# **Dell PowerStore Manager Overview**

May 2024

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## White Paper

#### Abstract

This white paper introduces and describes Dell PowerStore Manager. PowerStore Manager is a web-based solution that provides an easy-touse interface for management actions and monitoring operations which are crucial to an organization's needs.

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### **Executive summary**

Overview This white paper provides an overview of the Dell PowerStore platform user interface, PowerStore Manager, which enables management and monitoring of PowerStore clusters and associated appliances.

For hardware and high-level software details about PowerStore appliances, see the white paper <u>Dell PowerStore: Introduction to the Platform</u>.

Audience This white paper is intended for IT administrators, storage architects, partners, and Dell Technologies employees. It is also intended for any other individuals that are involved in the evaluation, acquisition, management, operation, or design of a Dell Technologies networked storage environment using PowerStore.

#### **Revisions**

Date	Part number/ revision	Description	
April 2020	H18150	Initial release: PowerStoreOS 1.0	
December 2020	H18150.1	Updated for PowerStoreOS 1.0.3; AD/LDAP section added	
April 2021	H18150.2	Updated for PowerStoreOS 2.0	
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July 2022	H18150.4	Updated for PowerStoreOS 3.0	
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November 2023	H18150.8	Updated the section Compute: Hosts & Host Groups, Initiators	
May 2024	H18150.9	Updated for PowerStoreOS 4.0 Removed references to PowerStore X	

# We value yourDell Technologies and the authors of this document welcome your feedback on this<br/>document. Contact the Dell Technologies team by email.

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Note: For links to other documentation for this topic, see the PowerStore Info Hub.

## Introduction

#### **PowerStore**

PowerStore achieves new levels of operational simplicity and agility. It uses a containerbased microservices architecture, advanced storage technologies, and integrated machine learning to unlock the power of your data. PowerStore is a versatile platform with a performance-centric design that delivers multidimensional scale, always-on data reduction, and support for next-generation media.

PowerStore brings the simplicity of public cloud to on-premises infrastructure, streamlining operations with an integrated machine-learning engine and seamless automation. It also offers predictive analytics to easily monitor, analyze, and troubleshoot the environment. PowerStore is highly adaptable, providing the flexibility to host specialized workloads directly on the appliance and modernize infrastructure without disruption. It also offers investment protection through flexible payment solutions and data-in-place upgrades.

#### PowerStore Manager

For most technology products available today, simplicity and ease of use are some of the top priorities. For PowerStore appliances, PowerStore Manager addresses these priorities by providing an easy-to-use and simplified management interface for IT generalists, while simultaneously providing advanced features for storage administrators. PowerStore Manager allows administrators to easily configure storage resources from their PowerStore appliances to meet the needs of their applications, hosts, and users.

The PowerStore Manager provisioning workflows simplify management by using best practices and recommended default values. These abilities help optimize system performance and minimize the overall costs of using and maintaining the system. Manage provisioned resources easily by using the intuitive filtering options to sort and view data to the user. PowerStore Manager can easily identify failed and faulted components through graphical representations of the system. PowerStore Manager also offers a wide range of Dell Technologies support options, directly from the user interface, to assist troubleshooting.

## **Terminology** The following table provides definitions for some of the terms that are used in this document.

Term	Definition
Appliance	Solution containing the base enclosure and any attached expansion enclosures.
Base enclosure	Enclosure containing both nodes (node A and node B) with 25 x NVMe drive slots in the front.
Cluster	One or more appliances in a single grouping and management interface. Clusters are expandable by adding more appliances to the existing cluster, up to the allowed amount for a cluster.
Expansion enclosure	Enclosures that can be attached to a base enclosure to provide additional storage.
NVMe over Fibre Channel (NVMe/FC)	Protocol used to perform Non-Volatile Memory Express (NVMe) commands over a Fibre Channel network.

#### Table 1. Terminology

Term	Definition		
NVMe over TCP (NVMe/TCP)	Protocol used to perform Non-Volatile Memory Express (NVMe) commands over an Ethernet network.		
Fibre Channel protocol	Protocol used to perform Internet Protocol (IP) and SCSI commands over a Fibre Channel network.		
File system	Storage resource that can be accessed through file-sharing protocols such as SMB or NFS.		
Internet SCSI (iSCSI)	Provides a mechanism for accessing block-level data storage over network connections.		
Network attached storage (NAS) server	File-level storage server used to host file systems. A NAS server is required to create file systems that use SMB or NFS shares.		
Network File System (NFS)	Access protocol that allows data access from Linux or UNIX hosts on a network.		
Node	Component within an appliance that contains processors and memory. Each appliance consists of two nodes.		
PowerStore Q	Container-based storage system that is running on purpose- built hardware. This storage system supports unified (block and file) workloads, or block-optimized workloads. The PowerStore Q model supports Quad-Level Cell (QLC) NVMe SSDs for data storage.		
PowerStore T	Container-based storage system that is running on purpose- built hardware. This storage system supports unified (block and file) workloads, or block-optimized workloads. The PowerStore T model supports Triple-Level Cell (TLC) NVMe SSDs for data storage.		
Representational State Transfer (REST) API	Set of resources (objects), operations, and attributes that provide interactive, scripted, and programmatic management control of the PowerStore cluster.		
Server Message Block (SMB)	Network file-sharing protocol, sometimes referred to as CIFS, used by Microsoft Windows environments. SMB provides access to files and folders from Windows hosts on a network.		
Snapshot	Point-in-time view of data stored on a storage resource. A user can recover files from a snapshot or restore a storage resource from a snapshot.		
VMware vSphere Virtual Volumes (vVols)	A VMware storage framework which allows VM data to be stored on individual Virtual Volumes. This ability allows for data services to be applied at a VM-level of granularity and according to SPBM. Virtual Volumes can also refer to the individual storage objects that are used to enable this functionality.		

## Appliance discovery

Introduction	When the PowerStore system base enclosure and optional expansion enclosures are installed and powered on for the first time, configure the system in one of the following ways:			
	• <b>Direct connection:</b> This is the recommended procedure and requires that you are physically present in the data center or lab where the base enclosure is installed.			
	• <b>Remote connection:</b> Use this procedure if you do not have physical access to the base enclosure. This method uses a predefined static IP address to discover and configure the system.			
	For more information about network configuration, see the <i>PowerStore Planning Guide</i> and <i>PowerStore Installation and Service Guide</i> at <u>dell.com/powerstoredocs</u> .			
Discovery with service port	The preferred method for configuration is to physically connect a workstation to the service port on node B of the PowerStore appliance. A static IP of 128.221.1.249 and subnet mask 255.255.255.0 is set on the workstation. You can log in to PowerStore and begin the Initial Configuration Wizard by directing a browser to 128.221.1.251. PowerStore systems running on versions previous to PowerStoreOS 3.0 require a connection to node A service port and directing the browser to 128.221.1.250.			
	For instructions and prerequisites for the direct-connect method, see the <i>PowerStore Quick Start Guide</i> at <u>dell.com/powerstoredocs</u> .			
Discovery with static IP address	If not using the recommended direct-connect method, you can discover PowerStore appliances running PowerStoreOS 1.0.3 and higher using a predefined static IP address. The user must set their workstation to an IP address in the 169.254.0.x/16 range which has access to the same network (untagged/native VLAN) that the PowerStore management ports are plugged into. After an IP on the workstation is set, the user can navigate using a browser to one of the predefined Static IP addresses below to start the Initial Configuration Wizard.			
	https://169.254.0.10 https://169.254.0.20 https://169.254.0.30 https://169.254.0.40 https://169.254.0.50			
	For more information about static IP discovery, see the documents <u>PowerStore:</u> <u>Networking Guide</u> and <u>Dell PowerStore: Introduction to the Platform</u> .			
Initial Configuration Wizard	When you launch the Initial Configuration Wizard either through the direct-connect or remote-connect options, a browser window tab automatically appears in the default Internet browser asking the user to log in to PowerStore. When you log in for the first time, enter the default credentials of <b>admin</b> for the <b>Username</b> and <b>Password123#</b> for the <b>Password</b> . Figure 1 shows an example of the login screen.			

PowerStore Manager			
Copyright © 2024 Dell Inc. or its subsidiaries. All Rights Rese	erved.		
Username admin Password			
Log In			

Figure 1. PowerStore Manager login screen

After you log in, the Initial Configuration End User License Agreement (EULA) appears, as shown in Figure 2. You must scroll to review the text, check the box next to **I accept this agreement**, and click **Accept**. The following figure shows an example of the EULA screen.

Initial Configuration
End User License Agreement
Congenitations on your new Del EMC purchase! Your purchase and use of the Del EMC product is subject to and governed by the Del EMC Commercial Terms of Sale, unless you have a separate written agreement with Del EMC that specifically applies to your order, and the Del End User License Agreement (EULA), which are each presented below in the following order: * Commercial Terms of Sale * Commercial Terms of Sale
The Comment of page of the Webled States are presented below and are also available online at the website below that corresponds to the country in which this product was purchased. By the act of closing "accept," you agree (or re-affine myor agreement to be foregoing terms and conditions. To the estimate that Dell's corr any Dell's the close of the close
Commercial Terms of Sale These Commercial Terms of Sale ("CTS") apply to orders for hardware, and services by direct commercial and public sector purchasers and to commercial end users who purchase through a reseller ("Outioner"), unless Customer and Suppliers (defined below) have entered in a superander written agreement that apples to Customer's orders for specific products or services, as which case, the separate written agreement governs Customer's purchase and use of such specific products or services. The term "Supplier(s)" means, as applicable: EVAC comparison (CMC")
1795 Sculd. Street Heipahoto, Masschutetts 0748 and Del Marketrig LR. ("Del7")
Bourd Rok, Treis 7862 Logi Moles: Del Leija Moles:
1. Sugget Matter and Parts of CTS. 1. Sincept. This: CTS opermits of them the synaphies in the synaphies provisioning of Products, Services and Third Party Products (if applicable) (collectively "Offenging"), for Customer's own internal use. 12. Products and Services. "Products" are either: (i) Suppler branked (if Transhave products: (Caspanner') or (ii) Suppler branked of Pranket's (Services) Services' and (Service). "Solver's "are: (ii) Suppler branket's (Transhave products: (Caspanner') or (ii) Suppler branket's (Transhave products) (Services) and The Party Products. Service definings (Services) and Services' and Caspanner's (Services) and Party Products. Is a real to "The CTS branket's Products Services and The Party Products. 12. Proneous: The CTS contains of the mathody with the terms and conditions agrigation to Suppler or Alfabetes (In suppler) supplementation and parts (Services) and the service (Caspanner'). "Services" and and conditions agrigation to Supplementation and the service (Caspanner'). The CTS down in the service of the service (Caspanner') and conditions agrigation to Supplementation and the service (Caspanner'). The CTS down in the service (Caspanner') and the service (Caspanner') and the service (Caspanner'). The CTS down in the service is and in the service of the service (Caspanner'). The CTS down in the service is and conditions agrigation to Supplementation and the service (Caspanner'). The CTS down in the service is and in the service of the service (Caspanner'). The CTS down in the service is and conditions agrigation to Supplementation and the State (Caspanner') and the service of the State (Caspanner') and the service of the service (Caspanner'). The CTS down in the service is a service of the s
2. Social part country, and country, and country and c
✓ Faccept this agreement DECLINE ACCEPT

Figure 2. PowerStore Discovery Utility > EULA

After you accept the EULA, the **Infrastructure Telemetry Notice** appears. If you choose to accept the notice, click **Next**.

Initial Configur	ation	×
Telemetry Notice	Telemetry Notice	
Cluster Details	PRFRASTRUCTURE TELENETRY NOTICE	
Default Users (	If you are acting on behalf of U.S. Federal Government agency or if Customer has an express written agreement in place stating that no remote support shall be performed for this machine, please stop attempting to enable the telemetry Collector and contact your sales account representation.	
Fault Tolerance	By continuing to enable this Collector, you acknowledge that you understand the information stated below and accept it.	
Management (	Phacy Dail, let and it group of companies may collect, use and there information, including limited personal information from our customers is connection with the deployment of this beleneity collector ("Callector"). We will collect limited personal data when you register the product or Callector and provide us with your contact databa such as name, contact databa and the company you work for. For more information, not now we use your personal information, including how to exercise your data subject.	3
Infrastructure ( Services	rights, please refer to our Dell Privacy Statement which is available online at https://www.delt.com/learn/policies-privacy-country-specific-privacy-policy.	
vCenter Information (Optional)	Telemetry Collector This Collector provide the standard state of the machine, such as diagnostics, configurations, usage characteristics, performance, and deployment location (collectively "System Data"), and it manages the renote access and the exchange of the Scenes Data with Data in the or its avoidenable sho diverse to access and the exchange of the Scenes Data with Data in the order of t	,
Cluster Creation	enabling the Collector, Customer consents to DePs connection to and remote access of the product containing the Collector and advisowledges that Del will use the System Data transmitted to Dell via the Collector as follows ("Permitted Purposes").	
Cluster Login	<ul> <li>remotely access the product and Collector to install, maintain, monitor, remotely support, neolive alerts and notifications from, and change certain internal system parameters of this product and the Customer's environment, in fulfilment of applicable warming variant operative construction patterns of the product.</li> <li>provide Customer vironment, in the customer's environment of the product.</li> </ul>	
Support & CloudiQ	<ul> <li>Utilize the System Data in connection with predictive analytics and usage intelligence to consult with and assist Customer, directly or through a reselier, to optimize Customer's future planning activities and requirements; and</li> <li>"ancommize" (i.e., remove any reference to a specific Customer) and aggregate System Data with that from products of other Customers and use such data to develop and improve products.</li> </ul>	
Component (	Customer may disable the Collector at any time, in which case all the above activities will stop. Customer acknowledges that this will imit Delify additions (if any) to support the product.	
Configuration () Complete	The Collector does not enable Dell or their service personnel to access, view, process, copy, modify, or handle Customer's business data stored on or in this product. System Data does not include personally identifiable data relating to any individuals.	
	NEXT	L

Figure 3. PowerStore Discovery Utility > Infrastructure Telemetry Notice

The Initial Configuration Wizard steps you through the following pages to configure the PowerStore appliances for the first time:

- **Telemetry Notice:** Provides information about the Dell Telemetry collector and privacy policy information.
- Cluster Details: Enables you to configure the friendly name of the cluster that appears in the upper-left side of PowerStore Manager and choose the deployment mode, either the default of Unified (SAN and NAS) or Block Optimized (SAN only). You can optionally add appliances to the cluster if wanted.
- Default Users: Enables you to configure the admin and service user passwords. The password requirements are listed below. By default, the service password will match the configured admin password. The user is required to change the default password for security reasons. Click the Update button after the passwords are defined, and the UI issues a notification that the passwords have been set. The password requirements are as follows:
  - Must be 8 to 40 characters
  - Must contain at least one upper case letter and one lower case letter
  - Must contain at least one numeric character
  - Must contain at least one special character (!, @ # \$ % ^ ~ ? \_)
  - Cannot include the single quote ('), ampersand (&), space, or non-English characters
- Fault Tolerance: Allows you to select the fault-tolerance level for each appliance. This determines the number of drives that can fail concurrently on an appliance without incurring data loss. You can choose single or double drive failure. For the PowerStore 3200Q model, double drive failure fault tolerance is enforced and cannot be changed.

