replication destination is mounted, work performed on it and then unmounted. The actual sequence is as follows:

1. The replication is re-evaluated.
2. If the replication is live then it is paused.
3. The updated replicated volumes are mounted on the mount host.
4. The After Mount script (specified in the [Mount Operation Wizard \(on page 642\)](#)) is invoked on the mount host. This script would typically cause the proxy backup to run, calling out to a third party backup product or invoke a Protector backup using a trigger schedule.
5. The Before Unmount script is invoked on the mount host. This script may be omitted.
6. The replicated volumes are unmounted from mount host.
7. If the replication is live then it is resumed.

Schedule Concepts

This section describes Ops Center Protector's schedule management features.

For further information, refer to:

- [Schedule Tasks \(on page 272\)](#)
- [Schedules UI Reference \(on page 748\)](#)

About Schedules

A *Schedule* defines when an operation should start or a period within which an operation is allowed or prevented from occurring.

The [Schedule Wizard \(on page 749\)](#) can be accessed from the [Schedules Inventory \(on page 748\)](#) or by clicking Manage Schedules in the [Policy Wizard \(on page 595\)](#) when configuring a Backup, Snapshot, Replicate or automated Mount operation.

Central to the operation of the Schedule Manager is the Recovery Point Objective (RPO). This setting defines how regularly a backup should be triggered. An RPO of 12 hours tells the Schedule Manager to schedule a backup at that interval, whilst also obeying any other user-defined constraints imposed on the schedule. For example, a backup can be allowed to occur only between 12am and 6am, and this restriction must be adhered to even if the RPO requires backups to occur every hour. See the [Policy Wizard \(on page 595\)](#) for details about RPOs.

Backup events are triggered by one of the following:

- A policy indicating that the RPO is reached.
- A schedule indicating that a Trigger Time is reached.
- A user manually injecting a backup event by clicking the Trigger operation button on the UI.
- A user (or script) manually injecting a backup event via the CLI.

Permitted backup times depend on the constraints used to build the schedule:

- RPO Backup Window – An RPO backup event can only occur during a backup window. By default, an implicit backup window is used that operates all day, every day. If a custom backup window element is created, then the default backup window is ignored.
- RPO Exclude Window – An RPO or scheduled backup event can never occur during an exclusion period.

Trigger Time, RPO Backup Window and RPO Exclude Window can be used in any combination within a single schedule, such that a backup will occur if one of the following is true:

- The backup has reached its RPO
- AND an RPO Backup Window is active
- AND an RPO Exclude Window is not active

OR:

- A Trigger Time schedule event occurs
- AND an RPO Exclude Window is not active

OR:

- A backup event is injected manually via the UI or CLI



Note: It is advised that scheduling features are used carefully. If you define too complex a mix of triggers, backup windows and exclude windows then it may be difficult to predict when backups will occur and thus achieve the desired RPO.

While backups occur either when a policy's Recovery Point Objective dictates, a scheduled Trigger Time or a manually injected backup event, the precise time at which they occur is subject to a number of factors:

- At the most basic level, the time at which the rules are activated determines when the initial and successive RPO based backups occur, unless affected by other factors.



Caution: For host based and hardware storage based backups, the first backup occurs automatically after the rules distribution is completed, irrespective of RPO.

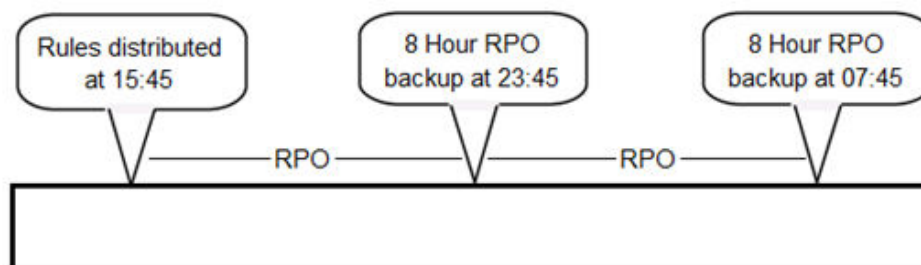


Figure 36 Data flow activation time (15:45) determines RPO backup times

- The RPO and/or Trigger Time defined in the policy determines when the next RPO backup will occur, relative to the previous RPO or Trigger Time backup.



Note: A backup event injected manually via the UI or CLI does not affect the timing of RPO based backups.

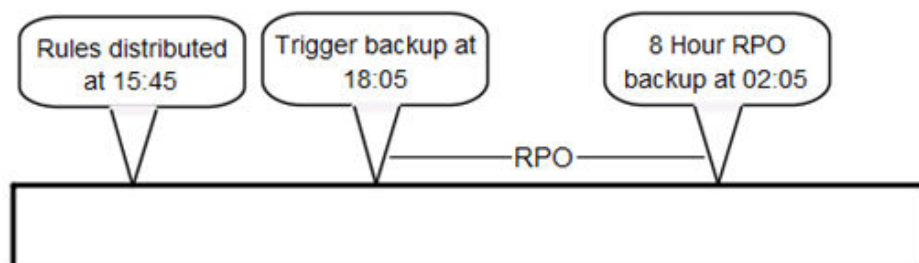


Figure 37 RPO backups occur relative to the time of the previous RPO or Trigger Time backup (18:05 + 8)

- If a backup is scheduled to occur Weekly or Monthly then:
 - If the Time is set to All Day then the backup will recur at the time of day that the rules were activated.

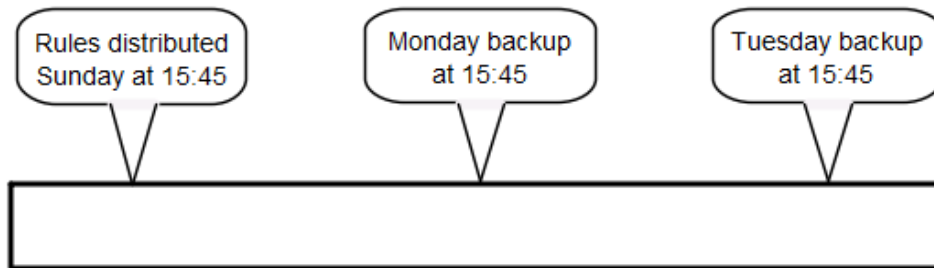


Figure 38 Data flow activation time (15:45) determines 'All Day' backup times

- If the Time is set to Scheduled Time then the backup will recur at the Start time or, if this can't be achieved, at the earliest opportunity within the Duration specified after the Start time.

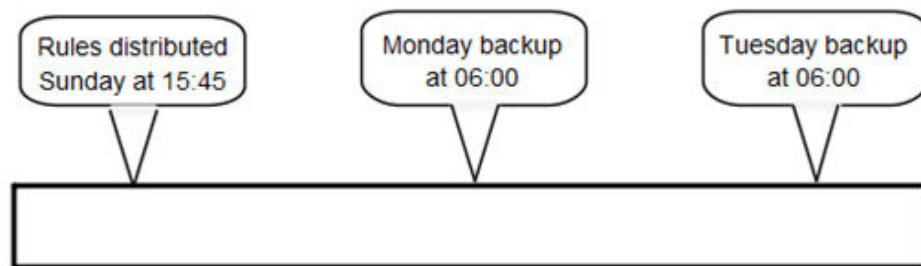


Figure 39 Start time (06:00) determines 'Trigger Time' backup times

- If a backup event is injected manually via the UI or CLI then a backup will occur at the time the event is received, but will not affect the timing of existing RPO backups.

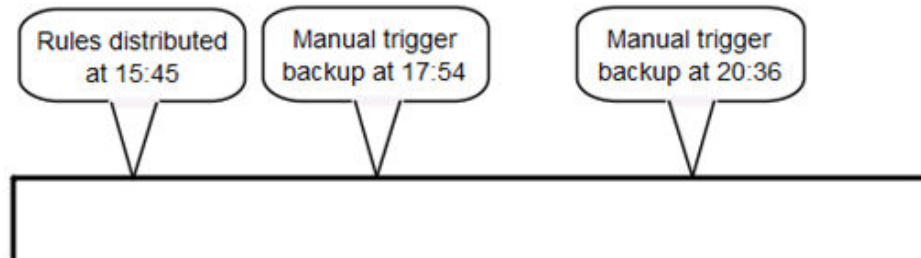


Figure 40 Manual injected backup events occur at the time the event is received (17:54, ...)

- The existence of an RPO Backup Window will prevent RPO based backups from occurring outside the defined window. Any RPO based backups that are scheduled outside of the backup window will be deferred until immediately after the next backup window opens (the operation is greyed on the diagram to indicate deferral). Successive RPO based backups will be rescheduled to occur relative to the deferred backup time.



Note: Backup events injected manually via the UI or CLI are not affected in any way by backup windows.

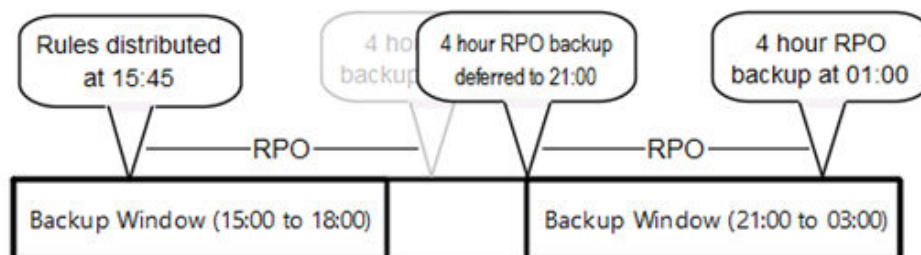


Figure 41 RPO based backups are deferred and rescheduled (21:00, ...) if outside a backup window

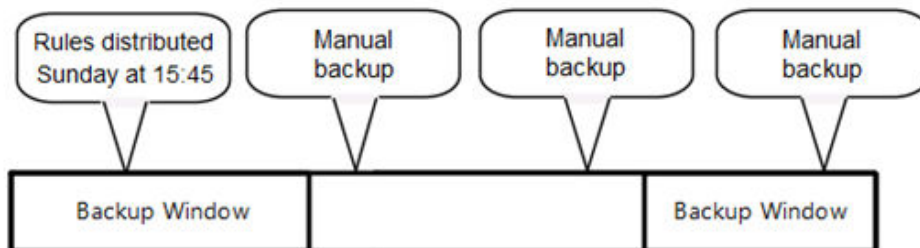


Figure 42 Manually injected backup events are not affected by backup windows

- The existence of an RPO Exclude Window period will prevent both Trigger Time and RPO based backups from occurring within the exclusion period. Any Trigger Time or RPO based backups that occur inside the exclusion period will be deferred until immediately after the exclusion period ends (the operation is greyed on the diagram to indicate deferral). Successive RPO based backups will be rescheduled to occur relative to the deferred backup. Trigger Time based backups proceed at their normally scheduled times outside of an RPO Exclude Window.



Note: Backup events injected manually via the UI or CLI are not affected in any way by exclusion windows.

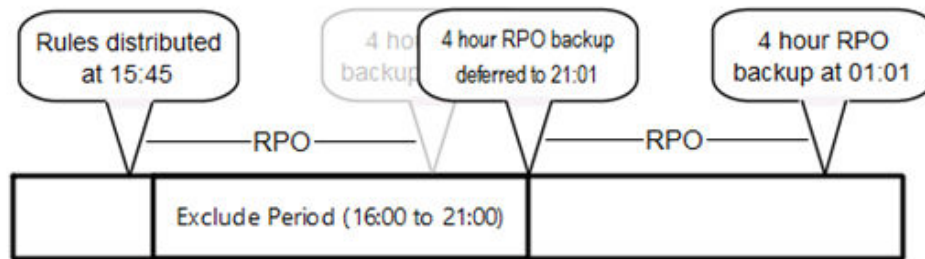


Figure 43 RPO backups are rescheduled (21:01, ...) if they occur inside an exclude period

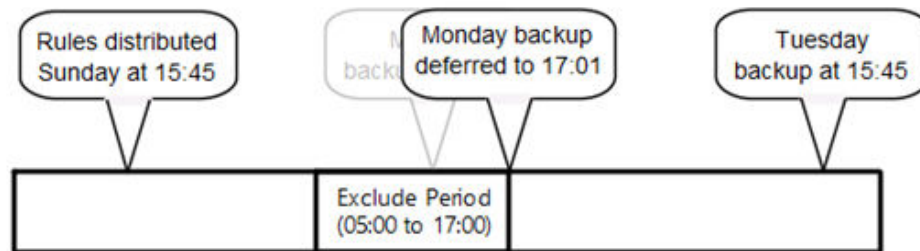


Figure 44 A Trigger Time backup is deferred (17:01) if it occurs inside an exclude period

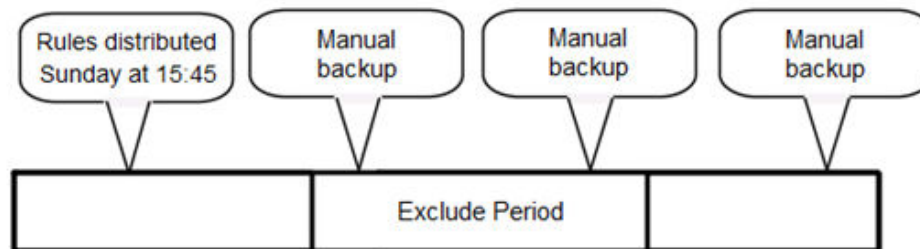


Figure 45 Manually injected backup events are not affected by exclusion periods

Monitor Concepts

This section describes Ops Center Protector's monitoring features.

For further information, refer to:

- [Monitor Tasks \(on page 256\)](#)
- [Monitor UI Reference \(on page 459\)](#)

About monitoring

Ops Center Protector provides real-time displays for all active data flows. The same data flow diagrams created when configuring data protection policies are used to show the status of participating nodes in real-time. The data flow diagrams are annotated with status icons on nodes and connectors, augmented with status information and various actions can be performed that are relevant to the selected node or connector.

When a node on the data flow is selected:

- The Jobs and Logs relating to that node are displayed alongside the data flow.
- Policy operations relating to that node can be triggered.
- If a status warning icon is displayed adjacent to the node then a description of the node status is provided.
- Depending on the node type selected, additional performance and status information pertaining to that node is displayed.
- If the node uses network bandwidth or on-board cache, then the current utilization is displayed.

Log Concepts

This section describes Ops Center Protector's logging features.

For further information, refer to:

- [Log Tasks \(on page 255\)](#)
- [Logs UI Reference \(on page 448\)](#)

About logs

Ops Center Protector maintains a list of log messages generated by the various subsystems running on Protector nodes. All log messages are sent to and stored on the Master node, where they are made available via the user interface.

Each log entry includes the following information in addition to a short textual description of the event:

- A unique ID assigned to every log entry, useful when discussing logs with colleagues and support engineers.
- Audit Flag indicating a change to the system status. These cannot be modified or deleted, for compliance purposes. The identity of the user initiating the action is recorded.
- Date and time recording when the log was generated on the originating node and received by the master node.
- Level identifying the importance of the log entry.
- Attachment enabling additional context information to be attached to the log entry.
- An ID identifying the position within the Protector code where the message was generated. The ID can be used to reference an engineering support database that provides additional description and identifies possible causes and solutions.

Numerous filters can be applied to the displayed logs to enable the user to locate relevant entries.

Log entries that relate to a particular activity, such as a repository resynchronization, are marked with a session marker. This session marker can be used to filter the logs so that only the log entries relating to that activity are displayed.

Log entries can be acknowledged by the user and marked with a comment so that it is clear that the event has been noticed and addressed.

The entire log data-base can be exported in various file formats so that it can be analyzed offline or presented in a report.

If a specific event or set of events occurs in the logs then notifications can be generated via email, SNMP or the OS System Event Log.

Notification Concepts

This section describes Ops Center Protector's notification features.

For further information, refer to:

- [Notification Tasks \(on page 260\)](#)
- [Notifications UI Reference \(on page 583\)](#)

About notifications

Ops Center Protector supports Windows System Event Logging, email, SNMP and custom alerting mechanisms.

Whenever a log message is received from a Protector node by the logging process on the Master node, it is checked against a user defined, priority ordered list of notification conditions. Each condition in this list can issue an alert depending on whether the log message meets certain criteria and, if necessary, stop any further notifications lower down the list being triggered.

If your site needs to receive alert notifications based on some other mechanism, then you can create a custom configuration file with instructions for which script/program Ops Center Protector should run, and the arguments to pass to it.

Job Concepts

This section describes Ops Center Protector's job management features.

For further information, refer to:

- [Job Tasks \(on page 254\)](#)
- [Jobs UI Reference \(on page 441\)](#)

About jobs

Ops Center Protector monitors jobs that are being performed in the system and provides progress and status information. Jobs are tasks being processed by the system. They are either system initiated tasks (e.g. a scheduled Backup or Report creation) or user initiated tasks (e.g. a Restore or a Repository Analysis). Jobs are executed by various subsystems on various Protector nodes and are tracked by the master node so that it can provide progress and status information to users.

Jobs are split into three types:

- Backup
- Restore
- Other

A job typically goes through a lifecycle of:

- Queued
- In Progress
- Completed (Succeeded or Failed)

Some jobs may also be placed in the following states:

- Paused
- Cancelled

The Jobs user interface presents the user with a list of currently active jobs and jobs that have recently completed. It enables some jobs to be paused or cancelled. The job report keeps a record of all completed jobs.

Restore Concepts

This section describes Ops Center Protector's restore management features.

For further information, refer to:

- [Restore Tasks \(on page 271\)](#)
- [Restore UI Reference \(on page 686\)](#)

About restoring data

The restore dashboard provides access to all the available backups created or managed by Ops Center Protector.

Depending on the type of backup created, the following actions can be performed:

- Repository, HCP and Amazon S3 backups - can be restored to their original or new location.
- Hitachi Block snapshots and ShadowImage replications can be reverted or mounted to a new location.
- Hitachi Block replications can be paused, resumed or have their direction swapped¹.

(1). Swapping applies only to continuous TrueCopy, Universal Replicator and Global-Active Device.

About Hitachi block based replication swapping (takeover/takeback)

Protector allows the user to swap the direction of TrueCopy, Universal Replicator and Global-Active Device replications. When a replication is swapped, the S-VOL takes-over the role of the primary volume and the P-VOL takes over the role of the secondary volume. A swapped replication can, of course, be swapped back to its normal state with the P-VOL as the primary and S-VOL as the secondary. The swap operation can also be used to restore consistency between Protector and storage where the direction of a replication in Protector does not match the current actual direction of the replication on storage.

A swap operation is typically performed either because maintenance is required, an application failure has occurred, a storage device has failed or disaster has befallen the primary site. Fail-over to the secondary site is therefore necessary.

For active-passive replications (TC and UR):

- If both P-VOL and S-VOL are operable and the link between the two sites is available then the replication will be reversed. This is called a swap takeover.
- If the replication cannot be re-established once in the swapped state (S-VOL to P-VOL), then the pair is placed in the *suspend for swapping (SSWS)* state until the problem is resolved. Once the problem is resolved, the swap must be completed by retrying the operation. This is called an S-VOL takeover.
- If a swap fully succeeds, the volume that is now the P-VOL will accept writes, and the volume that is now the S-VOL will not.

For active-active replications (GAD):

- A swap operation may be performed to move array processing load from the primary to the secondary device. If both P-VOL and S-VOL are operable and the link between the two sites is available, the secondary array will assume the higher processing load.
- If the replication pair has entered an *error* or *suspended* state, then once the problem is resolved, the site with the most recent data must be used to re-establish the replication. Because the replication is active-active and cross-path set-ups are possible, depending on the nature of the fault, the P-VOL or S-VOL could contain the most recent data:
 - If the P-VOL contains the most recent data, no swap is required:
 1. If necessary, unsuspend and unpaused the replication.
 2. Resynchronize the replication (via manual trigger or data flow reactivation).
 - If the S-VOL contains the most recent data:
 1. Swap the replication to copy the data from the S-VOL to the P-VOL.
 2. Swap the replication again to restore the original direction. This is optional, but highly recommended.
- The swap operation will result in the both P-VOL and the S-VOL remaining writable.

The following limitations apply when performing a swap operation:

- The replication must be implemented using an active live mover; paused or batch replications cannot be swapped.
- The replication must be implemented using TrueCopy, Universal Replicator or Global-Active Device.
- Snapshot (TI) and local replication (SI and RTI) operations can be assigned to the P-VOL or S-VOL, however remote replication (TC, UR, GAD and Failover) operations cannot.
- The state of the takeover is shown on the Monitor page and via the Storage page.
- The destination proxy node (ISM) must be available and active since it holds the required metadata for the replication.
- Volumes cannot be added or removed while the replication is reversed or in the SSWS state.
- When a GAD replication is swapped, the original P-VOL is marked as reserved. If the replication is torn-down whilst in the swapped state, the reserved flag on the original P-VOL will prevent it being reused. By design Protector never modifies P-VOL properties, so the reserved flag must be manually reset. It is only safe to do this if the replication is no longer under Protector's control; as is the case when tear-down is complete.
- Takeover is not integrated with any application swap automation (high availability fail-over or cluster management) software. Therefore additional steps may be required at the OS and/or application level to complete the process.
- It is important that Protector's view of the replication direction matches that of the storage. Replications should not be swapped outside of Protector. If this has happened, it is important that the replication direction is corrected to match Protector's direction before any non-swap operations are performed within Protector. This can be done using the swap operation to either alter the replication direction on the storage to match Protector or vice versa depending on the direction chosen in the wizard.

About restoring legacy application data

During the life cycle of Ops Center Protector, we add new functionality in each release. However, overtime some functionality had to be deprecated and removed from the product. To ensure your backups are usable, Ops Center Protector aims to enable restores of previously created backups even if the capability to create new backups of the same type is no longer available.

The following section details how to Restore data for backups created with legacy features

Restoring legacy Microsoft Exchange Server backups

Host-based

Microsoft Exchange Server backups can be restored as files to a user-specified location. You can then use Exchange Server's management tools and/or PowerShell commands to use them.

Block-based

Block-based backups can be mounted to a Windows client which enables access to the files. You can then use Exchange Server's management tools and/or PowerShell commands to use them.

It is not possible to revert block-based Exchange Server backups.

Restoring legacy Microsoft SQL Server backups

Host-based

Microsoft SQL Server backups can be restored as files to a user-specified location. The backups can be attached to an existing SQL Server instance using the SQL Server's management tools.

It is not possible to apply transaction logs to the restored databases.

Block-based

Microsoft SQL Server backups can be mounted to a Windows client, which provides access to the files. The backups can be attached to an existing SQL Server instance using the SQL Server's management tools.

It is not possible to apply transaction logs to the restored databases. It is also not possible to revert block-based SQL Server backups.

Restoring legacy SAP HANA backups

Host-based

Not applicable.

Block-based

SAP HANA backups can be mounted to a Linux client which makes the files available at a user-specified path. In addition, the configuration files which are part of the backup are restored to the following location:

```
$INSTALL_DIR/saphana_backup/<SID>/<backup_id>  
where:  
$INSTALL_DIR is the Protector installation dir,  
<SID> is the SAP HANA SID,  
<backup_id> is the snapshot ID
```

Restoring legacy CDP and Live backups**Host-based**

There are no changes to the restore behavior, CDP and Live backups can be restored normally.

Block-based

Not applicable.

Storage Concepts

This section describes Ops Center Protector's storage management features.

For further information, refer to:

- [Storage Tasks \(on page 273\)](#)
- [Storage UI Reference \(on page 756\)](#)

About storage

The storage inventory provides access to all the available data storage types managed by Ops Center Protector as follows:

- Generation 1 and Generations 2 Repository - batch backups of applications, VMs and filesystems.
- Hitachi Content Platform - batch backup of applications, VM's and filesystems.
- Amazon S3 - batch backup of applications, VM's and filesystems.
- Hitachi Block and Logical Block - snapshots and replications of applications, VMs, filesystems and LDEVs.

For each device type, selecting an entry in the inventory will display the details screen where the following are displayed:

- Logs relating to the device
- Jobs relating to the device
- Device configuration
- Storage and Store Details

Depending on the type of storage selected, the following actions can be performed:

- Repositories:
 - Mount/Unmount
- Hitachi Block:
 - View all host groups, journals, logical devices
 - View pool usage
 - Mount, unmount, revert, adjust expiry, transfer ownership or delete snapshots
 - Mount, unmount, pause, resume, swap, dissociate or delete replications

About Repositories

About Gen 2 Repository

The Protector Repository Gen 2 is a performance and capacity optimised object store. It conforms to the Unified Backup Infrastructure storage specification. Refer to the [Unified Backup Infrastructure concept \(on page 38\)](#) for more details.

The Repository differs from other native object storage in that it supports snapshots natively utilising re-direction on write. This allows for highly efficient management of shared data blocks and space reclamation is both fast and automatic.

There are no practical limits to the size of objects or number of objects in a repository.

To achieved optimal data reduction, it retains both object level and block level check sums.

For performance optimization, the Gen 2 Repository can be setup to be split across different storage. See [Repository Storage Node Wizard \(on page 556\)](#) for more details.

- Data directory – this is the where the bulk of the data is stored. Mass storage devices with performance characteristics of fast write streaming storage is ideal.
- Metadata Directory and Checksum Directory holds the metadata and the repository structure information. These benefits from fast random access such as SDD and NVMe storage. Typically these should be around 5% of the Data Directory capacity.

Hardware and OS recommendations

This section describes the ideal additional specification information for a repository machine. For more information see the product support matrices at <https://www.hitachivantara.com/en-us/products/data-protection/ops-center-protector.html#tech-specifications>.

Hardware:

As usual in most scenarios more is better but a point of diminishing returns will be reached. The most beneficial upgrade is extending the available memory. The repository storage group processes themselves never use a large amount of memory, but increasing memory beyond 16GB will ensure there is plenty of head room.

More important when specifying CPU, is the generation of CPU technology. Because moving mass data is at the core of what the repository does, faster memory will have a greater impact than for a normal application so the faster memory the better.

File System:

In addition to optimising the disk layout, it is also important to use the correct block size for NTFS. NTFS volumes should be formatted using 16k block size with a repository storage group default setting. It should under no circumstances be larger than the repository `DataBlockShift` setting which is 16k by default. If the NTFS block size is larger, then it will force the filesystem to read the block before it performs a write.

E.g. with a 64k NTFS block size, if Ops Center Protector needs to update a single repository block of 16k, it will write out the 16k block to the file system. However the file system will need to read the 64k NTFS block, change the relevant 16k section and then write back the full 64k block. This badly degrades performance, but it may not be noticeable when the repository is initially populated since these full backups would likely be large 2MB writes across several blocks. The degradation in performance would only be noticed over time when smaller, incremental updates start occurring.

Shutdown Time:

Windows only allows a few seconds for all services to shutdown before forcibly terminating them. An Ops Center Protector repository storage group can take a significant amount of time to close especially if it is busy synchronizing many machines at the point of a system shutdown.

The time Windows allows for process shutdown can be changed via the Windows registry. The registry entry to change this is:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control
\WaitToKillServiceTimeout
```

The value is in milliseconds; by default it is either 12000 or 20000 depending on OS version. It is important for the repository to shutdown correctly so we highly recommend changing this value to 5 minutes (300000 milliseconds).



Note: Incorrect editing of the Windows registry can cause system-wide problems that may require you to re-install Windows to correct them.

The knock on effect is that your server may take longer to shutdown, this setting applies to all services, so if a service is badly behaved and does not shutdown when asked, then the machine will take the full 5 minutes (plus OS cleanup time) to shutdown.

About Cloud Nodes (Amazon S3, HCP and HCP Cloud Scale)

Cloud storage nodes, Amazon S3, HCP and HCP Cloud Scale are used to transfer application data to cloud storage. All use the S3 protocol for communication.

Cloud storage nodes represent the storage in Amazon S3 cloud or on the HCP. When creating the node, you will define the necessary credentials to access the S3 service. These include:

- Access Key ID
- Secret Access Key
- Bucket Name
- Region (Amazon S3 only)

Additionally, you will define a Proxy node that will be the intermediary between the application and the S3 service. The proxy node can be any Windows or Linux OS nodes.

The role of the proxy node is to:

- Provide a secure system that can access the S3 service. Although the proxy node can be the same OS host as an application, it is recommended for security reason that this is an independent system to that of the application. The benefit of this is that this system can be given limited access ensuring that the application servers do not have access to the S3 credentials. This S3 node can then be used by multiple applications without the danger of compromising security or data leakage. It also means that the application servers do not need direct access to the internet.
- Provide a cache of the recovery points stored on the S3 server. This cache is only a copy of the index information and metadata, it is not the data itself and can be rebuilt from the S3 content. Having the cache however improves responsiveness of the system and decreases some of the S3 access, thereby saving cost.
- Provide an UBI compliant application interface. This allows you to use S3 storage with any of the next generation applications in the same fashion that you can use Generation 2 Repository. For a list of UBI compliant applications see XYZ. As UBI compliant storage, the S3 node can also receive data from or send data to other UBI compliant storage, such Generation 2 Repository or Generation 2 Hitachi Content Platform. This means it can be used to form a layered data retention solution.

Cloud storage node key features include:

Search friendly native format

A key feature of S3 support is to keep data stored on S3 in a native format as much as practicable. Any files less than 4GB in size, has its data stored in a single object. This means that 3rd party search, indexing and analytics tools can process the data in S3 directly. By default, files bigger than 4GB are split into 4GB segments that can easily be stitched together if required.

Delta block differencing

To reduce bandwidth and improve transfer speeds, by leveraging S3 partial transfers only the block changes within a file are sent to S3.

Virtual snapshots

A system whereby data is retained and indexed in S3 in such a way that recovery points use objects that are whole and not need rehydration but will share data that is common between other recovery points, saving storage space and providing optimal recovery speed.

Multi-factor parallelism

To further optimise data transfer speed in addition to delta block differencing, multiple objects are sent to S3 at the same time and multiple data blocks within those objects are sent separately to S3 in parallel.

Self-consistent store

Although some metadata is cached on the proxy, the data stored in S3 is self-consistent. Should a site experience complete data loss, a new instance of Protector can be spun and an S3 node can be configured to import the data.

Report Concepts

This section describes Ops Center Protector's reporting features.

For further information, refer to:

- [Report Tasks \(on page 270\)](#)
- [Reports UI Reference \(on page 660\)](#)

About reports

Ops Center Protector is able to generate a number of reports viewable both within the UI and exportable in various formats: The reports are split in to 3 different groups:

- **Jobs:**

- Jobs Report - An ongoing report listing all completed and/or failed backup, restore and other jobs.
- RPO Report - Generated when accessing the report page and also generated on a daily basis, lists operations that met and/or failed to meet their specified RPO.

- **Block Storage:**

- HORCM Count Report - An ongoing report listing the actual temporary and current HORCM instances for each Block Storage Device.
- Pool Usage Report - An ongoing report listing used and available pool capacities and thresholds for each Block Storage Device.
- Journal Usage Report - An ongoing report listing used and available journal capacities for each replication policy on each Block Storage Device.
- Network Transfer Report - An ongoing report listing last, in-flight and last-received Q markers and transfer times for each replication policy on each Block Storage Device.
- All Pairs - This report provides a list of all the replication pairs. There is no grouping. If multiple LDEVs are part of replication setup in Protector or they were together in a HRCM file, each individual LDEV will be shown as a replication. See [About Global Replication reports \(on page 121\)](#) for more information.
- Pairs by Storage Record - This report shows replication grouped by Protector record groups. This would be the replications shown inside a Protector dataflows. See [About Global Replication reports \(on page 121\)](#) for more information.
- Pairs by Consistency Group - This report shows replications grouped by Array Consistency Group. See [About Global Replication reports \(on page 121\)](#) for more information.
- Pairs by Copy Group - This report shows replications grouped by Array Copy Groups. See [About Global Replication reports \(on page 121\)](#) for more information.
- Pairs by Snapshot Group - This report shows snapshots grouped by Snapshot Groups. See [About Global Replication reports \(on page 121\)](#) for more information.

- **Host Based Storage:**

- Repository Usage Report - An ongoing report listing used size and total size, deduplication queue and tier queue lengths for each repository.
- HCP Usage Report - An ongoing report listing used size, capacity and object count for each HCP node.
- HCP Cloud Scale Report - An ongoing report listing used size, capacity and object count for each HCP Cloud Scale node.
- Amazon S3 Usage Report - An ongoing report listing used size for each Amazon S3 node.

- Backup Report - An ongoing report listing many parameters relating to repository, HCP and Amazon S3 backups. Each backup's session logs can be viewed from the summary report.

About Global Replication reports

The Global Replication Reports provide a method of giving a complete list of all replications on the arrays including replications that are not managed by Protector. This feature works by interfacing to Ops Center CM-REST which provides an inventory of replications on individual arrays. Protector caches the result from CM-REST and aggregates the results.

Key features

- Report on all replications on arrays
- Includes both replications that are managed by Protector and replications that are not
- Provide a list of individual replications pairs or grouped replication report Group replication reports include
 - Pairs by Storage Record report - List of replications and snapshots that are managed by Protector and have a replication or snapshot record
 - Pairs by Consistency Group report - List of replications and snapshots that have a common consistency group
 - Pairs by Copy Group report - List of replications that have a common copy group
 - Pairs by Snapshot Groups report - List of snapshots that have a common snapshot group
- Reports have predefined filters and an advanced filter.
- Ability to drill down on a replication / snapshot listing and view further details (Detail View).

Pre-requisite and Setup

To provide the reports, Protector queries Ops Center CM-REST. Consequently it is a requirement that CM-REST is configured for every array where the report is required. When setting up the Protector Block Node, there is now an additional section where you can specify the connection and credentials details for the REST interface on CM-REST.

When setting up a Block Node, it is optional to add the CM-REST information. You cannot however have a Block Node configured to use the CM-REST interface only.

Ops Center CM-REST can be configured to manage multiple arrays in the same way that a Protector node might manage multiple array. However it is not a requirement that Protector and CM-REST are configured symmetrically each dividing up the management the same way. It is also possible for CM-REST and Protector be installed on the same machine or on different systems.

Note that if CM-REST and Protector reside on the same array and are configured to use Fibre Channel Command device, they must be configured to use different array accounts. In the configuration where CM-REST and Protector both reside on the same host, if Protector and CM-REST share the same array account credentials there will be unpredictable behaviour and failures will occur.

Architecture

Each host that services a Protector Block Node, eg array, has a database to store the replication information for that array. Protector queries CM-REST every 1 hour by default to get the inventory of all replications for a configured array and stores the result in the database. When the user creates a report, the Protector Master will query each of the nodes that manage the block host to query their databases. The results will then be merged to provide the federated results into a single report. Because replications are frequently across two arrays, it is possible to get the result from both sides of the replications (eg from the P-VOL and from the S-VOL array). In that situation, Protector will choose the result that had the newest refresh. In the extended view of the report, the field "Cache Updated" gives an indication of how recently the database had been updated for that record.

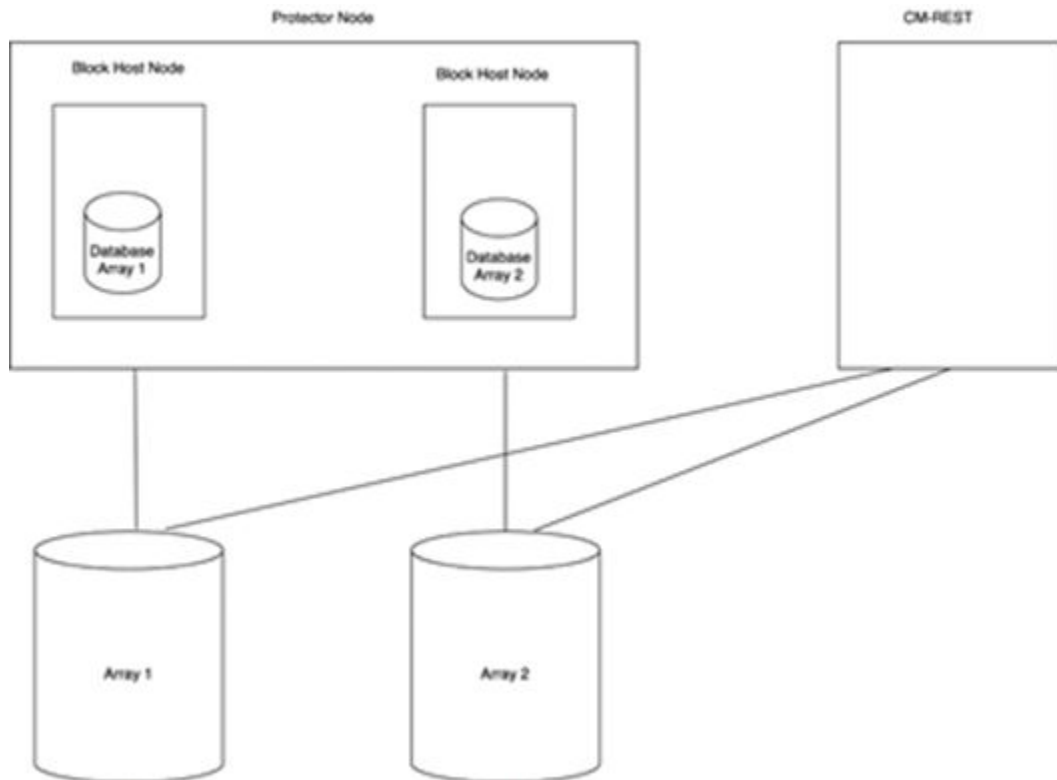


Figure 46 Global Replication Reports - Architecture

Report Choices

There are multiple choices of reports split into how the replications should be grouped. By default the reports will report across all replications on all arrays. Each report has extensive filtering capabilities that allow the reports to be more manageable in size and targeted towards the users needs. Note that the maximum number of return values is capped by default to 1000 rows. When returning to a report in the UI, the last search result will automatically be cached.

All Pairs

This report provides a list of all the replication pairs. There is no grouping. If multiple LDEVs are part of replication setup in Protector or they were together in a HRCM file, each individual LDEV will be shown as a replication.

Pairs by Storage Record

This report shows replication grouped by Protector record groups. This would be the replications shown inside a Protector dataflows.

Pairs by Consistency Group

This report shows replications grouped by Array Consistency Group.

Pairs by Copy Group

This report shows replications grouped by Array Copy Groups.

Pairs by Snapshot Group

This report shows snapshots grouped by Snapshot Groups.

Access Control Concepts

This section describes Ops Center Protector's access control features.

For further information, refer to:

- [Access Control Tasks \(on page 210\)](#)
- [Access Control UI Reference \(on page 301\)](#)

About Role Based Access Control (RBAC)

Role Based Access Control (RBAC) is a framework for defining what a user can see and do within Protector. Users are only allowed to perform activities that are contained within the roles they are assigned. Furthermore they can only perform those activities on the resources to which they have access.

When setting up access control, the following must be defined:

- How a user's credentials will be verified (*Authentication*).
- What rights of access a user will be granted (*Authorisation*).

About Access Permissions

Data flows, policies, schedules and notifications are created in Protector to configure its behaviour. Access to these configuration objects is controlled by granting *Permissions*. Permissions determine if a particular user or group has *Read Only Access* or *Read Write Access* to a configuration object.

Permissions are a secondary access check within Protector.

Taking policies as an example:

The system will first check if a user has the RBAC activity *View Policies*. If they don't then they won't be able to see anything. If they do then for all policies that exist, the system looks at the permission on each one. E.g:

Policy1 - created by Paul@Contoso.com has READ/WRITE access (he can see Policy1)

Policy2 - created by Ian@Contoso.com has READ/WRITE access (Paul cannot see Policy2; Ian can)

Policy3 - created by Ian@Contoso.com has READ/WRITE access, shared with Paul@Contoso.com with READ access. Paul can see Policy3 but he cannot edit it.

Policy4 - created by Ian@Contoso.com has READ/WRITE access, shared with Contoso.com \Managers group with READ access. Paul is not in the managers group so he can't see Policy4. However, Simon@Contoso.com is, so he can see Policy4 but can't change it.

About Ops Center Protector's implementation of RBAC

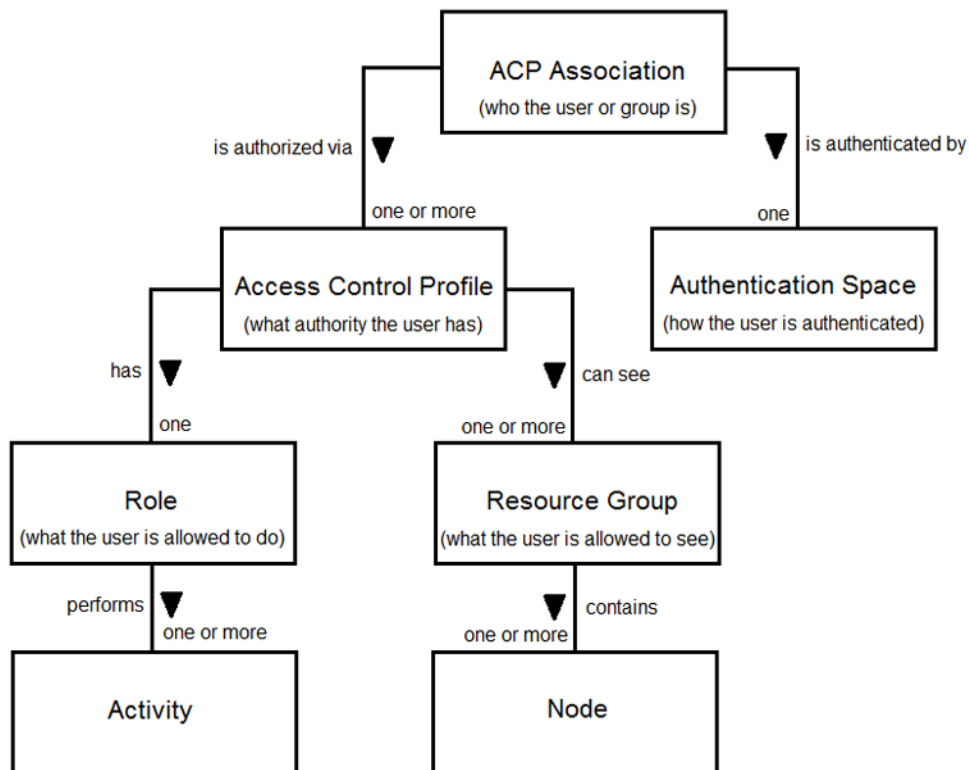


Figure 47 Ops Center Protector's RBAC Object Structure

An *Activity* is an operation (typically of the type: create, read, update or delete) that is performed on a resource, backup or other object within Protector. For example:

- a node may be created and have its properties viewed or modified.
- a data flow may be created, viewed, edited or deleted.
- a snapshot may be created, browsed, restored or retired.

Activities are arranged into *Activity Groups* that represent a cohesive set of activities relating to features such as *Nodes*, *Data Flows* and *Logs*. Activity groups make it easier to organise, locate and assign activities.

Roles contain a set of activities. For example, the role *Backup Administrator* is assigned to a user tasked with managing nodes, creating backup policies and restoring backups, whereas the role *Security Administrator* is assigned to a user responsible for authentication and authorisation of other users.

Resource Groups define a collection of physical and logical computing or storage resources that a user is permitted to access (such as groups of servers, storage devices, repositories etc.). The visibility of any given *Resource* within the Protector system is determined by whether that resource appears in the ACPs assigned to the user at authorization time.

Access Control Profiles combine *Roles* and *Resource Groups* to define the activities that can be carried out on groups or resources.

Authentication Spaces specify which authentication service to use for a specific user or group of users. Authentication services supported include Active Directory, LDAP, RADIUS and Local system logon. Protector enables you to simultaneously configure multiple authentication services. Protector also supports OpenID Connect to enable integration with Hitachi Ops Center's single sign-on functionality.

ACP Associations link individual users and groups of users to one or more *Access Control Profiles* so as to grant them the required level of authority. Authentication is performed when a user or group attempt to log on, by passing a user's credentials to the authentication service specified by the *Authentication Space*.

Backup data sets (such as the volumes and files included in a snapshot or a replicated file system) are created, archived, restored and retired by Protector as the result of executing backup policies. These backup objects store information about the resource from which the backup data originated. The visibility of the backup object (in some storage location such as a repository) is then generally governed by whether the user has access to the node from which the data originated.

To enable RBAC to be configured quickly and easily, Protector is shipped with a number of predefined Activity Groups, Roles, a default Resource Group, Access Control Profiles and an administrator level ACP Association (refer to [How to configure basic role based access control \(on page 210\)](#)). These predefined RBAC objects can, if required, be tailored to suit each customer's specific environment, as described in [How to configure advanced role based access control \(on page 212\)](#).

Selecting an Authentication Service

Protector can be configured to authenticate users and groups against the following:

- Local accounts on a Protector node running any supported OS.
- Accounts in Active Directory via a Protector proxy node running Windows.
- Accounts on an LDAP Server via a Protector proxy node running Linux or AIX.
- Accounts on a RADIUS server via a Protector proxy node running any supported OS.
- Accounts in Hitachi Ops Center via OpenID Connect to support single sign-on.

When a user logs in via the Protector web UI they must provide either their:

- Username – to identify themselves to Protector.
- Authentication Space - to tell Protector which authentication service to use.
- Password – to authenticate themselves.

or, if integrated with Hitachi Ops Center, redirect to the single sign-on page to provide their Ops Center credentials.

Authentication spaces

Protector uses the concept of *Authentication Spaces* when authenticating users. The Authentication Space tells the Protector master node which authentication service is able to validate a specific user's login credentials. Authentication requests are routed, by the master, to the proxy node responsible for communicating with the authentication service in question.

Although it is possible to nominate the master node as the proxy, it is often the case that the master node is either not in the required space or is of the wrong OS type. Consider the following scenario:

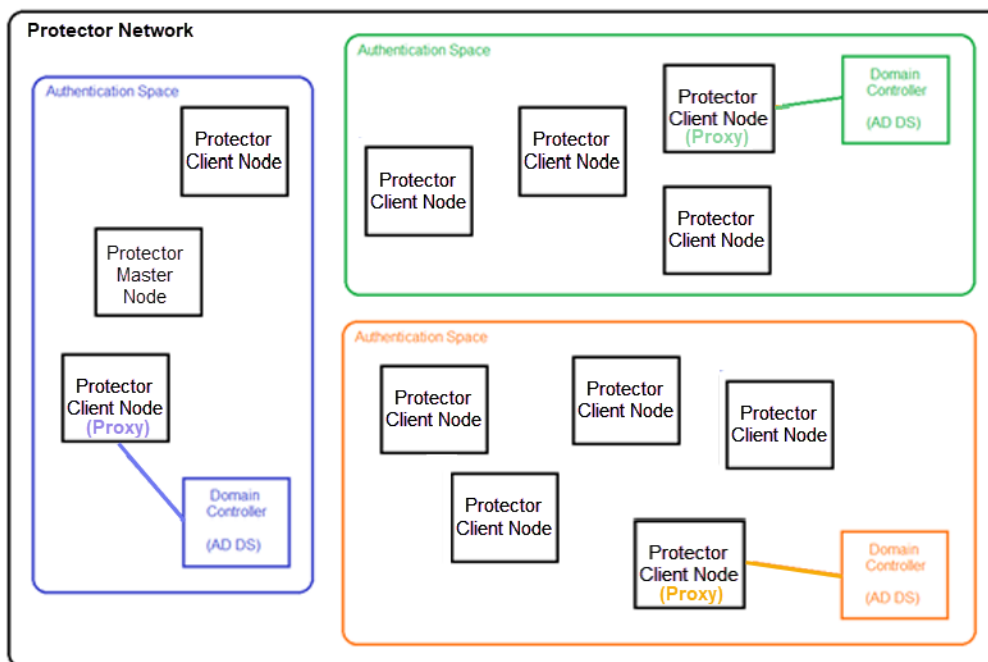


Figure 48 Authentication in a multi-space Protector environment

Here the Protector master node is responsible for nodes in three separate spaces, so a separate proxy is required to communicate with each authentication service. It is possible to have different authentication service types for each space.

Each *Authentication Space* requires configuration within Protector. The name of the authentication space forms part of the user's login. For example:

- An *Active Directory* authentication space could be configured to point to the AD server `ContosoDC.HV.local` and could be named `Contoso`. Users in this AD domain must authenticate with Protector using `<username>@Contoso`. Here `Contoso` is used as an alias for `ContosoDC.HV.local`. If you want to use the full domain name then the authentication space must also be named using the full domain name.
- A *Local Machine Accounts* authentication space is configured to point to the computer `TBell-Win7PC` and could be named `TBW7`. Users with local accounts on the machine `TBell-Win7PC` must authenticate with Protector using `<username>@TBW7`. Here `TBW7` is used as an alias for `TBell-Win7PC`. If you want to use the full computer name then the authentication space must also be named using the full computer name.

About Single Sign-On with Hitachi Ops Center

Protector can be integrated with Hitachi Ops Center and supports Ops Center's OpenID Connect based single-sign-on mechanism.

When Protector is installed with Ops Center, it is registered with Ops Center's OpenID Connect Provider. A corresponding OpenID Connect authentication space is also automatically added to Protector during the registration process.

When registered with Ops Center, Protector displays a button on its login page that enables users to be redirected to Ops Center's authentication page. Once authenticated by Ops Center's authorization server, users are redirected to the Protector UI and granted access as normal.

The OpenID Connect authentication space added to Protector can be used, in the same way as any other type of authentication space, to create the required ACP Associations that grant the required permissions.



Note: Only Group ACP Associations are supported for Ops Center OpenID Connect authentication spaces.

Authorising users and restricting access

Authorisation is granted to a user, group or entire authentication space by associating it with one or more ACPs. Each ACP defines a role that the user is assigned and one or more resource groups:

- The role defines what activities the user is allowed to perform.
- The resource groups define which resources the user is able to interact with.

In practice, an ACP is constructed by considering the following:

- What responsibilities will the users be given?
- What should the users be allowed to do?
- Which nodes should be visible to the users?

Bear in mind that if a resource is not included in a user's resource group then it will not appear in any Protector view for that user, be it node lists, data flow diagrams, monitor views, reports, storage inventories, logs etc. So consider whether users should be prevented from seeing resources or simply restricted in what they can do with those resource

Default access control configuration

Access control is configured to default setting immediately after installing the Protector master for the first time. The Protector administrator must log on via the web UI using the `<username>` credentials specified in the Master installation. This user is granted full access to everything within Protector allowing them to configure access control and any other aspect of Protector. The following access control objects are automatically defined at installation:

- The *Master* authentication space is used to direct authentication to the OS on the master node.
- The `<Username>@Master` ACP association grants the `<username>@master` user the built-in *Default Administrator* ACP.
- The *Default Administrator* ACP is given the role *Protector Admin* which allows all activities to be performed. This ACP also grants access to all nodes and all backups on any storage location.
- The *default* resource group includes all Protector nodes that identify themselves to the master node, be they authorised or unauthorised.



Note: It is recommended that: the top echelon of administrator accounts are created first, allowing lower level administrators to configure their resources and access rights independently.

Planning roles

Roles tend to follow reasonably consistent patterns across organisations, so in a multi-tenant environment for example, it is worth considering how roles can be defined so as to be reusable across each tenant's environment. When roles are defined at a general level they can be reused in ACPs for defining specific privileges. Thus a role such as *Backup Administrator* could be reused by multiple ACPs such as *Accounts Backup Admin*, *Legal Backup Admin* and *Production Backup Admin*. What differs between these ACPs are the accessible resources, not the activities that will be performed on them.

Protector ships with a number of pre-defined roles that can be cloned and modified or used as-is.

Planning resource groups

Resource groups are the mechanism for restricting the visibility of nodes in Protector. When a user is associated with an ACP, they will be restricted to viewing only those nodes listed in the resource groups included in that ACP.



Note: Resource groups control visibility of nodes. What the user is able to do with those nodes is dependent on the activities they are allowed to perform on them.

Resource groups are typically defined based on tenancy, organisational, divisional and departmental hierarchies. These hierarchies are likely to exist already in the IT infrastructure and can thus be reused as a basis for creating resource groups.

Applying access levels

An *Access Level* is attached to each resource group in an ACP. The access level controls which backups (including any logs or reports relating to that backup) are visible, and can be set to one of the following:

- **FULL** – All backups in a given storage location (e.g. a repository) are visible to the user irrespective of where the data originated from.
- **LIMITED** – Backups are visible if they originated from any of the nodes contained in the ACPs assigned to the user.

For **LIMITED** to work the storage node needs to be in the same resource group as the source nodes. For example, if a resource group is created with only a storage node in it and a user has **FULL** access to it, they can see all of the backups on that node. If the user has **LIMITED** access they can see no backups even if they have access to other resource groups.



Note: The access level only controls the visibility. What a user is able to do with visible backups is dependent on the activities they are allowed to perform on them.

A user given **LIMITED** access to a storage destination included in their resource group will only see log messages for that storage destination if they pertain to their backups. A user given **FULL** access level will see all log messages for that destination.

License Concepts

This section describes Ops Center Protector licensing.

For further information, refer to:

- [License Tasks \(on page 254\)](#)
- [Licenses UI Reference \(on page 444\)](#)

About licenses

Before using Ops Center Protector, you must enter one or more license keys using the user interface. You can obtain perpetual license keys by contacting your Hitachi Sales representative and providing the machine ID listed in the Protector License screen.

It is important to understand that the required license capacity is based on protected Front end capacity. This is the total size of the primary data set that can be protected. Primary data that is replicated to two sites only requires a license for the primary data, not the replicas. This applies to all node types.

Along with the required front end capacity license, other features require the following additional licenses:

- **Mover Licenses**

Mover licenses (Backup Mover License and Storage Replication License in the following table) permit the use of IP-based backup to specified targets or storage-based operations to protect a certain capacity of source data. You must install one or both mover licenses depending on the backup copy architecture that implements data protection.

- **Application Licenses**

Application licenses enable application or Hypervisor-aware protection. If you install an application license, you must also install a mover license that corresponds to the data protection operations that you want to use. The mover licenses supported for each application are listed in the following table.

The following table lists the licenses required for specific features:

| Feature | License (version 7.3 and later) |
|--|--|
| Inclusive storage | Licenses included with an array purchase: <ul style="list-style-type: none"> ▪ Frame capacity Storage Replication Mover license ▪ 1 TB Backup Mover license ▪ Unlimited Filesystem license |
| Host-based backups (over IP) Includes the following target nodes: <ul style="list-style-type: none"> ▪ Protector Repository ▪ Hitachi Content Platform ▪ AWS S3 | Backup Mover License Protects the following source node types and application nodes as listed in the Application license section: <ul style="list-style-type: none"> ▪ OS Host nodes ▪ VMWare nodes with the Protector agent installed ▪ VCenter nodes Also applies to Oracle RMAN backups using the Protector SBT channel connector. |
| Hardware storage replication Includes protection using array-based technologies for data provisioned from Hitachi Block storage. | Storage Replication (Mover) License |

| Feature | License (version 7.3 and later) |
|--|---|
| | <p>Protects the following source node types and application nodes as listed in the Application license section:</p> <ul style="list-style-type: none"> ▪ OS Host provisioned from Hitachi block ▪ VMware VM nodes with the Protector agent and physical RDMs ▪ Hitachi Block Host |
| <p>Application-aware protection</p> <p>Includes the following target nodes:</p> <ul style="list-style-type: none"> ▪ Protector Repository ▪ Hitachi Content Platform ▪ AWS S3 ▪ Hitachi Block | <p>Application Licenses</p> <ul style="list-style-type: none"> ▪ VMWare License (Backup or Storage Mover) ▪ Oracle Database License (Storage Mover only) ▪ SQL Server License - v7.3 and later (Storage Mover only) ▪ Hyper-V License (Storage Mover only) ▪ Filesystem (unlimited/no charge) (Backup or Storage Mover) |
| <p>Host based over-the-wire encryption</p> <p>Refers to technologies that prevent data from being read during in transmission.</p> | <p>Available</p> <p>No-cost license available in selected regions based on export rules and restrictions imposed by the country of sale.</p> |
| <p>Host based data-at-rest encryption</p> <p>Refers to technologies that prevent data from being read when residing in a repository.</p> | <p>Available</p> <p>No-cost license available in selected regions based on export rules and restrictions imposed by the country of sale.</p> |

A free, five week *Gen3* trial license is included with Protector, providing 1PB for each front end capacity listed above without encryption and enabled for VSP G/F350, G/F370, G/F700, G/F900 storage arrays.



Note: Overrunning the licensed front end capacity does not stop Protector from protecting your data, however some features might be limited until you license the over-capacity data.

Chapter 3: Data Protection Workflows

This chapter describes typical workflows for backing up and restoring data using Ops Center Protector.

Data Protection Workflows Overview

Each data protection workflow described here is a high level task that references of a series of subtasks.

Subtasks are detailed, lower level descriptions that explain how to do something via the UI or CLI.

Workflows and subtasks both refer out to user interface reference topics that describe the details of a particular web page, wizard or dialog that the user interacts with.

When following a workflow for the first time, it is recommended that you study the related subtasks and reference topics before carrying out the steps. This will ensure that you are aware of any notes, warnings and cautions that may apply.

Once you are familiar with the workflows and subtasks, it may only be necessary to refer to the reference topics, since all the important notes, warnings and cautions are located within the reference topics at the relevant point.



Tip: Refer to [Button Icons \(on page 288\)](#) to find the icons associated with the control names used in the step-by-step guides.

How to protect your data

Before you begin

This generic workflow describes the steps for protecting your data with Ops Center Protector.

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source nodes and/or proxies.
- Any applications being backed up have been installed as per the Protector requirements and prerequisites. Refer to the Protector support matrices at <https://www.hitachivantara.com/en-us/products/data-protection/data-instance-director.html#tech-specifications> and the appropriate Protector Application Guides listed in [Related documents \(on page 16\)](#).
- The Protector Client software and prerequisites have been installed on the destination nodes and/or proxies.
- Any destination storage devices have been set up as per the Protector requirements and prerequisites. Refer to:
 - [Hitachi Block prerequisites \(on page 20\)](#)
 - [Generation 1 Hitachi Content Platform prerequisites \(on page 23\)](#)
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. Refer to [How to configure basic role based access control \(on page 210\)](#) or [How to configure advanced role based access control \(on page 212\)](#).

This task describes the general steps to follow when protecting your data:

Procedure

1. Create the required source nodes and then check that they are authorized and online.
Source nodes represent the places where the data to be protected resides in your system. See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#).



Note: Source Hardware Storage Device nodes will need to be created even if they don't appear on the data flows for snapshot and replication operations.

2. Create the required destination nodes and then check that they are authorized and online.
Destination nodes represent the places where the data is to be backed up to. See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#).
3. Define the data protection policies.
Policies define the data sets to be protected and the methods to be used to protect them. See [How to create a policy \(on page 265\)](#).
4. Draw the backup data flows.
Data flow diagrams show the participating source and destination nodes and the data paths interconnecting them. See [How to create a data flow \(on page 225\)](#).
5. Assign the policies to the participating nodes on the data flows.
Policy assignments define precisely how the data flows from each source node to the respective destination nodes. See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

6. Compile and activate the data flows.

The source and destination nodes work autonomously by implementing rules locally. These rules are generated by the master node and disseminated to the participating nodes. See [How to activate a data flow \(on page 229\)](#).

7. Trigger the policies if required.

Policies are invoked according to a user defined schedule and/or RPO. In some cases it may be necessary or desirable to trigger policies manually. See [How to create a schedule \(on page 272\)](#), [How to trigger an operation from an active data flow \(on page 256\)](#) and [Triggering policies and operations with hdidcmd \(on page 834\)](#).

8. Monitor the data flows, logs etc. to ensure policies are operating as expected.

A number of other tools are provided that enable the correct functioning of data protection policies to be confirmed, including the:

- [Jobs Inventory \(on page 441\)](#) - lists each backup job as it is scheduled.
- [Logs Inventory \(on page 448\)](#) - lists information, warning and error messages.
- [Session Log Details \(on page 456\)](#) - list related log message for each session.
- [Reports Dashboard \(on page 660\)](#) - enables reports to be viewed and exported.
- [Notifications Inventory \(on page 583\)](#) - allows notification of events via email etc. (see [How to create a notification \(on page 260\)](#)).

9. Review the storage nodes to ensure backups are being created.

The various storage devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. These are shown in the [Storage Inventory \(on page 756\)](#).

How to restore your data

Before you begin

This generic workflow describes the steps for restoring data that is protected with Ops Center Protector.

It is assumed that a data protection policy has been implemented and that at least one complete backup data set has been created on the designated storage device. See [How to protect your data \(on page 132\)](#).

This task describes the general steps to follow when restoring your data:

Procedure

1. Identify the destination where the data set is to be restored.

Depending on the scenario, you may want to restore data to its original location or a different location

2. Ensure that the restore location is prepared to receive the restored data set. In the case of a replication, it will be necessary to prepare both sides of the replication pair.

Applications that access the data will need to be placed in the correct state and sufficient resources must be available to receive the data set.



Caution: The process of restoring data can result in the destruction of some original data that exists on the restore target. Ensure that any critical data is copied to a safe location and/or is included in the data set being restored.

3. Depending on the scenario, it may be necessary to suspend any backup policies currently active on the location where the data set is being restored.
Data flows can be deactivated via the [Monitor Inventory \(on page 459\)](#) or [Data Flows Inventory \(on page 350\)](#).
4. Locate the data set to be restored.
The [Restore Inventory \(on page 686\)](#) and [Storage Inventory \(on page 756\)](#) tracks all backups maintained by Protector.
5. Select the restore method and start the restore process.
It may be possible to restore the data to the original location, a different location, mount a volume to a new host or swap the direction of a replication. The [Restore Inventory \(on page 686\)](#) and [Storage Inventory \(on page 756\)](#) provide functions to restore, mount, revert and swap replications and snapshots.
6. Once the restore process is complete, further steps may be needed to fix-up the data set before using it.
For supported applications, these additional steps are described in the appropriate Application Guide (see [Related documents \(on page 16\)](#)). For other applications, consult the vendor's documentation.
7. Restart any applications that access the restored data.
For supported applications, these additional steps are described in the appropriate Application Guide (see [Related documents \(on page 16\)](#)). For other applications, consult the vendor's documentation.
8. Resume any existing backup policies for the restored data set. If a new restore location was chosen, consider if it is necessary to introduce new backup policies.
Data flows can be reactivated via the [Data Flows Inventory \(on page 350\)](#).

How to protect Ops Center Protector

Before you begin

In order for Ops Center Protector Master Node backups to be available following the total loss of the master node backups should be made to remote storage. Such storage may be a repository that is proxied by a client node HCP; HCP for Cloud Scale or Amazon S3.

When using HCP; HCP for Cloud Scale or Amazon S3 for backup either a client node or the master itself may be the proxy for the storage node.

When using a repository that repository must be hosted (i.e. proxied) by a client node. Note that only generation 2 repositories should be used.

Backing up the Protector Master Node Settings

Procedure

1. Create a policy. Refer [How to create a policy \(on page 265\)](#)
2. Add classification of type "Ops Center". Refer [How to add a classification to a policy \(on page 266\)](#)

3. For that classification select the master node, then under "Include Applications" select either "Include all Ops Center applications" or press the Add button and select "Ops Center Protector Master". Refer [Ops Center Classification Wizard \(on page 606\)](#) .
4. Add a backup operation to the policy with suitable schedule and/or RPO, etc
5. Create a dataflow. Refer [How to create a data flow \(on page 225\)](#) .
6. Drag the master node onto the data flow, the master node will be the source node.
7. Select the policy created above on that master. Refer [How to apply a policy to nodes on a data flow \(on page 228\)](#).
8. Drag the target storage node onto the data flow and connect the master source node to the repository. Refer [How to connect nodes on a data flow \(on page 228\)](#).
9. Select the backup operation in the above policy on the storage node. Refer [How to apply a policy to nodes on a data flow \(on page 228\)](#).
10. Activate the dataflow. Refer [How to activate a data flow \(on page 229\)](#).

This complete the backup of the protector settings, they will be automatically backed up in accordance with the schedule and/or RPO selected within the policy.

An additional backup may be performed by selecting the data flow from within the "Monitor" screen. Refer [How to trigger an operation from an active data flow \(on page 256\)](#).

How to recover Ops Center Protector

Before you begin

Ops Center Protector master node backups will be required when attempting to rebuild that master node whether that node is to be hosted on the original hardware or on a new system

When recovering to a new system that system must not be in used as a Ops Center Protector.

Where cloud storage has been used for backups this new system must have an internet connection and be able to communicate with required cloud storage system.

Where a repository hosted (proxied) by a client node has been used for backups you will need to know the directory path for that repository. This is the directory path that was specified when the repository was created.

In the event that the Master node is lost or otherwise permanently unavailable all settings for that master node may be recovered to a new master as described below. Note that if testing this procedure while the original master node is still available that master **MUST** be stopped prior to the commencement of the following actions.

Procedure

1. Create a new Master Node

- Install Protector as a recovery master node on a new system (see [How to install/upgrade Protector on Windows and Linux or AIX \(on page 232\)](#) . Where the system has previously had Ops Center Protector installed ensure it is completely uninstalled before re-installing (i.e. ensure the install directory has been removed)
- Give the new master a temporary name (e.g. Recovery_Master) This will be overwritten later in this procedure with the original master node name.
- Note the IP address of the new master.

2. Preparing a Repository Storage Proxy Node for use by the new Master Node



Note: This section can be ignored if the Ops Center Protector Master Node backups are not stored on a repository node:

On the client node that is proxy for the repository containing the protector settings backups:

- Stop the protector services. Refer [How to stop the services \(on page 259\)](#).
- To prepare the repository containing the Ops Center Master node backups for use by the 'recovery master' run the command.

```
setconfig --recoverymaster <ip_address> --repository
<repository_path>
```

where <ip_address> is the address of the new master and <repository_path> is the base directory of the repository containing the backup to be recovered. When successful the following response will be issues:

Repository located at <repository_path> prepared for use by a recovery master

- Start the protector services. Refer [How to start the services \(on page 259\)](#).
- Add Client and Repository nodes to the new recovery master Node, on the UI Nodes screen authorize the client node when it appears. Refer [How to authorize a node \(on page 258\)](#).
- Create new node. Refer [How to add a node \(on page 258\)](#).
- Select 'Storage' node type "Repository". Refer [Node Type Wizard \(on page 479\)](#).
- Specify a temporary name to be used for the repository node.
- Select the client node as the "Proxy Node"
- For creation mode select "Import existing repository", giving the path of the repository on the client when asked to "Select existing repository directory".
- When the node has been created the imported repository will appear in the nodes list and its will appear as 'online' once it has automatically mounted,

3. Preparing HCP/Cloud Storage for use by the new Master Node

This section can be ignored if the Ops Center Protector Master Node backups are not stored on a cloud node:

The new recovery master will be used as the proxy for the storage node. This storage node should be created as follows:

- Create new node. Refer [How to add a node \(on page 258\)](#).
- Select 'Storage' node type and then select the storage type that contains the Ops Center Protector Master back to be recovered. Refer [Node Type Wizard \(on page 479\)](#).
- Specify a temporary name to be used for the node.
- For creation mode select "Import an existing node".
- For proxy node select the recovery master itself .
- For the metadata cache directory specify a temporary directory. Be sure that this directory does not already exist.
- On the configure node screen specify the details of the HCP/Cloud storage.

When the node has been created the imported storage node will appear in the nodes list and its should appear as 'online' once it has automatically mounted

4. Recover the Original Master Settings

- On the restore screen (see [How to view available backups \(on page 271\)](#)) hit the 'Search' button. Unfortunately, it will be difficult to filter the results (other than by specifying the temporary name used for the storage node) because until the master settings have been recovered the node names, policy names, data flow names, etc, used for filtering are not known.
- Select the most recent master node settings backup from the recovery points listed and hit the 'restore' tool icon (see [Repository Snapshot Details \(Restore\) – Ops Center \(on page 744\)](#)).
- Select "Ops Center Protector Master" from the list of applications to restore, and hit 'Next'
- Select the current (master) node as the destination node and hit the 'Finish' button.
- The progress of the restore screen may be monitored from the 'Jobs' screen (see [How to view and control running jobs \(on page 254\)](#)) or 'Logs' screen (see [How to view logs \(on page 255\)](#)).

- When the restore completes it will be shown as 'Completed with warnings'. This is because the process of changing the master node to use the recovered settings cannot be performed while the master node is active. A message will be sent to the Log screen as the job completes detailing the Windows DOS command/Linux Shell command required to complete the recovery. Take a copy of this command string. For e.g.

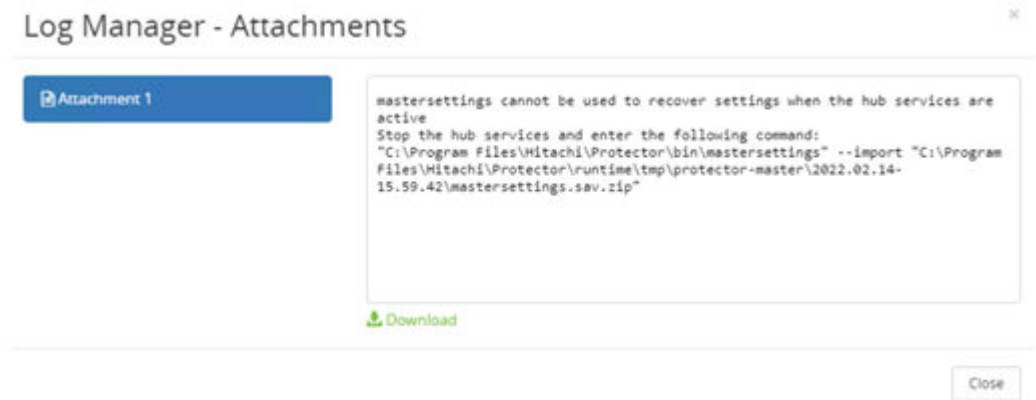


Figure 49 Log Manager - Attachments

- Stop the protector services. Refer [How to stop the services \(on page 259\)](#).
- From a Windows DOS command prompt or Linux shell command run the command noted in the previous step to restore the original master node settings.
- Start the protector services. Refer [How to start the services \(on page 259\)](#).

Where using a repository node the proxy node for that repository will appear on the UI as "offline". To return it to use by the recovered master:

- Stop the protector services. Refer [How to stop the services \(on page 259\)](#).
- To return the repository used for the recovery for use by the 'recovered master' run the command within a Windows DOS/Unix shell window change directory to the Protector 'bin' directory

```

setconfig --recoveredmaster <ip_address> --repository
<repository_path>
  
```

where <ip_address> is the address of the recovered master and <repository_path> is the base directory of the repository. When successful the following response will be issues:

```

Repository located at <repository_path> returned for use by the
recovered master
  
```

- Start the protector services. Refer [How to start the services \(on page 259\)](#)
- The master node UI should now be showing the client node and the repository node as 'online'.



Note: Although all client nodes will still have copies of their active rules the recovered master does not know what rules are active on each client, and so the UI Monitor screen shows no data flows. All required data flows should now be compiled and activated refer [How to activate a data flow \(on page 229\)](#).

Revert to Original Master

It is possible, following successful recovery of the master node settings to a new 'Recovered Master', to subsequently revert back to the original master system.

If any changes have been made to the master settings following recovery then a fresh backup of the Ops Center Protector Master Node settings should be performed and then the same procedure should be followed to restore this backup to the original system as was used to create the recovered master.

If no changes have been made to the master settings following recovery then the following steps may be followed to revert to using the original master node without the need for any new backup or recovery:

- Stop the protector services (see [How to stop the services \(on page 259\)](#) on the recovered master.
- Ensure the protector services are not running on the original master .
- Within a Windows DOS/Unix shell window change directory to the Protector 'bin' directory on the original master enter the CLI command `setconfig --forceprobe`
- Start the cofiohub service on the original master.

Host Based and HCP Workflows

This section describes high level workflows for repository based data protection including tiering to HCP and backup to cloud. These workflows focus on basic data protection scenarios involving files located on an OS Host. For guidance on protecting supported applications, refer to the relevant Protector Application Guide listed in [Related documents \(on page 16\)](#).

If you encounter problems, please refer to the following:

- [Troubleshooting General \(on page 853\)](#)
- [Troubleshooting HCP \(on page 860\)](#)
- [Troubleshooting VMware \(on page 865\)](#)

How to batch backup a file system path to a repository

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the file system path resides.
- The Protector Client software has been installed on the destination node where the Repository will reside.
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system, to a repository, using batch mode backup. The data flow and policy are as follows:

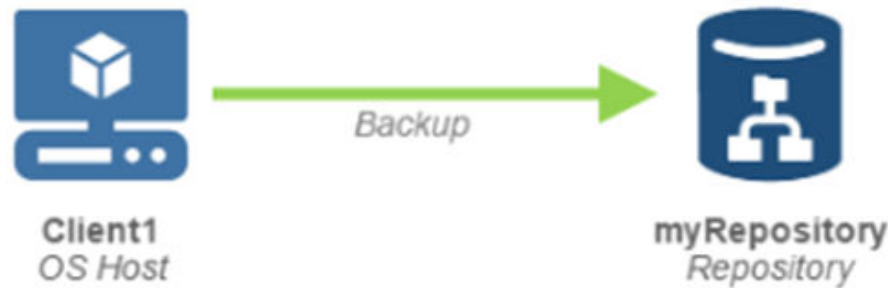


Figure 50 Batch Data Flow

Table 5 Path Backup Policy

| Classification Type | Parameters | Value |
|---------------------|------------|-------------|
| Path | Include | C:\testdata |

| Operation Type | Parameters | Value | Assigned Nodes |
|----------------|-------------|------------|----------------|
| Backup | RPO | 10 mins | Repository |
| | Retention | 1 hour | |
| | Run Options | Run on RPO | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production data to be backed up resides. For a file system backup using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).
2. Locate the destination node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online.
This node is where the repository will be hosted and is identified as the **Proxy Node** when creating the repository in the next step.
3. Create a new Repository node using the [Repository Storage Node Wizard \(on page 556\)](#) and check that it is authorized and online.
The *Repository* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). You can direct data from multiple nodes to a single repository so there is no need to create a new repository if a suitable one already exists. See [How to add a node \(on page 258\)](#), and [How to authorize a node \(on page 258\)](#).
4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#), [Path Classification Wizard \(on page 634\)](#) and [Backup Operation Wizard \(on page 639\)](#).
The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#).
5. Draw a data flow as shown in the figure above, that shows the *OS Host* source node connected to the *Repository* destination node via a *Batch* mover, using the [Data Flow Wizard \(on page 356\)](#).
See [How to create a data flow \(on page 225\)](#).
6. Assign the *Path-Backup* policy to the *OS Host* source node and the *Backup* operation to the *Repository* destination node on the data flow.
Select the *Standard Store Template* when assigning the operation to the repository. See [How to apply a policy to nodes on a data flow \(on page 228\)](#).
7. Compile and activate the data flow, checking carefully that there are no errors or warnings.
See [How to activate a data flow \(on page 229\)](#).
8. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).
The policy will be invoked automatically to create an initial backup and then repeatedly according to the RPO specified in the policy. The policy can also be manually triggered from the source node in the monitor data flow. See [How to trigger an operation from an active data flow \(on page 256\)](#).
9. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.
For a healthy data flow you may periodically see:
 - An animated resynchronization icon appear above the batch mover each time the RPO is reached.
 - Transient **Node Status** icons appear over nodes and associated information messages displayed to the right of the data flow area.

- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, replication and resynchronization events.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
 - Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
 - Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.
10. Review the status of the *Repository* via the relevant [Generation 1 Repository Details \(on page 795\)](#) and the stores via the relevant [Gen1 Repository Store Details \(on page 799\)](#), to ensure backup snapshots are being created.

Repositories require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a repository \(on page 273\)](#).

New snapshots will appear in the [Gen1 Repository Store Details \(on page 799\)](#) periodically as dictated by the *RPO* of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy. The retention period of individual snapshots can be modified here if required.

How to tier a file system path to HCP via a repository

Before you begin



Note: Tiering repository data to HCP is only available when using a generation 1 repository node and a generation 1 HCP node.



Note: In order to tier data from a repository store to HCP, a new tiering data flow, using a new, unpopulated repository store is required. Adding a tiering mover and HCP node to an existing repository data flow will not work.

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the file system path resides.
- The Protector Client software has been installed on the destination node where the Repository will reside.
- HCP generation 1 node has been set up as per the Protector requirements and prerequisites. Refer to [Generation 1 Hitachi Content Platform prerequisites \(on page 23\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when tiering data that resides on a file system, to HCP. These files are first ingested by a repository, using batch mode backup, and then immediately moved from the repository to an associated namespace within a tenant on HCP. Once data is tiered to HCP, the repository retains only the metadata describing the backed up files system. The data tiered to HCP can be located and restored by following the same workflow as that used for restoring repository data (see [How to restore a repository snapshot of a file system path \(on page 147\)](#)). The data flow and policy are as follows:



Figure 51 Tiering Data Flow

If you need frequent backups available in a local repository as well as long term backups on HCP, then implement a repo-to-repo data flow (see [How to backup an onsite repository to an offsite repository \(on page 149\)](#)) and tier to HCP from the second repository. The first repository will hold frequent local backups while the second manages long term retention on HCP.

Table 6 Path Backup Policy

| Classification Type | Parameters | Value |
|---------------------|------------|-------------|
| Path | Include | C:\testdata |

| Operation Type | Parameters | Value | Assigned Nodes |
|----------------|-------------|------------|---|
| Backup | RPO | 1 Week | Repository (this controls the retention of data on HCP) |
| | Retention | 5 Years | |
| | Run Options | Run on RPO | |
| Tier | None | N/A | Hitachi Content Platform |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production data to be backed up resides. For a file system backup using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).
2. Locate the intermediate node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online.
This node is where the repository will be hosted and is identified as the **Proxy Node** when creating the repository in the next step.
3. Create a new generation 1 Repository node using the [Repository Storage Node Wizard \(on page 556\)](#) and check that it is authorized and online.
The *Repository* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). You can direct data from multiple nodes to a single repository so there is no need to create a new repository if a suitable one already exists. See [How to add a node \(on page 258\)](#), and [How to authorize a node \(on page 258\)](#).
4. Create a new generation 1 Hitachi Content Platform node using the [Hitachi Content Platform Storage Node Wizard \(on page 530\)](#) and check that it is authorized and online.
The Hitachi Content Platform node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). You can direct data from multiple repository stores to a single HCP node (each repository store maps to a separate namespace within the HCP tenant), so there is no need to create a new HCP node if a suitable one already exists.



Note: Each HCP node in Protector represents a single tenant, so if you need to strictly segregate repository data then create separate HCP nodes for each tenant and consider placing them in separate RBAC resource groups.

See [How to add a node \(on page 258\)](#), and [How to authorize a node \(on page 258\)](#).

5. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#), [Path Classification Wizard \(on page 634\)](#), [Backup Operation Wizard \(on page 639\)](#) and [Tier Operation Wizard \(on page 647\)](#).

The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#).

6. Draw a data flow as shown in the figure above, using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the *Repository* intermediate node via a *Batch* mover, then to the Hitachi Content Platform destination node via a second *Batch* mover.

See [How to create a data flow \(on page 225\)](#).

7. Assign the *Path-Backup-Tier* policy to the *OS Host* source node, the *Backup* operation to the *Repository* node and the *Tier* operation to the HCP node on the data flow.

Select the *Standard Store Template* when assigning the operation to the repository. There is no value in selecting a template that performs source-side or repository-side deduplication in this situation. See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

8. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).



Note: Do not deactivate tiering data flows unless they are longer required. Subsequent reactivation will force the source and repository to undergo resynchronization, leading to all files being re-tiered to HCP.

9. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create an initial backup and then repeatedly according to the RPO specified in the policy. The policy can also be manually triggered from the source node in the monitor data flow. See [How to trigger an operation from an active data flow \(on page 256\)](#).

10. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you may periodically see:

- An animated resynchronization icon appear above the batch mover into the repository each time the RPO is reached.
- An animated tiering icon appear above the batch mover into the HCP node each time the repository tiers data.
- **Repository Statistics - Queues - Tier** values changing, indicating objects queued and actively being tiered to HCP.



Tip: Check the tier queue if RPO is not being met for tiered data flows.

- Transient **Node Status** icons appear over nodes and associated information messages displayed to the right of the data flow area.
- **Network/Cache Utilization** fluctuations within normal limits if large amounts of data are being backed up to the repository.

- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*. Note there is no *Tiering* job since this process takes place on an ad hoc basis.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, HCP namespace creation, resynchronization and ingestion throttling events.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
 - **Local/Remote Memory Cache** constantly at excessively high levels if large amounts of data are being backed up, indicating data transfer issues.
 - Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
 - Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.
11. Review the status of the *Repository* via the relevant [Generation 1 Repository Details \(on page 795\)](#) and the stores via the relevant [Gen1 Repository Store Details \(on page 799\)](#), to ensure backup snapshots are being created. Also monitor the health of HCP via its **Tenant Management Console**, especially **Namespaces - Usage**.

The UUID of the repository store (used to name the corresponding HCP namespace) can be found in the [Gen1 Repository Store Details \(on page 799\)](#).

Repositories require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a repository \(on page 273\)](#). A repository store that has been completely tiered to HCP will report a zero size.

The space reported by HCP to tier a repository may appear much larger than that reported by the source node's file system. HCP allocation size is 8KB minimum per object, and each file requires at least 2 HCP objects (one per stream). When tiering many small files, the size reported HCP usage will appear larger than expected. Add to this the fact that HCP will create 2 or more replicas depending on the DPL setting.

New snapshots will appear in the [Gen1 Repository Store Details \(on page 799\)](#) periodically as dictated by the *RPO* of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy. The retention period of individual snapshots can be modified here if required.

How to restore a repository snapshot of a file system path

Before you begin

It is assumed that a file system path policy that creates repository snapshots has been implemented and that at least one snapshot has been created in the designated repository store. See [How to batch backup a file system path to a repository \(on page 141\)](#) for an example of how to do this.

This task describes the steps to follow when restoring a file system path snapshot from a repository store to a node other than the one from which the backup originated, as shown:

Procedure

1. Identify the destination where the data set is to be restored. Here we will restore the snapshot to a different machine to the one from which the data originated.
Depending on the scenario, you can restore data to its original node and directory, its original node in a different directory or to a different node entirely.
2. Ensure that the restore location is prepared to receive the restored data set by locating the node in the [Nodes Inventory \(on page 476\)](#) and checking it is authorized and online.
The restore location must have Protector Client software installed. We will assume that no applications are accessing the restore location since the restored data doesn't yet exist.
3. In this example we will assume that there are no backup policies currently active on the location where the data set is being restored, so there is no need to suspend any data flows. The existing backup policy can continue to run while we perform our restore.
4. Locate the data set to be restored by navigating to the [Repository Snapshot Details \(Storage\) - File System \(on page 801\)](#) for the repository store snapshot in question.
See [How to view the contents of a snapshot in a repository store \(on page 273\)](#).
5. Check that the target restore location (identified in the previous steps) has enough free space to accommodate the restored snapshot.
The **Logical Size** of the snapshot is shown in the **Analysis Details** area of the [Repository Snapshot Details \(Storage\) - File System \(on page 801\)](#). It may be necessary to click **Analyze** if these details have not yet been evaluated.
6. Click **Restore Snapshot** to open the [Restore Repository Snapshot Wizard - File System \(on page 724\)](#).



Caution: The process of restoring data may result in the overwriting some of the original data that exists on the restore location.

Ensure that any critical data is copied to a safe location or is included in the data set being restored.

The [Restore Repository Snapshot Wizard - File System \(on page 724\)](#) - **Select restore options** page provides numerous **File Name Collision Policy** options to help manage potential file overwrite situations.

In this example we will restore to a different destination node but use the original file paths. No routing is required since the Repository and Restore target are connected to the same LAN.

- a. From the [Restore Repository Snapshot Wizard - File System \(on page 724\)](#), choose whether to restore the **Entire Snapshot** or a **User Selection** of files. Click **Next**.
- b. If restoring a **User Selection**, select the files and folders to be restored. Click **Next**.
- c. Set the **Destination Node** to the one identified in the previous steps above.
- d. Set **Restore To** to **Original Location** so that the files are placed on the same path as the originals.

- e. Set **File Name Collision Policy** to **Rename any colliding files** so that any existing files of the same name are preserved.

This has no effect when initially creating the restored files in a new location, but if the restore is repeated then it will preserve any existing files from previous restore jobs.

- f. Review the restore options carefully to ensure that everything has been specified correctly, then click **Finish** to initiate the restore job.

A `Processing` message will appear briefly, then the wizard will close and the [Jobs Inventory \(on page 441\)](#) will be displayed. A new *Restore Job* will appear at the top of the Jobs list, with the *Progress* entry initially indicating processing and finally indicating successful completion.

7. Once the restore process is complete, further steps may be needed to fix-up the data set before using it. In this example we will assume that no additional work is required other than inspecting the restored data on the target machine.

The amount of fix-up work required depends on the applications accessing the restored data.



Note: This example restores data created using a *Path* classification. If you are backing up one of the application types directly supported by Protector, then you should use one of the *Application* classifications and refer to the appropriate Application Guide listed in [Related documents \(on page 16\)](#).

8. Restart any applications that access the restored data.

For supported applications, these additional steps are described in the appropriate Application Guide (see [Related documents \(on page 16\)](#)). For other applications, consult the vendor's documentation.

9. Resume any backup policies for the restored data set. If you have restored data to a new location for repurposing (test and development work for example), you should consider if it is necessary to implement a new backup policy to protect this new instance. Data flows can be reactivated via the [Data Flows Inventory \(on page 350\)](#).

How to backup an onsite repository to an offsite repository

Before you begin



Note: When performing repository to repository backups repository generations can't be mixed.

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the file system path resides.
- The Protector Client software has been installed on the destination nodes where the repositories will reside.
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data backed up to a primary repository by copying it to a secondary repository. The secondary repository would normally be located offsite to provide protection from local catastrophic failures. The data flow and policy are as follows:



Figure 52 Repository to Repository Data Flow

Table 7 Repository Backup Policy

| Classification Type | Parameters | Value |
|---------------------|------------|-------------|
| Path | Include | C:\testdata |

| Operation Type | Parameters | Value | Assigned Nodes |
|------------------------|-------------|------------|--------------------|
| Onsite Daily (Backup) | RPO | 1 day | Onsite Repository |
| | Retention | 1 week | |
| | Run Options | Run on RPO | |
| Onsite Weekly (Backup) | RPO | 1 week | Onsite Repository |
| | Retention | 6 months | |
| | Run Options | Run on RPO | |
| Offsite Daily (Backup) | RPO | N/A | Offsite Repository |

| Operation Type | Parameters | Value | Assigned Nodes |
|-------------------------|-------------|---|--------------------|
| | Retention | 1 week | |
| | Run Options | Run on completion of operation <i>Onsite Daily</i> | |
| Offsite Weekly (Backup) | RPO | N/A | Offsite Repository |
| | Retention | 6 months | |
| | Run Options | Run on completion of operation <i>Onsite Weekly</i> | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production data to be backed up resides. See [How to authorize a node \(on page 258\)](#).
2. Locate the destination nodes in the [Nodes Inventory \(on page 476\)](#) and check that they are authorized and online.
These nodes are where the onsite and offsite repositories will be hosted and are identified as the **Proxy Node** when creating the repositories in the next step.
3. Create two new Repository nodes using the [Repository Storage Node Wizard \(on page 556\)](#) and check that they are authorized and online.
You can direct data from multiple nodes to a single repository so there is no need to create new repositories if suitable ones already exists. See [How to add a node \(on page 258\)](#), and [How to authorize a node \(on page 258\)](#).
4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#), [Path Classification Wizard \(on page 634\)](#) and [Backup Operation Wizard \(on page 639\)](#).



Note: Both onsite operations are triggered according to their RPOs; the offsite operations are then triggered on completion of their respective onsite operations. The RPOs for the offsite operations do not need to be specified; they have no effect.

See [How to create a policy \(on page 265\)](#).

5. Draw a cascaded data flow as shown in the figure above, that shows the *OS Host* source node connected to the *Onsite Repository* and then to the *Offsite Repository* destination nodes via *Batch* movers, using the [Data Flow Wizard \(on page 356\)](#).
See [How to create a data flow \(on page 225\)](#).

6. Assign the *Repository-Backup* policy to the *OS Host* source node, both *Onsite Backup* operations to the *Onsite Repository* and both *Offsite Backup* operations to the *Offsite Repository* destination nodes on the data flow.

If using generation 1 repositories select the *Standard Store Template* when assigning the operation to the repositories. See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

7. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).

8. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create an initial backup and then repeatedly according to the RPO specified in the policy. The policy can also be manually triggered from the source node in the monitor data flow. See [How to trigger an operation from an active data flow \(on page 256\)](#).

9. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.



Note: If the onsite repository contains a large amount of backup data and/or the network connection between the onsite and offsite repositories has limited bandwidth, the process of synchronizing the two repositories can be expedited by seeding the offsite repository as described in [How to seed an offsite repository \(on page 152\)](#).

10. Review the status of the *Repositories* via the relevant [Generation 1 Repository Details \(on page 795\)](#) and the *Stores* via the relevant [Gen1 Repository Store Details \(on page 799\)](#), to ensure backup snapshots are being created.

New snapshots will appear in the [Gen1 Repository Store Details \(on page 799\)](#) periodically as dictated by the *RPO* of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy. The retention period of individual snapshots can be modified here if required.

How to seed an offsite repository




Before you begin

It is assumed that you have an onsite repository containing a large amount of backup data, and you want to create a secondary offsite backup of this data. You may have attempted to set up an offsite data flow as described in [How to backup an onsite repository to an offsite repository \(on page 149\)](#), but data volume and/or bandwidth restrictions between sites are preventing the initial synchronization from completing in an acceptable timeframe.

Ensure that you have a removable disk available with enough spare capacity to hold the onsite repository's data files. This disk will be required to physically transport the data to the offsite location.

The initial synchronization can be completed more rapidly by seeding the offsite repository store with data from the onsite store. Once seeded, the offsite repository may request additional, lower volume, differential updates to ensure the two sites are completely synchronized. The process, known as seeding is performed as follows:

Procedure

1. In the [Monitor Details \(on page 460\)](#) for the relevant data flow, resynchronise the onsite repository by selecting the source nodes feeding into it, clicking **Trigger Operation** then selecting the operations that backup to the onsite repository.
2. Wait for the onsite repository to become synchronised with the source machine(s) at the primary site by confirming that the corresponding backup job has completed.
3. For both the onsite and offsite repository, note down the **Mount Directory** displayed in the **Configuration** area of the [Generation 1 Repository Details \(on page 795\)](#).
4. For both the onsite and offsite repository, unmount the repository by clicking **Unmount**.
The *Offline* status icon  will appear on the respective repository tiles in the [Storage Inventory \(on page 756\)](#) when the stores have unmounted.
5. Using Windows File Explorer, navigate to the repository root directory for the onsite repository (noted above) and copy the folder to a removable disk, then safely eject the disk from the machine.
6. For the onsite repository only, navigate to the [Generation 1 Repository Details \(on page 795\)](#) and mount the repository by clicking **Mount**.
The *Online* status icon  will appear on the onsite repository tile in the [Storage Inventory \(on page 756\)](#) when the stores have mounted. The onsite repository will now resume backup of your source nodes according to the onsite policies on force.
7. Take the removable disk containing the copy of the onsite repository to the remote site, insert it into the machine hosting the offsite repository and replace the files in the directory of the offsite repository (noted above) with those on the removable disk.
Physically transferring the data between the onsite and offsite nodes circumvents the bandwidth restrictions of the network between the two sites.
8. For the offsite repository, navigate to the [Generation 1 Repository Details \(on page 795\)](#) and mount the repository by clicking **Mount**.
The *Online* status icon  will appear on the offsite repository tile in the [Storage Inventory \(on page 756\)](#) when the stores have mounted.
9. In the [Monitor Details \(on page 460\)](#) for the relevant data flow, resynchronise the repositories by selecting the onsite repository, clicking **Trigger Operation** then selecting the operations that backup to the offsite repository.
Because the seeding process has been performed, only a minimal amount of data transfer will be required between the two sites.

Hitachi Block Workflows

This section describes high level workflows for Hitachi Block based data protection. These workflows focus on basic data protection scenarios involving primary and secondary LDEVs located on block storage devices. For guidance on protecting supported application data located on a block storage device refer to the relevant Protector Application Guide listed in [Related documents \(on page 16\)](#).

If you encounter problems, please refer to the following:

- [Troubleshooting General \(on page 853\)](#)
- [Troubleshooting Hitachi Block \(on page 855\)](#)
- [Troubleshooting VMware \(on page 865\)](#)

How to snapshot an Hitachi Block LDEV with Thin Image

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node that will act as a proxy for the Hitachi Block storage device. Note that for a Thin Image snapshot, the source and destination LDEVs are located on the same device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting an LDEV allocated from a Hitachi Block storage device. This is useful when Protector has no way of interacting with the application or OS that is using the LDEV. The snapshot will be crash consistent, because Protector is not able to orchestrate the snapshot operation in conjunction with applications using the LDEV. Thin Image hardware snapshots of the P-VOL are created as S-VOLs residing within the same storage device. For more information, refer to [About Thin Image differential and refreshed snapshots \(on page 69\)](#). The data flow and policy are as follows:



Figure 53 Hitachi Block Snapshot Data Flow

Table 8 Hitachi Block Snapshot Policy

| Classification Type | Parameters | Value |
|---------------------|-------------------------------|----------|
| Hitachi Block | Specify additional selections | Selected |
| | Logical Devices | 10323/10 |

| Operation Type | Parameters | Value | Assigned Nodes |
|----------------|---------------|---------------|----------------------|
| Snapshot | Mode | Hardware | Hitachi Block Device |
| | Hardware Type | Hitachi Block | |
| | RPO | 10 mins | |
| | Retention | 1 hour | |
| | Run Options | Run on RPO | |
| | Quiesce... | Not selected | |

Procedure

1. Locate the node in the [Nodes Inventory \(on page 476\)](#) that will control the Hitachi Block Device via a CMD (Command Device) interface and check that it is authorized and online.

This node is used by Protector to orchestrate snapshot creation and is identified as the **Proxy Node** when creating the Hitachi Block Device node in the next step. This node is known as an ISM node. The ISM node does not appear in the data flow.

2. Create a new Hitachi Block Device node (unless one already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that it is authorized and online. This node is where the production LDEV to be snapshotted is located.


For a snapshot using an Hitachi *Block* classification, an Hitachi *Block Device* node is required.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#).

3. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#), [Hitachi Block Classification Wizard \(on page 631\)](#) and [Snapshot Operation Wizard \(on page 645\)](#).

The Hitachi *Block* classification is grouped under **Physical** classifications. See [How to create a policy \(on page 265\)](#).

4. Draw a data flow as shown in the figure above, that shows only the Hitachi *Block Device* source node, using the [Data Flow Wizard \(on page 356\)](#).


At this stage the snapshot icon  is not shown. See [How to create a data flow \(on page 225\)](#).

5. Assign the *Snapshot* operation to the Hitachi *Block Device* source node. The *Block-Snapshot* policy will then be assigned automatically.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

The [Hitachi Block Snapshot Configuration Wizard \(on page 373\)](#) is displayed.

6. Select the **Snapshot Pool** by selecting one of the available Thin Image or hybrid pools.
7. Leave the remaining **Advanced Options** at their default settings, then click **OK**.

The snapshot icon  is now shown superimposed over the source node.

8. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).



Note: If the **Quiesce configured applications before backup** option was not deselected in the [Snapshot Operation Wizard \(on page 645\)](#), then a compiler warning message will be generated because Protector will not be able to quiesce applications using the LDEV.

9. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#) page.

The policy will be invoked repeatedly according to the RPO specified. The policy can also be manually triggered from the source node in the monitor data flow. You may want to manually trigger to create an initial snapshot. See [How to trigger an operation from an active data flow \(on page 256\)](#).

10. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- Snapshot jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being snapshotted.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

11. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and snapshots via the [Hitachi Block Snapshots Inventory \(on page 767\)](#), to ensure snapshots are being created.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#). The retention period of individual snapshots can be modified here if required.

New snapshots will appear in the [Hitachi Block Snapshots Inventory \(on page 767\)](#) periodically as dictated by the *RPO* of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy.

How to snapshot a file system with Thin Image

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the Hitachi Block storage device.
- The Protector Client software has been installed on the destination node that will act as a proxy for the Hitachi Block storage device. Note that for a Thin Image snapshot, the source and destination LDEVs are located on the same device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. Thin Image hardware snapshots of the P-VOL are created as S-VOLs residing within the same storage device. For more information, refer to [About Thin Image differential and refreshed snapshots \(on page 69\)](#). The data flow and policy are as follows:



Figure 54 Hardware Snapshot Data Flow

Table 9 Path Snapshot Policy

| Classification Type | Parameters | Value |
|---------------------|------------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameters | Value | Assigned Nodes |
|----------------|---------------|---------------|----------------|
| Snapshot | Mode | Hardware | OS Host |
| | Hardware Type | Hitachi Block | |
| | RPO | 10 mins | |
| | Retention | 1 hour | |
| | Run Options | Run on RPO | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production LDEV to be snapshotted is mounted.

For a file system snapshot using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the node in the [Nodes Inventory \(on page 476\)](#) that will control the Hitachi Block Device via a CMD (Command Device) interface and check that it is authorized and online.

This node is used by Protector to orchestrate snapshot creation and is identified as the **Proxy Node** when creating the Hitachi Block Device node in the next step. This node is known as an ISM node. The ISM node does not appear in the data flow.


3. Create a new Hitachi Block Device node (unless one already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that it is authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). Note that this node does not appear in the snapshot data flow diagram, but is identified when assigning the snapshot policy.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#), [Path Classification Wizard \(on page 634\)](#) and [Snapshot Operation Wizard \(on page 645\)](#).

The *Path* classification is grouped under **Physical** classifications. See [How to create a policy \(on page 265\)](#).

5. Draw a data flow as shown in the figure above, that shows only the *OS Host* source node, using the [Data Flow Wizard \(on page 356\)](#).

At this stage the snapshot icon  is not shown. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Snapshot* operation to the *OS Host* source node. The *Path-Snapshot* policy will then be assigned automatically.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

The [Hitachi Block Snapshot Configuration Wizard \(on page 373\)](#) is displayed.


7. Select the **Snapshot Pool** by selecting one of the available Thin Image or hybrid pools.



Caution:

Filling a Thin Image pool to capacity will invalidate all snapshot data contained within that pool. All snapshots in the pool will have to be deleted before snapshotting can be resumed.

8. Leave the remaining **Advanced Options** at their default settings, then click **OK**.

The snapshot icon  is now shown superimposed over the source node.

9. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).

10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#) page.

The policy will be invoked repeatedly according to the RPO specified. The policy can also be manually triggered from the source node in the monitor data flow. An initial snapshot will be taken shortly after rules distribution has completed. See [How to trigger an operation from an active data flow \(on page 256\)](#).

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- Snapshot jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being snapshotted.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and snapshots via the [Hitachi Block Snapshots Inventory \(on page 767\)](#), to ensure snapshots are being created.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#). The retention period of individual snapshots can be modified here if required.

New snapshots will appear in the [Hitachi Block Snapshots Inventory \(on page 767\)](#) periodically as dictated by the *RPO* of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy.

How to replicate an Hitachi Block LDEV with ShadowImage

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the destination node that will act as a proxy for the Hitachi Block storage device. Note that for a ShadowImage replication, the source and destination LDEVs are located on the same device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting an LDEV allocated from a Hitachi Block storage device. This is useful when Protector has no way of interacting with the application or OS that is using the LDEV. The replication will be crash consistent, because Protector is not able to orchestrate the replication operation in conjunction with applications using the LDEV. A ShadowImage hardware replication of the P-VOL is created as an S-VOL residing within the same storage device. For more information, refer to [About ShadowImage replication \(on page 72\)](#). The data flow and policy are as follows:



Figure 55 ShadowImage Replication Data Flow

Table 10 Hitachi Block Replication Policy

| Classification Type | Parameters | Value |
|---------------------|-------------------------------|----------|
| Hitachi Block | Specify additional selections | Selected |
| | Logical Devices | 10323/10 |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-------------|--------------------------------|---------------------------------------|
| Replicate | Run Options | Run on Schedule (See below) | Hitachi Block Device (source), |
| | Quiesce... | Not selected | Hitachi Block Device (destination) |

| Schedule Item Type | Parameter | Value | Policy Operations |
|--------------------|------------|----------------|--------------------------|
| Trigger | Days | Select All | Replicate (See above) |
| | Weeks | Select All | |
| | Time | Scheduled Time | |
| | Start Time | 15:00 | |
| | Duration | 00:00 | |

Procedure

1. Locate the node in the [Nodes Inventory \(on page 476\)](#) that will control the Hitachi Block Device via a CMD (Command Device) interface and check that it is authorized and online.

This node is used by Protector to orchestrate replication and is identified as the **Proxy Node** when creating the Hitachi Block Device node in the next step. This node is known as an ISM node. The ISM node does not appear in the data flow.

2. Create a new Hitachi Block Device node (unless one already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that it is authorized and online. This node is where the production LDEV to be replicated is located.

For a replication using an Hitachi *Block* classification, an Hitachi *Block Device* node is required.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). This node appears in the replication data flow as both the source and the destination node.

3. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)

- a. Define an Hitachi Block classification using the [Hitachi Block Classification Wizard \(on page 631\)](#).

The Hitachi *Block* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

In this example, ShadowImage replication will run as a batch operation based on a *Trigger* schedule. Continuous ShadowImage could also be implemented by using a continuous mover on the dataflow.

- c. Define a *Trigger* schedule using the [Schedule Wizard \(on page 749\)](#); accessed by clicking on **Manage Schedules**.

See [How to create a schedule \(on page 272\)](#).

4. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the Hitachi *Block Device* source node connected to the same Hitachi *Block Device* via a *Batch* mover.

ShadowImage is an in-system replication technology, so the Hitachi *Block Device* node is where both the source (P)VOL) and destination (S)VOL) volumes are located. See [How to create a data flow \(on page 225\)](#).

5. Assign the *Block-Replicate* policy to the Hitachi *Block Device* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

6. Assign the *Replicate* operation to the Hitachi *Block Device* destination node. The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

7. Set the replication type to **In System Clone**, then choose a **Pool** from one of the available *Dynamic Pools*. Leave the remaining parameters at their default settings and click **OK**.

8. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).



Note: If the **Quiesce configured applications before backup** option was not deselected in the [Replicate Operation Wizard \(on page 643\)](#), then a compiler warning message will be generated because Protector will not be able to quiesce applications using the LDEV.

9. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create a replication according to the schedule specified in the policy. The policy can also be manually triggered from the source node in the monitor data flow.



Note: No replication will be created until it is first triggered manually or by the schedule.

See [How to trigger an operation from an active data flow \(on page 256\)](#).

10. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- Replication jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

11. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and refreshed.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A new ShadowImage replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and be updated periodically as dictated by the schedule for the policy operation. The previous replication will be overwritten upon each refresh.

How to teardown the S-VOLs of a replication removed from a data flow

Before you begin

Either:

- The corresponding replication operation must be removed from the dataflow where it is defined and that dataflow must be reactivated

or:

- The dataflow defining the replication operation must be permanently deactivated.

An Hitachi block replication that was defined within or adopted by Protector must be explicitly removed from the underlying hardware as follows:

Procedure

1. Locate the replication record (corresponding to the replication operation that has been removed) in the [Hitachi Block Replications Inventory \(on page 777\)](#).

Replications that are eligible for teardown are marked with an **✖** in the top right corner of the tile.

2. Select the replication record to tear down, then click **Teardown** from the context menu.
3. The **Teardown Hitachi Block Replication Dialog** is displayed. If you are sure you want to proceed, type the word 'TEARDOWN', then click **Teardown**.
4. Go to the [Jobs Inventory \(on page 441\)](#) to ensure that a teardown job has been initiated and wait for it to complete.

The replication entry is not removed from the replications inventory until the teardown operation is completed successfully. If the teardown is unsuccessful, review the [Logs Inventory \(on page 448\)](#) to find out why. The teardown operation must be re-initiated by the user once the problem is resolved.

How to reactivate a replication operation that has been accidentally deactivated

An Hitachi block replication that was defined within or adopted by Protector may have been accidentally deactivated. One of following three cases will apply:

Case 1: Replication operation has not been removed but the data flow is deactivated

Protector considers a replication to have been removed from a dataflow only if the link between the source and destination has been removed or the source and/or destination node has been removed.



Note: It is possible to edit the replication parameters as long as any changes are supported by the hardware for that replication type. Protector will still consider the replication instance to be the same.

Procedure

1. If none of the above have occurred then the data flow can simply be reactivated by the user via the [Data Flows Inventory \(on page 350\)](#).

Because the replication has not been torn down, Protector will effectively re-adopt the corresponding replication from the storage hardware.

Case 2: Replication operation has been removed and the data flow has been reactivated

Protector considers a replication to have been removed from a dataflow if the link between the source and destination has been removed or the source and/or destination node has been removed.

Procedure

1. If this is the case, then the data flow must have a new replication operation added back in and then be reactivated by the user via the [Data Flows Inventory \(on page 350\)](#). Because Protector considers this new replication operation as an entirely new instance, the replication pair must be created from scratch on the storage array. The old replication becomes a static copy.

Case 3: The data flow containing the replication has been deleted

Protector considers the replication to have been removed.

Procedure

1. If this is the case, then a new data flow must be created containing a new replication operation and then be reactivated by the user via the [Data Flows Inventory \(on page 350\)](#). Because Protector considers this new replication operation as an entirely new instance, the replication pair must be created from scratch on the storage array. The old replication becomes a static copy.

How to create and use an Hitachi Block Host node

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node that will act as a proxy for the Hitachi Block storage device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

A block host node can be used in a data flow to represent a host machine that has LDEVs mounted on it that require protection. The block host can be used as a convenient alternative to specifying the hardware paths in the [Hitachi Block Classification Wizard \(on page 631\)](#). Typically the block host node is used to represent an application server that is not directly supported by a Protector classification.

Procedure

1. Identify the existing Hitachi Block Storage node where the LDEVs that require protection reside and ensure it is authorised and online.
2. Create a new Hitachi Block Host node using the [Hitachi Block Host Node Wizard \(on page 494\)](#). This node will represent the host where the production LDEVs to be protected are mounted.
 - a. Specify a **Node Name** that reflects the name or purpose of the host it represents. This is where the LDEVs are mounted.
 - b. Allocate the block host node to the same Access Control Resource Group as that of the block device node specified in the next step.
 - c. Select the **Hitachi Block Device**. This is the storage device where the LDEVs reside.
 - d. Optionally, specify the LDEVs mounted on the host that are to be protected. Normally you would specify these in the [Hitachi Block Classification Wizard \(on page 631\)](#), but it is often more logical to capture this information here.
3. Check that the newly created Hitachi Block Host node is authorised and online in the [Nodes Inventory \(on page 476\)](#).
4. Place the block host node on data flows in the same way that you would a block device source node.



Note: You can only use a block host node as a source node. You cannot, for example, replicate to a block host node.

5. Create a policy that includes a snapshot and/or replicate operation, and an associated block classification using the [Hitachi Block Classification Wizard \(on page 631\)](#).
 - a. Either: Select **Use Hitachi Block Host selections** to indicate that you want only the LDEVs specified in the [Hitachi Block Host Node Wizard \(on page 494\)](#) to be protected.
 - b. Or: Select **Specify additional selections** to indicate that you want the LDEVs specified in the [Hitachi Block Host Node Wizard \(on page 494\)](#) to be protected in addition to any specified in the **Logical Devices** field of the classification.
6. Assign the snapshot or replicate operation to the block host node in the data flow. See [How to apply a policy to nodes on a data flow \(on page 228\)](#).
7. Activate the data flow as normal. See [How to activate a data flow \(on page 229\)](#).

How to replicate a file system with ShadowImage

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the Hitachi Block storage device.
- The Protector Client software has been installed on the destination node that will act as a proxy for the Hitachi Block storage device. Note that for a ShadowImage replication, the source and destination LDEVs are located on the same device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A ShadowImage hardware replication of the P-VOL is created as an S-VOL residing within the same storage device. For more information, refer to [About ShadowImage replication \(on page 72\)](#). The data flow and policy are as follows:



Figure 56 ShadowImage Replication Data Flow

Table 11 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-------------|--------------------------------|----------------------------------|
| Replicate | Run Options | Run on Schedule (See below) | OS Host, Hitachi Block Device |

| Schedule Item Type | Parameter | Value | Policy Operations |
|--------------------|------------|----------------|--------------------------|
| Trigger | Days | Select All | Replicate (See above) |
| | Weeks | Select All | |
| | Time | Scheduled Time | |
| | Start Time | 15:00 | |
| | Duration | 00:00 | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the node in the [Nodes Inventory \(on page 476\)](#) that will control the Hitachi Block Device via a CMD (Command Device) interface and check that it is authorized and online.

This node is used by Protector to orchestrate replication and is identified as the **Proxy Node** when creating the Hitachi Block Device node in the next step. This node is known as an ISM node. The ISM node does not appear in the data flow.

3. Create a new Hitachi Block Device node (unless one already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that it is authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). This node appears in the replication data flow as the destination node.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)

- a. Define a *Path* classification using the [Path Classification Wizard \(on page 634\)](#).

The a *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

In this example, ShadowImage replication will run as a batch operation based on a *Trigger* schedule. Continuous ShadowImage could also be implemented by using a continuous mover on the dataflow.

- c. Define a *Trigger* schedule using the [Schedule Wizard \(on page 749\)](#); accessed by clicking on **Manage Schedules**.

See [How to create a schedule \(on page 272\)](#).

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the Hitachi *Block Device* via a *Batch* mover.

ShadowImage is an in-system replication technology, so the Hitachi *Block Device* node is where both the source (P-VOL) and destination (S-VOL) volumes are located. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Path-Replicate* policy to the *OS Host* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

7. Assign the *Replicate* operation to the Hitachi *Block Device* node.

The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

8. Set the replication type to **In System Clone**, then choose a **Pool** from one of the available *Dynamic Pools*. Leave the remaining parameters at their default settings and click **OK**.

9. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).

10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create a replication according to the schedule specified in the policy. The policy can also be manually triggered from the source node in the monitor data flow.



Note: No replication will be created until it is first triggered manually or by the schedule.

See [How to trigger an operation from an active data flow \(on page 256\)](#).

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- Replication jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and refreshed.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A new ShadowImage replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and be updated periodically as dictated by the schedule for the policy operation. The previous replication will be overwritten upon each refresh.

How to replicate a file system with Refreshed Thin Image

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the Hitachi Block storage device.
- The Protector Client software has been installed on the destination node that will act as a proxy for the Hitachi Block storage device. Note that for a Refreshed Thin Image replication, the source and destination LDEVs are located on the same device.
- The storage device has been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A Refreshed Thin Image hardware replication of the P-VOL is created as an S-VOL residing within the same storage device. For more information, refer to [About Thin Image differential and refreshed snapshots \(on page 69\)](#). The data flow and policy are as follows:



Figure 57 Refreshed Thin Image Replication Data Flow

Table 12 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-------------|--------------------------------|----------------------------------|
| Replicate | Run Options | Run on Schedule (See below) | OS Host, Hitachi Block Device |

| Schedule Item Type | Parameter | Value | Policy Operations |
|--------------------|------------|----------------|--------------------------|
| Trigger | Days | Select All | Replicate (See above) |
| | Weeks | Select All | |
| | Time | Scheduled Time | |
| | Start Time | 15:00 | |
| | Duration | 00:00 | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the production LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the node in the [Nodes Inventory \(on page 476\)](#) that will control the Hitachi Block Device via a CMD (Command Device) interface and check that it is authorized and online.

This node is used by Protector to orchestrate replication and is identified as the **Proxy Node** when creating the Hitachi Block Device node in the next step. This node is known as an ISM node. The ISM node does not appear in the data flow.

3. Create a new Hitachi Block Device node (unless one already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that it is authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). This node appears in the replication data flow as the destination node.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)

- a. Define a *Path* classification using the [Path Classification Wizard \(on page 634\)](#).

The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

Refreshed Thin Image replication runs as a batch operation based on a *Trigger* schedule.

- c. Define a *Trigger* schedule using the [Schedule Wizard \(on page 749\)](#); accessed by clicking on **Manage Schedules**.

See [How to create a schedule \(on page 272\)](#).

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the Hitachi *Block Device* via a *Batch* mover.

Refreshed Thin Image is an in-system replication technology, so the Hitachi *Block Device* node is where both the source (P-VOL) and destination (S-VOL) volumes are located. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Path-Replicate* policy to the *OS Host* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

7. Assign the *Replicate* operation to the Hitachi *Block Device* node.

The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

8. Set the replication type to **Refreshed Snapshot**, then choose a **Pool** from one of the available Thin Image *Pools*. Leave the remaining parameters at their default settings and click **OK**.

9. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).

10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create a replication according to the schedule specified in the policy. The policy can also be manually triggered from the source node in the [Monitor Details \(on page 460\)](#).



Note: No replication will be created until it is first triggered manually or by the schedule.

See [How to trigger an operation from an active data flow \(on page 256\)](#).

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- Replication jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and refreshed.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A new Refreshed Thin Image replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and be updated periodically as dictated by the schedule for the policy operation. The previous replication will be overwritten upon each refresh.

How to replicate a file system with Universal Replicator

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices. Note that for a Universal Replicator replication, the source and destination LDEVs are located on different devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A Universal Replicator hardware replication of the P-VOL is created as an S-VOL residing within a different storage device. For more information, refer to [About Universal Replicator \(on page 77\)](#). The data flow and policy are as follows:



Figure 58 Universal Replicator Replication Data Flow

Table 13 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-----------------|---|--|
| Replicate | Refresh Options | Select a schedule for 'Refresh on schedule' | OS Host, Secondary Hitachi Block Device |
| | Source Options | Do not Quiesce configured applications before backup. See note in the 'compile and activation' step below. | |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the primary LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary and secondary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.

These nodes are used by Protector to orchestrate replication of the primary LDEV to the secondary and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.

3. Create new primary and secondary Hitachi Block Device nodes (unless they already exist) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The secondary Hitachi Block Device node appears in the replication data flow as the destination node. The primary Hitachi Block Device node is represented in the data flow by the *OS Host* node where the primary LDEV is mounted.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#).

- a. Define a Path classification using the [Path Classification Wizard \(on page 634\)](#).

The a *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

When an application is used to automatically select the PVOLs used in this continuous replication a trigger schedule can be defined that invokes the application to re-evaluate the PVOLs involved.

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the secondary Hitachi *Block Device* via a *Continuous* mover.

Universal Replicator is a remote replication technology, so the Hitachi *Block Device* node shown on the data flow is the where the destination (S-VOL) volume is located. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Path-Replicate* policy to the *OS Host* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

7. Assign the *Replicate* operation to the Hitachi *Block Device* node.

The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

8. Set the replication type to **Asynchronous Remote Clone**, then:

- a. Choose a **Pool** from one of the available *Dynamic Pools*.
- b. Select a **Source Journal** on the primary Hitachi *Block Device* node.

- c. Select a **Destination Journal** (the secondary Hitachi *Block Device* node is selected implicitly).
 - d. Leave the remaining parameters at their default settings and click **OK**.
9. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).



Note: Because Universal Replicator cannot guarantee that the quiesce period constraint for Microsoft VSS can be met, the Rules Compiler will generate a warning if **Quiesce configured applications before backup** is selected in the policy's *Replicate* operation.

10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create and then maintain the replication according to the policy.

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will see:

- An initial replication job appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and maintained.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A Universal Replicator replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and will be updated as and when writes to the primary are made.

How to replicate a file system with TrueCopy

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices. Note that for a TrueCopy replication, the source and destination LDEVs are located on different devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A TrueCopy hardware replication of the P-VOL is created as an S-VOL residing within a different storage device. For more information, refer to [About TrueCopy replication \(on page 76\)](#). The data flow and policy are as follows:



Figure 59 TrueCopy Replication Data Flow

Table 14 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-----------------|---|--|
| Replicate | Refresh Options | Select a schedule for 'Refresh on schedule' | OS Host, Secondary Hitachi Block Device |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the primary LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary and secondary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.

These nodes are used by Protector to orchestrate replication of the primary LDEV to the secondary and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.

3. Create new primary and secondary Hitachi Block Device nodes (unless ones already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The secondary Hitachi Block Device node appears in the replication data flow as the destination node. The primary Hitachi Block Device node is represented in the data flow by the *OS Host* node where the primary LDEV is mounted.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)

- a. Define a Path classification using the [Path Classification Wizard \(on page 634\)](#).

The a *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

When an application is used to automatically select the PVOLs used in this continuous replication a trigger schedule can be defined that invokes the application to re-evaluate the PVOLs involved.

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the secondary Hitachi *Block Device* via a *Continuous* mover.

TrueCopy is a remote replication technology, so the Hitachi *Block Device* node shown on the data flow is the where the destination secondary volume (S-VOL) is located. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Path-Replicate* policy to the *OS Host* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).

7. Assign the *Replicate* operation to the Hitachi *Block Device* node.

The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

8. Set the replication type to **Synchronous Remote Clone**, then choose a **Pool** from one of the available *Dynamic Pools*. Leave the remaining parameters at their default settings and click **OK**.

9. Compile and activate the data flow, checking carefully that there are no errors or warnings.

See [How to activate a data flow \(on page 229\)](#).

10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create and then maintain the replication according to the policy.

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- An initial replication job appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and maintained.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A TrueCopy replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and will be updated as and when writes to the primary are made.

How to replicate a file system with Global-Active Device

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices. Note that for a Global-Active Device replication, the source and destination LDEVs are located on different devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A Global-Active Device hardware replication of the P-VOL is created as an S-VOL residing within a different storage device. For more information, refer to [About Global-Active Device replication \(on page 78\)](#). The data flow and policy are as follows:

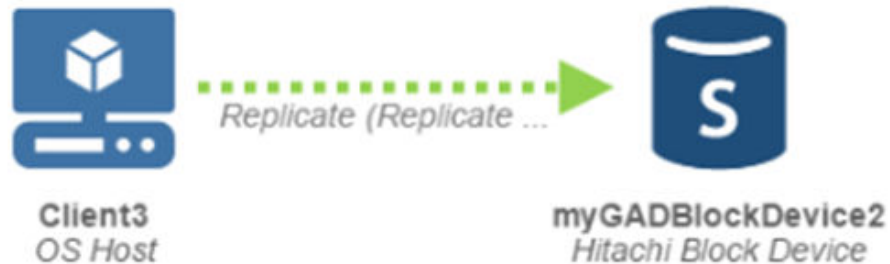


Figure 60 Global-Active Device Replication Data Flow

Table 15 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-----------------|---|--|
| Replicate | Refresh Options | Select a schedule for 'Refresh on schedule' | OS Host, Secondary Hitachi Block Device |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the primary LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary and secondary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.
These nodes are used by Protector to orchestrate replication of the primary LDEV to the secondary and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.
3. Create new primary and secondary Hitachi Block Device nodes (unless ones already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.
The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The secondary Hitachi Block Device node appears in the replication data flow as the destination node. The primary Hitachi Block Device node is represented in the data flow by the *OS Host* node where the primary LDEV is mounted.
4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)
 - a. Define a Path classification using the [Path Classification Wizard \(on page 634\)](#).
The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).
 - b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).
When an application is used to automatically select the PVOLs used in this continuous replication a trigger schedule can be defined that invokes the application to re-evaluate the PVOLs involved.
5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the secondary Hitachi *Block Device* via a *Continuous* mover.
Global-Active Device is a remote replication technology, so the Hitachi *Block Device* node shown on the data flow is the where the destination (S-VOL) volume is located. See [How to create a data flow \(on page 225\)](#).
6. Assign the *Path-Replicate* policy to the *OS Host* source node.
See [How to apply a policy to nodes on a data flow \(on page 228\)](#).
7. Assign the *Replicate* operation to the Hitachi *Block Device* node.
The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.
8. Set the replication type to **Active-Active Remote Clone**, then:
 - a. Choose a **Pool** from one of the available *Dynamic Pools*.
 - b. Choose a **Target Quorum** from one of those listed.
 - c. Leave the remaining parameters at their default settings and click **OK**.
9. Compile and activate the data flow, checking carefully that there are no errors or warnings.
See [How to activate a data flow \(on page 229\)](#).
10. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).
The policy will be invoked automatically to create and then maintain the replication according to the policy.

11. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- An initial replication job appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

12. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and maintained.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A Global-Active Device replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and will be updated as and when writes to the primary or secondary are made.

How to implement 3DC multi-target with delta UR replication

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for primary, secondary and tertiary Hitachi Block storage devices. Note that for GAD, TC and UR replications, the source and destination LDEVs are located on different devices.
- The primary, secondary and tertiary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when protecting data that resides on a file system created on an LDEV allocated from a Hitachi Block storage device. A GAD or TC replication of the P-VOL at the primary site is created as an S-VOL at the secondary site. A UR replication of the P-VOL is created as an S-VOL at the tertiary site. A Delta UR replication is created between the S-VOLs at the secondary and tertiary sites (this remains suspended unless primary site failure occurs). For more information, refer to [About three datacentre multi-target with delta \(on page 82\)](#).



Note: Protector currently only supports the setup of *3DC Multi-target with Delta Replication*. In the event of a primary, secondary or tertiary site failure, the [Monitor Details \(on page 460\)](#) data flow will display notifications indicating any problems with the corresponding movers, and appropriate messages will appear in the [Logs Inventory \(on page 448\)](#).

- For primary site failure:
 1. The *Delta* UR failover link will be invoked automatically by the underlying hardware storage devices to provide near immediate protection of the secondary site.
 2. The data flow should be dissociated from Protector before the hardware storage devices are recovered, following procedures defined in the relevant storage device operating manuals. See [How to dissociate a replication from Protector \(on page 209\)](#).
 3. The data flow for the recovered replication should be re-adopt into Protector and re-activated. See [How to adopt a replication into Protector \(on page 206\)](#)
- For secondary or tertiary site failure, the data flow should remain actived in Protector. Once the hardware storage devices are recovered, Protector will clear its notifications and resume.

The data flow and policy are as follows:

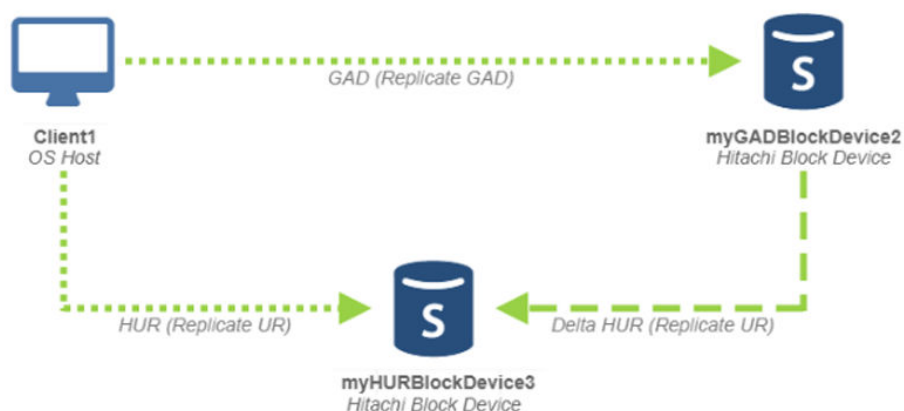


Figure 61 3DC Multi-target with Delta Replication Data Flow

Table 16 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-------------|---|--|
| Replicate | Run Options | N/A (GAD is a continuous replication, so the Run option is ignored) | Secondary Hitachi Block Device (from the primary) |
| Replicate | Run Options | N/A (UR is a continuous replication, so the Run option is ignored) | Tertiary Hitachi Block Device (from the primary) |
| Replicate | Run Options | N/A (Delta UR is a continuous replication, so the Run option is ignored) | Tertiary Hitachi Block Device (from the secondary) |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the primary LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary, secondary and tertiary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.

These nodes are used by Protector to orchestrate replication of the primary LDEV to the secondary and tertiary sites, and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.

3. Create new primary, secondary and tertiary Hitachi Block Device nodes (unless ones already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The secondary and tertiary Hitachi Block Device nodes appear in the replication data flow as the destination nodes. The primary Hitachi Block Device node is represented in the data flow by the *OS Host* node where the primary LDEV is mounted.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)

- a. Define a Path classification using the [Path Classification Wizard \(on page 634\)](#).

The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define three *Replicate* operations (these represent the primary to secondary GAD or UR, primary to tertiary UR and secondary to tertiary Delta UR replications) using the [Replicate Operation Wizard \(on page 643\)](#).

GAD and UR replications run as continuous operations and thus no schedule needs to be defined.

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the secondary and tertiary Hitachi *Block Devices* via *Continuous* movers, and the secondary connected to the tertiary Hitachi *Block Device* via a *Failover* mover.

GAD and UR are remote replication technologies, so the Hitachi *Block Device* nodes shown on the data flow are where the secondary and tertiary destination (S-VOL) volumes are located. See [How to create a data flow \(on page 225\)](#).

6. Assign the *Path-Replicate* policy to the *OS Host* source node.

See [How to apply a policy to nodes on a data flow \(on page 228\)](#).


7. Assign the first *Replicate* operation to the secondary Hitachi *Block Device* node. The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.

8. Set the replication type to **Active-Active Remote Clone**, then:

- a. Choose a **Pool** from one of the available *Dynamic Pools*.

- b. Choose a **Target Quorum** from one of those listed.
 - c. Leave the remaining parameters at their default settings and click **OK**.
9. Assign the second *Replicate* operation to the tertiary Hitachi *Block Device* node. The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.
10. Set the replication type to **Asynchronous Remote Clone**, then:
 - a. Choose a **Pool** from one of the available *Dynamic Pools*.
 - b. Choose a **Source Journal** from one of those listed for the primary node.
 - c. Choose a **Destination Journal** from one of those listed.
 - d. Leave the remaining parameters at their default settings and click **OK**.
11. Assign the third *Replicate* operation to the tertiary Hitachi *Block Device* node. The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.
12. Set the replication type to **Asynchronous Remote Failover**, then:
 - a. Choose a **Pool** from one of the available *Dynamic Pools*.
 - b. Choose a **Source Journal** from one of those listed for the tertiary node.
 - c. Leave the remaining parameters at their default settings and click **OK**.

Protector will automatically use the same **Destination Journal** as selected for the **Asynchronous Remote Clone** replication configured in the preceding steps.

 **Note:** If you specify a **Mirror Unit** for this **Asynchronous Remote Failover** replication, then it must differ from the one selected for the **Asynchronous Remote Clone** replication in the preceding steps.
13. Compile and activate the data flow, checking carefully that there are no errors or warnings.
See [How to activate a data flow \(on page 229\)](#).
14. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).
The policy will be invoked automatically to create and then maintain the replication accordingly.
15. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.
For a healthy data flow you will periodically see:
 - Initial replication jobs appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
 - Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
 - Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

16. Review the status of each Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the GAD and UR replications are being created and maintained. Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication processes can be paused and resumed from here if required.

There will be three replication records in the [Hitachi Block Replications Inventory \(on page 777\)](#) corresponding to the GAD, the active UR and the suspended failover UR replication.

How to synchronize snapshots with a replication

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices. Note that for a TrueCopy replication, the source and destination LDEVs are located on different devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task demonstrates how snapshot and replication operations can be synchronized with one another to ensure that all are performed at the same point in time and thus capture the identical state of the source data. For more information refer to [About synchronization groups \(on page 101\)](#).

Here, a TrueCopy replication of the P-VOL is created as an S-VOL residing within a different storage device. Synchronized TI snapshots are then created on the primary and secondary Block Storage devices. For more information, refer to [About local and remote snapshots \(on page 86\)](#). The data flow and policy are as follows:



Figure 62 TrueCopy Replication with Local and Remote Thin Image Snapshots Data Flow

Table 17 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|-------------------------------|---------------|---|--|
| Replicate | Run Options | N/A (TrueCopy is a continuous replication, so the Run option is ignored) | OS Host, Secondary Hitachi Block Device |
| Snapshot (on local device) | Mode | Hardware | OS Host |
| | Hardware Type | Hitachi Block | |
| | Retention | 2 hour | |
| | RPO | 10 mins | |
| | Run Options | Run on Schedule (see synch group schedule below) | |

| Operation Type | Parameter | Value | Assigned Nodes |
|--------------------------------|---------------|---|-----------------------------------|
| Snapshot (on remote device) | Mode | Hardware | Secondary Hitachi Block Device |
| | Hardware Type | Hitachi Block | |
| | Retention | 1 hours (this can differ from the local snapshot) | |
| | RPO | 10 mins (this must match the local snapshot) | |
| | Run Options | Run on Schedule (see synch group schedule below) | |

Table 18 Synchronization Group Schedule

| Schedule Item Type | Parameter | Value | Policy Operations |
|--------------------|--|-------|--|
| Trigger | N/A (this schedule defines a synchronization group name for local and remote snapshots. All parameters are ignored.) | N/A | Snapshot (local), Snapshot (remote) |

Procedure

1. Locate the source node in the [Nodes Inventory \(on page 476\)](#) and check that it is authorized and online. This node is where the primary LDEV to be replicated is mounted.

For a file system replication using a *Path* classification, a basic *OS Host* node is required. It is not necessary to create the source node in this case since all Protector client nodes default to this type when installed. See [How to authorize a node \(on page 258\)](#).

2. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary and secondary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.

These nodes are used by Protector to orchestrate replication of the primary LDEV to the secondary and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.

3. Create new primary and secondary Hitachi Block Device nodes (unless ones already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The secondary Hitachi Block Device node appears in the replication data flow as the destination node. The primary Hitachi Block Device node is represented in the data flow by the *OS Host* node where the primary LDEV is mounted.

4. Define a policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). This policy contains operations for the replication, local and remote snapshots. See [How to create a policy \(on page 265\)](#)

- a. Define a Path classification using the [Path Classification Wizard \(on page 634\)](#).

The *Path* classification is grouped under **Physical** in the [Policy Wizard \(on page 595\)](#).

- b. Define a *Replicate* operation using the [Replicate Operation Wizard \(on page 643\)](#).

TrueCopy replication runs as a continuous operation and thus no schedule needs to be defined.

- c. Define a local *Snapshot* operation using the [Snapshot Operation Wizard \(on page 645\)](#).

Thin Image snapshots run based on the RPO. However we also want to synchronize the local and remote snapshots. This is done by defining a trigger schedule that is applied to both the local and remote snapshot operations.

- d. Define a *Trigger* schedule using the [Schedule Wizard \(on page 749\)](#); accessed by clicking on **Manage Schedules** in the [Snapshot Operation Wizard \(on page 645\)](#) for the local snapshot.



Only the trigger schedule name is required; the parameters are not relevant here since the RPO of the local snapshot dictates when the local and remote snapshot operations are triggered. See [How to create a schedule \(on page 272\)](#).

- e. Define a remote *Snapshot* operation using the [Snapshot Operation Wizard \(on page 645\)](#).

To synchronize the local and remote snapshots, apply the same trigger schedule to this snapshot operation that was applied to the local snapshot operation.



Note: The local and remote snapshots must have the same RPO, otherwise a rules compiler error will be generated.

5. Draw a data flow as shown in the figure above using the [Data Flow Wizard \(on page 356\)](#), that shows the *OS Host* source node connected to the secondary Hitachi *Block Device* via a *Continuous* mover.
TrueCopy is a remote replication technology, so the Hitachi *Block Device* node shown on the data flow is the where the destination (S-VOL) volume is located. See [How to create a data flow \(on page 225\)](#).
6. Assign the *Path-Replicate-Snapshot-Snapshot* policy to the *OS Host* source node.
See [How to apply a policy to nodes on a data flow \(on page 228\)](#).
7. Assign the local *Snapshot* operation to the *OS Host* source node.
The [Hitachi Block Snapshot Configuration Wizard \(on page 373\)](#) is displayed.
8. Select the **Snapshot Pool** by selecting one of the available Thin Image or hybrid pools.
9. Leave the remaining **Advanced Options** at their default settings, then click **OK**.
The snapshot icon  is now shown superimposed over the source node.
10. Assign the remote *Snapshot* operation to the remote Hitachi *Block Device* node.
The [Hitachi Block Snapshot Configuration Wizard \(on page 373\)](#) is displayed.
11. Select the **Snapshot Pool** by selecting one of the available Thin Image or hybrid pools.
12. Leave the remaining **Advanced Options** at their default settings, then click **OK**.
The snapshot icon  is now shown superimposed over the source node.
13. Assign the *Replicate* operation to the remote Hitachi *Block Device* node.
The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.
14. Set the replication type to **Synchronous Remote Clone**, then choose a **Pool** from one of the available *Dynamic Pools*. Leave the remaining parameters at their default settings and click **OK**.
15. Compile and activate the data flow, checking carefully that there are no errors or warnings.
See [How to activate a data flow \(on page 229\)](#).
16. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).
The policy will be invoked automatically to create and then maintain the replication according to the policy. Snapshot operations will be triggered synchronously on the source and destination nodes according to the RPO.
17. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.
For a healthy data flow you will periodically see:
 - An initial replication job appearing in the **Jobs** area below the data flow that cycles through stages and ends in *Progress - Completed*.
 - Repeated replication and snapshot jobs appearing for the source node in the **Jobs** area triggered according to the RPO.
 - Repeated snapshot jobs appearing for the destination node in the **Jobs** area synchronized to the local snapshot.

- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

18. Review the status of the local and remote Hitachi *Block Devices* via the relevant [Hitachi Block Device Details \(on page 757\)](#) to ensure the replication and snapshots are being created and maintained.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

The replication process can be paused and resumed from here if required.

A TrueCopy replication will appear in the remote [Hitachi Block Replications Inventory \(on page 777\)](#) and will be updated as and when writes to the primary are made. New snapshots will appear in the local and remote [Hitachi Block Snapshots Inventory \(on page 767\)](#) periodically as dictated by the RPO of the policy. Old snapshots will be removed periodically as dictated by the *Retention Period* of the policy.

How to automatically mount a snapshot or replication

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the source node where the production Hitachi Block LDEV is mounted. Note that the LDEV is actually located on the primary Hitachi Block storage device.
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices. Note that for a TrueCopy replication, the source and destination LDEVs are located on different devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).

This task describes the steps to follow when replicating data on an a Hitachi Block storage LDEV, then using the replication for repurposing or performing a proxy backup. A TrueCopy replication of the P-VOL is created as an S-VOL and the S-VOL is then automatically mounted on a designated host machine. For more information, refer to [About TrueCopy replication \(on page 76\)](#) and [About the automated Mount operation \(on page 102\)](#). The data flow and policy is as follows:



Figure 63 TrueCopy Replication and Automated Mount Data Flow

Table 19 Path Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------|--|
| Path | Include | E:\testdata (E: is where the Hitachi Block LDEV is mounted) |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|----------------|---|--|
| Replicate | Run Options | N/A (TrueCopy is a continuous replication, so the Run option is ignored) | OS Host, Secondary Hitachi Block Device |
| Mount | Run Options | Run on Schedule (see schedule below) | Secondary Hitachi Block Device |
| | Source Options | Pre Script Post Script (scripts are user defined and | |

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-----------|------------------------|----------------|
| | | application dependent) | |

| Schedule Item Type | Parameter | Value | Policy Operations |
|--------------------|------------|----------------|----------------------|
| Trigger Time | Days | Select All | Mount (See above) |
| | Weeks | Select All | |
| | Time | Scheduled Time | |
| | Start Time | 13:00 | |
| | Duration | 00:00 | |

Procedure

- Follow the steps shown in [How to replicate a file system with TrueCopy \(on page 179\)](#) to create a TrueCopy replication, but with the addition of the Mount operation as follows:
- Add the Mount operation to the *Path-Replicate* policy as shown in the table above using the [Policy Wizard \(on page 595\)](#). See [How to create a policy \(on page 265\)](#)
 - Define a *Mount* operation using the [Mount Operation Wizard \(on page 642\)](#).
The Mount operation is initiated using a *Trigger* schedule.
 - Define the *Trigger* schedule shown in the table above, using the [Schedule Wizard \(on page 749\)](#) which is accessed by clicking on **Manage Schedules**.
See [How to create a schedule \(on page 272\)](#).
- Assign the *Mount* operation to the Hitachi *Block Device* node.
The [Hitachi Block Mount Configuration Wizard \(on page 433\)](#) is displayed.
- Set the mount operation type set to **Proxy Backup** and click **Next**.
Proxy Backup can be used in conjunction with a continuous replication because it only pauses the replication while the proxy backup script is running.
- Set the mount level to **OS** and click **Next**.
- Set the **Host** to the node where the replication S-VOL is to be mounted and click **Next**.
- Set the **Mount Location** to **Drive starting at letter**, select an available drive letter, then click **Finish**.
- Compile and activate the data flow, checking carefully that there are no errors.
A compiler warning (10366) will be generated stating that the replication will stop copying data to the destination while performing the proxy backup. This is expected behaviour. See [How to activate a data flow \(on page 229\)](#).

9. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).

The policy will be invoked automatically to create and then maintain the replication according to the policy. The proxy backup operation will run based on the specified schedule, pausing the replication while it executes.

10. Watch the active data flow via the [Monitor Details \(on page 460\)](#) to ensure the policy is operating as expected.

For a healthy data flow you will periodically see:

- An initial replication job appearing in the **Jobs** area below the data flow that cycle through stages and ending in *Progress - Completed*.
- Information messages appearing in the **Logs** area below the data flow indicating rules activation, storage handler and sequencer events.
- Attachments to storage handler log events confirming which volumes are being replicated.

For a problematic data flow you may see:

- Permanent **Node Status** icons appear over nodes and associated warning messages displayed to the right of the data flow area.
- Backup jobs appearing in the **Jobs** area below the data flow that cycle through stages and terminating in *Progress - Failed*.
- Warning and error messages appearing in the **Logs** area below the data flow indicating failed events.

11. Review the status of the Hitachi *Block Device* via the relevant [Hitachi Block Device Details \(on page 757\)](#) and replications via the [Hitachi Block Replications Inventory \(on page 777\)](#), to ensure the replication is being created and maintained.

Hitachi Block Devices require ongoing surveillance to ensure that they are operating correctly and sufficient resources are available to store your data securely. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

A TrueCopy replication will appear in the [Hitachi Block Replications Inventory \(on page 777\)](#) and will be updated as and when writes to the primary are made.

How to mount an Hitachi block snapshot or replication

Before you begin

It is assumed that a file system path policy that creates hardware snapshots or a replication has been implemented and that at least one snapshot or replication has been created on the designated Block storage device. See [How to snapshot a file system with Thin Image \(on page 157\)](#) or [How to replicate a file system with ShadowImage \(on page 167\)](#) for an example of how to do this.



Note: It is not possible to mount the S-VOL of a GAD replication, paused or otherwise.

This task describes the steps to follow when mounting a file system path snapshot or replication from a Block storage device to the node other than the one from which it originated:

Procedure

1. Identify the destination where the data set is to be restored. Here we will *mount* a snapshot or replication to a destination machine and volume.
Depending on the scenario, you can mount the snapshot or replication to its original node as a different volume or to a different node entirely. You can control the level of the mount operation so that the snapshot is added to a host group, through to mounting to the host OS.
2. Ensure that the restore location is prepared to receive the snapshot or replication data set by locating the node in the [Nodes Inventory \(on page 476\)](#) and checking it is authorized and online.



Note:

- For **Host** and **OS** level mounting, the mount location must have Protector Client software installed.
- **SAN** level mount does not specify a host so Protector Client software does not need to be installed.

3. Locate the data set to be mounted by navigating to the [Hitachi Block Snapshots Inventory \(on page 767\)](#) or [Hitachi Block Replications Inventory \(on page 777\)](#) for the Hitachi Block storage device in question.
See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).
4. Select the snapshot or replication that you want to mount, then click **Mount** to open the [Hitachi Block Snapshot or Replication Mount Wizard \(on page 695\)](#).
 - a. Select the mount level (**SAN**, **Host** or **OS**).
 - b. Choose **Automatically discover** or a **Selected Host Group**.
 - c. For **SAN** mount click **Finish**, for other mount types click **Next**.
 - d. Specify the **Host** (i.e. the target machine).
 - e. For **Host** mount click **Finish**, for **OS** mount click **Next**.
 - f. Specify the **Mount Location**.
 - g. For **OS** mount click **Finish**.


The [Jobs Inventory \(on page 441\)](#) is displayed and a mount job will appear that cycles through stages and ending in *Progress - Completed*.

5. Once the mount process is complete, further steps may be needed to fix-up the data set before using it. In this example we will assume that no additional work is required other than inspecting the restored data on the target machine.

The amount of fix-up work required depends on the applications accessing the restored data.



Note: This example mounts data created using a *Path* classification. If you are backing up one of the application types directly supported by Protector, then you should use one of the *Application* classifications and refer to the appropriate Application Guide listed in [Related documents \(on page 16\)](#).

6. Mounted snapshots or replications have a mount icon  displayed on the corresponding tile in the [Hitachi Block Snapshots Inventory \(on page 767\)](#) or [Hitachi](#)

[Block Replications Inventory \(on page 777\)](#). Once the mounted snapshot or replication is finished with, click **Unmount** to unmount it.

How to revert a file system path from a snapshot or local replication

Before you begin

It is assumed that a file system path policy that creates snapshots (TI) or a local replication (RTI or SI) has been implemented and that at least one snapshot or replication has been created on the designated Block storage device. See [How to snapshot a file system with Thin Image \(on page 157\)](#), [How to replicate a file system with Refreshed Thin Image \(on page 171\)](#) or [How to replicate a file system with ShadowImage \(on page 167\)](#) for an example of how to do this.

This task describes the steps to follow when reverting a file system path snapshot or local replication from a Block storage device to the node from which the snapshot originated:

Procedure

1. Identify the destination where the data set is to be restored. You can only *revert* the snapshot or local replication to its original node and volume, so the destination will be the same machine and volume from which the data originated.
2. Ensure that the restore location is prepared to receive the reverted data set by locating the node in the [Nodes Inventory \(on page 476\)](#) and checking it is authorized and online. The revert location must have Protector Client software installed.
3. Stop any applications that access the revert location and ensure the filesystem is unmounted from the OS.
For supported applications, these additional steps are described in the appropriate Application Guide (see [Related documents \(on page 16\)](#)). For other applications, consult the vendor's documentation.
4. The existing snapshot or local replication operation (and any replications immediately up and downstream of it) should be paused while revert is performed.



Caution: If snapshots and replications are combined on a data flow it is not possible to deactivate the scheduling of snapshots without also tearing down any replications on that data flow.

See [How to deactivate an active data flow \(on page 257\)](#).

5. Locate the data set to be reverted by navigating to the [Hitachi Block Snapshots Inventory \(on page 767\)](#) or [Hitachi Block Replications Inventory \(on page 777\)](#) for the Hitachi Block storage device in question.

See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).

6. Select the snapshot or local replication that you want to revert to, then click **Revert** to open the [Hitachi Block Revert Wizard \(on page 716\)](#). The word 'REVERT' must be typed in to enable the revert operation to proceed.



Caution: The process of reverting data will result in the overwriting of all of the original data that exists on the revert location.

Ensure that any critical data is copied to a safe location or is included in the data set being restored.

7. Once the revert process is complete, further steps may be needed to fix-up the data set before using it. In this example we will assume that no additional work is required other than inspecting the restored data on the target machine.



Note: When reverting a volume on a Windows machine, it is necessary to perform a reboot to ensure the volume is remounted correctly. For dynamic disks, if the reverted volume's status is indicated as '*Healthy (At Risk)*' then it will be necessary to **Offline** then **Online** the volume via the Windows **Disk Management** console.

The amount of fix-up work required depends on the applications accessing the restored data.



Note: This example restores data created using a *Path* classification. If you are backing up one of the application types directly supported by Protector, then you should use one of the *Application* classifications and refer to the appropriate Application Guide listed in [Related documents \(on page 16\)](#).

8. Restart any applications that access the restored data.
For supported applications, these additional steps are described in the appropriate Application Guide (see [Related documents \(on page 16\)](#)). For other applications, consult the vendor's documentation.
9. Resume any backup policies for the reverted data set.
Data flows can be reactivated via the [Data Flows Inventory \(on page 350\)](#).

How to swap (takeover/takeback) a replication

Before you begin

It is assumed that you have implemented a simple file system path, active-passive (i.e. TC or UR) replication policy with production applications accessing the primary volume(s) of the replication pair. See [How to replicate a file system with TrueCopy \(on page 179\)](#) for an example of how to do this.

If you are swapping an active-active (GAD) replication then additional steps may be required, especially if using a cross-path setup (refer to [About Hitachi block based replication swapping \(takeover/takeback\) \(on page 112\)](#) and [About Global-Active Device Cross Path \(on page 79\)](#)).

In the case of primary site maintenance, application failure, primary volume failure or disaster recovery, it may be necessary to move production to the secondary site, resolve the issue at the primary site and then move production back to the primary site.

Procedure

1. Move production from the primary to the secondary site by performing a *Swap* as follows:

- a. Stop any applications that access the primary volumes to be taken over and unmount the filesystem from the OS.
- b. Locate the replication to be taken over by navigating to the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) on the secondary device. See [How to view the status of a Hitachi Block storage device](#) (on page 274).

You will see that the replication's *Type* (displayed on the corresponding tile in the [Hitachi Block Replications Inventory](#) (on page 777)) is *Active Full Copy* and the *Swapped* state (displayed on the [Hitachi Block Replication Details \(Storage\)](#) (on page 780)) is *No*.

- c. From the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) click the **Swap** button.

The [Hitachi Block Replication Swap Wizard](#) (on page 720) will appear warning that swapping can cause data loss, however as long as access to the primary volumes has been stopped, it will be safe to proceed.

- d. Select a direction from the “*Direction*” dropdown. This is the intended final direction of the replication once the swap operation is complete.
- e. Type the word ' *SWAP* ' into the **Confirm Swap** field and click **OK**.

The [Jobs Inventory](#) (on page 441) is displayed and a new job will appear indicating that a *Swap Replication* operation is in progress. Click on the *Job Type* in the table to open the [Job Details](#) (on page 443) which list the log messages relating to the swap operation.

- f. Return to the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) and review the replication's status:
 - If the swap is successful then the *Swapped* state is set to *Yes*, indicating that the replication is now reversed (S-VOL to P-VOL) and is back in PAIR status. A *Swapped* status badge (see [Monitor Status Badges](#) (on page 470)) will also appear above the replication's mover on the [Monitor Details](#) (on page 460).
 - If the swap cannot be completed due to a P-VOL or data link fault then the *Swapped* state is set to *No* and *Suspend for Swap* state is set to *Yes*, indicating that the swap is not yet complete and is in SSWS status. Further action will be required on the primary block storage device or data link before the replication process can be re-established, but the secondary will be writeable.



Note: The flow direction of a replication pair should ONLY be determined by referring to the **Summary - Swapped** field on the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) for the secondary Block storage device. Primary and secondary volume information shown in the replications [Session Log Details](#) (on page 456) and associated [Log Attachments Dialog](#) (on page 458) should not be used to infer the flow direction following a swap.

- g. Start any applications that access the secondary volumes that have been taken over and resume production at the secondary site.
2. Perform any maintenance and recovery tasks at the primary site, resolve any faults with the data link between sites, then go back to the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) for the secondary to determine the status of the S-VOLs. Perform one of the following actions as appropriate:

- a. If the replication is *Swapped* (S-VOL status = PAIR) then proceed with moving production back to the primary site when ready, as detailed in step 3 below.
 - b. If the replication is *Suspended for Swap* (S-VOL status = SSWS) then click the **Unsuspend** button. The swap operation will be completed as described above. Production at the secondary site can now continue with replication to the primary site in operation.
 - c. If the S-VOL status is some value other than PAIR or SSWS then you will need to run the following CCI command sequence from outside Protector to recover the replication pairing: `pairsplit -R, pairsplit -S, paircreate`
3. Move production back to the primary site when ready to resume normal operations by performing a *Swap* as follows:
- a. Stop any applications that access the secondary volumes to be taken back.
 - b. Locate the replication to be taken back by navigating to the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) on the secondary device. See [How to view the status of a Hitachi Block storage device](#) (on page 274).
You will see that the replication's *Type* (displayed on the corresponding tile in the [Hitachi Block Replications Inventory](#) (on page 777)) is *Active Full Copy* and the *Swapped* state (displayed on the [Hitachi Block Replication Details \(Storage\)](#) (on page 780)) is *Yes*.
 - c. From the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) click the **Swap** button.
The [Hitachi Block Replication Swap Wizard](#) (on page 720) will appear warning that swapping can cause data loss, however as long as access to the secondary volumes has been stopped, it will be safe to proceed.
 - d. Type the word 'SWAP' into the **Confirm Swap** field and click **OK**.
The [Jobs Inventory](#) (on page 441) is displayed and a new job will appear indicating that a *Swap VSP Replication* operation is in progress. Click on the *Job Type* in the table to open the [Job Details](#) (on page 443) which list the log messages relating to the swap operation.
 - e. Return to the [Hitachi Block Replication Details \(Storage\)](#) (on page 780) and review the replication's status:
When the swap (takeback) is completed the *Swapped* state will be set to *No*, indicating that the replication is now normal (P-VOL to S-VOL) and is back in PAIR status. The *Swapped* status badge will disappear from above the replication's mover on the [Monitor Details](#) (on page 460).
 - f. Start any applications that access the primary volumes that have been taken back and resume production at the primary site.

How to expand a journal

Before you begin

It is assumed that you have one or more journals defined on the storage system and visible in the Journals inventory. (If the journal is not visible, then it may be necessary to manually refresh the inventory.)

If the journal is currently used by one or more replication pairs in PAIR/PAIR status, then it will be necessary to pause those replication pairs for the expansion to take full effect. Once expanded, the pairs can be resynchronized to PAIR/PAIR status, if desired.

Only journals composed of DP-VOLs can be resized by the product.

Procedure

1. If necessary, pause any replications using the journal to be expanded.
 - Replications managed by the product can be paused as described in [Hitachi Block Replications Inventory \(on page 777\)](#) and [Hitachi Block Replication Details \(Storage\) \(on page 780\)](#).
 - Replications not managed by the product will need to be manually paused using an external tool.
2. Locate the journal to be expanded, by navigating to one of the following locations:
 - the [Hitachi Block Journals Inventory \(on page 761\)](#) for the storage system that hosts the journal
 - the [Hitachi Block Journal Details \(on page 762\)](#) for the journal
 - [Hitachi Block Replication - Journals \(on page 785\)](#) for the replication that uses the journal
3. From any of these locations, click the Expand button. The [Figure 486 Hitachi Block Journal Expansion Dialog \(on page 762\)](#) will appear.
4. Enter a new size for the journal into the New Journal Size field, and click OK.
5. Go to the [Jobs Inventory \(on page 441\)](#) to ensure that a journal expansion job has been initiated, and wait for it to complete.
6. If the journal expansion is unsuccessful, review the [Logs Inventory \(on page 448\)](#) to find out why. The journal expansion operation must be re-initiated by the user once the problem is resolved.
7. If desired, resume any replications using the journal that was expanded.
 - Replications managed by the product can be resumed as described in [Hitachi Block Replications Inventory \(on page 777\)](#) and [Hitachi Block Replication Details \(Storage\) \(on page 780\)](#).
 - Replications not managed by the product will need to be manually resynchronized using an external tool.

How to delete a journal

Before you begin

It is assumed that you have one or more journals defined on the storage system and visible in the Journals inventory. (If the journal is not visible, then it may be necessary to manually refresh the inventory.)

If the journal is currently used by one or more replication pairs, then it cannot be deleted.

Only journals composed of DP-VOLs can be deleted by the product.

Procedure

1. Locate the journal to be expanded, by navigating to one of the following locations:
 - the [Hitachi Block Journals Inventory \(on page 761\)](#) for the storage system that hosts the journal
 - the [Hitachi Block Journal Details \(on page 762\)](#) for the journal
2. From any of these locations, click the Delete button. A confirmation dialog will appear.
3. Review the information presented and click OK.
4. Go to the [Jobs Inventory \(on page 441\)](#) to ensure that one journal deletion job has been initiated per selected journal, and wait for them to complete.
 - If a journal deletion is unsuccessful, review the [Logs Inventory \(on page 448\)](#) to find out why. Each journal deletion operation must be re-initiated by the user once the problem is resolved.

How to adopt a replication into Protector

Before you begin

It is assumed that the following tasks have been performed:

- The Protector Master software has been installed and licensed on a dedicated node. See [Installation Tasks \(on page 231\)](#) and [License Tasks \(on page 254\)](#).
- The Protector Client software has been installed on the nodes that will act as proxies for both primary and secondary Hitachi Block storage devices.
- The primary and secondary storage devices have been set up as per the Protector requirements and prerequisites. Refer to [Hitachi Block prerequisites \(on page 20\)](#).
- Permissions have been granted to enable the Protector UI, required activities and participating nodes to be accessed. In this example all nodes will be left in the default resource group, so there is no need to allocate nodes to user defined resource groups. Refer to [How to configure basic role based access control \(on page 210\)](#).
- Read [About Hitachi Block replication adoption \(on page 89\)](#) to understand how adoption works, its prerequisites, limitations and behaviour.

This task describes the steps to follow when adopting a replication that has been set up on the underlying hardware, outside of Protector. For more information, refer to [About Hitachi Block based backup technologies \(on page 66\)](#). The data flow and policy in this example are as follows:



Figure 64 Adopted TrueCopy Replication Data Flow

Table 20 Hitachi Block Replication Policy

| Classification Type | Parameter | Value |
|---------------------|-----------------|------------|
| Hitachi Block | Logical Devices | 212418/100 |
| | | 212418/101 |



Note: If you want to add source volumes to a replication policy after it has been adopted, then the Adopt existing replication option in the [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) must remain selected when you subsequently reactivate the data flow with the modified policy settings.

| Operation Type | Parameter | Value | Assigned Nodes |
|----------------|-------------|---|---|
| Replicate | Run Options | N/A (TrueCopy is a continuous replication, so the Run option is ignored) | Primary Hitachi Block Device, Secondary Hitachi Block Device |

To adopt a replication perform the following steps:

Procedure

1. Locate the nodes in the [Nodes Inventory \(on page 476\)](#) that will control the primary and secondary Hitachi Block Devices via CMD (Command Device) interfaces and check that they are authorized and online.

These nodes are used by Protector to orchestrate replication of the primary LDEV(s) to the secondary LDEV(s) and are identified as the **Proxy Node** when creating the primary and secondary Hitachi Block Device nodes in the next step. These nodes are known as ISM nodes. The ISM nodes do not appear in the data flow.

2. Create new primary and secondary Hitachi Block Device nodes (unless ones already exists) using the [Hitachi Block Device Node Wizard \(on page 513\)](#) and check that they are authorized and online.

The Hitachi *Block Device* node type is grouped under **Storage** in the [Node Type Wizard \(on page 479\)](#). See [How to add a node \(on page 258\)](#) and [How to authorize a node \(on page 258\)](#). The primary and secondary Hitachi Block Device nodes appear in the replication data flow as the source and destination nodes.


3. In the [Policies Inventory \(on page 594\)](#), create a new policy. See [How to create a policy \(on page 265\)](#)
 - a. Add an Hitachi Block classification, select **Specify additional selections** and specify the LDEV(s) or Host Group of the primary volume(s) in the **Logical Devices** field.
 - b. Add a **Replicate** operation. Select **Run on Schedule** and define a suitable schedule if a batch replication is being adopted.
 - c. Click **Finish** to create the policy.
4. In the [Data Flows Inventory \(on page 350\)](#), create the replication data flow, corresponding to the one you want to adopt. See [How to create a data flow \(on page 225\)](#).
 - a. Place the corresponding Hitachi *Block* source and destination nodes in the Data Flow workspace.
 - b. Connect the two nodes using a **Batch** or **Continuous** mover, as appropriate to the replication type being adopted.
 - c. Select the source node and assign the Hitachi *Block-Replicate* policy defined above.
 - d. Select the destination node and assign the *Replicate* operation. The [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed.
 - e. Select the type of replication on the left hand side of the dialog and then the **Adopt existing replication** option on the right.



Note: Refreshed Snapshot replications using Thin Image cannot be adopted.

Only the fields required for identifying the adopted replication are enabled. Those that have been disabled will be populated automatically once the replication has been adopted. Refer to the table in [About Hitachi Block replication adoption \(on page 89\)](#) to understand how the policy and data flow attributes are interpreted during the adoption process.

- f. Enter the parameters required to identify the adopted replication on the hardware.
5. Compile and activate the data flow, checking carefully that there are no errors or warnings.
See [How to activate a data flow \(on page 229\)](#).
6. Locate the active data flow in the [Monitor Inventory \(on page 459\)](#) and open its [Monitor Details \(on page 460\)](#).
 - a. If you are adopting a batch replication, select the source node and click **Trigger Operation**. The [Trigger Operation Dialog \(on page 470\)](#) is displayed.

- b. Select the replication operation and click **OK** to trigger it.
7. Go to the [Logs Inventory \(on page 448\)](#), identify the corresponding session and open the [Session Log Details \(on page 456\)](#) by clicking  **View Session** to the left of one of the related message.
If the adoption did not complete successfully, you will see one or more of the log messages listed in the table in [About Hitachi Block replication adoption \(on page 89\)](#). Make the necessary changes to the data flow and/or policies, recompile and activate the rules and try again.
8. Once the adoption process has completed successfully, go to the [Hitachi Block Replication Details \(Storage\) \(on page 780\)](#) for the corresponding replication and review the information to ensure that the desired replication has been adopted. See [How to view the status of a Hitachi Block storage device \(on page 274\)](#).
The secondary LDEVs are listed under **Phase - Logical Devices**. The **Adopted** attribute will be set to *true*.
If the wrong replication was adopted because the wrong *Mirror Unit* number was specified, it can be changed in the [Data Flow Wizard \(on page 356\)](#). Recompile and activate the rules and adopt the correct replication. The previously (erroneously) adopted replication will be left intact on the hardware but discarded by Protector.

How to dissociate a replication from Protector

An Hitachi block replication that has been defined within Ops Center Protector can be dissociated without it being removed from the underlying hardware.

Procedure

1. Go to the [Hitachi Block Replications Inventory \(on page 777\)](#) or [Hitachi Block Replication Details \(Storage\) \(on page 780\)](#) and locate the adopted replication that you want to dissociate.
2. Select the replication(s) and select **Dissociate** from the context menu.
3. A warning dialog is displayed. If you are sure you want to proceed then type the word 'DISSOCIATE' then click **OK**.
The replication entry is immediately removed from the list. However the dissociated data flow and policy definition will remain and must also be removed.
4. Go to the [Data Flows Inventory \(on page 350\)](#) and delete the dissociated data flows (assuming they are not involved in other policies still being managed by Protector).
5. Go to the [Policies Inventory \(on page 594\)](#) and delete the policies for the dissociated replications (assuming they are not involved in other policies still being managed by Protector).

Chapter 4: Tasks

This chapter describes, step by step, the tasks that users will perform to install, configure and operate Ops Center Protector.



Tip: Refer to [Button Icons \(on page 288\)](#) to find the icons associated with the control names used in the step-by-step guides.

Access Control Tasks

This section describes access control tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Access Control Concepts \(on page 123\)](#)
- [Access Control UI Reference \(on page 301\)](#)

How to configure basic role based access control

Before you begin

You will need to have:

- A Protector account with *Default Administrator* ACP authority. You will already have a `<Username>@Master` login with this authority if you installed Protector on the Master node. If you do not have an account with this authority then you will need to request one from your Protector administrator.
- Knowledge of users and user groups who require access to Protector and their data protection roles and responsibilities.
- The details of any authentication services that you intend to use to authenticate Protector users (e.g. Active Directory, LDAP, RADIUS etc.)

Refer to [Access Control Concepts \(on page 123\)](#) and [Access Control UI Reference \(on page 301\)](#) for further information.

Protector implements RBAC to control what actions users can perform on which resources. The RBAC implementation is extremely flexible and can be configured to be as open or restrictive as an organization demands.

This procedure will allow you to get up and running quickly, however to fully utilize RBAC's features you will need to setup a more advanced RBAC implementation. Refer to [How to configure advanced role based access control \(on page 212\)](#) for details on how to do this.

Protector includes the following built-in access control objects:

- The *'default'* Resource Group that all Protector nodes are a member of by default.
- The Roles:
 - Protector *Admin* that can perform all activities.
 - Protector *Security Manager* that can perform all access control activities.
 - Protector *Operator* that can view all resources and perform restore activities.
- The Access Control Profile:
 - *Default Administrator* that can perform all activities on all (*default*) resources.
- The *'Master'* Authentication Space that represents the local authentication service on the Master node's OS.
- The following Access Control Profile Association (depending on the *UserName* of the account on the Master node specified when Protector was installed):
 - *<UserName>@Master* that represents a user that has *Default Administrator* privileges.

This topic explains how to implement a basic RBAC policy:

Procedure

1. Use a web browser to log on to the Protector user interface at: `https://<Master>`, where *<Master>* is the IP address or DNS name of the Master node. The [Login Page \(on page 301\)](#) will be displayed.
2. Enter the username `<UserName>@master` and the associated password to log in with *Default Administrator* privileges.
3. Click the **Access Control** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Access Control Dashboard \(on page 302\)](#).
4. Create an Authentication Space that represents your organization's existing authentication service (see [How to create an Authentication Space \(on page 218\)](#)).
5. Create ACP Associations for each user, group or entire authentication space that requires access to Protector, using one of the built-in Access Control Profiles (see [How to create an Access Control Profile Association \(on page 223\)](#)).

You can create your own ACPs or clone an existing ACP and make changes to the clone (see [How to create an access control profile \(on page 217\)](#) and [How to clone an access control profile \(on page 217\)](#)).

6. It is recommended that the default ACP Association *<UserName>@master* is replaced with your own ACP associations, using dedicated usernames created in your organization's domain.

The default ACP Association cannot be deleted, but can be rendered unusable when the corresponding local Windows account is disabled. In the event that administrators are locked out from Protector due to access control configuration issues, this ACP Association is available as a way back in, by re-enabling the local Windows account.

**Caution:**

- The default ACP Association is generated automatically when Protector is installed, to enable initial configuration of access control features. This is based on the local Windows account specified during installation.
- The default `<Username>@Master` ACP association should be assigned to a user with the specific responsibility as the primary Protector administrator, to ensure security is not compromised.
- Access to the Master node should be strictly controlled to prevent malicious access to the Protector executables and associated configuration data.

How to configure advanced role based access control

Before you begin

You will need to have:

- A Protector account with *Default Administrator* authority. You will already have an `<Username>@master` login with this authority if you installed Protector on the Master node. If you do not have an account with this authority then you will need to request one from your Protector administrator.
- A good understanding of your organization's computing resources and the way they are managed and grouped into departments.
- Knowledge of where computing resource will be backed up to (i.e. the storage devices to be used).
- Knowledge of users and user groups who require access to Protector and their data protection roles and responsibilities.
- The details of any authentication services that you intend to use to authenticate Protector users (e.g. Active Directory, LDAP, RADIUS etc.)

Refer to [Access Control Concepts \(on page 123\)](#) and [Access Control UI Reference \(on page 301\)](#) for further information.

Protector implements Role Based Access Control (RBAC) to ensure that only those users with sufficient privileges can view or modify resources. The RBAC implementation is extremely flexible and can be configured to be as open or restrictive as an organization demands.

If you require only a basic RBAC implementation then refer to [How to configure basic role based access control \(on page 210\)](#)

Alternatively, custom roles and resource groups can be created that precisely control the nodes that are visible and the operations that can be performed on them. This topic explains how to plan and implement a custom RBAC policy:

Procedure

1. Identify the computing resources within your organisation, based on geographical, divisional, departmental, functional and project groupings.

These resources may be managed locally and/or centrally and this will also dictate how they are grouped together, for the purposes of access control when:

- Designing data protection policies and data flows
- Monitoring and reporting Protector performance
- Allocating and monitoring backup storage resources
- Auditing for compliance
- Administrating security and access controls
- Repurposing data for test and development
- Executing restore and disaster recovery procedures

For example, you might need to create the following resource groups in addition to the built-in *default* group:

(The names in this example are designed only to help illustrate how the RBAC objects are assembled into hierarchies).

- groupAccountsGlobal
- groupLegalGlobal
- groupHumanResourcesUS
- groupHumanResourcesUK
- groupDevelopmentUK
- groupProductionPrimaryUS
- groupProductionSecondaryUS

For guidance, refer to [How to create a resource group \(on page 216\)](#).

2. Identify the generic roles (not the individuals) required within your organisation for administering computing resources and the associated data protection processes.

For example, you might need to create the following roles based on, or in addition to, the built-in roles:

- roleBackupAdmin
- roleComplianceAuditor
- roleSecurityAdmin
- roleDevelopmentLead
- roleProtectorUser

3. Define precisely what activities each role should and should not be able to perform.

Protector defines numerous Activity Groups that are cohesive collections of Activities. Normally a role would be assigned all activities in a group, however individual activities can be assigned if fine grain control is required. For example, the *Logs* Activity Group contains the following Activities which can be granted to a role en-mass or individually:

- View Logs
- Manage Logs

- Purge Audit Logs
- Verify Audit Logs

For guidance on configuring Roles and their associated Activities, refer to [How to create a role \(on page 216\)](#).

4. Create Access Control Profiles based on the Resource Groups and Roles identified above. These ACPs combine a Role with one or more Resource Groups.

For example, it might be necessary to create the following ACPs, in addition to the built-in *Default Administrator* ACP:

- *acpAccountsBackupAdmin*
 - to allow *roleBackupAdmin* access to *groupAccountsGlobal*
- *acpLegalBackupAdmin*
 - to allow *roleBackupAdmin* access to *groupLegalGlobal*
- *acpDevelopmentBackupAdmin*
 - to allow *roleBackupAdmin* access to *groupDevelopmentUK*
- *acpProductionBackupAdmin*
 - to allow *roleBackupAdmin* access to *groupProductionPrimaryUS* and *groupProductionSecondaryUS*
- *acpDevelopmentUser*
 - to allow *roleProtectorUser* access to *groupDevelopmentUK*

For guidance on associating Roles with Resource Groups, refer to [How to create an access control profile \(on page 217\)](#).

5. Identify how users will be authenticated by Protector.

Protector supports a number of authentication protocols. If your organization has an established AD, LDAP or RADIUS authentication service or uses local accounts, then these can be used.

For example, it might be necessary to create the following user and group accounts:

- Donald McPhee has a UID (User ID) of *donald.mcphee* in the Active Directory authentication service *global.widgetdev.com*.

An Authentication Space is created named *widgetdev* that refers to that AD service. He logs into Protector with the UPN (User Principal Name) *donald.mcphee@widgetdev*.

- Pete Traynor has a UID of *traynorp* in the local OS Account on the Protector node *WIN7-PCEA45*.

An Authentication Space is created named *WIN7-PCEA45* that refers to that node. He logs in with the UPN *traynorp@WIN7-PCEA45*.

- Sarah Dean has a UID of *svpdean* in the RADIUS service *uk.widgetdev.com*.

An Authentication Space is created named *uk.widgetdev* that refers to that RADIUS service. She logs into Protector with the UPN *svpdean@uk.widgetdev*.

- The contract development team members are in a user group that has a UID of *devteam* in the LDAP authentication service *datadevs.biz*.

An Authentication Space is created named *datadevs* that refers to that LDAP service. They log in using the UPN *devteam@datadevs*.

For guidance, refer to [How to create an Authentication Space \(on page 218\)](#).

6. Associate authenticated users and user groups with Access Control Profiles (i.e. Roles and Resource Groups) so that those users are able to log on to Protector, access the resources they need and carry out the activities their roles allow.

An individual user can be associated with more than one ACP, and an ACP can be assumed by more than one user.

For example the following ACP Associations are required:

- *donald.mcphee@widgetdev* and *svpdean@uk.widgetdev* are authorized to perform the activities defined by *acpDevelopmentBackupAdmin* on its associated resources.
- *svpdean@uk.widgetdev* is, in addition, authorized to perform the activities defined by *acpProductionBackupAdmin* on its associated resources.
- The entire database development team *devteam@datadevs* are authorized to perform the activities defined by *acpDevelopmentUser* on its associated resources.
- *traynorp@WIN7-PCEA45* is authorized to perform the activities defined by *acpAccountsBackupAdmin* and *acpLegalBackupAdmin* on its associated resources.

For guidance on authorizing users with their respective Roles and Resource Groups, refer to [How to create an Access Control Profile Association \(on page 223\)](#).

7. It is recommended that the default ACP Association *<username>@master* is replaced with your own ACP associations, using dedicated usernames created in your organization's domain.

**Caution:**

- The default ACP Association is generated automatically when Protector is installed, to enable initial configuration of access control features. This is based on the local Windows account specified during installation. Best practice states that local accounts should be disabled on the Master to reduce security vulnerabilities.
- The default <Username>@Master ACP association should be assigned to a user with the specific responsibility as primary Protector administrator, to ensure security is not compromised.
- Access to the Master node should be strictly controlled to prevent malicious access to the Protector executables and associated configuration data.

How to create a resource group

Before you begin

Refer to [How to configure advanced role based access control \(on page 212\)](#) which describes how resource groups are used in configuring access control.

To create a resource group:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage Resource Groups** to open the [Access Control Resource Groups Inventory \(on page 336\)](#).
2. Click the **Create new item** tile to open the [Access Control Resource Group Wizard \(on page 337\)](#).
3. Enter a **Name** for the resource group and a **Description**, then click **Next**.
4. Select the resources to be included in the resource group from the left-hand list by clicking on each resource.
Each resource selected is added to the right-hand list. Resources can be removed from the right-hand list by selecting them there.
5. Click **Finish** to close the wizard and return to the inventory.

How to create a role

Before you begin

Refer to [How to configure advanced role based access control \(on page 212\)](#) which describes how roles are used in configuring access control.

To create a role:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage Roles** to open the [Access Control Roles Inventory \(on page 328\)](#).
2. Click the **Create new item** tile to open the [Access Control Role Wizard \(on page 329\)](#).

3. Enter a **Name** and **Description** for the role, then click **Next**.
4. Select the activity groups to apply to the role by clicking the checkbox to the left of the activity group names.
5. To apply individual activities, click the **+** to the left of the activity group name to expand the group, then select the required activities by clicking the checkbox to the left of the activity names.
6. Click **Finish** to close the wizard and return to the inventory.

How to create an access control profile

Before you begin

Refer to [How to configure advanced role based access control \(on page 212\)](#) which describes how access control profiles are used in configuring access control.

Ensure that the necessary resource groups and roles have been created (see [How to create a resource group \(on page 216\)](#) and [How to create a role \(on page 216\)](#)).

To create an access control profile:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage ACPs** to open the [Access Control Profiles Inventory \(on page 322\)](#).
2. Click the **Create new item** tile to open the [Access Control Profile Wizard \(on page 323\)](#).
3. Enter a **Name** and **Description** for the role, then click **Next**.
4. Select the required **Role** from the menu, then click **Next**.
5. Select the resource groups to be included in the access control profile from the left hand list by clicking on each resource group.
Each resource group selected is added to the right hand list. Resource groups can be removed from the right-hand list by selecting them there.
6. For each resource group included in the ACP, set the **Access Level** in the dropdown control to the right of the resource group in the right hand list.
The access level controls the visibility of backups of nodes in the resource group.
7. Click **Finish** to close the wizard and return to the inventory.

How to clone an access control profile

Before you begin

Refer to [How to configure advanced role based access control \(on page 212\)](#) which describes how access control profiles are used in configuring access control.



Note: A cloned access control profile is a point-in-time copy as opposed to inheritance of a parent access control profile. If you modify the original, none of those changes will be reflected in the clone.

Cloning is a way of creating a new ACP, based on an existing ACP. To clone an access control profile:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage ACPs** to open the [Access Control Profiles Inventory \(on page 322\)](#).
2. Select the tile for the ACP you want to clone, then click **Clone** in the menu above. A clone of the ACP will be added to the inventory having the same name but with (clone) appended.
3. To rename the clone refer to [How to edit an access control profile \(on page 218\)](#).

How to edit an access control profile

You can make changes to an existing access control profile as follows:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage ACPs** to open the [Access Control Profiles Inventory \(on page 322\)](#).
2. Click on the name of the ACP you want to edit. The [Access Control Profile Details \(on page 327\)](#) opens, showing the associated role and resource groups.
3. Click on the Edit button in the top right corner of the page. The [Access Control Profile Wizard \(on page 323\)](#) opens.
4. Edit the parameters as required, clicking **Next** and **Previous** to locate the items to edit.
5. When you have finished editing, go to the final page of the wizard and click **Finish**. The wizard is closed and the details page is displayed showing the updated parameters.

How to create an Authentication Space

Before you begin

Refer to [How to configure basic role based access control \(on page 210\)](#) or [How to configure advanced role based access control \(on page 212\)](#) which describes how Authentication Spaces are used in configuring access control.

Protector communicates with an authentication server via a single proxy node, which is specified when the access control Authentication Space is created. Ensure that the following prerequisites are met before you configure an AD, RADIUS or LAPD Authentication Space in Protector:

- The Protector proxy (which can be a Client or Master node) connecting to the authentication server is registered with it and any prerequisites listed in the authentication server documentation are met.
- The authentication server is not blocked by any firewalls.
- The configuration parameters for type of authentication server selected are known. See [Access Control Authentication Space Wizard \(on page 313\)](#) for what is required for each server type.

To create an Authentication Space:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage Authentication Spaces** to open the [Access Control Authentication Spaces Inventory \(on page 311\)](#).
2. Click the **Create new item** tile to open the [Access Control Authentication Space Wizard \(on page 313\)](#).
3. Enter a **Name** and **Description** for the Authentication Space, then click **Next**.



Note: For Active Directory, the **Name** must be the AD Domain Name.

4. Select the type of Authentication Space you require from the list on the left of the wizard. The parameters appropriate to the Authentication Space type selected are displayed on the right of the wizard. All Authentication Space types require a **Proxy** to be selected, (except **OS Accounts**, which require an **Authentication Node**) that actually holds the account information.
5. Enter the parameters required for the selected Authentication Space type, then click **Finish**.

How to configure an LDAP authentication space**Before you begin**

Ensure the LDAPv3 server is correctly configured as per the instructions supplied with the LDAP software.

Configure a Linux based Protector (Master or Client) node with a connection to the LDAP server to act as a proxy. If you have a Windows Master, then you must select a Linux Client as a proxy. In this example the node `Client5RHEL` will be nominated as the proxy.

If using LDAP over TLS, place the TLS CA certificate file on the Protector proxy node.



Note: Protector supports LDAP and LDAP over TLS (LDAPS) protocols. We recommend that initial communication checks are performed without TLS (using LDAP protocol). Once correct operation has been confirmed, change to TLS (using LDAPS protocol).

This is an illustrative example only. LDAP configurations vary considerably between organisations so the output for your environment may be quite different to that shown here. It is assumed that the person performing this configuration is well versed in LDAP and the way it is configured in your organization:

Procedure

1. Examine the configuration of the LDAP server, using one of the following methods to ensure you can log into the LDAP server (preferably via the Protector proxy node to confirm the connection is working). Make a note of the *Base DN* and *User/Group DNs* listed in the output:
 - a. Either connect to the LDAP server via a web based interface.

- b. Or connect via a command shell using the following Linux command. Consult the Linux man page for full syntax:

```
ldapsearch
-D "uid=admin,dc=mydomain,dc=com"
-w pa55w0rd
-H ldap://mydomain.com
-b "dc=mydomain,dc=com"
-s sub "(objectClass=*)" "
```

Where the `mydomain.com` LDAP server's administrator *UID* is `admin` and the password is `pa55w0rd`.

As an example, the output from `ldapsearch` should include the following configuration information. The **highlighted** parts will be required in the steps that follow:

- The *Base DN*:

```
# mydomain.com
dn: dc=mydomain,dc=com
objectClass: top
objectClass: dcObject
objectClass: organization
o: mydomain.com
dc: mydomain
```

- The Administrator's *DN* (used as the *Bind DN*):

```
# admin, mydomain.com
dn: cn=admin,dc=mydomain,dc=com
objectClass: simpleSecurityObject
objectClass: organizationalRole
cn: admin
description: LDAP administrator
```


- User *DNs* and *UIDs*:

```
# Joe Bloggs, mydomain.com
dn: cn=Joe Bloggs,dc=mydomain,dc=com
givenName: Joe
sn: Bloggs
cn: Joe Bloggs
uid: jbloggs
uidNumber: 1000
gidNumber: 500
homeDirectory: /home/users/jbloggs
loginShell: /bin/bash
objectClass: inetOrgPerson
objectClass: posixAccount
objectClass: top
```

- Group *DNs* and *memberUids*:

```
# Managers, Groups, mydomain.com
dn: cn=Managers,ou=Groups,dc=mydomain,dc=com
gidNumber: 501
objectClass: posixGroup
objectClass: top
cn: Managers
memberUid: jbloggs
memberUid: tsmith
memberUid: mjones
...
```

2. Configure the parameters in the [Access Control Authentication Space Wizard \(on page 313\)](#) as follows:



Note: The values entered are dependent on the particular LDAP configuration. Be sure to check the output generated by **searchldap** for your configuration to obtain the correct values.

- a. On the **Configure authentication type** page, select **LDAP** authentication, then enter the following parameters:

- **Proxy:** Client5RHEL
- **Server URI:** ldaps://mydomain.com
- **Server Port:** If not using the default value, enter a port number.
- **Base DN:** dc=mydomain,dc=com from the **searchldap** output:

```
# mydomain.com
...
dn: dc=mydomain,dc=com
...
```

- Select **Bind using specified account**

- **Bind Account DN:** `cn=admin,dc=mydomain,dc=com` from the **searchldap** output:

```
# admin, mydomain.com
...
dn: cn=admin,dc=mydomain,dc=com
...
```

- **Bind Account Password:** `pa55w0rd`
- If using the LDAPS protocol, click **TLS Configuration** and configure the **TLS Request Certificate Check** method, **TLS CA Certificate Directory** and **TLS CA Certificate File** to use.
 - Click **Advanced Configuration** and enter the following parameters based on the given **searchldap** output:

- **Person Filter:** `(objectClass=inetOrgPerson)`

```
# Joe Bloggs, mydomain.com
...
objectClass: inetOrgPerson
...
```

- **Group Filter:** `(objectClass=posixGroup)`

```
# Managers, Groups, mydomain.com
...
objectClass: posixGroup
...
```

- **Group Strategy:** select **Groups know users**

```
# Managers, Groups, mydomain.com
...
memberUid: jbloggs
memberUid: tsmith
memberUid: mjones
...
```

- **Group Member Attribute:** `memberUid`

```
# Managers, Groups, mydomain.com
...
memberUid: jbloggs
...
```

- **Group Member Type:** select **Member** value contains a UID

```
# Managers, Groups, mydomain.com
...
memberUid: jbloggs
...
```

```
# Joe Bloggs, mydomain.com
...
uid: jbloggs
...
```

- The following attribute values are evident from the output:
 - **CN Attribute:** cn
 - **DN Attribute:** dn
 - **UID Attribute:** uid

3. Click **Finish** to close the wizard.

How to create an Access Control Profile Association

Before you begin

Refer to [How to configure basic role based access control \(on page 210\)](#) which describes how access control profile associations are used in configuring access control.

Ensure that the necessary Access Control Profiles and Authentication Spaces have been created (see [How to create an access control profile \(on page 217\)](#) and [How to create an Authentication Space \(on page 218\)](#)).

To create an access control profile association:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage ACP Associations** to open the [Access Control Profile Associations Inventory \(on page 303\)](#).
2. Click the **Create new item** tile to open the [Access Control Profile Association Wizard \(on page 305\)](#).
3. Enter a **Name** and **Description** for the ACP Association.
4. Select the type of association you require from the list on the left of the wizard:
 - **User** - associates the specified user with the selected ACPs.
 - **Group** - associates all users in the specified group with the selected ACPs.
 - **Authentication Space** - associates all users in the specified Authentication Space with the selected ACPs.

The parameters appropriate to the ACP association type selected are displayed on the right of the wizard.

5. Enter the parameters required for the selected ACP association type, then click **Next**.

6. Select the ACPs to be included in the ACP association from the left-hand list by clicking on each ACP.
Each ACP selected is added to the right-hand list. ACPs can be removed from the right-hand list by selecting them there.
7. Click **Finish** to close the wizard and return to the inventory.

How to view the access control settings summary


Before you begin

Refer to [How to configure basic role based access control \(on page 210\)](#).

Ensure that the necessary access control profile associations have been created (see [How to create an Access Control Profile Association \(on page 223\)](#)).

To view a summary of the current access control settings for each Protector user or group:

Procedure

1. From the [Access Control Dashboard \(on page 302\)](#) click **Manage ACP Associations** to open the [Access Control Profile Associations Inventory \(on page 303\)](#).
You can also access the summary information from the [Access Control Authentication Spaces Inventory \(on page 311\)](#), [Access Control Profiles Inventory \(on page 322\)](#), [Access Control Roles Inventory \(on page 328\)](#) or [Access Control Resource Groups Inventory \(on page 336\)](#).
2. Open the drop down menu in the [Navigation Breadcrumbs \(on page 282\)](#) by clicking the  button and select **Summary** from the menu.
The [Access Control Summary \(on page 340\)](#) is displayed.
3. Click on the **[>]** to the left of the User or Group of interest to view its related ACPs, Role, Activity Groups, Activities, Resource Groups and Resources.

How to edit object permissions

Permissions control if an object (e.g. a data flow, schedule etc.) is visible to, or modifiable by specific users.



Note:

For normal creation of objects (e.g. policies, dataflows, schedules and store templates), the creating user is given Read/Write access, allowing that user to see and change the object. Users having the *RBAC Override Ownership Permissions* privilege can also see and edit the object. Nobody else will be able to view the object unless granted access.

Normal users (i.e. those without the *RBAC Override Ownership Permissions* privilege) are prevented from removing all permissions, although they can still remove their own access rights. Only users with the *RBAC Override Ownership Permissions* privilege can remove all permissions.

To edit the permissions for an object:

Procedure

1. Go to the *Details* or *Inventory* page of the object for which you want to edit the permissions.
2. Click **Edit Permissions** in the top right of the page.
The [Access Control Permissions Inventory \(on page 341\)](#) will be displayed, showing the users and groups that have read and write access to the object.
3. You can then do one of the following:
 - Add a new user or group permission by clicking the **Create New Item** tile.
 - Edit an existing permission by clicking the user or group name on a tile.
 - Remove an existing permission by selecting a tile and clicking **Remove**.

Editing does not allow the user or group name to be changed. To do this, remove the existing permission, then add a new one.

When you edit or create a permission, the [Access Control Permissions Wizard \(on page 342\)](#) opens.
4. For new permissions, Select the type of permission you require from the list on the left of the wizard:
 - User - to grant a single user permission
 - Group - to grant a group of users permission

The parameters appropriate to the permission type selected are displayed on the right of the wizard.
5. Check **Write Access** if you want the user or group to be able to modify the object. Read access is automatically granted to any user or group added to the permissions inventory for that object.
6. Click **Finish** to close the wizard and return to the inventory.

Data Flow Tasks

This section describes data flow configuration tasks that users will perform with Ops Center Protector.

Refer to [Data Protection Workflows \(on page 132\)](#) for detailed descriptions of specific Repository, Hitachi Block data protection scenarios.

For further information, refer to:

- [Data Flow Concepts \(on page 53\)](#)
- [Data Flows UI Reference \(on page 350\)](#)


How to create a data flow

Before you begin

Ensure that the policies that you want to assign have been defined, see [How to create a policy \(on page 265\)](#).


The following procedure describes how to create a simple one-to-one data flow. More complex data flows involving one-to-many and cascaded topologies can be constructed by following the same general approach:

Procedure

1. Click the **Data Flows** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Data Flows Inventory \(on page 350\)](#).
2. Click the **Create new item** tile to open the [Data Flow Wizard \(on page 356\)](#).
3. Enter a **Name** and **Description** for the data flow, then click **Next**.
The next wizard page is displayed with a blank workspace.
4. Drag a source node from the **Nodes** or **Node Groups** list onto the data flow workspace. The node is displayed on the workspace with a grey box around it showing it is selected. The available **Policies** appear next to the workspace. If a policy contains operations that can be performed locally to the node, without the need for a separate destination node (e.g. local snapshot operations), then these will be displayed directly below the policy.
5. Select the policies and/or local operations that you want to assign to the source node by checking all those that apply in the **Policies** listed to the right of the workspace.
 - If a policy is selected that requires a destination node and corresponding operation assignment to complete it, then a warning triangle icon  will appear next to the source node, indicating that the node has an incomplete policy assigned to it. Completing the policy assignment is described in the steps that follow.
 - If an operation is selected, then an operation properties dialog will be displayed. Enter the required operation properties in the dialog and click **OK**.

If you choose not to define the operation properties now (by clicking **Cancel**), they can be configured later by clicking the **Configure Operation Properties** button displayed below the respective operation in the **Policies** area to the right of the data flow workspace.

After the operation properties have been applied, they can be edited by clicking the **Edit Operation** button in the operation summary box next to the operation name.

If a node has a snapshot operation assigned to it, a snapshot icon  will appear in the bottom right corner of the node.
6. Now, place and connect the destination node. There are two methods for connecting nodes:
 - Drag the destination node from the **Nodes** list, passing over the source node that you want it to connect to, then drop the destination node where you want to place it. A connection is created between the destination and source node. Now select the destination node.
 - Place the destination node on the workspace then refer to [How to connect nodes on a data flow \(on page 228\)](#).

The destination node is displayed on the workspace with a grey box around it showing it is selected. The available **Policies** appear to the right of the workspace. If a policy contains operations that can be performed by the destination node (e.g. remote replication operations), then these will be displayed below the policy.

7. With the destination node selected, choose the operations that you want to assign to it by checking all those that apply in the **Policies** area to the right of the workspace. Note that the policy checkbox cannot be selected by the user. When an operation is selected, an operation properties dialog will be displayed. Enter the required properties in the dialog and click **OK**.

If an operation is selected that completes a policy previously selected on the source node, then the warning triangle icon will be removed from the source node, indicating that the node now has a completed policy assigned to it. The image below shows a source node with a remote policy assigned (*myReplication*) that is completely specified (the operation *Mirror (Replicate)* has been assigned to the destination node). A local operation (*mySnapshot*) has also been assigned to the source node.

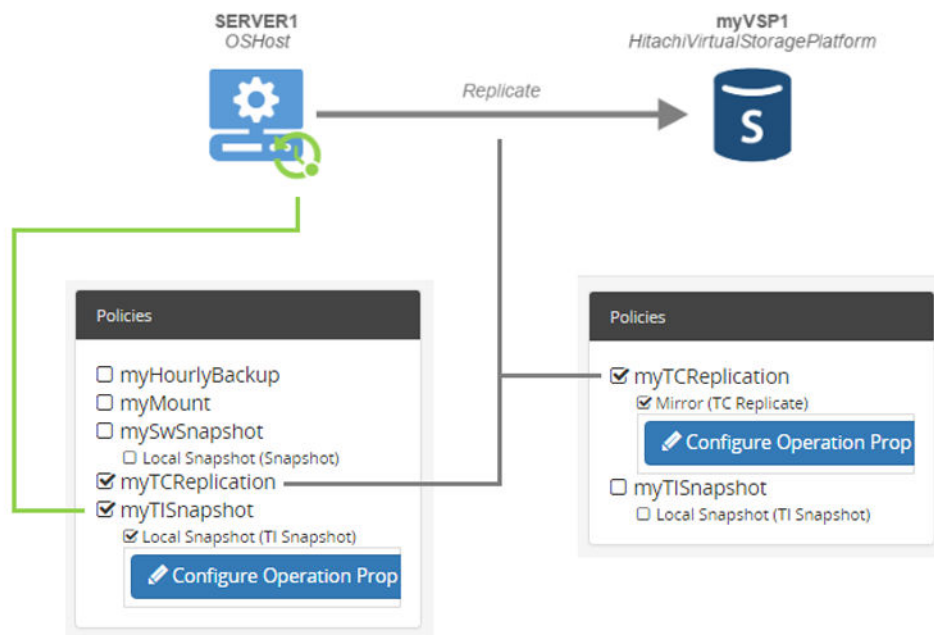


Figure 65 Source node with a remote policy assigned (completed assignment)

8. Select the connection between the source and destination nodes to display the **Routed Policies** and **Mover Settings** to the right of the workspace.
 - a. The **Routed Policies** area lists the policies being routed along the selected connector.
 - b. Select the **Type** of mover to be used in the **Mover Settings**.



Note: The *Data Flow Wizard* (on page 356) only prevents some incorrect mover and operation combinations from being constructed. The *Rules Compiler* will however generate warnings or errors for incorrect combinations. Ensure the correct mover type is used with a given operation when creating data flows.

- c. Optionally enter a **Label** for the connection.
- d. Turn network compression on or off with **Enable network data compression**.

- e. For *Host Based* policies only, click **Bandwidth Settings** to open the [Mover Bandwidth Settings Dialog \(on page 365\)](#), then set the times and days for **Default Speed**, **High Speed** and **Low Speed** network utilization by clicking the required cells.
9. When you have finished drawing the data flow and assigning policies, click **Finish**.

How to connect nodes on a data flow

Before you begin

Create a data flow as described in [How to create a data flow \(on page 225\)](#).

Nodes can be connected on a data flow as follows:

Procedure

1. Drop the two nodes that are to be connected on the data flow canvas.
2. Select the node where data will flow from.
3. Click the **Connect To** button in the top left of the canvas.
A dashed line will appear connected to the selected node at one end and the mouse cursor at the other.
4. Move the mouse cursor to the node where data will flow to and click to connect the two nodes.
A line will be drawn from the first node, to the second node with an arrowhead indicating the direction of data flow.
5. If the mover is not already selected, click on it to view and set the **Routed Policies** and **Mover Settings**.

How to apply a policy to nodes on a data flow

Before you begin

Create a data flow as described in [How to create a data flow \(on page 225\)](#).

Policies are applied to nodes on a data flow as follows:

Procedure

1. Select the source node on the data flow canvas.
2. In the **Policies** area to the right of the canvas select each policy that needs to be applied to the source node.
3. Click on the mover that routes the policy to the destination node to view the **Routed Policies**.
4. Select the destination node on the data flow canvas.
5. In the **Policies** area to the right of the canvas select each operation that needs to be applied to the destination node.

Only the individual operations can be applied; not the policy.

An **Operation Properties** dialog appropriate to the destination node and operation type will be displayed. For example the [Hitachi Block Replication Configuration Wizard \(on page 381\)](#) is displayed when applying a *Replication* operation to a *Hitachi Block* node.

6. Configure the operation properties as required then click **OK**.
7. Finally click **Finish** to progress to the next page of the [Data Flow Wizard \(on page 356\)](#).

How to activate a data flow

Before you begin

Ensure the data flows that you want to compile have been correctly defined (see [How to create a data flow \(on page 225\)](#)), that the required policies have been assigned and that no significant warning icons¹ are displayed on nodes in the data flow diagrams.

1. There is no reason why all policy operations must be applied in all cases. Warning icons may therefore be present, but they may indicate a warning, not an error.

To compile a data flow and activate the resulting rules:

Procedure

1. Click the **Data Flows** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Data Flows Inventory \(on page 350\)](#).
2. Select the data flows that are to be compiled by clicking in the selection icon in top left corner of the corresponding tiles.

Although it is possible to compile multiple data flows in one go, it may be easier to initially compile one at a time and rectify any compilation errors, before compiling all data flows and distributing rules in one operation.



Note: Activate data flows in batches not exceeding 20 data flows at a time. Activating more than this simultaneously can result in longer activation times.

3. Click **Activate** above the inventory.
The [Activate Data Flow Dialog \(on page 352\)](#) is displayed and the selected data flow(s) start compiling. After a short time the results of the compilation process are displayed with a message indicating that the compilation process succeeded or failed.
4. If the compilation succeeds then click **Activate** to update the rules on the affected nodes.
5. If the compilation fails then the **Activate** button will remain disabled. Examine the compiler output to locate the cause of the failure, rectify the data flow and/or policy then recompile.

General Tasks

This section describes general tasks that users can perform with Ops Center Protector.

How to navigate to a page using the breadcrumbs

You can find your location within the hierarchy of web pages in the Protector user interface at any time and navigate quickly to a parent or related page (refer also to [User Interface Page Layout \(on page 277\)](#)). To navigate using the breadcrumbs:

Procedure

1. Locate the [Navigation Breadcrumbs \(on page 282\)](#) just below the [Main Banner \(on page 278\)](#) at the top of the current web page.
The path to the current page is displayed with each parent page name separated by '/' .
The current page is displayed in black. If related pages are available then a dropdown menu button will be displayed to the right of the page name.
2. To navigate to a parent page, click on the page name in the path.
3. To navigate to a related page, click on the button to show a menu of related pages, then click on the page you require.

How to select a single item in an inventory

Items displayed in an inventory must be selected before an action can be applied to them using the buttons displayed above (see [Inventory Page \(on page 285\)](#)). To select individual items:

Procedure

1. Locate the selection button for the inventory item you want to select.
 - In tile view the selection button is displayed in the top left corner of each tile (see [Tile Control \(on page 287\)](#)).
 - In table view the selection button is displayed to the left of each item.
2. Click the selection button so that a check mark appears.
You can select one or more items at once, although some actions can only be applied to a single item.
The available action buttons above the inventory will be enabled or disabled as appropriate to the number of items selected.

How to select all items on an inventory page

On some inventory pages it is possible to quickly select all tiles or table entries (see [Inventory Page \(on page 285\)](#)). To select all items on a page:

Procedure

1. Go to the menu items just above the inventory tiles or table and click the **Select All** check box.
A check mark will appear against all tiles or table items in the inventory.
2. Click on the required command to apply the action to all items simultaneously.



Note: Select All only selects the items on the currently displayed page. If multiple pages are available, items on the non-displayed pages will not be selected.

How to set a filter on an inventory

Many inventory pages have a set of filters that can be applied to limit the items being displayed. The filter controls are normally displayed to the right of the inventory items (see [Inventory Page \(on page 285\)](#)). To filter an inventory:

Procedure

1. If the filter terms are not displayed to the right of the inventory page, click the **Show Search** button in the top right corner of the page.
2. Select the filter terms in the filter controls by:
 - Selecting the term from a dropdown menu
 - Typing in text directly, or
 - Selecting one or more items from a list

Most inventory pages will update in real time as the filter terms are selected, however the inventories accessed from the [Restore Inventory \(on page 686\)](#) require the **Search** button to be clicked before the filter is applied.

3. All filter terms will be cleared when you navigate away from the page, unless you return to it using your browser's **Back** button.
4. Individual filter terms can be cleared by:
 - Selecting the Any/All filter term if available
 - Manually deleting the text in the filter control, or
 - Deselecting the items in a list

How to change the UI settings

The locale, language and other factors that affect the way in which Protector displays data can be configured via the [Settings Wizard \(on page 279\)](#) (refer also to [User Interface Page Layout \(on page 277\)](#)). To adjust UI settings:

Procedure

1. On the [Main Banner \(on page 278\)](#), click the **Settings** icon.
The [Settings Wizard \(on page 279\)](#) opens.
2. Adjust the user interface settings to those required and click **Save**.
The settings will take effect immediately.

Installation Tasks

This section describes the software installation and initial configuration tasks.

How to install/upgrade Protector on Windows and Linux or AIX

Before you begin



Caution: Thin Image snapshot operations default to *Provisioned using floating device*. In versions prior to 6.5, this setting would automatically fallback to *Fully provisioned* if the hardware storage device did not support floating devices. With the introduction of *Cascade mode* snapshots in version 6.5 (now the default mode), this automatic fallback has been removed. Consequently:

- Data flows created in versions prior to 6.5 that contain Thin Image snapshot operations, with cascade mode is enabled, will now fail if the underlying hardware does not support *floating device*. These data flows must be manually reconfigured to use the correct provisioning type. Please note that if these data flows also contain replication operations, then these will be re-evaluated when the modified data flows are re-activated.
- Data flows created in versions prior to 6.5 that contain Thin Image snapshot operations, with cascade mode enabled, will now fail if the P-VOLs have any pre-existing non-cascade mode snapshots. If cascade mode is to remain enabled then any non-cascade mode snapshots must be deleted.
- For data flows created in version 6.5 or later, if the hardware storage device on which Thin Image snapshot operations are performed does not support *Floating device* and *Cascade mode*, then Thin Image operations will fail, unless the appropriate settings are selected in the respective data flows.

**Caution:**

- Refer to the Protector support matrices at <https://www.hitachivantara.com/en-us/products/data-protection/data-instance-director.html#tech-specifications> before attempting installation, to ensure that you understand the infrastructure requirements, available functionality and upgrade paths for your particular environment.
- If you intend to use Protector with Hitachi storage hardware then refer to the following before proceeding:
 - [Hitachi Block prerequisites \(on page 20\)](#)
 - Refer section "Generation 1 Hitachi Content Platform prerequisites" in User Guide.

**Note:**

When upgrading, it is highly recommended (and often necessary) to upgrade all nodes to the same version. The recommended order in which to upgrade is:

1. Internet Connected Nodes. If ICNs are not upgraded first, they may not be able to be 'push upgraded' through the UI. ICNs may appear to go offline until the master is upgraded.
2. Master Node(s).
3. Clients acting as ISMs, controlling Hitachi Block and File storage devices.
4. Clients acting as Data Destinations, such as Repositories.
5. Clients acting as Data Sources, such as application servers.

**Note:**

- For a new installation, the Master node must be installed before any Client nodes.
- When installing a new Master, you must select the account to use for initial Protector log-on. This account must be a local OS account which is able to successfully log in to the machine. These credentials will be input to the Protector UI to enable the initial access control configuration to be performed.
- Read the release notes shipped with the installer to ensure that the currently installed version can be upgraded to the new version. It may be necessary to upgrade to an intermediate version first and perform additional actions prior to and after upgrading.
- You may need to create an exception in your anti-virus software when installing.
- DO NOT upgrade while replications are in the process of pairing. Any active replications must be in the paired state before upgrade is carried out.
- It is recommended that you perform an upgrade only after currently active backups have been completed.
- Before upgrading, unmount any mounted snapshots and replications.

- It is recommended to backup /protector folder to avoid any issue during OS upgrade.
- If you uninstall a Client node, you will need to delete it from the Nodes Inventory before subsequently reinstalling it. This ensures that the Master node regenerates new identifiers for that node. If you do not do this then the reinstalled Client will not be recognized.
- Operating System Specific Behaviour:

| OS | Note |
|---------------|---|
| Linux | We recommend that Linux source nodes have a Logical Volume Manager (LVM) on each volume group. |
| Linux and AIX | <p>Ensure you have execute permissions using the command chmod 755, before running the installer.</p> <p>A minimum of 10 GB of free space is required in the 'unused' portion of the volume that is to be backed up. This is in addition to the space required for the allocated storage area. For example, if 100 GB of usable storage is required, then the total disk size will be 110 GB (100 GB of usable storage and 10 GB of unused storage for snapshot administration).</p> |
| AIX | It is only possible to install the Protector Client on an AIX node. |

All nodes that will participate in a backup data flow need to have Ops Center Protector installed. A node used only to access the web based user interface does not need to have any components installed on it.

Procedure

1. Locate and run the installer appropriate for the target OS and hardware architecture.



Tip: Protector can be installed directly from the command line if required. Refer section "Installing and upgrading Protector from the command line" from **User Guide** for details of the installer's command line options.

The installer filename has the following format:

Protector-*Rm.n-m.n.n.nnnnn-ostype-proctype*

where:

- *m.n-m.n.n.nnnnn* - is the version and build number
- *ostype* - is the target operating system type:
 - **Win**
 - **Linux**
 - **AIX**
- *proctype* - is the target processor type:
 - **x64**

The **Setup** wizard will be launched if a GUI shell is available. If not then the same information will be presented using the text mode shell.

2. If a previous installation of Ops Center Protector is found, the installer will prompt you to upgrade or abort the installation.
 - Click **Yes** to upgrade the existing Protector installation on this node.



Tip: When upgrading along a supported version upgrade path, any existing data flows, policies, schedules etc. will be preserved. If any further actions are required post upgrade, then these will be described in the Release Notes shipped with the new version.

- Click **No** to exit the installer wizard, in which case no changes will be made to the current installation.
3. When the **Setup** wizard appears, a welcome message is displayed. Click **Next** to begin the installation.
 4. When prompted, read the License Agreement.
 - Select **I accept the agreement** if happy to proceed and click **Next**.
 - Select **I do not accept the agreement** if not happy to proceed and click **Next**. The installation will be aborted and no changes will be made to the machine.

License keys are entered once the installation is complete via the License Inventory in the UI (See "How to Add a License" in User Guide).

5. To install in a non-default location, enter the path in the **Installation Directory** field or use the folder browser. Click **Next**.

6. Select the type of installation then click **Next**.

- **Master** Select this option to install the Master node in your network. If this is a new installation then the Master node must be installed before any Client nodes. The Master node is the central controller for all other nodes and serves as the connection point for the Web UI and REST API.



Note: The Master node automatically has all the capabilities of a Client node. It is however recommended that the Master node functions only as a Master. Multiple Master nodes can coexist on the same network, however Client nodes can only be authorized and controlled by one Master node.

- **Client** - Select this option to install all other node types. The specific roles assumed by Client nodes are defined via the Nodes Inventory once installation is completed (See section "How to add a node" in User Guide.). These roles include:
 - Data Sources (basic hosts, VMs, application servers, etc.)
 - ISMs (for controlling Hitachi Block and File storage hardware, etc.)



Caution: ISM nodes and their associated CMDs used to control storage devices must not be shared with applications other than those forming part of the Ops Center suite.

- Repositories (acting as host based backup storage destinations)

7. Specify a node name to be used within Ops Center Protector then click **Next**.



Note: Node names are limited to a maximum of 64 characters. By default, the name is set to the machine's host name. This name is only used by Protector, and will not change the name set by the operating system.

8. If the **Master** is being installed:

- a. Select a local **User Account** for logging on to the Protector web user interface immediately after installation is complete. You must know the password associated with the selected account. The account used can be changed after installation of the Master. Click **Next**.
- b. Accept or edit the **Protector User Interface Port** used to connect to the web based UI. By default it is set to 443, but can be changed if you already have another web server running on that port.

9. If a **Client** is being installed:

- a. Enter the **Master Hostname or IP** address or a DNS resolvable name of the Master node. If it is known that this node will be operating over a non-secure network, then we recommend enabling the **Internet connected node** option. This will encrypt transmitted data as an extra security precaution. Over-the-wire encryption requires a license and may not be available in some territories.

10. When the wizard indicates that it is ready to begin the installation, click **Next**. Ops Center Protector files are copied to the designated directories and the necessary components installed.

11. When the wizard indicates that the installation is complete, you will have the option to **Start Hitachi Ops Center Protector User Interface Now** in a web browser. Click **Finish**.



Note: You do not need to restart the machine. The installer starts all the necessary Ops Center Protector components on the system.

If a third party firewall is installed on the network, Protector will generate firewall warnings when it starts running. See [How to configure a third party firewall for Protector \(on page 245\)](#).

12. If this is a new installation of a Master node, then use a web browser to log on to the user interface at: `https://<Master>/#/Login`, where `<Master>` is the IP address or DNS name of the Master node. Refer to [How to configure a server-side SSL certificate using a UI \(on page 247\)](#) to prevent security warnings being displayed by the web browser.



Note: Initial logon must be done with the username specified for the **User Account** during the Master installation. The username must be qualified with the local domain name `master` as follows:

`<username>@master`

or

`master/<username>`

or

`master\<username>`

13. Set the locale and time zone appropriate the location of the nodes you are working with. See "How to change the UI settings" in User Guide
14. If you are upgrading, the Dataflows should now be reactivated and all destination nodes should be manually resynchronized with their sources. The upgrade process is then complete.
15. Finally, refer to one of the following topics to setup accounts for those users that required access to the Protector user interface.
 - "How to configure basic role based access control" (Refer User Guide) to configure the minimum required access control functionality.
 - "How to configure advanced role based access control" (Refer User Guide) to configure full access control functionality.

How to import Logs from Protector 6.x or Protector 7.0 to Protector 7.1 after Upgrade

Before you begin

Version 7.1 of Hitachi Protector switches from using MongoDB to Postgres for its databases. Protector will not to automatically transfer the logs from an existing installation during upgrade. The rationale for this was that such a transfer might take several hours (or longer) and therefore the upgrade process would be inappropriately long.

For customers wishing to retain all, or some, of their logs from their earlier installations a manual import method has been developed which can be executed post upgrade. The import utilises a command line tool called 'log-import.exe' (or 'log-import' on Linux systems) which resides in the Protector/bin installation directory.

Prior to running the log import tool upgrade the whole environment to 7.1 and ensure that the system and the logs are functioning correctly.

These instructions assume the import is being performed on a Windows master – the procedure is the same on Linux systems barring the tool name and path formats.

Procedure

1. Ensure the Protector services are running.
2. In a command prompt (or terminal) navigate to the Protector/bin directory. To perform an import using defaults issue the following command:

```
> log-import.exe
```

This will import the previous 13 weeks of logs (and statistics logs) from the pre 7.1 logs database into the 7.1 database.



WARNING: There must be sufficient free disk space for the import. The amount of free disk space should be at least double that of the size of the '<Protector>/db/saves/logdaemon' directory.

For a more detailed description of the log-import cli tool refer to <link to Porting legacy logs in to a newly upgraded 7.1 log database> (this is a new section to be created as defined below)

How to verify the SSL/TLS fingerprint of a client node prior to authorising

Before you begin

For security conscious customers a mechanism exists be used to ensure a node connecting to the system is that node and that there is no man in the middle (MITM) attack.

The Node Details screen for the relevant node displays the calculated SSL/TLS fingerprint for the node:



Figure 66 Node Details - calculated SSL/TLS fingerprint for the node

This displayed fingerprint can then be compared to the one generated on the client machine itself.

To generate the fingerprint on the client run the following cli command from a command prompt in the <install_path>bin directory:

```
sslfingerprint
```

The fingerprint for the node will be displayed and can be used for comparison.

How to install a Protector master or client on a Windows cluster

Before you begin



WARNING: This section only applies when clustering the master or protecting data without one of Protector's application integrations.

Do not use this method of installation in case you want to protect supported applications like Microsoft SQL Server or Microsoft Hyper-V. For these applications, install the client as you would for any regular standalone system (see [How to install/upgrade Protector on Windows and Linux or AIX \(on page 232\)](#)).

The Protector *Master* or *Client* capability can be installed on servers in a Windows cluster. Before starting the installation, review the following:

- Ensure that all servers meet the software prerequisites that are outlined in [How to install/upgrade Protector on Windows and Linux or AIX \(on page 232\)](#).
- Confirm that a cluster environment is set up and working correctly.
- For *Master* installations only, ensure that you have all the required license keys for Protector. A separate license key is required for each node in the cluster.

Protector installation for a cluster environment involves performing the following sub-tasks:

Procedure

1. Install Protector on each node in the cluster (see [How to install Protector on a node in a cluster \(on page 240\)](#)).
2. Add the *Cofio Hub* service (see [How to add the hub service to a cluster \(on page 241\)](#)).
3. For *Master* installations only:
 - a. Add Protector licenses for each node (see [How to add licenses to a clustered master \(on page 241\)](#)).
 - b. Add an authentication domain for the cluster ([How to configure authentication for a cluster \(on page 242\)](#)).

How to install Protector on a node in a cluster

To install Protector on a Windows Failover Cluster node:

Procedure

1. From the Windows **Failover Cluster Manager** console, identify the cluster server node that is currently in control (i.e. the node which has access to the shared disks).
2. Install Protector on the controlling node by running `Protector-m.n-m.n.n.nnnnn-WIN-ppp.exe`.
The Protector **Setup** dialog is displayed. Click **Next**.
3. Read and accept the license agreement, then click **Next**.
4. Change the **Installation Directory** to the shared drive where you want install Protector. If Protector is already installed on another node in the cluster then select that install location. Click **Next**.

For example, if your shared drive is `E:\` then the installation path might be on the shared drive: `E:\Hitachi\Protector`.



Note: The Protector **Installation Directory** must be the same for all nodes in the cluster.

5. Select either the **Master** or **Client** installation type, then click **Next**.
6. Change the default **Node Name** to one that represents the entire cluster. If Protector is already installed on another node in the cluster then use that name. Click **Next** to start the installation.



Note: The Protector **Node Name** must be the same for all nodes in the cluster.


7. If the **Master** is being installed:
 - a. Select a local **User Account** for logging on to the Protector web user interface immediately after installation is complete. You must know the password associated with the selected account. The account used can be changed after installation of the Master. Click **Next**.
 - b. Accept or edit the **Protector User Interface Port** used to connect to the web based UI.
8. If a **Client** is being installed:

- a. Enter the **Master Hostname or IP** address or a DNS resolvable name of the Master node.
9. When the wizard indicates that it is ready to begin the installation, click **Next**.
10. When the wizard indicates that the installation is complete, click **Finish**.
11. Open the Windows **Services** console, stop the *Cofio Hub* service and set its *Start Up Type* to *Manual*.
The *Cofio Hub* service will be controlled by the Failover Cluster Manager in a clustered configuration.
12. From the **Failover Cluster Manager** console, invoke failover to the next node in the cluster, then repeat the above procedure.

How to add the hub service to a cluster

Complete the following steps on the active node in the cluster.

Procedure

1. In the **Failover Cluster Manager** console, configure a *Generic Service* for the cluster using the **High Availability Wizard**.
 2. Select the *Cofio Hub* service from the list.
 3. Name the service (e.g. *CofioHubSvc*) and assign an IP address, then click **Next**.
 4. Select the shared disk that Protector is installed on.
 5. Do not replicate any registry settings.
 6. Confirm that all settings are correct and then proceed with configuring the service for high availability.
 7. Review the report to ensure that the service was configured correctly, then click **Finish**.
 8. If a **Master** is being installed, make a note of *Cofio Hub* service's IP address shown in the **Failover Cluster Manager** console. This will be used for accessing the Protector web UI.
-  **Note:** If the web UI is not accessible at this address, check your firewall for the following:

 - a. Ensure that Protector is not blocked by the firewall.
 - b. Enable port 30304 (Protector) and port 443 (HTTPS).
9. If a **Client** is being installed, authorize the node in the Nodes Inventory.
 10. Force a fail-over, to confirm that the Protector node remains online in the Nodes Inventory.

How to add licenses to a clustered master

Before you begin

Install the Protector Master on each of the nodes in the Windows cluster as described in [How to install a Protector master or client on a Windows cluster \(on page 239\)](#).

Because each machine in the cluster has a different machine ID, a separate license is required for each node:

Procedure

1. Navigate to the Protector web UI using the IP address for the *Cofio Hub* service.
2. Log in using the local machine credentials of `administrator@master`.
3. Add the license key for this machine following the procedure described in [How to Add a License \(on page 255\)](#).
4. To add the licenses for the remaining cluster nodes, browse to the installation directory, then navigate to the subdirectory `db\config`
5. Right click `License.xml` and open the file with **WordPad**.
The following XML is displayed showing the license key for the active node:

```
<licenses>
  <entry>ADYFKAE9PMM9BM2KXDNWCEO8PSABE244U8GA</entry>
</licenses>
```

6. Copy line 2 (the license key for the currently active cluster node) and insert it as a new line below line 2.
7. Change the license key on line 3 to match the one provided for the second cluster node.
The following XML should be displayed:

```
<licenses>
  <entry>ADYFKAE9PMM9BM2KXDNWCEO8PSABE244U8GA</entry>
  <entry>DFGA54AGFDFHDK675HH86453GHTFGD553DR</entry>
</licenses>
```

8. Repeat for each additional node.
9. Save and close the file.

How to configure authentication for a cluster**Before you begin**

Install Protector on each of the nodes in the Windows cluster as described in [How to install a Protector master or client on a Windows cluster \(on page 239\)](#).

During installation, a local administrator account is used. To complete a cluster installation, a domain administrator account must be set up within Protector that is available to all nodes in the cluster:

Procedure

1. Navigate to the Protector web UI using the IP address for the *Cofio Hub* service.
2. Log in using the local machine's `administrator@master` credentials.
3. Add an *Authentication Space* that will perform authentication for the cluster.
 - a. Specify the Authentication Space **Name**.
 - b. Select the required authentication type (e.g. **Active Directory**).
 - c. Select the cluster node as the **Proxy**.
 - d. Enter the **Active Directory Domain Name**.

4. Add an *ACP Association* that will provide administrator level access to Protector (see "How to create an Access Control Profile Association" (Refer User Guide)).
 - a. Specify the ACP Association **Name**.
 - b. Select the **User ACP Association** type.
 - c. **Browse** for the required **User Name** from the **Authentication Space** specified in the previous step.
 - d. Add the *Default Administrator* from the **Available Profiles** listed.
5. Log out of the web UI.
6. Log back into the web UI using the new `User@Domain` credentials specified in the above steps.
7. Force a fail-over, then log in again using the new credentials to confirm that Protector is still accessible.
8. Finally, refer to one of the following topics to setup accounts for those users that required access to the Protector user interface.
 - "How to configure basic role based access control" (Refer User Guide) to configure the minimum required access control functionality.
 - "How to configure advanced role based access control" (Refer User Guide) to configure full access control functionality.

How to remotely upgrade Protector client nodes

Before you begin



Caution: Thin Image snapshot operations default to *Provisioned using floating device*. In versions prior to 6.5, this setting would automatically fallback to *Fully provisioned* if the hardware storage device did not support floating devices. With the introduction of *Cascade mode* snapshots in version 6.5 (now the default mode), this automatic fallback has been removed. Consequently:

- Data flows created in versions prior to 6.5 that contain Thin Image snapshot operations, with cascade mode is enabled, will now fail if the underlying hardware does not support *floating device*. These data flows must be manually reconfigured to use the correct provisioning type. Please note that if these data flows also contain replication operations, then these will be re-evaluated when the modified data flows are re-activated.
- Data flows created in versions prior to 6.5 that contain Thin Image snapshot operations, with cascade mode enabled, will now fail if the P-VOLs have any pre-existing non-cascade mode snapshots. If cascade mode is to remain enabled then any non-cascade mode snapshots must be deleted.
- For data flows created in version 6.5 or later, if the hardware storage device on which Thin Image snapshot operations are performed does not support *Floating device* and *Cascade mode*, then Thin Image operations will fail, unless the appropriate settings are selected in the respective data flows.

**Note:**

- The *Manage Software Updates* RBAC activity must be assigned to users who perform upgrades. It is recommended that this activity is restricted to administrative users only.
- Upgrade of a Microsoft failover cluster node needs to be done locally, following a similar procedure to that described in [How to install a Protector master or client on a Windows cluster \(on page 239\)](#). It's not possible to upgrade remotely because the standby nodes in the cluster are not available. Attempting a remote upgrade will place the clustered Protector service in a failed state, taking it offline.
- Before upgrading unmount any mounted snapshots.
- DO NOT upgrade while replications are in the process of pairing. Any active replications must be in the paired state before upgrade is carried out.

An upgrade can be performed if the existing installation has become corrupted or a newer version of Ops Center Protector is available.

If upgrading, obtain the upgrade installer files from your Hitachi Vantara support representative.

When an upgrade starts, the Ops Center Protector services are shutdown, causing the upgrading *OS Host* node and any nodes for which it serves as a proxy, to go offline in the Nodes Inventory. Any active data flows using those nodes will be temporarily interrupted. These nodes will come back online again when the services are automatically restarted on the *OS Host* node, after the upgrade process is completed, and the affected data flows will resume operation.



Note: We recommend upgrading Ops Center Protector only after current backups have been completed.

**Note:**

When upgrading, it is highly recommended (and often necessary) to upgrade all nodes to the same version. The recommended order in which to upgrade is:

1. Internet Connected Nodes. If ICNs are not upgraded first, they may not be able to be 'push upgraded' through the UI. ICNs may appear to go offline until the master is upgraded.
2. Master Node(s).
3. Clients acting as ISMs, controlling Hitachi Block and File storage devices.
4. Clients acting as Data Destinations, such as Repositories.
5. Clients acting as Data Sources, such as application servers.

Procedure

1. Locate the installers and accompanying configuration files appropriate for the target OSs and hardware architectures in your Protector environment.

The installer's executable and configuration filenames have the following format:

Protector-*Rm.n-m.n.n.nnnnn-ostype-proctype*

where:

- *m.n-m.n.n.nnnnn* - is the version and build number
- *ostype* - is the target operating system type:
 - **Win**
 - **Linux**
 - **AIX**
- *proctype* - is the target processor type:
 - **x32**
 - **x64**
 - **PPC**

2. Copy both the installer and configuration files to the `C:\Programs Files\Hitachi\Protector\runtime\updater` folder on the Master node.

This folder will need to be created manually if this is the first time an update has been applied.

3. Click **Nodes** on the Navigation Sidebar to open the Nodes Inventory
4. Select the nodes to be upgraded (Master first, then Clients), then click **Upgrade Clients** to start the upgrade process.



Note:

- Only *OS Host Client* and *Master node* types can be upgraded remotely
- It is recommended to push out the upgrade to clients in batches of up to 20 nodes at a time.

When upgrading the Master node, the UI will logout when the node's services are stopped by the installer. Wait a few minutes, then log back in again and complete the upgrade of the remaining nodes.

When upgrading Client nodes, each one (and any nodes for which that Client acts as a *Proxy*) will go offline temporarily while the upgrade is applied.

When the nodes come back online, the *Version* shown on the respective tile will be updated accordingly.

5. All active data flows should now be reactivated and all destination nodes should be resynchronized with their sources.

How to configure a third party firewall for Protector

If a third party firewall is installed within your network, when processes are started as part of the Ops Center Protector software installation, firewall warnings might be generated.

Configure the firewall to allow communication between all Protector nodes on one open port: 30304 (TCP).

Additional ports that might need to be opened are:

- Protector User Interface, on port 443 (HTTPS), or the alternative specified during Master installation.
- Protector vCenter proxies, also on port 443 (HTTPS), use the VDDK and vSphere web API to talk to the vCenter.
- Protector VMware proxies, on port 902, are instructed by the vCenter to talk to the ESXi host for virtual disk transfer.

How to configure addresses for nodes on multiple networks

If your environment includes nodes connected to more than one network, e.g. a production network, backup network and the internet, then you will need to configure Ops Center Protector after installation in order to:

- Use one or more of those networks in preferential order depending on availability.
- Prevent (bar) the use of certain networks.
- Connect to remote nodes over the internet by defining an external IP addresses where those nodes may be contacted.

The following procedure must be performed on every node that is connected to the network in question:

Procedure

1. Open a command prompt as administrator.
2. Change directory to the `<Ops Center Protector install>\bin` folder.
3. Stop the Protector services by entering the command `diagdata --stop hub`.
4. Check the node's current configuration by entering the command `setconfig -l`
Refer to "Changing a node's profile with `setconfig`" in User Guide.
5. To configure a preferred IP address for the node, enter the command `setconfig -p nnn.nnn.nnn.nnn` where `nnn.nnn.nnn.nnn` is the IP address for the node on the preferred network.

Additional addresses may be added by listing them in order of preference separated by semicolons. Multiple addresses may need to be quoted depending on Operating System.

6. To configure a barred IP address for the node, enter the command `setconfig -b nnn.nnn.nnn.nnn` where `nnn.nnn.nnn.nnn` is the IP address for the node on the barred network.

Additional addresses may be added by listing them in order of preference separated by semicolons. Multiple addresses may need to be quoted depending on Operating System.

7. To configure an external (internet) IP address for the node, enter the command **setconfig -x *nnn.nnn.nnn.nnn*** where *nnn.nnn.nnn.nnn* is the IP address for the node on the internet.

Additional addresses may be added by listing them in order of preference separated by semicolons. Multiple addresses may need to be quoted depending on Operating System.

8. If you need to remove an address then enter the command **setconfig -r *nnn.nnn.nnn.nnn*** where *nnn.nnn.nnn.nnn* is the IP address.

Additional addresses may be added by listing them in order of preference separated by semicolons. Multiple addresses may need to be quoted depending on Operating System.



Note: The address(es) are removed from the preferred, barred and fixed list.

9. Review the node's new configuration by re-entering the command **setconfig -l**
10. Restart the Protector services by entering the command **hub start**.
11. Wait a few minutes, then reauthorise the node on the Master (See "How to authorize a node" in User Guide).

How to configure a server-side SSL certificate using a UI with Ops Center

If Protector is configured as part of an Ops Center setup, the **csslsetup** command is available. By using the **csslsetup** command, you can configure SSL communication for Hitachi Ops Center products installed on the same management server using a common secret key and server certificate. For more information on the usage and support scope of the **csslsetup** command, refer to "Configuring SSL communications by using the **csslsetup** command" in the Hitachi Ops Center Installation and Configuration Guide.

How to configure a server-side SSL certificate using a UI

There are two versions of the tool:

- **Certificatetool** This is a UI based tool and requires a windowing manager to be installed on the Master
- **Certificatetoolcli** This is CLI tool and can be run on a 'windows core installation' or a non-X11 linux installation

Before you begin

For Protector installations on Windows and Linux, there is a certificate tool which enables you to:

- Create a self-signed certificate
- Create a certificate signing request
- Install existing certificate

You will need the following Distinguished Names (DN) to create a CSR or self-signed certificate:

- Common Name (CN) - The fully qualified domain name (FQDN) to be secured.
- Organisation (O) - The legal incorporated name of your company.
- Organisational Unit (OU) - The department administering Protector.
- City/Locality (L)
- State/Country/Region (S)
- Country (C)
- Email Address - A point of contact in your Protector administrative team (optional)

Configure server-side SSL certificate using Windows

Windows

Procedure

1. On the Master node, open the folder `<Protector home>\bin`
2. Locate and run the program `certificatetool.exe` with administrator privileges.
3. Follow the instructions in the **Certificate Tool** wizard to:
 - **Create a self-signed certificate**
 - or **Create a certificate signing request**



Tip: The `.csr` file to be passed to your CA is created in the folder `<installation path>\db\ssl\webui\certificates`

The corresponding `.key` file is created in `C:\Program Files\Hitachi\Protector\db\ssl\webui\private`

- **Install Certificate**

Configure server-side SSL certificate using Linux

Linux

Procedure

1. On the Master node, open the folder `<installation path>/bin/`
2. Locate and run the program `certificatetool.exe`

3. Follow the instructions in the **Certificate Tool** wizard to:

- **Create a self-signed certificate**
- or **Create a certificate signing request**



Tip: The `.csr` file to be passed to your CA is created in the folder `<installation_path>/bin/db/ssl/webui/certificates`.
The corresponding `.key` file is created in `/opt/hitachi/protector/bin/db/ssl/webui/private`.

- **Install Certificate**



Note: The Certificate tool can be run as either a UI version or CLI text version, thus a windowing manager is no longer required for Linux or Windows installations.

How to configure a server-side SSL certificate manually

Before you begin

Obtain a valid SSL certificate file (`.crt` or `.cer`) and private key file (`.key`) for the Protector Web Server from your organization's Certificate Authority.

To configure server-side SSL for the Web UI:

Procedure

1. Copy your SSL certificate file to the folder `<installation_path>/db/ssl/certificates`.
2. Copy your SSL private key file to the folder `<installation_path>/db/ssl/private`.
3. On the Master node, open a command prompt at `<installation_path>/bin`.
4. Stop the Protector hub service by entering the command **diagdata --stop hub**.
5. Open the configuration file `<installation_path>/db/config/uic-system-config.cfg` in a text editor and do the following:
 - a. Set `SSL Certificate` to the location of your SSL certificate file:

```
<item argtype="single" name="SSL Certificate">
  <value type="string"> <installation_path>/db/ssl
/certificates/your_certificate.crt</value>
</item>
```

- b. Set `SSL Certificate Key` to the location of your SSL private key file:

```
<item argtype="single" name="SSL Certificate Key">
  <value type="string"> <installation_path>/db/ssl
/private/your_key.key</value>
</item>
```

- c. Set the `Webserver SSL` value to true:

```
<item argtype="single" name="Webserver SSL"
      <value type="bool">true</value>
</item>
```

You may need to insert the above XML within the following section of the config file:

```
<cofioxmllist>
...
</cofioxmllist>
```



Note: If you cut and paste these code fragments please ensure that line ends are correctly positioned.

6. Save the changes to the `uic-system-config.cfg` file.
7. Restart the Protector hub service on the Master node by entering the command `diagdata --start`.

How to add our CA certificate to the certificate store

Before you begin

In order to satisfy security scanner software the CA certificate used by Protector for inter-node communications needs to be trusted by the tool. To do this:

- Create a copy of `<installdir>/db/ssl/certificates/cacert.pem`
- Rename it to `cacert.crt`
- Propagate `cacert.crt` to all the relevant machines via your preferred method. This varies by OS and by configuration so is not documented here.

Using the CLI version of the certificate tool

As mentioned above, there is also a CLI version of the certificate tool. This was introduced in 7.3 to solve the problem of a non-X11 Linux installation or where the user is using a text based remote session. Also, where Windows is a 'Core-Installation' and thus a CLI version only.

The CLI version is not as rich in options as its UI counterpart, but it does have a set of useful options along with a set of examples.

To run the CLI version, simply enter the 'exe' name followed by the required arguments.

To see a list of the arguments and examples, like with all the Protector based CLIs enter:

```
certificatetoolcli --help
```

How to unregister the current certificate

There will always be situations where removal of the certificate and its components are required. This can be completed using the CLI version by using the 'u' argument:

```
certificatetoolcli -u
```



Note: It might be necessary to clear the browser cookies/Cached images and files for this change to take effect.

How to uninstall Protector

Before you begin



Caution:

- Uninstalling the Ops Center Protector Master does not deactivate active rules on Client nodes. To do this, you must deactivate all data flow(s) before uninstalling, or uninstall the Clients individually.
- Before uninstalling the Protector application the node (and any nodes proxied from it) must be removed from all dataflows, be unauthorized and deleted from the UI.

Operating System Specific Behaviour:

| OS | Note |
|---------------|---|
| Linux and AIX | <p>Completely removing Protector from a Linux or AIX machine is straight forward. Enter the following commands and follow the on-screen instructions:</p> <pre>/opt/hitachi/protector/uninstall rm -rf /opt/hitachi/protector</pre> |
| Windows | <p>Completely removing Protector from a Windows machine involves significantly more work, due partly to the additional functionality available on Windows nodes. Follow the steps listed below.</p> |

Procedure

1. Make a note of the path for the install directory and any repositories or ISMs. These will be required later if you wish to completely remove all traces of the installation and do not want to retain backup data stored in the repositories.
2. From the **Start** menu run **Uninstall Hitachi Ops Center Protector**. Alternatively, navigate to the installation directory and execute the command **uninstall.exe**. A dialog will be displayed asking you to confirm that you wish to proceed. Running the command **uninstall.exe --mode unattended** will cause the uninstall process to proceed without requiring user interaction; although popups may briefly appear before being automatically dismissed.
3. Click **Yes** to proceed with the uninstall process (or **No** to abort the process). A **Setup** dialog is displayed containing an **Uninstall Status** bar and information about what actions are currently being performed.

4. At some point during the uninstallation process you may be presented with a **Warning** dialog telling you that any repositories must be manually deleted. The uninstall process will pause until you click **OK**.
Manual removal of repositories is covered later on.
5. Eventually an **Info** dialog will be displayed stating that the uninstall process is complete. Click **OK**.
6. Delete any repository directories noted down before uninstalling. Ensure that there are no files or windows open at these locations or attempts at deletion may fail.
Protector and its repositories are now uninstalled and you can end the procedure at this point.

Some artefacts will still remain on your machine. These items are left in place either to facilitate easier reinstallation or because they remained after upgrading from an earlier version or from a failed install. If you want to remove these artefacts, then continue with the following steps:

7. Delete the Protector installation directory tree noted down before uninstalling. Ensure that there are no files or windows open at this location or attempts at deletion may fail.
8. A hidden directory `Protector-RecycleBin` may remain in the root directory. This can be removed.
9. Delete the Bitrock installer log files `bitrock_installer.log` and `bitrock_installer_<nnnn>.log` normally located in `C:\Users\Administrator\AppData\Local\Temp`
10. Open the Windows **Registry Editor** from the **Start > Run...** dialog by entering `regedit.exe` in the **Open:** field.
The **Registry Editor** window is displayed. Alternatively use the `reg delete` command from within a **Command Prompt**.
11. Carefully delete the following registry keys:



Caution: Incorrectly editing the Registry can cause the operating system to become unstable or stop working. Exercise extreme caution when performing this step.

- `HKEY_LOCAL_MACHINE\SOFTWARE\Cofio Software`
 - `HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Cofio Software`
 - `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CofioHub`
 - `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\dcefltr`
 - `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\sdrefltr`
 - `HKEY_LOCAL_MACHINE\SOFTWARE\Hitachi\Hitachi Ops Center Protector`
12. Confirm that the `dcefltr` and `sdrefltr` filter drivers are no longer installed on your system by entering the commands `sc query dcefltr` and `sc query sdrefltr`. You should see the following output in response to both commands:

```
The specified service does not exists as an
installed                               service.
```


Next steps

Occasionally an uninstallation may fail to complete successfully. In this situation there are a number of things that can be done before retrying:

- Ensure any files or folders that can block the uninstallation are closed.
- Reboot the machine to return it to a known, stable state.
- Reinstall Protector over the existing partially uninstalled version. In most cases this will allow an uninstallation to be successfully re-performed.

How to setup an existing Protector master for Ops Center

Adding Protector to Ops Center can be achieved using the `setupcommonservice` CLI tool located in the Protector bin directory. This will add Protector to as an Ops Center Instance and enable SSO functionality.

Run the `setupcommonservice` CLI tool with the appropriate arguments. You will be prompted for a username (if not provided as an argument) and password for an Ops Center administrator account. This will create an `opscenter` space and an ACP Association for Ops Center administrators. Protector should now be listed as a product in Ops Center titled with the hostname provided.

| Abbreviated Argument | Full Argument | Description |
|-------------------------|---------------|--|
| -h | --help | Display help |
| --cs-uri arg | | CS base uri e.g. https://myopscenter.com:443/portal |
| --cs-username arg | | CS username (optional). If this option is not provided it will be requested interactively. |
| --app-scheme arg | | Protector protocol scheme (http/https) |
| --app-hostname arg | | Protector hostname It can be the hostname or IP address. |
| --app-port arg | | Protector port (usually 443 if installed outside of Ops Center) |
| --ignore-ssl-errors arg | | Ignore SSL certificate errors (on/off) Default is on. |

Removing Protector from Ops Center

Ops Center ships with a Protector master preconfigured. If an existing Protector instance is being used it may be useful to remove this. To remove Protector, navigate to the 'Products' page in Ops Center and click the delete button (bin icon) on the Protector tile. This will unregister Protector and remove the Ops Center space.



Note: Any ACP associations for Ops Center will **not** be removed when deleting Protector from Ops Center.

Job Tasks

This section describes job control tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Job Concepts \(on page 111\)](#)
- [Jobs UI Reference \(on page 441\)](#)

How to view and control running jobs

Ops Center Protector tracks background asynchronous operations through jobs which can be viewed as follows:

Procedure

1. Click **Jobs** on the [Main Banner \(on page 278\)](#) to open the [Jobs Inventory \(on page 441\)](#).

Jobs can also be viewed from the [Monitor Details \(on page 460\)](#).

All currently running and recently completed jobs are displayed in a table with the most recently started job listed first.

2. From the [Jobs Inventory \(on page 441\)](#) select one or more jobs you want to control, by clicking the radio buttons to the left.
3. Click on the **More Actions** button above the table to see a menu of the available actions.

Depending on the type of job selected and the phase it has reached, some or all of the actions may not be available.

4. To view the details of a specific job, click on the **Job Type** in the table. The [Job Details \(on page 443\)](#) are displayed.

License Tasks

This section describes licensing tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [License Concepts \(on page 129\)](#)
- [Licenses UI Reference \(on page 444\)](#)

How to Add a License

You must provide Ops Center Protector with a valid license key in order to use its features as follows:

Procedure

1. Click **Licenses** on the Navigation Sidebar to open the License Inventory.
2. Copy the **Machine ID** displayed at the top of the License Inventory and include this in your license request email to your Hitachi Vantara support representative.
3. When you have received your license key, click **Add** to open the Activate License Wizard.
4. Copy the license key provided by your vendor and paste it into the **Licence Key** field.
5. Click **Finish**.
The License Details will be displayed. Review it to ensure that its expiry data is correct and that it provides the required features.

How to view a license

Ops Center Protector features are enabled via license keys which can be viewed as follows:

Procedure

1. Click **Licenses** on the [Navigation Sidebar \(on page 283\)](#) to open the [Licenses Inventory \(on page 444\)](#).
2. Click on the name of the license you want to view.
The [License Details \(on page 447\)](#) will be displayed.

Log Tasks

This section describes log review tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Log Concepts \(on page 109\)](#)
- [Logs UI Reference \(on page 448\)](#)

How to view logs

Ops Center Protector generates log messages as it performs activities. These can be viewed as follows:

Procedure

1. Click **Logs** on the [Main Banner \(on page 278\)](#) to open the [Logs Inventory \(on page 448\)](#).
All log messages are displayed in a table with the most recently generated log message listed first.

2. Click on the **Condensed View** or **Extended View** buttons to view fewer or more columns in the table.
3. Select one or more log entries you want to perform an action on, by clicking the check box buttons within the table.
You can then **Acknowledge Selected Logs** or **Create Log Notifications** for a message by clicking on the buttons above the table.
4. To view the attachments for a specific log entry, click on the **Attachments** icon in the table next to the log entry.
The [Log Attachments Dialog \(on page 458\)](#) is displayed.
5. To view only those logs that are associated with the same session (a job logs to a session), click the **View Session** icon in the table next to the log entry.
The [Session Log Details \(on page 456\)](#) are displayed, listing all logs for the session.

Monitor Tasks

This section describes data flow monitoring tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Monitor Concepts \(on page 108\)](#)
- [Monitor UI Reference \(on page 459\)](#)

How to trigger an operation from an active data flow

Before you begin

A data flow and associated policy has been defined, compiled and activated. For a typical example see [How to batch backup a file system path to a repository \(on page 141\)](#).



Tip: It is also possible to trigger operations from the [RPO Report \(on page 663\)](#).



Note: If a replication is paused, and subsequently evaluated due to trigger, schedule, or dataflow activation, the job must succeed, without actually resynchronizing the replication pairs of the paused replication. If the job were to fail in such circumstances, then jobs for downstream operations (other replication or snapshots) could not be executed.

An operation can be triggered manually from a monitor data flow as follows:

Procedure

1. Click **Monitor** on the [Main Banner \(on page 278\)](#) to open the [Monitor Inventory \(on page 459\)](#).
2. Locate the tile for the active data flow containing the nodes and policy operations you want to trigger, then click on the name of the data flow to open its [Monitor Details \(on page 460\)](#).

3. Select the **source node** on the data flow that implements the operation you want to trigger then click the **Trigger Operation** button in the top left of the data flow canvas. The [Trigger Operation Dialog \(on page 470\)](#) is displayed, listing all the available policies that can be triggered from that node.
4. Select the policy or policies that you want to trigger then click **OK**.
The dialog closes and a pop-up message is displayed indicating that the operation has been initiated. An animated icon appears above the related mover(s) on the data flow and a new job appears at the top of the Jobs list below the data flow. Once the operation has finished, the *Job Progress* will be set to *Completed* if the operation was successful or *Failed* if not.

How to deactivate an active data flow

Before you begin

A data flow and associated policy has been defined, compiled and activated. For a typical example see [How to batch backup a file system path to a repository \(on page 141\)](#).



Tip: Once deactivated, the data flow will be removed from the [Monitor Inventory \(on page 459\)](#). To reactivate the data flow, follow the steps described in [How to activate a data flow \(on page 229\)](#).

An active data flow can be deactivated as follows:

Procedure

1. Click **Monitor** on the [Main Banner \(on page 278\)](#) to open the [Monitor Inventory \(on page 459\)](#).
2. Locate the tile for the active data flow that you want to deactivate, then click on the name of the data flow to open its [Monitor Details \(on page 460\)](#).
You can also deactivate the data flow from the [Monitor Inventory \(on page 459\)](#), however opening the [Monitor Details \(on page 460\)](#) enables you to confirm that you are deactivating the correct data flow.
3. Click the **Deactivate** button.
A dialog is displayed before the data flow is deactivated. The [Monitor Details \(on page 460\)](#) closes and the [Monitor Inventory \(on page 459\)](#) is displayed with the deactivated data flow no longer listed.

Node Tasks

This section describes node configuration tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Node Concepts \(on page 50\)](#)
- [Nodes UI Reference \(on page 476\)](#)
- [Node Groups UI Reference \(on page 471\)](#)

How to add a node

Before you begin

The node must have the Protector Client software component installed (see [How to install/upgrade Protector on Windows and Linux or AIX \(on page 232\)](#)).



Note: OS *Host* nodes do not need to be added to the [Nodes Inventory \(on page 476\)](#) because they are automatically detected by the Master when the Client software component is installed.

The specific role of a node is determined when it is added to the [Nodes Inventory \(on page 476\)](#) as follows:

Procedure

1. Click **Nodes** on the [Navigation Sidebar \(on page 283\)](#) to open the [Nodes Inventory \(on page 476\)](#).
2. Click **Create new item** to open the [Node Type Wizard \(on page 479\)](#).
3. Select the type of node to be added then click **Start**.
The [Node Type Wizard \(on page 479\)](#) will guide you through creating a node of the required type.
4. Finally click **Finish** and the new node will appear in the [Nodes Inventory \(on page 476\)](#).


How to authorize a node

Before you begin

The node must appear in the [Nodes Inventory \(on page 476\)](#) (see [How to add a node \(on page 258\)](#)).

Nodes must be authorized by the Master node, before they are allowed to participate in a data flow, as follows:

Procedure

1. Click **Nodes** on the [Navigation Sidebar \(on page 283\)](#) to open the [Nodes Inventory \(on page 476\)](#).
2. Select the tile for the node you want to authorize by clicking in its top left corner.
Unauthorized nodes display a  icon in the top right corner
3. Click **Authorize Node** above the inventory area.
4. Wait a few moments for the node to be authorized.

Authorized nodes display a  icon in the top right corner.



Note: For extra security it is possible to verify the SSL/TLS fingerprint of the client node prior to authorization see [How to verify the SSL/TLS fingerprint of a client node prior to authorising \(on page 238\)](#)

How to stop the services

Before you begin

Sometimes it is necessary to stop the Protector services on a node, this needs to be done locally on the node itself.

- Open a console/command prompt window (On Windows select "Run as administrator", On Linux ensure you are running with root privileges using sudo))
- Within the command window change directory to the Protector 'bin' directory
- To stop the hub services – run the command:

```
diagdata --stop
```

How to start the services

Before you begin

If the Protector services have been stopped the services need to be restarted locally on the node itself.

- Open a console/command prompt window (On Windows select "Run as administrator", On Linux ensure you are running with root privileges using sudo))
- Within the command window change directory to the Protector 'bin' directory
- To stop the hub services – run the command:

```
diagdata --start
```

How to enable or disable encryption on a node

Before you begin

The node must appear in the [Nodes Inventory \(on page 476\)](#) (see [How to add a node \(on page 258\)](#)).

Nodes must be authorized by the Master node see [How to authorize a node \(on page 258\)](#).

Procedure

1. Click **Nodes** on the [Navigation Sidebar \(on page 283\)](#) to open the [Nodes Inventory \(on page 476\)](#).
2. Select the node you want to set the encryption state by clicking in its node name green text. The [Node Details \(on page 574\)](#) is displayed to enable the node's details to be viewed and edited.
 - a. Click **Enable\Disable Encryption** above the inventory area.
 - b. A popup message will be displayed indicating the encryption has been enabled or disabled as appropriate.
 - c. The **Encryption** entry in the **Configuration** table will be updated with the current state

How to change the account credentials for a Block Device node

Before you begin

It is assumed that there is already a block device configured and connected to a storage array.

Procedure

1. Click **Nodes** on the [Navigation Sidebar \(on page 283\)](#) to open the [Nodes Inventory \(on page 476\)](#).
2. Select the tile for the Block Device Node you want to change the credentials for by clicking in its top left corner.
3. Click **Edit Node** above the inventory area.
4. Click through the (inset link to **Hitachi Block Storage Node Wizard**) until you reach the 'Specify credentials for device' screen
5. Enter the new username/password as required.
6. Click through the rest of the wizard and click finish at the end. The credentials will now be updated for this Block Device node.

Notification Tasks

This section describes notification configuration tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Notification Concepts \(on page 110\)](#)
- [Notifications UI Reference \(on page 583\)](#)

How to create a notification

Before you begin

If you intend to use email as the notification method, you must configure the email notification settings first. Refer to [How to configure email settings for notifications \(on page 261\)](#).

Any message that appears in the [Logs Inventory \(on page 448\)](#) can be configured to generate a notification via email, SNMP or the System Event Log. A notification can either be created from the [Notifications Inventory \(on page 583\)](#) (in which case the notification parameters must be supplied by the user) or from the [Logs Inventory \(on page 448\)](#) (in which case the notification parameters are provided automatically from the selected log message:

Procedure

1. EITHER:
 - a. From the [Logs Inventory \(on page 448\)](#) select the log message that you want to be notified about by clicking the selection icon to the left of the message.

- b. Click the **Create Log Notification** button at the top of the log message table.
The [Notification Wizard \(on page 585\)](#) opens and the parameters are automatically populated based on the selected log message.
2. OR:
 - a. Open the [Notifications Inventory \(on page 583\)](#) by clicking on **Notifications** in the [Navigation Sidebar \(on page 283\)](#)
 - b. Click **Create New Item** at the top of the notification table.
The [Notification Wizard \(on page 585\)](#) opens so that the parameters describing the log message can be entered.
 - c. Select the type of message for which a notification will be generated and enter the required parameters:
 - **Logs** - creates a notification based on a generic log message.
 - **Hitachi Block Device Monitoring** - creates a notification based on a specific type of log message associated with Hitachi Block Storage device parameters.
3. Click **Next**, then select the **Match Behaviour** and **Notification Method(s)**
4. Click **Finish** to close the wizard and display the [Notifications Inventory \(on page 583\)](#).
5. Create additional conditions by clicking **Create New Item** at the top of the notification table. Once you have finished creating conditions, it is recommended that you test them (see [How to test a notification \(on page 262\)](#)).

How to configure email settings for notifications

Before you begin

Set up an email account that can be used by Protector to send out notification emails. You will need to know the following details for this account:

- The email Account Provider - e.g. Google, Hotmail, etc.
- Account Name - e.g. dataprotection@company.com
- Host Name - e.g. smtp.company.com
- IP Port Number - e.g. 25 for SMTP
- Encryption Type - TLS, START_TLS or NONE
- Authentication Method - ON, OFF or NTLM
- Username
- Password



Note: It is necessary to lower the security levels for Yahoo and Google email providers. Refer to your provider's account security settings to allow applications with less secure sign in technology.

To configure the email address for Protector notifications:

Procedure

1. Click the **Notifications** option in the [Navigation Sidebar \(on page 283\)](#) to open the [Notifications Inventory \(on page 583\)](#).
2. Click the **Configure Email Settings** button in the top right corner of the page to open the [Email Notifications Settings Wizard \(on page 584\)](#).
3. Enter the details for the **Sender Account** and **Receiver Account**.
4. Click **Test Email Settings** and check that a test email is received from Protector as expected.
5. Click **Finish** to close the wizard.

How to test a notification

Before you begin

Create one or more notifications (see [How to create a notification \(on page 260\)](#)).

Use the `sendlog` command (see [Generating log messages with sendlog \(on page 843\)](#)) to create logs to test that a notification event handler (NEH) functions properly.

When a notification event is triggered, a log message file is created that exists for the duration of the handler execution, after which it is deleted. To view the contents of a log message file, an event handler can be created that dumps the file to standard output. In Windows the following command could be placed in a batch file that acts as the NEH:

```
more < %1
```

A log message entry will appear on the [Logs Inventory \(on page 448\)](#) with an attachment containing the above batch command, followed by the XML formatted log message that triggered it.

How to customize alert notifications

If your site must receive alert notifications based on real-time or audit log events, then you can create a custom configuration file with instructions for which script/program Ops Center Protector must run as an event handler, and the arguments to pass to it.

Custom event handlers are added to the [Notification Wizard \(on page 585\)](#) as checkboxes in the Notification Method area.

By default, all Ops Center Protector notification handler configuration files are stored relative to the installation directory:

```
\db\config\notification
```

The path to the handler executable must be relative to the `\bin` directory where Ops Center Protector is installed. The default locations are as follows:

For Windows:

```
C:\Program Files\Hitachi\Protector\bin
```

For Linux:

```
/opt/hitachi/protector/bin
```

The built-in Email and System Event notification methods are configured by `email.cfg` and `systemlog.cfg` and implemented by `nehemail.exe` and `neheventlog.exe`, respectively (we recommend using the prefix `neh` to identify notification event handlers).

The first parameter passed to the handler is always the path to a log message file ([About the notifications log message file \(on page 264\)](#)). You can also specify your own additional arguments for Windows and Linux that are stored separately, so the same configuration file can be reused on both operating systems.

The custom handler is specified in the format shown in the following example (`customeventhandler.cfg`):

```
<cofioxmllist>
  <!-- text for custom notification method check box -->
  <item name="HandlerName" argtype="single" >
    <value type="string" >Custom</value>
  </item>

  <!-- default state of custom notification method check box -->
  <item name="Default" argtype="single" >
    <value type="bool" >False</value>
  </item>

  <!-- handler executable or script name -->
  <item name="HandlerExecutable" argtype="list" >
    <item name="WinExecutable" argtype="single" >
      <value type="string" >nehcustom.exe</value>
    </item>
    <item name="UnixExecutable" argtype="single" >
      <value type="string" >nehcustom</value>
    </item>
  </item>

  <!-- arguments 2, 3, ..., n passed to custom handler -->
  <item name="WinHandlerArgs" argtype="list" >
    <item name="HandlerArg" argtype="single" >
      <value type="string">windows custom arg</value>
    </item>
  </item>
  <item name="UnixHandlerArgs" argtype="list" >
    <item name="HandlerArg" argtype="single" >
      <value type="string">unix custom arg</value>
    </item>
  </item>
</cofioxmllist>
```

Any text printed to the standard output device by the handler will be included as an attachment to an error log message:

```
handler name notifier failed. (Attachment 1) *** Attachment count 1
*** "
```

The exit code of the handler is ignored.

About the notifications log message file

The log message file name is passed as the first parameter to all NEH handlers. It consists of a list of value pairs named:

`NotificationDetailFieldName` – a string identifying the parameter

and

`NotificationDetailFieldValue` – a value for the parameter

By reading these name-value pairs, the handler is able to analyze the log entry that caused it to be invoked and respond accordingly.

Log message files have a variable number of fields and can contain additional fields, such as a `SessionID` or a `Data Source`. The following table lists common fields.

| <code>Immutable</code> | The log message will not be cleared when erasing the logs. |
|-----------------------------|---|
| <code>SequenceNumber</code> | All logs have an ascending sequence number. |
| <code>MasterDate</code> | A 32 bit timestamp of when the master received the log message. |
| <code>LocalDate</code> | A 32 bit timestamp of when the log message was sent. |
| <code>Source</code> | The node from which the log message originated. |
| <code>Category</code> | The log message category. |
| <code>Level</code> | A value between 1 and 4 with 1 being <i>Detail</i> and 4 being <i>Error</i> . |
| <code>Attachments</code> | The text of any attachment to the log message. |
| <code>Log</code> | The body of the log message. |
| <code>Acked</code> | Indicates if the log message is acknowledged (0 or 1). |
| <code>BuildNumber</code> | The version of Ops Center Protector on the node that sent the log message. |

Policy Tasks

This section describes policy configuration tasks that users will perform with Ops Center Protector.

Refer to [Data Protection Workflows \(on page 132\)](#) for detailed descriptions of specific Repository and Hitachi Block data protection scenarios.

For further information, refer to:

- [Policy Concepts \(on page 92\)](#)
- [Policies UI Reference \(on page 594\)](#)

How to create a policy

Before you begin

Ensure that the nodes acting as sources and destinations for your backup data have been added to Protector, see [How to add a node \(on page 258\)](#).

To create a policy:

Procedure

1. Click the **Policies** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Policies Inventory \(on page 594\)](#).
2. Click the **Create new item** tile to open the [Policy Wizard \(on page 595\)](#).
3. Enter a **Name** and **Description** for the policy, then click **Next**.
4. From the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) you can either:
 - Add filters to an existing classification. Refer to [How to add a filter to a classification \(on page 268\)](#).
 - Click the **Create new item** tile to add another classification to the policy. Refer to [How to add a classification to a policy \(on page 266\)](#).
 - Edit an existing classification in the policy. Refer to [How to edit a classification in a policy \(on page 267\)](#).
 - Delete an existing classification from the policy. Refer to [How to delete a classification from a policy \(on page 267\)](#).
5. At least one classification must be added to a new policy. When you have finished adding classifications and filters, click **Next**.
The **Operation Selection** page of the [Policy Wizard \(on page 595\)](#) is displayed.
6. Select the required operation for the policy. At least one operation must be added to a new policy. Refer to [How to add an operation to a policy \(on page 269\)](#) before proceeding further.
7. From the **Operations** inventory page of the [Policy Wizard \(on page 595\)](#) you can either:
 - Click the **Create new item** tile to add another operation to the policy. Refer to [How to add an operation to a policy \(on page 269\)](#).
 - Edit an existing operation in the policy. Refer to [How to edit an operation in a policy \(on page 270\)](#).
 - Delete an existing operation from the policy. Refer to [How to delete an operation from a policy \(on page 270\)](#).
8. When you have finished adding operations, click **Finish**.

How to edit a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of editing the policy is understood.

To edit a policy:

Procedure

1. Click the **Policies** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Policies Inventory \(on page 594\)](#).
2. Select the required policy tile.
The [Policy Details \(on page 658\)](#) opens.
3. Click **Edit** above the inventory to open the [Policy Wizard \(on page 595\)](#).
4. Editing the policy is similar to creating one. Refer to [How to create a policy \(on page 265\)](#).
5. If required, you can now recompile and reactivate all data flows where the edited policy is used. Refer to [How to activate a data flow \(on page 229\)](#).

How to delete a policy

Before you begin



Note: It is not possible to delete a policy which has been applied to a node within a data flow (active or not). All data flows where the policy is used must therefore be reviewed and edited so that the policy to be deleted is unassigned from all nodes.

To delete a policy:

Procedure

1. Click the **Policies** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Policies Inventory \(on page 594\)](#).
2. Select the policy to be deleted by clicking in the top left corner of the corresponding tile.
3. Click **Delete** above the inventory.
4. Recompile and reactivate the rules for all data flows where the deleted policy was used.

How to add a classification to a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of adding the classification is understood.

To add a classification to a policy:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) either by creating a new policy ([How to create a policy \(on page 265\)](#)) or editing an existing one ([How to edit a policy \(on page 266\)](#)).
2. Click the **Create new item** tile to add a classification to the policy.
The **Classification Selection** page of the wizard is displayed.
3. Select the classification category you require on the left of the wizard.
The available classification types are displayed on the right of the wizard.
4. Select the required classification from the list on the right of the wizard, then click **Next**.
One of the following classification wizards is displayed:
 - Application classifications:
 - [Oracle Database Classification Wizard \(on page 607\)](#)
 - [Oracle RMAN Classification Wizard \(on page 610\)](#)
 - Hypervisor classifications:
 - [VMware Classification Wizard \(on page 622\)](#)
 - Physical classifications:
 - [Disk Type Classification Wizard \(on page 630\)](#)
 - [Hitachi Block Classification Wizard \(on page 631\)](#)
 - [Path Classification Wizard \(on page 634\)](#)
5. Enter the parameters required for the selected classification, then click **Apply**.

How to edit a classification in a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of editing the classification is understood.

To edit a classification:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the classification to be edited by clicking on the **<classification name>** of the corresponding tile.
The classification wizard is displayed.
3. Make the required changes to the classification, then click **Apply**.

How to delete a classification from a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of deleting the classification is understood.

To delete a classification:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the classification to be deleted by clicking in the top left corner of the corresponding tile.
3. Click **Delete** above the inventory.

How to add a filter to a classification

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of adding the filter is understood.

To add a filter to a classification:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) either by creating a new policy ([How to create a policy \(on page 265\)](#)) or editing an existing one ([How to edit a policy \(on page 266\)](#)).
2. Click the **Edit Filters** link on the required classification tile.
The [Classification Filters Wizard \(on page 648\)](#) is displayed.
3. Click the **Create new item** tile.
The **Classification Filter Selection** page of the wizard is displayed.
4. Select the required filter from the list displayed by the wizard, then click **Next**.
5. Enter the parameters required for the selected filter, then click **Apply**.

How to edit a filter on a classification

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of editing the filter is understood.

To edit a filter on a classification:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the filter to be edited by clicking on **Edit Filters** of the corresponding classification tile.
The [Classification Filters Wizard \(on page 648\)](#) is displayed.
3. Select the filter to be edited by clicking on the **<filter name>** of the corresponding tile.
4. Make the required changes to the filter, then click **Apply**.

How to delete a filter from a classification

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of deleting the filter is understood.

To delete a filter from a classification:

Procedure

1. Navigate to the **Classifications** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the filter to be deleted by clicking on **Edit Filters** of the corresponding classification tile.
The [Classification Filters Wizard \(on page 648\)](#) is displayed.
3. Select the filter to be deleted by clicking in the top left corner of the corresponding tile.
4. Click **Delete** above the inventory.

How to add an operation to a policy

It is recommended that all data flows where the policy is used are reviewed so that the effect of adding the operation is understood. Adding an operation may cause a compiler warning if the operation is not applied to all data flows using the policy.

To add an operation to a policy:

Procedure

1. Navigate to the **Operations** inventory page of the [Policy Wizard \(on page 595\)](#) either by creating a new policy ([How to create a policy \(on page 265\)](#)) or editing an existing one ([How to edit a policy \(on page 266\)](#)).
2. Click the **Create new item** tile to add an operation to the policy.
The **Operation Selection** page of the wizard is displayed.
3. Select the required operation from the list displayed by the wizard, then click **Next**.
One of the following operation wizards is displayed
 - [Mount Operation Wizard \(on page 642\)](#)
 - [Backup Operation Wizard \(on page 639\)](#)
 - [Replicate Operation Wizard \(on page 643\)](#)
 - [Snapshot Operation Wizard \(on page 645\)](#)
 - [Tier Operation Wizard \(on page 647\)](#)
 - [Access Operation Wizard \(on page 653\)](#)
4. Enter the parameters required for the selected operation. For some operations it is possible to select **Run on Schedule** under **Run Options** to specify when the operation will be run. To create a schedule click **Manage Schedules** then refer to [How to create a schedule \(on page 272\)](#).
5. Once the operation's parameters have been entered, click **Apply**.

How to edit an operation in a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of editing an operation is understood.

To edit an operation:

Procedure

1. Navigate to the **Operations** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the operation to be edited by clicking on the **<operation name>** of the corresponding tile.
The operation wizard is displayed.
3. Make the required changes to the operation, then click **Apply**.

How to delete an operation from a policy

Before you begin

It is recommended that all data flows where the policy is used are reviewed so that the effect of deleting the operation is understood.

To delete an operation:

Procedure

1. Navigate to the **Operations** inventory page of the [Policy Wizard \(on page 595\)](#) by editing an existing policy.
2. Select the operation to be deleted by clicking in the top left corner of the corresponding tile.
3. Click **Delete** above the inventory.

Report Tasks

This section describes reporting tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Report Concepts \(on page 119\)](#)
- [Reports UI Reference \(on page 660\)](#)

How to view a report

Ops Center Protector generates a number of different reports which can be viewed as follows:

Procedure

1. Click **Reports** on the [Main Banner \(on page 278\)](#) to open the [Reports Dashboard \(on page 660\)](#).
2. Select one the report type you want to view by clicking the corresponding button on the dashboard.
The selected report is displayed.
3. From a report page, click on the **Export** button in the top right to open the [Export Report Dialog \(on page 684\)](#) which enables the report to be exported in various formats.

Restore Tasks

This section describes data restore tasks that users will perform with Ops Center Protector.

Refer to [Data Protection Workflows \(on page 132\)](#) for detailed descriptions of specific Repository and Hitachi Block data restore scenarios.

For further information, refer to:

- [Restore Concepts \(on page 111\)](#)
- [Restore UI Reference \(on page 686\)](#)

How to view available backups



Tip: All the operations available from the Restore UI are also available from the Storage UI (see the [Storage UI Reference \(on page 756\)](#)). The Storage UI also enables additional operations to be performed.

Ops Center Protector maintains an inventory of all available backups that can be viewed as follows:

Procedure

1. Click **Restore** on the [Navigation Sidebar \(on page 283\)](#) to open the [Restore Inventory \(on page 686\)](#).
2. Modify the filter options in the Filters section of the Inventory page to narrow down the search results as required.
3. Click **Search** in the Filters section of the inventory page.
An inventory of all backups for that storage device type is displayed.
4. To view more details, click on the **<date and time>** of a backup tile to open the details page for a backup.
5. To perform a restore action, click on the **Restore, Mount, Unmount, Revert** or **Swap** button as appropriate to the backup type selected.

Schedule Tasks

This section describes schedule configuration tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Schedule Concepts \(on page 103\)](#)
- [Schedules UI Reference \(on page 748\)](#)

How to create a schedule

To create a schedule:

Procedure

1. Click the **Schedules** link on the [Navigation Sidebar \(on page 283\)](#) to open the [Schedules Inventory \(on page 748\)](#).
2. Click the **Create new item** tile to open the [Schedule Item Wizard \(on page 751\)](#). The **Specify name and description** page of the wizard is displayed.
3. Enter a **Name** and **Description** for the schedule, then click **Next**. The **Add one or more Schedules** page of the wizard is displayed.
4. From the **Add one or more Schedules** inventory page of the [Schedule Wizard \(on page 749\)](#), click **Create new item** to add an item to the schedule. The **Select Schedule item type** page of the [Schedule Item Wizard \(on page 751\)](#) is displayed.
5. Select the item **Type** from the list, then click **Next**. The **Configure Schedule item** page of the [Schedule Item Wizard \(on page 751\)](#) is displayed.
6. Select **Weekly** or **Monthly** on the left and edit the parameters displayed on the right.
7. Click **Apply** to add the item to the schedule. The [Schedule Wizard \(on page 749\)](#) is displayed, showing the list of items in the schedule.
8. From the **Add one or more Schedules** inventory page of the [Schedule Wizard \(on page 749\)](#) you can either:
 - Click **Create new item** to add another item to the schedule.
 - Select an existing item by clicking the selection icon to the left and click **Delete** to remove the item from the schedule.
 - Click on the item description (or click the selection icon to the left and click **Edit**) to edit an operation.
9. When you have finished adding items, click **Finish**.

Storage Tasks

This section describes storage management tasks that users will perform with Ops Center Protector.

For further information, refer to:

- [Storage Concepts \(on page 115\)](#)
- [Storage UI Reference \(on page 756\)](#)

How to view the status of a repository

Before you begin

It is assumed that a policy that creates repository snapshots has been implemented.

To view the status of a repository:

Procedure

1. Click **Storage** on the [Main Banner \(on page 278\)](#).
The [Storage Inventory \(on page 756\)](#) is displayed.
2. In the filters area, set the **Type** to *Repository*.
The inventory now only lists Repository storage nodes.
3. Click on the title of the tile corresponding to the required Repository.
The [Generation 1 Repository Details \(on page 795\)](#) for the that Repository are displayed.
4. Click one of the following buttons on the [Generation 1 Repository Details \(on page 795\)](#):
 - **View Node Details** to view the [Node Details \(on page 574\)](#).
 - **Analyze** or **Refresh** to analyze the repository sizes.
 - **Stores** to view the [Gen1 Repository Stores Inventory \(on page 796\)](#).

How to view the contents of a snapshot in a repository store

Before you begin

It is assumed that a policy that creates repository snapshots has been implemented and that at least one snapshot has been created in the designated repository store.

To view the contents of a repository snapshot:

Procedure

1. Click **Storage** on the [Main Banner \(on page 278\)](#).
The [Storage Inventory \(on page 756\)](#) is displayed.
2. In the filters area, set the **Type** to *Repository*.
The inventory now only lists Repository storage nodes.
3. Click on the title of the tile corresponding to the required Repository.
The [Generation 1 Repository Details \(on page 795\)](#) for that Repository are displayed.

4. Click the **Stores** button on the [Generation 1 Repository Details \(on page 795\)](#).
The [Gen1 Repository Stores Inventory \(on page 796\)](#) is displayed.
5. Click on the title of the tile corresponding to the required Store.
Each Store tile indicates the *Source Node* and *Policy* it is associated with.
The [Gen1 Repository Store Details \(on page 799\)](#) for the that Store are displayed.
6. Click on the title of the tile corresponding to the required *Snapshot*.
Each Snapshot tile indicates the *Date and Time* when it was created.
The [Repository Snapshot Details \(Storage\) - File System \(on page 801\)](#) for the Snapshot are displayed.

How to view the status of a Hitachi Block storage device

Before you begin

It is assumed that a policy that creates Hitachi Block hardware snapshots has been implemented and that at least one snapshot has been created in the designated pool on the device.

To view the hardware status:

Procedure

1. Click **Storage** on the [Main Banner \(on page 278\)](#).
The [Storage Inventory \(on page 756\)](#) is displayed.
2. In the filters area, set the **Type** to Hitachi Block Device or Hitachi *Logical Block Device*.
The inventory lists only Hitachi Block storage nodes.
3. Click on the title of the tile corresponding to the required device.
The [Hitachi Block Device Details \(on page 757\)](#) for the device are displayed.
4. Click one of the following buttons on the [Hitachi Block Device Details \(on page 757\)](#):
 - **Host Groups** to view the [Hitachi Block Host Groups Inventory \(on page 759\)](#)
 - **Journals** to view the [Hitachi Block Journals Inventory \(on page 761\)](#)
 - **Pools** to view the [Hitachi Block Pools Inventory \(on page 764\)](#)
 - **Logical Devices** to view the [Hitachi Block Logical Devices Inventory \(on page 766\)](#)
 - **Snapshots** to view the [Hitachi Block Snapshots Inventory \(on page 767\)](#).
 - **Replications or Clones** to view the [Hitachi Block Replications Inventory \(on page 777\)](#)
5. Click on the title of a tile in the selected inventory to view the details for that item.

Chapter 5: User Interface Reference

This chapter describes the Ops Center Protector based user interface.

User Interface Overview

This section provides a general overview of the Protector user interface.

User Interface Structure

The Ops Center Protector user interface follows a general pattern for the hierarchical layout of pages. Understanding this hierarchy will help you navigate the UI more effectively, enabling you to locate, create and edit resources quickly and easily.



Note: Before you can access the Protector UI, you must be granted access by a Protector administrator who will provide you with a user name and password. These credentials must be entered via the [Login Page \(on page 301\)](#). Depending on the roles assigned to you, your credentials may not allow you access to all areas or functions of the UI.

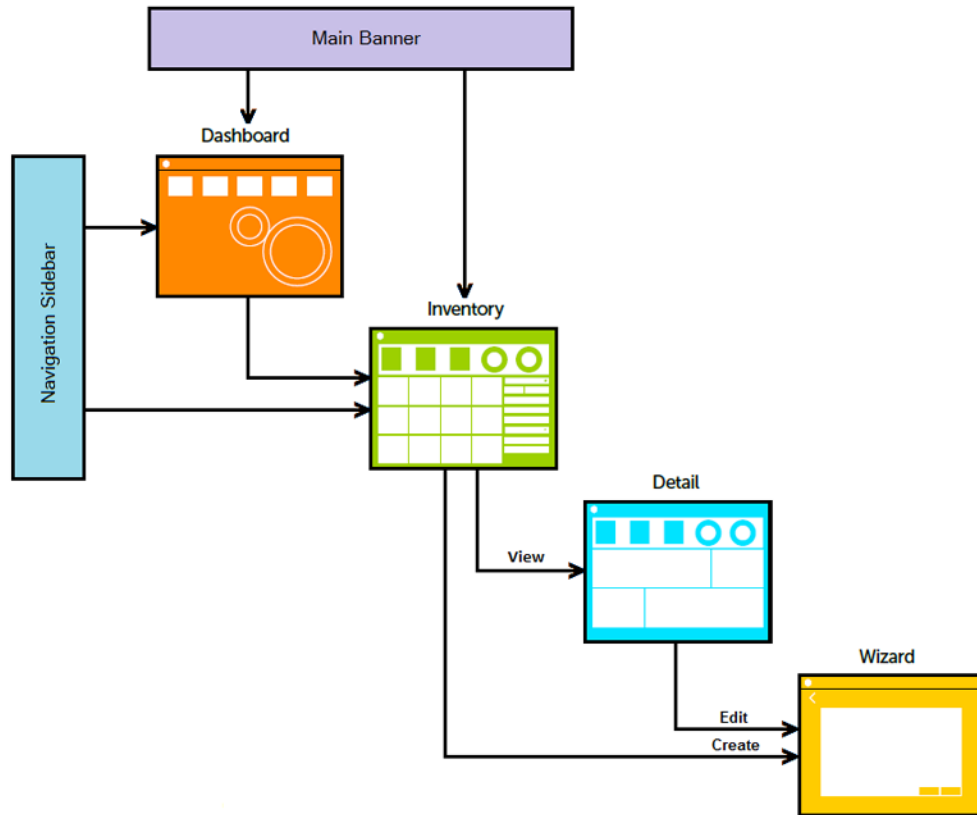


Figure 67 User interface general hierarchy

| Page Type | Description |
|--------------------|---|
| Main Banner | The Main Banner (on page 278) appears at the top of all pages in the user interface and provides links to all the frequently accessed monitoring and administration dashboards and inventories. |
| Navigation Sidebar | The Navigation Sidebar (on page 283) appears at the left of all pages in the user interface and provides links to all the frequently accessed management, configuration and design dashboards and inventories. |
| Dashboard | Dashboard pages (e.g. Default Dashboard (on page 284)) are used when information needs to be grouped together into related sets of resources and functions. From a dashboard it is possible to view the inventories of resources. |
| Inventory | Inventory pages (e.g. Nodes Inventory (on page 476)) list collections of resources of the same type. They can be filtered to display the entire set or a specific subset of those resources. From an inventory page it is possible to create, view and delete resources and perform other available actions on them. |

| Page Type | Description |
|-----------|---|
| Detail | Detail pages (e.g. Node Details (on page 574)) display all the properties of a particular resource. If a resource is a composite of other resources (e.g. policies are a composite of classifications and operations) then its detail page may contain inventories of those sub-resources. From a detail page it is possible to edit the resource and perform other available actions on them. |
| Wizard | Wizard pages (e.g. Node Type Wizard (on page 479)) are an ordered collection of dialogs that guide the user through the creation or modification of a resource. A dedicated wizard is provided for creating and editing each type of resource. If a resource is a composite of other resources then its wizard may invoke wizards for creating those sub-resources. |

User Interface Page Layout

The Ops Center Protector user interface is displayed in a web browser window and is arranged in the following way:

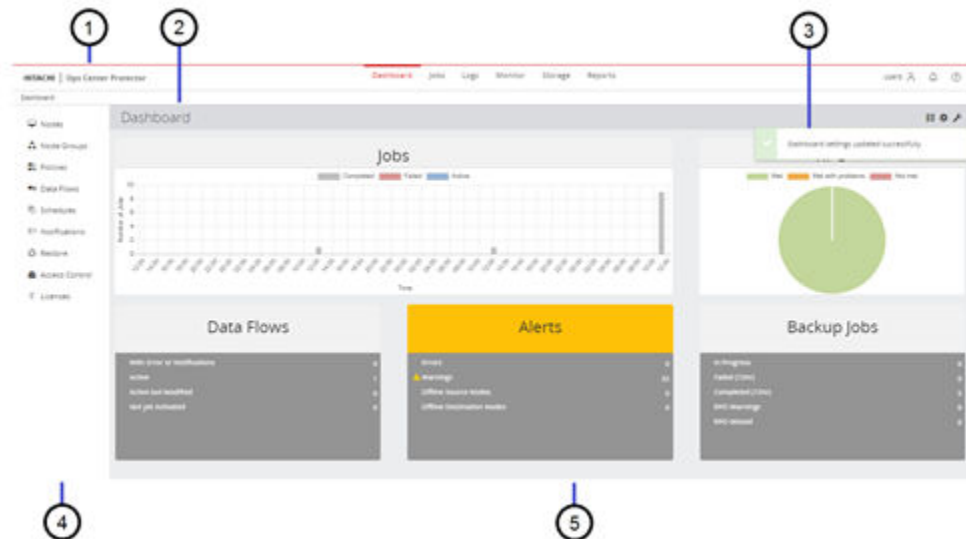


Figure 68 User interface page layout

| Control | Description |
|-----------|--|
| 1. Banner | The banner remains visible and active at all times. It contains links to frequently used monitoring and administrative functions. Refer to the Main Banner (on page 278) description for more details. |

| Control | Description |
|---------------------------------|--|
| 2. Breadcrumbs | The breadcrumbs remain visible and active at all times. They provide an indication of where you are in the hierarchy of pages and allow easy navigation to related pages. Refer to the Navigation Breadcrumbs (on page 282) description for more details. |
| 3. Pop-up Session Notifications | <p>One or more color coded session notification messages may appear down the right hand side of the page, these messages are displayed in response to user interaction via the UI:</p> <ul style="list-style-type: none"> ▪ Green - Indicates that the command has been executed successfully. ▪ Blue - Indicates that the command has been actioned but the outcome is not yet known. ▪ Red - Indicates the command failed. <p>The session messages are removed after a few seconds, but can be viewed in the Session Notifications list displayed via the Main Banner (on page 278). When a session notification message appears, check for entries in the Logs Inventory (on page 448) if further information is required.</p> |
| 4. Sidebar | The sidebar is available at all times. It contains links to management, configuration and design functions. Refer to the Navigation Sidebar (on page 283) description for more details. |
| 5. Page Area | <p>All pages relating to the Protector UI appear in this area. Refer to the Inventory Page (on page 285) description for more details.</p> <p>Following logon, the Default Dashboard (on page 284) is displayed. It presents an overview of the current system status and contains links to the associated pages.</p> |





Main Banner

The main banner appears at the top of all pages in the user interface and provides links to all the frequently accessed monitoring and administration functions.



Figure 69 Main Banner

| Control | Description |
|-----------|---|
| Dashboard | Opens the Dashboard (on page 284) |
| Jobs | Opens the Jobs (on page 441) |

| Control | Description |
|---|--|
| Logs | Opens the Logs (on page 448) |
| Monitor | Opens the Monitor (on page 459) |
| Storage | Opens the Storage Inventory (on page 756) |
| Reports | Opens the Reports (on page 660) |
|  | <p>The name of the currently logged in user is displayed here.</p> <p>Opens the menu from which the Settings Wizard (on page 279) Dialog and the logout option can be accessed. Click to logout.</p> |
|  Session Notifications | <p>Click to view the list of session notification messages. The messages listed here are a cache of the pop-up messages displayed in the web UI. The number of unread error notifications is displayed to the right of the button. All unread session notifications are considered to have been read when the list is opened then subsequently closed. All notifications can be cleared by selecting Clear at the top of the popup list.</p> <div>  Note: If you have a number of browser tabs open simultaneously, the notifications displayed here are local to the tab in which you are currently working. </div> |
|  Help | Displays a menu from which the Online Help dialog (on page 281) and About dialog (on page 281) can be accessed. |

Settings Wizard

Controls the presentation of information within the user interface.

Figure 70 User Interface Settings

| Control | Description |
|--------------------|--|
| Locale | Selects the locale so that information is presented in accordance with the conventions of the associated culture. |
| Time Zone | The time zone to be used to display dates and times on the UI. The Master node's time zone is not changed. |
| Use 24 hour format | Displays time in HH:MM:SS format when checked, otherwise AM/PM format is used. |
| Page Size | Sets the number of tiles or table entries displayed per page in the Inventory Page (on page 285) . |
| Default Layout | Selects tile or table view as the default in all Inventory Page (on page 285) s. |
| Cancel | Discards all changes made to the settings and reverts to those used prior to opening the Setting page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

About dialog

This dialog is displayed when the Help > About option is selected from the Main Banner.

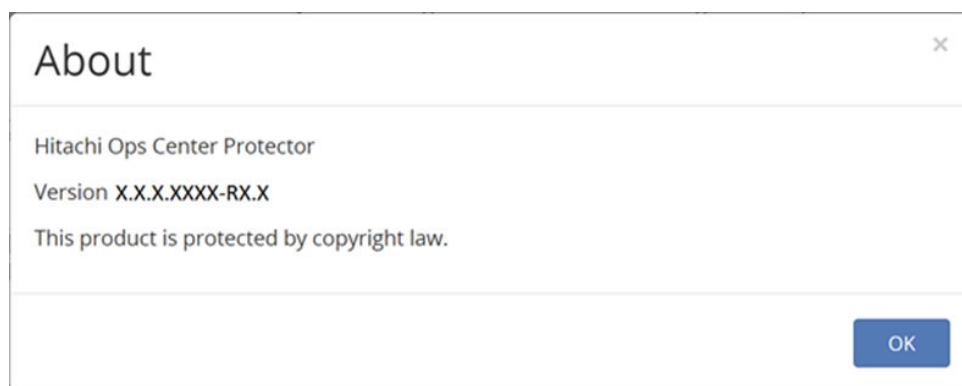


Figure 71 About Dialog

This dialog shows the build number for the Master node. You may need this when communicating with Hitachi Vantara Support.

Online Help dialog

This dialog is displayed when the Help > Online Help option is selected from the Main Banner.

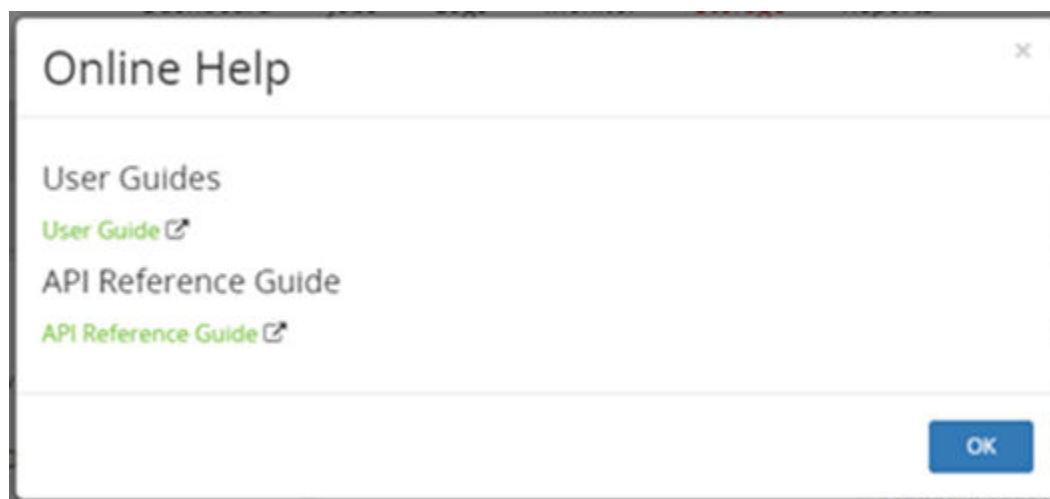



Figure 72 Online Help Dialog

Click the link to open online help versions of the Protector User Guide in separate browser tabs. This also includes Application specific information.

| Control | Description |
|---|--|
|  | <p>Link to open the online help versions of below documents in separate browser tabs. This also includes Application specific information.</p> <ul style="list-style-type: none"> ▪ User Guide ▪ API Reference Guide |

Navigation Breadcrumbs

The breadcrumbs appear at the top of all pages in the user interface and show the hierarchical location of the current page. This allows the user to navigate back to a parent page by clicking on the page name.

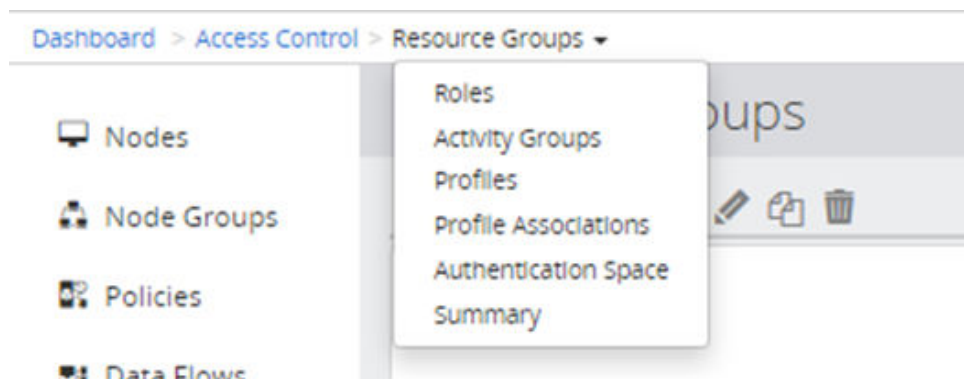



Figure 73 Breadcrumbs

| Control | Description |
|--------------------|--|
| Dashboard | <p>The home page in the hierarchy (i.e. the Default Dashboard (on page 284)).</p> <p>Click here to navigate directly to the home page.</p> |
| 1st Level Sub-page | <p>The 1st level sub-page (e.g. Access Control)</p> <p>Click here to navigate directly to this page.</p> |
| 2nd Level Sub-page | <p>The 2nd level sub-page (e.g. Resource Groups).</p> <p>Click here to navigate directly to this page.</p> <p>If other related pages are available, these are shown in a pop-up menu by clicking the  icon to the right of the parent page name. Click on one of the menu items to navigate directly to that page.</p> |
| Current Page | <p>The currently displayed page (e.g. Create).</p> |

Navigation Sidebar

The sidebar is displayed to the left of all pages in the user interface and provides links to all the frequently accessed management, configuration and design functions.

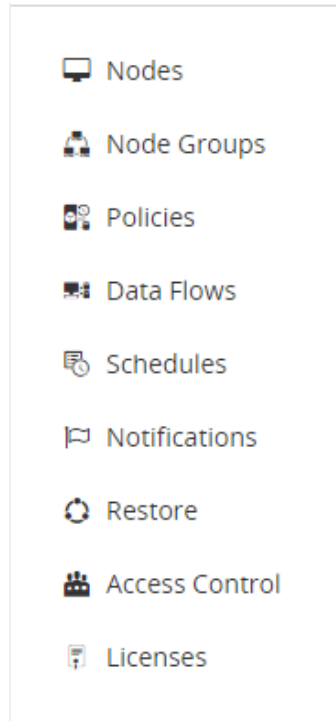


Figure 74 Navigation Sidebar

| Control | Description |
|----------------|--|
| Nodes | Opens the Nodes Inventory (on page 476) |
| Node Groups | Opens the Node Groups Inventory (on page 471) |
| Policies | Opens the Policies Inventory (on page 594) |
| Data Flows | Opens the Data Flows Inventory (on page 350) |
| Schedules | Opens the Schedules Inventory (on page 748) |
| Notifications | Opens the Notifications Inventory (on page 583) |
| Restore | Opens the Restore Inventory (on page 686) |
| Access Control | Opens the Access Control Dashboard (on page 302) |
| Licenses | Opens the Licenses Inventory (on page 444) |

Default Dashboard

The Default Dashboard is the home page for the Protector user interface. It displays summary information about system status including jobs, RPO, data flows, alerts and backups. It also provides links to the underlying pages where more detailed information can be found.



Note: When accessing the underlying pages from the Dashboard, a filter is automatically applied to the target page so that only the items indicated are displayed.

For example, if 5 Errors are indicated on the Alerts tile, clicking the corresponding text will open the Logs page from the Dashboard with a filter applied such that only error level logs are displayed.

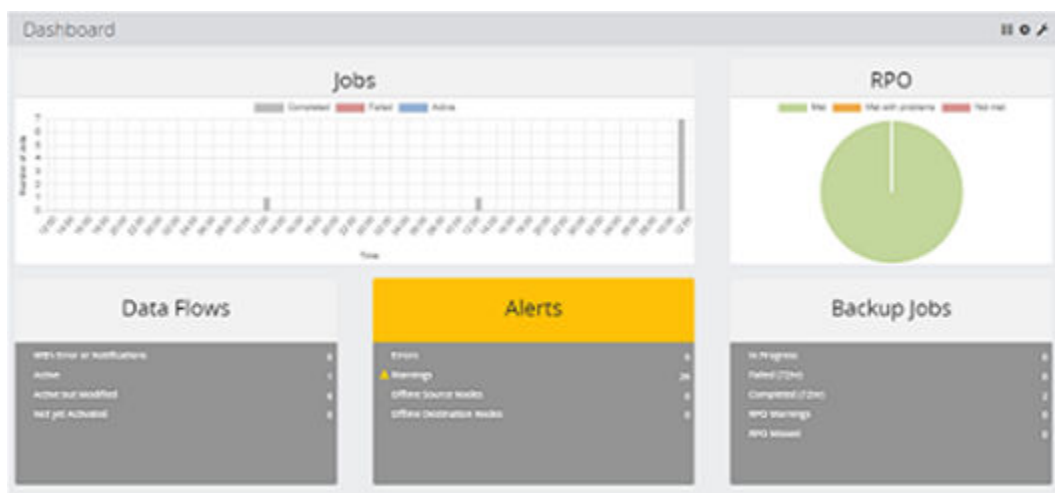



Figure 75 Main Dashboard

| Control | Description |
|------------|---|
| Jobs | <p>Plots the number of completed, failed and active jobs by the hour. The chart can be filtered by clicking the legends shown at the top of the tile. Clicking on the coloured part of a bar in the time series opens the Jobs Inventory (on page 441) with the appropriate filter applied.</p> <p>Note: The data displayed here will be reset if the hub service is restarted on the master node.</p> |
| RPO | <p>Plots the RPO status for all backups. The chart can be filtered by clicking the legends shown at the top of the tile. Clicking on a segment of the pie chart opens the RPO Report (on page 663) with the appropriate filter applied.</p> |
| Data Flows | <p>Clicking on a counter opens the Monitor Inventory (on page 459) or Data Flows Inventory (on page 350) with the appropriate filter applied.</p> |

| Control | Description |
|-----------------------------------|--|
| Alerts | Indicates the number of unacknowledged error and warning level log messages, and the number of offline nodes. Clicking on a counter opens the Logs Inventory (on page 448) or Nodes Inventory (on page 476) with the appropriate filter applied. |
| Backup Jobs | Indicates the status of backup jobs. Clicking on a counter opens the Jobs Inventory (on page 441) , Jobs Report (on page 665) or RPO Report (on page 663) with the appropriate filter applied. |
| Pause/Resume Dashboard Transition | When additional, user defined dashboards are added to the dashboard set, this button pauses or resumes the periodic transition between them. |
| Configure User Dashboard Set | Opens the Configure Dashboard Set wizard, enabling user dashboards to be added to or removed from the dashboard set. |
| Manage Dashboards | Opens the Dashboard Inventory , enabling new dashboards to be created, edited or deleted. <div>  Note: Dashboard creation requires an in-depth understanding of the Protector REST API. Please contact professional services if you need to add new dashboards. </div> |

Inventory Page

Inventory pages are used frequently within the Protector UI to manage and access resources. They follow a common layout with controls grouped in a consistent way as illustrated below.

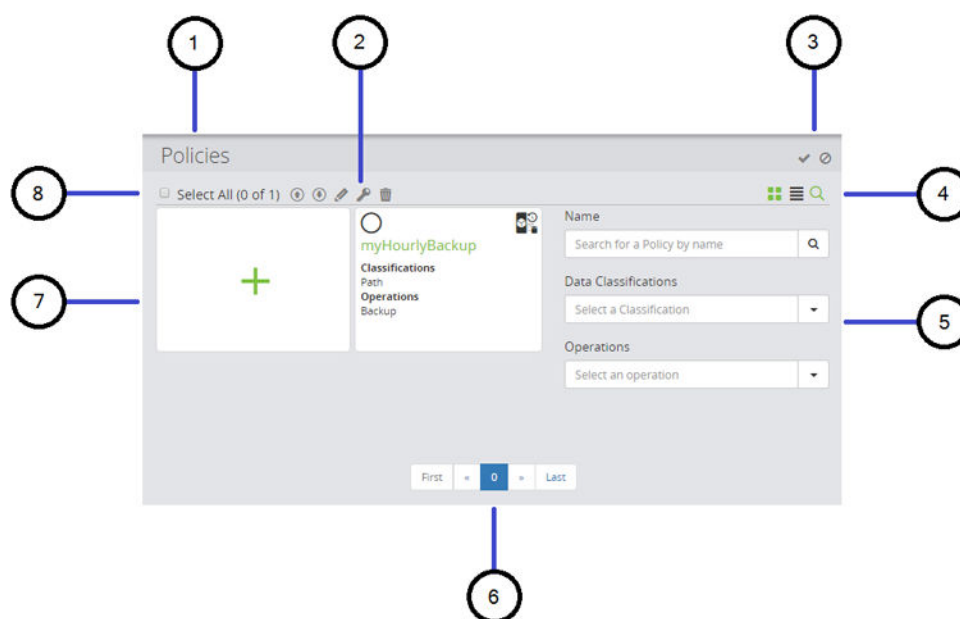








Figure 76 Inventory Page general arrangement (for illustration only)

| Item | Description |
|--------------------------------------|---|
| 1. Page Title | Identifies the function or scope of the page. |
| 2. Tile Related Controls | Buttons displayed here represent commands that can be applied to items selected in the Tile/Table Area immediately below them. The buttons may be enabled (displayed in black) or disabled (displayed in grey) depending on the number and type of tiles selected. |
| 3. Page or Resource Related Controls | Buttons displayed here represent commands that apply to the page in general (e.g. email sender account settings for notifications). |
| 4. Layout Controls |   Tile View Information about the resources displayed in an inventory are presented in tile mode. |
| |   Table View Information about the resources displayed in an inventory are presented in table mode. |
| |  Filters Click this button to toggle the filter controls (5) between hidden or shown. |
| 5. Filter Controls | <p>The controls displayed here allow the results displayed in the Tile/Table Area to the left to be filtered based on the criteria selected. The filter controls can be hidden or displayed (4). Each inventory has an associated set of filters. In the majority of cases the filters are applied as you select them. For Restore inventories the filters are applied once the Search button is clicked.</p> <div>  Note: If the display area is limited, the filter controls will be positioned above the Tile/Table Display Area (7). </div> |
| 6. Tile/Table Page Controls | When the number of items returned for the given filter criteria exceeds one page, these buttons are displayed to allow more results to be loaded. |

| Item | Description |
|------------------------------|---|
| 7. Tile/Table Display Area | The items returned for the given filter criteria are displayed here as separate tiles or rows in a table (depending on the display mode selected). Refer to Tile Control (on page 287) for more details about the controls displayed on tiles |
| 8. Select All Items Checkbox | All inventory items passing the applied filter criteria and displayed on the current page only are selected/deselected. |

Tile Control

Tiles are used to display the status and details of a resource in an inventory. They also contain a link to the details page for the resource in question and a checkbox to enable the resource to be selected.

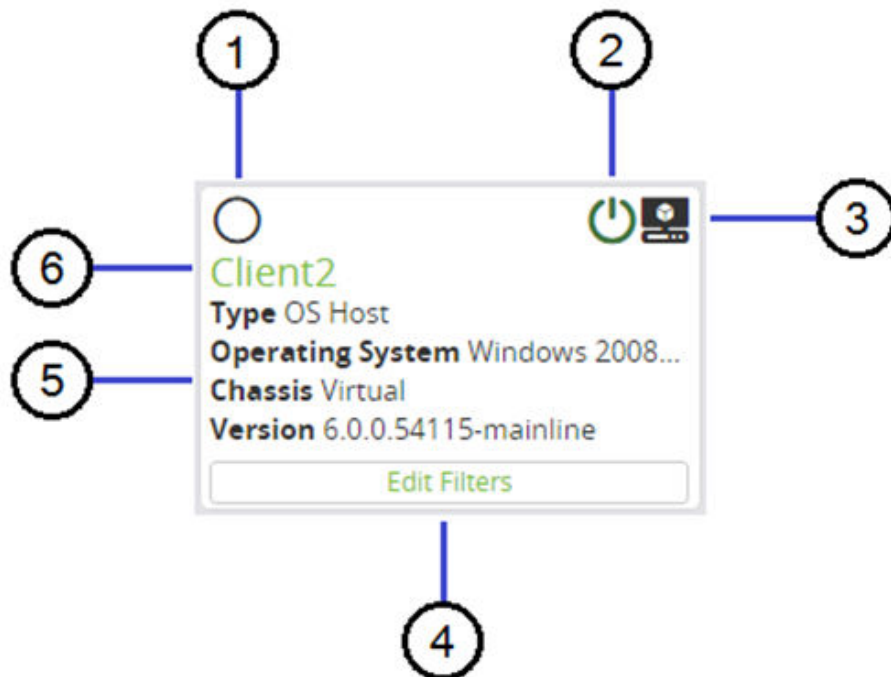








Figure 77 Tile general arrangement (for illustration only)















| Item | Description |
|-----------------------------|--|
| 1. Select/Deselect Checkbox | This control is used to select/deselect tiles. Selected items display a check mark in this control and will have the commands (selected in the control bar above the tile area) applied to them. |














| Item | Description |
|------------------------------------|---|
| 2. Supplementary Icons | For some tile types, supplementary icons may be displayed here to convey additional information (e.g. status). |
| 3. Item Type Icon | Each tile will have a specific icon displayed here to indicate the type of item to which it corresponds. |
| 4. Additional Hyperlink | For tiles that contain other items (e.g. Classifications may contain Filters) additional links to those items may be displayed here. Click the link to open the corresponding page. |
| 5. Item Description and Parameters | The key properties of the resource are displayed here. |
| 6. Item Name and Hyperlink | The name of the item is displayed here. Click on the name to open the corresponding details page. |















Button Icons















The following table lists all button icons used in the UI, their control names and their associated functions. The control names are used in the step by step guides described in [Tasks \(on page 210\)](#) and [Data Protection Workflows \(on page 132\)](#).







| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|---|
| Acknowledge All Error Logs |  | See Logs Inventory (on page 448) . |
| Acknowledge Selected Logs |  | See Logs Inventory (on page 448) . |
| Activate |  | See Data Flows Inventory (on page 350) . |
| Add to additional Host Groups |  | Hitachi Block Replications Inventory (on page 777) |
| Analyze |  | See Generation 1 Repository Details (on page 795) . |
| Authorize |  | See Nodes Inventory (on page 476) . |

| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|--|
| Back |  | See Monitor Details (on page 460) . |
| Clone |  | See Access Control Profiles Inventory (on page 322) . |
| Condensed View |  | See Logs Inventory (on page 448) . (Green when selected, black when deselected) |
| Configure Email Settings |  | See Notifications Inventory (on page 583) . |
| Connect To |  | See Data Flow Wizard (on page 356) . |
| Create a new item |  | See Inventory Page (on page 285) . |
| Create Log Notification |  | See .Logs Inventory (on page 448) |
| Deactivate |  | See Data Flows Inventory (on page 350) . |
| Deauthorize |  | See Nodes Inventory (on page 476) . |
| Decrease Priority |  | See Notifications Inventory (on page 583) . |
| Delete |  | See Data Flows Inventory (on page 350) etc. |
| Dissociate |  | See Hitachi Block Replications Inventory (on page 777) . |
| Edit Permissions |  | See Data Flows Inventory (on page 350) etc. |
| Edit |  | See Data Flows Inventory (on page 350) etc. |

| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|---|
| Tags |  | See Universal Tags (on page 42) etc. |
| Export |  | See Jobs Report (on page 665) . See Logs Inventory (on page 448) . |
| Extended View |  | See Logs Inventory (on page 448) . (Green when selected, black when deselected) |
| Help |  | See Main Banner (on page 278) . |
| Hide/Show Search |  | See Inventory Page (on page 285) . (Green when selected, black when deselected) |
| Host Groups |  | See Hitachi Block Device Details (on page 757) . |
| Increase Priority |  | See Notifications Inventory (on page 583) . |
| Journals |  | See Hitachi Block Device Details (on page 757) . |
| Logical Devices |  | See Hitachi Block Device Details (on page 757) . |
| Manage |  | See Node Details (on page 574) . |
| More actions |  | See Jobs Inventory (on page 441) . |
| Mount |  | See Hitachi Block Snapshots Inventory (on page 767) . |
| Pause |  | See Hitachi Block Replications Inventory (on page 777) . |

| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|--|
| Pools |  | See Hitachi Block Device Details (on page 757) . |
| Purge Logs. |  | See Logs Inventory (on page 448) . |
| Refresh |  | See Generation 1 Repository Details (on page 795) . |
| Remove from Host Groups |  | Hitachi Block Replications Inventory (on page 777) |
| Replications or Clones |  | See Hitachi Block Device Details (on page 757) . |
| Restore |  | See Gen1 Repository Store Details (on page 799) . |
| Resume |  | See Hitachi Block Replications Inventory (on page 777) . |
| Resynchronize |  | See Gen1 Repository Store Details (on page 799) . |
| Revert |  | See Hitachi Block Snapshots Inventory (on page 767) . |
| Select/Deselect item |  | See Tile Control (on page 287) . |
| Session Notifications |  | See Main Banner (on page 278) . |
| Set Expiry Date / Change Retention |  | See Hitachi Block Snapshots Inventory (on page 767) . |
| Settings |  | See Main Banner (on page 278) . |
| Snapshots |  | See Hitachi Block Device Details (on page 757) . |

| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|--|
| Stores |  | See Gen1 Repository Stores Inventory (on page 796) . |
| Swap |  | See Hitachi Block Replications Inventory (on page 777) . |
| Transfer RBAC Permissions to Another Node |  | See Hitachi Block Replications Inventory (on page 777) . |
| Trigger Operation |  | See Monitor Details (on page 460) . |
| Unmount |  | See Restore Inventory (on page 686) . |
| Unsuspend |  | See Hitachi Block Replications Inventory (on page 777) . |
| Upgrade Clients |  | See Nodes Inventory (on page 476) . |
| User Actions |  | See Main Banner (on page 278) . |
| User Snapshot |  | See Gen1 Repository Stores Inventory (on page 796) . |
| Validate |  | See Gen1 Repository Stores Inventory (on page 796) . |
| View as list |  | See Inventory Page (on page 285) . |
| View as tiles |  | See Inventory Page (on page 285) . |
| View Attachments |  | See Logs Inventory (on page 448) . |
| View Group Nodes |  | See Monitor Details (on page 460) . |

| Control Name (Listed Alphabetically) | Button Icon | Example |
|---|---|--|
| View Policy etc. |  | See Data Flow Wizard (on page 356) . (Opens the associated item in a new tab) |
| View Session |  | See Logs Inventory (on page 448) . |
| View The <node name> Node Details |  | See Generation 1 Repository Details (on page 795) . |
| Expand |  | See Hitachi Block Journals Inventory (on page 761) |
| Remote Path Group |  | See Hitachi Block Remote Path Groups Inventory (on page 788) |
| Enable encryption |  | See Node Details (on page 574) |

Universal Tags

As the number of managed objects increases within a system, it becomes progressively more difficult to manage large lists using only the object's native metadata. Universal tags provide a method for users to add extra metadata in the form of Tags to enhance the search and filter abilities of lists.

Tag-able objects

Tags can be applied to the following objects:

- Nodes
- Node groups
- Policies
- Policy Operations
- Data Flows
- Recovery Points

Figure 78 Create Node - Oracle Database

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the Node. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes made to the settings and reverts to those used prior to opening the current page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Figure 79 Add Tags - Edit User Tags

| Control | Description |
|-----------|--|
| Edit Type | Enter the Edit Type. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes made to the settings and reverts to those used prior to opening the current page. |
| Apply | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Tag inheritance and Propagation

Jobs and recovery points are objects that are generated by the system after a backup / snapshot operation.

To assist the manageability of these, they inherit the tags from the objects that were involved in creating them. Jobs and recovery points will inherit the tags from:

- The source node they represent in the data flow
- The node group the source node is in
- The storage node that stores the recovery point
- The data flow that created the recovery point
- The policy that created the recovery point
- Custom tags that were included if manually triggered

Inherited tags are assigned at the point that the jobs or recovery points are created and stored as independent tags against those objects. The tags assigned due to inheritance persist unchanged even if the originated object's tags later change, e.g. if a recovery point has inherited the tag "Production" from the Application Node, later removing that tag from that Application Node will not affect existing recovery point.

Note also that new recovery points and jobs will also only inherit any tags changes once the affected data flow have been re-activated. So if you were to alter the tags on a node, new recovery points will not reflect those changes until you re-activate the data flow that have those nodes.

You can add and remove tags on recovery points. You can modify tags on Recovery Points by either selecting the Recovery Point on the Restore Screen and selecting the "Edit Tag" icon, or viewing the Recovery point record and selecting the "Edit Tag" icon.

Types of Tags and Format

There are two types of tags; simple tags and key value pair tags.

Simple tags are straight forward labels. You may for instance tag all your production source machines with the tag "production". You could then go to the RPO report and check the RPO only for machines that are marked "production".

There are also key value pair tags. They are in the form of *key:value*. The concept is the ability to categorise a tag. For instance you can assign nodes a location tag in the form of *location:paris* or *location:London*. If you lost connection to a data center, you would be easily see that all the nodes at a particular location are down.

Tags can only contain alphanumeric characters, underscores and spaces. The ":" in a tag will designate it to be a key value pair. Capitalisation of tags is preserved but from a search and filter point of view ignored.

Search Filter using User Tags Query box

Many inventory screens have the ability to perform filter queries using tags. On those screens you will be provided with an entry box for adding a tag to search on. The search will return results that contains any tags that are in the search query, e.g. this search is an "or" operation on the selected tags. The tag needs to be an exact match the tag or the key value of the tag. The search however is not case sensitive.

So if you had an entry tagged: "Location:London" and "production" the following is the behaviour of the searches:

- Searching for tag: "Production" will return the entry because it is a case insensitive match.
- Searching for tag: "Prod" will not return the entry as this is a partial tag
- Searching for tag: "location:" will return the entry because the key value matches. "London" is not required
- Searching for tag: "location" will return the entry because the key is treated as a simple tag as well as key value pair tag
- Searching for tag: "Location:Paris" will not return the entry as the value doesn't match

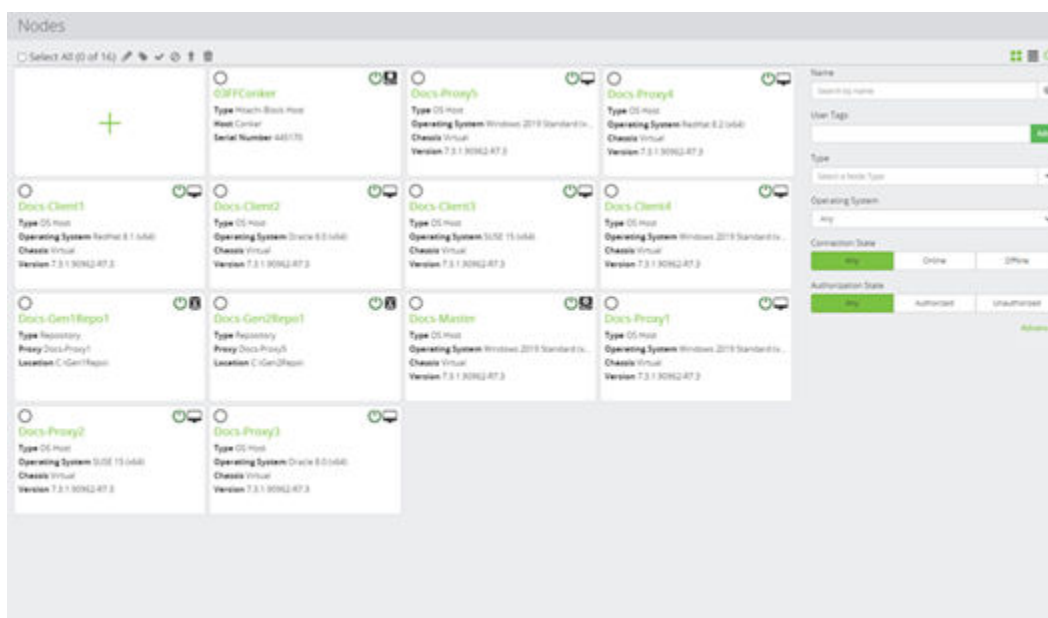















Figure 80 Nodes Inventory

| Control | Description |
|---|--|
|  Edit | Edits an existing node in the inventory. The Node Type Wizard (on page 479) is launched to enable the node's attributes to be changed. |
|  Tags | Modifies the tags of an existing object from either the inventory screen or the details screen of the object. |
|  Authorize | <p>Enabled only if one or more unauthorized nodes is selected in the inventory. Attempts to authorize the selected nodes with the Master node. Only nodes that have been authorized by the Master node may perform Protector functions.</p> <div>  Note: If an attempt is made to authorize an inactive or unknown node, or if the master node fails to communicate with the node, an error log is generated and the node remains unauthorized. </div> |
|  Deauthorize | <p>Enabled only if one or more authorized nodes is selected in the inventory. Attempts to deauthorize the selected nodes. Nodes that have been deauthorized cannot perform Protector functions.</p> |

| Control | Description |
|---|---|
| | <p> Note:</p> <ul style="list-style-type: none"> Before deauthorizing nodes that are no longer required, they must first be deleted from the current data flow definitions, then any modified active data flows must be reactivated. If any attempt is made to deauthorize a node that is implementing rules in the currently active data flows, an error message is generated for each such node and the node remains authorized. It is possible to de-authorize a node with active mounts. This should be avoided because once de-authorized it is not possible to unmount. |
|  Upgrade Clients | <p>Enabled only if one or more authorized nodes is selected in the inventory. Attempts to remotely upgrade the Protector software installed on the selected nodes. The required upgrade installer and configuration files must be present in the <code>C:\Programs Files \Hitachi \Protector\runtime\updater</code> folder on the Master node.</p> <p> Note:</p> <ul style="list-style-type: none"> Only <i>OS Host</i> nodes can be upgraded. It is recommended to upgrade nodes in batches of 20. It is recommended to manually upgrade the master node. |
|  Delete Node | <p>Enabled only if one or more nodes is selected in the inventory. The node is deleted from the inventory.</p> <p> Note: If an <i>OS Host</i> node is still running the Protector hub process and is configured to use the current <i>Master</i> node, then the node will re-appear as an unauthorized node as it periodically reconnects to the <i>master</i> node. Protector should be uninstalled from the node to stop this periodic reconnection.</p> |
|  Create a new item | <p>Adds a new node to the inventory. The Node Type Wizard (on page 479) is launched to guide you through the process.</p> |
| Existing Node(s) | <p>Nodes on which Protector has been installed are automatically detected and listed here along side those that have been added by the user. The Node Details (on page 574) is displayed to enable the node's details to be viewed and edited.</p> |

| Control | Description |
|---|---|
| |  Note: <ul style="list-style-type: none"> ▪ DHCP renewal can cause temporary disconnection of a node. ▪ If the host of a virtual machine(s) creates a Windows restore point, then the virtual machine(s) can temporarily disconnect. ▪ If a node has been assigned to another master, it will not appear in the inventory. |
|  Filter on Node Name | Filters the displayed results based on Node Name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node Type | Filters the displayed results based on Node Type. |
| Filter on Operating System | Filters the displayed results based on Operating System. |
| Filter on Connection State | Filters the displayed results based on Connection State. |
| Filter on Authorization State | Filters the displayed results based on Authorization State. |

Search Filter using advance Query

Using the Advance Query String you can get more control of how the queries work.

While the Tag Query box does an exact match of any of the tags. So in the Tag Query box you entered tags "vmware" and "location:new york" it would be equivalent to:

```
((userTagsKeys = "vmware") OR (userTags = "location:new york"))
```

There are however extra search methods available using the Advance Query. These include

| Value | Description |
|-----------------------|-------------------------|
| Exact Match Include | entry = value |
| Partial Match Include | entry ~ value |
| Boolean OR | condition OR condition |
| Boolean AND | condition AND condition |

If you wanted only to match any nodes with the string "vm" in the tag but only in location New York, you can use this custom query:

```
((userTagsKeys ~ "vm") AND (userTags = "location:new york"))
```



Figure 81 Nodes Inventory - Search Filter

Trigger Operation

Triggering Operations from the Monitor screen now have the ability to add a tag to the trigger. In a situation for instance where you wanted to create a backup of a system prior to the upgrade, you could do a trigger with a tag "Pre upgrade". It will be clear then in the restore screen the purpose of this adhoc backup and its timing.

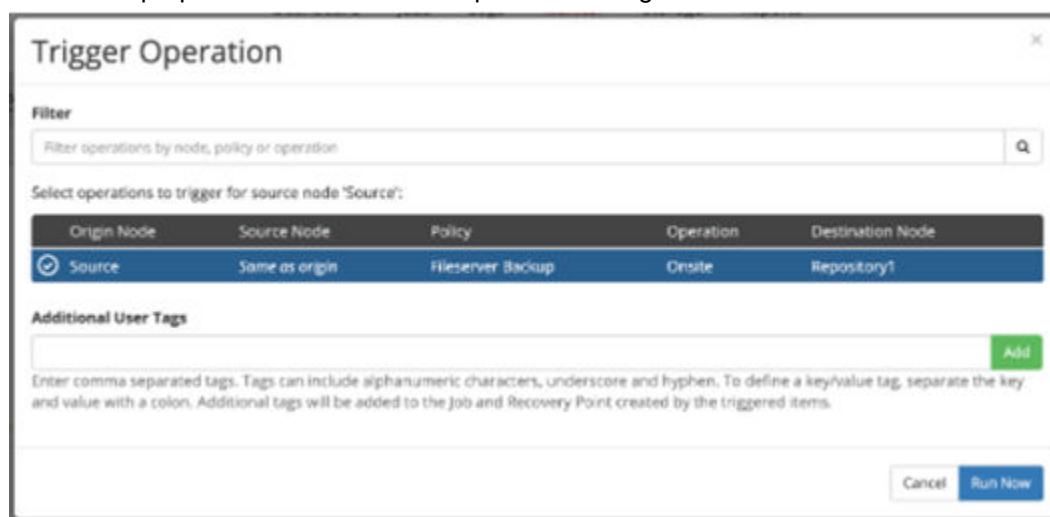


Figure 82 Trigger Operation

Permissions

If you have permission to modify an object e.g. Node, data flow, etc. as governed by the role based access rules, you will have the ability to add / remove tags. Tags belong to the object so any tags are visible to anyone who can view the object.

Tags Limitation

- There is no central inventory of existing tags. So currently there is no pick list or hint that a tag is in use.
- Generation 1 of the Repository does not fully support tags.

Access Control UI Reference

This section describes the Access Control UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:


- [Access Control Concepts \(on page 123\)](#)
- [Access Control Tasks \(on page 210\)](#)

Login Page

The user enters their credentials on this page in order to gain access to the web based user interface.



Figure 83 Login Page

| Control | Description |
|---|---|
| Username@AuthenticationSpace | Enter the username and Authentication Space in the format Username@AuthenticationSpace. Authentication Spaces are configured via the Access Control Authentication Spaces Inventory (on page 311) . |
| Password | Enter the password for the given username |
|  | Click to login. If authentication succeeds, the Default Dashboard (on page 284) will be displayed. If authentication fails for any reason, a message will be displayed just below the Username and Password fields. |
| Login with | <p>When Protector is integrated with Hitachi Ops CenterOps Center, this button is displayed to enable users to log in using SSO (Single Sign-On). The name of the OpenID Connect authentication space is displayed on the button.</p> <p>In this case, the Username@AuthenticationSpace and Password fields should be left unpopulated; the user being redirected to the appropriate SSO authentication page.</p> |

Access Control Dashboard

This dashboard enables the configuration of role based access control (RBAC) for users and groups who interact with Protector.



Tip: When configuring RBAC, start by defining Roles and Resource Groups first, then ACPs and Authentication Spaces. Finally define ACP Associations.

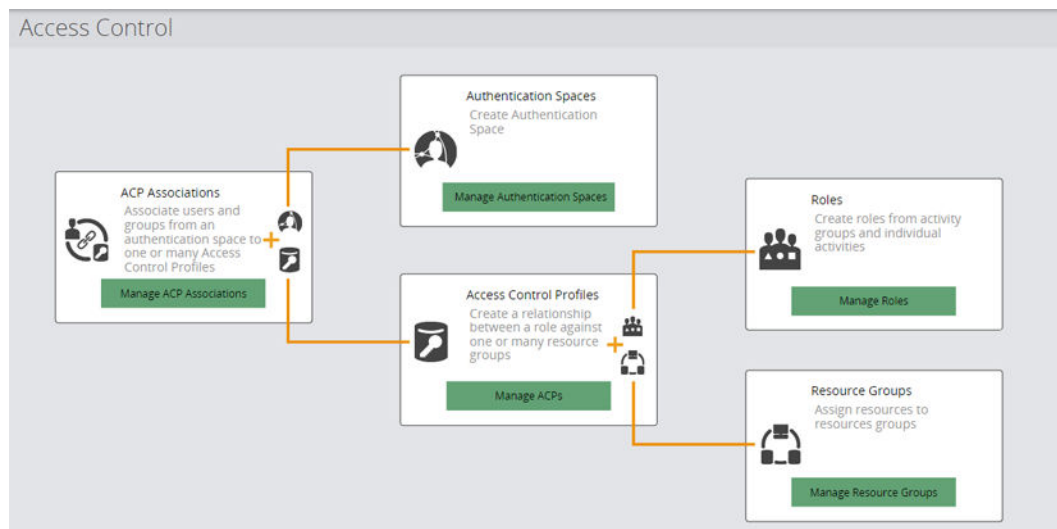


Figure 84 Access Control Dashboard

| Control | Description |
|--|--|
|  Manage ACP Associations | Opens the Access Control Profile Associations Inventory (on page 303) |
|  Manage Authentication Spaces | Opens the Access Control Authentication Spaces Inventory (on page 311) |
|  Manage ACPs | Opens the Access Control Profiles Inventory (on page 322) |
|  Manage Roles | Opens the Access Control Roles Inventory (on page 328) |
|  Manage Resource Groups | Opens the Access Control Resource Groups Inventory (on page 336) |

Access Control Profile Associations Inventory

This inventory details all defined ACP Associations. ACP Associations link individual users, groups of users, or all users in an entire authentication space to one or more Access Control Profiles. This in turn governs what activities users are able to perform within Protector, and on which resources.

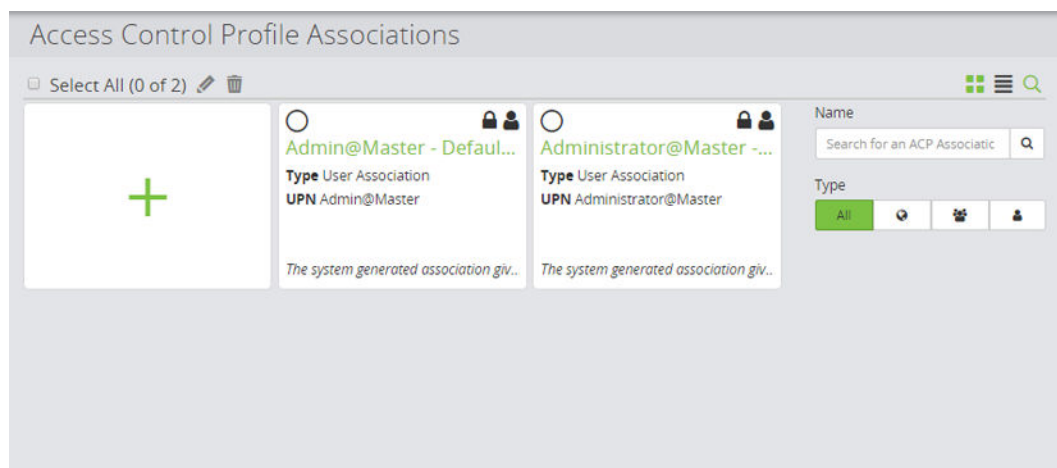










Figure 85 Access Control Profile Associations Inventory

| Control | Description |
|---|--|
|  Summary | Select the Summary option from the drop down menu in the Navigation Breadcrumbs (on page 282) to view the Access Control Summary (on page 340) . |
|  Edit | Edits an existing ACP Association in the inventory. The Access Control Profile Association Wizard (on page 305) is launched to enable the ACP Association's attributes to be changed. |
|  Delete | Enabled only when one or more ACP Association is selected. Deletes the selected item from the inventory. The associated Authentication Space and ACP are not deleted. |
|  Add | Creates a new ACP Association. The Access Control Profile Association Wizard (on page 305) is launched to guide you through the process. |
| System generated ACP Association(s) | At least one system generated ACP association is available when the product is installed. It associates an account chosen at installation time with a built-in ACP that provides the Protector Administrator role. This association cannot be deleted since it is necessary for initial login and configuration of access control by the application installer. System generated ACP Associations are marked with a  icon to indicate that they cannot be modified. The Access Control Profile Association Details (on page 311) is displayed to enable the association to be viewed. |
| User defined ACP Association(s) | Any number of user defined ACP Associations can be created. These are displayed in the inventory and are marked with an Authentication Space, Group or User icon depending on whether the ACP is associated with an entire Authentication Space, a group or an individual user. ACP Associations must be defined in order to grant users access to the web and command line interfaces. The Access Control Profile Association Details (on page 311) is displayed to enable the association to be viewed and edited. |
| Filter on ACP Association Name | Filters the displayed results based on the name. |
| Filter on Type | Filters the displayed results based on the association type: <ul style="list-style-type: none"> ▪ All ▪  Authentication Space Association ▪  Group Association ▪  User Association |

Access Control Profile Association Wizard

The screenshot shows a web-based wizard titled 'Create ACP Association'. The current step is 'Specify name and description'. It features two input fields: 'Name' and 'Description'. The 'Name' field is a single-line text box, and the 'Description' field is a larger multi-line text box. At the bottom right, there are three buttons: 'Cancel', 'Previous', and 'Next'. The 'Next' button is highlighted in green, indicating it is the active or recommended action.

Figure 86 ACP Association Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | Enter the name of the ACP association. |
| Description | Optional. Enter a short description of the ACP association. |
| Cancel | Discards all changes and reverts to the previous page. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create ACP Association

Select user for this association

Associate Individual User

User Name

User Principal Name (E.G., administrator@authenticationspace) Browse

User

Group

Authentication Space

Cancel Previous Next

Figure 87 ACP Association Wizard - Select user for this association (User)



Tip: A *User ACP Association* would typically be created to give individual users the highest level of access, e.g. Administrator or Security Manager ACP.

| Control | Description |
|-----------|--|
| User Name | The name of the user to associate with the ACP. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create ACP Association

Select user for this association

User
Group
 Authentication Space

Associate Group

Space

Group Name

Path to Group

For example, within Active Directory or LDAP 'OrganizationalUnit/SubOrganizationalUnit'.

Figure 88 ACP Association Wizard - Select user for this association (Group)



Tip: A *Group ACP Association* would typically be created to give management groups a high level of access.

| Control | Description |
|----------------------|---|
| Authentication Space | <p>The name of the Authentication Space from which the group is to be selected.</p> <p>Enter or select an Authentication Space from the drop down list, then click Browse to view a list of Groups for an Authentication Space. The selected Group will be automatically entered in the Group Name field below.</p> |
| Group Name | The name of the group to associate with the ACP. |
| Path to Group | Provide the path to the required OU, using '/' as the path delimiter. |

| Control | Description |
|----------|---|
| | <p>For example, the following AD structure defines a <i>Managers</i> group within three different OUs:</p> <ul style="list-style-type: none"> ▪ Contoso.com <ul style="list-style-type: none"> • Accounts <ul style="list-style-type: none"> ▪ Managers (Group) ▪ Goods In (Group) • Engineering <ul style="list-style-type: none"> ▪ Design <ul style="list-style-type: none"> ▪ Managers (Group) ▪ CAD Users (Group) ▪ Test <ul style="list-style-type: none"> ▪ Managers (Group) ▪ QA Engineers (Group) <p>Here Path to Group must be set to one of the following, depending on which <i>Managers</i> group is required:</p> <ul style="list-style-type: none"> ▪ <i>Accounts</i> ▪ <i>Engineering/Design</i> ▪ <i>Engineering/Test</i> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create ACP Association

Select user for this association

User

Group

Authentication Space

Associate Entire Space

Space

Select Space

Cancel Previous Next

Figure 89 ACP Association Wizard - Select user for this association (entire Authentication Space)



Tip: A *Authentication Space ACP Association* would typically be created to give everyone the most limited level of access, i.e. Operator ACP.

| Control | Description |
|----------------------|--|
| Authentication Space | The name of the Authentication Space to associate with the ACPs. Note: All users and groups within the Authentication Space will be associated with the chosen ACPs. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

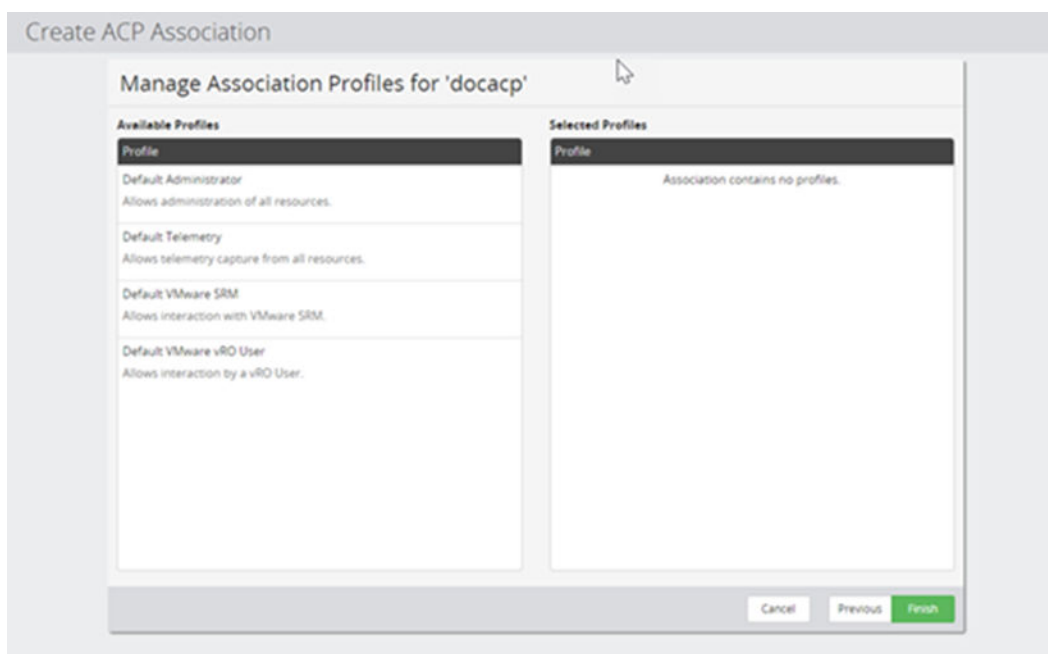


Figure 90 ACP Association Wizard - Manage Association Profiles

| Control | Description |
|--------------------|--|
| Available Profiles | List of available Access Control Profiles listed. Click on one or more of the available ACPs to add them to the ACP Profile. |
| Selected Profiles | List of selected Access Control Profiles listed. Click on one or more of the selected ACPs to remove them from the ACP Profile. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Access Control Profile Association Details

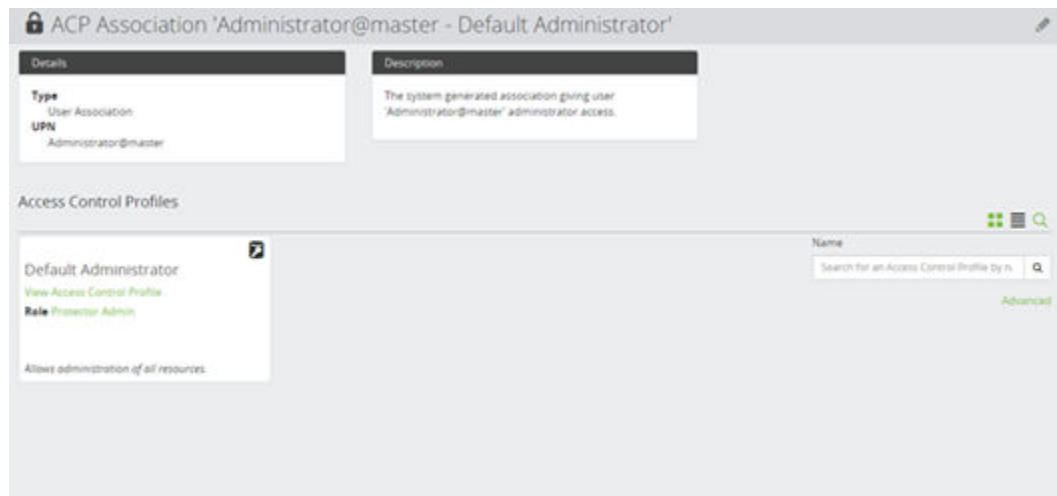





Figure 91 ACP Association Details

| Control | Description |
|---|--|
|  Edit | Launches the Access Control Profile Association Wizard (on page 305) to enable the group to be edited. |
|  View Access Control Profile | Click on the link on the ACP tile to open the Access Control Profile Details (on page 327) to enable the ACPs to be viewed and edited. |
|  Role | Click on the Role link on the ACP tile to open the Access Control Role Details (on page 332) to enable the Role to be viewed and edited. |
| Filter on Access Control Profile Name | Filters the displayed ACPs based on the name. |

Access Control Authentication Spaces Inventory

This inventory list all defined Authentication Spaces. These specify authentication services that Protector uses to authenticate users when they login.

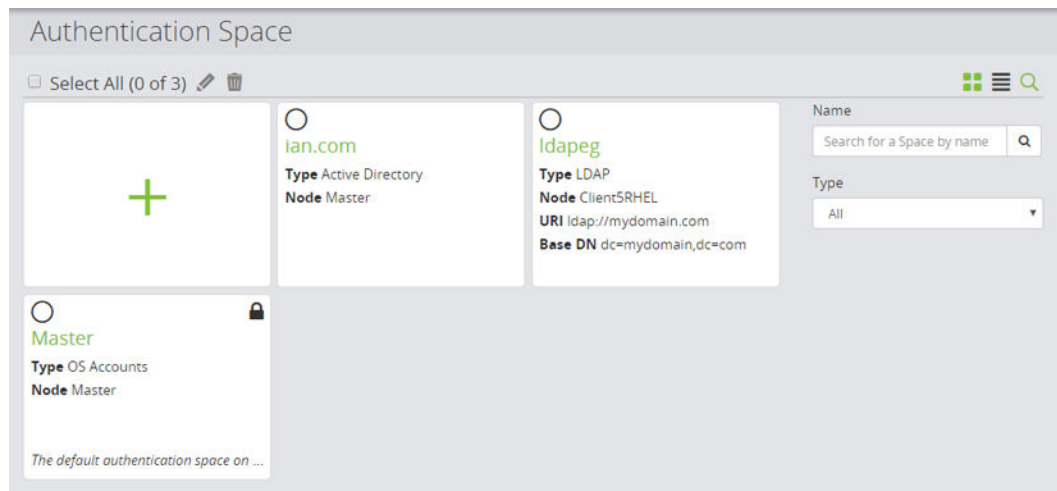









Figure 92 Authentication Spaces Inventory

| Control | Description |
|--|--|
|  Summary | Select the Summary option from the drop down menu in the Navigation Breadcrumbs (on page 282) to view the Access Control Summary (on page 340). |
|  Edit | Edits an existing Authentication Space in the inventory. The Access Control Authentication Space Wizard (on page 313) is launched to enable the Authentication Space's attributes to be changed. |
|  Delete | Enabled only when one or more Authentication Spaces is selected. Deletes the selected item from the inventory. |
|  Add | Creates a new Authentication Space. The Access Control Authentication Space Wizard (on page 313) is launched to guide you through the process. |
| System generated Authentication Space | A system generated Authentication Space is available when the product is installed. It defines where the local administrator account(s) on the master machine is authenticated. This Authentication Space cannot be deleted since it is necessary for initial login and configuration of access control by the application installer. The system generated Authentication Space is marked with a  icon to indicate that it cannot be modified. Click on the name of the Authentication Space to open the Access Control Authentication Space Details (on page 321). |
| OpenID Connect Authentication Space(s) | When Protector is integrated with Hitachi Ops Center, an OpenID Connect Authentication Space is automatically created to support single sign-on. Click on the name of the Authentication Space to open the Access Control Authentication Space Details (on page 321).  Note: OpenID Connect Authentication Spaces cannot be created via the UI. |

| Control | Description |
|---|---|
| User defined Authentication Space(s) | Any number of user defined Authentication Spaces can be created. These are displayed in the inventory and can be based on Active Directory, Local Machine, RADIUS or Stand-alone LDAP authentication servers. Click on the name of the Authentication Space to open the Access Control Authentication Space Details (on page 321) . |
|  Filter on Authentication Space Name | Filters the displayed results based on the Authentication Space name. |
| Filter on Type | Filters the displayed results based on the Authentication Space server type. |

Access Control Authentication Space Wizard

This wizard is launched when a new Authentication Space is added to the Authentication Spaces Inventory.

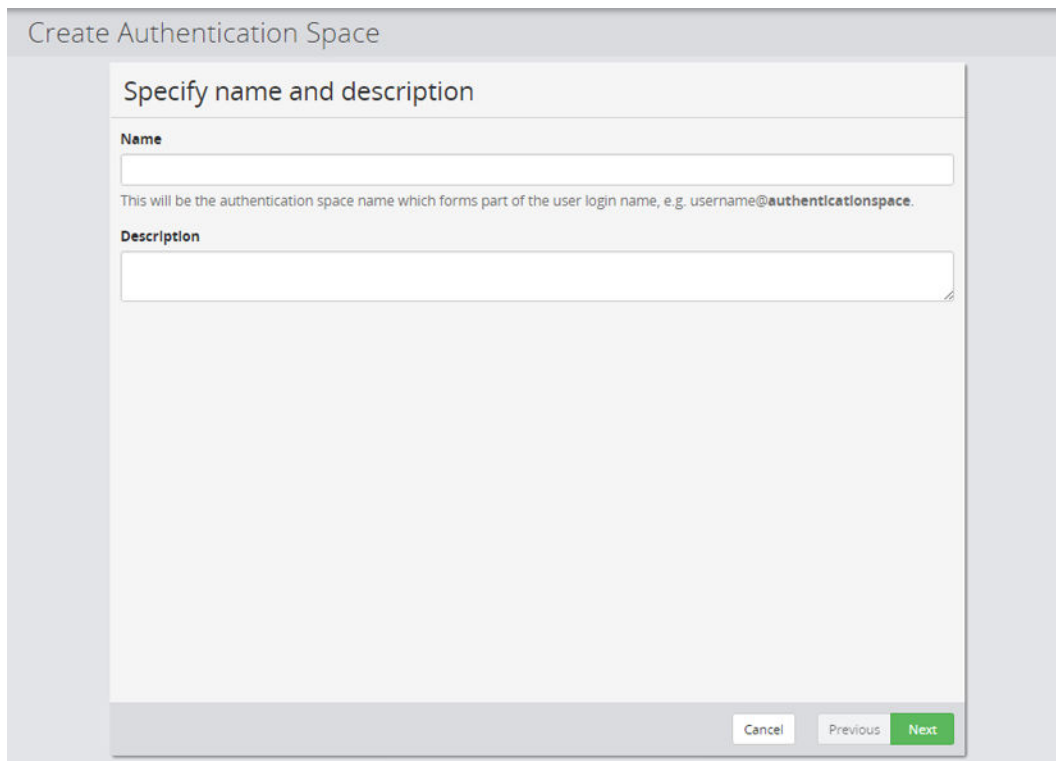


Figure 93 Authentication Space Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | Enter a name for the Authentication Space. |
| Description | Optional. Enter a short description of the Authentication Space. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create Authentication Space

Configure authentication type

Active Directory

OS Accounts

RADIUS

LDAP

Active Directory

Proxy



Select a Node

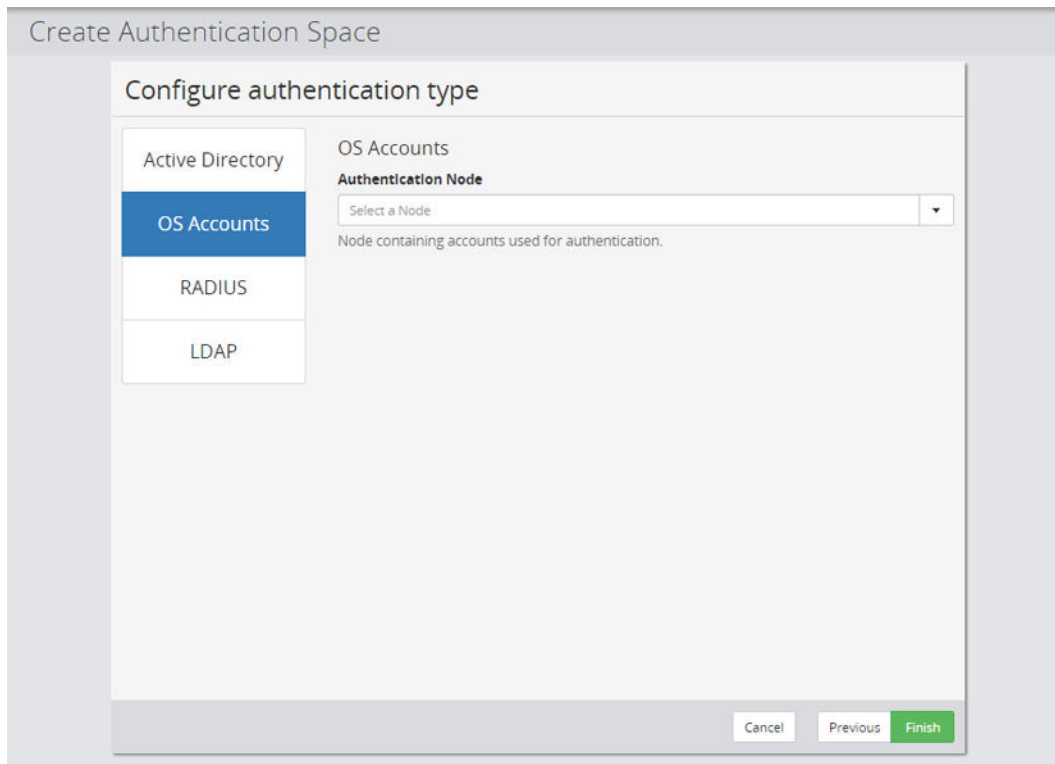
Node that has access to the Active Directory.

Active Directory Domain Name

Cancel Previous Finish

Figure 94 Authentication Space Wizard - Active Directory

| Control | Description |
|------------------------------|--|
| Proxy | <p>Type or select a Protector node that has a connection to the required Active Directory Service.</p> <p> Note: The AD Proxy must be a Windows node.</p> <p> Tip: To avoid the proxy becoming a single point of failure for authentication, select a clustered node where possible.</p> |
| Active Directory Domain Name | Enter the AD domain name, e.g. Contoso.com |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |



Create Authentication Space

Configure authentication type

Active Directory

OS Accounts

RADIUS

LDAP

OS Accounts

Authentication Node

Select a Node

Node containing accounts used for authentication.

Cancel Previous Finish

Figure 95 Authentication Space Wizard - OS Accounts

| Control | Description |
|---------------------|--|
| Authentication Node | Type or select a Protector node that will provide local authentication using the OS's authentication service. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create Authentication Space

Configure authentication type

Active Directory

OS Accounts

RADIUS

LDAP

RADIUS

Proxy

Select a Node

Host Name / IP Address

Port

1812

Secret Key

Secret key must be between 8 and 128 characters.

Timeout

10

Retry Count

3

Cancel Previous Finish

Figure 96 Authentication Space Wizard - RADIUS

| Control | Description |
|------------------------|--|
| Proxy | Type or select a Protector node that has a connection to the required RADIUS server. |
| Host Name / IP Address | Specify the IP address or DNS resolvable name of the required RADIUS server. |
| Port | Specify the IP port number or use the default port number (1812). |
| Secret Key | Specify the Secret Key for the RADIUS server. |

| Control | Description |
|-------------|--|
| Timeout | Specify the timeout period in seconds. |
| Retry Count | Specify the number of times a retry should be performed. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |


The screenshot shows the 'Create Authentication Space' wizard with the 'Configure authentication type' step selected. On the left, there are four tabs: 'Active Directory', 'OS Accounts', 'RADIUS', and 'LDAP' (which is highlighted in blue). The main area is titled 'LDAP' and contains the following fields and options:

- Proxy:** A dropdown menu with the text 'Select a Node' and a downward arrow.
- Server URI:** A text input field with the placeholder '(e.g. ldap://domain or ldaps://domain)' and a description: 'The URI of the LDAP server.'
- Server Port:** A text input field with a description: 'Server port. Default is 636 when connecting over SSL otherwise 389.'
- Base DN:** A text input field with the placeholder '(e.g. dc=domain,dc=com)' and a description: 'The base Distinguished Name from which searches are performed.'
- Bind options:** Two radio buttons: 'Use anonymous bind' (unselected) and 'Bind using specified account' (selected).
- Bind Account DN:** A text input field with a description: 'The default account with which to perform searches. If not set the server must support anonymous bind.'
- Bind Account Password:** A text input field with a description: 'The default account password. If not set the server must support anonymous bind.'

At the bottom right of the main area are two buttons: 'TLS Configuration' and 'Advanced Configuration'. At the very bottom of the wizard are three buttons: 'Cancel', 'Previous', and 'Finish' (which is highlighted in green).

Figure 97 Authentication Space Wizard - LDAP

| Control | Description |
|---------|--|
| Proxy | Type or select a Protector node that has a connection to the required LDAP server. |

| Control | Description |
|------------------------|---|
| |  Note: <ul style="list-style-type: none"> The LDAP Proxy must be a Linux node. An LDAP Authentication Space cannot be used to authenticate via Microsoft Active Directory, despite similarities between the two technologies. |
| Server URI | Enter the URI of the required LDAP server in the format <code>ldap://domain</code> or <code>ldaps://domain</code> |
| Server Port | Enter the LDAP server port number if different from the default value. The default is 636 when connecting over SSL, otherwise it is 389. |
| Base DN | <p>Enter the base Distinguished Name from which searches are performed.</p> <p>The default account distinguished name (DN) with which to perform initial searches. This is in LDAP DN format (e.g. <code>cn=Admin, ou=Users, dc=mydomain, dc=com</code>)</p> <p>The default account is needed to perform a lookup of a user's DN from their UID. Users log into Protector with a UID (e.g. <code>bmortimer@mydomain.com</code>) but the user's DN is needed for the LDAP bind and it is found using this account.</p> <p>If this value is not supplied the LDAP server must support anonymous bind.</p> |
| Bind Using | <p>Select how to bind to the server:</p> <ul style="list-style-type: none"> Use anonymous bind Bind using specified account - enter the credentials below |
| Bind Account DN | Enabled only if Bind using specified account is selected. Enter the default account with which to perform searches. |
| Bind Account Password | <p>Enabled only if Bind using specified account is selected. The default account password.</p> <p>This will be stored in an encrypted form within Protector until needed.</p> <p>If not set the server must support anonymous bind.</p> |
| TLS Configuration | Click to specify TLS configuration options. See below. |
| Advanced Configuration | Click to specify advanced configuration options. See below. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |

| Control | Description |
|---------|--|
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create Authentication Space

TLS Configuration

TLS Request Certificate Check
 Hard (most secure) ▼
 Determines how the client treats the server's certificate.

TLS CA Certificate Directory
 (default) Browse
 The directory containing CA certificates for the server.

TLS CA Certificate File
 Browse
 The CA certificate for the server.

Cancel Discard Previous Apply

Figure 98 TLS Configuration

| Control | Description |
|-------------------------------|--|
| TLS Request Certificate Check | <p>The TLS configuration in LDAP validates the way the Protector client treats the server certificate:</p> <ul style="list-style-type: none"> ▪ Never - Least Secure. No certificate is requested. The Protector client will allow the use of self-signed certificates from the server. ▪ Allow - A certificate is requested. The TLS session completes normally even if a bad certificate or no certificate is provided. ▪ Try - A certificate is requested. The TLS session completes normally even if no certificate is provided. However if a bad certificate is provided, TLS session terminates. ▪ Demand - Hard Secure. This is the default setting. A certificate is requested. The TLS session terminates if a bad certificate or no certificate is provided. The LDAP server's certificate must be valid and signed by a trusted CA. |

| Control | Description |
|------------------------------|--|
| TLS CA Certificate Directory | Specifies path to the directory containing CA certificate files for the server. |
| TLS CA Certificate File | Specifies the CA certificate file for the server. |
| Cancel | Cancels all changes and reverts to the previous page. |
| Discard | Discards all changes and reverts to the Access Control Authentication Space Wizard (on page 313) |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Create Authentication Space

Advanced Configuration

Person Filter

 The filter used to lookup users in the LDAP server in RFC 2254 format.

Group Filter

 The filter used to lookup groups in the LDAP server in RFC 2254 format.

Group Strategy
☒ Groups know users
☐ Users know groups
 The group lookup strategy for this LDAP server.

Group Member Attribute

 The attribute name that is used to lookup a group's users (e.g. member or uniqueMember) or a user's groups (e.g. memberOf).

Group Member Type
☒ Member value contains a DN
☐ Member value contains a UID
 The type value of the value stored in the group member attribute.

CN Attribute

 The name of the attribute holding common name.

DN Attribute

 The name of the attribute holding distinguished name.

UID Attribute

 The name of the attribute holding user ID.

Cancel Discard Previous **Apply**

Figure 99 Advanced Configuration

| Control | Description |
|---------------|--|
| Person Filter | Enter a search filter in RFC 2254 format to look up users. |

| Control | Description |
|------------------------|--|
| Group Filter | Enter a search filter in RFC 2254 format to look up groups. |
| Group Strategy | Specifies the group look up strategy of the LDAP server: <ul style="list-style-type: none"> Groups know users - Each group knows its members, which are found using member attributes. Users know groups - Each user knows its groups. |
| Group Member attribute | Used to look for a group's users or a user's groups. |
| Group Member Type | Specifies value type stored in Group Member attribute: <ul style="list-style-type: none"> Member value contains a DN Member value contains a UID |
| CN Attribute | Name of the attribute holding Common Name (CN). |
| DN Attribute | Name of the attribute holding Distinguished Name (DN). |
| UID attribute | The number of the attribute holding the user ID with the default UID. |
| Cancel | Cancels all changes and reverts to the main page. |
| Discard | Discards all changes and reverts to the Figure 94 Authentication Space Wizard - Active Directory (on page 314) page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Save | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Access Control Authentication Space Details

This page displays the details of an Access Control Authentication Space and enables you launch the wizard to edit them.

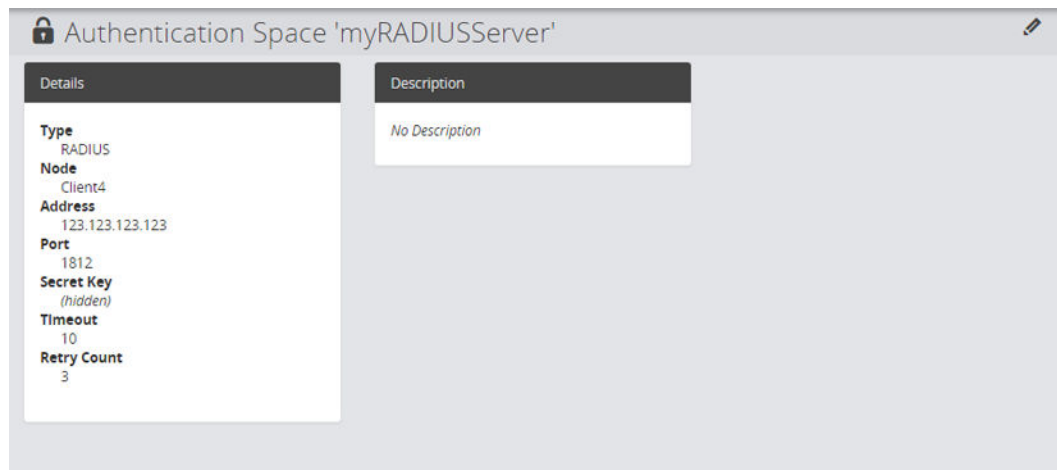



Figure 100 Authentication Space Details

| Control | Details |
|--|---|
|  Edit | Launches the appropriate Access Control Authentication Space Wizard (on page 313) to enable the Authentication Space to be edited |

Access Control Profiles Inventory

This inventory lists all defined Access Control Profiles (ACPs). These associate Roles to Resource Groups thus controlling what activities are allowed on each resource.

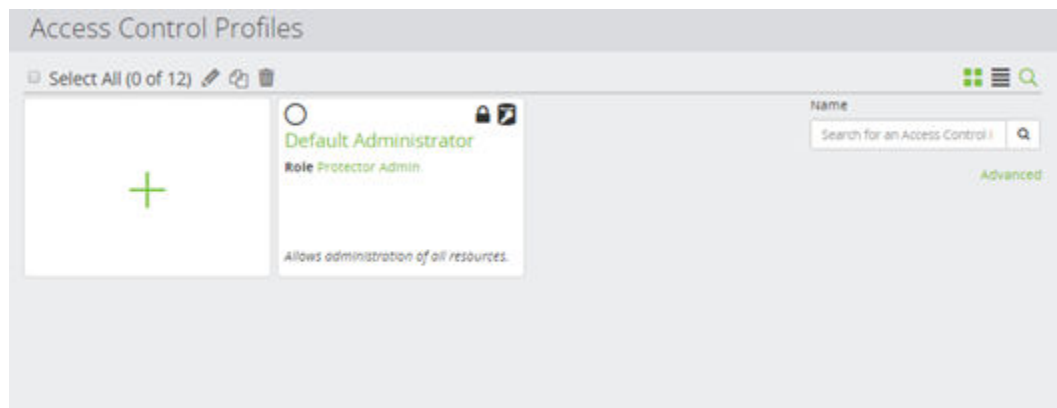










Figure 101 Access Control Profiles Inventory

| Control | Description |
|---|--|
|  Summary | Select the Summary option from the drop down menu in the Navigation Breadcrumbs (on page 282) to view the Access Control Summary (on page 340) . |

| Control | Description |
|---|--|
|  Edit | Edits an existing ACP in the inventory. The Access Control Profile Wizard (on page 323) is launched to enable the ACP's attributes to be changed. |
|  Clone | Enabled only when one or more ACPs is selected. Creates a clone of the selected item which can then be modified. The clone is a shallow copy, in that it references the same Role and Resource Groups as the original. |
|  Delete | Enabled only when one or more ACP Association is selected. Deletes the selected item from the inventory. The associated Role and Resource Groups are not deleted. |
|  Add | Creates a new ACP. The Access Control Profile Wizard (on page 323) is launched to guide you through the process. |
|  System generated ACPs | At least one system generated ACPs are available when the product is installed. This associates system generated role Protector Administrator, with the default resource group. These ACPs cannot be deleted since they provide a basic level of access control. System generated ACPs are marked with a  icon to indicate that they cannot be modified. The Access Control Profile Details (on page 327) is displayed to enable the permissions to be viewed. |
|  User defined ACP(s) | Any number of user defined ACPs can be created. These are displayed in the inventory. ACPs should be defined in order to grant the required level of access to groups of resources as appropriate to the users' responsibilities. The Access Control Profile Details (on page 327) is displayed to enable the permissions to be viewed and edited. |
| Filter on Access Control Profile Name | Filters the displayed results based on the Access Control Profile Name. |

Access Control Profile Wizard

This wizard is launched when a new ACP is added to the Access Control Profiles Inventory.

Create Access Control Profile

Specify name and description

Name

Description

Cancel

Previous

Next

Figure 102 Access Control Profile Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | The name of the Access Control Profile. |
| Description | Optional. A short description of the ACP. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Create Access Control Profile

Select the ACP Role

Role

Select Role

Cancel

Previous

Next

Figure 103 Access Control Profile Wizard - Select the ACP Role

| Control | Description |
|----------|---|
| Role | Select the role from the drop down list. The chosen role determines what activities owners of this ACP will be able to perform. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Create Access Control Profile

Select the ACP Resource Groups

Available Resource Groups

| Name | Description |
|-----------------|--|
| default | The system generated resource group into which all resources are added by default. |
| myResourceGroup | A user defined resource group |


Selected Resource Groups

| Name | Access Level |
|-----------------|--------------|
| myResourceGroup | FULL ▾ |

Cancel Previous Finish

Figure 104 Access Control Profile Wizard - Select the ACP Resource Groups

| Control | Description |
|---------------------------|---|
| Available Resource Groups | List of available Resources Groups. Click on one or more of the available Resource Groups to add them to the ACP. |
| Selected Resource Groups | List of selected Resources Groups. The role chosen in the previous page of the wizard can be performed on these resources. Click on one or more of the Resource Groups to remove them from the ACP. |
| Access Level | <p>Select the required Access Level from the dropdown list to the right of the Selected Resource Groups entry. The access level controls visibility of backups (including any logs or reports relating to that backup) on storage nodes within the resource group as follows:</p> <ul style="list-style-type: none"> LIMITED - a backup is visible if it originated from a node in the resource group. FULL - all backups, regardless of where they originated, are visible on any storage nodes within the resource group. |


| Control | Description |
|----------|--|
| |  Note: The access level only controls the visibility. What a user is able to do with visible backups is dependent on the activities they are allowed to perform on them. A user given LIMITED access to a storage destination included in their resource group will only see log messages for that storage destination if they pertain to their backups. A user given FULL access level will see all log messages for that destination. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |


Access Control Profile Details

This page displays the details of an Access Control Profile and enables you launch the wizard to edit them.



Figure 105 Access Control Profile Details

| Control | Description |
|--|--|
|  Edit | Launches the Access Control Profile Wizard (on page 323) to enable the ACP to be edited. |

| Control | Description |
|---|---|
| Role | Click on the role name link to open the Access Control Role Details (on page 332) . |
|  Resource Groups | Click on View Resource Group link on a tile to open the Access Control Resource Group Details (on page 339) . |
| Filter on Resource Name | Filters the displayed resources groups. |

Access Control Roles Inventory

This inventory lists all defined Roles. These roles define what activities are allowed to be performed.

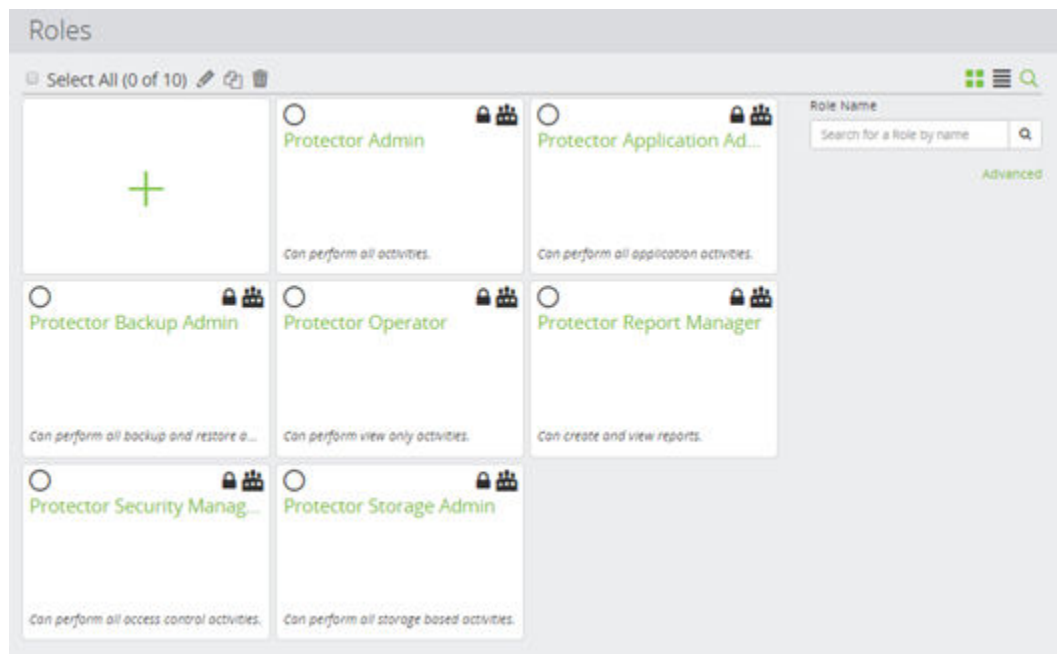










Figure 106 Roles Inventory

| Control | Description |
|---|--|
|  Summary | Select the Summary option from the drop down menu in the Navigation Breadcrumbs (on page 282) to view the Access Control Summary (on page 340) . |

| Control | Description |
|--|---|
|  Edit | Edits an existing Role in the inventory. The Access Control Role Wizard (on page 329) is launched to enable the Role's attributes to be changed. |
|  Clone | Enabled only when one Role is selected. Creates a clone of the selected item which can then be modified. |
|  Delete | Enabled only when one or more Roles are selected. Deletes the selected item from the inventory. |
|  Add | Creates a new Role. The Access Control Role Wizard (on page 329) is launched to guide you through the process. |
|  System generated Roles | At least three system generated Roles are available when the product is installed. They define default administrator, security manager and user roles. These roles cannot be deleted since they provide a basic level of access control. System generated roles are marked with a  icon to indicate that they cannot be modified. The Access Control Role Details (on page 332) is displayed to enable the permissions to be viewed. |
|  User defined Role(s) | Any number of user defined Roles can be created. These are displayed in the inventory. Roles should be defined in order to grant the required level of functionality appropriate to the users' responsibilities. The Access Control Role Details (on page 332) is displayed to enable the permissions to be viewed and edited. |
| Filter on Role Name | Filters the displayed results based on the Role Name. |

Access Control Role Wizard

This wizard is launched when a new Role is added to the Roles Inventory.

The screenshot shows a web-based wizard interface for creating a role. The title bar at the top says 'Create Role'. Below it, the main heading is 'Specify name and description'. There are two input fields: 'Name' and 'Description'. The 'Name' field is a single-line text box, and the 'Description' field is a larger multi-line text box. At the bottom right, there are three buttons: 'Cancel' (disabled), 'Previous' (disabled), and 'Next' (active/green).

Figure 107 Role Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | The name of the Role. |
| Description | Optional. A short description of the Role. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Create Role


Select Activity Groups and Activities

| Activity Group / Activity Name | Description |
|--|---|
| <input type="checkbox"/> Authentication | |
| <input type="checkbox"/> Authorization | |
| <input checked="" type="checkbox"/> Dataflows | |
| <input type="checkbox"/> Manage Dataflows | Allows a user to create, update, delete and view dataflows. |
| <input type="checkbox"/> Manage Destination Templates | Allows a user to create, update, delete and view destination templates. |
| <input checked="" type="checkbox"/> View Dataflows | Allows a user to view dataflows. |
| <input checked="" type="checkbox"/> View Destination Templates | Allows a user to view destination templates. |
| <input checked="" type="checkbox"/> Hardware Storage | |
| <input type="checkbox"/> Licenses | |
| <input type="checkbox"/> Logs | |
| <input type="checkbox"/> Monitoring | |
| <input checked="" type="checkbox"/> Nodes | |
| <input type="checkbox"/> Notifications | |
| <input type="checkbox"/> Permissions | |
| <input checked="" type="checkbox"/> Policies | |
| <input type="checkbox"/> Reports | |
| <input checked="" type="checkbox"/> Repositories | |
| <input checked="" type="checkbox"/> Restore | |
| <input type="checkbox"/> Rules | |

Cancel Previous **Finish**

Figure 108 Role Wizard - Select Activity Groups and Activities

| Control | Description |
|-----------------|---|
| Activity Groups | <p>Activity Groups contain a set of functionally cohesive Activities that are typically applied to a Role en-mass.</p> <p>Click the + button to the left of an Activity Group to expand and view the activities within a group.</p> <p>Click the checkbox to the left of an Activity Group to apply or remove all Activities within that group for the Role.</p> <p>Click the checkbox to the left of an Activity to apply or remove that Activity for the Role.</p> <p>The check box to the left of an Activity Group displays a '-' instead of a tick if only some of the Activities in the group have been applied.</p> <p>Refer to Controlling access to UI features with Activities and Activity Groups (on page 333) for details on how each activity affects access to the UI.</p> |

| Control | Description |
|------------|--|
| |  Note: The <i>Override Ownership Permissions</i> activity within the <i>Permissions</i> activity group allows users with this activity to view Policies, Dataflows, Destination Templates and Schedules regardless of who created them or who they are assigned to. Enable this permission with care. |
| Activities | Activities define what a user can do within Protector via the UI and via the REST API. Click the checkbox to the left of an Activity to apply or remove the activity for the Role. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Access Control Role Details

This page displays the details of a Role and enables you to launch the wizard to edit them.

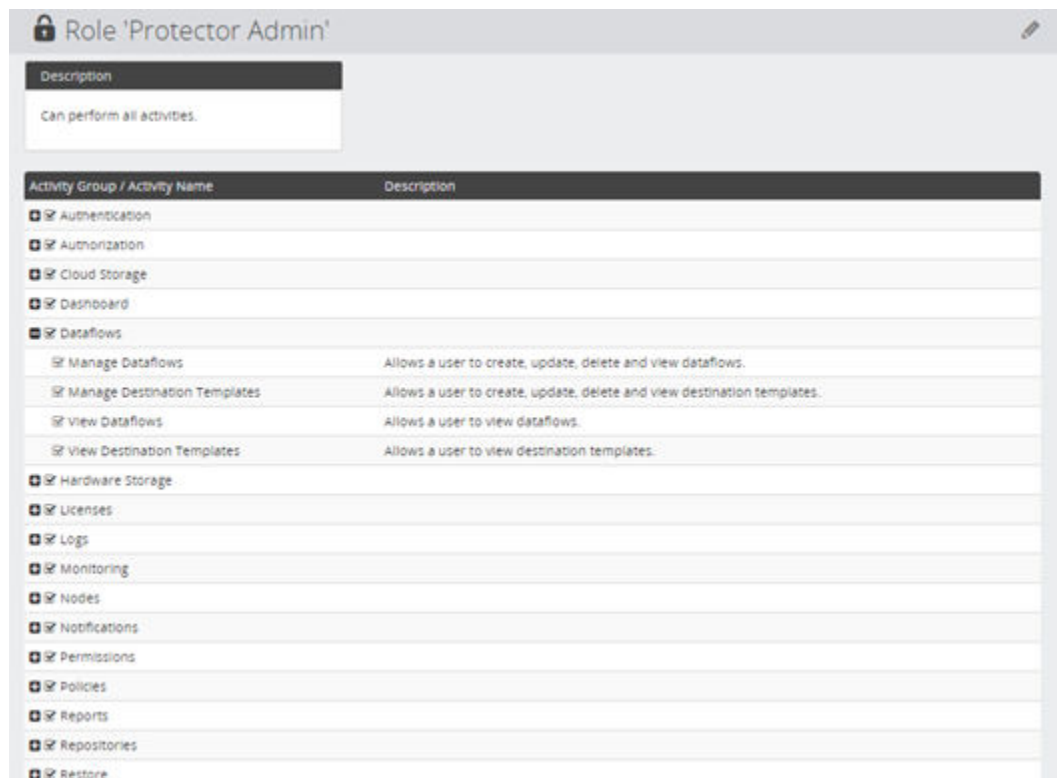



Figure 109 Role Details

| Control | Description |
|--|--|
|  Edit | Launches the Access Control Role Wizard (on page 329) to enable the role to be edited. |


Controlling access to UI features with Activities and Activity Groups

Access to Protector features is controlled by the *Activity Groups* and *Activities* assigned to the user. Access to a feature can be:

- Denied completely by disabling all activities
- Set to read-only by enabling only *View* activities (e.g. *View Policies*)
- Set to full control by enabling *Manage* activities (e.g. *Manage Policies*)
- Set to enable specific functionality within some features (e.g. *Trigger Operations* enables policies to be triggered from the **Monitor** page)

The following table lists the features available in Protector, along with the *Activity Groups* that control general access to those features. Fine grain access control to specific functions within a feature can be achieved by enabling or disabling specific *Activities*.

| User Interface Page | Activity Group | Activity |
|--|---|--------------------------|
| Pages accessible from the Main Banner: | | |
| Dashboard | Refer to Logs, Jobs, Nodes, Monitor, Policies, Data Flows and Licenses below. | |
| Jobs | Monitoring | View Jobs |
| | | Manage Jobs |
| Logs | Logs | View Logs |
| | | Manage Logs |
| | | Purge Audit Logs |
| | | Verify Audit Logs |
| | Notifications | View Log Notifications |
| | | Manage Log Notifications |
| Monitor | Monitoring | View Node Statistics |
| | Triggering | Trigger Operations |

| User Interface Page | Activity Group | Activity |
|------------------------------------|------------------|--|
| Storage | Hardware Storage | Manage Hardware. <div> Note: Enabling this option will automatically enable all other activities in this activity group regardless of their current state.</div> |
| | | Manage Hardware Snapshots and Clones |
| | | Mount Hardware Snapshots and Clones |
| | | Pause Hardware Replications |
| | | Revert Hardware Snapshots |
| | | Swap Hardware Replications |
| | | View Hardware |
| | Repositories | View Repositories |
| | | Use Repositories |
| | | Manage Repositories |
| Reports | Reports | View Reports |
| | | Manage Reports |
| Pages accessible from the Sidebar: | | |
| Nodes | Nodes | View Source Nodes |
| | | Manage Source Nodes |
| | | View Storage Nodes |
| | | Manage Storage Nodes |
| | Software Updates | View Software Updates |
| | | Manage Software Updates |
| Node Groups | Nodes | View Source Nodes |
| | | Manage Source Nodes |
| | | View Storage Nodes |
| | | Manage Storage Nodes |
| Policies | Policies | View Policies |

| User Interface Page | Activity Group | Activity |
|---------------------|----------------|--------------------------------|
| | | Manage Policies |
| Data Flows | Dataflows | View Dataflows |
| | | Manage Dataflows |
| | | View Destination Templates |
| | | Manage Destination Templates |
| | Rules | Manage Rules |
| Schedules | Schedules | View Schedules |
| | | Manage Schedules |
| Notifications | Notifications | View Notification Settings |
| | | Manage Notification Settings |
| Restore | Restore | Perform Restores |
| Access Control | Authentication | View Authentication Spaces |
| | | Manage Authentication Spaces |
| | Authorization | View RBAC Configuration |
| | | Manage RBAC Configuration |
| Licences | Licences | View Licenses |
| | | Manage Licenses |
| <Item> Permissions | Permissions | Override Ownership Permissions |

**Note:**

If a user does not have the required *Activity Group* or *Activity* assigned to them via a *Role* then the user interface will prevent the user performing the activity or viewing information in one or more of the following ways:

- Suppressing display of the associated controls.
- Overlaying a warning triangle icon within the associated controls.
- Displaying an `Access Denied` hover hint when the user moves the cursor over the associated controls.
- Displaying an `Access Denied` message where the associated information would normally appear on a page, wizard or dialog.
- Displaying an `Access Denied` pop-up *Session Notification* when the request is denied by the back-end handler code.

Access Control Resource Groups Inventory

This inventory lists all defined Resource Groups. Resource Groups are created to define logical groups of computing resources in the context of access control. They are distinct from Node Groups which are created to help define policies.

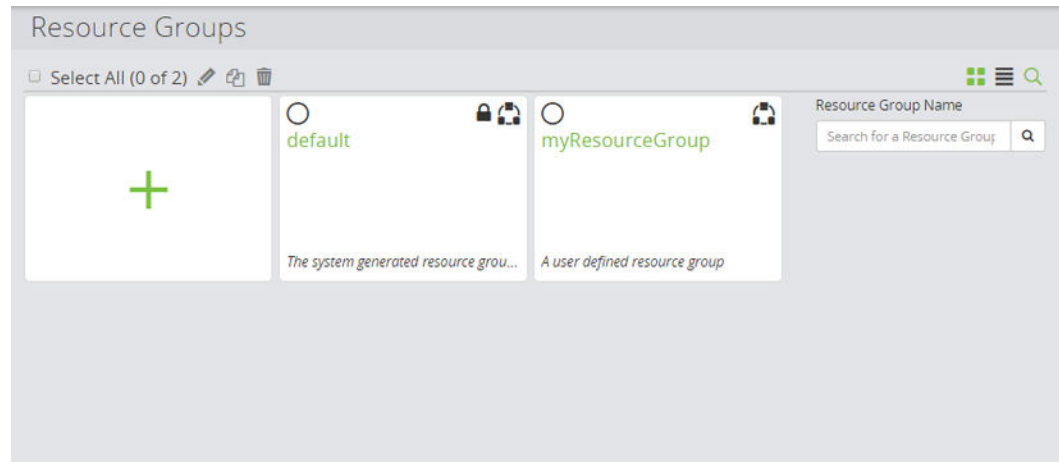










Figure 110 Resource Groups Inventory

| Controls | Description |
|---|--|
|  Summary | Select the Summary option from the drop down menu in the Navigation Breadcrumbs (on page 282) to view the Access Control Summary (on page 340). |
|  Edit | Edits an existing Resource Group in the inventory. The Access Control Resource Group Wizard (on page 337) is launched to enable the Resource Group's attributes to be changed. |
|  Clone | Enabled only when one Resource Group is selected. Creates a clone of the selected item which can then be modified. |
|  Delete | Enabled only when one or more Resource Groups is selected. Deletes the selected item from the inventory. The associated Nodes are not deleted. |
|  Add | Creates a new Resource Group. The Access Control Resource Group Wizard (on page 337) is launched to guide you through the process. |
|  System generated Resource Group | One system generated Resource Group is available when the product is installed. All nodes that are listed in the Nodes Inventory (on page 476) are automatically added to this default resource group. This resource cannot be deleted since it provides a basic level of access control. System generated Resource Groups are marked with a  icon to indicate that they cannot be modified. The Access Control Resource Group Details (on page 339) is displayed to enable the permissions to be viewed. |

| Controls | Description |
|--|--|
|  User defined Resource Group(s) | Any number of user defined Resource Groups can be created. These are displayed in the inventory. Resource Groups should be defined in order to restrict access to nodes. The Access Control Resource Group Details (on page 339) is displayed to enable the permissions to be viewed and edited. |
| Filter on Resource Group Name | Filters the displayed results based on the name. |

Access Control Resource Group Wizard

This wizard is launched when a new Resource Group is added to the Resource Groups Inventory.

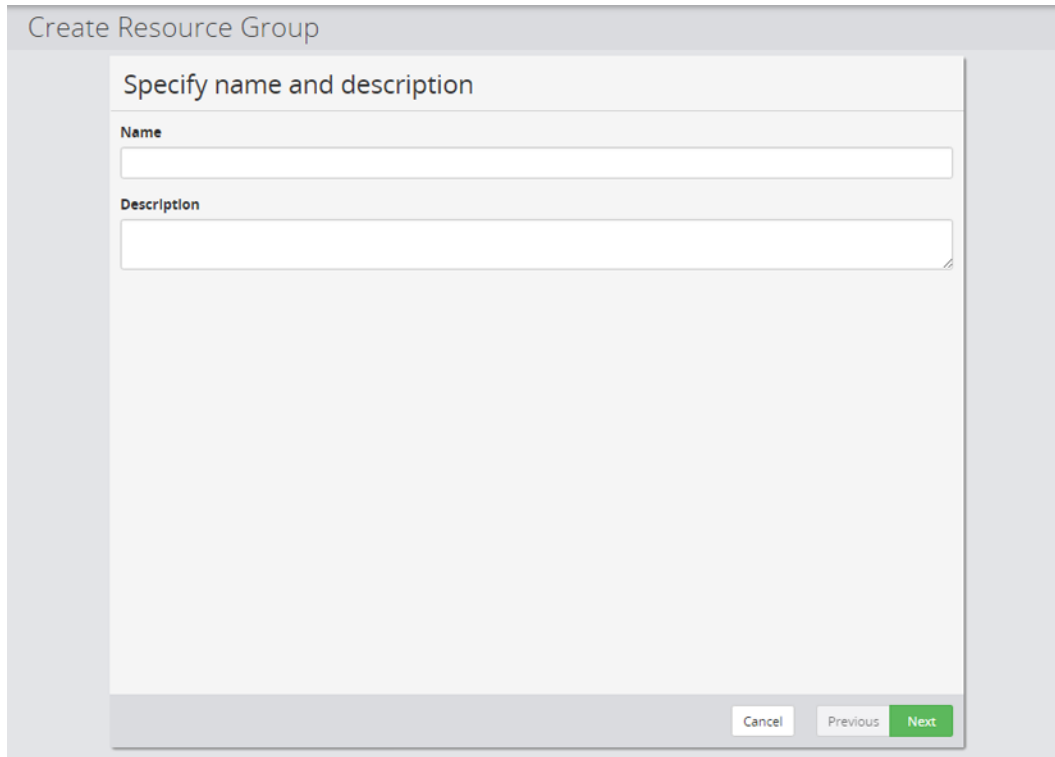



Figure 111 Resource Group Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | Enter the name of the resource group. |
| Description | Optional. Enter a short description of the resource group. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|--|
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

The screenshot shows the 'Create Resource Group' wizard at the 'Manage Resources for myResourceGroup' step. At the top, there's a 'Resource Name' search bar with the placeholder text 'Search for Resource by name'. Below this are two columns: 'Available Resources' and 'Selected Resources'. The 'Available Resources' list includes Client1, Client2, Client3, Client4, Master, myBlockDevice, myBlockHost, myLogicalBockDevice, myRepository, and myVMwareServer. The 'Selected Resources' list includes Client1, Client2, and myRepository. At the bottom, there are 'Cancel', 'Previous', and 'Finish' buttons. Instructions at the bottom of the lists read 'Click an item to add.' and 'Click an item to remove.'

Figure 112 Resource Group Wizard - Manage Resources

| Control | Description |
|---------------------|---|
| Resource Name | Searches for the resource by name. |
| Available Resources | Lists the available resources. Click on the name of the resource to add to the selected resource list. <div>  Note: If the Master node is included in a resource group then users with access to that group will also have access to administrative log messages. Access to the Master node should only be granted to administrative users. </div> |
| Selected Resources | Lists the selected resources. Click on the name of the resource to remove it from the selected resource list. |

| Control | Description |
|----------|--|
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Access Control Resource Group Details

This page displays the details of a Resource Group and enables you launch the wizard to edit them.

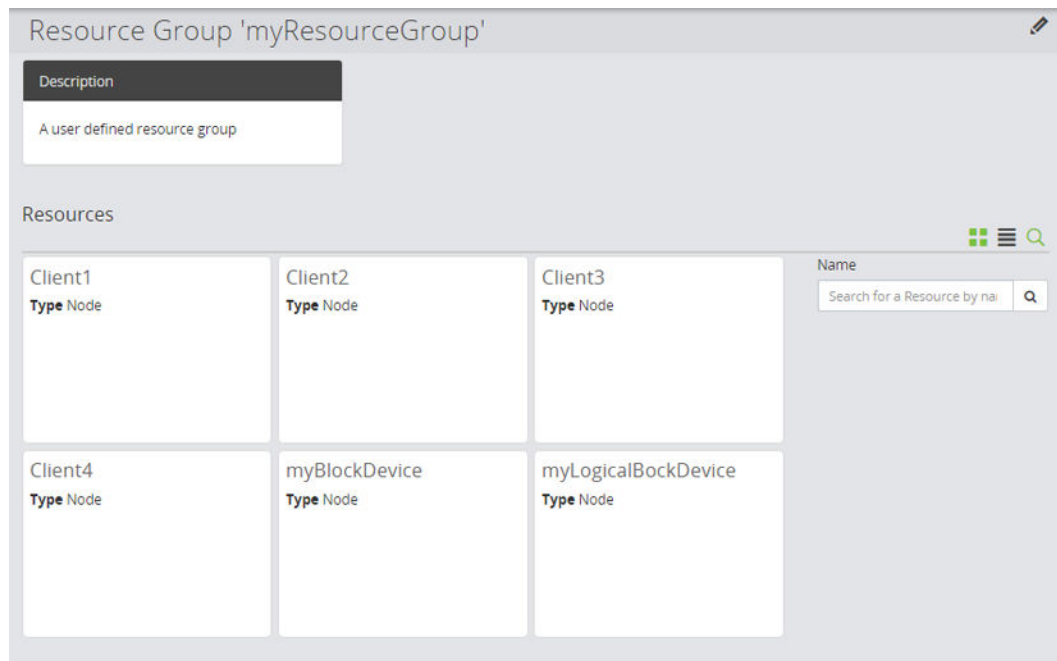


Figure 113 Resource Groups Details

| Control | Description |
|-------------------------|---|
| Edit | Launches the Access Control Resource Group Wizard (on page 337) to enable the group to be edited. |
| Filter on Resource Name | Filters the displayed results based on name. |

Access Control Summary

This page displays Access Control settings for each user or group configured within Protector.

| Access Control Summary | | |
|--|---------------------|--|
| Information The Access Control Summary displays all activities and resources each Access Control Profile Association allows access to. | | |
| Name | Type | Description |
| ▼ User 'Administrator@master' can do | Profile Association | |
| ▼ Default Administrator | Profile | Allows administration of all resources. |
| ▼ Protector Admin | Role | + |
| ▼ Activity Groups | | + |
| > Authentication | Activity Group | + |
| > Authorization | Activity Group | + |
| > Cloud Storage | Activity Group | + |
| > Dashboard | Activity Group | + |
| > Dataflows | Activity Group | + |
| > Permissions | Activity Group | + |
| > Telemetry | Activity Group | + |
| > Hardware Storage | Activity Group | + |
| > Monitoring | Activity Group | + |
| > Licenses | Activity Group | + |
| > Logs | Activity Group | + |
| > Notifications | Activity Group | + |
| > Nodes | Activity Group | + |
| > Policies | Activity Group | + |
| > Reports | Activity Group | + |
| > Repositories | Activity Group | + |
| > Restore | Activity Group | + |
| > Rules | Activity Group | + |
| > Schedules | Activity Group | + |
| > Software Updates | Activity Group | + |
| > Triggering | Activity Group | + |
| > Activities | | + |
| ▼ Resource Group | | + |
| ▼ default - FULL | Resource Group | The system generated resource group into which all resources are added by default. |
| Master | Resource | + |

Figure 114 Access Control Summary

| Tree Node | Description |
|----------------------|---|
| ACP Association Name | Each ACP Association defined within Protector is listed by name. Click [+] to view the related ACPs. |
| ACP Name | Shows the related ACPs below the ACP Association. Click [+] to view the related Role and Resource Groups. |
| Role Name | Shows the related Role below the ACP. Click [+] to view the related Activity Groups and Activities |

| Tree Node | Description |
|---------------------|---|
| Activity Group Name | Shows the related Activity Groups below the Role. Click [+] to view the related Activities. |
| Activity Name | Shows the related Activities below the Activity Group. |
| Resource Group Name | Shows the related Resource Groups below the ACP. Click [+] to view the related Resources. |
| Resource | Shows the related Resources below the Resource Group. |

Access Control Permissions Inventory

The Permissions Inventory is accessed via the Edit Permissions button on various items within the Web UI including policies, data flows and schedules. It enables read/write access for those items to be granted to specific users and groups.

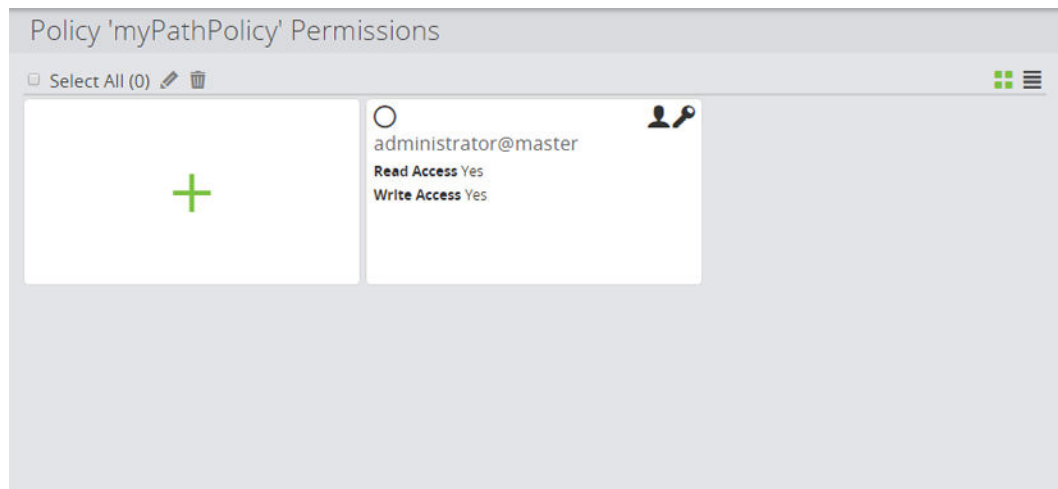







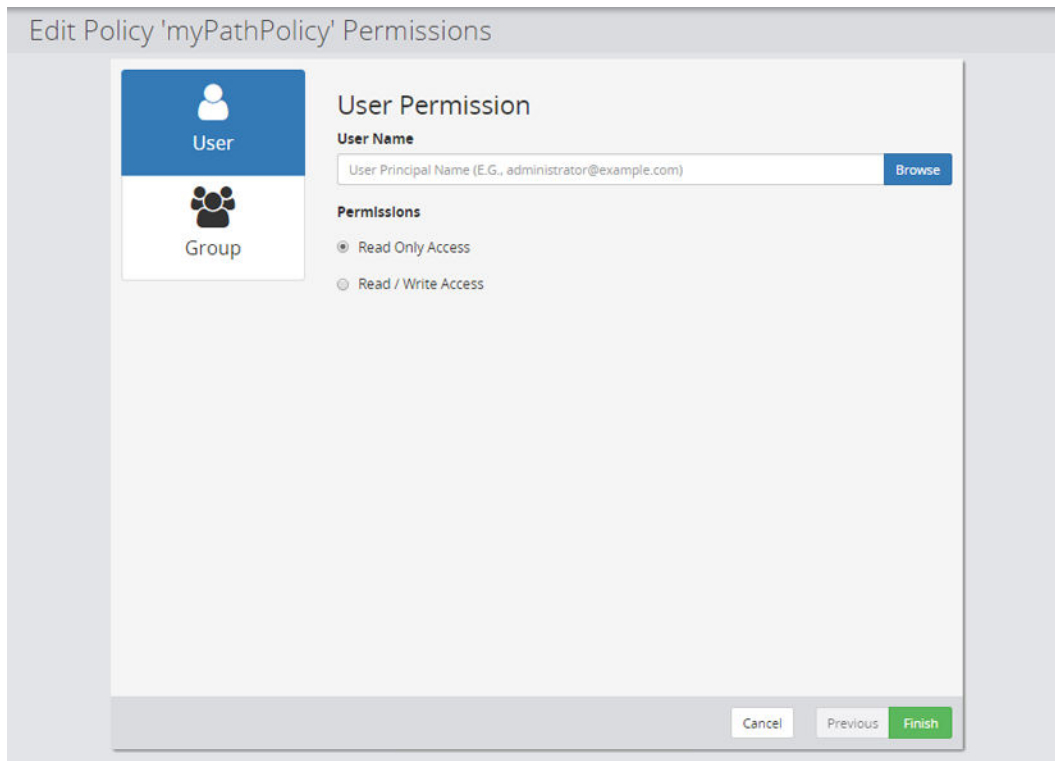
Figure 115 Permissions Inventory

| Control | Description |
|--|---|
|  Edit | Edits an existing permission in the inventory. The Access Control Permissions Wizard (on page 342) is launched to enable the policy's attributes to be changed. |
|  Delete | Enabled only when one or more permissions is selected. Deletes the selected item from the inventory. |
|  Add | Adds a new permission. The Access Control Permissions Wizard (on page 342) is launched to guide you through the process. |

| Control | Description |
|--|--|
|  Default Permission | By default the system adds the <i>administrator@master</i> user permission to controlled items and grants READ/WRITE access. The default permission provides a basic level of access control. The Access Control Permissions Wizard (on page 342) is launched to enable the permissions to be edited. |
|  User defined Permission(s) | Any number of user defined permission(s) can be added. These are displayed in the inventory. Permissions should be defined in order to grant the required level of access to Policies, Data Flows and other items as appropriate to the users' responsibilities. The Access Control Permissions Wizard (on page 342) is launched to enable the permissions to be edited. |

Access Control Permissions Wizard

This wizard is launched when a new user or group is added to the Permissions Inventory.



Edit Policy 'myPathPolicy' Permissions

User Permission

User Name

User Principal Name (E.G., administrator@example.com) Browse

Permissions

☒ Read Only Access

☐ Read / Write Access

Cancel Previous Finish

Figure 116 Permissions Wizard - User Permission

| Control | Description |
|--------------|--|
| User Name | Enter the user name and Authentication Space (username@AuthenticationSpace) or click Browse to lookup the Authentication Space and user. |
| Read Access | Grants Read access to the item. |
| Write Access | Grants Create, Read, Update and Delete access to the item. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Edit Policy 'myPathPolicy' Permissions

Group Permission

Select domain or browse for a user group Browse

Name

Path of Group

Permissions

☒ Read Only Access

☐ Read / Write Access

Cancel Previous Finish

Figure 117 Permissions Wizard - Group Permission

| Control | Description |
|----------------------|--|
| Authentication Space | Select the Authentication Space from the dropdown list or click Browse to lookup the Authentication Space and group. |

| Control | Description |
|---------------|--|
| Name | Enter the group name. This will be populated automatically if you click Browse. |
| Path of Group | If the group name is not unique between different organisational units (OUs) in the same Authentication Space, then enter the path to the group you are referring to using '\' as delimiter. |
| Read Access | Grants the group READ access to the item. |
| Write Access | Grants the group CREATE, READ, UPDATE and DELETE access to the item. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Access Control Transfer Permissions Dialog

This dialog is displayed when the permissions for a resource are being transferred from the current owner to new owner.

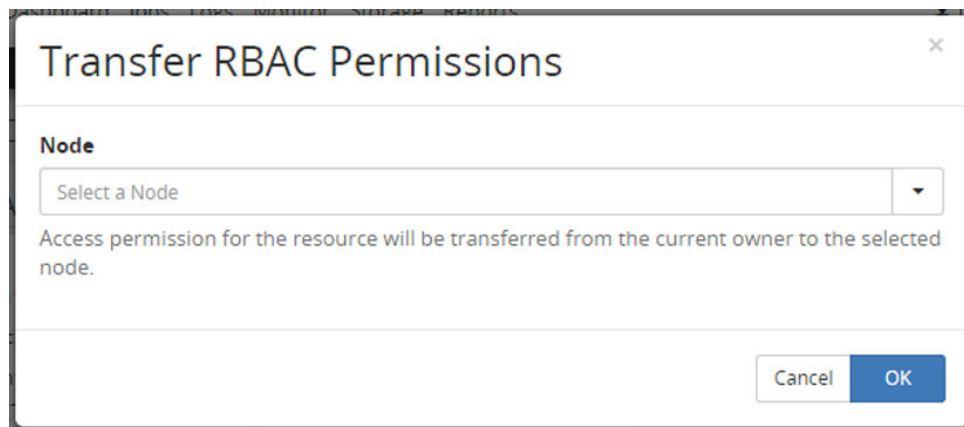


Figure 118 Transfer RBAC Permissions Dialog

| Control | Description |
|---------|--|
| Node | Select the node that will become the owner of this resource. |

Common Controls UI Reference

This section describes common controls found throughout the UI.

Path Dialog

This dialog is displayed when a path is selected using the Browse button to select a path.

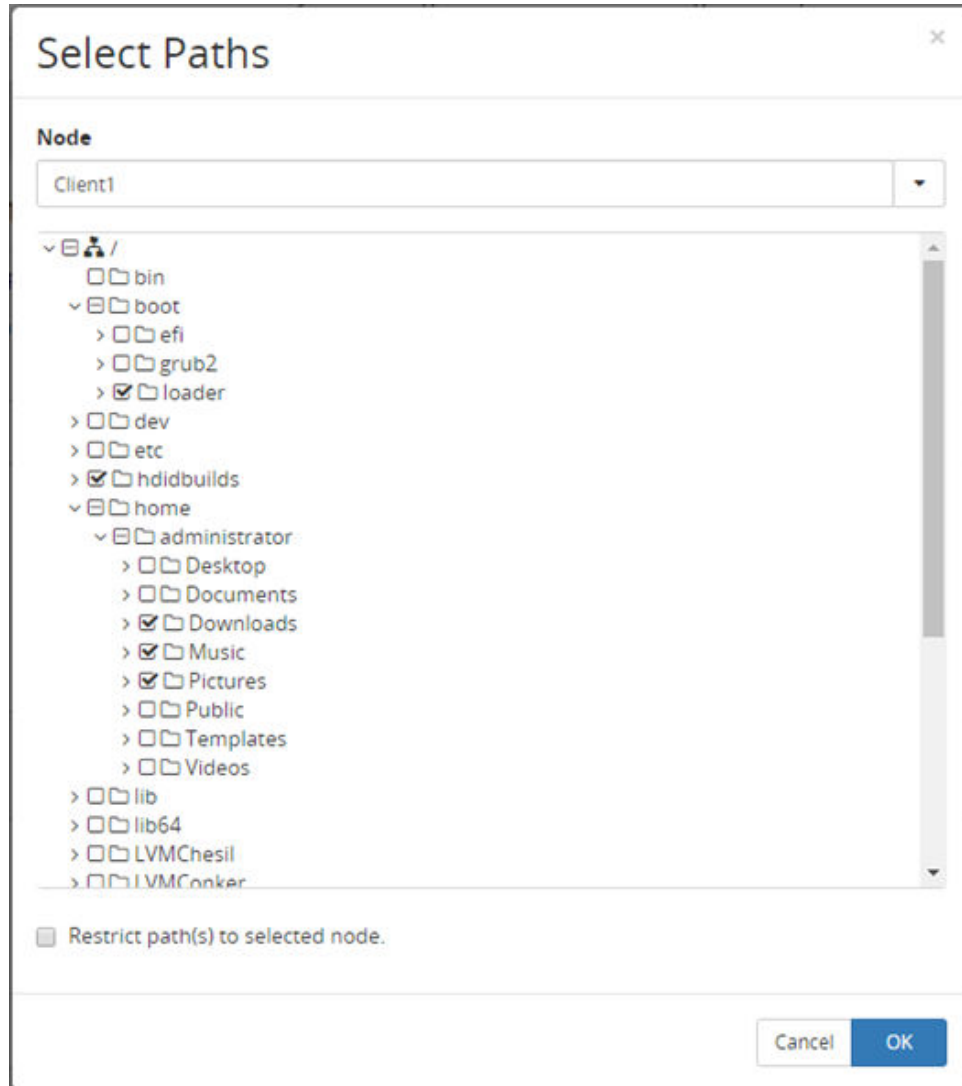



Figure 119 Path Dialog

| Control | Description |
|---------|---|
| Node | Select the node where the path resides. This control may be disabled if the node is already known or cannot be changed. |

| Control | Description |
|------------------------------------|--|
| Directory Tree | Expand the directory tree and select the required folder to specify the path. <div>  Note: If the directory does not exist, it can be created by closing this dialog and typing the required path into the edit box adjacent to the Browse button. </div> |
| Restrict path(s) to selected node. | Appears only when defining a <i>Path Classification</i> for a <i>Policy</i> . The path will be used only in conjunction with the specific Node specified above, rather than being applied to any node. |

Date Time Picker

The date time picker control allows a calendar date and time to be selected.

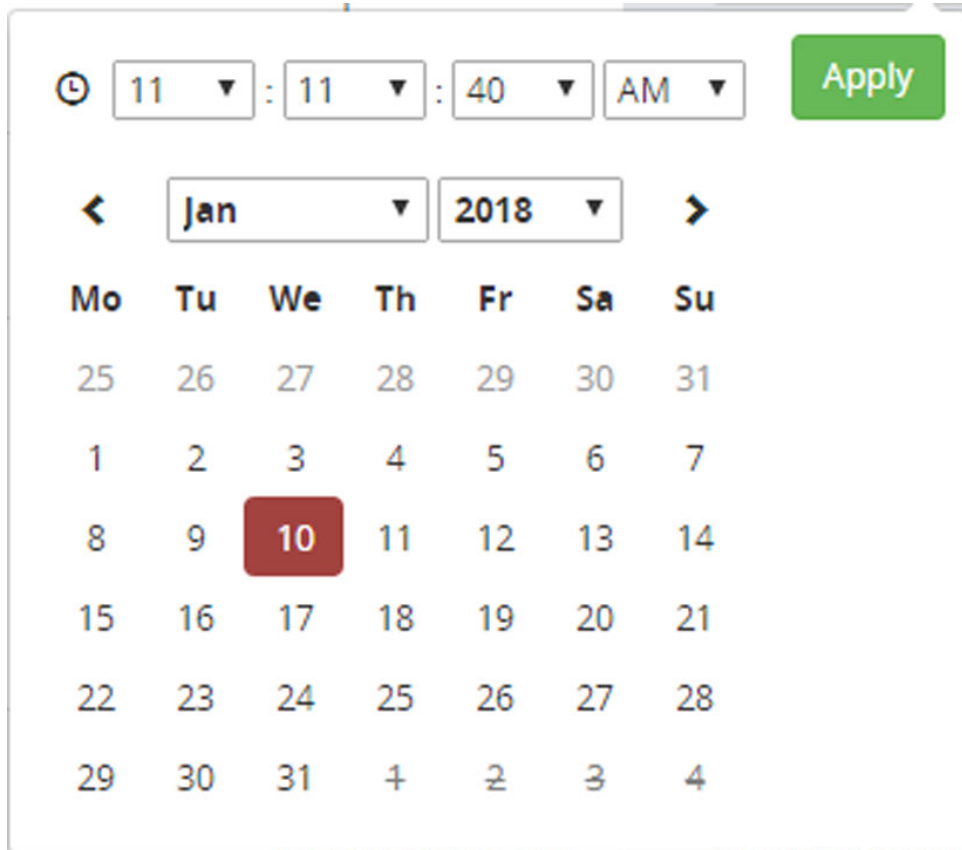


Figure 120 Date Time Picker

| Control | Description |
|---------|---|
| Hour | Select the hour from the dropdown list. |

| Control | Description |
|---------|--|
| Minute | Select the minute from the dropdown list. |
| Second | Select the second from the dropdown list. |
| AM/PM | Select AM or PM (not available if Use 24 hour format is selected in the Settings Wizard (on page 279)). |
| < | View previous month. |
| > | View next month. |
| Month | Select the month from the dropdown list. |
| Year | Select the year from the dropdown list. |
| Day | Select the day in the calendar (unavailable days are struck through). |



Note: It is necessary to select a Day when setting the Date/Time, if a day is not selected the selection will not take effect.

Date Time Range Picker

The date time range picker allows a calendar date and time range to be selected.


The image shows a 'Date Time Range' dialog box. At the top, there is a dropdown menu set to 'Custom Range'. Below it, two date-time fields are displayed: '09/01/2018 11:14:12 AM' and '31/01/2018 11:14:18 AM', separated by a 'To' label. A calendar modal is overlaid on the dialog. The modal has a clock icon, a time picker showing '11:14:18 AM', and a green 'Apply' button. The calendar shows the month of 'Jan' for the year '2018'. The date '31' is highlighted in a red box. The calendar grid shows days of the week (Mo, Tu, We, Th, Fr, Sa, Su) and dates from 25 to 31.

Figure 121 Date/Time Range Picker

| Control | Description |
|---------|---|
| Presets | <p>Select one of the following predefined ranges from the top dropdown list:</p> <ul style="list-style-type: none"> ▪ Today ▪ Yesterday ▪ Last 7 Days ▪ Last 14 Days ▪ This Month ▪ Last Month ▪ Custom Range - enables the calendar controls described below. |

| Control | Description |
|---------|--|
| From | If Custom Range is selected, click the lower left field to open a Date Time Picker (on page 346) to select the 'From' date time. |
| To | If Custom Range is selected, click the lower right field to open a Date Time Picker (on page 346) to select the 'To' date time. |

Hitachi Block Host Resize Dialog

The Logical Device resize dialog can be accessed from the Block Host screen using the  tool bar item. This dialog can be used to resize logical devices represented by the Block Host node that are part of a replication pair. For active live replications both the PVOLS and SVOLS are expanded to the same size. For paused live replications and batch replications only the PVOLS are expanded to the requested size the SVOLS will be expanded when the replication is resumed or resynchronized, see [Hitachi Block Device Advanced Settings Dialog \(on page 790\)](#) for the array settings required to enable this functionality.



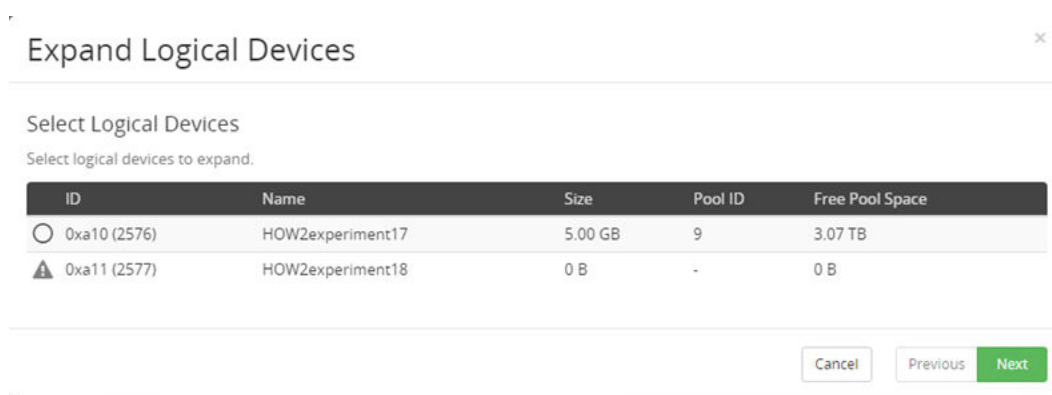
Note: All supported replication types, with the exception of Thin Image replications, can be expanded as well as floating Snapshots.



Note: To expand replications which have a live cascaded replications the cascaded replications must be paused prior to expanding the initial replication.



Note: To expand a block host which has multiple live replications all except one of the replications must be paused prior to expanding the block host.




| ID | Name | Size | Pool ID | Free Pool Space |
|---------------------------------------|------------------|---------|---------|-----------------|
| <input type="radio"/> 0xa10 (2576) | HOW2experiment17 | 5.00 GB | 9 | 3.07 TB |
| <input type="checkbox"/> 0xa11 (2577) | HOW2experiment18 | 0 B | - | 0 B |

Figure 122 Expand Logical Devices - Select Logical Devices

First, select all logical devices that require expansion and click Next



Note: Any entries in the table with the  are LDEVs which are not available for expansion. Hovering the mouse pointer over the warning triangle will give more information as to why the LDEV can not be expanded.

Expand Logical Devices ×

Input Expand by Amount
Input size to expand logical devices by:

| ID | Name | Size | Pool ID | Free Pool Space | Expand By | Unit |
|----------------|-----------|-----------|---------|-----------------|-----------|------|
| 0x36b0 (14000) | DanLDevs1 | 100.00 MB | 10 | 3.05 TB | 1 | GB |

Cancel Previous Finish

Figure 123 Expand Logical Devices - Input Expand by Amount

Then for each selected logical device specify how much to expand the volume by in units of GB or TB.



Note: During the expansion of a live replication it be paused, then the PVOL(s) and SVOL(s) will be expanded and finally the replication will be resumed. However, for swapped replications the expansion is done in the reverse order expanding the active SVOL first and then expanding the active PVOL.

Data Flows UI Reference

This section describes the Data Flows UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [Data Flow Concepts \(on page 53\)](#)
- [Data Flow Tasks \(on page 225\)](#)

Data Flows Inventory

This inventory lists all defined Data Flows whether they are active, inactive or under construction.

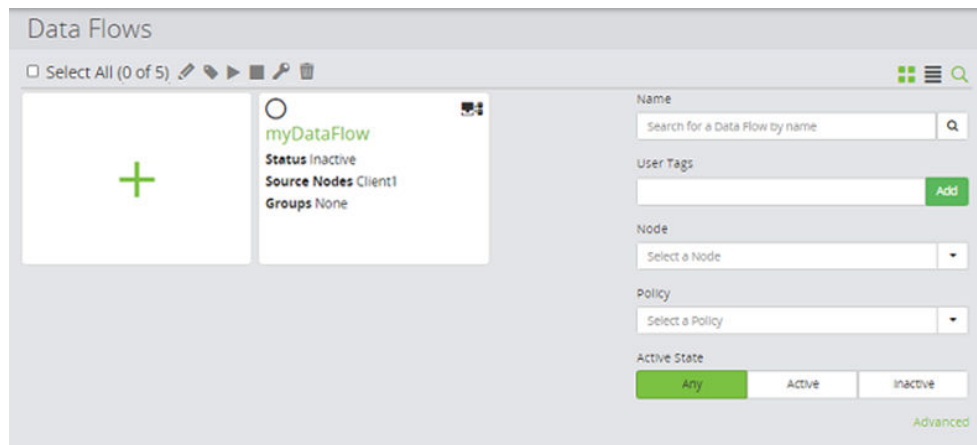









Figure 124 Data Flows Inventory

| Control | Description |
|--|--|
|  Edit | <p>Edits an existing data flow in the inventory. The Data Flow Wizard (on page 356) is launched to enable the data flow's attributes to be changed.</p> <p>Note: If an active data flow has been modified, but has not been reactivated, a warning triangle will be displayed in the <i>Status</i> field on the corresponding tile.</p> |
|  Tag | <p>Modifies the tags of an existing object from either the inventory screen or the details screen of the object.</p> |
|  Activate | <p>Enabled only when one or more data flows are selected. Displays the Activate Data Flow Dialog (on page 352) and attempts to compile the rules for the selected data flows. If compilation is successful then the rules can be activated.</p> <p>Caution: Activate data flows in batches not exceeding 20 data flows at a time. Activating more than this simultaneously can result in longer activation times.</p> |
|  Deactivate | <p>Enabled only when one or more data flows are selected. Deactivates the selected data flows.</p> <p>Caution: If the deactivated data flows contain storage hardware based operations, replications will be placed in the eligible for tear down state.</p> |
|  Delete | <p>Enabled only when one or more data flows are selected. Deletes the data flow from the inventory. Active data flows cannot be deleted.</p> |

| Control | Description |
|--|--|
|  Add | Creates a new Data Flow. Launches the Data Flow Wizard (on page 356) to guide you through the process. |
|  Existing Data Flow | Click the data flow name to open the Data Flow Details (on page 439) to enable you to view and edit the data flow. |
| Filter on Name | Filters the displayed results based on Data Flow Name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node | Filters the displayed results based on Node Name contained in the data flow. |
| Filter on Policy | Filters the displayed results based on Policy Name contained in the data flow. |
| Filter on Active State | Filters the displayed results based on the active state of the data flow. |

Activate Data Flow Dialog

This dialog is displayed when one or more data flows are activated.

Rules files control the operation of the Ops Center Protector components on each node in the data flow definition. Rules files are generated by the *Rules Compiler* after policies have been created, the data flows have been defined and policies assigned to source and destination nodes.



Caution: If you modify a policy or data flow that is currently active, then the data flow must be reactivated before your changes will take effect.

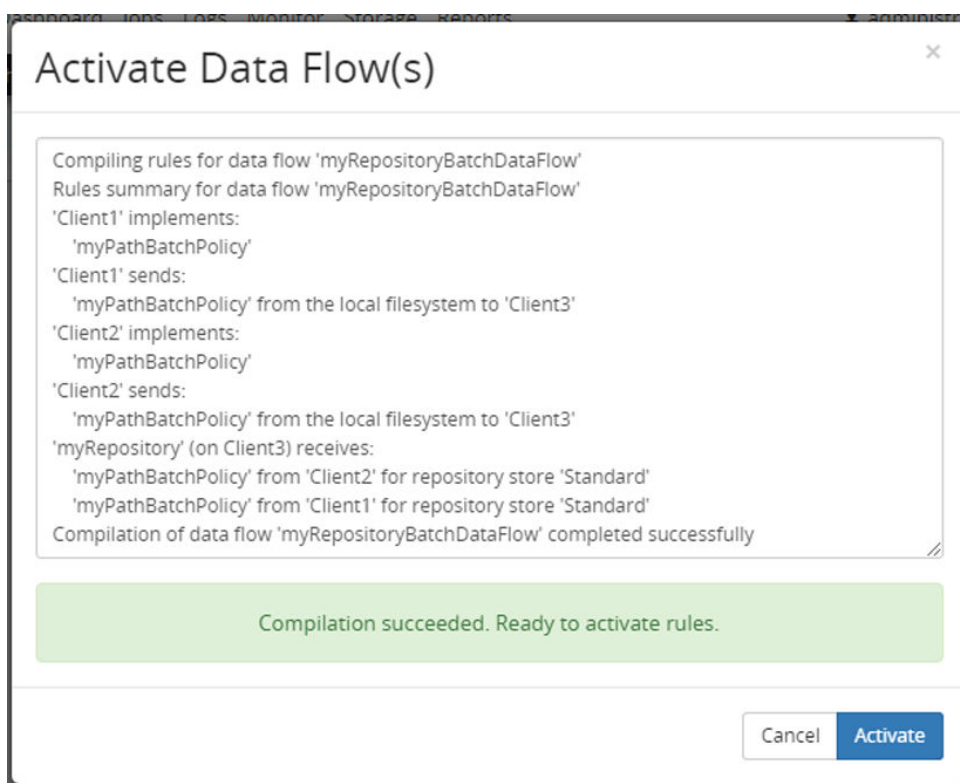


Figure 125 Activate Data Flow(s) Dialog (Compilation succeeded)

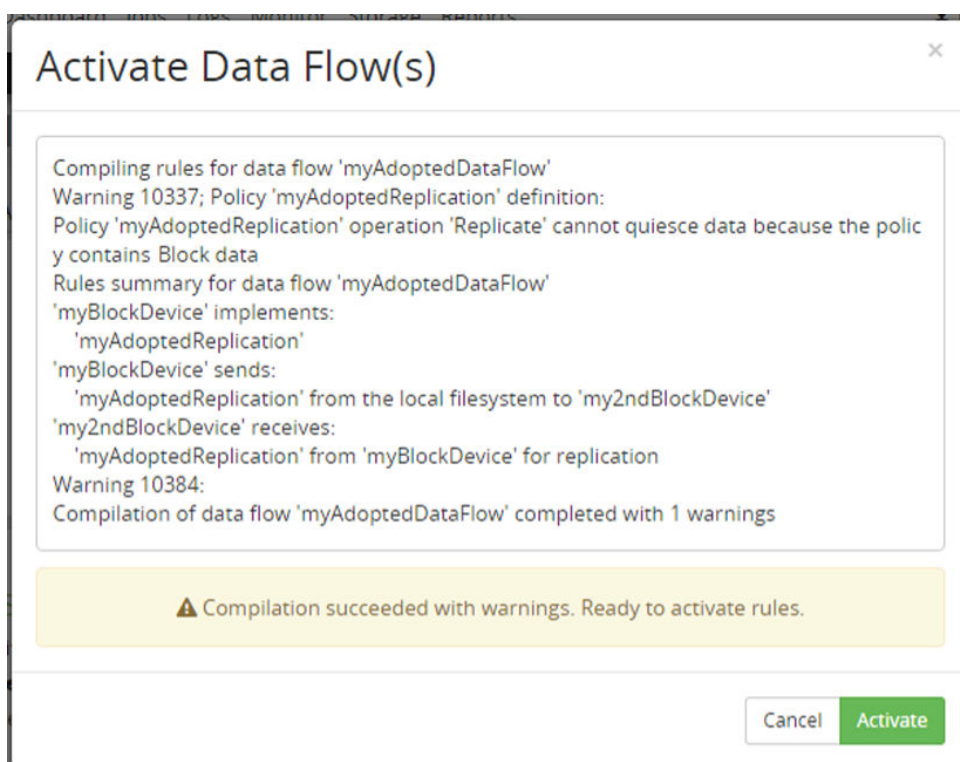


Figure 126 Activate Data Flow(s) Dialog (Compilation succeeded with warnings)

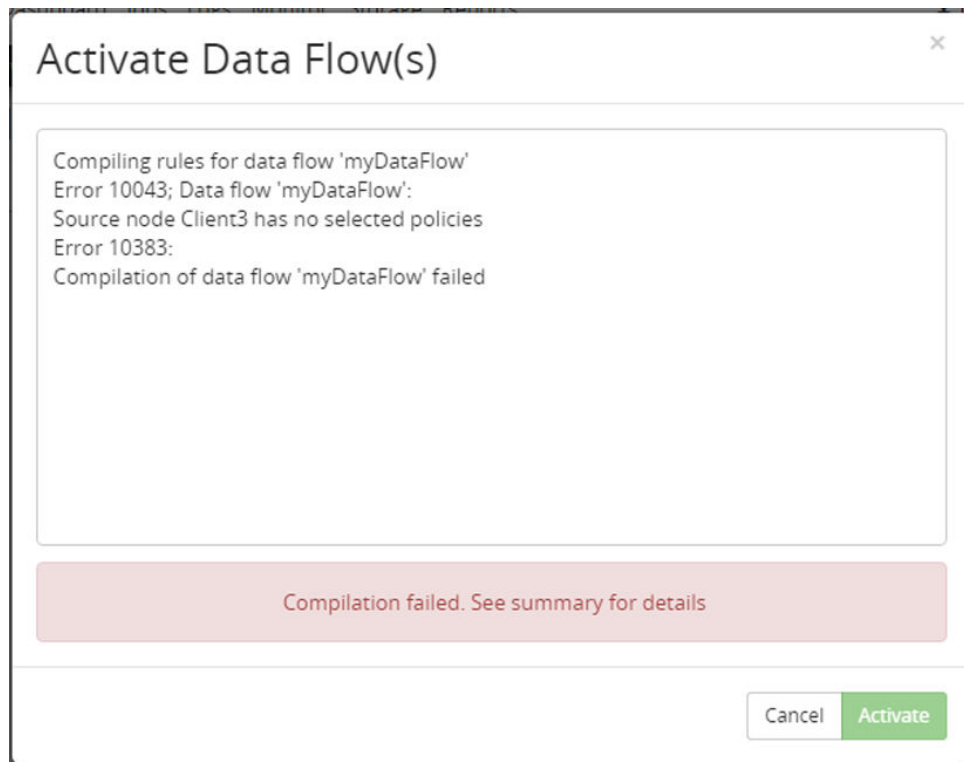




Figure 127 Activate Data Flow(s) Dialog (Compilation failed)

| Control | Description |
|---------------------|---|
| Compilation Details | <p>This lists the output from the rules compiler and shows error, warning and information messages.</p> <p>If the compilation is successful, it includes a summary of what policies each node in the data flow will be implementing, forwarding or processing. The data flow can be activated.</p> <p>If the compilation is successful but contains warnings, then the information contained here will assist you in resolving potential issues with the data flow and/or policies. The data flow can be activated.</p> <p>If the rules fail to compile then the information contained here will assist you in resolving issues with the data flow and/or policies. You may need to iterate through several compilation cycles to remove all compilation errors. The data flow cannot be activated.</p> <div>  Caution: Always inspect the compiler output. A successful compilation may contain warning messages which you should review. Successful compilation only indicates that the rules are valid, it does not imply that they are verified against your data protection requirements. Please regularly inspect the Default Dashboard (on page 284) and related status screens to ensure that your data is being protected in the manner you intended. </div> |

| Control | Description |
|---------------------|---|
| | <p>Compiler errors are commonly caused by:</p> <ul style="list-style-type: none"> ▪ incorrect or incomplete policies ▪ incomplete data flow definitions ▪ incorrect or incomplete data flow item attributes ▪ incomplete or ambiguous routes for policies ▪ missing parameters on destination nodes ▪ adding, editing or deleting policy classifications or operations without updating data flows |
| Compilation Outcome | <p>Indicates one of the following:</p> <ul style="list-style-type: none"> ▪ Blue - the rules are being compiled. Please wait. ▪ Green - the rules have been compiled successfully. The data flows and policies are valid (but not necessarily correct) and can be activated. ▪ Amber - the rules have been compiled successfully with warnings. The data flows and policies are valid (but not necessarily correct) and can be activated. The data flows and/or policies contain warnings that may need to be rectified. ▪ Red - the rules have not been compiled. The data flows and or policies contain errors that must be rectified before the data flows can be activated. |
| Activate | <p>This button is only enabled once the rules have compiled successfully. Click to distribute the rules to the affected nodes and activate them. The policies will then take effect depending on the availability of affected nodes, operations, trigger conditions or schedules defined. The Logs Inventory (on page 448) can be used to watch and review the progress of data flow activation.</p> |

| Control | Description |
|---------|--|
| | <div data-bbox="594 262 634 310"></div> <p>Note:</p> <p>Rules activation methods depend on the type of policy:</p> <ul style="list-style-type: none"> ▪ Host based: An initial 2 minute rules settlement period is applied after activation to allow rules to reach all participating nodes. If any operation is triggered within the settlement period it will be deferred until after it has expired. ▪ Block based: If the current rules are null or they predate the new rules, the ISM will wait up to 2 minutes for a new rule set to arrive. An information level log will be generated if this delay is invoked: Storage proxy node does not have required rules, waiting up to <DELAY> seconds. If, after waiting, the rules are still out of date, the ISM will attempt to use the rules it currently has. ▪ All: If a node in the data flow definition is unavailable, then the rules files cannot be sent to that node; activation continues for the available nodes. When the activation is complete, the new rules are activated on all available nodes. When the absent node becomes available and reconnects to the master, the new rules are sent automatically to that node and activated immediately after they are received. If any nodes are deleted from a previously activated data flow definition, then these nodes are deactivated when the new rules are activated. If any such node is not currently available, it is deactivated as soon as it reconnects to the master. |

Data Flow Wizard

This wizard is displayed when a new data flow is being created.

The Data Flow Wizard performs two principal functions:

- Defines the routing of policies that move data from source nodes to destination nodes.
- Assign policies to nodes on your network, defining what data to backup and the methods of protection to employ.

Figure 128 Data Flow Wizard - Name

| Control | Description |
|-------------|--|
| Name | Enter a name for the Data Flow. |
| Description | Optional. Enter a short description of the Data Flow. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |


Figure 129 Add Tags - Edit User Tags

| Control | Description |
|-----------|---|
| Edit Type | Enter the Edit Type. |
| Tags | Add the tags to be associated with the object being created. |
| Cancel | Discards all changes and reverts to the previous page. |
| Apply | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |



Figure 130 Data Flow Wizard

Table 21 Nodes Tab

| Control | Description |
|---|---|
|  Filter on Node Name | Filters the displayed results based on Node Name. |
| Filter on Node Type | Filters the displayed results based on Node Type. |
| Nodes List | List the available source and destination nodes that can be dragged onto the Data Flow Workspace. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|---|
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Table 22 Node Groups Tab












| Control | Description |
|--|---|
|  Filter on Group Name | Filters the displayed results based on Node Group Name. |
| Node Group List | List the available node groups that can be dragged onto the Data Flow Workspace. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Table 23 Data Flow Workspace and Applied Policies

| Control | Description |
|--|--|
|  Connect To | <p>Enabled only when a single node is selected on the diagram. Click to create a connection from the selected node to another node on the diagram. When the connector is displayed, click again on the destination node to complete the connection. By default the Mover Type is set to Batch; the properties associated with each connection can be edited via the Mover Settings controls (see 'Mover Settings' controls below). Only compatible elements can be connected.</p> <div>  Tip: Connections can also be created by dragging a destination node from the node list, over a source node to pick up the connector and then dropping it at the desired location. Alternatively you can drag a source node already on the diagram, over a destination node on the diagram and drop it there. </div> |

| Control | Description |
|---|--|
|  Delete | Enabled only when one or more nodes or movers are selected on the diagram. Removes the selected node(s) or mover(s) from the diagram. You can also press the Delete key. |
|  Node or Node Group Icon | Each node type is represented by a different icon (see Node Type Icons (on page 580)). The currently selected node is enclosed in a box. <div>  Tip: If a warning condition is detected whilst constructing a data flow (e.g. a policy has only been assigned to a source node) then a red warning triangle  will appear next to the offending node. </div> |
| Multiple Selection | Click and drag the cursor over nodes on the workspace to select multiple nodes and movers. Alternatively press and hold CTRL and click multiple nodes. |
| Select All | Click on the workspace then press CTRL++A to select all nodes and connectors. |
| Drag and Drop | Select and drag one or more nodes or movers to reposition them on the workspace. If the user moves a node, the icon will appear green if the node is dragged over another node it can be connected to, or red if not. If the user moves multiple items, the icons will not change color as creating connections from/to multiple items at once is not supported. If the user attempts to drop multiple items over the top of another item, the action will be canceled. |
|  Next Node | Click to move the focus to the next node on the data flow. |
|  Zoom In/Out | Click the buttons next to the workspace, press +/- on the keypad or hold down the CTRL key whilst using the mouse wheel to zoom in and out. The current zoom level is displayed between the zoom buttons. Click the zoom level to reset to 100% zoom. |
|  Fit to Screen | Click the button next to the workspace or press the HOME key to select a zoom level that allows the entire data flow to fit within the bounds of the workspace. |
| Pan | Right click anywhere on the workspace and drag the cursor. |
| Applied Policies (all) | If no nodes or movers are selected on the data flow workspace, then the area to the right of the workspace lists all the policies that have been applied in the data flow. Click the  button next to the policy name to open the Policy Details (on page 658) for that policy in a new browser tab. |

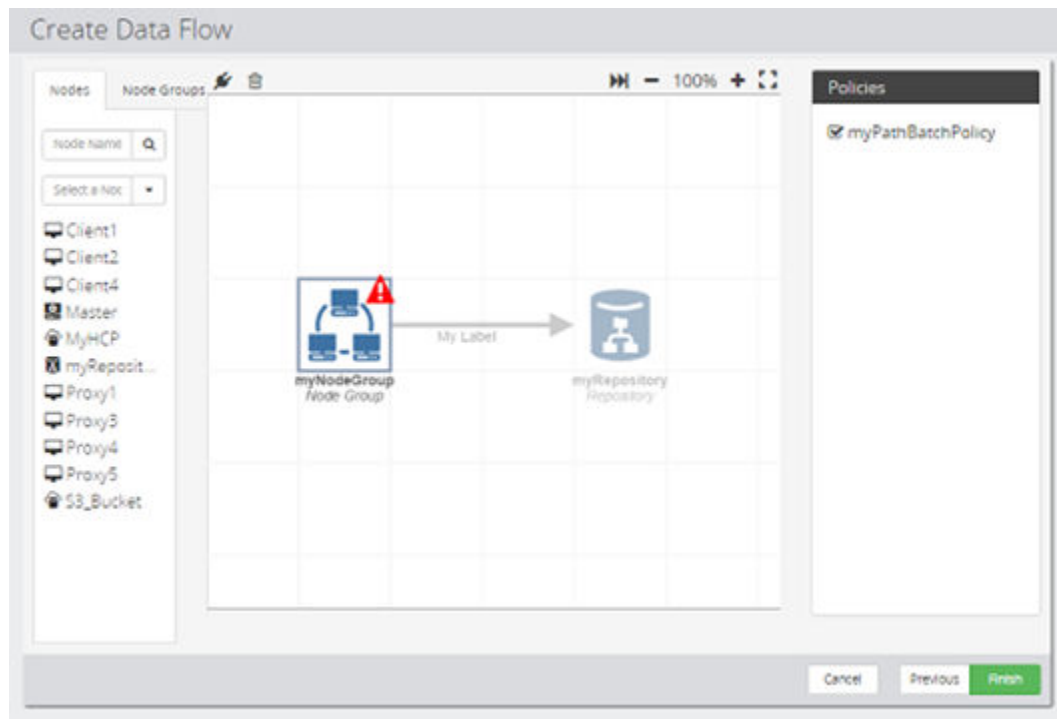




Figure 131 Data Flow Wizard - Source Node Policies

Table 24 Policies

| Control | Description |
|--|--|
|  Policies (source node selected) | <p>If a single source node is selected on the data flow canvas, then the area to the right of the canvas lists all the policies that can be or are applied to that node. Apply policies to the node by clicking the required policy names.</p> <div style="background-color: #e0f2f1; padding: 10px; border: 1px solid #c8e6c9;"> <p> Note: If the selected policy requires a destination node to complete the policy definition, the source node displays a warning symbol to indicate that the policy definition is incomplete.</p> </div> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

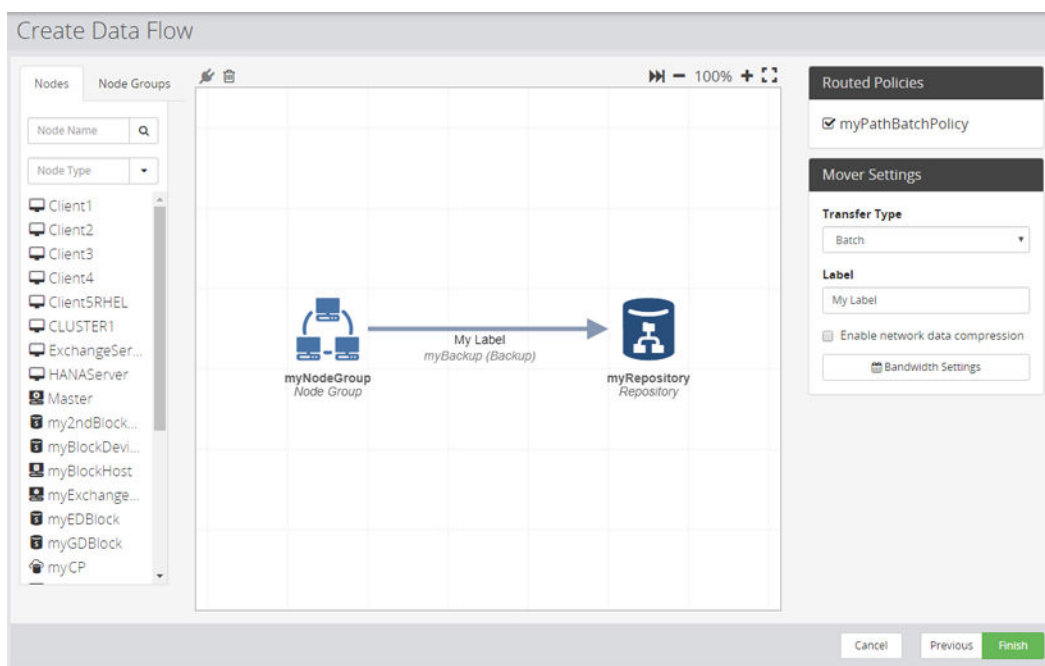



Figure 132 Data Flow Wizard - Mover Settings

Movers are connectors that represent how data is transferred from source node to destination node.

The mover provides options on how to route data for policies. If a source node is configured to implement a policy, then any movers connected to it automatically route that policy. If the mover is not configured to implement a policy, then the nodes further downstream are not able to either configure or implement the policy.

Table 25 Mover Settings

| Control | Description |
|--|---|
|  Routed Policies (mover selected) | <p>If a mover is selected on the data flow canvas, then the area to the right of the canvas lists all the policies that are routed by that mover.</p> |
| Transfer Type | <p>Changes the mover type to one of the following:</p> <ul style="list-style-type: none"> Batch (solid line) - data is moved in batches based on a schedule or trigger event. Continuous (dotted line) - used only for Hardware operations. Failover (dashed line) - used only for 3DC delta resync data flows. Defines a suspended replication path, between the secondary and tertiary site, that can be invoked if the primary site fails. <p>The arrowhead indicates the direction of data flow during normal backup operations.</p> |






| Control | Description |
|---------------------------------|--|
| |  Note: It is import to use a mover type that is compatible with the operation type specified in the Policy. This requires an understanding of the snapshot and replication technologies being used. If an incompatible mover type is used, then you will only be notified about the error when you attempt to compile the rules. <ol style="list-style-type: none"> 1. Remove the replication from the data flow. 2. Reactivate the data flow. 3. Replace the replication on the data flow using the required mover type. |
| Label | By default the mover label displayed on the connector is empty. This can be replaced with a label describing the connection on the data flow. This feature can be useful in situations where there is more than one mover connected to a node. |
| Enable network data compression | <p>For Host based operations only (ignored for Hardware based operations).</p> <p>Turns on data compression on the datalink between two nodes.</p>  Note: Compression decreases network utilization, but increases CPU usage. |
| Bandwidth Settings | <p>For Host based operations only (ignored for Hardware based operations).</p> <p>Opens Mover Bandwidth Settings Dialog (on page 365) to enable you to control the amount of bandwidth that data transfers use so that a network connection can be used simultaneously with other applications in the environment.</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |



Figure 133 Data Flow Wizard - Destination Node Policies

Table 26 Policies

| Control | Description |
|---|--|
|  Policies (destination node selected) | <p>If a single destination node is selected on the data flow canvas, then the area to the right of the canvas lists all the policies and their contained operations that can be or are applied to that node. Apply operations to the node by clicking the required operation names. A dialog opens, appropriate to the destination node type, that allows those properties to be specified (see Configure Operation Properties).</p> <p>The policies listed here are restricted to those that have been applied to upstream nodes and those that the destination node has the appropriate capabilities to receive.</p> <div style="background-color: #e0f2f1; padding: 10px; border: 1px solid #cfcfcf;"> <p> Note: A single policy can have several operations within it for a given data classification. The destination indicates which of those operations it can implement by displaying only the supported operation check boxes. The policy name check box cannot be selected by the user, the individual operations within the policy must be selected.</p> </div> |
| Configure Operation Properties | <p>When an operation is applied to a destination node you may need to specify properties for that operation. Click this button to open a dialog, appropriate to the destination node type, that allows those properties to be specified:</p> <ul style="list-style-type: none"> ▪ Generation 1 Repository Backup Configuration Dialog (on page 367) ▪ Hitachi Block Snapshot Configuration Wizard (on page 373) |

| Control | Description |
|----------|---|
| | <ul style="list-style-type: none"> ▪ Hitachi Block Replication Configuration Wizard (on page 381) ▪ Hitachi Block Mount Configuration Wizard (on page 433) <p>Once the properties are specified, the button is replaced with a summary of the properties. Click the Edit button next to the summary to reopen the dialog to change any properties. The operation type is displayed in italics next to the mover along with the user defined label.</p> <div>  Note: For Hitachi Block Replication Operation Properties: Once the operation properties have been configured and the data flow has been activated, the properties cannot be changed. Redistributing rules for the active data flow with edited properties will not change them. To change the operation properties, the existing data flow must first be deactivated then reactivated with the new properties. Deactivating the data flow will mark the replication eligible for tear down. </div> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Mover Bandwidth Settings Dialog

This dialog is used to specify when and how much bandwidth can be used by Protector to transfer data across the datalink between two nodes.

You can assign specific bandwidth constraints for defined time windows so that a network connection can be used simultaneously with other applications in the environment. For instance, you can decide to decrease bandwidth during the workday when bandwidth is required for production and increase it at night to allow backups to utilize maximum bandwidth.



Note: If the amount of data that must be replicated continuously exceeds the current bandwidth quota, then data is cached on the source until the bandwidth increases. Cache size on the Source Node can be adjusted to avoid any problems with non-transferred data reaching the cache limit. The configuration file `distributor.cfg` contains the values `MaxDiskCache` and `MaxMemoryCache` which can be increased if the cache limit becomes a problem.

Bandwidth Settings

| Hours: | 12 AM | 1 AM | 2 AM | 3 AM | 4 AM | 5 AM | 6 AM | 7 AM | 8 AM | 9 AM | 10 AM | 11 AM | 12 PM | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM | 7 PM | 8 PM | 9 PM | 10 PM | 11 PM |
|-----------|-------|------|------|------|------|------|------|------|------|------|-------|-------|-------|------|------|------|------|------|------|------|------|------|-------|-------|
| Monday | | | | | | | | | | | | | | | | | | | | | | | | |
| Tuesday | | High | High | High | High | High | | | Low | Low | Low | Low | Low | | | | | | | | | | | |
| Wednesday | | | | | | | | | | | | | | | | | | | | | | | | |
| Thursday | High | High | High | | | High | High | High | High | High | High | High | High | | | | | | | | | | | |
| Friday | | | | | | | | | | | | | | | | | | | | | | | | |
| Saturday | | | | | | | | | | | | | | | | | | | | | | | | |
| Sunday | | | | | | | | | | | | | | | | | | | | | | | | |

Click a time slot to toggle between high, low and default throttling speeds.

Throttle Settings

☐ **Default Speed**

☐ Unlimited

☒ **Throttled**

Mb/s

☒ **High Speed**

Mb/s

☒ **Low Speed**

Mb/s

Cancel OK

Figure 134 Bandwidth Settings Dialog

| Control | Description |
|---------------------|---|
| Week Grid | <p>Click the cells in the grid, corresponding to the hour-long periods where you want to throttle network bandwidth used by Protector, to one of the following levels (cells cycle through the three states each time they are clicked):</p> <ul style="list-style-type: none"> High - (Dark Green) High Speed throttling at the setting defined below. Low - (Light Green) Low Speed throttling at the setting defined below. None - (White) Default Speed throttling at the setting defined below. |
| Unlimited/Throttled | Sets the default speed to the maximum allowed (Unlimited) by the network or to a predefined level (Throttled). |
| Default Speed | Specifies the default throttle level. This may be set to any value including 0. |
| High Speed | Specifies the high throttle level. This must be set to a non-zero value and greater than the Low Speed level. |

| Control | Description |
|-----------|--|
| Low Speed | Specifies the low throttle level. This must be set to a non-zero value and less than the High Speed level. |

Generation 1 Repository Backup Configuration Dialog

This dialog is displayed when you assign an operation to a Generation 1 Repository node on a data flow.

When using a repository as a destination for a data flow a number of configuration options are available. These destination options for a repository node are contained within Store Templates. Each repository node can be associated with multiple stores templates. There are two default store templates (Standard and Deduplicated), however additional templates can be created.

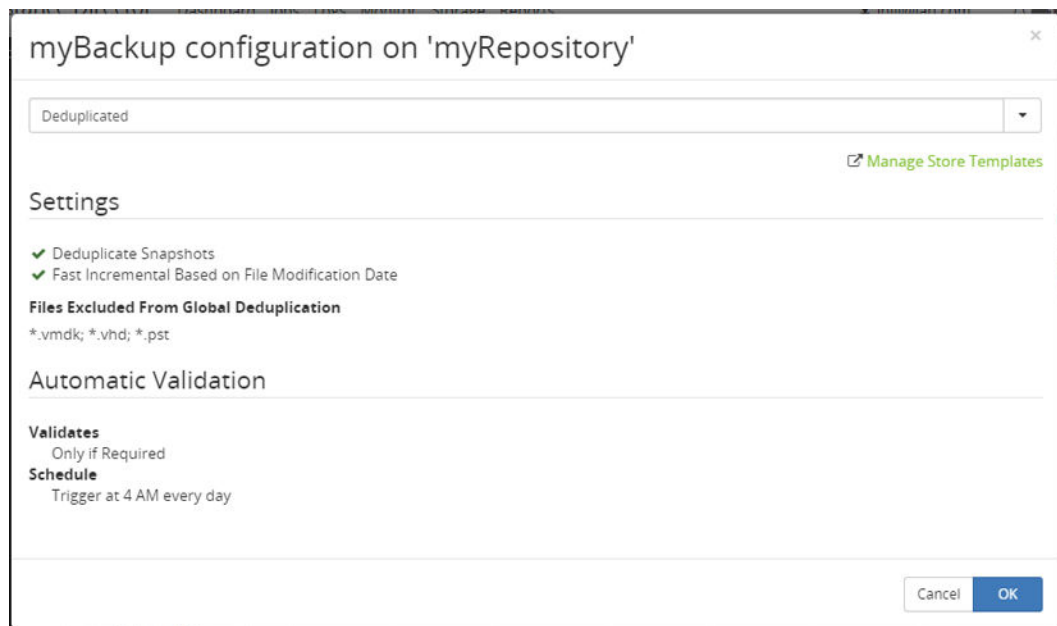



Figure 135 Repository Backup Configuration Dialog

| Control | Description |
|-----------------------------|---|
| Select Destination Template | Enter or select a Destination Template from the dropdown list. Once selected, the settings of the store template are displayed below. |

| Control | Description |
|------------------------|--|
| Manage Store Templates | Click this link to add to or edit the available destination templates. The Generation 1 Repository Destination Templates Inventory (on page 368) is opened in a new browser tab. <div>  Note: Once you have finished adding or editing templates in the new tab, simply close the tab and continue working with the Operation Properties Dialog. Any changes you have made to the templates will be applied, although they may not appear in the dialog unless you re-select the template. </div> |
| Settings | Lists the settings for the selected template. |

Generation 1 Repository Destination Templates Inventory

This inventory is displayed when managing Destination Templates for a Generation 1 Repository node.

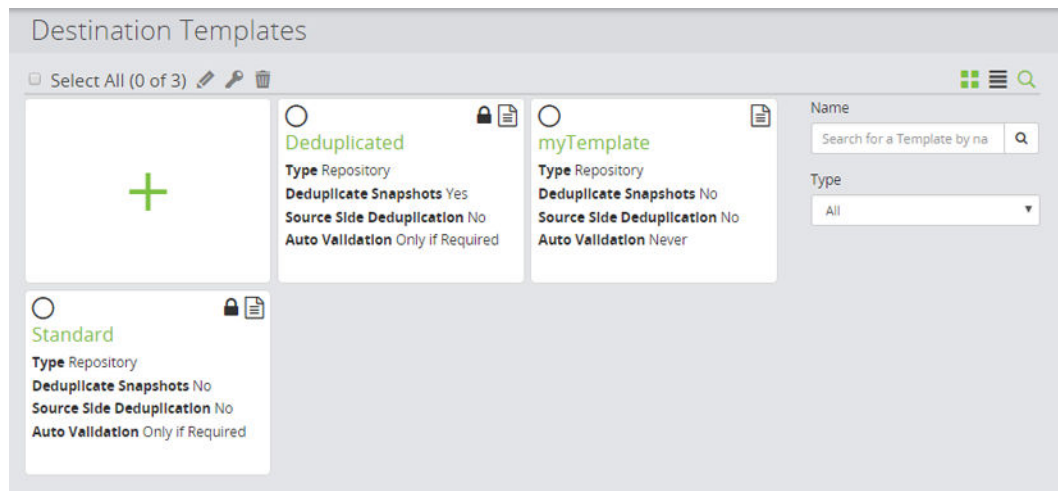









Figure 136 Destination Templates Inventory

| Control | Description |
|--|--|
|  Edit | Edits an existing template in the inventory. The Destination Template Wizard (on page 369) is launched to enable the template's attributes to be changed. |
|  Edit Permissions | Edits an existing template's access permissions. The Access Control Permissions Inventory (on page 341) is launched to enable the template's access permissions to be changed. |

| Control | Description |
|--|--|
|  Delete | Enabled only when one or more Templates is selected. Deletes the selected item from the inventory. |
|  Add | Creates a new Template. The Destination Template Wizard (on page 369) is launched to guide you through the process. |
|  System Generated Templates | At least two system generated Templates are available when the product is installed. These Templates cannot be deleted since they provide basic functionality. System generated Templates are marked with a  icon to indicate that they cannot be modified. Click the template's name to open the Destination Template Details (on page 372) to enable the parameters to be viewed. |
|  User Defined Template(s) | Any number of user defined Templates can be created. These are displayed in the inventory. Click the template's name to open the Destination Template Details (on page 372) to enable the parameters to be viewed. |
| Filter on Template Name | Filters the displayed results based on the template name. |
| Filter on Template Type | Filters the displayed results based on the template type. |

Destination Template Wizard

This wizard is displayed when a new Destination Template is being created.


The screenshot shows a web-based wizard titled "Create Destination Template". The current step is "Specify name". It features a text input field labeled "Name" with a placeholder text "Name". Below the input field is a large, empty rectangular area. At the bottom right of the wizard, there are three buttons: "Cancel", "Previous", and "Next". The "Next" button is highlighted in green, indicating it is the active or recommended action.

Figure 137 Destination Template Wizard - Specify name

| Control | Description |
|----------|--|
| Name | Enter a name for the template. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Create Destination Template

Configure destination template


Repository

Repository Destination Settings

- ☐ Source side deduplication
- ☒ Fast incremental based on file modification date
- ☐ Fine change detection
- ☐ Deduplicate snapshots
- ☒ Preserve hard links

Files excluded from global deduplication

*.vmdk; *.vhd; *.pst

Semicolon separated list of file extensions.

Automatic Validation


☒ Only if required
 ☐ Always
 ☐ Never



Select a Schedule

☐ Check all files during validation

Cancel Previous **Finish**

Figure 138 Destination Template Wizard - Configure destination template

| Control | Description |
|--|--|
| Source side deduplication | On occasions where many machines have identical roles within the data flow and also contain very similar data (for instance, OS data and installed software on machines on a corporate network) then a network speedup can be obtained by avoiding sending the same data multiple times. Check this option to make use of this. |
| Fast incremental based on file modification date | <p>If this is checked then Ops Center Protector decides what files need resynchronizing based on whether the modification date has changed. This reduces the time taken to resynchronize, but can be disabled if it is known that software is installed that will modify files without updating their size or modification date.</p> <div>  Note: If only file metadata changes between batch backups (e.g. file ownership or file permissions), then the changes are not captured. These changes are only captured when the file data changes. </div> |
| Fine change detection | Reduces the amount of data transferred and stored during a resynchronization. An entire file is transferred if it has changed and is less than one block in size. (This option should be used sparingly as there is a processing overhead.) |

| Control | Description |
|--|---|
| Deduplicate snapshots | Enables the storage group to deduplicate data across snapshots so the storage group only stores a single copy of the data. This option has a processing overhead. |
| Preserve hard links | <p>Performs checks so that only one instance of the data is stored, regardless of the number of links pointing to it. This option increases the file system scan time during a resynchronization or batch backup.</p> <p> Note: As of Protector 6.5, this option is enabled by default. This is not retrospective and will only apply when new stores are created.</p> |
| Files excluded from global deduplication | A semicolon-separated list of file extensions to be excluded from the store group's duplication detection can be entered here. |
| Automatic Validation | <p>Automatically resynchronize source to the destination based on a schedule. One of the following options can be selected:</p> <ul style="list-style-type: none"> ▪ Only if required – Will trigger resynchronization only if the destination is out of sync with the source nodes. ▪ Always – Will always perform a resynchronization with the source nodes based on the schedule. ▪ Never – An automatic validation will never be performed. Checking this option will disable the remaining options. |
| Select a Schedule | <p>Select a schedule to trigger automatic validation.</p> <p> Note: Schedules are created for automatic validation the same way as schedules for a policy. A schedule for automatic validation must use a Trigger, by default a pre created schedule named Trigger at 4 AM every day is selected.</p> |
| Check all files during validation | Ignores file modification date and checks every file for changes. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new settings. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Destination Template Details

This page displays the details of a Destination Template and enables you launch the wizard to edit them.

Deduplicated

Repository Destination Settings

Deduplicate Snapshots
Yes

Fast Incremental Based on File Modification Date
Yes

Fine Change Detection
No

Preserve Hard Links
No

Source Side Deduplication
No

Files Excluded From Global Deduplication
*.vmdk; *.vhd; *.pst



Automatic Validation

Validates
Only if Required

Schedule
Trigger at 4 AM every day

Check All Files During Resynchronization
No

Figure 139 Destination Template Details

| Control | Description |
|---|--|
|  Edit | Launches the Repository page of the Destination Template Wizard (on page 369) to enable you to edit the template. |
|  Permissions | Displays the Access Control Permissions Inventory (on page 341) to enable you to view and edit the template's permissions. |
| Repository Destination Settings | These are the settings entered via the Repository page of the Destination Template Wizard (on page 369) when the Template was created. |
| Automatic Validation | These are the settings entered via the Repository page of the Destination Template Wizard (on page 369) when the Template was created. Click on the Schedule name to open the Schedule Details (on page 755) in a separate browser tab. |

Hitachi Block Snapshot Configuration Wizard

This dialog is displayed when you assign a snapshot operation to a node that hosts data stored on an Hitachi Block device.



Caution: When a snapshot operation runs, Protector locks the *meta_resource* of the Block device until the operation completes. Block operations are queued waiting to get the resource lock; this can impact RPO.

**Note:**

All replication and snapshot S-VOLs must be created using free LDEV IDs that are mapped to the *meta_resource* group, and have virtual LDEV IDs matching their corresponding physical LDEV IDs.

For fully provisioned snapshots and all replications, this applies to the operation that creates that snapshot or replication.

For floating device snapshots and snapshots mounted using cascade mode, this applies to the mount or restore operation.

For fully provisioned snapshots mounted using cascade mode, this applies both to the operation that creates that snapshot and to the mount or restore operation.

If an operation tries to create one or more LDEVs, that operation will fail if there are not enough free LDEV IDs that meet the above conditions.




**Note:**

- The classifications that are applicable to Hitachi Block Snapshot operations are Path, Application, Hypervisor and Hitachi Block.
- Protector does not support any Hitachi Block storage LDEV with more than one partition or volume.
- If Protector is subsequently uninstalled, the existing snapshots and mounted volumes are left in place.

**Tip:**

- The actions that are performed by Protector as it executes a backup policy are captured by the Log Manager. Detailed logs and their attachments can be exported as a text file. (See [Export Logs Dialog \(on page 455\)](#) for more information.)
- Details of the hardware resources (LDEVs) used for a particular snapshot can be found in the [Hitachi Block Device Details \(on page 757\)](#).

Figure 140 Snapshot Configuration Wizard - Differential snapshot (using Thin Image)



| Control | Description |
|---------------|--|
| Storage Node | Specifies the target storage node where the P-VOL and snapshot S-VOLs are allocated. |
| Snapshot Pool | <p>Specifies the target storage pool from which snapshot S-VOLs are allocated.</p> <p>Select a Thin Image Pool or a Dynamic Provisioning Pool.</p> <div>  Caution: Filling a Thin Image pool to capacity will invalidate all snapshot data contained within that pool. All snapshots in the pool will have to be deleted before snapshotting can be resumed. </div> <div>  Note: Thin Image and Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage in Protector. </div> <div>  Tip: If the P-VOL has an association with a VSM or you select a target storage pool associated with a VSM then Protector will attempt to make the virtual and the physical ID of the S-VOL holding the snapshot identical. For this to work, an LDEV with a physical ID within the defined virtual LDEV range for the selected VSM must be available for use. </div> |

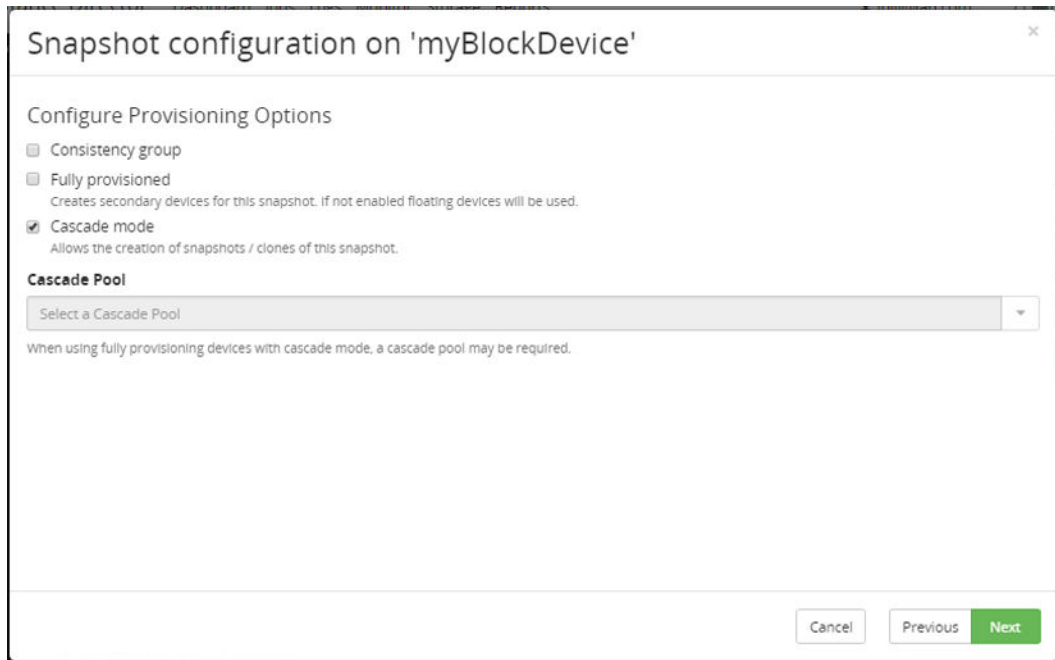
| Control | Description |
|------------------------|---|
| Advanced Configuration | Click to step through the advanced configuration option pages of the wizard, described below. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 141 Snapshot Configuration Wizard - Configure Resource Group

Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group).

| Control | Description |
|------------------------|--|
| Automatically Selected | <p>Allows Protector to automatically select a resource group in the following order of priority:</p> <ol style="list-style-type: none"> 1. If there are existing S-VOLs, then the resource group used by those will be selected. 2. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. 3. Resource group 0. |

| Control | Description |
|---------------|--|
| |  Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error. |
| User Selected | Specify the Resource Group in the associated combo-box.  Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user specification, then the operation will fail with an error. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Snapshot configuration on 'myBlockDevice'

Configure Provisioning Options

- ☐ Consistency group
- ☐ Fully provisioned
Creates secondary devices for this snapshot. If not enabled floating devices will be used.
- ☒ Cascade mode
Allows the creation of snapshots / clones of this snapshot.

Cascade Pool

Select a Cascade Pool

When using fully provisioning devices with cascade mode, a cascade pool may be required.

Cancel Previous Next

Figure 142 Snapshot Configuration Wizard - Provisioning Options

Specifies how the snapshot is provisioned and its mode of operation. Snapshots are created as differential, in-system snapshots using Thin Image.



Caution: Block storage has a limit of 1024 snapshots per LDEV. Ensure that the RPO and Retention periods are set such that this limit is not exceeded (i.e. Retention / RPO is less than or equal to 1024).

| Control | Description |
|-------------------|--|
| Consistency group | When performing a crash consistent snapshot (for example: using the hardware path classification), use this option to make it truly crash consistent. The hardware has a limited number of consistency groups available so they should be used sparingly. |
| Fully Provisioned | By default, this option is deselected and the snapshot will be provisioned using floating devices. Where supported by the array the storage device can store a larger number of snapshots using floating device. |
| Cascade Mode | The snapshot can be cascaded. This allows Protector to mount either the original snapshot or a duplicate of the original. Mounting a duplicate enables modifications to be made without affecting the original snapshot. Refer to About cascaded Thin Image snapshots (on page 71) for further guidance on configuring and mounting cascade mode snapshots. |
| Cascade Pool | If Fully Provisioned is selected above, it may be necessary to specify a dynamic or hybrid pool where Protector can create snapshot S-VOLs. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Snapshot configuration on 'myBlockDevice'

Specify Naming Options

Secondary Logical Device Name

☒ Match Origin
☐ Custom

HDID_LDEV_%SECONDARY_LDEV_ID%_%CREATION_DATE%_%CREATION_TIME%

Logical device names are limited to 32 characters, after variable resolution.

Display variables which can be used for the secondary LDEVs' name ▼

%ORIGIN_SERIAL% - Storage serial of origin volume of data flow.
 %ORIGIN_LDEV_ID% - LDEV id of origin volume of data flow.
 %ORIGIN_LDEV_NAME% - LDEV name of origin volume of data flow.
 %PRIMARY_SERIAL% - Storage serial of operation source volume.
 %PRIMARY_LDEV_ID% - LDEV id of operation source volume.

%PRIMARY_LDEV_NAME% - LDEV name of operation source volume.
 %SECONDARY_SERIAL% - Storage serial of volume created by operation.
 %SECONDARY_LDEV_ID% - LDEV id of volume created by operation.
 %CREATION_DATE% - Creation date of volume created by operation.
 %CREATION_TIME% - Creation time of volume created by operation.

Snapshot Group Name

☒ Automatically Generated
☐ Custom

Snapshot group name is limited to 28 characters.

Cancel Previous Next

Figure 143 Snapshot Configuration Wizard - Naming Options

Specifies how secondary LDEVs and snapshot groups will be named.

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Snapshot Group Name | <p>Specifies how the snapshot group will be named when the Provisioning Options - Consistency group option is not selected.</p> <ul style="list-style-type: none"> Automatically Generated - The snapshot group name is generated by Protector based on the rules context ID and policy name. Custom - The snapshot group is named using the string provided (limited to 28 characters). An '@' separator followed by a unique ID is then automatically appended to this name. The unique ID is composed of 3 base 36 characters and is required to enable Protector to manage the groups. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|--|
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Figure 144 Snapshot Configuration Wizard - DRU Options

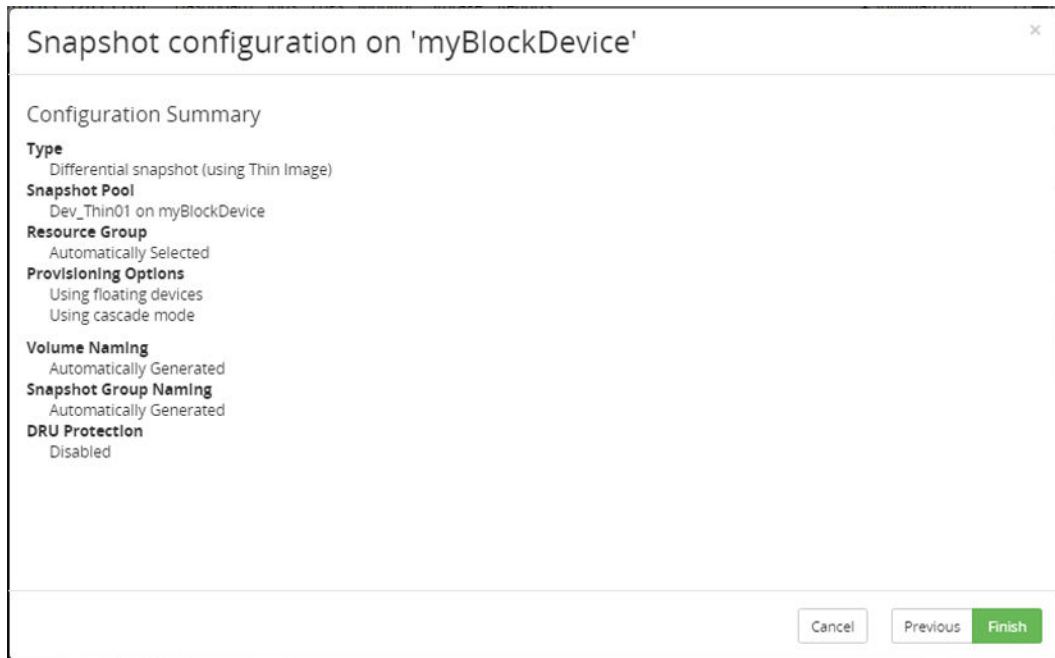
If Fully Provisioned is selected on the **Provisioning Options** page on this wizard, these options are enabled to specify Data Retention Utility (DRU) protection parameters.



Caution: Protector cannot mount a DRU protected snapshot. However a cascaded snapshot can be created and mounted if the original has Cascade mode enabled.

| Control | Description |
|-----------------|--|
| Protection Type | <p>One of the following can be selected:</p> <ul style="list-style-type: none"> None - DRU protection is not applied the snapshot Host Read Only (wtd) - Prevents hosts writing to the snapshot LDEV. Full (wtd + svd) - As for wtd, plus the array is prevented from changing the contents of a snapshot LDEV using resync or restore. It also prevents deletion, mapping and unmapping of the snapshot from its LDEV. |

| Control | Description |
|----------------------------------|--|
| |  Note: DRU can prevent mounting if the OS rejects a read-only volume (mount via cascade snapshot is unaffected, and therefore recommended). |
| Duration Of Settings Lock (Days) |  Caution: DRU protection cannot be removed while the lock is active. Specify a duration in days during which the applied DRU protection cannot be removed. Once this duration has expired the protection is not automatically removed; it must be removed manually. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Snapshot configuration on 'myBlockDevice'

Configuration Summary

- Type**
Differential snapshot (using Thin Image)
- Snapshot Pool**
Dev_Thin01 on myBlockDevice
- Resource Group**
Automatically Selected
- Provisioning Options**
Using floating devices
Using cascade mode
- Volume Naming**
Automatically Generated
- Snapshot Group Naming**
Automatically Generated
- DRU Protection**
Disabled

Cancel Previous Finish

Figure 145 Snapshot Configuration Wizard - Summary

Summarizes the configuration settings made by the user.

Hitachi Block Replication Configuration Wizard

This wizard is displayed when you assign a replication operation to a Hitachi Block Device node on a data flow.



Caution: When a replication operation runs, Protector locks the *meta_resource* of the Block Device until the operation completes. Block operations are queued waiting to get the resource lock; this can impact RPO.



Note:

All replication and snapshot S-VOLs must be created using free LDEV IDs that are mapped to the *meta_resource* group, and have virtual LDEV IDs matching their corresponding physical LDEV IDs.

For fully provisioned snapshots and all replications, this applies to the operation that creates that snapshot or replication.

For floating device snapshots and snapshots mounted using cascade mode, this applies to the mount or restore operation.

For fully provisioned snapshots mounted using cascade mode, this applies both to the operation that creates that snapshot and to the mount or restore operation.

If an operation tries to create one or more LDEVs, that operation will fail if there are not enough free LDEV IDs that meet the above conditions.



Note:

- The classifications that are applicable to Hitachi Block Replication operations are File Path, Application, Hypervisor and Hitachi Block LDEV.
- Protector does not support any Hitachi Block storage LDEV with more than one partition or volume.
- If Protector is subsequently uninstalled, the existing replications and mounted volumes are left in place.



Note: Protector will attempt to match destination LDEV IDs with those used by the source (except for in-system SI and RTI replications where this is impossible). The LDEV ID must be within the range configured for the target storage system and the LDEV ID must not be in use. If the LDEV ID cannot be matched on the target then the first available in-range LDEV ID will be selected.



Note:

Once the operation properties have been configured and the data flow has been activated, the properties cannot be changed. Reactivating rules for the active data flow with edited properties will not change them.

To change the operation properties, the existing data flow must first be deactivated then reactivated with the new properties. Deactivating the data flow will tear down the current replication.

**Tip:**

- The actions that are performed by hardware orchestration as it executes a block backup policy are captured by the Log Manager. Detailed logs and their attachments can be exported as a text file. (See [Export Logs Dialog \(on page 455\)](#) for more information.)
- Details of the hardware resources (LDEVs) used for a particular replication can be found in the [Hitachi Block Device Details \(on page 757\)](#).

Replicate configuration on 'my2ndBlockDevice'

Select Creation Mode

☒ Configure new replication

☐ Adopt an existing replication

Cancel Previous Next

Figure 146 Replicate Configuration Wizard - Configure New or Adopt Existing Replication

| Control | Description |
|----------------------------|---|
| Configure new replication | Creates a new replication defined by the user defined parameters. The Configure New Replication page of the wizard is displayed next. |
| Adopt existing replication | Adopts the replication defined by the user defined parameters from the matching pre-existing one on the hardware. The Adopt Existing Replication page of the wizard is displayed next. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

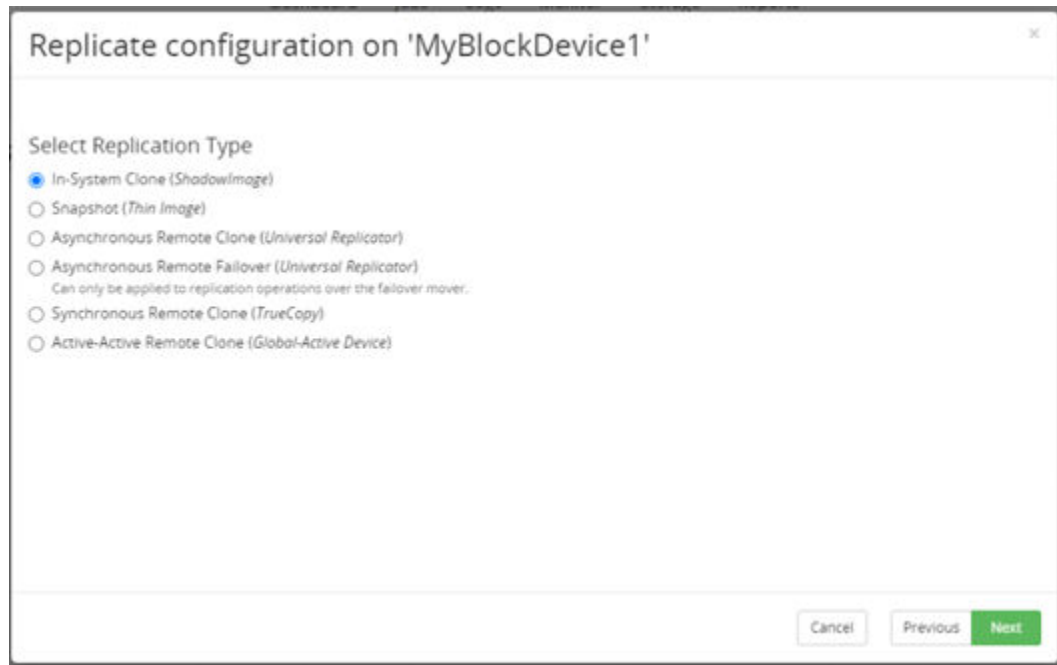


Figure 147 Replicate Configuration Wizard - Configure New Replication


| Control | Description |
|------------------|---|
| Replication Type | <p>Select the type of replication to create:</p> <ul style="list-style-type: none"> ▪ In System Clone - opens the Replication Configuration Wizard - In-System Clone (on page 387). ▪ Refreshed Snapshot - opens the Replication Configuration Wizard - Refreshed Snapshot (on page 392). ▪ Asynchronous Remote Clone - opens the Replication Configuration Wizard - Asynchronous Remote Clone (on page 398). ▪ Asynchronous Remote Failover - opens the Replication Configuration Wizard - Asynchronous Remote Failover (on page 409). ▪ Synchronous Remote Clone - opens the Replication Configuration Wizard - Synchronous Remote Clone (on page 416). ▪ Active-Active Remote Clone - opens the Replication Configuration Wizard - Active-Active Remote Clone (on page 424). |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 148 Replicate Configuration Wizard - Adopt Existing Replication



Note: Adoption requires the rules to be activated and the relevant policy to be triggered. Refer to [About Hitachi Block replication adoption \(on page 89\)](#) before using this feature.

| Control | Description |
|------------------|--|
| Replication Type | <p>Select the type of replication to adopt:</p> <ul style="list-style-type: none"> ▪ In System Clone - see About ShadowImage replication (on page 72) ▪ Refreshed Snapshot - see About Thin Image differential and refreshed snapshots (on page 69) ▪ Asynchronous Remote Clone - see About Universal Replicator (on page 77) ▪ Asynchronous Remote Failover - see About three datacentre multi-target with delta (on page 82) ▪ Synchronous Remote Clone - see About TrueCopy replication (on page 76) ▪ Active-Active Remote Clone - see About Global-Active Device replication (on page 78) |
| Mirror Unit | <p>Identify the mirror unit number of the replication to be adopted. Adoption requires at least one existing pair on the selected mirror unit.</p> |

| Control | Description |
|-----------|---|
| | <p> Note: If the mirror unit of an active replication is changed after initial data flow activation then:</p> <ol style="list-style-type: none"> 1. S-VOLs and pairing relationships for the replication will be destroyed (or dissociated if previously adopted). 2. The replication will then be recreated (or readopted if previously adopted) on data flow reactivation. A warning is issued by the rules compiler prior to activation. |
| Copy Pace | Determines how quickly the storage array will be told to copy data for the adopted replication. The array's default is Slow (3), Protector defaults to Medium (8). |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

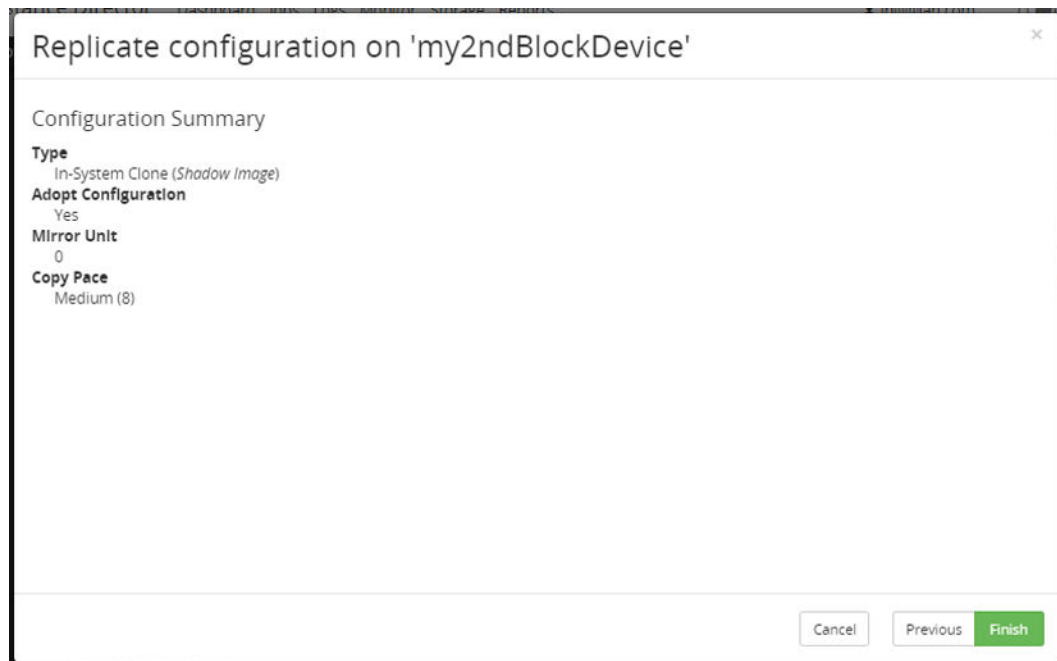




Figure 149 Replicate Configuration Wizard - Adoption Summary

Shows a summary of the replication configuration specified by the user. All other parameters defining the replication are obtained from the hardware when the data flow is activated and triggered.

Replication Configuration Wizard - In-System Clone

Figure 150 Replicate Configuration Wizard - In System Clone (ShadowImage) - Configure Pool etc.

| Control | Description |
|-------------|--|
| Pool | <p>Specifies the target storage pool from which replication LDEVs are allocated.</p> <p>Provides a list of available pools giving name and available space.</p> <p> Note: All replication types have pool except Asynchronous Remote Failover (Universal Replicator).</p> <p>Select a Dynamic Provisioning Pool for all replication types.</p> <p> Note: Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage/Pool in Protector.</p> |
| Mirror Unit | <p>The mirror unit number for the replication can be set to 0, 1 or 2. Select Allocate Automatically to allow Protector to choose one.</p> |




| Control | Description |
|------------------------|--|
| |  Note: If the mirror unit of an active replication is changed after initial data flow activation then: <ol style="list-style-type: none"> 1. S-VOLs and pairing relationships for the replication will be destroyed (or dissociated if previously adopted). 2. The replication will then be recreated (or readopted if previously adopted) on data flow reactivation. A warning is issued by the rules compiler prior to activation. |
| Copy Pace | Determines how quickly the storage array copies data. The array's default is Slow (3), Protector defaults to Medium (8). |
| Use Consistency Group | All P-VOLs in a replication are, by default, placed in the same consistency group to ensure consistency of data across all volumes. This option allows this behavior to be disabled. |
| Quick Resync/ Split | If selected, then <i>Quick Split</i> and <i>Quick Resynch</i> operations are performed by the storage hardware in the background, so that the secondary is available for reading/writing almost immediately after the replication is paused or resynchronized (depending on downstream data flow operations). If deselected then <i>Steady Split</i> and <i>Normal Copy</i> operations are performed in the foreground and the secondary is made available only once the operation is completed. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 151 Replicate Configuration Wizard - Configure Resource Group

| Control | Description |
|--------------------------|---|
| Configure Resource Group | <p>Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group).</p> <p> Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user selection, then the operation will fail with an error. This setting should not be modified for existing replications.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a resource group in the following order of priority: <ol style="list-style-type: none"> If there are existing S-VOLs, then the resource group used by those will be selected. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. Resource group 0. <p> Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error.</p> User Selected - The user specifies the Resource Group. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|--|
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Specify Naming Options

Secondary Logical Device Name

☐ Match Origin
☒ Custom

LDEV_%CREATION_DATE%%CREATION_TIME%

Logical device names are limited to 32 characters, after variable resolution.

Display variables which can be used for the secondary LDEVs' name ▼

%ORIGIN_SERIAL% - Storage serial of origin volume of data flow.
 %ORIGIN_LDEV_ID% - LDEV id of origin volume of data flow.
 %ORIGIN_LDEV_NAME% - LDEV name of origin volume of data flow.
 %PRIMARY_SERIAL% - Storage serial of operation source volume.
 %PRIMARY_LDEV_ID% - LDEV id of operation source volume.
 %PRIMARY_LDEV_NAME% - LDEV name of operation source volume.
 %SECONDARY_SERIAL% - Storage serial of volume created by operation.
 %SECONDARY_LDEV_ID% - LDEV id of volume created by operation.
 %CREATION_DATE% - Creation date of volume created by operation.
 %CREATION_TIME% - Creation time of volume created by operation.

Cancel Previous Next

Figure 152 Replicate Configuration Wizard - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

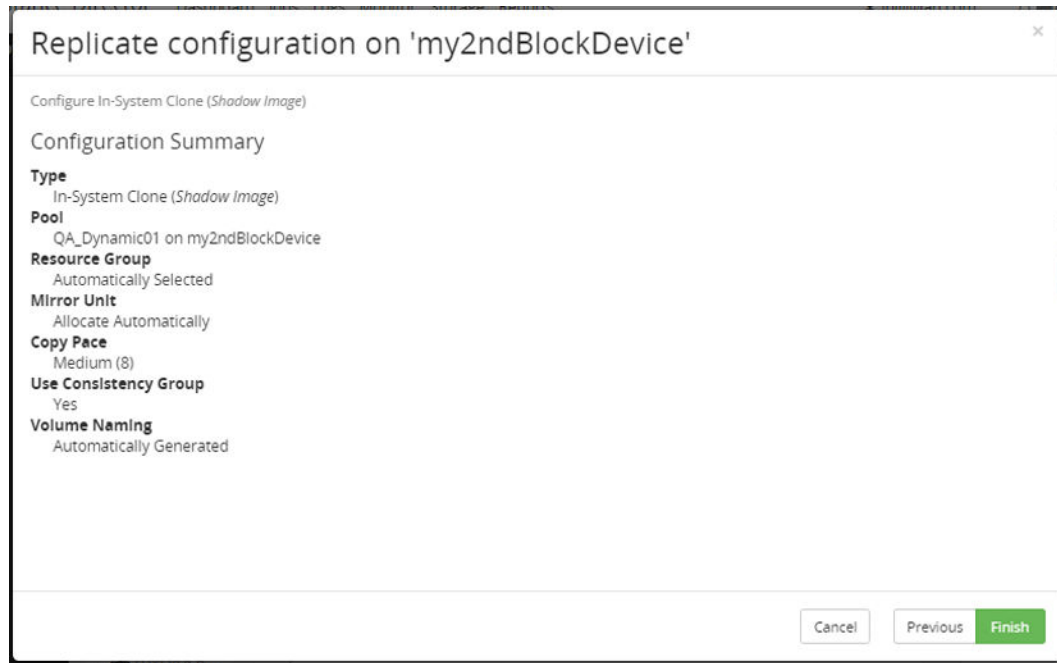


Figure 153 Replicate Configuration Wizard - In System Clone (ShadowImage) - Summary

Shows a summary of the replication configuration specified by the user.

Replication Configuration Wizard - Refreshed Snapshot





Note: Refreshed Thin Image must be used with a Batch mover on the data flow.

The replication is created as a single, differential, in-system snapshot using Thin Image. The snapshot is refreshed on each batch resync rather than creating a new snapshot for each resync.

When an RTI data flow is deactivated, the refreshed snapshot is deleted.

Figure 154 Replicate Configuration Wizard - Refreshed Snapshot (Thin Image) - Configure Pool etc.

| Control | Description |
|-----------------------|--|
| Pool | <p>Specifies the target storage pool from which replication LDEVs are allocated.</p> <p>Provides a list of available pools giving name and available space.</p> <p> Note: All replication types have pool except Asynchronous Remote Failover (Universal Replicator).</p> <p>Select a Thin Image Pool or a Dynamic Provisioning Pool.</p> <p> Note: Thin Image and Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage/Pool in Protector.</p> |
| Use Consistency Group | All P-VOLs in a replication are, by default, placed in the same consistency group to ensure consistency of data across all volumes. This option allows this behavior to be disabled. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Configure Resource Group



☒ Automatically Selected
Resource Group used by existing S-VOLs, or the Resource Group used by the P-VOLs, if all P-VOLs are in the same group. Otherwise Resource Group 0.

☐ User Selected

Select a Resource Group

Cancel Previous Next

Figure 155 Replicate Configuration Wizard - Configure Resource Group

| Control | Description |
|--------------------------|---|
| Configure Resource Group | <p>Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group).</p> <p> Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user selection, then the operation will fail with an error. This setting should not be modified for existing replications.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a resource group in the following order of priority: <ol style="list-style-type: none"> If there are existing S-VOLs, then the resource group used by those will be selected. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. Resource group 0. <p> Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error.</p> User Selected - The user specifies the Resource Group. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|--|
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure Refreshed Snapshot (Thin Image) (batch only)

Specify Naming Options

Secondary Logical Device Name

☒ Match Origin

☐ Custom

HDDID_LDEV_%SECONDARY_LDEV_ID%_%CREATION_DATE%_%CREATION_TIME%

Logical device names are limited to 32 characters, after variable resolution.

Display variables which can be used for the secondary LDEVs' name

%ORIGIN_SERIAL% - Storage serial of origin volume of data flow.
%ORIGIN_LDEV_ID% - LDEV id of origin volume of data flow.
%ORIGIN_LDEV_NAME% - LDEV name of origin volume of data flow.
%PRIMARY_SERIAL% - Storage serial of operation source volume.
%PRIMARY_LDEV_ID% - LDEV id of operation source volume.

%PRIMARY_LDEV_NAME% - LDEV name of operation source volume.
%SECONDARY_SERIAL% - Storage serial of volume created by operation.
%SECONDARY_LDEV_ID% - LDEV id of volume created by operation.
%CREATION_DATE% - Creation date of volume created by operation.
%CREATION_TIME% - Creation time of volume created by operation.

Snapshot Group Name

☒ Automatically Generated

☐ Custom

Snapshot group name is limited to 28 characters.

Cancel Previous Next

Figure 156 Replicate Configuration Wizard - Refreshed Snapshot (Thin Image) - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

| Control | Description |
|---------------------|---|
| Snapshot Group Name | <p>Specifies how the snapshot group will be named.</p> <ul style="list-style-type: none"> Automatically Generated - The snapshot group name is generated by Protector based on the rules context ID and policy name. Custom - The snapshot group is named using the string provided (limited to 28 characters). An '@' separator followed by a unique ID is then automatically appended to this name. The unique ID is composed of 3 base 36 characters and is required to enable Protector to manage the groups. |

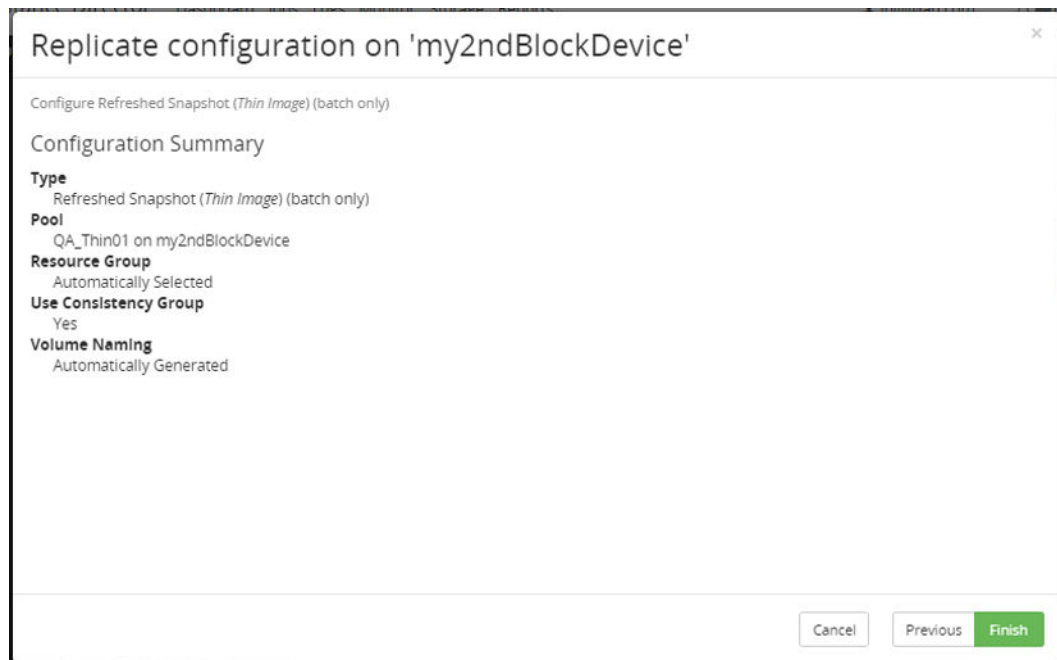


Figure 157 Replicate Configuration Wizard - Refreshed Snapshot (Thin Image) - Summary

Shows a summary of the replication configuration specified by the user.

Replication Configuration Wizard - Asynchronous Remote Clone

Replicate configuration on 'my2ndBlockDevice'

Configure Asynchronous Remote Clone (Universal Replicator)

Configure Replication Settings

Please Note: Changing the replication configuration will cause the replication to be torn down and recreated whether the replication was initialized by Protector or previously adopted.

Pool



Select a Pool


Mirror Unit

Allocate Automatically

Cancel Previous Next

Figure 158 Replicate Configuration Wizard - Asynchronous Remote Clone (Universal Replicator) - Configure Pool and Mirror Unit

| Control | Description |
|-------------|--|
| Pool | <p>Specifies the target storage pool from which replication LDEVs are allocated.</p> <p>Provides a list of available pools giving name and available space.</p> <p> Note: All replication types have pool except Asynchronous Remote Failover (Universal Replicator).</p> <p>Select a Dynamic Provisioning Pool.</p> <p> Note: Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage/Pool in Protector.</p> |
| Mirror Unit | <p>The mirror unit number for the replication can be set to 0, h1, h2 or h3.</p> <p>Select Allocate Automatically to allow Protector to choose one.</p> |

| Control | Description |
|----------|---|
| | <p> Note: If the mirror unit of an active replication is changed after initial data flow activation then:</p> <ol style="list-style-type: none"> 1. S-VOLs and pairing relationships for the replication will be destroyed (or dissociated if previously adopted). 2. The replication will then be recreated (or readopted if previously adopted) on data flow reactivation. A warning is issued by the rules compiler prior to activation. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

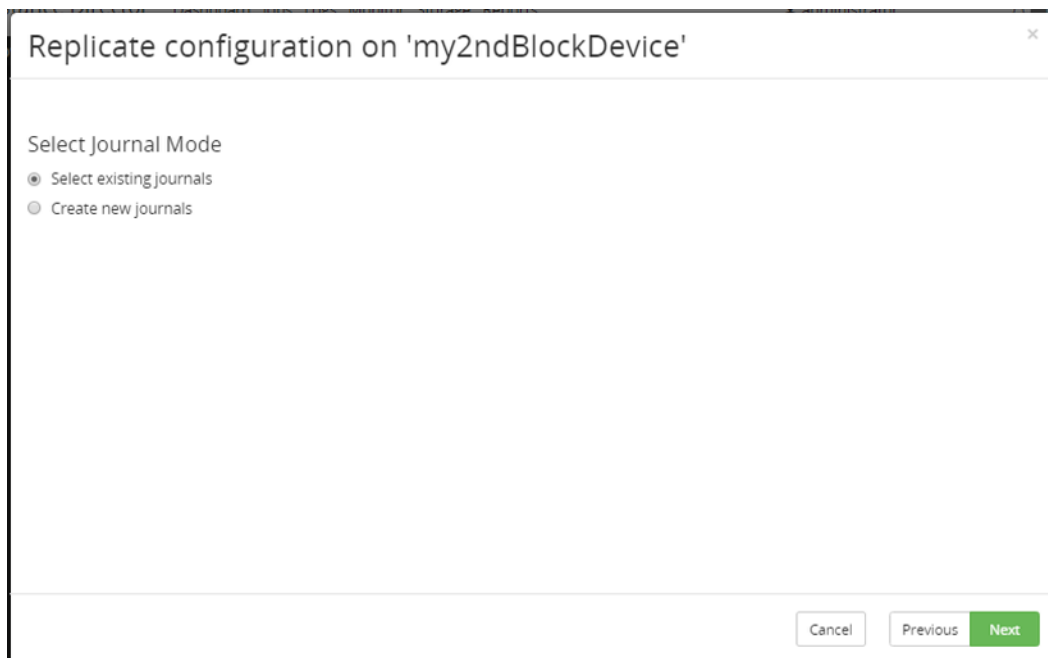


Figure 159 Replicate Configuration Wizard - Asynchronous Remote Clone (Universal Replicator) - Select Journal Mode

| Control | Description |
|--------------------------|--|
| Select existing journals | Select this option to use journals that already exist on the source and destination storage arrays. The Select existing journals wizard page is displayed next. |

| Control | Description |
|---------------------|---|
| Create new journals | Select this option to have Protector configure new journals on the source and destination storage arrays. The Create journals wizard page is displayed next. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 160 Replicate Configuration Wizard - Asynchronous Remote Clone (Universal Replicator) - Select existing journals



Note: The journals must be unique to each operation and policy in the data flow. The journal should also be used exclusively by Protector.

| Control | Description |
|---------------------|---|
| Source Journal | Specifies the node and journal on the source side of the replication. |
| Destination Journal | Specifies the journal on the destination side of the replication. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |

| Control | Description |
|---------|--|
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Create journals

Please Note: Changing the replication configuration will cause the replication to be torn down and recreated whether the replication was initialized by Protector or previously adopted.

Source Journal Pool

Select a Node

Select a Source Journal Pool

Destination Journal Pool

Select a Destination Journal Pool

Journal Sizes

GB

Journal Names

JNL_%JOURNAL_ID%_%DATA_FLOW_NAME%

Journal names are limited to 32 characters, after variable resolution.

Display variables which can be used for the journal name >

Cancel Previous Next

Figure 161 Replicate Configuration Wizard - Asynchronous Remote Clone (Universal Replicator) - Create journals





Note: The journals must be unique to each operation and policy in the data flow. The journal should also be used exclusively by Protector.

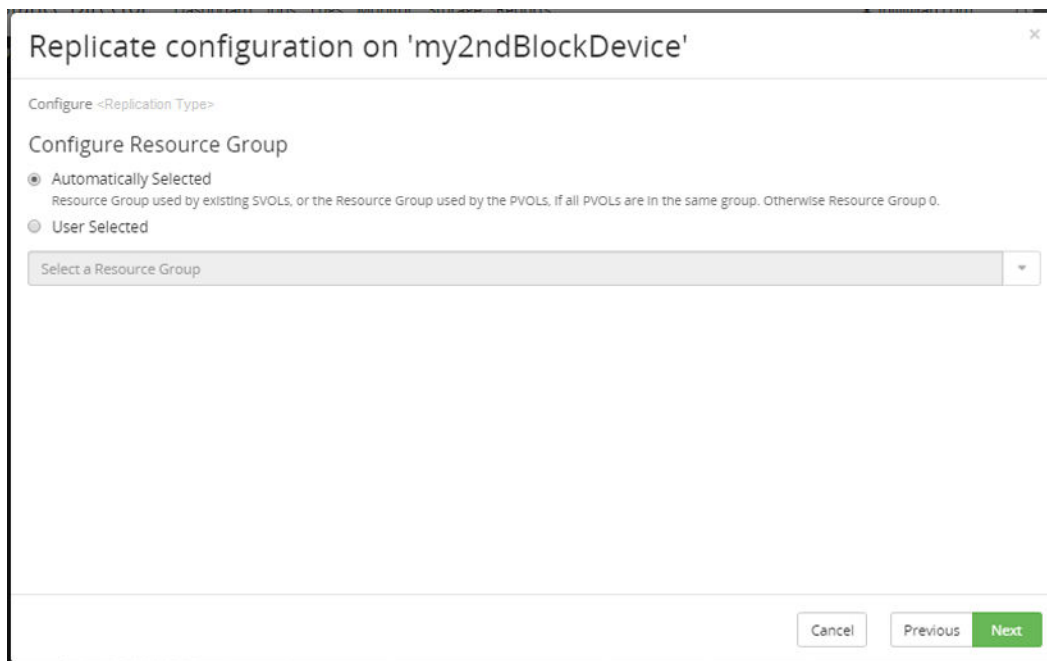
| Control | Description |
|--------------------------|---|
| Source Journal Pool | Specifies the node and pool where the source side journal will be created. |
| Destination Journal Pool | Specifies the pool where the destination side journal will be created. |
| Journal Sizes | Specifies the size of the source and destination journal. <div> <p>Note: Journal sizing is based on data change rate and link bandwidth. Refer to your storage array documentation for details.</p> </div> |

| Control | Description |
|---------------|--|
| Journal Names | The journals will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the journal name to view the available substitution variables. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 162 Replicate Configuration Wizard - Asynchronous Remote Clone - Select Remote Path Group

| Control | Description |
|--------------------------|--|
| Select Remote Path Group | <p>Specifies the Remote Path Group to be used for the replication.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a Remote Path Group <div style="background-color: #e0f2f1; padding: 10px; margin: 10px 0;"> <p> Note: For GAD it is recommended the user specifies a group to avoid sharing with other replications.</p> </div> <ul style="list-style-type: none"> User Selected - The user specifies the Remote Path Group. |

| Control | Description |
|----------|--|
| | <p> WARNING: You cannot specify the "User Selected" option and select a path group with an ID of 0. To use a path group with an ID of 0, specify the "Automatically Selected" option. The path group with the lowest ID will be selected (which will be ID 0, if a path group with that ID exists).</p> <p>Remote path groups are listed in the format: Path Group Id: 0x51 Port Mappings: 5E <-> 3E</p> <p>The arrow depicts the direction of the path, either left to right or bidirectional. The arrows can also have a line through them depicting the path is currently broken.</p> <p>Only remote path groups that are suitable for the replication are displayed, for example for GAD only bidirectional path groups are listed.</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Configure Resource Group

☒ Automatically Selected
Resource Group used by existing SVOLs, or the Resource Group used by the PVOLs. If all PVOLs are in the same group. Otherwise Resource Group 0.

☐ User Selected

Select a Resource Group

Cancel Previous Next

Figure 163 Replicate Configuration Wizard - Configure Resource Group



| Control | Description |
|--------------------------|--|
| Configure Resource Group | <p>Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group).</p> <p> Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user selection, then the operation will fail with an error. This setting should not be modified for existing replications.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a resource group in the following order of priority: <ol style="list-style-type: none"> If there are existing S-VOLs, then the resource group used by those will be selected. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. Resource group 0. <p> Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error.</p> <ul style="list-style-type: none"> User Selected - The user specifies the Resource Group. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 164 Replicate Configuration Wizard - Secondary Host Groups (Async. RC)



Caution: If replication S-VOLs are exposed to a host, the user is responsible for ensuring they are not in use during replication resynchronization. Failing to do so may result in a critical failure of the host.





Note: Protector analyses the LUN IDs of the P-VOLs in all host group paths and, if consistent and available, uses these LUN IDs for all S-VOL host group paths either during initial set-up, mounting, or when adding additional LUNs on demand.

To provide a graceful fallback:

- If the P-VOL LUN IDs are not consistent in all host group paths Protector will still use a consistent ID for S-VOL mappings, but these will not necessarily match any of the P-VOL LUN IDs.
- If a P-VOL has a consistent ID in all host group paths, but this LUN ID is not available in all S-VOL host group paths then Protector will choose a different, consistent LUN ID for the S-VOL for all host group paths.
- When not able to match LUN IDs with those used by P-VOLs and/or the S-VOLs, Protector chooses an unused LUN ID. In order to keep LUN ID's compatible with VMware and Hyper-V when selecting LUN ID's Protector will first attempt to select ID's at or below 255. If this is not it will then attempt at or below 1024, followed by at or below 2048. Finally, at or below the array maximum. A warning will be displayed when an ID can not be found in a range.

Some systems expect LUN ID 0 to be used only as a boot volume. Protector will therefore only use LUN ID 0 for the S-VOL host group paths if the P-VOL LUN ID is 0.

| Control | Description |
|--------------------------------------|---|
| Use Protector Provisioned Host Group | Protector will create a LUN path from each S-VOL it provisions in a placeholder host group. If this option is not selected, at least one Secondary Host Group must be specified below. |
| Enforce LUN ID Matching | For environments where LUN ID consistency is mandatory, selecting this option will cause the replication to fail if: <ul style="list-style-type: none"> ▪ The P-VOL does not have a consistent LUN ID in all host group paths. ▪ The P-VOL LUN ID is not available in all S-VOL host group paths. |
| Secondary Host Groups | <p>Specify zero or more host groups that Protector will configure to provide access to the S-VOL(s) when configuring replication scenarios. If no host groups are specified here then Protector will place the S-VOL(s) in it's dummy host group.</p> <p>Click the Add Host Group button to insert another Host Group selection control.</p> <p>Click the Remove button next to a Host Group selection control to delete it.</p> <div>  <p>Note:</p> <p>If a LUN path to be created already exists, Protector will not attempt to add it again, or to change its ID.</p> <p>The specified host groups must be in the same resource group as the secondary volumes.</p> <p>For GAD replications, if the host group names and port IDs match between primary and secondary storage nodes, Protector will attempt to match the LUN IDs used for the S-VOLs with those of the respective P-VOLs. If this cannot be achieved then a warning will be logged and the next available LUN ID will be used.</p> </div> <div>  <p>Tip: Use this option to specify host groups that enable access to S-VOL(s) when configuring GAD cross-path and multi-path and other replication scenarios where the S-VOL(s) will need to be accessed (e.g. during failover).</p> </div> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Specify Naming Options

Secondary Logical Device Name

☐ Match Origin
☒ Custom

LDEV_%CREATION_DATE%%CREATION_TIME%

Logical device names are limited to 32 characters, after variable resolution.

Display variables which can be used for the secondary LDEVs' name ▼

| | |
|---|---|
| %ORIGIN_SERIAL% - Storage serial of origin volume of data flow. | %PRIMARY_LDEV_NAME% - LDEV name of operation source volume. |
| %ORIGIN_LDEV_ID% - LDEV id of origin volume of data flow. | %SECONDARY_SERIAL% - Storage serial of volume created by operation. |
| %ORIGIN_LDEV_NAME% - LDEV name of origin volume of data flow. | %SECONDARY_LDEV_ID% - LDEV id of volume created by operation. |
| %PRIMARY_SERIAL% - Storage serial of operation source volume. | %CREATION_DATE% - Creation date of volume created by operation. |
| %PRIMARY_LDEV_ID% - LDEV id of operation source volume. | %CREATION_TIME% - Creation time of volume created by operation. |

Cancel Previous Next

Figure 165 Replicate Configuration Wizard - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

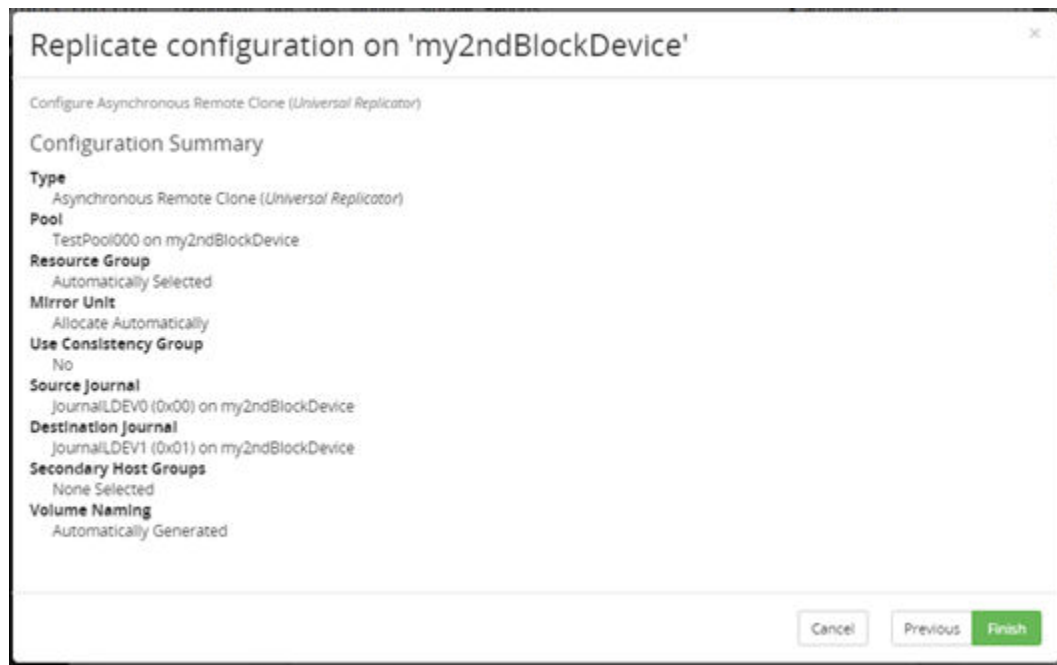


Figure 166 Replicate Configuration Wizard - Asynchronous Remote Clone (Universal Replicator) - Summary

Shows a summary of the replication configuration specified by the user.

Replication Configuration Wizard - Asynchronous Remote Failover

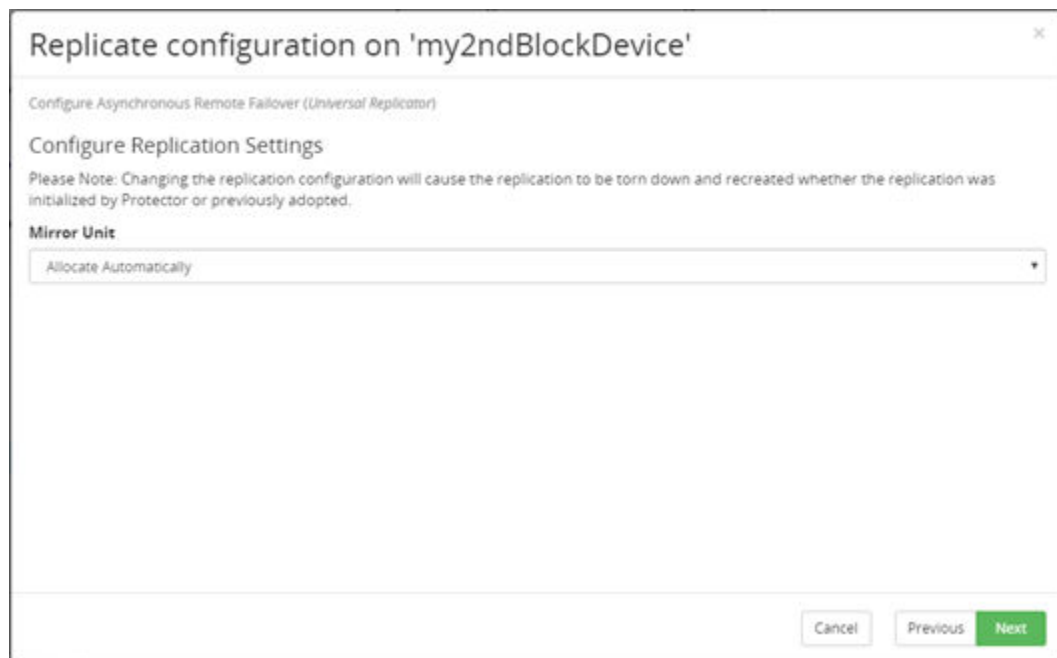



Figure 167 Replicate Configuration Wizard - Asynchronous Remote Failover (Universal Replicator Failover) - Configure Mirror Unit

| Control | Description |
|-------------|--|
| Mirror Unit | <p>The mirror unit number for the replication can be set to 0, h1, h2 or h3. Select Allocate Automatically to allow Protector to choose one.</p> <div>  Note: If the mirror unit of an active replication is changed after initial data flow activation then: <ol style="list-style-type: none"> 1. S-VOLs and pairing relationships for the replication will be destroyed (or dissociated if previously adopted). 2. The replication will then be recreated (or readopted if previously adopted) on data flow reactivation. A warning is issued by the rules compiler prior to activation. </div> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

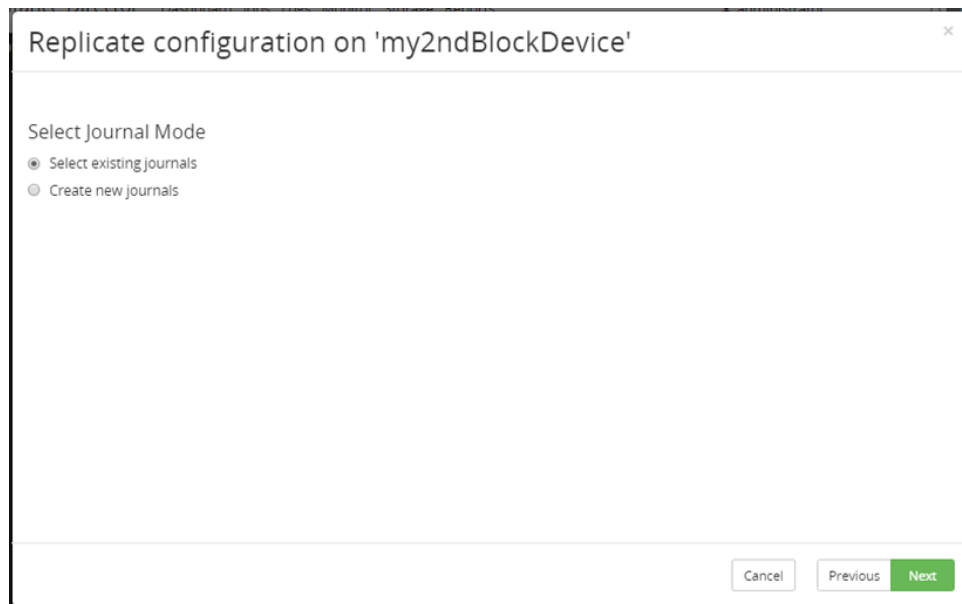


Figure 168 Replicate Configuration Wizard - Asynchronous Remote Failover (Universal Replicator Failover) - Select Journal Mode

| Control | Description |
|--------------------------|--|
| Select existing journals | Select this option to use journals that already exist on the source and destination storage arrays. The Select existing journals wizard page is displayed next. |

| Control | Description |
|---------------------|---|
| Create new journals | Select this option to have Protector configure new journals on the source and destination storage arrays. The Create journals wizard page is displayed next. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 169 Replicate Configuration Wizard - Asynchronous Remote Failover (Universal Replicator Failover) - Select existing journals



Note: The journal must be unique to each operation and policy in the data flow. The journal should also be used exclusively by Protector.

| Control | Description |
|----------------|---|
| Source Journal | Specifies the node and journal on the source side of the replication. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Figure 170 Replicate Configuration Wizard - Asynchronous Remote Failover (Universal Replicator Failover) - Create journals



Note: The journal must be unique to each operation and policy in the data flow. The journal should also be used exclusively by Protector.

| Control | Description |
|---------------------|--|
| Source Journal Pool | Specifies the node and pool where the source side journal will be created. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Select Remote Path Group

☒ Automatically Selected
☐ User Selected



Select Source Node

Select a Source Remote Path Group

Only paths that are suitable for this replication type will be shown.

Cancel Previous Next

Figure 171 Data Flow Wizard HPE Block Replication Configuration - Select Remote Path Group

| Control | Description |
|--------------------------|--|
| Select Remote Path Group | <p>Specifies the Remote Path Group to be used for the replication.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a Remote Path Group <p> Note: For GAD it is recommended the user specifies a group to avoid sharing with other replications.</p> <ul style="list-style-type: none"> User Selected - The user specifies the Remote Path Group. <p> WARNING: You cannot specify the "User Selected" option and select a path group with an ID of 0. To use a path group with an ID of 0, specify the "Automatically Selected" option. The path group with the lowest ID will be selected (which will be ID 0, if a path group with that ID exists).</p> <p>Remote path groups are listed in the format:</p> <p>Path Group Id: 0x51 Port Mappings: 5E <-> 3E</p> <p>The arrow depicts the direction of the path, either left to right or bidirectional. The arrows can also have a line through them depicting the path is currently broken.</p> <p>Only remote path groups that are suitable for the replication are displayed, for example for GAD only bidirectional path groups are listed.</p> |

| Control | Description |
|----------|--|
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure «Replication Type»

Specify Naming Options

Secondary Logical Device Name

☐ Match Origin
☒ Custom

LDEV_%CREATION_DATE%%CREATION_TIME%

Logical device names are limited to 32 characters, after variable resolution.

Display variables which can be used for the secondary LDEVs' name ▼

%ORIGIN_SERIAL% - Storage serial of origin volume of data flow.
 %ORIGIN_LDEV_ID% - LDEV id of origin volume of data flow.
 %ORIGIN_LDEV_NAME% - LDEV name of origin volume of data flow.
 %PRIMARY_SERIAL% - Storage serial of operation source volume.
 %PRIMARY_LDEV_ID% - LDEV id of operation source volume.
 %PRIMARY_LDEV_NAME% - LDEV name of operation source volume.
 %SECONDARY_SERIAL% - Storage serial of volume created by operation.
 %SECONDARY_LDEV_ID% - LDEV id of volume created by operation.
 %CREATION_DATE% - Creation date of volume created by operation.
 %CREATION_TIME% - Creation time of volume created by operation.

Cancel Previous Next

Figure 172 Replicate Configuration Wizard - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure Asynchronous Remote Failover (Universal Replicator)

Configuration Summary

- Type**
Asynchronous Remote Failover (Universal Replicator)
- Resource Group**
Automatically Selected
- Mirror Unit**
Allocate Automatically
- Use Consistency Group**
No
- Source Journal**
JournalLDEV0 (Dx00) on my2ndBlockDevice
- Volume Naming**
Automatically Generated

Cancel Previous Finish

Figure 173 Replicate Configuration Wizard - Asynchronous Remote Failover (Universal Replicator Failover) - Summary

Shows a summary of the replication configuration specified by the user.

Replication Configuration Wizard - Synchronous Remote Clone

Replicate configuration on 'my2ndBlockDevice'

Configure Synchronous Remote Clone (TrueCopy)

Configure Replication Settings

Please Note: Changing the replication configuration will cause the replication to be torn down and recreated whether the replication was initialized by Protector or previously adopted.

Pool

Select a Pool

On Destination Write Failure

- ☒ Ignore
- ☐ Fail source write
- ☐ Fail source write if not in error state



Copy Pace

Medium (8)

☒ Use Consistency Group

Cancel Previous Next

Figure 174 Replicate Configuration Wizard - Synchronous Remote Clone (TrueCopy) - Configure Pool etc.

| Control | Description |
|--|--|
| Pool | <p>Specifies the target storage pool from which replication LDEVs are allocated.</p> <p>Provides a list of available pools giving name and available space.</p> <p> Note: All replication types have pool except Asynchronous Remote Failover (Universal Replicator).</p> <p>Select a Dynamic Provisioning Pool.</p> <p> Note: Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage/Pool in Protector.</p> |
| Ignore | When writing to the primary volumes, confirm the write regardless of whether the data has been copied successfully to secondary volumes (Fence Level Never) . |
| Fail source write | Only confirm primary volume writes if the data is successfully copied to the secondary volume, generate a write error if not (Fence Level Data). |
| Fail source write if not in error status | Only generate a write error if the data is not successfully copied to the secondary volume and the replication has not been put into an error status PSUE (Fence Level Status). |
| Copy Pace | Determines how quickly the storage array copies data. The array's default is Slow (3), Protector defaults to Medium (8). |
| Use Consistency Group | All P-VOLs in a replication are, by default, placed in the same consistency group to ensure consistency of data across all volumes. This option allows this behaviour to be disabled. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Select Remote Path Group

☒ Automatically Selected
☐ User Selected



Select Source Node

Select a Source Remote Path Group

Only paths that are suitable for this replication type will be shown.

Cancel Previous Next

Figure 175 Data Flow Wizard Hitachi Block Replication Configuration - Select Remote Path Group TC Pool

| Control | Description |
|--------------------------|--|
| Select Remote Path Group | <p>Specifies the Remote Path Group to be used for the replication.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a Remote Path Group <p> Note: For GAD it is recommended the user specifies a group to avoid sharing with other replications.</p> <ul style="list-style-type: none"> User Selected - The user specifies the Remote Path Group. <p> WARNING: You cannot specify the "User Selected" option and select a path group with an ID of 0. To use a path group with an ID of 0, specify the "Automatically Selected" option. The path group with the lowest ID will be selected (which will be ID 0, if a path group with that ID exists).</p> <p>Remote path groups are listed in the format:</p> <p>Path Group Id: 0x51 Port Mappings: 5E <-> 3E</p> <p>The arrow depicts the direction of the path, either left to right or bidirectional. The arrows can also have a line through them depicting the path is currently broken.</p> <p>Only remote path groups that are suitable for the replication are displayed, for example for GAD only bidirectional path groups are listed.</p> |

| Control | Description |
|----------|--|
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Configure Resource Group

☒ Automatically Selected
Resource Group used by existing S-VOLs, or the Resource Group used by the P-VOLs, if all P-VOLs are in the same group. Otherwise Resource Group 0.



☐ User Selected

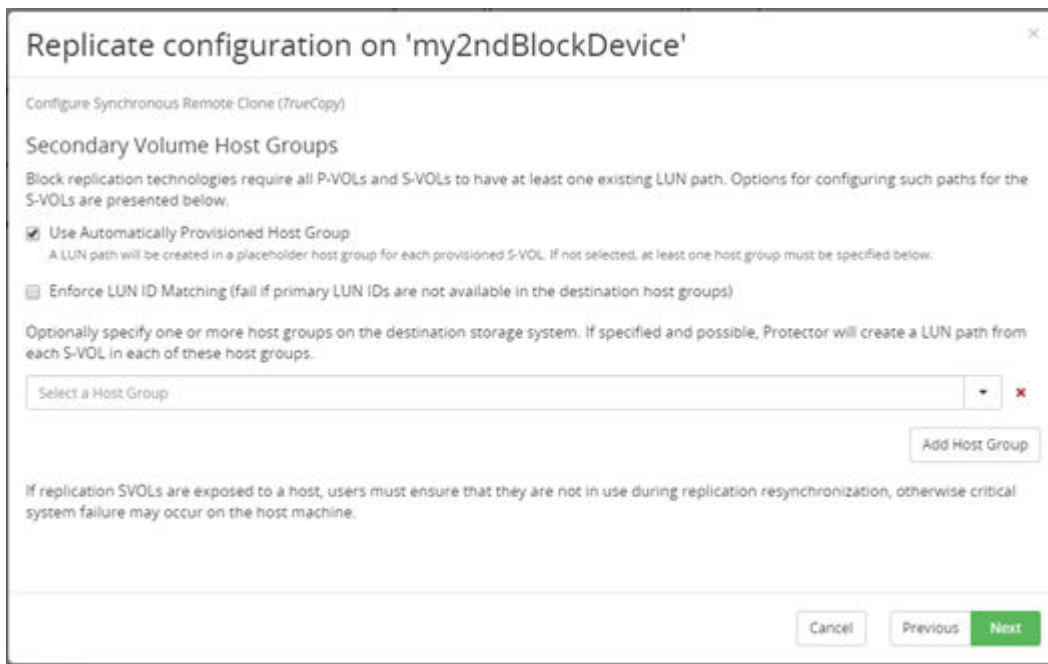
Select a Resource Group

Cancel Previous Next

Figure 176 Replicate Configuration Wizard - Configure Resource Group

| Control | Description |
|--------------------------|---|
| Configure Resource Group | Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group). |

| Control | Description |
|----------|---|
| | <p> Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user selection, then the operation will fail with an error. This setting should not be modified for existing replications.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a resource group in the following order of priority: <ol style="list-style-type: none"> If there are existing S-VOLs, then the resource group used by those will be selected. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. Resource group 0. <p> Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error.</p> <ul style="list-style-type: none"> User Selected - The user specifies the Resource Group. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Replicate configuration on 'my2ndBlockDevice'

Configure Synchronous Remote Clone (TrueCopy)

Secondary Volume Host Groups

Block replication technologies require all P-VOLs and S-VOLs to have at least one existing LUN path. Options for configuring such paths for the S-VOLs are presented below.

☒ Use Automatically Provisioned Host Group
A LUN path will be created in a placeholder host group for each provisioned S-VOL. If not selected, at least one host group must be specified below.

☐ Enforce LUN ID Matching (fail if primary LUN IDs are not available in the destination host groups)

Optionally specify one or more host groups on the destination storage system. If specified and possible, Protector will create a LUN path from each S-VOL in each of these host groups.

Select a Host Group

Add Host Group

If replication S-VOLs are exposed to a host, users must ensure that they are not in use during replication resynchronization, otherwise critical system failure may occur on the host machine.

Cancel Previous Next

Figure 177 Replicate Configuration Wizard - Secondary Host Groups (Sync. RC)



Caution: If replication S-VOLs are exposed to a host, the user is responsible for ensuring they are not in use during replication resynchronization. Failing to do so may result in a critical failure of the host.





Note: Protector analyses the LUN IDs of the P-VOLs in all host group paths and, if consistent and available, uses these LUN IDs for all S-VOL host group paths either during initial set-up, mounting, or when adding additional LUNs on demand.

To provide a graceful fallback:

- If the P-VOL LUN IDs are not consistent in all host group paths Protector will still use a consistent ID for S-VOL mappings, but these will not necessarily match any of the P-VOL LUN IDs.
- If a P-VOL has a consistent ID in all host group paths, but this LUN ID is not available in all S-VOL host group paths then Protector will choose a different, consistent LUN ID for the S-VOL for all host group paths.
- When not able to match LUN IDs with those used by P-VOLs and/or the S-VOLs, Protector chooses an unused LUN ID. In order to keep LUN ID's compatible with VMware and Hyper-V when selecting LUN ID's Protector will first attempt to select ID's at or below 255. If this is not it will then attempt at or below 1024, followed by at or below 2048. Finally, at or below the array maximum. A warning will be displayed when an ID can not be found in a range.

Some systems expect LUN ID 0 to be used only as a boot volume. Protector will therefore only use LUN ID 0 for the S-VOL host group paths if the P-VOL LUN ID is 0.

| Control | Description |
|--------------------------------------|---|
| Use Protector Provisioned Host Group | Protector will create a LUN path from each S-VOL it provisions in a placeholder host group. If this option is not selected, at least one Secondary Host Group must be specified below. |
| Enforce LUN ID Matching | For environments where LUN ID consistency is mandatory, selecting this option will cause the replication to fail if: <ul style="list-style-type: none"> ▪ The P-VOL does not have a consistent LUN ID in all host group paths. ▪ The P-VOL LUN ID is not available in all S-VOL host group paths. |
| Secondary Host Groups | Specify zero or more host groups that Protector will configure to provide access to the S-VOL(s) when configuring replication scenarios. If no host groups are specified here then Protector will place the S-VOL(s) in it's dummy host group. Click the Add Host Group button to insert another Host Group selection control. Click the Remove button next to a Host Group selection control to delete it. |

| Control | Description |
|----------|--|
| | <p> Note:</p> <p>If a LUN path to be created already exists, Protector will not attempt to add it again, or to change its ID.</p> <p>The specified host groups must be in the same resource group as the secondary volumes.</p> <p>For GAD replications, if the host group names and port IDs match between primary and secondary storage nodes, Protector will attempt to match the LUN IDs used for the S-VOLs with those of the respective P-VOLs. If this cannot be achieved then a warning will be logged and the next available LUN ID will be used.</p> <p> Tip: Use this option to specify host groups that enable access to S-VOL(s) when configuring GAD cross-path and multi-path and other replication scenarios where the S-VOL(s) will need to be accessed (e.g. during failover).</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

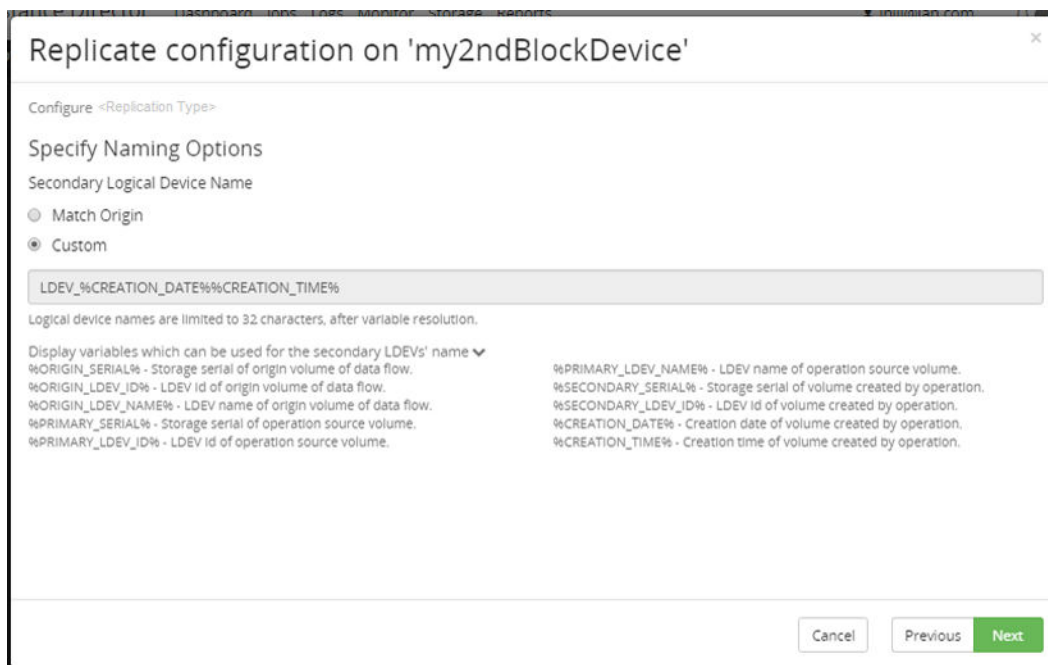


Figure 178 Replicate Configuration Wizard - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

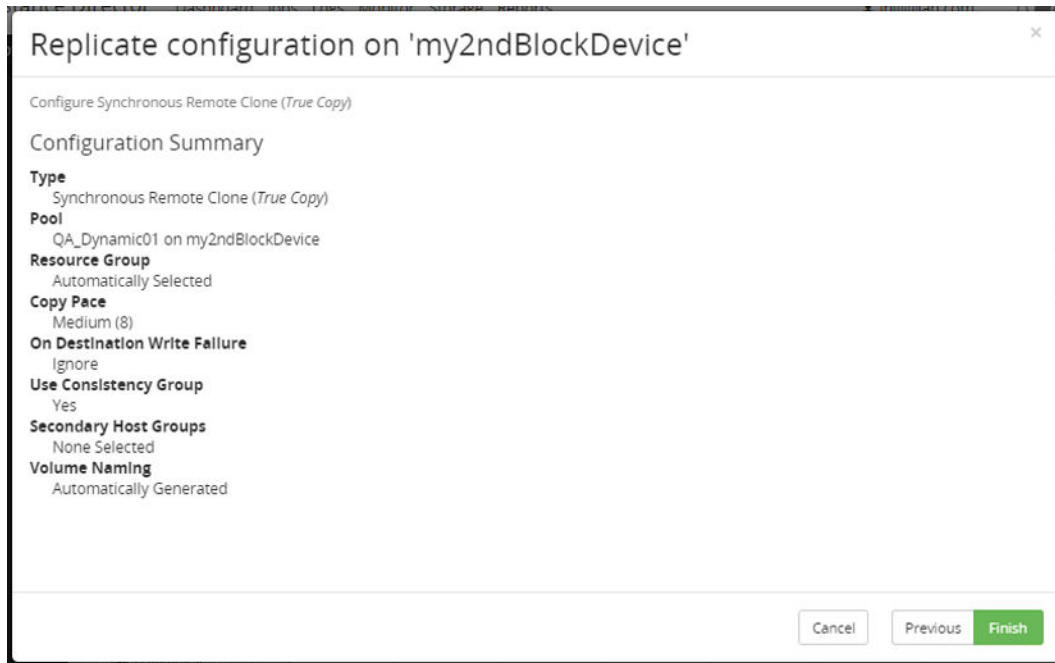


Figure 179 Replicate Configuration Wizard - Synchronous Remote Clone (TrueCopy) - Summary

Shows a summary of the replication configuration specified by the user.




Replication Configuration Wizard - Active-Active Remote Clone



Note:

- GAD is only available on VSP G series because virtualized LDEVs are required.
- Configuration or adoption of GAD cross-path scenarios requires CCI version 01-41-03/03 or greater to be installed on the ISM node.
- Primary volumes must be set up within a host group prior to configuring a GAD replication using Protector.
- GAD replications require the P-VOL and S-VOL to have matching virtual serial numbers and virtual LDEV IDs. Selecting Automatically Selected in the **Configure Resource Group** page of the wizard ensures this is done.
- Any LUN path to the secondary volume will become inaccessible if the GAD replication is deleted from Protector (i.e. torn down). This occurs because the virtual LDEV ID is automatically deleted from the S-VOL, causing host I/Os to be rejected. To recover from this, either recreate the GAD pair (if the pair was deleted unintentionally) or assign a new virtual ID to the clone S-VOL

Figure 180 Replicate Configuration Wizard - Active-Active Remote Clone (Global-Active Device) - Configure Pool etc.

| Control | Description |
|---------------|--|
| Pool | <p>Specifies the target storage pool from which replication LDEVs are allocated.</p> <p>Provides a list of available pools giving name and available space.</p> <p> Note: All replication types have pool except Asynchronous Remote Failover (Universal Replicator).</p> <p>Select a Dynamic Provisioning Pool.</p> <p> Note: Dynamic Provisioning Pools must be created using Storage Navigator prior to selecting the Target Storage/Pool in Protector.</p> |
| Target Quorum | <p>Selects the volume to use as the quorum disk.</p> <p> Note:</p> <ul style="list-style-type: none"> A Quorum disk is required to manage each GAD replication pair. It is best practice to allocate a separate Quorum disk for each pair. Both Quorum and Quorum-less disks are available for selection. |

| Control | Description |
|-----------------------|--|
| Mirror Unit | The mirror unit number for the replication can be set to 0 or h1. Select Allocate Automatically to allow Protector to choose one. |
| Copy Pace | Determines how quickly the storage array copies data. The array's default is Slow (3), Protector defaults to Medium (8). |
| Use Consistency Group | All P-VOLs in a replication are, by default, placed in the same consistency group to ensure consistency of data across all volumes. This option allows this behavior to be disabled. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Select Remote Path Group

☒ Automatically Selected
☐ User Selected



Select Source Node

Select a Source Remote Path Group

Only paths that are suitable for this replication type will be shown.

Cancel Previous Next

Figure 181 Data Flow Wizard Hitachi Block Replication Configuration - Select Remote Path Group

| Control | Description |
|--------------------------|--|
| Select Remote Path Group | <p>Specifies the Remote Path Group to be used for the replication.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a Remote Path Group <p> Note: For GAD it is recommended the user specifies a group to avoid sharing with other replications.</p> <ul style="list-style-type: none"> User Selected - The user specifies the Remote Path Group. <p> WARNING: You cannot specify the "User Selected" option and select a path group with an ID of 0. To use a path group with an ID of 0, specify the "Automatically Selected" option. The path group with the lowest ID will be selected (which will be ID 0, if a path group with that ID exists).</p> <p>Remote path groups are listed in the format: Path Group Id: 0x51 Port Mappings: 5E <-> 3E</p> <p>The arrow depicts the direction of the path, either left to right or bidirectional. The arrows can also have a line through them depicting the path is currently broken.</p> <p>Only remote path groups that are suitable for the replication are displayed, for example for GAD only bidirectional path groups are listed.</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure <Replication Type>

Configure Resource Group



☒ Automatically Selected
Resource Group used by existing S-VOLs, or the Resource Group used by the P-VOLs, if all P-VOLs are in the same group. Otherwise Resource Group 0.

☐ User Selected

Select a Resource Group

Cancel Previous Next

Figure 182 Replicate Configuration Wizard - Configure Resource Group

| Control | Description |
|--------------------------|---|
| Configure Resource Group | <p>Specifies the resource group to be used for S-VOLs, in order to support snapshots and replications from VSM volumes (adding volumes to a VSM is performed by adding the volumes to the correct resource group).</p> <p> Note: If there are existing S-VOLs, then the resource group used by those will be selected. If the existing S-VOLs are in multiple resource groups or in a resource group that contradicts the user selection, then the operation will fail with an error. This setting should not be modified for existing replications.</p> <ul style="list-style-type: none"> Automatically Selected - Allows Protector to automatically select a resource group in the following order of priority: <ol style="list-style-type: none"> If there are existing S-VOLs, then the resource group used by those will be selected. The resource group used by the P-VOLs, if the replication is in-system and the P-VOLs are all in one resource group. Resource group 0. <p> Note: If existing S-VOLs are in multiple resource groups, then the operation will fail with an error.</p> User Selected - The user specifies the Resource Group. |
| Cancel | Discards all changes and reverts to the previous page. |

| Control | Description |
|----------|--|
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

Replicate configuration on 'my2ndBlockDevice'

Configure Active-Active Remote Clone (Global-Active Device)

Secondary Volume Host Groups

Block replication technologies require all P-VOLs and S-VOLs to have at least one existing LUN path. Options for configuring such paths for the S-VOLs are presented below.

- ☒ Use Automatically Provisioned Host Group
A LUN path will be created in a placeholder host group for each provisioned S-VOL. If not selected, at least one host group must be specified below.
- ☐ Enforce LUN ID Matching (fail if primary LUN IDs are not available in the destination host groups)

Optionally specify one or more host groups on the destination storage system. If specified and possible, Protector will create a LUN path from each S-VOL in each of these host groups.

Select a Host Group ▼ ✖

Add Host Group

If replication S-VOLs are exposed to a host, users must ensure that they are not in use during replication resynchronization, otherwise critical system failure may occur on the host machine.

Cancel Previous **Next**

Figure 183 Replicate Configuration Wizard - Secondary Host Groups (GAD)



Caution: If replication S-VOLs are exposed to a host, the user is responsible for ensuring they are not in use during replication resynchronization. Failing to do so may result in a critical failure of the host.





Note: Protector analyses the LUN IDs of the P-VOLs in all host group paths and, if consistent and available, uses these LUN IDs for all S-VOL host group paths either during initial set-up, mounting, or when adding additional LUNs on demand.

To provide a graceful fallback:

- If the P-VOL LUN IDs are not consistent in all host group paths Protector will still use a consistent ID for S-VOL mappings, but these will not necessarily match any of the P-VOL LUN IDs.
- If a P-VOL has a consistent ID in all host group paths, but this LUN ID is not available in all S-VOL host group paths then Protector will choose a different, consistent LUN ID for the S-VOL for all host group paths.
- When not able to match LUN IDs with those used by P-VOLs and/or the S-VOLs, Protector chooses an unused LUN ID. In order to keep LUN ID's compatible with VMware and Hyper-V when selecting LUN ID's Protector will first attempt to select ID's at or below 255. If this is not it will then attempt at or below 1024, followed by at or below 2048. Finally, at or below the array maximum. A warning will be displayed when an ID can not be found in a range.

Some systems expect LUN ID 0 to be used only as a boot volume. Protector will therefore only use LUN ID 0 for the S-VOL host group paths if the P-VOL LUN ID is 0.

| Control | Description |
|--------------------------------------|---|
| Use Protector Provisioned Host Group | Protector will create a LUN path from each S-VOL it provisions in a placeholder host group. If this option is not selected, at least one Secondary Host Group must be specified below. |
| Enforce LUN ID Matching | For environments where LUN ID consistency is mandatory, selecting this option will cause the replication to fail if: <ul style="list-style-type: none"> ▪ The P-VOL does not have a consistent LUN ID in all host group paths. ▪ The P-VOL LUN ID is not available in all S-VOL host group paths. |
| Secondary Host Groups | Specify zero or more host groups that Protector will configure to provide access to the S-VOL(s) when configuring replication scenarios. If no host groups are specified here then Protector will place the S-VOL(s) in it's dummy host group. Click the Add Host Group button to insert another Host Group selection control. Click the Remove button next to a Host Group selection control to delete it. |

| Control | Description |
|----------|--|
| | <p> Note:</p> <p>If a LUN path to be created already exists, Protector will not attempt to add it again, or to change its ID.</p> <p>The specified host groups must be in the same resource group as the secondary volumes.</p> <p>For GAD replications, if the host group names and port IDs match between primary and secondary storage nodes, Protector will attempt to match the LUN IDs used for the S-VOLs with those of the respective P-VOLs. If this cannot be achieved then a warning will be logged and the next available LUN ID will be used.</p> <p> Tip: Use this option to specify host groups that enable access to S-VOL(s) when configuring GAD cross-path and multi-path and other replication scenarios where the S-VOL(s) will need to be accessed (e.g. during failover).</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

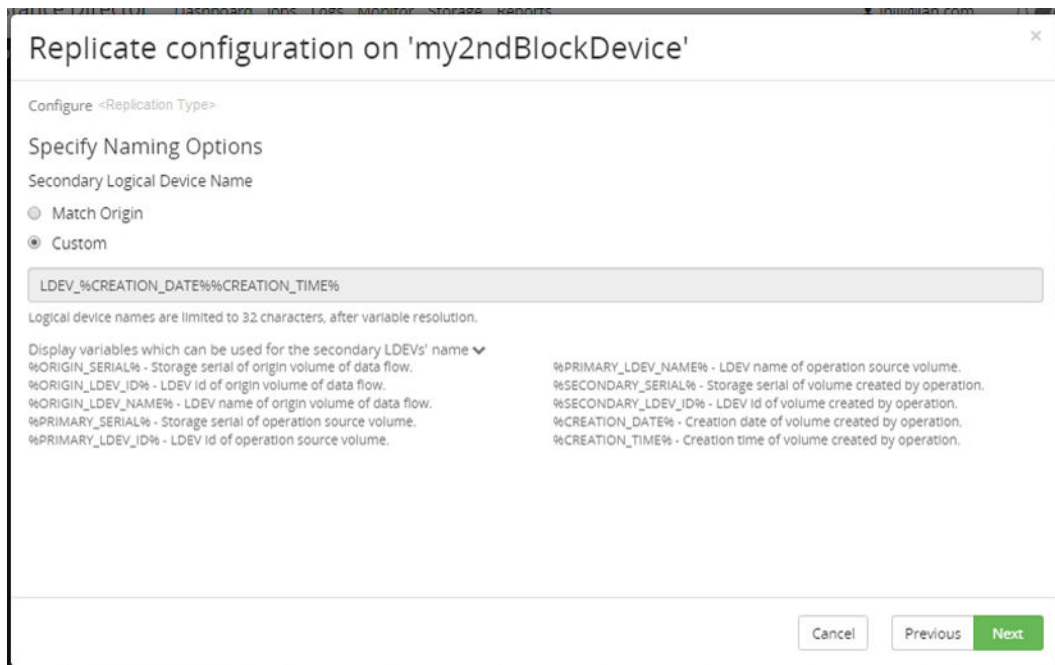


Figure 184 Replicate Configuration Wizard - Naming Options

| Control | Description |
|-------------------------------|--|
| Secondary Logical Device Name | <p>Specifies how S-VOLs will be named:</p> <ul style="list-style-type: none"> ▪ Match Origin - The S-VOL will be given the same name as that used for the origin P-VOL (i.e. the left-most volume in the data flow). ▪ Custom - The S-VOL will be named using the naming rule provided. The naming rule can consist of literal strings and/or one or more substitution variables listed. Click Display variables which can be used for the secondary LDEVs' name to view the available substitution variables: <ul style="list-style-type: none"> • %ORIGIN_SERIAL% - S/N of leftmost array in data flow. E.g. output string: 210613 • %ORIGIN_LDEV_ID% - ID of leftmost LDEV in data flow. E.g. output string: 00:3A:98 • %ORIGIN_LDEV_NAME% - name of leftmost LDEV in data flow. • %PRIMARY_SERIAL% - S/N of primary array in this operation. E.g. output string: 442302 • %PRIMARY_LDEV_ID% - ID of primary LDEV in this operation. E.g. output string: 00:4C:EB • %PRIMARY_LDEV_NAME% - name of primary LDEV in this operation. • %SECONDARY_SERIAL% - S/N of secondary array in this operation. E.g. output string: 356323 • %SECONDARY_LDEV_ID% - ID of secondary LDEV in this operation. E.g. output string: 01:F4:35 • %CREATION_DATE% - date secondary LDEV was created by this operation. E.g. output string: 20180427 • %CREATION_TIME% - time secondary LDEV was created by this operation. 1130 |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

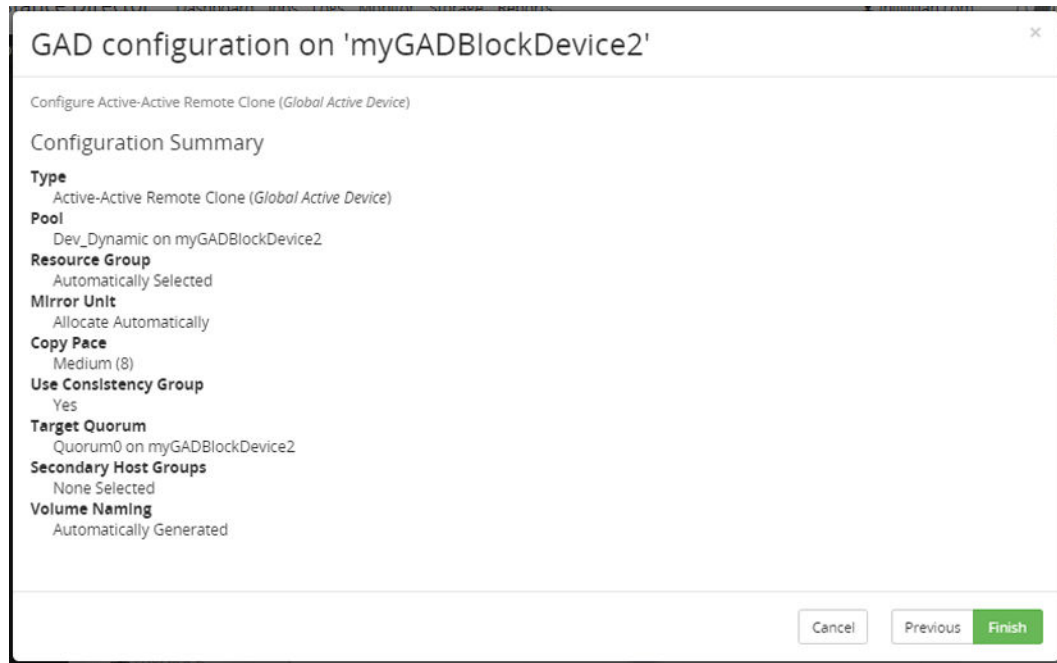


Figure 185 Replicate Configuration Wizard - Active-Active Remote Clone (Global-Active Device) - Summary

Shows a summary of the replication configuration specified by the user.

Hitachi Block Mount Configuration Wizard

This wizard is displayed when you assign a mount operation to a Hitachi Block storage node on a data flow.



Note:

- When mounting a snapshot that contains a mounted subdirectory, the subdirectory will be mounted as expected. However, the volume referenced by the subdirectory will also be mounted as a separate drive. Unmount will unmount both the expected and additional mounts.
- The automated mount operation is not suitable for Oracle ASM. The disks are be presented to the OS but need to be manually mounted.




Note: Operating system specific behaviour:

| OS | Note |
|------------|---|
| Linux | When mounting a Linux snapshot to a different Linux machine; in order for the user and group names to be displayed correctly the users and groups must have the same ID's as the source. |
| SUSE Linux | SUSE Linux is not able to perform automated mount operations if hosted on VMware. (RHEL and OEL Linux work as expected). |
| AIX | The system command importvg is invoked by Protector to mount snapshots to the user specified location. importvg creates a directory for the user specified location plus an empty directory corresponding to the original mount point. Neither of these directories are removed by Protector when the snapshot is eventually unmounted, although neither will contain any data. |

Figure 186 Mount Configuration Wizard - Mount Operation Type

| Control | Description |
|-----------|---|
| Repurpose | <p>Perform the mount sequence for the repurposing scenario (refer to About the repurposing mount sequence (on page 102) for details).</p> <p> Note: Repurpose is not valid for continuous replication; the rules compiler will issue an error if a continuous mover is used on the data flow in conjunction with this type of mount operation.</p> |

| Control | Description |
|--------------|---|
| Proxy Backup | Perform the mount sequence for the proxy backup scenario (refer to About the proxy backup mount sequence (on page 103) for details). <div>  Note: A proxy backup of a live replication will generate a warning in the compiler to tell the user that their replication will be paused until the proxy backup is complete. </div> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

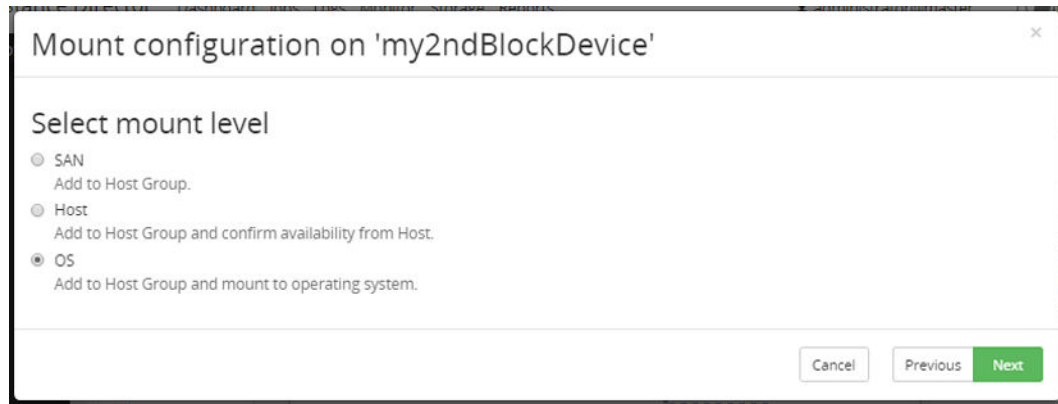



Figure 187 Mount Configuration Wizard - Mount Level

| Control | Description |
|----------|---|
| SAN | Adds the replication to a Host Group. |
| Host | Adds the replication to a Host Group and confirms that it is available from the specified Host. |
| OS | Adds the replication to a Host Group and mounts it on the specified Host's operating system. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |


The screenshot shows a window titled "Mount configuration on 'my2ndBlockDevice'". Below the title bar is a section labeled "Select Host Group". Under this section, there is a label "Host Group" followed by a text input field containing the placeholder text "Select Host Group". To the right of the input field is a small red 'X' icon. Below the input field is a button labeled "Add Host Group". At the bottom of the window, there are three buttons: "Cancel", "Previous", and "Finish". The "Finish" button is highlighted in green.

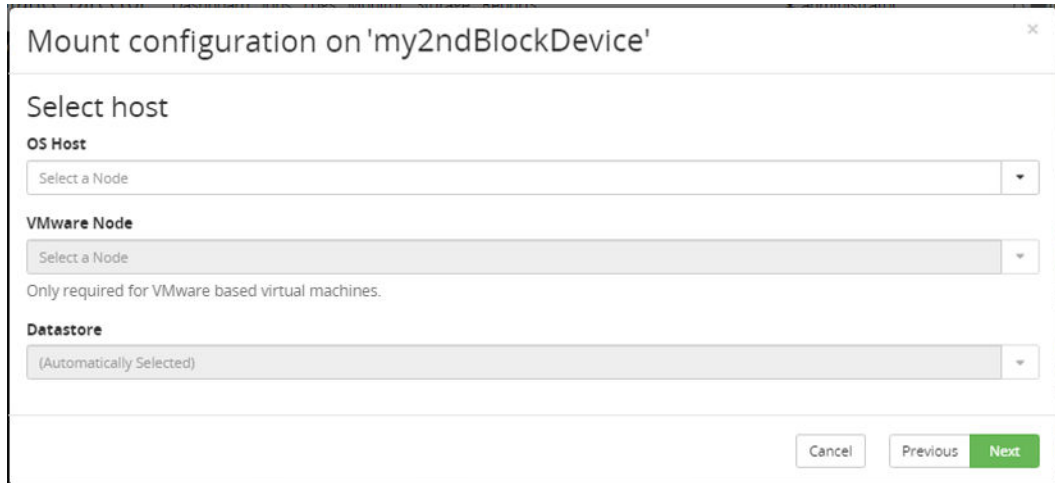
Figure 188 Mount Configuration Wizard - Select Host Group (SAN level mount only)

| Control | Description |
|----------------|---|
| Host Group | Manually specify or select a host group to use to expose a snapshot or replication. <div>  Note: When exposing an LDEV, the host group specified must be in the same resource group as the secondary volumes. </div> |
| Add Host Group | Click this button to add host groups when specifying a multi-path mount operation. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

The screenshot shows a window titled "Mount configuration on 'my2ndBlockDevice'". Below the title bar is a section labeled "Select Host Group". Under this section, there is a label "Host Group" followed by two radio buttons: "Automatically discover" (which is selected) and "Selected". Below the radio buttons is a text input field containing the placeholder text "Select a Host Group". To the right of the input field is a small red 'X' icon. Below the input field is a button labeled "Add Host Group". At the bottom of the window, there are three buttons: "Cancel", "Previous", and "Next". The "Next" button is highlighted in green.

Figure 189 Mount Configuration Wizard - Host Group (Host and OS level mount only)

| Control | Description |
|------------------------|---|
| Automatically discover | Protector will automatically select a host group to use to expose the snapshot or replication. |
| Selected | The user must specify one or more host groups to use to expose the snapshot or replication. |
| Select a Host Group | Manually specify or select a host group to use to expose a snapshot or replication. <div>  Note: When exposing an LDEV, the host group specified must be in the same resource group as the secondary volumes. </div> |
| Add Host Group | Click this button to add host groups when specifying a multi-path mount operation. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |



Mount configuration on 'my2ndBlockDevice'

Select host

OS Host

Select a Node

VMware Node

Select a Node



Only required for VMware based virtual machines.

Datastore

(Automatically Selected)

Cancel Previous Next

Figure 190 Mount Configuration Wizard - Select Host (Host and OS level mount only)

| Control | Description |
|-------------|---|
| OS Host | Specify the machine to mount to or expose to. <div>  Note: Unless the user selects a host group, the machine where the volume is to be mounted must have an existing volume on the same storage device. If there is no connection between the mount host and the block storage device then Protector will fail the mount operation after a timeout of 30 minutes. </div> |
| VMware host | Expose the volumes to the specified VMware host to enable them to be mounted to the VM. <div>  Note: Exposing using a VMware host requires that a VMware ESXi/vCenter node be configured. </div> |
| Datastore | Specifies a destination datastore when mounting to a VMware virtual machine which is part of a cluster, in which case the default datastore may not be a suitable place to save the RDM mount information. If the datastore field is left blank then mount information is saved alongside the VM. |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Next | Takes the user to the next screen in the wizard. |

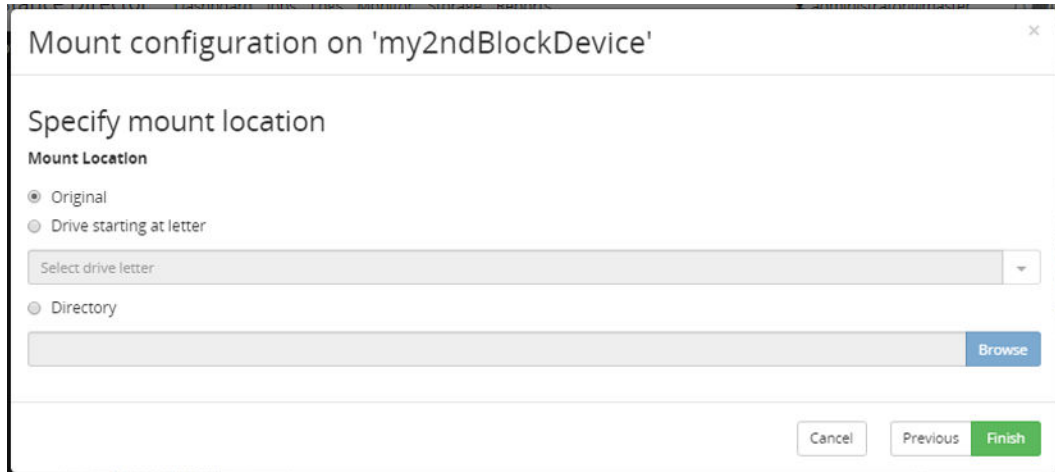




Figure 191 Mount Configuration Wizard - Specify mount location (OS level mount only)







| Control | Description |
|--------------------------|---|
| Original | <p>The replication is mounted at its original location.</p> <p> Note: Mounting at the original location will fail if there is already a volume mounted at that location.</p> |
| Drive starting at letter | <p>When mounting a replication that contains multiple volumes, the first volume will mount at the specified drive and subsequent drives are used for each additional volume.</p> |
| Directory | <p>When mounting a replication that contains multiple volumes, each volume will be assigned a separate subdirectory. Click Browse to view the drives and directories on the selected host. To create a new directory, type in the required path.</p> <p> Note: Protector does not check to make sure the directory selected as the mount point is empty. This means it is possible to mount a snapshot inside or even over the top of another mounted volume. This should be avoided.</p> |
| Cancel | Discards all changes and reverts to the previous page. |
| Previous | Takes the user to the previous screen in the wizard. |
| Finish | Commits the new changes. Pages currently open in other tabs and windows will need to be reloaded before the changes are seen by the user. |

Data Flow Details

This page displays the details of a Data Flow and enables you launch the wizard to edit, activate, deactivate and change access permissions.



Figure 192 Data Flow Details

| Control | Description |
|--|--|
|  Edit | Launches the Data Flow Wizard (on page 356) to enable you to edit the data flow. |
|  Tag | Modifies the tags of an existing object from either the inventory screen or the details screen of the object. |
|  Compile | Displays the Activate Data Flow Dialog (on page 352) and attempts to compile the rules for the data flow. If compilation is successful then the rules can be activated. |
|  Deactivate | Deactivates the selected data flow and removes its rules. <div> Caution: If the deactivated data flow contains storage hardware based operations, this will remove the pairing relationships.</div> |
|  Edit Permissions | Displays the Access Control Permissions Inventory (on page 341) to enable you to view and edit the data flow's permissions. |
| Data Flow Canvas | Shows the Data Flow diagram in read-only mode. |
| Applied Policies | The area to the right of the workspace lists all the policies that have been applied in the data flow. Click the node or mover of interest to view the applied policies and mover settings. |

| Control | Description |
|---------------------------|--|
| Summary | The area to the right of the workspace lists the Status of the data flow. |
| Status | The Status of the data flow can be Active or Inactive. |
| Activated | If the data flow is Active then Activated shows the date and time the data flow was activated. |
| Modified Since Activation | If the data flow is Active then Modified Since Activation shows if the data flow has been modified since it was activated, this can be either Yes or No. If the value is Yes then the currently distributed rules are different to those shown in the data flow. |
| Monitor | Displays the Monitor Details (on page 460) screen for this data flow |

Jobs UI Reference

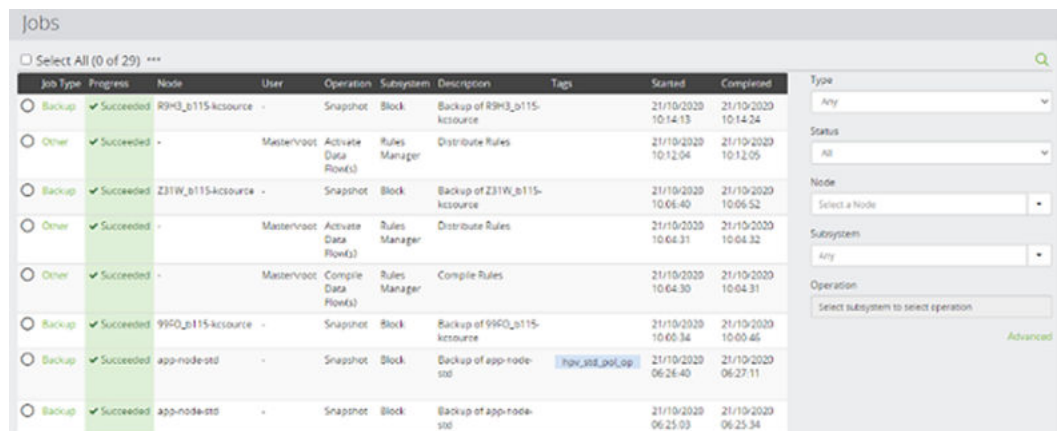
This section describes the Jobs UI, accessed via the [Main Banner \(on page 278\)](#).

For further information, refer to:

- [Job Concepts \(on page 111\)](#)
- [Job Tasks \(on page 254\)](#)


Jobs Inventory

The Jobs Inventory displays all currently running or recently completed jobs, for the purpose of operation confirmation and control.



| Job Type | Progress | Node | User | Operation | Subsystem | Description | Tags | Started | Completed |
|----------|-------------|--------------------|-------------|-----------------------|---------------|------------------------------|---------------|---------------------|---------------------|
| Backup | ✓ Succeeded | R9M3_b115-kcsource | - | Snapshot | Block | Backup of R9M3_b115-kcsource | | 21/10/2020 10:14:13 | 21/10/2020 10:14:24 |
| Other | ✓ Succeeded | - | MasterVroot | Activate Data Flow(s) | Rules Manager | Distribute Rules | | 21/10/2020 10:12:04 | 21/10/2020 10:12:05 |
| Backup | ✓ Succeeded | Z31W_b115-kcsource | - | Snapshot | Block | Backup of Z31W_b115-kcsource | | 21/10/2020 10:06:40 | 21/10/2020 10:06:52 |
| Other | ✓ Succeeded | - | MasterVroot | Activate Data Flow(s) | Rules Manager | Distribute Rules | | 21/10/2020 10:04:31 | 21/10/2020 10:04:32 |
| Other | ✓ Succeeded | - | MasterVroot | Compile Data Flow(s) | Rules Manager | Compile Rules | | 21/10/2020 10:04:30 | 21/10/2020 10:04:31 |
| Backup | ✓ Succeeded | 9950_b115-kcsource | - | Snapshot | Block | Backup of 9950_b115-kcsource | | 21/10/2020 10:00:34 | 21/10/2020 10:00:46 |
| Backup | ✓ Succeeded | app-node-std | - | Snapshot | Block | Backup of app-node-std | 799v388_99Log | 21/10/2020 06:26:40 | 21/10/2020 06:27:11 |
| Backup | ✓ Succeeded | app-node-std | - | Snapshot | Block | Backup of app-node-std | | 21/10/2020 06:25:03 | 21/10/2020 06:25:34 |

Figure 193 Jobs Inventory

| Control | Description |
|---|--|
|  More Actions | <p>Only enabled if the selected job is actionable. A menu appears with the available actions listed which can include:</p> <ul style="list-style-type: none"> Cancel - <i>Restore, Resync and Software Update</i> jobs. Pause - <i>Replication</i> jobs. Resume- <i>Replication</i> jobs. |
| Job Type | Click on the Job Type link in the jobs list to open the Job Details (on page 443) for the selected job. |
| Progress | <p>Indicates the status of a job as follows:</p> <ul style="list-style-type: none"> In Progress Paused Cancelled Succeeded Failed <p>Jobs with the status of Cancelled, Failed or Succeeded will be automatically removed 72 hours after completion. However, all removed jobs will be visible under job reports.</p> |
| Node | The node for which the job is being actioned for. Note that not all job will have a node specified. |
| User | User who initiated the job if not a system initiated job. |
| Operation | Type of operation being performed. |
| Subsystem | The part of the product responsible for the job being initiated. |
| Description | Description of the job being carried out. |
| Tags | List of tags associates with the job see Universal Tags (on page 42) for more detail. |
| Started/ Completed | Shows the data and time the job started/completed. |
| Filter on Type | Filters the displayed results based on Job Type. |
| Filter on Status | Filters the displayed results based on Status. |
| Filter on Node | Filters the displayed results based on Node name. |
| Filter on Subsystem | Filters the displayed results based on Subsystem type. |
| Filter on Operation | Only enabled if a Subsystem has been selected. Filters the displayed results based on Operation. |

Job Details

This page displays the details of a Job.

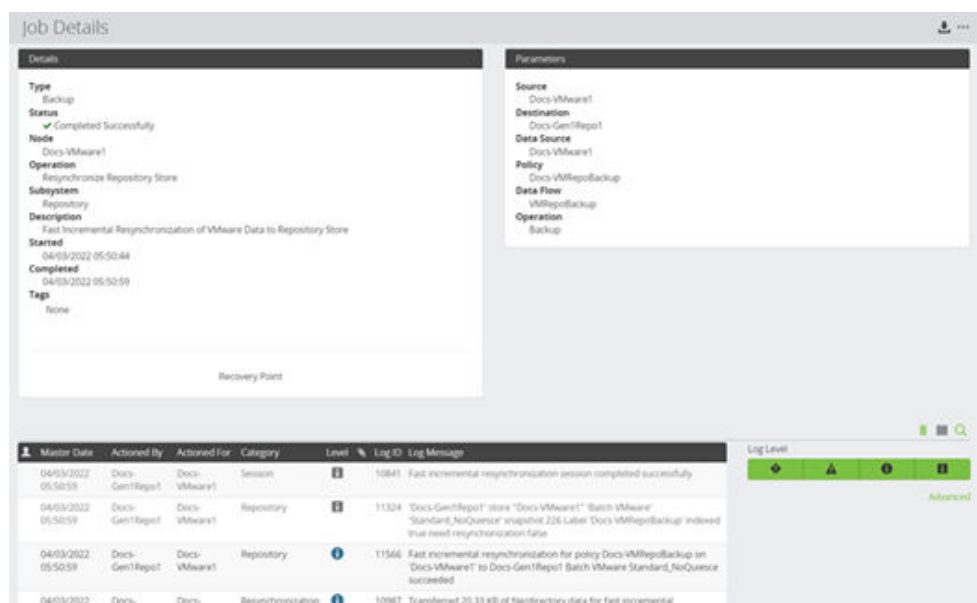







Figure 194 Job Details

| Control | Description |
|---|---|
|  Export Session Logs | Exports the log database entries for the displayed session as a file, respecting the currently specified filter terms. The Export Logs Dialog (on page 455) is displayed prior to the logs being exported. |
|  More Actions | Only enabled if the selected job is actionable. A menu appears with the available actions listed which can include: <ul style="list-style-type: none"> Cancel - <i>Restore</i>, <i>Resync</i> and <i>Software Update</i> jobs. Pause - <i>Replication</i> jobs. Resume - <i>Replication</i> jobs. |
| Details | Provides detailed information about the Job. For <i>Restore</i> and <i>Resync</i> jobs a <i>Progress</i> section is added that provides information about the progress of the job. Refer to Monitor Details (on page 460) . Once a job has completed the progress column will state <i>Completed Successfully</i> , <i>Completed with Errors</i> or <i>Failed</i> . For any status other than <i>Completed Successfully</i> refer to the logs section to determine the error. |
| Recovery Point | Click on Recovery Point to open the associated recovery point. |
| Parameters | Identifies the Source, Destination, Policy and Data Flow associated with the Job. |

| Control | Description |
|---|--|
| Logs | List log messages relating to the job. See Logs UI Reference (on page 448) for more details. |
|  Condensed View | Displays a reduced number of parameters in the log table. |
|  Extended View | Displays all available parameters in the log table. |
|  Show/ Hide Search | Toggles the display of the filtering options. |
| Filter on Log Level | Filters the displayed log results based on Log Level. |



Note: If job details are viewed whilst the job is active additional progress is shown. What is displayed is dependent on the application and destination type.

Licenses UI Reference

This section describes the Licenses UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [License Concepts \(on page 129\)](#)
- [License Tasks \(on page 254\)](#)

Licenses Inventory

The License Inventory page displays the existing licenses and enables new licenses to be added.



Note: The Protector software installation includes a built-in evaluation key for sites that want to use the product on a trial-to-permanent basis. After the software is installed, it can be used for 5 weeks before a permanent license key is required.

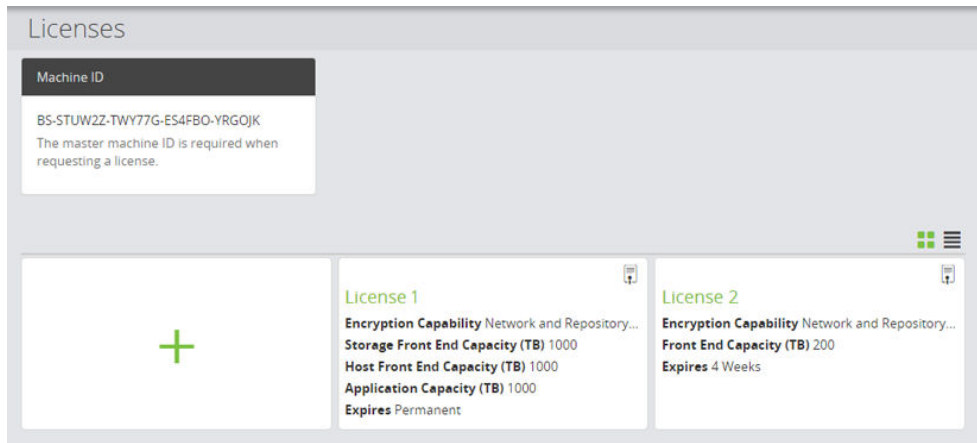




Figure 195 Licenses Inventory



| Control | Description |
|---|---|
|  Add | Click this tile to add a new license using the Activate License Wizard (on page 445) |
|  Existing Licenses | Click these tiles to view currently active License Details (on page 447) . The figure above shows both Gen2 and Gen3 license types. |

Activate License Wizard

A Protector activation key can be entered using this wizard.

The screenshot shows a software window titled "Activate License". Inside the window, there is a sub-section titled "License Activation". Below this title, there is a label "License Key" followed by a large, empty text input field for pasting a license key. At the bottom right of the window, there are three buttons: "Cancel", "Previous", and "Finish". The "Finish" button is highlighted in green.

Figure 196 Activate License Wizard

| Control | Description |
|-------------|--|
| License Key | <p>Paste the new license key here.</p> <div>  Note: <ul style="list-style-type: none"> In order to activate data flows, a valid Protector activation key must be provided. For cluster environments each machine in the cluster has a different machine ID, therefore a separate license key is required for each node. </div> |
| Cancel | Cancels the activation process. The new license will not be activated |
| Finish | <p>Completes the activation process. The new license will be displayed in the Licenses Inventory (on page 444)</p> <div>  Note: Any node requiring encryption should have the Hub service restarted following the new license being entered. If the node is already authorized, two Hub service restarts may be required. </div> |

License Details

This page displays the details of the selected license.

The screenshot shows the 'License '22000'' details page. It is divided into two main sections: 'Summary' and 'Features'. The 'Summary' section lists the License ID as 22000, the License Key as ADYFKAESLDHC3M2KVLNWCEO8PSABE244I, and the expiration date as 4 Weeks. The 'Features' section lists Encryption Capability as Network and Repository Encryption and Front End Capacity (TB) as 200.

| Summary | Features |
|--|--|
| License ID 22000 License Key ADYFKAESLDHC3M2KVLNWCEO8PSABE244I Expires 4 Weeks | Encryption Capability Network and Repository Encryption Front End Capacity (TB) 200 |

Figure 197 License Details - Gen2 (prior to Protector 6.5)

| Control | Description |
|-------------------------|--|
| License ID | A numeric identifier for the license |
| License Key | The license key provided by Hitachi Vantara |
| Expires | The time left before the license expires |
| Encryption Capability | Indicates whether network (over the wire) and/or repository (in place) encryption has been enabled |
| Front End Capacity (TB) | This is the maximum size of the primary data set that can be protected by Protector. |

The screenshot shows the 'License '22001'' details page. It is divided into two main sections: 'Summary' and 'Features'. The 'Summary' section lists the License ID as 22001, the License Key as ADYVKACXNWWCNM2KUTOGCEO8PSABFE44BPU9j, and the expiration date as 9 Days. The 'Features' section lists Encryption Capability as No Encryption, Storage Front End Capacity (TB) as 100, Host Front End Capacity (TB) as 100, Application Capacity (TB) as 100, and Inclusive Storage Devices as Enabled.

| Summary | Features |
|---|--|
| License ID 22001 License Key ADYVKACXNWWCNM2KUTOGCEO8PSABFE44BPU9j Expires 9 Days | Encryption Capability No Encryption Storage Front End Capacity (TB) 100 Host Front End Capacity (TB) 100 Application Capacity (TB) 100 Inclusive Storage Devices Enabled |

Figure 198 License Details - Gen3 (Protector 6.5 onwards)

| Control | Description |
|---------------------------------|--|
| License ID | A numeric identifier for the license |
| License Key | The license key provided by Hitachi Vantara |
| Expires | The time left before the license expires |
| Encryption capability | Indicates whether network (over the wire) and/or repository (in place) encryption has been enabled |
| Storage Front End Capacity (TB) | This is the maximum size of the primary data set that can be protected by Protector using storage hardware based policies in conjunction with OS host and Hitachi Block nodes. It includes data protection using: <ul style="list-style-type: none"> ▪ Hitachi Block Storage |
| Host Front End Capacity (TB) | This is the maximum size of the primary data set that can be protected by Protector using host based policies in conjunction with OS host nodes. It includes data protection using: <ul style="list-style-type: none"> ▪ Protector Repositories ▪ Hitachi Content Platform |
| Application Capacity (TB) | This is the maximum size of the primary data set that can be protected by Protector using application and hypervisor based policies in conjunction with application and hypervisor nodes. It includes data protection using: <ul style="list-style-type: none"> ▪ Protector Repositories ▪ Hitachi Content Platform ▪ Hitachi Block Storage |
| Inclusive Storage Devices | Any Hitachi storage array can be used by Protector if Inclusive Storage Devices is set to enabled |

Logs UI Reference

This section describes the Logs UI, accessed via the [Main Banner \(on page 278\)](#).

For further information, refer to:

- [Log Concepts \(on page 109\)](#)
- [Log Tasks \(on page 255\)](#)

Logs Inventory

The Logs Inventory displays system wide events for the purpose of operation confirmation, health monitoring, fault diagnosis and auditing.

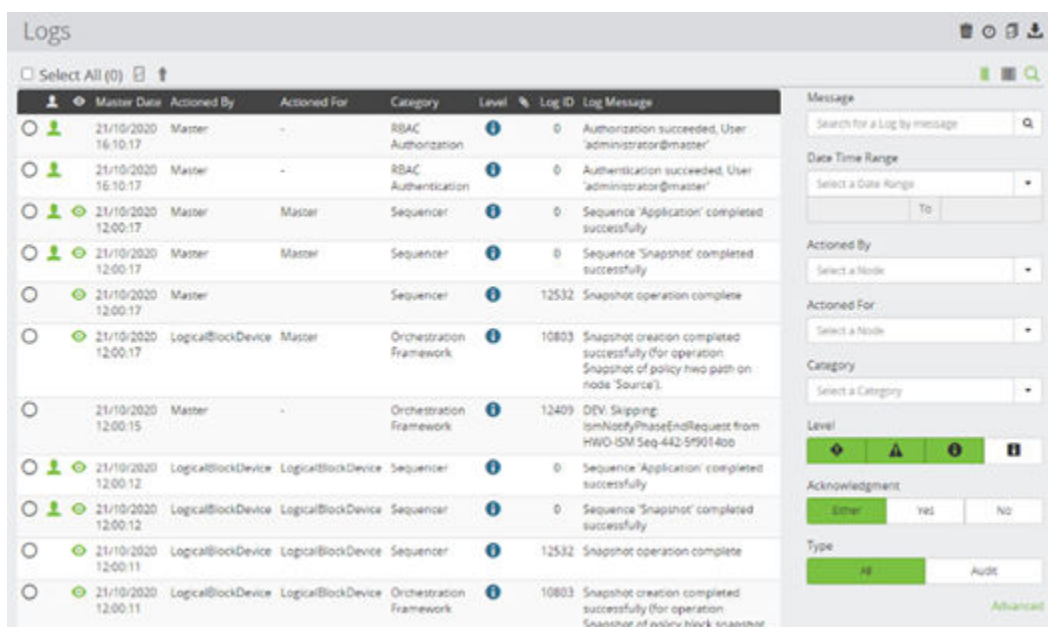







Figure 199 Logs Inventory

| Control | Description |
|--|---|
|  Purge Logs | Removes all logs of a given age and older from the log manager database. Logs marked as 'Audit' cannot be removed. The Purge Logs Dialog (on page 452) is displayed prior to the logs being purged. |
|  Edit purge schedule | Allows the automatic log purge schedule to be configured. The Log Purge Schedule (on page 453) is displayed. |
|  Acknowledge All Error Logs | Acknowledges all unacknowledged error logs in the log database. Unacknowledged error logs are displayed with a red background. Acknowledged logs are displayed in green and the acknowledgment message, date and time are displayed alongside the log entry. The Acknowledge Logs Dialog (on page 454) is displayed prior to the logs being acknowledged. |
|  Export Logs | Exports the log database as a file, respecting the currently specified filter terms. The Export Logs Dialog (on page 455) is displayed prior to the logs being exported. |
|  Acknowledge Selected Logs | Enabled only if one or more log entries are selected. Acknowledges all selected logs in the log database. Unacknowledged error logs are displayed with a red background. Acknowledged logs are displayed in green and the acknowledgment message, date and time are displayed alongside the log entry. The Acknowledge Logs Dialog (on page 454) is displayed prior to the logs being acknowledged. |














| Control | Description |
|---|---|
|  Create Log Notification | Enabled only if one log entry is selected. Creates a log notification condition for that log message type. The Notification Wizard (on page 585) is displayed to assist in creating the notification condition. |
|  Condensed View | Display a subset of the log fields in the log table. |
|  Extended View | Display all of the log fields in the log table. |
| Log Entry | Refer to the Log Fields table below for a full description of all fields. |
| Filter on Message | Filters the log table so that only logs containing the specified string in the Log Message field are displayed. |
| Filter on Date Time Range | Filters the log table so that only logs from the specified Master date and time are displayed. Opens the Date Time Range Picker (on page 347) . |
| Filter on Actioned By | Filters the log table so that only logs relating to the specified node that performs an action are displayed. |
| Filter on Actioned For | Filters the log table so that only logs relating to the specified node that requests an action are displayed. |
| Filter on Category | Filters the log table so that only logs of the specified Category are displayed. |
| Filter on Log Level | Filters the log table so that only logs of the specified Level and above are displayed. |
| Filter on Acknowledgement | Filters the log table so that only acknowledged or unacknowledged logs are displayed. |
| Filter on Log Type | Filters the log table so that only audit logs are displayed. |

Table 27 Log Fields

| Field Name | Description |
|--|---|
|  Select Log Entry | Each log entry can be selected using the selection checkbox. Click one or more log entries to apply an action to that item. |

| Field Name | Description |
|---|---|
|  Sequence Number | All logs have a sequence number associated with them representing the order in which they arrived at the master node. Some logs that are used for statistics and reporting do not appear in the log inventory and consequently there will be gaps in the displayed sequence numbers. |
|  Audit | Audit logs are marked with a  icon. Click on the Audit icon if present to display the audit information for the corresponding log message. Audit messages cannot be removed from the log database. |
|  Session | Logs relating to a session are marked with a  icon. Click on the Session icon if present to display all log messages that pertain to that same session. The Session Log Details (on page 456) is displayed. |
| Master Date | The date and time at which the log message was stored within the master node's log database. Each log entry appears in the log table in descending time order, with the latest log displayed first. |
| Local Date | The date and time at which the message was actually logged by the machine that generated the message. Due to network speed, connectivity issues or different time zones this can differ from the Master Date. |
| Actioned By | The machine from which the specific action is performed. |
| Action For | The machine that requested the specific action. |
| Category | The Protector component that generated the log. A special category named Session is used to indicate the start and end of a sequence of log entries relating to a specific transaction or job. Refer to Session Log Details (on page 456) for details. |
| Level | How important the log message is. This can be one of four values: <ul style="list-style-type: none">  Detail – These log messages can describe intricacies of a process, or non-critical information and do not require any action by the user.  Information – These messages give a higher-level overview of a process, and usually indicate normal operation. These messages do not require any action by the user. |

| Field Name | Description |
|--|--|
| | <ul style="list-style-type: none"> ⚠ Warning – Messages logged at warning level can indicate that the user should investigate the subject of the message to see if it requires further action. Warning messages are not necessarily critical. ❗ Error – Error messages are only logged when the attention of the user is required. They appear with a red background and cause an error badge to appear on relevant nodes within the Monitor Details (on page 460). The error must be acknowledged to clear this badge (see Acknowledgement Selected Logs button). |
|  Attachment | A  icon is displayed if an attachment is included with the log entry. It provides further information that can aid understanding. Click on the Attachment icon if present to display the Log Attachments Dialog (on page 458) which shows additional supporting information that cannot be displayed within the log table. |
| Log ID | A unique identifier that enables that log message to be looked up in the knowledge base. Not all log entries have a Log ID assigned (i.e. the ID is set to 0). If you require assistance regarding an unassigned ID, please contact support. |
| Log Message | The actual text content of the log message. When searching this field, words that are entered in the search box must appear in the log message text. Log messages are displayed with alternating background shading to aid readability. |
| Acknowledgment | A note entered by the user who acknowledged the log message and the date & time of acknowledgement. (See Acknowledgement Selected Logs button). |

Purge Logs Dialog

The Purge Logs dialog is displayed when the user attempts to remove logs from the log database.



Caution: Once purged, the log messages cannot be recovered, so be careful not to purge important log messages. Consider exporting logs before purging if in any doubt. Audit logs cannot be purged.



Note: Purging the logs removes the log information from the database but does not reduce its overall size.

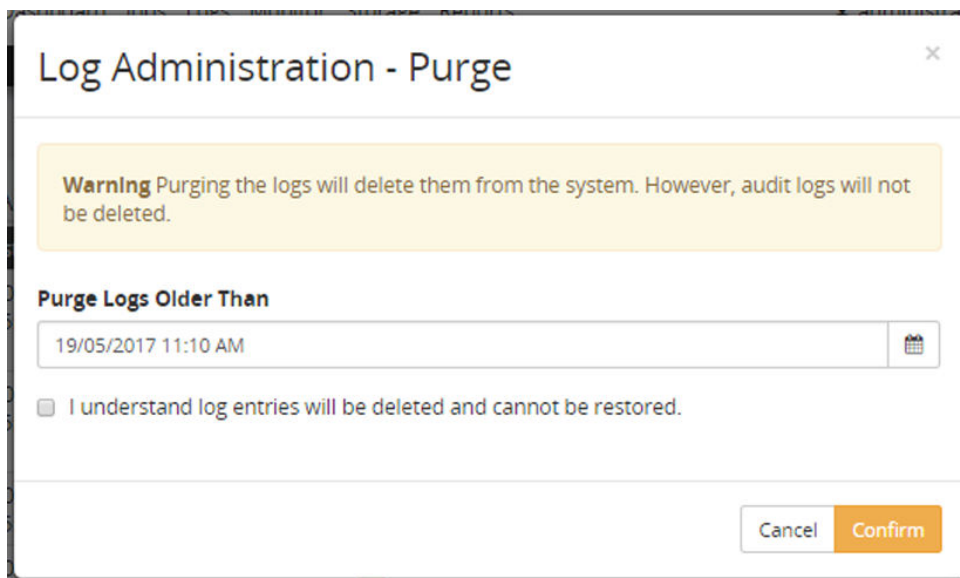


Figure 200 Purge Logs Dialog


| Control | Description |
|-----------------------------|---|
| Purge Logs Older Than | Specify the date and time, using the Date Time Picker (on page 346) , on and before which logs must originate for them to be deleted from the log database. Logs newer than this date and time will not be deleted. |
| I understand log entries... | As an interlock, this checkbox must be ticked in order to proceed with the purge operation. The Confirm button will not be enabled unless the checkbox is ticked. |

Log Purge Schedule

The Log Purge Schedule dialog is displayed when the user clicks on the Log Purge Schedule icon.

The Log Purse Schedule dialogs allows a user to enable or disable the automatic purging of logs. If enabled the user configures the maximum number of weeks logs are kept by for.

Figure 201 Log Purge Schedule Dialog

| Control | Description |
|--------------------------|---|
| Never | Disable automatic log purging. |
| Older than 13 weeks | Enable automatic log purging causing log messages which are older than, or become older than, the specified number of weeks to be permanently deleted. <div>  Note: Audit logs are not deleted. </div> |
| Acknowledgement checkbox | To enable the automatic purging feature, the user must acknowledge that purged logs are not recoverable. |

Acknowledge Logs Dialog

The Acknowledge Logs dialog is displayed when the user attempts to acknowledge a log message in the log database.

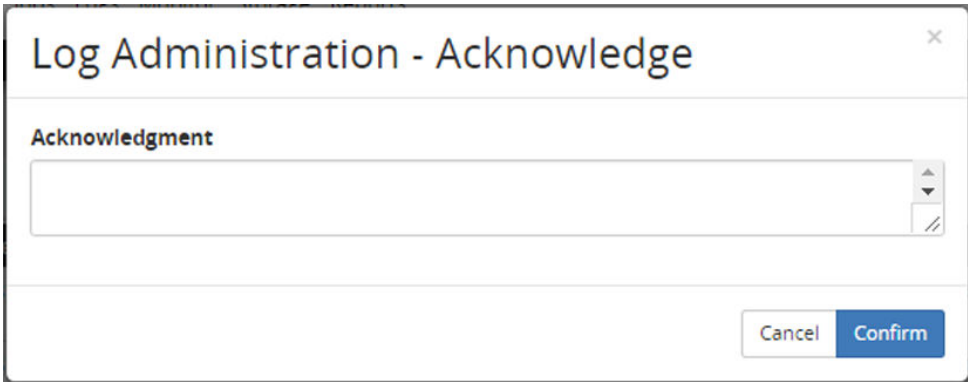


Figure 202 Acknowledge Logs Dialog

| Control | Description |
|----------------|--|
| Acknowledgment | Optional. Enter a short message that describes the action taken or reason for acknowledging the log. This will be appended with the date and time of acknowledgment upon confirmation. Drag the handle at the bottom right of the edit box to expand it. |

Export Logs Dialog

The Log Export dialog is displayed when the user clicks on the export icon on the Logs or Session page.



Note: Only logs currently displayed are exported. Ensure that you have the correct filters applied to the logs before exporting them.

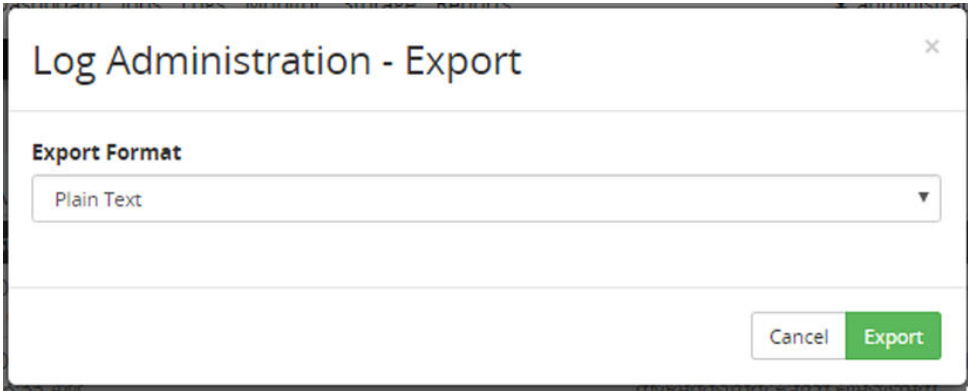


Figure 203 Export Logs Dialog

| Control | Description |
|---------------|--|
| Export Format | Select one of the following: <ul style="list-style-type: none"> ▪ HTML ▪ CSV ▪ Plain Text ▪ Plain Text with Attachments |
| Export | Click to begin the export process. The dialog will display progress of the export process and the export file will automatically be downloaded when ready. The export will be automatically downloaded even if the dialog is closed. |

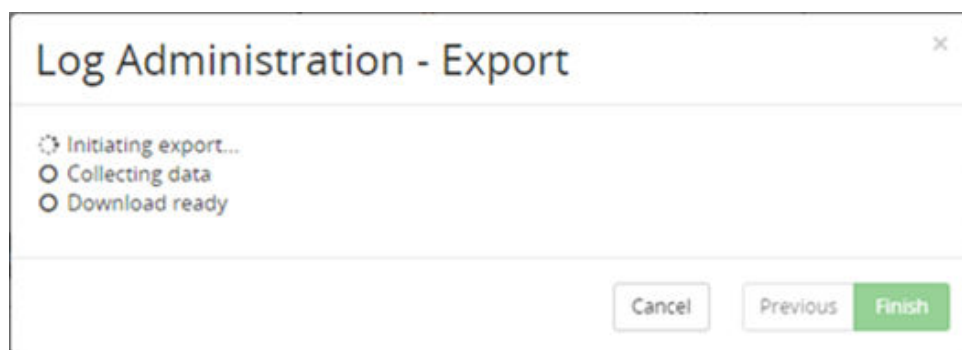


Figure 204 Export Logs Dialog – Export in progress

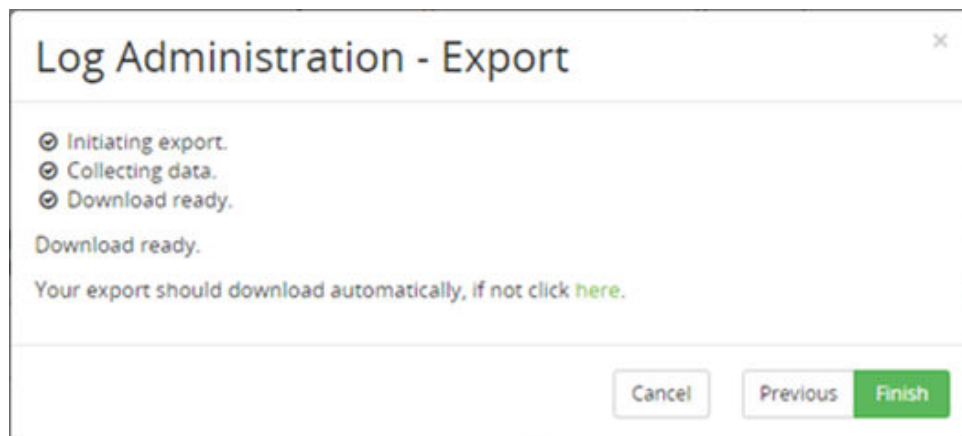


Figure 205 Export Logs Dialog - Export completed

Session Log Details



The Logs Session Details page is displayed when the user clicks on a Session icon in a log message.


A session contains all the logs related to a specific transaction or job. Log entries belonging to sessions are identified in the [Logs Inventory](#) (on page 448) by a Session icon. Several sessions can however be interleaved in the main Log, making it difficult to trace through a specific one, however all the logs from one specific session can be viewed on this page.

The screenshot shows the 'Logs - Session' interface. It has a top bar with a download icon. Below it are two panels: 'Summary' and 'Parameters'. The 'Summary' panel displays session details like Session ID, Start Date, End Date, Activity, and Resynchronization Type. The 'Parameters' panel lists Destination, Destination Store, Mover, Operation, Policy, and Source. Below these panels is a table of log entries with columns: Master Date, Actioned By, Actioned For, Category, Level, Log ID, and Log Message. To the right of the table is a 'Message' search bar and filter controls for 'Actioned By', 'Category', 'Level', and 'Acknowledgment'.

| Master Date | Actioned By | Actioned For | Category | Level | Log ID | Log Message |
|-----------------------|--------------|--------------|-------------------|-------|--------|--|
| 06/04/2020 3:17:52 PM | MyRepository | Client4 | Session | Info | 10841 | Fast incremental resynchronization session completed successfully |
| 06/04/2020 3:17:52 PM | MyRepository | Client4 | Repository | Info | 11324 | 'MyRepository' store 'Client4' 'Batch Rlesystem' 'Standard' snapshot 188 label 'repackackup' indexed true need resynchronization false |
| 06/04/2020 3:17:52 PM | MyRepository | Client4 | Repository | Info | 11566 | Fast incremental resynchronization for policy repackackup on 'Client4' to 'MyRepository Batch Rlesystem Standard' succeeded |
| 06/04/2020 3:17:52 PM | MyRepository | Client4 | Resynchronization | Info | 10933 | Completed a fast incremental resynchronization of 'Client4' to 'MyRepository Batch Rlesystem Standard' on 'Proxy2' |
| 06/04/2020 3:17:52 PM | Client4 | Client4 | Resynchronization | Info | 11177 | Transfer of 24,11 KB for fast incremental resynchronization of 'Client4' to 'Proxy2' 'MyRepository Batch Rlesystem Standard' |
| 06/04/2020 3:17:52 PM | Client4 | Client4 | Resynchronization | Info | 11175 | No file data requested for fast incremental resynchronization of 'Client4' to 'Proxy2' 'MyRepository Batch Rlesystem Standard' |
| 06/04/2020 3:17:52 PM | Client4 | Client4 | Resynchronization | Info | 11027 | Found no files with links |

Figure 206 Session Details

| Control | Description |
|---|--|
|  Export Session Logs | Exports the log database entries for the displayed session as a file, respecting the currently specified filter terms. The Export Logs Dialog (on page 455) is displayed prior to the logs being exported. |
| Summary | Provides summary information about the session. |
| Parameters | Identifies additional details for the session, where possible including, Source, Destination, Policy and Operation. |
|  Condensed View | Display a subset of the log fields in the session table. Green when selected, black when deselected. |

| Control | Description |
|---|--|
|  Extended View | Display all of the log fields in the session table. Green when selected, black when deselected. |
| Log Entry | Each log entry for the selected session appears in the session log table in descending time order, with the latest log displayed first. The log table is described in detail in Logs Inventory (on page 448) |
| Filter on Message | Filters the log table so that only logs containing the specified string in the Log Message field are displayed. |
| Filter on Actioned By | Filters the log table so that only logs relating to the specified node that performed the action are displayed. |
| Filter on Category | Filters the log table so that only logs of the specified Category are displayed. |
| Filter on Log Level | Filters the log table so that only logs of the specified Level and above are displayed. |
| Filter on Acknowledgement | Filters the log table so that only acknowledged or unacknowledged logs are displayed. |

Log Attachments Dialog

The Log Attachments dialog is displayed when the user clicks on the attachment icon for a log message.

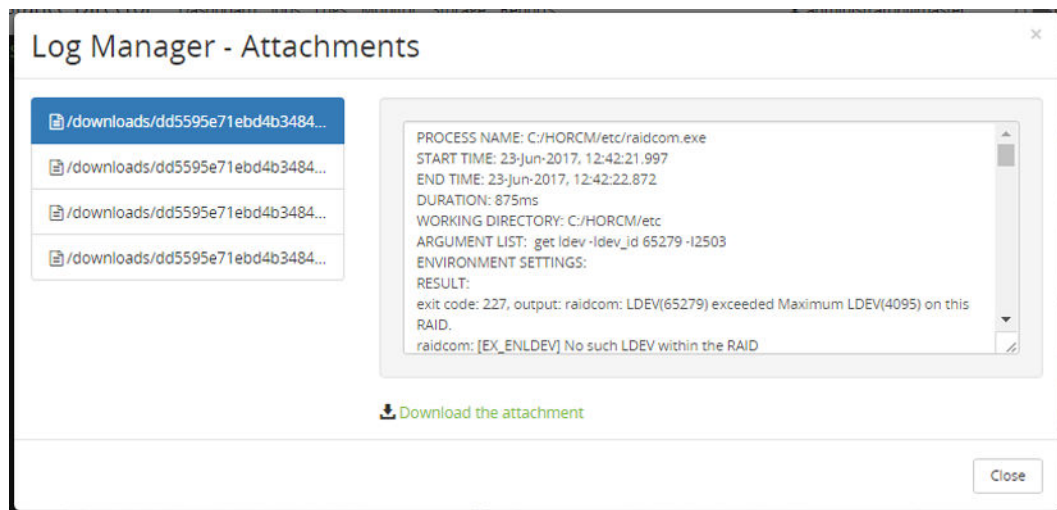



Figure 207 Log Manager - Attachments Dialog

| Control | Description |
|---|---|
| Attachment File Name | Each attachment is selected by clicking the buttons down the left side of the dialog. |
| Attachment text | The attachment text for the selected attachment is displayed in a text box to the right. |
|  Download the attachment | Click here to download the selected attachment as a .txt file. A tool tip is displayed indicating where the file will be downloaded. The download location may be configured via your browser. Your browser may prompt you when the file has downloaded and enable you to open it in a text editor. |

Monitor UI Reference

This section describes the Monitor UI, accessed via the [Main Banner \(on page 278\)](#).

For further information, refer to:

- [Monitor Concepts \(on page 108\)](#)
- [Monitor Tasks \(on page 256\)](#)

Monitor Inventory

The Monitor Inventory lists all data flows which have been activated.

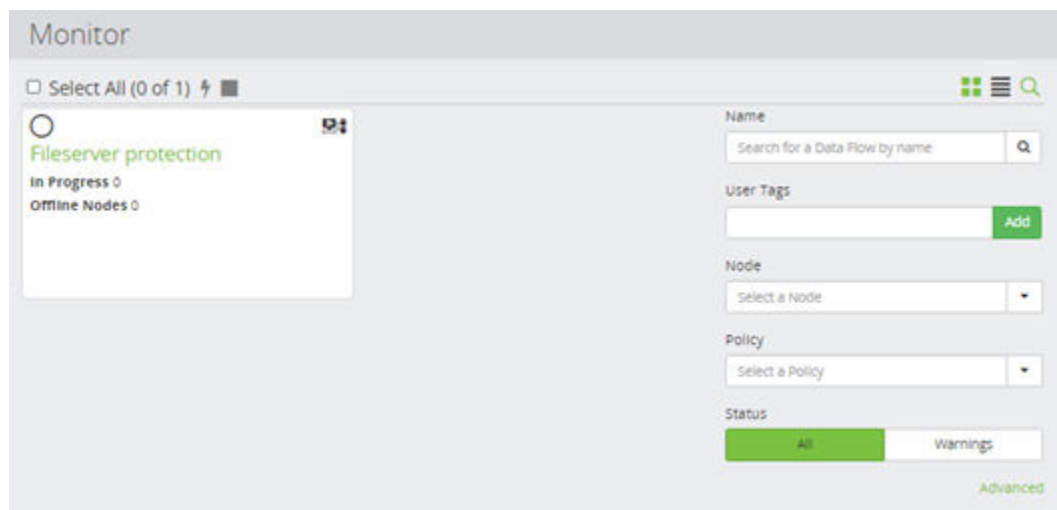






Figure 208 Monitor Inventory

| Control | Description |
|--|--|
|  Deactivate | <p>Enabled only when one or more data flows are selected. Deactivates the selected data flows.</p> <div>  Caution: If the data flow contains hardware storage based operations, this will remove the pairing relationships. </div> |
|  Data Flow | <p>Click on the data flow name to open the Monitor Details (on page 460) for the selected data flow. If the data flow is in a warning state (e.g. a replication is paused or swapped, or the storage array is in an unexpected state), then a warning icon () will be displayed here.</p> |
| Filter on Data Flow Name | Filters the displayed data flows based on the data flow name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node | Filters the displayed data flows based on the node name. |
| Filter on Policy | Filters the displayed data flows based on the policy name. |
| Status | Filter the displayed data flows based on the Status. It is possible to display All data flows or just the data flows with Warnings. |

Monitor Details

This page displays the details of an active Data Flow and enables you to monitor activities.

The Monitor Details page is split into several areas:

- Active Data Flow and Status Badges
- Context sensitive details dependent on what is selected on the data flow including:
 - Applied Policies
 - Summary information
 - Node details
 - Network/Cache Utilization
 - Mover status
 - Linked Records for hardware operations
 - Jobs relating to the selected node(s)
 - Job Details
 - Logs relating to the selected node(s)

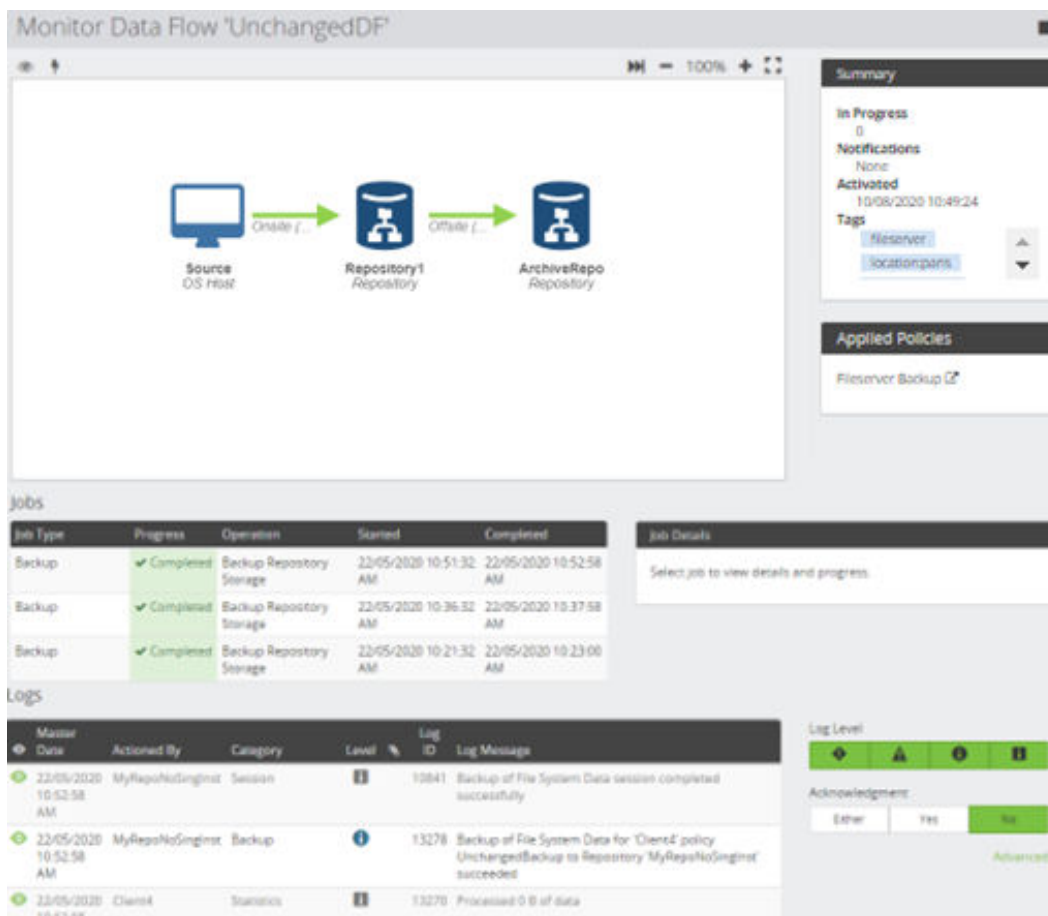


Figure 209 Monitor Data Flow Details Page (shown here with an OS Host node selected)

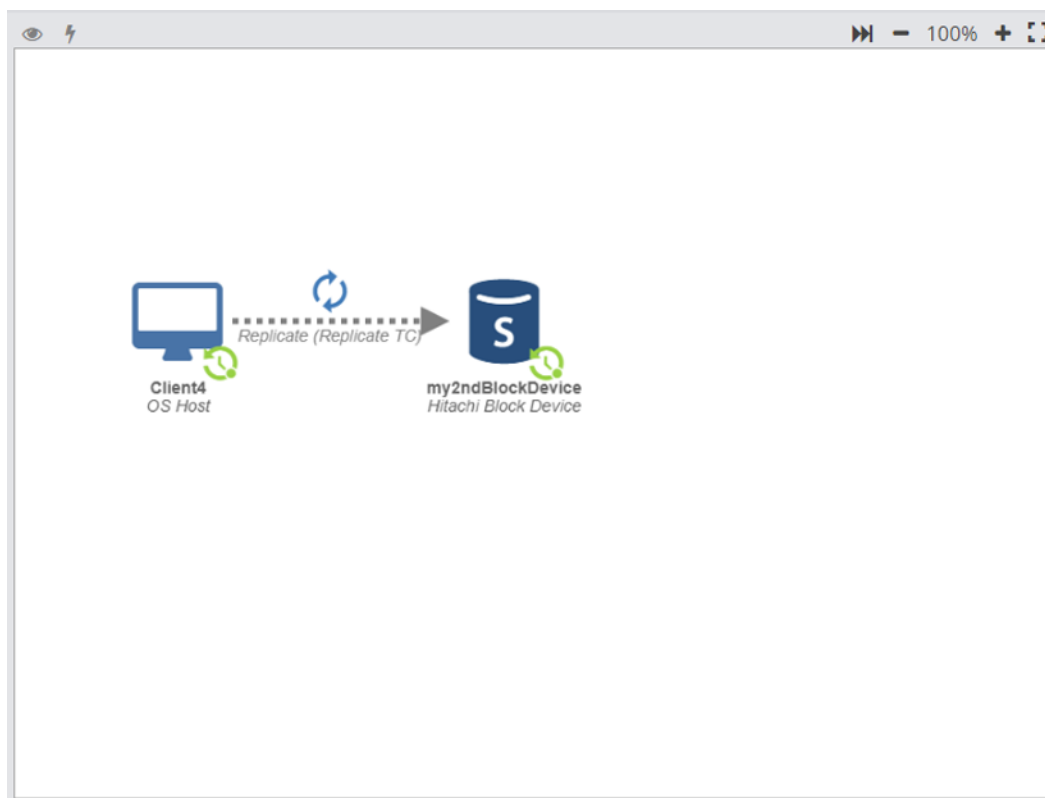


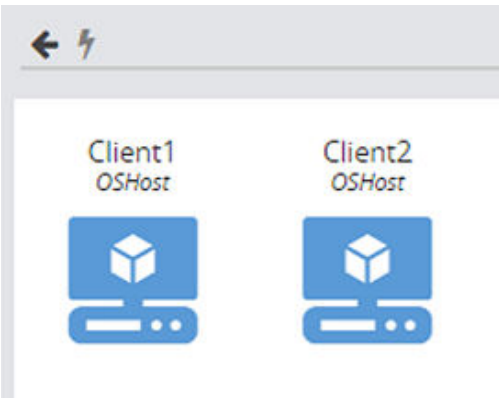














Figure 210 Active Data Flow Panel

| Control | Description |
|--|---|
|  Deactivate | Deactivates the data flow. The Monitor page is closed and the Monitor Inventory (on page 459) is displayed with the deactivated data flow removed from the inventory. To re-activate the data flow, locate it in the Data Flows Inventory (on page 350) and click Activate. |
|  View Group Nodes | <p>Displays the nodes within the selected node group and enables each node to be examined:</p>  <p>Click the  Back button to return to the data flow view.</p> |

| Control | Description |
|---|--|
|  Trigger Operation | Opens the Trigger Operation Dialog (on page 470) listing the available policy operations on the selected node. Selecting the required policy operation and clicking OK will instantly start the selected operation. |
|  Next Node | Click to move the focus to the next node on the data flow. |
|  Zoom In/Out | Click the buttons next to the workspace, press +/- on the keypad or hold down the CTRL key whilst using the mouse wheel to zoom in and out. The current zoom level is displayed between the zoom buttons. Click the zoom level to reset to 100% zoom. |
|  Fit to Screen | Click the button next to the workspace or press the HOME key to select a zoom level that allows the entire data flow to fit within the bounds of the workspace. |
|  Node | Select a node to view its details and current activity in the areas below and to the right. Source nodes, movers and destination nodes are represented by icons representing their type (see Node Type Icons (on page 580)). |
| Status Badge  (E.g.) | A status badge may be superimposed on a node, or above a mover, to indicate that the node is in a particular state. Refer to Monitor Status Badges (on page 470) for a description of each badge. Nodes that cannot be contacted by the master are displayed in red (either because no network connection can be made or because the Protector services are not running on the node). |
|  Snapshot Badge | A snapshot badge may be superimposed on a node (in the bottom right corner) to indicate that the node has a policy containing a snapshot operation applied to it. |
|  Connector | Connectors between node indicate the direction and type of mover: <ul style="list-style-type: none"> Batch mover  Continuous mover  Select a connector to view its details in the area to the right. A badge may be superimposed above a connector to indicate a particular state. Refer to Monitor Status Badges (on page 470) for a description of each badge. |

| Control | Description |
|---------|--|
| |  Note: For some replication data flows it is possible to swap the direction. The arrowhead on the monitor data flow connector does not change direction when the replication is swapped. |

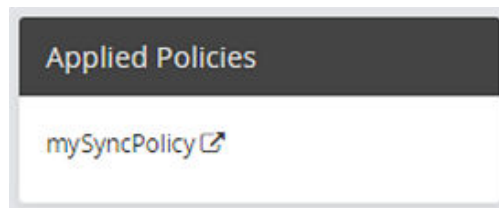



Figure 211 Applied Policies Panel (displayed when nothing is selected on the data flow)

| Control | Description |
|---|--|
| Policy Name  | Lists the policies applied on the data flow. Click the button at the end of the policy name to open the Policy Details (on page 658) in a separated browser tab. |

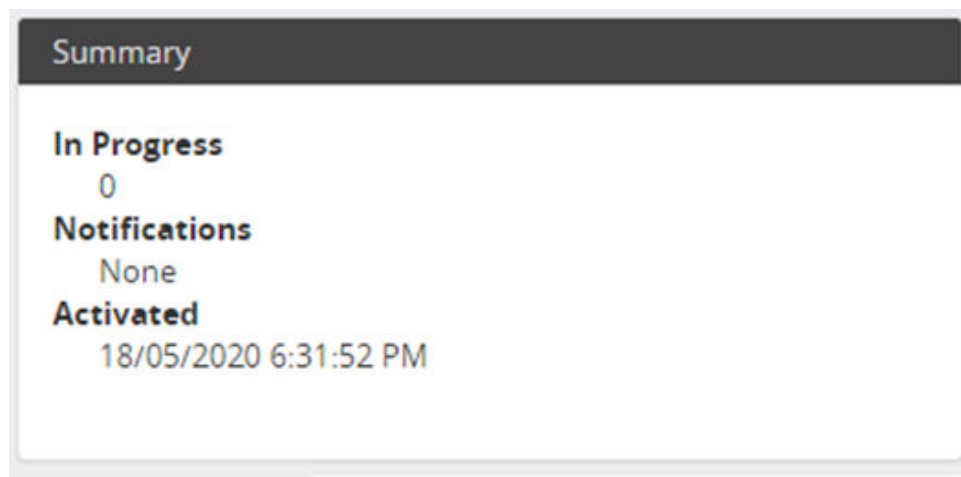


Figure 212 Summary Panel (displayed when nothing is selected on the data flow)

| Control | Description |
|-------------|---|
| In Progress | Indicates the number of jobs in progress. |

| Control | Description |
|---------------|---|
| Notifications | A list of notifications relating to the data flow. If the data flow is in a warning state (e.g. a replication is paused or swapped, or the storage array is in an unexpected state), then a warning icon (⚠) will be displayed alongside the notification text. |
| Activated | Shows the date and time the data flow was activated. |

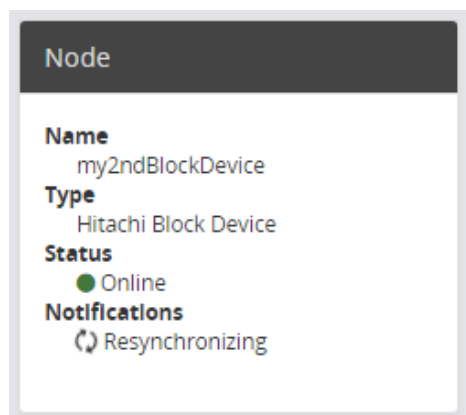


Figure 213 Node Panel (displayed when an OS Host or Repository node is selected)

| Control | Description |
|---------------|--|
| Name | The node name. |
| Type | The node type. |
| Status | Whether the node is online or offline. |
| Notifications | A list of notifications relating to the node. If the node on the data flow displays a status badge it will only show the highest priority notification, whereas this field will indicate all status notification (see Monitor Status Badges (on page 470)). |

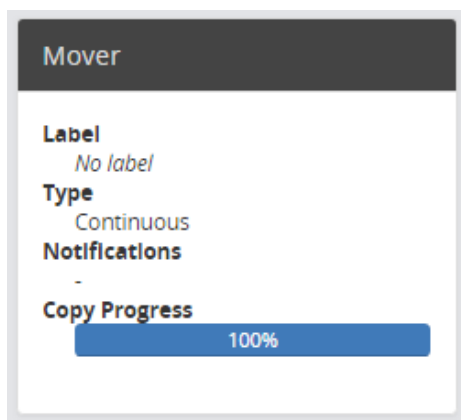


Figure 214 Mover (displayed when a mover is selected)

| Control | Description |
|---------------|--|
| Label | The user defined mover label text. |
| Type | The mover type. |
| Notifications | A list of notifications relating to the mover. If the mover on the data flow displays a status badge it will only show the highest priority notification, whereas this field will indicate all status notification (see Monitor Status Badges (on page 470)). |
| Copy Progress | Displayed only for block hardware replications. Indicates the concordance between the source and destination. |

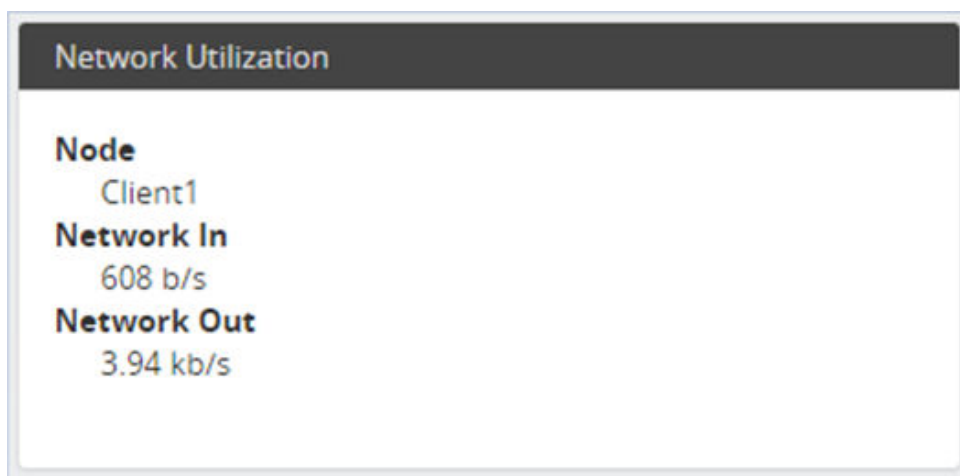


Figure 215 Network/Cache Utilization Panel (displayed when an OS Host node is selected)

| Control | Description |
|-------------|---|
| Node | Name of the node currently selected in the active data flow panel. |
| Network In | Shows the incoming network traffic for the node currently selected in the data flow. |
| Network Out | Shows the incoming and outgoing network traffic for the node currently selected in the data flow. |

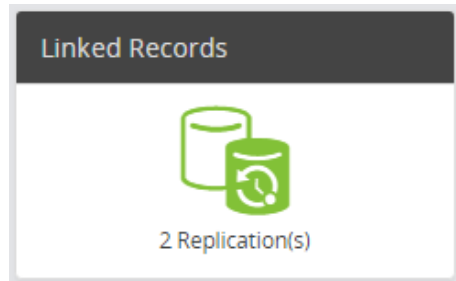



Figure 216 Linked Records Panel (displayed when an Hitachi Block Device destination node is selected)

| Control | Description |
|---|---|
|  Replication(s) | Click this button to open the Hitachi Block Replications Inventory (on page 777) showing replications relating to the selected Hitachi Block Device node. |

| Jobs | | | | |
|----------|-------------|--------------|---------------------|---------------------|
| Job Type | Progress | Operation | Started | Completed |
| Restore | ✓ Completed | Restore Data | 28/06/2018 11:17:52 | 28/06/2018 11:17:52 |
| Restore | ✓ Completed | Restore Data | 28/06/2018 11:16:13 | 28/06/2018 11:16:13 |
| Restore | ✓ Completed | Restore Data | 28/06/2018 11:14:50 | 28/06/2018 11:14:50 |

Figure 217 Jobs Panel (shows all jobs relating to the data flow or jobs relating to the selected node)

| Control | Description |
|---------|--|
| Jobs | Lists the jobs relating to the node currently selected in the data flow. Refer to Jobs Inventory (on page 441) for a description of the controls displayed in this area. |

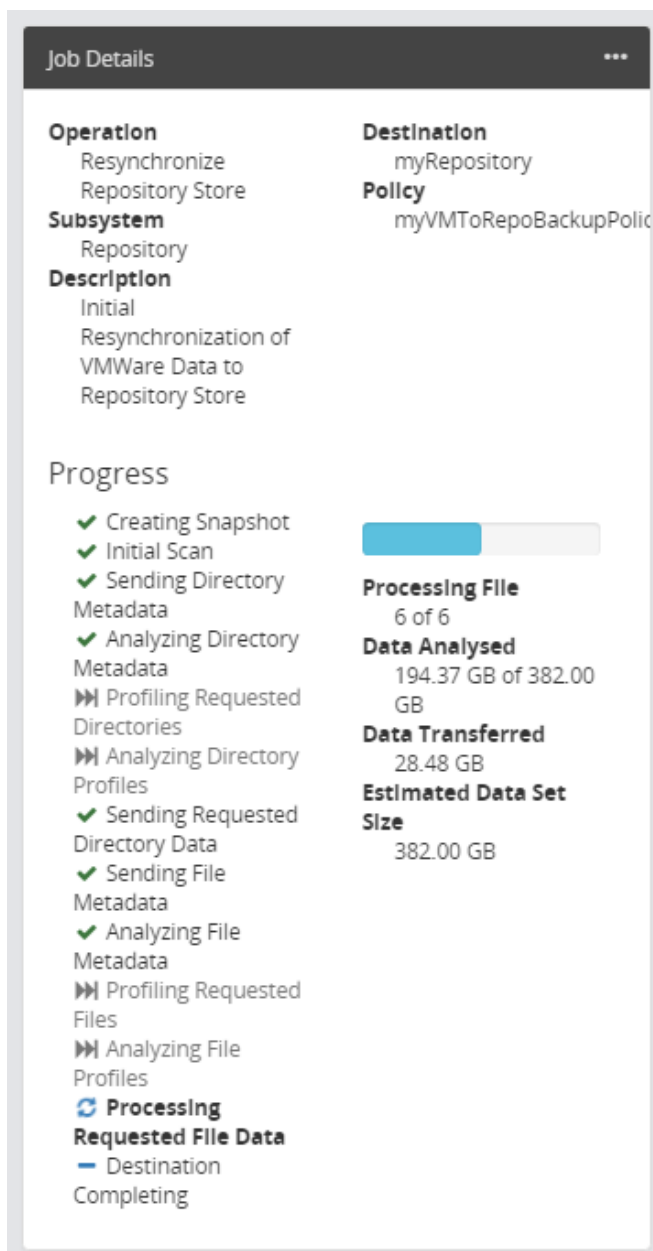








Figure 218 Job Details Panel (shows details of the selected job in the Jobs list.)


| Control | Description |
|---|--|
|  More Actions | <p>Only enabled if the selected job is actionable. A menu appears with the available actions listed which can include:</p> <ul style="list-style-type: none"> Cancel - <i>Restore, Resync and Software Update</i> jobs. Pause - <i>Replication</i> jobs. Resume- <i>Replication</i> jobs. |

| Control | Description |
|----------|---|
| Progress | Each step of the job is listed along with an icon indicating the status of that step. |

Table 28 Job Details Step Progress Icons

| Progress Icon | Description |
|---|------------------|
|  | Step is pending |
|  | Step in progress |
|  | Step succeeded |
|  | Step failed |
|  | Step skipped |

Logs

| Master | Date | Actioned By | Category | Level | Log ID | Log Message |
|---|---------------------|---------------|-----------------|---|--------|---|
|  | 28/06/2018 12:08:34 | myBlockDevice | Storage Handler |  | 12371 | Unlocked resource meta_resource on myBlockDevice (210613), lock released after 01s |
|  | 28/06/2018 12:08:32 | myBlockDevice | Storage Handler |  | 12375 | Locked resource meta_resource on myBlockDevice (210613), lock acquired after 926ms |
|  | 28/06/2018 12:08:00 | myBlockDevice | Storage Handler |  | 12371 | Unlocked resource meta_resource on myBlockDevice (210613), lock released after 01s |
|  | 28/06/2018 12:07:58 | myBlockDevice | Storage Handler |  | 12375 | Locked resource meta_resource on myBlockDevice (210613), lock acquired after 919ms |
|  | 28/06/2018 12:07:56 | myBlockDevice | Storage Handler |  | 12608 | Block record deletion requested (see attachment for details) *** Attachment count: 1 *** |

Log Level


Acknowledgment
☐ Either ☐ Yes ☒ No

Figure 219 Logs Panel (shows all logs relating to the data flow or logs relating to the selected node)

| Control | Description |
|--------------------------|--|
| Logs | Lists the logs relating to the node currently selected in the data flow. Refer to Logs Inventory (on page 448) for a description of the controls displayed in this area. |
| Filter on Log Level | Displays logs based on the selected Log Level. By default only Error level logs are displayed for more details select a lower log level option. |
| Filter on Acknowledgment | Displays logs based on the acknowledgment state. |

Trigger Operation Dialog

This dialog is displayed when a policy operation is manually triggered.

Figure 220 Trigger Operation Dialog

| Control | Description |
|-----------------------|--|
| Policy Operation List | Select the name of the policy and operation that you want to trigger. |
| Filter | Allows the displayed triggers to be filtered by node, policy or operation. |
| Additional User Tags | Add the tags to be associated with the object being created. |

Monitor Status Badges








Status badges are displayed on a node or mover to indicate an operating state, warning or error condition. Select the node or mover to view its status.



Note: Status badges reflect Protector's view of system state and may not concur with the underlying hardware state. For example, a batch replication will be paused by the storage device whenever it is within RPO and periodically unpaused while being re-evaluated due to the RPO being reached. These external pause/unpause states will not be indicated on the [Monitor Details \(on page 460\)](#) data flow. However, if the same replication is paused by the user from within Protector, then the paused state will be indicated.

Status badges are displayed in priority order on the [Monitor Details \(on page 460\)](#) data flow. When multiple status notifications exist simultaneously only the highest priority is shown. To see all notifications, select the node or mover in question and review the notifications in the associate node or mover panel adjacent to the data flow panel.

Table 29 Monitor Status Badges

| Priority | Badge | State |
|----------------|---|--|
| N/A |  | Disconnected Node - Displayed when a node has gone offline. |
| 1 (Highest) |  | Error - Displayed on a node or mover if it is in an error state. |
| 2 |  | Warning - Displayed on a node or mover if it is not in the expected state. |
| 3 |  | Paused - Displayed on a mover when a replication has been paused within Protector. |
| 4 |  | Swapped - Displayed on a mover when a replication has been swapped within Protector. |
| 5 |  | Resynchronizing - Displayed on a mover when (re)synchronization or replication re-evaluation is in progress. |
| =5 |  | Restoring - Displayed on a node that is restoring data. |

Node Groups UI Reference

This section describes the Node Groups UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [Node Concepts \(on page 50\)](#)
- [Node Tasks \(on page 257\)](#)
- [Nodes UI Reference \(on page 476\)](#)

Node Groups Inventory

This inventory lists all defined Node Groups.

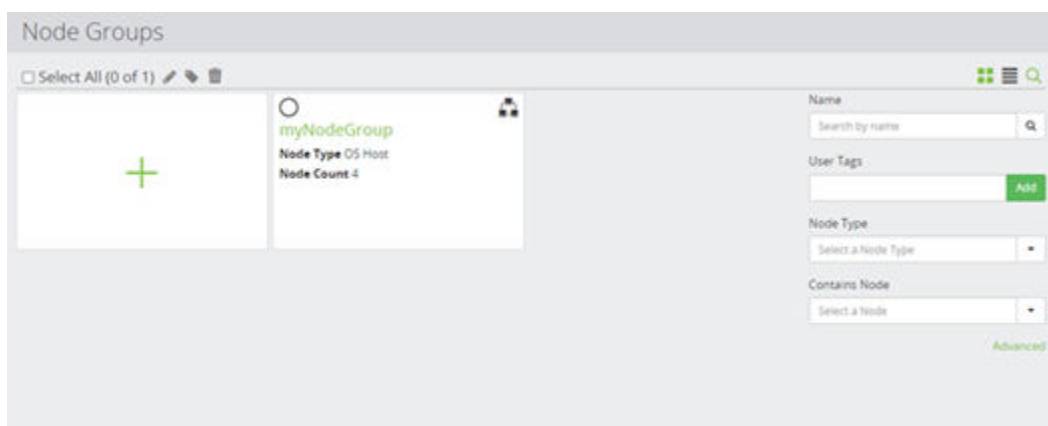






Figure 221 Node Groups Inventory

| Control | Description |
|--|---|
|  Edit Tags | Edits an existing node group in the inventory. The Node Group Wizard (on page 472) is launched to enable the group's attributes to be changed. |
|  Delete Node | Enabled only when one or more Node Group is selected. Deletes the selected item from the inventory. The associated Nodes are not deleted. |
|  Create a new item | Creates a new Node Group. The Node Group Wizard (on page 472) is launched to guide you through the process. |
|  User defined Node Group(s) | Any number of user defined Node Groups can be created. These are displayed in the inventory. Click on the node group name to open the Node Group Details (on page 475) which enables the group to be viewed and edited. |
| Filter on Name | Filters the displayed results based on Node Name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node Type | Filters the displayed results based on Node Type. |
| Filter on Contains Node | Filters the displayed results to groups that contain the node entered. |

Node Group Wizard

This wizard is launched when a new Node Group is added to the Node Groups Inventory.

Create Node Group

Specify name and description

Name

I

Description

Tags

Add

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Cancel Previous Next

Figure 222 Node Group Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | Enter the name of the node group. |
| Description | Optional. Enter a description of the node group. |
| Tags | Add the tags to be associated with the object being created. |

The screenshot shows a window titled "Create Node Group". Inside, there's a section titled "Specify Node Group type". This section contains two dropdown menus. The first is labeled "Node Type" and has the text "Select Node Type" with a downward arrow. The second is labeled "Operating System" and has the text "Select Operating System" with a downward arrow. At the bottom right of the window, there are three buttons: "Cancel", "Previous", and "Next". The "Next" button is highlighted in green.

Figure 223 Node Group Wizard - Specify Node Group Type

| Control | Description |
|------------------|---|
| Node Type | Specifies the node type that this group will contain. Only node types that can have a common policy assigned are available. |
| Operating System | If the <i>OS Host</i> node type is selected then this control is enabled so that a specific operating system can be selected. |

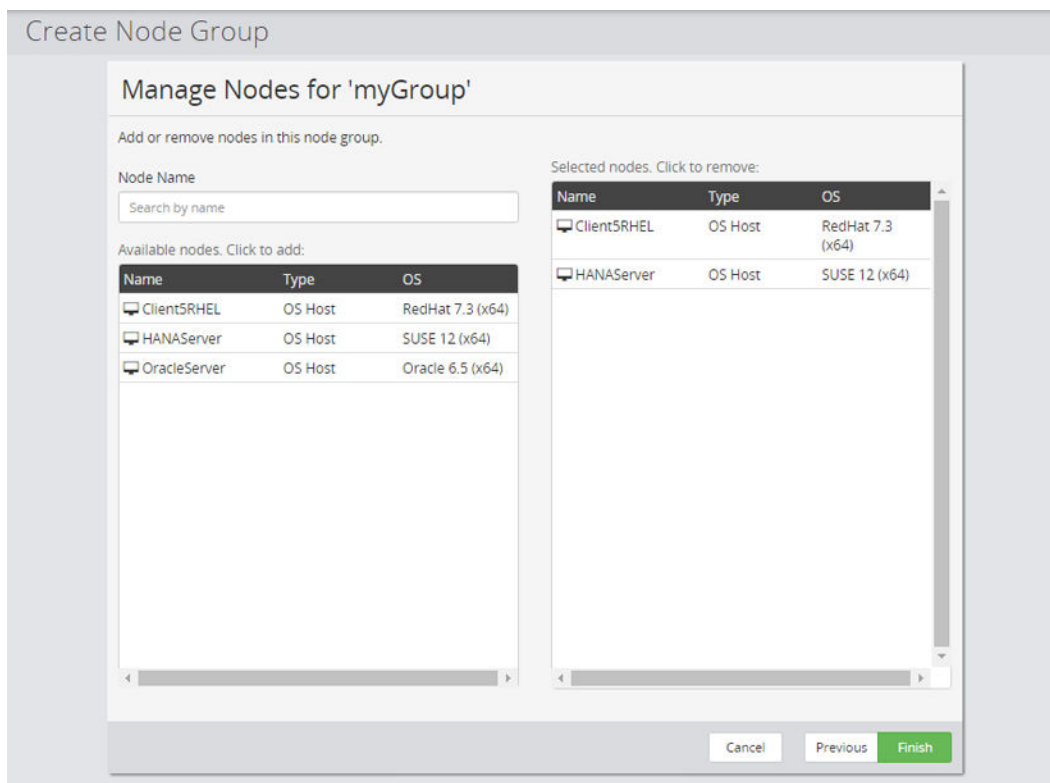


Figure 224 Node Group Wizard - Manage Nodes

| Control | Description |
|-----------------|---|
| Node Name | Filters the list of nodes displayed below by name. |
| Click to add | Lists all available nodes of the specified type. Click on the name of the node you want to add to this node group. |
| Click to remove | Lists all the nodes currently in this group. Click on the name of the node you want to remove from this node group. |

Node Group Details

This page displays the details of a Node Group and enables you launch the wizard to edit them.

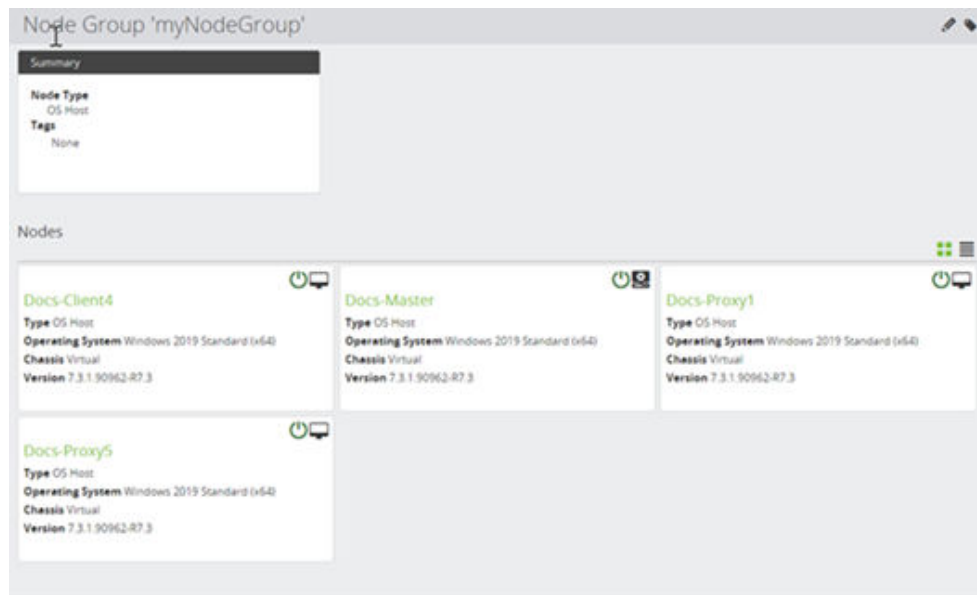





Figure 225 Node Group Details

| Control | Description |
|--|---|
|  Edit | Launches the Node Group Wizard (on page 472) to enable you to view and edit the node group. |
|  Tag | Modifies the tags of an existing object from either the inventory screen or the details screen of the object. |
|  Nodes in group | Click the node name to open the Node Details (on page 574) to enable you to view the node's status and details. |

Nodes UI Reference

This section describes the Nodes UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

Nodes Inventory

This inventory lists all the nodes in a Protector network, be they online, offline, authorized or deauthorized.

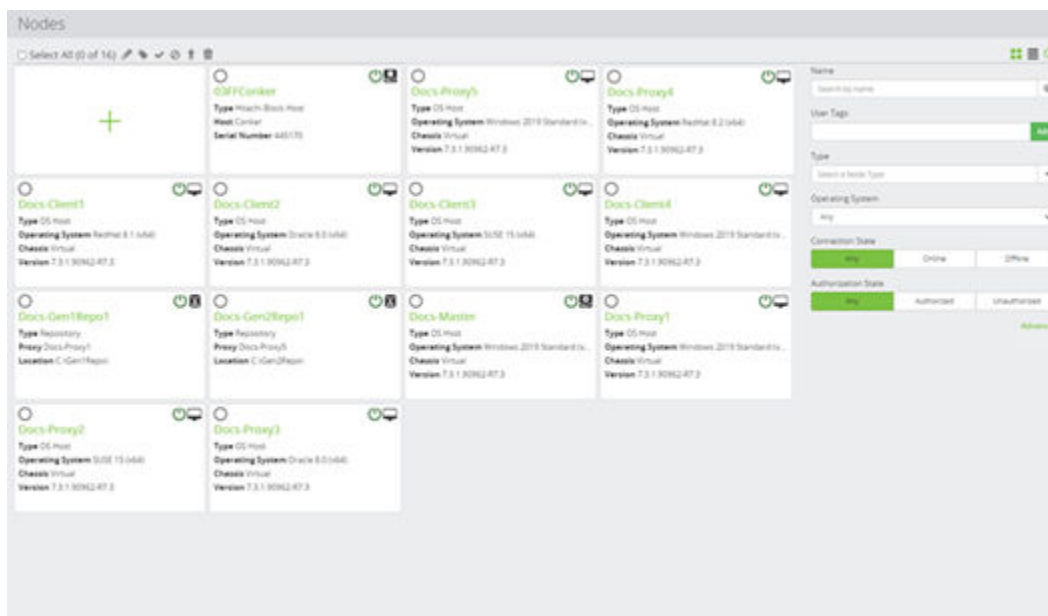















Figure 226 Nodes Inventory

| Control | Description |
|--|--|
|  Edit | Edits an existing node in the inventory. The Node Type Wizard (on page 479) is launched to enable the node's attributes to be changed. |
|  Edit Tags | Modifies the tags of an existing object from the either the inventory screen or the details screen of the object. |
|  Authorize | <p>Enabled only if one or more unauthorized nodes is selected in the inventory. Attempts to authorize the selected nodes with the Master node. Only nodes that have been authorized by the Master node may perform Protector functions.</p> <div>  Note: If an attempt is made to authorize an inactive or unknown node, or if the master node fails to communicate with the node, an error log is generated and the node remains unauthorized. </div> |
|  Deauthorize | Enabled only if one or more authorized nodes is selected in the inventory. Attempts to deauthorize the selected nodes. Nodes that have been deauthorized cannot perform Protector functions. |

| Control | Description |
|---|---|
| | <p> Note:</p> <ul style="list-style-type: none"> Before deauthorizing nodes that are no longer required, they must first be deleted from the current data flow definitions, then any modified active data flows must be reactivated. If any attempt is made to deauthorize a node that is implementing rules in the currently active data flows, an error message is generated for each such node and the node remains authorized. It is possible to de-authorize a node with active mounts. This should be avoided because once de-authorized it is not possible to unmount. |
|  Upgrade Clients | <p>Enabled only if one or more authorized nodes is selected in the inventory. Attempts to remotely upgrade the Protector software installed on the selected nodes. The required upgrade installer and configuration files must be present in the C:\Programs Files \Hitachi \Protector\runtime\updater folder on the Master node.</p> <p> Note:</p> <ul style="list-style-type: none"> Only <i>OS Host</i> nodes can be upgraded. It is recommended to upgrade nodes in batches of 20. It is recommended to manually upgrade the master node. |
|  Delete | <p>Enabled only if one or more nodes is selected in the inventory. The node is deleted from the inventory.</p> <p> Note: If an <i>OS Host</i> node is still running the Protector hub process and is configured to use the current <i>Master</i> node, then the node will re-appear as an unauthorized node as it periodically reconnects to the <i>master</i> node. Protector should be uninstalled from the node to stop this periodic reconnection.</p> |
|  Create a new item | <p>Adds a new node to the inventory. The Node Type Wizard (on page 479) is launched to guide you through the process.</p> |
| Existing Node(s) | <p>Nodes on which Protector has been installed are automatically detected and listed here along side those that have been added by the user. The Node Details (on page 574) is displayed to enable the node's details to be viewed and edited.</p> |

| Control | Description |
|---|---|
| |  Note: <ul style="list-style-type: none"> ▪ DHCP renewal can cause temporary disconnection of a node. ▪ If the host of a virtual machine(s) creates a Windows restore point, then the virtual machine(s) can temporarily disconnect. ▪ If a node has been assigned to another master, it will not appear in the inventory. |
|  Filter on Node Name | Filters the displayed results based on Node Name. |
| Filter on User Tags | Filters the displayed results based on Tags contained in the data flow. |
| Filter on Node Type | Filters the displayed results based on Node Type. |
| Filter on Operating System | Filters the displayed results based on Operating System. |
| Filter on Connection State | Filters the displayed results based on Connection State. |
| Filter on Authorization State | Filters the displayed results based on Authorization State. |

Node Type Wizard

This wizard is launched when a new Node is added to or edited in the Nodes Inventory.

Nodes can be created to represent subsystems that interact with Protector. Data from these systems can then be integrated into the usual Protector workflow.

Authorization will fail if the supplied configuration is invalid. To alter the configuration, edit the node's settings. Any changes will come into effect the next time data flows using the node are reactivated.



Note: Node names are limited to a maximum of 64 characters.

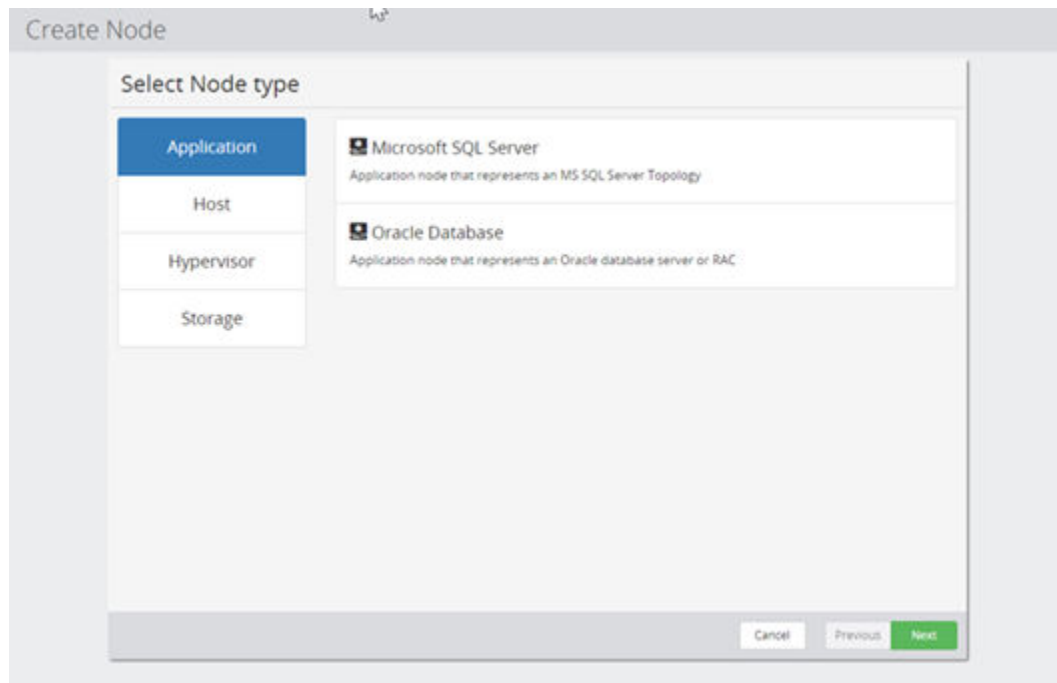




Figure 227 Node Type Wizard - Application

| Control | Description |
|--|---|
|  Microsoft SQL Server | Creates an application node representing Microsoft SQL Server . The Microsoft SQL Server Node Wizard (on page 484) is launched to guide you through the process. |
|  Oracle Database | Creates an application node representing an Oracle database server or RAC. The Oracle Application Node Wizard (on page 487) is launched to guide you through the process. |

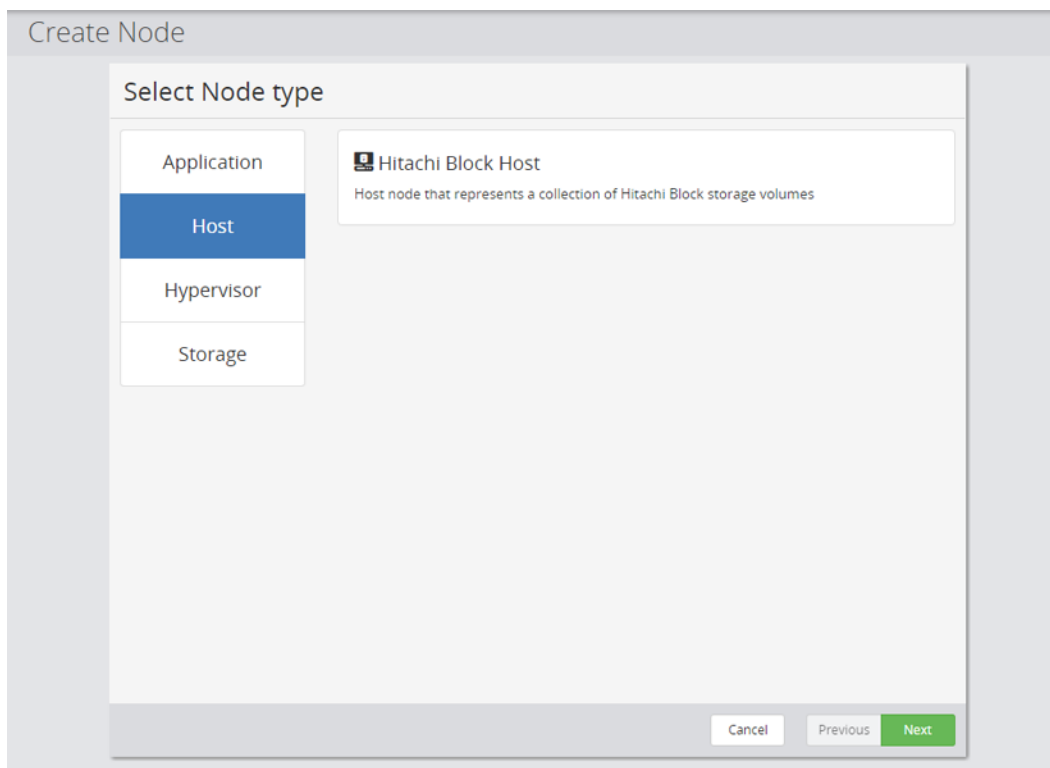



Figure 228 Select Node Type Wizard - Host

| Control | Description |
|---|--|
|  <p>Hitachi Block Host</p> | <p>Creates a host node that represents a number of Hitachi Block Storage volumes. The Hitachi Block Host Node Wizard (on page 494) is launched to guide you through the process.</p> |

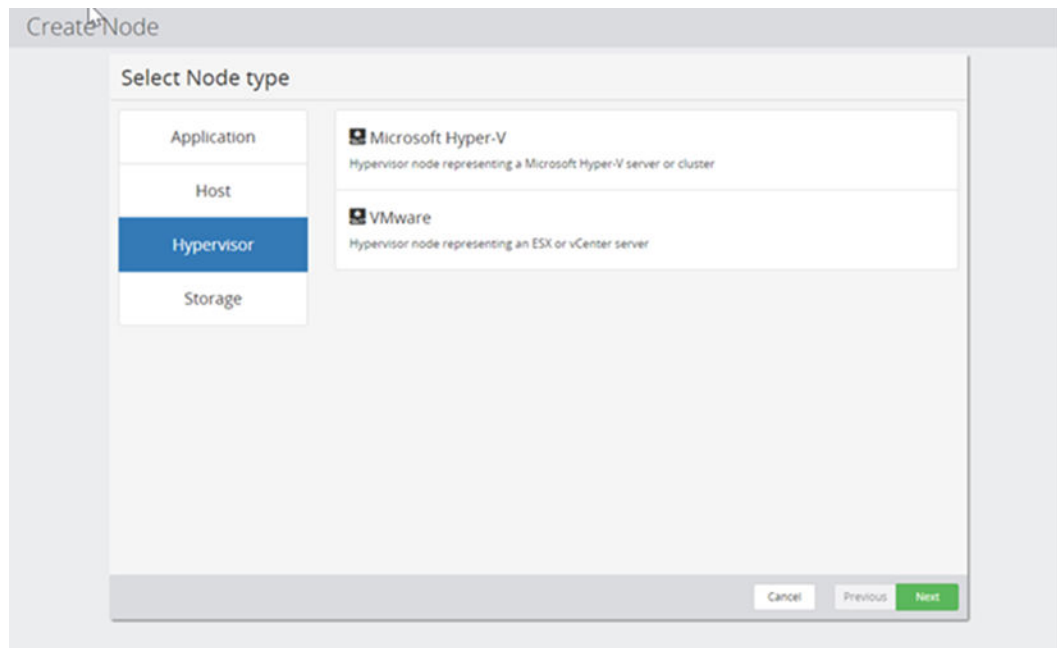




Figure 229 Select Node Type Wizard - Hypervisor

| Control | Description |
|--|---|
|  Microsoft Hyper-V | Creates a hypervisor node Microsoft Hyper-V. The Hyper-V Node Wizard (on page 500) is launched to guide you through the process. |
|  VMware | Creates a hypervisor node representing ESX or VCenter. The VMware Node Wizard (on page 505) is launched to guide you through the process. |

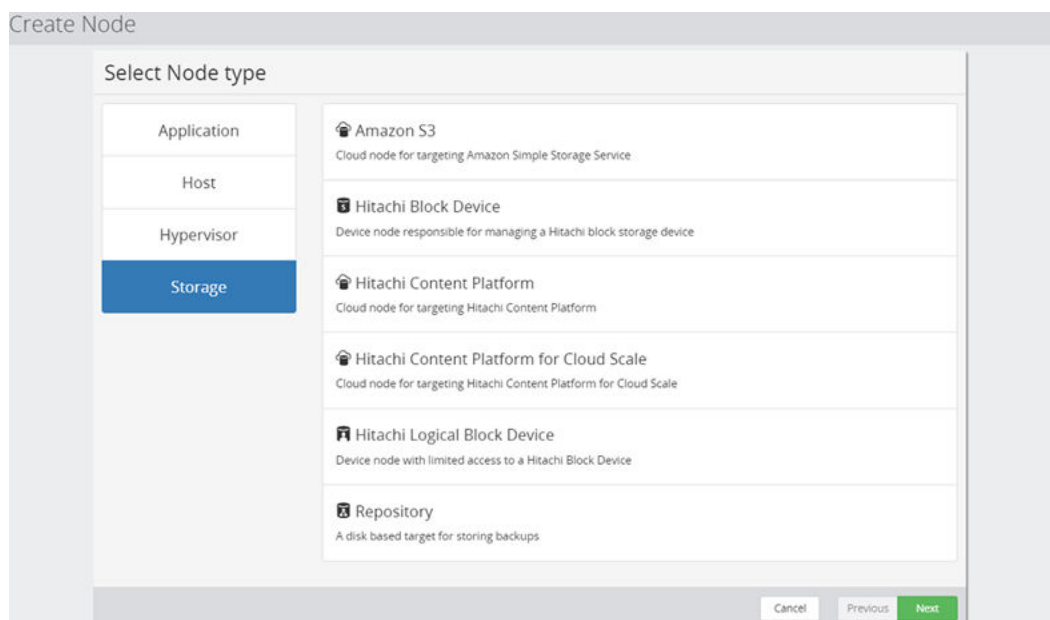







Figure 230 Select Node Type Wizard - Storage

| Control | Description |
|---|---|
|  Amazon S3 | Creates a storage node responsible for managing an Amazon SimpleStorage Service backup. The Amazon S3 Storage Node Wizard (on page 565) is launched to guide you through the process. |
|  Hitachi Block Device | Creates a device node responsible for managing a Hitachi Block device. The Hitachi Block Device Node Wizard (on page 513) is launched to guide you through the process. |
|  Hitachi Content Platform | Creates a storage node for targeting Hitachi Content Platform. The Hitachi Content Platform Storage Node Wizard (on page 530) is launched to guide you through the process. |
|  Hitachi Content Platform for Cloud Scale | Creates a storage node for targeting Hitachi Content Platform for Cloud Scale. The Amazon S3 Storage Node Wizard (on page 565) is launched to guide you through the process. |
|  Hitachi Logical Block Device | Creates a device node with limited access to a Hitachi Block device. The Hitachi Logical Block Device Node Wizard (on page 539) is launched to guide you through the process. |

| Control | Description |
|---|---|
|  Repository | Creates a disk based target for storing backups. The Repository Storage Node Wizard (on page 556) is launched to guide you through the process. |

Microsoft SQL Server Node Wizard

Protector will launch this wizard when a new Microsoft SQL Server node is added to the Nodes Inventory.

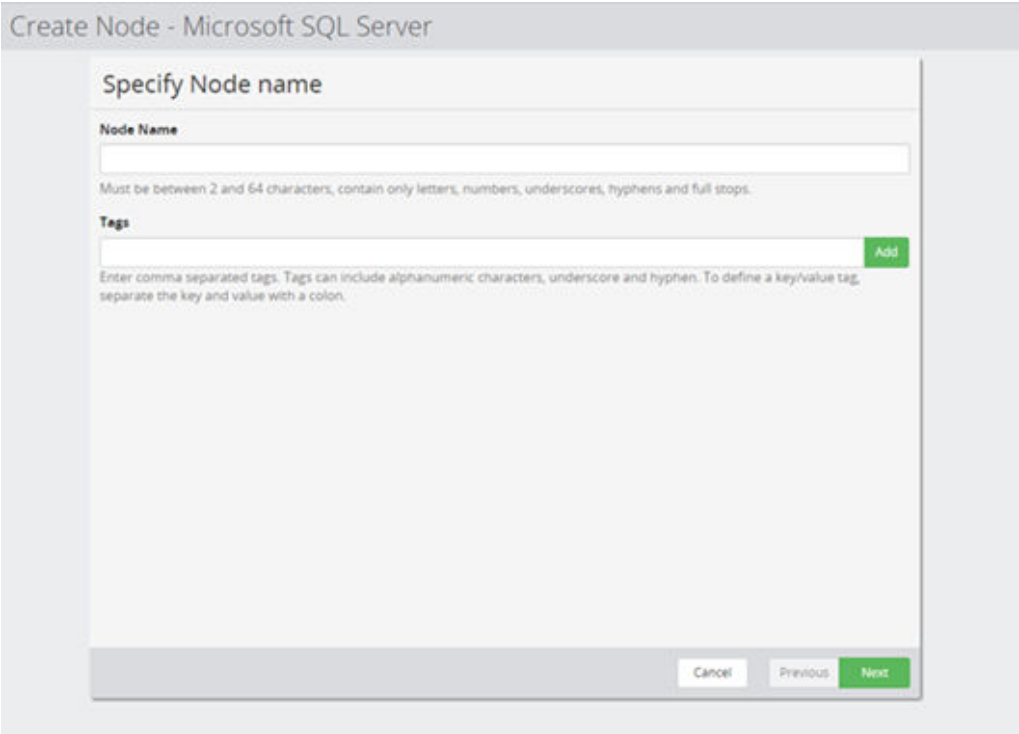


Figure 231 Microsoft SQL Node Wizard - Specify Node Name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the Microsoft SQL Server node. |
| Tags | Add the tags to be associated with the object being created. |

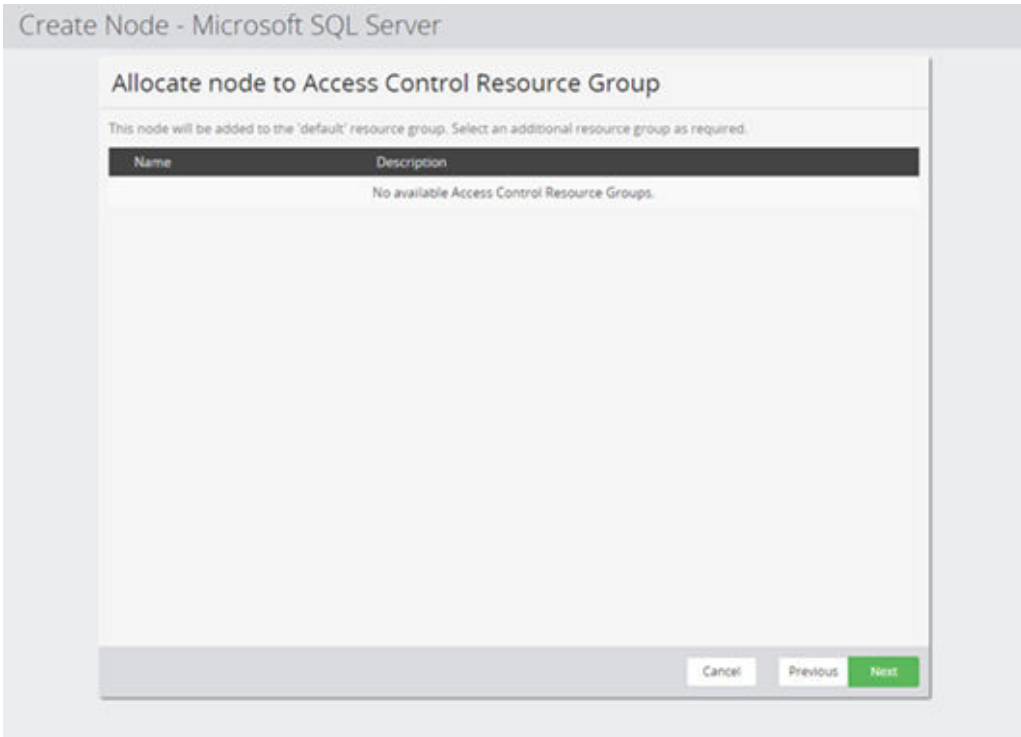


Figure 232 Microsoft SQL Node Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

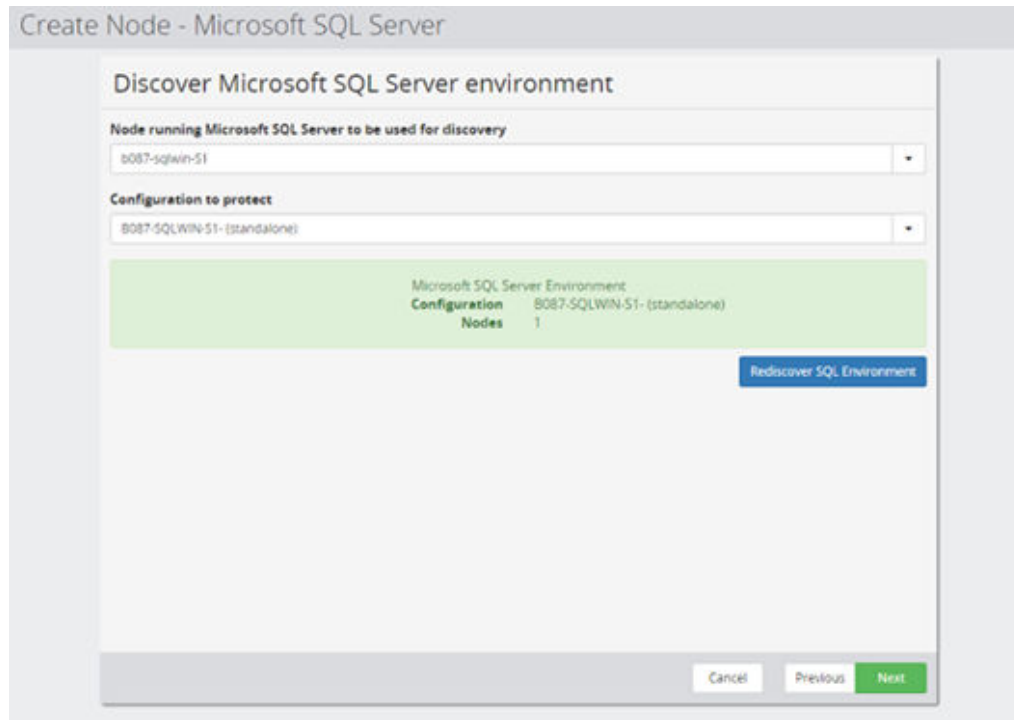


Figure 233 Microsoft SQL Node Wizard - Discover Microsoft SQL environment

| Control | Description |
|-----------------------------------|--|
| Node running Microsoft SQL Server | Select an OS Host node which is part of the Microsoft SQL Server standalone or cluster environment |
| Configuration to protect | Select the Microsoft SQL Server environment you want this node to represent. |
| Rediscover SQL Server Environment | Click in case you want to refresh the list of available SQL Server configurations. |

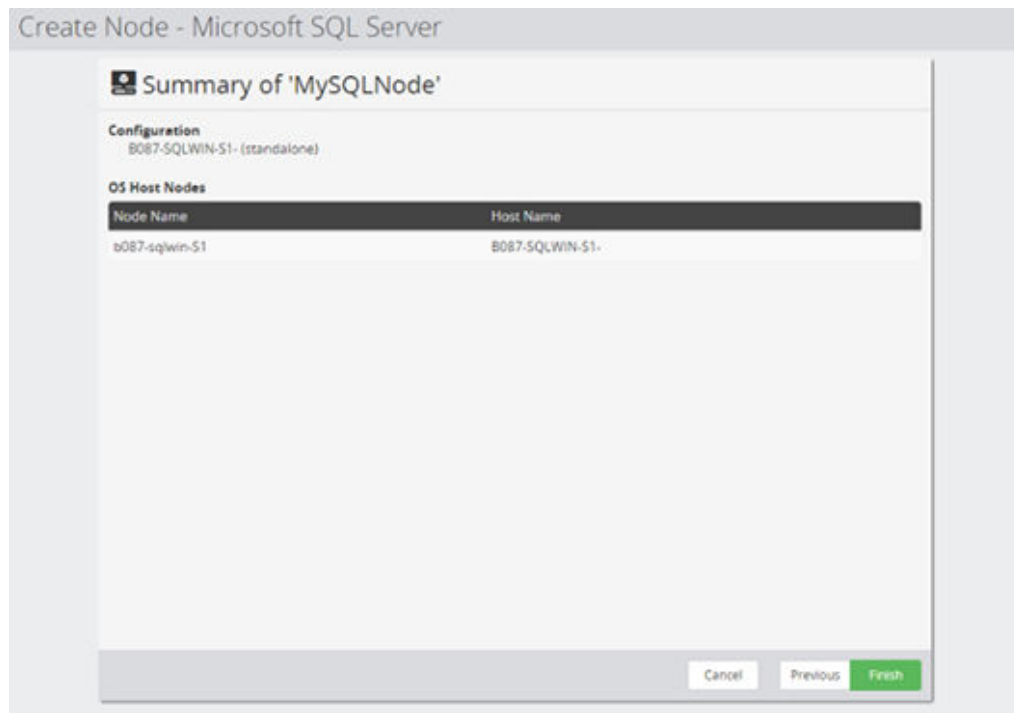


Figure 234 Microsoft SQL Node Wizard - Summary

| Control | Description |
|---------|---|
| Summary | Summary of the settings and nodes selected in the node creation wizard. |

Oracle Application Node Wizard

This wizard is launched when a new Oracle Database Node is added to the Nodes Inventory.



Note: If you have a clustered Oracle environment and add or remove nodes to or from the cluster, the Protector Oracle application node must be updated so that the Oracle environment can be rediscovered. Any active data flows including that node must be reactivated to update the rules.

Create Node - Oracle Database

Specify Node name

Node Name

|

Must be between 2 and 64 characters, contain only letters, numbers, underscores, hyphens and full stops.

Tags

Add

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Cancel Previous Next

Figure 235 Oracle Database Node Wizard - Specify Node Name

| Control | Description |
|-----------|---|
| Node Name | Enter a name for the Oracle node. |
| Tags | Modifies the tags of an existing object from the either the inventory screen or the details screen of the object. |

Create Node - Oracle Database

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|--------------------------------|-------------|
| <input type="radio"/> myResGrp | |

Cancel Previous **Next**

Figure 236 Oracle DB Node Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

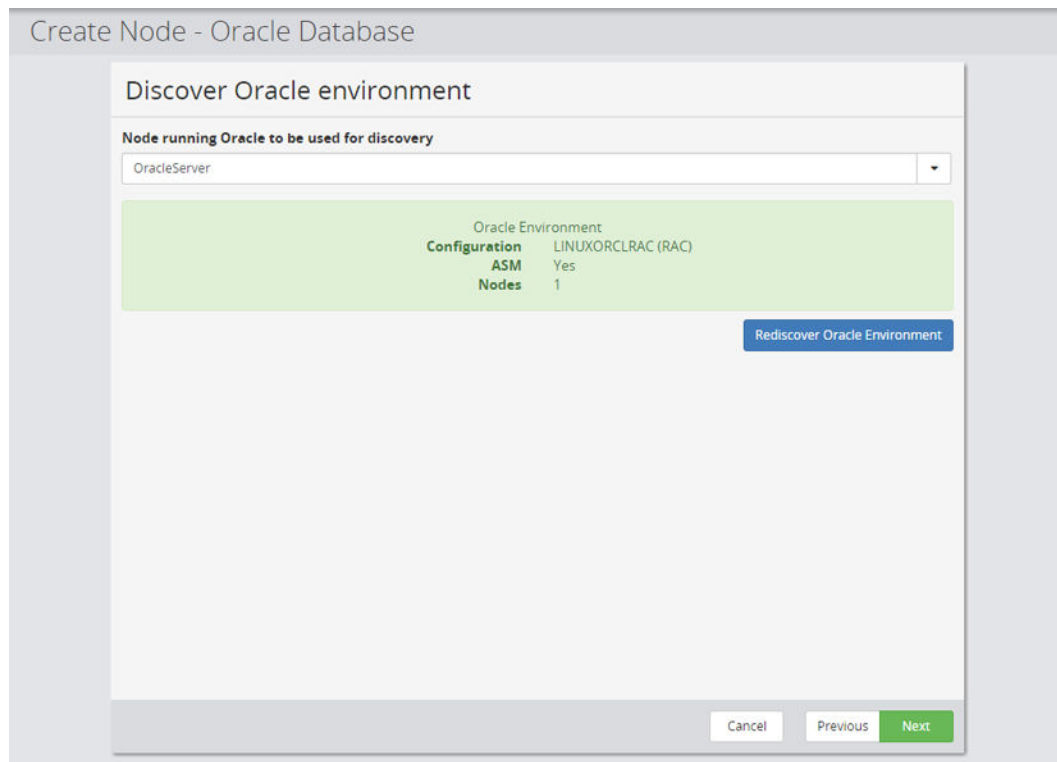


Figure 237 Oracle DB Node Wizard - Discover Oracle environment

| Control | Description |
|--|---|
| Node running Oracle to be used for discovery | Select the Protector client node that communicates with the Oracle server. This node will then discover the Oracle environment. |
| Rediscover Oracle Environment | Click this button to refresh the cached details. |



Note:

- If your Oracle setup uses ASM you can optionally specify which user is used to manage ASM.
- If your Oracle setup does not use ASM, this dialog will not be displayed.

Create Node - Oracle Database

Specify Oracle ASM credentials for 'myOracleServer'

Oracle Automated Storage Management (ASM) is a volume manager and a file system for Oracle database files that supports single instance Oracle Databases and Oracle Real Application Clusters (Oracle RAC) configurations

Per default we will automatically detect and use the required credentials to perform the necessary tasks. If a specific set of credentials should be used (e.g. for auditing purposes), different users for OS and/or database operations can be specified below

Operating System

☒ Default
Use owner of the oracle database binary from the grid environment

☐ Specify operating system user

Domain (Windows only)

Username

Username used to run the ASM related operating system commands

Password

Database

☒ Default
Use **sys** user

☐ Specify database user

Username

Database user, which is used to run SQL commands on the ASM instance

Password

Cancel Previous **Next**

Figure 238 Oracle DB Node Wizard - Specify Oracle ASM credentials

| Control | Description |
|------------------|---|
| Operating System | Select one of the following: <ul style="list-style-type: none"> Default - use the default owner of the Oracle database from the grid environment. Specify operating system user - specify the operating system user for the Oracle database. |
| Domain | For non-default operating system user only. If a Windows operating system is used, enter the domain name of the system to access Oracle ASM. |
| Username | For non-default operating system user only. Enter the Oracle Database username for the Oracle ASM. |
| Password | For non-default operating system user only. Enter the operating system username's password for the Oracle ASM. |
| Database | Select one of the following: <ul style="list-style-type: none"> Default - use the default database user to execute the SQL commands on the Oracle ASM instance Specify database user - specify the Oracle Database user who can execute the SQL commands on the Oracle ASM instance |

| Control | Description |
|----------|---|
| Username | For non-default database user only. Enter the Oracle Database username of the user who can execute the SQL commands on the Oracle ASM instance. |
| Password | For non-default database user only. Enter the password of the user who can execute the SQL commands on the Oracle ASM instance. |

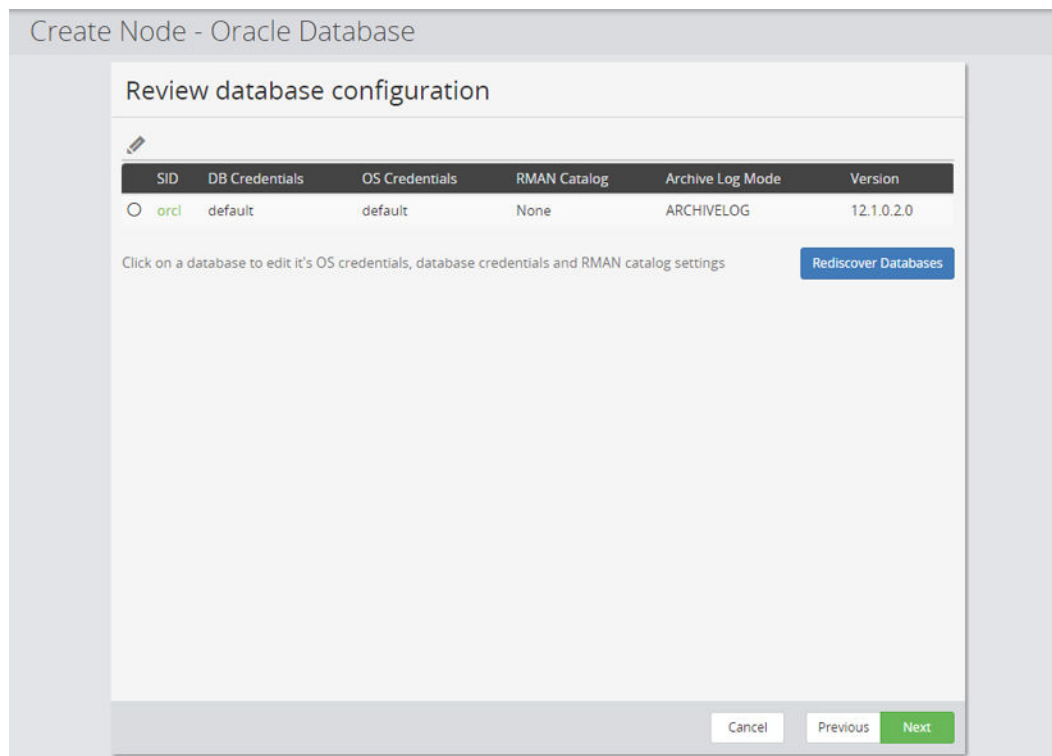


Figure 239 Oracle DB Node Wizard - Review database configuration

| Control | Description |
|----------------------|---|
| SID | Click on a database's SID to open the Specify Database credentials dialog (see below). |
| Rediscover Databases | Click this button to refresh the cached details. |

Create Node - Oracle Database

Specify Database credentials for 'ziondb'

By default the required credentials will be automatically detected. If a specific set of credentials should be used (e.g. for auditing purposes), different users can be specified below.

| | |
|---|--|
| Operating System <input checked="" type="radio"/> Default Use owner of the oracle database binary <input type="radio"/> Specify operating system user | Database <input checked="" type="radio"/> Default Use sys user <input type="radio"/> Specify database user |
|---|--|


| | |
|--|--|
| Domain (Windows only) <input type="text"/> Windows domain of the operating system user | Username <input type="text"/> Database user which is used to run SQL commands |
| Username <input type="text"/> Username which is used to run the operating system commands for this database | Password <input type="password"/> |

Figure 240 Oracle DB Node Wizard - Specify Database credentials

| Control | Description |
|------------------|--|
| Operating System | Select one of the following: <ul style="list-style-type: none"> Default - use the owner of the Oracle database binary. Specify operating system user - specify the operating system user. |
| Domain | For non-default operating system user only. If a Windows operating system is used, enter the domain name of the system to access Oracle ASM. |
| Username | For non-default operating system user only. Enter the username which is used to run the operating system commands for this database. |
| Password | For non-default operating system user only. Enter the username's password. |
| Database | Select one of the following: <ul style="list-style-type: none"> Default - use the default database user to execute the SQL commands on the Oracle ASM instance Specify database user - specify the database user who can execute the SQL commands on the Oracle ASM instance |
| Username | For non-default database user only. Enter the username of the user who can execute the SQL commands. |

| Control | Description |
|----------|--|
| Password | For non-default database user only. Enter the password of the user who can execute the SQL commands. |

Create Node - Oracle Database

 Summary of 'myOracleNode'

| | |
|---|--|
| Configuration orac6p5-869338 (Standalone) | ASM Configured Yes ASM OS User default ASM DB User default |
|---|--|

OS Host Nodes

| Node Name | Host Name |
|--------------|----------------|
| OracleServer | orac6p5-869338 |

Databases

| SID | DB Credentials | OS Credentials | RMAN Catalog | Archive Log Mode | Version |
|--------|----------------|----------------|--------------|------------------|------------|
| zlondb | default | default | None | ARCHIVELOG | 12.1.0.2.0 |

Cancel Previous Finish

Figure 241 Oracle DB Node Wizard - Summary

| Control | Description |
|---------|--|
| Summary | Summary of the selected configuration. |

Hitachi Block Host Node Wizard

A Hitachi Block Host node represents a group of Hitachi Block volumes attached to a host machine.



Note: A physical Block Device node must be created using the [Hitachi Block Device Node Wizard \(on page 513\)](#) before any Block Host nodes can be created on it.



Note: A Block Host node can also be based off of a Logical Block Device, this must also have been created before setting up the Block Host node using the [Hitachi Logical Block Device Node Wizard \(on page 539\)](#).

If a user is given access to a Block Host node by placing it in a resource group that they have access to, the associated physical Block Device node must also be placed in that resource group. It is not sufficient to include only a Logical Block Device node (based on the physical Block Device node) in that resource group.

Figure 242 Hitachi Block Host Wizard - Specify Node name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the Block Host node. |
| Tags | Add the tags to be associated with the object being created. |

Create Node - Hitachi Block Host

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|---------------------------------------|-------------------------------|
| <input type="radio"/> myResourceGroup | A user defined resource group |

Cancel Previous **Next**

Figure 243 Hitachi Block Host Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

The screenshot shows a web-based wizard interface. At the top, a header bar reads "Create Node - Hitachi Block Host". Below this, the main content area is titled "Select Hitachi Block Device". Underneath the title, there is a section labeled "Hitachi Block Device" containing a dropdown menu with the placeholder text "Select a Node". The dropdown menu is currently closed. At the bottom right of the main content area, there are three buttons: "Cancel", "Previous", and "Next". The "Next" button is highlighted in green, indicating it is the active or recommended action.

Figure 244 Hitachi Block Host Wizard - Select Hitachi Block Device

| Control | Description |
|----------------------|---|
| Hitachi Block Device | Enter or select a Hitachi Block node or Hitachi Logical Block node name from the dropdown list. |

Create Node - Hitachi Block Host

Specify Logical Devices

Enter Logical Devices using any of the following formats:

- *LDEV_ID* - for a single logical device, e.g., 100, 0x10
- *LDEV_ID-LDEV_ID* - for a logical device range, e.g., 200-299, 0x01-0x0F
- *Host Group ID* - for all logical devices within the host group, e.g., CL1-A-0, CL10-A-0


Included Logical Devices

Excluded Logical Devices

One entry per line.

Cancel Previous Next

Figure 245 Hitachi Block Host Wizard - Specify Logical Devices

| Control | Description |
|--------------------------|--|
| Included Logical Devices | Enter a list of LDEVs or Host Groups to be included in this Block Host (one logical device or host group specification per line) in the format described below. |
| Excluded Logical Devices | <p>Enter a list of LDEVs or Host Groups to be excluded from this Block Host (one logical device or host group specification per line) in the format described below.</p> <p> Tip: This enables the inclusion of an entire Host Group but exclusion of individual LDEVs within that Host Group.</p> |

LDEVs are entered using the format:

identifier

Where *identifier* is one of:

- *ldev_id* a single LDEV ID in hex or decimal
- *ldev_id-ldev_id* a range of LDEV IDs
- *host_group_id* a host group identifier using the format:
 - CL*c-s-h* where:
 - CL is a literal string
 - *c* is the physical channel number in the range 1...n
 - *s* is the physical slot number in the range A...Z
 - *h* is the logical host group ID in the range 0...255

For example:

0x00a0 for an LDEV specified in hexadecimal

220-230 for a range of LDEVs specified in decimal

CL2-A-12 for a host group



Note:

- Spaces and colons must not be present in the entries. If a space or colon is encountered on a line, the remaining text on that line from the space or colon will be disregarded. This allows entries that contain the LDEV name after a space or colon) to be present in the list.

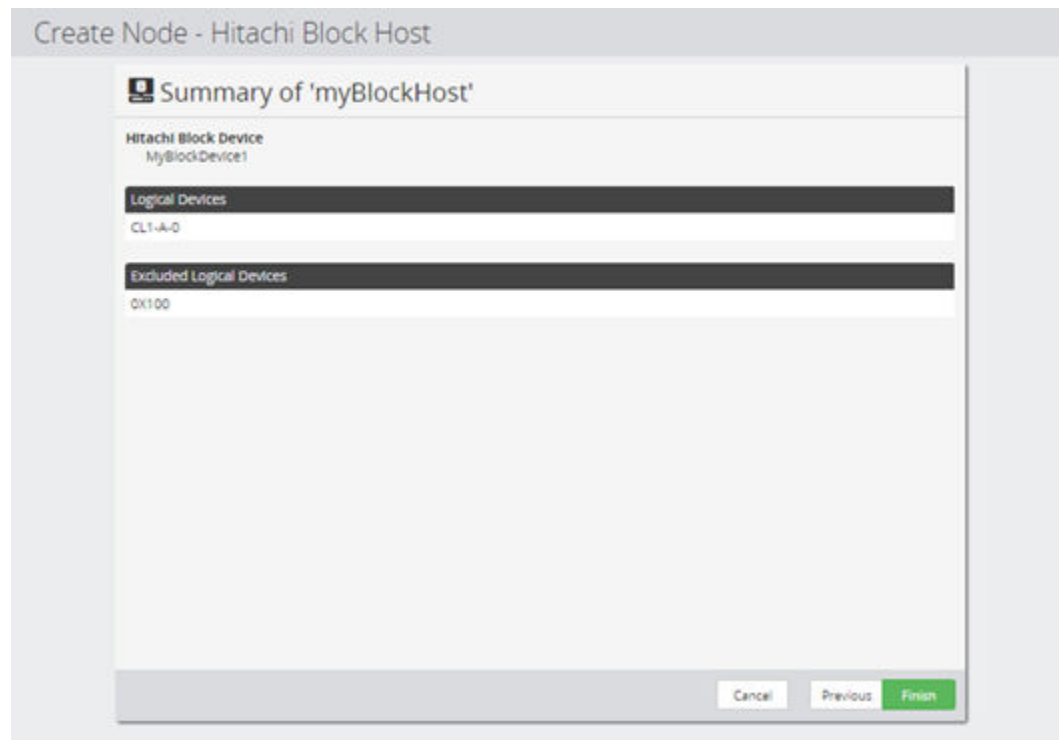


Figure 246 Hitachi Block Host Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

Hyper-V Node Wizard

This wizard is launched when a new Hyper-V Node is added to the Nodes Inventory.

Create Node - Hyper-V

Specify Node name

Node Name

Must be between 2 and 64 characters, contain only letters, numbers, underscores, hyphens and full stops.

Tags

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Cancel Previous Next

Figure 247 Hyper-V Node Wizard - Specify Node name

| Control | Description |
|-----------|---|
| Node Name | Enter a name for the Hyper-V node. |
| Tags | Add the tags to be associated with the object being created |

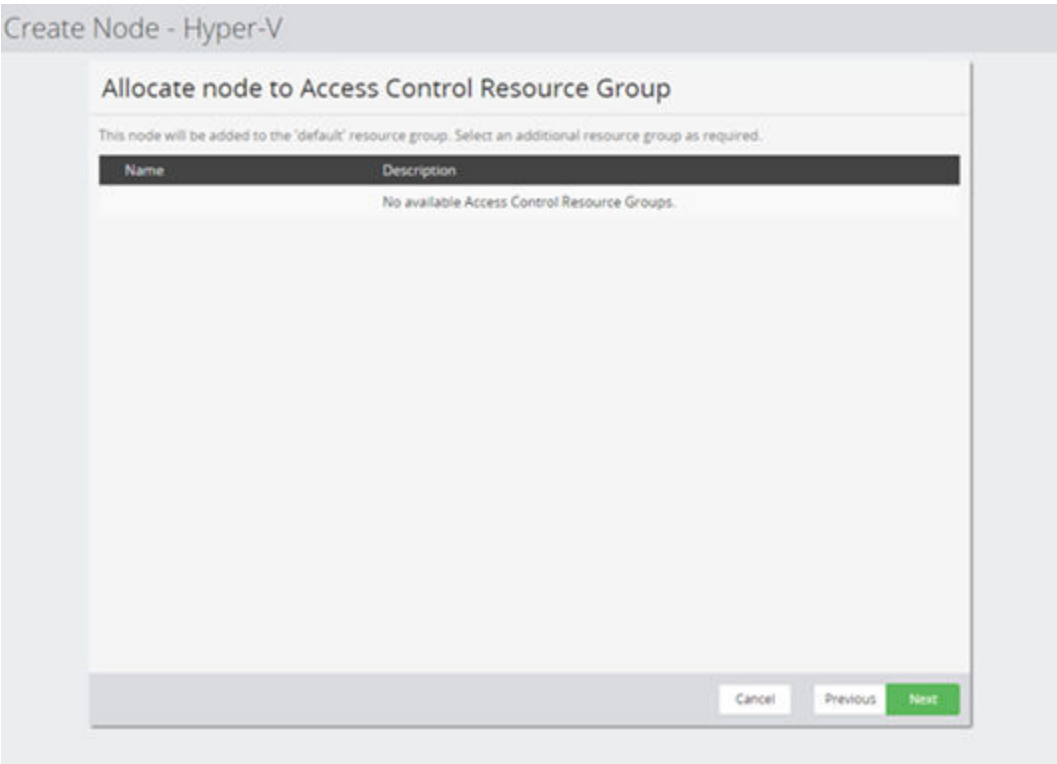


Figure 248 Hyper-V Node Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

Create Node - Hyper-V

Discover Hyper-V environment

Node running Hyper-V to be used for discovery

Select a Node

Username

Domain\Username

User with Hyper-V management privileges.

Password

Cancel Previous Next

Figure 249 Hyper-V Node Wizard - Select node running Hyper-V server

| Control | Description |
|----------------------|---|
| Node running Hyper-V | Select an OS Host node which is part of the Microsoft Hyper-V standalone or cluster environment |
| Username | Enter the username that will be used to perform backups and restores on this Hyper-V environment. The user requires privileges as detailed in Microsoft Hyper-V user privileges (on page 504) . |
| Password | Enter the password for the username provided above |

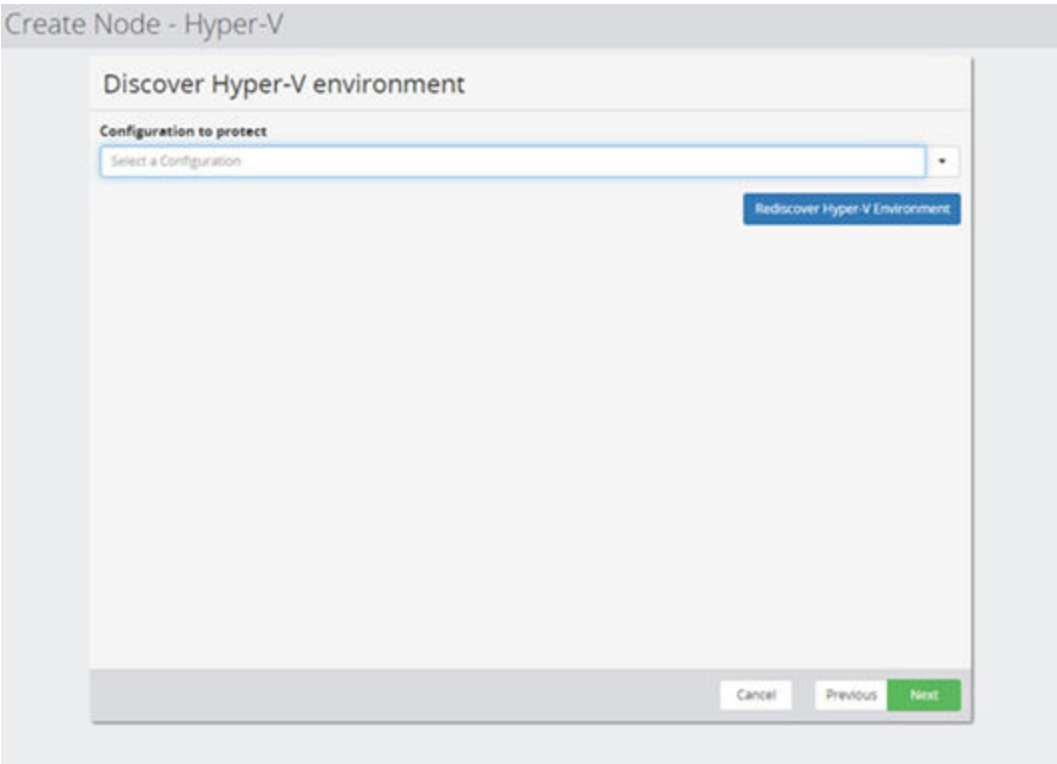


Figure 250 Hyper-V Node Wizard - Discover Hyper-V environment

| Control | Description |
|--------------------------------|---|
| Configuration to protect | Select the Hyper-V environment you want this node to represent |
| Rediscover Hyper-V Environment | Click in case you want to refresh the list of available Hyper-V configuration |

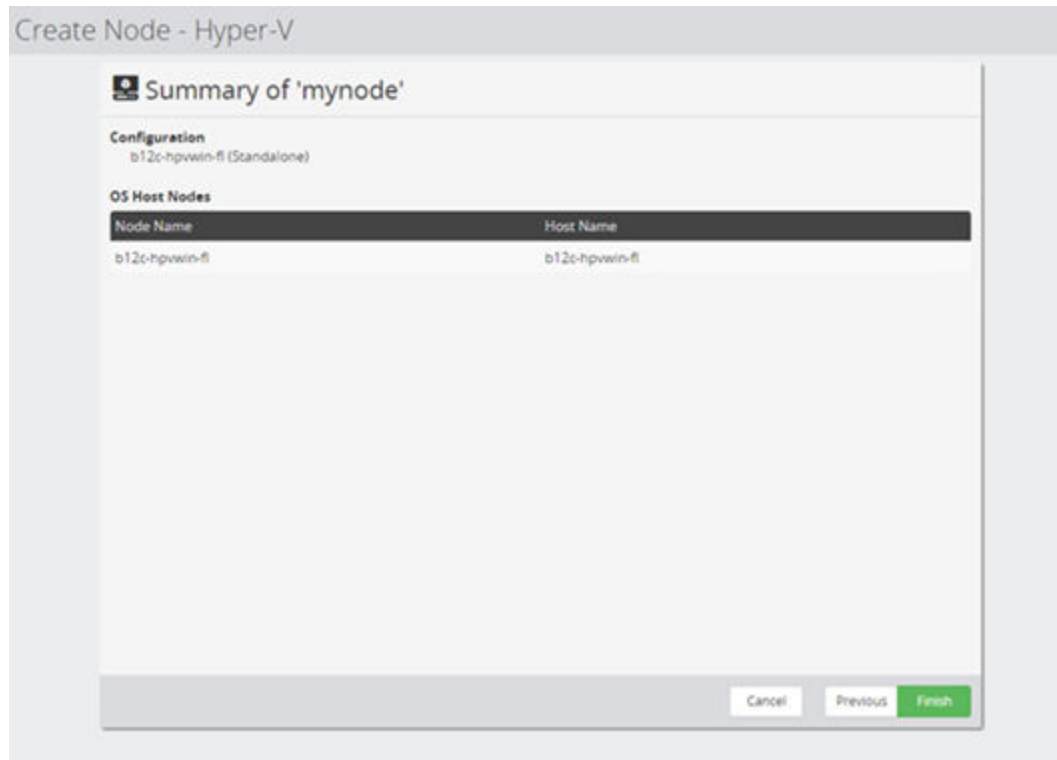


Figure 251 Hyper-V Node Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

Microsoft Hyper-V user privileges

To lookup, protect and restore Hyper-V virtual machines Protector requires credentials that are valid for all machines comprising the Hyper-V node.

In case of a cluster, these credentials must be domain credentials. For a standalone configuration, a local user is sufficient.

The user needs to be a member of the following groups in the domain and all nodes of the Hyper-V setup:


- Users
- Domain Users
- Backup Operators
- Hyper-V Administrators
- Remote Management Users

In addition, for a cluster the user requires the permission to administrate the cluster. The following command needs to be executed on every cluster node:

```
Grant-ClusterAccess -User domain\username -Full
```

VMware Node Wizard

This wizard is launched when a new VMware Node is added to the Nodes Inventory.

**Note:** If you use vCenter to manage an ESX/ESXi host, then a proxy node cannot be created for that host. Create a proxy using the managing vCenter node instead.

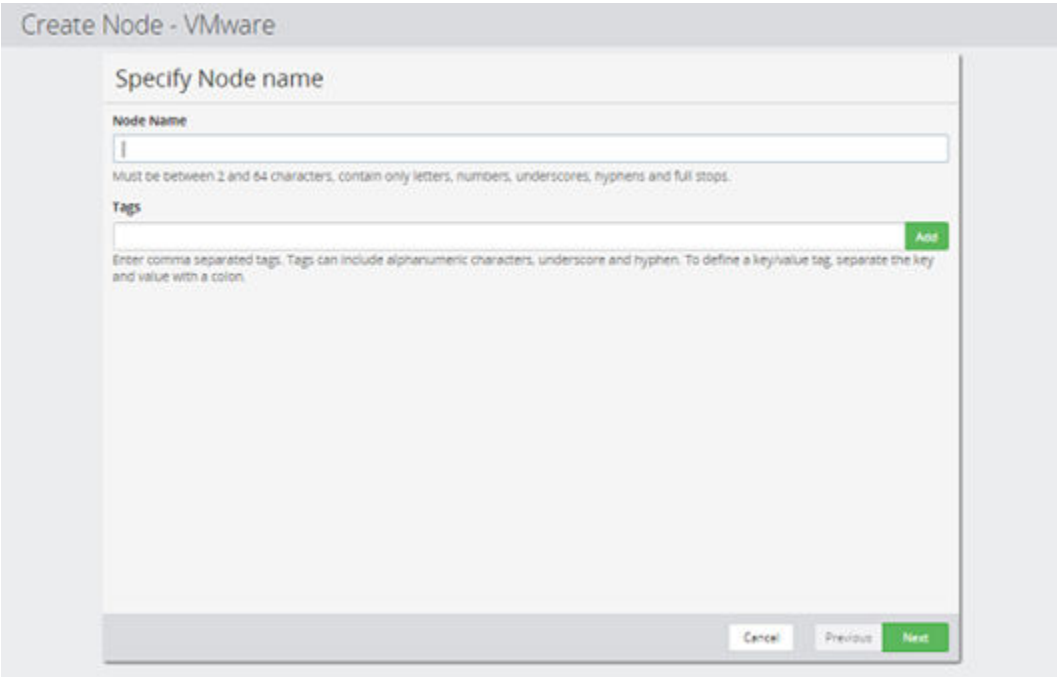


Figure 252 VMware Node Wizard - Specify Node name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the VMware node. |
| Tags | Add the tags to be associated with the object being created. |

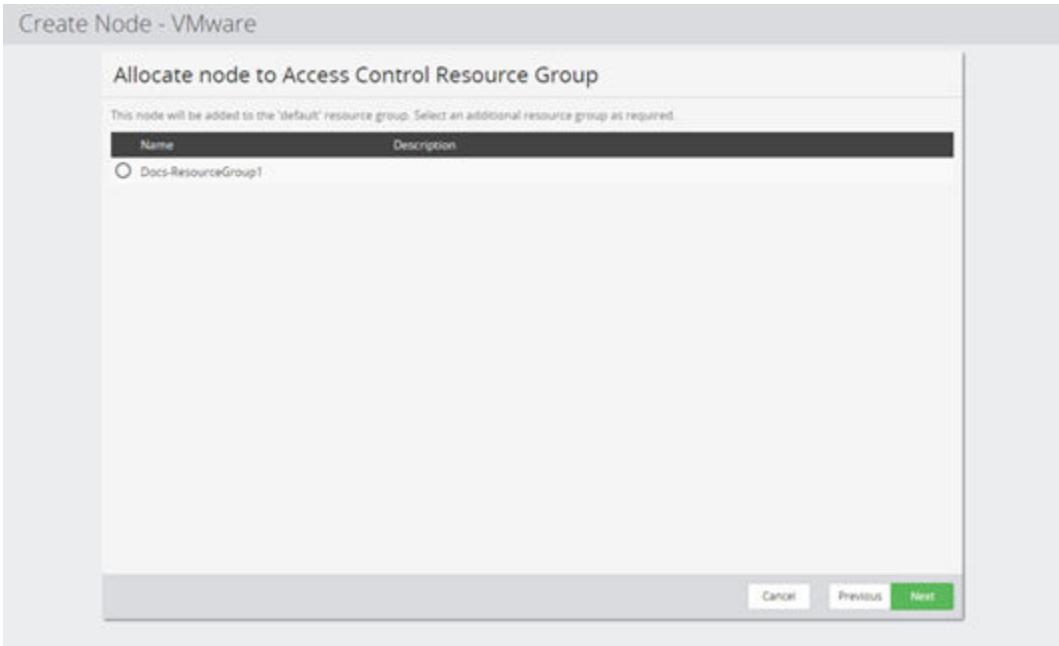


Figure 253 VMware Node Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

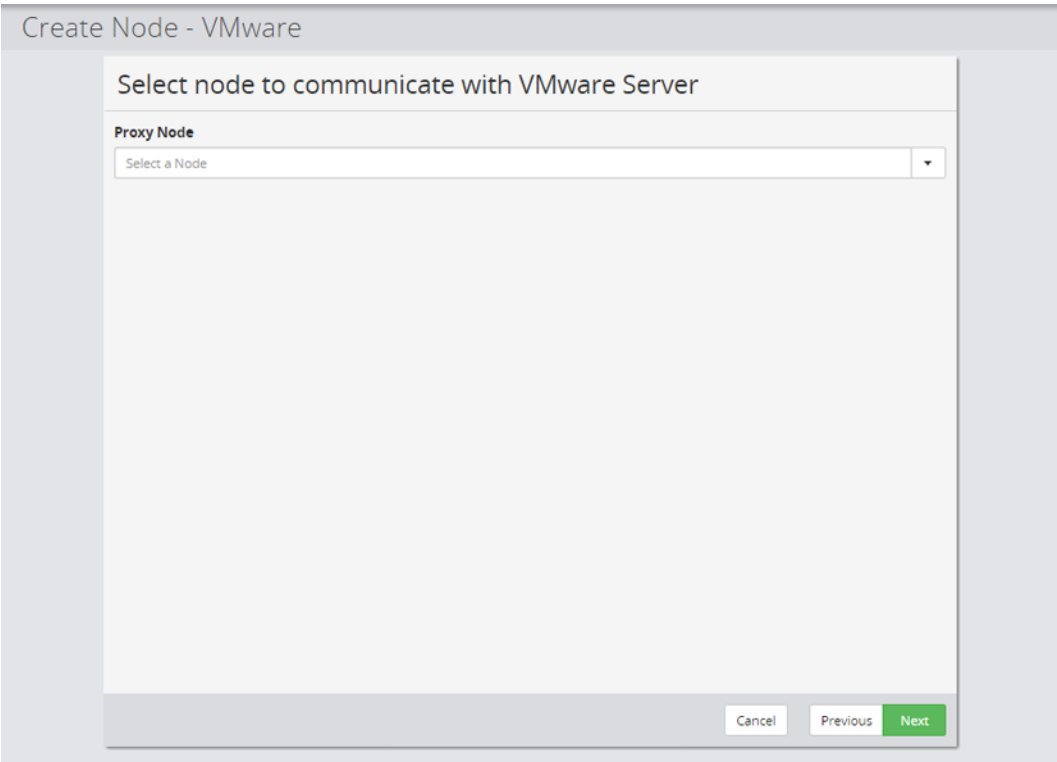



Figure 254 VMware Node Wizard - Select node to communicate with VMware Server

| Control | Description |
|------------|---|
| Proxy Node | Select a proxy node for the vCenter or ESX/ESXi host. |

| Control | Description |
|---------|---|
| | <p> Note:</p> <ul style="list-style-type: none"> ▪ If using tags, VMware Power CLI 6.5.0 or later must be installed on the proxy node. You will need to restart the proxy node after completing the installation. ▪ If you change the proxy of a VMware node while the node is in an activate data flow, or if you change the vCenter or ESX/ESXi host credentials, then you must reactivate affected data flows in order for the changes to take effect. ▪ When performing host based backups, avoid excessive traffic across the network by selecting a proxy node that is as close as possible to the eventual destination of the backup data. ▪ If the proxy shares access over a SAN to disks used by the VMware datastores and this provides faster data transfer rates than the LAN (NBD), then the VMware <i>SAN Transport Mode</i> will be used during host based backup to transfer data directly from the datastores to the proxy. |

Create Node - VMware

Specify VMware server

Host name or IP Address of vCenter / ESXi Server

Cancel Previous Next

Figure 255 VMware Node Wizard - Specify VMware Server

The same VMware node can be used in both host based and block storage based data flows.

| Control | Description |
|--|--|
| Host name or IP Address of vCenter / ESXi Server | Specify the vCenter or ESX/ESXi host name or IP address. |

Create Node - VMware


Specify VMware Credentials

Username

Password

Cancel Previous Next

Figure 256 VMware Node Wizard - Specify VMware Credentials

| Control | Description |
|----------|---|
| Username | Enter the username for the vCenter or ESX/ESXi host. <div>  Note: The user specified here must have the specified VMware user privileges (on page 511). </div> |
| Password | Enter the password for the vCenter or ESX/ESXi host. |

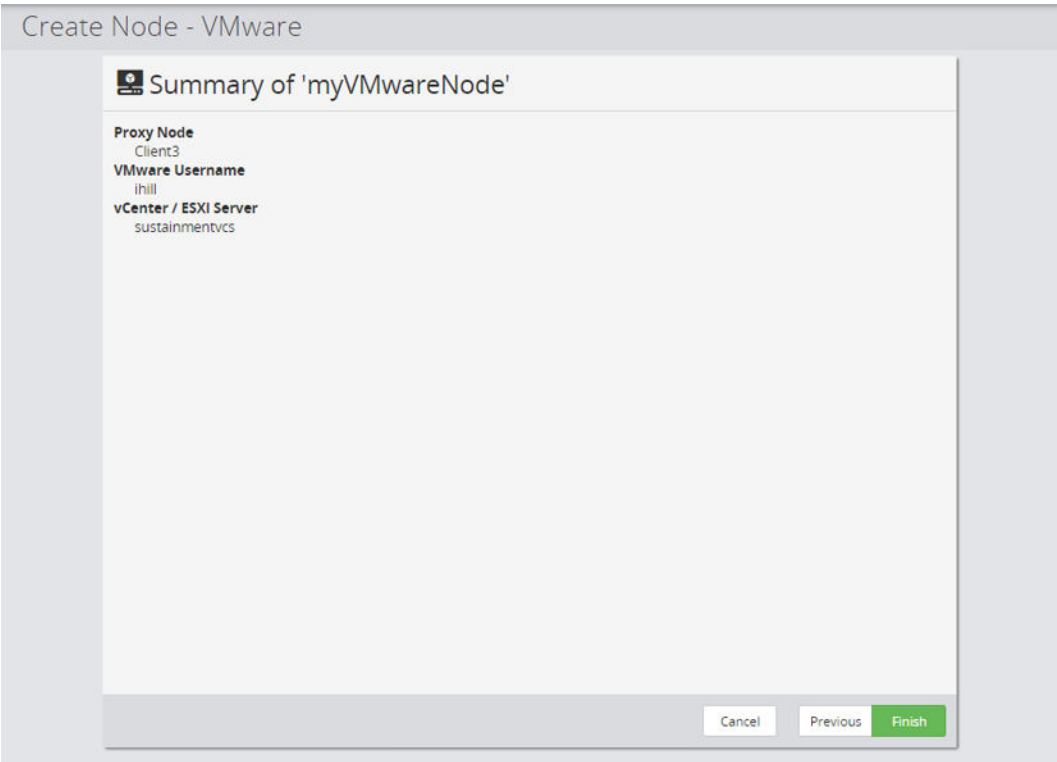


Figure 257 VMware Node Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

VMware user privileges

The VMware user specified when interacting with Protector (i.e. in the context of a hypervisor proxy node, Site Recovery Manager SRA or vRealize Orchestrator workflow) must have the following privileges assigned in vSphere:



Tip: Some privilege names have changed subtly between vSphere Client UI versions, so a little interpretation may be required. The names used here are consistent with those specified in <https://docs.vmware.com/en/VMware-vSphere/6.5/vsphere-esxi-vcenter-server-65-security-guide.pdf>

- Datastore:
 - Allocate space
 - Browse datastore
 - Low level file operations
 - Remove file
 - Rename datastore
 - Update virtual machine files
- Folder:
 - Create folder
- Global:
 - Disable methods
 - Enable methods
 - Licenses
 - Log event
 - Manage custom attributes
 - Set custom attribute
- Host:
 - Configuration:
 - Storage partition configuration
 - Connection Permission (vSphere 7 only)
- Network:
 - Assign network
 - Configure
- Resource:
 - Assign virtual machine to resource pool
 - Migrate powered off virtual machine
 - Migrate powered on virtual machine
- Sessions:

- Validate session
- Virtual Machine:
 - Configuration:
 - Add existing disk
 - Add new disk
 - Add or remove device
 - Advanced
 - Change CPU count
 - Change resource
 - Disk change tracking
 - Disk lease
 - Extend virtual disk
 - Host USB device
 - Memory
 - Modify device settings
 - Raw device
 - Reload from path
 - Remove disk
 - Rename
 - Reset guest information
 - Set annotation
 - Settings
 - Swapfile placement
 - Upgrade virtual machine compatibility
 - Guest operations:
 - Guest operation modifications
 - Guest operation program execution
 - Guest operation queries
 - Interaction:
 - Answer question
 - Backup operation on virtual machine
 - Console interaction
 - Device connection
 - Guest operating system management by VIX API
 - Power off

- Power on
- Inventory:
 - Create from existing
 - Create new
 - Register
 - Remove
 - Unregister
- Provisioning:
 - Allow disk access
 - Allow read-only disk access
 - Allow virtual machine download
 - Allow virtual machine files upload
 - Mark as template
 - Mark as virtual machine
- Snapshot management:
 - Create snapshot
 - Remove snapshot
 - Revert to snapshot
- dvPort group:
 - Create
 - Delete
- vApp:
 - Add virtual machine
 - Assign resource pool
 - Unregister
- vSphere Tagging:
 - Assign or Unassign vSphere Tag
 - Assign or Unassign vSphere Tag on Object (vSphere 7 only)

The System privileges (Anonymous, Read and View) are also required. These are automatically assigned to new and existing roles, but are not visible in the vSphere Client UI.

Hitachi Block Device Node Wizard

This wizard is launched when a new Hitachi Block Node is added to the Nodes Inventory.

Create Node - Hitachi Block Device

Specify Node name

Node Name

Must be between 2 and 64 characters, contain only letters, numbers, underscores, hyphens and full stops.

Tags

Add

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Resources or replication relationships created or adopted by Protector must only be managed, modified and deleted via Protector. Failure to do so will cause unpredictable consequences and is not supported unless specifically advised to do so by the Protector documentation.


☐ I confirm that I have read and understood this requirement

Cancel

Previous

Next

Figure 258 Hitachi Block Device Wizard - Specify Node Name

| Control | Description |
|--------------------|--|
| Node Name | Enter a name for the Hitachi Block storage node. |
| Tags | Add the tags to be associated with the object being created. |
| I confirm that ... | <div>This checkbox must be checked to proceed with the node configuration.</div> <div><div> Caution:</div><div>Resources or replication relationships created or adopted by Protector must only be managed, modified and deleted via Protector.</div><div>Failure to do so will cause unpredictable consequences and is not supported unless specifically advised to do so by the Protector documentation.</div></div> |

Create Node - Hitachi Block Device

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|---------------------------------------|-------------------------------|
| <input type="radio"/> myResourceGroup | A user defined resource group |

Cancel



Previous

Next

Figure 259 Hitachi Block Device Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

Figure 260 Hitachi Block Device Wizard - Select proxy node

| Control | Description |
|------------|---|
| Proxy Node | <p>Select a Protector node to act as a proxy.</p> <div>  Caution: ISM nodes and their associated CMDs used to control storage devices must not be shared with applications other than those forming part of the Ops Center suite. </div> <div>  Note: The proxy node is responsible for interfacing with the Block storage device. It can be a Windows or Linux machine with the Protector Client software installed and must be connected via a command device to the Block storage device. The command device must <i>only</i> have user authentication enabled. The proxy node must have supported version of CCI installed. Refer to the Command Control Interface documentation available at https://knowledge.hitachivantara.com. </div> |

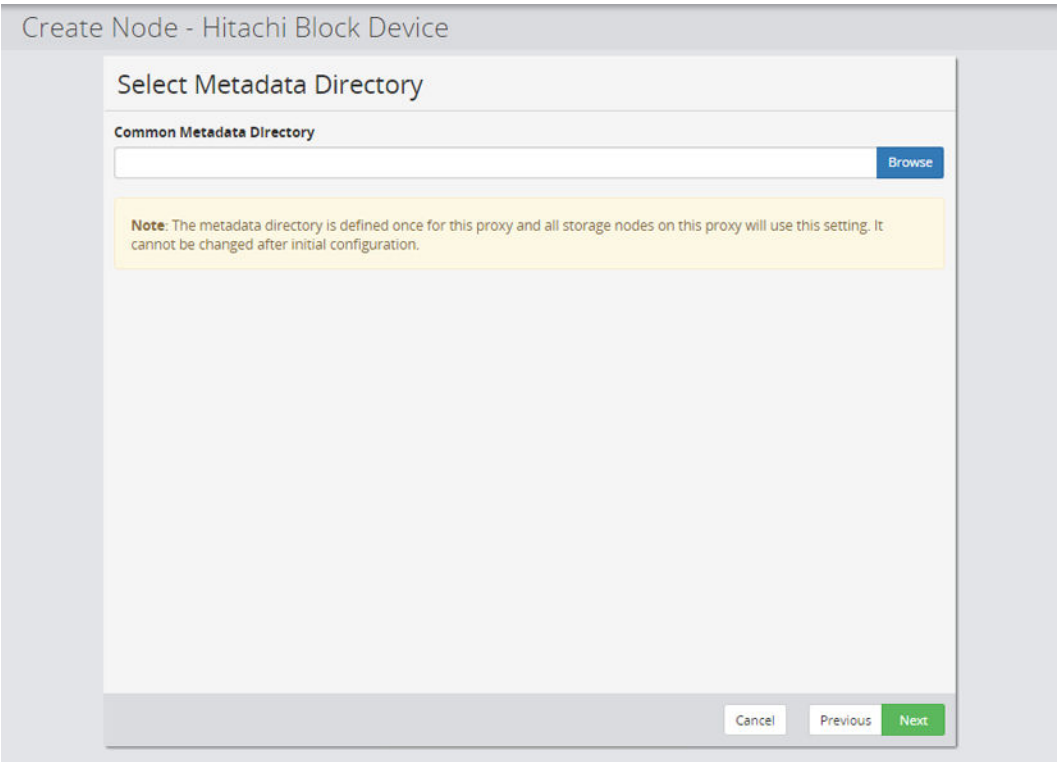



Figure 261 Hitachi Block Device Wizard - Select Metadata Directory

| Control | Description |
|---------------------------|--|
| Common Metadata Directory | <p>Enter a directory on the Proxy node where Protector can place metadata files related to Block snapshots and replications. Click the Browse button to open the Path Dialog (on page 345) if required.</p> <div> Note: The metadata directory is defined once for this proxy and all storage nodes on this proxy will use this setting. It cannot be changed after initial configuration.</div> |



 **Note:** This screen is only displayed during node creation, it is not displayed in edit mode.

Figure 262 Hitachi Block Device Wizard - Specify Device

| Control | Description |
|---------------------------------------|--|
| Select from detected storage devices | Select this option to specify the hardware storage device by serial number. A list of storage device serial numbers, available to the proxy node selected in the previous step, is displayed in the dropdown menu below. |
| Specify by IP or Hostname with a port | <p>Select this option to specify the hardware storage device using the IP address or hostname and port number of an IP command device on the storage device. Additional fibre and IP command devices can be added at a step later in the wizard.</p> <div> <p> Note:</p> <p>For HUS VM storage devices, use the IP address of the SVP.</p> <p>For VSP G1x00 storage devices, use the IP address of CTL1 or CTL2. DO NOT use the IP address of the SVP.</p> <p>When performance is important or where high workloads are expected, the use of Fibre Channel command devices is highly recommended. Using IP command devices will result in slower performance.</p> </div> |

Create Node - Hitachi Block Device

Specify credentials for device

Storage Device Serial Number
445169

Username



Password


Protector does not support using passwords which contain some special characters. See CCI / RAIDCOM documentation for further details.

The device account requires the following roles: Storage Administrator (Provisioning, Local Copy, Remote Copy), Security Administrator (View Only, View and Modify) and Support Personnel.

Cancel Previous Next

Figure 263 Hitachi Block Device Wizard - Specify credentials for device

| Control | Description |
|------------------------------|--|
| Storage Device Serial Number | <p>Displays the serial number of the Block device specified in the previous step.</p> <p> Note: When the serial number is displayed it is the serial number as provided by CCI, as such the serial number for the VSP 5000 series will have a “5” added to the beginning. Whereas the serial number for the VSP G1x00 and VSP F1500 will have a 3 added to the beginning.</p> |
| Username | <p>Enter the username for the Block device.</p> <p> Note: The username specified must be a member of the <i>Storage Administrator (Provisioning, Local Copy, Remote Copy)</i> and <i>Security Administrator (View Only, View and Modify)</i> on the Block device. In addition, the <i>Support Personnel</i> role is required for changing the Array SOM settings that allow LDEV resizing for replications. If the Block device cannot be accessed or its credentials are invalid then the node will fail authorization. The configuration wizard can be reopened to correct any errors.</p> |

| Control | Description |
|----------|--|
| Password | <p>Enter the password for the Block device.</p> <div>  Note: The password for authorizing a Block device must contain only useable CCI command characters: A-Za-z0-9'-. / : @ \ _ </div> |

Create Node - Hitachi Block Device

Specify configuration for Global Replication Reports

☐ Enable
To enable all global replication reports provide the details of a CM-REST server. This is not required for any other storage management operations.

CM-REST Server Address
Host name or IP Address

Port Number
 23450

☒ HTTPS
☐ Ignore SSL certificate errors

Username

Password


If the CM-REST server resides on the same server as this Block Node proxy, these credentials must be different to the Block Device node.


Refresh Interval
 1 Hours

Short refresh intervals are not recommended on busy systems

Cancel Previous Next

Figure 264 Hitachi Block Device Wizard - Specify Configuration for GRR

| Control | Description |
|-------------------------------|---|
| Enable | Allows the configuration of the Global Replication Reports to be filled out. |
| CM-REST Server Address | Enter either the Host Name or the IP Address of the CM-REST server. |
| Port Number | Enter the port number for the CM-REST server. |
| HTTPS | Select to enable secure communications to the CM-REST server. |
| Ignore SSL certificate errors | Select to ignore SSL certificate errors when communicating with the CM-REST server. |
| Username and Password | <p>Enter the username and password for the storage array.</p> <div>  Note: If CM-REST is on the same server as the Block Device Node then the credentials must be different. </div> |

| Control | Description |
|------------------|---|
| Refresh Interval | <p>Enter the required interval between refreshes of the GRR reports.</p> <div>  Note: Populating the data in the GRR reports requires interaction with the storage array and therefore on busy systems it is not recommended to have short refresh times as this may affect performance of the system. </div> |

Create Node - Hitachi Block Device

Specify LDEV Provisioning Range

LDEV Range

☒ All
☐ User defined

Start

0x00


End

0x00

Cancel Previous Next

Figure 265 Hitachi Block Device Wizard - Specify LDEV Provisioning Range

| Control | Description |
|--------------|--|
| All | Select this option if you want Protector to automatically detect the LDEV range from which snapshots and replications should be allocated. |
| User defined | Select this option if you want to manually specify the LDEV range from which snapshots and replications should be allocated. |

| Control | Description |
|---------|--|
| | <div data-bbox="594 262 638 315"></div> <p>Note:</p> <p>All replication and snapshot S-VOLs must be created using free LDEV IDs that are mapped to the <i>meta_resource</i> group, and have virtual LDEV IDs matching their corresponding physical LDEV IDs.</p> <p>For fully provisioned snapshots and all replications, this applies to the operation that creates that snapshot or replication.</p> <p>For floating device snapshots and snapshots mounted using cascade mode, this applies to the mount or restore operation.</p> <p>For fully provisioned snapshots mounted using cascade mode, this applies both to the operation that creates that snapshot and to the mount or restore operation.</p> <p>If an operation tries to create one or more LDEVs, that operation will fail if there are not enough free LDEV IDs that meet the above conditions.</p> |
| Start | Enabled only if User defined is selected. Enter the lower limit of the LDEV range to use for allocation. |
| End | Enabled only if User defined is selected. Enter the upper limit of the LDEV range to use for allocation. |

Create Node - Hitachi Block Device

Configure Command Device specification and priority

If any command devices are specified Protector will only use these command devices. If no command devices are specified it will attempt to use any fibre based command device available to the proxy. IP based command devices must be specified for them to be used. Command devices will be used in the order they are specified, failing over to the next if there is an issue.

Select All (0) [Edit] [Add] [Remove]

| Priority | Type | LDEV ID | IP Address | Port | Status |
|----------|-------|---------------|------------|------|--------|
| 1 | Fiber | Any Available | - | - | |

Cancel Previous Next




Figure 266 Hitachi Block Device Wizard - Command Device Specification and Priority



The user able to specify zero or more fibre or IP command devices in priority order.

If no command devices are specified, then Protector will attempt to control the hardware storage device via any fibre connected command device, available to the Proxy Node specified, in an order specified by HORCM.

If one or more command devices are specified, then Protector will attempt to control the hardware storage device via a command device in the order specified by the user. If the first command device fails, Protector will progress to the next. If all specified command devices fail then the operation fails. Protector will not attempt to use any command devices that are not specified, even if they are available.

for example, it is possible to specify a specific fibre command device, followed by any fibre command device, followed by a specific IP command device.

| Control | Description |
|---|---|
|  Edit | Enabled when only one command device is selected. Launches the Configure Command Device wizard below to allow the settings to be edited. |
|  Increase Priority | Enabled when only one command device is selected. Increases the priority of the selected command device. |
|  Decrease Priority | Enabled when only one command device is selected. Decreases the priority of the selected command device. |

| Control | Description |
|--|---|
|  Delete | Enabled when one or more command devices are selected. Deletes selected command device. |
|  Add | Launches the Configure Command Device wizard below to guide you through setting up a fibre or IP command device. |

Create Node - Hitachi Block Device

Configure Command Device

Fibre
IP

Fibre Command Device Options

☒ Use any available fibre command device

☐ Select from detected fibre command devices

Select a Fibre Command Device

Cancel Discard Previous Apply

Figure 267 Hitachi Block Device Wizard - Configure Command Device - Fibre

| Control | Description |
|--|--|
| Use any available fibre command device | Select this option to insert an entry in the command device list that allows Protector to use any available fibre command device. |
| Select from detected fibre command devices | Select this option to insert a specific fibre command device in the list. The detected fibre command devices are displayed in the dropdown menu below using their decimal LDEV ID. |

Create Node - Hitachi Block Device

Configure Command Device

Fiber

IP

IP Command Device Options

IP Address

Port Number

31001


Cancel


Discard

Previous

Apply

Figure 268 Hitachi Block Device Wizard - Configure Command Device - IP

 **Note:** When configuring IP command devices for VSP G1x00 storage devices, we recommend adding one for CTL1 and one for CTL2, to maintain dual redundancy.

| Control | Description |
|------------------------|---|
| IP Address or Hostname | <div>Enter the IP address or hostname of the command device to add to the list.</div> <div> Note: For HUS VM storage devices, use the IP address of the SVP. For VSP G1x00 storage devices, use the IP address of CTL1 or CTL2. DO NOT use the IP address of the SVP.</div> |
| Port Number | Enter the port number of the command device. |

Create Node - Hitachi Block Device

Specify LDEV Ranges for each VSM

Define a virtual LDEV range for each VSM serial you intend to use within Protector. The ranges are used to control the virtual LDEV IDs used for replications and snapshots (excluding GAD), and definitions should not include the IDs of any GAD volumes. Failure to provide such a range (or providing an incorrect range) may result in ID clashes when attempting to set up GAD replications.

Select All (0)

| Virtual Serial | Start | End |
|----------------|-------|-----|
| + | | |

Cancel Previous Next

Figure 269 Hitachi Block Wizard - Specify LDEV Ranges for each VSM



Note: GAD replications require P-VOLs and S-VOLs to have matching virtual serial numbers and virtual LDEV IDs. To avoid virtual LDEV ID collisions between GAD volumes and non-GAD S-VOLs (created by Protector for other types of replications and snapshots), it is possible to define virtual LDEV ID ranges to be used by those non-GAD operations. Virtual LDEV ranges can be specified for each VSM (Virtual Storage Machine) to be used.

| Control | Description |
|-------------------|--|
| Edit | Enabled only if one Virtual LDEV range is selected. The Configure Virtual LDEV Range page of the wizard (see below) is displayed to enable a port to be added. |
| Delete | Enabled only if one or more Virtual LDEV ranges are selected. Deletes the Virtual LDEV range(s) from the list. |
| Add | Adds a new Virtual LDEV range to the list. The Configure Virtual LDEV Range page of the wizard (see below) is displayed to enable a Virtual LDEV Range to be added. |
| Virtual Serial(s) | The Virtual Serial(s) and associated LDEV Ranges that will be used. |

Figure 270 Hitachi Block Wizard - Configure Virtual LDEV Range



Caution: These ranges are used to control the virtual LDEV IDs used for non-GAD replications and snapshots. They must be defined to exclude the IDs of any GAD volumes. Failure to provide such a range (or providing an incorrect range) may result in ID clashes when attempting to set up GAD replications.

| Control | Description |
|---------------------|--|
| VSM Serial Number | Enter the serial number of the VSM you intend to use within Protector. |
| Start of LDEV range | Enter the lower limit of the LDEV range to use for allocation. |
| End of LDEV range | Enter the lower limit of the LDEV range to use for allocation. |

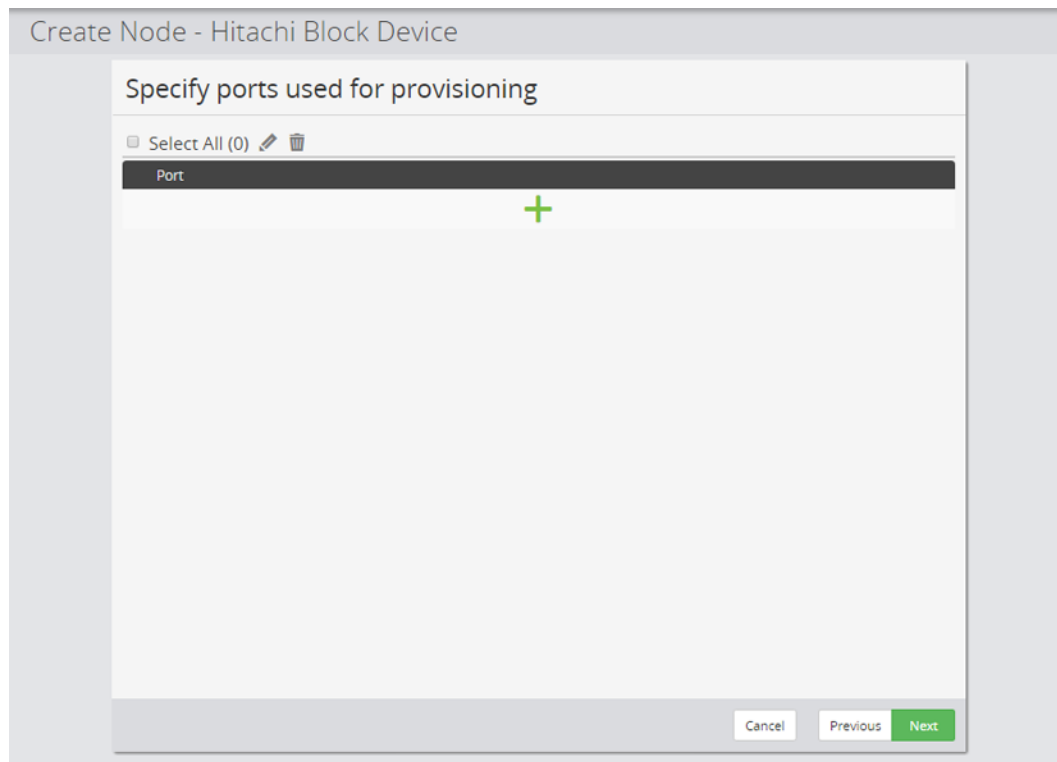





Figure 271 Hitachi Block Device Wizard - Specify ports used for provisioning

| Control | Description |
|--|--|
|  Edit | Enabled only if one provisioning port is selected. The Specify Port page of the wizard (see below) is displayed to enable a port to be added. |
|  Delete | Enabled only if one or more provisioning ports are selected. Deletes the port(s) from the list. |
|  Add | Adds a new provisioning port to the list. The Specify Port page of the wizard (see below) is displayed to enable a port to be added. |
| Provisioning Port(s) | Lists the ports that will be used for provisioning. |

Create Node - Hitachi Block Device

Specify Port

Port

CL 1 - A

Cancel

Discard

Previous

Apply

Figure 272 Hitachi Block Device Wizard - Specify Port



Note: If more than one provisioning port is selected, then the port with the least amount of LUNs will be used.

| Control | Description |
|---------|---|
| Port | <div>Enter the port identifier in the following format: CL_c-s where:<ul style="list-style-type: none">c is the physical channel number in the range 1...ns is the physical slot number in the range A...Z</div> |

Create Node - Hitachi Block Device

Summary of 'myBlock'

Proxy Node

Client1

Storage Device Serial Number

410297

Username

lanH

LDEV Provisioning Range

All Available

Configured Command Devices

| Type | LDEV ID | IP Address | Port |
|-------|---------------|------------|------|
| Fibre | Any Available | - | - |

Ports used for Provisioning

| Port |
|-------|
| CL1-A |

VSM Virtual LDEV Ranges

| VSM Serial Number | Start | End |
|-------------------|-------|------|
| 123456 | 0x00 | 0xff |

Cancel

Previous


Finish

Figure 273 Hitachi Block Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

Hitachi Content Platform Storage Node Wizard

This wizard is launched when a new Hitachi Content Platform Node is added to the Nodes Inventory.

 **Note:** Ensure that the Proxy Node defined within the wizard and the Hitachi Content Platform node are time synced. If the time is different by over 5 minutes, then the node creation and future backup may fail. It is recommend that the system time on all nodes should have the correct date/time associated with their particular region and time zone.

Create Node - Hitachi Content Platform

Specify Node name

Node Name

Must be between 2 and 64 characters, contain only letters, numbers, underscores, hyphens and full stops.

Tags

Add

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Cancel

Previous

Next

Figure 274 Hitachi Content Platform Wizard - Specify Node Name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the HCP storage node. |
| Tags | Add the tags to be associated with the object being created. |

Create Node - Hitachi Content Platform

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|---------------------------------------|-------------|
| <input type="radio"/> myResourceGroup | |

Cancel

Previous

Next

Figure 275 Hitachi Content Platform Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

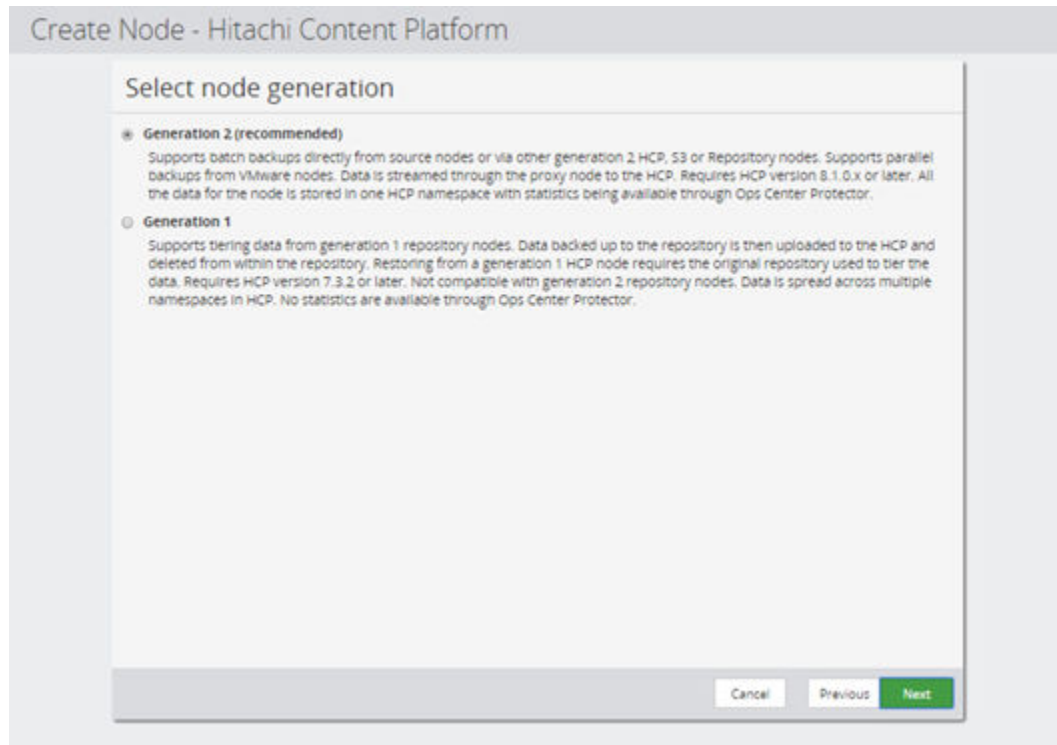


Figure 276 Hitachi Content Platform Wizard - Select Node Generation

| Control | Description |
|--------------|---|
| Generation 2 | Select this for a generation 2 storage node which is compliant with the new Universal Backup Infrastructure interface. This is the recommended option. |
| Generation 1 | Select this for a generation 2 storage node which required data to be sent via a generation 1 repository. Clicking Next will take you to the Configure Tenant Page. |

The screenshot shows a window titled "Create Node - Hitachi Content Platform". Inside, there's a section titled "Specify creation mode". Below this, under the heading "Mode", there are two radio button options: "Create a new HCP node" (which is selected) and "Import an existing HCP node". At the bottom right of the window, there are three buttons: "Cancel", "Previous", and "Next" (which is highlighted in green).

Figure 277 Hitachi Content Platform Wizard - Specify Node creation mode

| Control | Description |
|-----------------------------|---|
| Create a new HCP node | Select this to setup a new HCP node. |
| Import an existing HCP node | Select this to import an existing HCP node. |

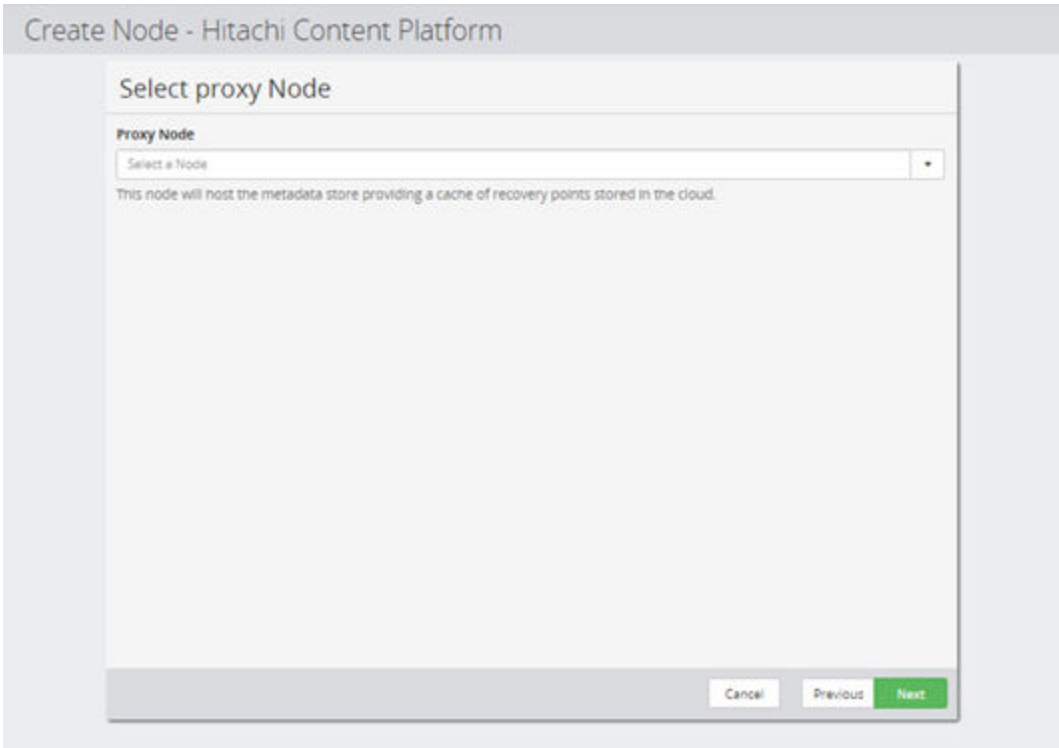


Figure 278 Hitachi Content Platform Wizard - Select Proxy Node

| Control | Description |
|------------|--|
| Proxy Node | Select a Protector node to act as a proxy. |

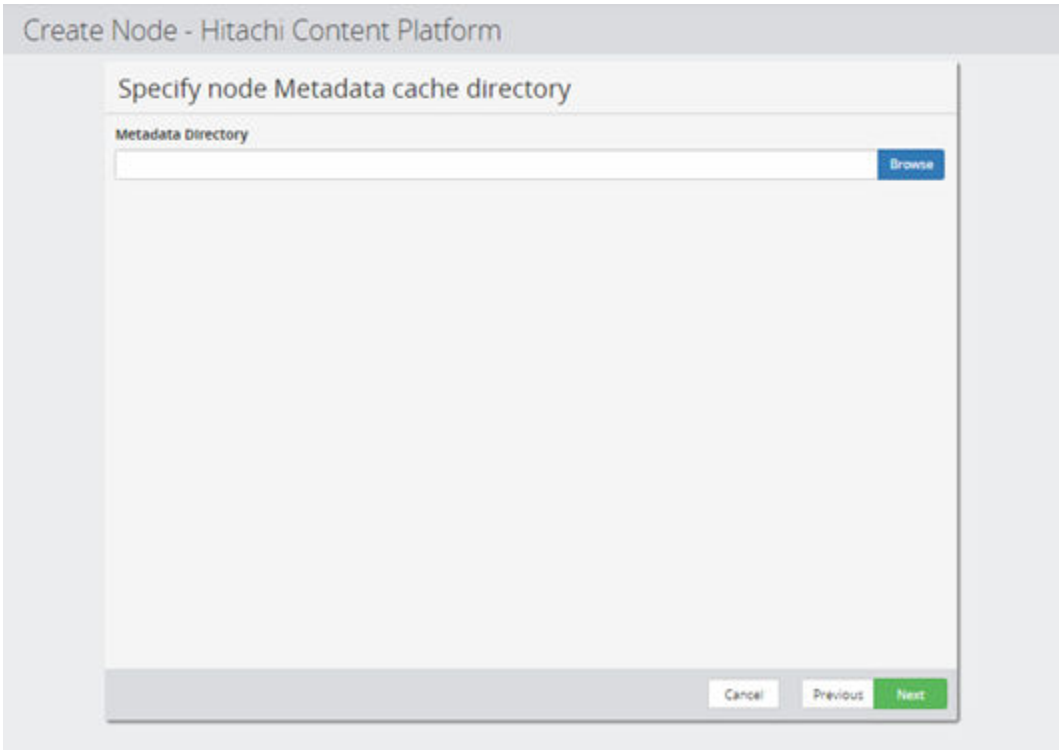


Figure 279 Hitachi Content Platform Wizard - Specify node Metadata cache directory

| Control | Description |
|--------------------|--|
| Metadata Directory | Enter a directory on the Proxy node where Protector can place metadata files related to HCP data. Click the Browse button to open the Path Dialog (on page 345) if required. |

Create Node - Hitachi Content Platform

Configure Tenant

Tenant Host Address

☐ Ignore SSL certificate errors

Username

Password

Cancel Previous **Next**

Figure 280 Hitachi Content Platform Wizard - Configure HCP Tenant

| Control | Description |
|-------------------------------|--|
| Tenant Host Address | Enter the host name for the tenant in the form <tenant>.<hcp_name>.<domain>. |
| Ignore SSL certificate errors | Allows the system to be used without properly configured SSL certificates. |
| Username | Enter a user name for the tenant specified above. |
| Password | Enter the password for the user. |

Create Node - Hitachi Content Platform

Configure Namespace defaults

The configuration here will be applied when creating new namespaces. Editing the node configuration will not affect namespaces which already exist.

Namespace


Initial Quota (GB)

Namespace Soft Quota Level

Percentage of free space at which the HCP prevents additional backups.

Cancel Previous **Next**

Figure 281 Hitachi Content Platform Wizard - Configure HCP Namespace defaults

| Control | Description |
|----------------------------|--|
| Namespace | This is automatically generated for a generation 1 HCP node and is therefore greyed out. For a generation 2 HCP node enter the desired namespace |
| Initial Quota (GB) | <p>Change the namespace quota from the default if required. It is important to estimate the quota required. Too small a value will result in tiering being stopped if the quota is exhausted. Too large a value will waste total tenant quota.</p> <p>This value is not displayed when importing an existing generation 2 HCP node.</p> <div>  Note: Changing the quota for an existing HCP node will only affect newly created namespaces. Existing namespaces created by Protector on that node will not be affected. </div> |
| Namespace Soft Quota Level | This is the percentage of free space at which additional backups are prevented |

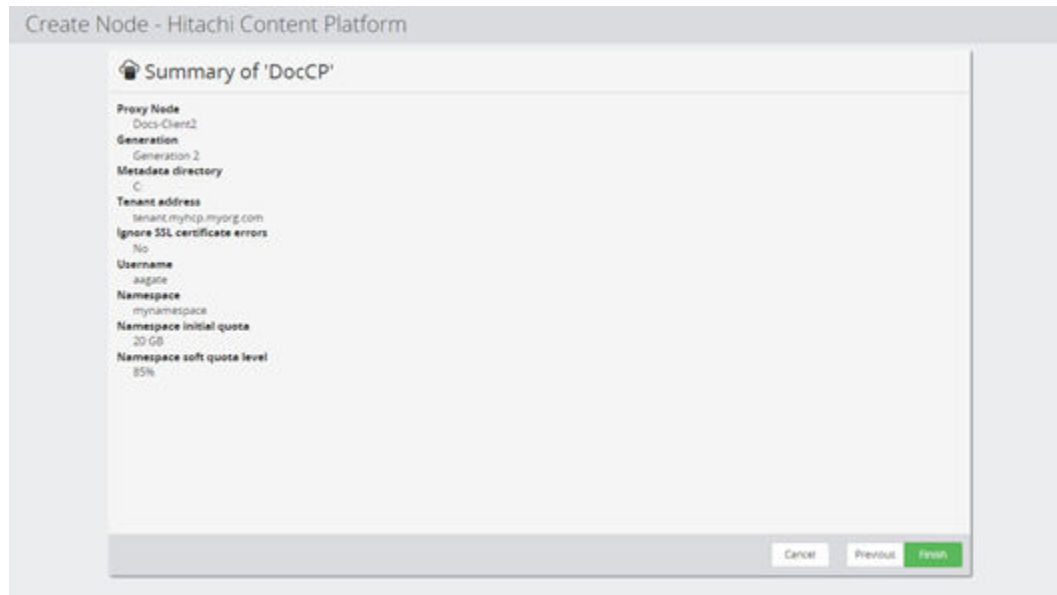


Figure 282 Hitachi Content Platform Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

Hitachi Logical Block Device Node Wizard

Hitachi Logical Block Storage Nodes implement multi tenancy by limiting what resources each tenant has access to on a physical block storage device shared with other tenants.

The Hitachi Logical Block Storage Node Wizard is used by storage administrators to create logical views of a physical storage device, so that multiple tenants can use a common device without interfering with each other's resources. [About multi-tenancy for Hitachi block storage \(on page 53\)](#) describes how Protector implements this arrangement.



Note: A Physical Block node must be created using the [Hitachi Block Device Node Wizard \(on page 513\)](#) before any Logical Block nodes can be created on it.

Figure 283 Hitachi Logical Block Wizard - Specify Node name

| Control | Description |
|--------------------------------------|--|
| Node Name | Enter a name for the Logical Block node. |
| Tags | Add the tags to be associated with the object being created. |
| Add to access control resource group | Check this box if you want to add it to a different resource group. |
| Resource Group | Type the name of the resource group or select one from the drop down list. |

Create Node - Hitachi Logical Block Device

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|---------------------------------------|-------------------------------|
| <input type="radio"/> myResourceGroup | A user defined resource group |

Cancel Previous **Next**

Figure 284 Hitachi Logical Block Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|---|
| Resource Groups | All nodes are automatically allocated to the 'default' RBAC resource group. Select the additional resource group(s), from those listed, to which this node will be allocated for the purposes of RBAC. Allocation to resource groups can also be done via the Access Control Resource Groups Inventory (on page 336). |

Figure 285 Hitachi Logical Block Wizard - Select Hitachi Block Device

| Control | Description |
|---------------------------|---|
| Hitachi Block Device Node | Enter or select the name of the Physical Block node on which the Logical Block node will be based . |

Figure 286 Hitachi Logical Block Wizard - Specify LDEV Provisioning Range


| Control | Description |
|------------|--|
| LDEV Range | <p>Specify the LDEV range on the physical storage device that will be made available by this logical storage device for provisioning S-VOLs.</p> <div>  Note: <p>All replication and snapshot S-VOLs must be created using free LDEV IDs that are mapped to the <i>meta_resource</i> group, and have virtual LDEV IDs matching their corresponding physical LDEV IDs.</p> <p>For fully provisioned snapshots and all replications, this applies to the operation that creates that snapshot or replication.</p> <p>For floating device snapshots and snapshots mounted using cascade mode, this applies to the mount or restore operation.</p> <p>For fully provisioned snapshots mounted using cascade mode, this applies both to the operation that creates that snapshot and to the mount or restore operation.</p> <p>If an operation tries to create one or more LDEVs, that operation will fail if there are not enough free LDEV IDs that meet the above conditions.</p> </div> |






Figure 287 Hitachi Logical Block Wizard - Specify Primary LDEV accessible to this device

Specifies the P-VOL(s) on the physical block device that will be available to this logical block device for snapshotting or replication. LDEVs can be specified by name, range and host group.



Note: This information is optional. If nothing is specified here, then no P-VOLs will be available for snapshotting or replicating on this logical block device.

| Control | Description |
|--|---|
|  Edit | Enabled only if one Primary LDEV is selected. The Specify Primary LDEVs filter page of the wizard (see below) is displayed to enable an LDEV Filter to be added. |
|  Delete | Enabled only if one or more LDEV Filters are selected. Deletes the LDEV Filter(s) from the list. |
|  Add | Adds a new LDEV Filter to the list. The Specify Primary LDEVs filter page of the wizard (see below) is displayed to enable an LDEV Filter to be added. |
| Existing LDEV Filter(s) | Lists the LDEV Filter(s) that will be used. |

Create Node - Hitachi Logical Block Device

Specify Primary LDEVs filter

Specify one or more criteria. The filter will combine all specified criteria to match LDEVs.

LDEV Name Pattern

LDEV ID Range

 to

Host Group ID


Cancel Discard Previous **Apply**

Figure 288 Hitachi Logical Block Wizard - Specify Primary LDEVs filter

Specify one or more of the following parameters to identify the Primary LDEV(s):



Note: The terms entered here are logically ANDed together, so an LDEV will only be selected if it matches the *Name Pattern* AND *ID Range* AND *Host Group ID*.

| Control | Description |
|-------------------|---|
| LDEV Name Pattern | Enter a regular expression (see Basic regular expressions (on page 554)) to identify matching Primary LDEV Names that will be made available on this logical block device. |
| LDEV ID Range | Enter the range of the Primary LDEV IDs that will be made available on this logical block device. |
| Host Group ID | Enter a Host Group identifier.  Tip: Host Group ID is normally used alone rather than in combination with the other filter terms presented here. |

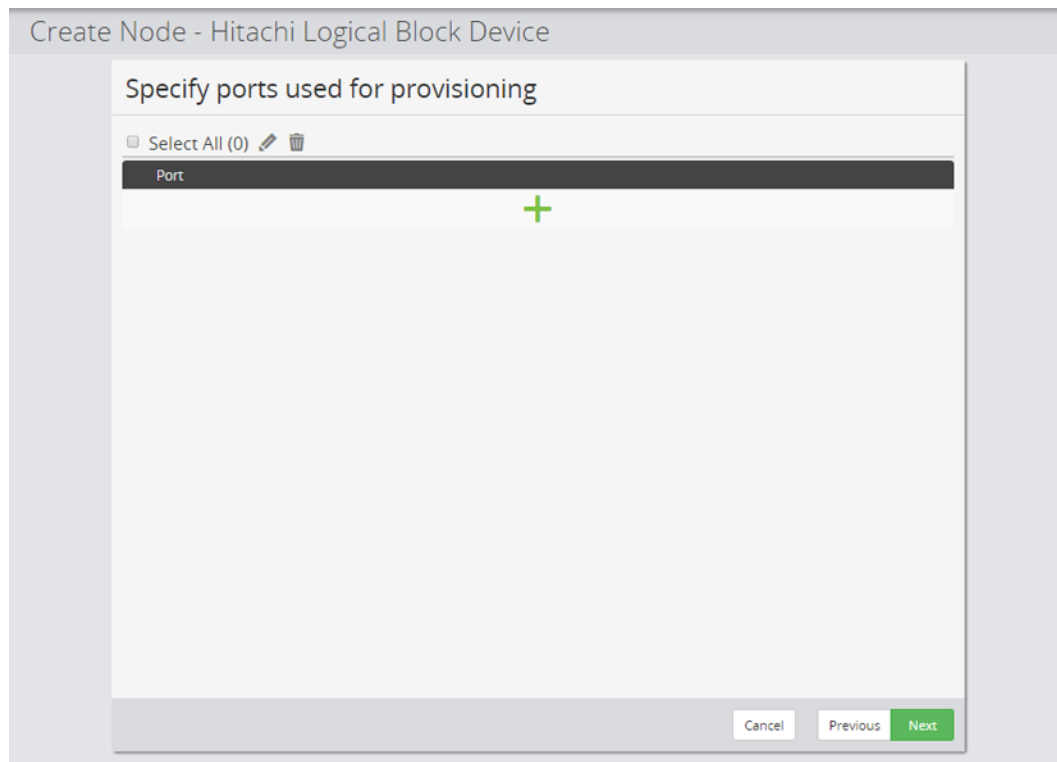





Figure 289 Hitachi Logical Block Wizard - Specify ports used for provisioning



Note: This information is optional. Protector creates dummy Host Groups for its own processing needs. If nothing is specified here, then Protector will use any available port when creating these dummy Host Groups.



Tip: Use this list to restrict Protector to using LUN allocations on designated ports only.

| Control | Description |
|--|--|
|  Edit | Enabled only if one provisioning port is selected. The Specify Port page of the wizard (see below) is displayed to enable a port to be edited. |
|  Delete | Enabled only if one or more provisioning ports are selected. Deletes the port(s) from the list. |
|  Add | Adds a new provisioning port for use by Protector to the list. The Specify Port page of the wizard (see below) is displayed to enable a port to be added. |
| Provisioning Port(s) | Lists the provisioning ports that will be used. |

Create Node - Hitachi Logical Block Device

Specify Port

Port

CL 1 - A

Cancel Discard Previous Apply

Figure 290 Hitachi Logical Block Wizard - Specify Port




| Control | Description |
|---------|---|
| Port | <p>Specify a port that can be used by Protector for its own processing needs.</p> <p>Enter a port identifier in the following format:</p> <p>CL_{C-S}</p> <p>where:</p> <ul style="list-style-type: none"> c is the physical channel number in the range 1...n s is the physical slot number in the range A...Z |



Figure 291 Hitachi Logical Block Wizard - Specify Journals accessible to this device



Note: This information is optional. If nothing is specified here, then no source or destination Journals will be available for Universal Replicator on this logical block device.

| Control | Description |
|--|--|
|  Edit | Enabled only if one Journal Range is selected. The Specify Journal range page of the wizard (see below) is displayed to enable a journal range to be added. |
|  Delete | Enabled only if one or more Journal Ranges are selected. Deletes the Journal Range(s) from the list. |
|  Add | Adds a new Journal Range to the list. The Specify Journal range page of the wizard (see below) is displayed to enable a Journal Range to be added. |
| Journal Ranges | The Journal Range to be used. |

The screenshot shows a window titled "Create Node - Hitachi Logical Block Device". Inside, there is a section titled "Specify Journal range". Below this title, the text "Journal ID Range" is displayed. Underneath, there are two input fields, each containing "0x00", separated by the word "to". At the bottom right of the window, there are four buttons: "Cancel", "Discard", "Previous", and "Apply". The "Apply" button is highlighted in green.

Figure 292 Hitachi Logical Block Wizard - Specify Journal range

| Control | Description |
|------------------|--|
| Journal ID Range | Enter the Journal ID range that will be made available on this logical block device. |






Figure 293 Hitachi Logical Block Wizard - Specify Host Groups accessible to this device



Note: This information is optional. If nothing is specified here, then no Host Groups will be available on this logical block device for:

- Mounting (see [Hitachi Block Snapshot or Replication Mount Wizard \(on page 695\)](#) and [Hitachi Block Mount Configuration Wizard \(on page 433\)](#)).
- Specifying GAD cross-path replication secondary Host Groups (see [Hitachi Block Replication Configuration Wizard \(on page 381\)](#)).

| Control | Description |
|--|---|
|  Edit | Enabled only if one Host Group is selected. The Specify Host Group Filter page of the wizard (see below) is displayed to enable a Host Group to be added. |
|  Delete | Enabled only if one or more Host Group Filters are selected. Deletes the Host Group Filter(s) from the list. |
|  Add | Adds a new Host Group Filter to the list. The Specify Host Group Filter page of the wizard (see below) is displayed to enable a Host Group Filter to be added. |
| Host Group Filter(s) | The Host Group Filter to be used. |

Create Node - Hitachi Logical Block Device

Specify Host Group filter

Specify one or more criteria. The filter will combine all specified criteria to match Host Groups.

Host Group Name Pattern

Host Group ID Range

0x00 to 0x00

Port

CL 1 - A

Cancel Discard Previous Apply

Figure 294 Hitachi Logical Block Wizard - Specify Host Group filter

Specify one or more of the following parameters to identify the Host Groups:



Note: The terms entered here are logically ANDed together, so a Host Group will only be selected if it matches the *Name Pattern* AND *ID Range* AND *Port ID*.

| Control | Description |
|-------------------------|---|
| Host Group Name Pattern | Enter a regular expression (see Basic regular expressions (on page 554)) to identify matching Host Group Names. |
| Host Group ID range | Enter the lower and upper limit of the Host Group ID range to use. |
| Port ID | Enter the port identifier in the following format: CLC-S where: <ul style="list-style-type: none"> C is the physical channel number in the range 1...n S is the physical slot number in the range A...Z |

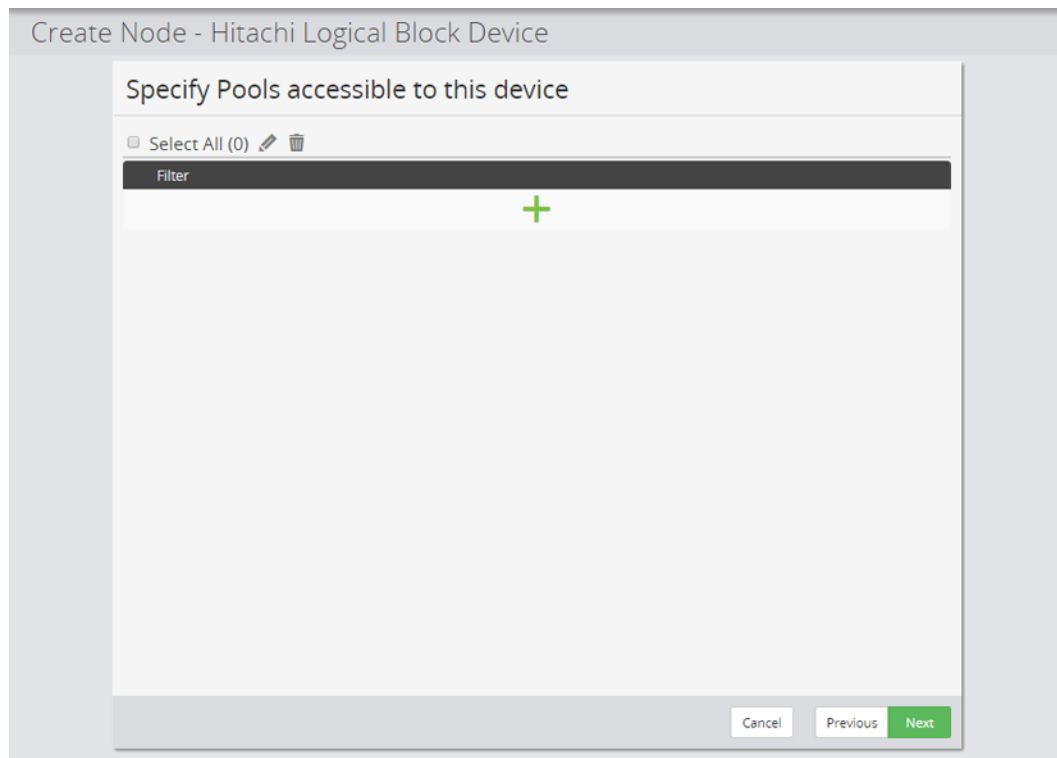





Figure 295 Hitachi Logical Block Wizard - Specify Pools accessible to this device



Note: This information is optional. If nothing is specified here, then no Pools will be available on this logical block device for creating snapshots or replications.

| Control | Description |
|--|--|
|  Edit | Enabled only if one Pool Filter is selected. The Specify Pool filter page of the wizard (see below) is displayed to enable a Pool Filter to be added. |
|  Delete | Enabled only if one or more Pool Filters are selected. Deletes the Pool Filter(s) from the list. |
|  Add | Adds a new Pool Filter to the list. The Specify Pool filter page of the wizard (see below) is displayed to enable a Pool Filter to be added. |
| Existing Pool Filter | The Pool Filter(s) to be used. |

Create Node - Hitachi Logical Block Device

Specify Pool filter

Specify one or more criteria. The filter will combine all specified criteria to match Pools.

Pool Name Pattern

Pool ID Range

 to

Cancel Discard Previous **Apply**

Figure 296 Hitachi Logical Block Wizard - Specify Pool filter

Specify one or more of the following parameters to identify the Pools:



Note: The terms entered here are logically ANDed together, so a Pool will only be selected if it matches the *Name Pattern* AND *ID Range*.

| Control | Description |
|-------------------|--|
| Pool Name Pattern | Enter a regular expression (see Basic regular expressions (on page 554)) to identify matching Pool Names. |
| Pool ID range | Enter the Pool ID range to use. |

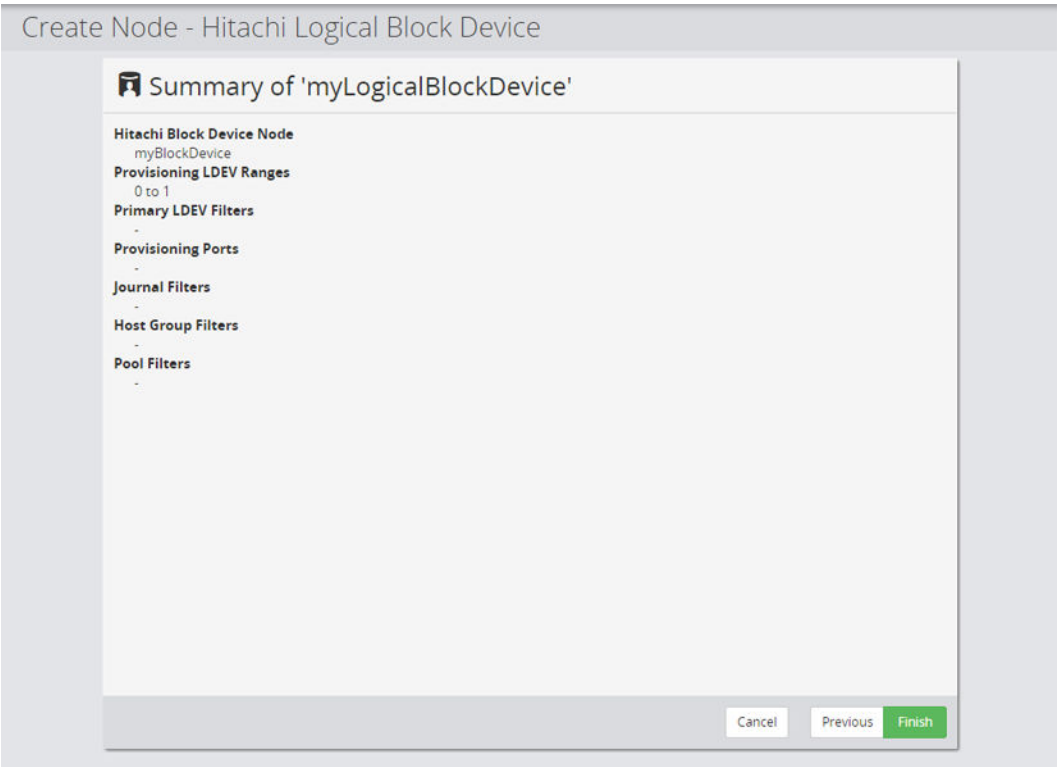


Figure 297 Hitachi Logical Block Wizard - Summary

| Control | Description |
|---------|----------------------------------|
| Summary | Summary of the settings entered. |

Basic regular expressions

Regular expressions (regex) are a powerful method of pattern matching in character strings. This topic describes a few basic regex terms. For a full explanation of regular expressions, please refer to one of the many books or online resources available.

Table 30 Commonly used regex matching terms


| Type of Match | Regex Example | Action | Explanation |
|--|---------------------------------|---|---|
| Contains the sub-string (case sensitive) | <code>this</code> | Matches any string containing the sub-string <code>this</code> , respecting the case e.g.: <code>Grab this</code> <code>thistle</code> | A sub-string on its own will be matched anywhere within the search string. |
| Contains the sub-string (case insensitive) | <code>(?i)this</code> | Matches any string containing the sub-string <code>this</code> , without regard to case e.g.: <code>Grab This</code> <code>thIstle</code> | The <code>(?i)</code> <i>mode modifier</i> turns off case sensitive matching |
| Starts with the sub-string | <code>^this</code> | Matches any string starting with <code>this</code> e.g.: <code>this is a tree</code> | The <code>^</code> <i>anchor</i> means the sub-string must appear at the start of the string being searched |
| Ends with the sub-string | <code>that\$</code> | Matches any string ending with <code>that</code> e.g.: <code>don't touch</code> <code>that</code> | The <code>\$</code> <i>anchor</i> means the sub-string must appear at the end of the string being searched |
| Starts with any of the sub-strings | <code>^(this that other)</code> | Matches any string starting with <code>this</code> or <code>that</code> or <code>other</code> e.g.: <code>this time it matters</code> and: <code>that's life</code> and: <code>other types available</code> | The <code> </code> <i>alternation operator</i> indicates any sub-string in brackets will be matched |

| Type of Match | Regex Example | Action | Explanation |
|---|----------------------------|---|--|
| Contains any of the sub-strings | (this that) | Matches any string containing <code>this</code> or <code>that</code> e.g.: <code>you can't touch this</code> and: <code>please don't do that</code> | The <code> </code> <i>alternation operator</i> indicates either sub-string in brackets will be matched |
| Starts with sub-string 1 and ends with sub-string 2 | <code>^this.*that\$</code> | Matches any string starting with <code>this</code> and ending with <code>that</code> e.g.: <code>this is the answer to that</code> | The <code>.</code> <i>metacharacter</i> matches any character, then the <code>*</code> <i>quantifier</i> indicates that zero or more of them will be matched |

Repository Storage Node Wizard

This wizard is launched when a new Repository Node is added to the Nodes Inventory.

Figure 298 Repository Wizard - Specify Node name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the Repository node. <div>  Note: Repository nodes that are hosted on the same Proxy Node must be uniquely named. </div> |
| Tags | Add the tags to be associated with the object being created. |

Create Node - Repository

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|---------------------------------------|-------------------------------|
| <input type="radio"/> myResourceGroup | A user defined resource group |

Cancel Previous **Next**

Figure 299 Repository Wizard - Allocate node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

Create Node - Repository

Select Proxy Node

Proxy Node

Select a Node

This node will host the repository data.

Cancel

Previous

Next

Figure 300 Repository Wizard - Select Proxy Node

| Control | Description |
|------------|---|
| Proxy Node | Enter or select the node that will host the Repository. |

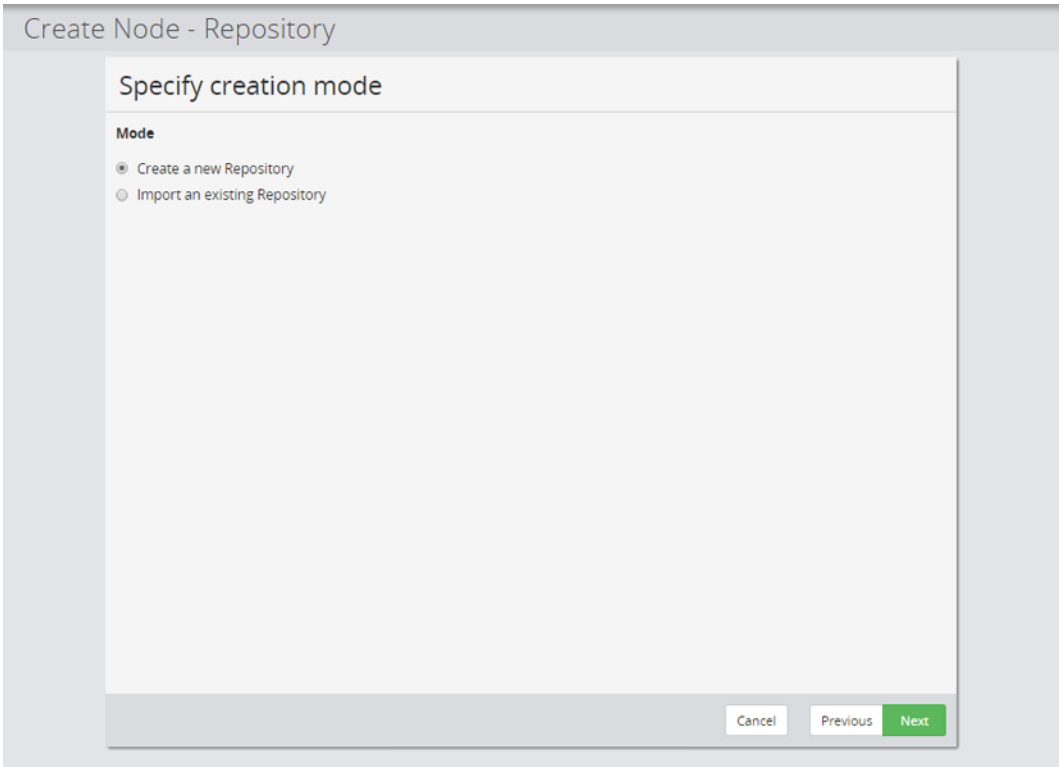


Figure 301 Repository Wizard - Specify creation mode

| Control | Description |
|---------|--|
| Mode | <div>Select one of the following options:</div> <div><div>Create a new Repository</div><div>Import an existing Repository</div></div> <div>If selection Import an existing Repository, you will be presented with the following wizard page.</div> |

Create New Repository

Create Node - Repository

Select existing repository directory

Directory

Browse

Encryption Passphrase (optional)

When importing an encrypted repository the passphrase should be provided so that the repository can be automatically mounted.

Cancel

Previous

Next

Figure 302 OR: Repository Wizard - Select existing repository directory

| Control | Description |
|----------------------------------|---|
| Directory | Enter the path of the directory where the existing repository resides or select the path by clicking the Browse button to open the Path Dialog (on page 345) . Clicking next will take you to the Summary Page. |
| Encryption Passphrase (optional) | If the repository was encrypted, enter the password specified when it was created if you want to mount it immediately. The passphrase can be entered later if you intend to leave it unmounted for now. |

Create Node - Repository

Select node generation

☒ **Generation 2 (recommended)**
Supports batch backups directly from source nodes or via other generation 2 Repository or Cloud nodes. Deduplication can be enabled repository-wide. Supports parallel backups from VMware nodes.

☐ **Generation 1**
Supports batch backup directly from source nodes or via other generation 1 Repository nodes. Deduplication can be enabled on a per-store basis.

Cancel Previous Next

Figure 303 Repository Wizard – Select node generation

| Control | Description |
|--------------|--|
| Generation 1 | A generation 1 repository should only be selected if it is being used to receive data from another generation 1 repository. Generation 1 repositories are deprecated and wherever possible generation 2 repositories should be used. |
| Generation2 | It is recommended to select a Generation 2 repository for all new repository setups. A generation 2 repository supports all new capabilities and utilizes the UBI framework. |

Create Node - Repository

Specify Repository directories

Root Directory
[Text Input] Browse

Data Directory
Inherit from root directory [Text Input] Browse

Metadata Directory
Inherit from root directory [Text Input] Browse


Checksum Directory
Inherit from root directory [Text Input] Browse

Cancel Previous Next

Figure 304 Repository Wizard – Specify Repository directories

| Control | Description |
|--------------------|---|
| Root Directory | The root directory is the location where the configuration data for the repository is held. |
| Data Directory | The data directory holds the actual backed up data contents of the repository. |
| Metadata Directory | The metadata directory holds the information that describes how the data in the data directory needs to be combined to make up a recovery point which can then be restored. |
| Checksum Directory | The checksum directory is used to store the checksums generated when Fine Change Detection is enabled. |

Figure 305 Repository Wizard – Configure Repository encryption

| Control | Description |
|------------------------------|--|
| Enable Repository Encryption | You can optionally encrypt the contents of your repository to enhance security of the data stored in it. In-place encryption may not be allowed in some territories, this capability is controlled by license. |
| Encryption Passphrase | Enter an encryption password of your choosing. This will be required by anyone who accesses the repository. <div>  Caution: An encrypted repository cannot be recovered without the password. If the password is forgotten, then the data in that repository will be inaccessible. </div> |

| Control | Description |
|-------------------------------|---|
| Confirm Encryption Passphrase | Re-enter the encryption password to ensure it has been typed correctly. |

Create Node - Repository

Configure Repository settings

☐ Optimize for Cloud Replication

☐ Single Instance Repository Data

Capacity Warning Level

85

Percentage of used space at which the repository enters the capacity warning state.

Capacity Critical Level

95

Percentage of used space at which the repository will automatically unmount.

Block Size

16K

Cancel Previous Next

Figure 306 Repository Wizard – Configure Repository settings

| Control | Description |
|---------------------------------|---|
| Optimize for Cloud Replication | Aligns block boundaries between the repository and the cloud in order to make cloud uploads more efficient. |
| Single Instance Repository data | Enables the repository to perform file stream level single instancing. This reduces the space backups take up if you have multiple backups of the same file. |
| Capacity Warning Level | When the used space on the filesystem which hosts the repository reaches this percentage level warning logs will be generated advising of low disk space. |
| Capacity Critical Level | When the used space on the filesystem which hosts the repository reaches this percentage level an error log will be generated, and the repository will unmount. |
| Block Size | Sets the block size the repository uses. It is recommended that this matches the filesystem block size where possible. |

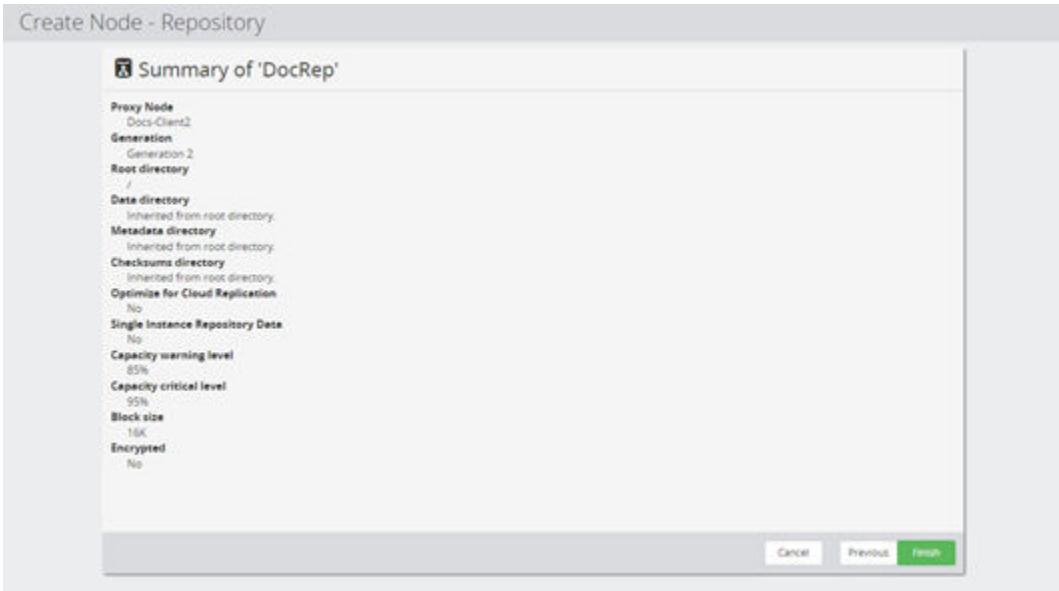


Figure 307 Repository Wizard - Summary

| Control | Description |
|---------|--|
| Summary | Summary of the parameters entered above. |

Import an existing Repository

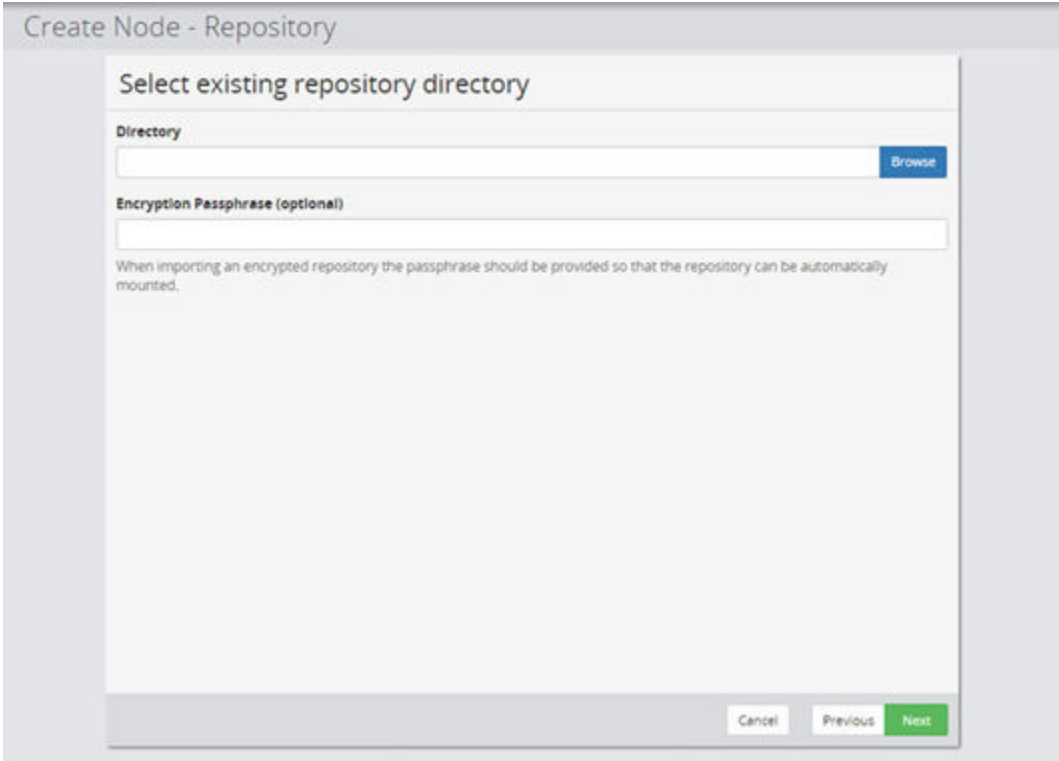


Figure 308 OR: Repository Wizard - Select existing repository directory for Import

| Control | Description |
|--|---|
| Directory | Enter the path of the directory where the existing repository resides or select the path by clicking the Browse button to open the Path Dialog (on page 345) . Clicking next will take you to the Summary Page. |
| Encryption Passphrase (optional) | If the repository was encrypted, enter the password specified when it was created if you want to mount it immediately. The passphrase can be entered later if you intend to leave it unmounted for now. |

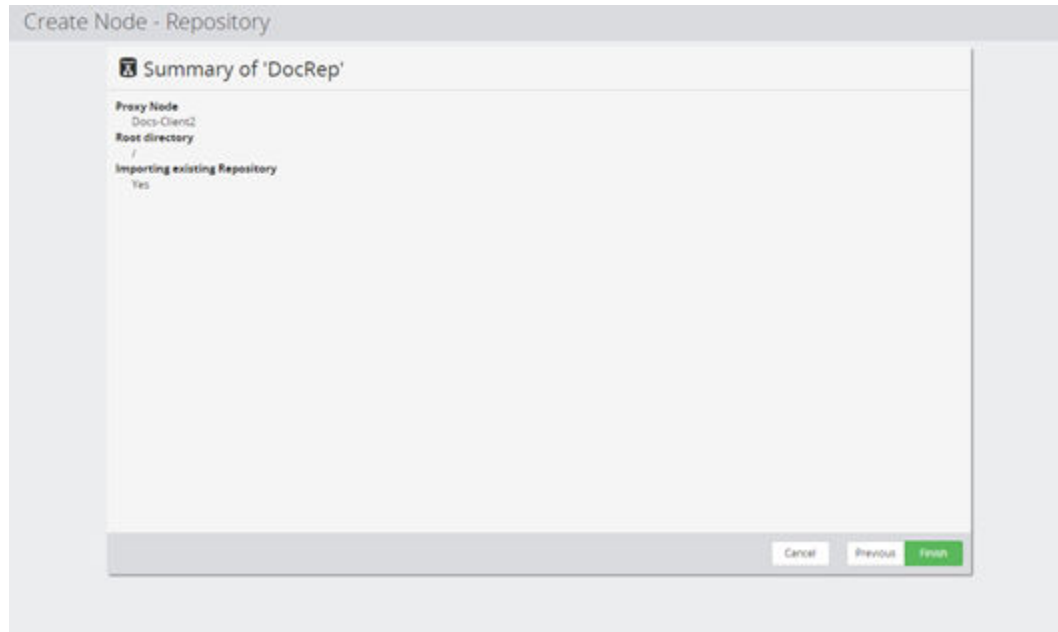


Figure 309 Repository Wizard – Summary of Import Repository Wizard

| Control | Description |
|---------|---|
| Summary | Summary of the parameters entered for Import Repository Wizard. |

Amazon S3 Storage Node Wizard

This wizard is launched when a new Amazon S3 Node is added to the Nodes Inventory.



Note: Ensure that the Proxy Node defined within the wizard is time synced. If the time is different by over 5 minutes, then the node creation and future backup may fail. It is recommended that the system time on all nodes should have the correct date/time associated with their particular region and time zone.



Note: There are some differences between the Amazon S3 node creation and the HCP Cloud Scale node creation which will be noted in this section. 'S3 Node' will be used as a general term to represent an Amazon S3 node.

Create Node - Amazon S3

Specify Node name

Node Name

I

Must be between 2 and 64 characters, contain only letters, numbers, underscores, hyphens and full stops.

Tags

Add

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Cancel Previous Next

Figure 310 S3 Node Wizard - Specify Node Name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the S3 node. |
| Tags | Add the tags to be associated with the object being created. |

Create Node - Amazon S3

Allocate node to Access Control Resource Group

This node will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|------|-------------|
| | |

☐ Test

Cancel Previous Next

Figure 311 S3 Node Wizard - Allocate Node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |



Figure 312 S3 Node Wizard - Specify Creation Mode

| Control | Description |
|---------|--|
| Mode | <p>Select one of the following options:</p> <ul style="list-style-type: none"> ▪ Create a new S3 node <ul style="list-style-type: none"> • This will start a new store in S3. ▪ Import an existing S3 Node <ul style="list-style-type: none"> • This will utilize a backup store that already exists. <p>Subsequent screens are the same for either choices.</p> |

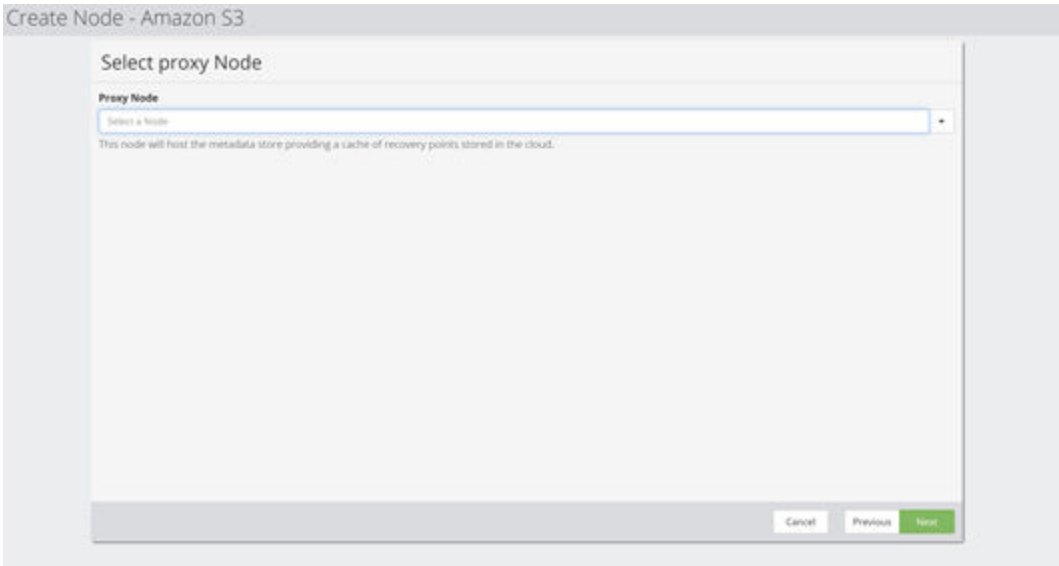


Figure 313 S3 Node Wizard - Select Proxy Node

| Control | Description |
|------------|---|
| Proxy Node | Enter or select the node that will host the S3 proxy. |



Figure 314 S3 Node Wizard - Specify Node Metadata Cache Directory

| Control | Description |
|-----------|---|
| Directory | <p>Enter the path of the directory where you want to create the new S3 metadata cache or select the path by clicking the Browse button to open the Path Dialog (on page 345).</p> <p>The metadata cache holds an index and metadata for backups that are stored in the S3 cloud. This is only a cache and can be rebuilt from the S3 cloud content if lost.</p> |

Amazon S3 specific configuration

Figure 315 Amazon S3 Wizard - Configure S3

| Control | Description |
|-------------------|---|
| Access Key ID | Amazon S3 Access Key ID. This is the equivalent of a user . See Amazon S3 documentation for further information. |
| Secret Access Key | Amazon S3 Secret Access Key. This is the equivalent of a password. See Amazon S3 documentation for further information. |
| Bucket Name | This a name of where you will store data in the Amazon S3. It needs to be globally unique across all users of AWS across all regions. Consider the bucket name to be akin to a URL and it uses the DNS compliant naming conventions. See Amazon S3 documentation for further information. |
| Region | This is the region where the store will be created. Generally, you should select a store closest to your geographic region. See Amazon S3 documentation for further information. |

HCP Cloud Scale Storage Node Wizard

This wizard is launched when a new HCP Cloud Scale Node is added to the Nodes Inventory.



Note: Ensure that the Proxy Node defined within the wizard is time synced. If the time is different by over 5 minutes, then the node creation and future backup may fail. It is recommended that the system time on all nodes should have the correct date/time associated with their particular region and time zone.



Note: There are some differences between the Amazon S3 node creation and the HCP Cloud Scale node creation which will be noted in this section. 'S3 Node' will be used as a general term to represent HCP Cloud Scale node.

Figure 316 HCP Node Wizard - Specify Node Name

| Control | Description |
|-----------|--|
| Node Name | Enter a name for the HCP node. |
| Tags | Add the tags to be associated with the object being created. |

Figure 317 HCP Node Wizard - Allocate Node to Access Control Resource Group

| Control | Description |
|-----------------|--|
| Resource Groups | Select the resource group(s) to which this node will be allocated for the purposes of RBAC. All nodes are automatically allocated to the 'default' resource group. |

Figure 318 HCP Node Wizard - Specify Creation Mode

| Control | Description |
|---------|--|
| Mode | <p>Select one of the following options:</p> <ul style="list-style-type: none"> ▪ Create a new S3 node <ul style="list-style-type: none"> • This will start a new store in S3. ▪ Import an existing S3 Node <ul style="list-style-type: none"> • This will utilize a backup store that already exists. <p>Subsequent screens are the same for either choices.</p> |

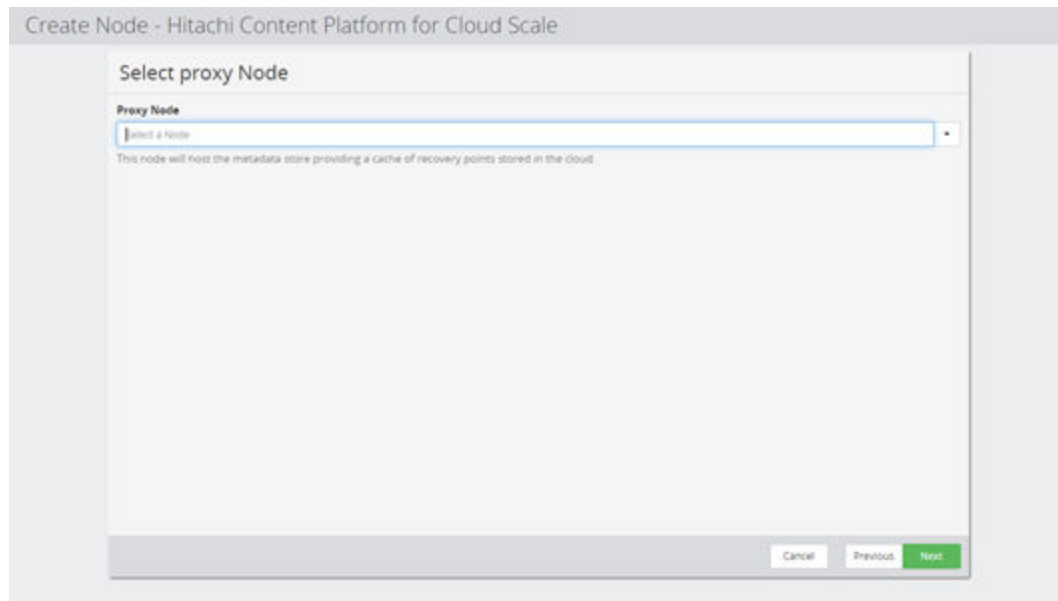


Figure 319 HCP Node Wizard - Select Proxy Node

| Control | Description |
|------------|---|
| Proxy Node | Enter or select the node that will host the S3 proxy. |

Figure 320 HCP Node Wizard - Specify Node Metadata Cache Directory

| Control | Description |
|-----------|---|
| Directory | <p>Enter the path of the directory where you want to create the new S3 metadata cache or select the path by clicking the Browse button to open the Path Dialog (on page 345).</p> <p>The metadata cache holds an index and metadata for backups that are stored in the S3 cloud. This is only a cache and can be rebuilt from the S3 cloud content if lost.</p> |

Figure 321 HCP Cloud Scale Wizard - Configure S3

| Control | Description |
|-------------------------------|--|
| S3 Service Endpoint | The HTTP endpoint to communicate with the HCP Cloud Scale S3 service. |
| Ignore SSL certificate errors | Ignore SSL errors when using self-signed certificates. |
| S3 Access Key | This is the equivalent of a user. |
| S3 Secret Key | This is the equivalent of a password. |
| Bucket Name | This a name of where you will store data on the HCP Cloud Scale device. Consider the bucket name to be akin to a URL and it uses the DNS compliant naming conventions. |

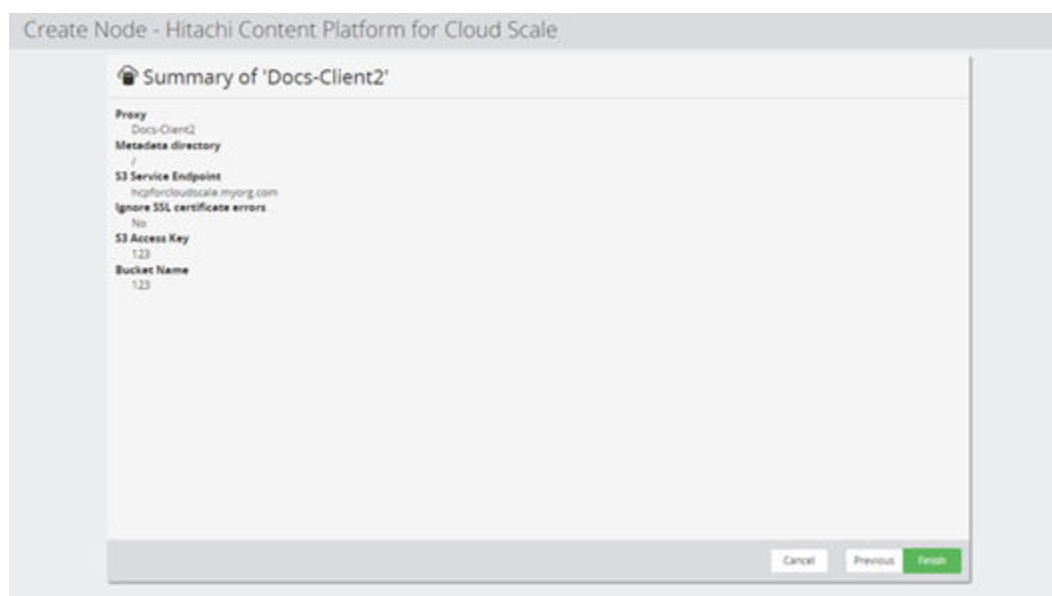


Figure 322 HCP Node Wizard - Summary

| Control | Description |
|---------|--|
| Summary | Summary of the parameters entered above. |

Node Details

This page displays the details of an existing node and enables the wizard to be launched to edit them.

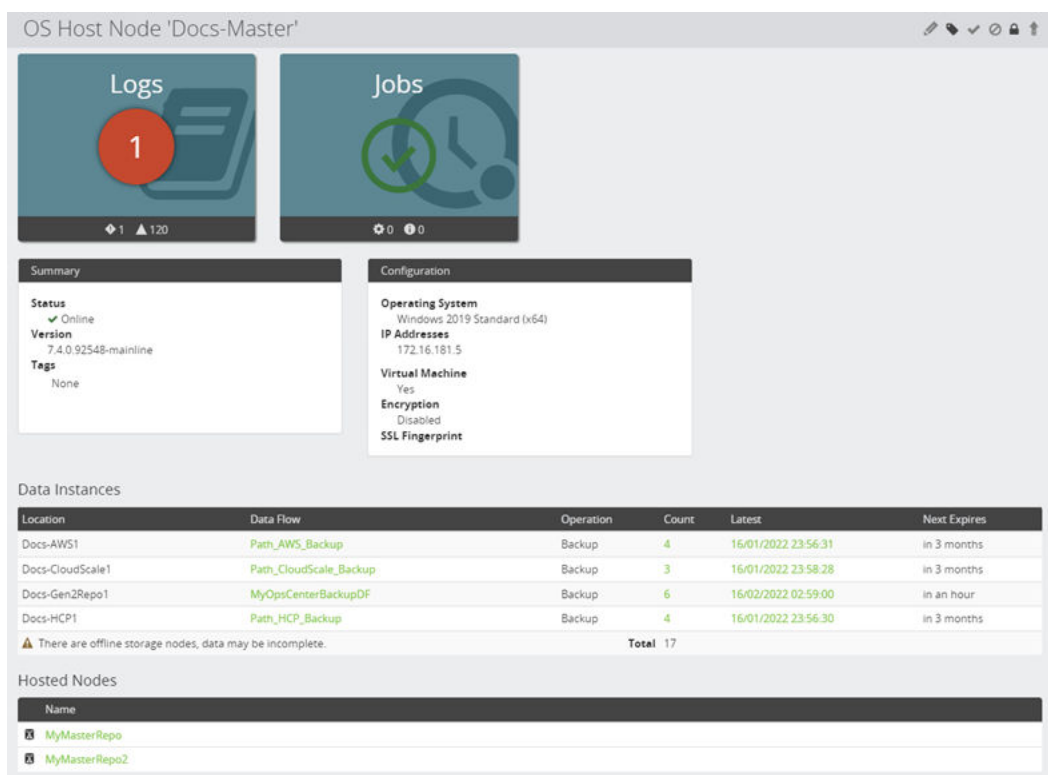


Figure 323 Node Details (OS Host)

Table 31 Common Controls (Displayed for all node types)

| Control | Description |
|---------|---|
| Logs | Indicates the number of unacknowledged error logs in red. If there are no errors then a green tick is displayed instead. Summarizes the number of unacknowledged errors and warnings. Opens the Logs Inventory (on page 448) . |
| Jobs | Indicates the number of failed jobs in red. If there are no failed jobs then a green tick is displayed instead. Summarizes the number of failed, paused and in-progress jobs. Opens the Jobs Inventory (on page 441) . |
| Summary | <p>Indicates the following:</p> <ul style="list-style-type: none"> Status (Online/Offline) - indicates if the node is contactable by the Master node. <div> <p>Note: OS Host have version. All other nodes have Proxy and Proxy Version</p> <ul style="list-style-type: none"> Proxy - Name of the OS Host node where this node reside. Protector Version - The version number of the Protector software running on the proxy node. </div> <ul style="list-style-type: none"> Tags |


| Control | Description |
|----------------|---|
| Data Instances | <p>Indicates the following:</p> <ul style="list-style-type: none"> Location – Name of the node where the data instance resides. Data Flow – Link to the Data Flow which describes the backup instance. Operation - Indicates operation type and name. Count – Indicates the number of recovery points for the storage system. Latest – Indicates the latest date and time when snapshot/backup is created.  - Indicates that one or more node are offline and as such there may be instances residing on these nodes so there is a potential that the count is incomplete. |

Table 32 OS Host Specific Controls



| Control | Description |
|--|--|
| Configuration | <p>Indicates the following:</p> <ul style="list-style-type: none"> Operating System - the name of the operating system on the node. Virtual Machine - indicates the machine is running on a hypervisor. IP Addresses - all the IP addresses in use on the node. |
| Hosted Nodes | Lists all the nodes for which this node acts as the proxy. |
|  Enable \Disable Encryption | Enables disables SSL encryption on the node. For more details see How to enable or disable encryption on a node (on page 259) . |

Table 33 Oracle Specific Controls

| Control | Description |
|--|--|
|  Edit | Launches the Oracle Application Node Wizard (on page 487) to enable the parameters to be edited. |
| Details | Displays the node's online status. |
| Configuration | Displays the node type and configuration. |

| Control | Description |
|------------|--|
| Host Nodes | Lists all the nodes that act as the proxy for this node. |

Table 34 VMware Specific Controls


| Control | Description |
|--|---|
|  Edit | Launches the VMware Node Wizard (on page 505) to enable the parameters to be edited. |
| Configuration | Indicates the following: <ul style="list-style-type: none"> VMware Username. VMware Server. |

Table 35 Hitachi Block Specific Controls




| Control | Description |
|--|--|
|  Manage | Opens the storage Hitachi Block Device Details (on page 757) for this node. |
|  Edit | Launches the Hitachi Block Device Node Wizard (on page 513) to enable the parameters to be edited. |
|  Edit Tags | Add the tags to be associated with the object being created. |
| Configuration | Indicates the following: <ul style="list-style-type: none"> Storage Serial. Username. LDEV Range. |
| Port | List the available ports for this node. |
| Command Device Type | Lists the command devices and their type. |
| Virtual Serial | Lists the Virtual Serial devices. |
| Hosted Nodes | Lists all the nodes for which this node acts as the proxy. |

Table 36 Hitachi Block Host Specific Controls




| Control | Description |
|--|---|
|  Edit | Launches the Hitachi Block Host Node Wizard (on page 494) to enable the parameters to be edited. |
|  Edit Tags | Add the tags to be associated with the object being created. |
|  Expand | Launches the Hitachi Block Host Resize Dialog (on page 349) to expand the one or more LDEVs associated with this Block Host node. |
| Summary | Displays the node's online status and tags. |
| Configuration | Indicates the Hitachi Block Device on which this node is based. |
| Included Logical Devices | List the LDEVs represented by this node. |
| Excluded Logical Devices | List the LDEVs excluded for this node. |

Table 37 Hitachi Logical Block Specific Controls




| Control | Description |
|--|--|
|  Manage | Opens the storage Hitachi Block Logical Device Details (on page 767) for this node. |
|  Edit | Launches the Hitachi Logical Block Device Node Wizard (on page 539) to enable the parameters to be edited. |
|  Edit Tags | Add the tags to be associated with the object being created. |
| Details | Displays the node's online status. |
| Configuration | Indicates the parent Hitachi Block Device Node. |
| LDEV Range | The LDEV provisioning ranges available for this node. |

Table 38 Repository Specific Controls







| Control | Description |
|---|--|
|  Manage | Opens the storage Generation 1 Repository Details (on page 795) for this node. |
|  Edit | Launches the Repository Storage Node Wizard (on page 556) to enable editing the capacity level. |
|  Tags | Edit Add the tags to be associated with the object being created. |
| Details | Displays the nodes proxy. |
| Configuration | Indicates the follow: <ul style="list-style-type: none"> ▪ Generation – The generation of the repository (affects supported options). ▪ Encryption – Repository encryption enabled or disabled. ▪ Cloud Optimized – (Generation 2) Data chunk size optimized for cloud storage. Enabled or disabled. ▪ Single Instancing – (Generation 2) Store a single instance of a block. Enabled or disabled. ▪ Capacity Warning Level – Percentage of disk space at which the repository enters the warning state. ▪ Capacity Critical Level – Percentage of disk space at which the repository will automatically unmount. ▪ Block Size. |
| Paths | Indicates the following: <ul style="list-style-type: none"> ▪ Root Directory. ▪ Data Directory. ▪ Metadata Directory. ▪ Checksums Directory. |








Table 39 Hitachi Content Platform Specific Controls






| Control | Description |
|--|--|
|  Edit | Launches the Hitachi Content Platform Storage Node Wizard (on page 530) to enable the parameters to be edited. |
|  Edit Tags | Add the tags to be associated with the object being created. |
| Configuration | Indicates the following: <ul style="list-style-type: none"> ▪ Generation – The generation of the HCP node. ▪ Metadata directory. ▪ Username - The username used when connecting to the HCP Tenant Console. ▪ Tenant Address - The address used when connecting to the HCP Tenant Console. ▪ HTTPS - Use HTTP or HTTPS when transferring data to and from HCP. |
| Namespace | <ul style="list-style-type: none"> ▪ Name. ▪ Created. ▪ Hard Quota – The size of name space. ▪ Soft Quota – Percentage of hard quota. |

Node Type Icons

The node icons and indicators used in the lists of unauthorized and authorized nodes.




| Icon | Description |
|---|--|
|  | Master Node - Indicates that this node is the master node. |


| Icon | Description |
|---|---|
|  | OS Host Node - A Workstation, Laptop or Server node with the Protector services installed. |
|  | Repository Node - A node with the Protector Repository component installed. Used to store snapshots of data backed up from various types of source nodes. |
|  | VMware ESX Node - A node containing virtual machines, and accessed through a separate proxy node. |
|  | Hitachi Content Platform Node - A node representing an Hitachi Content Platform. |
|  | Hitachi Block Node - A node representing a Hitachi Block Storage Device. |
|  | Hitachi Block Host Node - A node that represents a number of Hitachi Block Storage volumes. |
|  | Hitachi Logical Block Device Node - A logical view of Hitachi Block Storage Device node, having limited access to its resources. |

| Icon | Description |
|---|---|
|  | Oracle Node - Represents a cluster of servers running as an Oracle RAC that accesses databases on shared disks. |
|  | Unknown Node - The master node is unable to determine any node details, and cannot connect to it. |
|  | Inactive Node - Indicates that the node is not currently running the Protector hub process, or it is not currently attached to the network. The master node is currently unable to connect to the node. |
|  | Node Group - Represents a group of nodes that can be treated identically when assigning policies or monitoring activities. |
|  | S3 Node - A node representing an S3 Bucket |

Node Status Indicators

Small graphical indicators that provide visual cues as to a particular node's status.

| Icon | Description |
|---|---|
|  | Unauthorized Node - The node has Protector installed but has not been authorized by the Master node, so cannot interact with other Protector nodes. |
|  | Authorized Online Node - The node has Protector installed and has been authorized by the Master node, so can interact with other Protector nodes. |
|  | Offline - The node is not contactable from the Master so its status cannot be determined. |

| Icon | Description |
|---|--|
|  | Snapshotted Node - Indicates that the node has a policy containing a snapshot operation applied to it. |

Notifications UI Reference

This section describes the Notifications UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [Notification Concepts \(on page 110\)](#)
- [Notification Tasks \(on page 260\)](#)

Notifications Inventory

This page lists all configured log notifications and enables you to launch the wizard to create and edit them.

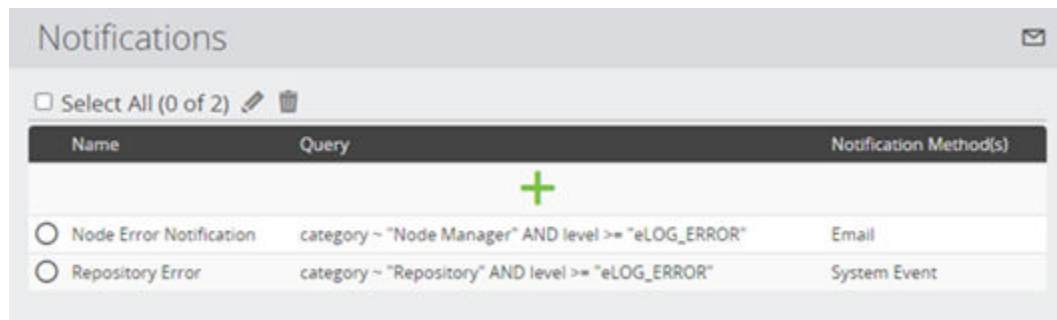






Figure 324 Notifications

| Control | Description |
|--|--|
|  Configure Email Settings | Launches the Email Notifications Settings Wizard (on page 584) to guide you through the process. |
|  Edit | Enabled when only one Notification is selected. Launches the Notification Wizard (on page 585) to allow the settings to be edited. |
|  Delete | Enabled when one or more Notifications are selected. Deletes selected Notifications. |

| Control | Description |
|---|--|
|  Add | Launches the Notification Wizard (on page 585) to guide you through setting up a Notification. |
| Notification(s) | <p>Any number of user defined Notifications can be created. These are displayed in the table in priority order. The table headings are as follows:</p> <ul style="list-style-type: none"> Name – Name of the notification item. Query – The formatted query used to identify log messages which trigger the notification. Notification Method(s) - How the user will be notified. |

Email Notifications Settings Wizard

This wizard provides the options for configuring the email account to send notifications from and to.



Note: Protector supports single step email account authentication. If the email account used to send notification is configured to use two step authentication, check that it is possible to allow applications to use less secure sign-in.

Configure Email Settings

Sender Account

Email Account Provider
Select a provider ▼

Account
example@example.com

Host Name
smtp.example.com

Port (Optional)
25

Encryption
None ▼

Authentication
ON ▼

Username

Password

Receiver Account

Receiver Email Address
example@example.com

Test Email Settings

Cancel Previous Finish

Figure 325 Configure Email Settings

| Control | Description |
|------------------------|---|
| Email Account Provider | Select the account provider. Can be one of: <ul style="list-style-type: none"> ▪ Google Mail ▪ Yahoo Mail ▪ Hotmail ▪ Microsoft Exchange ▪ Other |
| Account | Email address the notifications will be sent from. |
| Host Name | Host name for the email account that the notifications will be sent from. |
| Port (Optional) | The port number to use to contact the email server. |
| Encryption | Select the encryption method to be used. Can be one of: <ul style="list-style-type: none"> ▪ None ▪ START_TLS ▪ TLS |
| Authentication | Set Authentication either ON, OFF or NTLM. |
| Username | Only enabled when Authentication is set to On. Enter the username of the email account being used. |
| Password | Only enabled when Authentication is set to On. Enter the password of the email account being used. |
| Receiver Email Address | Enter the email address of the account(s) which should be the recipients of the notifications. |
| Test Email Settings | Clicking this button will send a test email based on the settings configured. If there are missing entries on the dialog then they will be highlighted. |

Notification Wizard

This wizard provides the options for configuring notifications.

Create Notification

Specify name

Name

Cancel

Previous

Next

Figure 326 Log notification wizard – name

| Control | Description |
|---------|---|
| Name | Enter the name of the log notification. |

Create Notification

Allocate notification to Access Control Resource Group

This log notification will be added to the 'default' resource group. Select an additional resource group as required.

| Name | Description |
|--|----------------------------|
| <input type="radio"/> critical resources | System critical resources. |

Cancel Previous **Next**

Figure 327 Log notification wizard – Allocate to Access Control Resource Group

| Control | Description |
|-----------------|---|
| Resource Groups | Select the resource groups to which this log notification will be allocated for the purposes of RBAC. All log notification are automatically allocated to the 'default' resource group. |

Create Notification

Specify Notification criteria

Logs

Pool Monitoring
For Hitachi Block Device

Journal Monitoring
For Hitachi Block Device

HUR Monitoring
For Hitachi Block Device

All Logs

Specify one or more criteria. The filter will combine all specified criteria to match a log message.

Message

Category

Log ID

Actioned By

Log Level

☒
☐
☐
☐

Cancel Previous Next

Figure 328 Notification Wizard - Logs

| Control | Description |
|-------------|--|
| Message | Enter part or all of the log message that will trigger the notification if seen in the logs. |
| Category | Select the category of the log entry that will trigger the notification. |
| Log ID | If the log entry has a Log ID then it can be specified here. |
| Actioned By | Select the Actioned By node name from the log entry that will trigger the notification. |
| Log Level | Select the level of the log entry that will trigger the notification. Logs of the specified Level and above will be matched for notification. Refer to Logs Inventory (on page 448) for a description of Log Levels. |

Create Notification

Specify Criteria

Logs

Pool Monitoring
For Hitachi Block Device

Journal Monitoring
For Hitachi Block Device

HUR Monitoring
For Hitachi Block Device

Pool Monitoring For Hitachi Block Device

Specify one or more criteria. The filter will combine all specified criteria to match a log message.

Storage Serial Number

Pool ID

Pool Name

Pool Type

Pool Capacity

☒ Free Space (less than)


(percent) %

☐ Used Space (greater than)

(percent) %

Cancel Previous **Next**

Figure 329 Notification Wizard - Hitachi Block Pool Monitoring

| Control | Description |
|-----------------------|--|
| Storage Serial Number | Enter the Serial Number of the storage device for which the notification will be generated. |
| Pool ID | Enter the Pool ID for which the notification will be generated. |
| Pool Name | Enter the Pool Name for which the notification will be generated. |
| Pool Type | Enter the Pool Type for which the notification will be generated. |
| Pool Capacity | <p>Select either of the following two options:</p> <ul style="list-style-type: none"> Free Space (less than) Used Space (greater than) <p>Then enter the percentage for which the notification will be generated.</p> <div>  <p>Note: Pool capacity is only checked for destination pools of active replications. Checking is performed every 10 minutes.</p> </div> |

Create Notification

Specify Criteria

Logs

Pool Monitoring
For Hitachi Block Device

**Journal Monitoring
For Hitachi Block Device**

HUR Monitoring
For Hitachi Block Device

Journal Monitoring For Hitachi Block Device

Specify one or more criteria. The filter will combine all specified criteria to match a log message.

Storage Serial Number

Journal ID

Policy

Select a Policy ▼

Journal Capacity

☒ Free Space (less than)

(percent) %

☐ Used Space (greater than)

(percent) %

Cancel Previous **Next**

Figure 330 Notification Wizard - Hitachi Block Journal Monitoring

| Control | Description |
|-----------------------|---|
| Storage Serial Number | Enter the Serial Number of the storage device for which the notification will be generated. |
| Journal ID | Enter the Journal ID for which the notification will be generated. |
| Policy | Select the Hitachi Block policy name for which the notification will be generated. |
| Journal Capacity | <p>Select either of the following two options:</p> <ul style="list-style-type: none"> Free Space (less than) Used Space (greater than) <p>Then enter the percentage for which the notification will be generated.</p> |

Create Notification

Specify Criteria

Logs

Pool Monitoring
For Hitachi Block Device

Journal Monitoring
For Hitachi Block Device

**HUR Monitoring
For Hitachi Block Device**

HUR Monitoring For Hitachi Block Device

Specify one or more criteria. The filter will combine all specified criteria to match a log message.

Storage Serial Number

Live HUR Network Latency

 ms

Policy

Select a Policy ▼

Source Node

Select a Node ▼

Destination Node

Select a Node ▼

Cancel Previous **Next**

Figure 331 Notification Wizard - Hitachi Block UR Monitoring

| Control | Description |
|-------------------------|---|
| Storage Serial Number | Enter the Serial Number of the storage device for which the notification will be generated. |
| Policy | Select the Block UR policy name for which the notification will be generated. |
| Source Node | Select the Source Node for which the notification will be generated. |
| Destination Node | Select the Destination Node for which the notification will be generated. |
| Live UR Network Latency | Enter the Network Latency above which the notification will be generated. A single notification is generated when this threshold is exceeded. The measurement must fall back below this threshold before another notification can be generated. |

Create Notification

Select Notification options


If a log message matches a notification will be made using the selected methods.

Notification Method

- ☒ Email
Send to example@example.com. Click [here](#) to configure email settings.
- ☐ SNMP v2c
- ☐ SNMP v3
- ☐ System Event

Cancel Previous **Finish**

Figure 332 Log notification wizard – Select notification options

| Control | Description |
|---------------------|--|
| Notification Method | <p>This defines how the event is notified to users:</p> <ul style="list-style-type: none"> ▪ Email – An email will be sent to a configured email account whenever a log meets the defined criteria. If no email configuration is detected. Click the link to configure the email accounts from which notifications will be sent and by whom they will be received via the Email Notifications Settings Wizard (on page 584) ▪ SNMP v2c – An SNMP Version 2c message will be sent to the Management Station. Currently there is no user interface for setting up the SNMP parameters. These parameters must be configured by manually editing the configuration file <code>[INSTALL_DIR]\db\config\notification\SNMPv2c.cfg</code>. This file contains the command line for executing the notification event handler <code>nehsnmp.exe</code> where the parameter values are defined. Type <code>nehsnmp.exe -h</code> at a command prompt to obtain a detailed list of the parameters and allowed values. ▪ SNMP v3 – As for SNMP v2c above except a Version 3 message is sent. The parameters for the Version 3 message are different and therefore a separate configuration <code>[INSTALL_DIR]\db\config\notification\SNMPv3.cfg</code> must be edited. Please also refer to the note below for details on configuring the MIB file. ▪ System Event – This will create a system event entry on the master node when a matching log is found. The system event log can be found in the Application log section within the Event Viewer on a Windows system, and in <code>/var/log/messages</code> on a Linux system. If you create a System Event notification with a User condition then the user name must be prefixed with <code>//BUILTIN/</code>. ▪ Custom handlers – It is possible for advanced users to write their own custom handlers to add to the Notification Method list. Contact customer support for details. <div data-bbox="597 1381 1393 1570">  Note: After changing configuration files, the hub service must be restarted for the changes to take effect. Open a command prompt in the <code>\bin</code> directory on the Master node type <code>diagdata --stop hub</code>, wait for the service to stop, then type <code>diagdata --start</code> </div> |



Note: After configuring `SNMPv2c.cfg` or `SNMPv3.cfg`, integrate the Management Information Base (MIB) file `HITACHI-Protector-MIB.txt` with the network management software. The MIB file describes the format of the SNMP Traps sent by Protector. The actual integration steps may vary depending on your network management software. For details, refer to the relevant network management software documentation. Navigate to the `[INSTALL DIR] \Hitachi\Protector\db\config\mibs` directory on the Master node. Locate and copy the MIB file to the MIB files directory (as defined in the relevant product documentation) on the host machine running the network management software.

Policies UI Reference

This section describes the Policies UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [Policy Concepts \(on page 92\)](#)
- [Policy Tasks \(on page 264\)](#)

Policies Inventory

This inventory lists all defined Policies. Each policy consists of a set of data classifications defining what to backup and a set of operations defining how to backup that data.

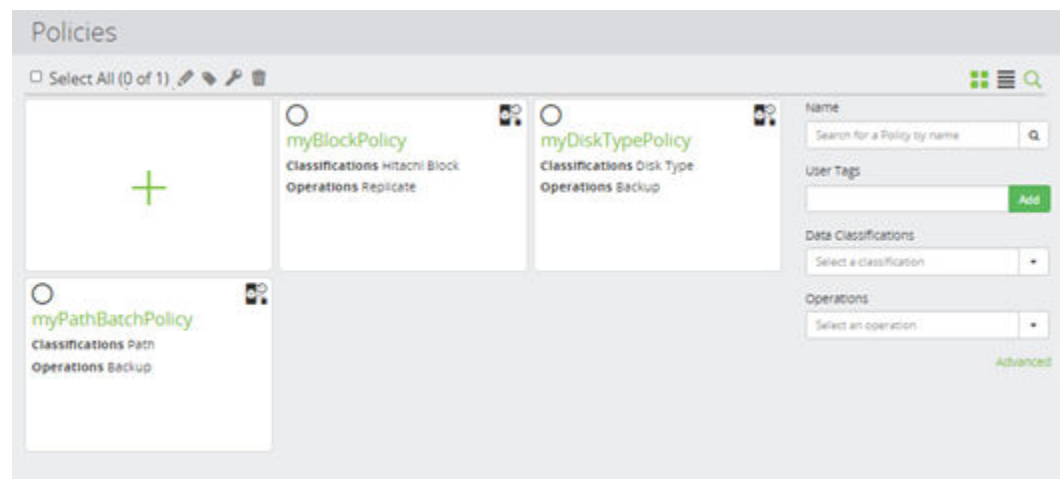







Figure 333 Policies Inventory

| Control | Description |
|---------|---|
| Edit | Edits an existing policy in the inventory. The Policy Wizard (on page 595) is launched to enable the policy's attributes to be changed. |

| Control | Description |
|---|---|
|  Tag | Modifies the tags of an existing object from either the inventory screen or the details screen of the object. |
|  Edit Permissions | Edits an existing policy's access permissions. The Access Control Permissions Inventory (on page 341) is launched to enable the policy's access permissions to be changed. |
|  Delete | Enabled only when one or more Policies are selected. Deletes the selected item from the inventory. The associated Classifications and Operations are also deleted. |
|  Add | Creates a new Policy. The Policy Wizard (on page 595) is launched to guide you through the process. |
|  Policy | Any number of user defined Policies can be created. These are displayed in the inventory. The Policy Details (on page 658) is displayed to enable the policy to be viewed and edited. |
| Filter on Policy Name | Filters the displayed results based on the policy name. |
| Filter on Data Classification | Filters the displayed results based on classification type. |
| Filter on Operations | Filters the displayed results based on operation type |

Policy Wizard

This wizard is launched when a new Policy is added to the Policies Inventory.

A Policy consists of the following parts:

- One or more Data Classification items that define what type of data is to be backed up.
 - Path and Disk Type classifications can also have additional Age, File Type and OS Type Filters applied to them.
- One or more Operation items that define what action is to be performed on that data.

**Note:**

- If the policy is in use in the current data flow definition, any modifications made to the policy only take effect following recompilation and reactivation of the affected data flows. If data operation items have been added or deleted, it may be necessary to first modify the data flow definition to take account of these changes before it is recompiled and reactivated.
- If a policy using the Replicate, CDP or Backup data operations has any part of its data classification changed, then all destination nodes for that policy need to be re-synchronized to include the change in scope of the policy.

Figure 334 Policy Wizard - Specify name and description

| Control | Description |
|-------------|--|
| Name | Enter a name for the policy. |
| Description | Optional. Enter a short description of the policy. |
| Tags | Add the tags to be associated with the object being created. |

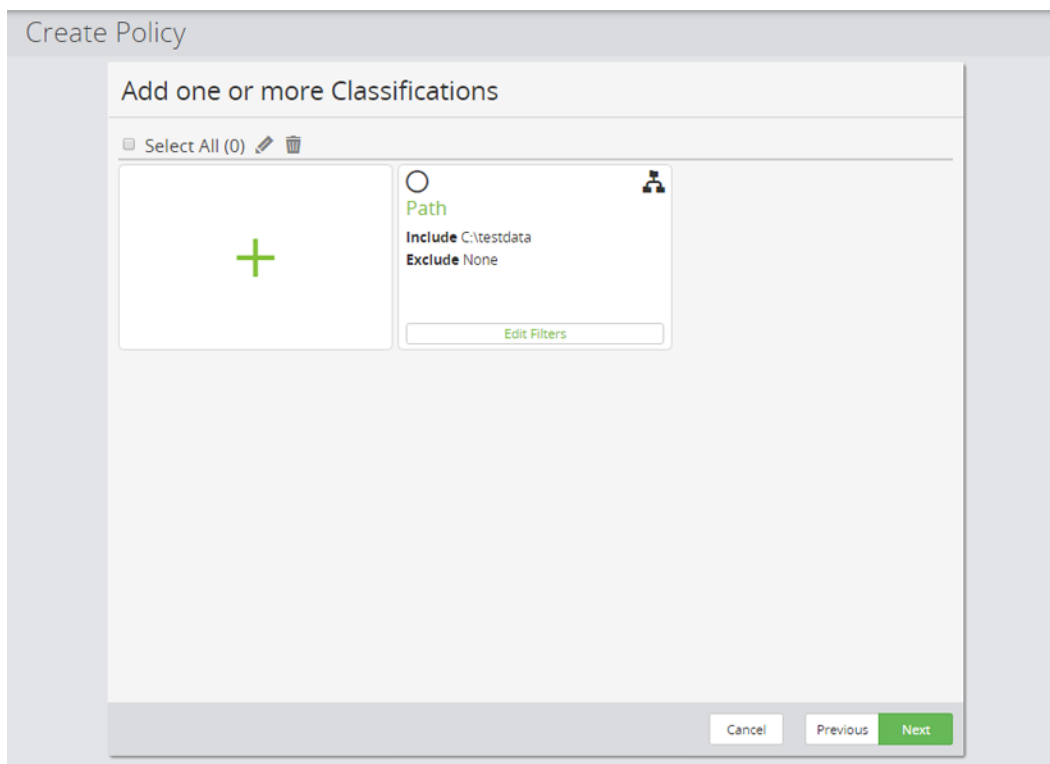





Figure 335 Policy Wizard - Classifications Inventory

| Control | Description |
|--|--|
|  Edit | Edits an existing classification in the inventory. The relevant Classification wizard is launched to enable the classification's attributes to be changed. |
|  Delete | Deletes the selected item from the inventory. |
|  Add | Creates a new Classification. The Classification Selection page (shown above) of this wizard is reopened to enable other classifications to be added to the policy. |
| Classification(s) | Any number of Classifications can be created. These are displayed in the inventory. The appropriate classification wizard is displayed to enable the classification to be viewed and edited. |
| Edit Filters | Launches the Classification Filters Wizard (on page 648) to enable you to add Filters to the classification. |

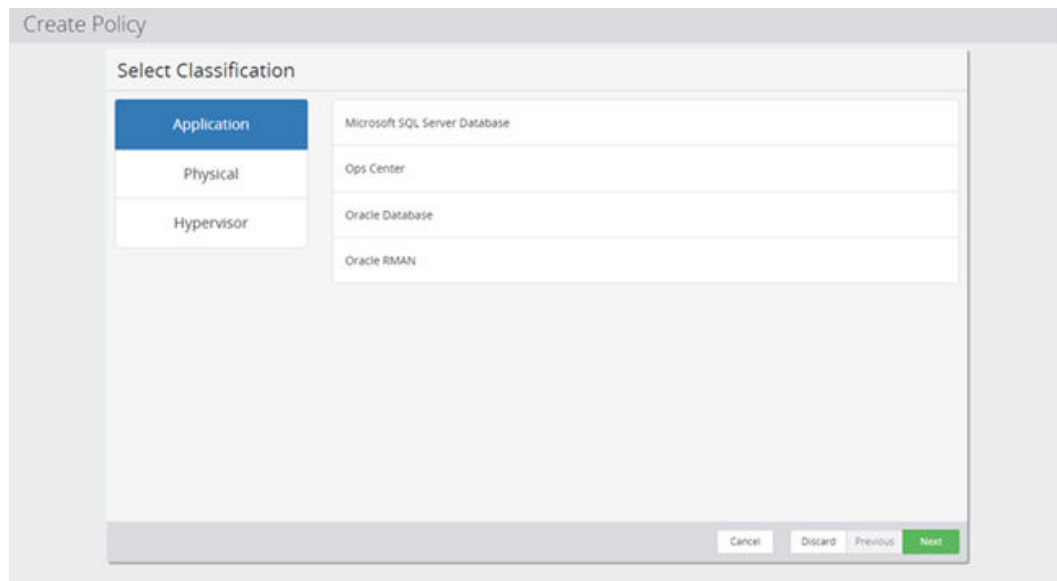


Figure 336 Policy Wizard - Select Classification (Application)

Each Application Classification Type defines a specific set of criteria for selecting data related to a specific application. For example, the Oracle type can be used to select data related to a specific Oracle database.

| Control | Description |
|-------------------------------|--|
| Microsoft SQL Server Database | Adds a Microsoft SQL Server Database classification to the policy. The Microsoft SQL Server Classification Wizard (on page 602) will be launched to guide you through the process. |
| Ops Center Application | Adds an Ops Center Application classification to the policy. The Ops Center Classification Wizard (on page 606) will be launched to guide you through the process. |
| Oracle Database | Adds an Oracle Database classification to the policy. The Oracle Database Classification Wizard (on page 607) will be launched to guide you through the process. |
| Oracle RMAN Database | Adds an Oracle RMAN Database classification to the policy. The Oracle RMAN Classification Wizard (on page 610) will be launched to guide you through the process. |

The screenshot shows a 'Create Policy' wizard window. The title bar says 'Create Policy'. Inside, the 'Select Classification' section has three buttons: 'Application', 'Physical' (which is highlighted in blue), and 'Hypervisor'. To the right of these buttons is a panel for the selected classification. Under 'Disk Type', there are two options: 'Hitachi Block' and 'Path'. At the bottom of the window, there are four buttons: 'Cancel', 'Discard', 'Previous', and 'Next' (which is green).

Figure 337 Policy Wizard - Select Classification (Physical)

Each Physical Classification type defines a specific set of criteria for selecting data on a node's file system. For example, the Path type can be used to select data by its folder location.

| Control | Description |
|---------------|--|
| Disk Type | Adds a Storage Type classification to the policy. The Disk Type Classification Wizard (on page 630) will be launched to guide you through the process. |
| Hitachi Block | Adds an Hitachi Block classification to the policy. The Hitachi Block Classification Wizard (on page 631) will be launched to guide you through the process. |
| Path | Adds a Path classification to the policy. The Path Classification Wizard (on page 634) will be launched to guide you through the process. |

The screenshot shows a 'Create Policy' window with a 'Select Classification' section. On the left, there are three buttons: 'Application', 'Physical', and 'Hypervisor'. The 'Hypervisor' button is highlighted in blue. To the right of these buttons is a list box containing 'Hyper-V' and 'VMware'. At the bottom right of the window, there are four buttons: 'Cancel', 'Discard', 'Previous', and 'Next'.

Figure 338 Policy Wizard - Select Classification (Hypervisor)


Each Hypervisor Classification Type defines a specific set of criteria for selecting data related to a specific hypervisor. For example, the VMware type can be used to select virtual machines on an ESXi Server.

| Control | Description |
|---------|---|
| Hyper-V | Adds a Hyper-V classification to the policy. The Hyper-V Classification Wizard (on page 614) will be launched to guide you through the process. |
| VMware | Adds a VMware classification to the policy. The VMware Classification Wizard (on page 622) will be launched to guide you through the process. |

The screenshot shows a 'Create Policy' window with a 'Select Operation' section. It contains a list of six operations: Access, Backup, Mount, Replicate, Snapshot, and Tier. At the bottom of the window, there are four buttons: 'Cancel', 'Discard', 'Previous', and 'Next'.

Figure 339 Policy Wizard - Select Operation

Each Operation Type represents an action that can be performed on data that matches the classification. For example, Snapshot can be used to create a point in time copy of the data specified by a Hitachi Block Classification.

| Control | Description |
|-----------|--|
| Backup | <p>Adds a backup operation to the policy. The Backup Operation Wizard (on page 639) will be launched to guide you through the process.</p> <p> Note: This operation cannot be applied to hardware storage devices.</p> |
| Mount | Adds a mount operation to the policy. The Mount Operation Wizard (on page 642) will be launched to guide you through the process. |
| Replicate | Adds a replication operation to the policy. The Replicate Operation Wizard (on page 643) will be launched to guide you through the process. |
| Snapshot | Adds a snapshot operation to the policy. The Snapshot Operation Wizard (on page 645) will be launched to guide you through the process. |
| Tier | Adds a tier operation to the policy. The Tier Operation Wizard (on page 647) will be launched to guide you through the process. |

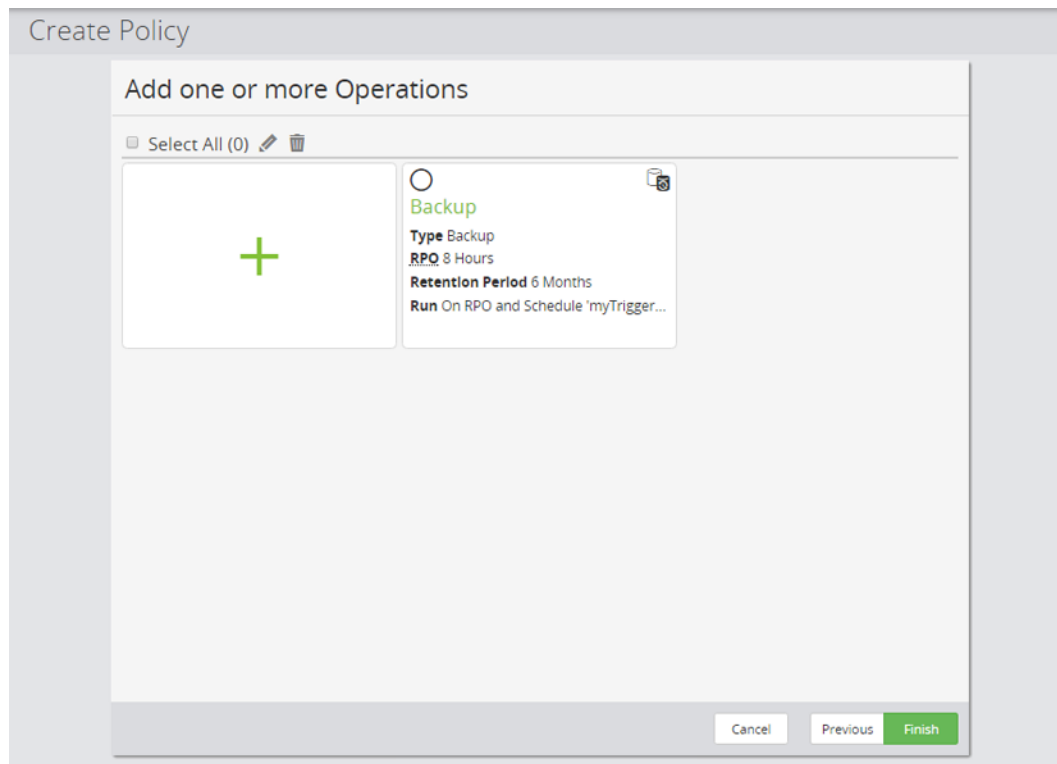





Figure 340 Policy Wizard - Add one or more Operations

| Control | Description |
|--|---|
|  Edit | Edits an existing operation in the inventory. The relevant Operation wizard is launched to enable the operation's attributes to be changed. |
|  Delete | Enabled only when one or more Operations is selected. Deletes the selected item from the inventory. |
|  Add | Creates a new Operation. The Operation Selection page of this wizard is reopened to enable other operations to be added to the policy. |
| Operation(s) | Launches the appropriate operations wizard to enable the operation to be viewed and edited. |

Microsoft SQL Server Classification Wizard

This wizard is launched when a new MS SQL Server classification is added to a Policy.

This wizard is launched when a new Microsoft SQL Server Database classification is added to the policy.

The Microsoft SQL Server Database classification conveniently specifies which should be included in a backup. Refer to [About Microsoft SQL Server Policy Classifications \(on page 99\)](#) for details on how this classification works.

Create Policy

Specify Microsoft SQL Server classification attributes

Node
Select a Node

Instance
Select Instance

User
-

Included Items

| Name |
|-------------------|
| No items selected |

+ Add

Backup Mode

☒ Full backup
Protect the complete database.

☐ Copy Only
Protect the complete database. Do not affect sequencing of transaction log or differential backups.

Cancel Discard Previous Apply

Figure 341 Microsoft SQL Server Wizard - Specify Microsoft SQL Server classification attributes

| Control | Description |
|----------------|--|
| Node | Select the Microsoft SQL Server node you want to protect with this classification. |
| Instance | Select the SQL Server instance, hosting the databases you want to protect. |
| User | List the user which will be used to protect the instance. Editing the credentials will open the Microsoft SQL Server Instance Credentials Dialog (on page 605) SQL Server Instance Credentials Dialog. |
| Included Items | Lists the databases which will be included in the backup. |
| Add | Opens the Microsoft SQL Server Database Selection Wizard (on page 604) , which allows databases to be added to the Included Items list above. |

| Control | Description |
|-------------|---|
| Backup Mode | <p>Select which backup type is desired for the selected databases:</p> <ul style="list-style-type: none"> ▪ Full backup Create a point in time copy of the complete database. ▪ Copy Only Create a point in time copy of the complete database. Does not affect sequencing of differential backups or transaction logs. |

Microsoft SQL Server Database Selection Wizard

This wizard is displayed when the user chooses to include database in a Microsoft SQL Server classification.

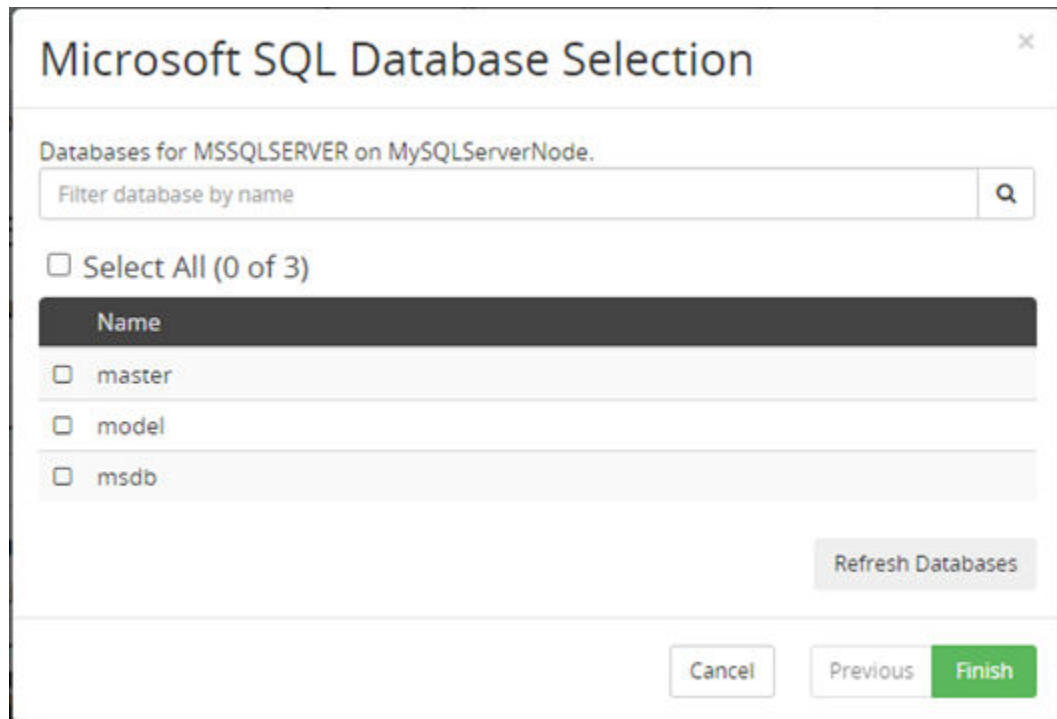



Figure 342 Microsoft SQL Database Selection

| Control | Description |
|---------|---|
| Search | Enter a part of a database name and confirm to filter the list of known databases |

| Control | Description |
|---------------|--|
| Database List | <p>Select one or more databases</p> <div>  Note: Do not select databases which are temporarily mounted by Protector. Including mounted databases in backups may cause problem during backup or when you try to unmount the database. </div> |

Microsoft SQL Server Instance Credentials Dialog

This dialog allows the user to specify which credentials should be used when protecting an instance

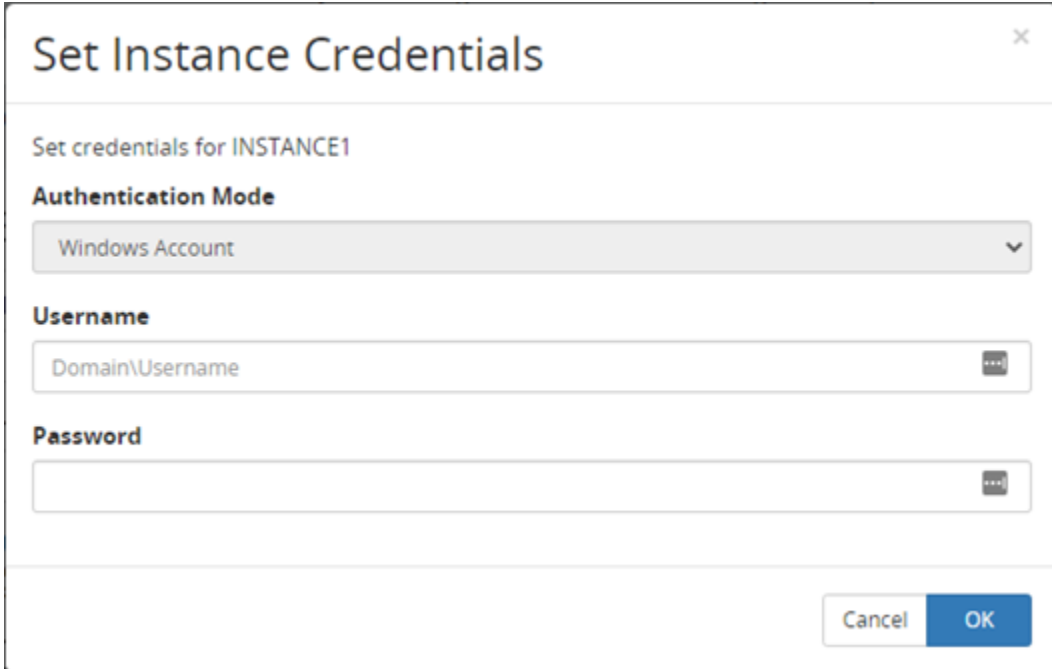


Figure 343 Microsoft SQL Server Instance Credentials Dialog

| Control | Description |
|---------------------|----------------------------------|
| Authentication Mode | Lists the required account type. |

| Control | Description |
|----------|---|
| Username | Specify the user which should be used to protect the databases of this instance. Use the format <NETBIOS DOMAIN NAME>\<username>. Refer to Microsoft SQL Server User Privileges (on page 606) for more details. |
| Password | Password for the user specified above |

Microsoft SQL Server User Privileges

To create, mount or revert block-based Microsoft SQL Server backups Protector requires credentials with the necessary permissions.

The user account must meet the following requirements:

- Windows account
- Member of the sysadmin role for the SQL Server instance


Ops Center Classification Wizard

This wizard is launched when a new Ops Center Application classification is added to a Policy. The Ops Center classification is used to define which applications are to be protected.



Note: Ops Center Classification Wizard allows to backup only the master node at present

Figure 344 Ops Center Wizard - Specify Ops Center Applications attributes

| Control | Description |
|----------------|--|
| Included Items | Lists the Ops Center resources that will be included in the backup policy. |
| Add | Opens the Ops Center Application Selection Wizard (on page 607) to enable Ops Center resources to be added to the include list above. <div>  Note: Only Ops Center Protector Master node can be backed up currently. </div> |
| Excluded Items | Lists the Ops Center resources that will be excluded from the backup policy. |
| Remove | Each row has a remove button at the end of the row, the selected Ops Center resource is removed from the include/exclude list. |
| Add | Opens the Ops Center Application Selection Wizard (on page 607) to enable VMware resources to be added to the exclude list above. |

Ops Center Application Selection Wizard

This wizard is displayed when the user includes or excludes Ops Center resources in a policy.



Figure 345 Ops Center Applications Selection for Inclusion/Exclusion Wizard

| Control | Description |
|------------------------|---|
| Available Applications | Select the Ops Center application you want to protect with this classification. |

Oracle Database Classification Wizard

This wizard is launched when a new Oracle Database classification is added to a Policy.

The Oracle Database classification is used to define which databases are to be protected.



Note: When used in combination with a storage hardware backup operation, Protector will discover the underlying hardware paths at runtime. For Hitachi Block storage hardware based backups, all the paths must exist on the same block hardware device.

Create Policy

Specify Oracle Database classification attributes

| SID | DB Credentials | OS Credentials | Archive Log Mode | Version |
|---------|----------------------------------|----------------------------------|------------------|------------|
| aoracle | default (edit) | default (edit) | ARCHIVELOG | 18.0.0.0.0 |

[Select Database](#)

Backup Mode

The configuration of the database defines how it can be protected. Please select one of the available backup modes below.

☒ **Online**
Backup the database while it is up and running. Database can be accessed during backup.


☐ **Offline**
Backup the database while it is offline. If the database is online when the backup starts it will be shutdown for the duration of the backup and cannot be accessed.

☐ **Crash Consistent**
Backup the database without explicitly putting it into a consistent state. Database can be accessed during backup. Oracle will perform implicit recovery on OPEN when the backup is used after a restore. Ensure that you use consistency groups for associated snapshot operations.

[Cancel](#) [Discard](#) [Previous](#) [Apply](#)

Figure 346 Oracle Database Wizard - Specify Oracle Database classification attributes

| Control | Description |
|-----------|---|
| Databases | Lists the currently selected databases. |

| Control | Description |
|-----------------|---|
| | <p>Only the databases listed are backed up.</p> <ul style="list-style-type: none"> For block based policies - Databases are discovered only once, when the policy is defined. For host based policies - This classification is not currently supported. |
| Select Database | Click to open the Select Database dialog shown below. |
| Backup Mode | <p>Select one of the following:</p> <ul style="list-style-type: none"> Online – Available only if Oracle Database is running in <code>ARCHIVELOG</code> mode. Oracle is briefly quiesced while an application consistent snapshot is made. Offline – Available always. Oracle is taken offline while an application consistent snapshot is made. Crash Consistent – Available only in Version 12c and if Oracle Database is running in <code>ARCHIVELOG</code> mode. Oracle remains running while a crash consistent snapshot is taken. <div>  Note: <ul style="list-style-type: none"> If the Backup Mode is set to Online, ensure that Quiesce configured applications before backup is selected in the Snapshot/Replicate Operation Attributes Wizard. If the Backup Mode is set to Crash Consistent, ensure that the Use consistency group option is selected in the Snapshot/Replicate Operation Properties Dialog on the data flow. </div> |

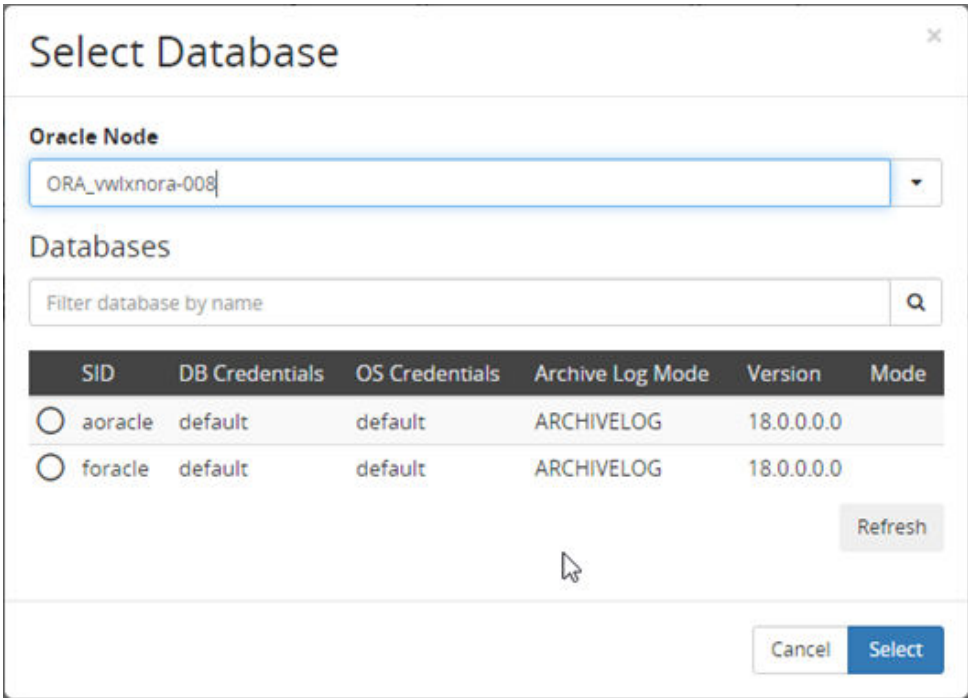


Figure 347 Oracle Database Wizard - Select Oracle Databases Dialog

| Control | Description |
|-------------------------|---|
| Oracle Node | Select a node representing the Oracle server hosting the database(s) to be selected for backup. |
| Filter database by name | Filters the databases list below to show only those entries that contain the filter string. |
| Databases | Select the database(s) to be backed up from the list. |
| Refresh | Click this button to refresh the cached details and clear the name filter. |

Oracle RMAN Classification Wizard

This wizard is launched when a new Oracle RMAN classification is added to a Policy.

The Oracle RMAN classification allows to conveniently specify, which databases can or cannot access Oracle RMAN data using the access operation.

Create Policy

Configure which Oracle databases are allowed or denied access

Allow Databases

| Name | Type |
|----------------------|------|
| No database selected | |

+ Add Databases

Deny Databases

| Name | Type |
|----------------------|------|
| No database selected | |

+ Add Databases

Preview Database Selection

Cancel Discard Previous Apply

Figure 348 Oracle RMAN Wizard - Specify Oracle Databases (Allowed / Denied Access)

| Control | Description |
|----------------------------|---|
| Allow Databases | Lists the databases that will be allowed access for Oracle RMAN access operations. |
| Add Databases | Opens the Oracle RMAN Database Selection Wizard (on page 612) to enable databases to be added to the Allow Databases list above. |
| Deny Databases | Lists the databases that will not be allowed access for Oracle RMAN access operations. |
| Add Databases | Opens the Oracle RMAN Database Selection Wizard (on page 612) to enable databases to be added to the "Deny Databases" list above. |
| Preview Database Selection | Click this button to preview the which databases are allowed access for an existing Oracle Database node. |

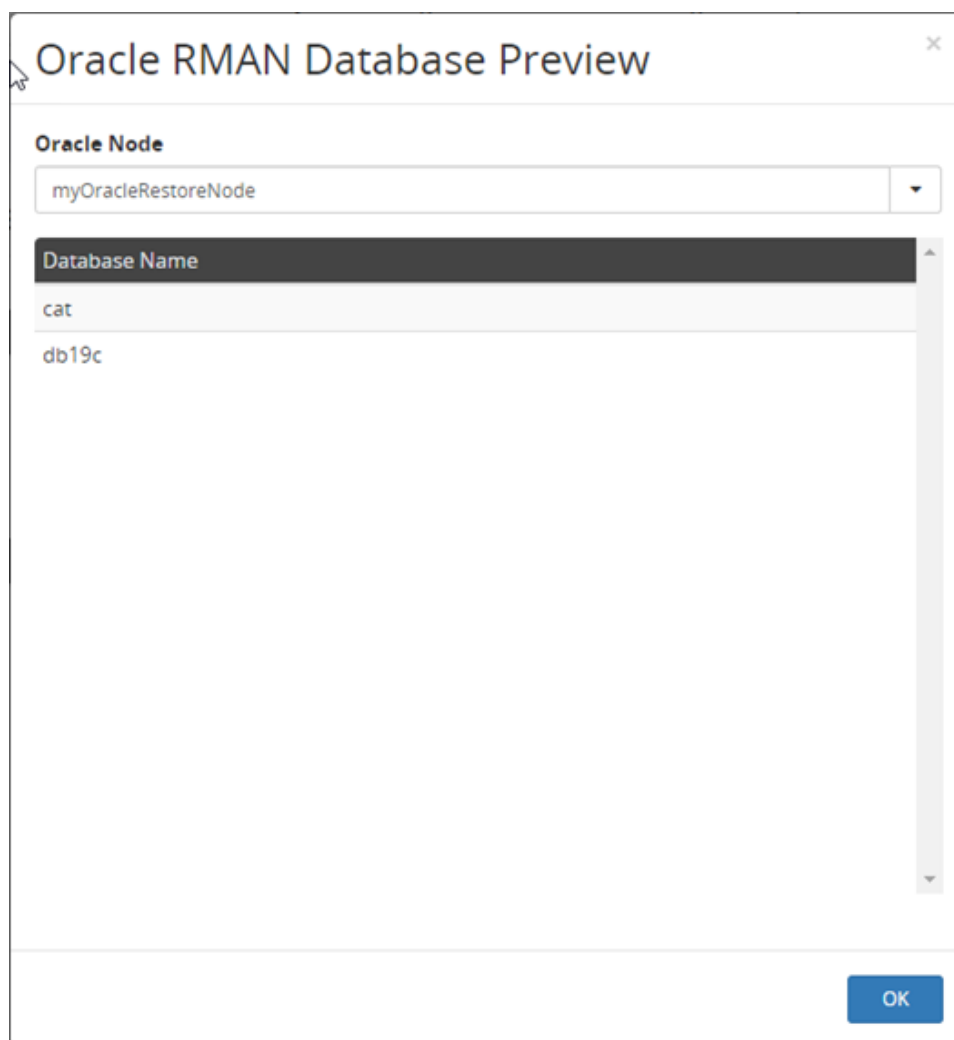


Figure 349 Oracle RMAN Database Preview

| Control | Description |
|---------------|--|
| Oracle Node | Select a node representing the Oracle setup, which should be previewed. |
| Database List | List all databases on this node which would be allowed access with the defined classification. |

Oracle RMAN Database Selection Wizard

This wizard is launched when a user adds entries to the list of allowed or denied databases in an Oracle RMAN classification.



Oracle RMAN SBT Database Selection for Inclusion

Select method

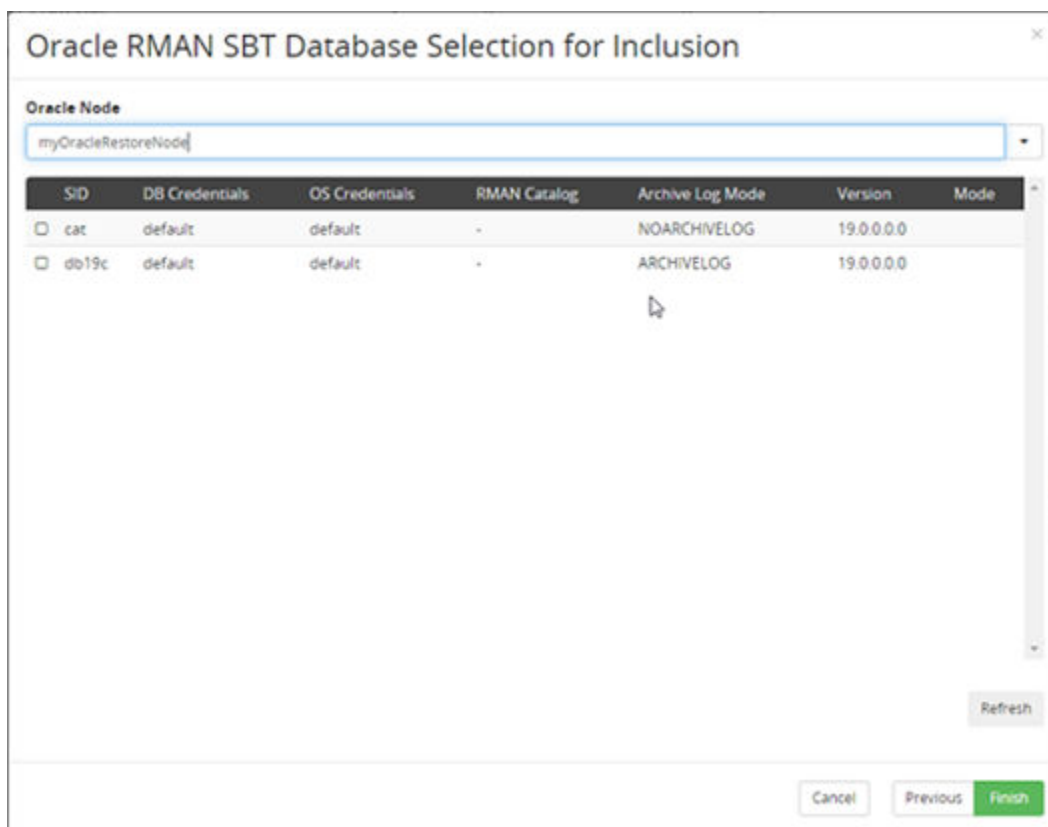
☒ Browse for Databases

☐ Specify database by name or wildcard

Cancel Previous Next

Figure 350 Oracle Database Selection – Select method

| Control | Description |
|---------------------------------------|---|
| Browse for databases | Select this option to browse an existing Oracle node for databases. See Oracle Database Selection – Browse by below. |
| Specify databases by name or wildcard | Select this option specify a database by name pattern match. See Oracle Database Selection – Specify name or wildcard below. |



Oracle RMAN SBT Database Selection for Inclusion

Oracle Node

myOracleRestoreNode

| SID | DB Credentials | OS Credentials | RMAN Catalog | Archive Log Mode | Version | Mode |
|--------------------------------|----------------|----------------|--------------|------------------|------------|------|
| <input type="checkbox"/> cat | default | default | - | NOARCHIVELOG | 19.0.0.0.0 | |
| <input type="checkbox"/> db19c | default | default | - | ARCHIVELOG | 19.0.0.0.0 | |


Refresh

Cancel Previous Finish

Figure 351 Oracle Database Selection – Browse by

| Control | Description |
|---------------|---|
| Oracle Node | Select an Oracle database application node to browse for databases. |
| Database List | Lists the databases which exist on the selected node. You can select one or more databases. |
| Refresh | Refreshes the list of databases for the selected node. This operation may take a few minutes. |

Figure 352 Oracle Database Selection – Specify name or wildcard

| Control | Description |
|---------|--|
| Pattern | <p>Enter a case insensitive pattern that will be used to match the database by name. The '*' character can be used to match any sequence of characters. E.g.: IH_* would match any database type whose name begins with IH_.</p> <div>  Note: Protector evaluates the pattern every time Oracle RMAN tries to access the data. If new databases are added later, they will still be allowed or denied access, depending if they match the pattern or not. </div> |

Hyper-V Classification Wizard

This wizard is launched when a new Hyper-V classification is added to policy.

The Hyper-V classification is used as a means to conveniently specify the Hyper-V resources which should be included in a backup. Refer to [About Hyper-V policy classifications \(on page 98\)](#) for details about how this classification works with host and block based operations.

Create Policy

Specify Hyper-V classification attributes

Include Items

| Name | Host Node | Type |
|-------------------|-----------|------|
| No items selected | | |

[+Add](#)

Exclude Items

| Name | Host Node | Type |
|-------------------|-----------|------|
| No items selected | | |

[+Add](#)

[Preview Selection](#)

Virtual Machine Consistency

☒ Application Consistent Checkpoints
☐ Crash Consistent Checkpoints

[Cancel](#)
[Discard](#)
[Previous](#)
[Apply](#)

Figure 353 Hyper-V Wizard - Specify Hyper-V classification attributes

| Control | Description |
|-----------------------------|---|
| Included Items | Lists the Hyper-V resources that will be included in the backup. |
| Add | Opens the Hyper-V Resource Selection Wizard (on page 616) to enable Hyper-V Resources to be added to the include/exclude items list above. |
| Excluded Items | Lists the Hyper-V VMs that will be excluded from the backup policy. |
| Remove | Each row has a remove button at the end of the row. When clicked the selected Hyper-V resource is removed from the include/exclude list. |
| Preview Selection | Opens the Hyper-V Classification Preview Wizard (on page 616) Hyper-V Classification Preview Wizard, that will preview which VMs will be included if the classification is applied to a selected Hyper-V node. |
| Virtual Machine Consistency | Select which level of consistency is desired for the virtual machines: <ul style="list-style-type: none"> ▪ Application consistent checkpoints will use Hyper-V integration services to quiesce the data inside the VM. ▪ Crash consistent checkpoints will just use the data currently available on the virtual disks. |

Hyper-V Classification Preview Wizard

This wizard is displayed when the user previews a Hyper-V policy classification.

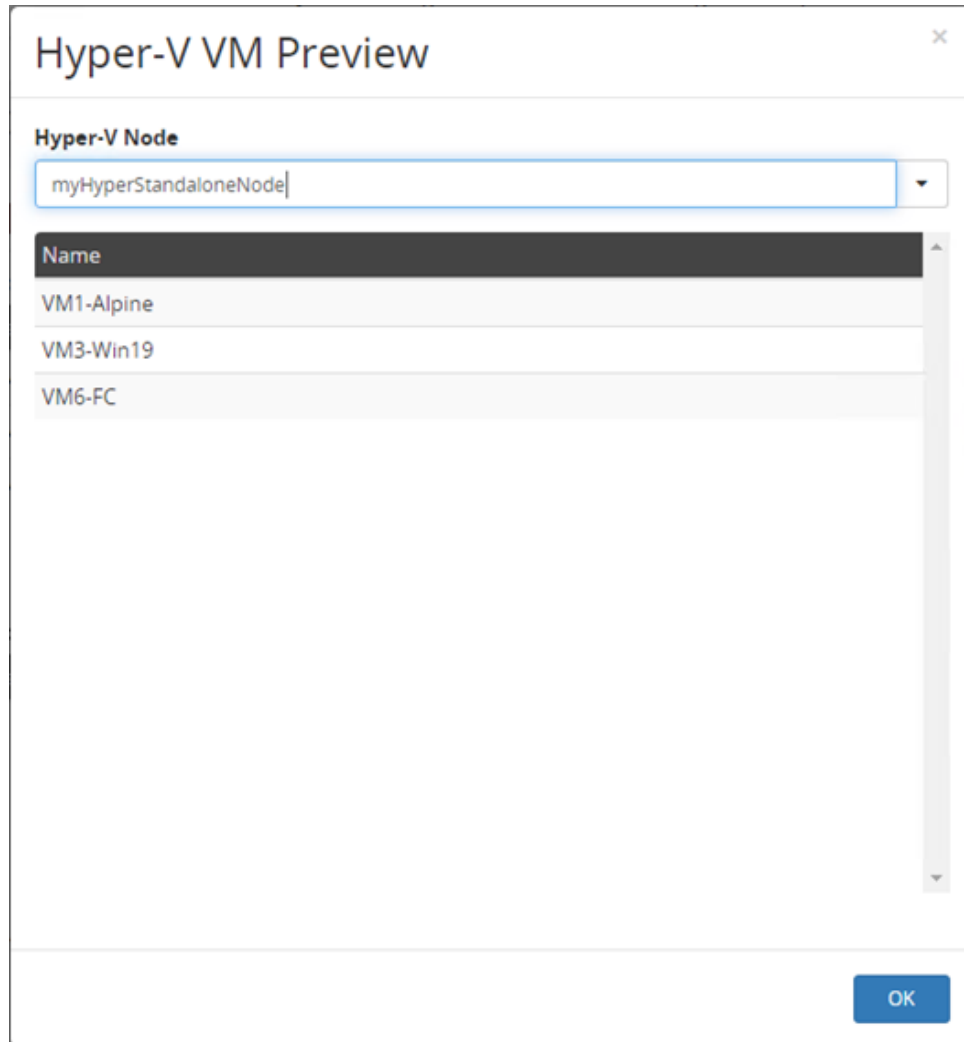


Figure 354 Hyper-V Classification Preview Wizard

| Control | Description |
|----------------------|--|
| Hyper-V Node | Select the Hyper-V app node you want to preview the classification for. |
| Virtual Machine List | Lists all virtual machines that would be considered for backup, based on the classification. |

Hyper-V Resource Selection Wizard

This wizard is displayed when the user includes or excludes Hyper-V resources in a policy.



Caution: Protector tracks Hyper-V VMs via their unique ID. If the id of an explicitly selected VM is changed (e.g. by deleting and restoring the VM) it will not be included in the backup and an error will be logged.

Figure 355 Hyper-V VM Selection for Inclusion

| Control | Description |
|---------------------------|---|
| Virtual Machines | Displays flat list of the virtual machines configured on a Hyper-V node. One more VMs can be selected.. See Hyper-V Resource Selection Wizard – Browse Virtual Machines (on page 618) below. |
| Virtual Machine Locations | <p>Displays a hierarchical view of a Hyper-V node's file system. See Hyper-V Resource Selection Wizard – Browse by Virtual Machine Locations (on page 619) below.</p> <p>Note: Protector will select all virtual machines, that have a configuration file under the select path. The list of VMs per path is re-evaluated at the beginning of each backup.</p> |
| Virtual Machine Host | <p>Displays a hierarchical view of Hyper-V nodes and VMs. It is possible to select one or more nodes of a cluster as well as individual VMs. See Hyper-V Resource Selection Wizard – Browse by Virtual Machine Hosts (on page 620) below.</p> <p>Note: If a host is selected Protector will select all virtual machines available on that host. The list of available virtual machines per host is re-evaluated at the beginning of each backup.</p> |

| Control | Description |
|---------|--|
| Pattern | Select if you want to specify a resource by type and name pattern match. See Hyper-V Resource Selection Wizard – Pattern search (on page 621) below. |

Hyper-V Resource Selection Wizard – Browse Virtual Machines

This page of the wizard is displayed when the browse by virtual machines option is selected in the initial wizard page above.

Figure 356 Hyper-V Policy Wizard - Classification – Browse Virtual Machines

| Control | Description |
|--------------|--|
| Hyper-V Node | Select the Hyper-V app node you want to select VMs from. |
| Search | Enter a part of a virtual machine name and confirm to filter the list of virtual machines. |

| Control | Description |
|----------------------|------------------------------|
| Virtual Machine List | Select one or more machines. |

Hyper-V Resource Selection Wizard – Browse by Virtual Machine Locations

This page of the wizard is displayed when the browse by virtual machine paths option is selected in the initial wizard page above.

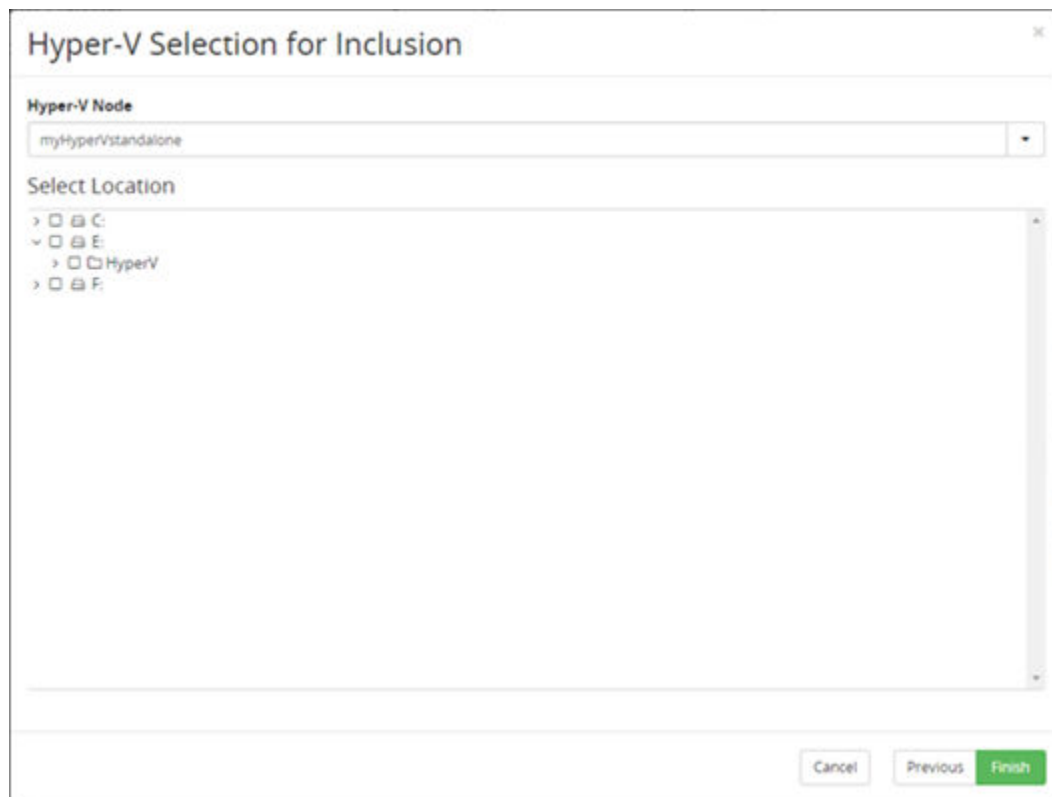



Figure 357 Hyper-VM - Browse by Virtual Machine Locations

| Control | Description |
|--------------|--|
| Hyper-V Node | Select the Hyper-V app node you want to select paths from. |
| Location | Select one or more paths. Protector will search for virtual machines under the defined path at the beginning of each backup. |

| Control | Description |
|---------|---|
| | <div>  Note: <ul style="list-style-type: none"> A virtual machine will only be selected for a backup if the virtual machine configuration is located under the specified path. <p>If any included VMs utilize additional paths, these will be added as to the backup as well. This ensures that backed up virtual machines can be fully restored.</p> <ul style="list-style-type: none"> For clustered Hyper-V nodes it is only possible to select paths which are located on cluster shared volumes, as only these paths are available on all nodes </div> |

Hyper-V Resource Selection Wizard – Browse by Virtual Machine Hosts

This page of the wizard is displayed when the browse by virtual machine host option is selected in the initial wizard page above.

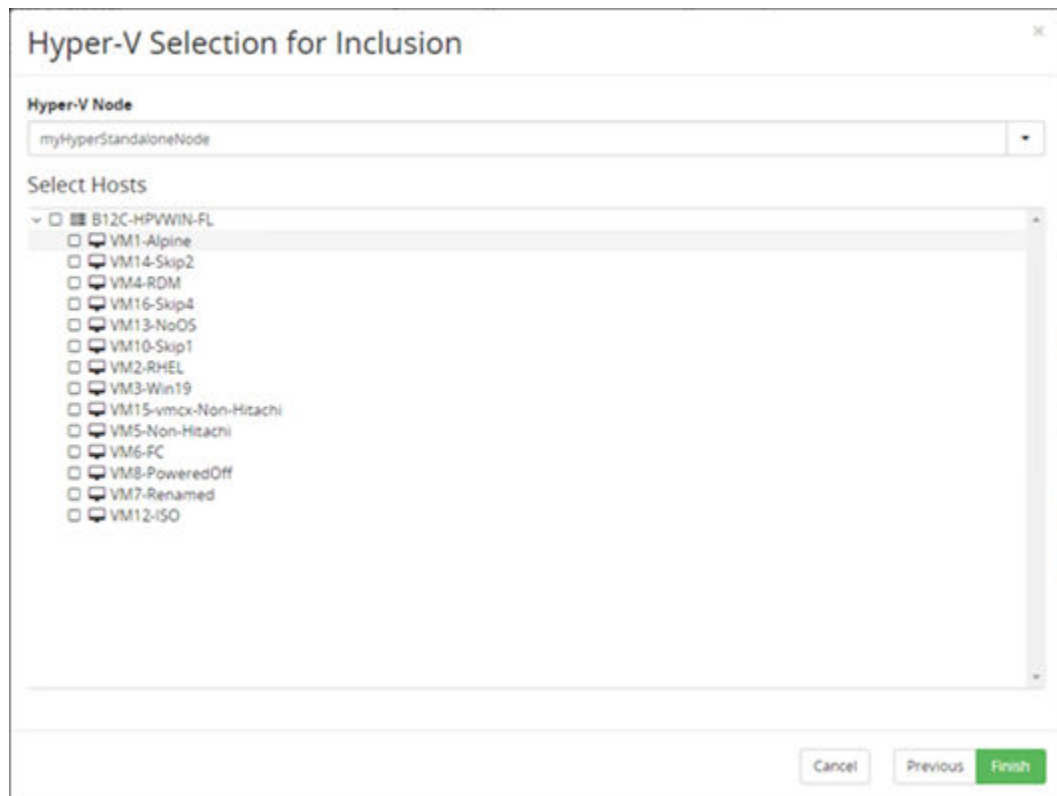



Figure 358 Hyper-V VM Selection - Browse by Virtual Machine Hosts

| Control | Description |
|--------------|---|
| Hyper-V Node | Select the Hyper-V app node you want to select hosts or VMs from. |
| Hosts | Select either individual virtual machines or complete hosts. In case a host is selected, Protector will determine the list of VMs available on the host at the beginning of the backup. |

Hyper-V Resource Selection Wizard – Pattern search

This page of the wizard is displayed when the pattern search option is selected in the initial wizard page above.

Figure 359 Hyper-V Resource Selection Wizard – Pattern search

| Control | Description |
|---------------|--|
| Resource Type | <p>Select a Hyper-V resource type, that will be matched by the provided name pattern. Available options:</p> <ul style="list-style-type: none"> Virtual Machine Virtual Machine Location (Path) Virtual Machine Host |
| Pattern | <p>Enter a case insensitive pattern that will be used to match the resource type by name. The '?' character matches any single character, while the '*' character can be used to match any sequence of characters. E.g.: IH_* would match any resource of the given type whose name begins IH_.</p> <div>  Note: Resources are re-evaluated against the name pattern every time the policy is executed. New resources having a name that matches this pattern, added after the policy is activated, will be automatically included in the backup. </div> |

VMware Classification Wizard

This wizard is launched when a new VMware classification is added to policy.

The VMware classification is used as a means of conveniently specifying the VMware resources on a vCenter or ESX/ESXi host. Refer to [About VMware policy classifications \(on page 97\)](#) for details about how this classification works with host and block based operations.

Figure 360 VMware Wizard - Specify VMware classification attributes



Note: If you attempt to edit a legacy VMware policy classification created prior to Protector 6.5, a message will be displayed asking you to reset the Include Items and Exclude Items lists.

| Control | Description |
|----------------|---|
| Included Items | Lists the VMware resources that will be included in the backup policy. <div> Note: Protector will not take a snapshot of a VM if that VM already has a Protector snapshot mounted to it. </div> |
| Add | Opens the VMware Resource Selection Wizard (on page 623) to enable VMware resources to be added to the include list above. |
| Excluded Items | Lists the VMware resources that will be excluded from the backup policy. |
| Remove | Each row has a remove button at the end of the row, the selected VMware resource is removed from the include/exclude list. |

| Control | Description |
|-------------|--|
| Add | Opens the VMware Resource Selection Wizard (on page 623) to enable VMware resources to be added to the exclude list above. |
| VMware Node | Select the VMware node the policy is being created for. |

VMware Resource Selection Wizard

This wizard is displayed when the user includes or excludes VMware resources in a policy.



Caution: Protector tracks VMware resources via their MoRef (Managed Object Reference). If a resource's MoRef is changed then it will not be included in the backup and a warning will be logged. Tracking resources via their MoRef means that they will be included in the backup even if vMotion moves them.



Figure 361 VMware Resource Selection for Inclusion/Exclusion Wizard - Select method

| Control | Description |
|--------------------------------------|---|
| Browse for resources | Select this option to browse for VMware resources in similar ways to those provided in vSphere Client. See VMware Resource Selection for Inclusion/Exclusion Wizard - Browse By below. |
| Specify resource by name or wildcard | Select this option to specify a resource by type and name pattern match. See VMware Resource Selection for Inclusion/Exclusion Wizard - Specify name or wildcard below. |

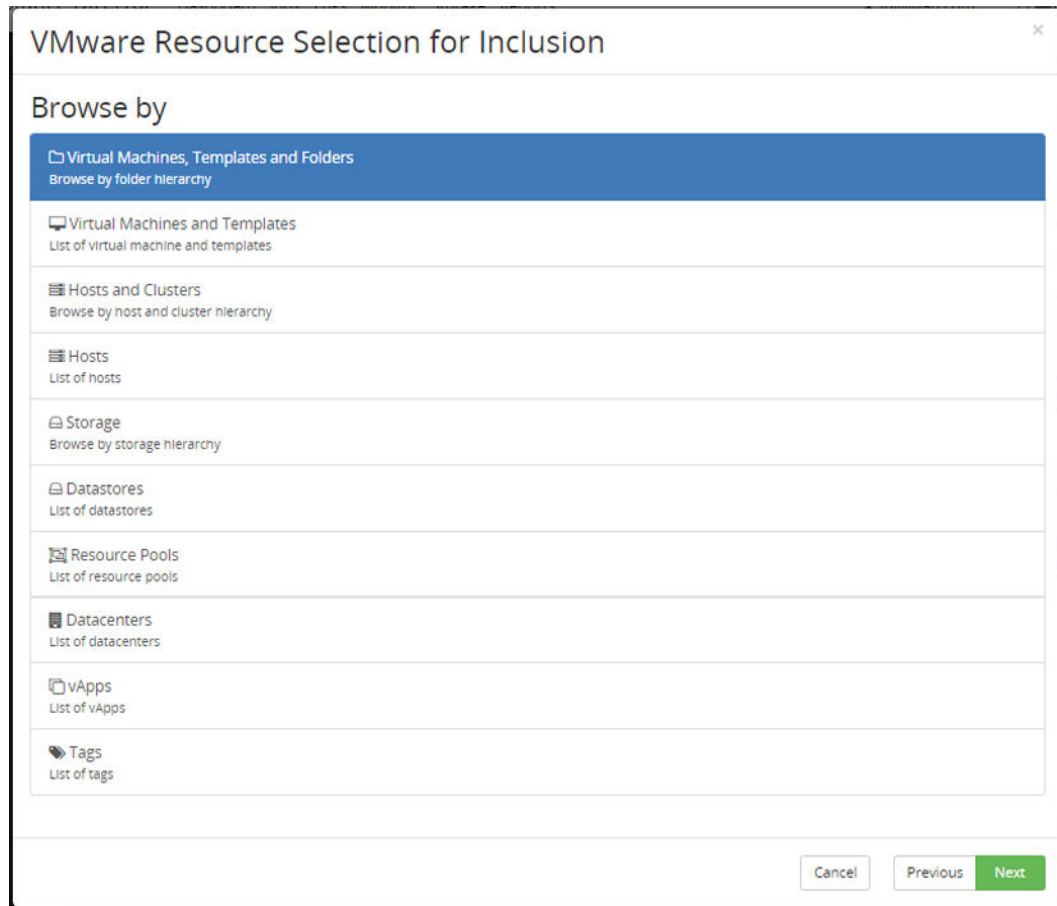



Figure 362 VMware Resource Selection for Inclusion/Exclusion Wizard - Browse by

This page of the wizard is displayed when the Browse for resources selection method is specified in the initial wizard page above.

| Control | Description |
|---|---|
| Virtual Machines, Templates and Folders | Displays a hierarchical view ordered by datacenters, folders, and virtual machines and templates. |
| Virtual Machines and Templates | Displays a flat list of virtual machines and templates ordered alphabetically. |
| Hosts and Clusters | Displays a hierarchical view ordered by datacenters, hosts and virtual machines. |
| Hosts | Displays a flat list of hosts ordered alphabetically. |
| Storage | Displays a hierarchical view ordered by datacenters and datastores. |
| Datastores | Displays a flat list of datastores ordered alphabetically. |
| Resource Pools | Displays a flat list of resource pools ordered alphabetically. |

| Control | Description |
|------------|--|
| Datcenters | Displays a flat list of datcenters ordered alphabetically. |
| vApps | Displays a flat list of vApps ordered alphabetically. |
| Tags | Displays a flat list of tags ordered alphabetically. <div>  Note: To browse by tags, the VMware proxy node must have PowerCLI installed. Refer to VMware Product Interoperability Matrices for vCenter Server/PowerCLI version compatibility. </div> |

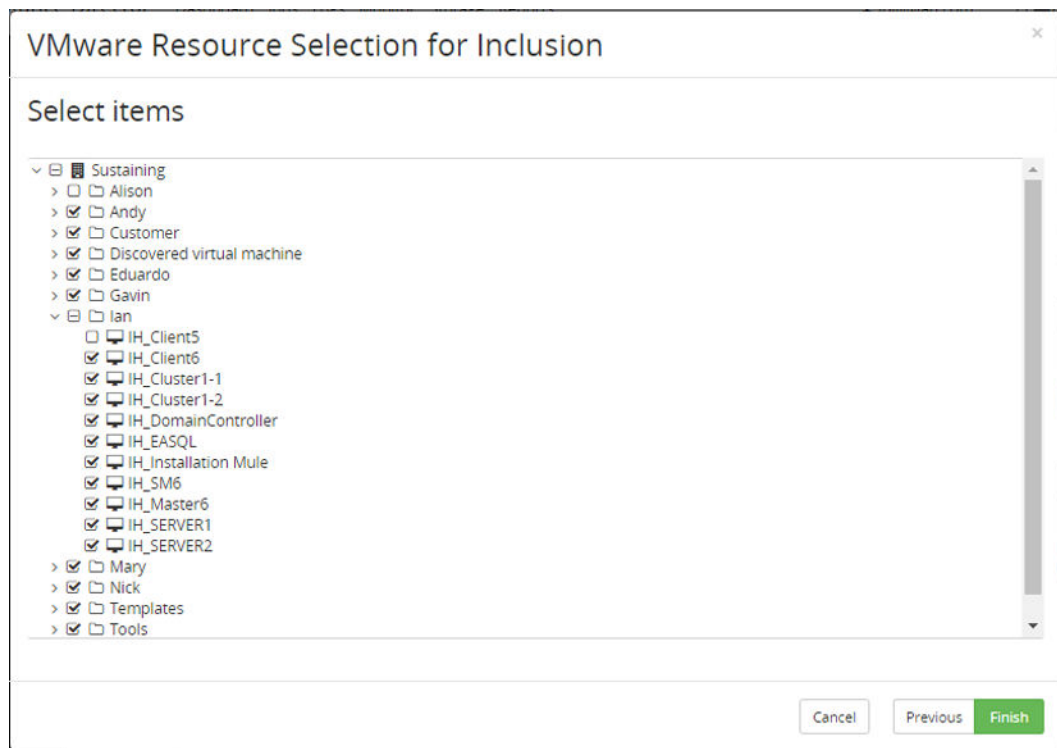


Figure 363 VMware Resource Selection for Inclusion/Exclusion Wizard - Virtual Machines, Templates and Folders Hierarchy

In a hierarchical view it is possible to select or deselect entire trees, sub-trees and individual nodes. For example, the screen-shot above shows the entire *Sustaining* datacenter selected, but with the *Alison* folder and the *IH_Client5* virtual machine deselected from a backup policy.

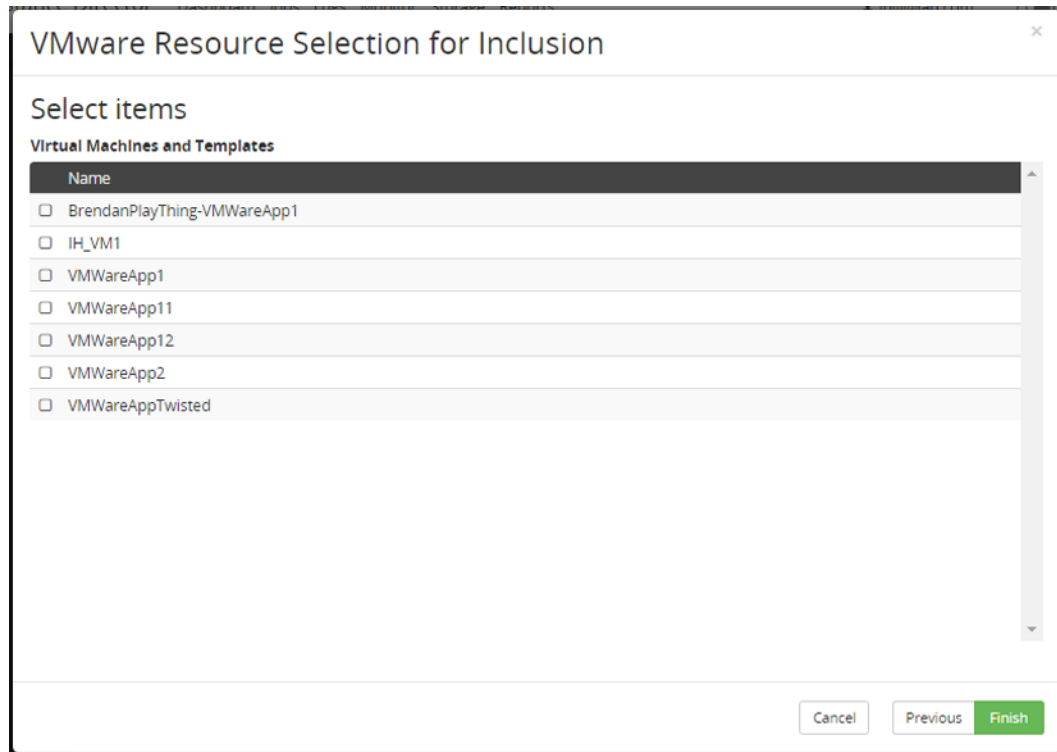


