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Enterprise**

HPE 3PAR StoreServ Management Console 3.4 User Guide

Abstract

This user guide provides information on the use of an installed instance of HPE 3PAR StoreServ Management Console software. For information on installation and deployment, see the HPE 3PAR StoreServ Management Console Administrator Guide.

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Contents

- Introduction..... 12**
 - Features summary..... 12
 - FAQ..... 13
 - What's new in 3.4..... 13
 - Release history..... 16
- Main Console quick tours..... 17**
 - Quick tour start..... 17
 - Main menu and banner quick tour..... 17
 - List panes quick tour..... 19
 - Detail panes quick tour..... 20
 - Filters quick tour..... 21
 - Tasks indicator and sidebar quick tour..... 22
 - New alerts indicator and sidebar quick tour..... 23
 - Help sidebar quick tour..... 24
 - Dialogs quick tour..... 25
 - General screens quick tour..... 27
 - Block Persona screens quick tour..... 28
 - Federation screens quick tour..... 28
 - File Persona screens quick tour..... 29
 - Data Protection screens quick tour..... 29
 - Security screens quick tour..... 30
 - Storage Optimization screens quick tour..... 31
 - Storage Systems screens quick tour..... 31
 - System Reporter screens quick tour..... 32
 - VMware quick tour..... 32
- Administrator Console quick tour..... 34**
 - Administrator Console Storage Systems screen quick tour..... 34
- Tasks..... 36**
 - General tasks..... 36
 - General screens, views, and actions summary..... 36
 - Changing global settings..... 36
 - Creating scheduled tasks..... 37
 - Customizing list panes..... 37
 - Customizing the main menu compact view..... 39
 - Dashboard screen – using and customizing..... 39
 - Activity panel..... 41
 - Allocated Capacity panel..... 41
 - Block Persona Status panel..... 42
 - Capacity Efficiency panel..... 42
 - Common Actions and Views panel..... 42
 - Daily Top Host Bandwidth panel..... 42
 - Daily Top Host Port Utilization panel..... 42
 - Daily Top Volume Bandwidth panel..... 43

Device Type Capacity panel.....	43
File Persona Status panel.....	43
Historical Capacity panel.....	43
Performance panel (alerts).....	44
Raw Capacity panel.....	44
RMC Protection Jobs panel.....	44
RMC Protected Volumes panel.....	45
Top Performance Outliers panel.....	45
Top Systems By Saturation panel.....	45
Storage Systems panel.....	46
System panel.....	46
System Performance panel (host ports).....	46
System Summary panel.....	47
Top Volume Hotspots by IOPs panel.....	47
Top Volume Hotspots By Latency panel.....	47
Total Capacity panel.....	47
Virtual Volume Protection panel.....	48
Enable FIPS mode.....	48
Enable connectivity to HPE InfoSight.....	48
Filters – using.....	49
Login banner message – using.....	50
Logging in to the Main Console.....	50
Managing scheduled tasks.....	51
Managing system alerts and tasks.....	51
Map views – using.....	51
Notifications box – using.....	52
Search box – using.....	52
Search box: database fields.....	54
Selecting screens.....	55
Specifying schedule patterns.....	55
Stop logins on first failure.....	56
Block Persona tasks.....	56
Block Persona screens, views, and actions summary.....	56
Adding policies.....	57
Adding to a virtual volume set.....	57
Compacting common provisioning groups.....	58
Converting virtual volumes.....	58
Creating, editing, and deleting hosts.....	58
Creating, editing, and deleting host sets.....	58
Creating, editing, and deleting virtual volumes.....	59
Creating, editing, and deleting virtual volume sets.....	59
Creating, editing, and deleting policies.....	59
Creating clones.....	59
Creating snapshots.....	60
Creating policies from virtual volumes.....	60
Creating snapshots of virtual volume sets.....	60
Creating similar virtual volumes.....	61
Editing and deleting clones.....	61
Editing and deleting snapshots.....	61
Editing and deleting virtual volume sets.....	61
Estimating virtual volume compression savings.....	61
Estimating virtual volume dedup savings.....	62
Exporting and unexporting virtual volumes.....	62
Exporting and unexporting virtual volume sets.....	63
Managing snapshot name patterns and schedules.....	64
Migrating hosts and host sets (Peer Motion).....	64
Migrating virtual volumes and virtual volume sets (Peer Motion).....	64

Naming snapshots.....	64
Promoting clones.....	65
Promoting snapshots.....	65
Refreshing capacity efficiency data.....	65
Resynchronizing clones.....	66
Stopping clones.....	66
Tuning virtual volumes.....	66
Federation Tasks.....	66
Federation screens, views, and actions summary.....	66
Data migration overview (storage federations).....	67
Adding, editing, and removing migration sources.....	68
Adding other migration sources.....	68
Changing the priority of a Peer Motion operation.....	68
Creating, editing, and deleting storage federations.....	69
Deleting, resuming, retrying, and aborting Peer Motion operations.....	69
Importing storage configurations to a storage federation.....	69
Refreshing external migration source system properties.....	69
Synchronizing storage federations.....	70
Taking over a Peer Motion operation.....	70
Upgrading SSMC 2.x storage federations.....	70
File Persona tasks.....	70
File Persona screens, views, and actions summary.....	71
Overview.....	72
Adding and editing antivirus servers.....	73
Adding and editing client filters.....	73
Adding and editing local users and groups.....	73
Adding and editing virtual IP addresses.....	74
Configuring a File Persona.....	74
Configuring LDAP.....	74
Creating and deleting file snapshots.....	74
Creating, editing, and deleting file shares.....	75
Creating, editing, and deleting file stores.....	75
Creating, editing, and deleting file provisioning groups.....	76
Creating, editing, and deleting virtual file servers.....	76
Deleting LDAP configurations.....	77
Editing configuration protocol settings.....	77
Enabling and disabling antivirus service.....	77
Failing over a file provisioning group.....	77
Growing a file provisioning group.....	78
Joining an Active Directory.....	78
Leaving an Active Directory.....	78
Managing admin path audit logs	78
Managing antivirus.....	78
Managing compliance requests.....	79
Managing data retention files.....	79
Managing file access audit logs	79
Managing data retention scans.....	80
Managing File Persona controller nodes.....	80
Managing file provisioning groups.....	80
Managing quotas.....	80
Reclaiming file snapshot space	80
Managing data retention scans.....	81
Updating virus definitions.....	81
Upgrading on-disk File Persona software.....	81
Data Protection tasks.....	82
Data Protection screens, views, and actions summary.....	82
Adding, editing, and removing RMC credential.....	83

Adding and removing Remote Copy links.....	83
Attaching, detaching, restoring, and deleting restore points.....	83
Configuring and removing Remote Copy quorum witnesses.....	83
Creating and editing Remote Copy configurations.....	84
Creating, editing, and deleting Remote Copy groups.....	84
Editing and removing Remote Copy target storage systems.....	84
Migrating Remote Copy groups (Peer Motion).....	85
Running disaster recovery operations on Remote Copy groups.....	85
Starting, stopping, and syncing Remote Copy groups.....	85
Switching over Remote Copy groups.....	85
Security tasks.....	85
Security screens, views, and actions summary.....	86
Copying LDAP configurations.....	86
Creating, editing, and deleting domains.....	87
Creating, editing, and deleting LDAP configurations.....	87
Creating and deleting users.....	87
Deleting connections.....	88
Editing LDAP authorizations.....	88
Editing user authorizations and passwords.....	88
Testing LDAP connections.....	88
Storage Optimization tasks.....	88
Storage Optimization screens, views, and actions summary.....	88
Creating, editing, and deleting Adaptive Optimization configurations.....	89
Creating, editing, and deleting Priority Optimization policies.....	89
Editing Adaptive Flash Cache.....	90
Enabling and disabling Adaptive Flash Cache.....	90
Enabling and disabling Priority Optimization policies.....	90
Scheduling Adaptive Optimization configurations.....	90
Storage Systems tasks.....	91
Storage Systems screens, views, and actions summary.....	91
Adding licenses.....	92
Clearing ports.....	92
Editing credentials.....	92
Editing drive enclosure locations.....	93
Editing port labels.....	93
Editing port settings (general).....	93
Editing port settings (protocol types).....	93
Editing storage system properties.....	95
Enabling and disabling ports.....	95
Encrypting stored data.....	95
Increasing the size of a System Reporter database volume.....	95
Initializing ports.....	96
Issuing a LIP command from a port.....	96
Locating hardware components.....	96
Pinging from ports.....	98
Refreshing snapshot efficiency data.....	99
Reloading port firmware.....	99
Setting and checking EKM servers.....	99
Showing and resetting battery test logs.....	99
Synchronizing port information with a Fibre Channel names server.....	100
Tuning storage systems.....	100
Viewing schematic diagrams.....	100
Viewing System Reporter samples availability.....	101
System Reporter tasks.....	101
System Reporter screens, views, and actions summary.....	101
Creating reports.....	102
Creating, editing, deleting and managing threshold alerts.....	103

Creating threshold alert queries.....	103
Editing and deleting reports.....	104
Exporting and importing reports.....	104
Increasing the size of a System Reporter database volume.....	105
Making reports private or public.....	105
Using real time reports.....	105
Viewing report charts.....	106
Viewing Specific Time Data Reports.....	107
Zooming into charts.....	108
VMware tasks.....	108
VMware screens, views, and actions summary.....	108
Creating, editing, and deleting storage containers (VMware).....	109
Administrator Console tasks.....	109
Administrator Console screens, views, and actions summary.....	109
Adding and removing storage systems.....	109
Connecting and disconnecting storage systems.....	110
Installing CA security certificates.....	110
Installing self-signed security certificates.....	111
Logging in to the Administrator Console.....	111
Managing and adding certificates.....	112
Upgrading SSMC	112
Troubleshooting.....	113
Actions are not available.....	113
Alerts for storage system hardware failures are not immediately seen.....	113
Cannot create a dedup virtual volume from a CPG that has AO.....	113
CPG capacity efficiency last refresh date does not change.....	114
CPG volumes count apparent reporting discrepancies.....	114
Host is not visible on partner port.....	114
Host sets total exported size seems small.....	115
Menu and action mouse clicks do not respond with IE browser.....	115
Peer Motion failed migration cleanup.....	115
Peer Motion migration of a Remote Copy group fails because snapshots could not be removed.....	116
Priority Optimization capability - apparent reporting discrepancy for a virtual volume.....	116
Remote copy source and backup virtual volume WWNs are not the same.....	116
Request-timeout messages when using Internet Explorer.....	117
Export of System Report - Performance Summary is missing charts.....	117
Attach/Detach Restore Points fails when you perform the action through HPE 3PAR SSMC..	117
System Reporter chart tooltips appear to be incorrect.....	118
System Reporter reports are not listed.....	118
System Reporter scheduled reports email is not received.....	118
System Reporter threshold alerts are not listed.....	119
Tasks sidebar does not show any tasks.....	119
The total exported size for a host seems too small.....	119
Virtual volume policy - reporting discrepancy for provisioning type of none.....	120
VMware virtual machine last host discrepancy.....	120
VMware VVols exported size shows zeros.....	120
Concepts.....	121
General concepts.....	121
HPE InfoSight alerts.....	121
Block Persona concepts.....	121
Storage virtualization overview.....	121

Autonomic groups (host sets, virtual volume sets).....	123
Capacity efficiency metrics.....	123
Chunklets.....	124
Clones (physical copies).....	124
Common provisioning groups.....	125
Exported virtual volumes (VLUNs).....	125
Hosts.....	125
Host Explorer software.....	126
Host sets.....	126
Logical drives.....	126
LUNs.....	126
Peer Motion overview.....	127
Policies.....	127
Protection policy.....	127
Smart SAN software.....	128
Snapshots (virtual copies).....	129
Virtual volumes overview.....	130
Virtual volume compression.....	130
Virtual volume conversion.....	130
Virtual volume deduplication.....	131
Virtual volume expiration time.....	131
Virtual volume provisioning.....	131
Virtual volume RAID.....	131
Virtual volume retention time.....	132
Virtual volume sets.....	133
Virtual volume spaces.....	134
Virtual volume tuning.....	134
Virtual volume types.....	134
File Persona concepts.....	134
Compliance officer user role.....	134
File access audit logs.....	135
File Persona overview.....	135
File shares.....	136
File stores.....	136
File provisioning groups.....	137
Quota soft limits and grace time.....	137
Virtual file servers.....	138
Data Protection concepts.....	138
Auto synchronize policy.....	138
Backup sets.....	138
Copy sets.....	139
Disaster recovery operations for non-SLD Remote Copy groups.....	139
Failover.....	139
Revert failover.....	140
Switchover.....	140
Recover.....	141
Restore.....	142
Disaster recovery operations for SLD Remote Copy groups.....	143
Failover.....	143
Switch failover.....	144
Recover.....	145
Restore.....	147
HPE Recovery Manager Central (RMC) software.....	149
HPE 3PAR SSMC and HPE RMC connectivity.....	150
Peer Persistence overview.....	150
Remote Copy overview.....	151
Remote Copy configurations overview.....	151

Restore points.....	152
Snapshot sets.....	152
User roles for adding and managing RMC credentials and Restore points.....	153
Security concepts.....	153
User accounts and roles.....	153
LDAP user authentication.....	154
Virtual domains overview.....	154
Storage Optimization concepts.....	154
Adaptive Flash Cache overview.....	155
Adaptive Optimization overview.....	155
Adaptive Optimization modes.....	155
Adaptive Optimization storage tiers.....	156
Priority Optimization overview.....	156
Priority Optimization policy settings.....	157
Storage system concepts.....	157
Alerts.....	157
Alerts for physical drive raw space.....	158
Analytics (Systems view).....	158
Performance chart.....	159
Saturation chart.....	160
Volumes by Latency.....	161
Volume hotspots.....	162
Capacity and space terminology.....	162
Capacity units.....	163
Controller nodes.....	163
Data-at-rest encryption overview.....	163
Drive enclosures and magazines.....	164
Hardware UID/locator lights.....	164
Licenses.....	164
Persistent Ports functionality.....	164
Physical drives and device types.....	165
Ports.....	165
Status and health states.....	166
System tasks.....	166
System tuning.....	166
World Wide Names (WWNs).....	166
Federation Configuration concepts.....	167
Federations configuration.....	167
Peer motion.....	167
System Reporter basic concepts.....	167
Advanced Analytics (System Reporter).....	167
Workload outliers.....	168
System Reporter overview.....	168
System Reporter database volume.....	169
System Reporter reports concepts.....	169
Export and Import reports overview.....	169
Export reports to CSV.....	169
Export reports to PDF.....	169
Reports and templates overview.....	170
Report access types (system, private, public).....	170
Scheduled report files and email.....	171
Histogram report templates.....	171
Enclosure Port - IO Time & Size Distribution: report template.....	171
Exported Volumes - IO Time & Size Distribution: report template.....	172
Host Port - IO Time & Size Distribution: report template.....	172
Physical Drive - IO Time & Size Distribution: report template.....	172
Historical capacity report templates.....	173

Adaptive Optimization - Space Moved: report template.....	173
CPGs - Capacity: report template.....	174
Physical Drive - Capacity: report template.....	176
System Capacity: report template.....	176
Virtual Volumes - Capacity: report template.....	177
Historical performance report templates.....	180
Adaptive Flash Cache - Performance Statistics: report template.....	180
Adaptive Optimization - Cumulative IO Density: report template.....	181
Adaptive Optimization - IO Density: report template.....	181
Controller Node Cache - Performance Statistics: report template.....	182
Controller Node CPU - Compare by Performance Statistics: report template.....	183
Controller Node CPU - Performance Statistics: report template.....	183
CPG - Cumulative IO Density: report template.....	184
CPG - IO Density: report template.....	184
Enclosure Port - Performance Statistics: report template.....	185
Exported Volumes - Compare by Performance Statistics: report template.....	185
Exported Volumes - Performance Statistics: report template.....	185
File Persona CPU Utilization - Performance Statistics: report template.....	186
File Persona Memory - Performance Statistics: report template.....	186
File Persona Networking - Performance Statistics: report template.....	187
FPG - Performance Statistics: report template.....	187
Host Port - Compare by Performance Statistics: report template.....	188
Host Port - Performance Statistics: report template.....	188
NFS Protocol - Performance Statistics: report template.....	189
Physical Drive - Compare by Performance Statistics: report template.....	189
Physical Drive - Performance Statistics : report template.....	190
Priority Optimization - Performance Statistics: report template.....	190
Remote Copy Links - Performance Statistics: report template.....	191
Remote Copy Volumes - Performance Statistics: report template.....	191
SMB Protocol - Performance Statistics: report template.....	192
System Report - Performance Summary: report template.....	192
Virtual Volumes - Performance Statistics : report template.....	193
Real time performance report templates.....	193
Exported Volumes - Real Time Performance Statistics: report template.....	193
Multiple Components - Real Time Performance Statistics: report templates.....	194
Physical Drive - Real Time Bar Performance Statistics: report template.....	195
Physical Drive - Real Time Performance Statistics: report template.....	195
Port (Control) - Real Time Performance Statistics: report template.....	196
Port (Data) - Real Time Performance Statistics: report template.....	196
System Reporter threshold alerts concepts.....	196
Threshold alerts and templates overview.....	197
Threshold alerts and email.....	197
Controller nodes threshold alert templates.....	198
Controller Nodes: threshold alert template.....	198
Node Cache: threshold alert template.....	198
System CPU Utilization: threshold alert template.....	198
Exported volumes threshold alert templates.....	199
Exported Volumes: threshold alert template.....	199
Exported Volumes Read IOPs and Service Time: threshold alert template.....	199
Exported Volumes Write IOPs and Service Time: threshold alert template.....	200
Physical drives threshold alert templates.....	200
Physical Drive FC Service Time: threshold alert template.....	200
Physical Drive NL Service Time: threshold alert template.....	201
Physical Drives SSD Service Time: threshold alert template.....	201
Physical Drives: threshold alert template.....	202
Port threshold alert templates.....	202
Host Port Service Time: threshold alert template.....	202

Ports: threshold alert template.....	203
Other threshold alert templates.....	203
Priority Optimization: threshold alert template.....	203
Remote Copy Links: threshold alert template.....	203
Remote Copy Volumes: threshold alert template.....	204
VMware concepts.....	204
VMware overview.....	204
VMware VVol physical size and logical size.....	204
Support and other resources.....	205
Accessing Hewlett Packard Enterprise Support.....	205
Accessing updates.....	205
Customer self repair.....	206
Remote support.....	206
Warranty information.....	206
Regulatory information.....	207
Documentation feedback.....	207
Websites.....	208

Introduction

Features summary

HPE 3PAR StoreServ Management Console (SSMC) software provides contemporary browser-based interfaces for monitoring HPE 3PAR StoreServ Storage systems.

Main Console

The Main Console includes the following key features:

- Login access to the Main Console can be configured based on HPE 3PAR StoreServ Storage user accounts and roles. Learn more: [**User accounts and roles**](#) on page 153.
- General screens for the dashboard, activities, schedules, and settings. Learn more: [**General screens quick tour**](#) on page 27.
- Block Persona screens for monitoring and managing hosts, host sets, virtual volumes, virtual volume sets, common provisioning groups, and policies. Learn more: [**Block Persona screens quick tour**](#) on page 28.
- Federations screens for monitoring and managing storage federation configurations and Peer Motion actions. Learn more: [**Federation screens quick tour**](#) on page 28.
- File Persona screens for monitoring and managing file shares, file stores, virtual file servers, file provisioning groups, and File Persona configurations. Learn more: [**File Persona screens quick tour**](#) on page 29.
- Data Protection screens for monitoring and managing Remote Copy configurations, Remote Copy groups, RMC credentials, and restore points. Learn more: [**Data Protection screens quick tour**](#) on page 29.
- Security screens for managing storage system user accounts, LDAP, user roles, storage system connections, and virtual domains. Learn more: [**Security screens quick tour**](#) on page 30.
- Storage Optimization screens for managing Adaptive Flash Cache configurations, and creating and managing Adaptive Optimization configurations and Priority Optimization configurations. Learn more: [**Storage Optimization screens quick tour**](#) on page 31.
- Storage Systems screens for managing and monitoring storage system licenses and hardware components, such as controller nodes, ports, drive enclosures, and physical drives. Learn more: [**Storage Systems screens quick tour**](#) on page 31.
- System Reporter screens for creating and managing reports and storage system threshold alerts. Learn more: [**System Reporter screens quick tour**](#) on page 32.
- VMware screens for monitoring and managing VMware storage containers and virtual machines. Learn more: [**VMware quick tour**](#) on page 32.

Administrator Console

The Administrator Console includes the following key features:

- Login is restricted to the HPE 3PAR SSMC administrator user account.
- Storage Systems screen for managing the storage systems that are connected to the HPE 3PAR SSMC server. Learn more: [**Administrator Console Storage Systems screen quick tour**](#) on page 34.

FAQ

- **Can I use legacy HPE 3PAR MC software and HPE 3PAR SSMC servers to manage my storage systems?**

In general, yes. However, with the release of HPE 3PAR Operating System 3.2.2, HPE 3PAR SSMC software is the default management tool for HPE 3PAR StoreServ Storage systems that support HPE 3PAR OS 3.2.2 and later.

- **Can I use HPE 3PAR CLI to manage my storage systems?**

Yes. However, command line interface (CLI) software is intended primarily for use by advanced users and storage specialists.

- **When I log in to HPE 3PAR MC, I can manage multiple storage systems that have different security credentials. Can I do this with HPE 3PAR SSMC?**

No. To manage multiple storage systems, each connected storage system must have the same security credentials (user name and password) that are used to log in to the HPE 3PAR SSMC Main Console. For more information, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

- **How can I manage more storage systems from an instance of HPE 3PAR SSMC?**

To be managed, a storage system must be listed on the Storage Systems screen on the Administrator Console and have a connection state of **Connected**. See the *HPE 3PAR StoreServ Management Console Administrator Guide* for the maximum number of storage systems that can be managed at one time from an instance of HPE 3PAR SSMC. Learn more: [Adding and removing storage systems](#) on page 109.

- **Where can I see health details?**

Health panels are included in the Overview view of most detail panes. Learn more: [Detail panes quick tour](#) on page 20.

- **Why is there an Action button and an Action + button on some dialogs?**

Clicking an **Action** button performs the action and closes the dialog. Clicking an **Action +** button performs the action but the dialog remains open. This is helpful when you need to perform the same action repeatedly. For example, the **Create Virtual Volume** dialog has a **Create** button and a **Create +** button. Learn more: [Dialogs quick tour](#) on page 25.

What's new in 3.4

HPE 3PAR StoreServ Management Console 3.4 (HPE 3PAR SSMC) includes the following new or enhanced features.

General changes

HPE 3PAR SSMC is available in Appliance mode only from 3.4 and later. For more details, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Block Persona – Policies

The Policies screen displays the following options for a Protection policy:

- Backup cloud bank store
- Copy cloud bank store

If a Cloud Bank store is used as backup for the Copy policy the options display Yes.

File Persona – Virtual File Servers

- The Manage Quotas dialog provides a new Refresh Quotas option, that allows you to refresh the data in the Quotas table. The option to periodically update the Quotas table was introduced in HPE 3PAR SSMC 3.3.1.
- The Manage Admin Path Audit Logs dialog enables you to manage the audit logs. You can select any of the logs created for a Virtual File Server (VFS) and delete the same.

General – Dashboard

- The Top Performance Outliers, Top Systems By Saturation, Top Volume Hotspots By IOPs, and Top Volume Hotspots By Latency panels are added. You can view the new panels in the default view of the dashboard. The panels enable you to identify:
 - A storage system reaching saturation threshold.
 - Saturation percentage of the storage system.
 - Volume hotspots in the storage system.
 - If the storage system reports high latency compared to peer storage systems with similar workload in HPE 3PAR SSMC.

General – Activity

HPE InfoSight is added as a filter option in Origin on the Activity screen. The option enables you to filter the HPE InfoSight alerts from the available notifications.

General – Settings

- The following check box and fields are added in the Applications panel in the Edit Global Setting dialog:
 - Enable connectivity to HPE InfoSight.
 - Web proxy address
 - Web proxy port
 - Web proxy user
 - Web proxy password
 - Advanced system performance and analytics reporting enabled
- An HPE InfoSight panel is added in the Settings window. The panel displays the InfoSight credentials, status, and errors/warnings if any at the time of connection.

You can edit the following details in the HPE InfoSight panel in the Edit Global Setting dialog:

 - HPE Passport user ID
 - HPE Passport password
 - Certificate
- An SMTP panel is added to configure the settings for SMTP server in HPE 3PAR SSMC.

File Persona – File Provisioning Groups

- Support for auto synchronize policy available from HPE 3PAR SSMC 3.4 and later.
- Automatic switchover when you perform a failover operation on the attached Remote Copy Group, when the Auto synchronize option is enabled. You do not have to perform separate Recover and Resync operation.
- The warning message that appears when you select the Failover Remote Copy group option from the action menu in Create file Provisioning Group is updated.
- The auto synchronize status for the attached Remote Copy Group is displayed in the General section of Overview.

Data Protection – Remote Copy Groups

The Auto synchronize option is added in the Create and Edit Group dialogs to enable or disable the auto synchronize feature. When you enable the auto synchronize option during failover operation, the source is automatically synched with the target storage system. The automatic syncing occurs after the system recovery and remote copy communications are re-established.

Storage Systems – Systems

- HPE InfoSight is added as a filter option in Origin on the Activity view of Systems screen. The option enables you to filter the HPE InfoSight alerts from the available notifications.
- An Analytics view is added in the Views. The Analytics view provides information about the performance and saturation of the storage system.
- A link to navigate to the Advanced Analytics component under System Reporter is added in the Analytics view. The component displays detailed charts for a selected storage system.

Federation – Peer Motion

An Email on completion option is added in the Start Peer Motion dialog. If you enable the option, an email notification is sent to the recipients upon completion of the Peer motion task.

System Reporter – Advanced Analytics

The Advanced Analytics component in System Reporter displays the throughput, latency, and workload outliers information for the selected storage system for a particular duration. You can select an available time period or set a custom time period as required.

System Reporter – Reports

- An Email recipients field is added in Create/Edit Reports dialog under Schedule after you enable the Schedule email option. The Schedule email option enables you to configure email recipients for each report and the same details are available in the Report Schedule screen.
- The Save option enables you to update any changes made using the interactive menu to the self-authored reports instead of navigating to the Edit Reports dialog.
- The Save as option enables you to create a new report with the changes to the interactive menu in the public or system generated report.

System Reporter – Threshold Alerts

An Email recipients field is added in Create/Edit Threshold alerts dialog under General after you enable email notification option. The option enables you to configure email recipients for each threshold alert and

the same details are available in the Threshold alert overview screen. Threshold alert Email configuration is specific for each user.

- A *Print this page* feature has been added to the online help and the results of online help searches now include content snippets.
- See the *HPE 3PAR StoreServ Management Console Administrator Guide* for compatibility, support, and version information.

Release history

HPE 3PAR SSMC major releases:

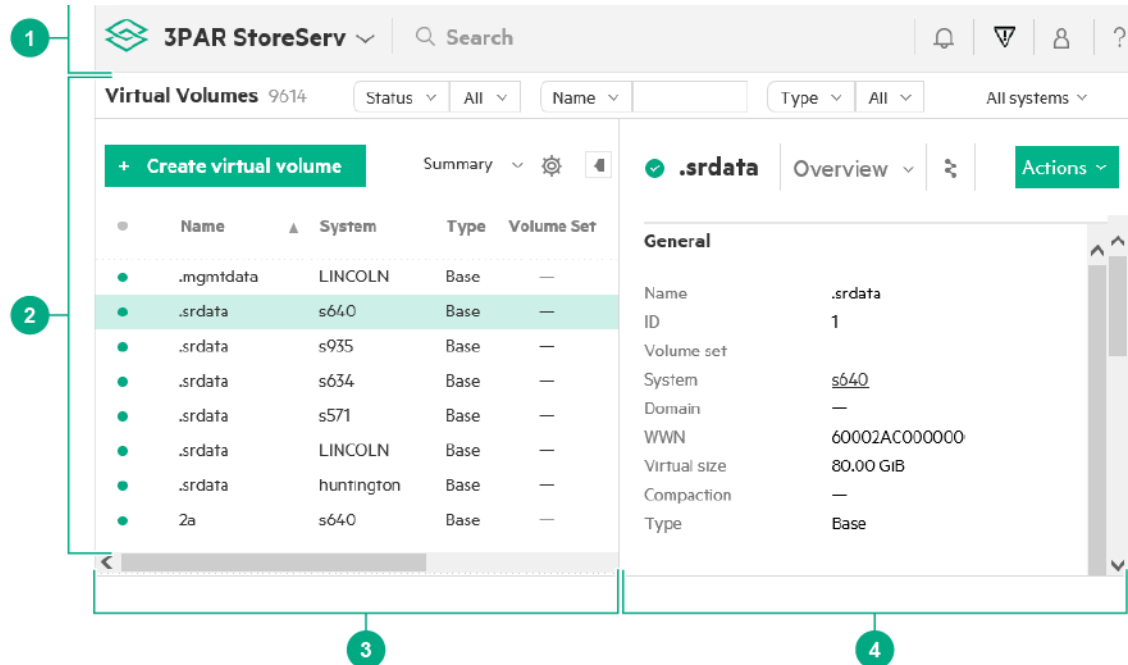
Release Date	Version	The software version numbers shown at the left are partial version numbers. When using the software, the full version number is displayed in the lower right corner of the browser window.
2018 (Sep)	3.4	
2018 (Feb)	3.3	
2017 (Aug)	3.2	
2017 (Feb)	3.1	
2016 (Nov)	3.0	
2016 (Apr)	2.4	
2015 (Dec)	2.3	
2015 (Aug)	2.2	
2015 (Apr)	2.1	
2014 (Dec)	2.0	

Main Console quick tours

Quick tours help you become familiar with the HPE 3PAR SSMC Main Console interface.

Quick tour start

The Main Console consists of the following parts:

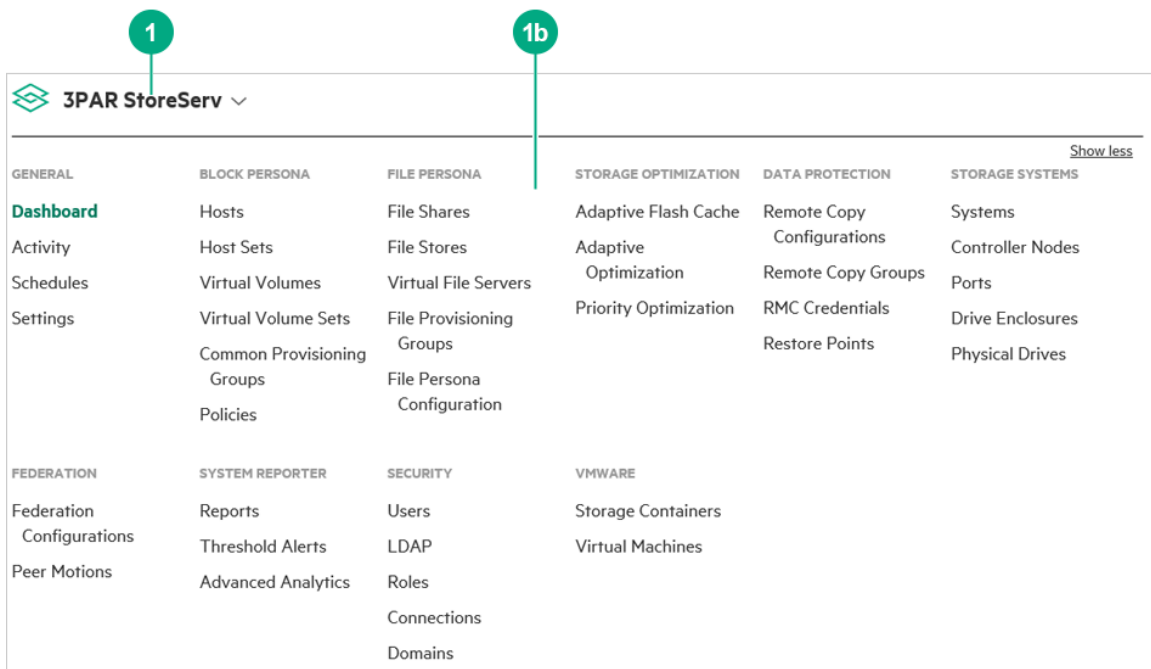
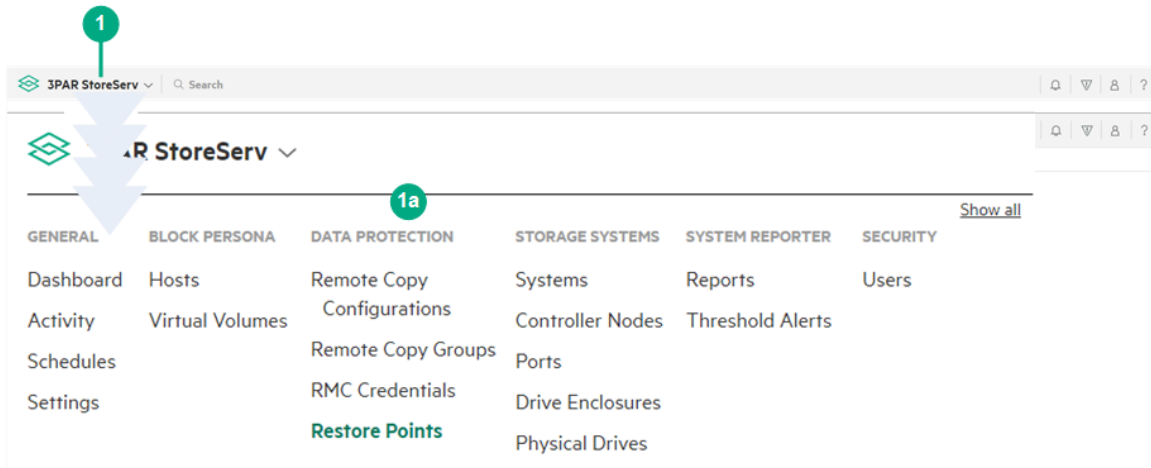


Main menu and banner (1). The main menu and banner area includes the menu for selecting screens, a search box, sidebars for activities and help, and a session menu. Learn more: [Main menu and banner quick tour](#) on page 17.

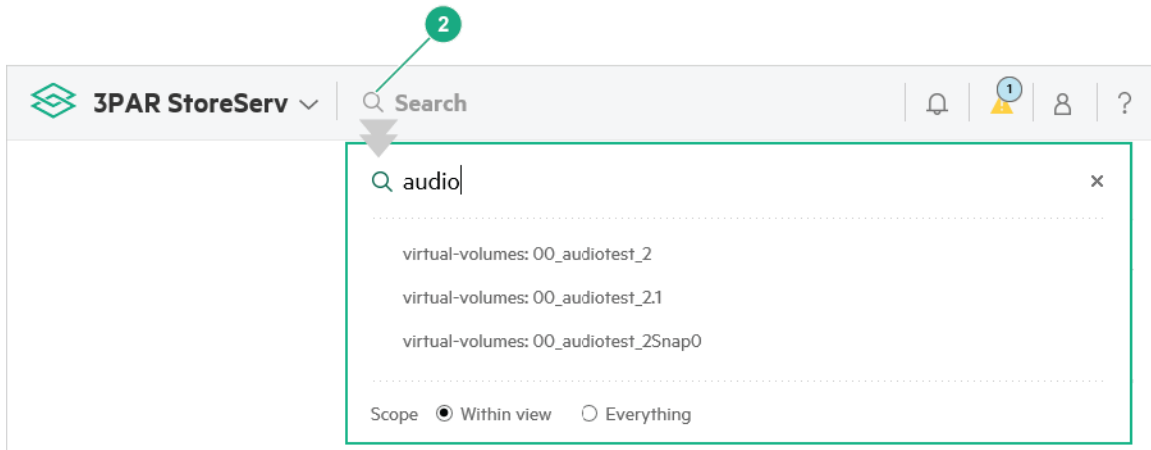
Screens (2). The screens area displays tabular and graphical information and provides action dialogs for managing storage systems. Most screens include a **list pane (3)** and a **detail pane (4)**. When you select an item in the list pane, additional information about it is displayed in the detail pane. When an item is selected, you can perform actions on it. Many lists can be sorted and filtered and include multiple views that you can select. Learn more: [Dialogs quick tour](#) on page 25, [List panes quick tour](#) on page 19, and [Detail panes quick tour](#) on page 20.

Main menu and banner quick tour

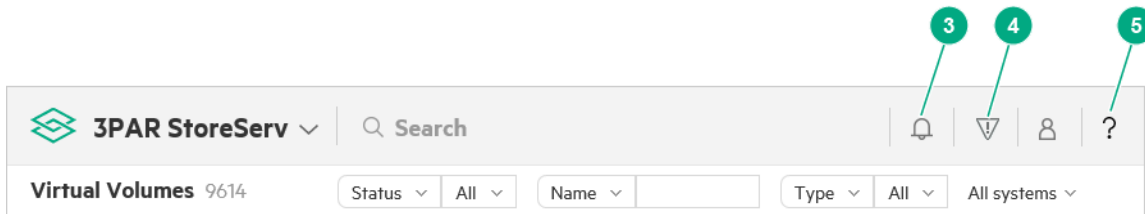
Main menu (1). Clicking the menu area on the banner opens the main menu of screens. Selecting a screen from the menu displays resources and action menus. Clicking **Show all** and **Show less** in the upper right corner of the main menu switches between a compact version of the menu (1a) and a full version (1b).



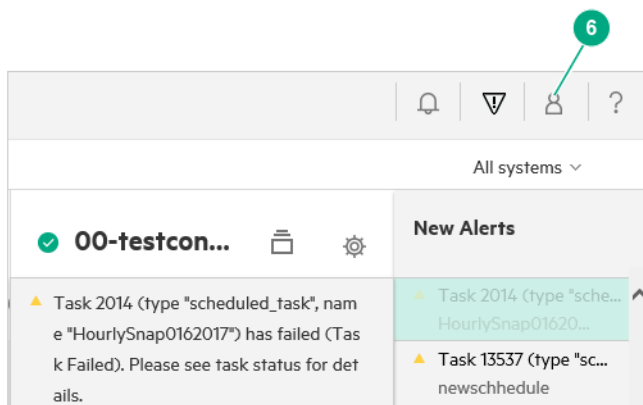
Search box (2). Clicking the banner search area opens the search box. As you type, a list of search results is displayed. Clicking an item selects and displays the item. Learn more: [Search box – using](#) on page 52.



Tasks, New alerts, and Help sidebars (3, 4, 5). Clicking the **Tasks** icon (🔔), **New alerts** icon (⚠️), or **Help** icon (❓) opens the respective sidebar on the right side of the screen. Learn more: [Tasks indicator and sidebar quick tour](#) on page 22, [New alerts indicator and sidebar quick tour](#) on page 23, [Help sidebar quick tour](#) on page 24.

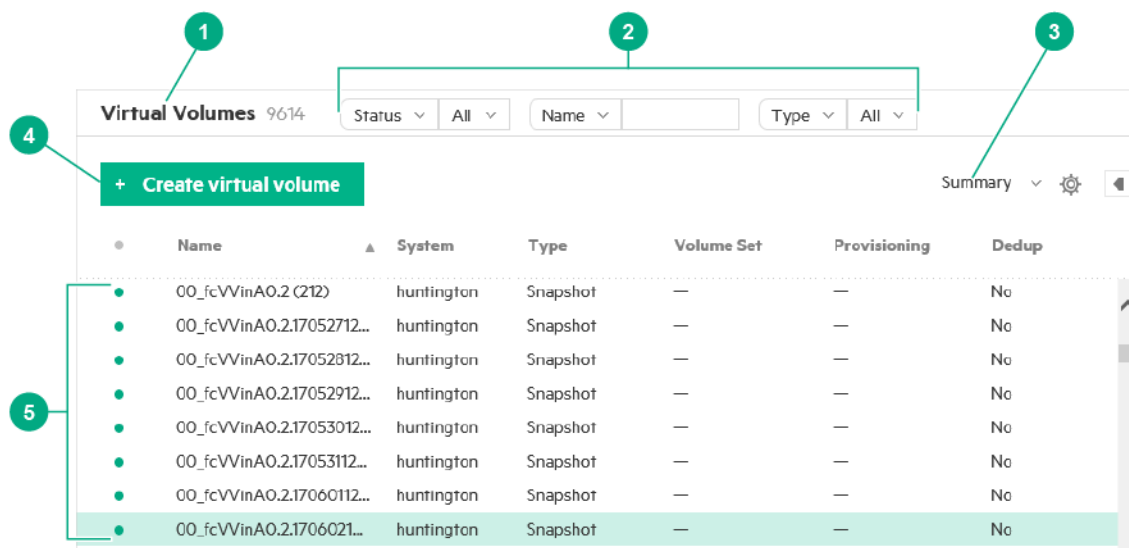


Session menu (6). Clicking the **Session** icon (👤) opens a menu for logging out or opening the Administrator Console in another browser window. The menu also displays the user name and the session duration.



List panes quick tour

The main features of list panes include the following:



When you select an item in the list pane, additional information about it is displayed in the detail pane. When an item is selected, you can perform actions on it. Many lists can be sorted and filtered and include multiple views that you can select.

Tip: You can change display settings for list panes and customize views. Learn more: [Customizing list panes](#) on page 37.

Resource name and count (1). The resource name and count are displayed at the top left of the pane. The count indicates the number of items in the list, based on the filters that are applied.

Filters (2). Filter menus are displayed horizontally at the top of the pane. Clicking a filter menu and changing a filter parameter changes the items that are displayed in the list.

Tip: The **Systems filter** (not shown) controls the list items that are displayed in all storage resources screens. Learn more: [Filters quick tour](#) on page 21.

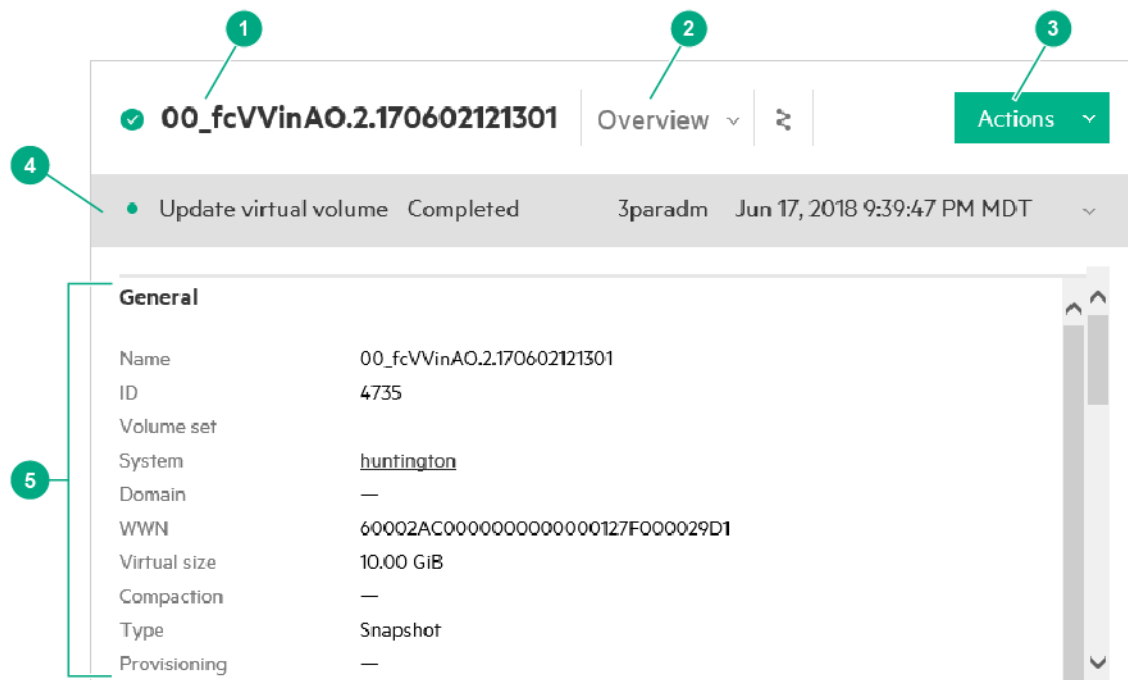
Views (3). The Views menu identifies the currently selected view. Most list panes have several views that you can select. Clicking the pin icon (📌, 📌) exposes or hides the Views menu. You can click the actions icon (⚙️) to customize views or add user-created views. Learn more: [Customizing list panes](#) on page 37.

Create action (4). Clicking a create button in the list pane opens a dialog for creating a resource. You can also create resources and perform other actions from the Actions menu in the detail pane. If you do not have permission to create the resource, the create button and actions are not displayed. Learn more: [Detail panes quick tour](#) on page 20.

Resource list and sorting (5). You can sort a resource list by clicking a column heading. A sort icon (⬆️, ⬆️) indicates the column that is controlling the order of items in the list.

Detail panes quick tour

The main features of detail panes include the following:



Resource name and state (1). The name and overall status of the selected resource are displayed at the top left of the pane. Learn more: [Status and health states](#) on page 166.

Views (2). The Views menu identifies the currently selected view. Most detail panes have several views that you can select, including Overview, Activity, and Map views. Map views can be selected from the Views menu or by clicking the map icon (). Learn more: [Map views – using](#) on page 51.

Tip: In some cases, a views icon () is displayed. Clicking the icon opens the Views menu.

Actions (3). The Actions menu allows you to perform actions on one or more resources that you have selected in the list pane. If you do not have permission to perform an action, the action is not displayed in the menu. Also, some actions might not be displayed due to system configurations, user roles, or properties of the selected resource.

Tips:

Actions are always performed on the selected resources in the list pane (left pane), not on what is shown in the detail pane (right pane).

In some cases, an actions icon () is displayed. Clicking the icon opens the Actions menu.

Notifications box (4). The notifications box is displayed when an alert or task has affected the resource. Learn more: [Notifications box – using](#) on page 52.

Resource detail (5). Information for the selected view is displayed in the resource detail area.

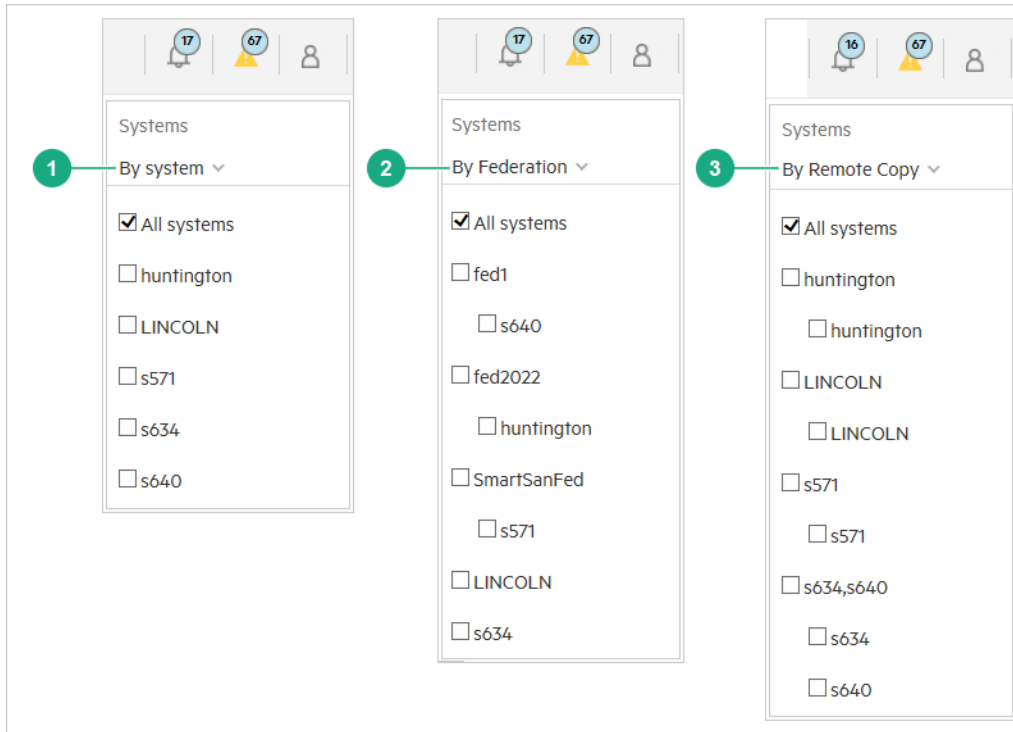
Filters quick tour

Filters are displayed horizontally at the top of a screen. Clicking a filter and changing a filter value changes the items that are displayed in the list pane of the screen.