- Management Network: Enables you to enter the IP addresses and network information for the management network. For systems running PowerStoreOS 2.0 and higher, the Storage Network configuration was removed from the Initial Configuration Wizard. PowerStore Manager recommends that you set up a Storage Network upon first login. PowerStore Manager access is only available using the more-secure HTTPS protocol. You can check the optional box to Enable HTTP redirect to HTTPS for Cluster IP. This will redirect any HTTP request to the more secure HTTPS protocol.
- Infrastructure Services: Allows you to configure DNS and NTP servers, and optionally configure the physical top-of-rack or out-of-band management switch credentials for network validation.
- vCenter Information (Optional): Enables you to configure integration with an existing VMware vCenter cluster and the PowerStore as a VASA storage provider.
- Cluster Creation: Allows you to review the chosen configuration information, validate the configuration, and initiate the cluster creation. You can also export the configuration details from this page. The validation process is automatically performed as part of the cluster creation process, but you may Validate before clicking Configure, if wanted. If there are any issues, the wizard notifies you of the errors and provides guidance to resolve them. The Initial Configuration Wizard sets up the services to bring up the PowerStore cluster.
- **Cluster Login:** Once the cluster creation completes, this step allows you to log in again with your newly created password. Then, you return to the Initial Configuration Wizard.
- Support & APEX AlOps Infrastructure Observability: Allows you to proceed with the default enablement of Support Connectivity and Infrastructure Observability or clear the options if you do not want to enable them. Support Connectivity allows you to stay ahead of disruptions with effortless support and richer insights. Infrastructure Observability requires Support Connectivity to be enabled. Infrastructure Observability is a single pane of glass for proactive monitoring, machine learning, and predictive analytics. You must provide contact information for support (names, email messages, phone numbers). You are also prompted for the connection type (Connect Directly or Connect using Secure Connect Gateway). Remote support is also checked by default, which allows authorized technical support agents to remotely troubleshoot issues over a secure connection.
- Component Initialization: Allows you to show the components such as Create Cluster and File Services that must be completed before the PowerStore cluster is ready. The message All PowerStore components have initialized successfully is displayed with a green checkmark when this process is completed.
- Configuration Complete: Provides the notification The PowerStore cluster is fully configured, and allows you to close the wizard or click Go to PowerStore Manager.

For more information about the initial discovery process and Initial Configuration Wizard, see the *PowerStore Quick Start Guide* and *PowerStore: Network Planning Guide* at <u>dell.com/powerstoredocs</u>.

Licensing Before you can use the software features on PowerStore appliances, you must install a proper license. PowerStore provides two options for licensing: Automatic Licensing and Manual Licensing.

The default option is Automatic Licensing which requires port 443 to be open. If you have the network port 443 open for the system management ports, the system automatically connects to Dell Technologies, acquires the appropriate license that is based on the system service tag, and installs it without any user intervention.

The other option is Manual Licensing. To obtain a license manually, go to the **Settings** menu > **Licensing** page. On the page, the **Install License** button opens a window which provides instructions on how to retrieve and upload a license file as shown in Figure 4.

If a license is not installed, the system uses a 30-day free-trial license while the administrator works to obtain a license. If the 30-day trial period ends before a license is installed, you are not able to perform management operations. For example, you cannot create a volume, take snapshots, upgrade software, or modify NAS servers. However, users still have access to storage data if there is an expired license.

Here are some considerations for licensing:

- The license file is all-inclusive, and all features are enabled automatically.
- To license the whole cluster, only one license file is required.
- If an appliance is reimaged or removed from the cluster, a license must be reapplied for that appliance upon initial configuration.
- The VMware ESXi host license is separate from the PowerStore license.

For more information, see the white paper <u>Dell PowerStore: Virtualization</u> Integration.

PowerStore RT-H2171			Install License	×
			PowerStore licenses can be manually installed. Follow the steps below to install a new license.	
🔠 Dashboard 🌾 Monitoring	Compute • 🗎 Storage • 🖤 Protection • 🕀 Migration	n • III Hardware	04	
Cattinge	PowerStore Licensing		Step 1	
occunga	Fowerstore Licensing		Export the PowerStore's activation data file. This will be required in the next step.	
Cluster	<ul> <li>Manage the license for your cluster.</li> </ul>		🛃 Export Activation file	
Properties				
Upgrades	Licensing		Step 2	
Licensing	PowerStore does not have an active license and is operating in a	trial period.	Visit the Dell Software Licensing Central support website and upload the PowerStore activation data file to retrieve the license file. This license file is required in the part step.	
Power Down			The true is the for the parent of the reactive.	
Recycle Bin	Status	🛕 Trial Refresh	Step 3	
Sacurity	License Expires On	2024-03-14 07:59 PM UTC -04:00		
second	License Type		Upload a license file to activate the PowerStore license.	
Authentication	Install License		Upload License	
Service Account				
ISOSLOHAP				
Certificates				
Signed Cluster Certificate				
Encryption				
KMIP				
Audit Logs				
Remote Logging				
SSH Management				
Compliance				
Login Message				lose
HTTP Redirect				

Figure 4. Settings page > PowerStore Licensing

## **PowerStore Manager user interface**

#### **Overview**

PowerStore Manager provides an optimal user experience using an HTML5-based web interface that allows you to manage and monitor the cluster and all associated appliances. This modern interface has been designed with simplicity and ease-of-use in mind for all storage-management needs. The top navigation menu includes several categories, most of which include cards that you can select for more information. The menu includes resources and system settings that are used on a frequent basis by administrators. The categories and subcategories in the main menu are described in the following table.

Category	Subcategories	Description	
Dashboard	None	View a comprehensive summary of cluster status, overall capacity, and system performance	
Monitoring	None	Consolidated view of system alerts, events, jobs, and system checks	
Compute	Host Information, Virtual Machines, vCenter Server Connection	View and configure hosts, virtual machines, and the cluster vCenter Server Connection	
Storage	Volumes, Volume Groups, Storage Containers, File Systems, NAS Servers, Quality of Service (QoS), Recycle Bin	View, configure, delete, prioritize, and recover storage resources for the cluster	
Protection	Replication, Metro, Metro Witness, Remote Backup, Remote Systems, Protection Policies	View and configure replication, Metro and Metro Witness, remote clusters, Remote backup to PowerProtect DD and protection policies including snapshot, replication, and remote backup rules	
Migration	Internal Migrations, Import External Storage	View and configure internal cluster migrations between appliances and imports to PowerStore from supported external systems	
Hardware	None	View and monitor hardware related to the cluster including drives and attached expansion enclosures	

Table 2. Navigation menu options

#### Dashboard

The dashboard is the first page that is displayed when you log in to PowerStore Manager. The page provides a status view of various system details, including system capacity, system health, storage health, and overall system performance. Different system details and information appear in the **Overview**, **Capacity**, and **Performance** tabs.

• The **Overview** tab includes high-level cluster information, including the number of configured storage and host resources, a user-selected resource watchlist, alerts, and system health metrics imported from Infrastructure Observability (available in PowerStoreOS versions 4.0 and later). This high-level information provides quick insight into the overall usage of the systems in the cluster, and it

highlights important issues that require the immediate attention of the administrator.



Figure 5. PowerStore Manager dashboard > Overview tab

The **Capacity** tab, as shown in Figure 6, includes information about the overall capacity of the systems in the cluster. The tab also shows a historical graph of usage which helps determine a capacity forecast over time. It might take several days for the capacity forecast to be displayed with a new system. PowerStoreOS versions 4.0 and later display the Overall DRR, Reducible DRR, and Unreducible Data metrics on the system when hovering over the **Data Savings** graphic. The **Capacity** tab also includes information about data savings and top storage consumers that are related to configured storage resources.

#### PowerStore Manager user interface



Figure 6. PowerStore Manager dashboard > Capacity tab

The **Performance** tab includes an overall cluster performance chart which shows toplevel performance metrics including latency, IOPS, I/O size, and bandwidth. Also included on the performance chart are graphed system alerts at the time they were identified, which is useful when troubleshooting performance anomalies. The performance chart itself can be exported in different formats including .jpeg, .pdf, .png, and .csv formats.

The following table shows the performance-metric retention periods and associated sampling intervals.

Time range setting	Sampling interval
Last 1 Hour	20 Seconds
Last 24 Hours	5 Minutes
Last 1 Month	1 Hour
Last 2 years	24 Hours

 Table 3.
 Sampling intervals and retention periods

#### Monitoring

The Monitoring page is the consolidated area of all appliance alerts, events, and jobs for the cluster. Events provide information about changes to the system, but do not rise to the level of an alert that indicates a problem with the system. Alerts, as shown in Figure 7, are categorized by severity which indicates the urgency of the alert. On the Jobs tab, you can monitor the status of user and system-created jobs. In PowerStoreOS version 2.0 and later, jobs that have completed with a warning status will be displayed. When the user clicks a job, they can view each individual job step for details about the warning.

PowerStore RT-H2171				4 5 8 0 🗰	
Hardware 🚩 Monitoring 📋 Compute - 😝 Storage - 🜓 Protection - ↔ Migration - 🖽 Hardware				Ø Settings	
Monitoring					
Alerts Events Jobs System Checks					
Acknowledge More Actions -		Showir	ng 8 filtered of	60 Alerts ү 🎹 🖸 C	
Severity Resource Type Acknowledged: Unacknowledged Cleared: Active Add Filters -				Restore Default Filters	
□ S_ 1 ↓ Code Description	Resource	Resource	Ackn	Timestamp	
□ ♦ 0x013 No virus checker server is available.	File virus	-	-	2024-02-21 10:44 AM UTC	
Ox023 Appliance detected host partial connectivity. Please ensure host is properly connected to b	Host	Window	-	2024-02-19 11:48 AM UTC	
•         0x018         Appliance port pairs are connected to the same data switch: first port of 4-Port card is con	Appliance	Applianc	-	2024-02-13 03:19 AM UTC	
Ox016 Cluster license installation error. Failed to obtain the license file. The trial period will expire	Cluster	RT-H2171	-	2024-02-14 03:17 AM UTC	
□ A 0x018 Management ports are connected to the same management switch e4.f0.04:cc.38:01.	Appliance	Applianc	-	2024-02-13 03:19 AM UTC	
Ox016 The trial period will expire on 2024-03-14 23:59:59:999999, after which no new storage prov	Cluster	RT-H2171	-	2024-02-14 03:17 AM UTC	
Ox00d Support Connectivity is not enabled for the cluster.	Cluster	RT-H2171	-	2024-02-14 03:17 AM UTC	
Ox003 New keystore changes have occurred.	Cluster	RT-H2171	-	2024-02-13 03:10 AM UTC	

#### Figure 7. Monitoring page > Alerts tab

The following table shows the supported alert severities and their descriptions.

lcon	Label	Indicates
	Information	An event has occurred that does not impact system functions. No action is required.
4	Minor	An error has occurred that you should be aware of, but it does not have a significant impact on the system. For example, a component is working, but its performance may not be optimal.
•	Major	An error has occurred that has a major impact on the system and should be remedied but may not have to be fixed immediately. For example, a component is failing and some or all functions may be degraded or not working.
8	Critical	An error has occurred that has a significant impact on the system, and it should be remedied immediately. For example, a component is missing or has failed, and recovery may not be possible.

In the details of each alert, more information is displayed including the System Impact, Repair Details, and Associated Events as shown in Figure 8. This information is useful in troubleshooting scenarios and allows users to remediate issues seen on the system.

#### PowerStore Manager user interface

				< 5 of 8 >	)	×			
⊞ <sub>Dashboard</sub> Monitori	Monitoring	🗇 Compute 🕶 😫 Storage 🕶 🌓 Protection 👻 🕁 Migration 👻 🚟 Hardware		State of appliance onboard management ports redundancy. (same_tor_switches_for_ports) Management ports are connected to the same management switch e4:f0.04.cc.38.01.					
Alerts	Events J	obs System Checks		Severity	Minor	_			
Acknowledge	More Action	15 *	ę	Event Code	0x01806802				
Coursilu	Deseures Tur	Astronomicational Caralastant Classical Astronomication		Appliance	Appliance-RT-H2171				
Severity	Resource Typ	e Acknowledged: 2 selected Cleared: Active Add Filters *		Associated Events	1 Events				
<mark>⊟</mark> S 1 ↓	Code	Description	Resource .	System Impact Management availa	bility may be impacted in case	e of			
•	0x013	No virus checker server is available.	File virus	high availability eve	nt.				
•	0x023	Appliance detected host partial connectivity. Please ensure host is properly connected to b	Host	Repair Details		.			
	0x018	Appliance port pairs are connected to the same data switch: first port of 4-Port card is con	Appliance	to two management	t switches. Cable both nodes t	to			
	0x016	Cluster license installation error. Failed to obtain the license file. The trial period will expire	Cluster	are not available.	ient switch only if two switche	:5			
▲	0x018	Management ports are connected to the same management switch e4:f0:04:cc:38:01.	Appliance	Support		- 1			
	0x016	The trial period will expire on 2024-03-14 23:59:59.999999, after which no new storage prov	Cluster	Knowledge Base     Gather Support M	Articles 🔝				
	0x00d	Support Connectivity is not enabled for the cluster.	Cluster	outlier oupport in	action of the second seco				
•			-		С	lose			

Figure 8. Monitoring page > Alert details

When alerts are no longer relevant or are resolved, the system automatically clears the alerts with no user intervention. This action ensures that cleared alerts are hidden from the default view so that only relevant issues are displayed to administrators. Cleared alerts can be optionally displayed through table filtering options. Alerts can also be acknowledged which removes the alert from default view. Acknowledging an alert does not indicate that the issue is resolved. You can view acknowledged alerts through the table-filtering options. You can also configure PowerStore Manager to send alert notifications to a specified email or SMTP server through the **Settings** menu.