Figure 364 VMware Resource Selection for Inclusion/Exclusion Wizard - Virtual Machines and Templates List

In a flat list view it is possible to select or deselect multiple items of the same type.

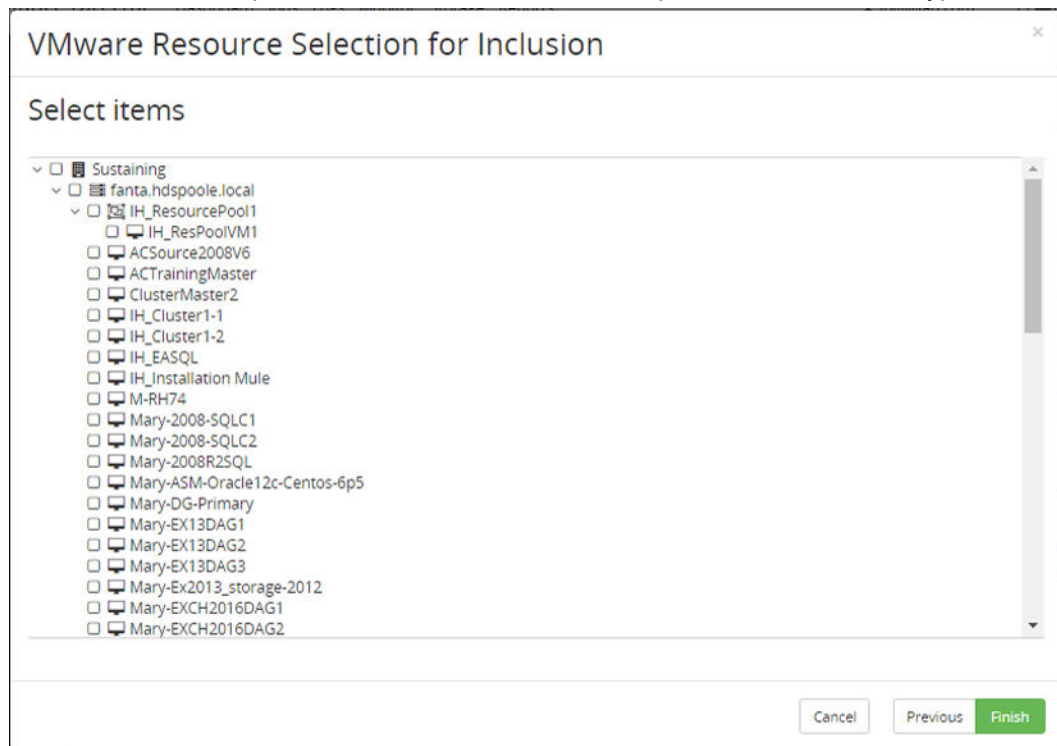


Figure 365 VMware Resource Selection for Inclusion/Exclusion Wizard - Hosts and Clusters Hierarchy

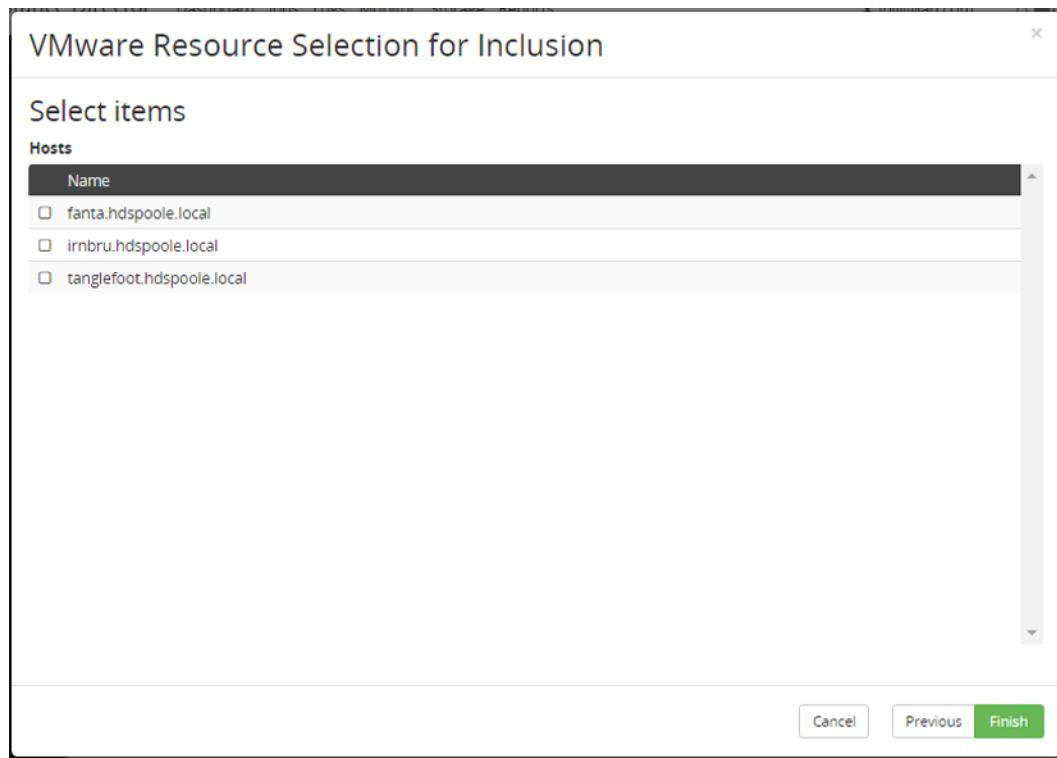


Figure 366 VMware Resource Selection for Inclusion/Exclusion Wizard - Hosts List

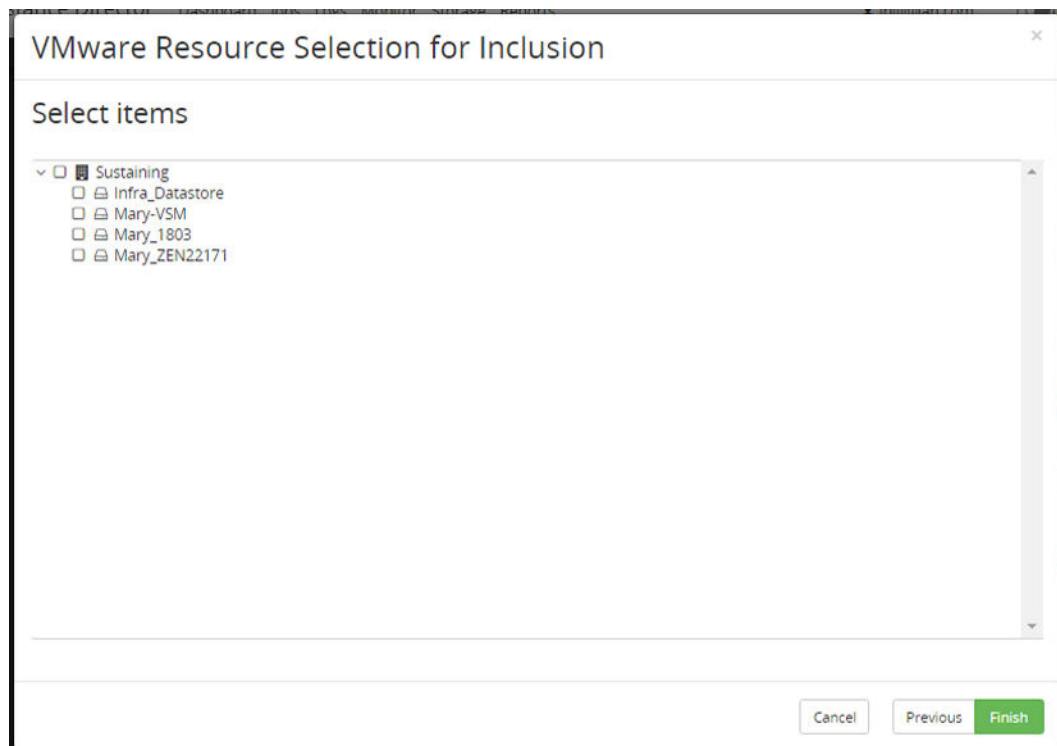


Figure 367 VMware Resource Selection for Inclusion/Exclusion Wizard - Storage Hierarchy

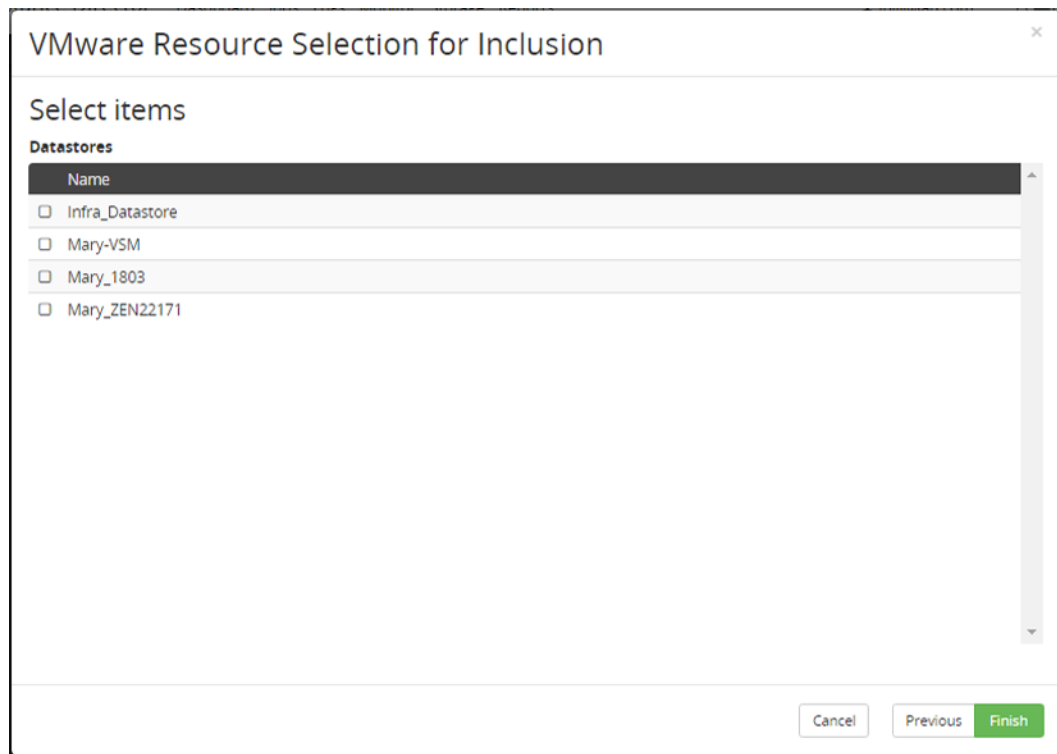


Figure 368 VMware Resource Selection for Inclusion/Exclusion Wizard - Datastores List

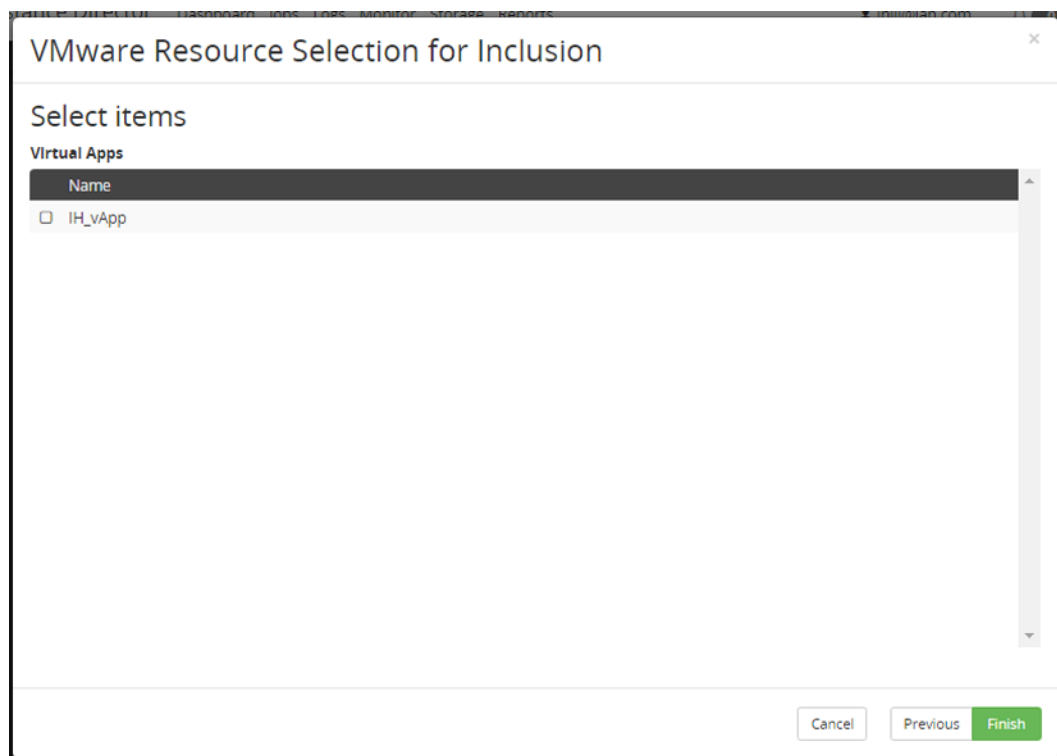


Figure 369 VMware Resource Selection for Inclusion/Exclusion Wizard - vApps List

The screenshot shows a window titled "VMware Resource Selection for Inclusion". Below the title bar is a section labeled "Select items". Under this section is a sub-header "Tags". Below "Tags" is a table with a header row "Name" and two rows of data: "Andy" and "IH_PolicyTag". Each row has a checkbox to its left. At the bottom right of the window are three buttons: "Cancel", "Previous", and "Finish".


Figure 370 VMware Resource Selection for Inclusion/Exclusion Wizard - Tags List

The screenshot shows a window titled "VMware Resource Selection for Inclusion". Below the title bar is a section labeled "Specify name or wildcard". Under this section is a sub-header "Resource Type" followed by a dropdown menu with "Select" as the current selection. Below that is a sub-header "Pattern" followed by a text input field containing the example "E.g., vm*, *-server, vm-*-server, db-server". At the bottom right of the window are three buttons: "Cancel", "Previous", and "Finish".

Figure 371 VMware Resource Selection for Inclusion/Exclusion Wizard - Specify name or wildcard

This page of the wizard is displayed when the Specify resource by name or wildcard selection method is specified in the initial wizard page above.

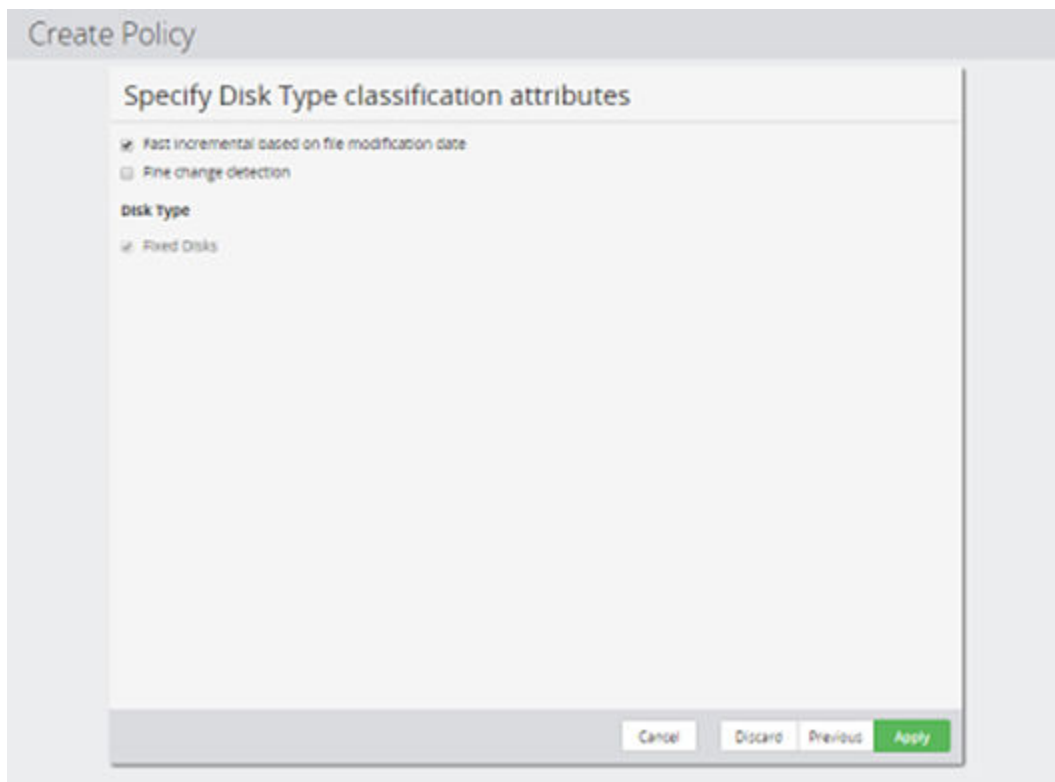
| Control | Description |
|---------------|--|
| Resource Type | Select a VMware resource type that will be matched by the provided name pattern. |

| Control | Description |
|---------|--|
| Pattern | <p>Enter a case insensitive pattern that will be used to match the resource type by name. The '*' character can be used to match any sequence of characters. E.g.: <code>IH_*</code> would match any resource of the given type who's name begins <code>IH_</code>.</p> <p> Note: Resources are re-evaluated against the name pattern every time the policy is executed. New resources having a name that matches this pattern, added after the policy is activated, will be automatically included in the backup.</p> |

Disk Type Classification Wizard

This wizard is launched when a new Disk Type classification is added to a Policy.

The Disk Type classification is used to limit backups to files that are located on fixed devices and/or to files that are located on removable disks. To specify file types use the [Classification Filters Wizard \(on page 648\)](#) in conjunction with this Classification.



Create Policy

Specify Disk Type classification attributes

☒ Fast incremental based on file modification date

☐ Fine change detection

Disk Type

☒ Fixed Disks

Cancel Discard Previous Apply

Figure 372 Physical Storage Type Wizard

| Control | Description |
|--|--|
| Fixed Disks | Backs up all fixed disks, as this is the only disk type option it is permanently selected. All drives connected to SCSI, ATAPI, ATA, SAS, Fiber, RAID, and so on are considered fixed. |
| Fast incremental based on file modification date | This is only applicable for backups to Generation 2 storage nodes. If this is checked then Ops Center Protector decides what files need resynchronizing based on whether the modification date has changed. This reduces the time taken to resynchronize, but can be disabled if it is known that software is installed that will modify files without updating their size or modification date. Notelf only file metadata changes between batch backups (e.g. file ownership or file permissions), then the changes are not captured. These changes are only captured when the file data changes. |
| Fine change detection | This is only applicable for backups to Generation 2 storage nodes. Reduces the amount of data transferred and stored during a resynchronization. An entire file is transferred if it has changed and is less than one block in size. (This option should be used sparingly as there is a processing overhead.) |

Hitachi Block Classification Wizard

This wizard is launched when a new Hitachi Block classification is added to a Policy.

The Hitachi Block classification is used to define which LDEVs are to be protected.

Create Policy

Specify Hitachi Block Storage classification attributes

☒ Use Hitachi Block Host selections
☐ Specify additional selections

Enter values using any of the following formats:

- *Serial/LDEV_ID* - for a single logical device, e.g., 12345/100, 12345/0x10
- *Serial/LDEV_ID-LDEV_ID* - for a logical device range, e.g., 12345/200-299, 12345/0x01-0x0F
- *Serial/Host Group ID* - for all logical devices within the host group, e.g., 12345/CL1-A-0, 12345/CL10-A-0


Included Logical Devices

Excluded Logical Devices

One entry per line.

Figure 373 Hitachi Block Classification Wizard - Specify Hitachi Block Storage classification attributes

| Control | Description |
|-----------------------------------|--|
| Use Hitachi Block Host selections | Select this option if the policy is used in conjunction with a Hitachi Block Host Node (see Hitachi Block Host Node Wizard (on page 494)). In this case the LDEVs were specified when the node was created. |
| Specify additional selections | <p>Select this option to specify the LDEVs when used in conjunction with a:</p> <ul style="list-style-type: none"> ▪ Hitachi Block Node (see Hitachi Block Device Node Wizard (on page 513)) or a ▪ Hitachi Logical Block Node (see Hitachi Logical Block Device Node Wizard (on page 539)) <p>You can also select this option if the policy is used in conjunction with a Hitachi Block Host Node (see Hitachi Block Host Node Wizard (on page 494)). In this case the LDEVs specified here will be in addition to those specified when the node was created.</p> |
| Included Logical Devices | Enter a list of LDEVs or Host Groups to be included in this Block Host (one logical device or host group specification per line) in the format described below. |

| Control | Description |
|--------------------------|--|
| Excluded Logical Devices | <p>Enter a list of LDEVs or Host Groups to be excluded from this Block Host (one logical device or host group specification per line) in the format described below.</p> <div>  Tip: This enables the inclusion of an entire Host Group but exclusion of individual LDEVs within that Host Group. </div> |

LDEVs are entered in the following format:

serial_number/identifier

Where:

- *serial_number* is the serial number of the Block storage device
- *identifier* is one of:
 - *ldev_id* a single LDEV ID in hex or decimal
 - *ldev_id-ldev_id* a range of LDEV IDs
 - *host_group_id* a host group identifier using the format:
 - CL*c-s-h* where:
 - CL is a literal string
 - *c* is the physical channel number in the range 1...n
 - *s* is the physical slot number in the range A...Z
 - *h* is the logical host group ID in the range 0...255

For example:

210613/0x00a0 for an LDEV specified in hexadecimal

210613/220-230 for a range of LDEVs specified in decimal

210613/CL2-A-12 for a host group

**Note:**

- Spaces and colons must not be present in the classification entries. If a space or colon is encountered on a line, the remaining text on that line from the space or colon will be disregarded. This allows existing entries (that contain the LDEV name after a space or colon) to be present in the list.
- When using pseudo multi-tenancy, if an LDEV or host group is manually specified that is not accessible then it will be excluded from the backup. An attachment is included in the log message that specifies what was included and excluded in the backup.
- If a selection of provisioned ports are specified, the port with the least amount of LUNs assigned to it will be used. The exception is when a TI Snapshot already exists and an update is made to the provisioned ports, in this case the port used will be taken from the existing TI snapshot set.
- When a replication already exists and a change is made to provisioned ports then the affected data flow must be reactivated. The existing replication will remain using the existing port after it has been resynchronized. New replications will use the updated settings.

Path Classification Wizard

This wizard is launched when a new Path classification is added to a Policy.

The Path classification allows you to define the path or paths for directories that contain files to be backed up. All files in each directory will be backed up. To specify file types use the [Classification Filters Wizard \(on page 648\)](#) in conjunction with this Classification.

**Caution:**

- Protector will not backup the files or directories referred to by a symbolic link. The symbolic link itself will be backed up, so upon restore the link will still work assuming the referenced files or directories exist in their original location. Essentially, Protector performs a shallow backup in respect of symbolic links.
- The following filesystem types are excluded from backups:
 - Windows: bad, cdrom, no root, ramdisk, unknown
 - Linux: autofs, binfmt_misc, configfs, debugfs, devpts, devtmpfs, fuse, group, hugetlbfs, mqueue, nfsd, proc, pstore, rootfs, rpc_pipefs, securityfs, selinuxfs, sysfs, tmpfs, vmblock
 - AIX: ahafs, autofs, cdrom, procfs



Note: When used in the context of storage hardware backups, Protector will discover the underlying hardware paths at runtime. For storage hardware based backups, all the paths must exist on the same block hardware device.

Create Policy

Specify Path classification attributes

Generation 2 host based storage (Repository and Cloud) options

☒ Fast incremental based on file modification date

☐ Fine change detection for repositories

Included Paths


One path per line.

Excluded Paths

One path per line.

Buttons: Cancel, Discard, Previous, Apply

Figure 374 Physical Path Wizard - Specify Path classification attributes

| Control | Description |
|----------------|---|
| Included Paths | Enter the paths to be included in the backup policy. The targeted directory paths are entered with one path specified per line. To specify file types add a Filter using the Classification Filters Wizard (on page 648) . Refer also to Path selection rules (on page 637) . |
| Excluded Paths | <p>Enter the paths to be excluded from the backup policy. The targeted directory paths are entered with one path specified per line. Files themselves cannot be specified – only directories. If Included Paths to be backed up contains one or more sub-paths that are not required, then enter the paths of these sub-directories here.</p> <p> Note: If Excluded Paths contains paths that are not sub-paths of Included Paths, Protector will backup the entire file system.</p> <p>Refer also to Path selection rules (on page 637).</p> |
| Select Paths | Opens the Select Classification Paths Dialog (on page 636) to enable you to select existing paths to be included or excluded. You can search for a path on a specific node and then apply that path broadly to all nodes or apply it to one node only. |

| Control | Description |
|--|---|
| Fast incremental based on file modification date | Only applicable to Generation 2 host based storage. If this is checked then Ops Center Protector decides what files need resynchronizing based on whether the modification date has changed. This reduces the time taken to resynchronize, but can be disabled if it is known that software is installed that will modify files without updating their size or modification date. Note: If only file metadata changes between batch backups (e.g. file ownership or file permissions), then the changes are not captured. These changes are only captured when the file data changes. |
| Fine change detection for repositories | Only applicable to Generation 2 repository backups. Reduces the amount of data transferred and stored during a resynchronization. An entire file is transferred if it has changed and is less than one block in size. (This option should be used sparingly as there is a processing overhead.) |



Tip: It is possible to use wildcard characters (*) within each path entry. Only one wildcard character is permissible within each path element. That is: C:*\hello is valid, whereas C:*document*\hello is not valid.

It is possible to use variables within a Path classification. See [About path macros \(on page 100\)](#) for details.

Select Classification Paths Dialog

This dialog is displayed when selecting paths (e.g. in the Path Classification Wizard).

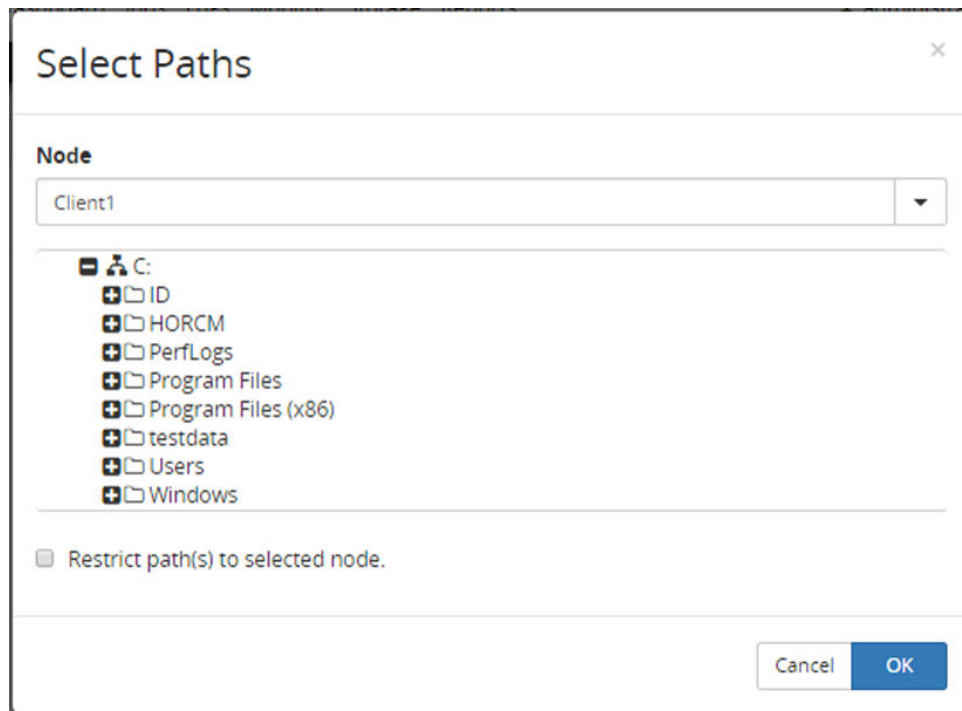


Figure 375 Select Paths Dialog

| Control | Description |
|-----------------------------------|--|
| Node | Enter the name of a node or select one from the dropdown menu. |
| Directory Tree | Expand the directory tree for the node and select the required directory. |
| Restrict path(s) to selected node | If selected then the path will only be applied to the node selected above; the path will be qualified with the node name (i.e. {node_name}path_name) in the Path Classification Wizard (on page 634) path list. If deselected then the path will be applied to all nodes where the policy is assigned. |

Path selection rules

A *Physical - Path* policy classification is a set of *Included Paths*, *Exclude Paths* and *Filters*. Paths must be specified following the rules listed below:

General path rules:

- Only directories can be specified by a path; files cannot.
- A path specification is only considered to refer to the leaf node of the path. For example:
`/path_element_1/path_element_2`
only refers to the `path_element_2` leaf node.
- `/home/` is the same as `/home`. The trailing delimiter is ignored.
- An *included path* must be defined to be a valid classification.
- An *excluded path* will never implicitly include other paths.
- An *excluded path* will be ignored if it is not a sub directory of an *included path*.
 - For example, if `/home` is set as both an *included path* and an *excluded path*, it will be included. This is because the *excluded path* it is not a sub-path of the *included path*.
- Only local files are backed up. Filesystem walking will not continue beyond a remote mount point.

Windows specific path rules:

- A windows path must start with `<drive letter>:\` (`<drive letter>` can be an actual drive letter or a `*` or `?`).
- Delimiters can be `/` or `\` and can be mixed within a path specification.

Posix specific path rules:

- A Posix path must start with `/`
- Delimiters can only be `/`

Wild card rules:

- The following characters that have special meaning in a path specification:
 - `*` matches zero or more characters.
 - `?` matches only a single character.
- If a path element contains a `*` it only matches directories at that level.
- Any number of `*` and `?` wildcards can be used in a path.

File filters:

- A file filter will only match files not directories.
- The same wildcard rules apply; directories will not be matched.

Path examples:

| Example | Interpretation |
|----------|---|
| /home/** | Selects all directories immediately beneath /home. The second * has no effect. |
| /home/*d | Selects all directories immediately beneath /home ending in d. The directory /home is not selected. |
| /home/? | Selects all directories immediately beneath /home that have a name that is exactly 1 character long. The directory /home is not selected. |
| /home/* | Selects all directories immediately beneath /home. The directory /home is not selected. |
| ? : \ | Selects all Windows drives, as will * : \ |
| /h*/*m* | Selects all directories that contain an m, that are beneath all directories at the root level starting with h. |
| /h*m* | Selects all directories at the root level that start with h and also have m in the name. Note that a directory named /hm would be selected since * matches zero or more characters. |
| /h*me | Selects all directories at the root level that starts with h followed by any number of characters and ending with me. |
| /h?me | Selects all directories at the root level that starts with h followed by any single character and ending with me. |

Backup Operation Wizard

This wizard is launched when a new Backup operation is added to a Policy.

The Backup operation makes complete or incremental copies of the source node's data (specified by the associated data classification). These backups are performed at times dictated by the Run Options.



Note: This operation cannot be applied to hardware storage devices.



Note: Operating System Specific Behaviour:

| OS | Note |
|-----|---|
| AIX | AIX host-based backups do not capture ACLs. |

Create Policy

Specify Backup operation attributes

Name
Backup

Tags
Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Run Options

- ☒ Run on RPO
- ☐ Run on RPO and Schedule
Select a Schedule: [dropdown] [Manage Schedules](#)
- ☐ Run on completion of operation
Select Operation: [dropdown]

Schedule Options

Recovery Point Objective
8 Hours

Retention
6 Months

Source Options

☒ Quiesce configured applications before backup


Pre Script
[text area]

Post Script
[text area]

Cancel Discard Previous **Apply**

Figure 376 Backup Wizard - Specify Backup operation attributes

| Control | Description |
|------------------------|---|
| Name | The name of the operation. The default name is 'Backup'. This is used to identify the operation when the policy is used in a Data Flow diagram and when operations are to be triggered sequentially. |
| Tags | Add the tags to be associated with the object being created. |
| Run Options | Select one of the following: <ul style="list-style-type: none"> Run on RPO - the operation is triggered whenever the RPO is reached. Run on RPO and Schedule - the operation will trigger based on the RPO and the selected Schedule Name. Run on completion of operation - the operation will be triggered on completion of the operation entered in the Select Operation field. This is used when a policy contains more than one operation and it is necessary that the operations occur in a sequential order. |
| Select a Schedule Name | Enabled only when the Run Option is set to Scheduled. Enter an existing schedule name or select one from the dropdown menu. |
| Manage Schedules | Opens the Schedules Inventory (on page 748) in a new tab to enable you to add, edit, review or delete schedules. The times, dates and/or windows within which backups are written to a repository can be controlled by a named schedule that is then selected in the Schedule Name control. Once you have finished working in the Schedules tab, close it and return to the Backup Wizard . |

| Control | Description |
|---|---|
| Select Operation | Enabled only when the Run Option is set to Run on completion of operation. Enter an existing operation name or select one from the dropdown menu. This is used when a policy contains more than one operation and it is necessary that the operations occur in a sequential order. |
| Recovery Point Objective | This can be set to a specified period and is used in conjunction with the Run Options. If Run on RPO or Run on RPO and Schedule is selected, then a backup is created whenever the Recovery Point Objective time is reached, following the initial backup performed when the policy is activated. |
| Retention | The backup is retained for the specified period before being retired. |
| Quiesce configured applications before backup | This is used to ensure backup consistency. If this option is selected and any Application classifiers are included in the policy, then these applications will be temporarily quiesced into a consistent state prior to the snapshot occurring. See About application quiescing (on page 100) . |
| Pre Script | <p>Specify a script that will be run before the backup is performed. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard.</p> <div>  Note: <ul style="list-style-type: none"> The Pre script and Post script fields have no effect with VMware ESX backups. If scripts need to be run either before or after a backup operation then those scripts need to be held locally on each virtual machine that must run them. See the following VMware articles for further information: https://pubs.vmware.com/vsphere-50 http://kb.vmware.com/selfservice In order to run a Python script as Pre and Post scripts is it necessary to precede the script name with the path and the name of the python binary as follows: <script bin path>/<full script bin name> <script> <p>So for Windows this would look like this: C:\Users\Administrator\AppData\Local\Programs\Python\Python38-32\python.exe E:\myScript.py</p> <p>For Linux: /usr/bin/python3 /opt/hitachi/Protector/scripts/myScript.py</p> </div> |
| Post Script | Specify a script that will be run after the backup is performed. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard. |

Mount Operation Wizard

This wizard is launched when a new Mount operation is added to a Policy.

The Mount operation is used to automatically mount and unmount the destination of a Hitachi Block and File storage replication so that it can be used in Repurposing and Proxy Backup scenarios.



Note: The selected mount host must have a pre-existing LUN mounted from the corresponding storage device (this is required for the auto discover feature to work). If not then the automated mount operation will fail and the error message "Cannot mount to machine that does not have path to storage" will be logged.



Note:

- Only Replications can be auto-mounted using the Mount operation; Snapshots cannot.
- The storage paths used for Proxy Backup and Repurposing are not deleted immediately after use, therefore it is possible that they may be shown as offline in the OS's Disk Management UI.
- If a mount operation needs to mount multiple disks and one of the mount operations fail, the replication destination is shown as mounted rather than partially mounted. The logs will indicate the mount was only partially successful.

Figure 377 Mount Wizard - Specify Mount operation attributes

| Control | Description |
|-------------------|---|
| Name | The name of the operation. The default name is 'Mount'. This is used to identify the operation when the policy is used in a Data Flow diagram and when operations are to be triggered sequentially. |
| Run Options | Select one of the following options: <ul style="list-style-type: none"> Run on Schedule - specify a trigger schedule name in the Select a Schedule field to specify when the mount operation should occur. |
| Select a Schedule | The mount operation can have its own trigger schedule that can be used when applied to a continuous replication. The operation can also be part of a synchronization group so that it can participate in a batch replication sequence. Enter an existing schedule name or select one from the dropdown menu. |
| Manage Schedules | Opens the Schedules Inventory (on page 748) to enable you to add, edit, review or delete schedules. |
| After Mount | Specify a script that will be run on the mount host after the volume is mounted, allowing the script writer to invoke an action after the volumes have been mounted on the mount host, e.g.: schedule a host based backup. By default Protector will look for the script on the mount host in the C:\Program Files\Hitachi\Protector\Scripts folder. |
| Before Unmount | Specify a script that will be run on the mount host before the volume is unmounted, allowing the script writer to put the application into a safe state before the volumes are unmounted from the mount host. By default Protector will look for the script on the mount host in the C:\Program Files\Hitachi\Protector\Scripts folder. |

Replicate Operation Wizard

This wizard is launched when a new Replicate operation is added to a Policy.

The Replicate operation maintains a complete copy of the source data (specified by the associated data classification) on the destination.

Create Policy

Specify Replication operation attributes

Name

Tags

Enter comma separated tags. Tags can include alphanumeric characters, underscore and hyphen. To define a key/value tag, separate the key and value with a colon.

Refresh Options

☒ Refresh when manually triggered

☐ Refresh on Schedule

☐ Refresh on completion of operation

Source Options (Batch Only)


☒ Quiesce configured applications before backup.

Pre Script
☐

Post Script
☐

Figure 378 Replicate Wizard - Replication Operation Attributes

| Control | Description |
|-------------------|--|
| Name | The name of the operation. The default name is 'Replicate'. This is used to identify the operation when the policy is used in a Data Flow diagram and when operations are to be triggered sequentially. |
| Refresh Options | Replication can be performed in real time using a continuous mover or in batch mode using a batch mover. In the case of a continuous mover these options will cause the application to re-evaluate the LDEVs being used in the replication. <ul style="list-style-type: none"> Run when manually triggered - the operation is manually triggered. Run on Schedule - the operation will trigger based on the schedule specified in the Select a Schedule field. Run on completion of operation - the operation will be triggered on completion of the operation entered in the Select Operation field. |
| Select a Schedule | Enabled only when the Run Option is set to Scheduled. Enter an existing schedule name or select one from the dropdown menu. |
| Manage Schedules | Opens the Schedules Inventory (on page 748) in a new tab to enable you to add, edit, review or delete schedules. The times, dates and/or windows within which backups are written to a repository can be controlled by a named schedule that is then selected in the Schedule Name control. Once you have finished working in the Schedules tab, close it and return to the Replicate Wizard . |

| Control | Description |
|---|--|
| Run on completion of operation | Enabled only when the Run Option is set to Run on completion of operation. Enter an existing operation name or select one from the dropdown menu. This is used when a policy contains more than one operation and it is necessary that the operations occur in a sequential order. |
| Quiesce configured applications before backup | <p>Only valid when performing a batch replication operation. This is used to ensure backup consistency. If this option is selected and any Application classifiers are included in the policy, then these applications will be temporarily quiesced into a consistent state prior to the snapshot occurring. See About application quiescing (on page 100).</p> <div>  Caution: <ul style="list-style-type: none"> Oracle - Policies containing these application classifications must have the quiesce application option checked, otherwise backups may not be restorable. VMware - Policies containing this hypervisor classification require that VMware Tools is installed on the VM to perform quiesced backups, otherwise backups will fail. </div> |
| Pre Script | Specify a script that will be run before the replication is started. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard. |
| Post Script | Specify a script that will be run after the replication is completed. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard. |

Snapshot Operation Wizard

This wizard is launched when a new Snapshot operation is added to a Policy.

The Snapshot operation is used to trigger snapshots of entire volumes. Multiple copies may be retained, enabling reversion to a specific point in time.



Caution:

- Snapshot operations always apply to the whole selected volume. Any associated data classifications are ignored.
- Snapshots will be automatically retired after the given retention period.

Create Policy

Specify Snapshot operation attributes

Name

Mode Options

Mode

Hardware Type

Run Options

☒ Run on RPO
☐ Run on RPO and Schedule
☐ Run on completion of operation

[Manage Schedules](#)

Schedule Options

Recovery Point Objective

Retention

Source Options


☒ Quiesce configured applications before backup

Pre Script

Post Script

Figure 379 Snapshot Wizard

| Control | Description |
|-------------------|--|
| Name | The name of the operation. The default name is 'Snapshot'. This is used to identify the operation when the policy is used in a Data Flow diagram and when operations are to be triggered sequentially. |
| Mode | This can currently only be set to: <ul style="list-style-type: none"> Hardware - for snapshots of Hitachi Block. |
| Hardware Type | Only enabled if Mode is set to Hardware. This can be set to: <ul style="list-style-type: none"> Hitachi Block - for VSP and HUS VM block storage |
| Run Options | Select one of the following: <ul style="list-style-type: none"> Run on RPO - the operation is triggered whenever the RPO is reached. Run on RPO and Schedule - the operation will trigger based on the RPO and the schedule name entered in the Select a Schedule field. Run on completion of operation - the operation will be triggered on completion of the operation entered in the Select Operation field. |
| Select a Schedule | Enabled only when the Run Option is set to Scheduled. Enter an existing schedule name or select one from the dropdown menu. |

| Control | Description |
|---|--|
| Manage Schedules | Opens the Schedules Inventory (on page 748) in a new tab to enable you to add, edit, review or delete schedules. The times, dates and/or windows within which snapshots are created can be controlled by a named schedule that is then selected in the Schedule Name control. Once you have finished working in the Schedules tab, close it and return to the Snapshot Wizard . |
| Select Operation | Enabled only when the Run Option is set to Run on completion of operation. Enter an existing operation name or select one from the dropdown menu. This is used when a policy contains more than one operation and it is necessary that the operations occur in a sequential order. |
| Recovery Point Objective | This can be set to a specified period and is used in conjunction with the Run Options. If no schedules are defined (i.e. Run on RPO is selected), then a snapshot is created whenever the Recovery Point Objective time is reached. |
| Retention | The backup is retained for the specified period before being retired. |
| Quiesce configured applications before backup | <p>This is used to ensure backup consistency. If this option is selected and any Application classifiers are included in the policy, these applications will be temporarily quiesced into a consistent state prior to the snapshot occurring. See About application quiescing (on page 100).</p> <div style="background-color: #fff9c4; padding: 10px; border: 1px solid #ccc;"> <p> Caution:</p> <ul style="list-style-type: none"> ▪ Oracle - Policies containing these application classifications must have the quiesce application option checked, otherwise backups may not be restorable. ▪ VMware - Policies containing this hypervisor classification require that VMware Tools is installed on the VM to perform quiesced backups, otherwise backups will fail. </div> |
| Pre Script | Specify a script that will be run before the snapshot is taken. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard. |
| Post Script | Specify a script that will be run after the snapshot is taken. This is used to ensure consistent state for applications other than those with a predefined Application Classification Wizard. |

Tier Operation Wizard

This wizard is launched when a new Tier operation is added to a Policy.

The Tier operation is used to trigger tiering of entire data from a repository store to a cloud storage platform.

Figure 380 Tier Wizard

| Control | Description |
|---------|--|
| Name | The name of the operation. The default name is 'Tier'. This is used to identify the operation when the policy is used in a Data Flow diagram and when operations are to be triggered sequentially. |

Classification Filters Wizard

This wizard is launched when Filters for a Path or Disk Type Classification are created or edited.

Classification Filters are applied to Path and Disk Type Classifications when used in conjunction with host based operations (Backup) to provide finer control over what is backed up.

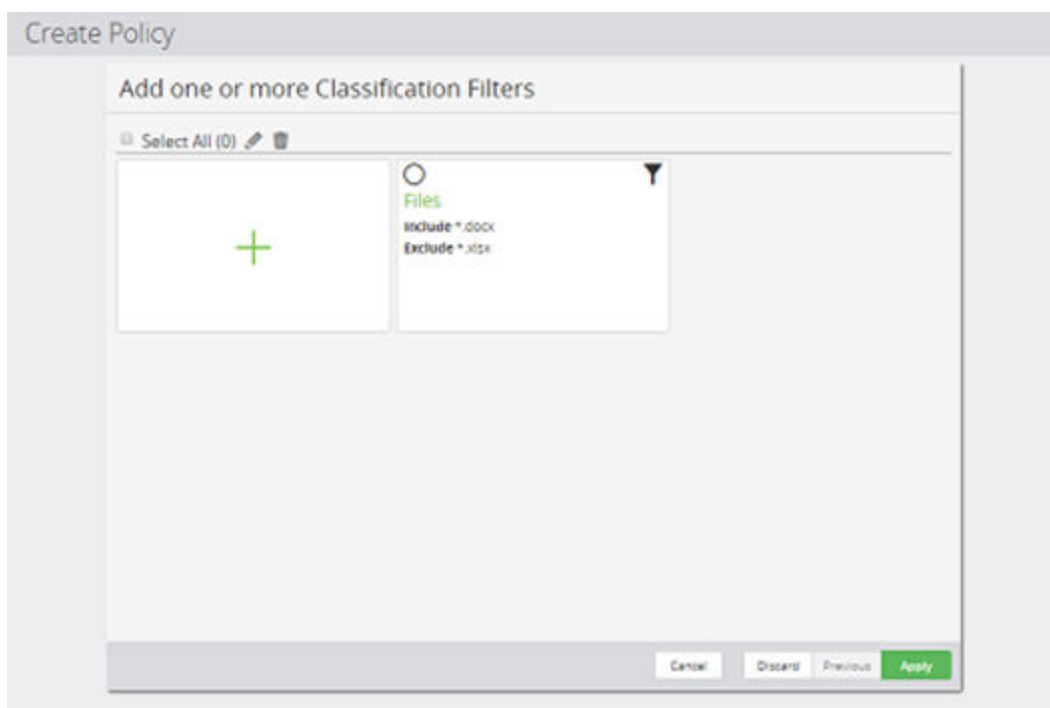






Figure 381 Classification Filter Wizard - Add one or more Classification Filters

| Control | Description |
|---|---|
|  Edit | Edits an existing filter in the inventory. The appropriate Filter wizard is launched to enable the filter's attributes to be changed. |
|  Delete | Deletes the selected item from the inventory. |
|  Add | Creates a new Classification Filter. The following wizard page is displayed allowing a Filter to be specified. |
|  Existing Filter | Click on the filter name to Launch the appropriate Filter wizard to enable the filter to be viewed and edited. |

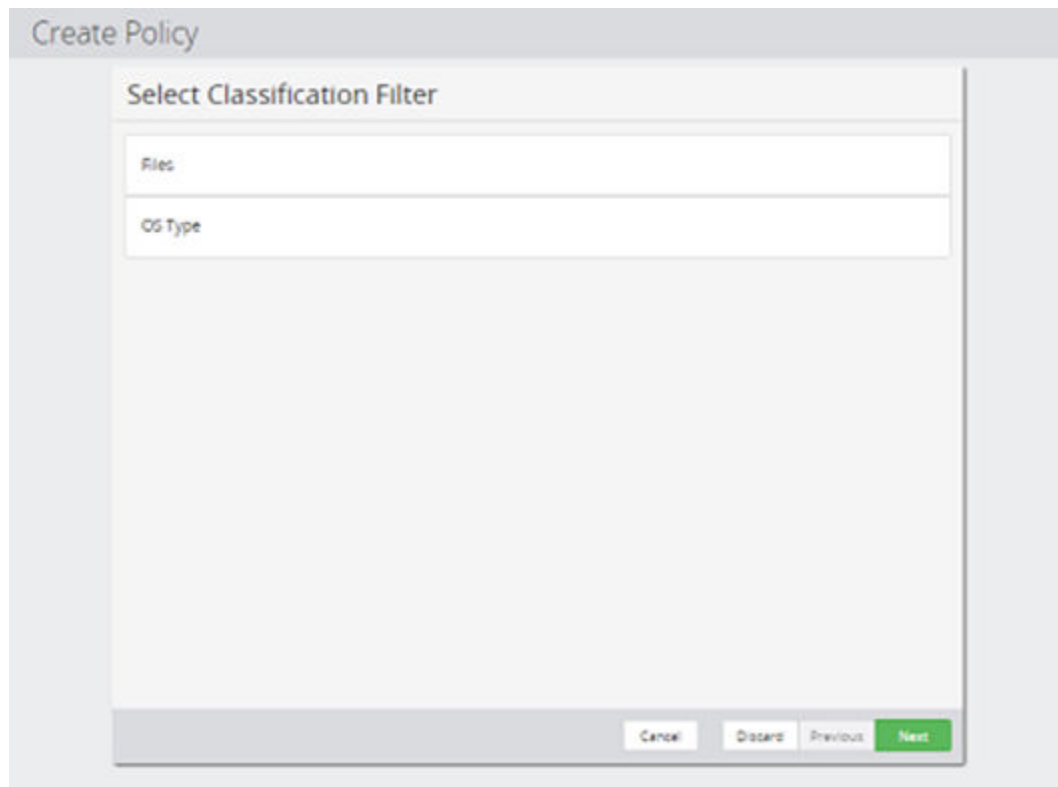


Figure 382 Filter Selection Wizard - Select Classification Filter

| Control | Description |
|---------|--|
| Files | Filters based on user defined file type. |
| OS Type | Filters based on OS Type. |

Figure 383 Filter Selection Wizard - Specify Files filter attributes

| Control | Description |
|------------------------------|---|
| Include Files | The specified file types will be included in the classification. All files, regardless of path, whose name matches the given name will be included. Specify one file name and extension per line. To specify paths, create a path classifier using the Path Classification Wizard (on page 634) and attach this filter to it. |
| Include File Type Categories | Launches the Select File type categories dialog (on page 652) . |
| Exclude Files | The specified file types will be excluded from the classification. Specify one file name and extension per line. |
| Exclude File Type Categories | Launches the Select File type categories dialog (on page 652) . |

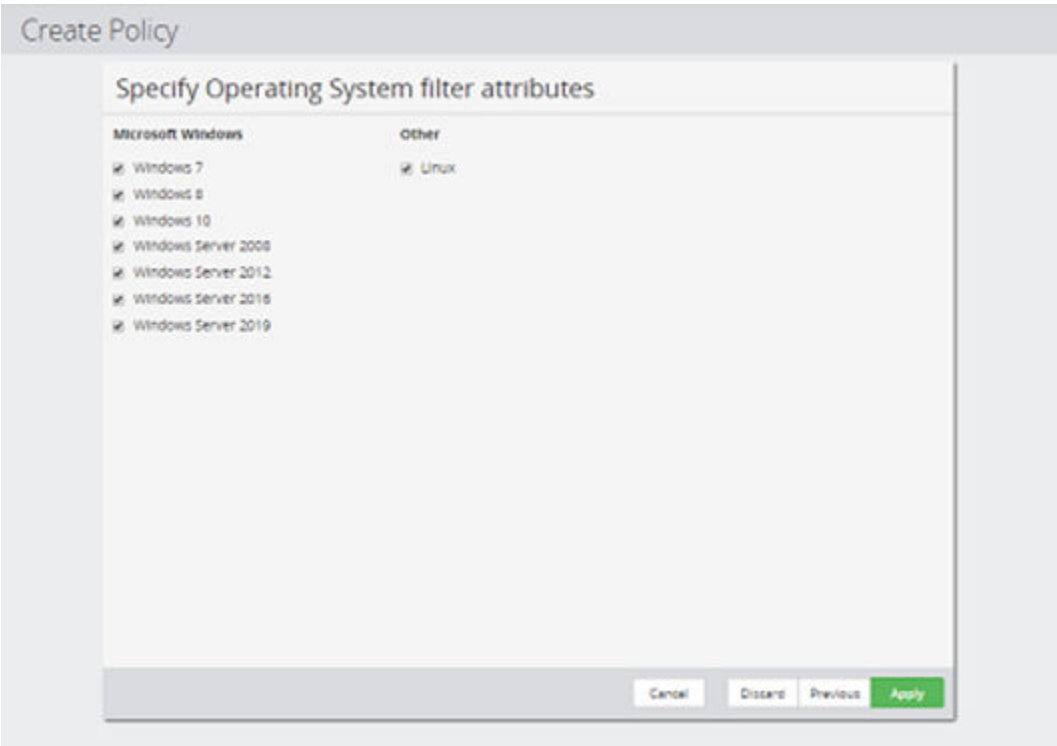


Figure 384 Filter Selection Wizard - Specify Operating System filter attributes

| Control | Description |
|---------|--|
| OS Type | Restricts the associated data classification to those machines running one or more of the selected operating system types. |

Select File type categories dialog

This dialog is lauched when Include or Exclude file type catagories is selected during classification filter creation or editing.

It facilitates selection of groups of items such as 'All Images' or 'All System' files with a single selection. Once the selection has been made the list can still be edited in the [Classification Filters Wizard \(on page 648\)](#)

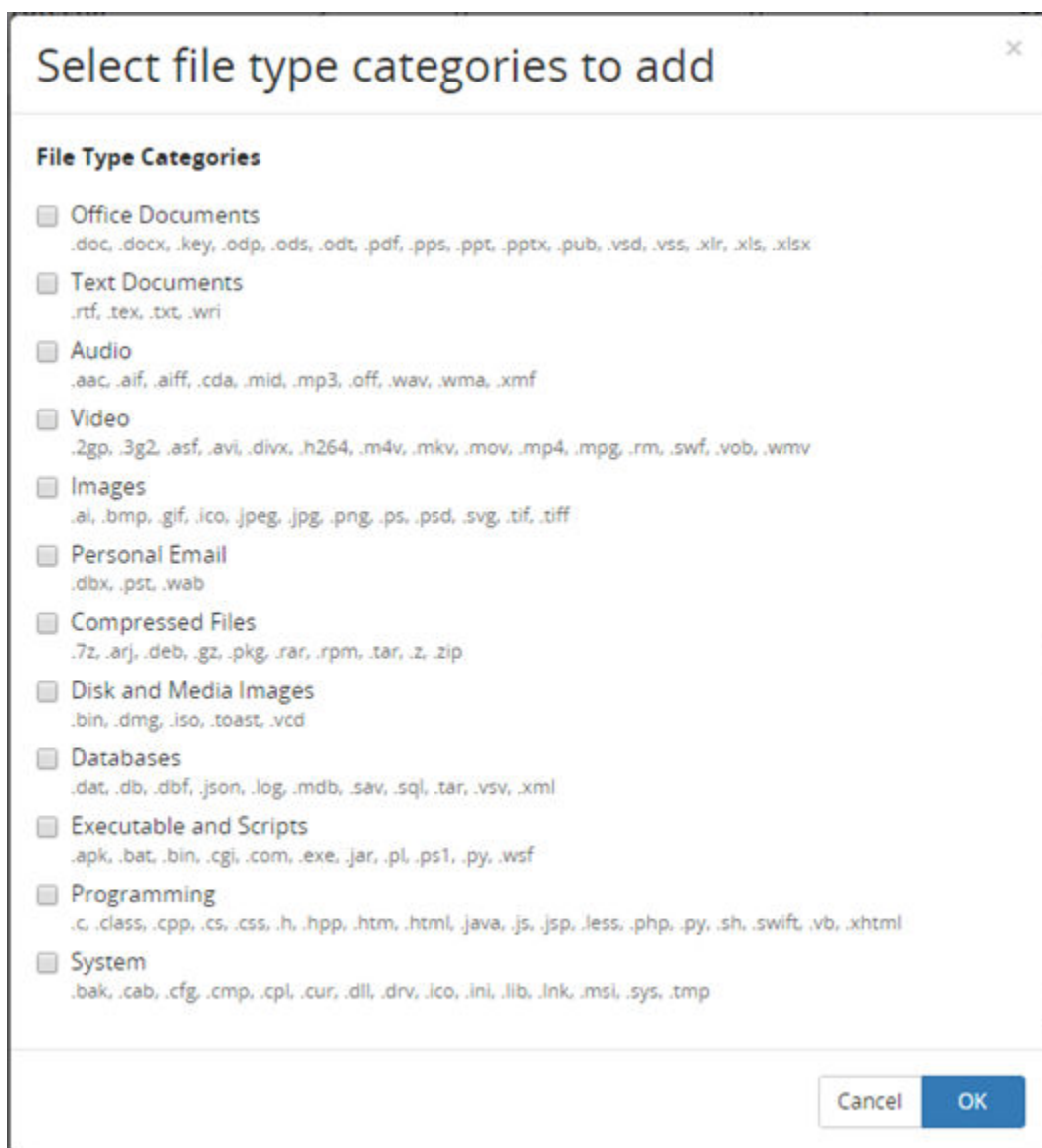


Figure 385 Select file type categories to add

| Control | Description |
|----------------------|---|
| File Type Categories | Select one or more categories to add those to the include or exclude list of the Classification Filters Wizard (on page 648). |

Access Operation Wizard

This wizard is launched when a new Access operation is added to a Policy.

The access operation allows a node full or read-only access to Oracle RMAN data on a Gen2 repository or other UBI datastore.



Note: It is not possible to apply this operation to hardware storage devices or Gen1 repositories

The screenshot shows a wizard window titled 'Create Policy'. Inside, there's a section 'Specify Access operation attributes'. It has a 'Name' label above a text input field containing 'Access'. Below this are two radio buttons: 'Read / Write' (which is selected with a blue dot) and 'Read only' (which is unselected). At the bottom right of the window are four buttons: 'Cancel', 'Discard', 'Previous', and 'Apply' (which is highlighted in green).

Figure 386 Access Operation Wizard

| Control | Description |
|--------------|--|
| Name | The name of the operation. The default name is 'Access'. This is used to identify the operation when the policy is used in a Data Flow diagram and when displaying the triggers on the command line. |
| Read / Write | When selected, Nodes using this operation have full access to the data. It is possible to create, read, change and delete data. |
| Read only | When selected, Nodes using this operation will only be able to read data created previously or by other nodes. Creation of new data, modifications and deletes will be blocked. |

Oracle RMAN Classification Wizard

This wizard is launched when a new Oracle RMAN classification is added to a Policy.

The Oracle RMAN classification allows to conveniently specify, which databases can or cannot access Oracle RMAN data using the access operation.

Create Policy

Configure which Oracle databases are allowed or denied access

Allow Databases

| Name | Type |
|----------------------|------|
| No database selected | |

+ Add Databases

Deny Databases

| Name | Type |
|----------------------|------|
| No database selected | |

+ Add Databases

Preview Database Selection

Cancel Discard Previous Apply

Figure 387 Oracle RMAN Wizard - Specify Oracle Databases (Allowed / Denied Access)

| Control | Description |
|----------------------------|---|
| Allow Databases | Lists the databases that will be allowed access for Oracle RMAN access operations. |
| Add Databases | Opens the Oracle RMAN Database Selection Wizard (on page 612) to enable databases to be added to the Allow Databases list above. |
| Deny Databases | Lists the databases that will not be allowed access for Oracle RMAN access operations. |
| Add Databases | Opens the Oracle RMAN Database Selection Wizard (on page 612) to enable databases to be added to the "Deny Databases" list above. |
| Preview Database Selection | Click this button to preview the which databases are allowed access for an existing Oracle Database node. |

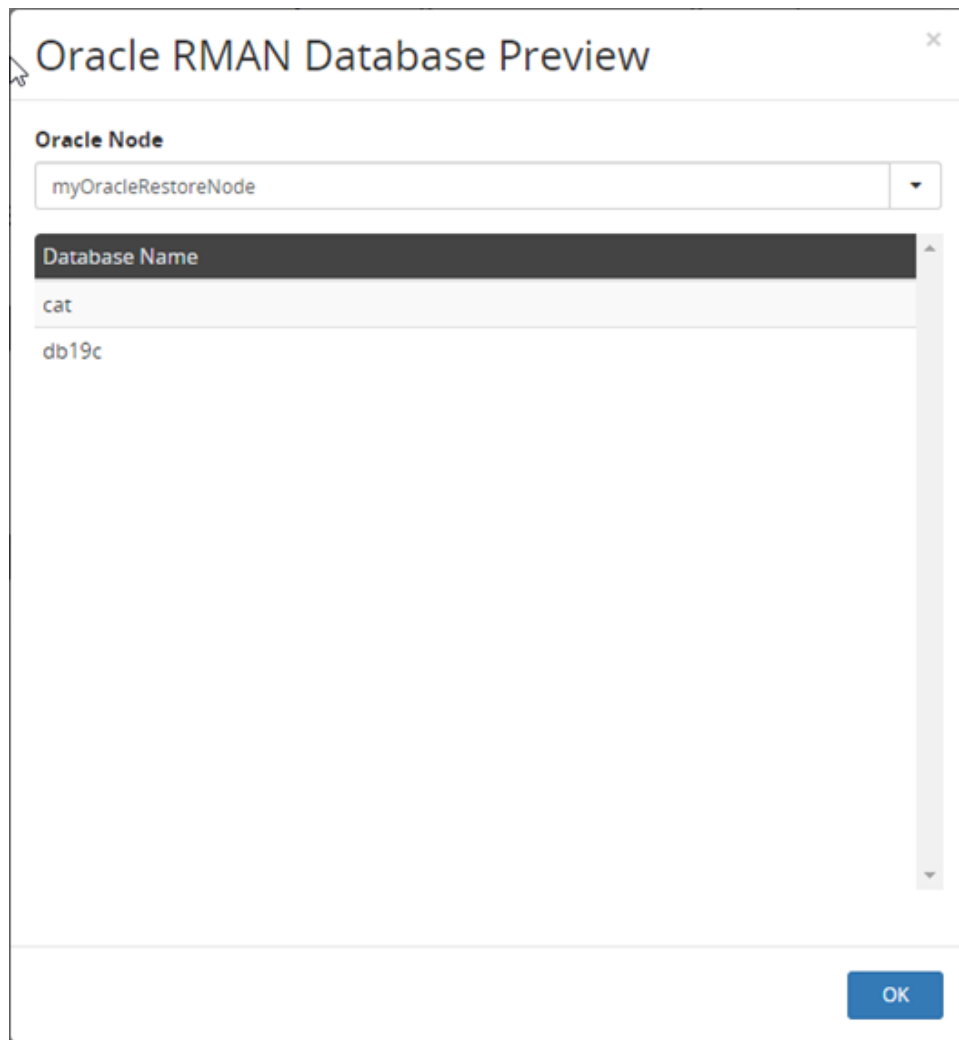



Figure 388 Oracle RMAN Database Preview

| Control | Description |
|---------------|--|
| Oracle Node | Select a node representing the Oracle setup, which should be previewed. |
| Database List | List all databases on this node which would be allowed access with the defined classification. |

Oracle RMAN Database Selection Wizard

This wizard is launched when a user adds entries to the list of allowed or denied databases in an Oracle RMAN classification.



Oracle RMAN SBT Database Selection for Inclusion

Select method

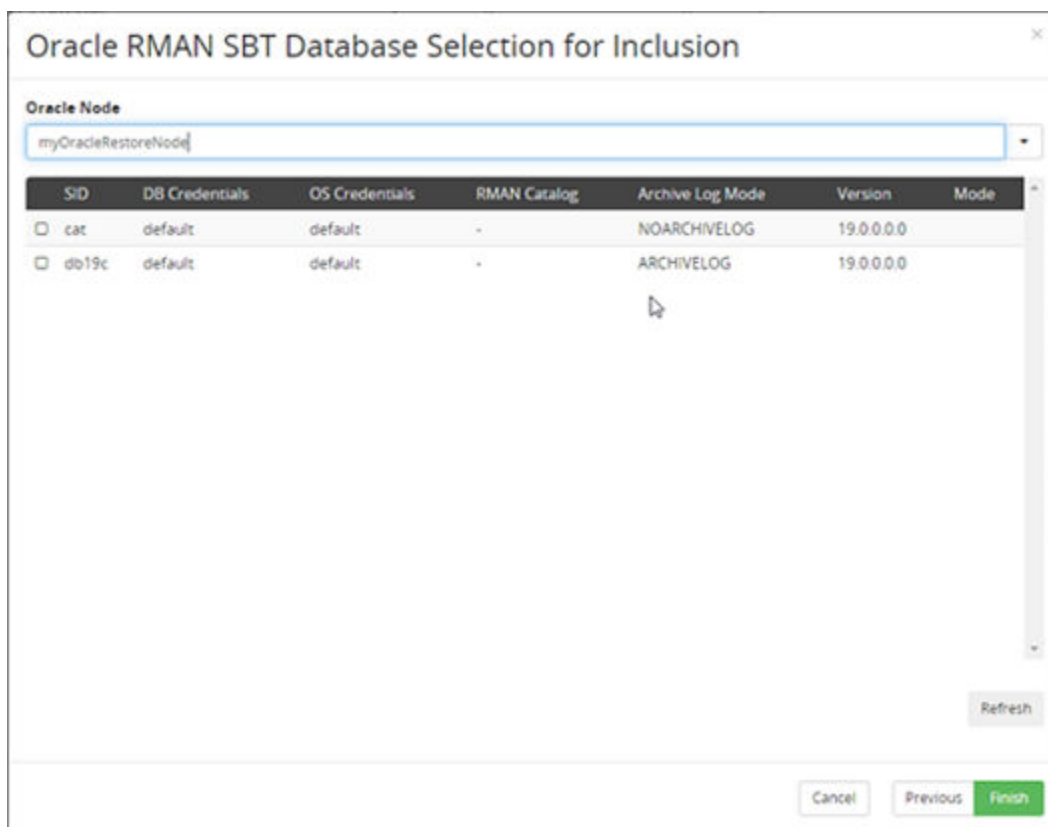
☒ Browse for Databases

☐ Specify database by name or wildcard

Cancel Previous Next

Figure 389 Oracle Database Selection – Select method

| Control | Description |
|---------------------------------------|---|
| Browse for databases | Select this option to browse an existing Oracle node for databases. See Oracle Database Selection – Browse by below. |
| Specify databases by name or wildcard | Select this option specify a database by name pattern match. See Oracle Database Selection – Specify name or wildcard below. |



Oracle RMAN SBT Database Selection for Inclusion

Oracle Node

myOracleRestoreNode

| SID | DB Credentials | OS Credentials | RMAN Catalog | Archive Log Mode | Version | Mode |
|--------------------------------|----------------|----------------|--------------|------------------|------------|------|
| <input type="checkbox"/> cat | default | default | - | NOARCHIVELOG | 19.0.0.0.0 | |
| <input type="checkbox"/> db19c | default | default | - | ARCHIVELOG | 19.0.0.0.0 | |


Refresh

Cancel Previous Finish

Figure 390 Oracle Database Selection – Browse by

| Control | Description |
|---------------|---|
| Oracle Node | Select an Oracle database application node to browse for databases. |
| Database List | Lists the databases which exist on the selected node. You can select one or more databases. |
| Refresh | Refreshes the list of databases for the selected node. This operation may take a few minutes. |

Figure 391 Oracle Database Selection – Specify name or wildcard

| Control | Description |
|---------|--|
| Pattern | <p>Enter a case insensitive pattern that will be used to match the database by name. The '*' character can be used to match any sequence of characters. E.g.: IH_* would match any database type whose name begins with IH_.</p> <div>  Note: Protector evaluates the pattern every time Oracle RMAN tries to access the data. If new databases are added later, they will still be allowed or denied access, depending if they match the pattern or not. </div> |

Policy Details

This page displays the details of a Policy and enables you to launch the wizard to edit them.

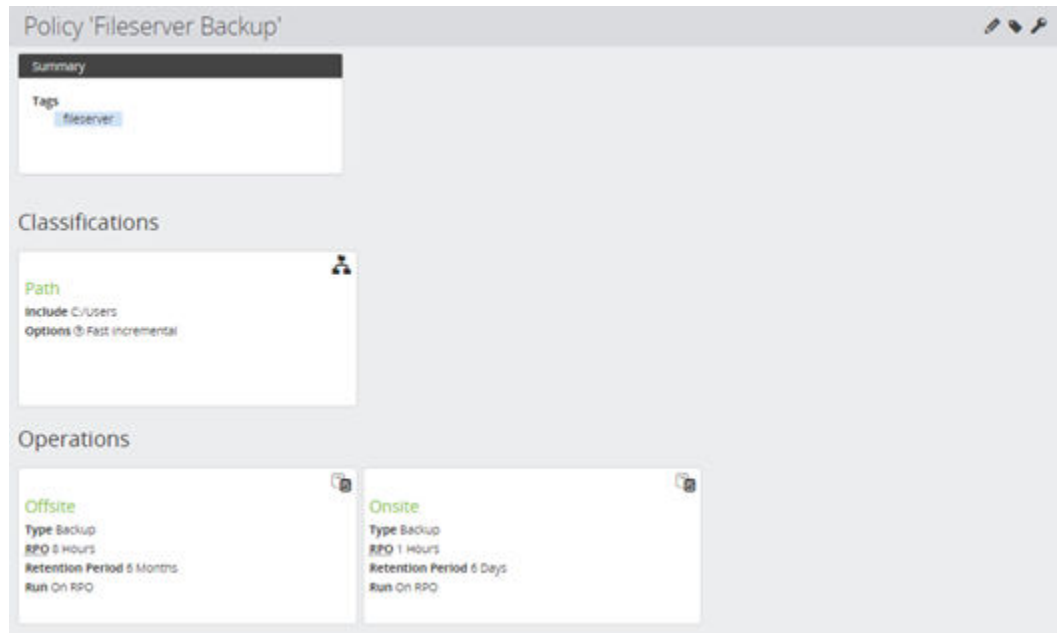





Figure 392 Policy Details

| Control | Description |
|---|---|
|  Edit | Launches the Policy Wizard (on page 595) at the Classifications page to enable the policy to be edited. |
|  Tag | Modifies the tags of an existing object from either the inventory screen or the details screen of the object. |
|  Permissions | Displays the Access Control Permissions Inventory (on page 341) to enable you to view and edit the policy's permissions. |
| Classification(s) | Lists the classifications for this policy. Click on a classification name to open the Policy Classification Details (on page 659) to enable you to view the classification. |
| Operation(s) | Lists the operations for this policy. Click on an operation name to open the Policy Operation Details (on page 660) to enable you to view the operation. |

Policy Classification Details

The Classification Details page is displayed when the user clicks on a classification in a policy.

Policy 'myPathPolicy' - Classification

Summary

Classification
Path

Included Paths
C:/testdata

Excluded Paths
None

Figure 393 Classification Details - Path Policy

Policy Operation Details

The Operation Details page is displayed when the user clicks on an operation in a policy.

Policy 'myPathPolicy' - Operation 'Backup'

Summary

Name
Backup

Operation
Backup

RPO
8 Hours

Retention Period
6 Months

Software Transfer Mode
Asynchronous Journalled

Run
Anytime

Quiesce Applications
Yes

Figure 394 Operation Details - Backup Operation

Reports UI Reference

This section describes the Reports UI, accessed via the [Main Banner \(on page 278\)](#).

For further information, refer to:

- [Report Concepts \(on page 119\)](#)
- [Report Tasks \(on page 270\)](#)

Reports Dashboard

The Reports Dashboard displays the various report types generated by Protector.

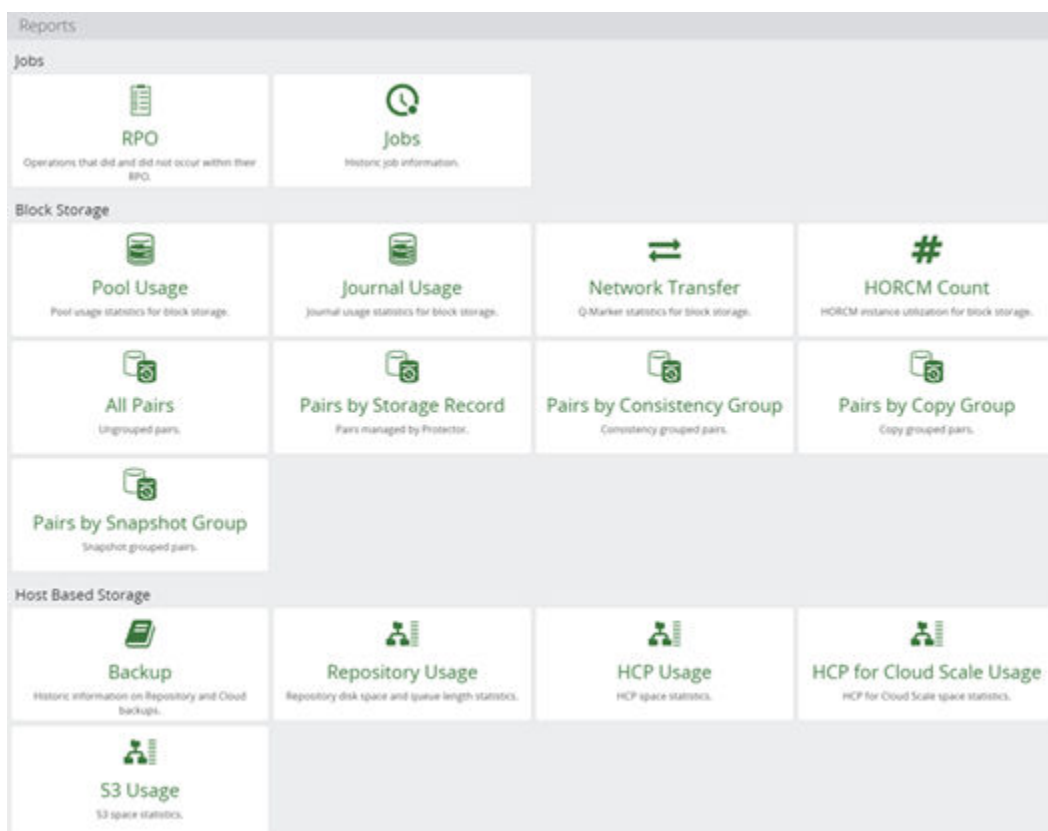


















Figure 395 Reports Dashboard

| Control | Description |
|--|--|
|  RPO | Select to view the RPO Report (on page 663) . |
|  Repository Usage | Select to view the Repository Usage Report (on page 666) . |
|  Pool Usage | Select to view the Pool Usage Report (on page 669) . |
|  Journal Usage | Select to view the Journal Usage Report (on page 671) . |
|  Network Transfer | Select to view the Network Transfer Report (on page 673) . |

| Control | Description |
|--|---|
|  Backup | Select to view the Backup Report (on page 668) . |
|  Jobs | Select to view the Jobs Report (on page 665) . |
|  HORCM Count | Select to view the HORCM Count Report (on page 674) |
|  HCP Usage | Select to view the HCP Usage Report (on page 676) |
|  HCP for Cloud Scale Usage | Select to view the HCP Cloud Scale Usage Report (on page 677) |
|  S3 Usage | Select to view the S3 Usage Report (on page 678) |
|  All Pairs | Select to view the Report Choices (on page 122) |
|  Pairs by Storage Record | Select to view the Report Choices (on page 122) |
|  Pairs by Consistency Group | Select to view the Report Choices (on page 122) |
|  Pairs by Copy Group | Select to view the Report Choices (on page 122) |

| Control | Description |
|---|---|
|  Pairs by Snapshot Group | Select to view the Report Choices (on page 122) |

RPO Report

The RPO Report page shows the RPO report for all active operations. This can then be filtered using the filter controls.

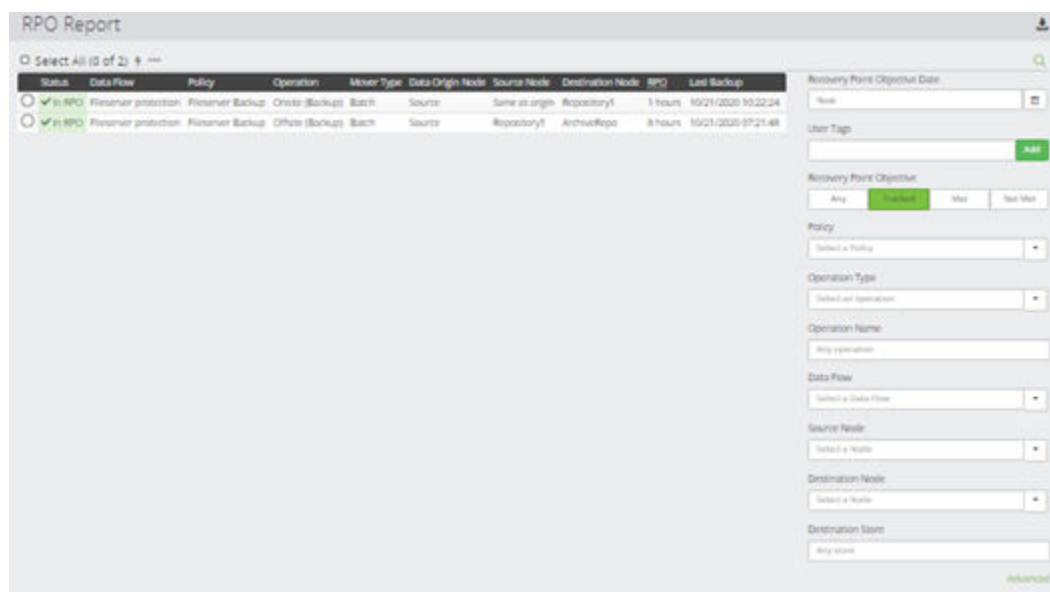





Figure 396 RPO Report

| Control | Description |
|---|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
|  Trigger Operation | Triggers the selected operations from the table below. |
|  More Actions | Displays a menu that provides access to UI pages relating to the selected RPO report entry. |

| Control | Description |
|---|---|
| Status | This table entry indicates when the policy operation is in or out of its RPO. Policy operations using continuous movers are show as not tracked. |
| Filter on Recovery Point Objective Date | Select a date and time for RPO. The Status column of the table will then indicate whether each policy operation meets that RPO date and time. Select Now for the current date and time. |
| Filter on User Tags | Filters the displayed results based on Tags. |
| Filter on Recovery Point Objective | Can be one of: <ul style="list-style-type: none"> Any - Shows operations whether they have met their RPO or not. Tracked - Shows only the operations which are tracked, i.e. filters out continuous hardware operations which do not have an RPO. Met - Only shows operations which have met their RPO. Not Met - Only shows operations which have not met their RPO. |
| Filter on Policy | Filters the report so that only entries with the specified policy are displayed. |
| Filter on Operation Type | Filters the report so that only entries with the selected operations are displayed. Can be one or more of: <ul style="list-style-type: none"> Access Backup Mount Replicate Snapshot Tier |
| Filter on Operation Name | Filters the report so that only entries with the specified Operation Name are displayed. |
| Filter on Data Flow | Filters the report so that only entries with the specified data flow are displayed. |
| Filter on Source Node | Filters the report so that only entries with the specified Source Node name are displayed. |
| Filter on Destination Node | Filters the report so that only entries with the specified Destination Node name are displayed. |
| Filter on Destination Store | Filters the report so that only entries with the specified Destination Store are displayed. |


| Control | Description |
|---------------------------------|---|
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Jobs Report

The screenshot shows the 'Jobs' report interface. At the top, there's a header 'Jobs' and a link 'Select All (0 of 208) ***'. Below this is a table with columns: Job Type, Progress, Node, Operation, Subsystem, Description, Started, and Completed. The table lists several backup jobs, all with a 'Succeeded' status. To the right of the table are filter controls for Type, Status, Node, Subsystem, and Operation. The 'Advanced' filter is currently selected.

| Job Type | Progress | Node | Operation | Subsystem | Description | Started | Completed |
|----------|-------------|---------|---------------------------|------------|--|-----------------------|-----------------------|
| Backup | ✓ Succeeded | Client4 | Backup Repository Storage | Repository | Backup of File System Data to Repository Storage | 10/06/2020 9:32:22 AM | 10/06/2020 9:33:30 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 9:28:48 AM | 10/06/2020 9:28:56 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 9:18:48 AM | 10/06/2020 9:18:56 AM |
| Backup | ✓ Succeeded | Client4 | Backup Repository Storage | Repository | Backup of File System Data to Repository Storage | 10/06/2020 9:17:21 AM | 10/06/2020 9:18:29 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 9:08:48 AM | 10/06/2020 9:08:56 AM |
| Backup | ✓ Succeeded | Client4 | Backup Repository Storage | Repository | Backup of File System Data to Repository Storage | 10/06/2020 9:02:22 AM | 10/06/2020 9:03:29 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 8:58:48 AM | 10/06/2020 8:58:56 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 8:48:48 AM | 10/06/2020 8:48:56 AM |
| Backup | ✓ Succeeded | Client4 | Backup Repository Storage | Repository | Backup of File System Data to Repository Storage | 10/06/2020 8:47:21 AM | 10/06/2020 8:48:29 AM |
| Backup | ✓ Succeeded | Client1 | Snapshot | Block | Backup of Client1 | 10/06/2020 8:38:48 AM | 10/06/2020 8:38:56 AM |
| Backup | ✓ Succeeded | Client4 | Backup Repository Storage | Repository | Backup of File System Data to Repository Storage | 10/06/2020 8:32:22 AM | 10/06/2020 8:33:31 AM |

Figure 397 Jobs Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Type | Filters the report so that only entries for the specified Job Type are displayed. |
| Filter on Status | Filters the report so that only entries for the specified Status are displayed. |
| Filter on Node | Filters the report so that only entries for the specified Node are displayed. |

| Control | Description |
|---------------------------------|---|
| Filter on Subsystem | Filters the report so that only entries for the specified Subsystem are displayed. |
| Filter on Operation | The Subsystem filter term must be selected to enable this control. Filters the report so that only entries for the specified Operation are displayed. |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Repository Usage Report

This page shows you the details of the Repository Usage.



Note: The repository's size increases by the number of deltas that are retained. For example, if your site completes one backup each day, and that backup is retained for two days with a change rate of 5% per day, then the size of the repository would be 100% plus 5% increase per day.

After a large set of data has been manually deleted, a large number of snapshots have expired, or a number of stores became inactive and were deleted from the repository, you will need to check the repository's status and remove the unused space. See [Reducing repository size \(on page 843\)](#) for more information.

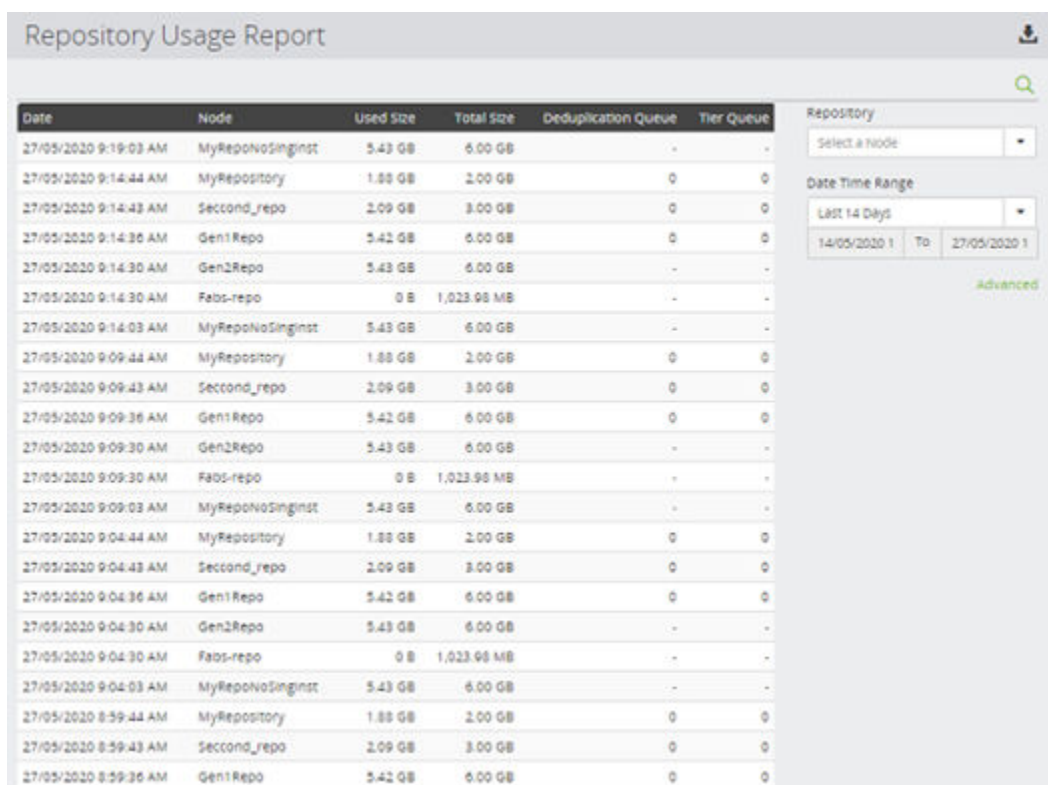



Figure 398 Repository Usage Report

| Control | Description |
|--|--|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Used Size | The actual logical size of the repository at any point in time. Typically this value will show rapid initial growth which rapidly reduces as the data change rate falls off. |
| Total Size | The allocated capacity of a repository. As this space is used this value steps up by preset increments (100Gb by default). The total size will always be greater than or equal to the used size. When data is removed from a repository it will not shrink, new data will use the free space in the repository before growing in size. |
| Deduplication Queue | Shows the frequency and duration of I/O activity for file-level deduplication within the repository. |
| Tier Queue | Shows the frequency and duration of I/O activity for file-level archiving within the repository. |
| Filter on Repository | Filters the report so that only entries for the specified repository are displayed. |

| Control | Description |
|---------------------------------|---|
| Filter on Date Range | Filters the all report so that only entries within the specified date range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Backup Report



The Backup Report page shows the full session summary report for all repository, HCP, HCP Cloud Scale and Amazon S3 based backup sessions.

The Backup report shows a history of all repository, HCP , HCP Cloud Scale and Amazon S3 based resynchronizations that have taken place within Protector. This list of sessions can be filtered in a similar method to Log Manager to find a specific session or range of sessions. It is also possible to View Session details (as in the [Logs Inventory \(on page 448\)](#)) by selecting an entry in the report.

The screenshot shows the 'Backup Report' page. It features a table with columns: View, Status, Started, Ended, Policy, Operation, Source Node, Destination Node, Activity, Activity Started, and Activity Ended. The table lists several successful backup sessions for 'Client4' on '10/06/2020'. To the right of the table is a sidebar with filters: Date Time Range (Last 14 Days, 28/05/2020 12:00 To 10/06/2020 11:59), Status (Any status), Policy (Select a Policy), Operation Type (Select an operation), Operation Name (Any operation), Source Node (Select a Node), Destination Node (Select a Node), and Destination Store Type (Any store type). An 'Advanced' link is at the bottom of the sidebar.

| View | Status | Started | Ended | Policy | Operation | Source Node | Destination Node | Activity | Activity Started | Activity Ended |
|------|---------|-----------------------|-----------------------|-----------------|-----------|-------------|------------------|----------------------------|-----------------------|-----------------------|
| | Success | 10/06/2020 9:32:22 AM | 10/06/2020 9:33:30 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 9:32:24 AM | 10/06/2020 9:33:30 AM |
| | Success | 10/06/2020 9:17:21 AM | 10/06/2020 9:18:29 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 9:17:24 AM | 10/06/2020 9:18:29 AM |
| | Success | 10/06/2020 9:02:22 AM | 10/06/2020 9:03:29 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 9:02:24 AM | 10/06/2020 9:03:29 AM |
| | Success | 10/06/2020 8:47:21 AM | 10/06/2020 8:48:29 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 8:47:24 AM | 10/06/2020 8:48:29 AM |
| | Success | 10/06/2020 8:32:22 AM | 10/06/2020 8:33:31 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 8:32:24 AM | 10/06/2020 8:33:30 AM |
| | Success | 10/06/2020 8:17:21 AM | 10/06/2020 8:18:29 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 8:17:24 AM | 10/06/2020 8:18:29 AM |
| | Success | 10/06/2020 8:02:22 AM | 10/06/2020 8:03:29 AM | UnchangedBackup | Backup | Client4 | MyRepoNoSingInst | Backup of File System Data | 10/06/2020 8:02:24 AM | 10/06/2020 8:03:29 AM |

Figure 399 Repository Resynchronizations Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
|  View Session | Click on the Session icon to display all log messages that pertain to that session. The Session Log Details (on page 456) is displayed. |
| Filter on Date Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Filter on Status | Filter the report by the status of the operations listed. |
| Filter on Policy | Filter the report by the Policy. |
| Filter on Operation Type | Filters the report so that only entries with the selected Operation Type are displayed. |
| Filter on Operation Name | Filters the report so that only entries with the specified Operation Name are displayed. |
| Filter on Source Node | Filters the report so that only entries with the specified Source Node name are displayed. |
| Filter on Destination Node | Filters the report so that only entries with the specified Destination Node name are displayed. |
| Filter on Destination Store Type | Filters the report so that only entries with the specified Destination Store Type are displayed. |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Pool Usage Report

This page shows you the details of the Pool Usage.

The Block Device Pool Usage report displays a list of Block pools currently containing records associated with Protector, their usage levels and configured warning and high watermark thresholds. Pools that have been allocated for use by Protector are only displayed and updated while snapshots or replications are held within them. A full list of pools is available in the Storage Navigator UI where the warning and high watermark (depletion) thresholds can be configured.

Entries are added to the report every 10 minutes (configurable) or whenever a snapshot or resynchronization event occurs. Used and free values may appear unchanged if the allocation has increased by less than the displayed resolution.

For dynamic pools, if the warning or high water threshold is reached then the entry is highlighted.

For snapshot (Thin Image) pools the warning threshold is not configurable. Snapshot pools will enter an error state when usage reaches a level of 5% below the high water threshold.



Caution: Should pool usage reach capacity, serious error conditions can arise.

For dynamic pools, the replications that use the pool are put into an error state and will refuse to accept additional data. Manual intervention is required before the pool can be used again.

For snapshot pools, the data in the pool will become corrupted, invalidating any and all snapshots stored within (hence a fixed 5% margin is defined to prevent this).

It is highly recommended that email notifications are set up to alert systems administrators when pool threshold events are logged. This can be done in the Hitachi Block Device Monitoring tab of the [Notification Wizard \(on page 585\)](#)

| Date | Storage Serial Number | Pool Name | Pool ID | Pool Type | Capacity | Free | Total | Dynamic Pool Snapshot Usage | Warning Threshold | High Water Threshold |
|-----------------------|-----------------------|-------------|---------|----------------------|----------|---------|---------|-----------------------------|-------------------|----------------------|
| 27/05/2020 9:23:26 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:22:50 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:22:49 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:22:05 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:18:16 AM | 412402 | Dev_Dynamic | 0x00 | Dynamic Provisioning | | 2.29 TB | 2.34 TB | - | 70% | 80% |
| 27/05/2020 9:13:26 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:13:20 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:13:19 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:12:05 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:08:16 AM | 412402 | Dev_Dynamic | 0x00 | Dynamic Provisioning | | 2.29 TB | 2.34 TB | - | 70% | 80% |
| 27/05/2020 9:03:25 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |
| 27/05/2020 9:02:16 AM | 445170 | QA_Thin | 0x0d | Snapshot | | 1.75 TB | 1.75 TB | - | 80% | 80% |

Storage Serial Number

Date Time Range

Last 14 Days


14/05/2020 1 To 27/05/2020 1

Pool Name

Pool Type

Advanced

Figure 400 Pool Usage Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Storage Serial Number | Filters the report so that only entries for Storage devices with the specified serial number are displayed. |
| Filter on Date Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Filter on Pool Name | Filters the report so that only entries for the specified Pool names are displayed. |
| Filter on Pool Type | Filters the report so that only entries for the specified Pool Types are displayed. |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Journal Usage Report

The Block Device Journal Usage Report displays a list of all UR replication policies, showing the source and destination journal usage. The list is updated at regular intervals. Search terms can be constructed, based on the field names in the report, using the Filter controls.



Caution: Should journal usage reach capacity, serious error conditions can arise.



Note: You must manually refresh the Journal information from the [Hitachi Block Device Details \(on page 757\)](#) page for each storage array reflected within the report to ensure that the links within the report work for any newly created journals.

Email notifications may be set up to alert systems administrators when the journal usage rises above a predetermined threshold. This can be done using the Hitachi Block Device Monitoring tab of the [Notification Wizard \(on page 585\)](#).

Block Device Journal Usage Report

| Linked Record | Date | Storage Serial Number | Journal ID | Journal Status | Policy | Data Flow | Operation | Data Source Node | Source Node | Source Storage Node |
|---------------|-----------------------|-----------------------|------------|----------------|------------------|--------------------|-----------|------------------|----------------|---------------------|
| | 10/06/2020 9:48:46 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:48:46 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:47:42 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:47:42 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:46:44 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:46:44 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:45:42 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:45:42 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:44:42 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:44:42 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:43:44 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:43:44 AM | 445170 | 0x05 | SNV | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |
| | 10/06/2020 9:42:42 AM | 412402 | 0x02 | PNN | Replicate Policy | Replicate Dataflow | Replicate | MyBlockHost | MyBlockDevice2 | MyBlockDevice2 |

Storage Serial Number

Any storage serial number

Date Time Range

Last 14 Days

28/05/2020 12:00 To 10/06/2020 11:59

Journal ID

Any journal

Journal Status

Any journal status

Journal Used Percentage

Exceeds used percentage

Policy

Select a Policy

Operation Name

Any operation

Source Node

Select a Node

Destination Node

Select a Node

Advanced

Figure 401 Journal Usage Report

| Control | Description |
|-----------------------------------|---|
| Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Storage Serial Number | Filters the report so that only entries for Storage devices with the specified serial number are displayed. |
| Filter on Date Range | Filters the report so that only entries within the specified Date Range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Filter on Journal ID | Filters the report so that only entries for the specified Journal ID are displayed. |
| Filter on Journal Status | Filters the report so that only entries for the specified Journal Status are displayed. |
| Filter on Journal Used Percentage | Filters the report so that only entries for journals which have exceeded the specified Journal Usage Percentage are displayed. |
| Filter on Policy | Filters the report so that only entries for the specified Policy are displayed. |
| Filter on Operation Name | Filters the report so that only entries for the specified Operation Name are displayed. |
| Filter on Source Node | Filters the report so that only entries for the specified Source Node are displayed. |

| Control | Description |
|---------------------------------|---|
| Filter on Source Storage Node | Filters the report so that only entries for the specified Source Storage Node are displayed. |
| Filter on Destination Node | Filters the report so that only entries for the specified Destination Node are displayed. |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |


Network Transfer Report

The Network Transfer Time Report displays a list of all UR replication policies, showing the network transfer time (defined as the time taken for the data to be transferred from the source journal to the destination journal). Entries are added to the report every 1 minute. Search terms can be constructed, based on the field names in the report, using the Filter controls.

Email notifications may be set up to alert systems administrators when the network transfer time rises above a predetermined threshold. This can be done using the Hitachi Block Device Monitoring tab of the [Notification Wizard \(on page 585\)](#).

| Lockset | Record | Date | Storage Serial Number | Policy | Date Range | Operation | Data Source Node | Source Node | Target Node | Destination Node | Last Sent Q-Number | Sent At | In-Flight Q-Number | Last Received Q-Number | Received At | Transfer Time (Approximate) | Average Transfer Time (Approximate) |
|---------|------------|----------|-----------------------|--------|------------|-----------|------------------|-------------|-------------|------------------|--------------------|---------------------|--------------------|------------------------|---------------------|-----------------------------|-------------------------------------|
| 1 | 16/11/2021 | 12:18:54 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:47:40 | 0 | 5-d703000006 | 16/11/2021 11:47:40 | 0ms | |
| 2 | 16/11/2021 | 12:17:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:46:35 | 0 | 5-d703000006 | 16/11/2021 11:46:35 | 0ms | |
| 3 | 16/11/2021 | 12:16:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:45:35 | 0 | 5-d703000006 | 16/11/2021 11:45:35 | 0ms | |
| 4 | 16/11/2021 | 12:15:50 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:44:35 | 0 | 5-d703000006 | 16/11/2021 11:44:35 | 0ms | |
| 5 | 16/11/2021 | 12:14:55 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:43:35 | 0 | 5-d703000006 | 16/11/2021 11:43:35 | 0ms | |
| 6 | 16/11/2021 | 12:13:54 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:42:39 | 0 | 5-d703000006 | 16/11/2021 11:42:39 | 0ms | |
| 7 | 16/11/2021 | 12:12:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:41:35 | 0 | 5-d703000006 | 16/11/2021 11:41:35 | 0ms | |
| 8 | 16/11/2021 | 12:11:55 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:40:41 | 0 | 5-d703000006 | 16/11/2021 11:40:41 | 0ms | |
| 9 | 16/11/2021 | 12:10:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:39:35 | 0 | 5-d703000006 | 16/11/2021 11:39:35 | 0ms | |
| 10 | 16/11/2021 | 12:09:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:38:35 | 0 | 5-d703000006 | 16/11/2021 11:38:35 | 0ms | |
| 11 | 16/11/2021 | 12:08:54 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:37:40 | 0 | 5-d703000006 | 16/11/2021 11:37:40 | 0ms | |
| 12 | 16/11/2021 | 12:07:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:36:35 | 0 | 5-d703000006 | 16/11/2021 11:36:35 | 0ms | |
| 13 | 16/11/2021 | 12:06:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:35:35 | 0 | 5-d703000006 | 16/11/2021 11:35:35 | 0ms | |
| 14 | 16/11/2021 | 12:05:49 | 445175 | HUB-S | hubs | HUB | L26V5401Center | Center | Center | Chesl | 5-d703000006 | 16/11/2021 11:34:35 | 0 | 5-d703000006 | 16/11/2021 11:34:35 | 0ms | |

Figure 402 Block Device Network Transfer Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |

| Control | Description |
|---------------------------------|---|
| Filter on Storage Serial Number | Filters the report so that only entries for Storage devices with the specified serial number are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified Date Range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Filter on Average Transfer Time | Filters the report so that only entries which have exceeded the specified Average Transfer Time number are displayed. |
| Filter on Policy | Filters the report so that only entries for the specified Policy are displayed. |
| Filter on Operation Name | Filters the report so that only entries for the specified Operation Name are displayed. |
| Filter on Data Source Node | Filters the report so that only entries for the specified Data Source Node are displayed. |
| Filter on Source Node | Filters the report so that only entries for the specified Source Node are displayed. |
| Filter on Source Storage Node | Filters the report so that only entries for the specified Source Storage Node are displayed. |
| Filter on Destination Node | Filters the report so that only entries for the specified Destination Node are displayed. |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

HORCM Count Report

The HORCM Count Report displays a count of HORCM instances (actual, temporary and current) for each in-band and out-of-band (IP) command device attached to each block storage device. The report is updated every hour (configurable). Search terms can be constructed, based on the field names in the report, using the Filter controls.

| Block Device HORCM Count Report | | | | | | | | | | | |
|---------------------------------|-----------------------|--------------------|-----------|--------------------|---------------|-------|------------------|---------------------|-------------------|--|--|
| Date | Storage Serial Number | Storage Proxy Node | Device ID | Physical Disk | IP Address | Port | Actual Instances | Temporary Instances | Current Instances | | |
| 27/05/2020 8:46:16 AM | 412402 | Proxy5 | - | - | 172.16.177.13 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 8:46:17 AM | 412402 | Proxy5 | 1044 | \\.\PhysicalDrive1 | - | - | 1179 | 369 | 949 | | |
| 27/05/2020 8:46:00 AM | 443170 | Proxy4 | - | - | 172.16.177.6 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 8:47:59 AM | 443170 | Proxy4 | 1034 | \\.\Device | - | - | 277 | 2 | 2 | | |
| 27/05/2020 7:47:48 AM | 412402 | Proxy5 | - | - | 172.16.177.13 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 7:47:47 AM | 412402 | Proxy5 | 1044 | \\.\PhysicalDrive1 | - | - | 1179 | 369 | 949 | | |
| 27/05/2020 7:46:59 AM | 443170 | Proxy4 | - | - | 172.16.177.6 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 7:46:54 AM | 443170 | Proxy4 | 1034 | \\.\Device | - | - | 277 | 2 | 2 | | |
| 27/05/2020 8:47:26 AM | 412402 | Proxy5 | - | - | 172.16.177.13 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 8:47:27 AM | 412402 | Proxy5 | 1044 | \\.\PhysicalDrive1 | - | - | 1179 | 369 | 949 | | |
| 27/05/2020 8:48:54 AM | 443170 | Proxy4 | - | - | 172.16.177.6 | 31001 | 1 | 0 | 1 | | |
| 27/05/2020 8:48:52 AM | 443170 | Proxy4 | 1034 | \\.\Device | - | - | 277 | 2 | 2 | | |
| 27/05/2020 8:47:07 AM | 412402 | Proxy5 | 1044 | \\.\PhysicalDrive1 | - | - | 1179 | 369 | 949 | | |
| 27/05/2020 8:47:07 AM | 412402 | Proxy5 | - | - | 172.16.177.13 | 31001 | 1 | 0 | 1 | | |

Storage Serial Number

Any Storage Serial Number


Date Time Range

Last 14 Days

14/05/2020 12:00:00 To 27/05/2020 11:59:59

Advanced


Figure 403 Block Device HORCM Count Report

| Control | Description |
|---|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Storage Serial Number | Filters the report so that only entries for Storage devices with the specified serial number are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified Date Range are displayed. Opens the Date Time Range Picker (on page 347) . |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

HCP Usage Report

| Date | Node | Used Size | Capacity | Object Count |
|-----------------------|-------|-----------|----------|--------------|
| 28/05/2020 8:13:41 AM | MyHCP | 11.14 MB | 20.00 GB | 1844 |
| 28/05/2020 8:06:41 AM | MyHCP | 11.14 MB | 20.00 GB | 1844 |
| 28/05/2020 8:03:41 AM | MyHCP | 11.14 MB | 20.00 GB | 1844 |
| 28/05/2020 7:58:41 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:53:41 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:48:41 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:43:41 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:38:40 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:33:40 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:28:40 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:23:40 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:18:40 AM | MyHCP | 11.11 MB | 20.00 GB | 1840 |
| 28/05/2020 7:13:40 AM | MyHCP | 11.09 MB | 20.00 GB | 1836 |
| 28/05/2020 7:08:40 AM | MyHCP | 11.09 MB | 20.00 GB | 1836 |
| 28/05/2020 7:03:40 AM | MyHCP | 11.09 MB | 20.00 GB | 1836 |
| 28/05/2020 6:58:40 AM | MyHCP | 11.06 MB | 20.00 GB | 1832 |
| 28/05/2020 6:53:40 AM | MyHCP | 11.06 MB | 20.00 GB | 1832 |
| 28/05/2020 6:48:40 AM | MyHCP | 11.06 MB | 20.00 GB | 1832 |
| 28/05/2020 6:43:40 AM | MyHCP | 11.06 MB | 20.00 GB | 1832 |


Figure 404 HCP Usage Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Node | Filters the report so that only entries for the specified Node are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Picker (on page 346) . |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

HCP Cloud Scale Usage Report

| Date | Node | Used Size |
|---------------------|----------------|-----------|
| 09/09/2021 14:17:43 | CloudScaleNode | 79.05 MB |
| 09/09/2021 14:12:43 | CloudScaleNode | 79.05 MB |
| 09/09/2021 14:07:43 | CloudScaleNode | 79.05 MB |
| 09/09/2021 14:02:43 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:57:42 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:52:42 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:47:42 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:42:42 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:37:42 | CloudScaleNode | 79.05 MB |
| 09/09/2021 13:32:42 | CloudScaleNode | 79.05 MB |


Figure 405 HCP Cloud Scale Usage Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Node | Filters the report so that only entries for the specified Node are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Picker (on page 346) . |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

S3 Usage Report

| Date | Node | Used Size |
|-----------------------|-----------|-----------|
| 27/05/2020 9:30:00 AM | S3_Bucket | 213.44 MB |
| 26/05/2020 9:30:00 AM | S3_Bucket | 208.06 MB |
| 25/05/2020 9:30:00 AM | S3_Bucket | 199.91 MB |
| 24/05/2020 9:30:00 AM | S3_Bucket | 191.88 MB |
| 23/05/2020 9:30:00 AM | S3_Bucket | 184.91 MB |
| 22/05/2020 9:30:00 AM | S3_Bucket | 178.07 MB |
| 21/05/2020 9:30:00 AM | S3_Bucket | 171.38 MB |
| 20/05/2020 9:30:00 AM | S3_Bucket | 164.81 MB |
| 19/05/2020 9:30:00 AM | S3_Bucket | 152.14 MB |
| 19/05/2020 9:30:00 AM | S3_Bucket | 152.14 MB |
| 18/05/2020 9:30:00 AM | S3_Bucket | 139.95 MB |
| 18/05/2020 9:30:00 AM | S3_Bucket | 139.95 MB |
| 17/05/2020 9:30:00 AM | S3_Bucket | 133.98 MB |
| 16/05/2020 9:30:00 AM | S3_Bucket | 128.21 MB |
| 15/05/2020 9:30:00 AM | S3_Bucket | 122.59 MB |


Figure 406 S3 Usage Report

| Control | Description |
|---|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Node | Filters the report so that only entries for the specified Node are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Picker (on page 346). |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |



Repository Usage Report

| Date | Node | Used Size | Total Size | Deduplication Quotient | Free Quotient |
|---------------------|------------------|-----------|------------|------------------------|---------------|
| 16/11/2021 16:25:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:21:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:20:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:16:55 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:13:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:11:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:10:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:06:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:05:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:01:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 16:00:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:56:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:55:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:51:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:50:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:46:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:45:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:41:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:40:18 | Dora-Gen2Report1 | 7.94 MB | 1,023 MB | 0 | 0 |
| 16/11/2021 15:36:35 | Dora-Gen2Report1 | 7.93 MB | 1,023 MB | 0 | 0 |

Figure 407 Repository Usage Report

| Control | Description |
|--|---|
|  Export | Launches the Export Report Dialog (on page 684) to export the report in the chosen file format. |
| Filter on Repository | Filters the report so that only entries for the specified Repository are displayed. |
| Filter on Date Time Range | Filters the report so that only entries within the specified date range are displayed. Opens the Date Time Picker (on page 346) . |
| Advanced | |
| Filter on Advanced Query String | Provides advanced search capabilities, allowing users to create filters based on combinations of API properties (see the API reference guide for more details). |
| Search | Returns the result on Advanced Query String. |

Global Replication Reports

The reports that make up the Global replication reports are all very similar in style only varying by the columns of data.  . The Global Replication reports are made up of the following 5 Block Storage Reports

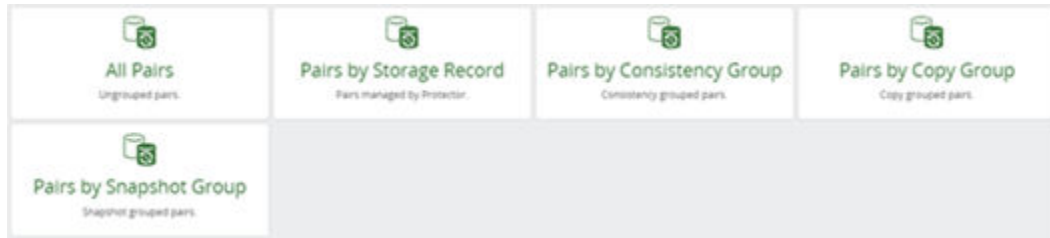




Figure 408 Global Replication Reports

Each Global Replication report provides similar flow as described below.

Each report has a condensed or expanded view. Expanded view  will display all the fields for a replication / snapshot while condensed view  will display the more commonly sought after information. Each report displays custom fields that are pertinent to that report.

| Type | Serial Number | Virtual Serial Number | LDEV ID | Mirror ID | Status | Managed | Storage Node | |
|------|---------------|-----------------------|---------|-----------|--------|---------|--------------|-----------|
| GAD | 415362 | - | 0x2ef4 | 0 | - | No | - | Primary |
| | 445170 | 415362 | 0xc7 | | PSUE | | conker | Secondary |
| GAD | 445169 | - | 0xaa4 | 0 | - | No | - | |
| | 445170 | 445169 | 0x157f | | PAIR | | conker | |
| GAD | 445169 | - | 0xaa5 | 0 | - | No | - | |
| | 445170 | 445169 | 0x1580 | | PAIR | | conker | |

Figure 409 Global Replication Report: View Report

In many columns for a given row in the replication reports, there are two values, one above the other. The first value represents the entry for the primary, the second represents the entry the secondary. So for instance, for the column "Array", the first entry is the array that the PVOs resides, and the second entry is the array which hosts the SVOLs. Note that this is how the array interprets the source and destination volumes which may differ from Protector which always maintains the source and destination as the way it is drawn on the dataflow.

| | WWN LUN | WWN LUN | Source LUN | Target LUN | Status | Managed | Storage Node | |
|-----|---------|---------|------------|------------|--------|---------|--------------|--|
| HUR | 445169 | - | 0x3300 | h1 | - | No | - | |
| | 445170 | 445170 | 0x3300 | | SSUS | | conker | |
| TC | 445169 | - | 0x3f0 | 0 | - | No | - | |
| | 445170 | 445170 | 0x1f06 | | PAIR | | conker | |
| TC | 445169 | - | 0x3f1 | 0 | - | No | - | |
| | 445170 | 445170 | 0x1f07 | | PAIR | | conker | |

Figure 410 Global Replication Report

If the replication or the storage is one that is managed by Protector then additional actions are available. This is will be evident by the vertical expansion control at the end of the row. Selecting this control will provide the user with further options allow them to view with Protector:

- **Storage Record** - This will take you to the storage record for that replication / Snapshot. This is only available if the replication is defined in a Dataflow.
- **Primary Storage** - This will take you to the Storage Node details screen for that replication's primary storage. This is only available if that storage was configured in Protector.
- **Secondary Storage** -This will take you to the Storage Node details screen for that replication's secondary storage. This is only available if that storage was configured in Protector.
- **Policy** - This will take you to the Policy definition for that replication . This is only available if the replication is defined in a Dataflow.
- **Dataflow** - This will take you to the Dataflow configuration for that replication. This is only available if the replication is defined in a Dataflow.
- **Monitor** - This will take to the Monitor screen for that replication. This is only available if the replication is defined in a Dataflow.

Report Filters

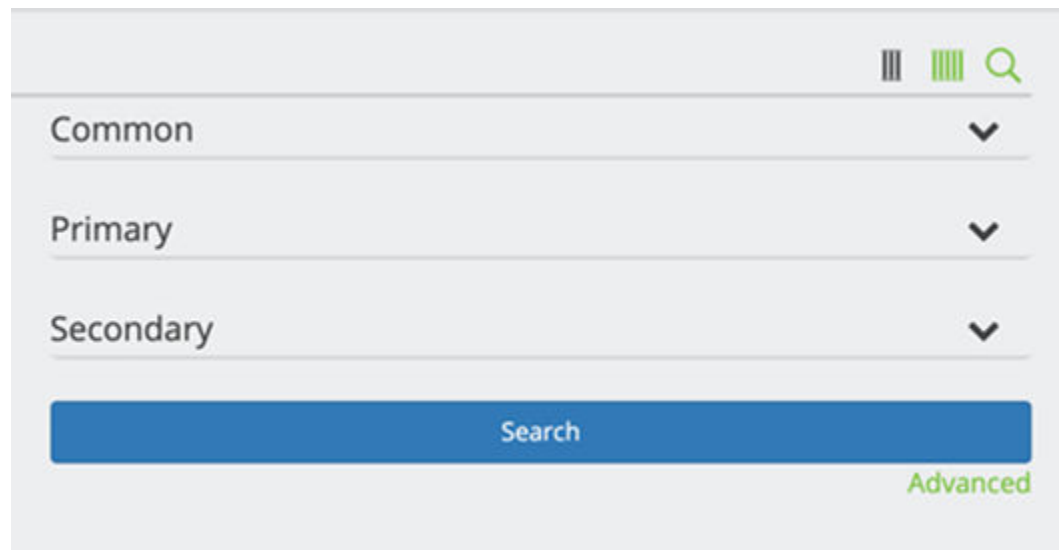


Figure 411 Report Filter

Each report comes with multiple filters that can help to manage the size of the report and be targeted to the users needs. The filters are grouped into three sections: Common, Primary, Secondary. These groups can be expanded to expose the filter attributes for that section . Common filter refers to attributes that are common to both the Primary and the Secondary side of a replication. Primary filter are attributes specific to the Primary side of a replication. Likewise, Secondary filter are attributes specific to the Secondary side of a replication. The filters can be used in conjunction to provide more targeted reports.

For Example:

- To view all replications going from one array to another, enter the primary array serial number in the Primary section and the secondary array serial number in the Secondary section.
- To view all replications coming into or going out of an array, enter the array serial number in the Common section.

Common filter attributes

Common
^

Storage Node

Select a Node

Serial Number

Virtual Serial Number

Name

Data Flow

Select a Data Flow

Policy

Select a Policy

Operation Name

Any operation

Managed

Select Managed

Has Errors

Any

Yes

No

Consistent State

Any

Yes

No

Consistent Direction

Any

Yes

No

Figure 412 Common filter attributes

Primary and Secondary filter attributes

Primary ^

Storage Node
 ▼

Storage Serial Number

Virtual Storage Serial Number

Mirror ID

Status

PAIR

COPY

PSUS

PSUE

Cache Updated
 ▼
 To

Figure 413 Primary and Secondary filter attributes

Export Report Dialog

This dialog is displayed when downloading a report.



Note:

- The report will be downloaded to a location determined by the web browser's settings.
- Any filtering applied when viewing the report will also be applied to the exported report.
- Exporting reports in HTML and PDF will have times exported in the same time zone as the Master node. Exporting in CSV or JSON will result in times being exported in UTC.



Figure 414 Export Report Dialog

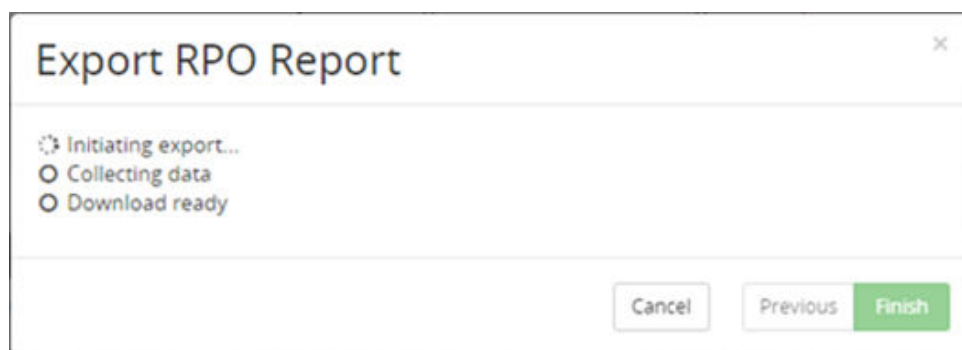


Figure 415 Export Report Dialog – Export in progress

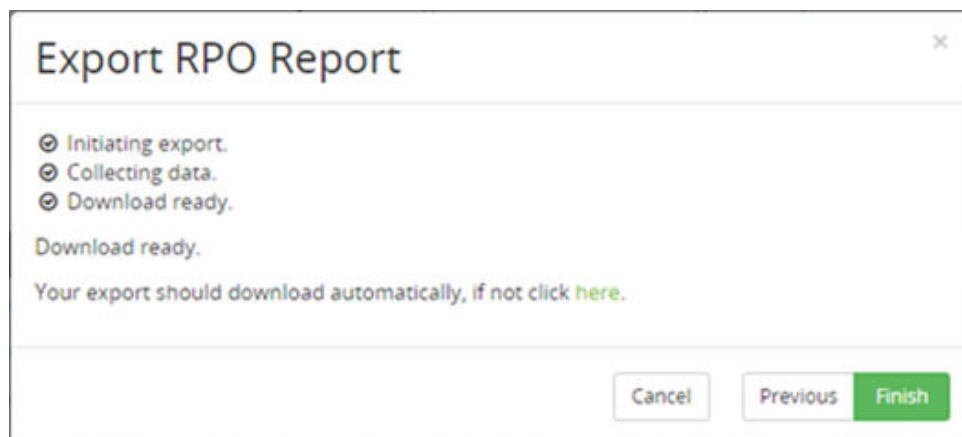


Figure 416 Export Report Dialog – Export completed

| Control | Description |
|---------------|---|
| Export Format | Select the desired format to export the report in. Can be one of: <ul style="list-style-type: none"> ▪ HTML ▪ PDF |

| Control | Description |
|---------|--|
| | <ul style="list-style-type: none"> ▪ CSV ▪ JSON |
| Export | Click to begin the export process. The dialog will display progress of the export process and the export file will automatically be downloaded when ready. The export will be automatically downloaded even if the dialog is closed. |

Restore UI Reference

This section describes the Restore UI, accessed via the [Navigation Sidebar \(on page 283\)](#).

For further information, refer to:

- [Restore Concepts \(on page 111\)](#)
- [Restore Tasks \(on page 271\)](#)

Restore Inventory

This inventory lists all the available backups from all storage types, allowing the user to select one or more for restoring.



Note: Nothing is displayed in the results area until a search has been performed.

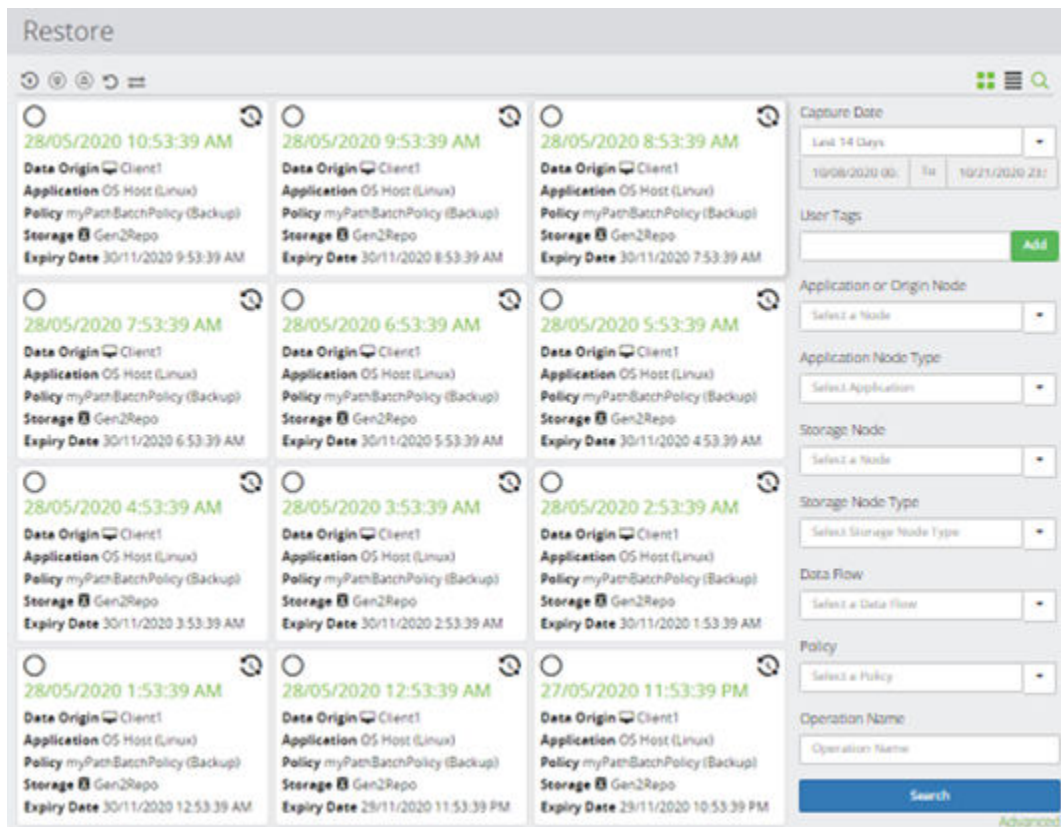












Figure 417 Restore All Inventory

| Control | Description |
|--|--|
|  Restore | Enabled when a Repository, HCP or S3 snapshot is selected. Refer to the Host Based Backup Restore Options (on page 724) section. |
|  Mount | Enabled only when an Hitachi Block snapshot is selected. Refer to the Block Restore Options (on page 689) . |
|  Unmount | Enabled only when an Hitachi Block snapshot is selected. Refer to the Block Restore Options (on page 689) section. |
|  Revert | Enabled only when an Hitachi Block snapshot is selected. Refer to the Block Restore Options (on page 689) section. |
|  Swap | Enabled only when an Hitachi Block replication is selected. Refer to the Block Restore Options (on page 689) . |
|  Repository Snapshot Tile | Refer to the Host Based Backup Restore Options (on page 724) . |

| Control | Description |
|--|---|
|  Hitachi Block Snapshot Tile | Refer to the Block Restore Options (on page 689) . |
|  Hitachi Block Replication Tile | Refer to the Block Restore Options (on page 689) . |
|  HCP Snapshot Tile | Refer to the Host Based Backup Restore Options (on page 724) section |
|  S3 Snapshot Tile | Refer to the Host Based Backup Restore Options (on page 724) section |
| Filter on Capture Date | Filters the displayed results based on the Date Range within which the backup was created. Opens the Date Time Picker (on page 346) |
| Filter on User Tags | Filters the displayed results based on Tags. |
| Filter on Application or Origin Node | Filters the displayed results based on the Source node or Application node from which the backup originated. |
| Filter on Application Node Type | Filters the displayed results based on the Application node type from which the backup originated. |
| Filter on Storage Node | Filters the displayed results based on the Storage node where the backup is held. |
| Filter on Storage Node Type | Filters the displayed results based on the Storage node type where the backup is held. |
| Filter on Data Flow | Filters the displayed results based on the Data Flow that created the backup. |
| Filter on Policy | Filters the displayed results based on the Policy that created the backup. |
| Filter on Operation Name | Filters the displayed results based on the Policy that created the backup. |
| Search | Click this button to initiate the search based on the filter criteria entered above. |

Block Restore Options

This section describes the Block Restore options, accessed via the [Restore Inventory \(on page 686\)](#). Refer to the following sections for details on how to restore the various block based protections operations.

Hitachi Block VMware Snapshot Restore Wizard

This wizard is displayed when you restore a VMware snapshot from a Hitachi Block device.

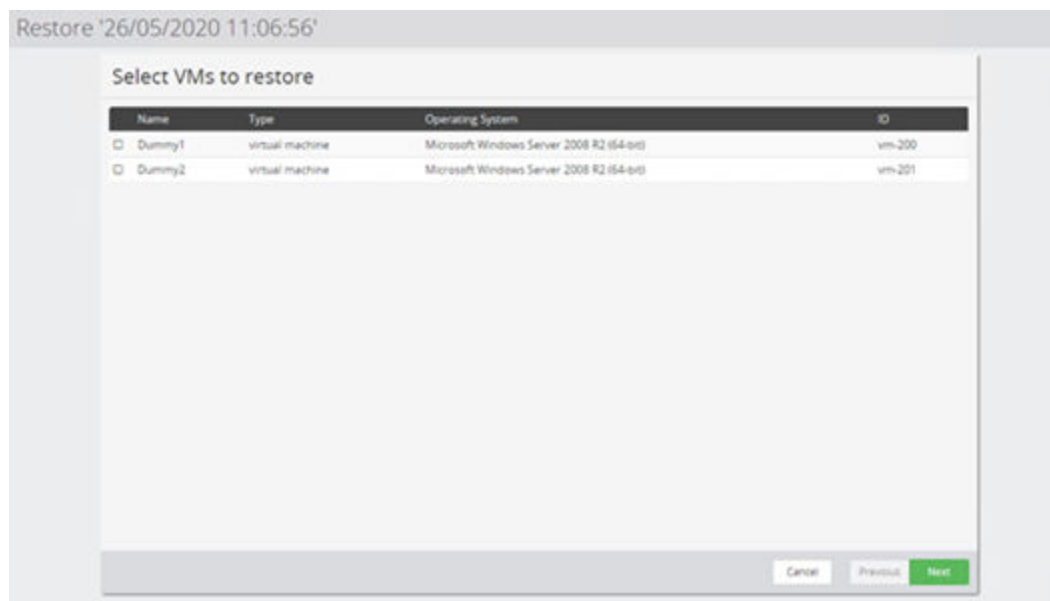


Figure 418 Restore VMware Snapshot Wizard - Select VMs to Restore

| Control | Description |
|-----------------|---|
| VMs in snapshot | Select the specific VMs within this snapshot that are to be restored. |

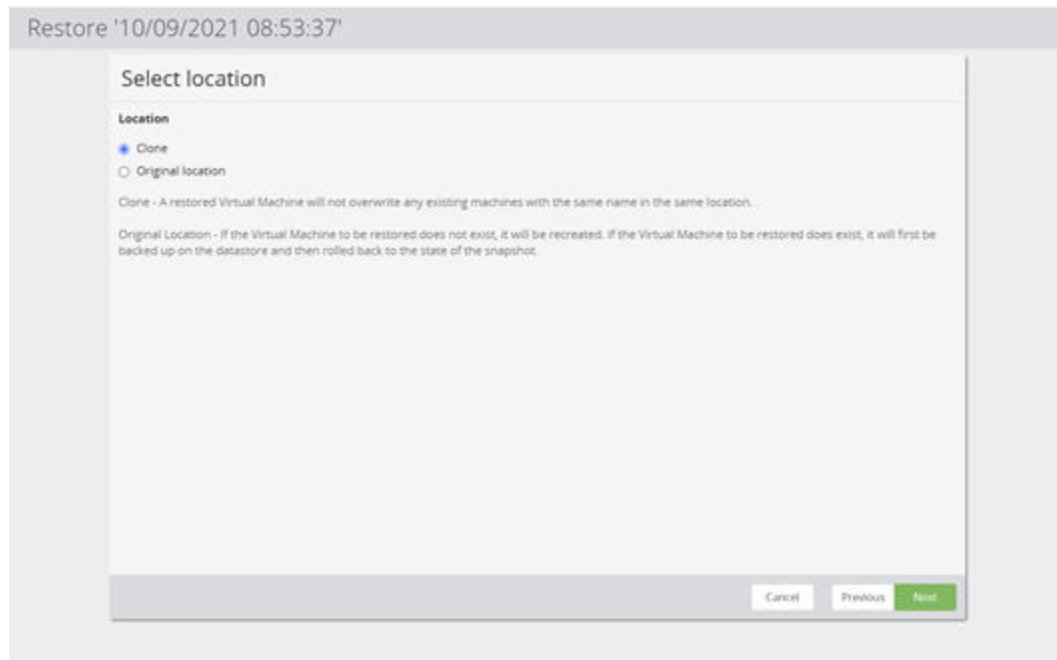




Figure 419 Restore VMware Snapshot Wizard - Select Location

| Control | Description |
|-------------------|---|
| Original location | <p>If the Virtual Machine to be restored does not exist, it will be recreated. If the Virtual Machine to be restored does exist, it will first be backed up on the datastore and then rolled back to the state of the snapshot.</p> <p> Note: If you want to replace the existing VM with the restored one, then delete it before restoring.</p> |
| Clone | <p>The backup will be restored as a clone at the specified location. The wizard displays the Set clone prefix and destination page when Next is clicked.</p> <p> Note: A restored Virtual Machine will not overwrite any existing machines with the same name in the same location. If a VM of the same name exists at the restore location then the restore job will fail and log and error to that effect.</p> |

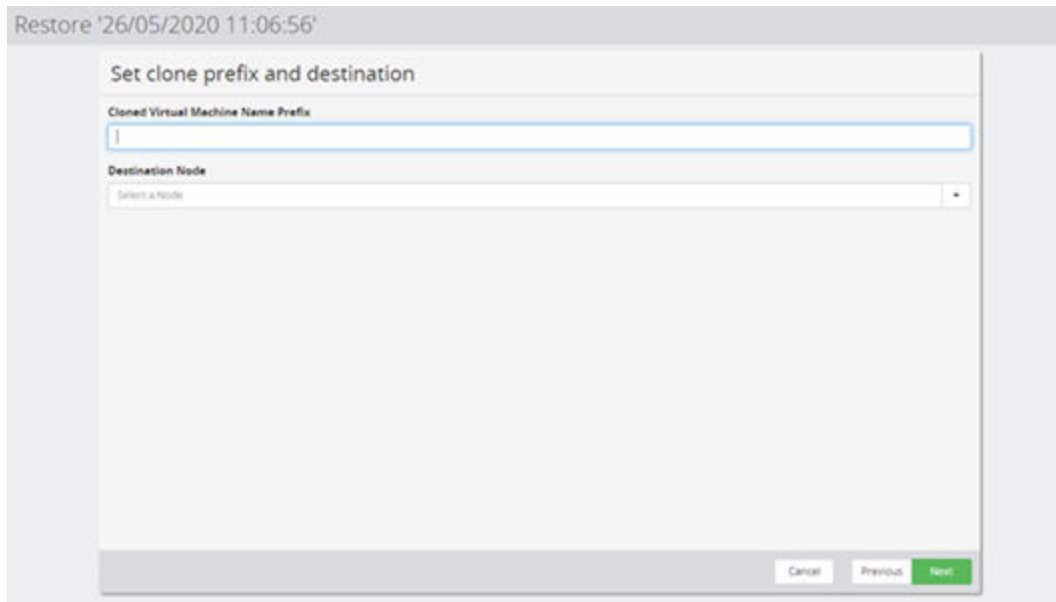


Figure 420 Restore VMware Snapshot Wizard - Clone Prefix and Destination

| Control | Description |
|------------------------------------|--|
| Cloned Virtual Machine Name Prefix | A prefix for the name(s) of the cloned VM(s) must be specified. If the resulting prefixed name is already used by an existing VM in the restore location then the restore will fail and an error will be logged. |
| Destination Node | Select the VMware Host or vCenter where the cloned VM(s) will be restored. |

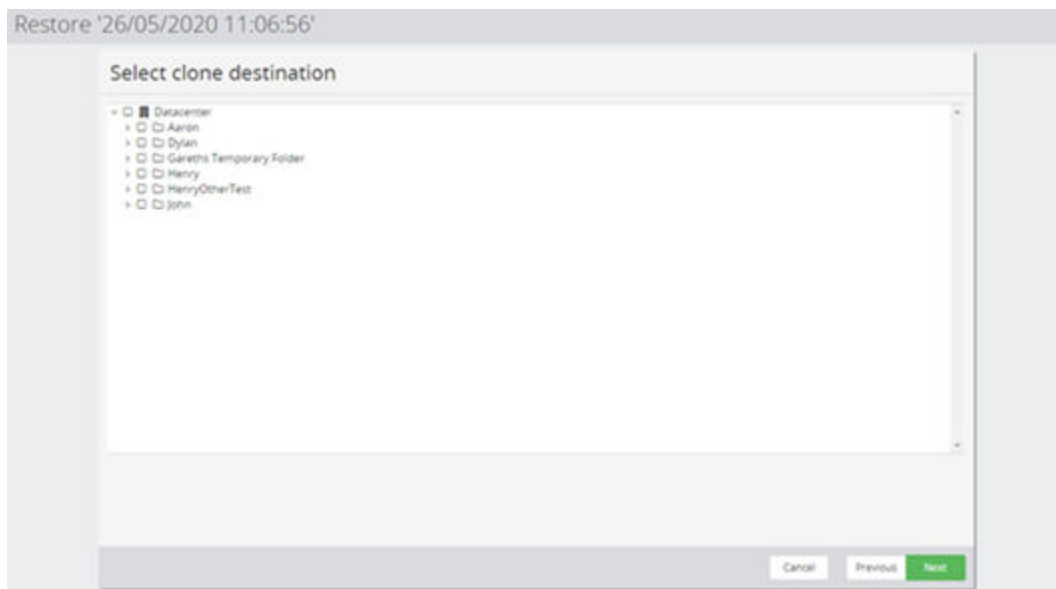


Figure 421 Restore VMware Snapshot Wizard - Select Clone Destination

| Control | Description |
|-------------|--|
| Destination | Select the VMware Datacenter and sub-folder where the cloned VM(s) will be restored. |

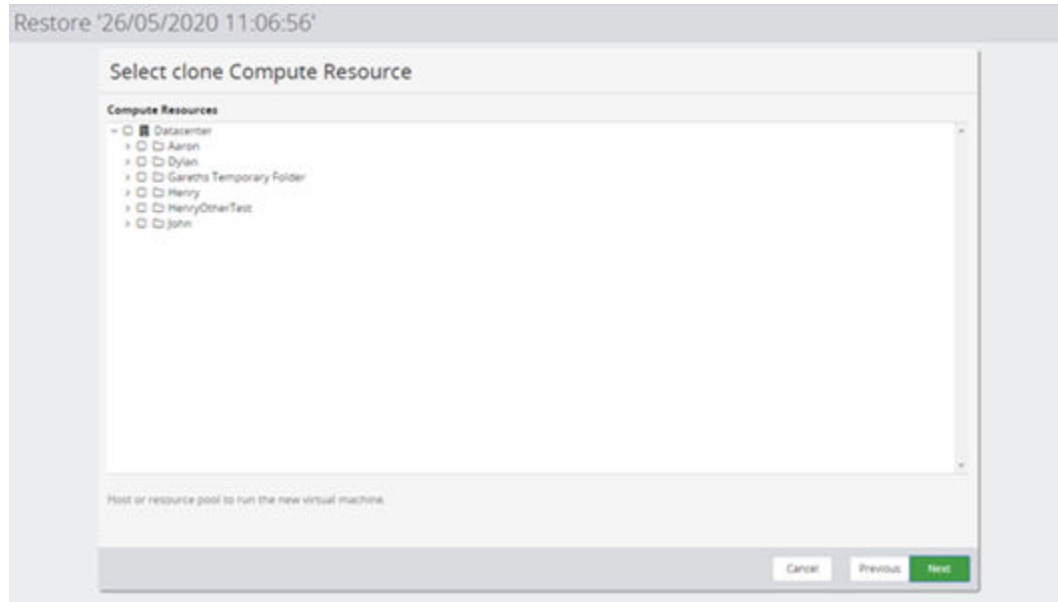


Figure 422 Restore VMware Snapshot Wizard - Select Clone Compute Resource

| Control | Description |
|-------------------|--|
| Compute Resources | Select the VMware Compute Resource where the cloned VM(s) will be run. |

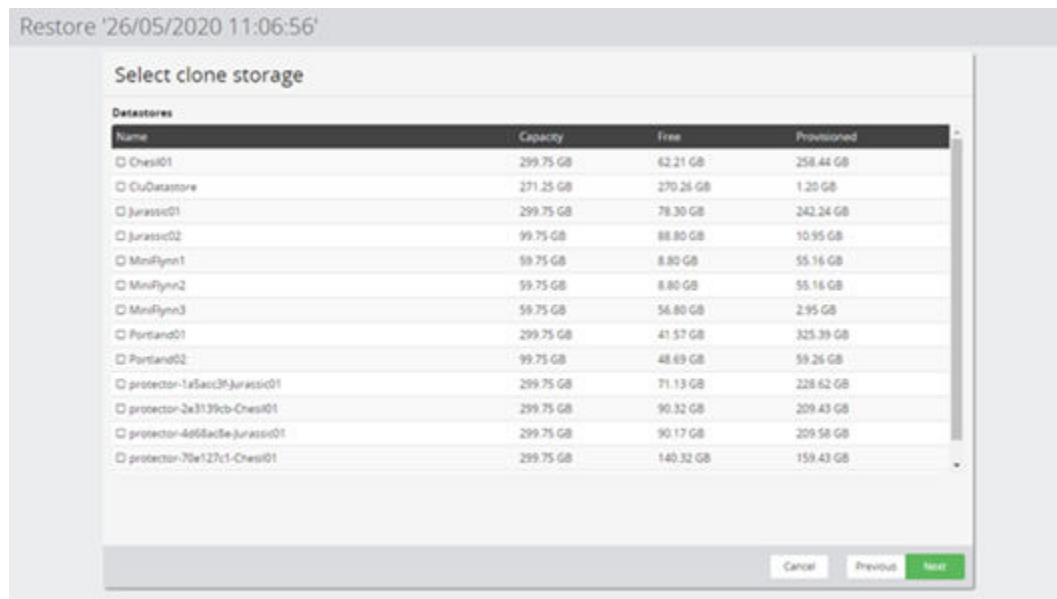


Figure 423 Restore VMware Snapshot Wizard - Select Clone Storage

| Control | Description |
|------------|---|
| Datastores | Select the VMware Datastore where the cloned VM(s) will stored. |

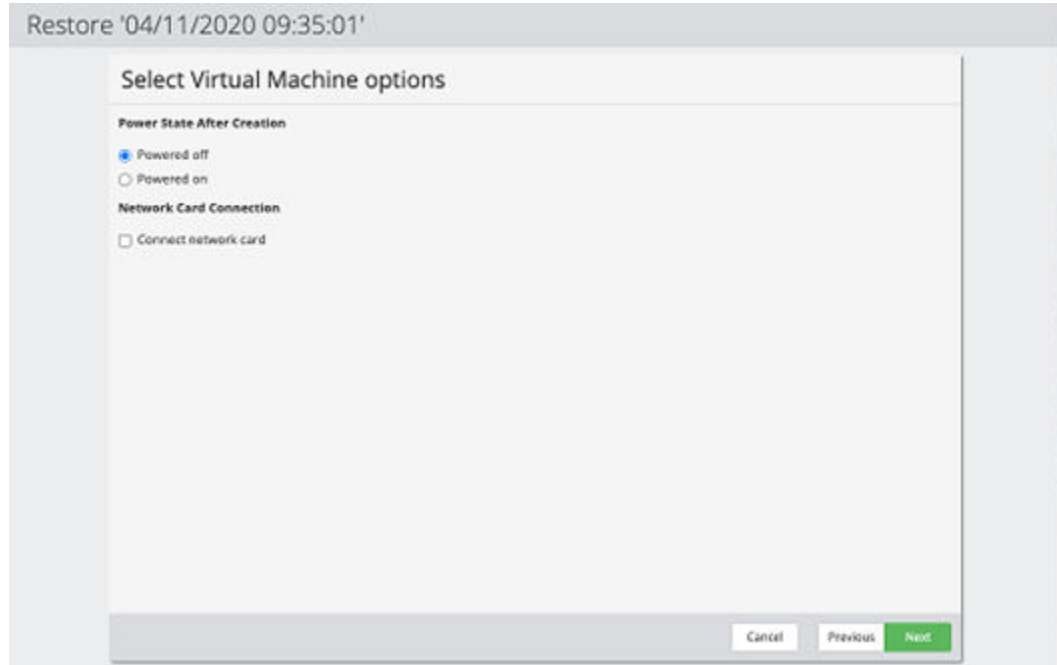


Figure 424 Restore VMware Snapshot Wizard - Select Virtual Machine Options

| Control | Description |
|--------------------|--|
| Powered off | Select this option to leave the restored VM(s) in the powered off state after they are restored. |
| Powered on | Select this option to place the restored VM(s) in the powered on state after they are restored. |
| Network Card State | Select this option to connect the restored VM network card on the VM(s) after they are restored. |

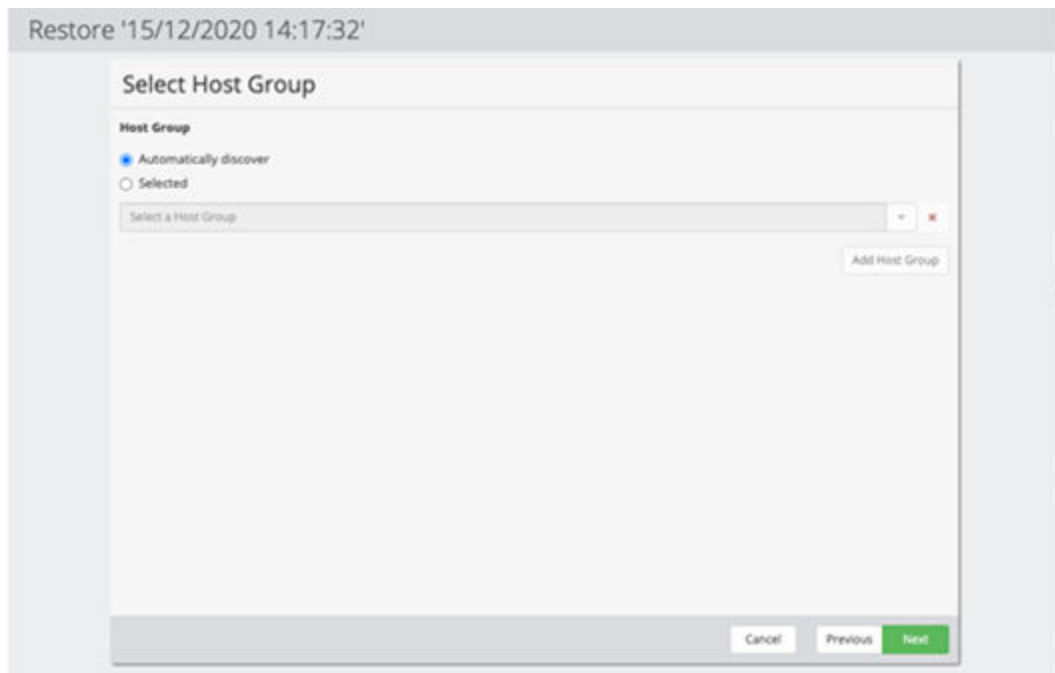


Figure 425 Restore VMware Snapshot Wizard – Select Host Groups

| Control | Description |
|------------------------|--|
| Automatically discover | Select this option to all the Host Groups to be automatically determined. |
| Selected | Use this option to specify the required Host Groups for exposing this restore point to the selected VMware system. |

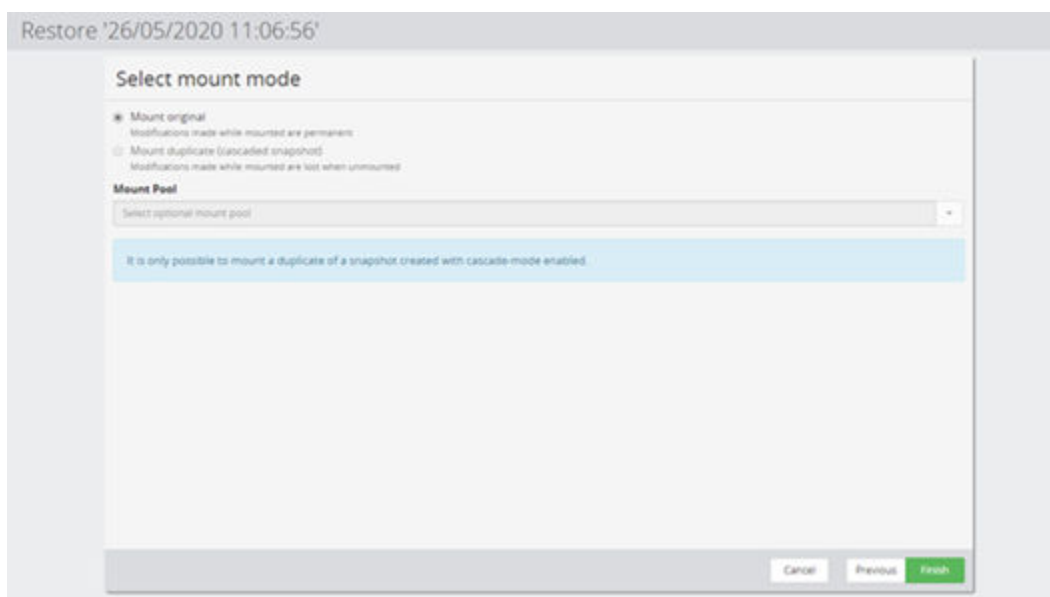




Figure 426 Restore VMware Snapshot Wizard - Select Mount Mode

| Control | Description |
|-------------------------------------|---|
| Mount Original | <p>Mounts the original (Level 1) snapshot and uses vMotion to move the restored VM(s) to the specified location.</p> <div>  Caution: The process of restoring the VM(s) removes it from the snapshot. The metadata for the snapshot will be updated, and thus it will disappear from the snapshot. </div> |
| Mount duplicate (cascaded snapshot) | <p>Only enabled if the original (Level 1) snapshot was created in cascade mode. Mounts a copy of the original snapshot (i.e. a Level 2 snapshot).</p> <div>  Note: The process of restoring the VM(s) removes it from the snapshot. However, because this is a copy, the original snapshot is preserved. </div> |
| Mount Pool | <p>Depending on the parameters specified for the snapshot operation on the data flow, a mount pool might be required. A message is displayed in a blue rectangle to explain if and why a mount pool is required.</p> |

Hitachi Block Snapshot or Replication Mount Wizard

This wizard is displayed when you mount a snapshot or replication from a Hitachi Block device.

This wizard allows you to expose volumes or mount the selected snapshot or replication.

**Caution:**

- When a snapshot or replication is mounted, it is made writable. Any changes made to the mounted original snapshot or replication will persist even after it has been unmounted.
- Any attempt to mount two or more copies of the same volume(s) simultaneously on the same machine will fail. The base OS will experience problems if there is already an instance of that file system mounted. This is because snapshots and replications share the same disk partition IDs as the original volume. In extreme conditions it can cause corruption to both disks.



Note: The selected mount host must have a pre-existing LUN mounted from the corresponding storage device (this is required for the auto discover feature to work). If not then the automated mount operation will fail and the error message "Cannot mount to machine that does not have path to storage" will be logged.

**Note:**

- It is not possible to mount the SVOL of a GAD replication, paused or otherwise.
- For Oracle ASM the disks will be presented to the OS but will need to be manually mounted.
- When mounting a snapshot that contains a mounted sub directory, the subdirectory will be mounted as expected. However, the volume referenced by the subdirectory will also be mounted as a separate drive. Unmount will unmount both the expected and unexpected mounts.
- The mount operation can take several minutes to complete.
- If a mount operation needs to mount multiple disks and one of the mount operations fail, the snapshot/replication destination is shown as mounted rather than partially mounted. The logs will indicate the mount was only partially successful.
- It is not possible to perform an OS level mount of a backup that was created using a block host node as its source as there would be no way to know what filesystem(s) (if any) are present on the LDEVs to be mounted. If an OS level mount is desired, then the source should be either an application node (with the appropriate application classification) or an OS host node (with a file system path classification).

**Note:** Operating System Specific Behaviour

| OS | Note |
|------------|---|
| Linux | When mounting a Linux snapshot to a different Linux machine; in order for the user and group names to be displayed correctly the users and groups must have the same ID's as the source. |
| SUSE Linux | SUSE Linux is not able to perform automated mount operations if hosted on VMware. (RHEL and OEL Linux work as expected). |
| AIX | The system command importvg is invoked by Protector to mount snapshots to the user specified location. importvg creates a directory for the user specified location plus an empty directory corresponding to the original mount point. Neither of these directories are removed by Protector when the snapshot is eventually unmounted, although neither will contain any data. |

Mount Snapshot '05/10/2019 12:51:40'

Select mount level

- ☐ SAN
Add to Host Group.
- ☐ Host
Add to Host Group and confirm availability from Host.
- ☐ OS
Add to Host Group and mount to operating system.
- ☒ Application
Add to Host Group, mount to operating system, configure by application.

Cancel Previous Next

Figure 427 Mount Wizard - Select mount level

| Control | Description |
|-------------|---|
| SAN | Adds the snapshot or replication to a Host Group. |
| Host | Adds the snapshot or replication to a Host Group and confirms that it is available from the specified Host. |
| OS | Adds the snapshot or replication to a Host Group and mounts it on the specified Host's operating system. |
| Application | <p>Displayed only for application snapshots. Adds the snapshot or replication to a Host Group and mounts it on the specified Host's operating system. The final step in the wizard provides one of the following application specific mount options:</p> <ul style="list-style-type: none"> ▪ Mount Wizard - Select Oracle Restore Options (on page 704) |

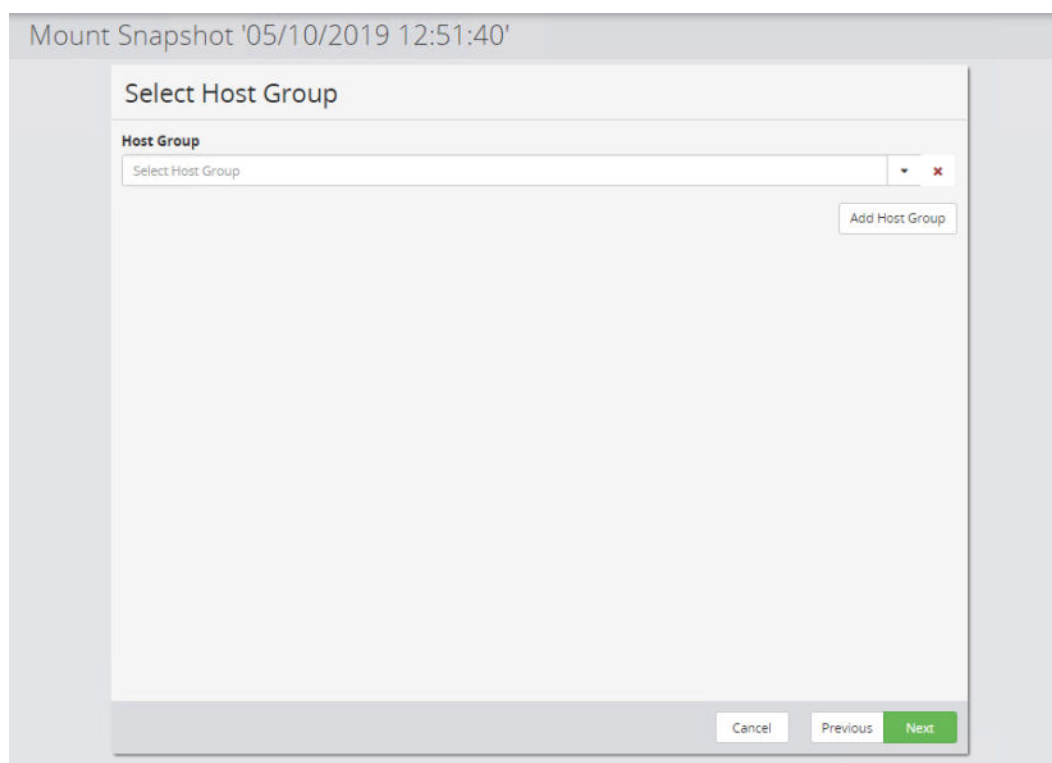



Figure 428 Mount Wizard - Select Host Group (SAN level mount only)

| Control | Description |
|----------------|---|
| Host Group | Manually specify or select a host group to use to expose a snapshot or replication. <div>  Note: When exposing an LDEV, the host group specified must be in the same resource group as the secondary volumes. </div> |
| Add Host Group | Click this button to add host groups when specifying a multi-path mount operation. |

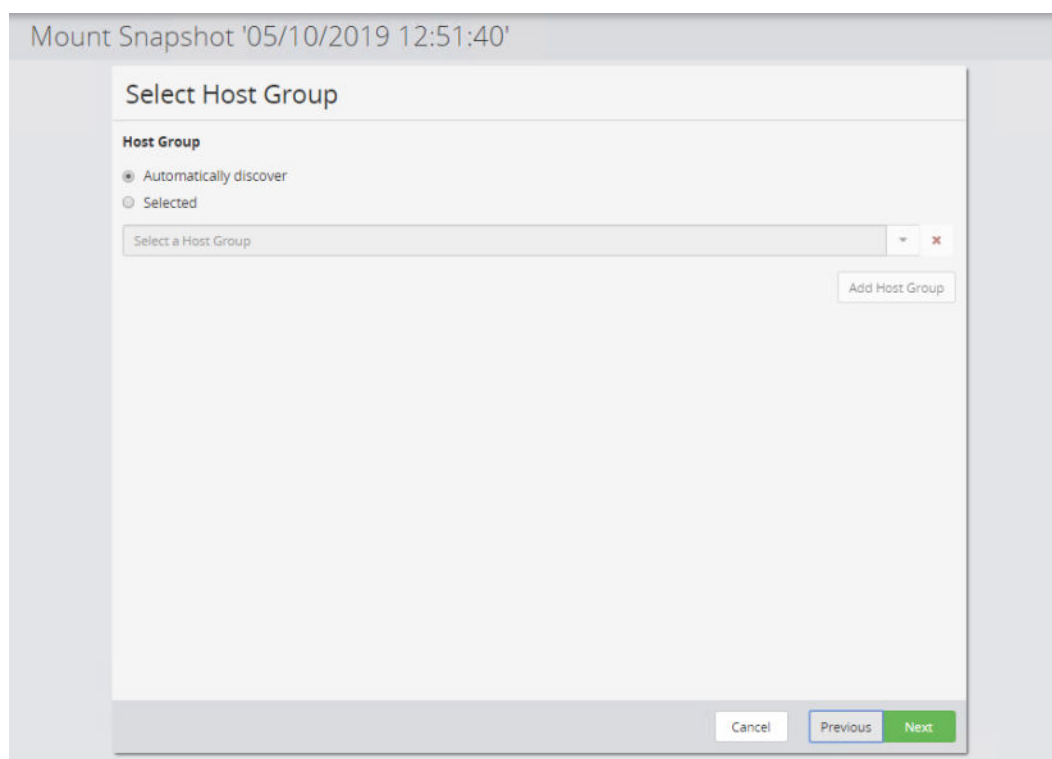



Figure 429 Mount Wizard - Select Host Group (Host and OS level mount only)

| Control | Description |
|------------------------|--|
| Automatically discover | Protector will automatically select a host group to use to expose the snapshot or replication. |
| Selected | The user must specify one or more host groups to use to expose the snapshot or replication. |

| Control | Description |
|---------------------|---|
| Select a Host Group | <p>Manually specify or select a host group to use to expose a snapshot or replication.</p> <div>  Note: When exposing an LDEV, the host group specified must be in the same resource group as the secondary volumes. </div> |
| Add Host Group | Click this button to add host groups when specifying a multi-path mount operation. |

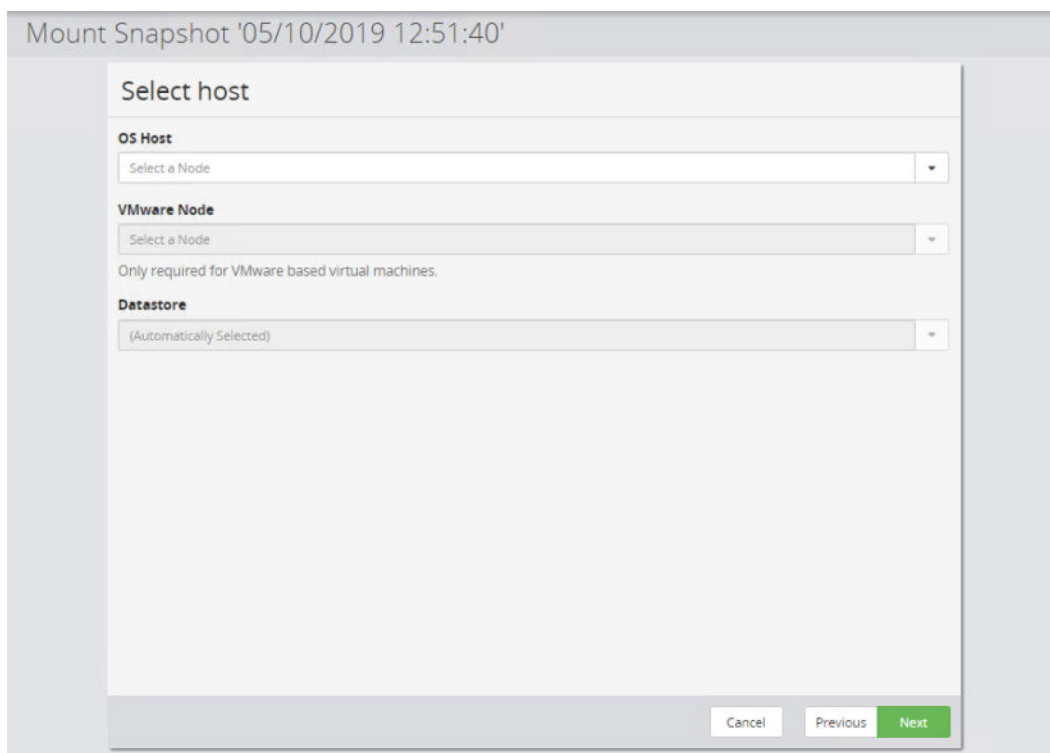




Figure 430 Mount Wizard - Select Host (Host and OS only level mount only)

| Control | Description |
|---------|--|
| OS Host | <p>Specify a Protector OS <i>Node</i> to mount to or expose to.</p> <div>  Note: Unless the user selects a host group, the machine where the volume is to be mounted must have an existing volume on the same storage device. If there is no connection between the mount host and the block storage device then Protector will fail the mount operation after a timeout of 30 minutes. </div> |

| Control | Description |
|-------------|--|
| VMware Node | Expose the volumes to the specified VMware host and mount them to the VM as RDM disks. <div>  Note: Exposing using a VMware host requires that a VMware Server node be configured in Protector and that the mount target VM has Protector Client and VMware Tools installed. </div> |
| Datastore | Specifies a destination datastore when mounting to a VMware VM which is part of a cluster, in which case the default datastore may not be a suitable place to save the RDM mount information. If the datastore field is left blank then mount information is saved alongside the VM. |

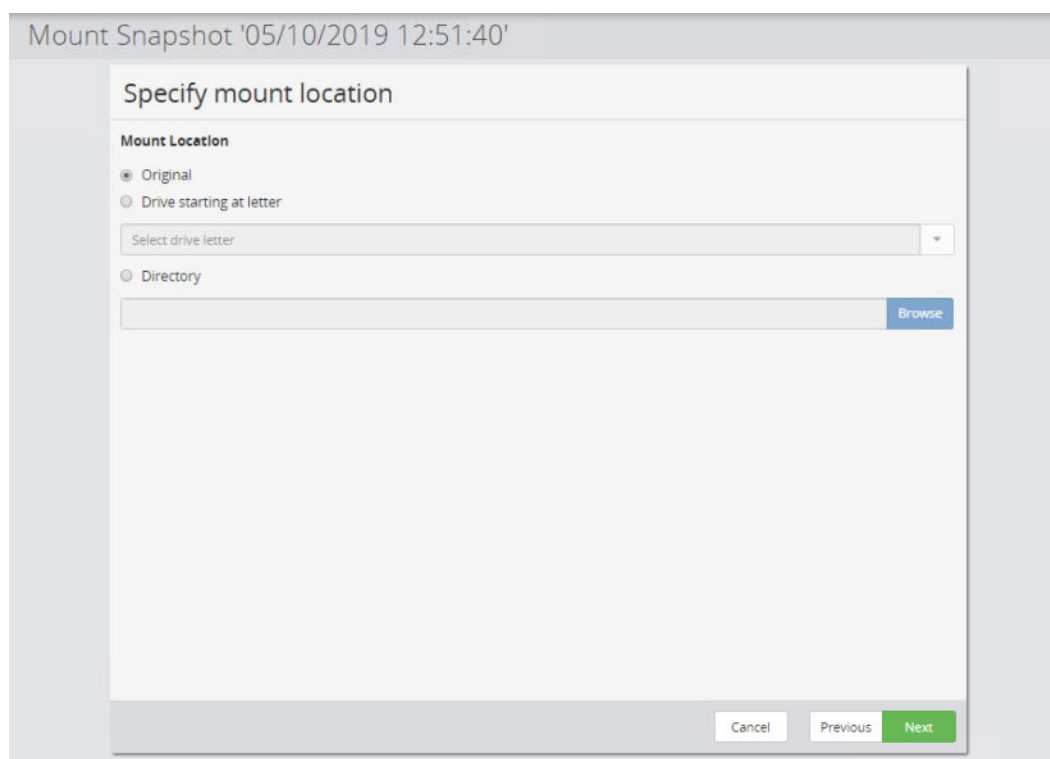




Figure 431 Mount Wizard - Specify mount location (OS level mount only)

| Control | Description |
|----------|--|
| Original | The snapshot or replication is mounted at its original location. <div>  Note: Mounting at the original location will fail if there is already a volume mounted at that location. </div> |

| Control | Description |
|--------------------------|---|
| Drive starting at letter | When mounting a snapshot or replication that contains multiple volumes, the first volume will mount at the specified drive and subsequent drives are used for each additional volume. |
| Directory | <p>When mounting a snapshot or replication that contains multiple volumes, each volume will be assigned a separate subdirectory. Click Browse to view the drives and directories on the selected host. To create a new directory, type in the required path.</p> <p> Note: Protector does not check to make sure the directory selected as the mount point is empty. This means it is possible to mount a snapshot inside or even over the top of another mounted volume. This should be avoided.</p> |

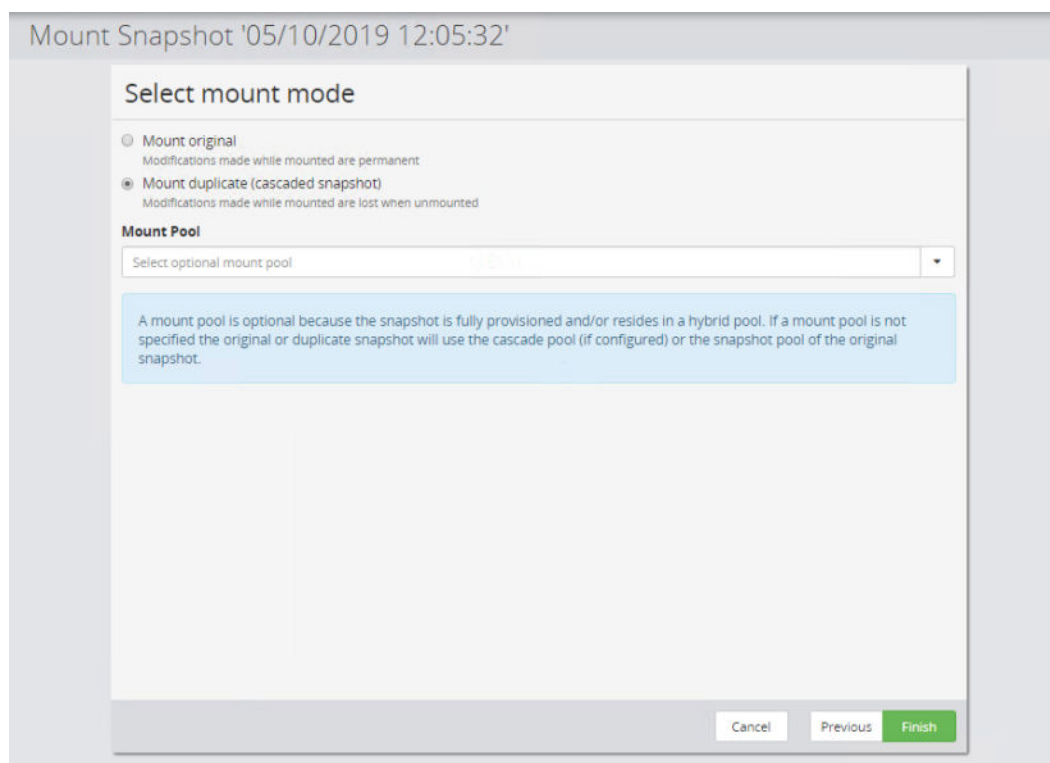




Figure 432 Mount Wizard - Select mount mode

| Control | Description |
|----------------|--|
| Mount Original | <p>Mounts the replication or the original (Level 1) snapshot.</p> <p> Note: If the mounted snapshot is modified then those changes will remain when the snapshot is unmounted.</p> |

| Control | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|--|------------|------------|------------|-----------------|----------|-------------------------|------------|-----------------|--------------------------|-------------------------|------------|-------------------|----------|--------------------|------------|-------------------|--------------------------|-------------------------|--------|-----------------|----------|-------------------------|--------|-----------------|--------------------------|-------------------------|--------|-------------------|----------|--------------------|--------|-------------------|--------------------------|-------------------------|
| Mount duplicate (cascaded snapshot) | <div>Enabled only for snapshots and if the original (Level 1) snapshot was created in cascade mode. Mounts a copy of the original snapshot (i.e. a Level 2 snapshot).</div> <div> Note: The mounted snapshot will be discarded when it is unmounted.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mount Pool | <div>Depending on the parameters specified for the snapshot operation on the data flow, a mount pool might or might not be required.</div> <div>The following table lists all the scenarios:</div> <table><tr><th>Snapshot Pool Type (specified on data flow)</th><th>Provisioning Type (specified on data flow)</th><th>Mount Mode</th><th>Mount Pool</th></tr><tr><td>Thin Image</td><td>Floating Device</td><td>Original</td><td>Required⁽¹⁾</td></tr><tr><td>Thin Image</td><td>Floating Device</td><td>Duplicate⁽⁴⁾</td><td>Required⁽¹⁾</td></tr><tr><td>Thin Image</td><td>Fully Provisioned</td><td>Original</td><td>N/A⁽³⁾</td></tr><tr><td>Thin Image</td><td>Fully Provisioned</td><td>Duplicate⁽⁴⁾</td><td>Optional⁽²⁾</td></tr><tr><td>Hybrid</td><td>Floating Device</td><td>Original</td><td>Optional⁽²⁾</td></tr><tr><td>Hybrid</td><td>Floating Device</td><td>Duplicate⁽⁴⁾</td><td>Optional⁽²⁾</td></tr><tr><td>Hybrid</td><td>Fully Provisioned</td><td>Original</td><td>N/A⁽³⁾</td></tr><tr><td>Hybrid</td><td>Fully Provisioned</td><td>Duplicate⁽⁴⁾</td><td>Optional⁽²⁾</td></tr></table> | Snapshot Pool Type (specified on data flow) | Provisioning Type (specified on data flow) | Mount Mode | Mount Pool | Thin Image | Floating Device | Original | Required ⁽¹⁾ | Thin Image | Floating Device | Duplicate ⁽⁴⁾ | Required ⁽¹⁾ | Thin Image | Fully Provisioned | Original | N/A ⁽³⁾ | Thin Image | Fully Provisioned | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ | Hybrid | Floating Device | Original | Optional ⁽²⁾ | Hybrid | Floating Device | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ | Hybrid | Fully Provisioned | Original | N/A ⁽³⁾ | Hybrid | Fully Provisioned | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ |
| Snapshot Pool Type (specified on data flow) | Provisioning Type (specified on data flow) | Mount Mode | Mount Pool | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thin Image | Floating Device | Original | Required ⁽¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thin Image | Floating Device | Duplicate ⁽⁴⁾ | Required ⁽¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thin Image | Fully Provisioned | Original | N/A ⁽³⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thin Image | Fully Provisioned | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hybrid | Floating Device | Original | Optional ⁽²⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hybrid | Floating Device | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hybrid | Fully Provisioned | Original | N/A ⁽³⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hybrid | Fully Provisioned | Duplicate ⁽⁴⁾ | Optional ⁽²⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Control | Description |
|---------|--|
| | <p>The following message is displayed in a blue rectangle to explain the options:</p> <ul style="list-style-type: none"> ▪ (1) "A mount pool is required because the snapshot is not fully provisioned and resides in a Thin Image pool." ▪ (2) "A mount pool is optional because the snapshot is fully provisioned and/or resides in a hybrid pool. If a mount pool is not specified the original or duplicate snapshot will use the cascade pool (if configured) or the snapshot pool of the original snapshot." ▪ (3) "A mount pool is not required because the secondary LDEVs are already fully provisioned." ▪ (4) "It is only possible to mount a duplicate of a snapshot created with cascade-mode enabled." |

Mount Wizard - Select Oracle Restore Options

When mounting block snapshots or replications created by a policy containing an *Oracle Database* classification, Protector will display the following additional wizard pages that allows application specific options to be configured:

Mount '06/01/2020 07:20:18'

Specify mount location



Mount Location

☒ New ASM Disk Group
☐ Original
☐ Directory

Browse

Cancel Previous Next

Figure 433 Mount Wizard - Specify Mount Location

| Control | Description |
|--------------------|--|
| New ASM Disk Group | <p>Mount the ASM disk groups using a new generated name to avoid conflicts with the original database or existing ASM disk groups. The new disk group name is auto generated. It comprises the original name and a numeric suffix, allowing for multiple copies of the same database to be mounted to a single host.</p> <p> Note: This option is only valid for backups of ASM based Oracle databases. The option will be disabled automatically if Protector detects a filesystem based Oracle database in a backup created with Protector 7.1 or newer.</p> |
| Original | <p>Mount the database using the same ASM disk groups or filesystem paths as the original database the backup was created from. If the path or disk group name is in use by an existing database, the mount will fail.</p> |
| Directory | <p>Mount the database to the provided path. If the path in use by an existing database, the mount will fail.</p> <p> Note: This option is only valid for backups of filesystem based Oracle databases. The option will be deactivated automatically, if Protector detects an ASM based Oracle database in a backup created with Protector 7.1 or newer.</p> |

Mount '06/01/2020 07:20:18'

Configure Oracle recovery options

Restore Mode

☒ Restore only

☐ Recover to last consistent state in backup

☐ Recover to point in time

06/01/2020 10:32:48

The selected date and time will be applied as the local time on which the database recovery is being performed. To avoid time zone conversions the UI time zone can be changed in the [user settings](#).


☐ Recover to system change number (SCN)

☐ Recover to current position

Cancel Previous Next

Figure 434 Mount Wizard - Select Oracle Restore Options

| Control | Description | Logs Reset Post Mount | Requires RMAN catalog | Requires control/ spfile in RMAN backup |
|--|--|--------------------------------|-----------------------------|---|
| Restore only | The database is simply mounted. It is left to the database administrator to recover manually. | No | No | No |
| Recover to last consistent state in backup | The database is recovered to the consistent state which was captured by the backup. The database is brought online. This type of mount can be performed with the data in the backup alone. | Depends (see note 1) | No | No |
| Recover to point in time | A timestamp is entered which defines the point in time to recover. This requires a connection to the RMAN catalog and logs which are shared with/ available to the host. | Depends (see note 1) | Yes | Yes (see note 2) |

| Control | Description | Logs Reset Post Mount | Requires RMAN catalog | Requires control/spfile in RMAN backup |
|---------------------------------------|--|-----------------------|-----------------------|--|
| Recover to system change number (SCN) | A system change number is entered which defines the change point to recover. This requires a connection to the RMAN catalog and logs which are shared with/available to the host. | Depends (see note 1) | Yes | Yes (see note 2) |
| Recover to current position | <p>The database is recovered to the most current position possible. This requires a connection to the RMAN catalog and logs which are shared with/available to the host.</p> <div>  Note: When mounting, the current position is the latest point in time which is provided by the archive logs referenced in RMAN catalog. It does not include any archive logs or redo logs on the source machine which have not been backed up via RMAN. </div> | Depends (see note 1) | Yes | Yes (see note 2) |



Note: (1) In the table above, logs will only be reset when Open Database is selected in the **Post Recovery Options** page of the wizard (see below).



Caution: (2) In the table above, for some recovery scenarios the RMAN catalog needs to hold a control file. RMAN can be configured to add a control/spfile backup every time an archive log backup is performed.

Mount '06/01/2020 07:20:18'




Select Post Recovery Options

☒ Change Oracle database ID (DBID)
☒ Change Oracle database unique name and SID
☐ Disable database schedule
☒ Open Database

Advanced Options

Cancel Previous Next

Figure 435 Mount Wizard - Select Post Recovery Options

| Control | Description |
|--|--|
| Change Oracle database ID (DBID) | <p>Creates a new DBID for the database.</p> <p> Tip: A DBID is a unique, Oracle generated number identifying each database. It is found in control files as well as datafile headers and is used to determine which database that file belongs to.</p> |
| Change Oracle database unique name and SID | <p>A new unique name and SID can be specified for the database.</p> <p> Tip: This changes the <code>unique_database_name</code> which is also used as the SID.</p> |
| Disable database schedule | <p>Disables database internal tasks scheduled for this database.</p> <p> Tip: The Oracle scheduler allows the administrator to schedule SQL commands as jobs. By selecting this option existing schedules will be disabled.</p> |
| Open Database | <p>If selected, then after recovery the database will placed in the <i>OPEN</i> state using the <i>RESETLOGS</i> or <i>NORESETLOGS</i> option, as per the requirements of the database. Otherwise the database will be left in the <i>MOUNT</i> state.</p> |
| Advanced Options | <p>Opens the Advanced Options page of the wizard.</p> |

Mount '06/01/2020 07:20:18'

Advanced Mount Options

Oracle Database Memory Target

☐

Database MEMORY_TARGET in GB. Will remove all other memory management related customization of the database.

Local Listener


☐

Network name of the Oracle Net local_listener.

Cancel Discard Previous **Apply**

Figure 436 Mount Wizard - Advanced Mount Options

This page of the wizard is not be displayed if Restore only or Recover to last consistent state in backup is selected in a previous step.

| Control | Description |
|-------------------------------|--|
| Oracle database Memory Target | <p>Sets the database MEMORY_TARGET in GB. Entering a value here will remove all other memory management related customization of the database.</p> <p> Tip: This allows Oracle databases from very powerful source systems to be deployed on less powerful systems. The PGA and SGA memory areas will be managed by Oracle within the given memory target.</p> |
| Local Listener | Sets the network name of the Oracle Net local_listener. |

Mount '06/01/2020 07:20:18'

Provide details for changing database ID or name

Password for sys user

Cancel Previous Next

Figure 437 Mount Wizard - Provide details for changing database ID or name

This page of the wizard will only be displayed if either Change Oracle database ID (DBID) or Change Oracle database unique name and SID options are selected in a previous step.

| Control | Description |
|-----------------------|--|
| Password for sys user | <p>Depending on the Oracle version:</p> <ul style="list-style-type: none"> Oracle 11g: The sys user password is required to change the Oracle database ID or database unique name. Oracle 12 or newer: This field can be left empty. |

Mount '06/01/2020 07:20:18'

Specify RMAN settings

The RMAN recovery catalog is used to store information about backups performed with the Oracle RMAN utility (e.g. transaction log backups). The catalog is used during database recovery.

RMAN Catalog Name

Username

Password

Cancel Previous Next

Figure 438 Mount Wizard - Specify RMAN credentials

This page of the wizard is not displayed if Restore only or Recover to last consistent state in backup is selected in a previous step.

| Control | Description |
|-------------------|---|
| RMAN Catalog Name | For RMAN only. Enter the RMAN Catalog Name as it is entered in the SQL*Net connect string to connect to the RMAN catalog. |
| Username | For RMAN only. Enter the username for the RMAN catalog. |
| Password | For RMAN only. Enter the password for the RMAN catalog. |

Hitachi Block VMware Mount Wizard

This wizard is displayed when you mount a VMware snapshot or replication from a Hitachi Block device.

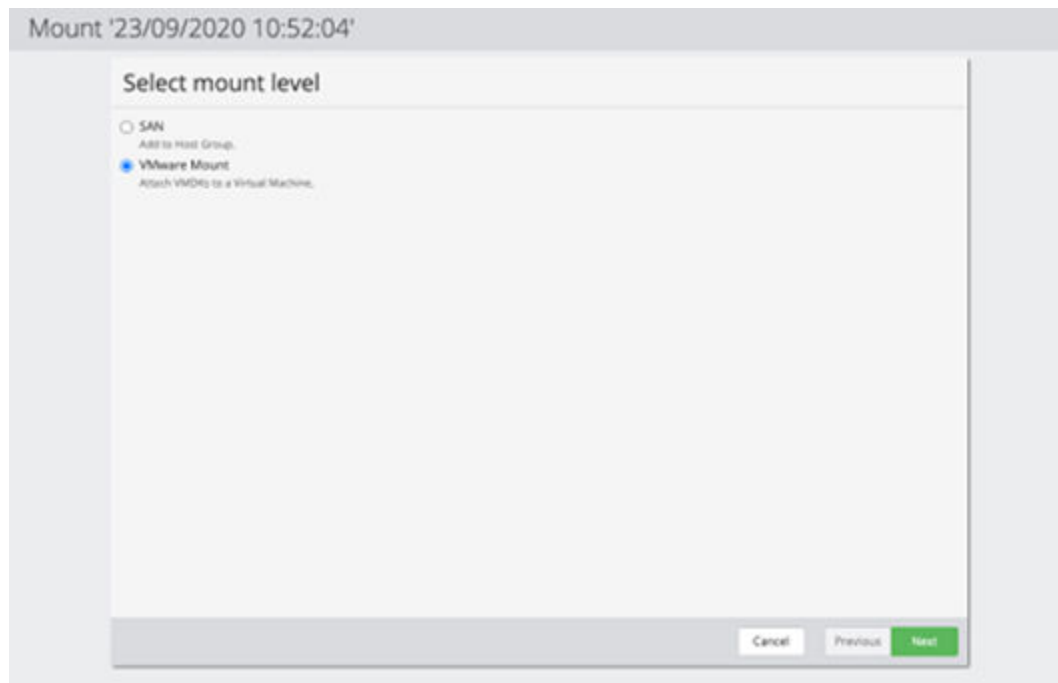


Figure 439 Mount VMware Wizard - Select Mount Level

| Control | Description |
|--------------|---|
| SAN | Expose this record to a Host Group |
| VMware mount | Mount the disks of a VM from the record, to a target VM |

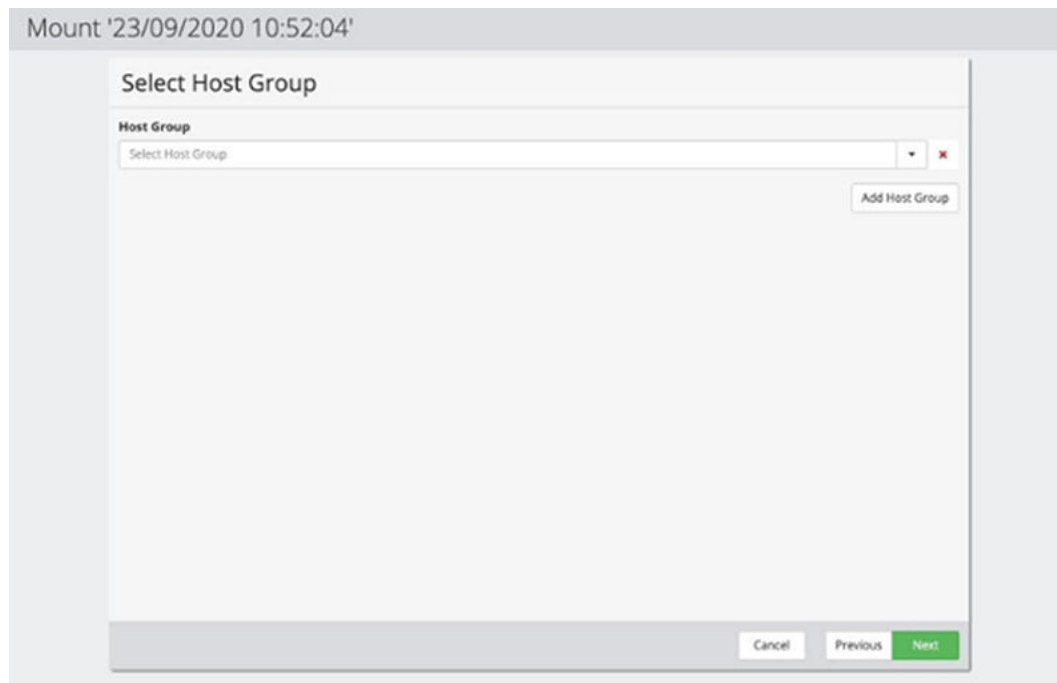


Figure 440 Mount VMware Wizard - Select Host Group

| Control | Description |
|------------|---|
| Host Group | Host Group to expose the record to. Multiple Host Groups can be added |

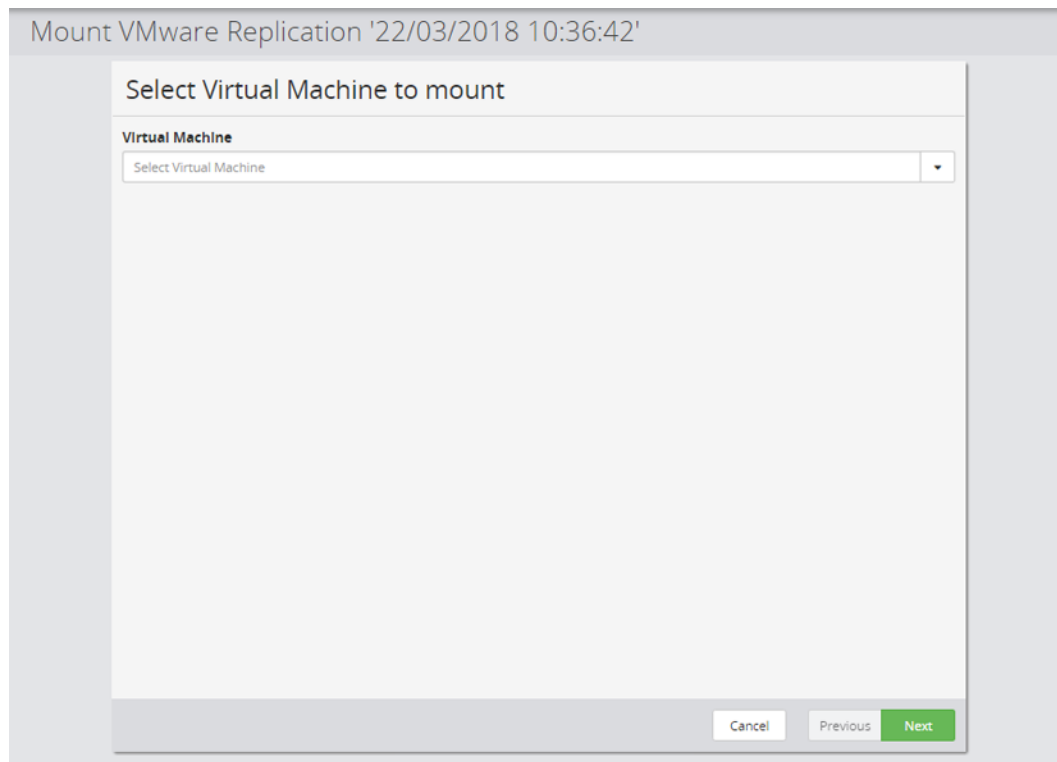


Figure 441 Mount VMware Wizard - Select Virtual Machine

| Control | Description |
|-----------------|--|
| Virtual Machine | Select the specific VM within this snapshot that is to have its disks mounted. |

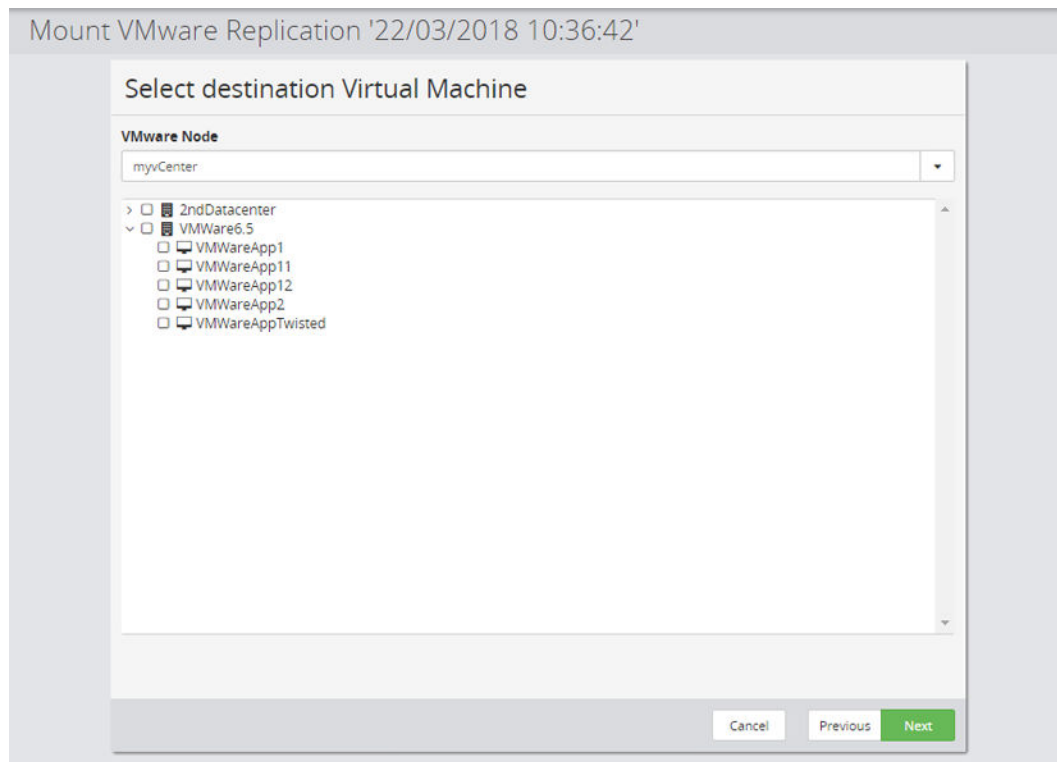


Figure 442 Mount VMware Wizard - Select Virtual Machine to Mount to

| Control | Description |
|-------------|---|
| VMware Node | Select the VMware Host or vCenter where the VM's disks will be mounted. |
| Destination | Select the VMware Datacenter, sub-folder and VM where the VM's disks will be mounted. |

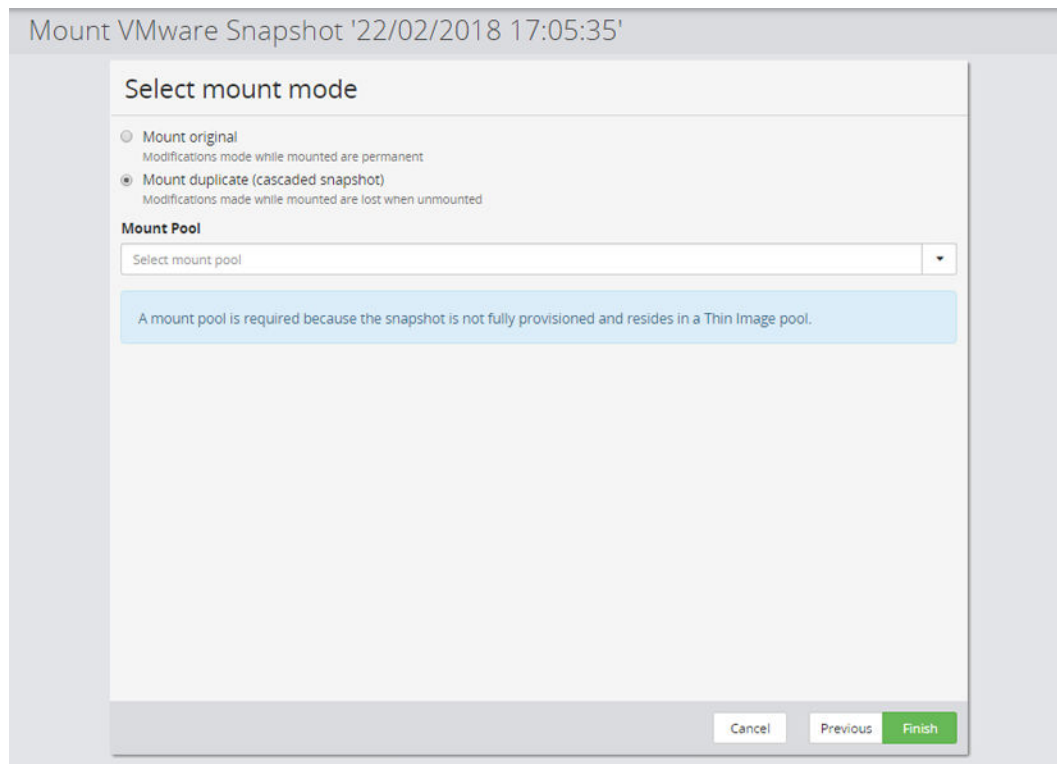


Figure 443 Mount VMware Wizard - Select Mount Mode

| Control | Description |
|-------------------------------------|---|
| Mount Original | <p>Mounts the VM's VMDKs using the replication or the original (Level 1) snapshot.</p> <p>Caution: Any changes made to the VMDKs will persist when they are unmounted.</p> |
| Mount duplicate (cascaded snapshot) | <p>Not available for replications. Only enabled if the original (Level 1) snapshot was created in cascade mode. Mounts the VM's VMDKs using a copy of the original snapshot (i.e. a Level 2 snapshot).</p> <p>Caution: Any changes made to the VMDKs will be lost when they are unmounted.</p> |
| Mount Pool | <p>Not available for replications. Depending on the parameters specified for the snapshot operation on the data flow, a mount pool might be required. A message is displayed in a blue rectangle to explain if and why a mount pool is required.</p> |

Hitachi Block Revert Wizard

This wizard allows a snapshot or local replication to be used to revert volume(s) to a prior state.



Caution: Reverting destroys any changes that were made to data on those volumes subsequent to the selected snapshot or local replication being taken.



Note:

- Before issuing a revert operation the user should ensure the volume being reverted is not having any other operation performed on it including being mounted, this can be confirmed in the [Hitachi Block Replication Details \(Storage\)](#) (on page 780). If it is mounted the revert will fail silently.