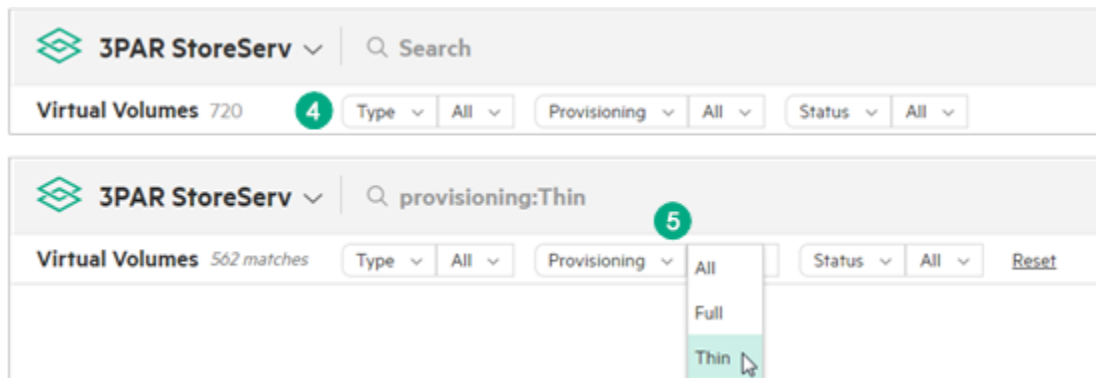
Systems filter: The Systems filter is at the upper right corner of most screens and is a global filter. When you select the storage systems to display on one screen, those storage systems are displayed on other screens. By default, all *connected* storage systems are selected.

The Systems filter is enhanced to display check boxes and conveys the ability to multi-select storage systems. When the user provides the appropriate selector the storage systems are displayed in the sticky system filter based on:

1. By system
2. By Federation
3. By Remote Copy

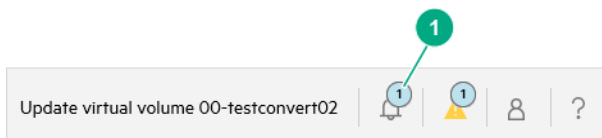


Other filters (4). Other filters are near the screen name and apply only to the screen that you are viewing. As you select properties and values for a filter, your choices are displayed on the filters line, in filter menus, and in the Search box (5). In this example, the Virtual Volumes list pane is being filtered. The left filter is for all types, the middle filter is for thin provisioned virtual volumes, and the right filter is for all statuses. Learn more: [Filters – using](#) on page 49.

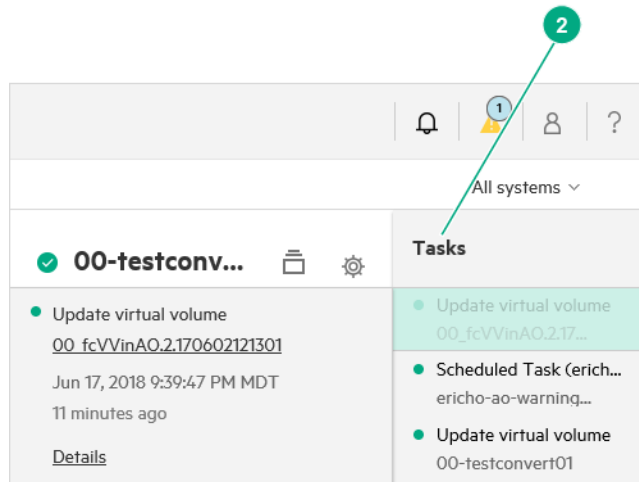


Tasks indicator and sidebar quick tour

Tasks indicator and sound (1). The Tasks indicator shows the number of unread tasks in the Tasks sidebar. When you initiate a task (for example, adding a virtual volume) a notification is displayed at the left of the icon and a sound is issued. You can enable and disable the notification sound on the Settings screen.



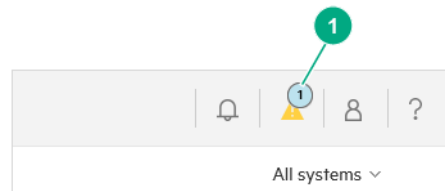
Tasks sidebar (2). Clicking the Tasks icon (🔔) opens the Tasks sidebar, which shows all tasks that you have performed during the session. Clicking a task displays additional details.



Tip: The Tasks sidebar provides different information than the Activity screen and Activity Views. This sidebar shows only the tasks associated with your user name since your login session started. The Activity screen and Activity Views show all user- and system-generated activities for the connected storage systems.

New alerts indicator and sidebar quick tour

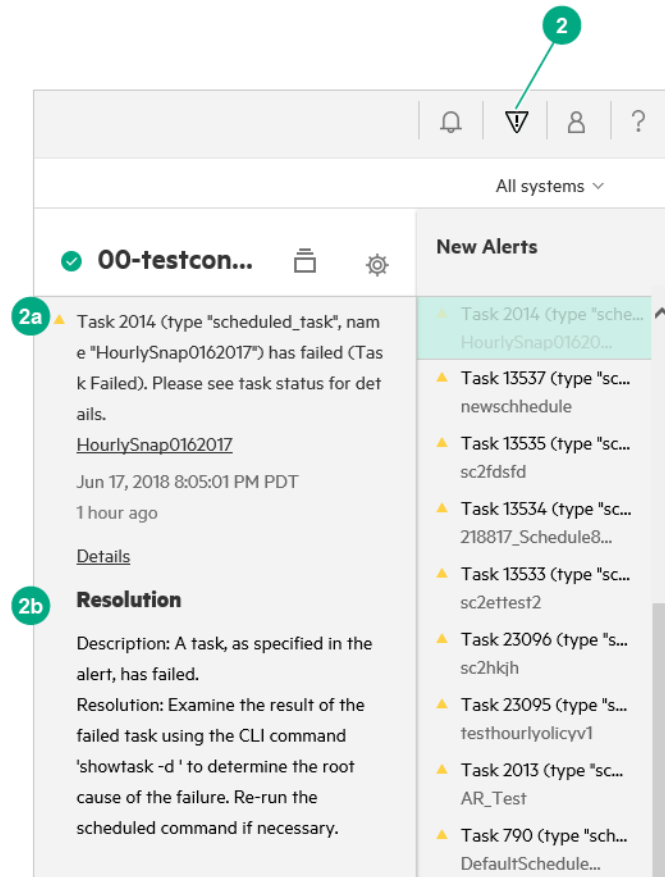
New alerts indicator (1). The new alerts indicator shows the number of new alerts on connected storage systems since you last logged in or last opened the new alerts sidebar. The icon indicates the most severe type of alert that has occurred since you last opened the sidebar. The new alerts indicator is per user. If you log in as different users, the new alert counts and icons might be different.



New alerts sidebar (2). Clicking the new alerts icon (🔔) opens the New Alerts sidebar. Clicking an alert displays a summary of the new alert (2a), a suggested resolution (2b), and links to affected components and details.

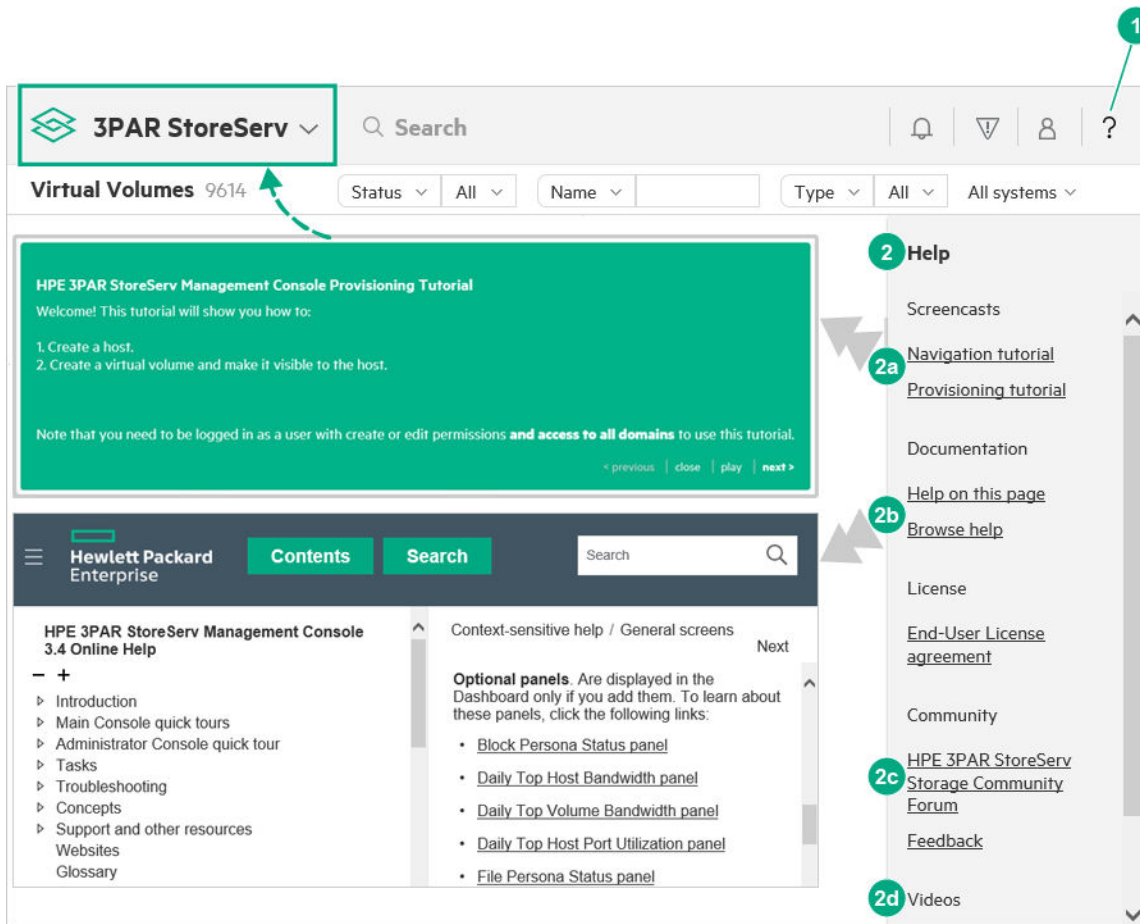
Tips:

- New alerts are listed in descending date/time order, with only the 20 most recent being shown.
- Only alerts with an activity state of *new* are listed in the sidebar. To see alerts with other states, you can navigate to the Activities screen and filter on Activity state.



Help sidebar quick tour

Clicking the Help icon (1) opens the Help sidebar (2).



Screencast tutorials (2a). You can run interactive screencast tutorials.

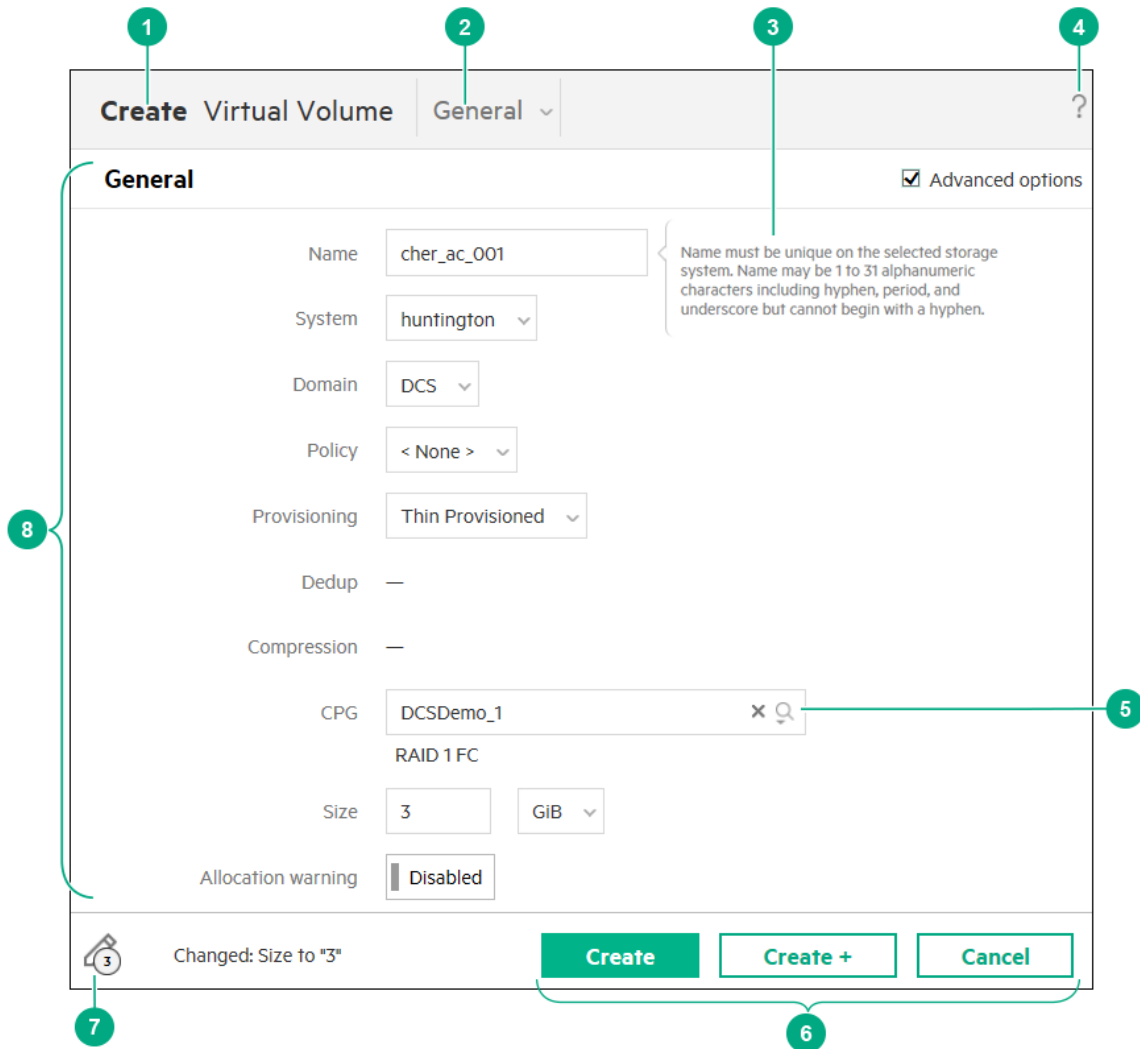
Online help (2b). You can choose to browse the entire help system, or open the help topic for the screen (page) that is displayed.

HPE 3PAR StoreServ Community (2c). You can access the HPE 3PAR StoreServ Community Forum and send feedback to Hewlett Packard Enterprise.

Videos (2d). You can access HPE 3PAR SSMC videos.

Dialogs quick tour

Dialogs allow you to perform actions on resources. You can open dialogs from the Actions menu on the detail pane. The main features of dialogs include the following:



Dialog name (1). This is the name of the dialog.

Views (2). Many dialogs include a Views menu. Selecting a view positions the selected panel at the top of the dialog.

Tooltips (3). Moving your cursor over a field or selection displays helpful information about making an entry or selection.

Help (4). Clicking the Help icon (?) opens help for the dialog.

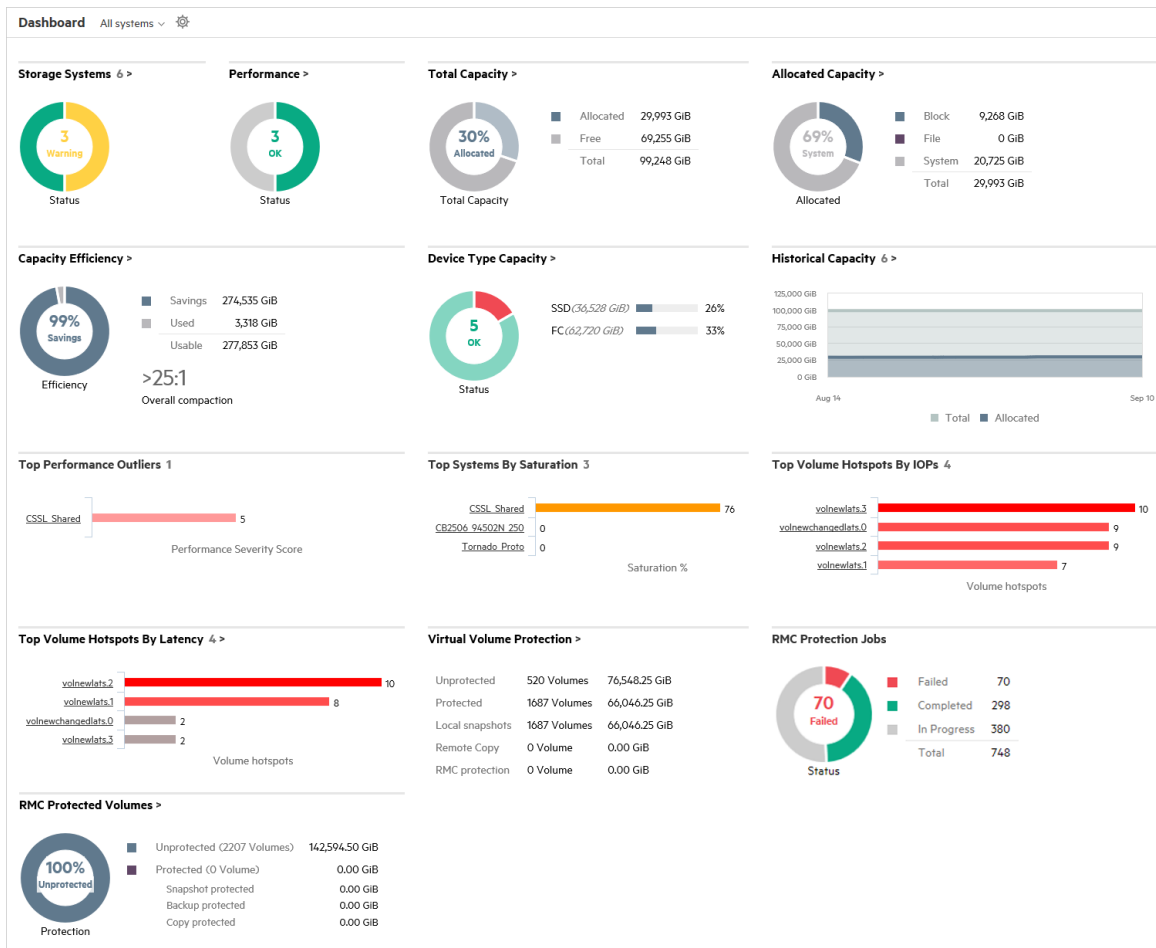
Resource selector/search (5). Clicking the Search icon, without entering any characters, displays a list of relevant resources. If you enter text, a dynamic list of resources is displayed as you type. Clicking an item in the list selects the resource.

Action buttons (6). Dialog actions are displayed at the bottom of the dialog. Clicking an action button performs the action and closes the dialog. Clicking an **action +** button performs the action and keeps the dialog open.

Changes indicator (7). The changes indicator shows how many changes you have made in the dialog and the last change you entered. Clicking the icon opens a window that displays all changes you have entered in the dialog.

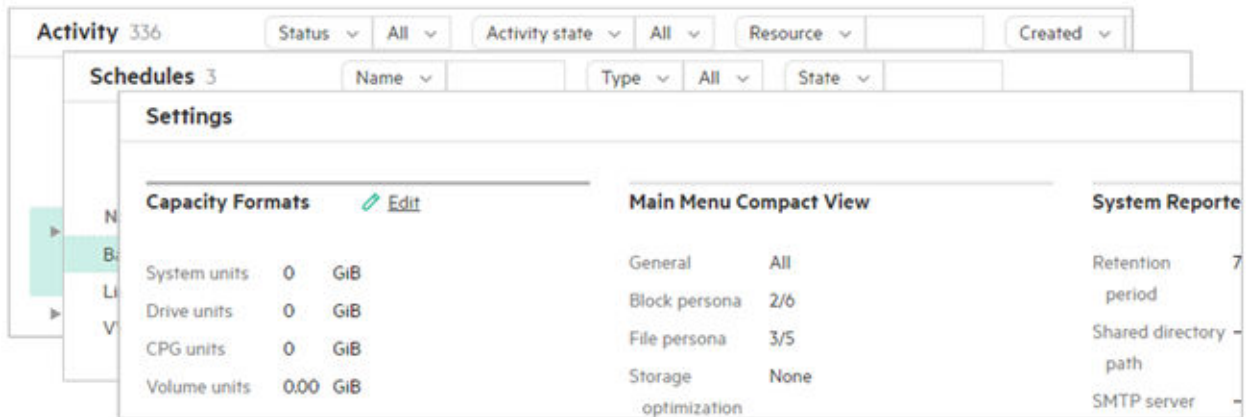
Panels (8). Related settings are grouped in panels. You can scroll panels up or down by using the scroll bar on the right side of the dialog.

General screens quick tour



Dashboard. The dashboard screen is displayed when you browse to an instance of HPE 3PAR SSMC. The screen summarizes the key status, capacity, and performance information of the connected storage systems. You can hover over or click graphics to display more details. Learn more: [Dashboard screen – using and customizing](#) on page 39.

Other General screens include the following:



Activity. Displays a list of storage system alerts and tasks and HPE 3PAR SSMC server-side activities. You can expand activities to show message codes and event details.

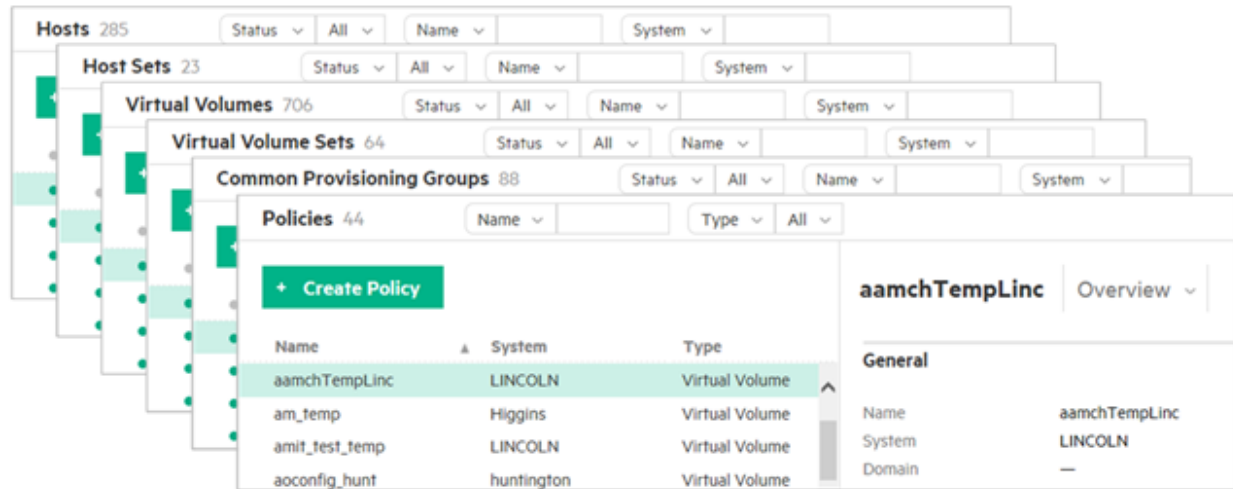
Schedules. Displays a list of scheduled tasks and an Actions menu.

Settings. Allows you to view and change global settings for the instance of HPE 3PAR SSMC.

Learn more: [General screens, views, and actions summary](#) on page 36.

Block Persona screens quick tour

Block Persona screens include the following:



Hosts: Displays a list of hosts, detail views, and an Actions menu. Learn more: [Hosts](#) on page 125.

Host Sets: Displays a list of host sets, detail views, and an Actions menu. Learn more: [Host sets](#) on page 126.

Virtual Volumes: Displays a list of virtual volumes, detail views, and an Actions menu. Learn more: [Virtual volumes overview](#) on page 130, [Exported virtual volumes \(VLUNs\)](#) on page 125, [Snapshots \(virtual copies\)](#) on page 129, [Clones \(physical copies\)](#) on page 124.

Virtual Volume Sets: Displays a list of virtual volume sets, detail views, and an Actions menu. Learn more: [Virtual volume sets](#) on page 133.

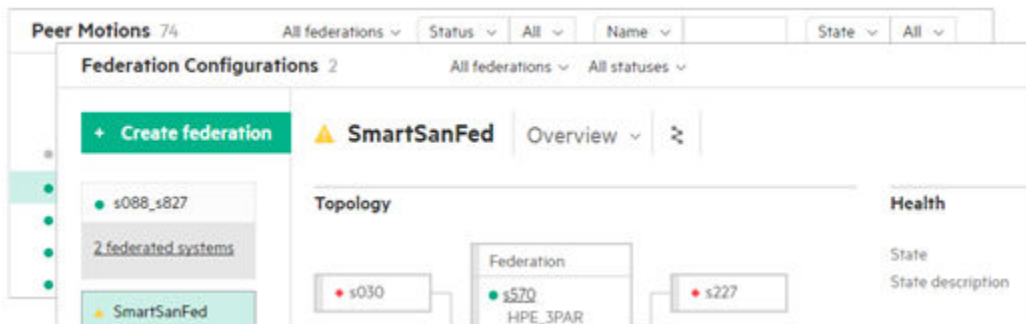
Common Provisioning Groups: Displays a list of common provisioning groups, detail views, and an Actions menu. Learn more: [Common provisioning groups](#) on page 125.

Policies: Displays a list of policies for virtual volume, snapshot, and protection and an Actions menu.

Learn more: [Block Persona screens, views, and actions summary](#) on page 56.

Federation screens quick tour

Federation screens include the following:



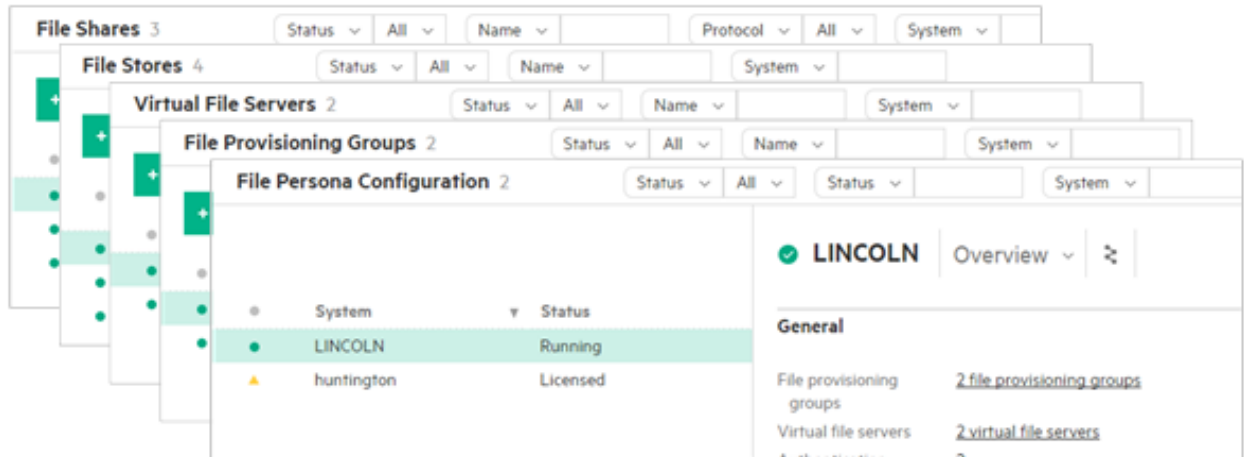
Federation Configurations. Displays a list of storage federation configurations, detail views, and an Actions menu.

Peer Motions. Displays a list of Peer Motion operations, detail views, and an Actions menu. Peer Motion operations include activities with federated storage systems using HPE 3PAR Peer Motion and HPE 3PAR Online Import.

Learn more: [Federations configuration](#) on page 167, [Peer Motion overview](#) on page 127.

File Persona screens quick tour

File Persona screens include the following:



Tip: File Persona screens are listed in the main menu only when one or more connected storage systems have an HPE 3PAR File Persona enabled.

File Shares. Displays a list of file shares, detail views, and an Actions menu. Learn more: [File shares](#) on page 136.

File Stores. Displays a list of file stores, detail views, and an Actions menu. Learn more: [File stores](#) on page 136.

Virtual File Servers. Displays a list of virtual file servers, detail views, and an Actions menu. Learn more: [Virtual file servers](#) on page 138.

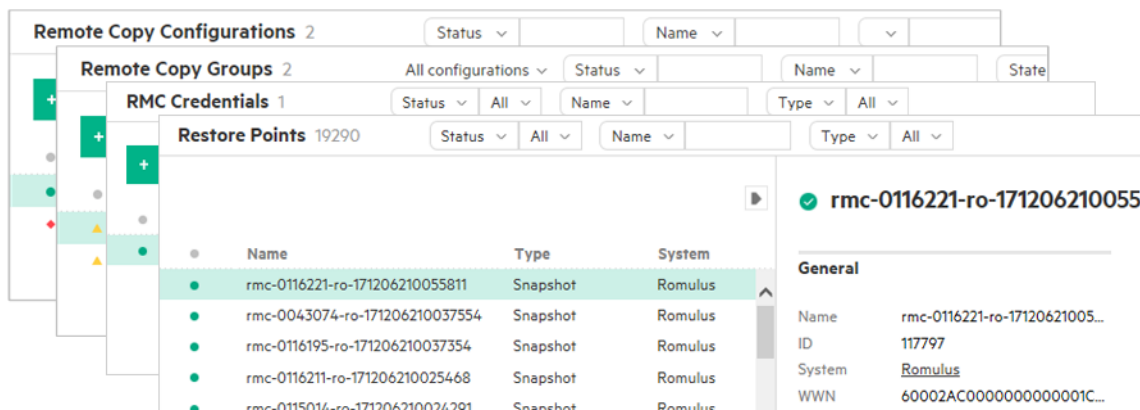
File Provisioning Groups. Displays a list of file provisioning groups, detail views, and an Actions menu. Learn more: [File provisioning groups](#) on page 137.

File Persona Configuration. Displays a list of storage systems that have File Persona capabilities, detail views, and an Actions menu. Learn more: [File Persona overview](#) on page 135.

Learn more: [File Persona screens, views, and actions summary](#) on page 71.

Data Protection screens quick tour

Data Protection screens include the following:



Remote Copy Configurations. Displays a list of Remote Copy configurations, detail views, and an Actions menu.. Learn more: [Remote Copy overview](#) on page 151.

Remote Copy Groups. Displays a list of Remote Copy groups, detail views, and an Actions menu.

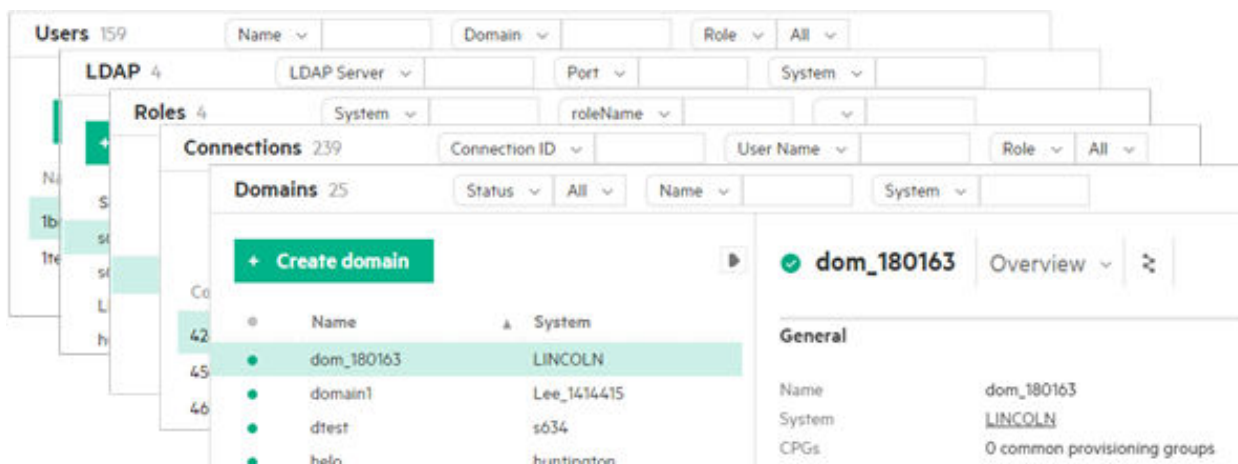
RMC Credentials: Displays a list of HPE RMC applications that are added into HPE 3PAR SSMC, detail views, and an Actions menu.

Restore Points: Displays a list of snapshots, snapshot sets, backup sets, copy sets, detail views, and an Actions menu.

Learn more: [Data Protection screens, views, and actions summary](#) on page 82.

Security screens quick tour

Security screens include the following:



Users. Displays a list of storage system users and an Actions menu. Learn more: [User accounts and roles](#) on page 153.

LDAP. Displays a list of storage systems and configured LDAP servers, detail views, and an Actions menu. Learn more: [LDAP user authentication](#) on page 154.

Roles. Displays a list of storage systems and user roles. Learn more: [User accounts and roles](#) on page 153.

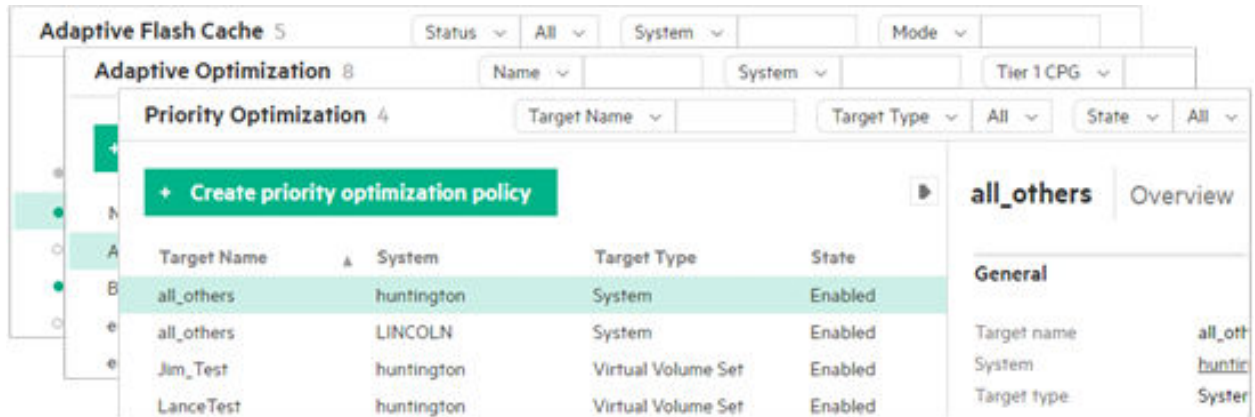
Connections. Displays a list of storage system connections and an Actions menu.

Domains. Displays a list of virtual domains, detail views, and an Actions menu. Learn more: [Virtual domains overview](#) on page 154.

Learn more: [Security screens, views, and actions summary](#) on page 86.

Storage Optimization screens quick tour

Storage Optimization screens include the following:



Adaptive Flash Cache. Displays a list of storage systems and their Adaptive Flash Cache (AFC) mode and state, detail views, and an Actions menu. Learn more: [Adaptive Flash Cache overview](#) on page 155.

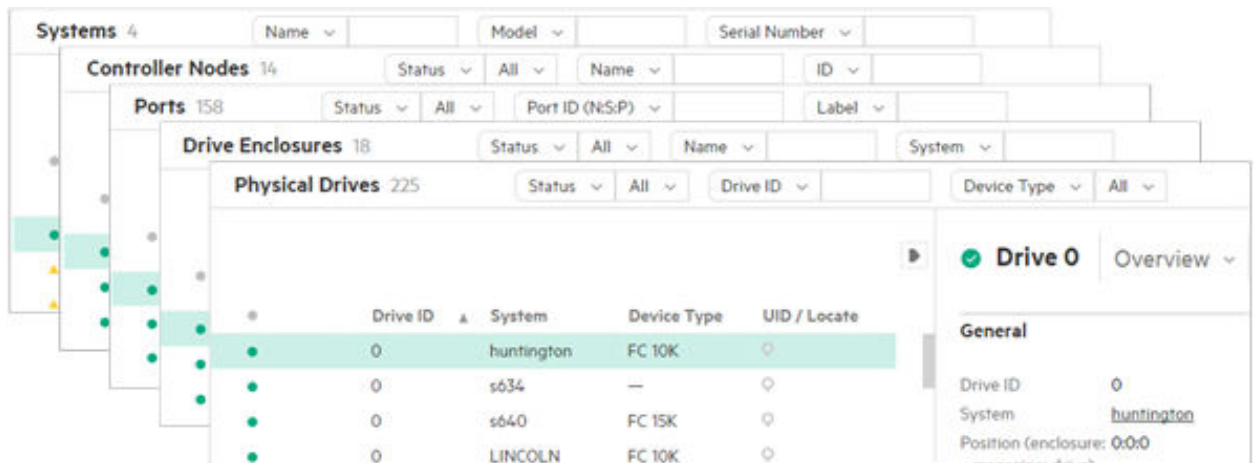
Adaptive Optimization. Displays a list of Adaptive Optimization (AO) configurations, detail views, and an Actions menu. Learn more: [Adaptive Optimization overview](#) on page 155.

Priority Optimization. Displays a list of Priority Optimization targets/policies, detail views, and an Actions menu. Learn more: [Priority Optimization overview](#) on page 156.

Learn more: [Storage Optimization screens, views, and actions summary](#) on page 88.

Storage Systems screens quick tour

Storage Systems screens include the following:



Systems. Displays a list of connected storage systems, detail views, and an Actions menu.

Controller Nodes. Displays a list of storage system controller nodes, detail views, and an Actions menu. Learn more: [Controller nodes](#) on page 163.

Ports. Displays a list of storage system ports, detail views, and an Actions menu. Learn more: [Ports](#) on page 165.

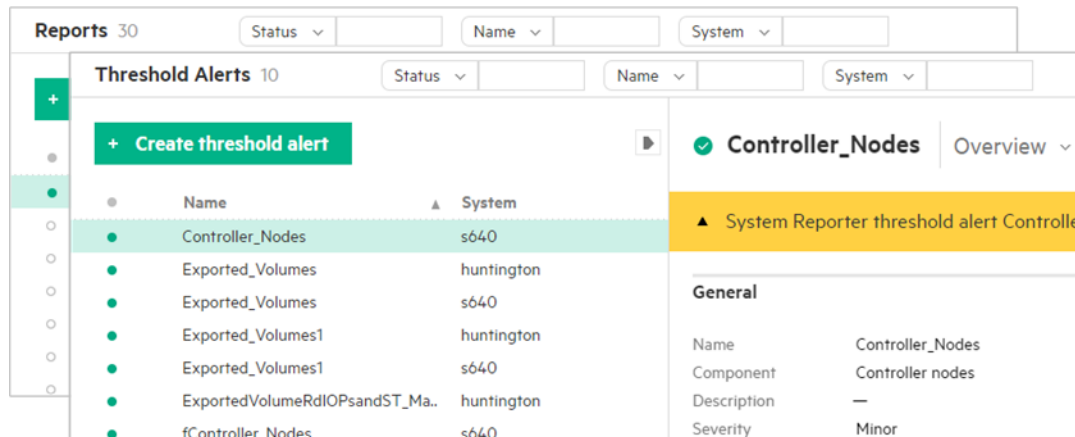
Drive Enclosures. Displays a list of drive enclosures, detail views, and an Actions menu. Learn more: [Drive enclosures and magazines](#) on page 164.

Physical Drives. Displays a list of physical drives, detail views, and an Actions menu. Learn more: [Physical drives and device types](#) on page 165.

Learn more: [Storage Systems screens, views, and actions summary](#) on page 91.

System Reporter screens quick tour

System Reporter screens include the following:



Reports. The Reports screen allows you to create and display System Reporter chart-style reports. When creating reports, you choose from predefined report templates. Learn more: [Reports and templates overview](#) on page 170, [Creating reports](#) on page 102, [Viewing report charts](#) on page 106.

Tip: The list can appear to be empty, depending on the filters that are selected.

Threshold Alerts. The Threshold Alerts screen allows you to create and display System Reporter threshold alerts. When creating threshold alerts, you choose from predefined alert templates. Learn more: [Threshold alerts and templates overview](#) on page 197, [Creating, editing, deleting and managing threshold alerts](#) on page 103.

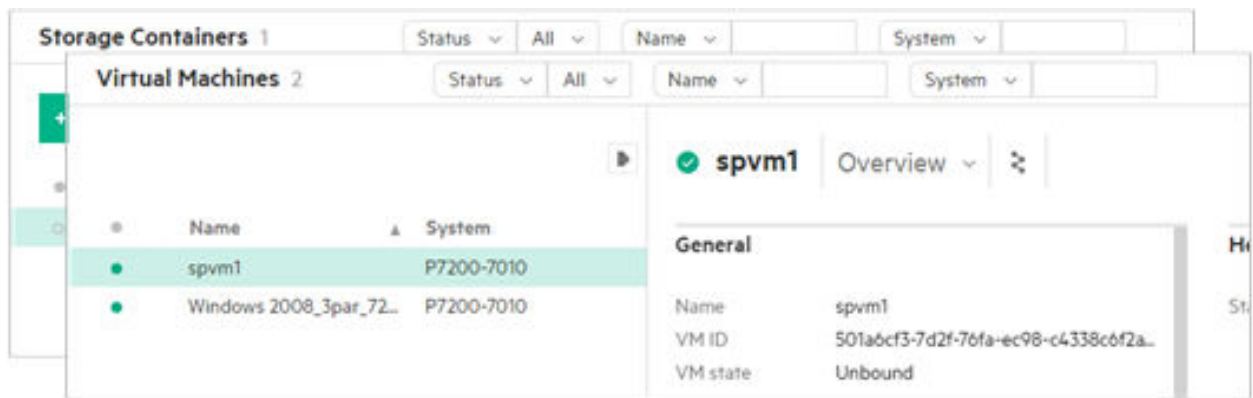
Tip: Until you create at least one threshold alert, the list is empty. Also, the list can appear to be empty, depending on the filters that are selected.

Advanced Analytics. The Advanced analytics screen displays the throughput, latency, and workload outliers information for a selected storage system in chart format. You can zoom in a particular section of the chart and view it as a new chart and set the time period for the same. Learn more: [Workload outliers](#) on page 168, [Performance chart](#) on page 159, [Saturation chart](#) on page 160.

Learn more: [System Reporter screens, views, and actions summary](#) on page 101.

VMware quick tour

VMware screens include the following:



Storage Containers. Displays a list of VMware storage containers, detail views, and an Actions menu.

Virtual Machines. Displays a list of VMware virtual machines and detail views.

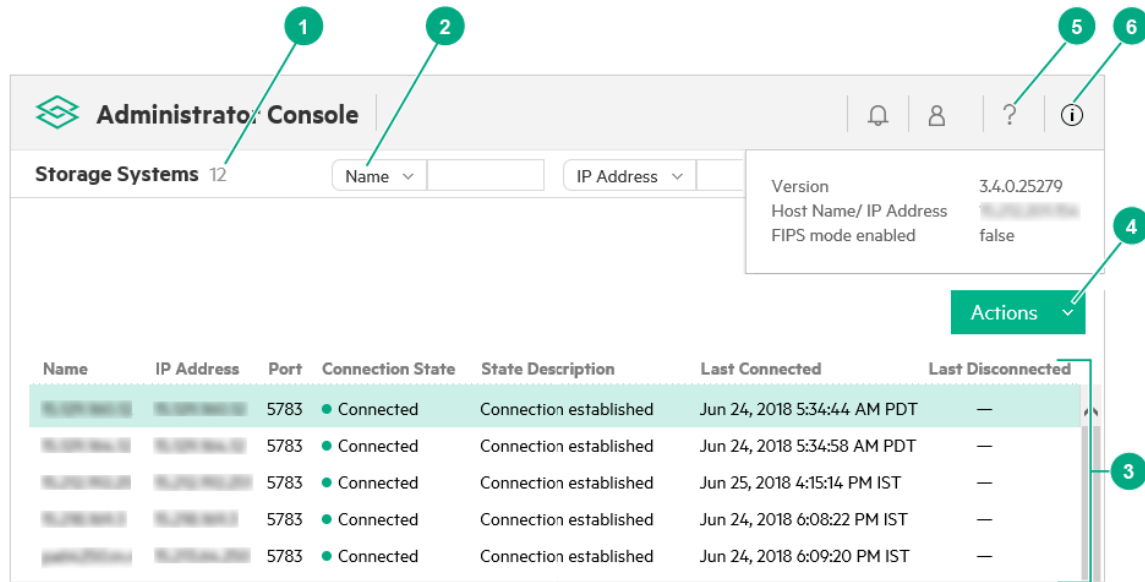
Learn more: [VMware overview](#) on page 204.

Administrator Console quick tour

This quick tour helps HPE 3PAR administrators become familiar with the HPE 3PAR SSMC Administrator Console.

Administrator Console Storage Systems screen quick tour

Access to the HPE 3PAR SSMC Administrator Console Storage Systems screen requires an HPE 3PAR SSMC administrator user account. The screen consists of the following parts:



Storage Systems count (1). A count of storage systems is displayed at the top left of the screen. The count indicates the number of storage systems in the list, based on the filter that is applied.

Filter (2). Filter menus are displayed at the top of the screen. Changing the filter changes the storage systems that are displayed in the list.

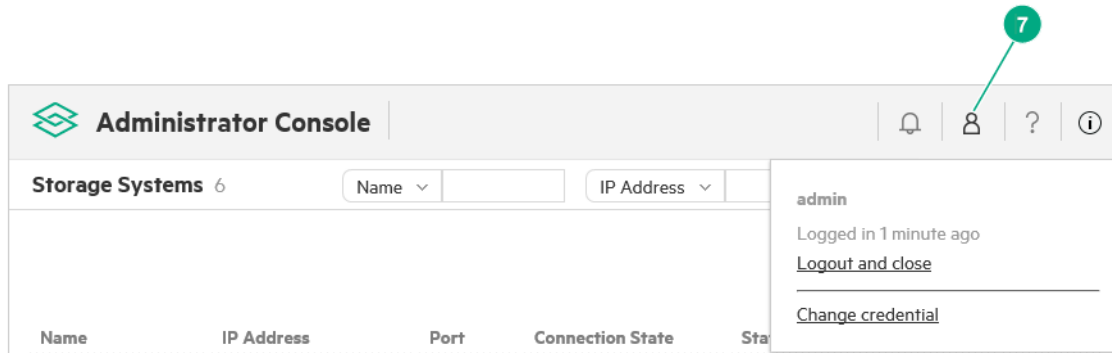
Storage systems list (3). This list shows storage systems that administrators can manage from the instance of HPE 3PAR SSMC. It includes information such as the storage system name, IP address, and connection state.

Actions (4). The Actions menu allows administrators to add or remove storage systems, upgrade HPE 3PAR SSMC appliance to later versions, and manage connections and certificates.

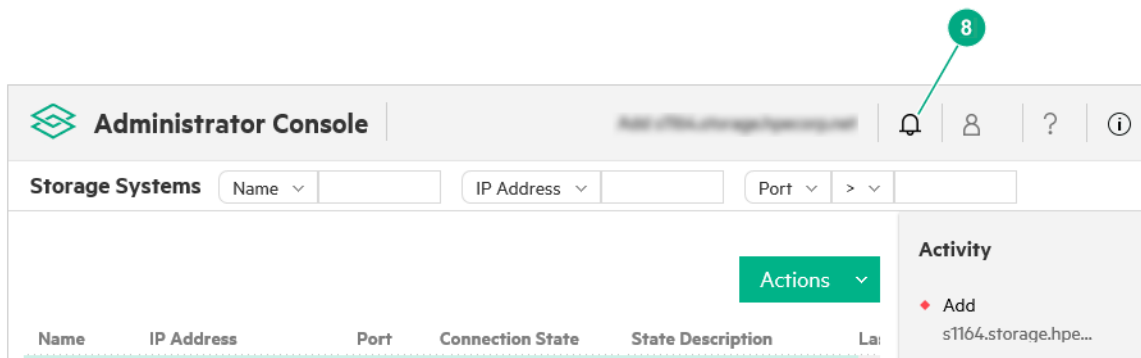
Help (5). Clicking the Help icon (?) displays help for the screen.