When a user logs in to PowerStore Manager, the system may display a global alert banner across the top of the menu buttons. Global banners inform users of specific events happening on the system by displaying three different banner styles: Informational (blue), Minor/Major (yellow), or Critical (red). Multiple global alerts are supported, and the color and message on the banner will always display the most severe alert. When a user clicks the global banner alert, the alert details will slide out from the right and the user may cycle through all active global alerts. Global alerts may include expiring license warnings, NDU in progress notifications, and critical issues such as a degraded system.

#### **System checks**

Introduced in PowerStoreOS 2.0, system checks can be run against your PowerStore cluster from the **Monitoring** > **System Checks** tab, see Figure 9. System checks can be run independently at any time to allow users to proactively check system health outside of the upgrade cycle. System Check jobs run the latest Health Check that has been installed on the system. Once the System Check job is complete, status information is displayed with a pass-to-fail ratio of the various components that were checked as shown in Figure 9.

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Monitoring										
Alerts Events Jobs	System Checks									
Profile       Service Engagement       Total       27         Last Run       2024-02-27 12:18 PM UTC-05:00       Passed       27         Run System Check       27 System Checks       V										
Item	Status ↑ Statu	s Message C	Category	Appliance		Node				
Disk Health	<ul> <li></li></ul>	H	lardware	Appliance-RT-H2171		Node A	Â			
Pre-Upgrade Check	<ul> <li>-</li> </ul>	s	oftware Service	Appliance-RT-H2171		Node A				
Pre-Upgrade Check	<ul> <li>-</li> </ul>	s	oftware Service	Appliance-RT-H2171		Node B				
Active Sessions Mismatch Check	<ul> <li>-</li> </ul>	S	oftware Service	Appliance-RT-H2171		Node A				

Figure 9. Monitoring page > System Checks

#### Compute: Hosts & Host Groups, Initiators

The Compute section contains multiple pages, one of which is the **Hosts Information** page as shown in Figure 10. The Host Information page defaults to the **Hosts & Hosts Groups** pane. It allows you to create and manage host configurations which are logical connections through which hosts or applications can access storage resources. When creating a host, the user must select an initiator type based off how the host will connect to the storage, either Fibre Channel, iSCSI, NVMe, or NVMe vVol.

You can pool individual hosts together into a host group. A host group is a collection of hosts that enables you to perform volume mapping operations across all the hosts in the group. For example, when you provision volumes for a host group, the volumes become available to all member hosts. A host group can only use one protocol. You cannot add a host to a host group that uses a different protocol.

NVMe host support is added in PowerStoreOS versions 2.0 and later to support end-toend NVMe/FC configurations. In PowerStoreOS versions 2.1 and later, NVMe support is extended to also include end-to-end NVMe/TCP host configurations.

vVols can also be accessed using NVMeoF. PowerStoreOS 3.0 and later includes support for NVMe/FC for vVols. PowerStoreOS 3.6 and later includes support for NVMe/TCP for vVols.

PowerStore Prod-Site2	2						∆ ≢ <sup>9</sup> ≗ © ⅲ
🗄 Dashboard 🏼 🏱 Monitoring	Compu	ite -	n 🕶 🚭 Migration 👻 🛛	III Hardware			③ Settings
Host Information	I						
Hosts & Host Groups + Add Host Modify	Initiators Add Host Gro	up Provision - More Action:	s <b>*</b>				12 Hosts & Host Groups 🛛 🍸 🚺 📝 C <sup>4</sup>
Name	Alerts	vSphere Host Name	Host/Host Group ↑	os	Initiator Type	Initiators	Volume Mappings
Linux-Host2	-	-	Host	Linux	NVMe	2	3
Sphere-Host1	-	hop051098.hop.lab.emc.com	Host	ESXi	iSCSI	1	2
Windows-Host4	-	-	Host	Windows	iSCSI	1	1
Windows-Host3	-	-	Host	Windows	iSCSI	1	6
Metro-Host2	-		Host	Linux	iSCSI	11	1
Uindows-TestHost			Host	Windows	iSCSI	1	14
Windows-Host2	-		Host	Windows	iSCSI	1	2
Metro-Host3	-		Host	Windows	iSCSI	1	1
Linux-Host1	-	-	Host	Linux	FC	2	1

Figure 10. Compute > Host Information > Hosts & Host Groups

The **Host Information** section also contains the Initiators pane in PowerStoreOS versions 3.0 and later as shown in Figure 11. This list view table displays all the initiators and initiator paths in one pane of glass for all supported protocols (iSCSI, FC, NVMe/FC, NVMe/TCP). This makes configuration and troubleshooting much more efficient for users. Click one of the blue initiator links in the identifier column displays the connected paths section of the UI showing the number of connections to node A and B. The total paths displayed make up the number shown on the main initiator pane under the Active Sessions column.

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Host Information			
Hosts & Host Groups Initiators			
		24	4 Initiators 🛛 🚺 🖸 C
Identifier	Initiator Type	Host ↑	Active Sessions
21:00:f4:e9:d4:57:89:ad	FC	Linux-Host1	2
21:00:f4:e9:d4:57:89.ac	FC	Linux-Host1	2
nqn.2014-08.org.nvmexpress:uuid:92481f1c-7917-4fb3-a9dd-d79fe392cbff	NVMe	Linux-Host2	2
nqn.2014-08.org.nvmexpress:uuid:c8105a1f-cf06-448e-8d27-feb6dbac9ddf	NVMe	Linux-Host2	2
iqn.1998-01.com.vmware:hop249109115.hop.lab.emc.com:975833056:66	iSCSI	Metro-Host1	4
iqn.2013-03.com.dell:999122337778	iSCSI	Metro-Host2	4
iqn.2013-03.com.dell:999122337773	iSCSI	Metro-Host2	4

Figure 11. Compute > Host Information > Initiators

**Machines** 

**Compute: Virtual** PowerStore Manager provides detailed monitoring capabilities for virtual machines (VMs). To access vCenter, launch the vSphere Web Client directly from PowerStore Manager. Under Compute > Virtual Machines (see Figure 12) you can view performance details, alerts, and connections for the VMs that are configured from the PowerStore cluster. In PowerStoreOS versions earlier than 3.0, you can view and manage data protection

policies. In PowerStoreOS versions 3.0 and later, you can no longer assign protection policies to Virtual Machines. For automatic snapshot creation, use VMware vSphere storage policies. Existing protection policies added to virtual machines on previous codes remain, and you can assign them at any time. The main view shows essential details for each VM, and you can filter, sort, refresh, and export the table data to a spreadsheet if required. VMs that are provisioned from the PowerStore cluster and on an associated ESXi host are added to the table automatically. Prior to PowerStoreOS 3.0, only VMs that are deployed on vVols can be viewed and managed in PowerStore Manager. PowerStoreOS versions 3.0 and later can also view and manage virtual machines on NFS and VMFS datastores. In PowerStoreOS versions 3.0 and later, you can add CPU and memory usage columns using the **Show/Hide Table Columns** icon as shown in Figure 12. This allows you to see whether particular VMs are consuming resources from within PowerStore Manager, to easily monitor and perform troubleshooting.

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Virtual Machines										
Protect - More Actio	ons 🔻						16 Virtual Ma	achines 5	7 🔲 🖸	C,
□ Name 个	Alerts	Power	Datasto	vSphere Host Na	Datastore	Guest OS	Logical	Provi	Protectio	
🗌 տ cloneME	-	Power	vVol	hop051	DatastoreSC1(S	Other (	1,018.7	1.1 TB	RP1:0	
DB_srv_I	-	Power	vVol	hop051	DatastoreSC1(S	Other (	879.3 GB	1.1 TB	RP1:0	
DB_srv_II		Power	vVol	hop051	DatastoreSC1(S	Other (	879.3 GB	1.1 TB	RP1:0	
DB_srv_III		Power	vVol	hop051	DatastoreSC1(S	Other (	879.3 GB	1.1 TB	RP1:0	
🗌 տ nymeCloneMe		Power	vVol	hop051	DatastoreNVMe	Other (	969.0 MB	1.2 TB	RP1:0	
vm Prod_srv_001		Power	vVol	hop051	DatastoreNVMe	Other (	1,000.5	1.2 TB	RP1:0	

Figure 12. Compute > Virtual Machines

#### Compute: vCenter Server Connection

PowerStore can configure a vCenter server connection during the Initial Configuration Wizard. For PowerStore T model appliances, this step is optional, and you can configure it manually after initial configuration. To register or manage the vCenter Server connection, go to **Compute** > v**Center Server Connection** as shown in Figure 13. Click **Launch** vSphere to start the vSphere Web Client and connect to the associated vCenter Server. You can also use this page to update the connection or disconnect as required. PowerStore T model appliances can also register the VASA provider from this page, which allows you to manage VMs that have been deployed on PowerStore storage volumes.

For more information about vSphere integration and registering the VASA provider, see the white paper <u>Dell PowerStore: Virtualization Integration</u>.



Figure 13. Compute > vCenter Server Connection

#### Storage: Volumes

In PowerStore Manager > **Storage** > **Volumes** (shown in Figure 14), you can create, view, manage, and delete volumes for the PowerStore appliances in the cluster. You can monitor detailed information about capacity, performance, alerts, protection status, and connectivity within the detailed view of a volume. Thin clones are also created and managed from this page.

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Volumes Instant Access											
+ Create Modify Provision Protect Repurpose More Actions 39 Volumes V 🕕 🖄 C											
□ Name ↑	Alerts	WWN	Volume Family	Logic	Provi	Host M	Storage	Protection Policy	QoS	Performanc	Volume Group
Backup-Vol1	-	naa.68ccf0	7.4 GB	400.0	400	1	SCSI	ProtectionPolicy3	-	High	-
Backup-Vol1-Clone	-	naa.68ccf0	7.4 GB	4.0 KB	400	1	SCSI			Low	-
BW - Business Ware	-	naa.68ccf0	186.5 GB	882.5	1.0 TB	1	SCSI	ProtectionPolicy1	-	Medium	Business Warehouse Group
BW - Business Ware	-	naa.68ccf0	186.5 GB	1,024	1.0 TB	1	SCSI	ProtectionPolicy1	-	Low	Business Warehouse Group
CRM - Customer Rel	-	naa.68ccf0	16.4 GB	500.0	500	1	SCSI	ProtectionPolicy1	-	Medium	-
CRM - Customer Rel	-	naa.68ccf0	16.4 GB	4.0 KB	500	1	SCSI	-	-	Low	-
🗌 📑 Demo-1	-	naa.68ccf0	0 GB	0 GB	100	1	SCSI	-	-	Medium	
Demo-3	-	naa.68ccf0	0 GB	0 GB	100	1	SCSI	-	-	Medium	-
Discover119	-	naa.68ccf0	62.8 KB	197.9	2.0 GB	1	SCSI	-	-	Medium	-

Figure 14. Storage > Volumes

PowerStoreOS 3.0 introduces the Snapshots column to the Volumes, Volume Groups, File Systems, and Virtual Machines list view tables. You can add it to the view by using the Show/Hide Table Columns icon and selecting the **Snapshots** item. This enables you to see how many snapshots are associated with a particular object. You can also click the Snapshots number, which opens the **Protection** pane for the object and shows the specific snapshot details including name, type, or creation time.

PowerStoreOS 4.0 introduces Data Efficiency metric columns such as Volume Family Unique Data, Family Overall DRR, Reducible DRR, and Unreducible Data. Figure 15 shows the new columns and the column options.

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Volumes Volumes Instant Access		_			
+ Create Modify Provision * Protect * Repurpose *	More Actions	•		Volume Family Unique Data	
Name Volume Family Univ	que Data 🔸 🛛 🛛 F	amily Overall DRR	Family Reducible DRR	Logical Used	le Data
SCM - Supply Ch	440.1 GB 7	1.0: 1	5.8:1	<ul> <li>Provisioned</li> <li>Host Mappings</li> </ul>	3.3 MB
SCM - Supply Ch	440.1 GB 7	1.0: 1	5.8:1	Storage Protocol Protection Policy	3.3 MB
SBX - Sandbox	436.7 GB 9	1.4: 1	7.2:1	QoS Policy	LO MB
SBX - Sandbox-C	436.7 GB 9	.4:1	7.2:1	Performance Policy	I.0 MB
G Mongo-DB	209.9 GB 9	.8: 1	7.5: 1	Appliance     Volume Group	0 GB
B Mongo-DB-Clone	209.9 GB 9	.8: 1	7.5: 1	Creation Time	0 GB
BW-Business	186.5 GB 1	0.2: 1	7.6: 1	Datastore	.3 MB
BW-Business	186.5 GB 1	0.2: 1	7.6:1	Replication Destination	.3 MB
	186.0 GB 4	1.7: 1	4.5: 1	Type Node Affinity	1.5 MB
ERP-Clone	186.0 GB 4	l.7: 1	4.5: 1	Metric Interval	1.5 MB
B SAPHANA-DATA	162.7 GB 7	.7: 1	6.2:1	Family Reducible DRR	3.8 MB
SQL-DB	147.1 GB 7	.7:1	6.2: 1	Family Unreducible Data     Metro Remote System     Matro Data	↓ 1.0 MB

Figure 15. Storage > Volumes > Show/Hide Table Columns

#### **Volume Application Tags**

PowerStoreOS 2.1 introduced Volume Application Tags. A Volume Application Tag is specified during volume creation, allowing users to label their volumes with a specific category and application type based on the use case for those volumes (Figure 16).