- For replications in a cascaded data flow, the immediate upstream and downstream volumes must be in an appropriate state (typically paused or suspended for swap). This is enforced by the storage array hardware.
- The revert operation can take some time to complete.

When reverting snapshots or local replications created by a policy containing an *Application Classification*, Protector will first display one of the following wizard pages that allow application specific options to be configured:

- [Revert Wizard - Configure Oracle Recovery Options](#) (on page 718)

Once any application specific options have been selected, the following wizard page will be displayed:

Revert Snapshot '19/06/2017 11:45:16 ...

Confirm Revert

Confirm Revert

Reverting can potentially cause the loss or destruction of data. If you are really certain you want to perform this operation enter 'REVERT' in the field above.

Cancel Previous Finish

Figure 444 Revert Wizard - Confirm Revert

| Control | Description |
|----------------|--|
| Confirm Revert | The word REVERT must be explicitly typed in to confirm the action. |

Revert Wizard - Configure Oracle Recovery Options

When reverting snapshots or local replications created by a policy containing an *Oracle Database* classification, Protector will first display the following wizard page that allows application specific options to be configured.

Revert Snapshot '10/04/2017 12:57:22'

Configure Oracle recovery options

Recovery Options

☒ Restore only
☐ Recover to last consistent state in backup
☐ Recover to point in time
☐ Recover to system change number (SCN)
☐ Recover to current position

10/04/2017 13:07:11

The selected date and time will be applied as the *local time* on which the database recovery is being performed. To avoid time zone conversions the UI time zone can be changed in the [user settings](#).

Cancel Previous Next

Figure 445 Revert Wizard - Configure Oracle Recovery Options

| Control | Description | Logs Reset Post Recovery |
|--|--|--------------------------|
| Restore only | The database is simply reverted and it is left to the database administrator to recover manually. | No |
| Recover to last consistent state in backup | The database is recovered to the consistent state which was captured by the backup. The database is brought online. This type of revert can be performed with the data in the backup alone; no RMAN catalogue is required. | Yes |

| Control | Description | Logs Reset Post Recovery |
|---------------------------------------|--|--------------------------|
| Recover to point in time | A timestamp is entered (in 24 hour format: YYYY-MM-DD:HH:MM:SS), which defines the point in time to recover. The time entered must be after the time the snapshot was created and before the last available transaction. This option requires a connection to the RMAN catalog and logs which are shared with/available to the host. | Yes |
| Recover to system change number (SCN) | A system change number is entered which defines the change point to recover. The SCN entered must be after the snapshot was created and before the last available transaction. This option requires a connection to the RMAN catalog and logs which are shared with/available to the host. | Yes |
| Recover to current position | The database is recovered to the most current position possible. Because access to the latest redo logs is available, it is possible to recover to the last transaction. This requires a connection to the RMAN catalog and logs which are shared with/available to the host. | No |

Revert Snapshot '10/04/2017 12:57:22'

Configure Oracle recovery options

Post Recovery Options

☒ Open Database

Cancel Previous Next

Figure 446 Revert Wizard - Post Recovery Options

| Control | Description |
|---------------|--|
| Open Database | If selected, then after recovery the database will be placed in the <i>OPEN</i> state using the <i>RESETLOGS</i> or <i>NORESETLOGS</i> option, as per the requirements of the database. Otherwise the database will be left in the <i>MOUNT</i> state. |

Revert Snapshot '10/04/2017 12:57:22'

Specify RMAN settings

The RMAN recovery catalog is used to store information about backups performed with the Oracle RMAN utility (e.g. transaction log backups). The catalog is used during database recovery.

RMAN Catalog Name

Name used in the SQL*Net connect string to connect to the RMAN catalog

Username

Password

Cancel Previous Next

Figure 447 Revert Wizard - Specify RMAN Credentials

This page of the wizard is not displayed if Restore only or Recover to last consistent state in backup is selected in a previous step.

| Control | Description |
|-------------------|---|
| RMAN Catalog Name | For RMAN only. Enter the RMAN Catalog Name as it is entered in the SQL*Net connect string to connect to the RMAN catalog. |
| Username | For RMAN only. Enter the username for the RMAN catalog. |
| Password | For RMAN only. Enter the password for the RMAN catalog. |

Hitachi Block Replication Swap Wizard

This wizard causes the direction of a replication to be reversed so that the secondary replicates to the primary.



Caution: When a replication is swapped, the secondary becomes writeable and the primary becomes read-only.



Note:

- If the swap cannot be completed then the replication pair enters the SSWS (suspended for swapping) state until the swap can be completed. The swap operation must be re-done by the user to complete a suspended swap.
- The flow direction of a replication pair should ONLY be determined by referring to the [Storage Inventory \(on page 756\)](#). Primary and secondary volume information shown in the [Log Attachments Dialog \(on page 458\)](#) should not be used to infer the flow direction following a swap.

Figure 448 Replication Swap Wizard

| Control | Description |
|--------------|--|
| Confirm Swap | The word SWAP must be explicitly typed in to confirm the action. |
| Direction | The final intended direction of the replication after the swap successfully completes. |

Hitachi Block Snapshot Details (Restore)

This page shows the details of a Snapshot on a Hitachi Block storage device.

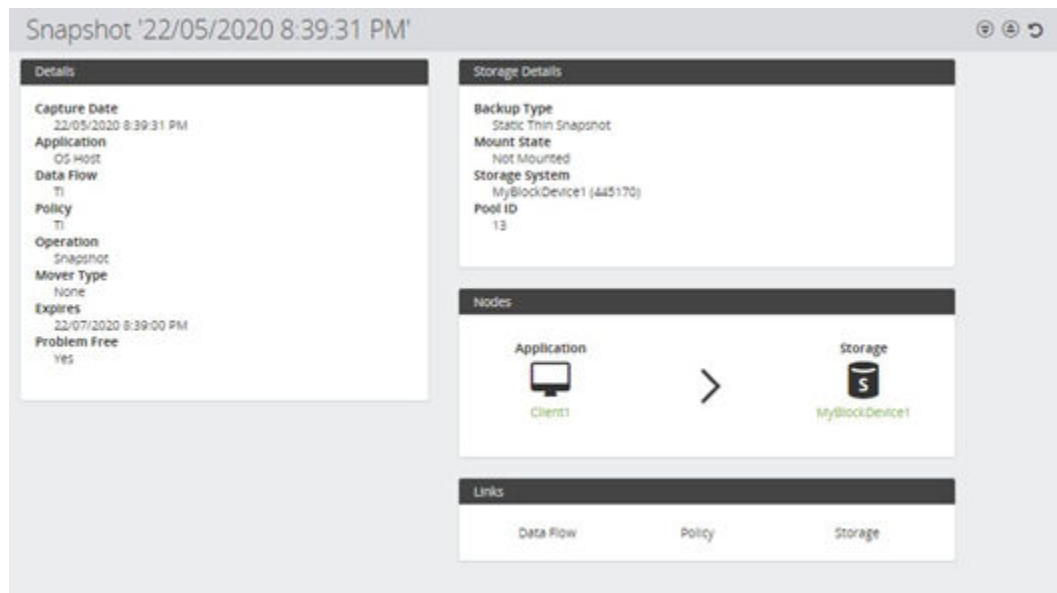







Figure 449 Snapshot Details (example shows VMware snapshot with included VMs listed)

| Control | Description |
|---|---|
|  Restore | Enabled only if a VMware snapshot is selected. Opens the Hitachi Block VMware Snapshot Restore Wizard (on page 689) to guide you through mounting the Snapshot. |
|  Mount | Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the Snapshot. |
|  Unmount | Unmounts the selected Snapshots. |
|  Revert | Enabled for non-VMware snapshots. Opens the Hitachi Block Revert Wizard (on page 716) . to guide you through reverting the snapshot. |
| Details | Lists the Snapshot details.  Tip: For Thin Image snapshots the <i>Type</i> field is set to <i>Static Thin Snapshot</i> indicating that the record is unchanging and requires the P-VOL to reconstruct an S-VOL. |
| Storage | Lists the following Storage details. |
| VMware Details for '<server>' | Only displayed for VMware snapshots. Lists the VMs included in the snapshot, the guest OS and whether the VM has been restored from the original snapshot and is thus no longer available to restore. |

| Control | Description |
|---------|---|
| Nodes | Shows the nodes involved in the snapshot and opens the Node Details (on page 574) for node. |
| Links | Provides links to the following pages that provide additional information about the replication: <ul style="list-style-type: none"> Data Flow - opens the Data Flow Details (on page 439) where the snapshot operation is assigned. Policy - opens the Policy Details (on page 658) where the snapshot operation is defined. Storage - opens the Hitachi Block Snapshot Details (Storage) (on page 769) view for the snapshot. |

Hitachi Block Replication Details (Restore)

This page shows the details of a Replication on a Hitachi Block storage device.

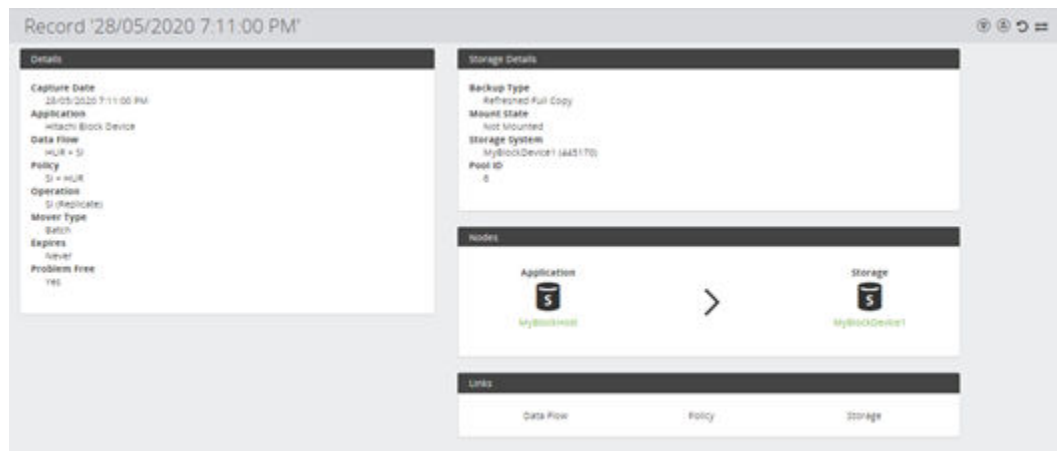





Figure 450 Replication Details

| Control | Description |
|---|---|
|  Mount | Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the Replication. |
|  Unmount | Unmounts the Replication. |
|  Swap | Opens the Hitachi Block Replication Swap Wizard (on page 720) to guide you through swapping the Replication direction. |
| Nodes | Lists the nodes involved with the replication. |

| Control | Description |
|---------|--|
| Storage | Lists the Storage details. |
| Links | <p>Provides links to the following pages that provide additional information about the replication:</p> <ul style="list-style-type: none"> ▪ Data Flow - opens the Data Flow Details (on page 439) where the replication operation is assigned. ▪ Policy - opens the Policy Details (on page 658) where the replication operation is defined. ▪ Storage - Opens the Hitachi Block Replication Details (Storage) (on page 780) for the replication, to help find and manually teardown deactivated replications. |

Host Based Backup Restore Options

This section describes the Host Based Restore options, accessed via the [Restore Inventory \(on page 686\)](#). Refer to the following sections for details on how to restore the various host based protections operations.

Restore Repository Snapshot Wizard - File System

This wizard is displayed when you restore a file system snapshot from a repository store.



Caution: Be careful when restoring data to a location that is in the scope of one or more Ops Center Protector policies. The restored data will not be incorporated by Ops Center Protector into its data flows until after a resynchronization has occurred and synchronization errors for the restored data can be logged until that point. Perform a manual resynchronization to correct the inconsistent state.



Note: The following data restoration limitations apply:

- Because of issues with translating security streams, data originating from Linux machines cannot be restored to Windows machines and vice versa. Data can only be restored to compatible OS types.

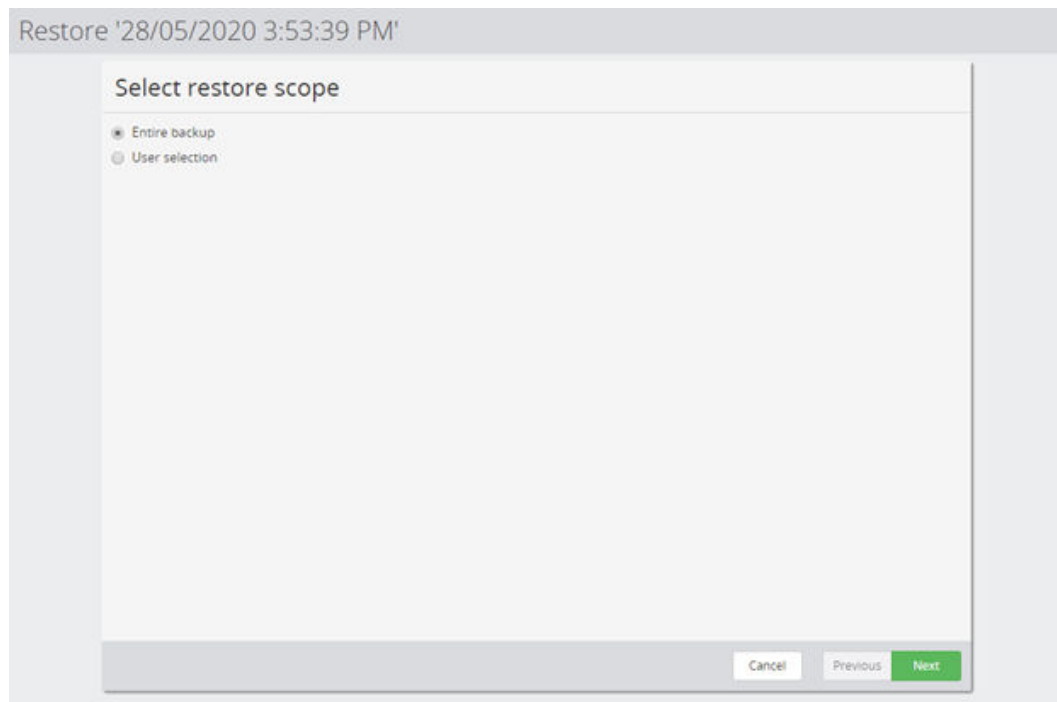


Figure 451 Restore File System Wizard - Select restore scope

| Control | Description |
|-----------------|---|
| Entire snapshot | The entire contents of the snapshot will be restored. The wizard displays the Select restore options page when Next is clicked. |
| User Selection | Only those files selected by the user will be restored. The wizard displays the Select files and directories to restore page when Next is clicked. |

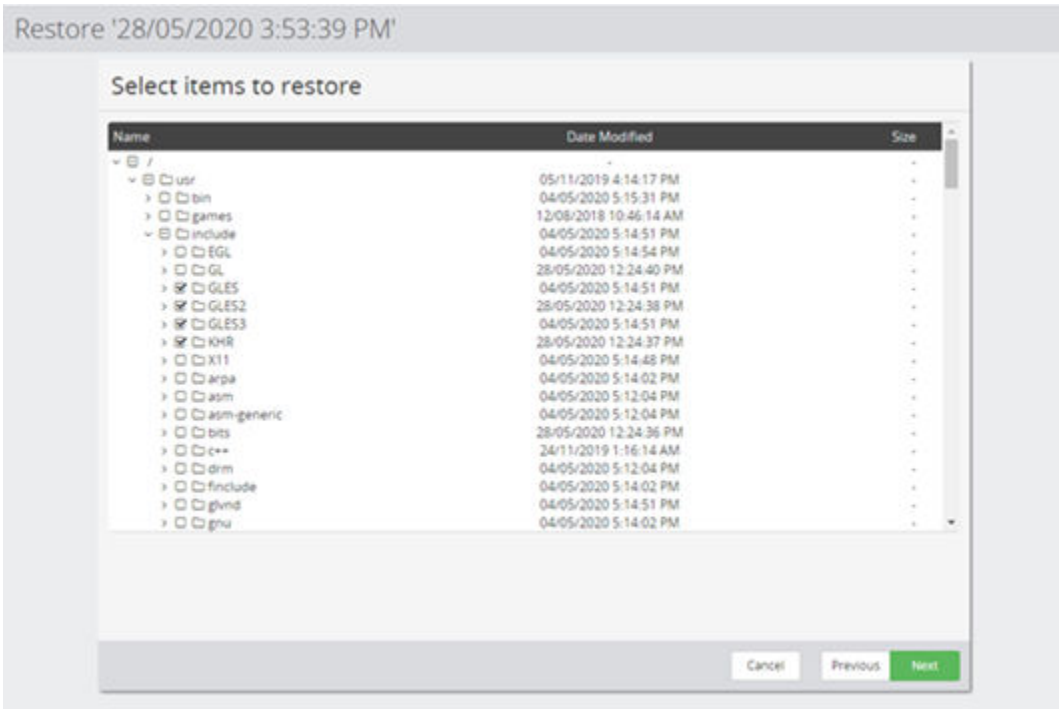


Figure 452 Restore File System Wizard - Select files and directories to restore

| Control | Description |
|----------------------|--|
| File System Contents | Select the directories and/or files you want to restore by clicking the checkbox to the left of its name (a tick mark is displayed next to every file that will be restored). To expand/collapse a folder, click the arrow symbol to the left of its name. |

Figure 453 Restore File System Wizard - Select restore options

| Control | Description |
|---|---|
| Destination Node | The target node for the restore. |
| Original Path | Use the original path names when restoring files. |
| Custom Path | Use a new path based on the Trim From Paths and Destination Path specification. Refer to the Trim From Path Examples in Destination Template Wizard (on page 369) . |
| Trim From Path | Presents a list of path prefixes that can be removed from the files being restored, whilst ensuring files remain grouped together in their respective folders. |
| Destination Path | The path specification to be prepended once the paths are trimmed. |
| Route via Node | Select a node to route via. Primarily used for Internet Connected Nodes where the destination is not directly connected to the repository node, so a proxy must be specified. |
| Attempt to overwrite colliding files, if that fails then rename | If overwriting fails then the file will be restored by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |

| Control | Description |
|---|---|
| Attempt to overwrite colliding files, if that fails then skip | If overwriting fails then the new file will NOT be restored. |
| Rename any colliding files | Differentiates all colliding files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Rename all restored files | Differentiates all restored files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Skip colliding files | Do not restore colliding files. |

Restore Repository Snapshot Wizard – Ops Center

This wizard is displayed when you restore a Ops Center snapshot from a repository store.



Caution: Be careful when restoring data to a location that is in the scope of one or more Ops Center Protector policies. The restored data will not be incorporated by Ops Center Protector into its data flows until after a resynchronization has occurred and synchronization errors for the restored data can be logged until that point. Perform a manual resynchronization to correct the inconsistent state.



Note: The following data restoration limitations apply:

- Because of issues with translating security streams, data originating from Linux machines cannot be restored to Windows machines and vice versa. Data can only be restored to compatible OS types.

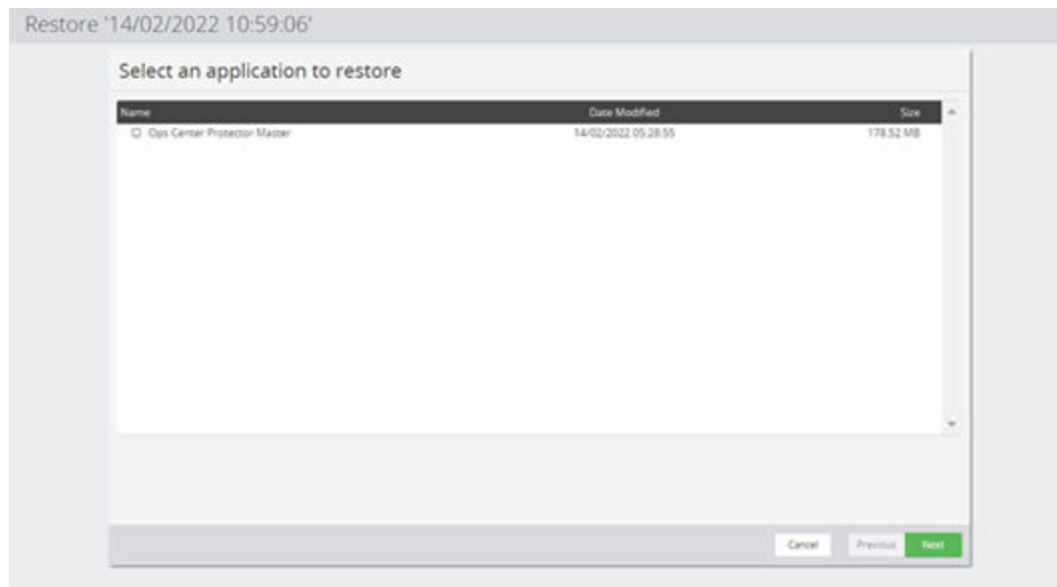


Figure 454 Restore Ops Center Application Wizard - Select application to restore

| Control | Description |
|-------------------------|--|
| Applications to Restore | Select the applications you want to restore by clicking the checkbox to the left of the application name (a tick mark is displayed next to every file that will be restored). The wizard displays the Select restore options page when Next is clicked. |

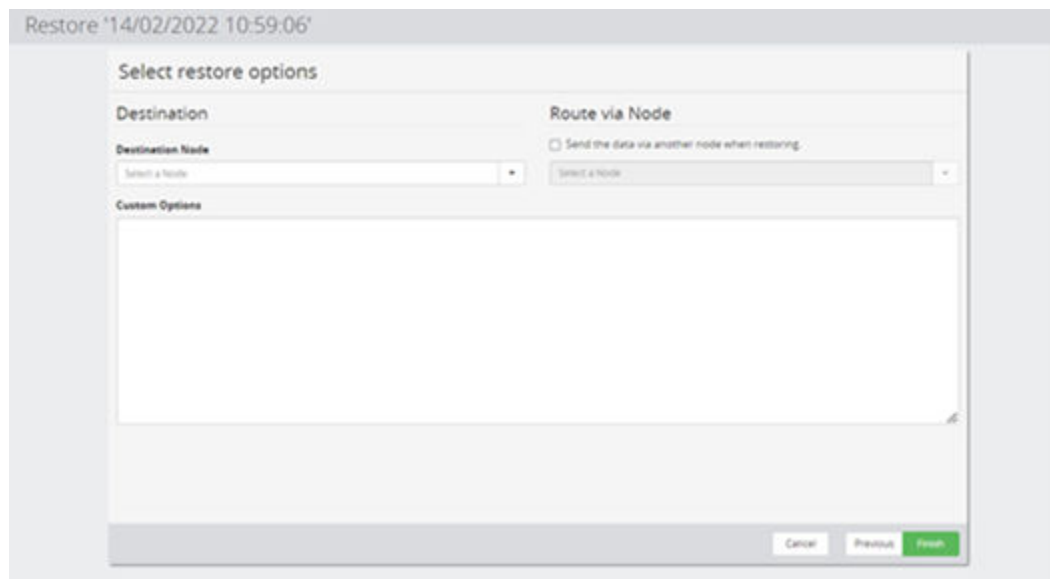


Figure 455 Restore Ops Center Application Wizard - Select restore options

| Control | Description |
|------------------|--|
| Destination Node | The target node for the restore. This destination node must be set to the node hosting the application to be recovered. |
| Route via Node | Select a node to route via. Primarily used for Internet Connected Nodes where the destination is not directly connected to the repository node, so a proxy must be specified. |
| Custom Options | Custom options may be entered in the text box - these options will be saved to a file and that file given to the applications 'restore command/script s parameter '%3'. These should only be entered if stated in the documentation for the application. |

Restore HCP Snapshot Wizard - File System

This wizard is displayed when you restore a file system snapshot from an HCPstore.



Caution: Be careful when restoring data to a location that is in the scope of one or more Ops Center Protector policies. The restored data will not be incorporated by Ops Center Protector into its data flows until after a resynchronization has occurred and synchronization errors for the restored data can be logged until that point. Perform a manual resynchronization to correct the inconsistent state.



Note: The following data restoration limitations apply:

- Because of issues with translating security streams, data originating from Linux machines cannot be restored to Windows machines and vice versa. Data can only be restored to compatible OS types.

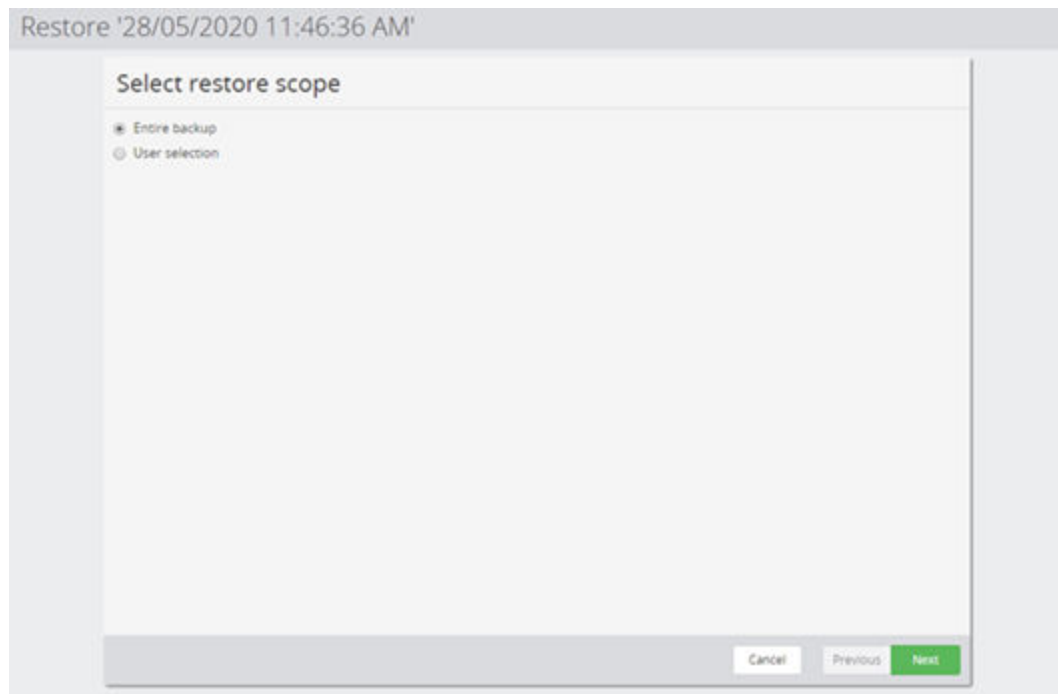


Figure 456 Restore HCP File System Wizard - Select restore scope

| Control | Description |
|-----------------|---|
| Entire snapshot | The entire contents of the snapshot will be restored. The wizard displays the Select restore options page when Next is clicked. |
| User Selection | Only those files selected by the user will be restored. The wizard displays the Select files and directories to restore page when Next is clicked. |

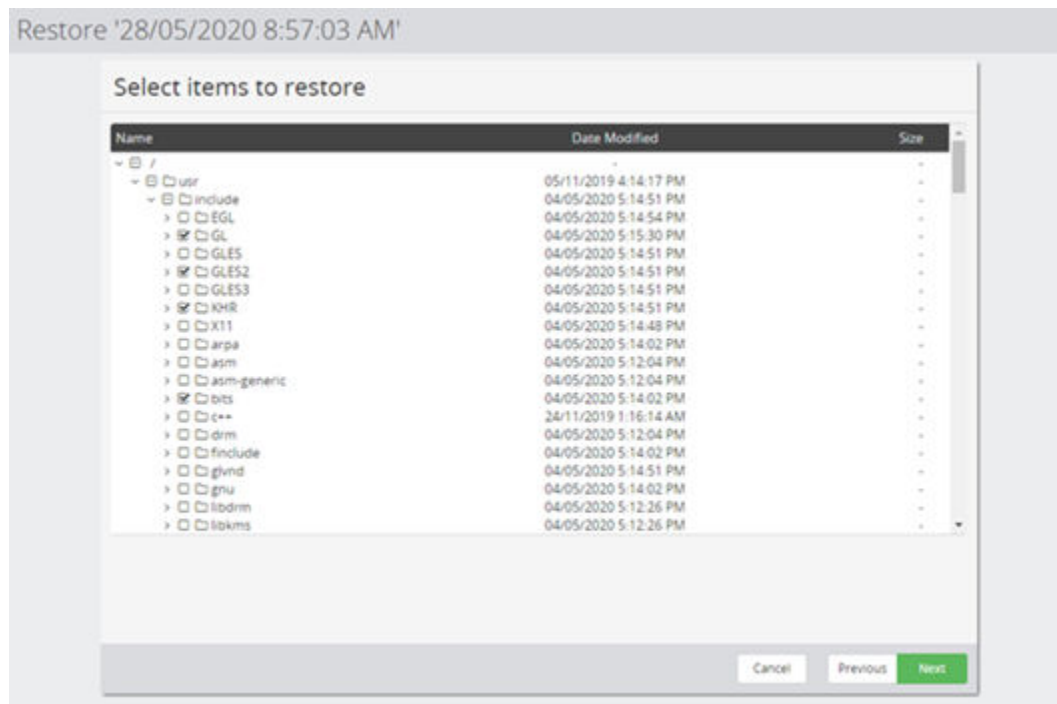


Figure 457 Restore HCP File System Wizard - Select items to restore

| Control | Description |
|----------------------|---|
| File System Contents | Select the directories and/or files you want to restore by clicking the checkbox to the left of its name (a tick mark is displayed next to every file that will be restored). To expand/collapse a folder, click the plus/minus symbol (+/-) to the left of its name. |

Restore '28/05/2020 11:46:36 AM'

Select restore options

Destination

Destination Node

Select a Node

Restore To

☒ Original Path
☐ Custom Path

Trim From Path

Select Path

Destination Path

Browse

Routing

Route via Node

☐ Send the data via another node when restoring.
 Select a Node

File Name Collisions

File Name Collision Policy

☒ Attempt to overwrite colliding files, if that fails then rename
☐ Attempt to overwrite colliding files, if that fails then skip
☐ Rename any colliding files
☐ Rename all restored files
☐ Skip colliding files

File name collisions can occur if a file on the destination exists with the same name and location as a file selected to be restored.

Cancel Previous Finish

Figure 458 Restore HCP File System Wizard - Select restore options

| Control | Description |
|---|---|
| Destination Node | The target node for the restore. |
| Original Path | Use the original path names when restoring files. |
| Custom Path | Use a new path based on the Trim From Paths and Destination Path specification. Refer to the Trim From Path Examples in Destination Template Wizard (on page 369) . |
| Trim From Path | Presents a list of path prefixes that can be removed from the files being restored, whilst ensuring files remain grouped together in their respective folders. |
| Destination Path | The path specification to be prepended once the paths are trimmed. |
| Route via Node | Select a node to route via. Primarily used for Internet Connected Nodes where the destination is not directly connected to the repository node, so a proxy must be specified. |
| Attempt to overwrite colliding files, if that fails then rename | If overwriting fails then the file will be restored by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |

| Control | Description |
|---|---|
| Attempt to overwrite colliding files, if that fails then skip | If overwriting fails then the new file will NOT be restored. |
| Rename any colliding files | Differentiates all colliding files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Rename all restored files | Differentiates all restored files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Skip colliding files | Do not restore colliding files. |

Restore Amazon S3 / HCP Cloud Scale Snapshot Wizard - File System

This wizard is displayed when you restore a file system snapshot from an S3 store.



Caution: Be careful when restoring data to a location that is in the scope of one or more Ops Center Protector policies. The restored data will not be incorporated by Ops Center Protector into its data flows until after a resynchronization has occurred and synchronization errors for the restored data can be logged until that point. Perform a manual resynchronization to correct the inconsistent state.



Note: The following data restoration limitations apply:

- Because of issues with translating security streams, data originating from Linux machines cannot be restored to Windows machines and vice versa. Data can only be restored to compatible OS types.

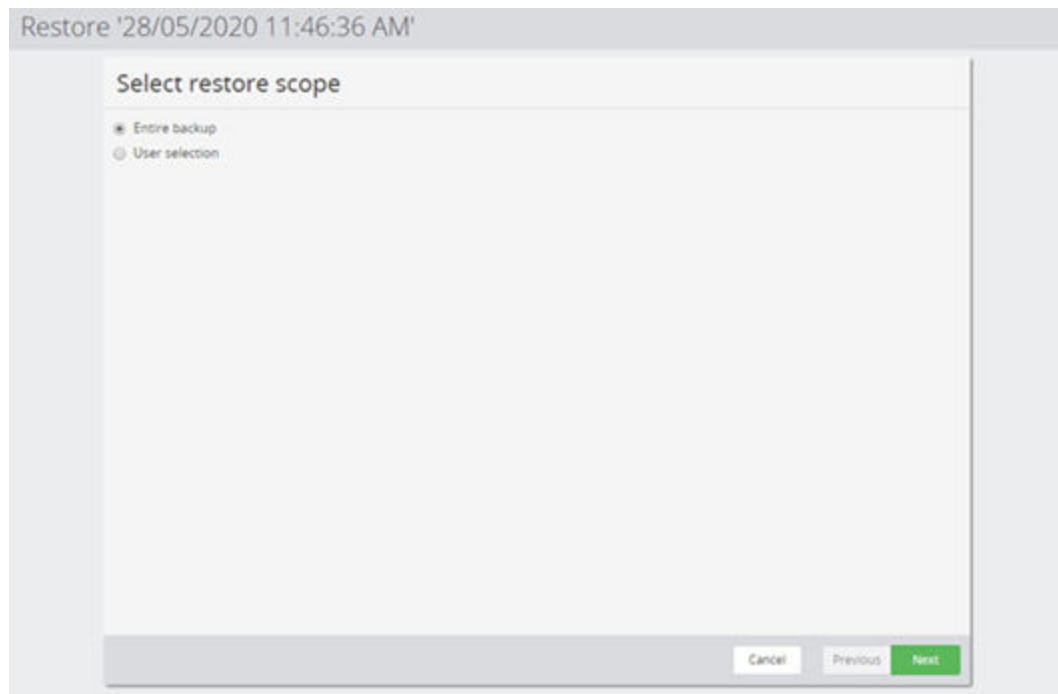


Figure 459 Restore S3 File System Wizard - Select restore scope

| Control | Description |
|-----------------|---|
| Entire snapshot | The entire contents of the snapshot will be restored. The wizard displays the Select restore options page when Next is clicked. |
| User Selection | Only those files selected by the user will be restored. The wizard displays the Select files and directories to restore page when Next is clicked. |

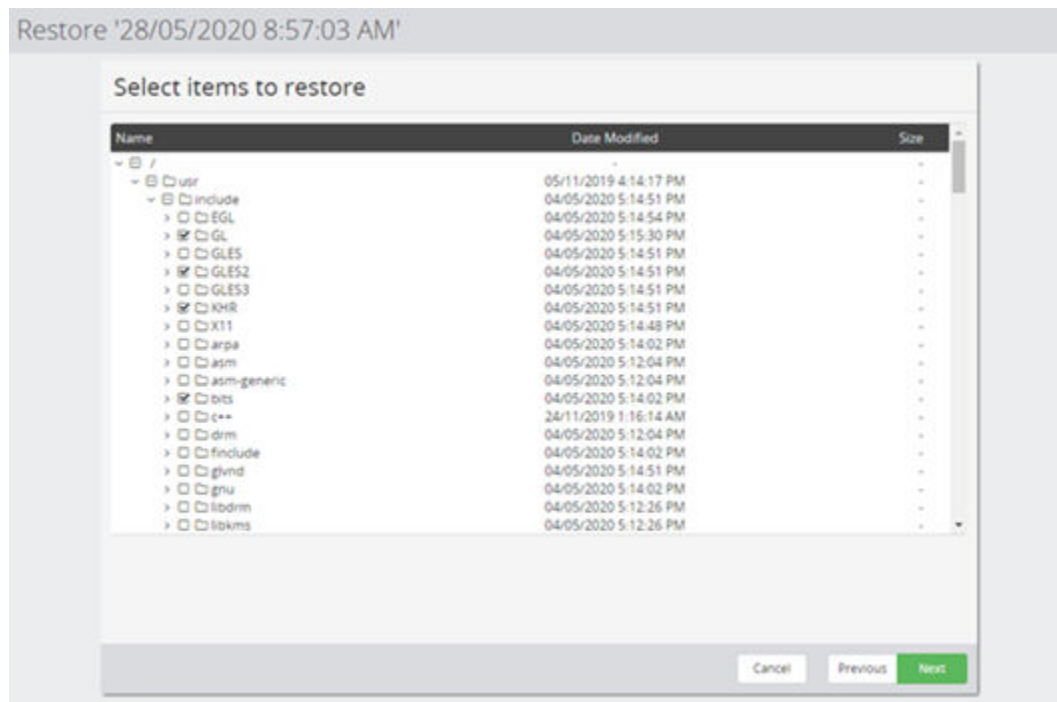


Figure 460 Restore S3 File System Wizard - Select items to restore

| Control | Description |
|----------------------|---|
| File System Contents | Select the directories and/or files you want to restore by clicking the checkbox to the left of its name (a tick mark is displayed next to every file that will be restored). To expand/collapse a folder, click the plus/minus symbol (+/-) to the left of its name. |

Restore '28/05/2020 11:46:36 AM'

Select restore options

Destination

Destination Node

Select a Node

Restore To

☒ Original Path
☐ Custom Path

Trim From Path

Select Path

Destination Path

Browse

Routing

Route via Node

☐ Send the data via another node when restoring.
 Select a Node

File Name Collisions

File Name Collision Policy

☒ Attempt to overwrite colliding files, if that fails then rename
☐ Attempt to overwrite colliding files, if that fails then skip
☐ Rename any colliding files
☐ Rename all restored files
☐ Skip colliding files

File name collisions can occur if a file on the destination exists with the same name and location as a file selected to be restored.

Cancel Previous Finish

Figure 461 Restore S3 File System Wizard - Select restore options

| Control | Description |
|---|--|
| Destination Node | The target node for the restore. |
| Original Path | Use the original path names when restoring files. |
| Custom Path | Use a new path based on the Trim From Paths and Destination Path specification. Refer to the Trim From Path Examples in Destination Template Wizard (on page 369). |
| Trim From Path | Presents a list of path prefixes that can be removed from the files being restored, whilst ensuring files remain grouped together in their respective folders. |
| Destination Path | The path specification to be prepended once the paths are trimmed. |
| Route via Node | Select a node to route via. Primarily used for Internet Connected Nodes where the destination is not directly connected to the repository node, so a proxy must be specified. |
| Attempt to overwrite colliding files, if that fails then rename | If overwriting fails then the file will be restored by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |

| Control | Description |
|---|---|
| Attempt to overwrite colliding files, if that fails then skip | If overwriting fails then the new file will NOT be restored. |
| Rename any colliding files | Differentiates all colliding files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Rename all restored files | Differentiates all restored files by prepending the restore version (that is <code>(VersionNumber)_filename.ext</code>) to the file name. |
| Skip colliding files | Do not restore colliding files. |

Restore from host based backup Wizard - VMware



Figure 462 Restore VMware Host Based Backup Wizard - Select files and directories to restore

| Control | Description |
|----------------------|---|
| Virtual Machine List | Select the VMs and Folders to restore. To expand/collapse a folder, click the arrow symbol to the left. |

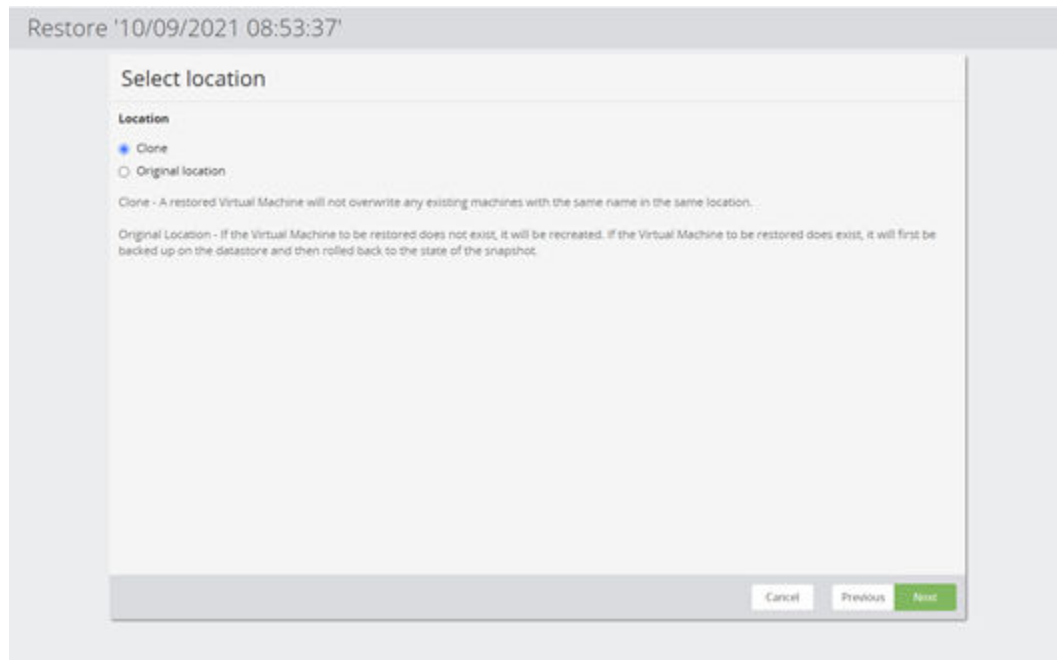




Figure 463 Restore VMware Host Based Backup Wizard - Select location

| Control | Description |
|-------------------|---|
| Original location | <p>If the Virtual Machine to be restored does not exist, it will be recreated. If the Virtual Machine to be restored does exist, it will first be backed up on the datastore and then rolled back to the state of the snapshot.</p> <p> Note: If you want to replace the existing VM with the restored one, then delete it before restoring</p> |
| Clone | <p>The backup will be restored as a clone at the specified location. The wizard displays the Set clone prefix and destination page when Next is clicked.</p> <p> Note: A restored Virtual Machine will not overwrite any existing machines with the same name in the same location. If a VM of the same name exists at the restore location then the restore job will fail and log and error to that effect.</p> |

Restore '05/07/2021 11:17:03'

Set clone prefix and destination

Destination Node

Select a Node ▼

Cloned Virtual Machine Name Prefix

Optional clone prefix

Cancel Previous **Next**

Figure 464 Restore VMware Host Based Backup Wizard - Set clone prefix and destination

| Control | Description |
|------------------------------------|--|
| Destination Node | Specifies which vCenter or ESX/ESXi node the VMs are to be restored to. |
| Cloned Virtual Machine Name Prefix | Optional: Clones the original VMs with the prefix applied to the name if specified. |

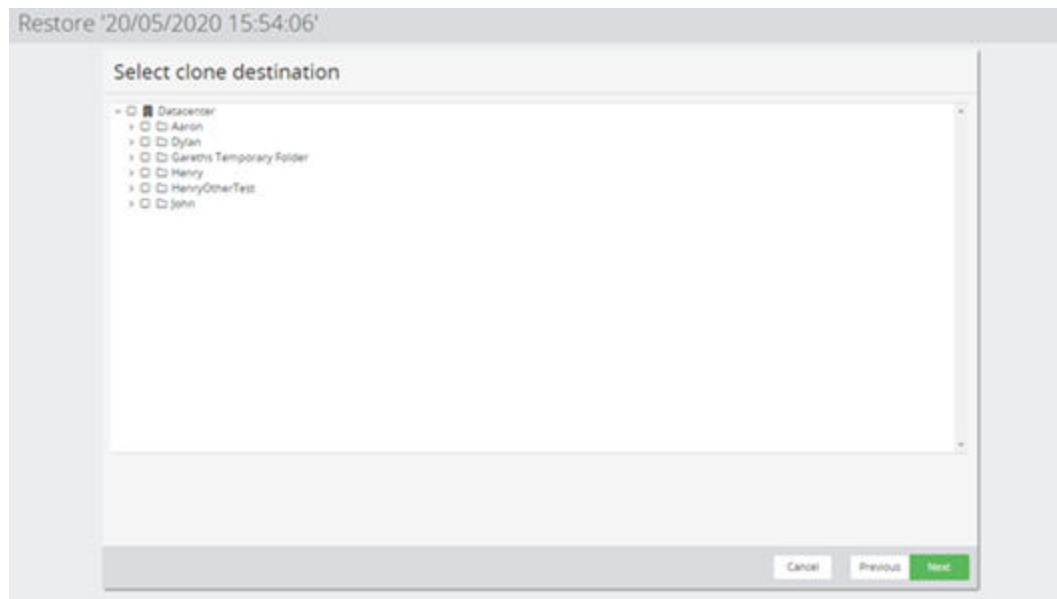


Figure 465 Restore VMware Host Based Backup Wizard - Select clone destination

| Control | Description |
|-------------------------|---|
| Datacenters/ Folders | Select the datacenter or folder where the clones are to be located. |

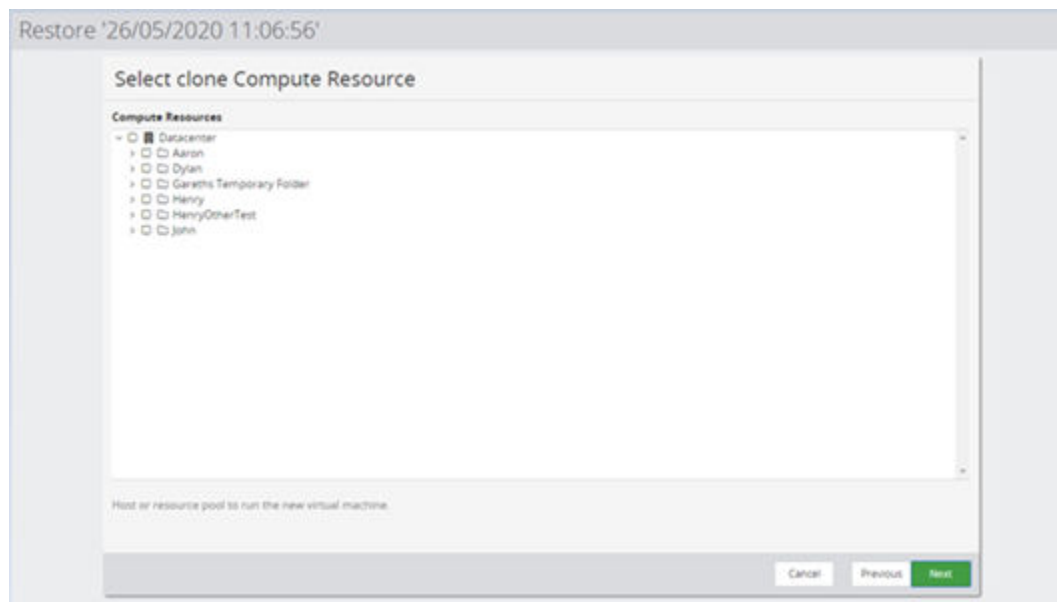


Figure 466 Restore VMware Host Based Backup Wizard - Select clone Compute Resource

| Control | Description |
|-------------------|--|
| Compute Resources | Select the host, vApp or resource pool where the clones are to be located. |

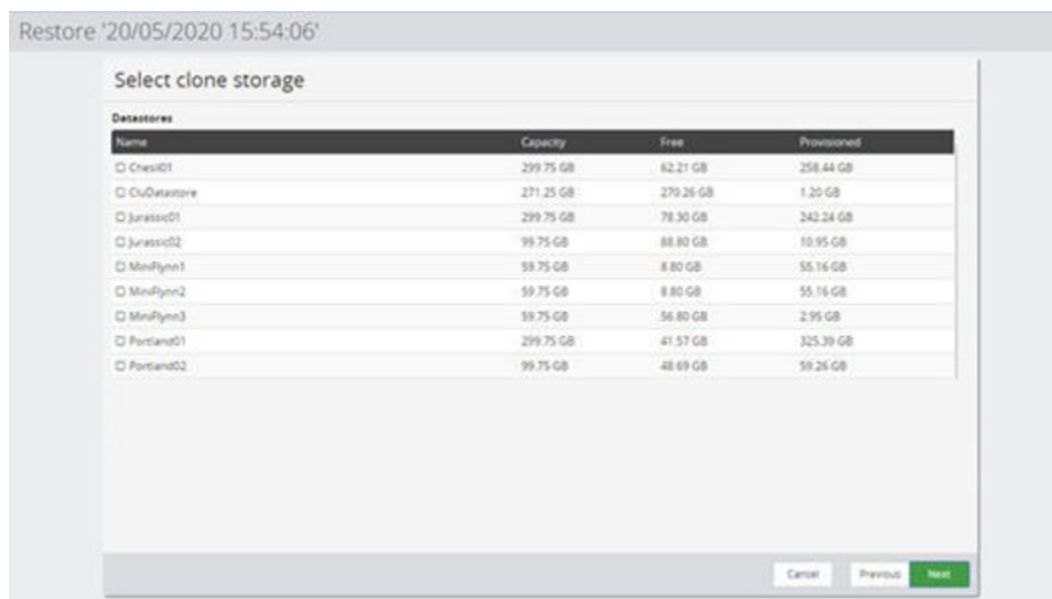


Figure 467 Restore VMware Host Based Backup Wizard - Select clone storage

| Control | Description |
|-----------|--|
| Datastore | Select the datastore where the clones are to be located. |

Restore '04/11/2020 09:35:01'

Select Virtual Machine options

Power State After Creation

☒ Powered off
☐ Powered on

Network Card Connection

☐ Connect network card

Cancel Previous Next

Figure 468 Restore VMware Host Based Backup Wizard - Select Virtual Machine options

| Control | Description |
|--------------------|--|
| Powered off | Select this option to leave the restored VM(s) in the powered off state after they are restored. |
| Powered on | Select this option to place the restored VM(s) in the powered on state after they are restored. |
| Network Card State | Select this option to connect the restored VM network card on the VM(s) after they are restored. |

Repository Snapshot Details (Restore) - File System

This page provides details of a File System Snapshot within a Repository and contains an inventory of all the files within that snapshot.



Note: The Storage UI contains a similar page ([Repository Snapshot Details \(Storage\) - File System \(on page 801\)](#)) with different data and more options.

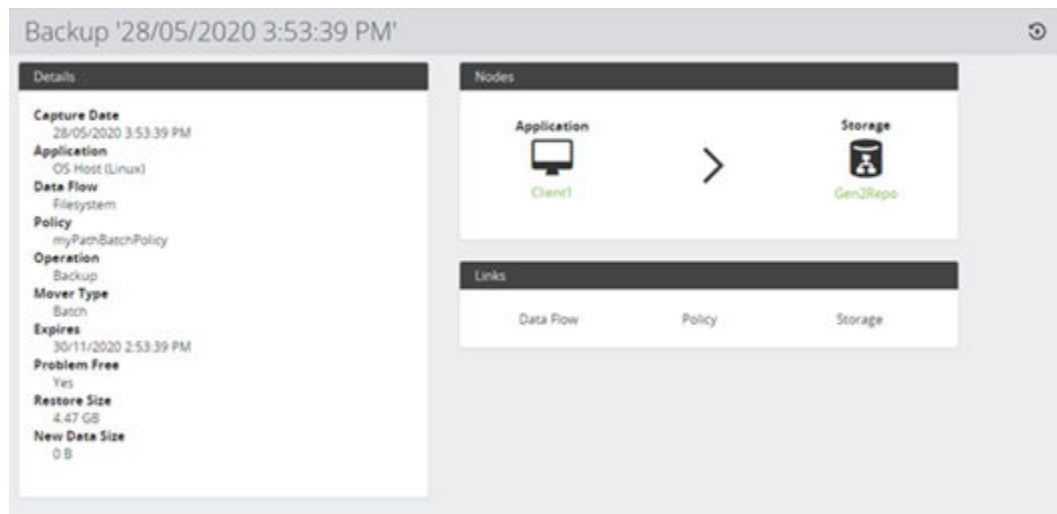



Figure 469 Repository Snapshot Details - File System

| Control | Description |
|---|---|
|  Restore | Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process. |
| Details | Provides summary information about the backup. |
| Nodes | Provides summary information about the source and destination node for the backup, with links to the relevant node screen. |
| Links | Provides links to the Data Flow, Policy and Storage screen relevant to this backup. |

Repository Snapshot Details (Restore) – Ops Center

This page provides details of an Ops Center Snapshot within a Repository and contains an inventory of all the files within that snapshot.



Note: The Storage UI contains a similar page ([Repository Snapshot Details \(Storage\) - File System \(on page 801\)](#)) with different data and more options.

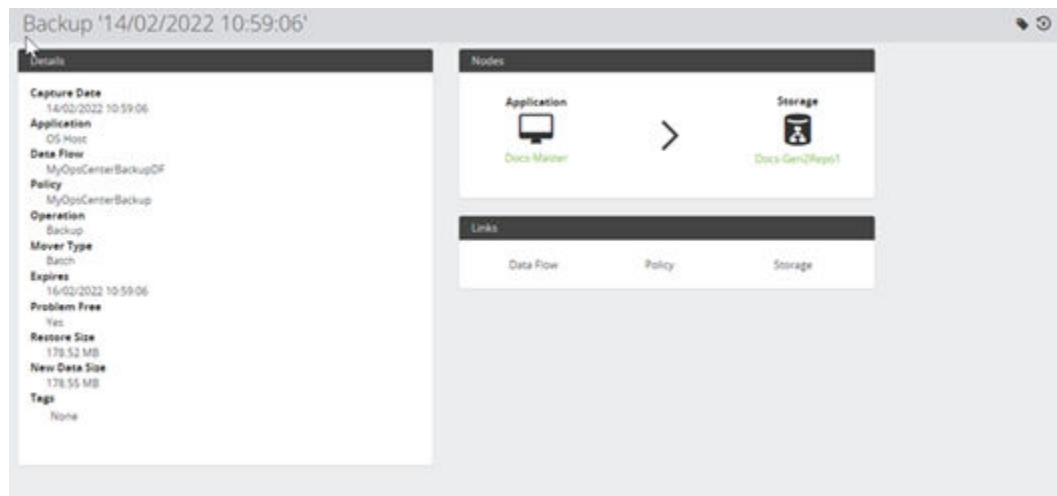



Figure 470 Repository Snapshot Details – Ops Center

| Control | Description |
|---|--|
|  Restore | Restores the snapshot. Opens the Restore Repository Snapshot Wizard – Ops Center (on page 728) to guide you through the process. |
| Details | Provides summary information about the backup. |
| Nodes | Provides summary information about the source and destination node for the backup, with links to the relevant node screen. |
| Links | Provides links to the Data Flow, Policy and Storage screen relevant to this backup. |

Repository Snapshot Details (Restore) - VMware

This page provides details of a VMware Snapshot within a Repository and contains an inventory of all the VMware files within that snapshot.



Note: The Storage UI contains a similar page ([Repository Snapshot Details \(Storage\) - VMware \(on page 803\)](#)) with different data and more options.

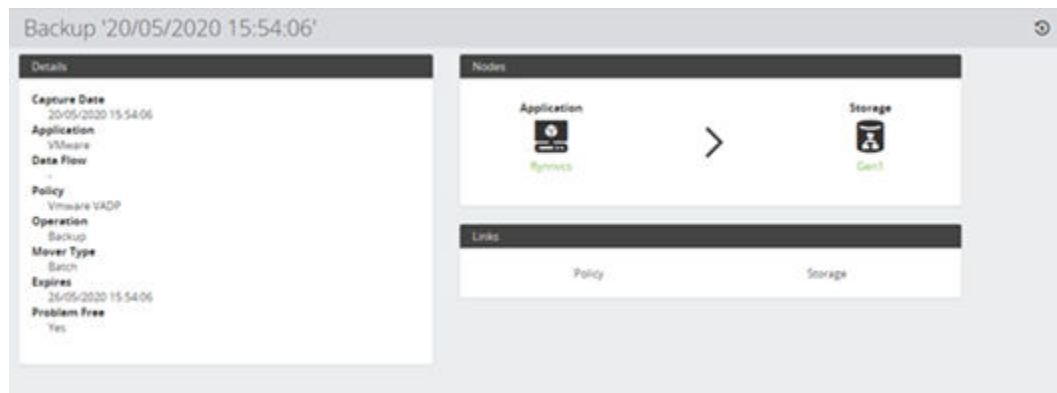



Figure 471 Repository Snapshot Details - VMware

| Control | Description |
|---|---|
|  Restore | Restores the snapshot. Opens the Restore from host based backup Wizard - VMware (on page 738) to guide you through the process. |
| Details | Provides summary information about the backup. |
| Nodes | Provides summary information about the source and destination node for the backup, with links to the relevant node screen. |
| Links | Provides links to the Data Flow, Policy and Storage screen relevant to this backup. |

HCP Snapshot Details (Restore) - File System

This page provides details of a File System Snapshot within an HCP store.



Note: The Storage UI contains a similar page ([Cloud Snapshot Details \(Storage\) - File System \(on page 813\)](#)) with different data and more

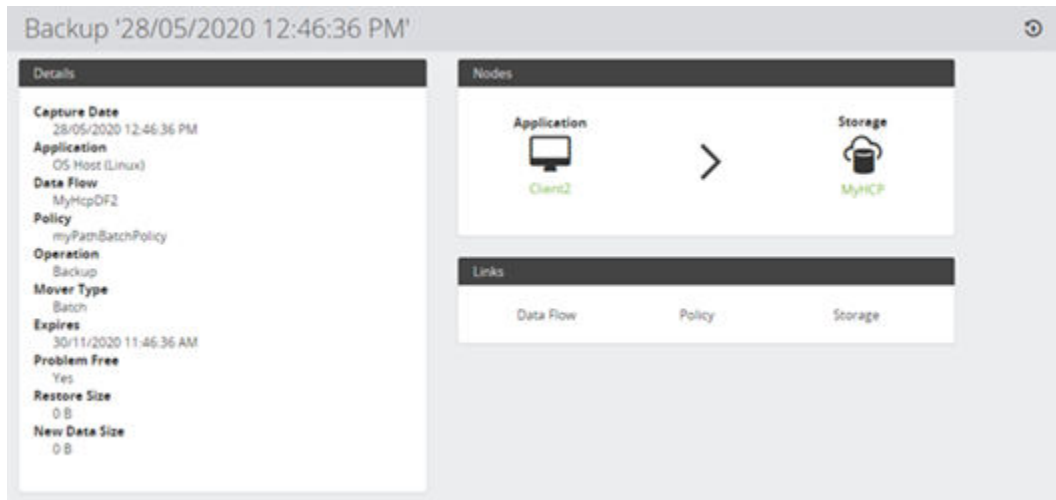



Figure 472 HCP Snapshot Details - File System

| Control | Description |
|---|--|
|  Restore | Restores the snapshot. Opens the Restore HCP Snapshot Wizard - File System (on page 730) to guide you through the process. |
| Details | Provides summary information about the backup. |
| Nodes | Provides summary information about the source and destination node for the backup, with links to the relevant node screen. |
| Links | Provides links to the Data Flow, Policy and Storage screen relevant to this backup. |

Amazon S3 / HCP / HCP Cloud Scale Snapshot Details (Restore) - File System

This page provides details of a File System Snapshot within an S3 store.



Note: The Storage UI contains a similar page ([Cloud Snapshot Details \(Storage\) - File System](#) (on page 813)) with different data and more.

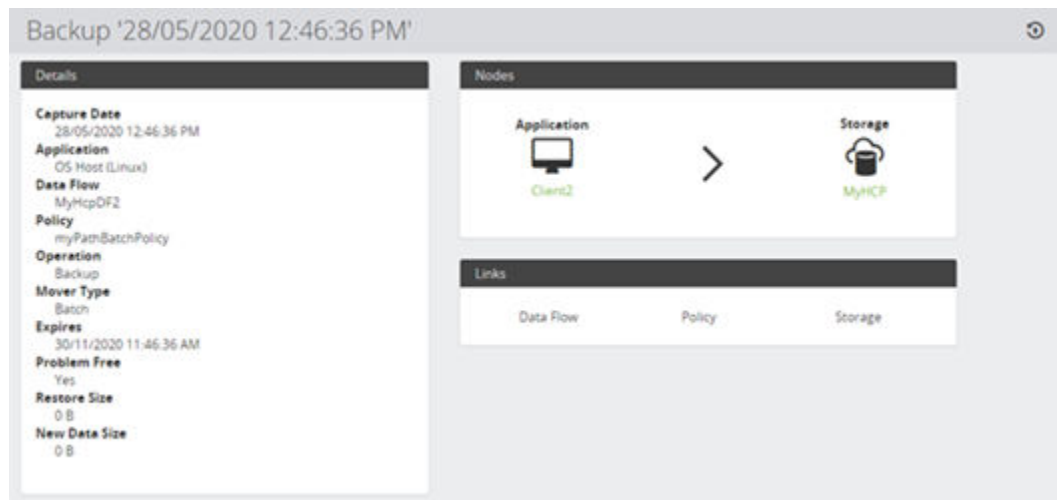



Figure 473 S3 Snapshot Details - File System

| Control | Description |
|---|--|
|  Restore | Restores the snapshot. Opens the Restore Amazon S3 / HCP Cloud Scale Snapshot Wizard - File System (on page 734) to guide you through the process. |
| Details | Provides summary information about the backup. |
| Nodes | Provides summary information about the source and destination node for the backup, with links to the relevant node screen. |
| Links | Provides links to the Data Flow, Policy and Storage screen relevant to this backup. |

Schedules UI Reference

This section describes the Schedules UI, accessed via the [Navigation Sidebar](#) (on page 283).

For further information, refer to:

- [Schedule Concepts](#) (on page 103)
- [Schedule Tasks](#) (on page 272)

Schedules Inventory

This inventory lists all defined Schedules. Schedules are created to specify when backup operations should and should not occur.

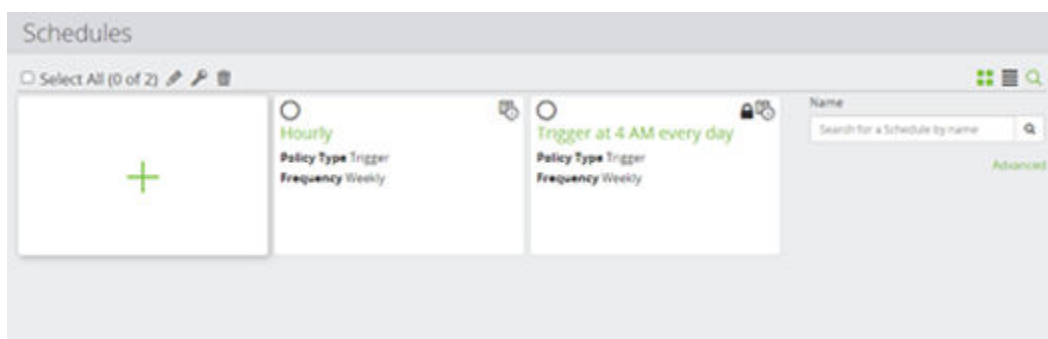







Figure 474 Schedules Inventory

| Control | Description |
|--|--|
|  Edit | Edits an existing schedule in the inventory. The Schedule Wizard (on page 749) is launched to enable the schedule's attributes to be changed. |
|  Edit Permissions | Edits an existing schedule's access permissions. The Access Control Permissions Inventory (on page 341) is launched to enable the schedule's access permissions to be changed. |
|  Delete | Enabled only when one or more Schedule is selected. Deletes the selected item(s) from the inventory. |
|  Add | Creates a new Schedule. The Schedule Wizard (on page 749) is launched to guide you through the process. |
|  Schedule(s) | Any number of user defined Schedules can be created. These are displayed in the inventory. Schedules should be defined to determine when operations should occur. The Schedule Details (on page 755) is displayed to enable the schedule to be viewed and edited. The schedule <i>Trigger at 4 AM every day</i> is built in and cannot be modified. |
| Filter on Schedule Name | Filters the displayed results based on the name. |

Schedule Wizard

This wizard is launched when a new Schedule is added to the Schedule Inventory. It shows Schedule elements and allows them to be created and edited.

Figure 475 Schedule Wizard - Specify name and description

| Control | Description |
|-------------|---|
| Name | Enter an identifying name for the schedule. |
| Description | Optional. Enter a short description of the schedule. This description can be viewed when selecting schedules for use in policies etc. |

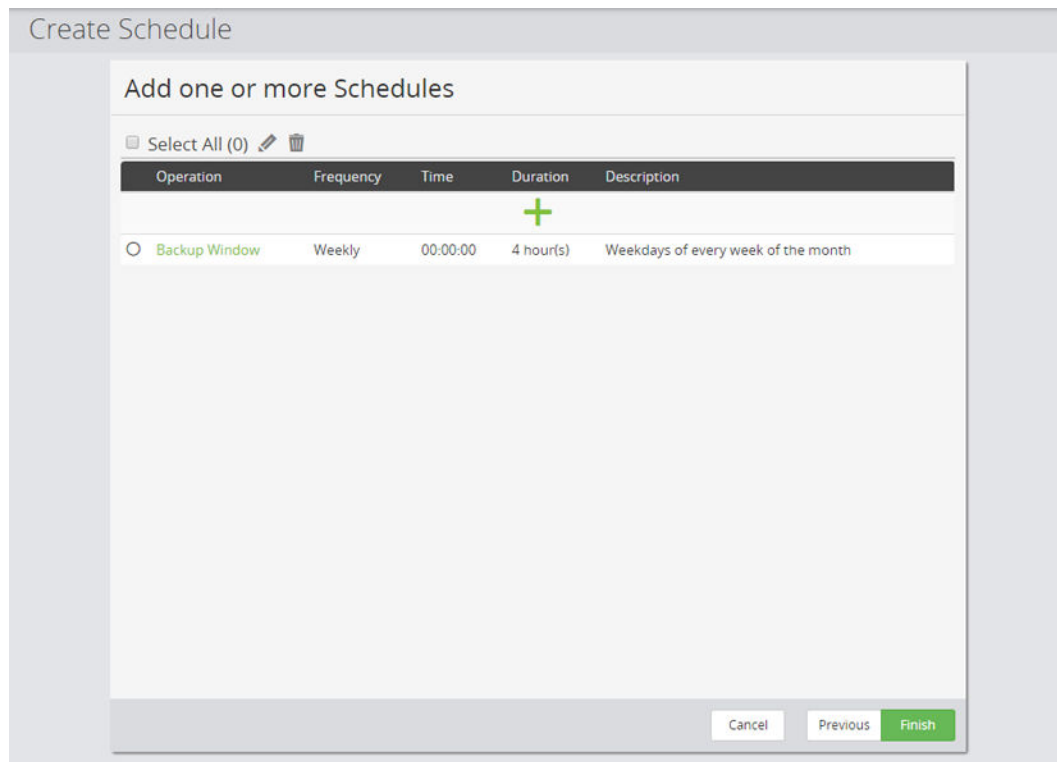





Figure 476 Schedule Wizard - Add one or more Schedule Items

| Control | Description |
|--|---|
|  Edit | Edits an existing schedule item in the list. The Schedule Item Wizard (on page 751) is launched to enable the schedule item's attributes to be changed. |
|  Delete | Enabled only when one or more Schedule items are selected. Deletes the selected Schedule item(s) from the list. |
|  Add | Creates a new Schedule item. A new schedule does not initially have any items so they must be created. The Schedule Item Wizard (on page 751) is launched to guide you through the process. |
| Schedule Element(s) | Any number of user defined Schedules items can be created. These are displayed in the table. Schedule items are combined to generate the required behaviour. The Schedule Item Wizard (on page 751) is displayed to enable the schedule item to be viewed and edited. |

Schedule Item Wizard

This wizard is launched when a new Schedule item is added to a Schedule. It shows the Schedule item options and allows them to be configured.

Create Schedule

Select Schedule item type

Type

- ☒ **RPO Backup Window**
A backup event can only start within a backup window
- ☐ **Exclude Window**
A backup event can not be started within an exclude window
- ☐ **Trigger Time**
The time at which the backup event will be started

Cancel Discard Previous **Next**

Figure 477 Schedule Item Wizard - Item Type**Table 40**

| Control | Description |
|-------------------|--|
| RPO Backup Window | A backup event can only start during a backup window. By default, an implicit backup window is used that operates all day, every day. If a custom backup window element is created, then the default backup window is ignored. |
| Exclude Window | A backup event cannot start during an exclusion window. |
| Trigger Time | Similar to a backup window, except that it mandates that a backup event must occur at the specified time or date, unless it occurs during an exclude period. |

The schedule item attributes are set by first selecting the corresponding operation type to display the corresponding wizard page:

- Weekly
- Monthly

Create Schedule

Weekly (selected) | Monthly

Weekly Schedule Options

Days

☐ Select All
☒ Monday ☒ Tuesday ☒ Wednesday ☒ Thursday ☒ Friday ☐ Saturday
☐ Sunday

Weeks

☒ Select All
☒ First ☒ Second ☒ Third ☒ Fourth ☒ Fifth ☒ Last

Time

☐ All Day ☒ Scheduled Time

Start Time

00 : 00 HH:MM
Schedule times are applied locally to the node on which the schedule is running.

Duration

0 Hours 0 Minutes

Cancel Discard Previous **Apply**

Figure 478 Schedule Item Wizard - Weekly

Weekly – As shown above, Weekly items are used to define schedules based on the days of the week. For example, you can create a schedule element that only occurs on weekends, or that never occurs on weekdays of the last week of the month. At least one day must be specified, while weeks are optional (every week is assumed if none are selected).



Note: The weeks listed do not refer to calendar weeks. The First Week of a month always includes the days from the 1st until the 7th, the Second Week includes the days from the 8th to the 14th, and so on. The Last week always refers to the 7 days prior to (and including) the last day of the month.

| Control | Description |
|------------|---|
| Days | Select one or more days of the week. |
| Weeks | Select one or more weeks of the month. |
| Time | Can be one of: <ul style="list-style-type: none"> All Day - operation can happen at any time of day. This option is disabled for the <i>Trigger</i> schedule item type. Scheduled Time - Set a start time and duration window within which the operation can or cannot occur. |
| Start Time | Only enabled once Scheduled Time has been selected. Select the time in HH:MM format for the operation to start. |

| Control | Description |
|----------|--|
| Duration | Only enabled once Scheduled Time has been selected. Enter the duration in HH:MM format for the window in which the operation is allowed to or prevented from starting. |

Create Schedule

Weekly

Monthly

Monthly Schedule Options

Days of Month

☐ Select All

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18

☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27

☐ 28 ☐ 29 ☐ 30 ☐ 31 ☐ Last

Time

☒ All Day ☐ Scheduled Time

Start Time

00 : 00 HH:MM

Schedule times are applied locally to the node on which the schedule is running.

Duration

0 Hours 0 Minutes

Cancel Discard Previous Apply

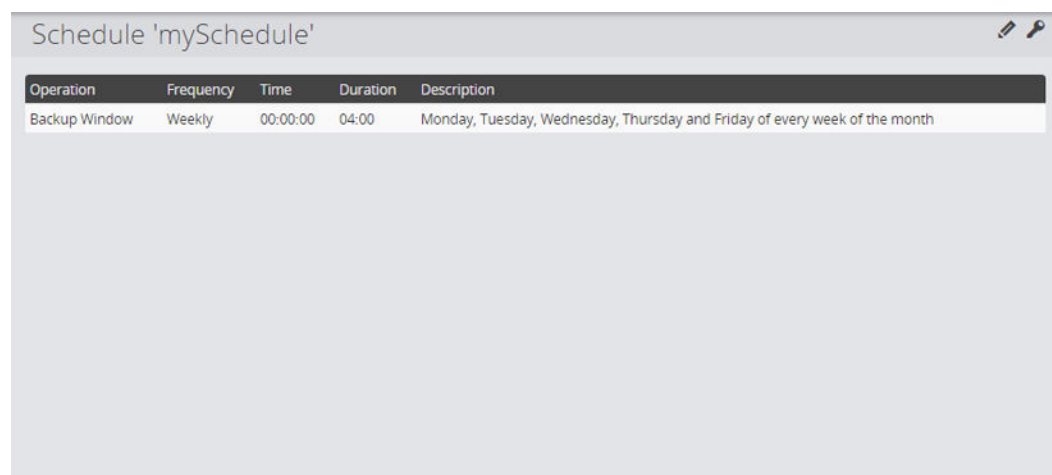
Figure 479 Schedule Item Wizard - Monthly

Monthly – As shown above, Monthly elements are used to define schedules based on days of the month. A monthly schedule element is applied on the same day or days each month. For instance, an element could be defined that triggers a backup on the last day of the month, or an element could be set to prevent backups from occurring on even numbered days. At least one day must be selected in order for a Monthly element to be valid. If the month in question does not contain the selected day (example: 29th Feb in a non-leap year) then the schedule element will not be applied.

| Control | Description |
|--------------|---|
| Day of Month | Can be one of: <ul style="list-style-type: none"> Select All - Selects all date options 1 .. 31 - Select one or more individual days of the month. Last - Selects the last day of the month. |



| Control | Description |
|------------|--|
| Time | Can be one of: <ul style="list-style-type: none"> All Day - operation can happen at any time of day. This option is disabled for the <i>Trigger</i> schedule item type. Scheduled Time - Set a start time and duration for the operation to occur. |
| Start Time | Only enabled once Scheduled Time has been selected. Select the time in HH:MM format for the operation to start. |
| Duration | Only enabled once Scheduled Time has been selected. Enter the duration in HH:MM format for the window in which the operation is allowed to start. |

Schedule Details



| Schedule 'mySchedule' | | | | |
|-----------------------|-----------|----------|----------|--|
| Operation | Frequency | Time | Duration | Description |
| Backup Window | Weekly | 00:00:00 | 04:00 | Monday, Tuesday, Wednesday, Thursday and Friday of every week of the month |

Figure 480 Schedule Details

| Control | Description |
|---|---|
|  Edit | Launches the Schedule Wizard (on page 749) to enable you to view and edit the schedule. |
|  Permissions | Opens the Access Control Permissions Inventory (on page 341) to allow you to view and edit the permissions for this schedule. |

Storage UI Reference

This section describes the Storage UI, accessed via the [Main Banner \(on page 278\)](#).

For further information, refer to:

- [Storage Concepts \(on page 115\)](#)
- [Storage Tasks \(on page 273\)](#)

Storage Inventory

This inventory contains storage information relating to all available storage nodes:

- Generation 1 Repository
- Generation 2 Repository
- Hitachi Block physical and logical storage devices
- HCP Storage Node
- Amazon S3 Storage Node
- HCP Cloud Scale Storage Node

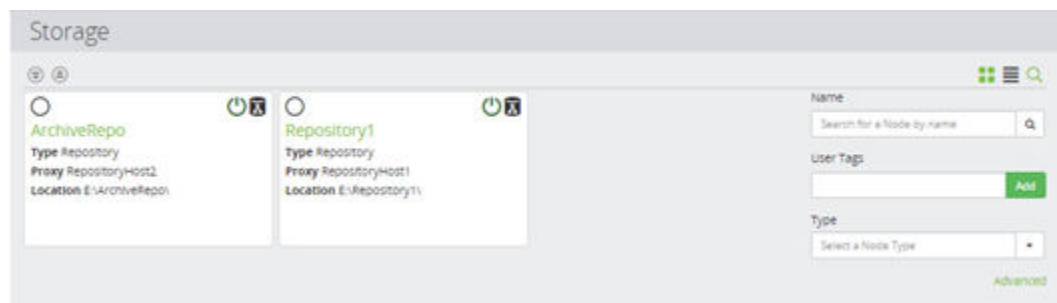


Figure 481 Storage Inventory

| Control | Description |
|---------------------|---|
| Storage Node(s) | Opens one of the following pages depending on the storage type: <ul style="list-style-type: none"> ▪ Hitachi Block Device Details (on page 757) ▪ Generation 1 Repository Details (on page 795) ▪ Generation 2 Repository Details (on page 805) ▪ Cloud Storage Details (on page 810) |
| Filter on Name | Filters the displayed results based on Node Name. |
| Filter on User Tags | Filters the displayed results based on Tags. |


| Control | Description |
|----------------|--|
| Filter on Type | <p>Filters the displayed results based on Node Type:</p> <ul style="list-style-type: none"> Amazon S3 HCP Cloud Scale Hitachi Block Device Hitachi Content Platform Generation 2 Hitachi Logical Block Device Hitachi Block Device Repository Generation 1 Repository Generation 2 |







Hitachi Block Device Details









This page displays the details of a Block Storage device and enables monitoring of its activities, state, and the snapshots and replications stored within it.



Figure 482 Hitachi Block Device Details

| Control | Description |
|---|--|
|  Refresh | Refreshes the Host Groups, Journals, Pools and Logical Devices data. |

| Control | Description |
|---|--|
| |  Note: A refresh must be performed to update information held on the storage array. |
|  Advanced Settings | Opens the Hitachi Block Device Advanced Settings Dialog (on page 790) to allow the advanced settings of the storage system to be modified. |
| Logs | Indicates the number of unacknowledged error logs in red. If there are no errors then a green tick is displayed instead. Numbers at the bottom show the unacknowledged errors and warnings. Opens the Logs Inventory (on page 448) . |
| Jobs | Indicates the number of failed jobs in red. If there are no failed jobs then a green tick is displayed instead. Numbers at the bottom show active and paused jobs. Opens the Jobs Inventory (on page 441) . |
| Details | Indicates the following: <ul style="list-style-type: none"> Status - online/offline Proxy - the node that acts as the ISM for the Block device. User Tags – Tags associated with the Block device. |
|  View Node Details | Takes you to the equivalent Node Management Node Details (on page 574) . |
| Configuration | Shows the configuration of the Hitachi Block Device. |
| Object Cache | Shows last updated date and time for Pools, Journals, Resource Groups, Quora, Host Groups, Remote Path Groups, and Logical Devices of Hitachi Block Device. For details on the cache refreshing see Hitachi Block Device Scheduled Cache Refresh (on page 791) <div>  Note: This screen in the UI does not automatically refresh. While the values are refreshed on a schedule it is necessary to reload the page in the browser to get an up to date view of the values. </div> |
|  Refresh | Duplicates the Refresh button at the top of the page. |
|  Host Groups | Indicates the number of Host Groups on the Device visible to the CCI user identified when the Block storage node was configured. If Host Groups exist in a resource group to which the user does not have access then they will not be displayed here. Click on the icon to open the Hitachi Block Host Groups Inventory (on page 759) . |

| Control | Description |
|---|--|
|  Journals | Indicates the number of Journals on the Device visible to the CCI user identified when the Block storage node was configured. Click on the icon to open the Hitachi Block Journals Inventory (on page 761) |
|  Pools | Indicates the number of Pools (Total, Snapshot and Dynamic) on the Device. Click on the icon to open the Hitachi Block Pools Inventory (on page 764) |
|  Logical Devices | Indicates the number of Logical Devices on the Device. If Logical Devices exist in a resource group to which the user does not have access then they will not be displayed here. Click on the icon to open the Hitachi Block Logical Devices Inventory (on page 766) |
|  Quorums | Indicates the number of Quorums on the device. Click on the icon to open the Hitachi Block Quorums Inventory (on page 792) . |
|  Remote Path Groups | Indicates the number of Remote Path Groups on the device. Click on the icon to open the Hitachi Block Remote Path Groups Inventory (on page 788) |
|  Snapshots | Indicates the number of Snapshots on the Device that have been created by Protector. Click on the icon to open the Hitachi Block Snapshots Inventory (on page 767) |
|  Replications and Clones | Indicates the number of Replications on the Device that have been created or adopted by Protector. Click on the icon to open the Hitachi Block Replications Inventory (on page 777) |
|  Resource Groups | Indicates the number of Resource Groups on the device. Click on the icon to open the Hitachi Block Resource Groups Inventory (on page 793) . |

Hitachi Block Host Groups Inventory

This inventory lists all Host Groups defined on a Hitachi Block storage device.

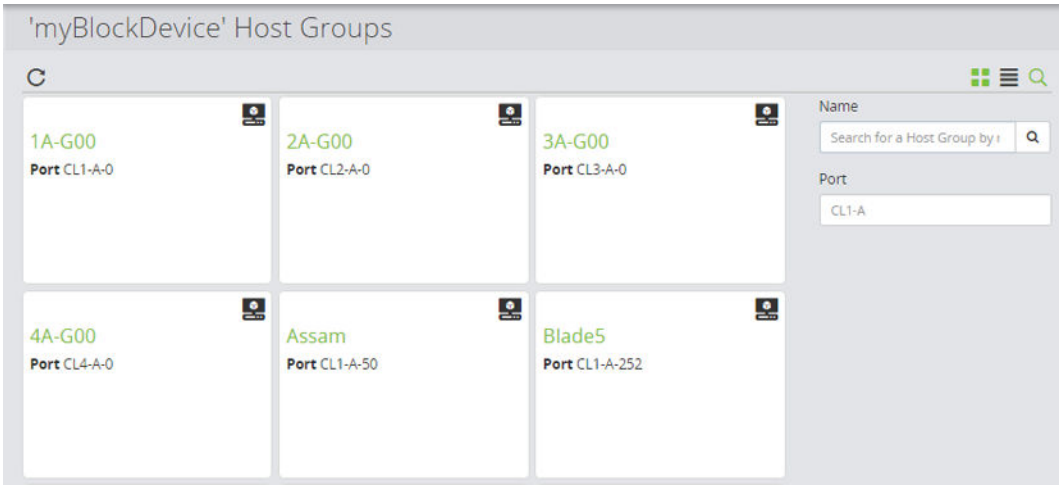





Figure 483 Host Groups Inventory

| Control | Description |
|---|---|
|  Refresh | Refreshes the displayed inventory. <div> Caution: Host Group details are only refreshed when refreshed manually. To ensure the latest information is displayed, this page must be manually refreshed periodically.</div> |
|  Host Group(s) | Click on a Host Group to open the Hitachi Block Host Group Details (on page 760) . |
| Filter on Name | Filters the displayed results based on the Host Group Name. |
| Filter on Port | Filters the displayed results based on the Port. |

Hitachi Block Host Group Details

This page shows the details of a Host Group on a Hitachi Block storage device.



Figure 484 Host Group Details

| Control | Description |
|---------|--------------------------------|
| Summary | Summarises Host Group details. |

Hitachi Block Journals Inventory

This inventory lists all Journals on a Hitachi Block storage device.



Note: The Journal inventory is not automatically updated and should be periodically manually refreshed to ensure the latest information is available.

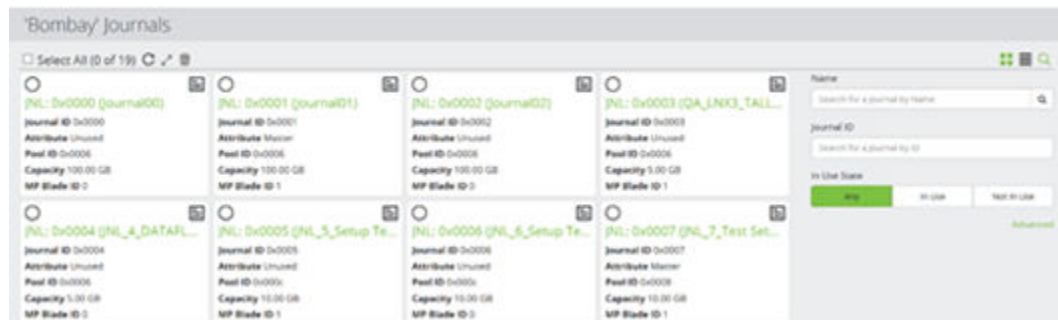




Figure 485 Journals Inventory

| Control | Description |
|---------|---|
| Refresh | Refreshes the displayed inventory. |
| Expand | Opens the Figure 486 Hitachi Block Journal Expansion Dialog (on page 762) to enable the capacity of the selected journal to be increased. |

| Control | Description |
|--|---|
|  Delete | Deletes the selected journal(s) from the storage system. A confirmation dialog opens to confirm the action. |
|  Journal(s) | Click on a Journal to open the Hitachi Block Journal Details (on page 762) . |
| Filter Journal ID | Filters the displayed results based on the Journal ID. |
| Filter on Use State | Filters the displayed results based on the use state of the Journal |



Expand Journal 'JNL: 0x0000 (Journal00)'

Please specify a new size for this journal.

Current size: 100.00 GB

New Journal Size

GB

New journal size must be greater than the current journal size.

Cancel OK

Figure 486 Hitachi Block Journal Expansion Dialog

| Control | Description |
|------------------|--|
| New Journal Size | Enter a new size for the journal. The new size must be larger than the current size. |

Hitachi Block Journal Details

This page shows the details of a Journal on a Hitachi Block storage device.

'Bombay' Journal '0'

Summary

Journal ID

0x0000

Name

JNL: 0x0000 (journal00)

Attribute

Unused

Pool ID

0x0006

Capacity

100.00 GB

Size of Journal Data Area

96.92 GB

Usage

0%

Usage Status

✓ journal usage is within the defined acceptable range

MP Blade ID

0

Inflow Control Enabled

No

Cache Mode Enabled

Yes

Data Overflow Watch

0 seconds

Path Watch Time Transfer Enabled

No

Path Blockade Watch Timer

5 minutes

Copy Pace

Low

Transfer Speed

256 Mbps

Type

Open



Remote Command Device Status

Not allocated

Logical Devices

| ID | Name | Capacity |
|-----|-----------|-----------|
| 200 | journal00 | 100.00 GB |

Figure 487 Journal Details

| Control | Description |
|--|---|
|  Expand | Opens the Figure 486 Hitachi Block Journal Expansion Dialog (on page 762) to enable the capacity of the selected journal to be increased. |
|  Delete | Deletes the selected journal(s) from the storage system. A confirmation dialog opens to confirm the action. |
| Summary | Summarises the Journal details. |
| Logical Devices | Displays information on the Logical Devices for the Journal. |

Hitachi Block Pools Inventory

This inventory lists all Pools on a Hitachi Block storage device.



Caution:

Filling a Thin Image pool to capacity will invalidate all snapshot data contained within that pool. All snapshots in the pool will have to be deleted before snapshotting can be resumed.

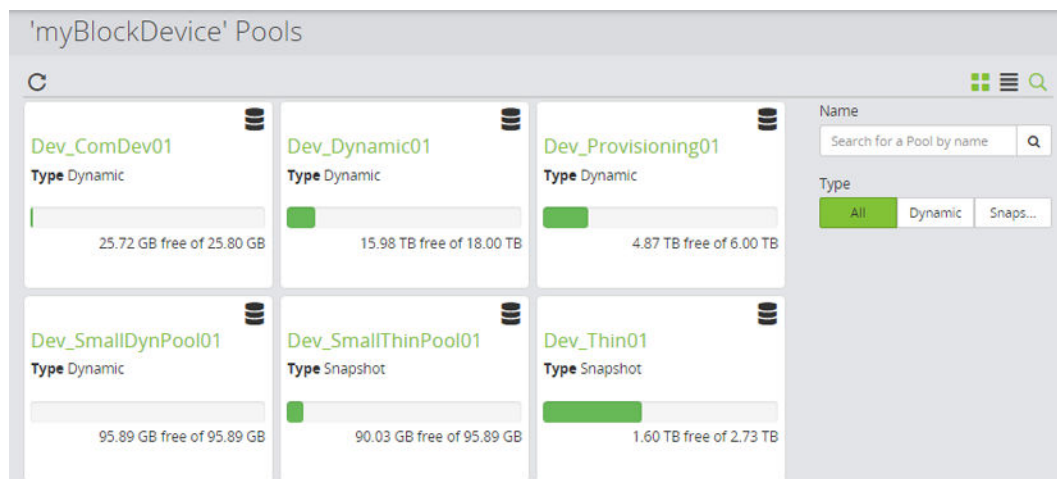






Figure 488 Pools Inventory

| Control | Description |
|---|--|
|  Refresh | Refreshes the displayed inventory.  Caution: Pool usage is only refreshed when refreshed manually. If these values are being used to monitor pool usage they must be manually refreshed periodically. |

| Control | Description |
|---|---|
|  Pool Tile(s) | <p>Click on a Pool name to open the Hitachi Block Pool Details (on page 765).</p> <p> Note: The pool capacity indicator bar changes colour when thresholds defined on and read from the storage array are crossed:</p> <ul style="list-style-type: none"> ▪ Green - indicates pool usage is within the <i>normal</i> range. ▪ Orange - indicates pool usage is at or above the <i>warning</i> level. The <i>warning</i> threshold defaults to 70%. ▪ Red - indicates pool usage is at or above the <i>depletion</i> level. The <i>depletion</i> threshold defaults to 80%. ⁽¹⁾ <p>(1) Thin Image pools only have a single threshold defined on the array. Protector transitions straight from the normal state to the depletion state.</p> <p>For dynamic pools containing replication S-VOLs, the replication will transition to an error state when the pool is full.</p> |
| Filter on Name | Filters the displayed results based on the Pool Name. |
| Filter on Type | Filters the displayed results based on the Pool Type: <ul style="list-style-type: none"> ▪ All ▪ Dynamic - Used to provision primary volumes, command devices and replications ▪ Snapshot - Used to provision snapshots |

Hitachi Block Pool Details

This page shows the details of a Pool on a Hitachi Block storage device.

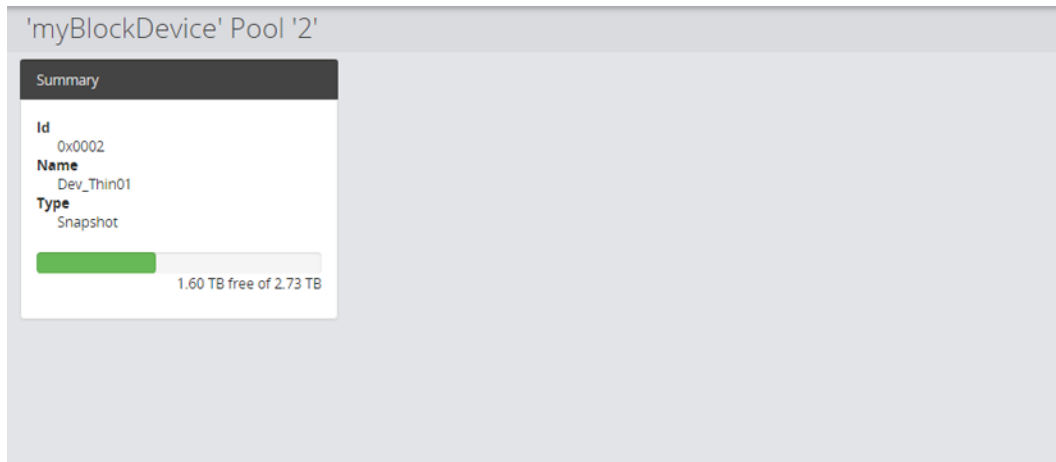


Figure 489 Pool Details

| Control | Description |
|---------|------------------------------|
| Summary | Summarises the Pool details. |

Hitachi Block Logical Devices Inventory

This inventory lists all Logical Devices on a Hitachi Block storage device.

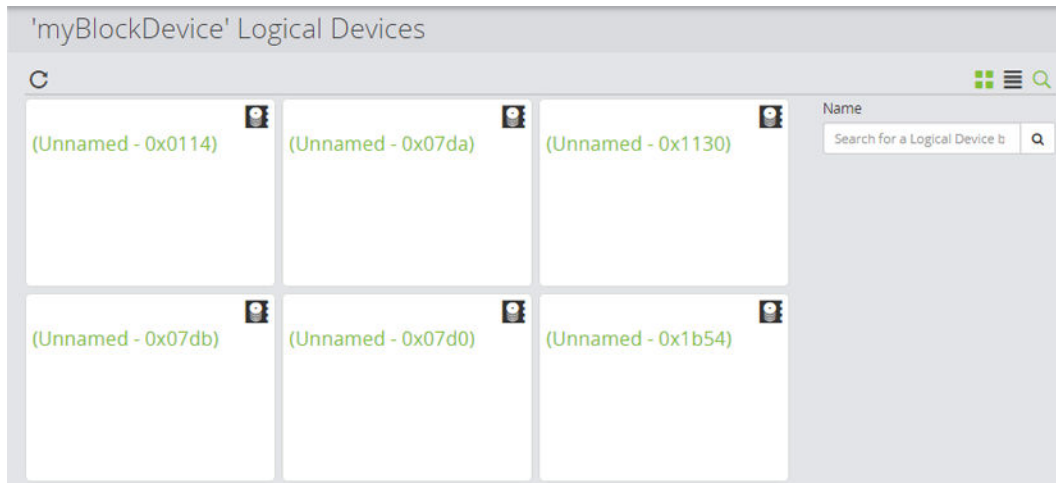





Figure 490 Logical Devices Inventory

| Control | Description |
|---|------------------------------------|
|  Refresh | Refreshes the displayed inventory. |

| Control | Description |
|---|--|
| |  Caution: Logical Device Inventory is only refreshed when refreshed manually. To ensure the latest information is displayed this page should be manually refreshed periodically. |
|  Logical Device(s) | Click on a Logical Device to open the Hitachi Block Logical Device Details (on page 767) . |
| Filter on Name | Filters the displayed results based on the Logical Device Name. |

Hitachi Block Logical Device Details

This page shows the details of a Logical Device on a Hitachi Block storage device.

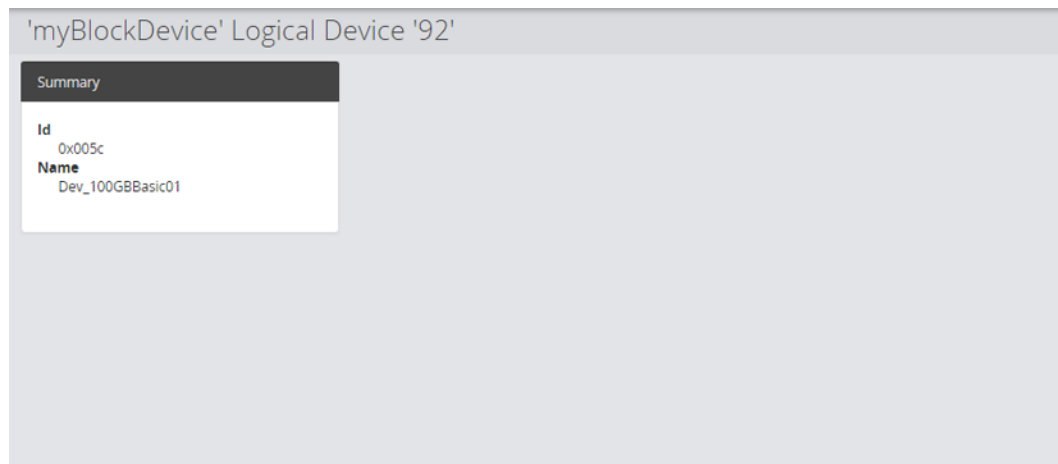


Figure 491 Logical Device Details

| Control | Description |
|---------|--|
| Summary | Summarises the Logical Device details. |

Hitachi Block Snapshots Inventory

This page provides an inventory of all the Snapshots stored on a Block Storage Device.

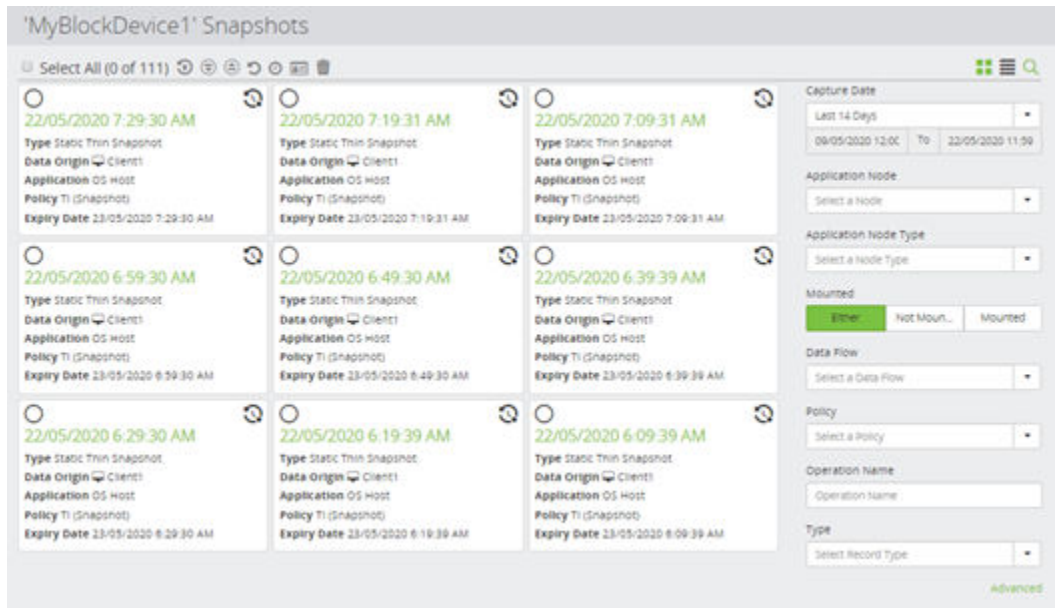













Figure 492 Hitachi Block Snapshots Inventory

| Control | Description |
|---|--|
|  Restore | Enabled only if one VMware Block snapshot is enabled. Opens the Hitachi Block VMware Snapshot Restore Wizard (on page 689) to guide you through restoring VM's from the snapshot Note: The restore operation may take several minutes to complete. |
|  Mount | Enabled only if one or more Snapshots are selected. Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the Snapshot.  Note: The mount operation can take several minutes to complete. |
|  Unmount | Enabled only if one mounted snapshot is selected. Unmounts the selected snapshot.  Note: The unmount operation can take several minutes to complete. |
|  Revert | Enabled only if one or more Snapshots are selected. Opens the Hitachi Block Revert Wizard (on page 716) to guide you through reverting the Snapshot. |
|  Set Expiry Date | Opens the Hitachi Block Change Snapshot Expiry Date Dialog (on page 773) to enable the expiry date of the selected snapshot(s) to be modified. |

| Control | Description |
|---|--|
|  Transfer RBAC Permissions | Allows RBAC ownership to be transferred from the current node to another node. Opens the Access Control Transfer Permissions Dialog (on page 344) . |
|  Delete | Enabled only if one or more Snapshots are selected. Deletes the snapshot from the pool. A confirmation dialog opens to confirm the action. If the snapshot record contains fully provisioned LDEVs then the user can view these details prior to deletion. |
|  Snapshot Date and Time | Click on the Snapshot's Date and Time to open the Hitachi Block Snapshot Details (Storage) (on page 769) . |
|  DRU Protection | Indicates that the snapshot has DRU protection applied. The protection can be removed (subject to lock duration) via the Hitachi Block Record Details (Storage) (on page 773) . |
| Filter on Capture Date | Filters the displayed results based on the Date Range specified in the Date Time Range Picker (on page 347) . |
| Filter on Application Node | Filters the displayed results based on source application node. |
| Filter on Application Node Type | Filters the displayed results based on source application node type |
| Filter on Mount status | Filters the displayed results based on mount status of the snapshot |
| Filter on Dataflow | Filters the displayed results based on Dataflow |
| Filter on Policy | Filters the displayed results based on the Policy. |
| Filter on Operation Name | Filters the displayed results based on mount status of the operation name |

Hitachi Block Snapshot Details (Storage)

This page shows the details of a Snapshot on a Hitachi Block storage device.

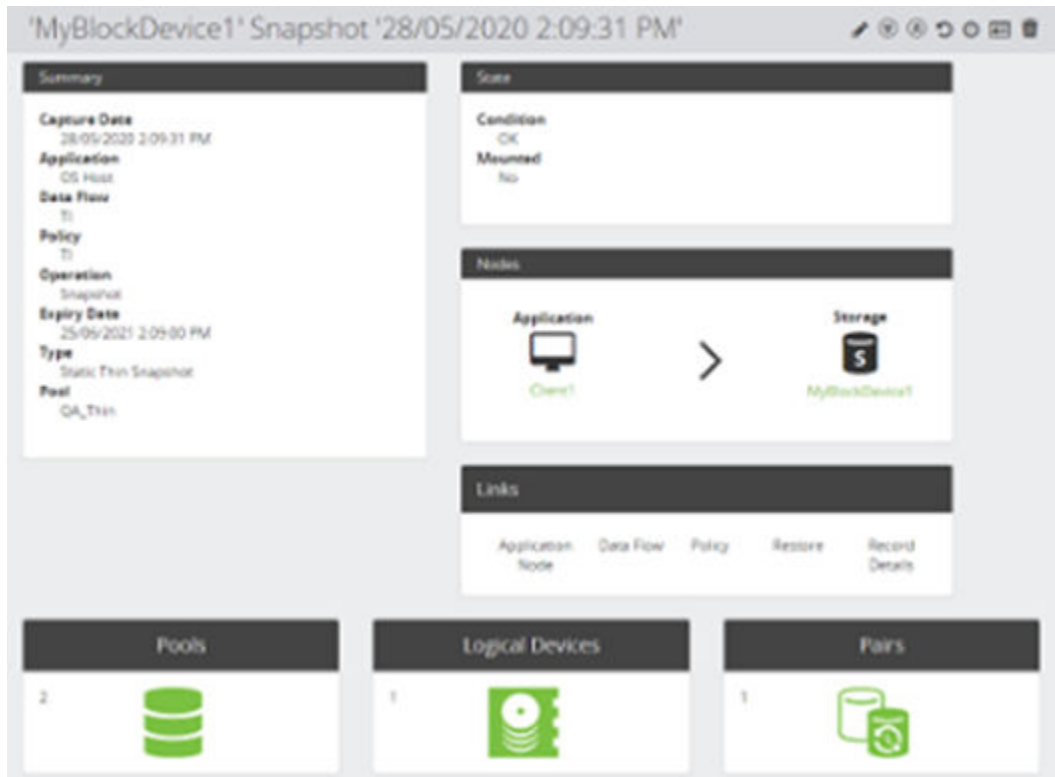













Figure 493 Snapshot Details

| Control | Description |
|--|--|
|  Rename Secondary LDEVs | Opens the Hitachi Block Rename Secondary LDEVs Dialog (on page 772) to enable renaming of LDEVs using a fixed string and/or substitution variables. |
|  Mount | Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the snapshot. Note: The mount operation can take several minutes to complete. |
|  Unmount | Unmounts the snapshot. The export is deleted. Note: The unmount operation can take several minutes to complete. |
|  Revert | Opens the Hitachi Block Revert Wizard (on page 716) to guide you through reverting the snapshot. |

| Control | Description |
|---|--|
|  Set Expiry Date | Opens the Hitachi Block Change Snapshot Expiry Date Dialog (on page 773) to enable the expiry date of the snapshot to be modified. |
|  Transfer RBAC Permissions | Allows RBAC ownership to be transferred from the current node to another node. Opens the Access Control Transfer Permissions Dialog (on page 344) . |
|  Remove DRU Protection | If the snapshot was created with DRU protection and the protection lock duration has expired, this will remove the protection. |
|  Delete | Deletes the snapshot from the pool. A confirmation dialog opens to confirm the action. |
| Summary | Identifies the hardware storage device, application, policy etc. Click on the policy name to open the Policy Details (on page 658) . |
| State | Indicates the status of the snapshot. |
| Links | <p>Provides links to the following pages that provide additional information about the snapshot:</p> <ul style="list-style-type: none"> ▪ Application Node - opens the Node Details (on page 574) for the source node from which the snapshot data set originated. ▪ Data Flow - opens the Data Flow Details (on page 439) where the snapshot operation is assigned. ▪ Policy - opens the Policy Details (on page 658) where the snapshot operation is defined. ▪ Replication - displayed only if the snapshot is of a replication's destination. Opens the Hitachi Block Replication Details (Storage) (on page 780) ▪ Record Details - opens the Hitachi Block Record Details (Storage) (on page 773) for the snapshot. ▪ Restore - opens the Hitachi Block Snapshot Details (Restore) (on page 721) for the snapshot. |
| Nodes | Shows the source and destination nodes involved in the snapshot. You can click on either node to go to their Node Details (on page 574) |
|  Pools | Opens Hitachi Block Snapshot - Pools (on page 774) , listing the pools used in this snapshot. |

| Control | Description |
|---|--|
|  Logical Devices | Opens Hitachi Block Snapshot - Logical Devices (on page 776) , listing the LDEVs in this snapshot. |
|  Pairs | Opens Hitachi Block Snapshot - Pairs (on page 775) , listing the pairs in this snapshot. |

Hitachi Block Rename Secondary LDEVs Dialog

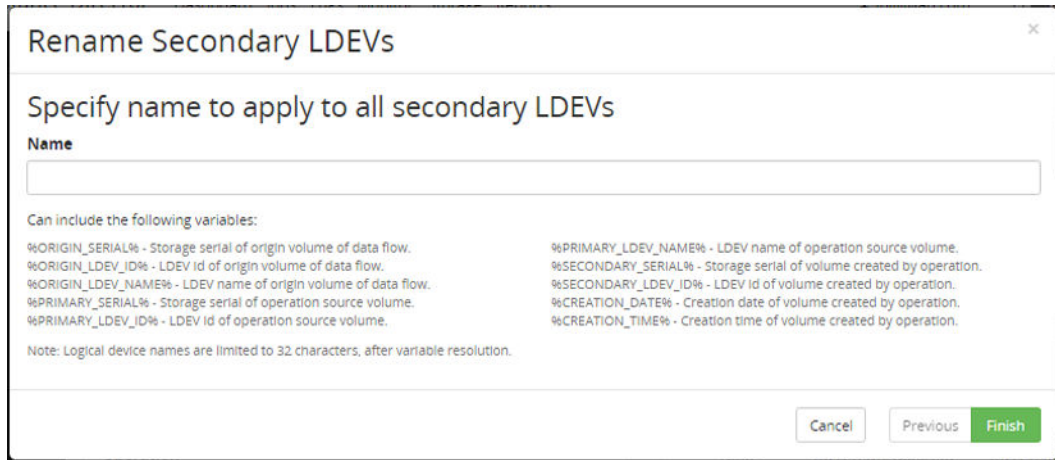




Figure 494 Rename Secondary LDEVs Dialog

| Control | Description |
|---------|---|
| Name | <p>Enter the string to be used to rename all secondary LDEVs for the given snapshot or replication. The name can consist of literal strings and/or any of the variables listed below the edit box.</p> <ul style="list-style-type: none"> ORIGIN refers to the left-most item in a cascaded data flow. PRIMARY refers to the item immediately to the left in a data flow. <p> Tip: Use the cut and paste tools in your browser to insert the required variable (including the surrounding % delimiters) to ensure the correct format and spelling.</p> <p>For example:</p> <p>Snap_%ORIGIN_SERIAL%_%ORIGIN_LDEV_ID%</p> <p>might result in each secondary LDEV being renamed:</p> <p>Snap_434525_00:3A:98</p> |

| Control | Description |
|---------|--|
| | <div>  Note: <ul style="list-style-type: none"> Logical device names are truncated to 32 characters, after variable resolution. When renaming intermediate secondaries in a cascaded replication, the names of downstream secondaries will not update until those replications are retriggered. </div> |

Hitachi Block Change Snapshot Expiry Date Dialog

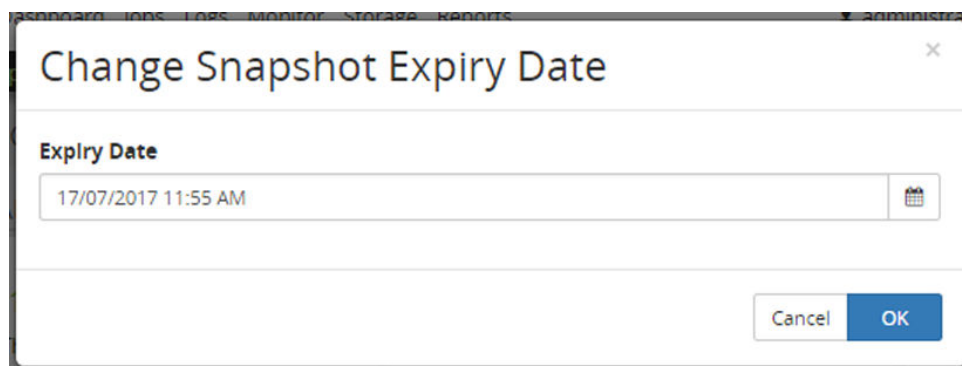


Figure 495 Change Snapshot Expiry Date Dialog

| Control | Description |
|-------------|--|
| Expiry Date | Enter the date and time that the snapshot will expire and be deleted. Opens the Date Time Picker (on page 346) . |

Hitachi Block Record Details (Storage)

This page shows the details of a record on a Hitachi Block storage device.

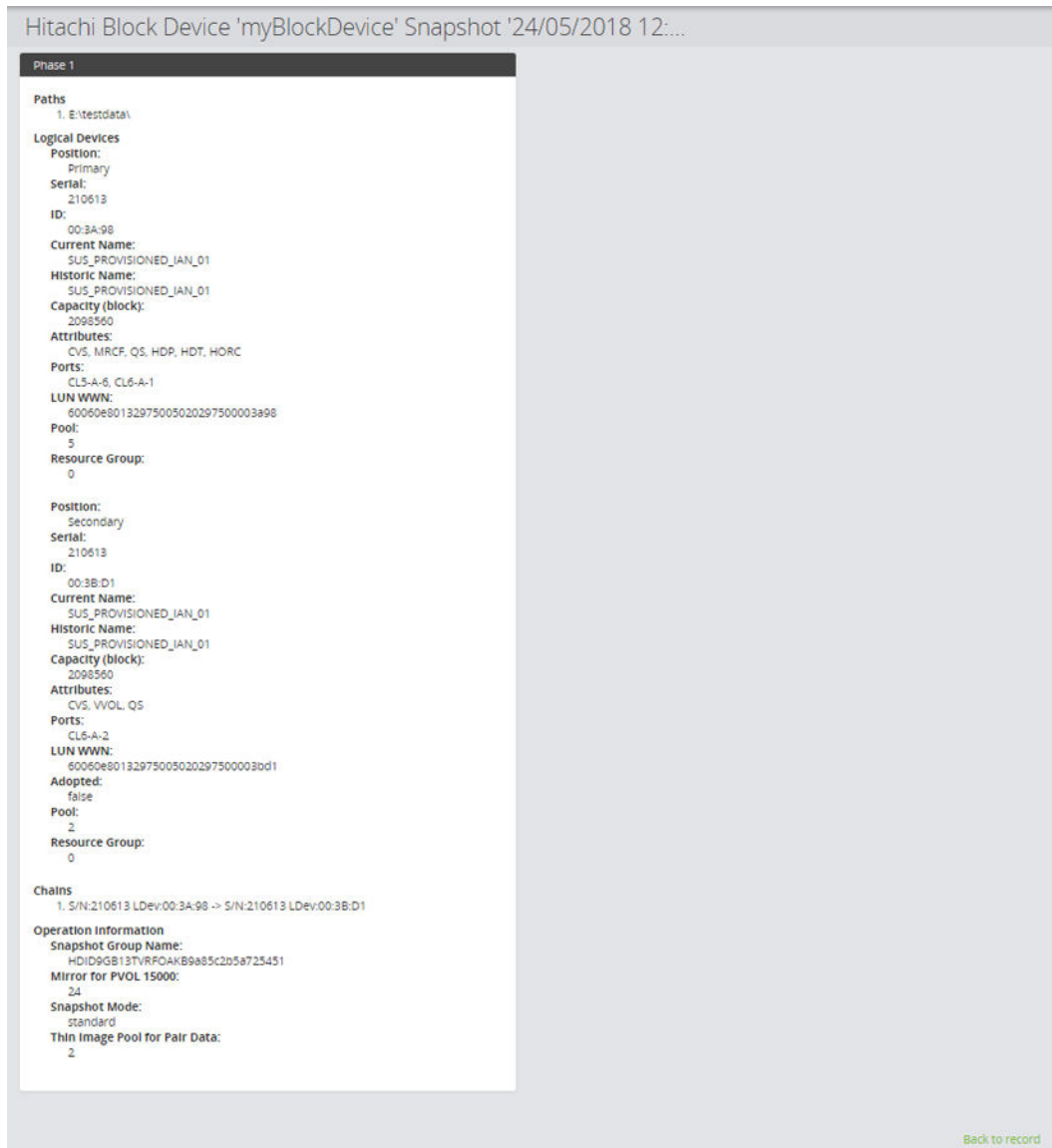


Figure 496 Record Details - Snapshot

| Control | Description |
|------------|---|
| Phase 1..n | <p>Identifies the paths, logical devices, chains and operation information for the snapshot.</p> <p>For policies having multiple data classifications or an application classification, the operation is performed in multiple phases. The record for each phase is displayed separately.</p> |

Hitachi Block Snapshot - Pools

Lists the pools used in a particular snapshot.

| Name | Storage | Type | Status | Capacity | Free | Total |
|--------|---------|------|--------|--------------------------------|------|-------|
| 0x0000 | 443-170 | - | - | Capacity status is unmonitored | | |
| 0x0000 | 443-170 | - | - | Capacity status is unmonitored | | |

Figure 497 Snapshot Pools

| Control | Description |
|---------------------|---|
| Snapshot Pools list | Each pool is listed, along with its attributes. |

Hitachi Block Snapshot - Pairs

Lists the pairs in a particular snapshot. This data is collected from [raidcom get snapshot] – for more information about certain context-sensitive values, please consult the relevant CCI documentation.

| ID | Storage | Status | Attribute | % | M | Mode | |
|--------|---------|--------|-----------|------|---|------|----------------------------|
| 0x1194 | 412402 | PAIR | P-VOL | 100% | - | - | → 0x1195 412402 PAIR S-VOL |
| 0x1195 | 412402 | PAIR | P-VOL | 100% | - | - | → 0x1197 412402 PAIR S-VOL |

Figure 498 Snapshot Pairs

| Control | Description |
|------------------------------|---|
| ID | Displays the ID of the LDEV. |
| Storage | Displays the serial number of the storage array. |
| Status | Not populated. |
| Attribute | Displays the status for this LDEV in this pair (eg COPY, PAIR, PSUS, SSUS). Not populated for Original Secondaries if the snapshot is floating and unmounted. |
| % | Not populated. |
| M | Not populated. |
| IO Mode | Not populated. |
| Direction (no column header) | Displays an arrow pointing from P-VOL to S-VOL. |

| Control | Description |
|---|---|
| Mirror Unit | Displays the mirror unit for the P-VOL of this pair. |
| Type | Displays the type of this pair (eg [TI]). |
| Fence Level | Not populated. |
| Quorum | Not populated. |
| Snapshot Pairs list | Each pair is listed, identifying the source LDEV's properties on the left and the destination LDEV's properties on the right, separated by an arrow indicating the direction of the snapshot. |
| Filter by Original Primary Volume Status | Filters the list by local volume status. |
| Filter by Original Primary Volume Attribute | Filters the list by local volume attribute. |
| Filter by Original Secondary Volume Status | Filters the list by remote volume status. |
| Filter by Original Secondary Volume Attribute | Filters the list by remote volume attribute. |

Hitachi Block Snapshot - Logical Devices

Lists the LDEVs used in a particular snapshot.





Figure 499 Snapshot Logical Devices

| Control | Description |
|---------------------|---|
| Snapshot LDEVs list | Each LDEV is listed, along with its attributes. |


Hitachi Block Replications Inventory

This page provides an inventory of all the Replications stored on a Block Storage node.



Caution: Deleting a replication record () or removing it from a host group (), when it is allocated to a host, may cause the host or an application running on it to fail.



Note: After a replication operation that created or adopted S-VOLs has been removed from a data flow, or the data flow has been deactivated, the corresponding record (marked ) should be torn down then deleted from the inventory once it is no longer required.

Records for replications in active data flows (marked *Refreshed Full Copy* or *Active Full Copy*) cannot be deleted.

If an S-VOL has been added to a host group, or has a LUN path allocated outside of Protector then it will not be deleted.

If an S-VOL has been renamed outside of Protector, then it will not be deleted because Protector will be unable to locate it.

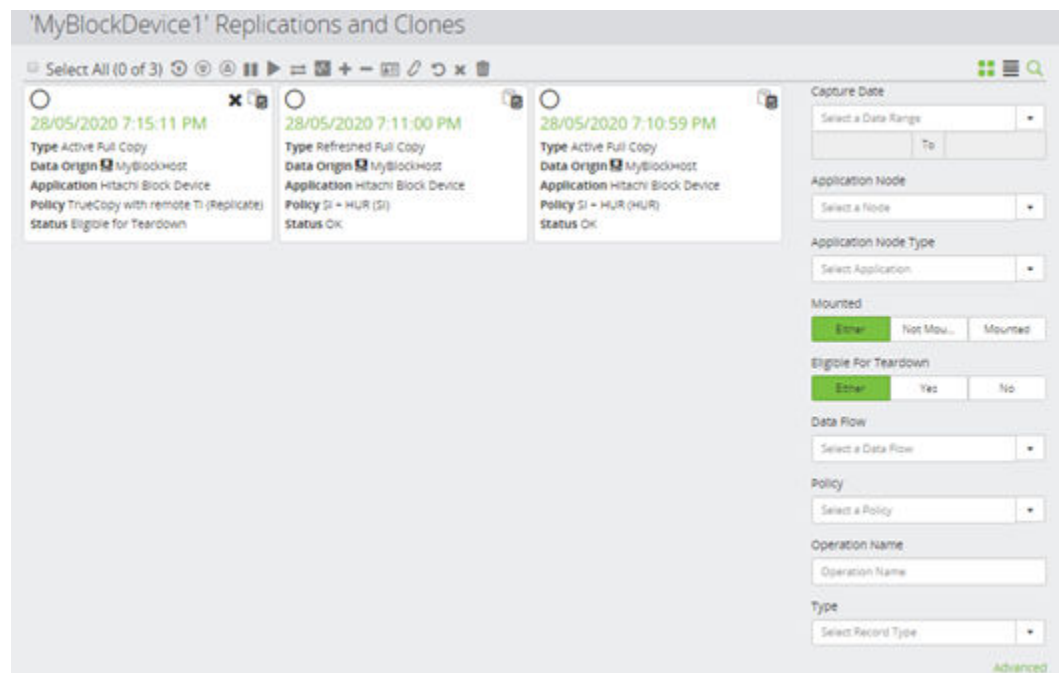






















Figure 500 Hitachi Block Replications Inventory

| Control | Description |
|---|---|
|  Restore | Enabled only if the a VMware Replication is selected. Opens the Hitachi Block VMware Snapshot Restore Wizard (on page 689). |

| Control | Description |
|---|--|
|  Mount | <p>Enabled only if one or more Replications are selected. Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the Replication.</p> <p> Note: The mount operation can take several minutes to complete.</p> |
|  Unmount | <p>Enabled only if one mounted replication is selected. Unmounts the selected replication.</p> <p> Note: The unmount operation can take several minutes to complete.</p> |
|  Pause | <p>Enabled only if one or more Replications are selected. Pauses the Replication.</p> |
|  Resume | <p>Enabled only if one or more Replications are selected. Resumes a paused Replication.</p> |
|  Swap | <p>Enabled only if one or more Replications are selected. Opens the Hitachi Block Replication Swap Wizard (on page 720) to guide you through swapping the Replication direction.</p> |
|  Unsuspend | <p>If a Swap operation cannot be completed due to a P-VOL or data link fault between the primary and secondary device, then the replication will enter the SSWS state (suspended for swapping) indicating that the swap is not yet complete. Unsuspend enables the replication process to be re-established once the cause has been rectified.</p> |
|  Add to additional Host Groups | <p>Enabled only if one or more replications are selected. Opens the Hitachi Block Add to Host Groups Dialog (on page 783) to enable LDEVs to be added to host groups in addition to the default <code>ProtectorProvisionedHostGroup</code> used by Protector.</p> <p> Note: A job is queued to perform the operation on the array and this may take some time to complete.</p> |
|  Remove from Host Groups | <p>Enabled only if one replication is selected. Opens the Hitachi Block Remove from Host Groups Dialog (on page 784) to enable LDEVs to be removed from host groups, including the default <code>ProtectorProvisionedHostGroup</code> used by Protector.</p> <p> Note: A job is queued to perform the operation on the array and this may take some time to complete.</p> |

| Control | Description |
|---|--|
|  Transfer RBAC Permissions | <p>Allows RBAC ownership to be transferred from the current node to another node. Opens the Access Control Transfer Permissions Dialog (on page 344).</p> |
|  Dissociate | <p>Enabled only if one or more Replications are selected. Dissociates a replication that was previously adopted by Protector. Removes the selected replication(s) from Protector including state information such as direction and mount location. The replication remains active on the hardware device(s).</p> <p>The word 'DISSOCIATE' must be entered before the command is executed.</p> <div>  Caution: Dissociating a replication removes all knowledge of the replication from Protector, including state information such as direction and mount location. </div> |
|  Teardown | <p>Enabled only if one or more Replications are selected. Initiates the teardown of the selected replications. The word 'TEARDOWN' must be entered before the command is executed.</p> |
|  Delete | <p>Enabled only if one or more Replications are selected. Deletes the replication record from Protector. The replication is also removed from the block storage device.</p> |
|  Replication Date and Time | <p>Click on the Replication's Date and Time to open the Hitachi Block Replication Details (Storage) (on page 780).</p> |
|  Eligible for Teardown | <p>Displayed on a replication tile next to the replication icon. Indicates that a replication is eligible for teardown.</p> |
| Filter on Capture Date Time | Filters the displayed results based on the replication Capture Date Time range specified in the Date Time Picker (on page 346) . |
| Filter on Application Node | Filters the displayed results based on the Source Application Node from which the replication is made. |
| Filter on Application Node Type | Filters the displayed results based on the Source Application Node Type. |
| Filter on Mounted status | Filters the displayed results based on the mount status |

| Control | Description |
|--|---|
| Filter on Eligible for Teardown Status | Filters the displayed results based on the Eligible for Teardown status |
| Filter on Data Flow | Filters the displayed results based on the Data Flow where the replication is defined |
| Filter on Policy | Filters the displayed results based on the Policy where the replication is defined. |
| Filter on Operation Name | Filters the displayed results based on the operation name defined within the policy. |
| Filter on Type | Filters the displayed results based on the replication type. |

Hitachi Block Replication Details (Storage)

This page shows the details of a Replication on a Hitachi Block storage device.



Note: Replication records must be manually removed here after they have been removed from the data flow. Records for replications currently in an active data flow cannot be torn down or deleted.

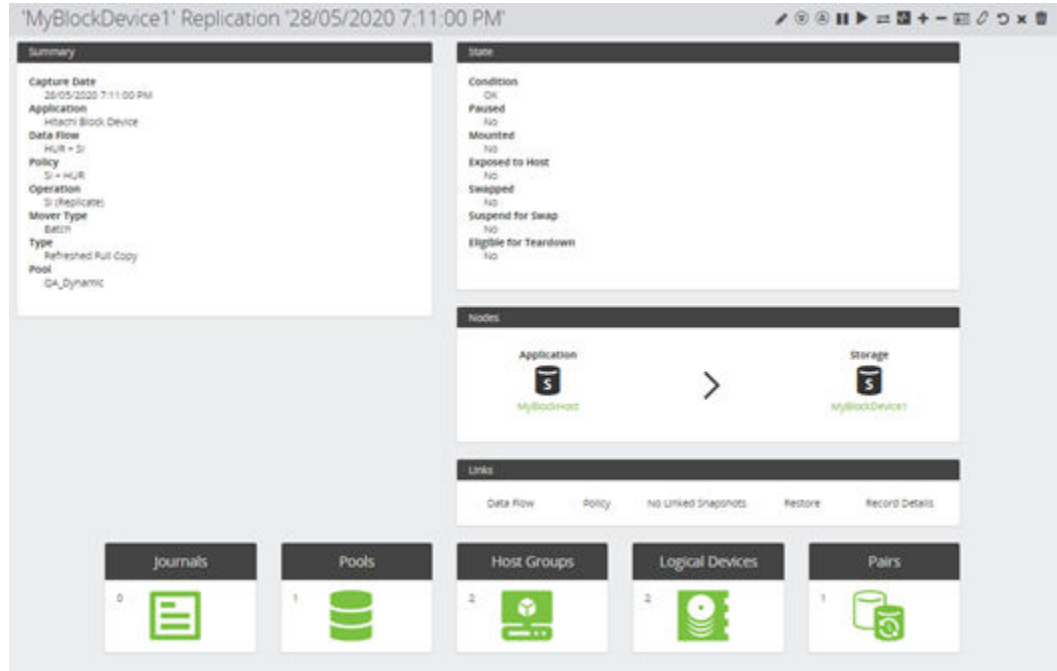

























Figure 501 Replication Details

| Control | Description |
|---|---|
|  Rename Secondary LDEVs | Opens the Hitachi Block Rename Secondary LDEVs Dialog (on page 772) to enable renaming of LDEVs using a fixed string and/or substitution variables. |
|  Mount | Opens the Hitachi Block Snapshot or Replication Mount Wizard (on page 695) to guide you through mounting the Replication. Note: The unmount operation can take several minutes to complete. |
|  Unmount | Unmounts the selected replication. The export is deleted. Note: The unmount operation can take several minutes to complete. |
|  Pause | Enabled only if one or more Replications are selected. Pauses the Replication. |
|  Resume | Resumes a paused Replication. |
|  Swap | Opens the Hitachi Block Replication Swap Wizard (on page 720) to guide you through swapping the Replication direction. |
|  Unsuspend | If a Swap operation cannot be completed due to a P-VOL or data link fault between the primary and secondary device, then the replication will enter the SSWS state (suspended for swapping) indicating that the swap is not yet complete. Unsuspend enables the replication process to be re-established once the cause has been rectified. |
|  Add to additional Host Groups | Opens the Hitachi Block Add to Host Groups Dialog (on page 783) to enable LDEVs to be added to host groups in addition to the default <code>ProtectorProvisionedHostGroup</code> used by Protector. A job is queued to perform the operation on the array and this may take some time to complete. |
|  Remove from Host Groups | Opens the Hitachi Block Remove from Host Groups Dialog (on page 784) to enable LDEVs to be removed from host groups, including the default <code>ProtectorProvisionedHostGroup</code> used by Protector. A job is queued to perform the operation on the array and this may take some time to complete. |
|  Transfer RBAC Permissions | Allows RBAC ownership to be transferred from the current node to another node. Opens the Access Control Transfer Permissions Dialog (on page 344). |

| Control | Description |
|--|--|
|  Dissociate | <ul style="list-style-type: none"> ▪ Dissociates a replication from Protector. ▪ Removes the selected replication(s) from Protector including state information such as direction and mount location. ▪ The replication remains active on the hardware device(s). ▪ The word 'DISSOCIATE' must be entered before the command is executed. <div>  Caution: Dissociating a replication removes all knowledge of the replication from Protector, including state information such as direction and mount location. </div> |
|  Teardown | Initiates the teardown of the replication. The word 'TEARDOWN' must be entered before the command is executed. |
|  Delete | Deletes the replication record from Protector. The replication is also removed from the block storage device. |
| Summary | Identifies the hardware storage device, application, policy and general status. |
| State | Indicates the status of the replication. |
| Nodes | Indicates the Nodes involved in the replication. Opens the Node Details (on page 574) for the node selected. |
| Links | <p>Provides links to the following pages that provide additional information about the replication:</p> <ul style="list-style-type: none"> ▪ Data Flow - opens the Data Flow Details (on page 439) where the replication operation is assigned. ▪ Policy - opens the Policy Details (on page 658) where the replication operation is defined. ▪ Snapshots - displayed only if the replication's destination is snapshotted. Opens a filtered version of the Hitachi Block Snapshots Inventory (on page 767) that lists snapshot of the destination. ▪ Restore - Opens the Hitachi Block Replication Details (Restore) (on page 723) ▪ Resource Details - Hitachi Block Record Details (Storage) (on page 773) |
|  Journals | Opens Hitachi Block Replication - Journals (on page 785) , listing the journals used in this replication. |

| Control | Description |
|---|--|
| |  Note: You must manually refresh the journal information from the Hitachi Block Journals Inventory (on page 761) to ensure the current list of Journals is up to date |
|  Pools | <p>Opens Hitachi Block Replication - Pools (on page 786), listing the pools used in this replication.</p>  Note: : You must manually refresh the pool information from the Hitachi Block Pools Inventory (on page 764) to ensure the current list of Pools is up to date |
|  Host Groups | <p>Opens Hitachi Block Replication - Host Groups (on page 786), listing the host groups for this replication.</p>  Note: : You must manually refresh the Host Group information from the Hitachi Block Host Groups Inventory (on page 759) to ensure the current list of Host groups is up to date |
|  Logical Devices | <p>Opens Hitachi Block Replication - Logical Devices (on page 786), listing the LDEVs in this replication.</p>  Note: You must manually refresh the Logical Device information from the Hitachi Block Logical Devices Inventory (on page 766) to ensure the current list of Logical Devices is up to date |
|  Pairs | <p>Opens Hitachi Block Replication - Pairs (on page 787), listing the pairs in this replication.</p> |

Hitachi Block Add to Host Groups Dialog

This dialog is displayed when adding an existing replication S-VOL to another host group(s).

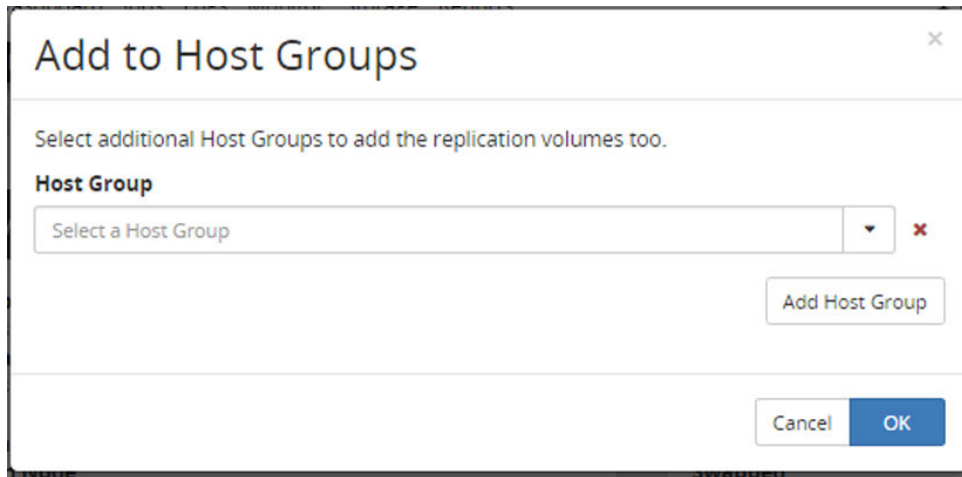



Figure 502 Add to Host Groups Dialog

| Control | Description |
|-------------|--|
| Host Groups | <p>Specify zero or more host groups that Protector will configure to provide access to the S-VOL.</p> <p>Click the Add Host Group button to insert another Host Group selection control.</p> <p>Click the Remove button next to a Host Group selection control to delete it.</p> <div style="background-color: #e0f7fa; padding: 10px; margin-top: 10px;"> <p> Note:</p> <p>If a LUN path to be created already exists, Protector will not attempt to add it again, or to change its ID.</p> <p>The specified host groups must be in the same resource group as the secondary volumes.</p> <p>For GAD replications, if the host group names and port IDs match between primary and secondary storage nodes, Protector will attempt to match the LUN IDs used for the S-VOLs with those of the respective P-VOLs. If this cannot be achieved then a warning will be logged and the next available LUN ID will be used.</p> </div> |

Hitachi Block Remove from Host Groups Dialog

This dialog is displayed when removing an existing replication S-VOL from a host group(s).

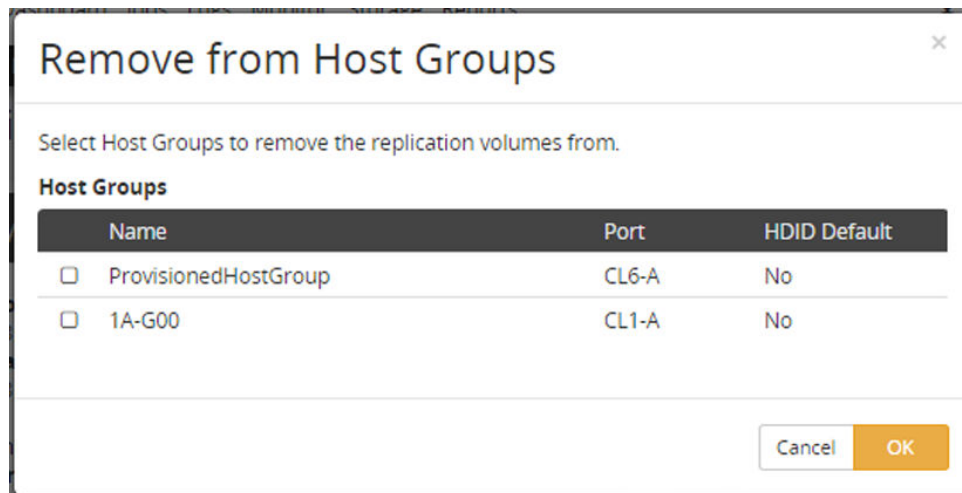



Figure 503 Remove from Host Groups Dialog


| Control | Description |
|-------------|---|
| Host Groups | <p>Specify one or more host groups to remove the S-VOL from.</p> <p>Click the check box next to the Host Group(s) from which the S-VOL is to be removed.</p> <div>  Note: It is not possible to remove the last remaining Host Group if the S-VOL still has replication or snapshot pairings. </div> |

Hitachi Block Replication - Journals

Lists the journals used in a particular UR replication.



Figure 504 Replication Journals

| Control | Description |
|--|---|
|  Expand | Opens the Figure 486 Hitachi Block Journal Expansion Dialog (on page 762) to enable the capacity of the selected journal to be increased. |

| Control | Description |
|---------------------------|--|
| Replication Journals list | Each journal is listed, along with its attributes. |

Hitachi Block Replication - Pools

Lists the pools used in a particular replication.

'MyBlockDevice1' Snapshot '28/05/2020 6:39:31 PM' Pools

| Name | Storage | Type | Status | Capacity | Free | Total |
|---------|---------|------|--------|---------------------------------|------|-------|
| (p0000) | 443170 | - | - | Capacity status is unmonitored. | | |
| (p0000) | 443170 | - | - | Capacity status is unmonitored. | | |

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Figure 505 Replication Pools

| Control | Description |
|------------------------|---|
| Replication Pools list | Each pool is listed, along with its attributes. |

Hitachi Block Replication - Host Groups

Lists the Host Groups used in a particular replication.

Hitachi Block Device 'myBlockDevice' Clone '17/08/2...

| Name | Port | Allocated | Usage Position | Logical Devices |
|----------------------|-------|-----------|----------------|-----------------|
| 1A-G00 | CL1-A | Yes | Secondary | 0x3aa2 |
| ProvisionedHostGroup | CL6-A | No | Secondary | 0x3aa2 |

Figure 506 Replication Host Groups

| Control | Description |
|------------------------------|---|
| Replication Host Groups list | Each host group is listed, along with its attributes. |

Hitachi Block Replication - Logical Devices

Lists the LDEVs used in a particular replication.

'MyBlockDevice1' Snapshot '28/05/2020 6:39:31 PM' Logical Devices

| Name | Storage | Pairs | Resource Group | Model | Status | Total |
|------------------|---------|--------------------|----------------|-------|--------|----------|
| Dev00001 (b0001) | 445170 | CL1-6-34, CL2-6-33 | (b0000) | --- | PAIR | 20 00 08 |

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Figure 507 Replication Logical Devices

| Control | Description |
|------------------------|---|
| Replication LDEVs list | Each LDEV is listed, along with its attributes. |

Hitachi Block Replication - Pairs

Lists the pairs in a particular replication. Depending on pair type, this data is collected from [pairstatus] or [raidcom get snapshot] – for more information about certain context-sensitive values, please consult the relevant CCI documentation.

'Chesil' Replication '28/10/2021 18:23:18' Pairs

| Original Primaries | | | | | | | Original Secondaries | | | | | | | Properties | | | |
|--------------------|---------|--------|-----------|---|-----|---------|----------------------|---------|--------|-----------|---|-----|---------|-------------|------------|-------|--------|
| ID | Storage | Status | Attribute | % | U/D | M. Mode | ID | Storage | Status | Attribute | % | U/D | M. Mode | Mirror Unit | Fence Type | Level | Quorum |
| ✓ 0x1194 412402 | PAIR | P-VOL | 100% | - | ✓ | → | 0x1198 412402 | PAIR | S-VOL | 100% | - | ✓ | 0 | SI | - | - | - |
| ✓ 0x1195 412402 | PAIR | P-VOL | 100% | - | ✓ | → | 0x1197 412402 | PAIR | S-VOL | 100% | - | ✓ | 0 | SI | - | - | - |

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Original Primary Volume Status

Original Primary Volume Attribute

Original Secondary Volume Status

Original Secondary Volume Attribute

[Advanced](#)

Figure 508 Replication Pairs

| Control | Description |
|-----------|--|
| ID | Displays the ID of this LDEV. |
| Storage | Displays the serial number of the storage array hosting this LDEV. |
| Status | Displays the status for this LDEV in this pair (eg COPY, PAIR, PSUS, SSUS, SSWS). |
| Attribute | Displays the attribute for this LDEV in this pair (eg P-VOL, S-VOL, SMPL). |
| % | Displays the % value for this LDEV in this pair. The meaning of this value is context-sensitive, depending upon the pair status and pair type. This value is taken directly from the <code>pairstatus</code> command. For guidance on how to interpret this value please consult the <code>pairstatus</code> information in the CCI Command Reference. |

| Control | Description |
|---|--|
| M | Displays the M value for this LDEV in this pair. The meaning of this value is context-sensitive, depending upon the pair status and pair type. This value is taken directly from the <code>pairdisplay</code> command. For guidance on how to interpret this value please consult the <code>pairdisplay</code> information in the CCI Command Reference. |
| I/O Mode | Displays the I/O Mode for this LDEV (eg L/M, B/B). Only populated for pairs of type [Active-Active Remote Clone]. |
| Direction (no column header) | Displays an arrow pointing from P-VOL to S-VOL. |
| Mirror Unit | Displays the mirror unit for the P-VOL of this pair. |
| Type | Displays the type of this pair (eg [SI], [TC]). |
| Fence Level | Displays the fence level for this pair. Only populated for pairs of remote replication types. |
| Quorum | Displays the quorum ID for this pair. Only populated for pairs of type [Active-Active Remote Clone]. |
| Replication Pairs list | Each pair is listed, identifying the source LDEV's properties on the left and the destination LDEV's properties on the right, separated by an arrow indicating the direction of the replication. |
| Filter by Original Primary Volume Status | Filters the list by local volume status. |
| Filter by Original Primary Volume Attribute | Filters the list by local volume attribute. |
| Filter by Original Secondary Volume Status | Filters the list by remote volume status. |
| Filter by Original Secondary Volume Attribute | Filters the list by remote volume attribute. |

Hitachi Block Remote Path Groups Inventory

This inventory lists all Remote Path Groups on a Hitachi Block storage device.

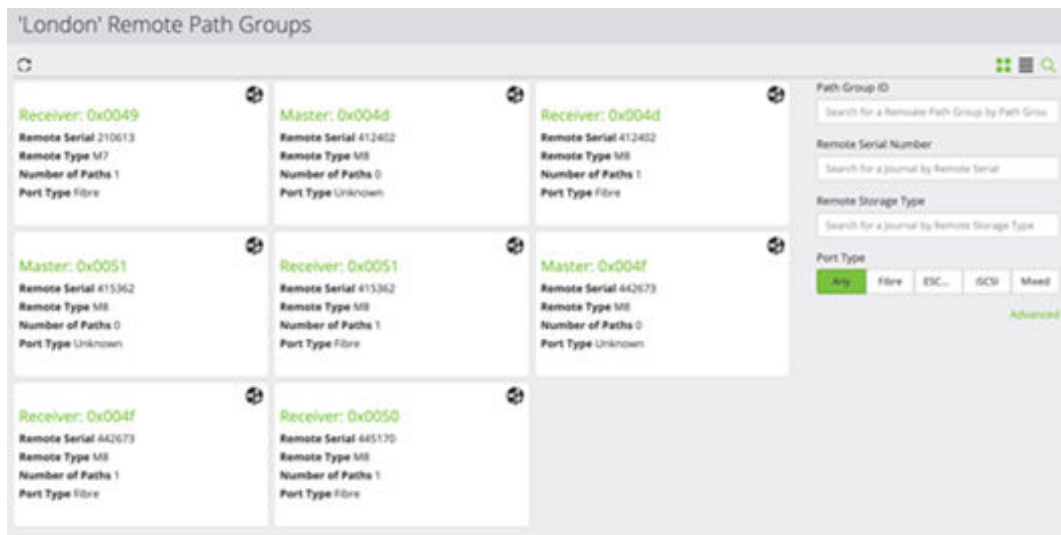





Figure 509 Remote Path Groups Inventory

| Control | Description |
|--|---|
|  Refresh | Refreshes the displayed inventory. <div>  Caution: Remote Path Group Inventory is only refreshed when refreshed manually. To ensure the latest information is displayed this page should be manually refreshed periodically. </div> |
|  Path Group | Click on a Path Group to open the Hitachi Block Remote Path Group Details (on page 789) . |
| Filter on ID | Filters the displayed results based on the Path Group ID. |
| Filter on Serial | Filters the displayed results based on the serial number of the remote array. |
| Filter on Storage | Filters the displayed results based on the type of storage. |
| Filter on Port type | Filters the displayed results based on the type of port. |

Hitachi Block Remote Path Group Details

This page shows the details of a Remote Path Group on a Hitachi Block storage device.

"London" RemotePathGroup '445169,445170,M8,80,eCONTROL_UNIT_TYPE_RECEIVER'

Summary
Path Group ID
045050
Master Control Unit
--
Receiver Control Unit
--
Control Unit Type
Receiver
Path Type
None
Control Unit Status
Normal
Minimum Number of Paths
1
Number of Paths
1
Incident Mode
--
Access Option
--
Timeout Value for Remote ID in Seconds
15
Round Trip Time in Milliseconds
1

Local
Storage Node ID
London
Serial Number
445169
Storage Type
SAS

Remote
Storage Node ID
Paris
Serial Number
445170
Storage Type
SAS

Nodes

Local

>

Remote

Remote Paths

| Path Number | Master Port Number | Receiver Port Number | Port Type | Path Status | Master Control Unit | Receiver Control Unit | Control Unit Type |
|-------------|--------------------|----------------------|-----------|-------------|---------------------|-----------------------|-------------------|
| 0 | C3-4 | C3-6 | Fibre | Normal | -- | -- | Receiver |

Outbound (local) Replications

| Name | Type | Data Origin | Application | Policy | Operation | Tags | Paused | Mounted | Eligible for Termination |
|--------------------|------------------|-------------|--------------------|--------------------|-----------|------|--------|---------|--------------------------|
| London001 11/01/13 | Active Full Copy | Protectors | Hitachi Block Host | Replication Policy | Replicate | | No | No | No |

Inbound (remote) Replications

| Name | Type | Data Origin | Application | Policy | Operation | Tags | Paused | Mounted | Eligible for Termination |
|----------------------------------|------|-------------|-------------|--------|-----------|------|--------|---------|--------------------------|
| No inbound (remote) replications | | | | | | | | | |

Figure 510 Remote Path Group Details

| Control | Description |
|-----------------------|---|
| Summary | Summarises the Logical Device details. |
| Local | Details the remote path group. |
| Remote | Details the remote storage node. |
| Nodes | Provides links to both the local and remote storage screens. |
| Remote Paths | Shows the paths in the remote path group. |
| Outbound replications | Shows outbound (local) replications managed by Protector using the remote replication path. |
| Inbound replications | Shows inbound (remote) replications managed by Protector using the remote replication path. |

Hitachi Block Device Advanced Settings Dialog

This dialog is displayed when the advanced settings for a block device node is being modified.

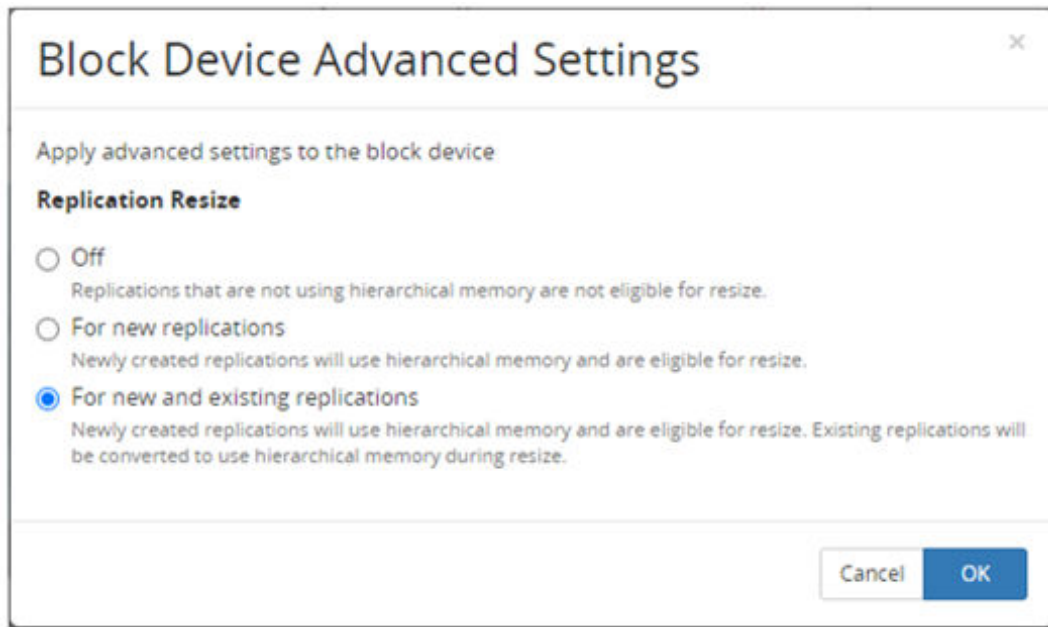



Figure 511 Block Device Advanced Settings Dialog

| Control | Description |
|--------------------|---|
| Replication Resize | <p>Changes the replication resize option. This option determines if, or when replications will utilize Hierarchical Memory. A replication must be using hierarchical memory to support expansion of replicated Logical Devices.</p> <p> Note: The option "For new replications" may not always be available if it is not supported by the hardware.</p> |

Hitachi Block Device Scheduled Cache Refresh

The various caches for the Block Device are refreshed on a scheduled basis. The defaults for these refreshes are as detailed in the following table:

| Item | Refresh Frequency |
|--------------------|-------------------|
| Pools | 2 minutes |
| Journals | 2 minutes |
| Resources | 2 minutes |
| Quora | 1 hour |
| Host Groups | 1 hour |
| Remote Path Groups | 1 hour |

| Item | Refresh Frequency |
|-------|-------------------|
| LDEVs | 24 hours |

These defaults are configurable on a per storage proxy basis so Block Devices sharing the same proxy node will have the same settings. If alternative configurations are required contact support for assistance.



WARNING: Excessive refreshing of these caches can put significant load on the storage arrays.

Hitachi Block Quorums Inventory

This page lists all the Quorums on a Hitachi Block Storage device.

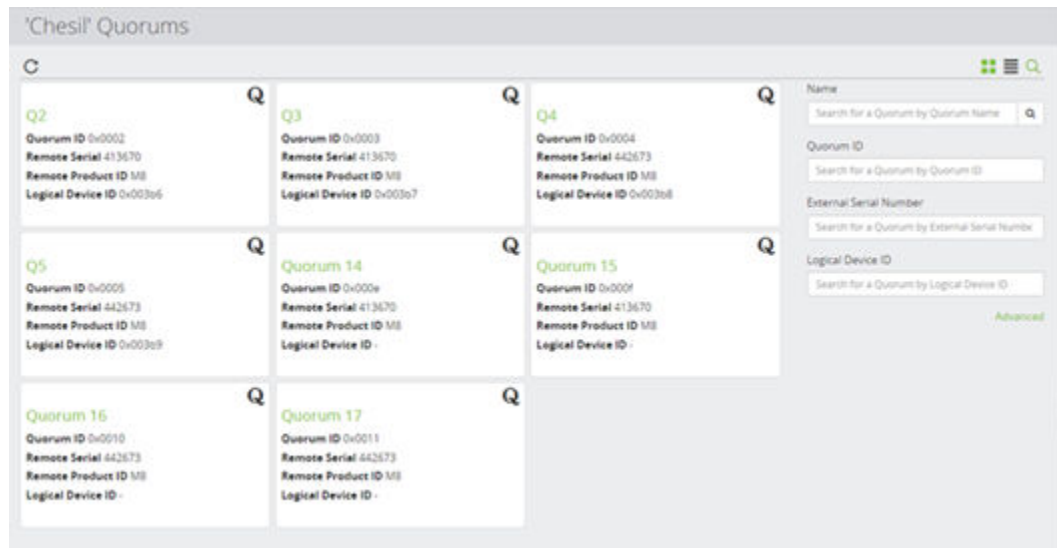



Figure 512 Quorums Inventory

| Control | Description |
|---|--|
|  Refresh | Refreshes the Cache and initiates the refreshing the Resources. <div> Note: A refresh must be performed to update information held on the Quorum screen. </div> |
| Filter on Name | Filters the displayed results based on the name of the Quorum. |
| Filter on Quorum ID. | Filters the displayed results based on the ID of the Quorum. |

| Control | Description |
|----------------------------------|--|
| Filter on External Serial Number | Filters the displayed results based on the External Serial Number of the Quorum. |
| Filter on Logical Device ID. | Filters the displayed results based on the Logical Device ID. of the Quorum. |

Hitachi Block Quorums Details

This page shows the details of the Quorums on a Hitachi Block Storage Device.

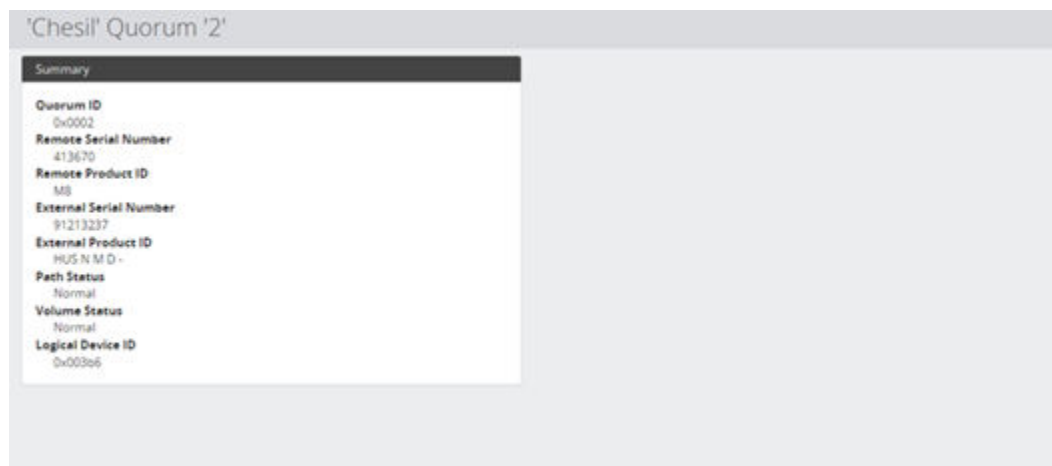


Figure 513 Quorums Details

| Control | Description |
|---------|----------------------------|
| Summary | Summarizes Quorum details. |

Hitachi Block Resource Groups Inventory

This inventory lists all defined Resource Groups for this Block Device. Resource Group are created to define logical groups of computing resources in the context of Hitachi Block Storage Device.

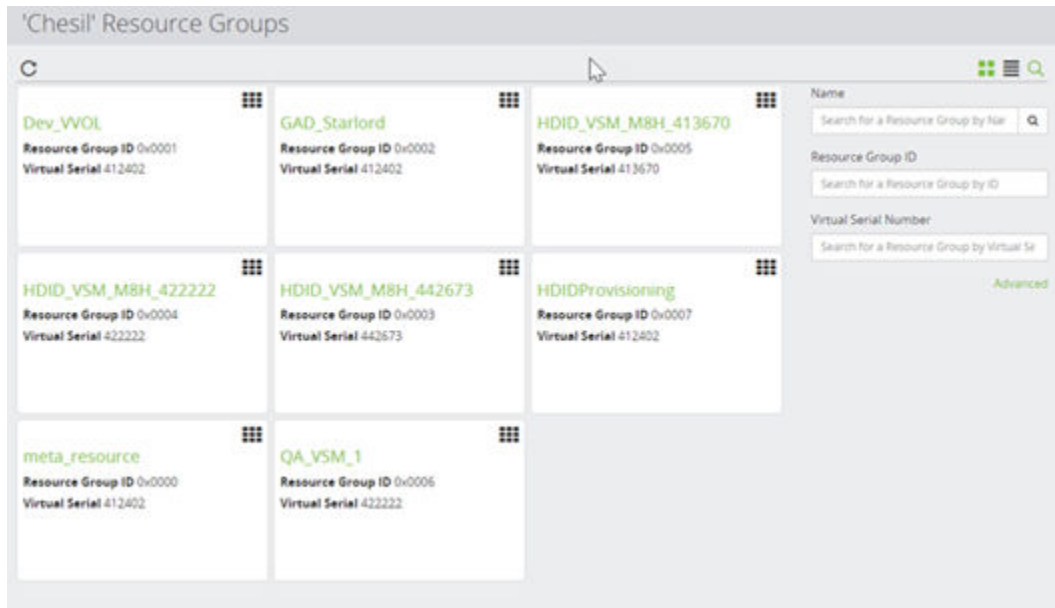




Figure 514 Hitachi Block Resource Groups Inventory

| Control | Description |
|--|---|
|  Refresh | Refreshes the Cache and initiates the refreshing the Resources. <div>  Note: A refresh must be performed to update information held on the Quorum screen. </div> |
| Filter on Name | Filters the displayed results based on the name of the Resource Group . |
| Filter on Resource Group ID. | Filters the displayed results based on the ID of the Resource Group . |
| Filter on Virtual Serial Number | Filters the displayed results based on the Virtual Serial Number of the Resource Group . |

Hitachi Block Resource Group Details

This page shows the details of the Resource Group on a Hitachi Block Storage Device.

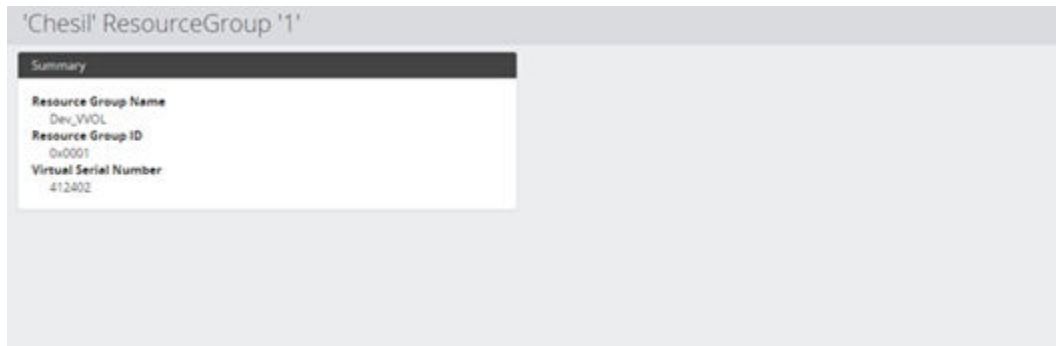


Figure 515 Resource Group Details

| Control | Description |
|---------|------------------------------------|
| Summary | Summarizes Resource Group details. |

Generation 1 Repository Details

This page displays the details of a Gen1 Repository and enables you to monitor its activities, state and the snapshots stored within it.

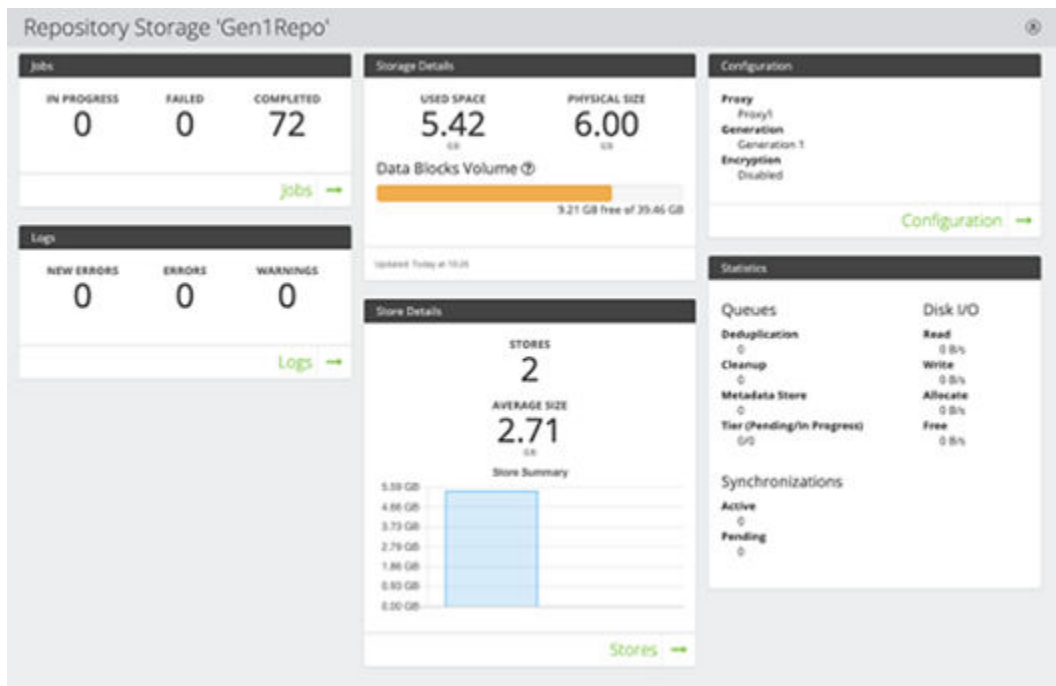




Figure 516 Repository Details

| Control | Description |
|---|---|
|  Mount | Mounts the repository to either its original location or to an alternative location. If the repository is being mounted to an alternate location, a full resynchronization will be required. |
|  Unmount | Unmounts the repository. |
| Jobs | Indicates the number of In Progress jobs as well as the Failed and Completed jobs in the last 72 hours. The Jobs link opens the Jobs Inventory (on page 441) . |
| Logs | Indicates the number of New Errors, Errors and Warnings in the last 72 hours. New errors are errors that have not been acknowledged. The Logs link opens the Logs Inventory (on page 448) . |
| Storage Details | Indicates the following: <ul style="list-style-type: none"> Physical size of the repository as well as the used space within the physical size Disk space statistics - used, free and total |
| Stores Details | Indicates the number of Stores within the Repository and the size of each store. The Stores link opens the Gen1 Repository Stores Inventory (on page 796) . |
| Configuration | Indicates the following: <ul style="list-style-type: none"> The proxy node – The node hosting the repository The generation of the repository (Generation 1 or 2) Encrypted -yes/no |
| Statistics | Indicates the following: <ul style="list-style-type: none"> Queues - indicates the background activities being performed. Synchronizations Capacity Disk I/O (Megabytes/second) |

Gen1 Repository Stores Inventory

This inventory lists all the Stores within a Repository.

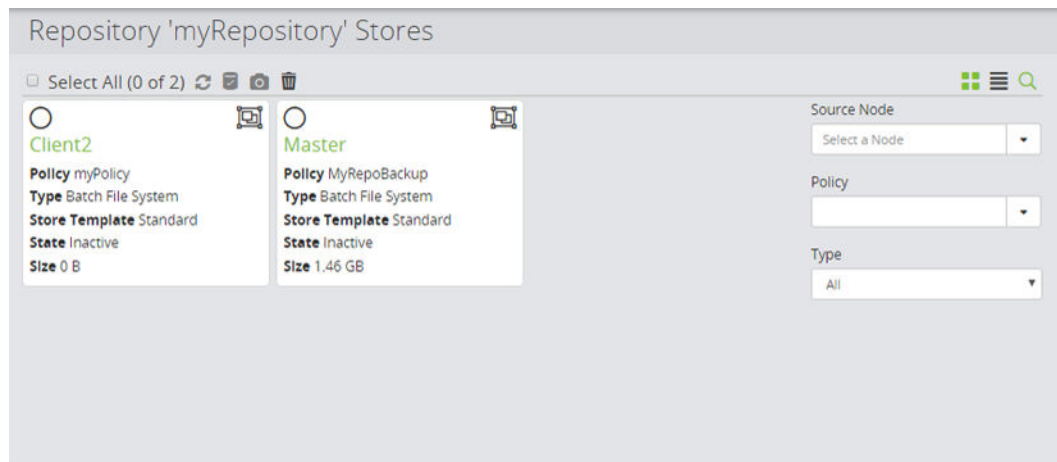









Figure 517 Repository Stores Inventory

| Control | Description |
|--|--|
|  Resynchronize | Enabled when one or more Stores are selected. Opens the Resynchronize Repository Store Dialog (on page 798) to resynchronize the stores with their sources. |
|  Validate | Enabled when one or more Stores are selected. Validates the contents of the store against the respective source nodes. <div>  Note: Validation is done for checksums of data on the source machine against those in the repository stores. Checksums for data in repository stores that are tiered to the cloud are not validated against checksums held on the cloud storage platform. </div> |
|  User Snapshot | Enabled when only one Store is selected. Opens the Create Repository User Snapshot Dialog (on page 798) to create a single snapshot of the whole store – not just an individual policy. <div>  Note: User Snapshots are retained forever or until they are manually deleted. </div> |
|  Delete | Enabled when one or more Stores are selected. This option is only available if the store is inactive – that is, no active policies currently transfer data to a store with this name. Selecting it will delete this store and all the snapshots contained within it. |
|  Existing Store(s) | Opens the Gen1 Repository Store Details (on page 799) enabling you to view and perform operations on the store. |
| Filter on Source Node | Filters the displayed results based on the Source node from which data is being ingested. |

| Control | Description |
|------------------|--|
| Filter on Policy | Filters the displayed results based on the Policy for which the store is used. |
| Filter on Type | Filters the displayed results based on the Store Type selected. |

Resynchronize Repository Store Dialog

This dialog is displayed prior to a Repository Store being resynchronized by the user. It presents additional functions that can be performed during a resynchronization.

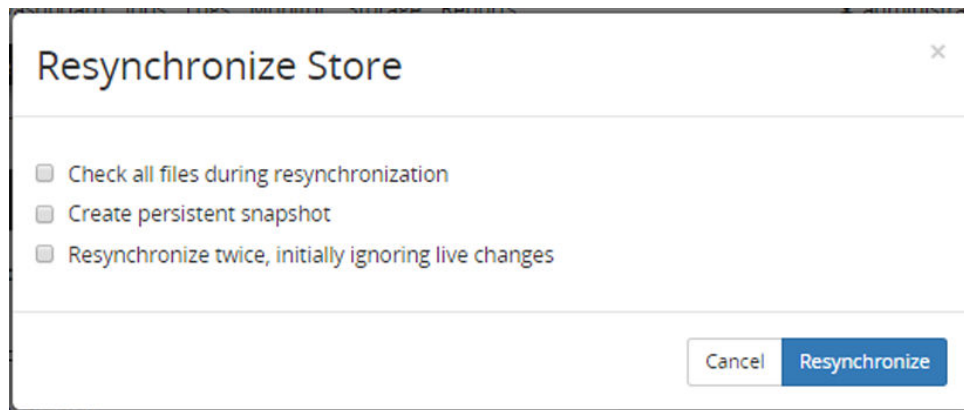


Figure 518 Resynchronize Store Dialog

| Control | Description |
|--|--|
| Check all files during resynchronization | Ignores file modification date and checks every file for changes. |
| Create persistent snapshot | Once the resynchronization is complete, a persistent snapshot will be created. This snapshot will be retained indefinitely, but can be manually deleted. |
| Resynchronize twice, initially ignoring live changes | Two resynchronizations will be performed. The first will ignore any live changes that are made; the second will not ignore them. This option is only valid for a live policy and is ignored when using batch. It is used when there are problems with disk cache overflow. Using this option will reduce the disk usage. |

Create Repository User Snapshot Dialog

This dialog is displayed when a User Snapshot is being created.

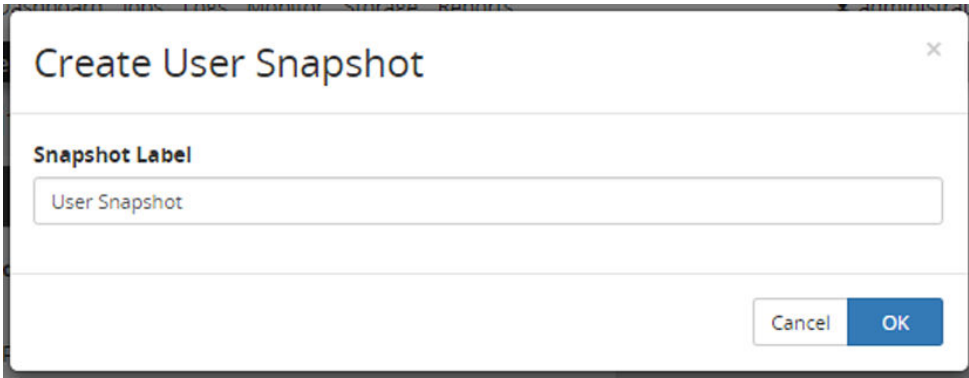


Figure 519 Create User Snapshot Dialog

| Control | Description |
|----------------|--|
| Snapshot Label | Enter a name to identify the snapshot. |

Gen1 Repository Store Details

This page provides details of a Store within a Repository and contains an inventory of all the Snapshots within that Store.

Repository 'myRepository' Store 'Standard'

Summary

Source Node
Client2

Policy
myPolicy

Store Type
Batch File System

State
Inactive

Contains
213 Files, 23 Directories

Last Modified Date
29/01/2018 13:24:50

Unassigned ⓘ
0 B

Total Size
0 B

UUID
8ca04574674844d494f2fd6fb218efc3







Snapshots
Select All (0 of 5) ⓘ

Date Time Range
Select a Date Range To

| | | |
|--|--|--|
| <p>29/01/2018 13:24:50</p> <p>Source Client2</p> <p>Type Policy</p> <p>Policy myPolicy</p> <p>Differential Size 0 B</p> <p>Expiry Date 12/02/2018 13:24:50</p> | <p>28/01/2018 13:24:51</p> <p>Source Client2</p> <p>Type Policy</p> <p>Policy myPolicy</p> <p>Differential Size 0 B</p> <p>Expiry Date 11/02/2018 13:24:51</p> | <p>27/01/2018 13:24:50</p> <p>Source Client2</p> <p>Type Policy</p> <p>Policy myPolicy</p> <p>Differential Size 0 B</p> <p>Expiry Date 10/02/2018 13:24:50</p> |
| <p>26/01/2018 13:24:50</p> <p>Source Client2</p> <p>Type Policy</p> <p>Policy myPolicy</p> <p>Differential Size 0 B</p> <p>Expiry Date 09/02/2018 13:24:50</p> | <p>26/01/2018 13:23:40</p> <p>Source Client2</p> <p>Type Policy</p> <p>Policy myPolicy</p> <p>Differential Size 0 B</p> <p>Expiry Date 09/02/2018 13:23:40</p> | |

Figure 520 Repository Store Details

| Control | Description |
|----------------------|--|
| <p>Resynchronize</p> | Opens the Resynchronize Repository Store Dialog (on page 798) to resynchronize the stores with their sources. |
| <p>Validate</p> | Validates the contents of the store against the respective source nodes. |
| <p>User Snapshot</p> | <p>Opens the Create Repository User Snapshot Dialog (on page 798) to create a single snapshot containing all the data in the store at that point in time. The snapshot is of the whole store – not just an individual policy. The data from all policies whose destination is that store will be contained within the same user snapshot.</p> <p> Note: User snapshots are retained forever or until they are manually deleted.</p> |

| Control | Description |
|--|---|
|  Delete | This option is only available if the store is inactive – that is, no active policies currently transfer data to a store with this name. Selecting it will delete this store and all the snapshots contained within it. |
|  Restore | Enabled only when a single snapshot is selected. Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process. |
|  Analyze | Enabled only when a single snapshot is selected. Analyzes the snapshot to provide details about file count, size and changes. This is done on an individual snapshot and can take a few seconds to several minutes to complete depending on repository load and snapshot size. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Delete | Enabled only when one or more snapshots are selected. Deletes the selected snapshots. Note: The latest snapshot cannot be deleted by the user. Also, if the snapshot is the only one remaining in the store then it will not be automatically retired. This provides a safeguard in the scenario where backups fail for a period of time, since at least one backup will be retained. |
|  Snapshot(s) | Opens the Repository Snapshot Details (Storage) - File System (on page 801) to enable you to view the snapshot and perform operations on it. |
| Filter on Date Range | Filters the displayed results based on the dates entered in the Date Time Range Picker (on page 347) . |

Repository Snapshot Details (Storage) - File System

This page provides details of a Snapshot within a Store and contains an inventory of all the Files within that Snapshots.



Note: The Restore UI contains a similar page ([Repository Snapshot Details \(Restore\) - File System \(on page 743\)](#)) with different data and fewer options.

Repository 'myRepository' Snapshot '29/01/2018 13:...

Summary

Source Node
Client2

Capture Date
29/01/2018 13:24:50

Storage Capture Date
29/01/2018 13:24:53

Policy
myPolicy

Type
Policy

Synchronized
Yes

Problem Free
Yes

Differential Size ⓘ
0 B

Expiry Date
12/02/2018 13:24:50

Analysis Details

Contents
213 files, 23 directories

New Files
0

New Size
0 B





Modified Files
0

Modified Size
0 B

Total Logical Size ⓘ
744.23 MB

| Name | Size | Date Modified | Date Created |
|----------|-----------|---------------------|---------------------|
| c: | - | - | - |
| testdata | - | 20/08/2014 15:05:48 | 20/08/2014 15:05:45 |
| DIR_1 | - | 30/07/2014 10:04:26 | 20/08/2014 15:05:47 |
| DIR_13 | - | 30/07/2014 10:04:27 | 20/08/2014 15:05:47 |
| FILE_102 | 46.00 KB | 02/12/2013 16:13:09 | 20/08/2014 15:05:47 |
| FILE_103 | 132.00 KB | 02/12/2013 16:13:09 | 20/08/2014 15:05:47 |

Figure 521 Repository Snapshot Details

| Control | Description |
|--|---|
|  Restore Snapshot | Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process. |
|  Analyze Snapshot | Analyzes the snapshot to provide details about file count, size and changes. This is done on an individual snapshot and can take a few seconds to several minutes to complete depending on repository load and snapshot size. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Delete | Schedules the snapshot for deletion. The snapshot is not deleted immediately. No further operations can be performed on a snapshot pending deletion. |
| Summary | Provides summary information about the snapshot. |
| Analysis Details | Indicates details about file count, size and changes. It includes the logical size of all files contained within the snapshot. |

| Control | Description |
|-----------------------|---|
| Files System Contents | Displays the entire directory structure and files contained within this snapshot. |

Repository Snapshot Details (Storage) - VMware

This page provides details of a VMware Snapshot within a Store and contains an inventory of all the files within that snapshot.



Note: The Restore UI contains a similar page ([Repository Snapshot Details \(Restore\) - VMware \(on page 745\)](#)) with different data and fewer options.

Repository 'myRepository' Snapshot '20/02/2018 09:...'

Summary

Source Node
myVMwareServer

Capture Date
20/02/2018 09:53:05

Storage Capture Date
20/02/2018 10:38:33

Policy
myVMwareToRepoPolicy

Type
Policy

Synchronized
Yes

Problem Free
Yes

Differential Size ⓘ
59.48 GB

Expiry Date
21/02/2018 09:53:05

Analysis Details

Contents
11 files, 3 directories

New Files
11

New Size
681.00 GB

Modified Files
0

Modified Size
0 B




Total Logical Size ⓘ
681.00 GB

[View Modified/New File List](#)

| Name | Size | Date Modified | Date Created |
|--|-----------|---------------------|--------------|
| <div> <div></div> <div>IH_DomainController</div> </div> | - | - | - |
| <div> <div></div> <div>System Configuration</div> </div> | 21.88 KB | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>Virtual Hard disk 1 Configuration.vmdk</div> </div> | 590 B | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>Virtual Hard disk 1 Data.vmdk</div> </div> | 191.00 GB | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>IH_EASQL</div> </div> | - | - | - |
| <div> <div></div> <div>System Configuration</div> </div> | 20.19 KB | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>Virtual Hard disk 1 Configuration.vmdk</div> </div> | 535 B | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>Virtual Hard disk 1 Data.vmdk</div> </div> | 250.00 GB | 20/02/2018 09:53:11 | - |
| <div> <div></div> <div>IH_Installation Mule</div> </div> | - | - | - |

Figure 522 Repository Snapshot Details

| Control | Description |
|-----------------------------|---|
| <div>Restore Snapshot</div> | Restores the snapshot. Opens the Restore from host based backup Wizard - VMware (on page 738) to guide you through the process. |

| Control | Description |
|--|--|
|  Analyze Snapshot | Analyzes the snapshot to provide details about file count, size and changes. This is done on an individual snapshot and can take a few seconds to several minutes to complete depending on repository load and snapshot size. |
|  Change Retention | Enabled only when a one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Delete | Schedules the snapshot for deletion. The snapshot is not deleted immediately. No further operations can be performed on a snapshot pending deletion. |
| Summary | Provides summary information about the snapshot. |
| Analysis Details | <p>If the repository has never been analyzed then an Analyze button is displayed.</p> <p>Otherwise, it indicates details about file count, size and changes. It includes the logical size of all files contained within the snapshot. Click the View Modified/New File List to show details of the modified or new files in this snapshot (see below).</p> |
| Snapshot Contents | Displays the entire contents within this snapshot. |

| Snapshot '12/07/2017 12:02:02 PM' Analysis | | |
|---|--------|-----------|
| Name | Origin | File Size |
| /Master6/System Configuration | Copied | 23.47 KB |
| /Master6/Virtual Hard disk 1 Configuration.vmdk | Copied | 533 B |
| /Master6/Virtual Hard disk 1 Data.vmdk | Copied | 40.00 GB |
| /Master6/Virtual Hard disk 2 Configuration.vmdk | Copied | 535 B |
| /Master6/Virtual Hard disk 2 Data.vmdk | Copied | 200.00 GB |

Figure 523 New/Modified Files*Change Repository Snapshot Retention Dialog*

This dialog is displayed when the retention date of a snapshot is changed.

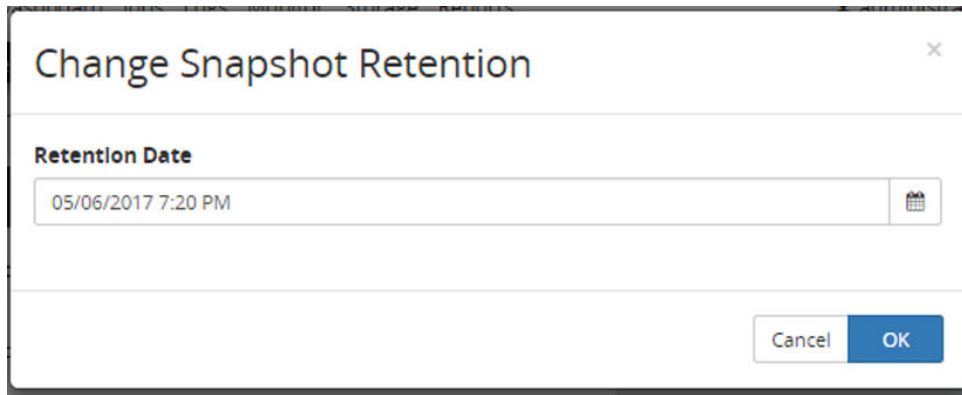


Figure 524 Change Snapshot Retention Dialog

| Control | Description |
|----------------|---|
| Retention Date | Select the new date (using the Date Time Picker (on page 346)) after which the backup data will be retired |

Generation 2 Repository Details

This page displays the details of a Gen2 Repository and enables you to monitor its activities, state and the snapshots stored within it.

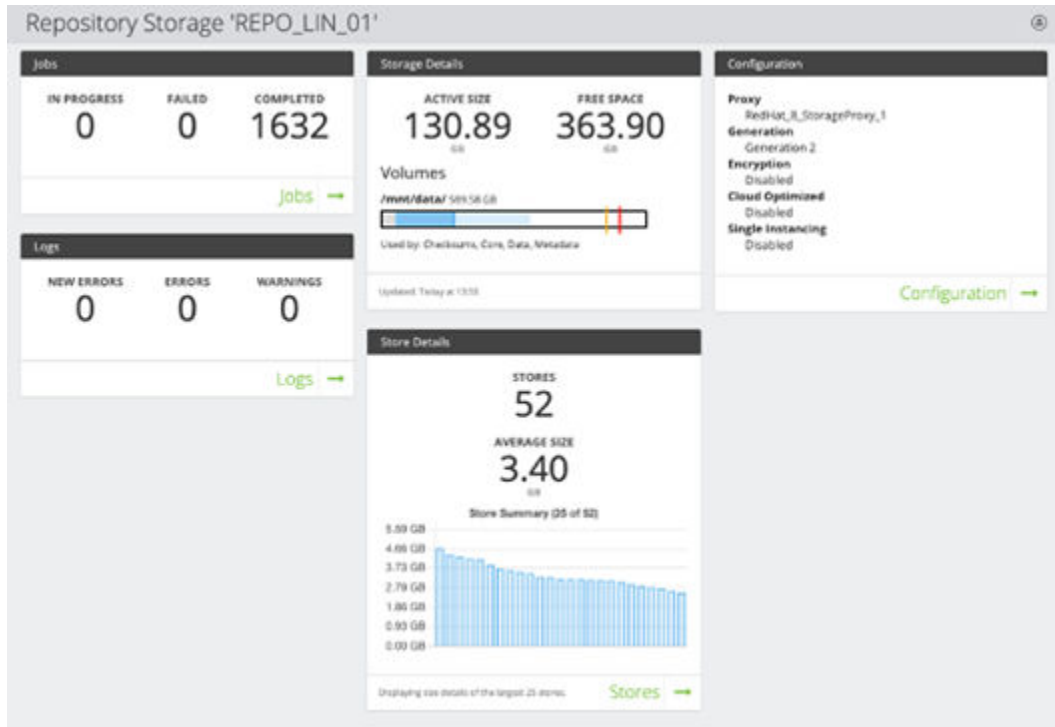




Figure 525 Repository Details

| Control | Description |
|---|---|
|  Mount | Mounts the repository to either its original location or to an alternative location. If the repository is being mounted to an alternate location, a full resynchronization will be required. |
|  Unmount | Unmounts the repository. |
| Jobs | Indicates the number of In Progress jobs as well as the Failed and Completed jobs in the last 72 hours. The Jobs link opens the Jobs Inventory (on page 441) . |
| Logs | Indicates the number of New Errors, Errors and Warnings in the last 72 hours. New errors are errors that have not been acknowledged. The Logs link opens the Logs Inventory (on page 448) . |
| Storage Details | Indicates the following: <ul style="list-style-type: none"> ▪ Active Size – The size of the active data within the repository. This can be smaller than the physical size of the repository, in this case the active size can grow without the physical size growing. ▪ Free Space – The amount of free disk space available on the disk hosting the data part of the repository. ▪ Volumes – Shows disk space statistics for each volume the repository is hosted on. Typically repository metadata and data are stored on different volumes. |
| Stores Details | Indicates the number of Stores within the Repository and the size of each store. The Stores link opens the Gen2 Repository Stores Inventory (on page 806) . |
| Configuration | Indicates the following: <ul style="list-style-type: none"> ▪ The proxy node – The node hosting the repository ▪ Generation - The generation of the ▪ Encrypted - Enabled / Disabled ▪ Cloud Optimized – Enables efficient transfer of data from the repository to cloud storage ▪ Single Instancing – Identical streams (files) are only stored once |

Gen2 Repository Stores Inventory

This inventory lists all the Stores within a Repository.

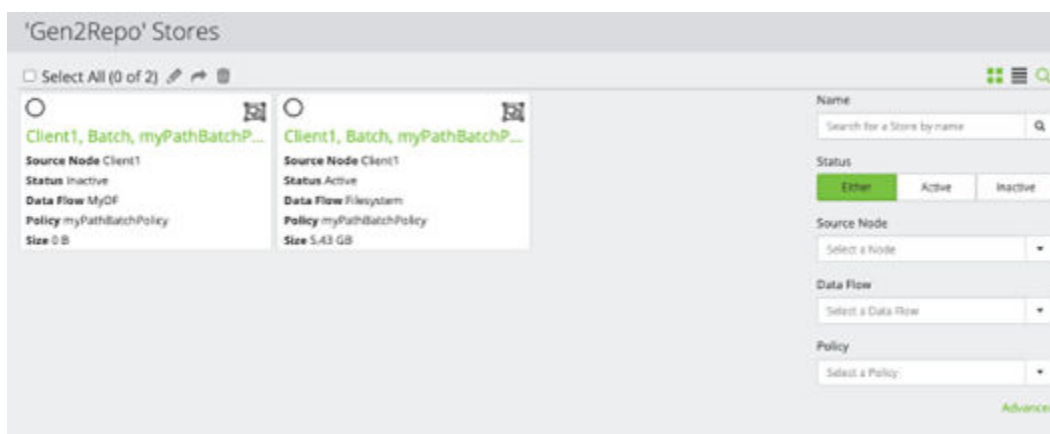






Figure 526 Gen2 Repository Stores Inventory

| Control | Description |
|---|--|
|  Rename | Enabled when one Store is selected. This option renames the selected store and can be changed with affecting operations. |
|  Repurpose | Enabled when one store is selected. This option should only be used in very specific disaster recovery situations and under the guidance of customer support. |
|  Delete | Enabled when one or more Stores are selected. This option is only available if the store is inactive – that is, no active policies currently transfer data to a store with this name. Selecting it will delete this store and all the snapshots contained within it. |
|  Existing Store(s) | Opens the Generation 2 Repository Details (on page 805) enabling you to view and perform operations on the store. |
| Filter on Name | Filters the displayed results based on the name of the store. |
| Filter on Status | Filters the displayed results based on the status of the store. |
| Filter on Source Node | Filters the displayed results based on the Source node from which data is being ingested. |
| Filter on Dataflow | Filters the displayed results based on the Dataflow for which the store is used. |
| Filter on Policy | Filters the displayed results based on the Policy for which the store is used. |

Gen2 Repository Store Details

This page provides details of a Store within a Repository and contains an inventory of all the Snapshots within that Store.

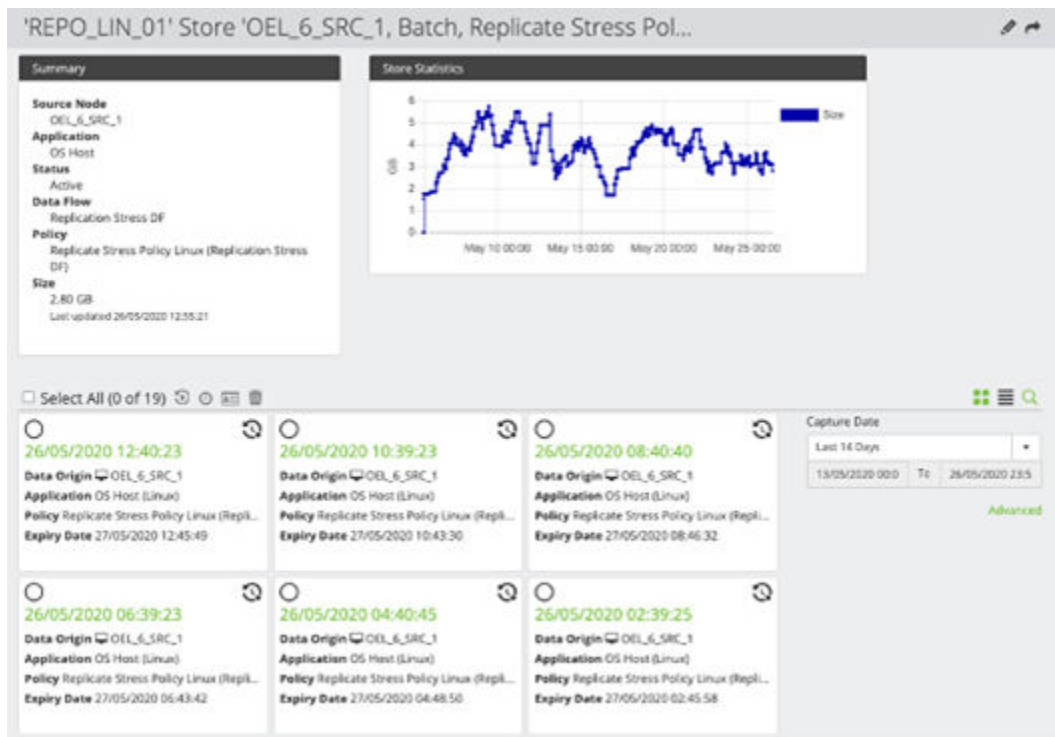









Figure 527 Gen2 Repository Store Details

| Control | Description |
|--|--|
|  Rename | Enabled when one Store is selected. This option renames the selected store and can be changed with affecting operations. |
|  Repurpose | Enabled when one store is selected. This option should only be used in very specific disaster recovery situations and under the guidance of customer support. |
|  Restore | Enabled only when a single snapshot is selected. Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process.. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Transfer Ownership | Enabled only when one or more snapshots are selected. Allows the ownership of the recovery point to be changed. By changing the owning resource to a node that a user has access to enables the user to see and act upon the recovery point. |
|  Delete | Enabled only when one or more snapshots are selected. Deletes the selected snapshots. |

| Control | Description |
|----------------------|--|
| |  Note: The latest snapshot cannot be deleted by the user. Also, if the snapshot is the only one remaining in the store then it will not be automatically retired. This provides a safeguard in the scenario where backups fail for a period of time, since at least one backup will be retained. |
| Filter on Date Range | Filters the displayed results based on the dates entered in the Date Time Range Picker (on page 347) . |

Repository Snapshot Details (Storage) - File System

This page provides details of a Recovery Point within a Store and contains an inventory of all the Files within that Recovery Point

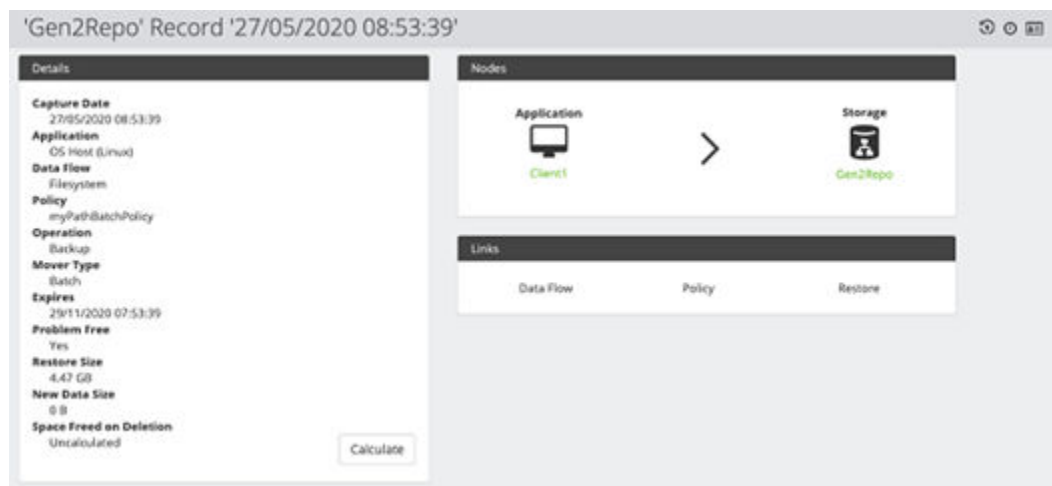





Figure 528 Gen2 Repository Recovery Point Details

| Control | Description |
|--|--|
|  Restore | Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Transfer Ownership | Allows the ownership of the record to be changed. By changing the owning resource to a node that a user has access to enables the user to see and act upon the record. |
| Calculate | Calculates the amount of space that would be freed in the repository if this recovery point was deleted. |

| Control | Description |
|-----------------------|---|
| Files System Contents | Displays the entire directory structure and files contained within this snapshot. |

Cloud Storage Details

This page displays the details of either an Amazon S3, HCP or HCP Cloud Scale container. It enables you to monitor its activities, state and the snapshots stored within it.



Figure 529 Cloud Details

| Control | Description |
|-----------------|--|
| Jobs | Indicates the number of In Progress jobs as well as the Failed and Completed jobs in the last 72 hours. The Jobs link opens the Jobs Inventory (on page 441). |
| Logs | Indicates the number of New Errors, Errors and Warnings in the last 72 hours. New errors are errors that have not been acknowledged. The Logs link opens the Logs Inventory (on page 448). |
| Storage Details | Indicates the following for HCP: <ul style="list-style-type: none"> The used size The total capacity Indicates the following for S3: <ul style="list-style-type: none"> The used size |

| Control | Description |
|----------------|--|
| Stores Details | Indicates the number of Stores within the Cloud and the size of each store. The Stores link opens the Cloud Stores Inventory (on page 811). |
| Configuration | <p>Indicates the following for HCP:</p> <ul style="list-style-type: none"> Proxy – The node hosting the HCP Generation - The generation of the HCP node Namespace - The HCP namespace used to store the data Tenant Address – The address of the HCP Tenant <p>Indicates the following for S3</p> <ul style="list-style-type: none"> Proxy – The node hosting the S3 Bucket Name – The name of the bucket used to store the data Region – The Amazon region the bucket is located |

Cloud Stores Inventory

This inventory lists all the Stores within a Cloud. This screen is the same for all cloud types.

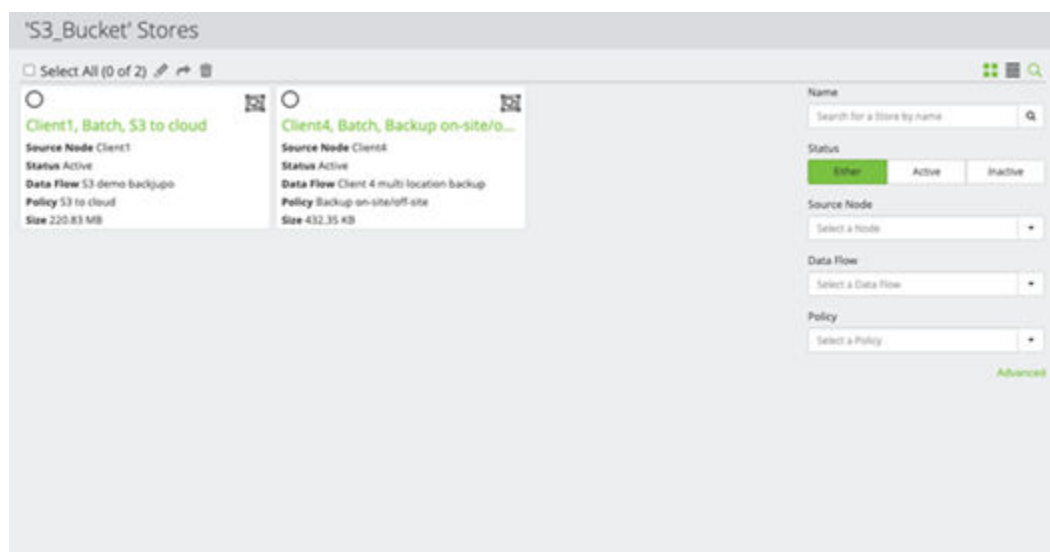





Figure 530 Cloud Stores Inventory

| Control | Description |
|---|--|
|  Rename | Enabled when one Store is selected. This option renames the selected store and can be changed with affecting operations. |

| Control | Description |
|---|--|
|  Repurpose | Enabled when one store is selected. This option should only be used in very specific disaster recovery situations and under the guidance of customer support. |
|  Delete | Enabled when one or more Stores are selected. This option is only available if the store is inactive – that is, no active policies currently transfer data to a store with this name. Selecting it will delete this store and all the snapshots contained within it. |
| Filter on Name | Filters the displayed results based on the name of the store. |
| Filter on Status | Filters the displayed results based on the status of the store. |
| Filter on Source Node | Filters the displayed results based on the Source node from which data is being ingested. |
| Filter on Dataflow | Filters the displayed results based on the Dataflow for which the store is used. |
| Filter on Policy | Filters the displayed results based on the Policy for which the store is used. |

Cloud Store Details

This page provides details of a Store within a Cloud and contains an inventory of all the Snapshots within that Store. The screen is the same for all cloud types.

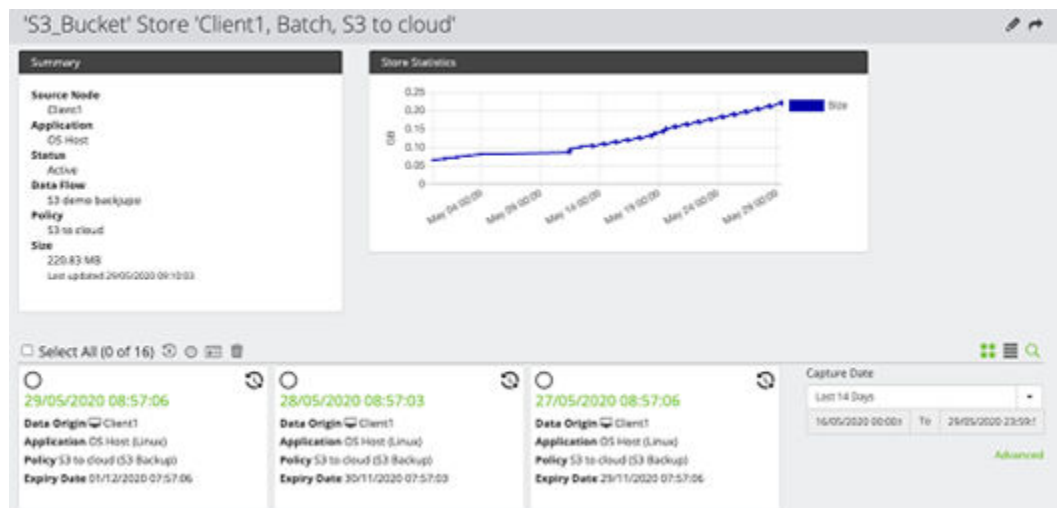











Figure 531 Cloud Store Details

| Control | Description |
|--|--|
|  Rename | Enabled when one Store is selected. This option renames the selected store and can be changed with affecting operations. |
|  Repurpose | Enabled when one store is selected. This option should only be used in very specific disaster recovery situations and under the guidance of customer support. |
|  Restore | Enabled only when a single snapshot is selected. Restores the snapshot. Opens the to guide you through the process. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Transfer Ownership | Enabled only when one or more snapshots are selected. Allows the ownership of the recovery point to be changed. By changing the owning resource to a node that a user has access to enables the user to see and act upon the recovery point. |
|  Set Expiry Date | Opens the Hitachi Block Change Snapshot Expiry Date Dialog (on page 773) to enable the expiry date of the selected snapshot(s) to be modified. |
|  Transfer Owner | Enabled only when one or more snapshots are selected. Allows the ownership of the recovery point to be changed. By changing the owning resource to a node that a user has access to enables the user to see and act upon the recovery point. |
|  Delete | <p>Enabled only when one or more snapshots are selected. Deletes the selected snapshots.</p> <div>  Note: The latest snapshot cannot be deleted by the user. Also, if the snapshot is the only one remaining in the store then it will not be automatically retired. This provides a safeguard in the scenario where backups fail for a period of time, since at least one backup will be retained. </div> |
| Filter on Date Range | Filters the displayed results based on the dates entered in the Date Time Range Picker (on page 347) . |

Cloud Snapshot Details (Storage) - File System

This page provides details of a Recovery Point within a Store and contains an inventory of all the Files within that Recovery Point.

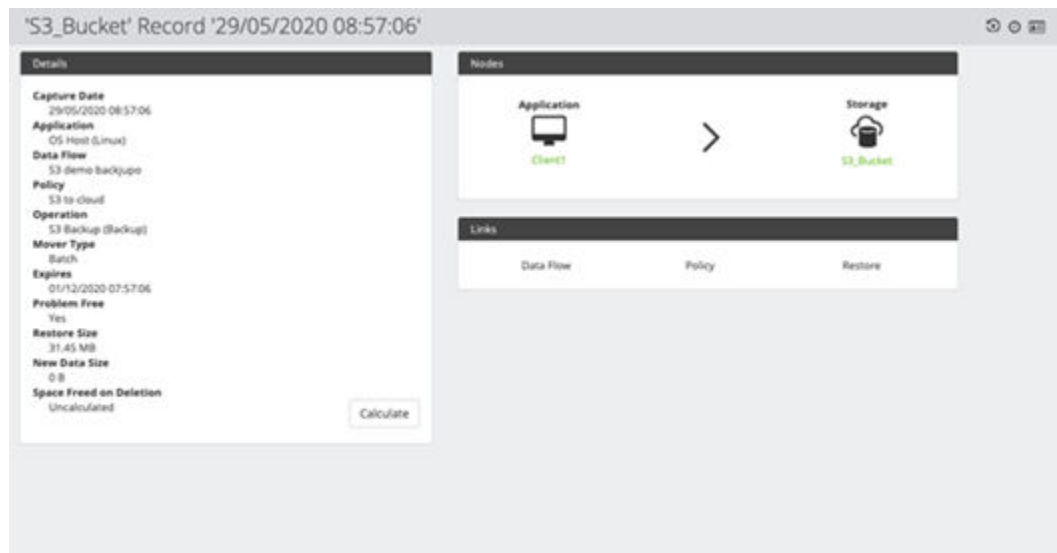





Figure 532 Cloud Recovery Point Details

| Control | Description |
|--|--|
|  Restore | Restores the snapshot. Opens the Restore Repository Snapshot Wizard - File System (on page 724) to guide you through the process.. |
|  Change Retention | Enabled only when one or more snapshots are selected. Opens the Change Repository Snapshot Retention Dialog (on page 804) |
|  Transfer Ownership | Allows the ownership of the record to be changed. By changing the owning resource to a node that a user has access to enables the user to see and act upon the record. |
| Calculate | Amazon S3 only, Calculates the amount of space that would be freed in the repository if this recovery point was deleted. |

Chapter 6: Command Line Interface Reference

This chapter describes the usage of command line tools installed with Ops Center Protector.

All commands are run from the `\bin` directory. By default these are located as follows.

For Windows:

```
C:\Program Files\Hitachi\Protector\bin
```

For Linux:

```
/opt/hitachi/protector/bin
```

We recommend that CLI based commands are run by experienced administrators only.



Note: Information about additional Ops Center Protector command line tools and their arguments is available from the Ops Center Protector Knowledge Base. These tools are only to be used with explicit guidance by Customer Support.

Gathering diagnostic information with `diagdata`

`diagdata` is a CLI tool that is used to aid diagnostic testing of Ops Center Protector. It provides the following functions:

- Stopping and starting of Ops Center Protector services
- Resetting the Ops Center Protector system state
- Raising and lowering of trace level for diagnostics
- Collection of Ops Center Protector state information to aid investigation of issues

Command line options

Table 41 General options

| Abbreviated argument | Full argument | Description |
|----------------------|---------------|---------------|
| -h | --help | Display help. |

Table 42 Service options

| Abbreviated argument | Full argument | Description |
|--------------------------|----------------------------|---|
| <code>-r arg</code> | <code>--restart arg</code> | Auto restart active services yes no |
| <code>--start arg</code> | | Starts the hub service. Options are none, all, hub. 'none' means no argument is required. |
| <code>--stop arg</code> | | Stops the hub service. Options are none, all, hub. 'none' means no argument is required. |

Table 43 Protector

| Abbreviated argument | Full argument | Description |
|----------------------|------------------------------|--|
| <code>-d arg</code> | <code>--trace-dir arg</code> | Set the trace directory. |
| <code>-T arg</code> | <code>--temp-dir arg</code> | Set the temp directory. |
| <code>--reset</code> | | Resets the state of the Ops Center Protector node and flushes cache and logs. Can only be run if Ops Center Protector services are stopped (see <code>--stop</code>). |

Table 44 Dump options

| Abbreviated argument | Full argument | Description |
|----------------------|---------------------|---|
| <code>-f</code> | <code>--full</code> | Produce a full dump of the Ops Center Protector configuration on the system, including all trace files. Results are placed in a ZIP file named: <code>diag_node</code> <code>name_YYYYMMDDhhmm.zip</code> |

| Abbreviated argument | Full argument | Description |
|----------------------|-------------------------------|---|
| | | <p>in the directory: <i>Data-Instance-Director-install\runtime</i></p> <p>This ZIP file can be requested by Hitachi Vantara support when investigating complex end user issues.</p> <p>Can be combined with <code>--spilt</code></p> |
| <code>-m</code> | <code>--mini</code> | <p>Similar to <code>-f</code> but only saves a recent portion of all trace files.</p> <p>Can be combined with <code>--spilt</code></p> |
| <code>-c arg</code> | <code>--collect arg</code> | <p><i>arg</i> specifies which data must be collected. Use <code>all</code> to collect all components. For additional component names use <code>-c help</code>.</p> <p>Can be combined with <code>--spilt</code></p> |
| <code>-o arg</code> | <code>--output-dir arg</code> | <p><i>arg</i> specifies an optional output directory. Default is <i>Protector\runtime</i></p> |
| <code>-n arg</code> | <code>--tracename arg</code> | <p><i>arg</i> specifies a filter mask which uses wildcards to target only specific trace files e.g. <code>diagdata -f --tracename repos*</code>.</p> <p>Multiple filters can be used seperated by <code>';</code> e.g. <code>hub*;node*;repo*</code>. For Linux use <code>"hub*;node*;repo*")</code>.</p> |
| <code>-a arg</code> | <code>--traceage arg</code> | <p><i>arg</i> specifies an age, in days, to target only trace files modified in that time frame.</p> |

| Abbreviated argument | Full argument | Description |
|-----------------------|------------------------------|---|
| <code>-z</code> | <code>--nosnapshots</code> | Prevents <i>diagdata</i> from creating snapshots before a dump (this may result in some files not being added to the diagnostic dump). |
| <code>-Z</code> | <code>--withsnapshots</code> | Attempt <i>diagdata</i> snapshots regardless of configuration. The default mode of operation. For linux , snapshots will only be taken for LVM filesystems |
| <code>--no-md5</code> | | Disable MD5 checksum on created zip files. |

Table 45 Trace options

| Abbreviated argument | Full argument | Description |
|----------------------|--------------------------|---|
| <code>-t arg</code> | <code>--trace arg</code> | <p>Sets the trace level of the node. Valid arguments are:</p> <p><i>TraceAlways</i> – logs only salient events, minimizing trace file size. This is the default level.</p> <p>The trace output increases in detail with the following levels:</p> <p><i>TraceTesting</i>, <i>TraceNormal</i>, <i>TraceVerbose</i> up to <i>TraceDebug</i> logs everything and generates trace files on disk of up to 4GB (configurable).</p> <p>Trace files are placed in <i>TRA</i> files in the directory:</p> <p><i>[Install-Dir]\runtime\trace</i></p> |

| Abbreviated argument | Full argument | Description |
|----------------------|---------------|--|
| -p | --deltrace | Delete inactive trace files. Any trace files currently in use by the Protector system will not be deleted. Deletes the contents of <code>[Install-Dir]\runtime\trace</code> |
| -x | --delalltrace | Stop Protector services, delete all trace and then restart them. |
| -i | --info | Get information about this node and current trace status. |

Table 46 Windows crash dump file options

| Abbreviated argument | Full argument | Description |
|----------------------|------------------------|--|
| -l <i>arg</i> | --dumplevel <i>arg</i> | Not available on Linux. Sets Protector crash dump level <code>full</code> <code>default</code> . |
| --test-dump | | Not available on Linux. Generates a Windows dump file for test purposes. |

Table 47 Archive options

| Abbreviated argument | Full argument | Description |
|----------------------|-------------------------|---|
| -S <i>arg</i> | --split-file <i>arg</i> | Split an existing zip file (path specified by <i>arg</i>) into multiple chunks (configurable, 1GB default). Intended to be used if the file is too big to be uploaded to a file service. |

| Abbreviated argument | Full argument | Description |
|----------------------|--------------------------------|--|
| <code>-C arg</code> | <code>--concatenate arg</code> | File name for the concatenated file. That must be followed by the list of the files to be concatenated. Example: <code>--concatenate diag.zip part.000 part.001 part.002</code> |
| <code>--split</code> | | Split the zip in multiple chunks (configurable, 1GB default), this is used with the <code>--full</code> , <code>--mini</code> and <code>--collect</code> options. Intended to be used if the file is too big to be uploaded to a file service. |

Usage Examples:

Stopping the Ops Center Protector services on any node:

```
diagdata --stop
```

Setting the trace level of the Ops Center Protector services on any node:

```
diagdata --trace TraceAlways
```

Collect a mini diagnostic log from a node:

```
diagdata --mini
```

Collect a full diagnostic log from a node:

```
diagdata --full
```

Gathering diagnostic information with 'support manager cli'

Support manager cli is a powerful CLI tool that is based on **diagdata** and many of these commands should be familiar. The main advantage of the support manager CLI tool over **diagdata**, is that it is a remote tool and thus doesn't require specific access to any of the nodes vi remote desk top/ssh, which is always the case when running **diagdata** to control and collect information from nodes. Also, the support manager cli can run on the master as well, to collect data from that Master.

It provides the following functions from a command prompt on the Master node only and can also run commands that are targeted for the Master node:

- Remotely, stopping and starting of Ops Center Protector services.
- Remotely resetting the Ops Center Protector system state.
- Remotely raising and lowering of trace level for diagnostics.
- Remote collection of Ops Center Protector state information to aid investigation of issues.

It would be advantageous if the user also has experience of using **diagdata**.

This tool is invoked in the following way:

The executable is in <Protector Installation>/bin

1. Windows: From a cmd prompt or PowerShell prompt enter '[./]supportmanagercli'
2. Linux: From a terminal session ./supportmanagercli

Like many of the CLI tools provided to support the Protector product, running the tool without any arguments, will print out the arguments/options that may be used. Many of these options, like **diagdata** can be concatenated together to create specific requirements.

Following the usage options below, there is a compressive set of notes that describes how the options can be used.

The table(s) below describe how each of the arguments would be used:

| Abbreviated argument | Full argument | Description |
|----------------------|---------------|----------------------------|
| | --verbose | More verbose output. |
| -h | --help | Produce this help message. |

Table 48 Information options

| Abbreviated argument | Full argument | Description |
|----------------------|---------------|--|
| -i | --info | Get information about specified nodes. |
| | --show-nodes | Show list of specified nodes (or all nodes if none specified). |

Table 49 Collection options

| Abbreviated argument | Full argument | Description |
|----------------------|---------------------|---|
| -m | --mini | Perform mini dump on specified machines, and collect the resulting archives on the master. |
| -f | --full | Perform full dump on specified machines and collect the resulting archives on the master. |
| -c <arg> | --collect <arg> | Indicate which data must be collected from specified machines. Use 'all' to collect all components. For help use 'help'. |
| -n <arg> | --tracename <arg> | Optional filter mask, which uses wildcards to target only specific trace files e.g. --tracename repos* (multiple filters can be used separated by ';' e.g. hub*;node*;repo* for Linux use "hub*;node*;repo*") |
| -a <arg> | --traceage <arg> | Takes an integer which is the number of days to go back from today. |
| -z <arg> | --nosnapshots <arg> | Optional filter mask, which uses age in days to target only trace files modified in that time frame. |
| | --no-md5 | Disable MD5 checksum on created zip files |
| | --split | Split collected dump files into multiple chunks. Intended to be used if the file is too big to be uploaded to a file service. See the note 1 below |

| Abbreviated argument | Full argument | Description |
|----------------------|----------------|---|
| -o <arg> | --output <arg> | Optional output directory when trace is sent to the Master. The default value shown is correct for the installation location. |



Note: The size of the 'chunks' used in the split option is configurable. This can be changed by editing the config file: `db/config/diagdata.cfg` and locating the following xml section on the associated node. The value is in bytes with a default of 1GB – ie 1,073,741,824

```
<item name="File Part Chunk Size" argtype="single">
  <value type="uint32">1073741824</value>
</item>
```

Table 50 Management options

| Abbreviated argument | Full argument | Description |
|----------------------|-----------------------|---|
| -t<arg> | --trace <arg> | Set trace level on specified machines for new and running processes. |
| | --trace-new <arg> | Set trace level on specified machines for new processes only. |
| | --trace-running <arg> | Set trace level on specified machines for running processes only. |
| -p | --delalltrace | Delete all trace files on specified machines. This option will stop the services, delete all trace, and start the services. |

Table 51 Trace directory options

| Abbreviated argument | Full argument | Description |
|----------------------|---------------|---|
| -d<arg> | --trace-dir | Set the Protector trace directory on specified machine. |

Table 52 Node selection options

| Abbreviated argument | Full argument | Description |
|----------------------|--------------------------------------|---|
| | <code>--all-nodes <arg></code> | Specify that all nodes should be included. |
| | <code>--node-name <arg></code> | Optional filter mask, which uses wildcards to include specific nodes by their name (multiple filters can be specified, separated by ','). |
| | <code>--node-type <arg></code> | Optional filter mask, which uses wildcards to include specific nodes by their type (multiple filters can be specified, separated by ','). |
| | <code>--test-node-filter</code> | Test a node filter only, without performing any operation on the nodes returned by that filter. |

Table 53 Other shared options

| Abbreviated argument | Full argument | Description |
|----------------------------|------------------------|--|
| <code>-r<arg></code> | <code>--restart</code> | Restart services on specified machines. Valid with management options and trace directory options. |

How to build the options:

As mentioned above, this tool runs on the Master only, thus from a Windows or a Linux Master. It will run in a Windows CMD or Power Shell Window or in a Linux terminal window. It will not run from any other node type and it will not run from an AIX based node.

The 'binary' is located in the <installation>/bin area and is named 'supportmanagercli' (Note the binary name, as there are some other binary files with similar names in the same place)

Like many CLI tools, the options need to be 'strung' together. The following table(s), in no particular order will show how the options could be used:

Preceded any of the options with 'supportmanagercli' from a Windows CMD window and './supportmanagercli' from Windows PowerShell Or Linux terminal window:

SYNOPSIS:**Table 54 supportmanagercli [OPTIONS] NodeSelection**

| Option | Description |
|--|---|
| <code>--show-nodes</code> | List all nodes as 3 lists 'OSHost Nodes involved', 'OSHost Nodes' and 'Agentless Nodes' |
| <code>--info --node-name <node name></code> | Displays information about a specific node, nodes names using wild cards, a csv list (Note: no spaces between commas) |
| <code>--info --all-nodes</code> | Displays information about all nodes |
| <code>--info --node-type <node type></code> | Displays information node types -ie OSHost, HyperV, HBBHCP, HitachiBlockDevice |
| <code>--test-node-filter</code> | <p>This is used to test the filter:</p> <pre>--test-node-filter --node-name *<name>*</pre> <pre>--test-node-filter --node-type *<type>*</pre> <p>Or use just a wild card:</p> <pre>--test-node-filter --node-name *</pre> <pre>--test-node-filter --node-name *</pre> |
| <code>--deltrace --node-name <node name></code> | Delete inactive trace for a specific node |
| <code>--deltrace --all-nodes</code> | Delete inactive trace for all nodes |
| <code>--delalltrace --node-name <node name></code> | Delete all trace files on specified node (Services will be restarted) |
| <code>--delalltrace --all-nodes</code> | Delete all trace files on all nodes (Services will be restarted) |
| <code>--trace-dir <dir> --node-name <node name></code> | Set the trace directory on specified node (Requires the services to be restarted) |
| <code>--trace-dir <dir> --all-nodes</code> | Set all trace directories (Requires the services to be restarted) |
| <code>--trace <Trace Level> --node-name <node name></code> | Set specified trace level on specific nodes (new and running processes) |
| <code>--trace <Trace Level> --all-nodes</code> | Set specified trace level on ALL nodes (new and running processes) |

| Option | Description |
|--|---|
| <code>--trace-new <Trace Level> --node-name <node name></code> | Set specified trace level on specific nodes (new processes) |
| <code>--trace-new <Trace Level> --all-nodes</code> | Set specified trace level on ALL nodes (new processes) |
| <code>--trace-running <Trace Level> --node-name <node name></code> | Set specified trace level on specific nodes (running processes) |
| <code>--trace-running <Trace Level> --all-nodes</code> | Set specified trace level on ALL nodes (running processes) |
| <code>--full --node-name <node name></code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <protector home>/runtime/remote trace collection/<time stamp directory> |
| <code>--full --all-nodes</code> | Collect data from all nodes and put it into the Master's <protector home>/runtime/remote trace collection/<time stamp directory> |
| <code>--mini --node-name <node name></code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <protector home>/runtime/remote trace collection/<time stamp directory> |
| <code>--mini --all-nodes</code> | Collect data from all nodes and put it into the Master's <protector home>/runtime/remote trace collection/<time stamp directory> |
| <code>--full --node-name <node name> --output-dir <dir></code> | Specify a Master collection directory (<dir> will be created on the Master) |
| <code>--full --all-nodes --output-dir <dir></code> | Specify a Master collection directory (<dir> will be created on the Master) |
| <code>--mini --node-name <node name> -output-dir <dir></code> | Specify a Master collection directory (<dir> will be created on the Master) |
| <code>--mini --all-nodes -output-dir <dir></code> | Specify a Master collection directory (<dir> will be created on the Master) |

| Option | Description |
|--|---|
| <code>--full --node-name <node name></code> <code>--split --no-md5</code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> and split the zip into chunks. Don't compute the MD5 |
| <code>--full --all-nodes -split --no-md5</code> | Collect data from all nodes and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> and split the zip into chunks. Don't compute the MD5 |
| <code>--mini --node-name <node name></code> <code>--split --no-md5</code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> and split the zip into chunks. Don't compute the MD5 |
| <code>--mini --all-nodes -split --no-md5</code> | Collect data from all nodes and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> and split the zip into chunks. Don't compute the MD5 |
| <code>--full --node-name <node name></code> <code>--tracename</code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> <code>--tracename</code> will get specific trace files and also works with wild cards. Case insensitive. |
| <code>--full --node-name <node name></code> <code>--traceage</code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> <code>--traceage</code> will get only trace up to n days old - ie <code>--traceage 3</code> will collect that is between 0 days to 3 days old. |
| <code>--full --node-name <node name></code> <code>--nosnapshots</code> | Collect data from the node name (can use CSV - no space) and put it into the Master's <code><protector home>/runtime/remote trace collection/<time stamp directory></code> <code>--nosnapshots</code> will disable snapshots when to collect data from nodes. |

| Option | Description |
|--|---|
| <code>--restart --node-name <node name></code> | Send to restart nodes - Note using option '--all-nodes' will also restart the Master as well. |

Finally, the `--verbose` option can be appended to any of the above. It will obviously create a lot of output. To work with extra output a redirect can be used to send all the data into a file. Also, the data can be filtered as well with the following windows or Linux commands:

To send data to a file, use the redirect '>':

```
customersupportcli
    --info --all-nodes > <file name>
```

To filter out a pattern, use the:

- **Windows:** `|findstr <pattern>`
 - `customersupportcli --info --all-nodes |findstr <pattern>`
- **Linux:** `|grep <pattern>`
 - `customersupportcli --info --all-nodes |grep <pattern>`
- **PowerShell:** `|select-string <pattern>`
 - `customersupportcli --info --all-nodes | select-string <pattern>`



Note: Always quote any arguments which have spaces, for example,

If setting a new trace directory on Windows to `C:\Program Files\Hitachi\trace` the command `supportmanagercli --trace-dir C:\Program Files\Hitachi\trace` will set the trace directory to `C:\Program`

Show all nodes:

supportmanagercli --show-nodes

OSHost nodes involved:

```
Docs-Client8
Docs-Client4
Docs-Client6
Docs-Proxy1
Docs-Client5
Docs-Proxy4
Docs-Client3
Docs-Proxy5
Docs-Proxy2
Docs-Client2
```


Docs-Proxy3

Docs-Master

Docs-Client1

OSHost Nodes:

Docs-Client2 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Client1 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Proxy3 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Client3 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Client4 (Type: Server, Virtual, Windows; Status: Authorized,
Up; Version: 7.4.0.92768-R7.4)

Docs-Proxy1 (Type: Server, Virtual, Windows; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Client5 (Type: Server, Virtual, Windows; Status: Authorized,
Up; Version: 7.4.0.92768-R7.4)

Docs-Client8 (Type: Server, Virtual, Windows; Status: Authorized,
Up; Version: 7.4.0.92768-R7.4)

Docs-Proxy5 (Type: Server, Virtual, Windows; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Client6 (Type: Server, Server/Workstation, AIX; Status:
Authorized, Up; Version: 7.4.0.92753-R7.4)

Docs-Proxy4 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Docs-Master (Type: Server, Virtual, Windows; Status: Authorized, Up,
Master; Version: 7.4.0.92768-R7.4)

Docs-Proxy2 (Type: Server, Virtual, Linux; Status: Authorized, Up;
Version: 7.4.0.92768-R7.4)

Agentless Nodes:

Chesil (Type: HitachiBlockDevice; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Proxy5)

Docs-Gen1Repo1 (Type: Repository; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Proxy1)

Gen1OnDoc-client8 (Type: Repository; Status: Authorized, Up; Proxy/
Host Node(s): Docs-Client8)

MyMasterRepo2 (Type: HBBRepository; Status: Authorized, Up; Proxy/
Host Node(s): Docs-Master)

```
Conker (Type: HitachiBlockDevice; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Proxy4)

Docs-CloudScale1 (Type: HBBHCPCloudScale; Status: Authorized, Down;
Proxy/Host Node(s): Docs-Proxy5)

MyMasterRepo (Type: HBBRepository; Status: Authorized, Up; Proxy/
Host Node(s): Docs-Master)

Docs-Gen2Repo1 (Type: HBBRepository; Status: Authorized, Up; Proxy/
Host Node(s): Docs-Proxy5)

Docs-HCP1 (Type: HBBHCP; Status: Authorized, Up; Proxy/Host Node(s):
Docs-Proxy5)

Docs-HyperV1 (Type: HyperV; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Client5, Docs-Client5)

Docs-AWS1 (Type: HBBS3; Status: Authorized, Down; Proxy/Host
Node(s): Docs-Proxy5)

Docs-SQL1 (Type: MSSQLSRV; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Client4, Docs-Client4)

Docs-VMware1 (Type: VMware; Status: Authorized, Up; Proxy/Host
Node(s): Docs-Proxy1)
```

Retrieve the trace level from a single node:

This uses the windows 'findstr' to match the words "Hub Trace Level"

```
supportmanagercli --info --node-name Docs-Client4|findstr /c:"Hub Trace Level:"
[Docs-Client4]: Hub Trace Level: TraceAlways
```

Retrieve the trace level from a number of nodes: (use CSV no spaces)

```
supportmanagercli --info --node-name Docs-Client4,Docs-Proxy4 |findstr /c:"Hub Trace
Level:"
[Docs-Proxy4]: Hub Trace Level: TraceAlways
[Docs-Client4]: Hub Trace Level: TraceAlways
```

Retrieve the trace level from all nodes:

```
supportmanagercli --info --all-nodes |findstr /c:"Hub Trace Level:"
[Docs-Proxy3]: Hub Trace Level: TraceAlways
[Docs-Client5]: Hub Trace Level: TraceAlways
[Docs-Proxy2]: Hub Trace Level: TraceAlways
[Docs-Client2]: Hub Trace Level: TraceAlways
[Docs-Client1]: Hub Trace Level: TraceAlways
[Docs-Master]: Hub Trace Level: TraceAlways
[Docs-Client6]: Hub Trace Level: TraceAlways
[Docs-Proxy5]: Hub Trace Level: TraceAlways
```

[Docs-Client3]: Hub Trace Level: TraceAlways

[Docs-Client8]: Hub Trace Level: TraceAlways

[Docs-Proxy1]: Hub Trace Level: TraceAlways

[Docs-Proxy4]: Hub Trace Level: TraceAlways

[Docs-Client4]: Hub Trace Level: TraceAlways

Set trace on a single node to TraceDebug

supportmanagercli --trace TraceDebug --node-name Docs-Proxy1

OSHost nodes involved:

Docs-Proxy1

[Docs-Proxy1]: Trace level for new processes set to TraceDebug

[Docs-Proxy1]: Trace level for running processes set to TraceDebug

[Docs-Proxy1]: Operation completed.

Operation completed on nodes:

Docs-Proxy1

Exiting...

Set trace on all nodes to TraceDebug

supportmanagercli --trace TraceDebug --all-nodes

OSHost nodes involved:

Docs-Proxy2

Docs-Client3

Docs-Proxy3

Docs-Master

Docs-Client8

Docs-Proxy4

Docs-Client1

Docs-Proxy5

Docs-Client2

Docs-Client5

Docs-Client6

Docs-Client4

Docs-Proxy1

[Docs-Proxy2]: Trace level for new processes set to TraceDebug

[Docs-Proxy2]: Trace level for running processes set to TraceDebug
[Docs-Proxy2]: Operation completed.
[Docs-Client3]: Trace level for new processes set to TraceDebug
[Docs-Client3]: Trace level for running processes set to TraceDebug
[Docs-Client3]: Operation completed.
[Docs-Proxy3]: Trace level for new processes set to TraceDebug
[Docs-Proxy3]: Trace level for running processes set to TraceDebug
[Docs-Proxy3]: Operation completed.
[Docs-Master]: Trace level for new processes set to TraceDebug
[Docs-Master]: Trace level for running processes set to TraceDebug
[Docs-Master]: Operation completed.
[Docs-Client8]: Trace level for new processes set to TraceDebug
[Docs-Client8]: Trace level for running processes set to TraceDebug
[Docs-Client8]: Operation completed.
[Docs-Proxy4]: Trace level for new processes set to TraceDebug
[Docs-Proxy4]: Trace level for running processes set to TraceDebug
[Docs-Proxy4]: Operation completed.
[Docs-Client1]: Trace level for new processes set to TraceDebug
[Docs-Client1]: Trace level for running processes set to TraceDebug
[Docs-Client1]: Operation completed.
[Docs-Proxy5]: Trace level for new processes set to TraceDebug
[Docs-Proxy5]: Trace level for running processes set to TraceDebug
[Docs-Proxy5]: Operation completed.
[Docs-Client2]: Trace level for new processes set to TraceDebug
[Docs-Client2]: Trace level for running processes set to TraceDebug
[Docs-Client2]: Operation completed.
[Docs-Client5]: Trace level for new processes set to TraceDebug
[Docs-Client5]: Trace level for running processes set to TraceDebug
[Docs-Client5]: Operation completed.
[Docs-Client6]: Trace level for new processes set to TraceDebug
[Docs-Client6]: Trace level for running processes set to TraceDebug
[Docs-Client6]: Operation completed.
[Docs-Client4]: Trace level for new processes set to TraceDebug
[Docs-Client4]: Trace level for running processes set to TraceDebug

[Docs-Client4]: Operation completed.

[Docs-Proxy1]: Trace level for new processes set to TraceDebug

[Docs-Proxy1]: Trace level for running processes set to TraceDebug

[Docs-Proxy1]: Operation completed.

Operation completed on nodes:

Docs-Master

Docs-Client8

Docs-Client5

Docs-Proxy3

Docs-Proxy1

Docs-Proxy2

Docs-Client2

Docs-Client4

Docs-Client3

Docs-Client1

Docs-Proxy4

Docs-Client6

Docs-Proxy5

Exiting...

And, to verify that all nodes are now set to TraceDebug:

supportmanagercli --info --all-nodes |findstr /c:"Hub Trace Level:"

[Docs-Client2]: Hub Trace Level: TraceDebug

[Docs-Client6]: Hub Trace Level: TraceDebug

[Docs-Client1]: Hub Trace Level: TraceDebug

[Docs-Client3]: Hub Trace Level: TraceDebug

[Docs-Proxy3]: Hub Trace Level: TraceDebug

[Docs-Client5]: Hub Trace Level: TraceDebug

[Docs-Proxy4]: Hub Trace Level: TraceDebug

[Docs-Proxy5]: Hub Trace Level: TraceDebug

[Docs-Proxy1]: Hub Trace Level: TraceDebug

[Docs-Client8]: Hub Trace Level: TraceDebug

[Docs-Proxy2]: Hub Trace Level: TraceDebug

[Docs-Client4]: Hub Trace Level: TraceDebug

[Docs-Master]: Hub Trace Level: TraceDebug

Triggering policies and operations with `hdidcmd`

Usage Example:

`hdidcmd` allows REST commands to be sent to the master. This topic demonstrates how to trigger a policy operation via the REST interface using this command line tool. Access to the REST API is controlled by RBAC, therefore the user:

1. Open a command prompt.
2. Login to Protector using the following command to begin a session:

```
hdidcmd --activity "Login"
--space Authentication SpaceName
--userName UserName
--password Password
--ip IpAddress
--port <Port>
```

Where:

- *AuthenticationSpaceName* is the *Authentication Space* where **Username** can be authenticated.
- *UserName* is the user name for the session. The specified *UserName* must have the *Trigger Operations* activity assigned to them and have visibility of the nodes, data flows and policies specified in the trigger command.
- *Password* is the password for *UserName*
- *IpAddress* is the IP address of the Master node
- *Port* is the port used to connect to the master server. This value is optional



Note: Sessions are maintained on a 'per command prompt' basis. If no activity is detected after 2 hours then the session will be terminated.

3. Trigger the required operation by specifying the *data flow*, *source node*, *policy* and *operation* using the following command:

```
hdidcmd --activity "Trigger Operation"
[--dataflowName dataflowName | --dataflowId dataflowId]
[--sourceNodeName sourceNodeName | --sourceNodeId sourceNodeId]
[--policyName PolicyName | --policyId policyId]
[--operationName operationName | --operationId operationId]
[--syncGroup syncGroup ]
[--wait]
```

The following names (found in the UI) can be specified:

- *dataflowName* is the textual name of the data flow where *sourceNodeName* appears
- *sourceNodeName* is the textual name of the source node where the operation is assigned
- *PolicyName* is the textual name of the policy
- *operationName* is the textual name of the operation within *PolicyName*
- *synchGroup* is the textual name of the shedule that is used to synchronise a group of hardware based operations

Alternatively the following IDs can be specified:

- *dataflowId*
- *sourceNodeId*
- *policyId*
- *operationId*

These are determined using the following command:

```
hdidcmd --activity "View Triggers"
```

The **--wait** option causes the command to wait until all the jobs are either *completed*, *failed* or *paused*; i.e. in some state other than *in progress*.

4. Logout from Protector using the following command to end the session:

hdidcmd --activity "Logout"

```
hdidcmd --activity "Login" --space Master --userName "administrator" --
password 3253GHRt3 --ip 192.168.45.149
```

Operation Successful!

```
hdidcmd --activity "View Triggers"
```

```
{
  "trigger": [
    {
      "id": "0",
      "policyId": "2deb212ef02445458a1da13230bcf8dc",
      "policyName": "myPathBackupPolicy",
      "operationId": 1,
      "operationName": "Backup",
      "dataflowName": "myOSHostToRepoDataFlow",
      "dataflowId": "7ef4f80e-81da-456d-b44b-07789f80b522",
      "sourceNodeId": "Client1@B2-289YQR-37XVXP-I2QLXH-B4IB2E[0-1-
2]",
      "sourceNodeInstance": 19,
      "destinationNodeId": "myRepository@00-B36A96-A2E2B8-437AB6-
0BEF11[0-1-10]",
      "destinationNodeInstance": 20,
      "moverType": "eMOVER_BATCH",
      "syncGroup": "",
      "dataOriginNodeInstance": 19,
      "dataOriginNodeId": "Client1@B2-289YQR-37XVXP-I2QLXH-B4IB2E[0-
1-2]"
    }
  ],
  "pageInfo": {
    "totalCount": 1,
    "end": true
  }
}
```

Operation Successful!

```
hdidcmd --activity "Trigger Operation" --dataflowName
"myOSHostToRepoDataFlow" --source
NodeName "Client1" --policyId "2deb212ef02445458a1da13230bcf8dc" --
operationId 1
```

```
{
  "job": [
    {
      "id": "{6e127915-7553-464b-8511-0606b4bec3a4}"
    }
  ]
}
```

Operation Successful!

```
hdidcmd --activity "Logout"
```

```
Operation Successful!
```

Archiving master node setting with *mastersettings*

The master node configuration files can be zipped to an archive file using the **mastersettings** command. During the procedure, only the master node settings are zipped up; other information such as repositories and their metadata stores and log messages are excluded.

We recommend that you back up the master node configuration files once a week. You can set up a backup policy on a recurring schedule that runs the **mastersettings** CLI tool as a pre-script, then backs up the resulting zip file.



Note: A *host based front end capacity license* is required to perform backup of the master node using **mastersettings**.

Table 55 Command line options

| Abbreviated Argument | Full Argument | Description |
|----------------------|-------------------------|---|
| -h | --help | Displays command line parameter usage instructions. |
| -e | --export <i>zipfile</i> | <p>Zips up all configuration files to <i>zipfile</i>.</p> <p>If no path is specified, the file will be created in the <code>\$Protector_HOME\runtime</code> directory.</p> <p>If no <code>.zip</code> suffix is specified, then it will be appended.</p> <p>The file is created in zip format and can be read with commonly available tools such as WinZip.</p> |

| Abbreviated Argument | Full Argument | Description |
|----------------------|---|--|
| -c | <code>--config <i>cfgfile</i></code> | Used with <code>--export</code> and <code>--import</code> . Specifies a configuration file used to control what files are included and excluded in the archive. By default, the <i>cfgfile</i> name <code>mastersettings.cfg</code> is assumed. (See About the mastersettings.cfg file (on page 841) .) |
| -i | <code>--import <i>zipfile</i></code> | Restores all master node configuration files from <i>zipfile</i> . The CofioHub service must be stopped prior to importing. |
| -p | <code>--preclear <i>True False</i></code> | Used when importing a zip file. Indicates whether existing master node configuration files are to be deleted prior to restoring them from the archive. |

Usage examples:

Archiving the master node configuration files:

```
mastersettings -e mastercfgfiles.zip
```

Configuring of mastersettings:

`mastersettings.cfg` is an XML file that contains information indicating which Ops Center Protector files are to be:

- included or ignored when creating the archive (exporting)
- deleted or ignored when restoring the archive (importing)

This file is located in the following directory:

```
$Protector_HOME$\db\config
```

The `mastersettings.cfg` file can contain information as described in the following table.

Table 56 Configuration file options:

| Item Name | Description |
|-------------|---|
| Path | The path to be backed up. The path specified is relative to the <code>\$Protector_HOME</code> directory. |
| Depth | <p>The depth, defined as a value, within the path to be backed up:</p> <p>-1 (default) backs up all files in all subdirectories.</p> <p>1 backs up only the files in the path.</p> <p>2 backs up all files in the path and within subdirectories of the path (but not the subdirectories themselves).</p> |
| Export Mask | Controls which files in the path are backed up. Can contain the following entries: (If no export mask is specified then all files will be matched and exported). |
| | NameMask A file name mask such as <code>*.cfg</code> . |
| | MatchAction Indicates how to process matching files: Either <code>CopyFile</code> or <code>IgnoreFile</code> |
| | NonMatchAction Indicates how to process non-matching files: Either <code>CopyFile</code> or <code>IgnoreFile</code> |
| Import Mask | Controls what is cleared from the path prior to a restore. Can contain the following entries: (If no import mask is specified then all files will be matched and deleted prior to the restore unless the option <code>--preclear false</code> is specified at the command line). |
| | NameMask A file name mask such as <code>*.cfg</code> . |
| | MatchAction Indicates how to process matching files: Either <code>DeleteFile</code> or <code>IgnoreFile</code> |

| Item Name | Description |
|-----------|--|
| | NonMatchAction Indicates how to process non-matching files: Either DeleteFile or IgnoreFile |

Configuration file examples:

The following XML tells **mastersettings.exe** to export all files in and below the main Ops Center Protector configuration directory:

```
<item name="Entry" argtype="list" >
  <item name="Path" argtype="single" >
    <value type="string" >db/config</value>
  </item>
  <item name="Depth" argtype="single" >
    <value type="int32" >2</value>
  </item>
</item>
```

The following XML tells mastersettings.exe not to export any files from the media manager events directory, but to delete all events from that directory prior to a restore. This will ensure that all events that are logged prior to an import are deleted, because they will not be relevant after the master settings have been restored.

```
<item name="Entry" argtype="list" >
  <item name="Path" argtype="single" >
    <value type="string" >db/mediamanager/events</value>
  </item>
  <item name="Export Mask" argtype="list" >
    <item name="MatchAction" argtype="single" >
      <value type="string" >IgnoreFile</value>
    </item>
  </item>
  <item name="Import Mask" argtype="list" >
    <item name="MatchAction" argtype="single" >
      <value type="string" >DeleteFile</value>
    </item>
  </item>
</item>
```

About the mastersettings.cfg file

mastersettings.cfg is an XML file that contains information indicating which Ops Center Protector files are to be zipped up (exported) or deleted prior to a restore (imported). This file is located in the following directory:

```
$Protector_HOME$\db\config
```

The mastersettings.cfg file can contain information as described in the following table.

Table 57 Configuration settings

| Item Name | Description |
|-------------|---|
| Path | The path to be backed up. The path specified is relative to the \$Protector_HOME directory. |
| Depth | <p>The depth, defined as a value, within the path to be backed up:</p> <p>-1 (default) backs up all files in all subdirectories.</p> <p>1 backs up only the files in the path.</p> <p>2 backs up all files in the path and within subdirectories of the path (but not the subdirectories themselves).</p> |
| Export Mask | Controls which files in the path are backed up. Can contain the following entries: (If no export mask is specified then all files will be matched and exported). |
| | NameMask A file name mask such as *.cfg. |
| | MatchAction Indicates how to process matching files: Either CopyFile or IgnoreFile |
| | NonMatchAction Indicates how to process non-matching files: Either CopyFile or IgnoreFile |
| Import Mask | Controls what is cleared from the path prior to a restore. Can contain the following entries: (If no import mask is specified then all files will be matched and deleted prior to the restore unless the option --preclear false is specified at the command line). |
| | NameMask A file name mask such as *.cfg. |
| | MatchAction Indicates how to process matching files: Either DeleteFile or IgnoreFile |

| Item Name | Description |
|-----------|--|
| | NonMatchAction Indicates how to process non-matching files: Either DeleteFile or IgnoreFile |

Examples

The following XML tells **mastersettings** to export all files in and below the main Ops Center Protector configuration directory:

```
<item name="Entry" argtype="list" >
  <item name="Path" argtype="single" >
    <value type="string" >db/config</value>
  </item>
  <item name="Depth" argtype="single" >
    <value type="int32" >2</value>
  </item>
</item>
```

The following XML tells **mastersettings** not to export any files from the intelligentstoragemanager events directory, but to delete all events from that directory prior to a restore. This will ensure that all events that are logged prior to an import are deleted, because they will not be relevant after the master settings have been restored.

```
<item name="Entry" argtype="list" >
  <item name="Path" argtype="single" >
    <value type="string" >db/intelligentstoragemanager/events</value>
  </item>
  <item name="Export Mask" argtype="list" >
    <item name="MatchAction" argtype="single" >
      <value type="string" >IgnoreFile</value>
    </item>
  </item>
  <item name="Import Mask" argtype="list" >
    <item name="MatchAction" argtype="single" >
      <value type="string" >DeleteFile</value>
    </item>
  </item>
</item>
```

Reducing repository size

If there is a large amount of free space within a repository, due to removal of a large backup set, it is possible to reduce the overall size of the repository. However this should only be done if the free space is required for another purpose. The repository is designed to re-use available internal space before growing in size to accommodate more data. If it is necessary to free space within a repository raise a support ticket for assistance with the process.

Generating log messages with **sendlog**

Use the **sendlog** command to create Protector log entries from a script.

Table 58 Command line options

| Abbreviated Argument | Full Argument | Description |
|----------------------|-------------------------|--|
| -h | --help | Displays command line parameter usage instructions. |
| -m <i>arg</i> | --message <i>arg</i> | <i>Log Message</i> field in the Logs. Specify a string in quotes. |
| -n <i>arg</i> | --node <i>arg</i> | <i>Actioned By</i> field in the Logs. Specify a string in quotes. |
| -l <i>arg</i> | --level <i>arg</i> | <i>Level</i> field in the Logs. Specify one of the following strings: <ul style="list-style-type: none"> ▪ detail ▪ information ▪ warning ▪ error ▪ reporting |
| -c <i>arg</i> | --category <i>arg</i> | <i>Category</i> field in the Logs. Specify a string in quotes. |
| -t <i>arg</i> | --tag <i>arg</i> | Log tag in the format: <pre>key:String NodeID uint32 int32 int64 uint64 ISODate Bool:value</pre> |
| -a <i>arg</i> | --attachment <i>arg</i> | <i>Attachments</i> field in the Logs. Specify a filename to attach. |
| -u <i>arg</i> | --user <i>arg</i> | <i>User</i> name field in the View Audit bubble. For use by Hitachi Vantara Support only. |
| -z <i>arg</i> | --process <i>arg</i> | Audit process. For use by Hitachi Vantara Support only. |
| -d <i>arg</i> | --space <i>arg</i> | <i>User</i> name (authentication space) field in the View Audit bubble. For use by Hitachi Vantara Support only. |

| Abbreviated Argument | Full Argument | Description |
|----------------------|------------------------------|--|
| <code>-i arg</code> | <code>--ipaddress arg</code> | <i>Address</i> field in the View Audit bubble. Specify an IP address. For use by Hitachi Vantara Support only. |
| <code>-p arg</code> | <code>--port arg</code> | <i>Address</i> field (port) in the View Audit bubble. Specify an IP port. For use by Hitachi Vantara Support only. |
| <code>-o arg</code> | <code>--action arg</code> | <i>Action</i> field in the View Audit bubble. Specify a string. For use by Hitachi Vantara Support only. |
| <code>-s arg</code> | <code>--success arg</code> | <i>Action Result</i> field in the View Audit bubble. For use by Hitachi Vantara Support only. |

Usage Example:

Running the following command will create a log message in the category *Test*, at the level *Information* with the message "Test log message".

```
sendlog -c "Test" -l information -m "Test log message"
```

Importing legacy (7.0 or older) logs in to a newly upgraded 7.1 or later log database

Version 7.1 of Hitachi Protector switches from using MongoDB to Postgres for its databases. Protector will not to automatically transfer the logs from an existing installation during upgrade. The rationale for this was that such a transfer might take several hours (or longer) and therefore the upgrade process would be inappropriately long.

The 'log-import' tool options can be displayed using the following command:

```
> log-import.exe --help
```

The options are:

| Option | Description |
|--|--|
| <code>-h [--help]</code> | Show the help message |
| <code>-p [--period] arg (=13)</code> | The time period in weeks before now from which to import data (default 13 weeks) |

| Option | Description |
|----------------------------|--|
| -t [--type] arg (=both) | The type of data to import, either "logs", "stats" or "both" (default "both") |
| -d [--directory] arg | The directory containing the mongo DB to import (default <Protector>/db/saves/logdaemon) |
| -D [--dumpdirectory] arg | The temporary directory to dump the database into (default <Protector>/db/saves/logdaemon.dump) |
| -T [--dumptimeout] arg | (=3600) The max time allowed (in seconds) to dump the existing database (default 3600) |
| -n [--numthreads] arg | The number of threads to run in parallel when importing data (default determined by hardware capability) |

Usage Example:

Running the following command would import 20 weeks, limit collection to logs only, and limit execution to 16 CPU cores:

```
Log-import.exe -p 20 -t logs -n 16
```

Options Detailed Description

--help

This is self-explanatory.

--period

Specify the time period, in weeks before now, from which to import data. The default for this option is 13 weeks. To only import the last weeks' worth of data then supply 1 to this option. If your database retains logs for a year and you want to import them all then specify 52.

--type

Protector stores in its logs database both logs and statistics. These statistics are used on some displays (e.g. store sizes) and in some reports. The default for this option is 'both' which will import the logs and statistics from the MongoDB. To import only logs then supply 'logs' as the argument to this parameter. To import only statistics, then supply 'stats' as the argument to this parameter.

--directory

This option specifies the location of the MongoDB (normally <Protector>/db/save/logdaemon). If the database is in a non-standard location use this option specifying the path to the alternate location.

--dumpdirectory

This option specifies the location of temporary directory used by the tool to dump the content of the MongoDB (normally <Protector>/db/save/logdaemon.dump).

`--dumptimeout`

The timeout in seconds the tool will wait for the dump to complete. The default of 1 hour should be sufficient in all but extreme cases. If the database is so large that dumping it takes longer than 1 hour use this option specifying a longer timeout.

`--numthreads`

This argument can be used to control the amount of computing power (CPU) the tool will utilise when importing data. The default utilises all available CPU cores on the hardware platform up to a maximum of 64 cores. To reduce the load the tool places on the system specify a lower number here bearing in mind the lower the number the longer the import will take.

Free Space Problems

If space is a limiting factor on the volume on which Protector is installed, then the following is recommended:

1. Move the '<Protector>/db/save/logdaemon' folder to a secondary volume containing sufficient free space.
2. Execute the tool using the '--directory' option specifying the new location of the 'logdaemon' directory.

Changing a node's profile with **setconfig**

If you need to change a client machine's Master node, you can do so by running the **setconfig** utility from the command line interface.

The following is information about the most commonly used options and command usage.

Table 59 Command line options

| Abbreviated Argument | Full Argument | Description |
|----------------------|-------------------------|--|
| -h | --help | Displays command line parameter usage instructions. |
| -l | --list | Lists the node's address settings. |
| -c | --clear | Clear the client node's master setting. |
| -m <i>address</i> | --master <i>address</i> | Set the IP address of the client node's master. This option is used with -f |

| Abbreviated Argument | Full Argument | Description |
|----------------------------------|-------------------------------------|---|
| -f | --force | Forcibly set the client node's master. This option is used with -m and -c if the node in question is already connected to an authorized master. |
| -e <i>name ipaddress</i> | --resetmaster <i>name ipaddress</i> | Reset name and IP address of master node e.g.: --resetmaster myMaster 192.168.12.23 |
| -n | --name <i>name</i> | Set node name (excluding ID part) |
| --full | | This option is used with -n. The name given is the full node name including ID |
| -p | --prefer <i>IPaddress</i> | Add preferred network(s) |
| -b | --bar <i>IPaddress</i> | Bar network(s) |
| -x | --fixed <i>IPaddress</i> | Add fixed address(s). Sets the external-facing address of the Master when backing up over the Internet. This is the IP address that will be entered when installing Internet connected nodes. |
| -r | --remove <i>IPaddress</i> | Remove addresses from fixed/preferred/barred list(s) |
| --firewalltrue | | Node is the other side of a firewall from the master. Provides the same behavior as selecting Internet connected node during the software installation. |
| --deletesslcert <i>node-name</i> | | Delete the SSL certificate for the local node/specified node. |
| --encrypted | | All data transfer to be encrypted |

| Abbreviated Argument | Full Argument | Description |
|---------------------------------|---------------|--|
| <code>--filterrulescheck</code> | | Check the filter rules for the file system are up-to-date and triggers a resync if they needed updating. |

Usage example:

Setting the Master node IP address:


```
setconfig --master 192.156.34.0
```

Installing and upgrading Protector from the command line

Use the `-R<release_num>-<build_num>-<os>-<architecture>` command to install or upgrade Protector from the command line. Notice that a separate installer is supplied on the ISO for each supported OS and architecture type.

Table 60 Command Line Options

| Argument | Description |
|---|--|
| <code>--help</code> | Displays the list of valid options in a pop-up dialog. |
| <code>--install-directory <i>arg</i></code> | Specifies the installation directory. Windows Default is C:\Program Files\Hitachi\Protector Linux Default is /opt/hitachi/protector |
| <code>--node-type <i>arg</i></code> | Specifies the installation type: <ul style="list-style-type: none"> ▪ master ▪ client (default) |
| <code>--mode <i>arg</i></code> | Sets the installation mode: Windows options: <ul style="list-style-type: none"> ▪ win32 - interactive wizard (default) ▪ unattended - no user interaction Linux options <ul style="list-style-type: none"> ▪ gtk - GUI using GTK libraries (default) ▪ xwindow - GUI using basic X11 ▪ text - Interactive text ▪ unattended - Non-interactive |

| Argument | Description |
|--|---|
| <code>--unattendedmodeui <i>arg</i></code> | Sets the UI displayed for unattended installation: <ul style="list-style-type: none"> ▪ none (default) ▪ minimal ▪ minimalWithDialogs |
| <code>--debugtrace <i>arg</i></code> | Specifies a filename for debug trace output. |
| <code>--debuglevel <i>arg</i></code> | Sets the level of verbosity for debug trace output: <ul style="list-style-type: none"> ▪ 0 - lowest ▪ 1 ▪ 2 (default) ▪ 3 ▪ 4 - highest |
| <code>--node-name <i>arg</i></code> | Specifies the Protector node name. Default is the OS node name. |
| <code>--user-account <i>arg</i></code> | Used only when installing a master node. Specifies the account to use for initial login to Protector after installation of a master node. |
| <code>--ui-port <i>arg</i></code> | Used only when installing a master node. Specifies the user interface port. Default is 443 (HTTPS). |
| <code>--master-name <i>arg</i></code> | Used only when installing client nodes. Specifies the node name or IP address of the master. Clients use to contact the master. |
| <code>--internet-connected <i>arg</i></code> | Used only when installing client nodes. Installs the node as an internet connected node: <ul style="list-style-type: none"> ▪ 0 - not internet connected (default) ▪ 1 - internet connected <div>  Note: This node will connect to the master over an unsecured network. Choosing this option will cause all data sent and received to be encrypted and will also enable this node to function behind a firewall. Over-the-wire encryption requires a license and may not be available in all territories. </div> |

| Argument | Description |
|--|--|
| <code>--installer-language <i>arg</i></code> | Specifies the installation language: <ul style="list-style-type: none"> ▪ <code>en</code> - English (default) ▪ <code>ja</code> - Japanese ▪ <code>zh_CN</code> - Simplified Chinese |
| <code>--optionfile <i>arg</i></code> | Specifies an installation option file. Instructs the installer to take the command line values from a file when <code>--mode unattended</code> is specified. The options are listed, line by line, as <code>key=value</code> pairs. |
| <code>--version</code> | Displays product version information in a pop-up dialog. |

Running the following command will perform an unattended installation or upgrade of a Protector version 6.8 AIX PowerPC client node:

```
HDID-R6.8-6.8.0.59802-AIX-PPC-64.run --mode unattended --install-
directory \opt\hitachi\hdid --node-type client --node-name myClient
--master-name myMaster
```

Listing Oracle RMAN channel configurations with schedulershow

`schedulershow` is a CLI tool that is used to aid the Oracle database administrator to configure Oracle RMAN to save and restore data using a datastore managed by Ops Center Protector. It provides the following functionality.

- List the Oracle RMAN dataflows active on the current node
- Create a sample RMAN channel definition for a dataflow operation

In order for a node to store or access any data in a Protector managed datastore using Oracle RMAN, the node has to be part of a dataflow and granted access using the `access` operation. Once the dataflow is compiled and distributed, it can be listed with `schedulershow` and Oracle RMAN can access it using an SBT channel.

Table 61 Command line options

| Abbreviated Argument | Full Argument | Description |
|----------------------|---------------------|---------------|
| <code>-h</code> | <code>--help</code> | Display help. |

| Abbreviated Argument | Full Argument | Description |
|----------------------|---------------------|---|
| -c | ---config <trigger> | Display RMAN channel configuration for a dataflow. The command provides a list of valid triggers when running the it without parameters.. |

Usage Example

List all Oracle RMAN dataflows active on this node

```
app/bin/schedulershow
Application DataFlow Source OperationName Storage Trigger
Oracle mysampledfl myOracleNode Access myRepository
1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea604046
Oracle Demo2 myOracleNode Access myRepository
6e7b941d5e73ec5a3ce72b64e70c36c56e6d12f76a379d0982d130d1b505a895
```

Get the Oracle RMAN channel definition for a dataflow

```
app/bin/schedulershow -c
1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea604046
# Application = Oracle
# DataFlow=mysampledfl
# Source=myOracleNode
# OperationName=Access
# Storage=myRepository
#
Trigger=1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea60
4046
DEVICE TYPE 'SBT_TAPE' PARMS
'SBT_LIBRARY=/opt/hitachi/protector/app/lib/
libhsbt.so, SBT_PARMS=(TRIGGER=1f04eeec33b10190b79ea6d47a65f3943f5a9d
e0c1a5d1557afeb420ea604046) '
```

Chapter 7: Troubleshooting

This chapter provides guidelines for how to troubleshoot issues that might occur when using Ops Center Protector.

For troubleshooting activities carried out in conjunction with the support organization it may be necessary to collect diagnostics information from the machines involved in the dataflows displaying an issue. In order for the support organization to investigate the issue it is normally necessary to reproduce this issue with debug trace enabled and then collect diagdata from the machines involved.

To set a node in to debug trace run the following cli command from a command prompt in the <install_path>bin directory:

```
Diagdata -t TraceDebug
```

It will then ask if you want to set the trace level or the running processes – respond with Y to agree to that.

This need to be done on all nodes involved in the dataflow presenting an issue. Once this has been done recreate the issue on the system. Then on each node run the following command:

```
Diagdata -f
```

This will take a while to run but will generate a .zip file in <install_path>runtime send these zip files to the support organization. Once the zip files have been collected run the following command:

```
Diagdata -t TraceAlways
```

And again agree to setting the trace for running processes.

More detailed information on diagdata can be found here ([Gathering diagnostic information with diagdata \(on page 815\)](#)).

Troubleshooting General

This section provides guidelines for how to troubleshoot general issues that might occur when using Ops Center Protector.

Error copying file during Protector upgrade

Problem:

The following error is displayed while attempting to upgrade Protector:

```
Error copying file from C:/Program Files/Hitachi/Protector/xxxxxxx  
to C:/Program Files/Hitachi/Protector/xxxxxxx
```

Abort Retry Ignore

Solution:

Please wait and retry, the binary is probably being slow to shutdown. If the problem persists seek assistance from Hitachi Vantara Support.

Protector backups failing on some Linux distributions

Problem:

On some Linux distributions the **avahi-daemon** can interfere with Protector network communications. This may cause backups to fail.

Solution:

Disabling or un-installing the **avahi-daemon** resolves this issue.

Logging in with multiple tabs open causes circular log in request

Problem:

Protector allows a user to open multiple browser tabs to enable different UI pages to be viewed simultaneously. If the user is logged out, due to a session timeout for example, an **Unauthorized** dialog is displayed in the current tab. Logging back in to the current tab, then switching to another tab can result in another **Unauthorized** dialog being displayed, forcing the user to log in again. Under certain conditions, a circular log in request may be encountered, as the user switches back and forth between tabs.

Solution:

Log in to the current tab displaying the **Unauthorized** dialog, then if the **Unauthorized** dialog is seen in any other tabs, ignore it and click your browser's Page Reload button instead.

Moving system time backwards causes problems

Problem:

Moving system time backwards causes problems.

Solution:

Moving system time backwards is not recommended. If this is required then restart the Protector hub service after doing so.

Session ID and access failure messages using IE

Problem:

When attempting to access the Protector web UI using Microsoft Internet Explorer on Windows Server Editions, messages of the following type are displayed:

- Received non-login message with no session ID
- Failed to access <Page Name>

Solution:

This is most likely due to Internet Explorer's Enhanced Security Configuration (ESC), which is turned on by default with Server Editions of Windows, preventing cookies from being stored on the machine.

Turn off ESC when using Internet Explorer.

Unicode characters not displayed correctly in web UI

Problem:

When displaying Unicode characters, the Protector web UI may not render them correctly. This may happen when the text being displayed originated on a Protector client in one locale, but is viewed using a browser on a machine in a different locale.

Solution:

Ensure that the browser being used has the required fonts installed. Refer to your browser's documentation for details.

Troubleshooting Hitachi Block

This section provides guidelines for how to troubleshoot issues that might occur when using Hitachi Block storage.

Cannot create any more snapshots

Problem:

When trying to create a snapshot, the following error message is logged:

```
Handler call failed: [...] failed to create snapshot pair [...]
```

Block storage has a limit of 1024 snapshots per LDEV. When this limit is reached, no more snapshots can be created.

Solution:

Review the RPO and Retention you have specified. If you set an overly aggressive RPO combined with long retention times then the snapshot limit can easily be breached.

Cannot create snapshots in the specified pool

Problem:

The following error message is logged when creating a snapshot:

```
Handler call failed: [] snapshots that are in a different pool
```

This indicates that the primary volume (P-VOL) in question already has a pool assigned for snapshots, and this is not the same pool as defined in the policy. Block storage will only allow one pool to be used for snapshots (S-VOLs) per P-VOL.

Solution:

Review the policy to ensure that the correct snapshot pool is specified.

Cannot make a mounted snapshot multipathed

Problem:

When mounting a snapshot there is always only one path to the disk.

Solution:

To make the mounted snapshot multipathed requires additional steps outside of Protector, dependent on the type of OS on mount host.

Cannot revert snapshot if source machine is unavailable

Problem:

If the source machine where the primary volume is mounted is unavailable, it is not possible to revert a snapshot using Protector. This is because Protector needs to unmount the primary volume prior to reverting it using the snapshot.

Solution:

In the case of a Hitachi Block hardware path classification, the source machine does not need to be available but it is important to unmount the volume before performing the revert.

Cannot tear down adopted replication having other pairings

Problem:

If a replication is adopted in Protector but other replications or snapshots are associated with the replication pair it will not be possible for Protector to remove the replication.

Solution:

Before removing the replication from Protector, first remove the associated snapshots and replications.

Clean-up actions not performed if replication setup fails

Problem:

If the set-up phase of a replication fails, Protector will not clean-up the changes made on the hardware.

Solution:

Detailed steps to perform the clean-up by hand can be found on the Hitachi Vantara knowledge base.

Error 10360 activating UR data flow with grouped source nodes

Problem:

When attempting to activate a data flow in which a node group is specified as the source of a UR replication, the rules compiler generates the following error, indicating that the journal is already assigned to one of the sources within the group:

The Hitachi Block Storage node *<Destination Name>* has a target journal selected for data from *<SourceName2 'OperationName'>* operation 'UR' but that journal is already assigned to *<SourceName1 'OperationName'>* operation 'UR'

Solution:

For UR, the selected journals must be unique to each operation and policy in the data flow. This means that a node group cannot be specified as a source when drawing a UR data flow.

Identify each source node explicitly on the data flow and assign unique journals for each replication operation.

Error when removing replications from Protector

Problem:

When removing a replication from Protector the following error message maybe logged:

Replication pair status change *** Attachment count: 1 ***

Solution:

In this circumstance (i.e. when removing a replication), this error can be safely ignored.

In all other circumstances this error should not be ignored and should be investigated.

ISM crashed, shutdown or rebooted whilst activating a replication or snapshot data flow

Problem:

If an ISM node crashes, shuts down or reboots whilst a replication or snapshot data flow is being activated, Protector will indicate that the job(s) associated with the activation has failed.

Solution:

Protector is resilient to this type of failure. Try retriggering the operations on the associated data flow(s) once the ISM has finished rebooting.

Policy returns 'Could not start HORCM instance [...]'

Problem:

This error message occurs when a policy is triggered and there is a problem with the command device (CMD) used by the HORCM instance to communicate with the storage device:

- The command device is being shared with another server.
- The command device has been initialized (and possibly put online) as a disk at the OS level.

Solution:

The array maintains a reference count for the command device instances. There can be a maximum of 4096 instances per storage system. If HORCM is not shutdown cleanly using **horcmshutdown** then the reference count will not be decremented and the instance will be leaked. Over time this can cause an inability to start HORCM instances for that array.

Try detaching the command device from the Protector proxy node, clearing its command device attribute then setting it up again (this subtracts the number of instances for that command device from the total count). Alternatively, try unmapping the existing command device and mapping a new one.

Proxy node cannot access the LDEV's resource group

Problem:

When the user account does not have permission to access the LDEV the following error message is logged:

```
Handler call failed: refreshLogicalDevices Failed [...]
```

This is because the LDEV is not in a resource group that the user account can access.

This can be confirmed by navigating to `C:\HORCM\etc` on the proxy node and running the following command:

```
raidcom.exe get ldev -ldev_id LdevId -I0
```

The following message will be returned:

```
raidcom: [EX_EGPERM] Permission denied with the Resource Group
```

Solution:

Ensure that the user account specified for the block device proxy node has access to the resource group being used.

Renaming an LDEV fails due to unresolved variables

Problem:

When trying to name or rename an LDEV using a variable (e.g. `%ORIGIN_SERIAL%`), the following error message is logged:

```
Unable to generate custom secondary logical device name because one or more variables could not be resolved.
```

If the referenced LDEV has no name then `%XXXX_LDEV_NAME%` variables will evaluate to an empty string and an error will be logged.

If upgrading from a version earlier than v6.6, the information required to resolve substitution variables may not be present in the metadata for existing LDEVs created prior to upgrade. For example the %ORIGIN_SERIAL% (serial number of the origin storage array for the LDEV) is not included in previous Protector versions.

- For replications, this metadata is added when the replication is next evaluated, following an upgrade to Protector v6.6.
- For snapshot, this metadata is never added since snapshots are not re-evaluated, and will eventually be retired.

Solution:

Review the naming string in the Secondary Logical Device Name field of the **Replication/ Snapshot Operation Properties** or **Rename Secondary LDEVs** dialog, and for:

- %XXXX_LDEV_NAME% variables - Ensure the existing LDEV has a name, then retry the naming operation.
- All other variables - For replications, ensure they have been re-evaluated, then retry the naming operation. For snapshots, remove the offending substitution variable(s).

Windows 2008 Server doesn't show changes to reverted disk

Problem:

On Windows 2008 Server, after successfully reverting a disk it is possible that changes are not reflected on the OS.

Solution:

Use the disk management console on the server to offline and then online the disk.

Snapshot fails with error "Cannot create snapshots: specified pool does not have a platform type of "OPEN""

Problem:

Attempt to create snapshot fails with the above error.

Solution:

One possible cause for this is that the destination pool has been deleted outside of Protector.

Replication fails with error "Replication policy specifies a pool that is not of type Thin Provisioning or Smart Tiers, cannot create secondary logical devices"

Problem:

Attempt to create or re-evaluate a replication fails with the above error.

Solution:

One possible cause for this is that the destination pool has been deleted outside of Protector.

Error received stating "Failed to start HORCM instance for command device"

Problem:

Many activities can result in the above error being generated. However within Hitachi there is no more information to help diagnose the issue.

Solution:

Locate the HORCM log file which is by default located in C:\HORCM for Windows or \HORCM for Linux. Investigate the errors produced in the log file, refer to the HORCM documentation for more details on this..

Troubleshooting HCP

This section provides guidelines for how to troubleshoot issues that might occur when using Hitachi Content Platform.

Changing the namespace size on HCP node has no effect

Problem:

Changing the namespace size once an HCP node has been created has no effect.

Solution:

To change the namespace size please use the HCP user interface.

Cannot connect to HCP or HTTP 503 Service Unavailable

Problem:

The messages:

`Couldn't connect to server`

or

`HTTP status 503 Service Unavailable`

might appear when attempting to authorizing an HCP node.

Solution:

Check that the Management API is enabled in the Tenant Console on HCP for that tenant.

Couldn't resolve HCP host name

Problem:

The message:

`Couldn't resolve host name`

might appear when attempting to authorize an HCP node, or might be logged when tiering.

Solution:

Check that the HCP tenant can be contacted; for example, by pinging the tenant using the host name to ensure DNS is working correctly.

If system level credentials were provided then ensure that the Allow HCP system-level users to manage me and search across my space check box is checked on the HCP's **Tenant's Overview** window.

HCP connection returns HTTP status 403 Forbidden

Problem:

The message:

HTTP status 403 Forbidden

might appear when authorizing an HCP node or might be logged when tiering.

Solution:

Check all the HCP node details are correct including Username, Password and Tenant.

HCP returns Request Entity Too Large error

Problem:

The message:

Request Entity Too Large

might be logged when tiering to HCP.

Solution:

Check on HCP that the namespace has not exceeded its quota and that the tenant has not exceeded its quota.

HCP restore finished with minor issues

Problem:

The message:

The restore finished with minor issues.

might be logged when restoring from HCP.

Solution:

This may occur if files have been deleted from HCP by an application other than Protector. The log attachment lists the paths that the missing files were originally backed up from by Protector.

HCP Node stays offline after node creation

Problem:

After creating a HCP node, it remains offline:

Solution:

Ensure that the Proxy Node defined within the wizard and the Hitachi Content Platform node are time synced. If the time is different by over 5 minutes, then the node creation and future backup may fail. It is recommend that the system time on all nodes should have the correct date/time associated with their particular region and time zone.

Troubleshooting Oracle Database

This section provides guidelines for how to troubleshoot issues that might occur when using Oracle Databases.

An online backup or mount fails

Problem:

In the event of a failure, Protector attempts to revert the operations performed up to the point of the failure, but success cannot be guaranteed.

Solution:

If an Oracle online backup fails, then check that the operations described in the attachments to the log entry `backupOnline Worksteps` are reverted. It is especially important that the step `endOnlineBackup` is performed. If not then execute the steps described in the attachment to the log entry `endOnlineBackup`.

If an Oracle offline backup fails, check that the database is started.

If a mount fails then check if the status of the snapshot is mounted. If so, then perform an un-mount. In addition to this, check that an eventual ASM Diskgroup (`asmcmd lsdg`) is un-mounted and removed from the resource group (`asmcmd umount ASM_DISKGROUP;` `srvctl remove diskgroup -g ASM_DISKGROUP`). Do not try to issue a mount operation to another server, prior a successful un-mount operation.

Failed to discover Oracle environment when creating application node

Problem:

The following error message is seen when attempting to discover an Oracle Environment in the 'Create Node – Oracle Database' section:

```
Failed to discover Oracle Environment
```

Solution:

1. Click **Rediscover Oracle Environment**



Note: If click fails, continue with the below steps.

2. Ensure that Oracle is running. If not, start Oracle and repeat the discover process.
3. Edit the file `/etc/nsswitch.conf`
 - a. Using a suitable editor, open the file `/etc/nsswitch.conf`

- b. Locate the line that starts with `hosts` and comment it out with a `#`
- c. Copy the line and re-order it so that `dns` is first and `files` is last. E.g.:

```
#hosts: files dns myhostname
hosts: dns myhostname files
```

- d. Save the file.
- e. Attempt to discover the Oracle Environment again. The edited file should be picked up straight away and thus it should not be necessary to restart or reboot.

Oracle database snapshot fails to mount

Problem:

The following error message is logged if you attempt to mount an Oracle database snapshot to a location where one is already mounted:

```
Handler call failed: [...] ASM Diskgroups [...] mounted
```

Solution:

You cannot mount a second snapshot of the database to a location where one is already mounted.

RAC lock on database failed

The following error message is logged, during online snapshot operations, for all but one node in a RAC environment:

```
Handler call failed: [...] RAC Lock Database failed, check if [...]
```

Only one RAC node will succeed to lock the database prior to online snapshotting, all other nodes in the RAC will fail.

Solution:

Check that the operation has succeeded on exactly one of the RAC nodes.

Cannot find Oracle database metadata files on mount

Problem:

The metadata files relating to the mounted Oracle database files cannot be located.

Solution:

The following information message is logged when an Oracle database is mounted:

```
OracleHandler [...]: mount for 'Oracle DB: [...]' finished [...]
```

The attachment lists the destination paths where the Oracle metadata files have been placed.

Error when reverting on ASM in normal/high redundancy mode

Problem:

If you attempt to revert a database running on ASM in normal or high redundancy mode, the following warning message is logged during backup operations, followed by the error message:

```
Handler call failed: [...] normal or high redundancy used; revert
not possible with one mirror
```

Solution:

ASM normal/high redundancy modes are currently not supported.

Warning during backup if data/redo files in the same directory

Problem:

The following warning message is logged during backup operations when the data and redo files of the Oracle database are located in the same directory:

```
OracleHandler [...]: Oracle Database Files and Redo in the [...]
```

Solution:

It is not recommended to have redo logs and data on the same physical disks, as this may cause unusable backups for anything other than crash consistent backups. Please refer to **Oracle application software prerequisites** for more information.

Oracle RAC RPO based policy creates more snapshots than expected

Problem:

When using the 'All Day' schedule option for an Oracle RAC policy and relying on the RPO setting alone, more snapshots than expected may be created. This can happen if rules are activated while one node in the RAC is busy or restarting, causing the activation time to be offset for that node.

Solution:

Try using the 'Scheduled Time' option rather than an RPO. Also check that the RAC nodes' times are synchronized.

Listing Oracle RMAN channel configurations with schedulershow

schedulershow is a CLI tool that is used to aid the Oracle database administrator to configure Oracle RMAN to save and restore data using a datastore managed by Ops Center Protector. It provides the following functionality.

- List the Oracle RMAN dataflows active on the current node
- Create a sample RMAN channel definition for a dataflow operation

In order for a node to store or access any data in a Protector managed datastore using Oracle RMAN, the node has to be part of a dataflow and granted access using the access operation. Once the dataflow is compiled and distributed, it can be listed with schedulershow and Oracle RMAN can access it using an SBT channel.

Table 62 Command line options

| Abbreviated Argument | Full Argument | Description |
|----------------------|---------------------|---|
| -h | --help | Display help. |
| -c | ---config <trigger> | Display RMAN channel configuration for a dataflow. The command provides a list of valid triggers when running the it without parameters.. |

Usage Example**List all Oracle RMAN dataflows active on this node**

```
app/bin/schedulershow

Application DataFlow Source OperationName Storage Trigger
Oracle mysampledfl myOracleNode Access myRepository
1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea604046

Oracle Demo2 myOracleNode Access myRepository
6e7b941d5e73ec5a3ce72b64e70c36c56e6d12f76a379d0982d130d1b505a895
```

Get the Oracle RMAN channel definition for a dataflow

```
app/bin/schedulershow -c
1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea604046

# Application = Oracle
# DataFlow=mysampledfl
# Source=myOracleNode
# OperationName=Access
# Storage=myRepository
#
Trigger=1f04eeec33b10190b79ea6d47a65f3943f5a9de0c1a5d1557afeb420ea60
4046

DEVICE TYPE 'SBT_TAPE' PARMS
'SBT_LIBRARY=/opt/hitachi/protector/app/lib/
libhsbt.so, SBT_PARMS=(TRIGGER=1f04eeec33b10190b79ea6d47a65f3943f5a9d
e0c1a5d1557afeb420ea604046) '
```

Troubleshooting VMware

This section provides guidelines for how to troubleshoot issues that might occur when using VMware.

VM MAC Conflict alarm when restoring cloned VM

Problem:

When restoring a cloned VM with the original VM present, vSphere Client may display the following critical alarm:

```
VM MAC Conflict
```

Solution:

The alarm can be ignored.

When the VM is restored, vSphere may detect a transient MAC conflict between the original and cloned VM before a new MAC address is automatically assigned to the clone.

Restoring VMs to original location fails with 'Restore failed to recover all the required VMs'

Problem:

The following messages are displayed in the logs when attempting to restore a VM to its original location:

```
Handler 'VMwareESX' call failed: Restore failed to recover all the
required VMs
```

```
Restore failed to recover all the required VMs *** Attachment
count: 1 ***
```

The attachment identifies the VMDK file associated with the VM that failed to restore.

Cause:

If a VM only resides on one datastore, Protector will not consolidate that VMs snapshots when it is restored (thus all its intermediate snapshots are preserved). This can cause a restore failure under certain conditions.

Solution:

Try selecting Clone instead of Original location when specifying the restore location in Protector. This will cause Protector to consolidate the VM's snapshots.

SAN transport message logged for non-SAN datastore

Problem:

The following message is logged when performing an incremental backup of a datastore that is not accessible using SAN Transport Mode:

```
Disk 'Virtual Hard disk <n> Data.vmdk' snapshot          opened
with 'san' transport mode
```

Solution:

This log message may be generated if you are using a virtual machine as the proxy node. For some versions of vCenter and ESXi, the incorrect transfer mode is reported to Protector. Either ignore the log message or use a physical proxy node to prevent the message.

SRM recovery fails with 'Cannot process consistency group [...] expected [...] role target'

Problem:

The following message is displayed by SRM when performing a test or real fail-over or fail-back recovery operation:

```
Failed to sync data on replica devices.
```

Cause:

```
Cannot process consistency group '{<CTG ID>}' with role  
'promotedTarget' when expected consistency group with role 'target'
```

Cause:

SRM checks that replications are in the expected state before performing the recovery operation. This message may be generated if the continuous TrueCopy replication between the production and recovery site has been paused or swapped outside of SRM.

SRM replications must not be paused or swapped outside of SRM.

Solution:

In SRM, perform Discover Devices, then check the Status of the datastores. If the status is *Failover complete*, check if the corresponding TC replication in Protector is in the paused state and un-pause it if required.

Datastores status should be either *Outgoing Replication* or *Incoming Replication* before starting a failover.

vRO Ad Hoc Backup fails with '[...] Tag 'HDID/Protector Ad Hoc' already in use [...]

Problem:

The following message is logged in vRO when running the 'Ad Hoc Backup' workflow:

```
(com.hitachivantara.protector.backup/performAdHocBackupOf) Error  
in (Dynamic Script Module name : performAdHocBackupOf#17)
```

```
HdidPluginException[Cannot perform Ad Hoc Backup, Tag 'HDID/  
Protector Ad Hoc' already in use. Other VM(s) may be  
backed up because the following objects are tagged:  
[Name: , Type: VirtualMachine, Id: vm-4398]
```

Please try again later or contact your system administrator if the failure persists.

Cause:

If you manually assign the 'HDID/Protector Ad Hoc' tag to a VM and subsequently delete that VM, then run the 'Ad Hoc Backup' workflow on any other VM, the operation will fail with the above error.

Solution:

Delete the 'HDID/Protector Ad Hoc' tag from vSphere then recreate it.

The 'Ad Hoc' tag should never be manually assigned. It should only be automatically assigned by Protector vRO workflow scripts.

vRO Ad Hoc Backup fails with 'Cause: VMwareException[Tagging cardinality violation]'

Problem:

The following message is logged in vRO when running the 'Ad Hoc Backup' workflow:

```
(com.hitachivantara.protector.backup/performAdHocBackupOf) Error in  
(Dynamic Script Module  
  name : performAdHocBackupOf#9) MasterException[failed to associate  
Tag [name: Protector Ad  
  Hoc, Id: urn:vmomi:InventoryServiceTag:...] to VM [vm-...],  
Cause:  
  VMwareException[Tagging cardinality violation] ]
```

Cause:

For the vRO Ad Hoc Backup Workflow to work, it needs to tag the desired VM with the 'HDID/Protector Ad Hoc' tag.

The error '*Tagging cardinality violation*' indicates that the VM already has a tag that belongs to the same tag category as the 'HDID/Protector Ad Hoc' tag. And that this tag category is restricted to "Tags Per Object: One tag". As such only one tag from the category can be assigned to the desired VM.

Solution:

Move the 'HDID/Protector Ad Hoc' tag into its own category.

If you cannot create a new category, then alter the category tag cardinality such that “Tags Per Object” is “Many tags”. (See screenshot below)

Figure 533 Creating a new Category for vRO tags

Troubleshooting Amazon S3

This section provides guidelines for how to troubleshoot issues that might occur when using Amazon S3.

Amazon S3 Node stays offline after node creation

Problem:

After creating an Amazon S3 node, it remains offline:

Solution:

Ensure that the Proxy Node defined within the wizard and the Amazon S3 Proxy node are time synced. If the time is different by over 5 minutes, then the node creation and future backup may fail. It is recommend that the system time on all nodes should have the correct date/time associated with their particular region and time zone.

Troubleshooting Oracle RMAN

This section provides guidelines for how to troubleshoot issues that might occur when using Oracle RMAN.

ORA-27211: Failed to load Media Management Library

Oracle RMAN error message:

ORA-19554: error allocating device, device type: SBT_TAPE, device name:

ORA-27211: Failed to load Media Management Library

Additional information: 4156

The Media Management Library can not be loaded.

Cause:

Oracle RMAN cannot locate Protectors Oracle RMAN integration library

Solution:

Check the RMAN channel configuration and ensure the SBT_LIBRARY path section is correct and the filesystem permissions allow the oracle user to read the file.

The schedulershows command will generate channel configurations with the correct path, however you will have to check the filesystem permission manually.

ORA-19511: ... sbtinit2: initialize communication failed

Oracle RMAN error message:

ORA-19554: error allocating device, device type: SBT_TAPE, device name:

ORA-27023: skgfsbi: media manager protocol error

ORA-19511: non RMAN, but media manager or vendor specific failure, error text:

sbtinit2: initialize communication failed

Cause:

There are two possible causes for this error message

- The trigger / channel is no longer valid
- The UBI datastore (e.g Gen2 Repository, Hitachi Content Platform Gen2, Amazon S3) is not available

Solution:

- Check the target storage (e.g. Gen2 Repository, Hitachi Content Platform Gen2, Amazon S3) is available and listed as online
- Check the Oracle Application node is part of the dataflow and the dataflow is activated
- Compare the channel definition (specifically the trigger id) with the definitions listed by the schedulershows command

ORA-19511: ... sbtbackup: write to store not allowed

Oracle RMAN error message:

ORA-27028: skgfcrcr: sdtbackur returned error

ORA-19511: non RMAN, but media manager or vendor specific failure,
error text:

sdtbackur: write to store not allowed

Cause

The policy does not allow this node to write into the store.

Solution:

Ensure you use an “Access” operation with read/write permissions on the dataflow.

ORA-19511: ... Data Folder not found

Oracle RMAN error message:

ORA-27027: sdtremove2 returned error

ORA-19511: non RMAN, but media manager or vendor specific failure,
error text:

sdtremove: internal - Data Folder not found

Cause

The server lost the connection to the target storage during the operation

Solution:

- Ensure the datastore used in this dataflow is online and available
- Restart RMAN
- Use RMAN to perform a consistency check (e.g. crosscheck backup / crosscheck backupset)
- Retry the operation

If this does not solve your problem, please contact support

ORA-19511: ... no Root Object

Oracle RMAN error message:

ORA-27028: skgfcrcr: sdtbackur returned error

ORA-19511: non RMAN, but media manager or vendor specific failure,
error text:

internal - no Root Object

Cause

The RMAN integration cannot establish the connection to the storage target.

Solution:

- Ensure the datastore used in this dataflow is online and available
- Restart RMAN

- Use RMAN to perform a consistency check (e.g. crosscheck backup / crosscheck backupset)
- Retry the operation

If this does not solve your problem, please contact support

ORA-19511: ... database <dbname> not allowed

Oracle RMAN error message:

```
ORA-27028: skgfcrcr: sbtbackup returned error
```

```
ORA-19511: non RMAN, but media manager or vendor specific failure,  
error text:
```

```
sbtbackup: processing database myoradb not allowed
```

Cause

The database is not allowed access in the **Oracle RMAN classification**

Solution:

- Change the Oracle RMAN classification of the policy to allow the database access
- Activate the dataflow
- Restart RMAN and retry the operation

ORA-19511: ... Store exists but cannot be accessed

Oracle RMAN error message:

```
RMAN-03002: failure of backup command at 06/03/2020 12:33:44
```

```
ORA-27023: skgfsbi: media manager protocol error
```

```
ORA-19511: non RMAN, but media manager or vendor specific failure,  
error text:
```

```
sbtinit2: init store failed -- initializeStore: Store exists but  
cannot be accessed by this node. Store permissions may have to be  
adjusted
```

Cause

Store permissions are not correct and need to be updated. The owner node must be a node on the dataflow.

Solution:

Change the store ownership, by performing the following steps:

- Identify the following information
 - Name of the dataflow
 - Name of the policy
 - Name of a Oracle application node using the policy on this dataflow
 - Name of the storage target node (e.g. gen2 repository used to store the data)
- List the stores inventory of the storage target node
- Select the relevant store for the dataflow from the list and select the "Repurpose" action
 - Ensure you pick the correct store by comparing the dataflow and policy names. The Application should be "Oracle Database"
- Fill in the following information and repurpose

| Control | Value |
|----------------------------|------------------------------------|
| Source Node | Select the Oracle application node |
| Policy | Leave blank |
| Data Flow | Leave blank |
| Automatically rename store | Ensure this is not selected |

- Restart RMAN and retry the operation

Troubleshooting Hyper-V

This section provides guidelines for how to troubleshoot issues that might occur when using Hyper-V.

A virtual machine is not included in a backup.

Problem:

When performing a backup, it does not include a virtual machine. Protector does not report any errors for the virtual machine during the backup job.

Solution:

The Hyper-V classification does most likely not include this virtual machine.

Review and update the Hyper-V classification of the policy. Use the preview functionality for a list of VMs included by the policy.

A virtual machine is no longer included in backups after it has been restored.

Problem:

A virtual machine has been restored, now it is no longer included in backups.

Cause:

When selecting a virtual machine explicitly (via browse) in a Hyper-V classification, Protector will refer to this VM via its ID. Restoring a virtual machine assigns a new ID to the restored VM. As the classification still refers to the original ID, the restored VM will not be included in the backup.

Solution:

Update the Hyper-V classification to include the restored VM and re-activate the data flow.

Restore to original fails stating the node does longer exists

Problem:

When you try to restore to the original, an error is displayed, indicating that the node no longer exists.

Solution:

Perform a clone restore instead

Restore to Hyper-V cluster fails as virtual machine already exist

Problem:

Restoring a virtual machine to a Hyper-V cluster fails, stating that the virtual machine already exists, however, Hyper-V Manager does not list the VM.

Cause:

This is usually caused by a partially deleted VM. In case of a clustered Hyper-V there is the virtual machine and an associated cluster role. When the virtual machine is deleted via the Microsoft's Failover Cluster Manager or SCVMM both the VM And the role are deleted. However, if the virtual machine is deleted via PowerShell or Hyper-V Manager the cluster role may remain.

Solution:

Ensure both the virtual machine and the associated cluster role are deleted, before you re-try the restore.

Verification of Hyper-V credential fails

Problem:

When creating or editing a Hyper-V node the provided credentials are rejected.

Solution:

double check you provided the correct domain, user, and password

verify Hyper-V and WMI services are running on all nodes, which are part of the Hyper-V setup

In case of a clustered Hyper-V environment, verify the cluster service is running on all nodes

Virtual FC adapters, pass through disks or mapped ISOs are missing after a restore

Problem:

After restoring the virtual machine, it does no longer contain virtual fibre channel adapters, mapping to pass through disks or mappings to ISOs.

Solution:

It is currently not possible to protect or restore these connections to external resources. Use your Hyper-V management tool to re-add them.

VM is skipped during backup because config version is too small

Problem:

During a backup job, a virtual machine is skipped. The associated error message shows that the configuration version is too low.

Solution:

Use the Microsoft's Hyper-V Manager or PowerShell to upgrade the virtual machine version. See <https://docs.microsoft.com/en-us/windows-server/virtualization/hyper-v/deploy/upgrade-virtual-machine-version-in-hyper-v-on-windows-or-windows-server> for additional guidance.

Glossary

Archive

A copy that is created for long-term retention.

Asynchronous journalling

Transactions are written to disk and also placed in a journal log file, to protect against data loss in the event of a system failure. Transactions from the log file are sent to the destination machine.

Asynchronous replication

Transactions are held in memory before being sent over the network. If the network is unavailable then transactions are written to disk and sent to the destination machine when the connection is re-established. Asynchronous replication is optimal for connections with sporadic efficiency.

Backup

A copy that is created for operational and disaster recovery.

Bandwidth throttling

Used to control when and what proportion of available network bandwidth is used by Ops Center Protector for replication.

Batch backup

A process by which the repository is updated periodically using scheduled resynchronizations. This method involves a scan of the source machine's file system, but only the changed bytes are transferred and stored. This method is useful for data that does not change often, such as data contained on the operating system disk. Linux based source nodes are only able to perform batch backups.

Clone

An operation where a copy of the database is created in another storage location in a local or remote site.

COPY

A hardware orchestration related status code that indicates that a volume pair is being created. An initial copy or resynchronization is being performed.

Data flow

Identifies the data sources, movers and destinations participating in a backup, along with interconnection paths between them. Policies are assigned to each node to determine what type of data is backed up.

Data source

A machine hosting a file system or application where the Protector client software is installed.

Deduplication

A method of reducing the amount of storage space that your organization requires, to archive data, by replacing multiple instances of identical data with references to a single instance of that data.

Destination node

A machine that is capable of receiving data for the purposes of archiving. This machine might be the Ops Center Protector Repository or Block device.

Dynamic Provisioning Virtual Volume (DP-VOL)

Dynamic Provisioning Virtual Volume. A virtual volume that has no memory space. Used in Dynamic Provisioning.

Hitachi Open Remote Copy Manager (HORCM)

HORCM is a daemon process on the CCI server that communicates with the storage system and remote servers.

Intelligent Storage Manager (ISM)

A Protector Client node that acts as a proxy to Block storage devices.

ISM may also refer to the Intelligent Storage Manager process that runs within the Protector Client software.

License key

A unique, alphanumeric code that is associated with the unique machine ID that is generated during the Ops Center Protector installation. The license key must be activated in order to use the software.

Logical Device (LDEV)

An individual drive (or multiple drives in a RAID configuration) in the storage system. An LDEV might or might not contain any data and might or might not be assigned to any hosts. Each LDEV has a unique identifier, or address, within the storage system. The identifier is composed of the logical disk controller (LDKC) number, control unit (CU) number, and LDEV number.

The LDEV IDs within a storage system do not change. An LDEV formatted for use by open-system hosts is called a logical unit (LU).

Master node

The machine that controls the actions of other nodes within the Ops Center Protector network.

Metadata Store (MDS)

Records metadata that describes items that are held in repositories. The MDS supports indexing of stored data, thus enabling fast searches when locating data for restoration.

Mover

Defines the type of data movement operation to be performed between source and destination nodes, during the creation of a data flow. Batch movers perform block level data transfers on a scheduled basis, whereas continuous movers perform byte level data transfers on a near-continuous basis.

Node Group

Multiple machines of the same type can be assigned to one or more node groups. Within the Data Flow page, you can assign policies to nodes within node groups en-mass.

PAIR

A hardware orchestration related status code that indicates that a volume pair is now created. The initial copy has finished, and the paired volumes are synchronized.

PFUL

A hardware orchestration related status code that indicates that the amount of the data in the journal volume exceeds the threshold. The volume pair is not split and data continues to be copied.

PFUS

A hardware orchestration related status code that indicates that the amount of the data in the journal volume has reached 100% and the volume pair is split and data is no longer being copied.

Policy

A configurable data protection objective that is mapped to machines or groups, and to the data management agents that implement the policy. Multiple policies can be assigned to a single node.

Primary Volume (P-VOL)

The volume in a copy pair that contains the original data to be replicated. The data on the P-VOL is duplicated synchronously or asynchronously to the secondary volume (S-VOL).

PSUE

A hardware orchestration related status code that indicates that a volume pair is split due to an error.

PSUS

A hardware orchestration related status code that indicates that a volume pair is split by operation, or deleted from the storage system on the secondary site. This value is output for the P-VOL.

Raw Device Mapping (RDM)

Raw Device Mapping enables a LUN from a SAN to be directly connected to a VMware VM.

Recovery Point Objective (RPO)

The frequency at which a backup will occur. This governs the point in time to which data can be recovered should a restore be needed.

Refreshed Thin Image (RTI)

A local replication technique based on Thin Image snapshot. The S-VOL is refreshed based on a schedule or on demand. The S-VOL is a thin copy of the P-VOL and therefore needs the P-VOL to be available. Because the S-VOL is refreshed, its ID remains unchanged whenever its contents are updated.

Replication

An operation where a copy of the data is created in another local or remote location automatically.

Repository

A destination node that stores data from one or more source nodes. The Ops Center Protector Repository supports batch backup, archiving, and versioning policies.

Secondary Volume (S-VOL)

The volume in a copy pair that is the copy of the original data on the primary volume (P-VOL). See also primary volume.

SMPL

A hardware orchestration related status code that indicates that a volume is un-paired.

Snapshot (Thin Image)

A point in time copy of the data that is based on references to the original data.

Source node

Any node (server, workstation or virtual machine) that hosts data to be protected by Ops Center Protector. The source node has an Active Data Change Agent, which is responsible for monitoring the host file system and performing the relevant actions defined by the policies. Nodes need to be configured as a source node if they need to transfer locally stored data to a destination node, or implement data tracking, blocking and auditing functions. A node can be both a source and destination simultaneously.

SSUS

A hardware orchestration related status code that indicates that a volume pair is split by operation, or deleted from the storage system on the secondary site. This value is output for the S-VOL.

SSWS

A hardware orchestration related status code that indicates that the P-VOL and S-VOL are switched. The S-VOL is writable.

Synchronous replication

Transactions are transferred to the remote storage device immediately and the write operation is signaled as completed only once data is confirmed as written to both primary and secondary volumes. Synchronous replication is optimal for connections with high efficiency.

Virtual Storage Machine (VSM)

Virtual Storage Machine. A virtualised block storage device that exists within a physical storage array.

Hitachi Vantara



Corporate Headquarters

2535 Augustine Drive

Santa Clara, CA 95054 USA

HitachiVantara.com | community.HitachiVantara.com

Contact Information

USA: 1-800-446-0744

Global: 1-858-547-4526

HitachiVantara.com/contact