About (6). Clicking the About icon (i) displays the connection and version details of the HPE 3PAR SSMC instance.

Session menu (7). Clicking the Session icon (u) opens a menu for logging out or changing the HPE 3PAR SSMC administrator password. The menu also displays the user name and the session duration.



Activity indicator and sidebar (8). Clicking the Activity icon (🔔) opens the Activity sidebar. The Activity sidebar shows the activities that you have performed in the Administrator console during the session. Clicking an activity displays additional details.



Learn more: [Administrator Console screens, views, and actions summary](#) on page 109.

Tasks

These topics provide guidance on performing tasks using HPE 3PAR SSMC.

General tasks

These topics provide guidance on performing tasks using the General screens and action dialogs, and using general features of the HPE 3PAR SSMC interface.

General screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the General screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Activity screen

- List pane view: single view
- Detail pane views: not applicable
- Actions menu (alerts): Mark as new, Mark as fixed, Acknowledge, Delete
- Actions menu (tasks): Delete, Stop, Pause, Resume

Dashboard screen

- Standard panels: Storage Systems, Performance, Total Capacity, Allocated Capacity, Capacity Efficiency, Device Type Capacity, Historical Capacity
- Actions (⚙️): Add panels, Create dashboard, Create copy of dashboard, Edit dashboard, Delete dashboards, Manage dashboards

Schedules screen

- List pane standard views: compact view and Schedules
- Detail pane views: Overview, Activity
- Actions menu: Delete, Resume, Suspend, Edit

Settings screen

- List pane views: not applicable
- Detail pane views: not applicable
- Actions menu: not applicable

Changing global settings

You can view and change HPE 3PAR SSMC global settings.

Procedure

1. On the main menu, select **General > Settings**.
2. To change a global setting, hover over the appropriate settings panel, and then click the edit icon () that appears near the panel name.
3. Follow the instructions on the dialog that opens.

Creating scheduled tasks

For each of the following actions, there is an option on the dialog to create a scheduled task:

- Compact CPG
- Create Antivirus Scan (File Persona)
- Create File Snapshot (File Persona)
- Create Report (System Reporter, historical report type)
- Create Snapshot (individual virtual volumes)
- Create Snapshot (virtual volume sets)
- Create Threshold Alert (System Reporter)
- Reclaim File Snapshot Space (File Persona)
- Schedule (Adaptive Optimization)

When you create a scheduled task for an action, you can specify a schedule pattern (recurrence) on the dialog, which automatically creates a scheduled user task that appears in the Schedules screen.

Learn more: [Specifying schedule patterns](#) on page 55.

Customizing list panes

In the following, *standard views* refer to list pane views that are supplied with HPE 3PAR SSMC software. Standard views are available to all users. *User-created views* refer to views that are created by users. A user-created view is available only to the user who creates it.

Specifying the columns (properties) in a view

1. Navigate to the list pane that you want to customize.
2. On the list pane, click the actions icon () at the right of the named view. If necessary, click the pin icon () at the top right of the list to display the View menu.
3. Do one of the following:
 - Hover over **Select columns**. On the dialog that opens, select or clear the properties. As each property is selected or cleared, a column is added or removed from the view. Properties that do not have a check box cannot be removed from the view.
 - Select **Edit view** and follow the instructions on the dialog that opens.

Restoring the default columns (properties) in a view

1. Navigate to the list pane for which you want to restore the default columns (properties).
2. On the list pane, click the actions icon (⚙️) at the right of the named view. If necessary, click the pin icon (📌) at the top right of the list to display the View menu.
3. Hover over **Select columns**. On the dialog that opens, click **Restore default columns**.

Adding user-created views

You can add your own views to a list pane. User-created views are available only to the user who creates it.

1. Navigate to the list pane for which you want to add a user-created view.
2. On the list pane, click the actions icon (⚙️) at the right of the named view. If necessary, click the pin icon (📌) at the top right of the list to display the View menu.
3. Select **Create view** and follow the instructions on the dialog that opens.

Editing views

You can edit standard views and user-created views. For standard views, you can specify the columns (properties) in the view, but you cannot change the name of the view. For user-created views, you can specify the columns (properties) in the view and change the name of the view.

1. Navigate to the list pane for which you want to edit a view.
2. On the list pane, click the actions icon (⚙️) at the right of the named view. If necessary, click the pin icon (📌) at the top right of the list to display the View menu.
3. Select **Edit view** and follow the instructions on the dialog that opens.

Deleting views

You can only delete your own user-created views. You cannot delete standard views.

1. Navigate to the list pane for which you want to delete a view.
2. On the list pane, click the actions icon (⚙️) at the right of the named view. If necessary, click the pin icon (📌) at the top right of the list to display the View menu.
3. Select **Delete view** and follow the instructions on the dialog that opens.

Editing a list pane View menu

You can specify the order of the views in a View menu. You can also specify the view that is the default view for a list pane.

1. Navigate to the list pane whose View menu you want to edit.
2. On the list pane, click the actions icon (⚙️) at the right of the named view. If necessary, click the pin icon (📌) at the top right of the list to display the View menu.
3. Select **Manage views** and follow the instructions on the dialog that opens.

Specifying compact/expanded views and row layouts for all list pane views

You can specify whether all list panes are shown by default with a compact view or an expanded view. You can also specify the default number of rows for all list panes, and the row density (spacing) for all list panes.

Tip: Each list pane has one unnamed compact view. A compact view has only a few columns. Most list panes also have several expanded views. Expanded views are named views that typically include many columns.

1. On the main menu, select **General > Settings**.
2. Hover over the **Data Tables** panel, and then click the edit icon () that appears near the panel name.
3. Follow the instructions on the dialog that opens.

Learn more: [List panes quick tour](#) on page 19.

Customizing the main menu compact view

You can specify the screens that are listed on the compact version of the main menu.

Procedure

1. On the main menu, select **General > Settings**.
2. Hover over the **Main Menu Compact View** settings panel, and then click the edit icon () that appears near the panel name.
3. Follow the instructions on the dialog that opens.

Learn more: [Main menu and banner quick tour](#) on page 17.

Dashboard screen – using and customizing

The Dashboard screen summarizes the key properties and health of connected storage systems. The Dashboard can include standard panels, optional panels, and user-created panels.

Standard panels. Are always displayed in the Dashboard (unless you remove them). To learn about these panels, click the following links:

- [Activity panel](#) on page 41
- [Allocated Capacity panel](#) on page 41
- [Capacity Efficiency panel](#) on page 42
- [Device Type Capacity panel](#) on page 43
- [Common Actions and Views panel](#) on page 42
- [Historical Capacity panel](#) on page 43
- [Top Performance Outliers panel](#) on page 45
- [Performance panel \(alerts\)](#) on page 44
- [Raw Capacity panel](#) on page 44
- [RMC Protected Volumes panel](#) on page 45
- [RMC Protection Jobs panel](#) on page 44
- [Top Systems By Saturation panel](#) on page 45

- **Storage Systems panel** on page 46 (all connected storage systems)
- **System panel** on page 46 (single connected storage system)
- **System Performance panel (host ports)** on page 46
- **Total Capacity panel** on page 47
- **Top Volume Hotspots by IOPs panel** on page 47
- **Top Volume Hotspots By Latency panel** on page 47
- **Virtual Volume Protection panel** on page 48

Optional panels. Are displayed in the Dashboard only if you add them. To learn about these panels, click the following links:

- **Block Persona Status panel** on page 42
- **Daily Top Host Bandwidth panel** on page 42
- **Daily Top Volume Bandwidth panel** on page 43
- **Daily Top Host Port Utilization panel** on page 42
- **File Persona Status panel** on page 43
- **System Summary panel** on page 47

Specifying Storage Systems. To specify the connected storage systems that are reported in the Dashboard, click the Systems menu. The menu appears in the upper left corner of the screen, near the Dashboard title. By default, *All systems* is selected.

Customizing the Dashboard

- To add a panel to the Dashboard, click the actions icon () that appears in the upper left corner of the screen. Then select **Add panels** and follow the instructions on the dialog that opens.
- To edit a panel, hover over the panel name until the edit icon () appears in the panel, and then click the icon.
- To remove a panel, hover over the panel name until the delete icon () appears in the panel, and then click the icon.
- To move a panel to a different location, hover over the panel name until the move icon () appears in the panel. Then drag and drop the panel to a new location.
- To display the Dashboard actions menu, click the actions icon (). To perform an action, select **Create dashboard**, **Create copy of dashboard**, **Edit dashboard**, **Delete dashboards**, or **Manage dashboards** and follow the instructions on the dialog that opens.

Tips:

- Using the Storage Systems filter on other screens does not impact the information that is shown in the Dashboard. For example, selecting storage systems on the Virtual Volumes screen does not impact the storage systems that are reported on the Dashboard screen.
- When you delete a standard or optional panel, the panel is removed from the Dashboard but you can add the panel back later. Deleting a user-created panel permanently deletes the panel from the Dashboard. User-created panels cannot be added back without recreating them.

Activity panel

The Dashboard Activity panel summarizes new user- and system-generated alerts and tasks for the selected storage systems.

Clicking the title above the chart opens the Activity screen.

New Alerts

- Clicking **New alerts** opens the Activity screen to show new alerts activity. New alerts are alerts that have occurred since you last logged in to the instance of HPE 3PAR SSMC.
- Clicking the critical count () or warning count () opens the Activity screen to show the respective alert types.

Tasks

- Clicking **Tasks** opens the Activity screen to show task activity. Tasks are the actions that you have performed while logged in to the instance of HPE 3PAR SSMC.
- Clicking the critical count () or warning count () opens the Activity screen to show the respective task types.

Learn more: [Alerts](#) on page 157.

Allocated Capacity panel

The Dashboard Allocated Capacity panel summarizes *Block Persona* storage, *File Persona* storage, and *system* storage of the selected storage systems.

Tip: File Persona capacity is only displayed for connected storage systems that have an HPE 3PAR File Persona enabled.

- Clicking the title above the chart opens the System Capacity view on the Systems screen.
- You can hover over chart segments to display the percentage of space that is allocated for Block Persona storage, File Persona storage, and system storage.
- Block capacity is the space that is used for Block Persona storage. At a low level, it is the logical drive space that is mapped to virtual volumes that are used for Block Persona.
- File capacity is the space that is used for File Persona storage. At a low level, it is the amount of logical drive space that is mapped to virtual volumes that are used for File Persona.
- System capacity is space that is allocated for system administration and spares. Space for spares that is part of allocated Block Persona and File Persona space is not included.

Block Persona Status panel

The Dashboard Block Persona Status panel summarizes the status for selected Block Persona resource types (objects) on the selected storage systems.

- Resource types can include common provisioning groups, hosts, host sets, virtual volumes, and virtual volume sets.

Clicking a resource total count opens the corresponding screen. For example, clicking the total count for virtual volumes opens the Virtual Volumes screen.

Clicking a resource status count opens the corresponding screen, with the list of resources filtered by status. For example, clicking the virtual volumes count for critical status opens the Virtual Volumes screen with the list filtered for critical status.

- Status indicators are  *Critical*,  *Warning*, and  *OK*. Learn more: [Status and health states](#) on page 166.

Capacity Efficiency panel

The Dashboard Capacity Efficiency panel summarizes the space savings and efficiency of the selected storage systems.

- Clicking the title opens the Capacity Efficiency view on the Systems screen.
- You can hover over chart segments to display the percentage of free space (space savings) and the percentage of used space.
- Savings is the amount of unused space.
- Used is the amount of reserved space (without RAID overhead).
- Usable is the amount of usable space expressed as virtual size.
- Overall compaction is the ratio of usable space to used space (usable:used). A larger ratio indicates a higher efficiency and greater space savings.

Learn more: [Capacity and space terminology](#) on page 162.

Common Actions and Views panel

The Dashboard Common Actions and Views panel provides links to commonly used action dialogs and screens.

Daily Top Host Bandwidth panel

The Dashboard Daily Top Host Bandwidth panel lists the hosts that have the top read/write activity for the selected storage systems during the previous day. (For storage systems that are running HPE 3PAR OS 3.2.2 or later.)

Daily Top Host Port Utilization panel

The Dashboard Daily Top Host Port Utilization panel lists the hosts that have the top read/write average ratio for the selected storage systems during the previous day. (For storage systems that are running HPE 3PAR OS 3.3.1 or later.)

The percentage based bandwidth option is available from HPE 3PAR OS 3.3.1 MU3 or later.

Daily Top Volume Bandwidth panel

The Dashboard Daily Top Volume Bandwidth panel lists the virtual volumes that have the top read/write activity for the selected storage systems during the previous day. (For storage systems that are running HPE 3PAR OS 3.2.2 or later.)

Device Type Capacity panel

The Dashboard Device Type Capacity panel summarizes device type capacities and status (*OK*, *Warning*, *Critical*) for the selected storage systems, based on raw space alerts.

- Clicking the title above the chart opens the Device Type Capacity view on the Systems screen.
- You can hover over chart segments to display the number of storage systems by alert status. Clicking a segment opens the Device Type Capacity view on the Systems screen.
 - An OK segment indicates storage systems that have no *Warning* or *Critical* raw space alerts.
 - A Warning segment indicates storage systems that have one or more *Warning* raw space alerts (75% of capacity), but no *Critical* raw space alerts.
 - A Critical segment indicates storage systems that have one or more *Critical* raw space alerts (95% of capacity).
 - When user-defined raw space alerts have been set for a storage system, the device type capacity status is always shown as *OK/Normal*. User-defined raw space alerts always have a *Normal* status that suppresses the system default raw space alerts.
- SSD shows the total raw capacity and percentage allocated for storage on solid-state physical drives.
- FC shows the total raw capacity and percentage allocated for storage on fast class physical drives.
- NL shows the total raw capacity and percentage allocated for storage on near line physical drives.

Learn more: [Alerts for physical drive raw space](#) on page 158, [Status and health states](#) on page 166, [Physical drives and device types](#) on page 165.

File Persona Status panel

The Dashboard File Persona Status panel summarizes the status for selected File Persona resource types (objects) on the selected storage systems.

- Resource types can include File Persona configurations, file shares, file stores, file provisioning groups, and virtual file servers.

Clicking a resource total count opens the corresponding screen. For example, clicking the total count for file shares opens the File Shares screen.

Clicking a resource status count opens the corresponding screen, with the list of resources filtered by status. Clicking the file shares count for critical status opens the File Shares screen with the list filtered for critical status.

- Status indicators are  *Critical*,  *Warning*, and  *OK*. Learn more: [Status and health states](#) on page 166.

Historical Capacity panel

The Dashboard Historical Capacity panel summarizes the total raw capacity and the allocated capacity of the selected storage systems over the last 30 days. The number of storage systems that are reporting historical capacity is displayed in the title above the chart.

Historical capacity data is displayed only for connected storage systems that are running HPE 3PAR OS 3.2.1.12 or later.

Clicking the title opens the System Capacity view on the Systems screen.

Performance panel (alerts)

The Dashboard Performance panel for alerts summarizes the overall performance status (*OK*, *Warning*, *Critical*) of the selected storage systems, based on user-defined performance alerts. If a storage system has both *Critical* and *Warning* performance alerts, the overall performance status is reported as *Critical*.

Performance status is displayed only for selected storage systems that have an HPE 3PAR System Reporter license and that have generated user-defined performance alerts.

- Clicking the chart title opens the Threshold Alerts screen.
- You can hover over chart segments to display the number of storage systems in the segment. Clicking a segment opens the Threshold Alerts screen to show the user-defined performance alerts.
 - An OK segment indicates the number of storage systems that have not generated any *major* or *minor* user-defined performance alerts.
 - A Warning segment indicates the number of storage systems that have generated user-defined *minor* performance alerts, but have not generated user-defined *major* performance alerts.
 - A Critical segment indicates the number of storage systems that have generated user-defined *major* performance alerts or have generated *major* and *minor* user-defined performance alerts.
 - An Other segment indicates the number of storage systems that do not have HPE 3PAR System Reporter licenses. An Other segment can also include storage systems that have HPE 3PAR System Reporter licenses but have not had any user-defined performance alerts created.

Raw Capacity panel

The Dashboard Raw Capacity panel summarizes the raw storage capacity for the selected storage systems.

- Clicking the title above the chart opens the Device Type Capacity view on the Systems screen.
- The utilization graph shows the total allocated and free capacity for the raw physical drives.

Learn more: [**Capacity and space terminology**](#) on page 162, [**Physical drives and device types**](#) on page 165.

RMC Protection Jobs panel

The Dashboard RMC Protection Jobs panel summarizes the status of the RMC protection jobs that are running in HPE 3PAR SSMC.

- You can hover over chart segments to display the status of the protection jobs. The status segments are displayed with different colors.
- A Failed segment indicates the number of failed protection jobs on the storage systems.
- A Completed segment indicates the number of protection jobs that are completed on the storage systems.
- An In Progress segment indicates the number of protection jobs in progress on the storage systems.

Learn more: [Status and health states](#) on page 166

RMC Protected Volumes panel

The RMC Protected Volumes panel on the dashboard summarizes the percentage of the RMC protected and unprotected virtual volumes. The panel also provides information about the snapshot, copy, and backup protected.

You can hover over chart segments to display the percentage of protected and unprotected virtual volumes.

- A Protected segment indicates the percentage of virtual volumes that are protected using RMC protection policies.
- An Unprotected segment indicates the percentage of virtual volumes that are not protected using RMC protection policies.

NOTE: If no HPE RMC instances are connected to HPE 3PAR SSMC, the panel provides a link to the **Data Protection > RMC Credentials** screen.

Learn more: [Status and health states](#) on page 166

Top Performance Outliers panel

The Top Performance Outliers panel lists the top 10 storage systems that are managed by HPE 3PAR SSMC, ranked according to their performance severity scores.

The ranks range between 0 to 10 and are represented in colors between gray changing over to red. The colors indicate the following:

- Gray or closer to gray - No noticeable performance anomaly in the storage system.
- Red or closer to red - Performance anomalies detected on the storage system.

The performance rank depends on the performance (latency) of the storage system that is measured at a 5-minute interval. The rank measures the relative severity of latency that is reported by the storage system in comparison to the latency that is observed in the field. The performance severity score is a weighted mean of the performance scores in the past 24-hours for the storage system. The performance of a single storage system is displayed as a line graph for over the past 24-hours or a selected time period.

Learn more: [Performance chart](#) on page 159

Top Systems By Saturation panel

The Top Systems by Saturation panel lists the top 10 storage systems that are managed by HPE 3PAR SSMC ranked by their saturation levels. The panel enables you to identify a storage system that is closer to the saturation.

The saturation of a storage system is calculated based on the ratio of the following:

- Current IOPS and/or throughput measured at 5-minute interval.
- The preferred IOPS and/or throughput.

The saturation is represented as a percentage value. The preferred IOPS and/or throughput is the optimal value depending on the specific type of system configuration and the workload running on the storage system. The saturation score is a weighted mean of the saturation levels for the storage system over the past 24 hours. The saturation of a single storage system is displayed as a line graph for over the past 24-hours or a selected time period.

In the Saturation chart, the scores are presented as gradient colors which range between green, yellow, and red, where:

- Green - Storage system with saturation below 50%.
- Yellow - Storage system with saturation between 50% to 70%.
- Red - Storage system with the saturation above 70%.

NOTE: The other colors in the saturation chart visualizes the transition from higher saturation to lower transition scores.

Learn more: [Saturation chart](#) on page 160

Storage Systems panel

The Dashboard Storage Systems panel summarizes the overall hardware status (*OK*, *Warning*, *Critical*) of the selected storage systems. If a storage system has hardware components with both a *Critical* and a *Warning* status, the overall hardware status is reported as *Critical*. (The *Warning* state is also known as a *Degraded* state). The number of connected storage systems is displayed in the title above the chart.

- Clicking the chart title opens the Systems screen.
- You can hover over chart segments to display the number of storage systems in the segment. Clicking a segment opens the Systems screen.
 - An OK segment indicates the number of storage systems that have an overall hardware status of *OK*.
 - A Warning segment indicates the number of storage systems that have an overall hardware status of *Warning* (*Degraded*).
 - A Critical segment indicates the number of storage systems that have an overall hardware status of *Critical*.

Learn more: [Status and health states](#) on page 166.

System panel

The Dashboard System panel summarizes the overall hardware status (*OK*, *Warning*, *Critical*) of a single storage system. If a storage system has hardware components with both a *Critical* and a *Warning* status, the overall hardware status is reported as *Critical*. (The *Warning* state is also known as a *Degraded* state).

Clicking the chart title opens the Systems screen where you can view additional information and perform actions.

Learn more: [Status and health states](#) on page 166.

System Performance panel (host ports)

The Dashboard System Performance panel for host ports summarizes host port performance of the selected storage systems.

Performance is displayed only for selected storage systems that have an HPE 3PAR System Reporter license.

- Clicking the chart title opens the Performance view on the detail pane of the Systems screen.
- You can hover over chart graphs to display performance metrics data.

System Summary panel

The Dashboard System Summary panel summarizes the overall health summary, tasks, capacity, performance, and alerts generated for the selected storage system.

Clicking the chart title opens the Systems summary screen where you can view additional information and perform actions.

Learn more: [Status and health states](#) on page 166.

Top Volume Hotspots by IOPs panel

The Top Volume Hotspots by IOPs panel lists the top ten virtual volumes across the storage systems that are managed by HPE 3PAR SSMC ranked by their IOPs hotspot ranks. The panel enables you to identify the virtual volumes that are saturating the storage system.

The IOPs hotspot rank for each virtual volume depends on the number of times the virtual volume appears as an outlier. A virtual volume is considered an outlier when the metric value (that is the input output per second (IO/s)) reported for the virtual volume is unusually higher than the values reported by the rest of the virtual volumes in the storage system.

Example:

In a scenario with 100 virtual volumes on a storage system:

- Three virtual volumes have an IOPs of 30 ms.
- 97 virtual volumes have an IOPs of 1 ms.

The three virtual volumes which have a higher IOPs than the majority are called Outliers.

The rank is calculated based on the IOPs recorded for the virtual volume in the past 24 hours compared to the other virtual volumes (in the storage system) that are weighed against the actual IOPs value. The rank can be from zero ranging to 10. If the rank is zero, the virtual volumes do not appear on the panel.

The virtual volume on the top of the ranking list indicates that the same volume has been servicing a higher number of IOPs compared to the rest of the virtual volumes in the storage system.

Top Volume Hotspots By Latency panel

The Top Volume Hotspots by Latency panel lists the top ten virtual volumes across the storage systems that are managed by HPE 3PAR SSMC ranked by their latency hotspot ranks.

The latency hotspot rank for each virtual volume depends on the number of times the virtual volume appears as an outlier. The rank is calculated based on the latency reported by the virtual volume in the past 24 hours compared to the other virtual volumes (in the storage system) that are weighed against the actual latency value.

The virtual volume at the top of the ranking list indicates that the same volume has been experiencing an unusual performance penalty compared to the rest of the virtual volumes in the storage system.

Learn more: [Top Volume Hotspots by IOPs panel](#) on page 47, [Volume hotspots](#) on page 162

Total Capacity panel

The Dashboard Total Capacity panel summarizes the total raw capacity of the selected storage systems.

- Clicking the title above the chart opens the Capacity view on the Systems screen.
- You can hover over chart segments to display the percentage of raw storage space that is allocated and the percentage that is free.
- Allocated capacity is space that is used for chunklets, including chunklets that are used for logical drives, spares, and failed capacity.

- Free capacity is the portion of logical drive space that has not been reserved.
- Unavailable capacity, as reported by the HPE 3PAR CLI `showsys -space` command, is not included in the total.

Learn more: [Capacity and space terminology](#) on page 162, [Chunklets](#) on page 124.

Virtual Volume Protection panel

The Dashboard Virtual Volume Protection panel summarizes the count and capacity values of all the protected, unprotected, local snapshots, Remote Copy, and RMC protection virtual volumes.

- A Protected segment indicates the count and capacity values of base virtual volumes that are protected through one of the three available options:
 - Local snapshots
 - Replication groups
 - RMC protection policies
- An Unprotected segment indicates the count and capacity values of base virtual volumes that are not protected.
- Local snapshots segment indicates the count and capacity values of base virtual volumes with local snapshots or have a snapshot policy.
- Remote Copy segment indicates the count and capacity values of base virtual volumes with Remote Copy groups.
- RMC protection segment indicates the count and capacity values of base virtual volumes with RMC protection.

Learn more: [Status and health states](#) on page 166

Enable FIPS mode

Federal Information Processing Standards (FIPS) is a U.S. government standard for approving cryptographic modules. When FIPS mode is enabled for HPE 3PAR SSMC, the console uses cryptographic modules which are FIPS 140-2 level 1 validated. These modules are operated in compliance with their validation criteria when FIPS mode is enabled.

You can enable and disable the **FIPS mode enabled** option in the **Application** panel on the **Edit Global Settings** dialog of the **Settings** screen.

NOTE: The HPE 3PAR SSMC with FIPS mode enabled does not support HPE 3PAR OS 3.2.2 MU5 or earlier versions for the storage systems that HPE 3PAR SSMC manages. However, if the source HPE 3PAR storage systems are running on HPE 3PAR OS 3.1.2 or 3.1.3, you can use the Online Import Utility (OIU) feature in HPE 3PAR SSMC to perform migrations. Use the Peer Motion Utility (PMU) to migrate from the other HPE 3PAR OS versions.

Important: After you enable this option, restart HPE 3PAR SSMC for the changes to take effect.

Learn more: [Changing global settings](#) on page 36.

Enable connectivity to HPE InfoSight

HPE InfoSight is a predictive analytics platform that enables you to predict and prevent infrastructure issues before they occur. When HPE InfoSight connectivity is enabled for HPE 3PAR SSMC, you can

view and receive notifications (alerts) that are relevant to the storage systems that HPE 3PAR SSMC manages.

Navigate to <https://infosight.hpe.com/> and click **Create Account**, or login with your existing HPE Passport user account and follow the prompts to register the storage systems.

To gather alerts for a particular storage system from HPE InfoSight, you must:

- Add and configure the storage system in both HPE 3PAR SSMC.
- Register your storage systems in HPE InfoSight.
- Provide your HPE Passport user account credentials in HPE 3PAR SSMC.

To register your storage system in HPE InfoSight, see Adding a system (available under Performing Storage System Tasks) in HPE 3PAR Service Processor Software User Guide.

If your HPE 3PAR StoreServ storage system is already registered in HPE InfoSight, you can continue to the steps to add your HPE Passport user account in HPE 3PAR SSMC.

Prerequisites

Ensure the following to enable connectivity to HPE InfoSight:

1. Configure the proxy settings (web-proxy address and port details).

❗ **IMPORTANT:** The configured proxy must support TLS V1.2 protocol.

2. Configure HPE InfoSight to assign the correct permissions to the InfoSight user created.

The HPE Passport user account must be a member of the system group that has access to the storage system (for which you intend to receive the alerts). You can create different passport accounts for different groups of storage administrators in your organization.

You can enable and disable the **Enable connectivity to HPE InfoSight** option in the **Application** panel on the **Edit Global Settings** dialog of the **Settings** screen. This option is enabled by default.

You can enter the web proxy address and port details in the Application panel. The web proxy address can be an http or https address, with or without authentication.

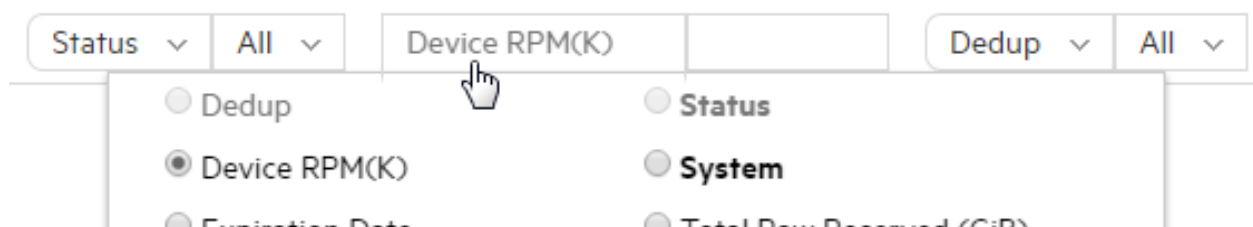
NOTE: If you try to add or modify the HPE InfoSight login credentials when the HPE InfoSight connectivity is disabled, a message to enable the connectivity to HPE InfoSight appears.

Learn more: [Changing global settings](#) on page 36.

Filters – using

Filters that are specific to a list pane are displayed near the screen name. Clicking a filter and selecting or entering a filter value changes the items that are displayed in the list pane.

In the following example, the current filter (the filter being specified) is the middle filter. Properties have already been selected in the left and right filters.



Filter selector legend

- **Bold black.** The property (column) is displayed in list pane and can be selected for the current filter.
- **Bold gray.** The property (column) is displayed in the list pane but cannot be selected for the current filter because it already is selected in another filter.
- **Normal black.** The property (column) is not displayed in the list pane but the property is known and can be selected for the current filter.
- **Normal gray.** The property (column) is not displayed in the list pane and cannot be selected for the current filter because it already is selected in another filter.

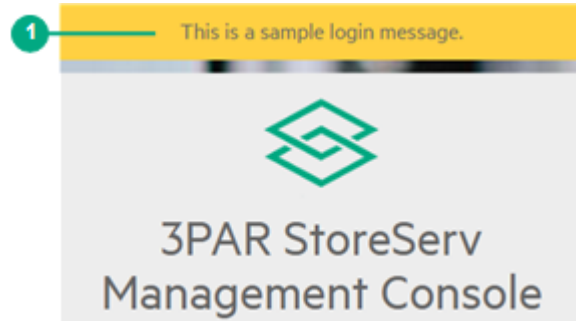
Filter values

- Many filter values can be selected from the filter menus. For example, the **Provisioning** filter allows you to filter the list pane for Full, Thin, or All provisioning.
- Filters also allow you to filter by the name of an object. For example, the **Names** filter allows you to filter the list pane for items that include the characters *test* in the item name.
- Some filters allow you to include numeric operators (<, <=, =, >, >=) and values. For example, the **Virtual Size** filter allows you to filter the list pane for virtual volumes whose virtual size is greater than 50 GiB.

Learn more: [Filters quick tour](#) on page 21.

Login banner message – using

HPE 3PAR SSMC administrators can display a custom login banner message (1) that all users can see when they log in to HPE 3PAR SSMC.



Administrators can enable and disable the message, and specify the message text using the **Application** panel on the **Edit Global Settings** dialog for the **Settings** screen. Learn more: [Changing global settings](#) on page 36.

Logging in to the Main Console

Tip: To manage multiple storage systems, each connected storage system must have the same security credentials (user name and password) that are used to log into the HPE 3PAR SSMC Main Console. For more information, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Procedure

1. Browse to the server on which HPE 3PAR SSMC software is installed, **https://<IP address or FQDN>:8443**. The login screen opens.

The default port number is 8443.

2. Enter a user name and password.
3. Click **Login**. The **Dashboard** screen is displayed.

See also: [Logging in to the Administrator Console](#) on page 111.

Managing scheduled tasks

Tip: Some actions cannot be performed on system tasks.

Procedure

1. On the main menu, select **General > Schedules**.
2. In the list pane, select the scheduled task, and then select **Delete**, **Resume**, **Suspend**, or **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Specifying schedule patterns](#) on page 55, [Creating scheduled tasks](#) on page 37.

Managing system alerts and tasks

A user with the proper privileges can assign owners, and clear or restore alerts and tasks.

Procedure

1. On the main menu, select **General > Activity**. The **Activity** screen opens and displays alerts and tasks.
2. To display only *alerts* or *tasks*, do one of the following:
 - On the **Category** filter menu, select **Alerts**.
 - On the **Category** filter menu, select **Tasks**.
3. To perform an action:
 - Select the alert, and then select **Mark as new**, **Mark as fixed**, **Acknowledge**, or **Delete** on the **Actions** menu.
 - Select the task, and then select **Delete**, **Pause**, **Stop**, or **Resume** on the **Actions** menu.

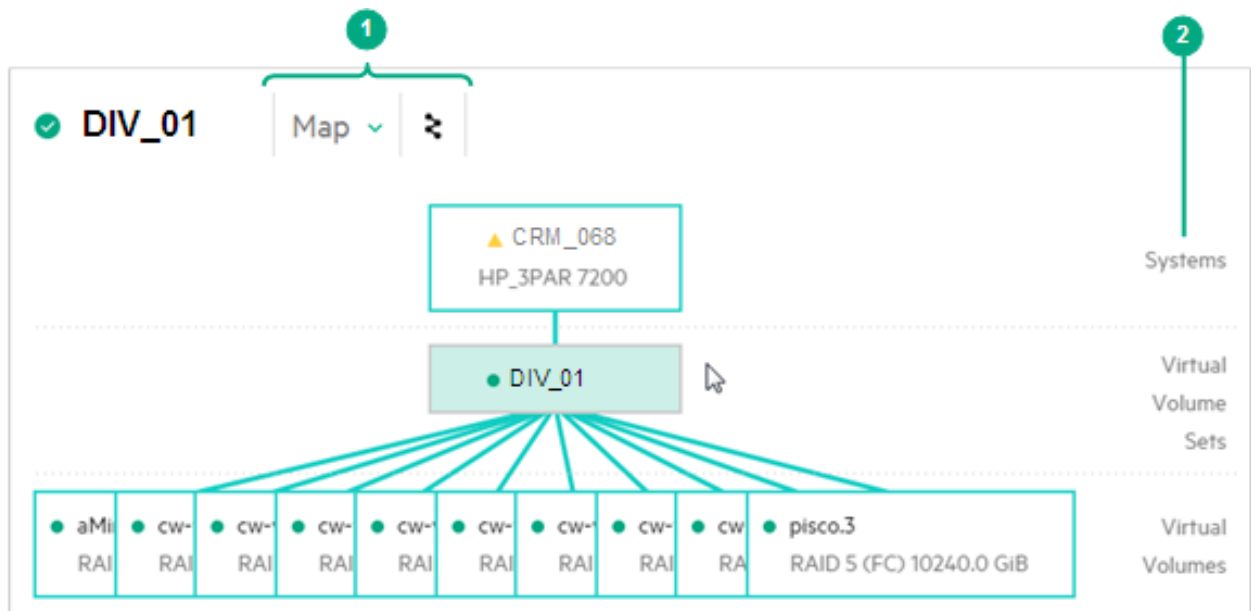
Learn more: [System tasks](#) on page 166.

Map views – using

Map views are available on many detail panes. You can display the Map view of a resource by selecting **Map** in the View menu or by clicking the Map icon (1). Most maps are organized in a vertical hierarchy, with the selected resource shown in a box in the central portion of the map. The hierarchy levels are labeled on the right side (2).

The connecting lines between boxes show the relationships between resources. You can hover over the boxes to see the connecting lines and relationships. Clicking the box of a related resource switches the screen to show the Map view of the resource.

The following example shows the Map view of a virtual volume set (center), its member virtual volumes (bottom), and the storage system (top).



Notifications box – using

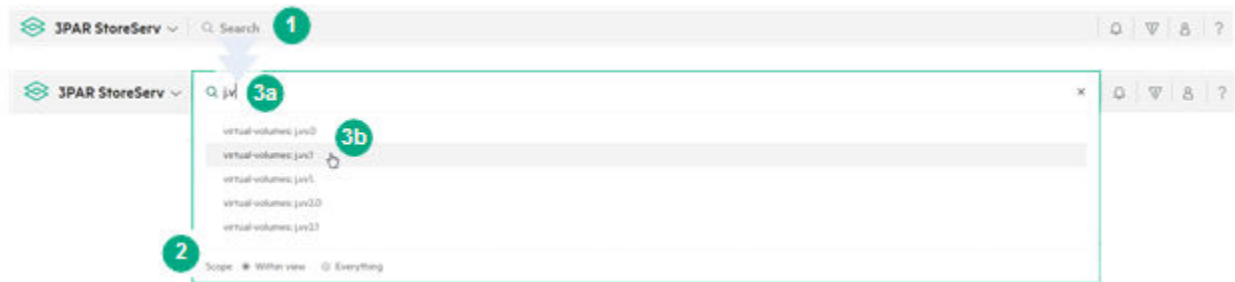
A summary-level notifications box (1) is displayed in some detail panes when activities – alerts or tasks – have affected the resource. Clicking anywhere in the box expands it to display more information (2), including a suggested resolution (2a). Clicking the **Details** hyperlink (2b) selects the detail pane **Activity** view so you can see more details about the selected notification.

The screenshot shows a notifications box for a resource named 'LINCOLN'. The top bar includes 'Overview' and 'Actions' dropdowns. A summary notification (1) is shown: 'Max allowable tpdctl processes o...' with a timestamp of 'Feb 14, 2017 9:34:25 PM PST'. Clicking this notification expands it to show more details (2). The expanded view includes a 'Resolution' section (2a) with a description and a suggested resolution: 'Reduce the number of CLI client requests. If the problem persists, reboot the node hosting the CLI connections.' A 'Details' link (2b) is also present. On the right side of the expanded notification, there is a list of related notifications, including 'Node 0 eth2 Ethernet d...', 'Max allowable tpdctl pr...', 'Max allowable CLI serv...', and '207 authentication failu...'.

Search box – using

Clicking the banner search area (1) opens the search box. Search behavior is based on the screen that you are viewing. For most screens, you can choose whether the search scope (2) is for items in the

current screen (*Within view*), or for items in all screens (*Everything*). This example shows a *Within view* search of the Virtual Volumes screen.



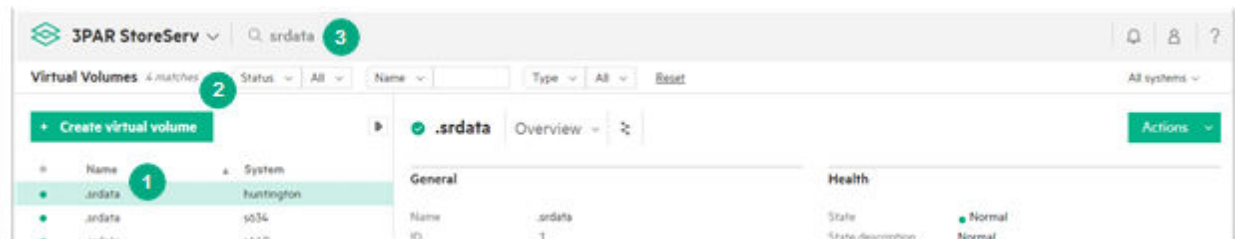
As you type (3a), a list of search results, up to the first 10, is shown in the search box (3b). You can press **Enter** to complete your entry, or you can select (click) a search result.

Tips:

- *Within view* searches find matches in item names on the screen you are viewing. *Everything* searches find matches in item names, and certain other properties, across all screens. Learn more: [Search box: database fields](#) on page 54.
- To close the search box, click anywhere outside the box.
- To clear a search entry, click inside the search area to open the search box, and then click the clearing icon (X) in the upper right corner.
- Previous search entries, if any, are shown near the bottom of the search box.
- To search for a port ID, you must escape the colons in the port ID with a backslash (\) character. For example, to search for port 0:1:2, enter 0\:1\:2.

Screen-specific searches

For the search of a specific screen (*Within view* scope), the screen is filtered to show only the items that matched your search (1). A results indicator (2) shows the number of items that matched your search. Your search entry continues to be shown (3) until you perform another search. In this example, the screen shows only the virtual volumes that matched the search entry.



Everything searches

For the search of all screens (*Everything* scope), or when viewing the Dashboard, Roles, or Settings screens, the search results are shown on the Search screen. The search results identify the screen in which the item is located (1), the item name (2), and, if applicable, the database field (3). Clicking anywhere on a search result displays the item in the appropriate screen. This example shows an *Everything* search that was initiated from the Virtual Volumes screen.



Create-dialog searches

You can also search for, and open, dialogs that create resources. For example, when viewing the Virtual Volumes screen, if you enter *create* in the Search box, the search results include the item *virtual-volumes: create virtual-volumes*. Clicking the item opens the Create Virtual Volume dialog.

If you perform a create-dialog search with a scope of *Everything*, or search from the Dashboard, Roles, or Settings screens, then all creation dialogs are listed.

Tip: If there are many alerts, tasks, or resources that contain the word *create*, you can often narrow the results by entering *create* followed by a space ("*create* ").

Search box: database fields

Search results are based on the screen that you are viewing. The following shows the fields that are searched when you are viewing a specific screen and use the *Within view* search scope. If you use the *Everything* search scope, all fields that are shown in the list are searched.

Screen name	Fields searched
Activity:	Alert ID, alert message code
Adaptive Flash Cache:	Name
Adaptive Optimization:	Name
Common Provisioning Groups:	Name, AO configuration name
Connections:	Name
Controller Nodes:	Name
Dashboard:	All of the fields shown in this <i>Fields searched</i> column
Domains:	Name
Drive Enclosures:	Name, firmware version, serial number, manufacturer, model number
Federation Configurations:	Name
File Persona Configuration:	Name
File Provisioning Groups:	Name
File Shares:	Name
File Stores:	Name
Hosts:	Name, comment, contact, host path, location
Host Sets:	Name, comment
LDAP:	Name
Peer Motions:	Name

Table Continued

Physical Drives: Name, firmware version, serial number, manufacturer, model number
Ports: Name, WWN, label
Priority Optimization: Name
Remote Copy Configurations: Name
Remote Copy Groups: Name, cluster name, source group name
Reports: Name
Roles: All of the fields shown in this <i>Fields searched</i> column
Schedules: Name
Settings: All of the fields shown in this <i>Fields searched</i> column
Storage Containers: Name
Systems: Name, comment, contact, location, owner, version, WWN
Templates: Name
Threshold Alerts: Name
Users: Name
Virtual File Servers: Name
Virtual Machines: Name
Virtual Volumes: Name, comment, WWN
Virtual Volume Sets: Name, comment

Selecting screens

Procedure

1. Click the left end of the banner. The main menu is displayed.
2. Select the screen that you want to display.

Tip: You can also use back and forward navigation in your browser to display previously viewed screens.

Learn more: [Main menu and banner quick tour](#) on page 17.

Specifying schedule patterns

Dialogs for creating or editing a scheduled task allow you to choose from the following schedule patterns:

- Once now. Specify the settings to start the task now.
- Once later. Specify a date and time to start the task.
- Hourly. Specify the number of minutes after the hour to start the task.
- Daily. Specify the time of day to start the task.
- Weekly. Specify a day of the week and time of day to start the task.
- Advanced. Specify single daily, multiple daily, monthly, days of the week, and a time of day to start to the task.

To specify dates and times, click the **Starting at** box on the dialog and then select a date and time.

Learn more: [Creating scheduled tasks](#) on page 37, [Managing scheduled tasks](#) on page 51.

Stop logins on first failure

You can enable and disable the **Stop logins on first failure** option in the **Application** panel on the **Edit Global Settings** dialog of the **Settings** screen.

Assume that multiple 3PAR StoreServ storage systems are connected to HPE 3PAR SSMC and these systems are using LDAP authentication. In this case, a single failed SSMC login attempt can result in one failed LDAP authentication attempt for each connected 3PAR StoreServ system. This can result in you being locked out of the LDAP account. To prevent this, enable the **Stop logins on first failure** option in the settings screen. The HPE 3PAR SSMC login process will then halt after the first failed StoreServ authentication attempt.

Important: After you enable this option, restart HPE 3PAR SSMC for the changes to take effect.

Learn more: [Changing global settings](#) on page 36.

Block Persona tasks

These topics provide guidance on performing tasks using the Block Persona screens and action dialogs.

Block Persona screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Block Persona screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Common Provisioning Groups screen

- List pane standard views: compact view, Summary, Alert, Allocation, Capacity, Compaction, Raw Capacity, Usage
- Detail pane views: Overview, Settings, Activity, Map
- Actions menu: Create, Edit, Delete, Refresh capacity efficiency, Compact

Hosts screen

- List pane standard views: compact view, Summary, Descriptors
- Detail pane views: Overview, Host Details, Exports, Performance, Activity, Map
- Actions menu: Create, Edit, Delete, Export, Unexport, Start Peer Motion

Host Sets screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Exports, Performance, Activity, Map
- Actions menu: Create, Edit, Delete, Export, Unexport, and Start Peer Motion

Policies screen

- List pane standard views: single view
- Detail pane views: Overview, Activity
- Actions menu: Create, Edit, Delete, and Manage snapshot name patterns and schedules

Virtual Volumes screen

- List pane standard views: compact view, Summary, Allocation, Capabilities, Capacity, Compaction, CPG Space, History, Raw Capacity, Space History
- Detail pane views: Overview, Capacity, Settings, Copies, Exports, Performance, Restore Points, Activity, Map
- Actions menu: Create, Create similar, Add to virtual volume set, Save as policy, Edit, Delete, Export, Unexport, Convert, Tune, Restart tune, Rollback tune, Create snapshot, Promote snapshot, Create clone, Stop clone, Resync clone, Promote clone, Start Peer Motion, Estimate dedup savings, and Estimate compression savings

Virtual Volume Sets screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Capacity, Exports, Performance, Activity, Map
- Actions menu: Create, Edit, Delete, Export, Unexport, Create snapshot, Start Peer Motion

Adding policies

Procedure

1. On the main menu, select **Block Persona > Virtual volumes**.
2. Click **+ Create virtual volume** or select **Create** on the **Actions** menu.
3. To select an available protection policy and specify settings to create a schedule, click **Add policies**.
The **Add policies** option is available only if the HPE RMC application added in HPE 3PAR SSMC has associated protection policies.
4. Follow the instructions on the dialog that opens.

Learn more: [Policies](#).

Adding to a virtual volume set

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volumes, and then select **Add to virtual volume set** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volume sets](#) on page 133.

Compacting common provisioning groups

Procedure

1. On the main menu, select **Block Persona > Common Provisioning Groups**.
2. In the list pane, select the CPGs, and then select **Compact** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Common provisioning groups](#) on page 125.

Converting virtual volumes

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volumes, and then select **Convert** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volume conversion](#) on page 130.

Creating, editing, and deleting hosts

Procedure

1. On the main menu, select **Block Persona > Hosts**.
2. Do one of the following:
 - Click **+ Create host** or select **Create** on the **Actions** menu.
 - In the list pane, select the host, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Hosts](#) on page 125.

Creating, editing, and deleting host sets

Procedure

1. On the main menu, select **Block Persona > Host Sets**.
2. Do one of the following:
 - Click **+ Create host set** or select **Create** on the **Actions** menu.
 - In the list pane, select the host set, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Host sets](#) on page 126.

Creating, editing, and deleting virtual volumes

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. Do one of the following:
 - Click **+ Create virtual volume** or select **Create** on the **Actions** menu.
 - In the list pane, select the virtual volume, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volumes overview](#) on page 130.

Creating, editing, and deleting virtual volume sets

Procedure

1. On the main menu, select **Block Persona > Virtual Volume Sets**.
2. Do one of the following:
 - Click **+ Create virtual volume set** or select **Create** on the **Actions** menu.
 - In the list pane, select the virtual volume set, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volume sets](#) on page 133.

Creating, editing, and deleting policies

Procedure

1. On the main menu, select **Block Persona > Policies**.
2. Do one of the following:
 - Click **+ Create policy** or select **Create** on the **Actions** menu.
 - In the list pane, select the policy, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Policies](#).

Creating clones

Tip: Before using the Create Clone dialog, create a virtual volume that has the characteristics you want. This ensures that an appropriate virtual volume is available for selection.

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volume to copy, and then select **Create clone** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Clones \(physical copies\)](#) on page 124.

Creating snapshots

Important: Carefully consider your choice of the snapshot name, especially if you are creating a recurring schedule pattern. Learn more: [Naming snapshots](#) on page 64.

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volume, and then select **Create snapshot** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Creating policies from virtual volumes

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volume, and then select **Save as policy** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Policies](#).

Creating snapshots of virtual volume sets

Important: Carefully consider your choice of the snapshot name, especially if you are creating a recurring schedule pattern. Learn more: [Naming snapshots](#) on page 64.