You can use application-centric management to view and sort through the volumes by application type by adding the new **Application** column in the list view as seen in Figure 17. There are six different predefined categories, each with several different application types. If the application type is not listed, the user can manually enter their own application name. Finally, if the five categories do not match up with the application you are looking for, you can select the **Other** category and optionally enter the application type, up to 32 characters in length.

- Relational Databases: Oracle, SQL Server, PostgresSQL, MySQL, IBM DB2
- **Big Data & Analytics:** MongoDB, Cassandra, SAP HANA, Spark, Splunk, ElasticSearch
- Business Applications: ERP / SAP, CRM, Exchange, SharePoint
- Healthcare: EPIC, Meditech, Allscripts, Cerner
- Virtualization: Virtual Servers (VSI), Containers/Kubernetes, Virtual Desktop (VDI)
- Other: User specified application type

Create Volumes		×
Properties	Properties	
Host Mappings	General	Additional Properties
Summary	Name (Or Prefix)	Associated Volume Group - optional
	Marketing_Vol	None Selected Select
	Description - optional	Volume Protection Policy - optional
		None
		QoS Policy - optional
		None -
	Category Application	Volume Performance Policy 👔
	Select a category -	Medium
	Quantity Relational Databases Size	
	1 Big data & Analytics GB -	
	Business Applications	
	Healthcare	
	Other	
		Cancel Finish Next

Figure 16. Create Volumes Wizard > Application Category

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Volumes Volumes Instant	Access											
+ Create Modify	Provision •	Protect • Repurpo	se - More Actio	ons 🕶					44 Volumes	7	2	G
Name	Alerts	Application	WWN	Volume	Logic	Provi	Host	Stora	Reset Columns		1	Volur
SAPHANA-LOG	-	ERP / SAP	naa.68ccf09800	. 89.2 GB	500	500	1	SCSI	Autofit Columns		Ē	<b>3</b> -
Aarketing-Clone	-	CRM	naa.68ccf09800		4.0 KB	600	1	SCSI	General		-	-
C VMFS001	-	PostgreSQL	naa.68ccf09800		1.0 GB	99.0	1	SCSI	Alerts		Ē	3-
Backup-Vol1	-	SAP HANA	naa.68ccf09800	. 64.7 GB	400	400	1	SCSI	Application		-	-
SAPHANA-DATA	-	ERP / SAP	naa.68ccf09800	. 279.7 GB	1,024	1.0 TB	1	SCSI	WWN		Ē	3-
Uiew-Topology1	-	SQL Server	naa.68ccf09800		4.0 KB	400	0	None	<ul> <li>NGUID</li> <li>Volume Family Uniq</li> </ul>		-	-
Backup-Vol1-C	-	MongoDB	naa.68ccf09800	. 64.7 GB	399	400	1	SCSI	Logical Used		-	-
CRM - Custom	-	Oracle	naa.68ccf09800	. 70.3 GB	500	500	1	SCSI	Host Mappings	•	-	
🗌 🖨 test3-eql	-	Containers/Kubernetes	naa.68ccf09800.		10.0	20.0	1	SCSI		Medi	-	-
4												*

Figure 17. Storage > Volumes > Application Column

Application tags can be changed after a volume is created by modifying the volume properties and specifying a different application category and type. Any existing volumes created before PowerStoreOS 2.1 will not have any Application Tags configured. After upgrading to PowerStoreOS 2.1, the user can manually apply Application Tags to existing volumes. Once an Application Tag is applied to a volume, it cannot be removed, however it can be modified as needed. Application Tags can also be set and managed through the REST API or PowerStore CLI (pstcli).

Designed with interoperability in mind, Application Tags are applied at the volume level and cannot be applied to the Volume Group itself. However, Volume Groups support member volumes with Application Tags. If there are multiple member volumes with different Application Tags, the Volume Group will show as a **Mixed** application category.

Application Tags have also been designed with backwards compatibility in mind. When creating a Volume through REST API or pstcli, the Application Tag fields are not a required field. However, in PowerStore Manager, Application Tags must be specified to

continue the Create Volume Wizard. This is to prevent issues with pre-existing automation scripts or applications after upgrading to PowerStoreOS 2.1.

Consider the following points when applying and managing Application Tags:

- **Cloning Volumes**: Clones of a Volume with an application tag will inherit the tag of the parent volume.
- **Snapshots of Volumes**: Snapshots do not inherit the Application Tags of the source volume, and operations like refresh and restore do not affect the Application Tag of the source volume.
- Internal Migration of Volumes: The Application Tag will be migrated and retain the same value as the source volume.
- **Importing Volumes**: Imported Volumes will not have an Application Tag set and can be modified post-import to add an Application Tag.
- **Replication:** The Application Tags are always replicated to the destination volume.

#### **View Topology**

PowerStoreOS versions 3.0 and later allow you to view information about the topology of a volume or volume group. This feature provides a hierarchy as a graphical family tree between volumes, clones, and snapshots. This makes it efficient to visualize the family relationship with one click, as opposed to querying the data based on the family ID, which can be time-consuming. This feature is supported for volumes and volume groups. Figure 18 shows that after you select a volume, you can click **More Actions** > **View Topology** to see the topology.

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Volumes										
+ Create Modify Provision + Protect + F	Repurpose 🔻	More Actions -		39 \	/olumes, 1 selected	' 🔲 🖸	C			
Name	Alerts	Migrate	Host Mappings	Storage Protocol	Protection Policy	Snapsho				
SCM - Supply Chain Management	-	Change Performance Policy Change QoS Policy	1	SCSI	ProtectionPolicy1	0	Â			
SCM - Supply Chain Management-Clone	-	Change Metric Granularity	1	SCSI	-	0				
SBX - Sandbox	-	Compare IO Performance	1	SCSI	ProtectionPolicy1	0	Ш			
SBX - Sandbox-Clone	-	Add to Watchlist	1	SCSI	ProtectionPolicy1	0	Ш			
Mongo-DB	-	Remove from Watchlist	1	SCSI	ProtectionPolicy1	0				
Mongo-DB-Clone	-	Gather Support Materials	1	SCSI	-	0				
BW - Business Warehouse-Clone	-	View Topology	1	SCSI	ProtectionPolicy1	0				
BW - Business Warehouse	-	882.5 GB 1.0 TB	1	SCSI	ProtectionPolicy1	0				

Figure 18. Storage > Volumes > View Topology

Figure 19 shows an example of the Topology for the volume **BW – Business Warehouse**. Notice that below the **Snapshots** icon, the volume has four snapshots created. There is also a clone created from snap5. You can click the different objects in the topology to show more detailed information about the panes on the right, such as the details, capacity, and hosts the volume is mapped to. You can collapse and expand objects in the topology with the minus and plus signs, and you can also drag objects to reposition them as wanted. Any user changes to the view persist and remain intact, even after a logout. You can also use the search box to search for specific items. This new view allows you to understand impacts of your actions and avoid errors.



Figure 19. Storage > Volumes > Topology

Figure 20 shows the capacity and family capacity details on the capacity pane. The family capacity includes all space consumed by the base volume, and all clones and snapshots including internal system snapshots used for replication. The capacity shown may not always match the objects in the topology. In PowerStoreOS version 4.0 and later, Volume Family Unique Data, Overall DRR, Reducible DRR, and Unreducible Data metrics can be viewed from this pane as well.

Details Ca	pacity Mapped Hosts	×
Capacity		
	Provisioned	400.0 GB
	Logical Used	400.0 GB
100%	Logical Free	4.0 KB
Used	Thin Savings	1:1
	Snap Savings	5: 1
	Snapshot/Thin Clone Space	3.9 TB
	Volume Family Unique Data	64.7 GB
Family Capacity	Dravisionad	4 9 TR
	Provisioned	4.3 ID
100%	Logical Osed	4.3 ID
Used	Logical Free	742.4 MD
	Thin Savings	 5-3
	Snap Savings	5: I 2 0 TP
	Volume Eemily Unique Date	5.7 CB
	Family Overall DRP	18.6:1
	Funny Overan DRR	10.0.1
	Eamily Deducible DDD	10.5.1

Figure 20. View Topology > Capacity Tab

#### Storage: Volume Groups

A volume group is a logical container for a group of volumes and provides a single point of management for multiple storage resources that work together as a unit. For example, you can use volume groups to monitor metrics and manage data protection for

development applications, user applications, and user storage resources. You can also use volume groups to separate the management of test environments from development environments.

To configure a volume group in PowerStore Manager, go to **Storage** > **Volume Groups** as shown in Figure 21. In this page, you can create, view, manage, and delete volume groups. On this page, you can also create and manage thin clones from volume groups. To monitor the capacity, performance, protection status, and view members of a volume group, click the name of the group to display it in the page table.

PowerStore Prod-Site1				۵	롿 2 0 🗰						
器 Dashboard	Compute - Storage -	🕈 Protection 🗸 🕀	Migration - 🔠 Hardware		Settings						
Volume Groups           Volume Groups											
+ Create Modify Provision	Protect • Repurp	More Actions	•	6 Volume Groups	7 🔟 🖸 C						
□ Name ↑	Alerts Write-Order	Logic Provi	Storage Protectio	QoS Performance.	Members						
Business Warehouse Gr	- No	1.9 TB 2.0 TB	SCSI Protectio	- Mixed	Volumes (2)						
	– Yes	0 GB 555	SCSI –	High	Volumes (1)						
	– No	1.5 TB 1.5 TB	SCSI Protectio	- Medium	Volumes (2)						
SAPHANA.2024-03-15T	– Yes	0 GB 0 GB	None -		-						
SBX Group	No	4.0 TB 4.0 TB	SCSI Protectio	- Mixed	Volumes (2)						
Sphere Group	– Yes	1.0 GB 432	SCSI –	High	Volumes (2)						

Figure 21. Storage > Volume Groups

Storage: Recycle Bin In PowerStoreOS versions 3.5 and later, a recycle bin is supported for block volumes, volume groups, and clones. This allows users an additional way to prevent accidental deletion of block storage. When a resource is deleted in the GUI, it will be placed into the Recycle Bin by default. Users have the option to skip the recycle bin in the delete resource window, causing immediate deletion. Note that deleting a volume has the same prerequisites as previous PowerStoreOS versions.



Figure 22. Delete Volume Window

When a block storage resource has been placed in the Recycle Bin, a user has two options: **Expire Now** or **Recover**. Expire Now will trigger expiration and immediately delete the object; the Recover option will restore the object back into the storage section for use. The expiration duration for resources in the Recycle Bin can be configured

between 0-30 days. The default setting is seven days. Setting the value to 0 days causes resources to expire immediately.

**Important**: The Recycle Bin expiration setting applies to the entire cluster. While resources are in the recycle bin, they still consume storage capacity and count against system limits.

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믑 Dashboard  🖻	Monitoring	🗍 Compute 🗸	🛢 Storage 🗸	$\P$ Protection -	🕀 Migrati	ion 🗸 🏢 Hardware				Ô	Settin	igs
Recycle Bir	1											
Volumes	olume Group	5										
Recover	e Now						3 Vol	umes, 1 selecto	ed 7	7 🛄		C
🗖 Name 个	Alerts	Logical Used	Provision	Application	Туре	Deletion Time	Expiration Time	Snap	Applia	nce		
DDVE_Backup	-	0 GB	140.0 GB	Splunk	Prim	2024-02-27 10:54	2024-03-05 10:54	0	🖽 Ap	pliance	RT-H21	71
Finance - Old	-	0 GB	120.0 GB	Exchange	Prim	2024-02-27 10:55	2024-03-05 10:55	0	🖽 Ap	pliance-	RT-H21	71
Marketing - Ol	i –	0 GB	85.0 GB	Exchange	Prim	2024-02-27 10:56	2024-03-05 10:56	0	🖽 Ap	pliance-	RT-H21	71

Figure 23. Recycle Bin

#### Storage: Storage Containers

You can use a storage container to present vVol storage from PowerStore to vSphere. vSphere mounts the storage container as a vVol datastore and makes it available for VM storage. In PowerStoreOS versions 3.0 and later, storage containers are classified as either SCSI or NVMe. This classification dictates the storage protocol that they support. In previous versions of PowerStoreOS, all storage containers were considered SCSI by default. A storage container spans all appliances in the cluster and uses storage from each. The specific appliance that a given vVol resides on is visible in PowerStore Manager, and you can migrate a vVol between appliances in the same cluster. Use the **Storage > Storage Containers** page (Figure 24) to create and manage storage containers within PowerStore Manager.

PowerStore Prod-Site1								۵	∉9 ≗ ⊘ Ⅲ
믬 Dashboard 🏼 🏱 Monitoring	🗍 Compu	ute 👻 🥃 Storag	e 🗸 🖷 🛡 Prote	ection 👻 🕀 I	Migration <del>•</del>	IIII Hardwar	e		O Settings
Storage Container	S						4 5	Storage Containers	7 🔟 🗹 ୯
Name	Alerts	Datastore	Storage	Used S	Quota	Total S	Free Sp	High Water	Number of vVols
StorageContainer-1	-	DatastoreS	SCSI	11.7 TB	0 GB	64.8 TB	58.5 TB	85%	44
NVMeSC-1	-	DatastoreN	NVMe	11.7 TB	0 GB	64.8 TB	58.5 TB	85%	52
StorageContainer-2	-		SCSI	11.7 TB	0 GB	64.8 TB	58.5 TB	85%	0
PowerStore Power	-		SCSI	11.7 TB	0 GB	64.8 TB	58.5 TB	85%	0

Figure 24. Storage > Storage Containers

Storage: NASBefore file systems on a Unified PowerStore appliance are configured, you must create a<br/>NAS server. A NAS server is a virtualized network-attached storage server that uses<br/>SMB, NFS, FTP, or SFTP protocols to catalog, organize, and transfer files within file-<br/>system shares and exports. A NAS server, the basis for multitenancy, must be created<br/>before you can create file-level storage resources. A NAS server is responsible for the

configuration parameters on the set of file systems that it serves. To create, view, manage, or delete NAS servers, use the **Storage** > **NAS Servers** page in PowerStore Manager, as shown in Figure 25.

PowerStore	Remote-Site3						∆ f	📲 ° & 📲
🗄 Dashboard	P Monitoring	🕽 Compute 👻 🚦	Storage 👻 🛡 Protec	tion 👻 🕀 Mig	ration 👻 🛄 Hard	ware		③ Settings
NAS Ser	VETS							
+ Create	Modify Protect	▼ Repurpose	More Actions				4 NAS Servers	7 II [] C
Name	Alerts	NFS SM	IB Preferred Node	Current	Preferred IPv	Preferred IPv	Replication	Protection Pol
Productio	on	Yes Yes	s 1000T-A-nod	1000T-A	192.	-	No	-
Image_S	erver –	Yes Yes	s 1000T-A-nod	1000T-A	192.	-	No	ProtectionPol
🗌 demo	-	Yes No	1000T-A-nod	1000T-A		-	No	
UnityNAS	s –	Yes No	1000T-A-nod	1000T-A	-	-	No	-

Figure 25. Storage > NAS Servers

Common Anti-Virus Agent (CAVA) enables third party software to identify and eliminate known viruses before they infect files on SMB shares. PowerStoreOS versions 4.0 and later allow users to manage and configure CAVA directly through PowerStore Manager, CLI, and REST API without any third-party tools.

PowerStore Prod-Site176						A E	: 2 O III
B Dashboard P Monitoring	🗍 Compute 👻 🗧 Storage 🗸 🖤	Protection 👻 🖑 Migr	ation 🕶 📰 Hardwa	are			Settings
NAS Servers > ⊟ Pro	oduction_General_Server 6	9					Actions *
Capacity Free Provisioned © 2.6 TB • 5.9 TB	Performance Latency IOPS Bandwidth 1.06 ms 7.9 kIOPS 61.6 MB/s	Alerts Critical Major Minor O 0 0 0 0	Protection Policy	Network	Naming Services	Sharing Protocols	Security & Events
Kerberos Antivirus Antivirus Service Active File Systems to be Scanned	Events Publishing           Disable           Status         Account Privileges	Audit Info					
File System					Config Type	u constante a	
Production_General_FS0					General		<u>^</u>
Production_General_FS1					General		
Production_General_FS2					General		
Production_General_FS3					General		

Figure 26. Storage > NAS Servers > Security & Events > Antivirus

#### Storage: File Systems

A file system represents a storage resource that provides network file storage. The types of file systems that you can create are determined by the file-sharing protocols (SMB, NFS, or multiprotocol) that are enabled for NAS servers on the PowerStore appliances in your cluster. You can create, view, manage, and delete file systems, SMB shares, and NFS exports from the **Storage** > **File Systems** page as shown in Figure 27.

PowerStore	Remote-Site3					A =	ዸ ? Ⅲ
🗄 Dashboard 🕴	🖻 Monitoring 🗍 Con	npute 👻 🥃 Storage 🗸	Protection	🔹 🕀 Migratio	on 👻 🏢 Hardware		Settings
File System	MS SMB Shares	NFS Exports					
+ Create	odify Protect -	Repurpose • More	Actions 🔻			25 File Systems	7 🔳 🖸 C
□ Name 个	Con	nfig Type Alerts	Size Used	Total Size	NAS Server Name	Protection Policy	FLR Mode
🗌 💾 demofs	1 Gen	neral –	2.0 GB	20.0 GB	demo	-	-
🗌 💾 demofs2	2 Gen	neral –	2.0 GB	20.0 GB	demo		-
🗌 💾 demofs	3 Gen	neral	2.0 GB	20.0 GB	demo		-
🗌 💾 Image_F	SO Gen	neral –	337.6 GB	500.0 GB	Image_Server	ProtectionPolicy2	-

Figure 27. Storage > File Systems

Storage: Quality-of-Service (QoS) is the ability to limit the performance capabilities of a resource. This allows granular prioritization of I/O for storage resources to ensure administrators meet their SLAs within their organization. Limits can be placed on non-critical applications, which frees resources for other applications. PowerStoreOS versions 4.0 and later support QoS for block storage resources. To set QoS on a resource, a Block IO Limit Rule and QoS Policy must be created. The Block IO Limit rule object specifies the type of rule to implement and the metric to limit. Block IO limit rules support Absolute and Density based limits. I/O can be limited using an IOPs limit, bandwidth limit, or a combination of the two. QoS can be found by navigating to **Storage > Quality of Service (QoS)**. For more information about configuring Block QoS Policies and Block IO Limit Rules, see the <u>Dell PowerStore Configuring Volumes</u> guide.

PowerStore Prod-Site22	28			۵	€ گ		
맘 Dashboard	🗍 Compute 🕶 🛢 Storage 🕶	Protection	🗘 Migration 👻 🔠 Hardw	are	<	Settin	ngs
Quality of Service (QoS)	Block IO Limit Ru	les					
Block QoS Policies	+ Create Modify Mo	re Actions 🕶		1 IO Limit Rule	7 🛙		C
Block IO Limit Rules							
	□ Name ↑	Туре	Max IOPS	Max Bandwidth (KBps)		Burst	\$
	Demo	Absolute	1000	13000		3	1%

Figure 28. Storage > Quality of Service (QoS) > IO Limit Rules

#### Protection: Remote Systems

You can use the **Protection** > **Remote Systems** page (Figure 29) to configure remote system connections between source and destination PowerStore clusters to enable remote replication. For PowerStore, the remote system connection is associated with a replication rule which is applied to a supported storage resource. You can create remote system connections ahead of time in the **Remote Systems** page, or while creating a replication rule.

PowerStore HQ-S	Site101					۵	<b>⊴</b> ª 2 0 <b>Ⅲ</b>			
🗄 Dashboard 🏼 🏱 Mo	onitoring 🗍 Compu	ite 🕶 🗐 St	torage - Protection -	🕀 Migration 🕶	IIII Hardware		Settings			
Remote Syst	+ Add     Modify     Delete     More Actions •     2 Remote Systems     7 []     []     C <sup>4</sup>									
🗌 Name 🛧	Туре	Alerts	Capability	Management/Fi	Data Connection	Management IP	Network Latency			
PowerProtect	PowerProtect	-	[⊕] Remote Backup	ОК	🗸 ОК	192.	-			
PowerStoreD	PowerStore	-	9 Block, vVol, Metro 日 File	OK OK	🗸 ОК	192.	Low (< 5 ms)			

Figure 29. Protection > Remote Systems

#### Protection: Replication

Data replication is a process in which storage data is duplicated to a remote cluster, which provides an enhanced level of redundancy if the main storage system fails. Replication minimizes the downtime-associated costs of a system failure and simplifies the recovery process from a natural disaster or human error.

PowerStore has consistently provided asynchronous replication for block storage. However, with the introduction of PowerStoreOS 3.0, this feature was extended to file storage. As a result, all data types, whether housed in block or file volumes, or within volume groups, can be replicated in an asynchronous manner.

Asynchronous replication of vVol-based VMs is also supported with PowerStoreOS versions 3.0 and later with VMware SRM integration.

In PowerStoreOS versions 4.0 and later, native synchronous replication is supported. This is available for Network Attached Storage (NAS) servers along with their underlying file systems, volumes, and volume groups.

When a protection policy with a replication rule is applied to a volume, volume group, or NAS server, the related replication session that is created appears in **Protection** > **Replication** page (Figure 30). You can use this page to monitor, pause, or fail over replication sessions as needed.

PowerStore	Remote-Site3								⊥ € <sup>9</sup> 2 0 Ⅲ
🔠 Dashboard	P Monitoring 🗍 Comp	oute 🕶 🗎 Sto	rage 👻 💙	Protection -	🕀 Migrati	ion 👻 🏢	Hardware		<li>Settings</li>
Replicati	ON failover							28 Replic	ation Sessions 🛛 🏹 🚺 🖸 C <sup>4</sup>
Source	↑ Session Status	Source	Resource	Destin	Desti	Local	Repli	Policy	Last Synchronization Time
Backup-V	ol1 🗸 Operating	Curren	Volume	Powe	Back	Sour	Asyn	Prote	2024-03-15 02:29 PM UTC -04:00
Business	Wa 🗸 Operating	Curren	Volume	Powe	Busi	Sour	Asyn	Prote	2024-03-15 02:29 PM UTC -04:00
CRM - Cu	sto 🗸 Operating	Curren	Volume	Powe	CRM	Sour	Asyn	Prote	2024-03-15 02:29 PM UTC -04:00
DB_srv_I	C <sup>4</sup> Synchroni	Curren	Replicati	Powe	DB_s	Sour	Asyn	Prote	2024-03-15 02:25 PM UTC -04:00
ERP	✓ Operating	Curren	Volume	Powe	ERP	Sour	Asyn	Prote	2024-03-15 02:29 PM UTC -04:00
🗌 > Imag	e_S 🗸 Operating	Curren	NAS Serv	Powe	lmag	Sour	Sync	Prote	-

Figure 30. Protection > Replication

#### Protection: Metro

PowerStoreOS versions 3.0 and later support the Metro Volume implementation, which you can use for disaster avoidance, application load balancing, and migration scenarios. This feature provides active-active I/O to a Metro Volume across two PowerStore clusters. It supports FC/SCSI or iSCSI-connected VMware ESXi hosts. In PowerStoreOS version 4.0 and later, the system has expanded metro support to volume groups as well as Linux and Windows hosts. When Metro Volume is implemented, you can see the details in **Protection** > **Metro** page (Figure 31). You can use this page to monitor, end, pause, and to set the local preferred role.

PowerStore Remote-Site3							∆ <b>≝</b> ° ≗ ⊘ ∎
믑 Dashboard 🏼 P Monitoring 🕻	🕽 Compute 🕶	🛢 Storage 🕶	Protection -	🕀 Migration 🕶	IIII Hardware		<ul> <li>Settings</li> </ul>
Metro End Metro Pause Set Loc					3 M	etro Resources, 1 sel	ected 🛛 🍸 🚺 🗹 C <sup>a</sup>
■ Metro Status ↑	Resource	Remote Sys	Local Preferre	Туре	Witness Name	Witness State	Estimated Completion Time
🗹 🗸 Operating Normally (A	MetroVG	PowerStore	Preferred	Volume G	MetroWitness	<ul> <li>Engaged</li> </ul>	-
🗌 🗸 Operating Normally (A	Metro-001	PowerStore	Preferred	Volume	MetroWitness	<ul> <li>Engaged</li> </ul>	-
🗌 🗸 Operating Normally (A	Metro-003	PowerStore	Preferred	Volume	MetroWitness	<ul> <li>Engaged</li> </ul>	-

Figure 31. Protection > Metro

#### Protection: Metro Witness

Starting with PowerStore version 3.6, Metro Volume supports a witness server. The witness server is software that is installed on a host at a third site. The witness monitors the status of the local and remote PowerStore systems. When a failure occurs, the witness determines which system remains accessible to hosts and continues to service I/Os. This adds more resiliency and further mitigates the potential risk of split-brain scenarios.

PowerStore	PowerStore	Demo			🗢	€ <sup>1</sup> 2 0 Ⅲ
🗄 Dashboard	P Monitoring	🗍 Compute 🕶	Storage - Protection	n 🗸 🚯 Migration 👻 🏢 Hardware		Settings
Metro W	itness	7				
+ Add M	odify Delete	]			1 Metro Witness, 1 selected	7 🔟 🖸 C'
Name ↑		Alerts	Address	Connection State	Metro Resources Description	
MetroWiti	ness	-	192.168.105.136	🗸 ОК	3 -	

Figure 32. Metro Witness (Protection > Metro Witness)

Protection: Native PowerProtect DD Backup Integration In PowerStoreOS version 3.5 and later, the system can complete backups directly to a PowerProtect Data Domain series appliance. A PowerProtect DD system would need to be added as a remote system under **Protection > Remote Systems**. This feature allows the backup traffic to be directly offloaded to the backup storage appliances, which eliminates the need for a backup host. PowerStore supports both physical and virtual edition (DDVE) PowerProtect appliances. Backups are supported on volumes and volume groups.

There are three primary functions when using the remote backup feature:

- Backup Session Backs up data from a supported storage object to a PowerProtect DD system. The data is backed up in the form of a point-in-time snapshot on the PowerProtect appliance.
- Retrieve Session Allows users to pull data from a PowerProtect appliance to a PowerStore appliance.
- Instant Access Allows hosts connected to a PowerStore appliance to temporarily access the data residing on the PowerProtect DD series appliance.

PowerStore HQ-Si	te101				Δ	₫!	2 O	
믬 Dashboard 🏼 P Mon	itoring 🗍 Comput	e 🕶 🛢 Storage	e   Protection	🕀 Migration 🕶 🛄 I	Hardware		③ Set	ttings
Remote Back Backup Sessions Pause Resume	UD Retrieve Sessions Delete Backup	Resources	Instant Access S	essions 2 B	ackup Sessions	Ŷ	• 2	C
Status	Source Name	Туре	Remote System	Protected By	Alerts	Last B	ackup Tin	ne
🗌 💭 Prepare	Backup-Vol1	Volume	PowerProtect-App	ProtectionPolicy3	-	2024-	03-20 04:	54 PM
🗌 💭 Prepare	SAPHANA	Volume gr	PowerProtect-App	ProtectionPolicy3	-	2024-	03-20 05:	55 PM

Figure 33. Protection > Remote Backup

#### Protection: Protection Policies

A protection policy consists of snapshot rules, a replication rule, a remote backup rule, or a combination of each that you create to establish consistent data protection across storage resources. After you configure a protection policy, you can associate new or existing storage resources with the protection policy. Remote backup rules are used with the native PowerProtect DD backup integration feature which was introduced in PowerStoreOS 3.5.