Procedure

1. On the main menu, select **Block Persona > Virtual Volume Sets**.
2. In the list pane, select the virtual volume set, and then select **Create snapshot** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Creating similar virtual volumes

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volume to use as the basis for creating a similar virtual volume, and then select **Create similar** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volumes overview](#) on page 130.

Editing and deleting clones

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the clone, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Clones \(physical copies\)](#) on page 124.

Editing and deleting snapshots

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the snapshot and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Editing and deleting virtual volume sets

Procedure

1. On the main menu, select **Block Persona > Virtual Volume Sets**.
2. In the list pane, select the virtual volume set, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Estimating virtual volume compression savings

You can estimate the potential space savings if one or more existing virtual volumes were to be converted to compressed virtual volumes.

Starting a compression estimate

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select one or more virtual volumes, and then select **Estimate compression savings** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Viewing a compression estimate result

When the action is completed, the results of the estimate are shown on the Activity sidebar and on the Activity screen with the activity name *Compression estimate virtual volumes (volume name)*.

To view the compression estimate on the Activity screen:

1. On the main menu, select **General > Activity**.
2. Select the **Compression estimate virtual volumes (volume name)** activity in the list.
3. Click the expand icons (►) until the **Task Detail** is displayed. The estimate is located near the end of the task detail.

Learn more: [Virtual volume compression](#) on page 130.

Estimating virtual volume dedup savings

You can estimate the potential space savings if one or more existing virtual volumes were to be converted to thinly deduped virtual volumes in the same common provisioning group.

Starting a dedup estimate

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select one or more virtual volumes, and then select **Estimate dedup savings** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Viewing a dedup estimate result

When the action is completed, the results of the estimate are shown on the Activity sidebar and on the Activity screen with the activity name **Preview dedup ratio (checkvv)**.

To view the dedup estimate on the Activity screen:

1. On the main menu, select **General > Activity**.
2. Select the **Preview dedup ratio (checkvv)** activity in the list.
3. Click the expand icons (►) until the **Task Detail** is displayed. The estimate is located near the end of the task detail.

Learn more: [Virtual volumes, provisioning types](#).

Exporting and unexporting virtual volumes

Volume-centric procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volumes, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Exported virtual volumes \(VLUNs\)](#) on page 125.

Host-centric procedure

1. On the main menu, select **Block Persona > Hosts**.
2. In the list pane, select the host, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Host-set-centric procedure

1. On the main menu, select **Block Persona > Host Sets**.
2. In the list pane, select the host set, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Exported virtual volumes \(VLUNs\)](#) on page 125.

Exporting and unexporting virtual volume sets

Volume-set-centric procedure

1. On the main menu, select **Block Persona > Virtual Volume Sets**.
2. In the list pane, select the virtual volume set, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Exported virtual volumes \(VLUNs\)](#) on page 125.

Host-centric procedure

1. On the main menu, select **Block Persona > Hosts**.
2. In the list pane, select the host, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Host-set-centric procedure

1. On the main menu, select **Block Persona > Host Sets**.
2. In the list pane, select the host set, and then select **Export** or **Unexport** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing snapshot name patterns and schedules

Procedure

1. On the main menu, select **Block Persona > Policies**.
2. Select **Manage snapshot name patterns and schedules** on the **Actions** menu to create name patterns and schedules.
3. Follow the instructions on the dialog that opens.

Learn more: [Policies](#).

Migrating hosts and host sets (Peer Motion)

1. On the main menu, do one of the following:
 - Select **Block Persona > Hosts**.
 - Select **Block Persona > Host Sets**.
2. In the list pane, select the host or host set to migrate, and then select **Start Peer Motion** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Tip: To manage Peer Motion migration activities, see [Deleting, resuming, retrying, and aborting Peer Motion operations](#) on page 69, [Changing the priority of a Peer Motion operation](#) on page 68.

Learn more: [Federations configuration](#) on page 167, [Peer Motion overview](#) on page 127.

Migrating virtual volumes and virtual volume sets (Peer Motion)

1. On the main menu, do one of the following:
 - Select **Block Persona > Virtual Volumes**.
 - Select **Block Persona > Virtual Volume Sets**.
2. In the list pane, select the virtual volumes or virtual volume sets to migrate, and then select **Start Peer Motion** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Tip: To manage Peer Motion migration activities, see [Deleting, resuming, retrying, and aborting Peer Motion operations](#) on page 69, [Changing the priority of a Peer Motion operation](#) on page 68.

Learn more: [Federations configuration](#) on page 167, [Peer Motion overview](#) on page 127.

Naming snapshots

When you create snapshots, carefully consider your choice of a snapshot name in the Create Snapshot dialog, especially if you are creating a recurring schedule pattern.

- Choosing **Custom** name patterns may result in conflicting names for recurring scheduled tasks.
- Choosing **Parent Volume & Time Stamp** and **Parent Volume & Time in Seconds Since Epoch** ensures unique snapshot names being used for recurring scheduled tasks.

When the same snapshot name is used for recurring scheduled tasks, care must be taken to prevent naming conflicts from causing scheduled tasks to fail.

An external process is often used in conjunction with recurring scheduled tasks to remove or rename snapshots. External processes can ensure that later iterations of a scheduled snapshot do not conflict with a snapshot from a prior iteration.

If your workflow does not account for removal or renaming of scheduled snapshots, select a naming format that creates different names for each iteration.

Promoting clones

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the clone, and then select **Promote clone** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Clones \(physical copies\)](#) on page 124.

Promoting snapshots

Caution: Promoting a snapshot overwrites the data on the target virtual volume with the data from the snapshot. Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the snapshot, and then select **Promote snapshot** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Refreshing capacity efficiency data

You can update the capacity efficiency data for a CPG and all of its virtual volumes.

Procedure

1. On the main menu, select **Block Persona > Common Provisioning Groups**.
2. In the list pane, select the CPG, and then select **Refresh capacity efficiency** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Common provisioning groups](#) on page 125.

Resynchronizing clones

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the clone, and then select **Resync clone** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Clones \(physical copies\)](#) on page 124.

Stopping clones

If necessary, you can stop the copy process for a clone while it is running.

Caution: When a clone process is stopped, the clone virtual volume reverts to being a base virtual volume and will contain incomplete data.

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the clone, and then select **Stop clone** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Clones \(physical copies\)](#) on page 124.

Tuning virtual volumes

Tip: The **Restart tune** and **Rollback tune** actions apply only if the ongoing tune action of a virtual volume has been interrupted.

Procedure

1. On the main menu, select **Block Persona > Virtual Volumes**.
2. In the list pane, select the virtual volume, and then select **Tune**, **Restart tune**, or **Rollback tune** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Virtual volume tuning](#) on page 134.

Federation Tasks

These topics provide guidance on performing tasks using the Federation screens and action dialogs.

Federation screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Federation screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Peer Motions screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Virtual Volumes, Virtual Volume Sets, Activity
- Actions menu: Resume, Retry, Abort, Delete, Change priority, Take over

Federation Configurations screen

- List pane standard views: single view
- Detail pane views: Overview, Peer Links, Recommended Zones, Activity, Map
- Actions menu: Create, Edit, Delete, Upgrade, Add migration source, Edit migration source, Remove migration source, Sync federation, Import configuration, Refresh external systems, Start Peer Motion

Data migration overview (storage federations)

You can migrate selected objects (hosts, host sets, virtual volumes, and virtual volume sets) from legacy 3PAR or non-3PAR storage systems to destination storage systems that are in a storage federation.

1. Adding source storage systems

The first step is to select a storage federation to be the destination for the data migration and then add the legacy 3PAR or non-3PAR storage systems as migration sources.

- On the main menu, select **Federation > Federation Configurations**. A list of storage federation configurations is displayed.
 - If you see a storage federation configuration that you want to use as the destination for the data migration, go to step 1b.
 - If necessary, create a new storage federation configuration to use as the destination before continuing. Learn more: [**Creating, editing, and deleting storage federations**](#) on page 69.
- In the list pane, select the storage federation configuration to be the destination for the data migration, and then select **Add migration source** on the **Actions** menu.
- A sequence of dialogs guides you through the steps to select and add migration source storage systems.

2. Importing a configuration

After adding the migration source storage systems to the storage federation configuration, the next step is to select the configuration settings and resources that you want to import to the storage federation configuration.

- Select **Import configuration** on the **Actions** menu.
- A sequence of dialogs guides you through the steps to select and import settings and resources that apply to legacy 3PAR or non-3PAR storage systems.

3. Starting data migration

After importing the configuration settings, you can perform data migration of the resource types (hosts, host sets, volumes, and volume sets) that apply to legacy 3PAR or non-3PAR storage systems.

- a. Select **Start Data Migration** on the **Actions** menu.
- b. A sequence of dialogs guides you through the steps to select the objects and start the data migration.

Adding, editing, and removing migration sources

Procedure

1. On the main menu, select **Federation > Federation Configurations**.
2. In the list pane, select the storage federation configuration, and then select **Add migration source**, **Edit migration source**, or **Remove migration source** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Federations configuration](#) on page 167.

Adding other migration sources

You can add storage systems that *cannot be managed* by HPE 3PAR SSMC to a storage federation configuration. For example, you can add legacy 3PAR storage systems and non-3PAR storage systems. To allow unidirectional migration between federations, you can add a federated system as a migration source.

Procedure

1. On the main menu, select **Federation > Federation Configurations**.
2. In the list pane, select the storage federation configuration, and then select **Add migration source** on the **Actions** menu.
3. On the dialog that opens, click **Select source**
4. On the **Select Source System** dialog, click **Add systems** and follow the instructions on the dialog that opens.

Learn more: [Federations configuration](#) on page 167.

Changing the priority of a Peer Motion operation

After a Peer Motion operation has been started, you can change its priority (low, medium, high).

Tip: The priority can be changed unless the state of the operation is **completed**, **completed with error**, **failed**, or **aborted**.

Procedure

1. On the main menu, select **Federation > Peer Motions**.
2. In the list pane, select the Peer Motion operation, and then select **Change priority** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting storage federations

Important: HPE recommends that a storage federation not be managed by more than one instance of HPE 3PAR SSMC.

Procedure

1. On the main menu, select **Federation > Federation Configurations**.
2. Do one of the following:
 - Click **+ Create federation** or select **Create** on the **Actions** menu.
 - In the list pane, select the storage federation configuration, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Federations configuration](#) on page 167.

Deleting, resuming, retrying, and aborting Peer Motion operations

You can manage the Peer Motion operations on a storage federation.

Tip: The actions that are available depend on the state of the Peer Motion operation.

Procedure

1. On the main menu, select **Federation > Peer Motions**.
2. In the list pane, select the Peer Motion operation, and then select **Delete**, **Resume**, **Retry**, or **Abort** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Importing storage configurations to a storage federation

Procedure

1. On the main menu, select **Federation > Federation Configurations**.
2. In the list pane, select the storage federation configuration, and then select **Import configuration** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Federations configuration](#) on page 167.

Refreshing external migration source system properties

You can refresh the properties of migration source storage systems that are cached in an instance of HPE 3PAR SSMC.

Procedure

1. On the main menu, select **Federation > Federation Configurations**.

2. Select **Refresh external systems** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Synchronizing storage federations

Procedure

1. On the main menu, select **Federation > Federation Configuration**.
2. In the list pane, select the storage federation configuration, and then select **Sync federation** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Federations configuration](#) on page 167.

Taking over a Peer Motion operation

A Peer Motion operation can be managed by only one instance of HPE 3PAR SSMC at a time. If necessary, you can change the instance of HPE 3PAR SSMC that manages a data migration operation.

Important: Hewlett Packard Enterprise recommends that the *Take over* action be used only in cases where the server that originated the Peer Motion operation has become unavailable.

Procedure

1. Log in to the HPE 3PAR SSMC server that you want to use to manage the Peer Motion operation.
2. On the main menu, select **Federation > Peer Motions**.
3. In the list pane, select the Peer Motion operation, and then select **Take over** on the **Actions** menu.
4. Follow the instructions on the dialog that opens.

Upgrading SSMC 2.x storage federations

Important: After HPE 3PAR SSMC software has been upgraded from version 2.x to version 3.0 or later, a storage federation upgrade action should be performed on each storage federation that was created with HPE 3PAR SSMC version 2.x.

The Upgrade action is required before any other actions can be performed on the storage federation. When a storage federation upgrade action is started, all upgrade operations are performed automatically and require no user interaction.

Procedure

1. On the main menu, select **Federation > Federation Configurations**.
2. In the list pane, select the storage federation configuration and then select **Upgrade** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

File Persona tasks

These topics provide guidance on performing tasks using the File Persona screens and action dialogs.

File Persona screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the File Persona screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

File Persona Configuration screen

- List pane standard views: single view
- Detail pane views: Overview, Authentication Settings, Antivirus Settings, Network Settings, File Persona Route Settings, Protocol Settings, User Mappings, Activity, Map
- Actions menu: Configure file persona, Resume file persona node, Pause file persona node, Delete file persona node pair, Edit protocol settings, Delete LDAP configuration, Leave active directory, Configure local users, Configure local groups, Edit user mappings, Export user mappings, Update virus definition, Create virtual file server, Recover file provisioning groups

File Provisioning Groups screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Reclamation Tasks, Activity, Map
- Actions menu: Create, Edit, Delete, Unmount, Recover, Activate, Deactivate, Grow, Node failover, Reassign, Upgrade on-disk version, Reclaim file snapshot space, Manage file snapshot reclaim tasks, Create virtual file server

File Shares screen

- List pane standard views: compact view, Summary
- Detail pane views (FTP): Overview, FTP Configuration Settings, Activity, Map
- Detail pane views (NFS): Overview, NFS Export Settings, NFS Audit Events, Activity, Map
- Detail pane views (Object): Overview, Activity, Map
- Detail pane views (SMB): Overview, Client Filters, User Permissions, SMB Audit Events, Activity, Map
- Actions menu: Create, Edit, Delete, Schedule data retention scan, Manage data retention files

File Stores screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, File Snapshots, Antivirus, Data Retention, Activity, Map
- Actions menu: Create, Edit, Delete, Manage existing antivirus scans, Manage antivirus quarantine, Create file snapshot, Delete file snapshot, Create antivirus scan, Create file share, Schedule data retention scan, Manage data retention files, Manage data retention scans

Virtual File Servers screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Quotas, Antivirus, File Snapshots, Reclamation Tasks, Data Retention, File Access Audit Settings, Admin Path Audit Logs, Activity, Map
- Actions menu: Create, Edit, Delete, Grow, Manage quotas, Manage existing antivirus scans, Modify antivirus policy, Manage antivirus quarantine, Reclaim file snapshot space, Manage file access audit logs, Manage admin path audit logs, Create file snapshot, Create antivirus scan, Create file store, Create file share

Overview

When at least one connected storage system supports File Persona (file services) features, you can access the following screens to view resources and perform actions.

- File Persona Configuration screen
- File Shares screen
- File Stores screen
- Virtual File Servers screen
- File Provisioning Groups screen

Tip: File Persona screens are listed in the full main menu. They are not listed in the compact main menu.

Basic setup

The following steps allow you to configure and manage a File Persona using a minimum of steps.

1. Use the **File Persona Configuration** screen to configure and manage the File Persona on a storage system. Learn more: **Configuring a File Persona** on page 74.

Tip: Unless the File Persona on a storage system has been configured, it will not be in a running state. You must configure File Persona node pairs before the File Persona can run.

2. Use the **Virtual File Servers** screen to create and manage one or more virtual file servers in the File Persona configuration. Learn more: **Creating, editing, and deleting virtual file servers** on page 76.
3. Use the **File Shares** screen to create and manage one or more file shares on each of the virtual file servers. Learn more: **Creating, editing, and deleting file shares** on page 75.

Advanced setup

The following steps give you more control over File Persona features.

1. Use the **File Persona Configuration** screen to configure a File Persona on a storage system. Learn more: **Configuring a File Persona** on page 74.

Tip: Unless the File Persona on a storage system has been configured, it will not be in a running state. You must configure File Persona node pairs before the File Persona can run.

2. Use the **File Provisioning Groups** screen to create and manage one or more file provisioning groups in the File Persona configuration. Learn more: **Creating, editing, and deleting file provisioning groups** on page 76.
3. Use the **Virtual File Servers** screen to create and manage one or more virtual file servers on each of the file provisioning groups. Learn more: **Creating, editing, and deleting virtual file servers** on page 76.

4. Use the **File Stores** screen to create and manage one or more file stores on each of the virtual file servers. Learn more: [Creating, editing, and deleting file stores](#) on page 75.
5. Use the **File Shares** screen to create one or more file shares on each of the file stores. Learn more: [Creating, editing, and deleting file shares](#) on page 75.

Adding and editing antivirus servers

You can add and edit the antivirus servers used for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona, and then select **Configure file persona** on the **Actions** menu.
3. On the dialog that opens, select the **Advanced options** check box.
4. On the **Antivirus Settings** panel, under **Antivirus Servers**, click **Add** or click its edit icon (), as appropriate.
5. Follow the instructions on the dialog that opens.

Adding and editing client filters

You can add and edit client filters for file shares. The dialogs for NFS and SMB client filters help you make choices.

Procedure

1. On the main menu, select **File Persona > File Shares**.
2. In the list pane, select the file share, and then select **Edit** on the **Actions** menu.
3. In the **Additional Settings** panel on the dialog that opens, under **Client List**, click **Add** or click its edit icon (), as appropriate.
4. Follow the instructions on the dialog that opens.

Adding and editing local users and groups

You can add and edit local users and groups for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the storage system, and then select **Configure local users** or **Configure local groups** on the **Actions** menu.

NOTE: If you do not have access to a particular file share, map the local and AD (active directory) users to each other to gain access to the SMB file shares.

3. Follow the instructions on the dialog that opens.

Adding and editing virtual IP addresses

You can add and edit the virtual IP addresses of virtual file servers for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Edit** on the **Actions** menu.
3. In the **Networking** panel on the dialog that opens, click **Add** or click the edit icon () , as appropriate.
4. Follow the instructions on the dialog that opens.

Configuring a File Persona

You can configure the **highest-level** properties and settings of the File Persona on a storage system. For example, you can configure the File Persona node pairs, network settings, DNS settings, and authentication settings.

Tip: Unless the File Persona on a storage system has been configured, it will not be in a running state. You must configure File Persona node pairs before the File Persona can run.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona, and then select **Configure file persona** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Configuring LDAP

You can configure LDAP for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Configure file persona** on the **Actions** menu.
3. On the dialog that opens, select the **Advanced options** check box.
4. On the **Authentication Settings** panel, specify the **LDAP Configuration Settings**.

Creating and deleting file snapshots

You can create and delete file snapshots for the File Persona on a storage system.

Creating file snapshots from a Virtual File Server screen

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Create file snapshot** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating and deleting file snapshots from a File Stores Screen

1. On the main menu, select **File Persona > File Stores**.
2. In the list pane, select the file store, and then select **Create file snapshot** or **Delete file snapshot** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Deleting file snapshots from a Virtual File Servers screen

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server.
3. In the detail pane, select the **File Snapshots** view.
4. On the line for a file store, click its file snapshots delete icon (✕).
5. Follow the instructions on the dialog that opens.

Creating, editing, and deleting file shares

You can create, edit, and delete file shares for the File Persona on a storage system.

You can specify the properties and settings of file shares on a storage system. For example, you can specify file share names, share type (FTP, NFS, Object, or SMB), share path (parent file store and virtual file server), and additional settings such as client filters and access permissions.

Procedure

1. On the main menu, select **File Persona > File Shares**.
2. Do one of the following:
 - Click **+ Create file share** or select **Create** on the **Actions** menu.
 - In the list pane, select the file share, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting file stores

You can create, edit, and delete file stores for the File Persona on a storage system.

HPE 3PAR SSMC can automatically create file stores whenever you create file shares. You can specify the properties and settings of file stores on a storage system. For example, you can specify file store names, the parent virtual file server, and additional settings such as antivirus scan policies and quotas for file sizes and number of files.

Procedure

1. On the main menu, select **File Persona > File Stores**.
2. Do one of the following:
 - Click **+ Create file store** or select **Create** on the **Actions** menu.
 - In the list pane, select the file store, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting file provisioning groups

You can create, edit, and delete file provisioning groups for the File Persona on a storage system.

You can specify the properties and settings of file provisioning groups on a storage system. For example, you can specify file provisioning group names, storage allocation settings (CPG and size), and deployment nodes (primary and alternate File Persona controller nodes).

Tips:

- You can create a file provisioning group by selecting **Advanced options** when you create a virtual file server. Learn more: [Creating, editing, and deleting virtual file servers](#) on page 76
- You can also edit or delete a file provisioning group by configuring a File Persona. Learn more: [Configuring a File Persona](#) on page 74.

Procedure

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. Do one of the following:
 - Click **+ Create file provisioning group** or select **Create** on the **Actions** menu.
 - In the list pane, select the file provisioning group, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting virtual file servers

You can create, edit, and delete virtual file servers for the File Persona on a storage system.

You can specify the properties and settings of virtual file servers on a storage system. For example, you can specify virtual file server names, storage allocation settings, network settings and antivirus settings.

Tip: You can create a file provisioning group by selecting **Advanced options** when you create a virtual file server.

Procedure

1. On the main menu, select **File Persona > Virtual File Servers**.
2. Do one of the following:

- Click **+ Create virtual file server** or select **Create** on the **Actions** menu.
 - In the list pane, select the virtual file server, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Deleting LDAP configurations

You can delete LDAP configurations for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Delete LDAP configuration** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing configuration protocol settings

You can edit configuration protocol settings for a File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Edit protocol settings** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Enabling and disabling antivirus service

You can enable and disable the antivirus service for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona, and then select **Configure file persona** on the **Actions** menu.
3. On the dialog that opens, select the **Advanced options** check box.
4. On the **Antivirus Settings** panel, enable or disable the **Antivirus service**, as appropriate.

Failing over a file provisioning group

Procedure

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. In the list pane, select the file provisioning group, and then select **Node failover** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Growing a file provisioning group

You can grow file provisioning groups for a File Persona on a storage system.

Growing a file provisioning group from the File Provisioning Groups screen

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. In the list pane, select the file provisioning group, and then select **Grow** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Growing a file provisioning group from the Virtual File Servers screen

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Grow** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Joining an Active Directory

You can specify how the File Persona on a storage system joins an Active Directory.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Configure file persona** on the **Actions** menu.
3. On the **Authentication Settings** panel, specify the **Active Directory Settings** for joining.

Leaving an Active Directory

You can specify when the File Persona on a storage system leaves an Active Directory.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Leave active directory** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing admin path audit logs

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the Virtual File Servers, and then select **Manage admin path audit logs** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing antivirus

You can manage the antivirus features of the File Persona on a storage system.

See also: [Updating virus definitions](#) on page 81.

Managing antivirus from a Virtual File Servers screen

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Create antivirus scan**, **Manage existing antivirus scans**, **Manage antivirus quarantine**, or **Modify antivirus policy** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing antivirus from a File Stores screen

1. On the main menu, select **File Persona > File Stores**.
2. In the list pane, select the file store, and then select **Create antivirus scan**, **Manage existing antivirus scans**, or **Manage antivirus quarantine** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing compliance requests

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the file persona configuration, and then select **Manage compliance requests** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing data retention files

Managing data retention files for a file share

1. On the main menu, select **File Persona > File Shares**.
2. In the list pane, select the file share, and then select **Manage data retention files** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing data retention files for a file store

1. On the main menu, select **File Persona > File Stores**.
2. In the list pane, select the file store, and then select **Manage data retention files** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing file access audit logs

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the Virtual File Servers, and then select **Manage file access audit logs** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [File access audit logs](#).

Managing data retention scans

1. On the main menu, select **File Persona > File Stores**.
2. In the list pane, select the file store, and then select **Manage data retention scans** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing File Persona controller nodes

You can manage the controller nodes for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Resume file persona node**, **Pause file persona node**, or **Delete file persona node pair** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing file provisioning groups

You can manage the file provisioning groups for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. In the list pane, select the file provisioning group, and then select **Activate**, **Deactivate**, **Grow**, **Node failover**, or **Reassign** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing quotas

You can manage user, group, and file store quotas for the File Persona on a storage system.

Procedure

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Manage quotas** on the **Actions** menu.

NOTE: To avoid random quota updates in case of duplicate entries, use distinct names in multiple name services like LDAP and Local users.

3. Follow the instructions on the dialog that opens.

Reclaiming file snapshot space

You can reclaim file snapshot space for the File Persona on a storage system.

Reclaiming file snapshot space from a File Provisioning Groups screen

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. In the list pane, select the file provisioning group, and then select **Manage file snapshot reclaim tasks**, or **Reclaim file snapshot space** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Reclaiming file snapshot space from a Virtual File Servers screen

1. On the main menu, select **File Persona > Virtual File Servers**.
2. In the list pane, select the virtual file server, and then select **Reclaim file snapshot space** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Managing data retention scans

Scheduling data retention scans for a file share

1. On the main menu, select **File Persona > File Shares**.
2. In the list pane, select the file store, and then select **Schedule data retention scan** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Scheduling data retention scans for a file store

1. On the main menu, select **File Persona > File Stores**.
2. In the list pane, select the file store, and then select **Schedule data retention scan** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Updating virus definitions

You can update virus definitions for the File Persona on a storage system.

See also: **Managing antivirus** on page 78.

Procedure

1. On the main menu, select **File Persona > File Persona Configuration**.
2. In the list pane, select the File Persona configuration, and then select **Update virus definition** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Upgrading on-disk File Persona software

File Persona software is stored on disk for each file provisioning group. You can update on-disk File Persona software for a file provisioning group to the latest version that is available.

Procedure

1. On the main menu, select **File Persona > File Provisioning Groups**.
2. In the list pane, select the file provisioning group, and then select **Upgrade on-disk version** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Data Protection tasks

These topics provide guidance on performing tasks using the Data protection screens and action dialogs.

Data Protection screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Data Protection screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

- You can use HPE 3PAR SSMC to create and manage many aspects of Remote Copy 1-to-1, N-to-1, 1-to-N, and M-to-N configurations. Learn more: [Remote Copy configurations overview](#) on page 151.
- To manage all aspects of Remote Copy configurations, you can use HPE 3PAR Management Console (MC) software or HPE 3PAR Command Line Interface (CLI) software.

Remote Copy Configurations screen

- List pane standard views: single view
- Detail pane views: Overview, Targets, Links, Groups, Activity
- Actions menu: Create, Edit, Add links, Remove links, Edit target, Remove targets, Configure quorum witness, Remove quorum witness

Remote Copy Groups screen

- List pane standard views: compact view, Summary, Role
- Detail pane views: Overview, Volume Pairs, Source Volumes, Target Volumes, Activity, Map
- Actions menu: Create, Edit, Delete, Start, Stop, Sync, Failover, Switch failover, Switchover, Revert failover, Recover, Restore, Start Peer Motion

Restore Points screen

- List pane standard views: single view
- Detail pane views: Overview, Exports
- Actions menu: Attach, Detach, Restore, and Delete

RMC credentials screen

- List pane views: single view
- Detail pane views: Overview
- Actions menu: Add, Edit, Remove

Adding, editing, and removing RMC credential

Procedure

1. On the main menu, select **Data Protection > RMC Credentials**.
2. Do one of the following:

- Click **+ Add RMC credential** or select **Add** on the **Actions** menu.

NOTE: You can add up to four HPE RMC instances as part of the **RMC Credentials** in HPE 3PAR SSMC.

- In the list pane, select the HPE RMC credential, and then select **Edit** or **Remove** on the **Actions** menu.

3. Follow the instructions on the dialog that opens.

Learn more: [User roles for adding and managing RMC credentials and Restore points](#) on page 153.

Adding and removing Remote Copy links

Procedure

1. On the main menu, select **Data Protection > Remote Copy Configurations**.
2. In the list pane, select the Remote Copy configuration, and then select **Add links** or **Remove links** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Attaching, detaching, restoring, and deleting restore points

Procedure

1. On the main menu, select **Data Protection > Restore Points**.
2. In the list pane, select the restore point and then select **Attach**, **Detach**, **Restore**, or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Restore points](#) on page 152, [User roles for adding and managing RMC credentials and Restore points](#) on page 153.

Configuring and removing Remote Copy quorum witnesses

This procedure applies to Peer Persistence quorum witnesses for Remote Copy groups. Learn more: [Peer Persistence overview](#) on page 150.

Procedure

1. On the main menu, select **Data Protection > Remote Copy Configurations**.
2. In the list pane, select the Remote Copy configuration, and then select **Configure quorum witness** or **Remove quorum witness** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating and editing Remote Copy configurations

Procedure

1. On the main menu, select **Data Protection > Remote Copy Configurations**.
2. Do one of the following:
 - Click **+ Create configuration** or select **Create** on the **Actions** menu.
 - In the list pane, select the Remote Copy configuration, and then select **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting Remote Copy groups

Procedure

1. On the main menu, select **Data Protection > Remote Copy Groups**.
2. Do one of the following:
 - Click **+ Create group** or select **Create** on the **Actions** menu.
 - In the list pane, select the Remote Copy group, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing and removing Remote Copy target storage systems

Procedure

1. On the main menu, select **Data Protection > Remote Copy Configurations**.
2. In the list pane, select the Remote Copy configuration, and then select **Edit target** or **Remove targets** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Migrating Remote Copy groups (Peer Motion)

Procedure

1. On the main menu, select **Data Protection > Remote Copy Groups**.
2. In the list pane, select the Remote Copy group to migrate, and then select **Start Peer Motion** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Tip: To manage Peer Motion migration activities, see [Deleting, resuming, retrying, and aborting Peer Motion operations](#) on page 69, [Changing the priority of a Peer Motion operation](#) on page 68.

Learn more: [Federations configuration](#) on page 167, [Peer Motion overview](#) on page 127.

Running disaster recovery operations on Remote Copy groups

Procedure

1. On the main menu, select **Data Protection > Remote Copy Groups**.
2. In the list pane, select the Remote Copy group, and then select **Failover**, **Switch failover**, **Switchover**, **Revert failover**, **Recover**, or **Restore** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Starting, stopping, and syncing Remote Copy groups

Procedure

1. On the main menu, select **Data Protection > Remote Copy Groups**.
2. In the list pane, select the Remote Copy group, and then select **Start**, **Stop**, or **Sync** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Switching over Remote Copy groups

This procedure applies to Peer Persistence switchover of Remote Copy groups. Learn more: [Peer Persistence overview](#) on page 150.

Procedure

1. On the main menu, select **Data Protection > Remote Copy Groups**.
2. In the list pane, select the Remote Copy group, and then select **Switchover** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Security tasks

These topics provide guidance on performing tasks using the Security screens and action dialogs.

Security screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Security screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Connections screen

- List pane standard views: single view
- Detail pane views: default view
- Actions menu: Delete

Domains screen

- List pane standard views: compact view, Summary, Capacity, Compaction, Raw Capacity
- Detail pane views: Overview, Activity, Map
- Actions menu: Create, Edit, Delete

LDAP screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Authorizations, Activity
- Actions menu: Create, Edit, Delete, Edit authorization, Test connection, Copy LDAP configuration

Roles screen

- List pane standard views: single view
- Detail pane views: not applicable
- Actions menu: none

Users screen

- List pane standard views: single view
- Detail pane views: not applicable
- Actions menu: Create, Edit authorization, Edit password, Delete

Copying LDAP configurations

You can copy an LDAP configuration from one storage system to other connected storage systems.

Procedure

1. On the main menu, select **Security > LDAP**.
2. In the list pane, select the LDAP configuration, and then select **Copy LDAP configuration** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting domains

Procedure

1. On the main menu, select **Security > Domains**.
2. Do one of the following:
 - Click + **Create domain** or select **Create** on the **Actions** menu.
 - In the list pane, select the domain, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating, editing, and deleting LDAP configurations

Procedure

1. On the main menu, select **Security > LDAP**.
2. Do one of the following:
 - Click + **Create LDAP configuration** or select **Create** on the **Actions** menu.
 - In the list pane, select the LDAP configuration, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Creating and deleting users

Procedure

1. On the main menu, select **Security > Users**.
2. Do one of the following:
 - Click + **Create user** or select **Create** on the **Actions** menu.
 - In the list pane, select the user, and then select **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Deleting connections

Procedure

1. On the main menu, select **Security > Connections**.
2. In the list pane, select the connection, and then select **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing LDAP authorizations

Procedure

1. On the main menu, select **Security > LDAP**.
2. In the list pane, select the LDAP configuration, and then select **Edit authorization** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing user authorizations and passwords

Tip: The **Edit password** option might not be available to all due to user roles and rights.

Procedure

1. On the main menu, select **Security > Users**.
2. In the list pane, select the user, and then select **Edit authorization** or **Edit password** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Testing LDAP connections

Procedure

1. On the main menu, select **Security > LDAP**.
2. In the list pane, select the LDAP configuration, and then select **Test connection** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Storage Optimization tasks

These topics provide guidance on performing tasks using the Storage Optimization screens and action dialogs.

Storage Optimization screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Storage Optimization screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Adaptive Flash Cache screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Activity
- Actions menu: Edit, Enable all volumes, Enable volume sets, Disable

Adaptive Optimization screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Activity, Map
- Actions menu: Create, Edit, Delete, Schedule

Priority Optimization screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Activity, Map
- Actions menu: Create, Edit, Enable, Disable, Delete

Creating, editing, and deleting Adaptive Optimization configurations

Procedure

1. On the main menu, select **Storage Optimization > Adaptive Optimization**.
2. Do one of the following:
 - Click **+ Create AO configuration** or select **Create** on the **Actions** menu.
 - In the list pane, select the Adaptive Optimization configuration, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Adaptive Optimization overview](#) on page 155.

Creating, editing, and deleting Priority Optimization policies

Procedure

1. On the main menu, select **Storage Optimization > Priority Optimization**.
2. Do one of the following:
 - Click **+ Create priority optimization policy** or select **Create** on the **Actions** menu.
 - In the list pane, select the Priority Optimization policy, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Priority Optimization overview](#) on page 156.

Editing Adaptive Flash Cache

The following procedure opens a dialog for configuring Adaptive Flash Cache (AFC) on a storage system.

If the storage system that you select has an HPE 3PAR OS that supports Adaptive Flash Cache, but does not have the required SSD physical drives, you can use the simulation mode on the dialog to assess how Adaptive Flash Cache would perform.

Procedure

1. On the main menu, select **Storage Optimization > Adaptive Flash Cache**.
2. In the list pane, select the storage system, and then select **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Adaptive Flash Cache overview](#) on page 155.

Enabling and disabling Adaptive Flash Cache

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Procedure

1. On the main menu, select **Storage Optimization > Adaptive Flash Cache**.
2. In the list pane, select the storage system, and then select **Enable all volumes**, **Enable volumes sets**, or **Disable** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Adaptive Flash Cache overview](#).

Enabling and disabling Priority Optimization policies

Procedure

1. On the main menu, select **Storage Optimization > Priority Optimization**.
2. In the list pane, select the Priority Optimization policy, and then select **Enable** or **Disable** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Priority Optimization overview](#) on page 156.

Scheduling Adaptive Optimization configurations

Procedure

1. On the main menu, select **Storage Optimization > Adaptive Optimization**.
2. In the list pane, select the Adaptive Optimization configuration, and then select **Schedule** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Storage Systems tasks

These topics provide guidance on performing tasks using the Storage Systems screens and action dialogs.

Storage Systems screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the Storage Systems screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Controller Nodes screen

- List pane standard views: compact view, Summary, Physical Memory
- Detail pane views: Overview, Schematic, Adapter Cards, Power Supplies, Microcontroller, System Fans, Internal Drive, Batteries, Performance, Activity, Map
- Actions menu: Locate, Stop locate, Show battery test log, Reset battery test log

Drive Enclosures screen

- List pane standard views: compact view, Summary, Capacity Summary, SSD Summary, FC Summary, NL Summary, Drive Summary
- Detail pane views: Overview, Schematic, Magazines, Interface Cards, Power Supplies, Cooling Fans, Physical Drives, SFPs, Activity, Map
- Actions menu: Edit, Locate, Stop locate

Physical Drives screen

- List pane standard views: compact view, Summary, Capacity, Connectivity, Error Counts, State
- Detail pane views: Overview, Schematic, Performance, Activity, Map
- Actions menu: Locate, Stop locate

Ports screen

- List pane standard views: compact view, Summary, Error Rate, State
- Detail pane views: Overview, Schematic, Settings, Hosts, Sessions, Performance, Activity, Map
- Actions menu: Edit, Edit label, Disable, Enable, Initialize, Clear, Reload firmware, Sync to name server, Ping, Locate, Stop locate

Systems screen

- List pane standard views: compact view, Summary, Device Type Capacity, System Capacity, Capacity Efficiency, Ports, Physical Drives, Snapshot Efficiency
- Detail pane views: Overview, Configuration, Capacity, Capacity Savings, Capacity Forecasting, Encryption, System Reporter, Settings, Services, Software, Fabrics, Licenses, Layout, Performance, Activity, Map
- Actions menu: Edit, Locate, Stop locate, Tune, Refresh snapshot efficiency, Add license, Enable encryption, Export backup file, Restore backup file, Rekey encryption, Set EKM servers, Check EKM servers

Adding licenses

To add an HPE 3PAR StoreServ Storage system license, you must be able to access a license key file or copy and paste the encrypted license key characters into HPE 3PAR SSMC. Learn more: [Licenses](#) on page 164.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. In the list pane, select the storage system, and then select **Add license** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Clearing ports

You can clear RCIP (Remote Copy (over) IP), RCFC (Remote Copy (over) Fibre Channel), and iSCSI (Internet Small Computer System Interface) ports.

Important: When you clear a port, its IP address is cleared and the port is taken offline. To bring the port back online, you must edit the port and provide a valid IP address and subnet mask.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select the port, and then select **Clear** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing credentials

Sometimes it might be necessary to edit the storage system credentials that are saved on the HPE 3PAR SSMC server.

Tip: Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account. A storage system must be in the Disconnected state before its saved credentials can be edited.

1. Log in to the **Administrator Console**. The **Storage Systems** screen in the Administrator Console is displayed.

Learn more: [Logging in to the Administrator Console](#) on page 111.

2. Select the storage system.

- a. If the connection state is not **Disconnected**, select **Disconnect** on the **Actions** menu.
 - b. On the **Actions** menu, select **Edit**.
3. Follow the instructions on the dialog that opens. If you disconnect storage systems before editing, you can select **Connect to the system** on the **Edit** dialog to reconnect automatically.

Editing drive enclosure locations

Procedure

1. On the main menu, select **Storage Systems > Drive Enclosures**.
2. Select the drive enclosure, and then select **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing port labels

You can edit port labels for ports that have the following protocols: FC, FCoE (Fibre Channel over Ethernet), RCFC, iSCSI, and SAS (Serial Attached SCSI).

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select the port, and then select **Edit label** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing port settings (general)

You can edit some settings for ports that have FC, FCoE, iSCSI, RCFC, and RCIP protocols. The settings for ports with other protocols cannot be edited.

See also: **Editing port settings (protocol types)** on page 93.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select the port, and then select **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Editing port settings (protocol types)

See also: **Editing port settings (general)** on page 93.

The dialog for editing storage system ports includes the following port types and settings.

Tip: Asterisks indicate settings that you can change.

FC settings

- Connection mode*. Choices are Disk, Host, RCFC, and Peer.
- Connection type*. Choices are Point and Loop.

- Unique node WWN*. Choices are Enable and Disable.
- Configured rate*. The data transfer rate. Choices are Auto, 1, 2, 4, and 8 Gbps. Auto allows the storage system to select the rate.
- VLUN Change Notification (VCN)*. Choices are Enable and Disable.
- Interrupt coalesce*. Choices are Enable and Disable.

FCoE settings

- Connection mode. Preset and fixed as Host mode.
- Connection type. Preset and fixed as Point type.
- Unique node WWN*. Choices are Enable and Disable.
- Configured rate*. The data transfer rate. Choices are Auto, 1, 2, 4, and 8 Gbps. Auto allows the storage system to select the rate.
- VLUN Change Notification (VCN)*: Choices are Enable and Disable.
- Interrupt coalesce*. Choices are Enable and Disable.

iSCSI settings

- DHCP*. Choices are Enable and Disable (in HPE 3PAR OS prior to 3.2.2).
- IP address*. IP address in IPv4 or IPv6 format.
- VLAN tag*. VLAN identifier indicating the VLAN to which a frame belongs.
- Subnet mask*. Subnet mask in IPv4 format.
- Gateway*. IP address in IPv4 or IPv6 format. If the IP address specified is IPv6 then prefix length.
- MTU*. Limits the size of data packets transmitted over the connection. Choices are 1500 and 1900.
- iSNS primary IP address*. IP address in IPv4 or IPv6 format.
- iSNS TCP port*. TCP port number.
- Send Target Group Tag*. Target portal group number.

RCFC settings

- Connection mode*. Choices are Disk, Host, RCFC, and Peer.
- Connection type*. Choices are Point and Loop.
- Unique node WWN. Preset and fixed as Disabled.
- Configured rate*. The data transfer rate. Choices are Auto, 1, 2, 4, and 8 Gbps. Auto allows the storage system to select the rate.

RCIP settings

- IP address*. IP address in IPv4 or IPv6 format.
- Subnet mask*. Subnet mask in IPv4 format.
- Gateway*. IP address in IPv4 or IPv6 format. If the IP address specified is IPv6 then prefix length.

- **MTU***. Limits the size of data packets transmitted over the connection. Choices are 1500 and 1900.
- **Configured rate***. The data transfer rate. Choices are Auto and 1 Gbps. Auto allows the storage system to select the rate.

Editing storage system properties

You can change system-level properties such as the system name, raw space alerts, virtual volume retention time and descriptors.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system, and then select **Edit** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Enabling and disabling ports

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select the port, and then select **Enable** or **Disable** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Encrypting stored data

On storage systems that support HPE 3PAR Data-at-rest encryption, you can enable the encryption features, export the authorization key backup file, restore an authorization key backup file, and rekey the encryption.

Learn more: [Data-at-rest encryption overview](#) on page 163

Important: Hewlett Packard Enterprise strongly recommends that you use the HPE 3PAR SSMC **Export backup file** action to create a backup file of the authentication key and save it externally from the storage system. The default backup file name is `recovery.dar`.

Tip: In environments with multiple storage systems, Hewlett Packard Enterprise recommends that you assign unique file names that can be associated with each encrypted storage system.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system, and then select **Enable encryption**, **Export backup file**, **Restore backup file**, or **Rekey encryption** as appropriate on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Increasing the size of a System Reporter database volume

You can increase the size of the System Reporter volume on a storage system.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system and then select the **System Reporter** view in the detail pane.
3. Select **Edit** on the **Actions** menu, or hover over the detail pane and click the edit icon () near the **System Reporter Samples Availability** title.
4. Follow the instructions on the dialog that opens.

Initializing ports

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select the port, and then select **Initialize** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Issuing a LIP command from a port

You can issue a Loop Initialization Primitive command from a port that is on a Fibre Channel loop.

Caution: Issuing a LIP command from a port resets the topology for the entire Fibre Channel loop on which the port is located and will impacts other ports on the loop.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. Select a port that is on the Fibre Channel loop that you want to initialize, and then select **Issue LIP** on the **Actions** menu.

Tip: By default, the action is disabled and does not appear on the Ports Actions menu. The action can be enabled and added to the Actions menu using the **Advanced port** option on the Preferences panel in the Global Settings dialog.

3. Follow the instructions on the dialog that opens.

Locating hardware components

You can start and stop (turn on and turn off) UID/locator lights for certain hardware components.

Tip: UID/locator lights availability and types can vary with storage system models, and use of the location feature can vary with user roles and domain permissions. For more information, see the *HPE 3PAR CLI Reference Manual*.

Learn more: [Hardware UID/locator lights](#) on page 164.

Locating adapter cards, batteries, and power supplies

1. On the main menu, select **Storage Systems > Controller Nodes**.
2. On the list pane, select the controller node that contains the component.

3. On the detail pane, select the **Adapter Cards** view, **Power Supplies** view, **System Fans** view, or **Batteries** view, as appropriate. A list of components is displayed.
4. Find the component in the list and hover over its UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating controller nodes

1. On the main menu, select **Storage Systems > Controller Nodes**.
2. On the list pane, select the controller node.
3. Do one of the following:
 - On the **Actions** menu, select **Locate** or **Stop locate**.
 - Hover over the UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating cooling fans

1. On the main menu, select **Storage Systems > Drive Enclosures**.
2. On the list pane, select the drive enclosure that contains the cooling fans.
3. On the detail pane, select the **Cooling fans** view. A list of cooling fans is displayed.
4. Find the cooling fan in the list and hover over its UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating drive enclosures

1. On the main menu, select **Storage Systems > Drive Enclosures**.
2. On the list pane, select the drive enclosure.
3. Do one of the following:
 - On the **Actions** menu, select **Locate** or **Stop locate**.
 - Hover over the UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating interface cards

1. On the main menu, select **Storage Systems > Drive Enclosures**.
2. On the list pane, select the drive enclosure that contains the interface card.
3. On the detail pane, select the **Interface Cards** view. A list of interface cards is displayed.
4. Find the interface card in the list and hover over its UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating magazines

1. On the main menu, select **Storage Systems > Drive Enclosures**.
2. On the list pane, select the drive enclosure that contains the magazine.
3. On the detail pane, select the **Magazine** view. A list of magazines is displayed.
4. Find the magazine in the list and hover over its UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating ports

Tip: Not all port types support the location feature.

1. On the main menu, select **Storage Systems > Ports**.
2. On the list pane, select the port.
3. Do one of the following:
 - On the **Actions** menu, select **Locate** or **Stop locate**.
 - Hover over the UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating physical drives

1. On the main menu, select **Storage Systems > Physical Drives**.
2. On the list pane, select the physical drive.
3. Do one of the following:
 - On the **Actions** menu, select **Locate** or **Stop locate**.
 - Hover over the UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Locating storage systems

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system.
3. Do one of the following:
 - On the **Actions** menu, select **Locate** or **Stop locate**.
 - Hover over the UID/locator light icon. A tooltip and the icon color indicate whether the light is off () or on (). Click the icon to turn the light on or off.

Pinging from ports

You can ping from an iSCSI or RCIP port to a destination IP address.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. On the list pane, select the port, and then select **Ping** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Refreshing snapshot efficiency data

You can update the snapshot efficiency data for a storage system.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. In the list pane, select the storage system, and then select **Refresh snapshot efficiency** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Reloading port firmware

You can reload firmware for FC, SAS, CNA (Converged Network Adapter), and RCIP ports. This action also resets the port.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. On the list pane, select the port, and then select **Reload firmware** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Setting and checking EKM servers

Prerequisites

An HPE 3PAR EKM (External Key Management) encryption security certificate must have been previously installed on the storage system before the **Set EKM servers** action can be completed. For information on installing HPE 3PAR EKM encryption security certificates on HPE 3PAR storage systems, see the *HPE 3PAR Command Line Interface Administrator Guide*.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. In the list pane, select the storage system, and then select **Set EKM servers** or **Check EKM servers** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Showing and resetting battery test logs

You can display the battery test log for a controller node. The battery test log can be helpful for performing battery maintenance. You can also reset the battery test log to clear old test results.

Procedure

1. On the main menu, select **Storage Systems > Controller Nodes**.
2. In the list pane, select the controller node, and then select **Show battery test log** or **Reset battery test log** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Synchronizing port information with a Fibre Channel names server

You can synchronize (update) the system port database with port information from the name server on a Fibre Channel fabric.

Procedure

1. On the main menu, select **Storage Systems > Ports**.
2. On the list pane, select a port that has an FC, FCoE, or RCFC protocol, and then select **Sync to name server** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Tuning storage systems

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system, and then select **Tune** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [System tuning](#) on page 166.