Protection policies automatically manage snapshot, replication, and backup operations that are based on the included rules. You can create policies with various rules to meet your local and remote protection needs and assign a policy to resources to provide identical protection to those resources.

Each protection policy can only include one replication rule, one remote backup rule, and up to four snapshot rules. To create and manage protection policies, go to **Protection** > **Protection Policies** as shown Figure 34.

#### PowerStore Manager user interface

PowerStore   HQ-Site101								4 e	<u>)</u> 2 (	
🔡 Dashboard 🏼 🏱 Monitoring	🗍 Compute 🕶 🛢	Storage 🕶	Protection -	🕀 Migration 🗸	IIII Haro	lware			③ Se	ettings
Protection	Protection F	rotection Policies								
Protection Policies	+ Create Mod	fy More	e Actions 🔻				5 Protection	Policies	7 🛛 🖸	] C'
Snapshot Rules Replication Rules	🗌 Name 🛧	Snap	Replication Rule	Remote	Volu	Volu	Virtu	Virtu	File S	NAS
Remote Backup Rules	Protection	0	ReplicationRu	-	6	2	0	0	0	0
	Protection	1			0	0	0	0	21	0
	Protection	1	ReplicationRu	DD rem	1	1	0	0	0	0
	Protection	1	ReplicationRu		0	0	0	0	0	1
	RP1:0	0	ReplicationRu		0	0	15	41	0	0

Figure 34. Protection > Protection Policies

#### Migration: Migration Actions

There are two ways to migrate storage resources in PowerStore Manager: manual migration and assisted migration. When a volume or volume group is provisioned on a specific appliance, you can choose to manually migrate the storage resource to another appliance in the cluster later. Assisted migrations are recommendations that are based on regular monitoring of storage resources across the appliances in the cluster. These recommendations are generated based on many factors including drive wear, appliance capacity, host connectivity, and health. Recommendations are shown under **Migration** > **Internal Migration** as shown in Figure 35. Before removing or shutting down an appliance for service, use this feature to migrate storage resources to another appliance and prevent disruption. When you migrate a volume or volume group, all associated snapshots and thin clones also migrate with the storage resource. To start a migration, select the associated migration action and click **Start Migration**.

PowerStore   HQ-Site101					ム ≇⁰ ≗ ⊘ ⅲ					
🔡 Dashboard 🏼 🏱 Monitoring	🗍 Compute 🗸 🛢 Storage 🗸 📢	🗘 Protection 👻 🎂 I	Migration 👻 🛄 H	Hardware	③ Settings					
Internal Migrations	Internal Migrations Migration Actions Migrations									
				3 M	igration Sessions 🛛 🍸 🚺 🔀 C					
Name	Storage Resource	Rescan Status	Rescan Host	Migration Type	Creation Time $ \psi$					
DB_srv_I - 1000T-A	DB_srv_I and related objects	✓ Completed	0	Manual	2024-03-20 08:12 PM UTC -04:00					
vvolVM2 - 1000T-A	vvolVM2 and related objects	✓ Completed	0	Manual	2024-03-12 09:31 PM UTC -04:00					
VSphere Group - 1000T-A	vSphere Group and related objects	<ul> <li>Completed</li> </ul>	1	Manual	2024-03-12 09:27 PM UTC -04:00					

Figure 35. Migration > Internal Migrations

Migration: Internal Migrations When a migration is initiated, all migration sessions are displayed under **Migration** > **Internal Migrations** > **Migrations** as shown in Figure 36. This page allows you to easily monitor migrations in the cluster and determine the status of each migration along with an estimation of completion time.

PowerStore HQ-S	Site101						Δ :	€ ≗ @ Ⅲ
믑 Dashboard  눧 Mo	onitoring 🗍 (	Compute 🗸 🛢 Storage 🗸	$ ensuremath{\mathbb{O}} $ Protection -	Migration	- IIII Ha	rdware		Settings
Internal Migr	Internal Migrations Migration Actions Migrations							
Delete Pause	Resume						3 Migration Sessions	7 🔲 🖸 C
Name	Source S	Storage Resource	Destination	Status 🛧	ETA	Progr	Туре	Last Sync Date
DB_srv_I - 100	5200T-B	DB_srv_I and related o	1000T-A	🗸 Com	-	100	Replication Group	2024-03-21 01:43
VSphere Grou	5200T-B	vSphere Group and rel	1000T-A	🗸 Com	-	100	Volume Group	2024-03-21 01:43
vvolVM2 - 100	5200T-B	vvolVM2 and related o	1000T-A	🗸 Com	-	100	Replication Group	2024-03-21 01:43

Figure 36. Migration > Internal Migration > Migrations

#### Migration: Import External Storage

t PowerStore supports importing external storage from supported storage platforms. The PowerStore import feature supports the following block storage resources from other arrays: LUNs and volumes, consistency groups and volume groups, and thick and thin clones, depending on the source system. PowerStore can manage the import process non-disruptively with a host orchestrator called a host plug-in which is installed on all hosts that access the source data. Agentless import is also supported, but it is a disruptive process which requires application downtime. Go to Migration > Import External Storage (see Figure 37) to connect to supported storage platforms and enable a nondisruptive import. To connect to a remote system from PowerStore, you must have the management IP address, iSCSI IP addresses, and credentials. FC target WWNs are automatically discovered.

PowerStoreOS versions 3.0 and later support native file import. Dell VNX2 is supported with 3.0 and later, and Unity is supported with 4.0 and later. This capability includes support for both NFS and SMB file systems. Proper networking and configuration of the **File Import Interface** is required to use this import functionality.

PowerStoreOS versions 4.0 and later support import from universal remote systems, which allows the PowerStore to perform agentless imports for a wide range of block storage systems. FC and iSCSI backend connections are supported and the discovery does not require control path connectivity to the remote storage system.

For more information about imports and the import process, see the white paper <u>Dell</u> <u>PowerStore: Migration Technologies</u>.

**Note**: Ensure that all existing hosts and storage systems are referenced in the <u>PowerStore Simple</u> <u>Support Matrix</u>. If a system is not referenced, open an RPQ for support.

#### PowerStore Manager user interface

PowerStore PowerS	StoreDemo			Add Remote System		×
B Dashboard  본 Monito	oring 📋 Compute 🕶 🗎 St	orage 👻 🛡 Protec	ction 👻 🐣 Migratio	Turne		
Import Externa	l Storage			Universal		•
Remote Systems	Block Hosts Block Import	ts File Imports	File Import In	Name Remote Storage System		
+ Add Remote System		NAS Server Mor	e Actions 👻	Management IP Address or FQDN		
🗌 Remote Syste 🛧	Name	Alerts	Management IP	192.168.1.99		
NetApp	svm_iscsi-test	-	192.168.127.200	Description - optional		
PS Equallogic	psdemo-test-grp	-	192.168.98.150			
Storage Center	Storage Center 71108	-	192.168.98.110			
🗌 Unity	FNM00184800225	-	192.168.80.34	Data Connection Type		
VNX	APM00140947297	-	192.168.20.118		Fibre Channel	
XtremIO	dt-online-r10-x1-2	-	192.168.125.51	-		
				Select FC Targets		
					22 Fc Targets, 1 selected	l 🛛 C
				WWNN	WWPN	
				20:00:00:24:ff:4e:8f:5e	21:00:00:24:ff:4e:8f:5e	Î
					Car	ncel Add

Figure 37. Migration > Import External Storage > Add Remote System

PowerStore HQ-Si	te101					¢ ≇ <sup>9</sup> 8 Ø <b>‼</b>			
믬 Dashboard	itoring 🗍 Compute 🗸	Storage -	<ul> <li>Protection -</li> </ul>	🕹 Migration 👻 🛄 H	Hardware	Settings			
Import Extern	Import External Storage								
+ Add Remote Systems	Import Volume	Import NAS Se	erver More Actio	ns •		6 Remote Systems 🛛 🏹 🛄 🔀 C <sup>4</sup>			
🗌 Remote 个	Name	Alerts	Management IP	Management/File S	Data Connection	Capability			
NetApp	svm_iscsi-test	- 1	192.	ОК	🗸 ОК	Block Agentless Import			
PS Equallogic	psdemo-test-grp	- 1	192.	ОК	🗸 ОК	Block Non Disruptive Import, Block Agentless Import			
Storage Center	Storage Center 71	- 1	192.	ОК	🗸 ОК	😰 Block Non Disruptive Import, Block Agentless Import			
Unity	FNM00184800225	- 1	192.	ок ок	🗸 ОК	Block Non Disruptive Import, Block Agentless Import File			
UNX	APM00140947297	- 1	192.	ОК	🗸 ОК	🔁 File			
XtremIO	dt-online-r10-x1-2	- 1	192.	ОК	🗸 ок	Block Agentless Import			

Figure 38. Migration > Import External Storage

 Migration:
 After an import is successfully initiated, the import session displays under Migration >

 Imports
 Import External Storage > Block Imports or File Imports (Figure 39). This page allows you to manage the import sessions as required including the following supported operations: Cancel, Cutover, Enable Destination Volume, Start Copy, Pause, Resume, and Cleanup. During an ongoing import, a cancel operation enables you to change the active path to the source storage resource. When a cutover operation is performed, the import session can no longer be canceled.

PowerStore	HQ-Site	:101						۵	€ 2 0 Ⅲ
🗄 Dashboard	P Monito	oring 🗍 Comp	ute 🔹 🗎 Storage 🕶	Protection	n ▼      🚭 Migration	- IIII Hardware			Settings
Import E Remote Sys	Import External Storage           Remote Systems         Block Imports         File Imports         File Import Interface								
Import Action	15 -							5 Block Imports	7 II [] C
Туре	Impo	Source Re	Remote System ID	Remote	Destination	Import State	Copy Progre	Start Time	Last Updated Time 🛛 🗸
Vol	Agen	Discover93	8bc1f7d4-b282	XtremI0	Discover93	✓ Import Completed	100%	2024-03-20 11:06	2024-03-20 11:10 PM
Vol	Agen	Demo-1	49158a24-ce62	Unity	Demo-1	Copy In Progress	2%	2024-03-20 11:08	2024-03-20 11:09 PM
Vol	Agen	Demo-3	49158a24-ce62	Unity	Demo-3	P Ready To Enable		2024-03-20 11:09	2024-03-20 11:09 PM
Vol	Agen	Discover1	8bc1f7d4-b282	XtremI0	Discover119	▶ Ready For Cutover	100%	2024-03-20 11:07	2024-03-20 11:08 PM
Vol	Agen	SC_vols 5	9baf4c30-749f-4	Storage	SC_vols 5	Paused	6%	2024-03-20 10:53	2024-03-20 11:08 PM

Figure 39. Migration > Import External Storage > Block Imports

Table 5 shows the actions available for import sessions along with the associated descriptions. An action depends on the import job current state.

Table 5. Import actions

Action	Overview						
Cancel	Cancels import session and goes back to source						
	Terminates a session that has not been cutover						
	Disables access to the destination volume						
	Deletes the destination volume or volume group associated with the import session						
Cutover	Cuts over the resource in PowerStore						
	• Stops background copy and removes host mappings from source						
	<b>Note</b> : After a cutover has been completed, it cannot be canceled, a it is not possible to revert to the source resource.						
Pause	Suspends a copy-in-progress import session						
	Only pauses the background copy; host I/O is still mirrored						
Resume	Resumes a paused session						
	<ul> <li>Starts the background copy again from where it was paused and continues the host I/O mirroring</li> </ul>						
Cleanup	Removes an import session in clean-up-required state						
	Removes an import session that had a failure						

Actions applicable to A	gentless Import
Enable Destination Volume	<b>Note:</b> Before you select this action, ensure the host application accessing the source volume or volumes is shut down. Also, ensure the host mappings are removed from the volume or volumes in the source system.
	Enables destination resource for writes
	Connectivity with the source system goes into inactive state
	For each import session that is in the <b>Ready To Enable Destination</b> <b>Volume</b> state, select the import session, and select <b>Import Actions</b> > <b>Enable Destination Volume</b> to progress each import session to the <b>Ready to Start Copy</b> state.
Start Copy	<b>Note:</b> Ensure the host application has been reconfigured to access and use the destination volume or volumes in PowerStore.
	Starts the background copy and continues the host I/O mirroring
	For each import session that is in the <b>Ready to Start Copy</b> state, select the import session, and select <b>Import Actions</b> > <b>Start Copy</b> to progress each import session to the <b>Copy In Progress</b> state

#### Hardware

For PowerStore, an appliance consists of a base enclosure and optional expansion enclosures. A base enclosure includes two nodes and slots for up to 25 drives, while expansion enclosures enable adding more drives and increasing the storage capacity of the appliance. To view the overall health of the physical hardware of appliances, go to **Hardware > Appliances** as shown in Figure 40. This page lists all appliances that are associated with the cluster. Click an appliance in the table to display the appliance details page to review more information.

PowerStore HQ-Site	e101						۵	€ 2		
🗄 Dashboard Þ Monite	oring 🗍 Con	npute 👻 🗎 Storage 🕶	Protection	<ul> <li>➡ Migration -</li> </ul>	Hardware				🔅 Setti	ings
Hardware Appliances Clust	Hardware          Appliances       Cluster FE Ports         + Add       Modify       Remove       More Actions ~       2 Appliances       Y       II       Z       C <sup>4</sup>									
□ Name ↑	Alerts	Model	Service Tag	Express Service Code	Status	IP Address		Tot	al Capac	ity
🗌 🚍 1000T-A	-	PowerStore 1000T	78YJBX2	15779214614	Online	192.			9.71	тв
□ 🚍 5200T-B	-	PowerStore 5200T	GH05QM3	35856710139	Online	192.			55.1 T	тв

Figure 40. Hardware page

In the appliance details page, you can review the metrics, alerts, and health information for the selected appliance and its associated components (Figure 41). This information is similar to the Dashboard view, but is filtered for the selected appliance, which is useful in daily administrative tasks. In terms of physical hardware component health and status, click the **Components** card on the right side of the page. In the components view, you can see different views of the base enclosure including **Drives** (Figure 42), **Rear View**, and **Top View**. Each view has different components that can be selected for more information including the part number, health status, and other component-specific details. When a component has an issue or is faulted, the graphical figure indicates an alert, depending on the type of issue, to visually notify the user of an error.

On the **Drives** tab, there is an option to **Blink LED**. When the base enclosure is selected, click the button to blink all LEDs for the drives, the base-enclosure LED, and the rear-fault LED simultaneously. This action is useful when you are trying to identify a particular system in a rack of multiple appliances. Click the button again to stop the LEDs from blinking. When a specific drive is selected, click **Blink LED** to blink the LED of only that drive. This action is useful when an individual drive must be located in the data center.



Figure 41. Hardware > [APPLIANCE] > Capacity tab



Figure 42. Hardware > [APPLIANCE] > Components > Drives

#### **Appliance Performance**

From the **Hardware > [APPLIANCE] > Performance** card, you can view performance metrics for the selected appliance. Performance data is polled every 20 seconds and rolled into timeline charts that update at different frequencies depending on the timeline selected.

- Last hour data is updated every 20 seconds.
- Last 24 Hours data is updated every 5 minutes.
- Last 1 month data is updated every 1 hour.
- Last 2 years data is updated every 24 hours.

You can select different performance categories from the drop-down menu on the left column. The following table shows the performance metric categories available from the drop-down menu.

Category	Metrics	Description
Summary	Latency, IOPS, Bandwidth	Displays the Latency, IOPS, and Bandwidth performance metrics for the appliance.
Bandwidth details	Latency, Total Bandwidth, Read Bandwidth, Write Bandwidth	Amount of data that moved through the system within a specified period. The bandwidth metrics include average total bandwidth, average read bandwidth, and average write bandwidth. Bandwidth is calculated by multiplying the IOPS by the IO size.
IOPS details	Latency, Total IOPS, Read IOPS, Write IOPS	Number of read and write requests that the system serviced within a specified period. The IOPS metrics include average total IOPS, average read IOPS, and average write IOPS.
Latency details	Latency, Ready Latency, Write Latency	How fast the system responded to read and write requests within a specified period. The latency metrics include average total latency, average read latency, and average write latency.
CPU Utilization details	Latency, CPU Utilization	The percentage of CPU Utilization on the cores dedicated to servicing storage I/O requests (available only for Overall Performance metrics).
IO Size details	Latency, Avg. IO Size, Read IO Size, Write IO Size	Number of read and write requests' size that performed I/O operations within a specified period. The IO size metrics include average total size, average read size, and average write size.
Queue depth	Latency, Queue Depth	The number of pending IO requests.

Table 6. Appliance Performance Metrics

In PowerStoreOS 2.0, node CPU stats were added to the **CPU Utilization details** category which allows you to monitor each node's CPU utilization and latency metrics.

In PowerStoreOS 3.0 and higher, you can adjust the layout to show between one and three columns for easier viewing.

Note: Appliance performance metrics are also available over REST API.

#### **Port IO Performance**

From the **Hardware > [APPLIANCE] > Ports** card, you can view IO Performance details for Ethernet, and Fibre Channel ports by checking the chosen port and clicking the **IO Performance** button from the **More Actions** drop-down menu. From the port IO Performance page, you can view performance metric details for Host IO latency, IOPS, Bandwidth, IO Size, and Queue Depth for that specific port. The ports card also allows you to perform link aggregation, map storage networks, tag ports for replication, and compare performance metrics.

#### Other system status messages and settings

There are other status messages and settings in the upper-right corner of PowerStore Manager, as shown in Figure 43. Each icon provides different information to the administrator and is always available. The following sections provide more information about each icon.



Figure 43. Other system status information and settings

#### CloudIQ/vCenter/metro node connection

The first icon in the top blue banner of PowerStore Manager provides quick links to CloudIQ, VMware vSphere, and metro node, respectively, as shown in Figure 44. To see PowerStore appliances in CloudIQ, you must configure SupportAssist and check the Connect to CloudIQ checkbox. Note, if a vCenter connection has not been configured in Compute > vCenter Server Connection, the quick link for VMware vSphere is not available. To configure a metro node connection, go to Settings > Networking > Metro Node.



Figure 44. CloudIQ, VMware vSphere, and metro node quick links

#### Running jobs

To see active or recently completed jobs, click the **Jobs** (stacked squares icon) in the upper-right corner, and the window shown in Figure 45 appears. For recent and active jobs, this view also shows the percentage that is completed. When there are multiple PowerStore appliances in the cluster, the window includes a tab for **Required Actions** 

which shows any assisted-migration recommendations on the system from the **Migration** > **Internal Migrations** > **Migration Actions** page. Lastly, The **View All Jobs** button takes you directly to **Monitoring** > **Jobs** for a full list of all jobs.

Recei	Recent Jobs (2)							
~	Create policy.	Clear						
~	Clear							
	Clear All							
	View All Jobs							

Figure 45. Jobs icon

#### **Quick access alerts**

PowerStore Manager enables you to quickly see relevant alerts on the system through the **Alerts** icon in the top menu bar (Figure 46). Links in the dialog lead to the **Alerts** page, which lists all alerts that are associated with the cluster. Here, users can get more details about the alerts and information about how to remedy the associated issues. Click an alert to go to the **Monitoring** page, with the alert automatically selected, to see more alert information and the suggested repair flow if applicable.

	Ç <b>.</b> e	8 🕐 🗰
Critical 🕕 Major 🚯 Minor 2 Info 2		③ Settings
i RT-H2171	13 days a	ago
Support Connectivity is not enabled for the cluster.		
Updated: 2024-02-14 03:17 AM UTC -05:00		
<b>1</b> RT-H2171	14 days a	ago
New keystore changes have occurred.		
Updated: 2024-02-13 03:10 AM UTC -05:00		ılt Filters
	View All Ale	rts

Figure 46. Quick access alerts

#### Logged-in user options

In the top blue banner, the Profile icon (Figure 47) includes various options including resetting user preferences, changing the password of the logged-in user, and a **Log out** option.



Figure 47. Logged-in user options

#### **Online help**

The next icon in the top menu bar is the context-sensitive help menu shown in Figure 47. The options for the corresponding dialog dynamically change based on the current page or wizard in PowerStore Manager. For example, if the user is on the **Volumes** page, the online help icon displays an option to go directly to online help for Volumes as shown in Figure 48. This feature helps you find the exact information to learn more about the system, instead of having to search through the various pages in the online help. The **Help** icon also provides a quick link to **Settings** > **Support** > **General Support**. It links to an **About** menu which includes the current software version, a **Gather Support Materials** button, and a **Configuration Recommendations** menu.

2 £ 0	
Help for Volumes	ngs
Online Help	
General Support	
Gather Support Materials	
About	
Configuration Recommendations	C'

Figure 48. Online help icon

#### PowerStore Manager user interface



Figure 49. Online Help > Volumes

Settings menu The Settings icon (gear symbol near the top menu bar) leads to the Settings menu. The Settings menu (Figure 50) enables administrators to set or configure many settings that are important to the cluster but are less frequently used. The menu lets you upgrade system software, configure support connectivity, configure infrastructure services, and enable SSH, among other actions.

PowerStore	RT-H2171						۵		8	?	
🗄 Dashboard	P Monitoring	🗍 Compute 🕶	🛢 Storage 🕶	$\mathbf{V}$ Protection -	🕀 Migration 🕶	IIII Hardware			•	Setting	gs
Settings		Prope	rties								
Cluster		Change the	properties of the o	cluster.							
Properties											
Upgrades		Propertie	S							0	8
Licensing		Cluster Nan	ne		RT-H2171						
Power Down		Cluster Tim	e		2024-02-27 12:	51:16 PM UTC -05:00					
Recycle Bin		Global ID			PS6da06347d1	1f					
Security		NVMe Qual Primary Ap	fied Name bliance		nqn.1988-11.co Appliance-RT-H	om.dell:powerstore:00 12171	):6da06	347d11f	5BE6787	73	
Authentication		Primary No	de on Appliance		NodeA						
Users											
Service Account	t										
ISCSI CHAP											
Certificates											
Signed Cluster (	Certificate										
Encryption											
KMIP											
Audit Logs											
Remote Logging	9										
SSH Manageme	ent										
Compliance											
Login Message		•									

#### Figure 50. Settings page

The following table shows all available settings in the **Settings** menu.

Category	Settings	General description
Cluster	Properties, Upgrades, Licensing, Power Down, Recycle Bin	Update cluster-friendly name, manage system upgrades, manage system licensing, power down the system, and manage the expiration duration of the Recycle Bin.
Security	Authentication, Users, Service Account, ISCSI CHAP, Certificates, Signed Cluster Certificate, Encryption, KMIP, Audit Logs, Remote Logging, SSH Management, Compliance, Login Message, HTTP Redirect, VASA Certificate	Manage system settings related to security topics including authentication, authorization, encryption, and managing SSH access.
Networking	Cluster MTU, Network IPs, Infrastructure Services, SMTP Server, SNMP, Metro Node	Configure various system settings related to networking including system IPs, MTU size, DNS, NTP, physical switches, and metro node connection.
Support	Metric Collection Configuration, Support Connectivity, Gather Support Materials, Metrics Archives, General Support, Disable Support Notifications, Email Notifications	Configure Support Connectivity, support contacts, generate support materials for troubleshooting, and configure email addresses to which to send system alerts.

Table 7. Settings menu options

#### **Cluster Power Down**

A Power Down Cluster Wizard is available in PowerStoreOS version 4.0 and later. The wizard validates that the system is ready to be powered down, identifies any active storage objects on the system, and confirms with the administrator prior to proceeding.

PowerStore	Power Down Cluster		×
88 Dashboard	Validation	Validation	
Settings	Active Objects	The Validation step performs an assessment of possible errors, warnings, and active objects which may affect this operation.	
Cluster Properties Upgrades	Confirm	▲ Appliances with QLC-Based Flash drives will retain data for up to 30 days while powered off. Appliances with TLC-Based Flash drives will retain data for up to 90 days while powered off. Data corruption may occur if the drives are powered off for more than these thresholds, or if kept in temperatures above 40° C (104° F).	
Licensing Power Down Recycle Bin		Before powering down the cluster, temporarily disconnect host access from all storage resources to prevent data loss. Modify the role to non-preferred and pause all metro volumes. When the cluster is powered back up, reconnect the hosts and resume the metro volumes.	
Security		Perform validation	
Users		Cluster Prod-Site 176 has running, scheduled or paused import sessions. Either wait for the import sessions to be completed or cancel the import sessions.	
Service Account		The cluster has objects with I/O activity during the last 5 minutes.	
Certificates Signed Cluster		Ignore errors and proceed, regardless of possible data loss	
Encryption			
Audit Logs		Cancel Next	

Figure 51. Settings > Power Down > Power Down Cluster

#### Support Connectivity

The **Settings** menu > **Support** > **Support** Connectivity category enables you to configure and manage Support Connectivity. The Support Connectivity feature provides an IP-based connection that enables Dell Support to receive error files and alerts from your appliance, and to perform remote troubleshooting that results in a fast and efficient time-to-resolution. Dell Technologies recommends that you enable the Support Connectivity feature to accelerate problem diagnosis, perform troubleshooting, and help speed time to resolution. PowerStore offers the ability to connect directly or by using the Secure Connect Gateway. The ability to connect PowerStore to CloudIQ and enable remote support is also available to be enabled in this section. If you do not enable the Support Connectivity and remote support features, you may need to collect appliance information manually to assist Dell Support with troubleshooting and resolving problems with your appliance.

For more information about Support Connectivity and options for remote troubleshooting, see the <u>PowerStore Security Configuration Guide</u>.

#### **Upgrades**

From the **Settings** menu > **Cluster** > **Upgrades** page, users can manage, upload, and deploy various Non-Disruptive Upgrade (NDU) packages for the PowerStore cluster. Generally, NDU packages consist of two categories: Software Releases and Thin Packages. Software Releases are PowerStoreOS upgrades which contain the full operating system image or patch or hotfix images for a specific operating system version. Thin Packages contain a smaller and more targeted amount of functionality than regular PowerStoreOS packages. These packages may also consist of different package types

such as Disk Firmware or Health Check updates. Thin Packages are smaller in size, take less time to apply, and often do not require node reboots.

Since Health Check packages can be upgraded outside of the PowerStoreOS upgrade path, PowerStoreOS 2.1 provides users the ability to run an Upgrade Extensions System Check before a PowerStore NDU. When any PowerStore NDU package file besides a Health Check is selected with PowerStoreOS below version 3.0, the UPGRADE button is disabled (see Figure 52).

The button is enabled if the Upgrade Extensions have run within 60 minutes before and no further System Checks are performed after the Upgrade Extensions job completes. If any of these conditions are not met, a tooltip providing instructions to run Upgrade Extensions from Monitoring > System Checks is displayed as seen in Figure 52. The run Upgrade Extensions job runs any off-cycle Health Check packages that have been installed on the system. PowerStoreOS versions 3.0 and later do not require you to run the Upgrade Extensions job before running an NDU.

C
in tl
1

Figure 52. Upgrades

PowerStoreOS versions 3.0 and later offer the ability to automatically download software packages if support connectivity is enabled. Click on the **Download Settings** button in the Upgrades page to enable automatic download.

#### PowerStore Manager user interface



Figure 53. Automatic download

When enabling automatic download in PowerStoreOS versions 4.0 and later, users can select their **Software Release Package Preference**. Target is selected by default, which indicates the release has achieved runtime and stability requirements to make it the current target code. Latest provides the most recent software release with the latest and greatest feature set. Users with this guidance can directly download target or latest software packages to achieve specific requirements in their environment without having to download from a separate support site.



Figure 54. Download settings

**Note**: Users can manually check for software package updates even if automatic download is not enabled.

PowerStoreOS versions 3.0 and later supports the use of language packages within the upgrades menu of PowerStore Manager. The purpose of this feature is to adapt PowerStore to make it easier to use for users around the world. This involves translations of texts and adding specific local components for different regions. You can download language packs for supported languages from the Dell website and upload the package to PowerStore. After you complete this step, you can select your wanted language, date, and time format options from the user preferences menu item under the user icon (Figure 55).