Viewing schematic diagrams

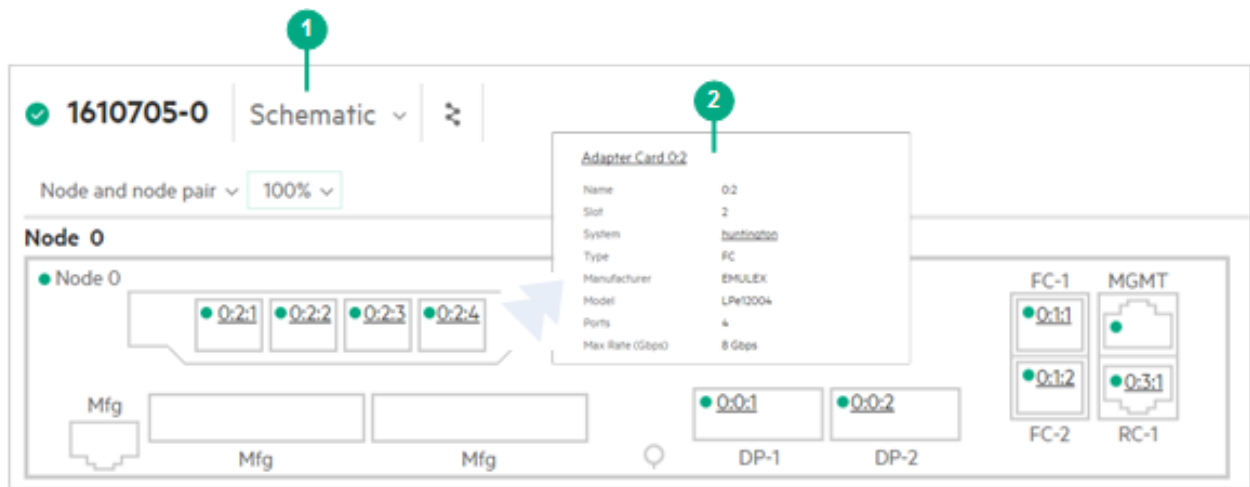
A Schematic view is available on the detail pane of the following screens: Controller Nodes, Drive Enclosures, Physical Drives, and Ports. Schematic views provide hardware diagrams with links to related storage system components. Hovering over a diagram displays detailed component information.

Tip: Schematic diagrams are only available for certain HPE 3PAR StoreServ Storage system models.

Procedure

1. On the main menu, select **Storage Systems > Controller Nodes, Drive Enclosures, Physical Drives, or Ports**.
2. On the list pane, select the hardware component.
3. On the detail pane, select the **Schematic** view (1). Hovering over the schematic displays details in popup windows (2).

Example controller node schematic



Viewing System Reporter samples availability

For storage systems that have the System Reporter capability, you can view the availability of data samples in the System Reporter database.

Sample types include Adaptive Optimization (logical drive region), Daily, Hi-res, and Hourly.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system.
3. In the detail pane, select the **System Reporter** view. Information about the samples availability is displayed.

System Reporter tasks

These topics provide guidance on performing tasks using the System Reporter screens and action dialogs.

System Reporter screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the System Reporter screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Advanced Analytics screen

- List pane standard views: None
- Detail pane views: None
- Actions menu: None

Reports screen

- List pane standard views: Compact view, Summary
- Detail pane views: Charts, Schedules, Summary, Activity
- Actions menu: Create, Create multiple reports, Edit, Make private, Make public, Delete, Reset zoom, Export to CSV, Export to PDF, Export reports, Import reports, Start real time, Stop real time

Threshold Alerts screen

- List pane standard views: Compact view, Summary
- Detail pane views: Overview, Activity
- Actions menu: Create, Edit, Enable threshold alert, Disable threshold alert, Enable email notification, Disable email notification, Delete

Tips:

- The Advanced Analytics screen displays the throughput, latency, and workload outliers information for the selected storage system for a particular duration. You can select the time period as per requirement. The time periods available for selection are:
 - One day
 - Three days
 - One week
 - Two weeks
 - Custom (The option allows you to view the zoomed in selection as a new chart, where you can set the time period).
- Using the HPE 3PAR SSMC Administrator Console to disconnect or remove a storage system does not remove the reports for the storage system.
- If you select resources (objects) by using the **Select objects** option and the resources are later deleted from the storage system, the report will not show the deleted resources. However, if you use the **Select object rules** option, the report will show data for deleted resources for as long as the data is available.
- For a Remote Copy report or Exported Volumes report, if you select a resource (object) that has multiple paths, then the report will contain information on all the resource-path combinations. If the number of resource-path combinations exceeds 100, a message will indicate that some of the combinations must be removed before the report can be generated. For example, if 30 resources are selected, and each resource has 4 paths, then the total of 120 resource-path combinations must be reduced to 100 or fewer before the report can be generated.
- Report templates are available for host and disk port types. To create a report for other port types, you can choose an available port report template, and then use the **Select by rules** option to select other port types.

Creating reports

The following methods can be used to create user reports:

- Create single – create one report at a time. When you select a report template to use for a report, you can review the report settings and accept or change the settings before you create the report.
- Create multiple – quickly create multiple reports at one time. The reports are created using all default settings. You cannot review or change report settings when you create the reports. However, you can edit and change the report settings after the reports are created.

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. Do one of the following:
 - Click **+ Create report** or select **Create** on the **Actions** menu. This action creates a single report.
 - Click **Create multiple reports** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Reports and templates overview](#) on page 170, [Report access types \(system, private, public\)](#) on page 170, [Using real time reports](#) on page 105.

Tips:

- For historical reports, if you select the **Select objects** option, you can include up to 100 objects.
- When you close a report dialog and save the report settings, only the currently selected objects option is saved. For example, if you first select the **Select objects** option, and then you select the **Select object rules** option and save the report, the report is saved with your **Select object rules** selections, and your **Select objects** selections are not saved.

Creating, editing, deleting and managing threshold alerts

Creating and deleting threshold alerts

1. On the main menu, select **System Reporter > Threshold Alerts**.
2. Do one of the following:
 - Click **+ Create threshold alert** or select **Create** on the **Actions** menu.
 - In the list pane, select the threshold alert, and then select **Edit** or **Delete**.
3. Follow the instructions on the dialog that opens.

Managing threshold alerts

1. In the list pane, select the threshold alert, and then select **Enable threshold alert**, **Disable threshold alert**, **Enable email notification**, or **Disable email notification** on the **Actions** menu.
2. The action is started immediately.

Creating threshold alert queries

Procedure

1. On the main menu, select **System Reporter > Threshold Alerts**.
2. Click **+ Create threshold alert** or select **Create** on the **Actions** menu.
3. On the dialog that opens, select the threshold alert template that you need.

The threshold alert query is displayed at the top of the metrics panel (1). As you make changes to individual metrics, the alert query automatically changes.

You can use the **Add metric** button and the delete icon (✕) to add and remove metrics from a query.

You can also choose whether a logical AND or logical OR operator is applied to a metric (2). And, you can change the order of the metrics by hovering over the up/down icon (3) and dragging the metric to a new location.

The screenshot shows the 'Metrics' panel with a 'Selected query' field at the top containing the query: `{ Idle percentage >= 0 AND User percentage > 10 } OR System percentage > 10`. Below this is a table with columns: Logical operator, Metric Name, Operator, Threshold Value, and Description. The table contains three rows of metrics. A green circle with the number 1 points to the 'Selected query' field. A green circle with the number 2 points to the 'AND' logical operator dropdown. A green circle with the number 3 points to the 'OR' logical operator dropdown. At the bottom of the panel is an 'Add metric' button.

Logical operator	Metric Name	Operator	Threshold Value	Description
↑	Idle percentage	>=	0	CPU time in idle percentage
2 AND ↓	User percentage	>	10	CPU time in user mode percentage
3 OR ↓	System percentage	>	10	CPU time in system mode percentage

Add metric

Editing and deleting reports

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. In the list pane, select the report and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Report access types \(system, private, public\)](#) on page 170.

Exporting and importing reports

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. In the list pane, select the report and then select **Export reports** or **Import reports** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Reports and templates overview](#) on page 170, [Export and Import reports overview](#) on page 169.

Increasing the size of a System Reporter database volume

You can increase the size of the System Reporter virtual volume on a storage system.

Procedure

1. On the main menu, select **Storage Systems > Systems**.
2. On the list pane, select the storage system and then select the **System Reporter** view in the detail pane.
3. Select **Edit** on the **Actions** menu, or hover over the detail pane and click the edit icon (✎) near the **System Reporter Samples Availability** title.
4. Follow the instructions on the dialog that opens.

Making reports private or public

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. Do one of the following:
 - In the list pane, select the reports that you want to make private, and then select **Make private** on the **Actions** menu.
 - In the list pane, select the reports that you want to make public, and then select **Make public** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Learn more: [Report access types \(system, private, public\)](#) on page 170.

Using real time reports

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. In the list pane, set the data types filter for **Real Time**.
3. In the list pane, select the real time report, and then do one of the following:
 - Select **Edit** on the **Actions** menu. Follow the instructions on the dialog that opens.
 - Select **Start real time** or **Stop real time** on the **Actions** menu, or click the **Start** or **Stop** icons on the detail pane. The action is immediately applied to the report.

Tips:

General

- You can specify the data-collection polling interval when you create or edit a real time report.
- Hewlett Packard Enterprise recommends Chrome browsers for viewing the real time reports.
- Zooming on a real time report zooms in both the X and Y axis.

Objects

- If you select the **All objects** option on the Add objects dialog, you cannot select individual objects.
- If you select the **Select objects** option and plot only the aggregated series, you can include up to 100 objects. If you select the **Select objects** option and plot only individual series, you can include up to 10 objects. If you select the **Select objects** option and plot both the aggregated series and individual series, you can include up to 9 objects.

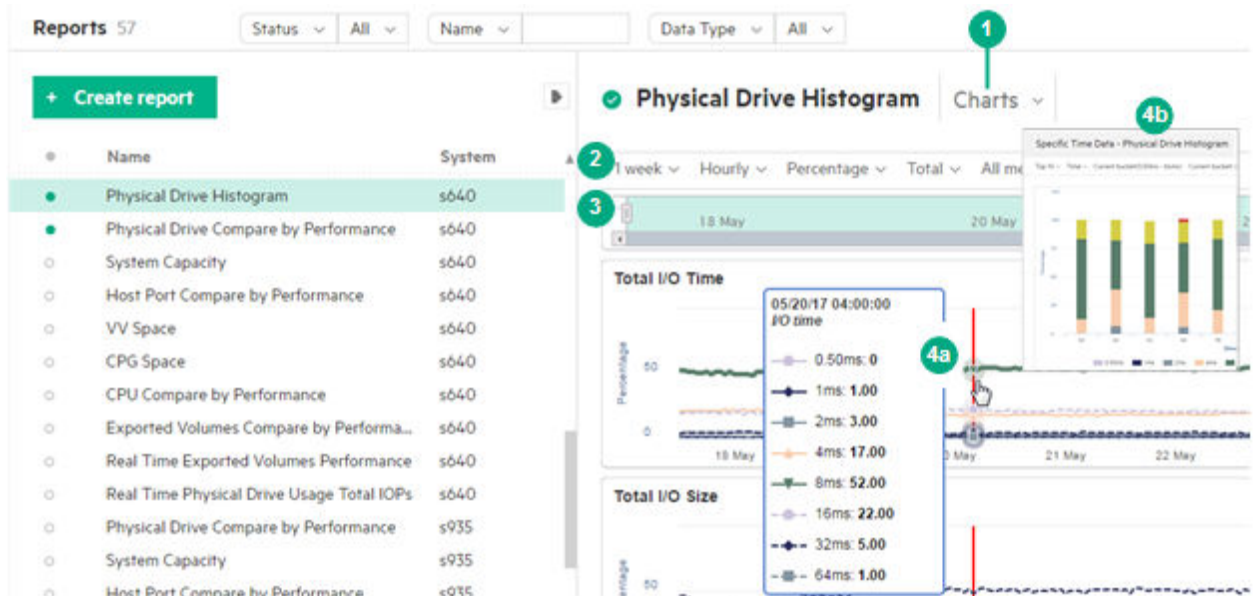
Restarts

- If you stop a real time report and then restart the report, the chart is cleared and is redrawn based on the new starting time.
- If you zoom into a real time report and then reset the zoom, the chart is cleared and is redrawn based on when the zoom was reset.
- If the HPE 3PAR SSMC server is stopped and restarted while you are viewing a real time report, you must select **Start real time** on the **Actions** menu to restart the plotting.
- The data-collection timeout for a real time report is 30 minutes. For example, if you are viewing a real time report and switch to a different report or screen, and you do not return to the report, data collection for the report stops after 30 minutes. If you return to the report after 30 minutes, you must click **Start real time** on the **Actions** menu to restart the report and data collection.

Viewing report charts

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. In the list pane, select the report.
3. **Tip:** The list can appear to be empty depending on the filters that are selected.
4. Select the **Charts** view (1).



Interactive controls for chart metrics (2) are displayed under the report title. You can use the controls to change the data that is displayed in the chart.

NOTE: To save the applied changes to an existing report, you can select the **Save** or **Save As** option. The **Save** option is available only to the author of the report.

A chart timeline and **zoom bar** (3) are displayed near the top of the detail pane.

As you move the cursor along chart graphics, a popup shows **details** (4a). On historical charts that span a time interval, clicking directly on a graphic element displays a **Specific Time Data** report (4b) for that point on the timeline.

Moving charts. To move an individual chart up or down, hover over the chart title until the move icon appears (), then drag and drop the chart in a new location.

Maximizing and minimizing charts. To maximize or minimize charts, click the maximize or minimize icon () at the right side of the interactive controls.

Displaying charts in separate windows. To display charts in a separate browser window, click the pop out icon ( if available) at the right side of the interactive controls.

Learn more: [Zooming into charts](#) on page 108, [Using real time reports](#) on page 105.

Viewing Specific Time Data Reports

Procedure

1. On the main menu, select **System Reporter > Reports**.
2. In the list pane, select the report that you want to view.
3. Click a graphic element to display the **Specific Time Data** report for that point on the timeline.

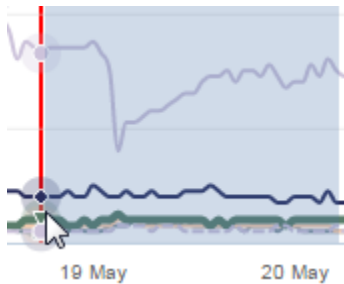
Tips:

- For AO Space Moved reports, all AO configurations are shown in the report. Clicking a specific configuration displays a noncumulative report for the configuration. For Cumulative Region Density reports, a Most Active Region report is displayed.
- The IO Density report does not include a specific time selection.

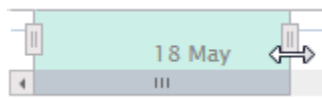
Zooming into charts

You can zoom into a portion of a report chart using the following methods. To return a report chart to its default display, click **Reset Zoom** on the **Actions** menu.

Cursor. On the report chart, locate the portion that you want to zoom into. Click the first data point. Hold down the button and drag the cursor toward the second data point. As you drag the cursor, shading indicates the selected portion. At the second data point, release the button. The report chart is redrawn, zooming into the portion that you selected.



Zoom bar. Scroll to the top of the report chart and find the zoom handles. Hover over the zoom handles and move them to select the portion to zoom into.



VMware tasks

These topics provide guidance on performing tasks using the VMware screens and action dialogs.

VMware screens, views, and actions summary

This topic summarizes the Views and Action menus that you can use to perform tasks from the VMware screens.

Tip: Some actions might not be available due to system configurations, user roles, or properties of the selected resource.

Storage Containers screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, Virtual Machines, VMware VVols, Performance, Map
- Actions menu: Create, Edit, Delete

Virtual Machines screen

- List pane standard views: compact view, Summary
- Detail pane views: Overview, VMware VVols, Performance, Map
- Actions menu: not applicable

Creating, editing, and deleting storage containers (VMware)

Procedure

1. On the main menu, select **VMware > Storage Containers**.
2. Do one of the following:
 - Click **+ Create storage container** or select **Create** on the **Actions** menu.
 - In the list pane, select the storage container, and then select **Edit** or **Delete** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Administrator Console tasks

These topics provide guidance on performing tasks using the HPE 3PAR SSMC Administrator Console.

Administrator Console screens, views, and actions summary

This topic summarizes the Storage Systems screen and the actions that are available in the Administrator Console.

Storage Systems screen

- List pane view: single view
- Detail pane views: not applicable
- Actions menu: Add, Edit, Connect, Disconnect, Remove, Accept certificate, Manage certificates, Upgrade

Adding and removing storage systems

To manage a storage system from the Main Console, the storage system must first be added to the Storage Systems screen in the Administrator Console.

After a storage system is removed from the Storage Systems screen in the Administrator Console, it cannot be managed from the Main Console until it is added again in the Administrator Console.

Tips:

- Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account.
- To manage multiple storage systems, each connected storage system must have the same security credentials (user name and password) that are used to log in to the HPE 3PAR SSMC Main Console. For more information, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Procedure

1. Log in to the **Administrator Console**. The administrator **Storage Systems** screen is displayed. Learn more: [Logging in to the Administrator Console](#) on page 111.
2. Do one of the following:
 - On the **Actions** menu, select **Add**.
 - Select the storage system, and then select **Remove** on the **Actions** menu.
Important: Removing a storage system from the list deletes all reports that have been created for the storage system.
3. Follow the instructions on the dialog that opens.
4. After adding a storage system, check its connection status. For a newly added storage system to appear in the Main Console, its connection status must be *Connected*.

Tip:

- When you start a new browser session to the Main Console, the newly added and connected storage systems automatically appear in the Main Console screens.
- For existing browser sessions to the Main Console, the newly added and connected storage systems appear in the **Systems filter** and are automatically included in the Main Console screens. If you do not want the newly added and connected storage systems to appear in the Main Console screens, you can deselect them in the **Systems filter**. Learn more: [Filters quick tour](#) on page 21

Connecting and disconnecting storage systems

To manage or view a storage system in the HPE 3PAR SSMC Main Console, the storage system must be connected using the HPE 3PAR SSMC Administrator Console. To prevent management or viewing of a storage system in the Main Console, the storage system must be disconnected using the Administrator Console.

Tip: Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account.

Procedure

1. Log in to the **Administrator Console**. The administrator **Storage Systems** screen is displayed. Learn more: [Logging in to the Administrator Console](#) on page 111.
2. Select the storage system, and then select **Connect** or **Disconnect** on the **Actions** menu.
3. Follow the instructions on the dialog that opens.

Installing CA security certificates

When using the HPE 3PAR SSMC Administrator Console to connect to some storage systems, it might be necessary to manually install CA (Certificate Authority) security certificates on the HPE 3PAR SSMC server before the storage system can be connected. This can be required the first time you attempt to connect to a storage system that has CA signed certificates, or when self-signed certificates have been changed to CA signed certificates since the last login.

Tip: Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account.

Procedure

1. Log in to the **Administrator Console**. The administrator **Storage Systems** screen is displayed. Learn more: [Logging in to the Administrator Console](#) on page 111.
2. If a storage system has a state of *Not Connected, Valid CA certificate needs to be installed on the SSMC server*, complete the following steps.
3. Create root CA and intermediate CA credentials. See the *HPE 3PAR StoreServ Management Console Administrator Guide* for details on creating the credentials.
4. Copy the root CA and intermediate CA certificates to the HPE 3PAR SSMC server in the following directory:
Linux

```
/opt/hpe/ssmc/ssmcbase/data/StoreServMC/security
```
5. Select the storage system whose CA security credentials you have installed. On the **Actions** menu, select **Connect**. The state shows *Not Connected, Certificate acceptance needed*.
6. On the **Actions** menu, select **Accept certificate**.
7. Follow the instructions on the dialog that opens.

Installing self-signed security certificates

When using the HPE 3PAR SSMC Administrator Console to first connect to some storage systems, it might be necessary to use the Administrator Console to install a self-signed security certificate on the HPE 3PAR SSMC server before the storage system can be connected.

Tip: Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account.

Procedure

1. Log in to the **Administrator Console**. The administrator **Storage Systems** screen is displayed. Learn more: [Logging in to the Administrator Console](#) on page 111.
2. Select the storage system whose self-signed security credentials must be installed. The state is *Not Connected, Certificate acceptance needed*. On the **Actions** menu, select **Accept certificate**.
3. Follow the instructions on the dialog that opens.

HPE 3PAR SSMC installs self-signed security certificates in the following directory:

Linux

```
/opt/hpe/ssmc/ssmcbase/data/StoreServMC/security
```

Logging in to the Administrator Console

Direct login

1. Browse to the server on which HPE 3PAR SSMC software is installed, **https://<IP address or FQDN>:8443**. The login screen opens.

Tip: The default port number is 8443. Another port might have been assigned during installation of the software.

2. Select the **Administrator Console** check box.

3. Enter the HPE 3PAR SSMC administrator user name and password.
4. Click **Login**. The **Storage Systems** screen in the Administrator Console is displayed.

Login from the Main Console

1. When already logged in to the Main Console, click the Session icon () in the banner, and then select **Administrator Console**. The login screen opens with **Administrator Console** check box preselected.
2. Enter the HPE 3PAR SSMC administrator user name and password.
3. Click **Login**. The **Storage Systems** screen in the Administrator Console is displayed.

Learn more: [Administrator Console Storage Systems screen quick tour](#) on page 34.

Managing and adding certificates

Tip: Access to the HPE 3PAR SSMC Administrator Console requires an HPE 3PAR SSMC administrator user account.

Procedure

1. Log in to the **Administrator Console**.
2. On the **Actions** menu, select **Manage certificates** to perform the following:
 - a. To add certificate for a connected HPE 3PAR StoreServ storage system, click **Add certificate** on the **Manage certificates** dialog.
 - b. To delete an existing certificate, click the  icon for the respective certificate.
3. Follow the instructions on the dialog that opens.

Upgrading SSMC

To upgrade HPE 3PAR SSMC, the administrator must select the required upgrade package for the supported version of HPE 3PAR SSMC.

Procedure

1. Log in to the **Administrator Console**.
2. On the **Actions** menu, select **Upgrade SSMC**.

NOTE: The upgrade option is applicable only if you are upgrading the HPE 3PAR SSMC software from v3.4 to any higher version.

3. Follow the instructions on the dialog that opens.
4. HPE 3PAR SSMC is restarted after the upgrade.

NOTE: To verify the successful upgrade of HPE 3PAR SSMC, go to **About** screen and verify the version.

Troubleshooting

These topics provide HPE 3PAR SSMC troubleshooting information. For detailed information, see the *HPE 3PAR StoreServ Management Console Release Notes* and the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Actions are not available

Symptom

Action menus do not list any actions to select.

Cause

If you log in to HPE 3PAR SSMC and change the password for your login account, you will not be able to use the Action menus. Also, you cannot continue normal operation for the remainder of the session.

Action

You must log out and then log in again with the new password to continue with normal operation.

Alerts for storage system hardware failures are not immediately seen

Symptom

After a hardware component on a connected storage system fails, an alert is not immediately seen in HPE 3PAR SSMC.

Cause

It can take 1 to 2 minutes following a storage system hardware failure for the alert to be displayed in HPE 3PAR SSMC.

This issue is known behavior. No action is required.

Cannot create a dedup virtual volume from a CPG that has AO

Symptom

When using the Create Virtual Volume dialog, a message indicates that errors must be corrected to proceed.

Cause

This issue can happen if you select *Dedup Yes* and then manually enter a CPG that has an AO configuration. The Create Virtual Volume dialog prevents creation of dedup virtual volumes from CPGs that have AO configurations.

Action

Instead of manually entering a CPG, select a CPG from the filtered list of CPGs that are valid for dedup.

CPG capacity efficiency last refresh date does not change

Symptom

After completing a *Refresh capacity efficiency* action for a Common Provisioning Group, the *Last refreshed* date in the *Capacity Efficiency* panel might not change.

Cause

The capacity efficiency information has been refreshed even though the date does not change. The *Last refreshed* date will be updated when the storage system next initiates a scan of the virtual volumes in the Common Provisioning Group.

This issue is known behavior. No action is required.

CPG volumes count apparent reporting discrepancies

Symptom

On the Common Provisioning Groups screen, the virtual volumes count in the list pane *Total Volumes* column Summary view, differs from counts in the detail pane, Overview view.

For example, a common provisioning group might show a count of 6 volumes in *Total Volumes* column. But the detail pane shows a *Volumes* count of 2 and a *Snapshots* count of 2, for an implied total count of 4 volumes.

Cause

The count in the *Total Volumes* column includes base virtual volumes and clone virtual volumes, but does not include snapshot virtual volumes. In the detail pane, the *Volumes* count is for base virtual volumes and does not include clone virtual volumes. Thus, when a common provisioning group includes snapshots or clones, the reported total count and the implied total count can be different.

This issue is known behavior. No action is required.

Learn more: [Virtual volumes overview](#) on page 130, [Clones \(physical copies\)](#) on page 124, [Snapshots \(virtual copies\)](#) on page 129.

Host is not visible on partner port

Symptom

The health state of a host shows as *degraded* with the description: *Host is not visible on partner port*

Cause

The persistent ports are not configured correctly. Provisioning activities, however, are not being impacted.

Action

You can continue with the current host port configuration. However, Hewlett Packard Enterprise recommends changing the host paths to be on adjacent controller nodes (for example 0/1, 2/3) using the same slot and ports. Learn more: [Persistent Ports functionality](#) on page 164.

Host sets total exported size seems small

Symptom

On the Host Sets screen, the expanded list pane view includes columns for *Volumes Exported to Member Hosts*, *Volumes Exported to Host Set*, and *Total Exported Size*. In some cases, the total exported size might seem too small (or show as zero) relative to the number of exported virtual volumes that are listed.

Cause

The total exported size sums the size of the virtual volumes that are exported to the **host set**. The total does not sum the size of the virtual volumes that are exported to individual hosts in the host set.

This issue is known behavior. No action is required.

Menu and action mouse clicks do not respond with IE browser

Symptom

When using Microsoft Internet Explorer, some mouse clicks in HPE 3PAR SSMC do not respond.

For example, after using the IE browser back button, the HPE 3PAR SSMC main menu, actions menus, and create buttons do not respond to mouse clicks.

Cause

The issue is related to the browser being used.

Action

Select any table entry or a different pull-down menu in HPE 3PAR SSMC and try the action again.

Peer Motion failed migration cleanup

Symptom

When deleting a Peer Motion migration with a state of *Failed (Restartable)*, the dialog indicates that a manual cleanup procedure is required.

Cause

The Peer Motion migration failed due to unspecified causes.

Action

Follow the manual cleanup procedure in the section *Cannot Admit or Importing a Volume Fails* in the *HPE 3PAR Peer Motion and HPE 3PAR Online Import User Guide*.

Peer Motion migration of a Remote Copy group fails because snapshots could not be removed

Symptom

A Peer Motion message indicates that a migration failed because snapshots could not be removed.

Cause

This issue can happen when a Peer Motion migration of a specific Remote Copy group is performed. And later an attempt is made to migrate the same Remote Copy group back to the original storage system.

Action

1. Remove the snapshots that are indicated in the message.
2. Retry the Peer Motion migration of the Remote Copy group back to the original storage system.

Priority Optimization capability - apparent reporting discrepancy for a virtual volume

Symptom

The Priority Optimization policy target is shown as *disabled* on the Capabilities panel. However, the Virtual Volume screen, detail pane, Settings view does not show a dash to indicate that there is no capability.

Cause

The Capabilities panel shows a dash only when a virtual volume is not configured for (capable of) Priority Optimization. It does not indicate when the Priority Optimization policy target is disabled.

This issue is known behavior. No action is required.

Remote copy source and backup virtual volume WWNs are not the same

Symptom

In a Remote Copy peer persistence configuration, a source and backup virtual volume do not have the same WWN.

Cause

A source and backup virtual volume in a Remote Copy peer persistence configuration will have same WWN only if the Remote Copy configuration is 1-to-1. And both the source and backup storage system have an HPE 3PAR Peer Persistence license enabled.

This issue is known behavior. No action is required.

Learn more: [Remote Copy configurations overview](#) on page 151, [Peer Persistence overview](#) on page 150.

Request-timeout messages when using Internet Explorer

Symptom

Request timeout messages are displayed in HPE 3PAR SSMC when using Internet Explorer.

Cause

This problem is related to Internet Explorer.

Action

Close and restart Internet Explorer or use a different browser. HPE recommends using Chrome with HPE 3PAR SSMC.

Export of System Report - Performance Summary is missing charts

Symptom

After exporting the System Report - Performance Summary, the export file (CSV or PDF) is missing some component charts.

Cause

In rare cases, System Reporter is unable load data for some components.

Action

If desired, you can review details regarding missing component charts in the Activity for exporting the report.

Attach/Detach Restore Points fails when you perform the action through HPE 3PAR SSMC

Symptom

The restore points that you created using HPE RMC may fail to restore when the Attach/Detach Restore Points action is performed in HPE 3PAR SSMC.

Cause

This issue can happen if you export or unexport the virtual volumes through any interface other than HPE RMC and RMC is not aware of the current status of the virtual volume. If the virtual volume is exported or unexported to/from a host, the same is not reflected in HPE RMC recovery set.

Action

1. Go to HPE RMC and refresh the corresponding recovery set to which the virtual volume belongs.
2. Then retry the action in HPE 3PAR SSMC.

System Reporter chart tooltips appear to be incorrect

Symptom

Time-and-value points are not properly shown in chart tooltips when more data points are returned from a storage system than are plotted in a chart.

For example, consider two data points returned from a storage system, such as (09:49:58, 230.05) and (09:50:03, 289.88). When the chart shows many data points and a mouse pointer is moved near this time period, the tooltip shows (09:50:00, 238.7933333333).

Cause

System Reporter time-interval reports use data point grouping. Data point grouping replaces a sequence of data points with one grouped point, which is plotted in the chart. The value of each grouped point is calculated from the original values of the returned data points.

Action

To see the actual data point values, you can zoom into the chart. Learn more: [Zooming into charts](#).

System Reporter reports are not listed

Symptom

Reports are not listed on the System Reporter Reports screen.

Cause

The list can be empty depending on the report filters that you select.

Learn more: [Filters quick tour](#) on page 21, [Creating reports](#) on page 102.

Action

- On the Reports filter, ensure that **All systems** is selected.
- If present, click the filter **Reset**.

System Reporter scheduled reports email is not received

Symptom

Scheduled reports email is not received.

Cause

- The SMTP server for email is not accessible to the HPE 3PAR SSMC server. The SMTP server for email is specified on the *Settings* screen.
- An antivirus configuration, firewall, or SELinux is blocking the email.

Action

Use the *Task Detail* panel on the *Activity* screen to help troubleshoot the issue. Click the expand icons (►) to open the task and view the task detail.

System Reporter threshold alerts are not listed

Symptom

No threshold alerts are listed on the System Reporter Threshold Alerts screen.

Cause

The list can be empty depending on the filters that you select.

Tip: Also, until at least one threshold alert is created, the Threshold Alerts list is empty.

Learn more: [Filters quick tour](#) on page 21, [Creating, editing, deleting and managing threshold alerts](#) on page 103.

Action

- On the Threshold Alerts filter, Ensure that **All systems** is selected.
- If present, click the filter **Reset**.

Tasks sidebar does not show any tasks

Symptom

After performing actions that generate tasks, no tasks are displayed in the Tasks sidebar.

Cause

This issue can occur if the time on an HPE 3PAR SSMC server is behind the browser by 10 minutes or more.

Tip: Different times that are due to differences in time zones are automatically accounted for and do not cause the issue.

Action

Synchronize the time on the HPE 3PAR SSMC server and your browser.

The total exported size for a host seems too small

Symptom

On the Hosts screen, detail pane, Overview view, the sizes reported in the Total Exported Size panel seem too small.

Cause

The issue can occur in the unusual situation of a host not having any active paths to a storage system. The lack of active paths causes the size of the exported virtual volumes (relative to the host) to be treated as zero.

This issue is known behavior. After an active path is restored, the Total Exported Size panel for the host will be updated.

Virtual volume policy - reporting discrepancy for provisioning type of none

Symptom

When a virtual volume policy is created in CLI with a provisioning type of *none*, HPE 3PAR SSMC shows the provisioning type as *Full*. And MC shows the provisioning type as *Thin or Full*.

Cause

Different management software can report provisioning types differently.

This issue is known behavior.

If desired, you can edit the virtual volume policy in HPE 3PAR SSMC to change the provisioning type to *None*, or to another provisioning type. Also, when you use the Create Virtual Volume dialog, you can change the provisioning type that is autofilled from the virtual volume policy.

VMware virtual machine last host discrepancy

Symptom

On the Virtual Machines screen, the *Last host* field on the detail pane shows a different host than is shown in VMware vCenter.

Cause

The *Last host* field shows the last VMware ESXi host to perform a bind operation for the virtual machine. The last host field does not necessarily represent the current binding status.

This issue is known behavior. No action is required.

VMware VVols exported size shows zeros

Symptom

On the Hosts screen, the *Total Exported Size* panel in the detail pane shows zeros, even though the *Exports* panel shows that VMware VVols are exported to the host.

Cause

Exported size properties do not apply to VMware VVols.

This issue is known behavior. No action is required.

Concepts

These topics explain key concepts for HPE 3PAR SSMC features.

General concepts

These topics explain key general concepts for HPE 3PAR SSMC.

HPE InfoSight alerts

Configure HPE 3PAR SSMC and make sure that the storage systems are registered in HPE InfoSight to gather the InfoSight alerts in HPE 3PAR SSMC.

When you enable connectivity to HPE InfoSight in HPE 3PAR SSMC:

- Relevant notifications and alerts from HPE InfoSight are gathered in HPE 3PAR SSMC.
- The alerts and notifications are displayed along with other alerts and notifications for the respective HPE 3PAR storage system.

HPE InfoSight applies analytic/machine learning methods to detect known issue patterns on the uploaded call home data that might occur in future. The alert about a potential issue may help to prevent data unavailability issues that might occur if left undetected.

The HPE InfoSight alerts are gathered and displayed in the Activity view of the Systems screen. An option is added to filter the InfoSight alerts.

NOTE: To receive the InfoSight alerts, add the storage systems that are managed by HPE 3PAR SSMC in HPE InfoSight.

Learn more: [Enable connectivity to HPE InfoSight](#) on page 48

Block Persona concepts

These topics explain key concepts for HPE 3PAR SSMC Block Persona features.

Storage virtualization overview

At a low level, HPE 3PAR operating systems divide physical drives into allocation units called chunklets, which are used to create logical drives. Chunklets and logical drives are not visible to users.

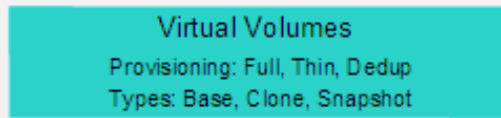
Users create common provisioning groups (CPGs) which are pools of storage space that define storage properties such as RAID type and physical drive device type. Users create virtual volumes from common provisioning groups and export the virtual volumes to hosts. Exporting a virtual volume makes it visible to the host OS and host applications.

Hosts



Virtual Volumes

Storage space exported to hosts



CPGs

Pools of logical drive space



Logical Drives

Chunklets arranged as rows of RAID sets



Matching colors indicate that logical drives are created from any available chunklets

Chunklets

Physical drive space allocated in 256 MB or 1 GB units



Chunklets are created from any available physical drives

Physical Drives

Fibre Channel / fast class (FC)
SATA / nearline (NL)
Solid state drives (SSD)



HPE 3PAR operating systems automatically create the logical drives that are required for common provisioning groups. A key feature of logical drives is that their size is automatically increased when data that is written from hosts approaches capacity thresholds on the storage system.

Learn more: [Hosts](#) on page 125, [Virtual volumes overview](#) on page 130, [Exported virtual volumes \(VLUNs\)](#) on page 125, [Logical drives](#) on page 126, [Chunklets](#) on page 124, [Physical drives and device types](#) on page 165.

You can use HPE 3PAR SSMC to perform many Block Persona tasks. Learn more: [Block Persona screens, views, and actions summary](#) on page 56.

Autonomic groups (host sets, virtual volume sets)

The autonomic groups feature allows users to create host sets and virtual volume sets. Each host set and each virtual volume set can be managed as a single resource. When members are added to a host set or virtual volume set, export actions are applied automatically to the new members.

For example, if a virtual volume set is exported to a host set, each virtual volume in the volume set is exported to each host in the host set. If a host is then added to the host set, the virtual volumes in the virtual volume set are automatically exported to the newly added host. Similarly, if a virtual volume is added to the virtual volume set, the newly added virtual volume is exported automatically to each host in the host set.

Capacity efficiency metrics

HPE 3PAR SSMC reports several metrics that indicate the capacity efficiency of HPE 3PAR StoreServ storage systems.

Compaction ratios

The compaction ratio for a virtual volume is the ratio of the virtual size compared to the physical space used for the virtual volume. For example, if a 10 GiB thinly provisioned base virtual volume uses 2.5 GiB of physical space, the compaction ratio is 4:1.

Compaction ratios are calculated as follows:

- **Thinly provisioned base virtual volume.** The compaction ratio is the virtual size, divided by the physical space used for the volume.
- **Thinly deduplicated base virtual volume.** The compaction ratio is the virtual size, divided by the sum of the physical space used for the volume and the associated physical space in the Dedup Store.
- **Thinly provisioned virtual volume family.** The compaction ratio is the sum of the virtual sizes for the base volume and its snapshots, divided by the sum of the physical space used for the base volume and its snapshots.
- **Thinly deduplicated virtual volume family.** The compaction ratio is the sum of the virtual sizes for the base volume and its snapshots, divided by the sum of the physical space used for the base volume and its snapshots and associated physical space in the Dedup Store.
- **Fully provisioned virtual volume.** The compaction ratio is the sum of the virtual sizes of all base volumes and snapshots in the group, divided by the sum of the physical space used for the base volumes, snapshots, and Dedup Store.
- **Common provisioning group.** The compaction ratio is the sum of the virtual sizes of all base volumes and snapshots in the group, divided by the sum of the physical space used for the base volumes, snapshots, and Dedup Store.

Deduplication ratios

The deduplication ratio for a virtual volume is the ratio of the physical space that would have been used without deduplication, compared to the physical space used for the virtual volume. Deduplication ratios do not include savings from inline zero-block detection.

Deduplication ratios are calculated as follows:

- **Thinly deduplicated base virtual volume.** The deduplication ratio is the size of the data written to the virtual volume, divided by the sum of the physical space used for the virtual volume and associated physical space in the Dedup Store.
- **Thinly deduplicated virtual volume family.** The deduplication ratio is the size of the data written to the base virtual volume and its snapshots, divided by the sum of the physical space used for the base virtual volume and its snapshots and associated physical space in the Dedup Store.
- **Common provisioning group.** The deduplication ratio is the size of the data written to all thinly deduplicated base virtual volumes and snapshots in the group, divided by the sum of the physical space used for thinly deduplicated virtual volumes in the group and associated physical space in the Dedup Store. The deduplication ratio for a common provisioning group can be higher than the deduplication ratio for individual virtual volumes in the group. This happens when Dedup Store pages are shared by multiple virtual volumes.

Overprovisioning ratios

Overprovisioning is when a storage system indicates to hosts that the amount of usable capacity is greater than the amount of system-usable storage space. In HPE 3PAR SSMC, overprovisioning ratios are reported for common provisioning groups, with the ratios roughly being the difference between the virtual size of the volumes and the available physical space, divided by the physical space available for the volumes. For example, if the virtual size of the volumes in a common provisioning group is 400 GiB but only 320 GiB of physical capacity is available to the system, the overprovisioning ratio is 0.25:1 (25%).

For information on using CLI commands to display overprovisioning information, see the *HPE 3PAR Command Line Interface Administrator Guide*.

Chunklets

Chunklets are basic units of storage that are created automatically by HPE 3PAR operating systems when physical drives are added to a storage system. HPE 3PAR operating systems use chunklets to create logical drives, with each chunklet being assigned to only one logical drive. Chunklets are not visible to users.

Each chunklet is a unit of contiguous space on a physical drive. All chunklets are 1 GB.

Learn more: [Storage virtualization overview](#) on page 121.

Clones (physical copies)

HPE 3PAR SSMC allows you to create point-in-time clones (physical copies) of virtual volumes. When the Create Clone action starts, a point-in-time snapshot is instantly created of the parent virtual volume. Then all of the data is physically copied to the target virtual volume. If you choose to retain the point-in-time snapshot, the relationship between the clone and its parent virtual volume is retained, which allows you to later resynchronize the clone with the parent.

- Prior to creating a clone virtual volume, you must create an unexported virtual volume with the characteristics that you want for the clone. The Create Clone dialog ensures that only appropriate virtual volumes are available for selection as a target.
- An option in the Create Clone dialog allows the point-in-time snapshot to be saved, or not saved. If the snapshot is saved, the target virtual volume becomes a clone that can be resynchronized later with the parent. If the snapshot is not saved, the data is copied from the parent to the target virtual volume, but the target does not become a clone. Rather, the target remains a base virtual volume and cannot be resynchronized with the parent.

- Copying data from a large parent virtual volume can take several minutes to hours. Until the copy process is complete, the clone virtual volume cannot be exported to a host.
- If necessary, you can stop the cloning process while it is running. If you stop the cloning process, the target virtual volume reverts to being a base virtual volume and will contain incomplete data.

Resynchronization

Resynchronization updates data on a clone with newer point-in-time data from the parent virtual volume. The HPE 3PAR OS takes a new snapshot of the parent and uses the new and old snapshots to update the clone. By default, the old snapshot is deleted and the new snapshot is retained for later resynchronization.

Learn more: [Resynchronizing clones](#) on page 66.

Promotion

The **Promote clone** action changes a virtual volume from a **clone** to a **base** virtual volume. Promotion removes the association between the clone and the parent virtual volume.

Clone snapshots

The snapshots (virtual volumes) that are created automatically for clones have file names that begin with the letters `vvcp`, for example `vvcp.667.588`.

Common provisioning groups

Common provisioning groups (CPGs) are user-defined pools of storage space. When a common provisioning group is created, its properties, such as RAID type and physical drive device type, are specified. HPE 3PAR operating systems automatically create the underlying logical drives for the common provisioning group that have those properties.

Learn more: [Storage virtualization overview](#) on page 121.

Compaction

Unused space in a common provisioning group can be reclaimed by compacting it. Compacting using the Trim option performs a trim that reclaims space in empty logical drives. Compacting using the Full option performs an initial trim, and if possible, reclaims more space by moving data and performing a final trim.

Learn more: [Compacting common provisioning groups](#) on page 58.

Exported virtual volumes (VLUNs)

Exporting a virtual volume makes it available to hosts by creating an association between the virtual volume on a storage system and a logical unit number (LUN) on a host. The association, called a virtual LUN (VLUN), defines the association between a virtual volume and a host.

A virtual volume can be exported to a host by multiple paths that differ by the host ports on the storage system, host WWNs, host iSCSI names, or host names. Thus, a virtual volume can have multiple VLUNs.

For example, assume that a storage system has two host ports, 0:1:2 and 1:1:2. If a virtual volume is exported to Host A and is also exported to Host B, then the virtual volume has four VLUNs (HostA via 0:1:2, Host A via 1:1:2, Host B via 0:1:2, and Host B via 1:1:2).

Tip: In System Reporter, the performance for an exported virtual volume shows the host facing VLUN performance metrics of the virtual volume and not the internal (back end) performance metrics of the virtual volume.

Hosts

An HPE 3PAR StoreServ Storage system treats a host as a set of initiator port WWNs or iSCSI names. Hosts that are physically connected to ports on a storage system are detected automatically.

New WWNs or iSCSI names can be assigned to host paths before hosts are physically connected. These names do not need to be associated with target ports on the system controller nodes. This provides plug-and-play functionality that avoids manual reconfiguration after new hosts are connected.

FCoE connectivity is supported on HPE 3PAR StoreServ 10000 Storage systems and HPE 3PAR StoreServ 7000 Storage systems through the use of CNA adapters. CNA ports can be configured to be used as FCoE or iSCSI ports.

Active and inactive hosts

An active host is connected to a storage system port and is recognized by the HPE 3PAR operating system as having a port connection. An active host might have a number of volumes exported to it.

An inactive host is recognized by the HPE 3PAR OS, but does not appear to have a port connection. This can occur when a host is offline or is disconnected from a system port, or if there is an error condition.

Host Persona

A host persona is a set of behaviors that allows hosts that are connected to FC or iSCSI ports to deviate from the default host behavior. By assigning a persona to a host, multiple host types that require different responses can share the same storage system port. For example, hosts running Windows, Linux, and AIX operating systems can connect to the same storage system port.

In host persona type 2, the remote target port group (RTPG) feature automatically enables active/active multipathing for supported Windows host operating systems.

Learn more: [**Creating, editing, and deleting hosts**](#) on page 58.

Host Explorer software

HPE 3PAR Host Explorer is optional host agent software that reports detailed host configuration information for hosts that are connected to HPE 3PAR StoreServ Storage systems. The detailed host information assists when creating hosts with HPE 3PAR management software. No license is required to use HPE 3PAR Host Explorer.

HPE 3PAR Host Explorer runs in the background (as a service or daemon) on VMware ESXi hosts, Windows hosts, and Linux hosts, and can communicate over Fibre Channel and iSCSI connections.

Host sets

Hosts can be combined into host sets, which are autonomic groups that can be managed as a single resource.

Learn more: [**Autonomic groups \(host sets, virtual volume sets\)**](#) on page 123, [**Creating, editing, and deleting host sets**](#) on page 58.

Logical drives

Logical drives are virtual units of storage that implement RAID and other properties. A key feature of logical drives is that their size is increased automatically when writes from host applications to virtual volumes approach capacity thresholds.

HPE 3PAR operating systems create logical drives from chunklets and can map a logical drive to more than one virtual volume. Logical drives are not visible to users.

Learn more: [**Storage virtualization overview**](#) on page 121, [**Virtual volume RAID**](#) on page 131.

LUNs

A LUN is used by hosts to identify exported virtual volumes. The term LUN is a SCSI convention. The terms LUN, disk, drive, and virtual volume are often used interchangeably.

Peer Motion overview

HPE 3PAR Peer Motion software provides host and virtual volume migration features on HPE 3PAR StoreServ Storage systems, and in HPE 3PAR storage federations.

These features are installed as part of certain versions of HPE 3PAR OS but require an HPE 3PAR Peer Motion software license to use. For information regarding HPE 3PAR StoreServ Storage platform support and network interface card requirements, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

You can use HPE 3PAR SSMC to perform Peer Motion online, non-disruptive migration of hosts, host sets, virtual volumes, and virtual volume sets between storage systems that are in a storage federation. Learn more: **Federations configuration** on page 167.

HPE 3PAR Peer Motion high-level concepts:

- Support for Peer Motion migrations of hosts depends on the host persona.
- During Peer Motion migrations, host I/O requests to exported virtual volumes are non-disruptively serviced.
- To migrate a virtual volume that is a member of a Remote Copy group, the Remote Copy group must be migrated.
- HPE 3PAR StoreServ Storage federations require that each member storage system have an HPE 3PAR Peer Motion license.

Policies

You can create, save, and use policies repeatedly to create virtual volumes and snapshots that have identical or similar properties.

The different policies available are virtual volume, protection, and snapshot.

The properties for a virtual volume policy in the Policies screen autofill the fields in Create Virtual Volume dialog. You can change autofilled properties before you create the new virtual volume.

You can create a policy for snapshot schedules, which includes the following:

- A name pattern that is used for naming snapshots.
- The frequency at which the snapshots are created.

The snapshot policy can be associated with multiple virtual volumes and virtual volume sets.

Important: The create, edit, and delete option is not supported for protection policies in this release.

Protection policy: Predefined back up policies imported from HPE Recovery Manager Central (if configured in SSMC Applications) that can be set on virtual volumes.

Snapshot policy: Predefined set of patterns and schedules that allow a snapshot schedule to be created on a virtual volume or virtual volume sets.

Learn more: **HPE Recovery Manager Central (RMC) software**, **Restore Points**, **Protection policy**, **Virtual volumes overview** on page 130, and **Virtual volume sets overview**.

Protection policy

HPE Recovery Manager Central 4.1 introduces the concept of protection policies which provide a policy-based management of data protection. A protection policy is a specified collection of attributes that define target system, the protocol, retention, and expiration for the data to be protected. A protection policy defines how and where the data is protected. Protection policy can be associated with different virtual

volumes along with a schedule which defines when the data has to be protected. HPE RMC allows the following three levels of protection that can be defined within a protection policy:

- Snapshot set policy
- Backup policy
- Copy policy (Catalyst Copy)

NOTE: HPE 3PAR SSMC 3.3 and later supports integrated data protection through HPE Recovery Manager Central (RMC), which provides an end-to-end solution to provision and manage HPE 3PAR StoreServ. The feature also allows you to set up data protection policies and back up data to a cloud platform using HPE StoreOnce Cloud Bank.

If you have a Cloud Bank store as the backup for your Copy policy, the following options on the Policies screen display **Yes** for a Protection policy:

- **Backup cloud bank store**
- **Copy cloud bank store**

The Protection policy feature supports the integration of volume provisioning workflows available in HPE 3PAR SSMC. You can also set up a data protection policy on the virtual volume which is configured on Recovery Manager Central (RMC) by the user. The feature also enables setting up a protection policy on an existing volume from HPE 3PAR SSMC and performs complete life cycle management of restore points.

Important: The create, edit, and delete option is not supported for protection policies in this release.

You can add HPE RMC instances into HPE 3PAR SSMC as part of its external application integration framework. User can perform the following tasks from HPE 3PAR SSMC upon adding the RMC instances:

- List HPE RMC applications in the **RMC Credentials** menu item. Perform **Add**, **Edit**, and **Remove** of the HPE RMC application.
- List the protection policies configured for each HPE RMC application in **Block Persona > Policies** screen.
- Set up protection policies and schedules while provisioning a virtual volume through the **Block Persona > Virtual Volumes > Create** dialog.
- Set up and modify protection policies and schedules for existing virtual volumes through **Block Persona > Virtual Volumes > Edit** dialog.
- View the Protection policies associated with a virtual volume in **Block Persona > Virtual Volumes > Overview > Copies** screen.
- View restore points created by the Protection policies for a specified virtual volume in **Data Protection > Restore Points** screen.

Learn more: [HPE Recovery Manager Central \(RMC\) software](#), [Restore Points](#), and [Policies](#)

Smart SAN software

HPE 3PAR Smart SAN software provides features that allow HPE 3PAR StoreServ Storage systems to communicate with HPE switches to automatically create zoning.

The feature is installed on storage systems as part of the HPE 3PAR OS but require an HPE 3PAR Smart SAN software license to use. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

HPE 3PAR Smart SAN software is also embedded in certain HPE switches. An HPE 3PAR StoreServ Storage system determines whether an attached switch supports the HPE 3PAR Smart SAN features.

Target Driven Peer Zoning (TDPZ) is the feature in HPE 3PAR Smart SAN that performs automatic zoning. Peer zones are managed through storage system ports. Each peer zone contains a single target port with multiple initiator peer port members. The target port that creates a peer zone is the principal member of the zone. Only a principal member can create, add or remove members, and delete the peer zone.

NOTE: Automatic creation of TDPZ zones occurs when you create a host with Smart SAN support on an HPE 3PAR StoreServ storage system. However if a peer zone with the same name exists on the storage system, the create host operation occurs, but the zone creation fails. The failure of the peer zone creation generates an alert.

Snapshots (virtual copies)

HPE 3PAR SSMC allows you to instantly create point-in-time snapshots (virtual copies) of virtual volumes.

At the point in time when a snapshot is created, it is instantly available for use and contains only pointers to the source virtual volume. As data on the source virtual volume changes, the changed data is recorded in the snapshot. The HPE 3PAR OS uses the pointers and the tracked changes to represent the original source virtual volume.

❗ **IMPORTANT:** If more than the advisable number of snapshots runs around the same time, they utilize the system manager resources and system I/O bandwidth, which slows the system down.

Hewlett Packard Enterprise recommends to limit the number of schedules to the following numbers for optimal storage system performance:

- Up to 375 schedules for HPE 3PAR StoreServ 7200 and HPE 3PAR StoreServ 7400.
- Up to 500 for HPE 3PAR StoreServ 8000, 9450, 10000, and 20000 models.

The data on a snapshot is consistent with its source but is not necessarily consistent with the host file system or application. That is, a snapshot preserves the data that was written to the source virtual volume when the snapshot was created, but it does not preserve data that resides only in host application memory or file system buffers.

- Snapshots can be made of base virtual volumes, clones, or other snapshots.
- The number of snapshots per base virtual volume that can be made varies with the version of HPE 3PAR OS.
- The maximum number of snapshots per storage system depends on the storage system configuration.

Creation and management of virtual volume snapshots on a storage system requires an HPE 3PAR Virtual Copy software license.

Read and write modes

The relationship of read and write modes for a source virtual volume and its snapshots is based on the following:

- Base virtual volumes are always read/write mode.
- A snapshot of a base virtual volume is always read-only mode.
- Subsequent snapshots (on the same tree) alternate between read/write and read-only modes.

Snapshot promotion

Snapshot promotion copies data from a snapshot back to the source base virtual volume or to a parent read/write snapshot on the same tree. The feature allows a base virtual volume or snapshot to be rolled back to a previous point in time. The promoted snapshot remains on the system.

A snapshot cannot be promoted if it is exported to a host or the target virtual volume is exported to a host.

Virtual volumes overview

Virtual volumes are created from pools of storage called common provisioning groups and can be exported to hosts. Virtual volumes are the only data layer in HPE 3PAR storage virtualization that is visible to hosts.

- Virtual volume types include base, clone, and snapshot. Learn more: [Virtual volume types](#) on page 134.
- Provisioning. A virtual volume can be provisioned as full or thin. Learn more: [Virtual volume provisioning](#) on page 131.
- After a virtual volume is created, its size can be increased up to a maximum size. The maximum size depends on the version of the HPE 3PAR OS.
- Other key properties of virtual volumes include expiration time, retention time, RAID, space types (user, copy, admin), and compression.

Learn more: [Virtual volume expiration time](#) on page 131, [Virtual volume retention time](#) on page 132, [Virtual volume RAID](#) on page 131, [Common provisioning groups](#) on page 125, [Storage virtualization overview](#) on page 121.

Virtual volume compression

Compression is the capability of certain versions of HPE 3PAR OS to automatically perform in-line data compression when hosts write data to thinly provisioned or thinly deduplicated virtual volumes that reside on SSD physical drives. In-line data compression increases space efficiency and bandwidth, and can extend the life of SSD physical drives.

Learn more: [Virtual volumes overview](#) on page 130, [Physical drives and device types](#) on page 165.

Virtual volume conversion

Conversion allows key properties of a virtual volume to be changed without interrupting host I/O to the virtual volume. The virtual volume provisioning, and compression setting (on/off) and dedup setting can be changed. In addition, the original virtual volume can be kept or deleted, and the converted virtual volume can be moved to a different common provisioning group.

A common virtual volume conversion is to change the properties of a virtual volume from *full* to *thin*, *dedup*, or *compression*. The converted virtual volume is smaller and more efficient than the original volume because the unused space in the original volume is not copied to the converted volume. Changing the properties of a virtual volume from *thin* provisioned to *full* results in a larger virtual volume, but it can be useful in some environments.

Conversion of virtual volumes on a storage system requires an HPE 3PAR Thin Conversion software license and an HPE 3PAR Dynamic Optimization software license.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume deduplication

A deduplicated virtual volume is a thinly provisioned virtual volume that uses in-line deduplication. In-line deduplication eliminates duplicate writes to help extend the life of SSD physical drives.

Virtual volume expiration time

The **expiration time** for a virtual volume is the length of time before the volume is automatically deleted from the storage system.

The length of time is relative to when the expiration time is specified and enabled. For example, if the expiration time is enabled on Monday for a length of 4 days, the virtual volume will be automatically deleted at the same time of day on Friday.

- The length of virtual volume expiration time can be from 1 hour up to 43800 hours (1825 days or 5 years).
- If a virtual volume's expiration time and retention time are both specified, the expiration time cannot be less than the retention time. Learn more: [Virtual volume retention time](#) on page 132.
- Virtual volume expiration time is displayed in the Settings view of virtual volume detail panes and can be enabled and disabled using the advanced options, policy settings in the create and edit dialogs for virtual volumes.

Virtual volume provisioning

A virtual volume can be provisioned as full or thin.

Full. A fully provisioned virtual volume is one in which the space that is allocated at creation time is the full capacity (size) of the virtual volume.

For example, when a fully provisioned virtual volume is created with a 10 GiB virtual capacity, the storage system allocates the full 10 GiB of space.

Thin. A thinly provisioned virtual volume is one in which a minimal amount of the space is allocated at creation time. After the virtual volume is exported to a host, the virtual volume size grows automatically with the host writes, up to the user-defined size limit.

For example, when a thinly provisioned virtual volume is created with a 10 GiB virtual capacity, the storage system initially allocates only 0.625 GiB (0.5 GiB user space and 0.125 GiB admin space). After the virtual volume is exported to a host, and the data grows with host writes, the storage system automatically increases the virtual capacity, up to the 10 GiB limit. There are automatic and user-defined alerts to help manage the virtual capacity.

Creation of thinly provisioned virtual volumes on a storage system requires an HPE 3PAR Thin Provisioning software license.

Dedup. A thinly deduplicated virtual volume is a thinly provisioned virtual volume that uses in-line deduplication. In-line deduplication eliminates duplicate writes to help extend the life of SSD physical drives.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume RAID

Unlike traditional RAID, all HPE 3PAR RAID levels distribute data across **all** available physical drives using one of the following methods:

- Data striping, which improves speed by performing I/O with an entire group of physical drives at the same time.
- Data mirroring, which provides data redundancy by storing data and a copy of the data.
- Parity error checking, which provides automatic detection and correction if there is corruption of a physical drive.

HPE 3PAR storage systems support the following RAID types for virtual volumes. Each RAID type uses a different combination of RAID methods that impact data redundancy, the amount of physical drive space used, and I/O speed. Hewlett Packard Enterprise recommends that you not use RAID 0. Use RAID 1, RAID 5, or RAID 6 instead to include data protection (fault tolerance).

Tip: When creating common provisioning groups with HPE 3PAR SSMC, the default choice for RAID type is RAID 6 with FC and NL device types, and RAID 5 for SSD device types.

RAID 0 – Data is striped across chunklets on different physical drives that might be in different drive magazines or drive enclosures. RAID 0 improves performance but does not provide data protection (fault tolerance).

RAID 1 – Data is striped across RAID 1 sets. A RAID 1 set includes chunklets that contain the same data. The chunklets are distributed across different physical drives that might be located in different drive magazines or drive enclosures. RAID 1 sets are also known as a mirror sets. A RAID 1 set can function with the loss of all but one of the chunklets in the set.

RAID 5 – Data is striped across RAID 5 sets. A RAID 5 set includes chunklets for data and chunklets for parity. The chunklets are distributed across different physical drives that might be located in different drive magazines or drive enclosures. RAID 5 sets are also known as parity sets. A RAID 5 set can function with the loss of any one of the chunklets in the set.

RAID 6 – Data is striped across RAID MP sets. A RAID MP set includes one chunklet for data and two chunklets for parity. The chunklets in each RAID MP set are distributed across different physical drives that might be located in different drive magazines or drive enclosures. RAID MP is also known as RAID 6 or a double-parity set. A RAID MP set can function with the loss of any two of the chunklets in the set.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume retention time

The **retention time** for a virtual volume is the length of time during which the virtual volume cannot be deleted by any means. This prevents accidental deletion and intentional deletion of a virtual volume, even by storage administrators with the highest roles and rights.

The length of the virtual volume retention time is relative to when the retention time is specified and enabled. For example, if the retention time is enabled on Monday for a length of 4 days, the virtual volume cannot be deleted by any means until the same time of day on Friday.

The virtual volumes retention time feature requires an HPE 3PAR Virtual Lock software license for the storage system.

- When a virtual volume is created (or its properties are edited), its retention time cannot be set to a value that exceeds the maximum retention time policies that are in effect.
- After a virtual volume's retention time has started, the length of the retention time can be increased but it cannot be decreased, stopped, or disabled.

- If a virtual volume's retention time and expiration time are both specified, its retention time cannot be longer than the expiration time. Learn more: [Virtual volume expiration time](#) on page 131.
- Virtual volume retention time is displayed in the Settings view of virtual volume detail panes and can be enabled and disabled using the advanced options, policy settings in the create and edit dialogs for virtual volumes.

Storage system policy for virtual volumes maximum retention time

- While the storage system policy for virtual volumes maximum retention time is disabled, a new virtual volume cannot have its retention time set and an existing virtual volume cannot have its retention time changed.
- While the storage system policy for virtual volumes maximum retention time is enabled, a new virtual volume can have its retention time set and an existing virtual volume can have its retention time changed.
- The storage system policy for virtual volumes maximum retention time can be from 1 hour up to 43800 hours (1825 days or 5 years). The default is 336 hours (14 days).
- The storage system policy for virtual volumes retention time is displayed in the Settings view of storage system detail panes and can be enabled and disabled using the advanced options, policy settings in the edit dialog for storage systems.

Domain policy for maximum virtual volumes retention time

- Virtual volumes maximum retention time policies can be established for individual domains.
- While a domain policy for virtual volumes maximum retention time is disabled, the storage system policy for virtual volumes maximum retention time applies. For example, if the storage system policy for virtual volumes maximum retention time is enabled, then a new virtual volume in the domain can have its retention time set and an existing virtual volume in the domain can have its retention time changed, with the length of time being limited to the storage system policy maximum value.
- While a domain policy for virtual volumes maximum retention time is enabled and has a non-zero value for the length of time, a new virtual volume in the domain can have its retention time set and an existing virtual volume in the domain can have its retention time changed.
- While a domain policy for virtual volumes maximum retention time is enabled and has a zero (0) value for the length of time, a new virtual volume in the domain cannot have its retention time set and an existing virtual volume in the domain cannot have its retention time changed.
- A domain policy for virtual volumes maximum retention time can be from 1 hour up to 43800 hours (1825 days or 5 years). The default is 336 hours (14 days).
- The domain policy for virtual volume retention time is displayed in the Overview view of domain detail panes and can be enabled and disabled using the advanced options, policy settings in the create and edit dialogs for domains.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume sets

Virtual volumes can be combined into virtual volume sets, which are autonomic groups that can be managed as a single resource.

Learn more: [Autonomic groups \(host sets, virtual volume sets\)](#) on page 123, [Virtual volumes overview](#) on page 130.

Virtual volume spaces

Virtual volumes include the following types of space:

User space. The user space contains the user data that is exported as a LUN to a host. Virtual volume user space corresponds to the logical drive regions in a common provisioning group that are available to a host.

Copy space. Copy space contains changed user data for snapshots. Copy space is also known as snapshot space. The space consists of logical drive regions in a common provisioning group that contain copies of user data that has changed since the last snapshot.

Admin space. Admin space contains pointers to the changed user data in the copy space. The space consists of logical drive regions in a common provisioning group that track changes to the virtual volume since the last snapshot.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume tuning

HPE 3PAR SSMC allows you to tune the user space and copy space of a virtual volume. It also allows you to change certain properties of a virtual volume by assigning it to a different common provisioning group. For example, you can change the device type and RAID type of a virtual volume by changing the common provisioning group in which the virtual volume is a member. Tuning a virtual volume does not interrupt host I/O to the virtual volume.

If the tuning of a virtual volume is interrupted due to a component failure or user-initiated cancellation, the tuning can be restarted, or the virtual volume can be rolled back to reestablish the properties it had before the tuning was started.

Tuning of virtual volumes on a storage system requires an HPE 3PAR Dynamic Optimization software license.

Learn more: [Virtual volumes overview](#) on page 130.

Virtual volume types

A virtual volume can be a base type, clone, or snapshot.

Base. A base virtual volume is a virtual volume that is not a clone or a snapshot.

Clone. A clone is a virtual volume that contains a physical copy of the data from another virtual volume at a point in time. Learn more: [Clones \(physical copies\)](#) on page 124.

Snapshot. A snapshot is a virtual volume that uses virtualization to represent the data on another virtual volume at a point in time. Learn more: [Snapshots \(virtual copies\)](#) on page 129.

Learn more: [Virtual volumes overview](#) on page 130.

File Persona concepts

These topics explain key concepts for HPE 3PAR SSMC File Persona features.

For additional information, see the *HPE 3PAR File Persona User Guide*.

Compliance officer user role

File Persona file services supports archival solutions at compliance mode level. Any operation that compromises the integrity of a retained file on the compliance enabled name space is not allowed by any single user (including a super user).

Any operation on a retained file and the compliance enabled name space can be issued by a user with administrative role. To allow the requester to execute the command, the issued request has to be

approved by the compliance officer user. When the compliance officer approves or rejects the request, the status is updated in the request queue as per the request ID. Then requester can execute the approved request. This is not relevant to the enterprise WORM namespace and is only relevant for file stores and virtual file servers with Compliance WORM policy set.

Learn more: [Managing compliance requests](#).

File access audit logs

Enable the file access audit option to generate audit events for all:

- User logins
- User logoffs
- File operations for both NFS and SMB protocols

The logs are created for each VFS (Virtual File Server). You can view the list of generated log files and perform view/delete operation on those log files.

The details about audit command, user, role, time stamp, and the status of the action is available in audit logs.

The events include IP address of the client and location of the file which is accessed. In addition for SMB, the events will have username and SID and for NFS, the events include UID and GID details. File access audit is provided for HPE SMB and NFS to start with File Persona actions.

NOTE: UID/GID Guidelines:

- For File Persona 1.4 and earlier, the ID value must be between 1000 and 65535.
- For File Persona 1.5 and later, the ID value must be between 100 and 1000000000 but not 65534.

Log rotation and compression are based on fixed file size, specified time (in minutes), or number of files. User can also delete logs based on retention period set.

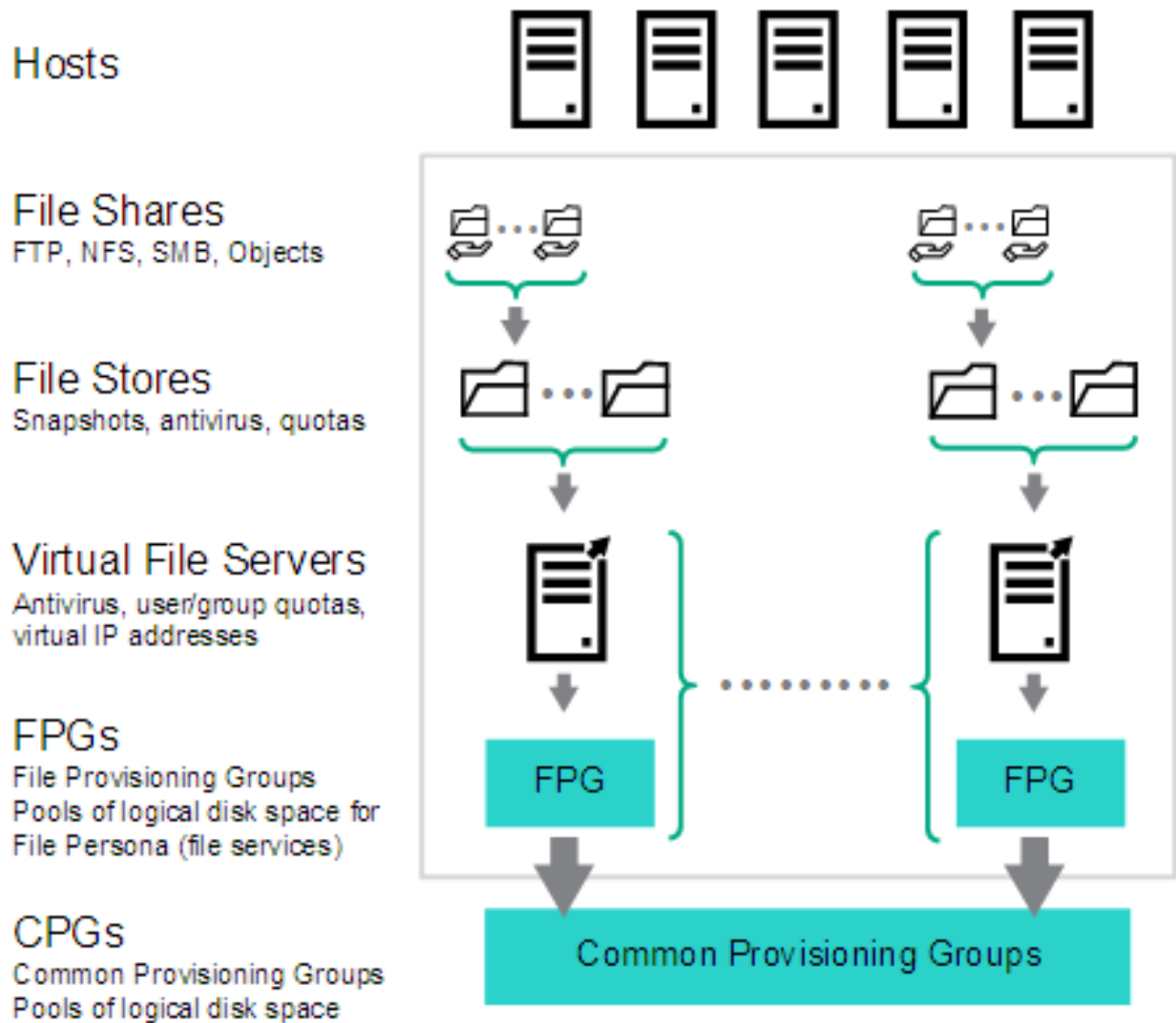
File Persona overview

HPE 3PAR File Persona software provides the NFS, SMB, and Object Access API features on HPE 3PAR StoreServ Storage systems.

These features are installed as part of certain versions of HPE 3PAR OS but require an HPE 3PAR File Persona software license to use. For information regarding HPE 3PAR StoreServ Storage platform support and network interface card requirements, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

The following are key File Persona components:

- File Persona *file shares* are the logical containers on a storage system that hold the files that users and groups can access over a network. Learn more: [File shares](#) on page 136.
- File Persona *file stores* are the logical containers on a storage system that hold one or more file shares. Learn more: [File stores](#) on page 136.
- File Persona *virtual file servers* are logical containers on a storage system that hold one or more file stores and provide the network connectivity for user access. Learn more: [Virtual file servers](#) on page 138.
- File Persona *file provisioning groups* are logical containers on a storage system that hold virtual file servers. Each file provisioning group holds one virtual file server and can be thought of as providing *file system* resources on a storage system. Learn more: [File provisioning groups](#) on page 137.



You can use HPE 3PAR SSMC to perform many File Persona tasks. Learn more: [File Persona screens, views, and actions summary](#) on page 71.

File shares

File Persona *file shares* are the logical containers on a storage system that hold the files that users and groups can access over a network. A file share can be thought of as a folder, for example, a folder named *home*.

FTP, NFS, SMB, and Object share types are supported. Properties and settings for file shares include share type, share path, client filters list, read/write permissions, and access privileges. Each file share has a share path that specifies the subdirectory, file store and virtual file server. Learn more: [Creating, editing, and deleting file shares](#) on page 75.

File stores

File Persona *file stores* are the logical containers on a storage system that hold one or more file shares.

Properties and settings for file stores include antivirus scan settings and file quota settings for file size limits and number of files. Antivirus scan settings are initially inherited from the parent virtual file server, but they can be changed.

HPE 3PAR SSMC can automatically create file stores when you create file shares that require a new file store. You can also directly create file stores and edit file store properties and settings. Learn more: **Creating, editing, and deleting file stores** on page 75.

HPE 3PAR SSMC also provides advanced tasks for managing file store antivirus quarantines and file snapshots. Learn more: **Managing antivirus** on page 78, **Creating and deleting file snapshots** on page 74, **Reclaiming file snapshot space** on page 80.

File provisioning groups

File Persona *file provisioning groups* are logical containers on a storage system that hold the virtual file servers. Each file provisioning group holds one virtual file server and can be thought of as providing the File Persona *file system* resources on a storage system.

Properties and settings for file provisioning groups include storage allocation and controller node pair. The storage allocation settings specify the common provisioning group in which the file provisioning group is located. The controller node pair specifies the primary and alternative controller nodes on which the File Provisioning Group runs.

HPE 3PAR SSMC automatically creates file provisioning groups when you create virtual file servers that require a new file provisioning group. You can also directly create file provisioning groups and edit file provisioning group properties and settings. Learn more: **Creating, editing, and deleting file provisioning groups** on page 76.

Disaster recovery management is extended to file provisioning from File Persona 1.5 and later. You can perform failover, recover, and restore operation on the file provisioning groups. The actions are similar in Remote Copy group and FPGs (File Provisioning groups) other than the FPG being:

- Unmounted on the source storage system.
- Mounted on the target storage system.

Thus enabling the recovery of files from the source to target storage system with one operation.

The restore operation performs the following:

- Unmounting of FPG from target storage system.
- Restores the Remote Copy group.
- Mounts the FPG on the source storage system.

You can have access to the files either on the target or source storage system with minimum downtime.

HPE 3PAR SSMC also provides actions for managing:

- File provisioning groups
- Snapshot space reclamation
- File Persona controller node pair

Learn more: **Managing File Persona controller nodes** on page 80, **Reclaiming file snapshot space** on page 80.

Quota soft limits and grace time

A *capacity soft limit* specifies the amount of storage that a user, group, or file store can use before a grace period for writes begins. If the user, group, or file store does not reduce the amount of used storage below the soft limit, before the grace period ends, then the user, group, or file store writes are blocked.

A *files soft limit* specifies the number of files that a user, group, or file store can have before a grace period for writes is begun. If the user, group, or file store does not reduce the number of files below the soft limit before the grace period ends, then the user, group or file store writes are blocked.

Virtual file servers

File Persona *virtual file servers* are logical containers on a storage system that hold one or more file stores.

Properties and settings for virtual file servers include storage allocation, networking virtual IP addresses, and antivirus scan policies. The storage allocation settings specify the common provisioning group and file provisioning group in which a virtual file server is located. Learn more: [Creating, editing, and deleting virtual file servers](#) on page 76.

Virtual file servers also provide antivirus quarantine and file snapshot capabilities, and implement the quotas for users, groups, and file stores.

Learn more: [Managing quotas](#) on page 80, [Managing antivirus](#) on page 78, [Creating and deleting file snapshots](#) on page 74, [Reclaiming file snapshot space](#) on page 80.

Data Protection concepts

These topics explain key concepts for HPE 3PAR SSMC Data Protection features.

Auto synchronize policy

HPE 3PAR SSMC 3.4 and later supports the auto synchronize policy.

If you enable the auto synchronize option and perform a failover, the Remote Copy group automatically recovers and synchronizes all the virtual volumes in the group after the failover. The automatic recovery is applicable for both automatic or manual failover scenarios.

Example:

When a site fails, the HPE 3PAR StoreServ storage system automatically recovers and synchronizes all the virtual volumes in the Remote Copy group after:

- The system recovery and initialization completes.
- The Remote Copy communications are re-established.

The Health section in the Remote Copy Groups Overview displays state description as normal even after a failover, due to the internal switchover from source to target.

NOTE:

- The auto synchronize policy allows you to use the failover command when the remote copy synchronous groups are started and online. You can avoid stopping the synchronous groups before initiating a failover command to the secondary storage system.
- In an SLD or 3DC Peer Persistence configuration, the policy can be set only on the synchronous target of the Remote Copy group.

You can enable the auto synchronize option in: **Data Protection > Remote Copy Groups > Create/Edit Group**.

Backup sets

Backup sets provide a second level of data protection with backup from HPE 3PAR StoreServ to HPE StoreOnce. The backups to HPE StoreOnce are block-level copies of virtual volumes which are de-

duplicated to save space. These copies are used to revert to the original or a different HPE 3PAR StoreServ storage system, even if the original base virtual volume is lost.

Learn more: [HPE Recovery Manager Central \(RMC\) software](#), [Restore Points](#), and [Protection policy](#).

Copy sets

Copy set provides the third and highest level of data protection. The copy set creates the copy of a backup set on another HPE StoreOnce Catalyst Store or on a different Catalyst Store of the same HPE StoreOnce.

Learn more: [HPE Recovery Manager Central \(RMC\) software](#), [Protection policy](#), and [Restore Points](#).

Disaster recovery operations for non-SLD Remote Copy groups

Failover

A failover changes the Remote Copy group role on the target system from secondary to primary-rev. The hosts connected to the target system can read/write on LUNs that are associated with the virtual volumes in a Remote Copy group.

The failover action is supported for the synchronous, periodic, and asynchronous streaming modes.

The following scenario displays the state of `sysA` (source) and `sysB` (target) before and after failover:

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

Group state: Stopped

DR state: Normal

Replication direction: Stopped

After Failover

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

Group state: Stopped

DR state: Failover

Replication direction: Stopped

NOTE: After you perform a Recover action from this state and start the Remote Copy group, the replication happens from `sysB` to `sysA`.

When auto synchronize policy is enabled

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

Group state: Stopped (Started allowed for sync mode)

DR state: Normal

Replication direction: Stopped (`sysA` to `sysB` if in sync mode and the group state is Started)

After Failover

`sysA`: Target, secondary, read-only access

`sysB`: Source, primary, read/write access

Group state: Started

DR state: Normal

Replication direction: Started from `sysB` to `sysA`

Learn more: [**Disaster recovery operations for non-SLD Remote Copy groups**](#) on page 139, [**Disaster recovery operations for SLD Remote Copy groups**](#) on page 143.

Revert failover

A revert failover operation reverts the previous failover operation. The Remote Copy group on the source system and the target system becomes primary and secondary respectively. The hosts connected to the source system can read/write on LUNs that are associated with the virtual volumes in a Remote Copy group. However the hosts connected to the target system are read-only.

The revert failover action is supported for the synchronous, periodic, and asynchronous streaming modes.

The following scenario displays the state of `sysA` (source) and `sysB` (target) before and after revert failover:

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

Group state: Stopped

DR state: Failover

Replication direction: Stopped

After Revert failover

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

Group state: Stopped

DR state: Normal

Replication direction: Stopped

NOTE: After you perform a Revert failover and start the Remote Copy group, the replication starts from `sysA` to `sysB`.

Switchover

The switchover operation swaps the Remote Copy group roles from primary to secondary without impacting the host IO.

For Remote Copy groups in Peer Persistence ensure the following for a switchover:

- The associated hosts must be connected to both the primary and secondary storage systems.
- The WWNs of primary and secondary virtual volumes must be consistent.
- The host persona of the host must support RTPG.

NOTE: The secondary virtual volume does not have read access (even if status shows read-only), as the secondary path state is set to standby internally.

The switchover action is supported for synchronous mode only.

The following scenario displays the state of `sysA` (source) and `sysB` (target) before and after switchover:

Prerequisite state

`sysA`: Source, primary, read/write access
`sysB`: Target, secondary, No read/write access
Group state: Started
DR state: Normal
Replication direction: `sysA` to `sysB`

After Switchover

`sysA`: Target, secondary, No read/write access
`sysB`: Source, primary, read/write access
Group state: Started
DR state: Normal
Replication direction: `sysB` to `sysA`

NOTE: After the switchover completes, `sysA` becomes secondary and `sysB` becomes primary.

Recover

A recovery reverses the replication and synchronizes the delta changes from the target to primary storage system for a Remote Copy group. The group role on the source storage system becomes secondary-rev. The hosts connected to the source system will not have write access on the LUNs that are associated with the virtual volumes in a Remote Copy group.

The recover action is supported for the synchronous, periodic, and asynchronous streaming modes.

! **IMPORTANT:** By default the Remote Copy group starts after the recover operation. Select the **Do not start groups after role reversal is completed** option to prevent the Remote Copy group from starting automatically.

The following scenario displays the state of `sysA` (source) and `sysB` (target) before and after recover:

Prerequisite state

`sysA`: Source, primary, read/write access
`sysB`: Target, primary-rev, read/write access
Group state: Stopped
DR state: Failover
Replication direction: Stopped

After Recover

`sysA`: Source, secondary-rev, read/write access
`sysB`: Target, primary-rev, read-only access

Group state: Started/Stopped (if the **Do not start groups after role reversal is completed** option is selected)

DR state: Recover

Replication direction: `sysB` to `sysA` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

Restore

A restore operation restores replication for the Remote Copy groups to a prefailover state after the recover operation completes. The Remote Copy group role on the source system and the target system becomes primary and secondary respectively. The hosts connected to the source system can read/write on LUNs that are associated with the virtual volumes in a Remote Copy group. However the hosts connected to the target system are read-only.

The restore action is supported for the synchronous, periodic, and asynchronous streaming modes.

The following two scenarios display the state of `sysA` (source) and `sysB` (target) before and after restore:

Scenario A: DR is in failover state

❗ **IMPORTANT:** If DR is in failover state, the recover operation is started internally. By default the Remote Copy group is started after the restore. Select the **Do not start groups after role reversal is completed** option to prevent the Remote Copy group from starting automatically.

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

Group state: Stopped

DR state: Failover

Replication direction: Stopped

After Restore

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

Group state: Started/Stopped (if you select the **Do not start groups after role reversal is completed** option, the Remote Copy group is stopped)

DR state: Normal

Replication direction: `sysA` to `sysB` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

Scenario B: DR is in recover state

❗ **IMPORTANT:** By default the Remote Copy group is started after the restore. Select the **Do not start groups after role reversal is completed** option to prevent the Remote Copy group from starting automatically.

Prerequisite state

`sysA`: Source, secondary-rev, read-only access

`sysB`: Target, primary-rev, read/write access

Group state: Stopped/Started

DR state: Recover

Replication direction: Stopped/*sysB* to *sysA*

After Restore

sysA: Source, primary, read/write access

sysB: Target, secondary, read-only access

Group state: Started/Stopped (if you select the **Do not start groups after role reversal is completed** option, the Remote Copy group is stopped)

DR state: Normal

Replication direction: *sysA* to *sysB* (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

Disaster recovery operations for SLD Remote Copy groups

Prerequisite

To perform disaster recovery operations for a Remote Copy group, *sysA*, *sysB*, and *sysC* must have the following SLD relationships:

- *sysA::sysB* in synchronous
- *sysA::sysC* in periodic
- *sysB::sysC* in periodic (backup)

Failover

A failover changes the Remote Copy group role on the target system from secondary to primary-rev. The hosts connected to the target system can read/write on LUNs that are associated with the virtual volumes in a Remote Copy group. The operation enables Remote Copy to synchronize data from other targets and then start replication to those targets for synchronous long-distance configurations.

You can choose either *sysB* or *sysC* to failover. Assume that the failover is being done to *sysB* here.

! **IMPORTANT:** By default replication is started between *sysB* and *sysC*. Select the **Do not start groups after role reversal is completed** option to prevent the Remote Copy group from starting automatically.

The following scenario displays the state of *sysA* (source), *sysB* (target), and *sysC* (target) before and after failover:

Prerequisite state

sysA: Source, primary, Read/Write access

sysB: Target, secondary, Read-only access

sysC: Target, secondary, Read-only access

Group state (*sysA::sysB*): Stopped

Group state (*sysA::sysC*): Stopped

Group state (*sysB::sysC*): Backup

DR state: Normal

Replication direction: Stopped

After Failover

`sysA`: Source, primary, Read/Write access

`sysB`: Target, primary-rev, Read/Write access

`sysC`: Target, secondary, Read-only access

Group state (`sysA::sysB`): Stopped

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started

DR state: Failover

Replication direction: `sysB` to `sysC` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

When auto synchronize policy is enabled

Prerequisite state

`sysA`: Source, primary, Read/Write access

`sysB`: Target, secondary, Read-only access

`sysC`: Target, secondary, Read-only access

Group state (`sysA::sysB`): Started

Group state (`sysA::sysC`): Started

Group state (`sysB::sysC`): Backup

DR state: Normal

Replication direction: `sysA` to `sysB` and `sysA` to `sysC`

After Failover

`sysA`: Target, secondary, Read-only access

`sysB`: Source, primary, Read/Write access

`sysC`: Target, secondary, Read-only access

Group state (`sysA::sysB`): Started

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started

DR state: Normal

Replication direction: `sysB` to `sysA` and `sysB` to `sysC`

Switch failover

The Switch failover operation reverses the roles of two target systems in a Remote Copy synchronous long-distance configuration. After you execute a switch failover the roles of the Remote Copy groups on the target storage systems are the following:

- The target system where the failover operation started becomes secondary.
- The other target system becomes primary-rev.

You can read/write on LUNs that are associated with the virtual volumes in a selected Remote Copy group on the primary-rev target system. However the LUNs on the secondary target system are read-only.

-
- ❗ **IMPORTANT:** The operation switches the primary-rev side between the two targets (`sysB` and `sysC`) of the SLD group after initial failover. You can do the Switch failover operation only for an SLD Remote Copy group.
-

The following scenario displays the state of `sysA` (source), `sysB` (target), and `sysC` (target) before and after switch failover:

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

`sysC`: Target, secondary, read-only access

Group state (`sysA::sysB`): Stopped

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started (if you select the **Do not start groups after role reversal is completed** option during failover, the Remote Copy group is stopped)

DR state: Failover

Replication direction: `sysB` to `sysC`

NOTE: If you select the no-start option, the replication is stopped.

After Switch failover

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

`sysC`: Target, primary-rev, read/write access

Group state (`sysA::sysB`): Backup

Group state (`sysA::sysC`): Stopped

Group state (`sysB::sysC`): Stopped

DR state: Failover

Replication direction: Stopped (when you trigger the start option, the replication starts from `sysC` to `sysB`)

Recover

A recovery reverses replication and synchronizes the delta changes from the target to primary storage system for the Remote Copy groups. The group role on the source storage system becomes secondary-rev. The hosts connected to the source storage system will not have write access on the LUNs that are associated with the virtual volumes in a Remote Copy group.

-
- ❗ **IMPORTANT:** By default replication starts between `sysB` and `sysC`. Select the **Do not start groups after role reversal is completed** option to prevent the Remote Copy group from starting automatically.
-

The following scenario displays the state of `sysA` (source), `sysB` (target), and `sysC` (target) before and after recover:

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

`sysC`: Target, secondary, read-only access

Group state (`sysA::sysB`): Stopped

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started (if you select the no-start option during failover, the group is in stopped state)

DR state: Failover

Replication direction: `sysB` to `sysC` (if you select the **Do not start groups after role reversal is completed** option during the previous failover, the replication is stopped)

After Recover

`sysA`: Source, secondary-rev, read-only access

`sysB`: Target, primary-rev, read/write access

`sysC`: Target, secondary, read-only access

Group state (`sysA::sysB`): Started

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started

DR state: Recover

Replication direction: `sysB` to `sysA`, `sysB` to `sysC` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

Assume that the failover target is `sysC` or when the failover is done to `sysB` followed by switch-failover to `sysC`.

The following scenario displays the state of `sysA` (source), `sysB` (target), and `sysC` (target) before and after recover:

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

`sysC`: Target, primary-rev, read/write access

Group state (`sysA::sysB`): Backup

Group state (`sysA::sysC`): Stopped

Group state (`sysB::sysC`): Started (if you select the **Do not start groups after role reversal is completed** option during the previous failover, the group is in stopped state)

DR state: Failover

Replication direction: `sysC` to `sysB` (if you select the **Do not start groups after role reversal is completed** option during the previous failover, the replication is stopped)

After Recover

`sysA`: Source, secondary-rev, read-only access

`sysB`: Target, secondary, read-only access

`sysC`: Target, primary-rev, read/write access

Group state (`sysA::sysB`): Backup

Group state (`sysA::sysC`): Started

Group state (`sysB::sysC`): Started

DR state: Recover

Replication direction: `sysC` to `sysA`, `sysC` to `sysB` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

Restore

A restore operation restores replication for the Remote Copy groups to a prefailover state after the recover operation completes. The Remote Copy group role on the source system and the target system becomes primary and secondary respectively. The hosts connected to the source storage system can read/write on LUNs that are associated with the virtual volumes in a Remote Copy group. However the hosts connected to the target system are read-only.

The following two scenarios display the state of `sysA` (source), `sysB` (target), and `sysC` (target) before and after restore:

Scenario A: DR is in failover state

! **IMPORTANT:** Restore from a failover state after you enable the **Do not start groups after role reversal is completed** option leads to Recover state.

Prerequisite state

`sysA`: Source, primary, read/write access

`sysB`: Target, primary-rev, read/write access

`sysC`: Target, secondary, read-only access

Group state (`sysA::sysB`): Stopped

Group state (`sysA::sysC`): Backup

Group state (`sysB::sysC`): Started (if you select the **Do not start groups after role reversal is completed** option during failover, the group is in stopped state)

DR state: Failover

Replication direction: `sysB` to `sysC` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

After Restore

`sysA`: Source, primary, read/write access

`sysB`: Target, secondary, read-only access

`sysC`: Target, secondary, read-only access

Group state (`sysA::sysB`): Started

Group state (`sysA::sysC`): Started

Group state (`sysB::sysC`): Backup

DR state: Normal

Replication direction: *sysA* to *sysB*, *sysA* to *sysC*

Scenario B: DR is in recover state

Prerequisite state

sysA: Source, secondary-rev, read-only access

sysB: Target, primary-rev, read/write access

sysC: Target, secondary, read-only access

Group state (*sysA::sysB*): Started

Group state (*sysA::sysC*): Backup

Group state (*sysB::sysC*): Started

DR state: Recover

Replication direction: *sysB* to *sysA*, *sysB* to *sysC*

After Restore

sysA: Source, primary, read/write access

sysB: Target, secondary, read-only access

sysC: Target, secondary, read-only access

Group state (*sysA::sysB*): Started

Group state (*sysA::sysC*): Started

Group state (*sysB::sysC*): Backup

DR state: Normal

Replication direction: *sysA* to *sysB*, *sysA* to *sysC*

Assume the failover target is *sysC* or when the failover is done to *sysB* followed by switch-failover to *sysC*.

The following scenario displays the state of *sysA* (source), *sysB* (target), and *sysC* (target) before and after recover:

Scenario A: DR is in failover state

! **IMPORTANT:** Restore from a failover state after you enable the **Do not start groups after role reversal is completed** option leads to Recover state.

Prerequisite state

sysA: Source, primary, read/write access

sysB: Target, secondary, read-only access

sysC: Target, primary-rev, read/write access

Group state (*sysA::sysB*): Stopped

Group state (*sysA::sysC*): Stopped

Group state (*sysB::sysC*): Started (if you select the **Do not start groups after role reversal is completed** option during failover, the group is in stopped state)

DR state: Failover

Replication direction: `sysC` to `sysB` (if you select the **Do not start groups after role reversal is completed** option during the previous failover, the replication is stopped)

After Restore

`sysA`: Source, primary, read/write access
`sysB`: Target, secondary, read-only access
`sysC`: Target, secondary, read-only access
Group state (`sysA::sysB`): Started
Group state (`sysA::sysC`): Started
Group state (`sysB::sysC`): Backup
DR state: Normal
Replication direction: `sysA` to `sysB`, `sysA` to `sysC`

Scenario B: DR is in recover state

Prerequisite state

`sysA`: Source, secondary-rev, read-only access
`sysB`: Target, secondary, read-only access
`sysC`: Target, primary-rev, read/write access
Group state (`sysA::sysB`): Backup
Group state (`sysA::sysC`): Started
Group state (`sysB::sysC`): Started
DR state: Recover
Replication direction: `sysC` to `sysA`, `sysC` to `sysB` (if you select the **Do not start groups after role reversal is completed** option, the replication is stopped)

After Restore

`sysA`: Source, primary, read/write access
`sysB`: Target, secondary, read-only access
`sysC`: Target, secondary, read-only access
Group state (`sysA::sysB`): Started
Group state (`sysA::sysC`): Started
Group state (`sysB::sysC`): Backup
DR state: Normal
Replication direction: `sysA` to `sysB`, `sysA` to `sysC`

HPE Recovery Manager Central (RMC) software

HPE Recovery Manager Central (RMC) software integrates HPE 3PAR StoreServ primary storage with HPE StoreOnce backup systems to provide converged data protection that delivers assured recovery using restore points. HPE RMC supports flexible recovery options using snapshots, backups and replicated data copies to meet a wide variety of disaster recovery requirements.

The backups can be used to restore back to the original or a different HPE 3PAR StoreServ storage system, even if the original base volume is lost.

HPE 3PAR SSMC and HPE RMC connectivity

Requirements for HPE 3PAR SSMC and HPE RMC connection

- Configure and set up the latest HPE RMC version.
- Configure the HPE 3PAR SSMC and HPE RMC with the same HPE StoreServ storage system.
- HPE 3PAR SSMC must be able to connect to HPE RMC over (port 443) HTTPS protocol.
- Create the protection policies in an HPE RMC instance.

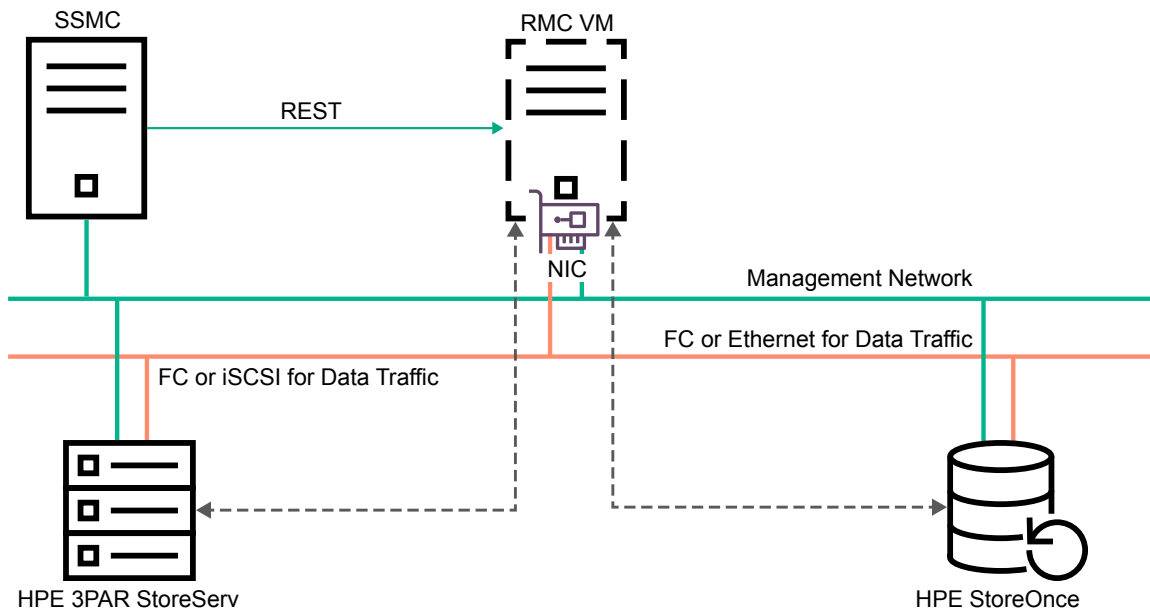


Figure 1: HPE 3PAR SSMC - HPE RMC connectivity

Peer Persistence overview

HPE 3PAR Peer Persistence software provides the switchover and automatic failover features on HPE 3PAR StoreServ Storage systems that are in a Remote Copy configuration.

The features are installed on storage systems as part of the HPE 3PAR OS but require an HPE 3PAR Peer Persistence software license to use. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Peer Persistence supports Remote Copy replication at sites that are at metropolitan distances from each other. A peer relationship is established between source and backup storage systems that allows hosts and host applications to remain online during a switchover or automatic failover.

Peer Persistence switchover

The Peer Persistence switchover operation *manually* redirects host I/O with a storage system at one site to a storage system at another site, and reverses the direction of data replication between the sites.

Peer Persistence failover

The Peer Persistence failover operation *automatically* redirects host I/O with a failed storage system to another storage system in a manner that is transparent to hosts and host applications.

Peer Persistence quorum witness

Peer Persistence failover uses HPE 3PAR Quorum Witness software to monitor for conditions that trigger the automatic failover. The quorum witness server is typically installed at a third site that would not be impacted by failure of the source or backup sites, and connects to the source and backup storage systems using non-remote-copy links. The site and link independence allows the quorum witness server to determine failures of the source and backup storage systems and sites and failures of inter-site links.

You can use HPE 3PAR SSMC to perform several Peer Persistence tasks. Learn more: [**Data Protection screens, views, and actions summary**](#) on page 82.