User Preferences		×
Language Preference		
This setting determines the PowerStore Manage more languages by installing additional language Settings).	's interface language. You can add a packs from the Upgrades page (unde	٢
<ul> <li>English language was selected automatica browser setting and installed language part</li> </ul>	Ily according to your sk.	
Language		
English		
Auto detect language from browser		
Format Preferences		
Date Format		
YYYY-MM-DD 👻	2024-02-27	
Time Format		
hh:mm A 🔹	11:49 AM	
Time-zone Format		
UTC -	UTC -05:00	
Reset User Preferences		
As you use PowerStore Manager, your preference chart settings, and watchlist contents are saved experience.	is such as table columns, sort orders, automatically to personalize your	
Alternatively, you can reset these preferences to	their default values.	
Reset User Preferences		
	Cancel App	ly

Figure 55. Language Option

#### **Network IPs**

From the **Settings** menu > **Networking** category, you can configure and manage the system's **Network IPs**. Each network consists of its own VLAN, Netmask, Gateway, and MTU size. Table 8 shows the various networks and a brief description of their function.

Table 8. Network IPs overview

Network	Function	General description
Management	Connects PowerStore cluster to management services	Connectivity to DNS, NTP, and vCenter, and enables external clients to access your cluster for management purposes

Network	Function	General description		
Storage	Connects PowerStore cluster to an external storage network or creates a Storage network	Provides external clients or hosts network connectivity to the storage in your cluster		
File Mobility	Connects traffic between PowerStore file clusters in replication and file import environments			
Intra-cluster Management (ICM)	Internal management network	Provides continuous management connectivity between appliances within the PowerStore cluster		
Intra-cluster Data (ICD)	Internal data network	Provides continuous storage connectivity between appliances within the PowerStore cluster		

PowerStoreOS 2.0 added multitenancy and traffic isolation support to Storage networks. You can configure up to eight storage networks per interface, with up to a total of 256 different storage networks using IPv4 addresses, IPv6 addresses, or both in PowerStoreOS versions 4.0 and later. PowerStoreOS versions 3.0 and later added the **File Mobility** network to the Network IPs section of settings. The file mobility network is the pre-requisite infrastructure required for the exchange of control traffic between file clusters in replication and file import environments. It uses the same management network VLAN and subnet settings.

In PowerStoreOS 4.0, an enhancement to storage networks allows uses to create multiple storage networks with defined purposes. These purposes include Storage (iSCSI), Storage (NVMe/TCP), and Replication. This feature allows storage networks for host connectivity, and dedicated networks for replication. When configuring a network for replication, PowerProtect DD integration, and import, consult the <u>Import</u>, <u>Protecting Your</u> <u>Data</u>, and <u>Best Practices</u> guides for specific guidance.

#### **User management**

Besides email notification settings, the **Settings** menu > **Users** section enables you to manage local users and set up Active Directory or OpenLDAP Directory Services to authenticate users and map them to PowerStore roles. PowerStoreOS 1.0.3 and later support external user directories for authentication and authorization. Managing users in a centralized directory reduces the tasks to set up accounts on each system individually and might be a requirement to meet company rules and compliance.

#### Role-based access control

Role-Based Access Control (RBAC) allows for users to have different privileges, which provides a means to separate administration roles to better align with skill sets and responsibilities. To ensure an end-to-end secure environment, PowerStore systems have various roles that are assigned specific privileges to perform different tasks. These roles include, but are not limited to: Operator, VM Administrator, and Storage Admin. Dell Technologies recommends giving users the fewest privileges possible while still enabling them to meet their responsibilities. As an example, it is sufficient to give only **Operator** privileges to an account which is only responsible for monitoring instead of giving full privileges with the Administrator role. To get a more compressive list of the PowerStore

roles and privileges, see the PowerStore Security Configuration Guide at: <u>dell.com/powerstoredocs</u>.

#### Local User

By default, PowerStore has an integrated **admin** user which is assigned to the **Administrator** role to manage a PowerStore cluster. You can set up more users under **Settings** > **Users** > **Users** > **Local** tab. Security Administrators or Administrators can also reset a password, and lock or unlock existing users on the system.

For more information about local user management, see the PowerStore Security Configuration Guide at: <u>dell.com/powerstoredocs</u>.

#### Active Directory/OpenLDAP: Overview

The Active Directory/OpenLDAP feature requires PowerStoreOS 1.0.3 or later. You can manage the directory server settings in **Settings** > **Security** > **Authentication**. To individually map AD/LDAP users or groups to a role in PowerStore, go to **Settings** > **Security**> **Users** > **LDAP** tab. PowerStore supports one instance of a directory connection with one or multiple servers for redundancy.

The directory structure of Active Directory and OpenLDAP is similar, but the implementation of each directory server may use a different naming scheme and structure. A directory service is based on a hierarchical database that is referenced as a tree. Some implementations may represent the geographical structure of an organization, and other implementations show the organizational structure. Like a tree, the structure starts with a root which usually represents domain components (DC) of a computer network or organization and splits into multiple branches. Each branch starts with a structural object-like organizational unit (OU) or common name (CN). The tree can continue with more branches or end in leaf objects. Leaf objects can stand for individual items like a user, a group, or a computer. Within the tree, each leaf object is identified by a concatenated string of individual elements that are separated by commas and is called a distinguished name (DN). Each DN is unique in a directory. For example, a user and group can have the same leaf name, but the path to the object makes the leaf instance a unique DN. To find the right leaf object for a user or group that is used for authentication, you can limit a lookup to certain parts of the tree by using a search path. A search path is useful when the directory represents a company structure, when using a filter for attributes, or when using a combination of both.

Figure 56 shows the LDAP structure which is used for the following examples.



Figure 56. LDAP tree example

An example of a user object in a directory structured by the organization may look like this:

```
dn: cn=PowerStore User, ou=users, ou=Storage, dc=dell, dc=com
cn: PowerStore User
objectClass: person
sn: PowerStore
uid: pstuser
uidNumber: 1234
home: /home/pstuser
```

In this example, if the PowerStore users are only in the storage department, a good choice for the user search path would be: **ou=users**, **ou=storage**, **dc=dell**, **dc=com**. In the example, more information is used to narrow down the type of the object with a filter where objectClass is **person**.

The structure of groups is similar to users. The group might be as follows:

```
dn: cn=PowerStore Users, ou=groups, ou=Storage, dc=dell, dc=com
objectClass: Group
cn: PowerStore Users
member: cn=Powerstore User A, ou=users, ou=Storage, dc=dell,
dc=com
member: cn=Powerstore User B, ou=users, ou=Storage, dc=dell,
dc=com
member: cn=Powerstore User C, ou=users, ou=Storage, dc=dell,
dc=com
```

Similar to the user object above, it is possible in that structure to limit the lookup only to the branch: **ou=groups, ou=storage, dc=dell, dc=com**, and filter for the objectClass

**Group** to search for a group. The group example shows member attributes containing the distinguished name of each individual user. Other implementations may use the **memberUid** attribute where only the user UID is listed. In that case, the directory must ensure that UIDs are unique.

For security reasons, anonymous lookups are not allowed by the LDAP administrator, and an authentication against the directory server is required beforehand. PowerStore uses **Bind DN** and **Bind DN Password** to establish the directory server connection for initial lookups and role mapping.

To set up AD/LDAP authentication, request the following information from the directory administrator for PowerStore if not already known:

- Type of the directory: Active Directory or OpenLDAP
- IP Address of at least one directory server
- When SSL is used, the signing CA cert file must be uploaded to PowerStore

**Note**: When enabling SSL, it is mandatory that the server IP is configured as subjectAlternateName (SAN) in the directory server certificate.

- Domain name
- Bind DN and password
- Advanced configuration information:
- ID Attribute, which is usually samAccountName or uid
- User objectClass like a user or person
- User search path
- Group member attribute, which is usually a member or memberUid
- The mapped ID attribute to the group where cn is the default for PowerStore
- Group objectClass, which could be group or groupOfNames
- Group search path
- Number of Search levels for subtree- or nested search

#### AD/LDAP: Directory connection

You can set up an AD or OpenLDAP server connection in PowerStore Manager > **Settings** > **Users** > **Directory services**. When you select the **Server Type** in PowerStore Manager, the advanced settings use common default settings for the selected type. When the default values do not match your environment, you can change them accordingly. When a directory server connection is set up, PowerStore provides a **Verify connection** button to check if PowerStore Manager can access the directory server.

#### AD/LDAP: User to role mapping

After a directory connection is established, you can start mapping individual users or groups to a role in PowerStore. To perform this task, click **Settings** > **Users** > **Users in LDAP** tab. When you start to set up a mapping, PowerStore Manager requests the mapping type of **User** or **Group**, the **Domain**, and the **Account Name** that is used in AD/LDAP. The role is located in the drop-down menu for **Account Role**. This role selects

one of the PowerStore roles mapped to the AD/LDAP object after applying the Add Account dialog. When PowerStore is not able to look up the given Account Name, the system cannot look up the given name with the ID attribute as given in the directory connection configuration. The error message Account does not exist in LDAP server! appears in PowerStore Manager and requires a validation of the current configuration. For remediation, you must check if the Account Name matches with a corresponding user object or group object in AD/LDAP. It is also possible that a wrong attribute setting for Directory Service prevents the lookup.

#### Login Message

A Login Message provides the ability for storage administrators to create, enable, and disable a customizable login message starting in PowerStoreOS 2.1. The Login Message is displayed whenever you go to the PowerStore Manager login page from your browser. You can use Login Messages for a wide variety of use cases, such as informing you what system you are logged into or even provide a security warning. You can easily configure the Login message from PowerStore Manager through Settings > Security > Login Message. Here, you can enable the message, enter your text up to 2000 characters, and click the Apply button (Figure 57). After you enable the message, it is seen by all users from the PowerStore Manager login page as shown in Figure 58. You can also enable and configure Login Messages through REST API and PowerStore CLI. Only the Storage Administrator or Security Administrator roles can edit, enable, and disable Login Messages.

PowerStore	RT-H2171						۵		8	?	
🗄 Dashboard	P Monitoring	🗍 Compute 🕶	🛢 Storage 🕶	$\P$ Protection -	🕀 Migration 🕶	IIII Hardware			•	Settir	ngs
Settings		Login	Message								
Upgrades		<ul> <li>Manage the</li> </ul>	customized login	message. When it i	s enabled, the mess	age will be displayed	when lo	ogging i	in to the	e cluste	er.
Licensing											
Power Down		🗸 The lo	gin message was	updated.							×
Recycle Bin		Enat	oled								
Security		Message									
Authentication		Welcome	to PowerStore Ma	nager UI.							
Users		The use of	this system is inf	tended for Authorize	d users ONLY.						
Service Account	t										
ISCSI CHAP											
Certificates											
Signed Cluster (	Certificate										
Encryption			Apply								
KMIP											
Audit Logs											
Remote Logging	9										
SSH Manageme	ent										
Compliance											
Login Message		•									

Figure 57. Settings > Security > Login Message

PowerStore Manager
Copyright © 2024 Dell Inc. or its subsidiaries. All Rights Reserved.
Welcome to PowerStore Manager UI. The use of this system is intended for Authorized users ONLY.
Username admin Password
Log in

Figure 58. PowerStore Manager Login page with Login Message enabled

## **PowerStore CLI**

#### **Overview**

For IT generalists, managing PowerStore systems through the PowerStore Manager interface is comprehensive enough to accomplish all daily administrative tasks. For advanced use cases, the PowerStore CLI (PSTCLI) interface enables users to create scripts to automate routine tasks. You can use the PSTCLI to perform the same tasks that can be performed in PowerStore Manager. These tasks include configuring and managing storage resources, protecting data, managing users, viewing performance metrics, and other similar tasks.

For more information about using the PSTCLI, see the *PowerStore Command Line Interface User Guide* and *PowerStore CLI Reference Guide* at <u>dell.com/powerstoredocs</u>.

### **PowerStore REST API**

#### **Overview**

The REST API is an application programming interface that uses familiar HTTP operations like GET, PATCH, POST, and DELETE. The REST architecture includes certain constraints that ensure that different implementations of REST conform to the same guiding principles. This architecture gives developers ease of application development when working with different REST API deployments. REST APIs have become more popular and more widely used in data centers where administrators are looking to standardize their management needs across all their appliances, regardless of vendor.

The PowerStore platform includes REST API support, which provides another way to manage PowerStore appliances and automate various tasks. Generally, the PowerStore REST API has the same capabilities as PowerStore Manager. The PowerStore REST API formats all communications in JSON notation. Users can send REST API requests using their favorite scripting languages, such as Perl and PHP, to manage PowerStore systems

in their environment. This ability provides flexible management and enables more complexity with scripted operations.

After a system is up and running, users can go to the following web addresses to gain access to the REST API reference commands (**<Management\_IP>** is the management IP of your PowerStore cluster):

https://<Management\_IP>/swaggerui

This online REST API command reference location allows users to test REST API commands on their live system which can be incorporated into other scripts.

For more information about using REST API for PowerStore appliances, see the *REST* API Developers Guide and PowerStore REST API Reference Guide at dell.com/powerstoredocs.

### Conclusion

#### **Overview**

PowerStore Manager realizes a core design goal of PowerStore—to simplify storage management. Using a modern HTML5 architecture and an easy-to-navigate user interface, PowerStore Manager ensures a quality experience for storage administrators while using best practices for storage-management requirements. PowerStore Manager provides an intuitive interface that does not require extensive or specialized knowledge. From simple tasks like provisioning a block volume, to using advanced features like local and remote replication, PowerStore Manager is a powerful tool that enables users to realize the potential of their PowerStore systems. For users that prefer command-line tools, PowerStore also supports a fully functional CLI and REST API which are useful for scripting use cases and enable more complex operation possibilities.

## References

 Dell
 The Dell Technologies Info Hub > Storage site provides expertise that helps to ensure customer success with Dell storage platforms.

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 Storage
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<u>Dell.com/powerstoredocs</u> provides detailed documentation about how to install, configure, and manage PowerStore systems.