Remote Copy overview

HPE 3PAR Remote Copy software provides the remote replication and disaster recovery features on HPE 3PAR StoreServ storage systems.

The features are installed on storage systems as part of certain versions of HPE 3PAR OS but require an HPE 3PAR Remote Copy software license to use. For information about HPE 3PAR StoreServ storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Remote Copy configurations and operations are based on a linked pair of storage systems. In a Remote Copy pair, one storage system acts as the source storage system and the other acts as the backup storage system. The source storage system contains the source virtual volumes and the backup storage system contains the corresponding backup virtual volumes. Backup virtual volumes are snapshots of the source virtual volumes. Learn more: [**Remote Copy configurations overview**](#) on page 151.

You can use HPE 3PAR SSMC to perform many Remote Copy tasks. Learn more: [**Data Protection screens, views, and actions summary**](#) on page 82.

Disaster recover overview

In normal operation, data is replicated from the source storage system to the backup storage system. This is called the natural direction of replication.

Tip: *Source* and *backup* storage systems are also known as *primary* and *secondary* storage systems.

An overview of disaster recovery steps follows.

1. The source storage system fails or is taken offline. Replication to the backup storage system stops.
2. A failover changes the virtual volumes on the backup storage system to source virtual volumes and host I/O with the virtual volumes is enabled.
3. The source storage system comes back online.
4. The direction of replication is reversed so that data is replicated from the backup storage system to the source storage system. The source and backup virtual volumes are synchronized.
5. Replication returns to its natural direction and host I/O with the source virtual volumes is re-enabled.

Remote Copy configurations overview

1-to-1 configuration

A unidirectional 1-to-1 Remote Copy configuration consists of one storage system that is the primary system, and one storage system that is the backup storage system. The primary storage system holds only primary volume groups and the backup storage system holds only secondary volume groups.

A bidirectional 1-to-1 Remote Copy configuration consists of two storage systems that each function as both a primary and backup storage system. Each storage system contains both primary and secondary volume groups and provides backup for the other, according to the direction of replication specified for each volume group.

N-to-1 configuration

An N-to-1 Remote Copy configuration is composed of multiple Remote Copy pairs. A maximum of four primary storage systems can use the same backup storage system. The configuration can have up to four unidirectional or bidirectional Remote Copy pairs, as long as the remote target system has the minimum number of nodes required to support the number of source systems.

1-to-N configuration

A 1-to-N Remote Copy configuration is composed of multiple Remote Copy pairs. A single primary storage system can use a maximum of four backup storage systems. One primary system participates in four Remote Copy pairs, one for each backup system.

M-to-N configuration

An M-to-N Remote Copy configuration is comprised of 4x4 fan-in and fan-out with bidirectional data replication. The replication occurs without the need for dedicated Remote Copy pairs. Replication modes can be either synchronous, asynchronous periodic, or a mixture of modes.

! **IMPORTANT:** A storage system can be part of only one remote copy configuration. Thus to create a storage system linked pair using a storage system that is already a part of another linked pair, you have to:

- Edit the existing Remote Copy configuration.
 - Then add the new storage system to the existing Remote Copy configuration.
 - Configure the Remote Copy links.
-

Synchronous long-distance configuration

A synchronous long distance (SLD) Remote Copy configuration is composed of two targets: one synchronous group and one asynchronous periodic group.

One primary system uses two backup systems and participates in two Remote Copy pairs, one for each backup system. The Remote Copy volume groups from the primary storage system are replicated to the two separate target storage systems simultaneously. Data is replicated to one target in synchronous mode and to the second in asynchronous periodic mode.

Restore points

Restore points refers to a snapshot, snapshot set, backup set, or copy set which represents point in time copy of data on a target specified in the protection policies at specified schedule.

Restore points provides the privilege of being able to operate on objects and perform actions namely attach, detach, restore, and delete without going into details of the object type and location. Restore points enables the user to identify the most recent point-in-time copy of the data on any target and help them to restore if there is a data recovery.

You can define different levels of protection for a host using restore points. The snapshot, snapshot sets, and backup sets enable you to create a backup across storage systems in a data center. The copy sets can create a backup across data center.

Learn more: [**HPE Recovery Manager Central \(RMC\) software**](#)

Snapshot sets

Snapshot sets provide the first level of data protection. Snapshot is a point-in-time copy of the base volume. Snapshot sets are group-consistent (created simultaneously) copies of the virtual volumes.

Learn more: [**HPE Recovery Manager Central \(RMC\) software**](#), [**Restore Points**](#), and [**Protection policy**](#).

User roles for adding and managing RMC credentials and Restore points

If the user role on at least one of the storage systems configured in HPE 3PAR SSMC is Super when you are logged in, then you have the privilege to:

- Add RMC Credential
- Edit RMC Credential
- Remove RMC Credential

If the user role on all storage systems configured in HPE 3PAR SSMC is Super when you are logged in, then you have the privilege to:

- Attach restore points
- Detach restore points
- Delete restore points
- Restore the restore points

All the other roles like Create, Edit, and Browse are treated as a Browse role. If you have the Create, Edit, and Browse roles, you can only view the restore points and the added RMC credentials.

Learn more: [**Attaching, detaching, restoring, and deleting restore points**](#) on page 83, [**Adding, editing, and removing RMC credential**](#) on page 83.

Security concepts

These topics explain key concepts for HPE 3PAR SSMC security features.

User accounts and roles

To access an HPE 3PAR StoreServ Storage system, you must have a user account. Each HPE 3PAR OS user is assigned a role, and each role is assigned a set of rights. The roles and rights that are assigned to the user determine which tasks the user can perform.

Standard roles

Browse. Rights are limited to read-only access. There are some exceptions for the Browse role. For more information about rights corresponding to the Browse role, see *HPE 3PAR OS Command Line Interface Reference Guide*.

Edit. Rights are granted to most operations, for example creating, editing, and removing virtual volumes and other objects.

Super. Rights are granted to all operations.

Service. Rights are limited to operations that are required to service the system. This role allows limited access to user information and user group resources.

❗ **IMPORTANT:** A user with Super role can create and edit CPGs, Virtual volumes, hosts, Remote Copy groups in all the defined domains including `No Domain`.

A user with Edit role who is authorized for one or more of the defined domains (except for `No domain`), can edit but cannot create some of the mentioned objects in that domain by default. However, a user with Edit role who is authorized for `No domain` can create and edit these objects in `No domain` and all the other defined domains.

For more information about rights corresponding to Standard roles, see *HPE 3PAR OS Command Line Interface Reference Guide*.

Extended roles

The extended roles define a set of rights optimized for users with specialized or restricted tasks. For example, assigning a user the Create role allows the user to create virtual volumes and other objects. The role does not allow the user to remove virtual volumes.

Create. Rights are limited to creating objects, for example creating virtual volumes, common provisioning groups, hosts, and schedules.

Basic Edit. Basic edit rights are similar to the edit role, for example creating and editing virtual volumes and other objects. However, the rights to remove objects are more restrictive than for the edit role.

3PAR AO. Rights are limited to use by Hewlett Packard Enterprise for Adaptive Optimization operations.

3PAR RM. Rights are limited to use by Hewlett Packard Enterprise for Recovery Manager operations.

You can use HPE 3PAR SSMC to perform many Security User tasks.

Learn more: [Security screens, views, and actions summary](#) on page 86.

LDAP user authentication

An *LDAP user* is authenticated and authorized using information from a LDAP server. If multiple systems are configured to use the same LDAP server, an LDAP user with access to one system can access all systems with the role and rights assigned to the LDAP group.

The HPE 3PAR OS contains an LDAP client that can be configured to use an LDAP server for authentication and authorization of storage system users.

You can use HPE 3PAR SSMC to perform many Security LDAP tasks. Learn more: [Security screens, views, and actions summary](#) on page 86.

Virtual domains overview

HPE 3PAR Virtual Domains software provides the domain features on HPE 3PAR StoreServ Storage systems.

These features are installed as part of the HPE 3PAR OS but require an HPE 3PAR Virtual Domains software license to use. For information regarding HPE 3PAR StoreServ Storage platform support and network interface card requirements, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

A virtual domain can be thought of as a virtual private storage system within a physical storage system. Multiple virtual domains can be created on a storage system, each with its own storage resources, secure access, users, and hosts.

Storage resources and hosts can be assigned to a specific virtual domain, or can have no virtual domain association. The *no domain* contains resources that do not belong to a specified virtual domain.

Secure access to resources in a virtual domain is controlled by user accounts, roles, and rights. Only users with rights in that virtual domain can work with those resources. For example, virtual domain A can allow access to a user, but virtual domain B can block access to that user. A user can have access to more than one domain, and can have different user roles in each domain. Users with the super role can browse and edit resources in all virtual domains.

You can use HPE 3PAR SSMC to perform many Security Virtual Domain tasks. Learn more: [Security screens, views, and actions summary](#) on page 86.

Storage Optimization concepts

These topics explain key concepts for HPE 3PAR Storage Optimization features.

Adaptive Flash Cache overview

HPE 3PAR Adaptive Flash Cache consists of features that extend the system cache on HPE 3PAR StoreServ Storage systems that have a combination of SSD physical drives and hard disk physical drives.

The features are installed on storage systems as part of certain versions of HPE 3PAR OS and do not require a license to use. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Adaptive Flash Cache extends the storage system DRAM cache by using a portion of the SSD physical drive capacity to cache the read requests for the hard disk physical drives. The storage system handles read requests using the DRAM cache up to 90 percent of DRAM utilization, and then small blocks (less than 64 KiB) of random read data are automatically moved to the SSD extended cache.

- Adaptive Flash Cache can be enabled for all virtual volumes on a storage system or for only the virtual volumes that are in virtual volume sets.
- A storage system must have at least 64 GiB of SSD space per controller node pair and must be configured in 16 GiB increments. The maximum SSD space in a configuration depends on the storage system model.
- A built-in simulation mode can be used in conjunction with the System Reporter *Adaptive Flash Cache - Performance Statistics* report to see how Adaptive Flash Cache would perform on a storage system that does not currently include SSD physical drives.

Adaptive Optimization overview

HPE 3PAR Adaptive Optimization software provides features for increasing the performance and cost effectiveness of HPE 3PAR StoreServ Storage systems.

These features are installed as part of the HPE 3PAR OS but require an HPE 3PAR Adaptive Optimization software license to use. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Adaptive Optimization can:

- Improve performance by moving frequently accessed data from low-performance storage to high-performance storage.
- Improve cost-effectiveness by moving less frequently accessed data from high-performance (higher-cost) storage to low-performance (lower-cost) storage.
- Balance performance and cost effectiveness.

Multiple user-defined Adaptive Optimization configurations can be created on a storage system with each configuration specifying two or three storage tiers. Learn more: **Adaptive Optimization storage tiers** on page 156.

When an Adaptive Optimization configuration is run, the access rates for the physical drives in each storage tier are analyzed and, if specified, the stored data is automatically moved between the tiers, based on the optimization mode. Learn more: **Adaptive Optimization modes** on page 155.

You can use HPE 3PAR SSMC to perform many Adaptive Optimization tasks. Learn more: **Storage Optimization screens, views, and actions summary** on page 88.

Adaptive Optimization modes

Adaptive Optimization modes include the following:

- The *performance mode* focuses on moving data from lower-performance tiers to higher-performance tiers.
- The *cost mode* focuses on moving data from higher-performance tiers (higher-cost physical drives) to lower-performance tiers (lower-cost physical drives).
- The *balanced mode* provides a balance between optimizing for performance and cost.

Adaptive Optimization storage tiers

- Storage tiers in each Adaptive Optimization configuration are numbered 0, 1, and 2. Tier 0 should be for high-performance storage, Tier 1 for mid-performance storage, and Tier 2 for low-performance storage. It is recommended that storage Tier 0 be used for SSD physical drives, Tier 1 for fast class (FC) physical drives, and Tier 2 for nearline (NL) physical drives. Learn more: **Physical drives and device types** on page 165.
- Each Adaptive Optimization configuration on a storage system must have at least two storage tiers. The maximum is three tiers.
- Each storage tier corresponds to a common provisioning group, and each common provisioning group can be a member of only one Adaptive Optimization configuration. For information on recommended common provisioning group sizes for tiers, see the *Adaptive Optimization for HPE 3PAR StoreServ Storage technical white paper*.
- Adaptive Optimization and data movements are based on factors that are tracked by HPE 3PAR System Reporter, such as the amount of space that is available in the storage tiers, the average service times, and the average access-rate densities.

Storage tier minimum and maximum space settings

The following space settings can be enabled and disabled for an AO storage tier:

Minimum space – Specifies the minimum size for the common provisioning group in an AO storage tier. AO movements of data between storage tiers will not cause the common provisioning group to fall below this size.

Maximum space – Specifies the maximum size for the common provisioning group in an AO storage tier. AO movements of data between storage tiers will not cause the common provisioning group to exceed this size.

Priority Optimization overview

HPE 3PAR Priority Optimization software provides I/O performance optimization features on HPE 3PAR StoreServ Storage systems.

These features are installed as part of the HPE 3PAR OS but require an HPE 3PAR Priority Optimization software license to use. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Priority Optimization policies can be created for a storage system, the virtual volume sets on a storage system, and the virtual domains on a storage system. Each policy can specify a priority, latency goal, maximum performance limits and minimum performance goals for the IOPS and bandwidth of the virtual volumes that are covered by the policy. When the limits and goals of a higher priority policy are not met, the storage system automatically throttles (reduces) the IOPS and bandwidth of the virtual volumes that are covered by the lower-priority policies. Learn more: **Priority Optimization policy settings** on page 157.

Other policy concepts:

- Individual policies can be enabled and disabled.
- A policy for a virtual domain applies to all of the virtual volumes in the domain.
- A policy for a virtual volume set applies to all of the virtual volumes in the set.
- To create a policy for a single virtual volume, the virtual volume must be the only member of a virtual volume set.
- Priority Optimization policies are also known as quality-of-service (QoS) rules.

You can use HPE 3PAR SSMC to perform many Priority Optimization tasks. Learn more: [Storage Optimization screens, views, and actions summary](#) on page 88.

Priority Optimization policy settings

Policy priority – Priority Optimization policies can have a priority of high, normal, or low. When a storage system gets busy, it can start to throttle (reduce) the IOPS, bandwidth, or both, of the virtual volumes that are covered by the lower priority policies. This is done to meet the latency goals of the higher priority policies.

- A priority setting of *high* should be used for critical applications. A setting of *normal* and *low* priority should be used for less critical applications.
- The priority settings are ignored if a storage system does not have any policies that specify a latency goal, IOPS minimum performance goal, or a bandwidth minimum performance goal.

Latency goal – A policy can specify a latency time goal (ms) for the virtual volumes that are covered by the policy. The latency goal is also known as a response time goal.

If a latency goal is specified in a policy, other policies must specify minimum performance goals so that the storage system can determine how much it can throttle the IOPS and bandwidth of the virtual volumes that are covered by the lower priority policies.

Maximum performance limits – A policy can specify the maximum performance limit for the virtual volumes in the policy target. A storage system throttles (reduces) the performance to prevent the maximum limits from being exceeded. Maximum performance limits can be specified for IOPS (IO/s), bandwidth (KB/s), or both.

Minimum performance goals – A policy can specify the minimum performance goal for the virtual volumes in the policy target. A storage system will not throttle (reduce) performance below the minimum goals in order to meet the latency goal of a higher priority policy. Minimum performance goals can be specified for IOPS (IO/s), bandwidth (KB/s), or both.

- If a policy specifies minimum performance goals for IOPS or bandwidth, then a maximum performance limit for IOPS or bandwidth must also be specified in the policy.
- IOPS and bandwidth minimum performance goals are ignored if the storage system does not have any policies that specify a latency goal.

Storage system concepts

These topics explain key concepts for HPE 3PAR StoreServ Storage system features.

Alerts

The HPE 3PAR SSMC interface displays the following types of HPE 3PAR StoreServ Storage system alerts:

		OK / normal alert – Indicates normal activity. No action is required.
		Critical alert – Indicates that <i>immediate</i> action is required to resolve an issue with a logical or physical component.
		Major, minor, degraded alert – Indicates that action is required to resolve an issue with a logical or physical component.

See also: [Alerts for physical drive raw space](#) on page 158, [Status and health states](#) on page 166.

Alerts for physical drive raw space

HPE 3PAR StoreServ Storage systems check every hour to see if the total available raw space on physical drives has fallen below system thresholds. Total raw space alerts are issued as follows:

Critical alert – 95% or more of physical drive raw space is allocated; 5% or less is free. Hewlett Packard Enterprise strongly recommends adding physical drive capacity as soon as possible to prevent write failures.

Major alert – 85% or more of physical drive raw space is allocated; 15% or less is free. Hewlett Packard Enterprise strongly recommends adding physical drive capacity as soon as possible.

Minor alert – 75% or more of physical drive raw space is allocated; 25% or less is free. Hewlett Packard Enterprise strongly recommends adding physical drive capacity.

Info alert – 50% or more of physical drive raw space is allocated; 50% or less is free. Hewlett Packard Enterprise recommends adding physical drive capacity.

See also: [Alerts](#) on page 157.

User-defined raw space alerts

User-defined raw space alerts can be established for physical drive device types. The thresholds can be set from 10 to 1,000,000 GiB using the HPE 3PAR MC Edit System dialog or using the HPE 3PAR CLI `setsys` commands. User-defined raw space alerts are issued at the same 95%, 85%, 75%, and 50% levels as the total system alerts.

Tips:

- When interpreting raw space alerts in HPE 3PAR SSMC, consider that user-defined raw space thresholds might have been set in other management software.
- The alerts for total physical drive raw space are always on and cannot be turned off. User-defined alerts for physical drive raw space can be turned on and off in the HPE 3PAR MC and HPE 3PAR CLI.

Analytics (Systems view)

The performance analytics feature monitors and analyzes saturation and performance of a storage system. The Analytics view in Systems screen displays charts for:

- Performance
- Saturation
- Volumes by latency
- Volume hotspots

Performance and saturation alerts

An SSMC alert is generated for the performance and saturation levels. The alert is generated when the storage system experiences either one of the following:

- Elevated service time in the past 24 hours.
- Elevated saturation levels in the past 24 hours.

Performance chart

The performance chart is displayed in the:

- Analytics view of Systems screen.
- The Performance Outliers panels in the Dashboard.

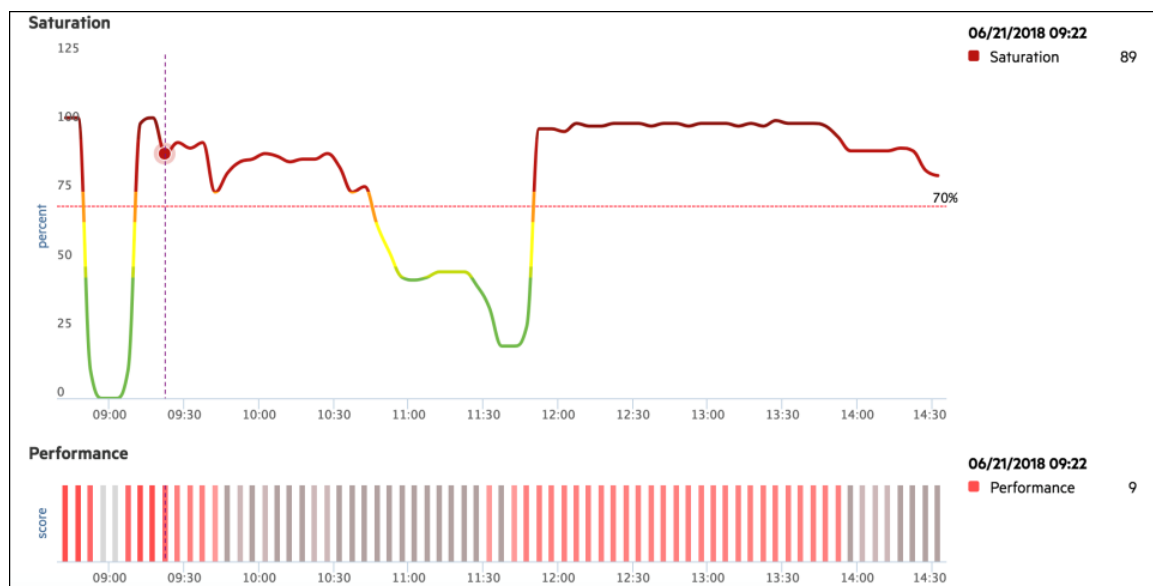


Figure 2: Performance chart

The performance chart (heat map) provides information about the:

- Periods of time when the performance is identified as outliers (latency is unusually high) for a particular workload.
- Periods of time when the hosts must have experienced high storage latency.

Latency

Latency (response time or the time taken to service an IO) is a measure of the performance of the system and depends on the:

- Storage system configuration
- Workload characteristics
- Current load

If the parameters that influence the metrics are known, you can calculate an approximate latency.

Performance/Latency score

Latency score is a comparison between the following:

- Measured latency of a storage system at a given point in time.
- Latency observed across storage systems with similar configuration and workload in the install base or the field.

The comparison determines if the value of the metric (latency) is optimal or unusual (an outlier). The latency score measures the relative severity of the latency that is reported by the storage system in comparison to the latency observed in the field. The performance chart reports the latency score for observations at 5 minute intervals. The observations are reported as column charts.

The latency score ranges from 0 to 10, where:

- 0 indicates that the latency reported by the storage system is observed in the field.
- 10 indicates that the latency is unusually high for the given workload characteristics.

Exceptions for the performance score (latency score)

- The performance score for a storage system reaching 100% saturation must be higher than 0 for the observations at that time. However, this score is not mandatory and a performance score 0 could indicate that the cache hit is beyond 50%.
- If the response time is expected to be in the similar range as observed in the field, the score might be still reported as 0 or a value closer to 0.
- If the storage system has a configuration which is resource-intensive (too many compressed volumes), the latency recorded might still be an outlier compared to the typical latency for the specific type of workload. In such scenarios, the performance score can be a higher value which is closer to 10.

Saturation chart

The saturation chart is displayed in the:

- Analytics view of Systems screen.
- The Top systems by saturation panel in the Dashboard for a single system.
- Overview View of Systems screen.

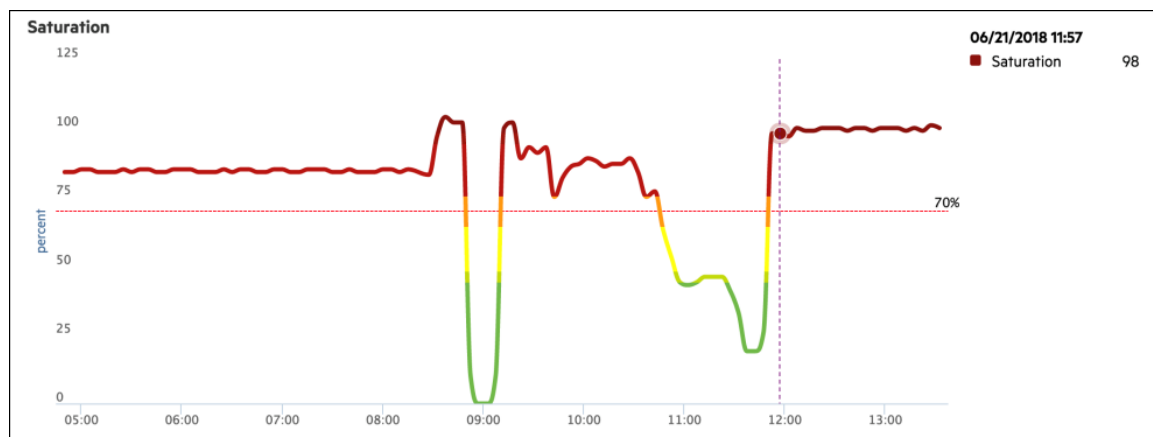


Figure 3: Saturation chart

The saturation chart provides an insight about the:

- Saturation levels of the storage system during the selected time interval.
- Periodicity in the change of saturation levels.

The saturation chart in the Analytics view indicates the saturation levels of the storage system that are measured using data samples from the selected time interval.

Calculating saturation level

Saturation level is calculated based on the following:

- Type of workload that is running on the storage system: The workload running on a storage system depends on the request size and the percentage of read and write throughput that is serviced by the system.
- Virtual volume types.
- Configuration of the storage system. The configuration depends on the following:
 - Model
 - Number of nodes
 - Drive type
 - Port type
 - Number of chassis
 - Volume type (compression, dedupe, thin, and so on)

The relevant metrics are measured at a 5 minute interval and the preferred throughput (number of inputs/outputs per second) is calculated. The throughput the storage system is able to deliver within a reasonable response time is defined as the preferred throughput. The preferred throughput is measured against the actual throughput that is being serviced by the storage system. The preferred throughput varies with the configuration and the type of workload that is running on the storage system. The ratio is represented as percentage in the line chart.

NOTE: Saturation levels can exceed 100%, if you have a storage system with lesser than the optimal number of drives. The preferred throughput is an indicator of the optimal threshold. The storage system is expected to perform appropriately when the saturation is within the optimal threshold. However, the system could still deliver more inputs/outputs per second beyond this level but the latency would be high.

Volumes by Latency

The volumes by latency chart display the top five virtual volumes ranked according to latency.

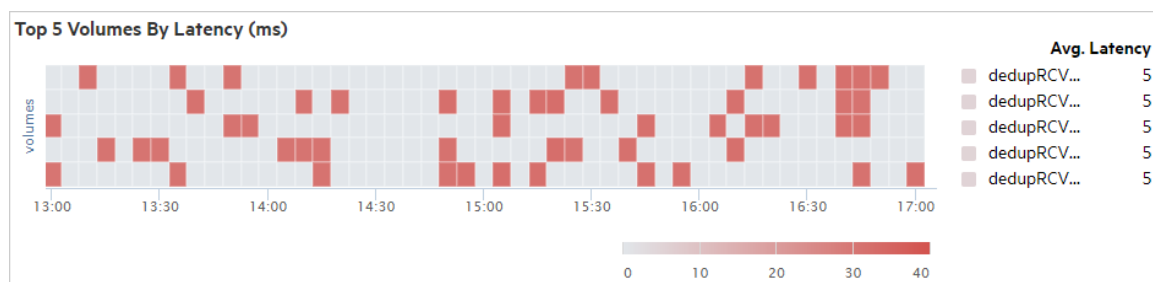


Figure 4: Volumes by latency

Volume hotspots

Hotspots are indicators to identify the saturation of a storage system. Hotspots provide information about:

- Objects or entities responsible for saturating specific resources in the storage system.
- Objects that are over saturated when compared to the similar objects in the storage system.

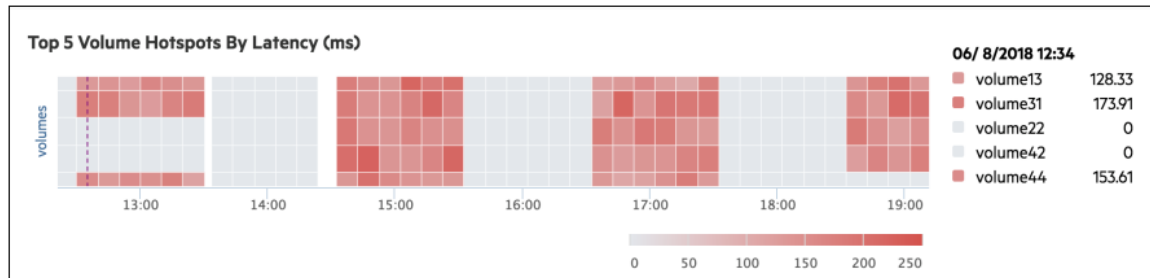


Figure 5: Volume hotspots by latency

Hotspots

Hotspots identify the virtual volumes that are under more stress when compared to the other virtual volumes in the storage system. The identification is done with respect to the virtual volume latency (response time). Hot spot identification is useful to point to the virtual volumes that are servicing intense workloads which may result in the overall load on a storage system. An intense workload on a virtual volume may not always lead to an overall storage system saturation.

Insights

You can view the performance insights by clicking on the virtual volume hotspot in the graph.

Calculating hotspot rank

The rank for the hotspots is calculated using the following measurements:

- The frequency with which the specific virtual volume appears as an outlier during each sampling interval over a given period of observation.
- The median value of the latencies reported by virtual volumes that are outliers during each sampling interval.

Example

Most of the virtual volumes in a storage system are reporting a latency of 3ms. There are few virtual volumes that report a latency higher than 9ms. Then the virtual volumes that report higher latency are considered as outliers.

The virtual volumes which appear frequently during each sampling interval (5 minute) are weighed against each other by their respective frequency of occurrence and ranked.

NOTE: Hotspots may not always be reported as there may not be outliers observed during a period of observation. For example, if all virtual volumes report latency values that are in proximity even if the latency is high, no hotspots are reported.

Capacity and space terminology

Allocated. The space that is used for chunklets. This includes chunklets that are used for logical drives, spares, and failed capacity.

Block (Persona). The space that is configured for HPE 3PAR Block Persona use.

File (Persona). The space that is configured for HPE 3PAR File Persona use.

Free. The portion of logical drive space that has not been reserved.

Grown. The user space or copy space that has been added to a virtual volume since it was created.

Raw reserved. The reserved space plus the RAID overhead.

Reclaimed. Indicates unused user space or copy space that has been reclaimed and made available to the storage system.

Reserved. The portion of logical drive space that has been mapped to virtual volumes, including the user space, copy space, and admin space of virtual volumes. It does not include the space for RAID overhead.

Savings (efficiency). The amount of free space in a thinly provisioned virtual volume. The free space in a thinly provisioned virtual volume represents the savings compared to the equivalent fully provisioned virtual volume.

System. The space that is used by the storage system for administrative functions.

Used. The portion of *reserved* space that has been used. When host applications write to virtual volumes, the affected *user*, *copy*, and *admin* spaces are counted as used space.

User space, copy space, admin space. Types of space in a virtual volume. Copy space is also known as snapshot space. Admin space contains snapshot metadata.

Virtual size. The size of a virtual volume that is displayed to host applications. The virtual size depends on RAID levels and does not have a correlation to physical drive space for the virtual volume.

Learn more: [Storage virtualization overview](#) on page 121, [Virtual volumes overview](#) on page 130, [Common provisioning groups](#) on page 125, [Logical drives](#) on page 126, [Chunklets](#) on page 124.

Capacity units

Storage capacity in HPE 3PAR SSMC can be displayed as MiB (mebibytes), GiB (gibibytes), TiB (tebibytes), or PiB (pebibytes).

1 MiB = 1,048,576 bytes (2^{20})

1 GiB = 1,073,741,824 bytes (2^{30}), or 1024 MiB

1 TiB = 1,099,511,627,776 bytes (2^{40}), or 1024 GiB

1 PiB = 1,125,899,906,842,624 bytes (2^{50}), 1024 TiB

Learn more: [Changing global settings](#) on page 36.

Controller nodes

Controller nodes can include power supplies, batteries, network adapter cards, microcontrollers, and fans. Fibre Channel, gigabit Ethernet, and iSCSI ports on controller nodes connect the storage system to networks, host computers, and other storage systems. The number of hardware controller nodes in HPE 3PAR StoreServ Storage models varies from two to eight per storage system.

Data-at-rest encryption overview

HPE 3PAR Data-at-rest Encryption software, in conjunction with self encrypting physical drives (SEDs), provides data encryption features on certain models of HPE 3PAR StoreServ Storage systems.

The features are installed with certain versions of HPE 3PAR OS but require an HPE 3PAR Data-at-rest Encryption license to protect an entire storage system. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Data on individual SED physical drives is encrypted automatically on the drive medium and no license is necessary. However, using the HPE 3PAR Data-at-rest Encryption license, and enabling encryption for a

storage system, logically binds the SED physical drives to the storage system. And the same encryption key is used for all physical drives.

A local encryption key manager is included in the HPE 3PAR OS. An encryption authentication key is kept on the storage system. However, Hewlett Packard Enterprise strongly recommends that you also use the HPE 3PAR SSMC **Export backup file** action to create a backup file of the authentication key. It is also recommended that you save the backup file externally from the storage system.

External key managers are also supported. HPE 3PAR SSMC includes actions for establishing connections to external encryption key management servers. Learn more: **Setting and checking EKM servers** on page 99.

Learn more: **Encrypting stored data** on page 95.

A storage system must be populated with only encryption-supported physical drives and cannot have a mix of encrypted and nonencrypted physical drives.

FIPS 140-2 compliance

Federal Information Processing Standard 140-2 defines four security levels for cryptographic modules. HPE 3PAR storage systems with SED physical drives are compliant with FIPS 140-2 level 2 when HPE 3PAR Data-at-rest Encryption software is licensed and enabled.

Drive enclosures and magazines

Physical drives are mounted in drive magazines that are mounted in drive enclosures. Drive enclosures are also known as cages.

Hardware UID/locator lights

HPE 3PAR StoreServ Storage systems and hardware components such as controller nodes, drive enclosures, magazines, and physical drives have UID/locator lights that you can turn on and off to help locate the components.

Tip: UID/locator lights availability and types can vary with storage system models, and use of the location feature can vary with user roles and domain permissions. For more information, see the *HPE 3PAR CLI Reference Manual*.

Learn more: **Locating hardware components** on page 96.

Licenses

License keys are required to enable licensed features on HPE 3PAR StoreServ Storage systems. You can use HPE 3PAR SSMC to add licenses to connected storage systems. Learn more: **Adding licenses** on page 92.

Printed license Entitlement Certificates for HPE 3PAR StoreServ Storage systems include an Entitlement Order Number. You can register licenses and receive license keys by browsing to **<http://www.hpe.com/support/hpesc>**. Under My Support Center, click **Manage my contracts and warranties**.

Persistent Ports functionality

HPE 3PAR Persistent Ports functionality works for FC, FCoE, and iSCSI host ports to provide uninterrupted failover in events such as:

- HPE 3PAR OS upgrade
- Maintenance that requires a controller node to be taken offline. For example, when adding a new HBA.
- A controller node failure

- Storage system loss of sync to an FC fabric
- Storage system host ports being deliberately taken offline

Prerequisites for the HPE 3PAR Persistent Ports functionality to work

For FC host ports:

- Connect the same host port on the host facing HBAs in a node pair to the same FC fabric. HPE recommends using different FC switches on the fabric (for example, 0:1:1 and 1:1:1).
- Set the host facing HBAs to Target mode.
- Configure the host facing HBAs for point-to-point connection (no support for loop).
- The FC fabric being used must support NPIV and have NPIV enabled.

For FCoE host ports:

- Connect the same Converged Network Adapter (CNA) port on host facing HBAs in a node pair to the same FCoE network. HPE recommends using different FCoE switches on the network (for example, 0:1:1 and 1:1:1).
- Set the host facing CNAs to Target mode.
- The FCoE network being used must support NPIV and have NPIV enabled.

For iSCSI host ports:

Connect the same host port on host facing CNAs in a node pair to the same IP network. HPE recommends using different IP switches on the fabric (for example, 0:1:1 and 1:1:1).

Each controller node in a storage system has a *native* identity and a *guest* identity. The Persistent Ports functionality redirects host I/O requests from a native host port on one controller node to the guest host port on the partner controller node in response to various events. The redirection is transparent to high-level host I/O and removes the need for host-level multipath software to respond to the events.

Physical drives and device types

Physical drives (also known as physical disks) are the hard drives and solid-state drives that are mounted in drive enclosures in HPE 3PAR StoreServ Storage systems. When physical drives are added to a storage system, HPE 3PAR operating systems automatically divide the physical drives into chunklets.

Physical drives are also characterized by device type.

Fast class (FC). Fibre Channel and SAS drives

Nearline (NL). Enterprise SATA drives

Solid-state drive (SSD). Solid-state disk drives

Learn more: [Storage virtualization overview](#) on page 121, [Chunklets](#) on page 124.

Ports

Storage system controller nodes use several port types and protocols to connect the storage system to networks, host computers, storage system components, and other systems.

- FC (Fibre Channel) ports connect controller nodes to hosts and drive enclosures.
- FCoE ports connect controller nodes to hosts.

- FSIP ports use gigabit Ethernet with HPE 3PAR File Persona software.
- iSCSI ports connect controller nodes to hosts. The iSCSI ports can only be used to connect a storage system to a host.
- RCFC ports use Fibre Channel to connect the primary and secondary storage systems in a Remote Copy configuration.
- RCIP ports use gigabit Ethernet to connect the primary and secondary storage systems in a Remote Copy configuration.
- SAS ports connect controller nodes to hosts and drive enclosures.

Status and health states

HPE 3PAR SSMC displays the following status and health states for logical and physical components:

	Creating – An animated in-progress icon indicates that HPE 3PAR SSMC is creating the resource.
	Critical – Indicates that a logical or hardware component has failed or is not operational.
	OK / normal – Indicates that a logical or hardware component is operating normally.
	Unknown – Indicates that the status or state of a logical or hardware component cannot be determined.
	Warning / Degraded – Indicates that a logical or hardware component is operational, but its performance is degraded or its high availability is at risk due to a single point of failure.

See also: [Alerts](#) on page 157, [Alerts for physical drive raw space](#) on page 158.

System tasks

System tasks are long-running tasks that are started by storage system processes or by users or scripts using HPE 3PAR CLI Task Manager commands. For more information, see the *HPE 3PAR Command Line Interface Administrator's Manual*.

You can remove and cancel system tasks from HPE 3PAR SSMC. Learn more: [Managing system alerts and tasks](#) on page 51.

System tuning

HPE 3PAR SSMC allows you to tune a storage system on demand. The tuning action analyzes the storage system virtual volumes, logical drives, and physical drives and then balances resources to deliver optimum performance.

Analysis and tuning are done in the background without impacting host I/O or changing storage characteristics such as RAID levels and device types. You can also **analyze** a storage system without performing a physical tune and review the analysis findings.

Tuning a storage system requires an HPE 3PAR System Tuner software license.

World Wide Names (WWNs)

A WWN is a unique identifier assigned to a device in a storage area network (SAN). Each WWN has 16 hexadecimal characters, consisting of a prefix issued by IEEE that identifies the company, and a suffix

issued by the company. HPE 3PAR SSMC can display WWNs in several formats, for example, 50002AC00049384F, 50002ac00049384f, 50002ac0 0049384f, and 50:00:2a:c0:00:49:38:4f.

Learn more: [Changing global settings](#) on page 36.

Federation Configuration concepts

These topics explain key concepts for Federation configuration features.

Federations configuration

HPE 3PAR StoreServ Storage federations provide features for non-disruptively migrating hosts, host sets, virtual volumes, virtual volume sets, and Remote Copy groups between storage systems. You can use HPE 3PAR SSMC to create and manage storage federations that include *federated storage systems* and *migration-source* storage systems.

A federated storage system has federation features that are installed as part of certain versions of HPE 3PAR OS and also has an HPE 3PAR Peer Motion software license. A *migration-source* storage system is not federation capable. Typically this is a legacy 3PAR storage system, or a third party storage system, that is not being managed by the instance of HPE 3PAR SSMC.

HPE 3PAR SSMC storage federation high-level concepts:

- **Caution:** Managing a storage federation with more than one instance of HPE 3PAR SSMC is not supported.
- An instance of HPE 3PAR SSMC can manage multiple storage federations, subject to the storage system limit per HPE 3PAR SSMC instance.
- A storage federation can include up to eight storage systems.
- A storage federation must include at least one federation-capable storage system and can include up to four federation-capable storage systems.
- The number of legacy migration-source storage systems in a storage federation counts against the storage system total for the federation.
- Storage system configuration settings and resources can be copied to storage federations.

Peer motion

HPE 3PAR Peer Motion software provides host and virtual volume migration features on HPE 3PAR storage federations.

These features are installed as part of certain versions of HPE 3PAR OS but require an HPE 3PAR Peer Motion software license to use.

You can use HPE 3PAR SSMC to perform Peer Motion online, non-disruptive migration of hosts, host sets, virtual volumes, and virtual volume sets between storage systems that are in a storage federation.

System Reporter basic concepts

These topics explain key concepts for HPE 3PAR SSMC System Reporter features.

Advanced Analytics (System Reporter)

The Advanced Analytics screen in System Reporter displays charts for:

- **Throughput:** Displays the read and write throughput at 5-minute intervals in a bar graph. The graph is color coded by read and write performance scores.
- **Latency:** Indicates the read and write latency of a storage system for a selected time period.
- **Workload outliers:** Highlights the host outliers over selected periods of time.

NOTE: If you configure System Reporter to view the samples at a frequency of less than 5 minutes, then there is a gap in the data measured in the samples. In this case, some of the data observations have a difference of less than 5 minutes and the others are 5 minutes apart.

Learn more: [Workload outliers](#) on page 168, [Performance chart](#) on page 159

Workload outliers

Outliers are displayed as a chart based on the hosts and measured against various categories such as:

- Host Service Time Read
- Host Service Time Write
- Host Read
- Host Write

The hosts are considered as outliers, when compared to the other active hosts connected to the storage system. The outliers report a significantly higher value for the above metrics.

The intensity of the color on the heat map is a measure of the value of the metric. An option is available on the chart to view the specific hosts and the volumes that were identified as outliers.

You can view the host and virtual volume details by clicking each of the host outliers in the Workload outliers chart as shown:



Figure 6: Workload outliers chart

System Reporter overview

HPE 3PAR System Reporter software provides features for generating storage system performance and utilization reports, and for creating user-defined storage system threshold alerts.

The features are installed on a storage system as part of certain versions of HPE 3PAR OS. Some reports are available for use without a license, but to use all of the reports and features an HPE 3PAR System Reporter license is required. For information regarding HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

You create System Reporter reports and threshold alerts from predefined templates, either using only the default options and metrics or by selecting specific options and metrics. Learn more: [Reports and templates overview](#) on page 170, [Threshold alerts and templates overview](#) on page 197.

The storage system performance data is collected automatically and stored in a database on the storage system. The database can retain years of data. Learn more: [System Reporter database volume](#) on page 169.

System Reporter database volume

The System Reporter database is located on the storage system in a virtual volume named `.srdata`.

The virtual volume and database are created during initialization of a storage system and data collection is begun immediately and continues automatically.

When the `.srdata` virtual volume is created, its size is:

- 60 GB (2 controller node systems)
- 80 GB (4 controller node systems)
- 100 GB (8 controller node systems)

If necessary, you can use HPE 3PAR SSMC to increase the size. Learn more: [Increasing the size of a System Reporter database volume](#) on page 105.

System Reporter reports concepts

These topics explain key concepts for HPE 3PAR SSMC System Reporter features.

Export and Import reports overview

If you are using multiple HPE 3PAR SSMC instances to manage the same set of storage systems, then you export reports from one HPE 3PAR SSMC instance and import the same into another. This option enables you to recreate the same set of reports in another HPE 3PAR SSMC instance which is used to maintain the same storage system.

The **Export reports** action exports configuration data of the report to a zip file for the selected storage systems. The compressed zip file is downloaded automatically to your system from where the export reports action was initiated.

The **Import reports** action imports the zip file with the configuration data of the self authored report. The reports are visible for the storage systems that are connected in HPE 3PAR SSMC.

Learn more: [Creating reports](#) on page 102, [Reports and templates overview](#) on page 170, [Report access types \(system, private, public\)](#) on page 170

Export reports to CSV

The **Export to CSV** action exports the performance data of the report in CSV format. The exported report is downloaded automatically to your system from where the **Export to CSV** action was initiated.

Learn more: [Creating reports](#) on page 102, [Reports and templates overview](#) on page 170, [Report access types \(system, private, public\)](#) on page 170, [Export and Import reports overview](#) on page 169

Export reports to PDF

The **Export to PDF** action exports the performance data along with report configuration details in PDF file format. The performance data is available in graphical (charts) representation. The exported report is downloaded automatically to your system from where the **Export to PDF** action was initiated.

Learn more: [Creating reports](#) on page 102, [Reports and templates overview](#) on page 170, [Report access types \(system, private, public\)](#) on page 170, [Export and Import reports overview](#) on page 169

Reports and templates overview

Report templates allow you to quickly create graphic reports of storage system capacities and performance.

The report templates contain predefined values for Time Period and Sampling, Objects, Chart Options, and other settings.

There are several ways to create reports:

- With the **Create** action, you can choose to create one report at a time. After you select a report template, you can review the report settings and accept or change the settings before you create the report.
- With the **Create multiple reports** action, you can choose to create multiple default reports at one time. You cannot review or change the report settings before you create the reports. The reports are created using all default settings. However, after default reports are created, you can edit and change the report settings.

Learn more: [Creating reports](#) on page 102, [System Reporter screens quick tour](#) on page 32, [Viewing System Reporter samples availability](#) on page 101.

Histogram reports – These reports include metric types for analyzing the distribution of I/O times and I/O size on a storage system. Learn more: [Histogram report templates](#) on page 171.

Historical capacity reports – These reports include metric types for analyzing storage system capacities and utilization. Learn more: [Historical capacity report templates](#) on page 173.

Historical performance reports – These reports include metric types for analyzing storage system performance over time. Learn more: [Historical performance report templates](#) on page 180.

Real time performance reports – These reports include metric types for analyzing storage system performance in real time. Learn more: [Real time performance report templates](#) on page 193.

Report templates availability

Some report templates are available for selection only if the required license is found for the selected storage system. For example, report templates for Remote Copy are listed only if the selected storage system has a Remote Copy license.

The availability of report templates also depends on the version of HPE 3PAR OS that is running on the selected storage system. For version support information, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

Report access types (system, private, public)

Reports can have one of the following access types:

System. A system report is a report that has been created automatically by a storage system. A system report is visible to all users of the storage system, but cannot be edited. Users with appropriate roles can delete a system report, which makes the report not visible to that user.

Private. A private report is a report that has been created by user and designated by that user as being private. A private report is visible only to the user that created the report. A private report can only be edited or deleted by the user that created the report.

Public. A public report is a report that has been created by a user and designated by that user as being public. A public report is visible to all users of the storage system, but the report can only be edited by the user that created the report. When a public report is deleted by the user that created the report, the report

is not visible to any users. And, the report is removed from the instance of HPE 3PAR SSMC. When a public report is deleted by another user, the report is not visible to that user.

Scheduled report files and email

- When HPE 3PAR SSMC runs a historical report on a schedule, copies of each report are saved and links to the reports are added to the Schedules detail view on the Reports screen.
- By default, scheduled reports are saved in PDF and CSV formats for seven days. You can use the Settings screen to change whether either file type is saved and to change the report file retention time.
- The default report files location is: `/opt/hpe/ssmc/ssmcbase/data/persist/scheduledreports`
- Rather than saving report files on the HPE 3PAR SSMC server, you can use the Settings screen to specify a shared directory for saving them. If the shared directory becomes inaccessible, the report files are saved in the default location on the HPE 3PAR SSMC server.

NOTE: To configure the shared directory path, create the directory under `/home/ssmcadmin`. The SSMC administrator has to provide appropriate permission to the new directory path: `chmod 777 /home/ssmcadmin/DirectoryName`. Directory name refers to the new directory that is created by the administrator.

Scheduled reports email

The HPE 3PAR SSMC server can be configured to automatically send scheduled reports by email to the recipients that you specify. When you create or edit a scheduled report, specify whether to email the report to the configured recipients.

Tip: Email server settings, from address, and email recipients are specified on the Settings screen.

Histogram report templates

The report templates for histogram reports include metric types for analyzing the distribution of I/O times and I/O sizes on a storage system. A list of histogram report templates follows.

- **Enclosure Port - IO Time & Size Distribution: report template** on page 171
- **Exported Volumes - IO Time & Size Distribution: report template** on page 172
- **Host Port - IO Time & Size Distribution: report template** on page 172
- **Physical Drive - IO Time & Size Distribution: report template** on page 172

Enclosure Port - IO Time & Size Distribution: report template

This template produces histogram reports for enclosure ports.

Summary

- Report template name: Enclosure Port - IO Time & Size Distribution
- Default report name: Enclosure Port Histogram
- Default charts (metrics): I/O time (0.50ms min to 64ms max), I/O size (4k min to 256k max)

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: Select object rules, port type = disk

Exported Volumes - IO Time & Size Distribution: report template

This template produces histogram reports for exported virtual volumes.

Summary

- Report template name: Exported Volumes - IO Time & Size Distribution
- Default report name: Exported Volumes Histogram
- Default charts (metrics): I/O time (0.50ms min to 64ms max), I/O size (4k min to 256k max)

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Host Port - IO Time & Size Distribution: report template

This template produces histogram reports for host ports.

Summary

- Report template name: Host Port - IO Time & Size Distribution
- Default report name: Host Port Histogram
- Default charts (metrics): I/O time (0.50ms min to 64ms max), I/O size (4k min to 256k max)

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: Select object rules, port type = host

Physical Drive - IO Time & Size Distribution: report template

This template produces histogram reports for physical drives.

Summary

- Report template name: Physical Drives - IO Time & Size Distribution
- Default report name: Physical Drive Histogram
- Default charts (metrics): I/O time (0.50ms min to 64ms max), I/O size (4k min to 256k max)

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Historical capacity report templates

The report templates for historical capacity reports include metric types for analyzing storage system capacities and utilization. A list of historical capacity report templates follows.

- **Adaptive Optimization - Space Moved: report template** on page 173
- **CPGs - Capacity: report template** on page 174
- **Physical Drive - Capacity: report template** on page 176
- **System Capacity: report template** on page 176
- **Virtual Volumes - Capacity: report template** on page 177

Adaptive Optimization - Space Moved: report template

This template produces historical capacity reports for storage space that has been moved in Adaptive Optimization configurations.

Summary

- Report template name: Adaptive Optimization - Space Moved
- Default report name: AO Space Moved
- Default charts (metrics): Space moved

Key default settings

- Report type: Time interval
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- %1(T0) -> %2(T1): Adaptive Optimization, percentage of space moved from tier 0 to tier 1.
- %1(T0) -> %2(T2): Adaptive Optimization, percentage of space moved from tier 0 to tier 2.
- %1(T1) -> %2(T0): Adaptive Optimization, percentage of space moved from tier 1 to tier 0.

- %1(T1) -> %2(T2): Adaptive Optimization, percentage of space moved from tier 1 to tier 2.
- %1(T2) -> %2(T0): Adaptive Optimization, percentage of space moved from tier 2 to tier 0.
- %1(T2) -> %2(T1): Adaptive Optimization, percentage of space moved from tier 2 to tier 1.
- Tier 0 -> 1: Adaptive Optimization, amount of space moved from tier 0 to tier 1.
- Tier 0 -> 2: Adaptive Optimization, amount of space moved from tier 0 to tier 2.
- Tier 1 -> 0: Adaptive Optimization, amount of space moved from tier 1 to tier 0.
- Tier 1 -> 2: Adaptive Optimization, amount of space moved from tier 1 to tier 2.
- Tier 2 -> 0: Adaptive Optimization, amount of space moved from tier 2 to tier 0.
- Tier 2 -> 1: Adaptive Optimization, amount of space moved from tier 2 to tier 1.

Learn more: **Capacity and space terminology** on page 162.

CPGs - Capacity: report template

This template produces historical capacity reports for common provisioning groups.

For storage systems with HPE 3PAR OS prior to 3.3.1

Summary for storage systems with HPE 3PAR OS prior to 3.3.1

- Report template name: CPGs - Capacity
- Default report name: CPG Space
- Default charts (metrics): CPG space allocation, CPG growth, Capacity efficiency
- Other charts (metrics): CPG space used vs free, Used space, Free space

Key default settings for storage systems with HPE 3PAR OS prior to 3.3.1

- Report type: Time interval
- Sampling: Daily
- Report duration (period): 3 months
- Objects: All objects

Key metric terms and descriptions for storage systems with HPE 3PAR OS prior to 3.3.1

- Admin Free Space: Amount of admin free space available for common provisioning group allocation.
- Admin Space: Amount of admin space available for currently allocated common provisioning groups.
- Admin Used Space: Amount of admin space currently used for common provisioning group allocation.
- Compaction Ratio: Ratio of the physical storage space that virtual volumes consume compared to their virtual size. The ratio applies to both thinly provisioned and thinly deduped virtual volumes.
- Dedup Ratio: Ratio of the physical storage space that would have been used without deduplication, compared to the physical storage space used by thinly deduped virtual volumes. The dedup ratio does not include savings from inline zero detection.
- Growth Space: Amount of space available for common provisioning group growth.

- Snap Free Space: Amount of raw snap (copy) space available for common provisioning group allocation.
- Snap Space: Amount of snap (copy) space available for currently allocated common provisioning groups.
- Snap Used Space: Amount of raw snap (copy) space currently used for common provisioning group allocation.
- User Space: Amount of user space available for currently allocated common provisioning groups.
- User Free Space: Amount of user free space available for common provisioning group allocation.
- User Used Space: Amount of user space currently used for common provisioning group allocation.
- Total Space: Total amount of space available for currently allocated common provisioning groups.
- Total Free Space: Total amount of free space available for common provisioning group allocation.
- Total Used Space: Total amount of space currently used for common provisioning group allocation.

For storage systems with HPE 3PAR OS 3.3.1 or later

Summary for storage systems with HPE 3PAR OS 3.3.1 or later

- Report template name: CPGs - Capacity
- Default report name: CPG Space
- Default charts (metrics): CPG growth, Capacity efficiency
- Other charts (metrics): CPG space used vs free, Data reduction

Key default settings for storage systems with HPE 3PAR OS 3.3.1 or later

- Report type: Time interval
- Sampling: Daily
- Report duration (period): 3 months
- Objects: All objects

Key metric terms and descriptions for storage systems with HPE 3PAR OS 3.3.1 or later

- Free Space: Total amount of free space available for common provisioning group allocation.
- Used Space: Total amount of space currently used for common provisioning group allocation.
- Total Space: Total amount of space available for currently allocated common provisioning groups.
- Growth Space: Amount of space available for common provisioning group growth.
- Dedup Ratio: Ratio of the physical storage space that would have been used without deduplication, compared to the physical storage space used by thinly deduplicated virtual volumes. The dedup ratio does not include savings from inline zero detection.
- Compression Ratio: Ratio of the physical storage space used after compressing virtual volumes, compared to the physical storage space that would have been used without compression.
- Data Reduction: Ratio of the physical storage space savings considering deduplication savings and compression savings.

- **Compaction Ratio:** Ratio of the physical storage space that virtual volumes consume compared to their virtual size. The ratio applies to both thinly provisioned and thinly deduplicated virtual volumes.
- **Overprovisioning Ratio:** Ratio of the total virtual volume virtual size to the physical storage space.

Learn more: [**Capacity and space terminology**](#) on page 162.

Physical Drive - Capacity: report template

This template produces historical capacity reports for physical drives.

Summary

- Report template name: Physical Drive - Capacity
- Default report name: Physical Drive Space
- Default charts (metrics): Chunklet usage

Key default settings

- Report type: Time interval
- Sampling: Daily
- Report duration (period): 3 months
- Objects: All objects

Key metric terms and descriptions

- **Normal available:** Normal available (unused) chunklets that have been cleaned (initialized).
- **Normal used:** Normal used chunklets that are OK.
- **Spare available:** Spare available (unused) chunklets that have been cleaned (initialized).
- **Spare used:** Spare used chunklets that are OK.
- **Total space in chunklets**

Learn more: [**Capacity and space terminology**](#) on page 162.

System Capacity: report template

This template produces historical capacity (space utilization) reports for storage systems.

Summary

- Report template name: System Capacity
- Default report name: System Capacity
- Default charts (metrics): Space utilization

Key default settings

- Report type: Time interval
- Sampling: Daily

- Report duration (period): 3 months
- Objects: All objects

Learn more: **Capacity and space terminology** on page 162.

Virtual Volumes - Capacity: report template

This template produces historical capacity reports for virtual volumes.

For storage systems with HPE 3PAR OS prior to 3.3.1

Summary for storage systems with HPE 3PAR OS prior to 3.3.1

- Report template name: Virtual Volumes - Capacity
- Default report name: VV Space
- Default charts (metrics): Space efficiency, used space, virtual size
- Other charts (metrics): Raw reserved space, Reserved space, VCopy space, Free space, Capacity efficiency

Key default settings for storage systems with HPE 3PAR OS prior to 3.3.1

- Report type: Time interval
- Sampling: Daily
- Report duration (period): 3 months
- Objects: All objects

Key metric terms and descriptions for storage systems with HPE 3PAR OS prior to 3.3.1

- Admin Free Space: Admin Rsvd Space that is not used. This is 0 (zero) for snapshots.
- Admin Raw Rsvd Space: Raw physical drive space that is reserved for the admin space (snapshot metadata) in a virtual volume. This is 0 (zero) for snapshots.
- Admin Rsvd Space: Space that is reserved for admin space in a virtual volume (Admin Used Space + Admin Free Space). This is 0 (zero) for snapshots.
- Admin Used Space: Admin space (snapshot metadata) space that is used by virtual volumes. This is 0 (zero) for snapshots.
- Admin Vcopy Space: Admin space that is used by snapshots only. This is 0 (zero) for all virtual volumes that are not snapshots. The value is calculated by running the HPE 3PAR CLI `updatesnapspace` command. HPE 3PAR System Reporter does not run this command. Beginning with HPE 3PAR OS 2.3.1, running the `updatesnapspace` command can be scheduled to run periodically.
- Compaction Ratio: Ratio of the physical storage space that virtual volumes consume compared to their virtual size. The ratio applies to both thinly provisioned and thinly deduped virtual volumes.
- Dedup Ratio: Ratio of the physical storage space that would have been used without deduplication, compared to the physical storage space used by thinly deduped virtual volumes. The dedup ratio does not include savings from inline zero detection.
- Snap Free Space: Snap space that is not used. This is 0 (zero) for snapshots.

- Snap Raw Rsvd Space: Raw physical drive space that is reserved for snap (copy) space in a virtual volume. This is 0 (zero) for snapshots.
- Snap Rsvd Space: Space that is reserved for snap (copy) space in a virtual volume (Snap Used Space + Snap Free Space). This is 0 (zero) for snapshots.
- Snap Used Space: Snap (copy) space that is used in a virtual volume. This is 0 (zero) for snapshots.
- Snap Vcopy Space: Snap (copy) space that is used in snapshots only. This is 0 (zero) for virtual volumes that are not snapshots. The value is calculated by running the HPE 3PAR CLI `updatesnapspace` command. HPE 3PAR System Reporter does not run this command. Beginning with HPE 3PAR OS 2.3.1, running the `updatesnapspace` command can be scheduled to run periodically.
- User Free Space: User space that is not used. This is 0 (zero) for snapshots.
- User Raw Rsvd Space: Raw physical drive space that is reserved for user space in a virtual volume. This is 0 (zero) for snapshots.
- User Used Space: User space that is used in a virtual volume. For fully provisioned virtual volumes, all User Rsvd Space is considered used. For thinly provisioned virtual volumes, only some portion of the User Rsvd Space can be used (the rest is User Free Space). This is 0 (zero) for snapshots.
- User Rsvd Space: Space that is reserved for user space in a virtual volume. This is 0 (zero) for snapshots.
- Total Raw Rsvd Space: Total raw physical drive space (User + Snap + Admin) that is reserved for a virtual volume. This is 0 (zero) for snapshots.
- Total Rsvd Space: Total reserved space for a virtual volume (User Rsvd Space + Snap Rsvd Space + Admin Rsvd Space). This is 0 (zero) for snapshots.
- Total Used Space: Total used space for a virtual volume (User Used Space + Snap Used Space + Admin Used Space). This is 0 (zero) for snapshots.
- Total Vcopy Space: Total (Snap + Admin) Vcopy space used by snapshots only. This is 0 (zero) for all virtual volumes that are not snapshots. The value is calculated by running HPE 3PAR CLI `updatesnapspace` command. HPE 3PAR System Reporter does not run this command. Beginning with the HPE 3PAR OS 2.3.1, running the `updatesnapspace` command can be scheduled to run periodically.

For storage systems with HPE 3PAR OS 3.3.1 or later

Summary for storage systems with HPE 3PAR OS 3.3.1 or later

- Report template name: Virtual Volumes - Capacity
- Default report name: VV Space
- Default charts (metrics): Space efficiency, Used space, Virtual size
- Other charts (metrics): Raw reserved space, Reserved space, VCopy space, Free space, Capacity efficiency

Key default settings for storage systems with HPE 3PAR OS 3.3.1 or later

- Report type: Time interval
- Sampling: Daily

- Report duration (period): 3 months
- Objects: All objects

Key metric terms and descriptions for storage systems with HPE 3PAR OS 3.3.1 or later

- **Compaction Ratio:** Ratio of the physical storage space that virtual volumes consume compared to their virtual size. The ratio applies to both thinly provisioned and thinly deduplicated virtual volumes.
- **Snap Free Space:** Snap space that is not used. This is 0 (zero) for snapshots.
- **Compression Ratio:** Ratio of the physical storage space used after compressing virtual volumes, compared to the physical storage space that would have been used without compression.
- **Host Writes:** Amount of unique space written by hosts to the virtual volume.
- **Snap Free Space:** Snap space that is not used. This is 0 (zero) for snapshots.
- **Snap Raw Rsvd Space:** Raw physical drive space that is reserved for snap (copy) space in a virtual volume. This is 0 (zero) for snapshots.
- **Snap Rsvd Space:** Space that is reserved for snap (copy) space in a virtual volume (Snap Used Space + Snap Free Space). This is 0 (zero) for snapshots.
- **Snap Used Space:** Snap (copy) space that is used in a virtual volume. This is 0 (zero) for snapshots.
- **Snap Vcopy Space:** Snap (copy) space that is used in snapshots only. This is 0 (zero) for virtual volumes that are not snapshots. The value is calculated by running the HPE 3PAR CLI `updatesnapspace` command. HPE 3PAR System Reporter does not run this command. Beginning with HPE 3PAR OS 2.3.1, running the `updatesnapspace` command can be scheduled to run periodically.
- **User Free Space:** User space that is not used. This is 0 (zero) for snapshots.
- **User Raw Rsvd Space:** Raw physical drive space that is reserved for user space in a virtual volume. This is 0 (zero) for snapshots.
- **User Used Space:** User space that is used in a virtual volume. For fully provisioned virtual volumes, all User Rsvd Space is considered used. For thinly provisioned virtual volumes, only some portion of the User Rsvd Space can be used (the rest is User Free Space). This is 0 (zero) for snapshots.
- **User Rsvd Space:** Space that is reserved for user space in a virtual volume. This is 0 (zero) for snapshots.
- **Total Raw Rsvd Space:** Total raw physical drive space (User + Snap + Admin) that is reserved for a virtual volume. This is 0 (zero) for snapshots.
- **Total Rsvd Space:** Total reserved space for a virtual volume (User Rsvd Space + Snap Rsvd Space + Admin Rsvd Space). This is 0 (zero) for snapshots.
- **Total Used Space:** Total used space for a virtual volume (User Used Space + Snap Used Space + Admin Used Space). This is 0 (zero) for snapshots.
- **Total Vcopy Space:** Total (Snap + Admin) Vcopy space used by snapshots only. This is 0 (zero) for all virtual volumes that are not snapshots. The value is calculated by running HPE 3PAR CLI `updatesnapspace` command. HPE 3PAR System Reporter does not run this command. Beginning with the HPE 3PAR OS 2.3.1, running the `updatesnapspace` command can be scheduled to run periodically.

Learn more: **Capacity and space terminology** on page 162.

Historical performance report templates

The report templates for historical performance reports include metric types for analyzing storage system performance over time. A list of historical performance report templates follows.

- **Adaptive Flash Cache - Performance Statistics: report template** on page 180
- **Adaptive Optimization - Cumulative IO Density: report template** on page 181
- **Adaptive Optimization - IO Density: report template** on page 181
- **Controller Node Cache - Performance Statistics: report template** on page 182
- **Controller Node CPU - Compare by Performance Statistics: report template** on page 183
- **Controller Node CPU - Performance Statistics: report template** on page 183
- **CPG - Cumulative IO Density: report template** on page 184
- **CPG - IO Density: report template** on page 184
- **Enclosure Port - Performance Statistics: report template** on page 185
- **Exported Volumes - Compare by Performance Statistics: report template** on page 185
- **Exported Volumes - Performance Statistics: report template** on page 185
- **File Persona CPU Utilization - Performance Statistics: report template** on page 186
- **File Persona Memory - Performance Statistics: report template** on page 186
- **File Persona Networking - Performance Statistics: report template** on page 187
- **FPG - Performance Statistics: report template** on page 187
- **Host Port - Compare by Performance Statistics: report template** on page 188
- **Host Port - Performance Statistics: report template** on page 188
- **NFS Protocol - Performance Statistics: report template** on page 189
- **Physical Drive - Compare by Performance Statistics: report template** on page 189
- **Physical Drive - Performance Statistics : report template** on page 190
- **Priority Optimization - Performance Statistics: report template** on page 190
- **Remote Copy Links - Performance Statistics: report template** on page 191
- **Remote Copy Volumes - Performance Statistics: report template** on page 191
- **SMB Protocol - Performance Statistics: report template** on page 192
- **System Report - Performance Summary: report template** on page 192
- **Virtual Volumes - Performance Statistics : report template** on page 193

Adaptive Flash Cache - Performance Statistics: report template

This template produces historical performance reports for Adaptive Flash Cache configurations.

Summary

- Report template name: Adaptive Flash Cache - Performance Statistics
- Default report name: Adaptive Flash Cache - Performance

- Default charts (metrics): Flash cache hit percentage, flash cache used percentage, node cache hit percentage
- Other charts (metrics): Access count, IOPs, Bandwidth, Flash cache queue, Node cache queue

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Adaptive Optimization - Cumulative IO Density: report template

This template produces historical cumulative I/O density performance reports for Adaptive Optimization configurations.

Summary

- Report template name: Adaptive Optimization - Cumulative IO Density
- Default report name: AOCFG - Cumulative IO Density
- Default charts (metrics): Cumulative region IO density

Key default settings

- Report type: Time interval
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Cumulative Access Rate: Cumulative access rate for an Adaptive Optimization configuration.
- Cumulative Space: Cumulative access space for an Adaptive Optimization configuration.

Adaptive Optimization - IO Density: report template

This template produces historical I/O density performance reports for Adaptive Optimization configurations.

Summary

- Report template name: Adaptive Optimization - IO Density
- Default report name: AOCFG - IO Density
- Default charts (metrics): Space, IO Time

Key default settings:

- Report type Time interval
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- IO/min: Number of I/O operations per minute (I/O density).
- Percentage IO: I/O operations as a percentage (cumulative I/O time).
- Space: Adaptive Optimization cumulative space.
- Percentage space: Percentage of Adaptive Optimization cumulative space.

Controller Node Cache - Performance Statistics: report template

This template produces historical performance reports for controller node caches.

Summary

- Report template name: Controller Node Cache - Performance Statistics
- Default report name: Controller Node Cache Performance
- Default charts (metrics): Hit percentage, delay ack
- Other charts (metrics): Access count, Locked blocks, Page states, Dirty pages, Max dirty pages

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Clean: Number of clean cache pages (valid data on page).
- FC 10K, FC 15K: Fibre Channel drives, speed 10K, 15K.
- Free: Free space for the cache.
- Lock blk/s: Number of locked blocks.
- NL: Nearline drive.
- Read hits/s: Number of reads that hit in the node cache.
- Read miss/s: Number of reads that miss in the node cache.
- Reads/s: Percentage of reads (out of total reads) that hit in the cache.
- Recov: During node down, the number of dead node pages that were recovered and must be written to disk.
- SSD 100K, SSD 150K: Solid-state drives, speed 100K, 150K.

- Write1: Number of dirty pages that have been modified exactly 1 time. A page is dirty when it has been modified in cache but has not been written to physical drives.
- WriteN: Number of dirty pages that have been modified more than 1 time.
- Write hits/s: Number of writes for which the page is already in cache and is dirty. Dirty refers to previously written data that has not been flushed to physical drives.
- Writes/s: Percentage of writes (out of total writes) that hit in the cache.
- Write miss/s: Number of writes that miss in the cache. A write is considered a miss if the page is not in the cache or if the page is not dirty in the cache. Dirty refers to previously written data that has not been flushed to physical drives.
- Write scheduled: Number of pages scheduled to be written to physical drives.
- Writing: Number of pages currently being written by the flusher to physical drives.

Controller Node CPU - Compare by Performance Statistics: report template

This template produces historical performance comparison reports for controller node CPUs.

Summary

- Report template name: Controller Node CPU - Compare by Performance Statistics
- Default report name: CPU Compare by Performance
- Default charts (metrics): Time
- Other charts (metrics): Interrupts, Context switches

Key default settings

- Compare by: Top 10, User time
- Report type: Time interval
- Sampling: Hi-res
- Report duration (period): 1 day
- Objects: All objects

Controller Node CPU - Performance Statistics: report template

This template produces historical performance reports for controller node CPUs.

Summary

- Report template name: Controller Node CPU - Performance Statistics
- Default report name: CPU Performance
- Default charts (metrics): Time
- Other charts (metrics): Interrupts, Context switches

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

CPG - Cumulative IO Density: report template

This template produces historical cumulative I/O density performance reports for common provisioning groups.

Summary

- Report template name: CPG - Cumulative IO Density
- Default report name: CPG - Cumulative IO Density
- Default charts (metrics): Cumulative region IO density

key default settings

- Report type: Time interval
- Report duration (period): 1 week
- Objects: Select objects = CPGs

Key metric terms and descriptions

- Cumulative Access Rate: Cumulative access rate for a CPG.
- Cumulative Space: Cumulative access space for a CPG.

CPG - IO Density: report template

This template produces historical I/O density performance reports for common provisioning groups.

Summary

- Report template name: CPG - IO Density
- Default report name: CPG - IO Density
- Default charts (metrics): Space, IO Time

Key default settings

- Report type: Time interval
- Report duration (period): 1 week
- Objects: Select objects = CPGs

Key metric terms and descriptions

- IO/min: Number of I/O operations per minute (I/O density).
- Percentage IO: IO operations in percentage (cumulative I/O time).

- Space: CPG cumulative space.
- Percentage space: Percentage of CPG cumulative space.

Enclosure Port - Performance Statistics: report template

This template produces historical performance reports for enclosure ports.

Summary

- Report template name: Enclosure Port - Performance Statistics
- Default report name: Enclosure Port Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, Queue length, Average busy

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: Select object rules, port type = disk

Exported Volumes - Compare by Performance Statistics: report template

This template produces historical performance comparison reports for exported virtual volumes.

Summary

- Report template name: Virtual Volumes - Compare by Performance Statistics
- Default report name: Exported Volumes Compare by Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, Queue length, Average busy

Key default settings

- Compare by: Top 10, Total IOPs
- Report type: Time interval
- Sampling: Hi-res
- Report duration (period): 6 hours
- Objects: All objects

Exported Volumes - Performance Statistics: report template

This template produces historical performance reports for exported virtual volumes.

Summary

- Report template name: Exported Volumes - Performance Statistics
- Default report name: Exported Volumes Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, Queue length, Average busy

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Length: Queue length at the sample time. The queue length is an instantaneous measure at the sample time, not an average over the sample interval. Due to the way that RCFC ports process data, the queue length might not be a valid measure.
- Avg busy: The percentage of time that a resource (object) is busy (has at least one outstanding I/O operation). This is not the same as the percentage of available bandwidth that is being used. For example, a port shown as 50% busy might have much less than 50% of its bandwidth utilized. This is because the port might be idle for a substantial period of time between the request and the response. For RCFC ports, the value is always 100%.

File Persona CPU Utilization - Performance Statistics: report template

This template produces historical performance reports for File Persona CPU utilization.

Summary

- Report template name: File Persona CPU Utilization - Performance Statistics
- Default report name: File Persona CPU Utilization Performance
- Default charts (metrics): CPU Utilization

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

File Persona Memory - Performance Statistics: report template

This template produces historical performance reports for File Persona memory utilization.

Summary

- Report template name: File Persona Memory - Performance Statistics
- Default report name: File Persona Memory Performance
- Default charts (metrics): Memory Utilization

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

File Persona Networking - Performance Statistics: report template

This template produces historical performance reports for File Persona networking.

Summary

- Report template name: File Persona Networking - Performance Statistics
- Default report name: File Persona Networking Performance
- Default charts (metrics): Bytes, Packets

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

FPG - Performance Statistics: report template

This template produces historical performance reports for File Persona file provisioning groups.

Summary

- Report template name: FPG - Performance Statistics
- Report name: FPG Performance
- Default charts (metrics): Bytes, packets, latency
- Other charts (metrics): Operations, blocks

Key default settings

- Report type: Time interval
- Sampling: Hourly

- Report duration (period): 1 week
- Objects: All objects

Host Port - Compare by Performance Statistics: report template

This template produces historical performance comparison reports for host ports.

Summary

- Report template name: Host Port - Compare by Performance Statistics
- Default report name: Host Port Compare by Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, Queue length, Average busy

Key default settings

- Compare by: Top 10, Total IOPs
- Report type: Time interval
- Sampling: Hi-res
- Report duration (period): 6 hours
- Objects: All objects

Host Port - Performance Statistics: report template

This template produces historical performance reports for host ports.

Summary

- Report template name: Host Port - Performance Statistics
- Default report name: Host Port Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, queue length, average busy

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: Object rules, port type = host

Key metric terms and descriptions

- **Length:** Queue length at the sample time. The queue length is an instantaneous measure at the sample time, not an average over the sample interval. Due to the way that RCFC ports process data, the queue length might not be a valid measure.
- **Avg busy:** The percentage of time that a resource (object) is busy (has at least one outstanding I/O operation). This is not the same as the percentage of available bandwidth that is being used. For example, a port shown as 50% busy might have much less than 50% of its bandwidth utilized. This is because the port might be idle for a substantial period of time between the request and the response. For RCFC ports, the value is always 100%.

NFS Protocol - Performance Statistics: report template

This template produces historical performance reports for File Persona NFS protocol file sharing.

Summary

- Report template name: NFS Protocol - Performance Statistics
- Default report name: NFS Protocol Performance
- Default charts (metrics): RPC stats, V3 operations, V4 operations
- Other charts (metrics): V3 read dir stats, V4 read dir stats

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Physical Drive - Compare by Performance Statistics: report template

This template produces historical performance comparison reports for physical drives.

Summary

- Report template name: Physical Drive - Compare by Performance Statistics
- Default report name: Physical Drive Compare by Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, Queue length, Average busy

Key default settings

- Compare by: Top 10, Total IOPs
- Report type: Time interval
- Sampling: Hi-res
- Report duration (period): 6 hours
- Objects: All objects

Physical Drive - Performance Statistics : report template

This template produces historical performance reports for physical drives.

Summary

- Report template name: Physical Drive - Performance Statistics
- Default report name: Physical Drive Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, queue length, average busy

Key default settings:

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Length: Queue length at the sample time. The queue length is an instantaneous measure at the sample time, not an average over the sample interval. Due to the way that RCFC ports process data, the queue length might not be a valid measure.
- Avg busy: The percentage of time that a resource (object) is busy (has at least one outstanding I/O operation). This is not the same as the percentage of available bandwidth that is being used. For example, a port shown as 50% busy might have much less than 50% of its bandwidth utilized. This is because the port might be idle for a substantial period of time between the request and response. For RCFC ports, the value is always 100%.

Priority Optimization - Performance Statistics: report template

This template produces historical performance reports for Priority Optimization configurations.

Summary

- Report template name: Priority Optimization - Performance Statistics
- Default report name: Priority Optimization
- Default charts (metrics): IOPs, service time, bandwidth, rejection
- Other charts (metrics): Wait time, I/O size, queue length

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Remote Copy Links - Performance Statistics: report template

This template produces historical performance reports for Remote Copy links.

Summary

- Report template name: Remote Copy Links - Performance Statistics
- Default report name: Remote Copy Links
- Default charts (metrics): Link throughput, link heart beat
- Other charts (metrics): Transmitted data

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Receive: Aggregate of incoming data from the targets.
- Round trip time: Aggregate of round-trip times of all targets.
- Send: Aggregate of outgoing data to the targets.

Remote Copy Volumes - Performance Statistics: report template

This template produces historical performance reports for Remote Copy virtual volumes.

Summary

- Report template name: Remote Copy Volumes - Performance Statistics
- Report name: Remote Copy Volumes
- Default charts (metrics): IOPS, service time, bandwidth
- Other charts (metrics): I/O size, queue length, average busy

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

Key metric terms and descriptions

- Length: Queue length at the sample time. The queue length is an instantaneous measure at the sample time, not an average over the sample interval. Due to the way that RCFC ports process data, the queue length might not be a valid measure.
- Avg busy: The percentage of time that a resource (object) is busy (has at least one outstanding I/O operation). This is not the same as the percentage of available bandwidth that is being used. For example, a port shown as 50% busy might have much less than 50% of its bandwidth utilized. This is because the port might be idle for a substantial period of time between the request and response. For RCFC ports, the value is always 100%.

SMB Protocol - Performance Statistics: report template

This template produces historical performance reports for File Persona SMB protocol file sharing.

Summary

- Report template name: SMB Protocol - Performance Statistics
- Default report name: SMB Protocol Performance
- Default charts (metrics): Round trip response time, operations
- Other charts (metrics): Round trip packets, total operations

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All objects

System Report - Performance Summary: report template

This template produces reports that summarize the historical performance of key components in a storage system.

Summary

- Report template name: System Report - Performance Summary
- Default report name: System Performance Report
- Default components and metrics
 - Exported Volumes: IOPs, service time, bandwidth
 - Host Ports: IOPs, service time, bandwidth
 - Hosts: IOPs, service time, bandwidth
 - Node Cache: Hit percentage, delay ack
 - Node CPU: Time, interrupts, context switches
 - Physical Drives: IOPs, service time, bandwidth

Key default settings

- Report type: Time interval
- Sampling: Hi-res
- Report duration (period): 4 hours

Virtual Volumes - Performance Statistics : report template

This template produces historical performance reports for virtual volumes.

Summary

- Report template name: Virtual Volumes - Performance Statistics
- Default report name: Virtual Volume Performance
- Default charts (metrics): IOPs, service time, bandwidth
- Other charts (metrics): I/O size, queue length, average busy

Key default settings

- Report type: Time interval
- Sampling: Hourly
- Report duration (period): 1 week
- Objects: All Objects

Real time performance report templates

The report templates for real time reports include metric types for analyzing storage system performance in real time. A list of real time performance report templates follows.

- **Exported Volumes - Real Time Performance Statistics: report template** on page 193
- **Multiple Components - Real Time Performance Statistics: report templates** on page 194
- **Physical Drive - Real Time Bar Performance Statistics: report template** on page 195
- **Physical Drive - Real Time Performance Statistics: report template** on page 195
- **Port (Control) - Real Time Performance Statistics: report template** on page 196
- **Port (Data) - Real Time Performance Statistics: report template** on page 196

Exported Volumes - Real Time Performance Statistics: report template

This template produces real time performance reports for exported virtual volumes.

Summary

- Report template name: Exported Volumes - Real Time Performance Statistics
- Default report name: Real Time Exported Volumes Performance
- Objects, metrics, and metric types are user specified. Metric choices are IO/s, IO size, bandwidth, and service time. Metric type choices are read, write, and total.

Key default settings

- Report type: Time continuum
- Polling interval: 5 seconds

Multiple Components - Real Time Performance Statistics: report templates

This template produces real time performance reports for comparing multiple component types. You can also use the template to create real time reports for a single component type.

Summary

- Report template name: Multiple Components - Real Time Performance Statistics
- Default report name: Real Time Compare Components
- Objects for components, metrics, and metric types are user specified. Metrics and types choices vary with the component types. Component types that can be selected include: Node cache, Node CPU, Physical drives, Ports (data), Ports (control), iSCSI ports, Priority Optimization, Exported volumes, Remote copy volumes, Remote copy links, Virtual volumes, and Virtual volume cache.

Key default settings

- Report type: Time continuum
- Polling interval: 5 seconds

Key metric terms and descriptions for iSCSI ports, Ethernet protocol

- Rx Packets/Sec (Ethernet): Number of packets received per second in Ethernet protocol.
- Tx Packets/Sec (Ethernet): Number of packets transmitted per second in Ethernet protocol.
- Total Rx/Tx Packets/Sec (Ethernet): Number of packets received and transmitted per second in Ethernet protocol.
- Rx Bytes/Sec (Ethernet): Number of bytes received per second in Ethernet protocol.
- Tx Bytes/Sec (Ethernet): Number of bytes transmitted per second in Ethernet protocol.
- Total Rx/Tx Bytes/Sec (Ethernet): Number of bytes received and transmitted per second in Ethernet protocol.
- Errors/Sec (Ethernet): Number of errors received per second in Ethernet protocol.

Key metric terms and descriptions for iSCSI ports, IP protocol

- Rx Packets/Sec (IP): Number of packets received per second in IP protocol.
- Tx Packets/Sec (IP): Number of packets transmitted per second in IP protocol.
- Total Rx/Tx Packets/Sec (IP): Number of packets received and transmitted per second in IP protocol.
- Rx Bytes/Sec (IP): Number of bytes received per second in IP protocol.
- Tx Bytes/Sec (IP): Number of bytes transmitted per second in IP protocol.
- Total Rx/Tx Bytes/Sec (IP): Number of bytes received and transmitted per second in IP protocol.
- Errors/Sec (IP): Number of errors received per second in IP protocol.

Key metric terms and descriptions for iSCSI ports, TCP protocol

- Rx Packets/Sec (TCP): Number of packets received per second in TCP protocol.
- Tx Packets/Sec (TCP): Number of packets transmitted per second in TCP protocol.
- Total Rx/Tx Packets/Sec (TCP): Number of packets received and transmitted per second in TCP protocol.
- Rx Bytes/Sec (TCP): Number of bytes received per second in TCP protocol.
- Tx Bytes/Sec (TCP): Number of bytes transmitted per second in TCP protocol.
- Total Rx/Tx Bytes/Sec (TCP): Number of bytes received and transmitted per second in TCP protocol.
- Errors/Sec (TCP): Number of errors received per second in TCP protocol.

Key metric terms and descriptions for iSCSI ports, iSCSI protocol

- Rx Packets/Sec (iSCSI): Number of packets received per second in iSCSI protocol.
- Tx Packets/Sec (iSCSI): Number of packets transmitted per second in iSCSI protocol.
- Total Rx/Tx Packets/Sec (iSCSI): Number of packets received and transmitted per second in iSCSI protocol.
- Rx Bytes/Sec (iSCSI): Number of bytes received per second in iSCSI protocol.
- Tx Bytes/Sec (iSCSI): Number of bytes transmitted per second in iSCSI protocol.
- Total Rx/Tx Bytes/Sec (iSCSI): Number of bytes received and transmitted per second in iSCSI protocol.
- Errors/Sec (iSCSI): Number of errors received per second in iSCSI protocol.

Physical Drive - Real Time Bar Performance Statistics: report template

This template produces real time bar graph performance reports for physical drives. Only the latest sample data is plotted.

Summary

- Report template name: Physical Drive - Real Time Bar Performance Statistics
- Default report name: Real Time Physical Drive Performance Latest Data
- Objects, metrics, and metric types are user specified. Metric choices are IO/s, IO size, bandwidth, and service time. Metric type choices are read, write, and total.
- Total IOPs are aggregated for all physical drives.

Key default settings

- Report type: Most recent sample
- Polling interval: 5 seconds

Physical Drive - Real Time Performance Statistics: report template

This template produces real time performance reports for physical drives.

Summary

- Report template name: Physical Drive - Real Time Performance Statistics
- Default report name: Real Time Physical Drive Performance
- Object, metrics, and metric types are user specified. Metric choices are IO/s, IO size, bandwidth, and service time. Metric type choices are read, write, and total.

Key default settings

- Report type: Time continuum
- Polling interval: 5 seconds

Port (Control) - Real Time Performance Statistics: report template

This template produces real time performance reports for ports (control).

Summary

- Report template name: Port (control) - Real Time Performance Statistics
- Default report name: Real Time Port Control Performance
- Objects, metrics, and metric types are user specified. Metric choices are IO/s, IO size, bandwidth, and service time. Metric type choices are read, write, and total.

Key default settings

- Report type: Time continuum
- Polling interval: 5 seconds

Port (Data) - Real Time Performance Statistics: report template

This template produces real time performance reports for ports (data).

Summary

- Report template name: Port (Data) - Real Time Performance Statistics
- Default report name: Real Time Port Data Performance
- Objects, metrics, and metric types are user specified. Metric choices are IO/s, IO size, bandwidth, and service time. Metric type choices are read, write, and total.

Key default settings

- Report type: Time continuum
- Polling interval: 5 seconds

System Reporter threshold alerts concepts

These topics explain key concepts for HPE 3PAR SSMC System Reporter threshold alert features.

Threshold alerts and templates overview

Threshold alert templates allow you to quickly create alerts that help identify performance issues on a storage system. Many threshold alert templates provide default metrics and values; however, you can also change the metrics and values when you create the alert. Threshold alert templates are available only for storage systems that have the required System Reporter license.

Threshold alert templates

- **Controller nodes threshold alert templates** on page 198
- **Exported volumes threshold alert templates** on page 199
- **Physical drives threshold alert templates** on page 200
- **Port threshold alert templates** on page 202
- **Other threshold alert templates** on page 203

Threshold alert operators

Threshold alerts and templates use the following operators:

Symbol	Operator
<	Less than
<=	Less than or equal
>	Greater than
>=	Greater than or equal
=	Equal
!=	Not equal

Alert on object count setting

When *Alert on object count* is *disabled*, an alert is generated for each object that meets the conditions. When the *Alert on object count* is *enabled*, a single alert is generated when the specified number of objects meets the conditions.

For example, assume that an Exported Volumes threshold alert has a metric of Average Busy greater than 50%, and the storage system has 24 virtual volumes that meet the criteria.

If the *Alert on object count* is *disabled*, there would be 24 separate alerts.

If the *Alert on object count* is *enabled* and the count is set to 10, there would be a single alert, indicating that 10 or more virtual volumes have meet the criteria.

If the *Suspend repeat alerts* is *enabled* and the time is set to 24 minutes or hours or days, repeat alerts are not generated during the selected suspension time period.

Threshold alerts and email

The HPE 3PAR SSMC server can be configured to send threshold alert notifications by email to the recipients that you specify. When you create or edit a threshold alert, specify whether to email the alert to the configured recipients.

Tip: Email server settings, from address, and email recipients are specified on the Settings screen.

Controller nodes threshold alert templates

Controller node threshold alert templates

- **Controller Nodes: threshold alert template** on page 198
- **Node Cache: threshold alert template** on page 198
- **System CPU Utilization: threshold alert template** on page 198

Controller Nodes: threshold alert template

This template produces threshold alerts for controller nodes.

Summary

- Threshold alert template name: Controller Nodes
- Default threshold alert name: Controller_Nodes
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects
- Recurrence pattern: Disabled by default. If enabled, the default is to send an alert if the criteria is met 2 times in last 2 hi-res samples.

Node Cache: threshold alert template

This template produces threshold alerts for controller node caches.

Summary

- Threshold alert template name: Node Cache
- Default threshold alert name: Node_Cache
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects
- Recurrence pattern: Disabled by default. If enabled, the default is to send an alert if the criteria is met 2 times in last 2 hi-res samples.

System CPU Utilization: threshold alert template

This template produces threshold alerts for controller node caches.

Summary

- Threshold alert template name: System CPU Utilization
- Default threshold alert name: System_CPU_Utilization_Major
- Default severity: Major

Key default settings

- Sampling: Hi-res
- Objects: All objects
- Metrics: Idle percentage < 10 %
- Recurrence pattern: Disabled by default. If enabled, the default is to send an alert if the criteria is met 2 times in last 2 hi-res samples.

Exported volumes threshold alert templates

Exported virtual volumes threshold alert templates

- **Exported Volumes: threshold alert template** on page 199
- **Exported Volumes Read IOPs and Service Time: threshold alert template** on page 199
- **Exported Volumes Write IOPs and Service Time: threshold alert template** on page 200

Exported Volumes: threshold alert template

This template produces threshold alerts for exported virtual volumes.

Summary

- Threshold alert template name: Exported Volumes
- Default threshold alert name: Exported_Volumes
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

Exported Volumes Read IOPs and Service Time: threshold alert template

This template produces threshold alerts for exported virtual volumes reads and service time.

Summary

- Threshold alert template name: Exported Volumes Read IOPs and Service Time
- Default threshold alert name: ExportedVolumeRdIOPsandST_Major
- Default severity: Major

Key default settings

- Sampling: Hi-res
- Objects: All objects
- Alert on object count: Enabled = 10
- Metrics:
Read IOPs > 1000
Read service time > 40 ms

Exported Volumes Write IOPs and Service Time: threshold alert template

This template produces threshold alerts for exported virtual volumes reads and service time.

Summary

- Threshold alert template name: Exported Volumes Write IOPs and Service Time
- Default threshold alert name: ExportedVolumeWrIOPsandST_Major
- Default severity: Major

Key default settings

- Sampling: Hi-res
- Objects: All objects
- Alert on object count: Enabled = 10
- Metrics:
Write IOPs > 1000
Write service time > 30 ms

Physical drives threshold alert templates

Physical drive threshold alert templates

- **Physical Drive FC Service Time: threshold alert template** on page 200
- **Physical Drive NL Service Time: threshold alert template** on page 201
- **Physical Drives SSD Service Time: threshold alert template** on page 201
- **Physical Drives: threshold alert template** on page 202

Physical Drive FC Service Time: threshold alert template

This template produces threshold alerts for fast class (FC) physical drive service time.

Summary

- Threshold alert template name: Physical Drive FC Service Time
- Default threshold alert name: PD_FC_Service_Time_70ms_Major
- Default severity: Major

Key default settings

- Sampling: Hourly
- Objects: Object rules, Device type = FC
- Alert on object count: Enabled = 8
- Metrics:
 - Total bandwidth > 1024 KBps
 - Total IOPs > 100
 - Total service time > 70 ms

Physical Drive NL Service Time: threshold alert template

This template produces threshold alerts for near line (NL) physical drive service time.

Summary

- Threshold alert template name: Physical Drive NL Service Time
- Default threshold alert name: PD_NL_Service_Time_80ms_Major
- Default severity: Major

Key default settings

- Sampling: Hourly
- Objects: Object rules, Device type = NL
- Alert on object count: Enabled = 4
- Metrics:
 - Total bandwidth > 512 KBps
 - Total IOPs > 50
 - Total service time > 80 ms

Physical Drives SSD Service Time: threshold alert template

This template produces threshold alerts for solid state (SSD) physical drive service time.

Summary

- Threshold alert template name: Physical Drive SSD Service Time
- Default threshold alert name: PD_SSD_Service_Time_9ms_Major
- Default severity: Major

Key default settings

- Sampling: Hourly
- Objects: Object rules, Device type = SSD

- Alert on object count: Enabled = 8
- Metrics:
 - Total bandwidth > 3072 KBps
 - Total IOPs > 200
 - Total service time > 9 ms

Physical Drives: threshold alert template

This template produces threshold alerts for physical drives.

Summary

- Threshold alert template name: Physical Drives
- Default threshold alert name: Physical_Drives
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

Port threshold alert templates

Port threshold alert templates

- **Host Port Service Time: threshold alert template** on page 202
- **Ports: threshold alert template** on page 203

The percentage based bandwidth option is available from HPE 3PAR OS 3.3.1 MU3 or later.

Host Port Service Time: threshold alert template

This template produces threshold alerts for host ports service time.

Summary

- Threshold alert template name: Host Port Service Time
- Default threshold alert name: Host_Port_Service_Time_Major
- Default severity: Major

Key default settings

- Sampling: Hi-res
- Objects: Select object rules, Port type = host
- Alert on object count: Enabled = 2
- Metrics:
 - Read service time > 100 ms

Total IOPs > 1000

Write service time > 80 ms

Ports: threshold alert template

This template produces threshold alerts for ports.

Summary

- Threshold alert template name: Ports
- Default threshold alert name: Ports
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

Other threshold alert templates

Other threshold alert templates

- **Priority Optimization: threshold alert template** on page 203
- **Remote Copy Links: threshold alert template** on page 203
- **Remote Copy Volumes: threshold alert template** on page 204

Priority Optimization: threshold alert template

This template produces threshold alerts for Priority Optimization configurations.

Summary

- Threshold alert template name: Priority Optimization
- Default threshold alert name: Priority_Optimization
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

Remote Copy Links: threshold alert template

This template produces threshold alerts for Remote Copy links.

Summary

- Threshold alert template name: Remote Copy Links
- Default threshold alert name: Remote_Copy_links
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

Remote Copy Volumes: threshold alert template

This template produces threshold alerts for Remote Copy virtual volumes.

Summary

- Threshold alert template name: Remote Copy Volumes
- Default threshold alert name: Remote_Copy_Volumes
- Default severity: Minor

Key default settings

- Sampling: Hi-res
- Objects: All objects

VMware concepts

These topics explain key concepts for HPE 3PAR SSMC VMware features.

VMware overview

Certain versions of HPE 3PAR OS include storage provider (VASA) features for VMware. For information about HPE 3PAR StoreServ Storage platform support, see the *HPE 3PAR StoreServ Management Console Administrator Guide*.

You can use HPE 3PAR SSMC to create and monitor vSphere storage containers and to report the vSphere virtual volumes (VVols) and virtual machines that vSphere administrators have created for use with the storage containers.

Each vSphere storage container consists of an underlying HPE 3PAR virtual volume set.

VMware VVol physical size and logical size

HPE 3PAR SSMC reports the physical size and logical size of VMware VVols on the Storage Containers screen, detail pane VMware VVols view.

The physical size of a VMware VVol represents the storage space used on physical drives in the storage system. The physical size is a best estimate when certain space saving technologies are used. The logical size is the size that VMware ESXi requested when creating the VMware VVol.

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:
<http://www.hpe.com/assistance>
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:
<http://www.hpe.com/support/hpesc>

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.

- To download product updates:

Hewlett Packard Enterprise Support Center

www.hpe.com/support/hpesc

Hewlett Packard Enterprise Support Center: Software downloads

www.hpe.com/support/downloads

Software Depot

www.hpe.com/support/softwaredepot

- To subscribe to eNewsletters and alerts:
www.hpe.com/support/e-updates
- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:
www.hpe.com/support/AccessToSupportMaterials

❗ **IMPORTANT:** Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HPE Passport set up with relevant entitlements.

Customer self repair

Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:

<http://www.hpe.com/support/selfrepair>

Remote support

Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

If your product includes additional remote support details, use search to locate that information.

Remote support and Proactive Care information

HPE Get Connected

www.hpe.com/services/getconnected

HPE Proactive Care services

www.hpe.com/services/proactivecare

HPE Proactive Care service: Supported products list

www.hpe.com/services/proactivecaresupportedproducts

HPE Proactive Care advanced service: Supported products list

www.hpe.com/services/proactivecareadvancedsupportedproducts

Proactive Care customer information

Proactive Care central

www.hpe.com/services/proactivecarecentral

Proactive Care service activation

www.hpe.com/services/proactivecarecentralgetstarted

Warranty information

To view the warranty information for your product, see the links provided below:

HPE ProLiant and IA-32 Servers and Options

www.hpe.com/support/ProLiantServers-Warranties

HPE Enterprise and Cloudline Servers

www.hpe.com/support/EnterpriseServers-Warranties

HPE Storage Products

www.hpe.com/support/Storage-Warranties

HPE Networking Products

www.hpe.com/support/Networking-Warranties

Regulatory information

To view the regulatory information for your product, view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at the Hewlett Packard Enterprise Support Center:

www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional regulatory information

Hewlett Packard Enterprise is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH (Regulation EC No 1907/2006 of the European Parliament and the Council). A chemical information report for this product can be found at:

www.hpe.com/info/reach

For Hewlett Packard Enterprise product environmental and safety information and compliance data, including RoHS and REACH, see:

www.hpe.com/info/ecodata

For Hewlett Packard Enterprise environmental information, including company programs, product recycling, and energy efficiency, see:

www.hpe.com/info/environment

Documentation feedback

Hewlett Packard Enterprise is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (**docsfeedback@hpe.com**). When submitting your feedback, include the document title, part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.

Websites

General websites

Hewlett Packard Enterprise Information Library

www.hpe.com/info/EIL

Single Point of Connectivity Knowledge (SPOCK) Storage compatibility matrix

www.hpe.com/storage/spock

Storage white papers and analyst reports

www.hpe.com/storage/whitepapers

For additional websites, see **[Support and other resources](#)**.