Take Full Advantage of Your PowerVault ME4 Storage Investment

A technologies overview to improve ME4 Series management, operational efficiency and support

Abstract

Dell EMC PowerVault ME4 Series are designed to meet the needs of the entry storage market and are exceedingly flexible for deployment across a wide range of workloads including HPC Parallel File Systems, Safety and Security, VDI and Virtualization implementations. This paper describes ME4 Series technologies that can help customers take full advantage of their ME4 Series investment in areas such management, integrations, configuration and support.

February 2020

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Executive summary

For some customers, implementing and managing storage can be challenging especially when the business is surrounded by budget constraints and resource limitations that consume and overwhelm IT. Storage products that are designed with simplicity and ease of use as design goals can fundamentally and positively change the way IT is able to deploy, manage and support their infrastructure investment. Maintaining performance predictability, enabling ease of management and experiencing a built-in self-service and support environment are what drives the architecture of PowerVault storage. The purpose of this whitepaper is to validate the PowerVault storage investment by providing insights into some of the technology features and capabilities available with the product that will help customers optimize how they configure, manage and support any PowerVault array. This whitepaper will outline certain technologies, integrations and serviceability features that customers may not be aware and that will help them take full advantage of their investment for reliably running workloads critical to their business.


PowerVault ME4 Series

1 PowerVault ME4 Management Ecosystem

1.1 Dell EMC OpenManage Enterprise for PowerVault ME4

Dell EMC OpenManage Enterprise is an intuitive single console for managing and unifying up to 8,000 server, storage, networking and 3rd party devices including the automated discovery, proactive monitoring and alert creation for PowerVault MD3 and ME4 Storage arrays. If customers are already using OpenManage Enterprise to monitor and manage their PowerEdge servers and would like to use OpenManage Enterprise to monitor and receive alerts on their PowerVault Storage devices, then OpenManage Enterprise can be the unified console for this purpose. OME uses SNMP to communicate with PowerVault MD3 storage devices while PowerVault ME4 storage support is implemented using https to get additional information which is not available over SNMP.

When you implement OpenManage Enterprise with PowerVault, you'll have the benefit of an easy to use HTML5 interface with intuitive dashboard views that provide critical PowerVault information "at a glance". Additionally, OME provides you with seamless integration with OpenManage Mobile giving you anytime access to any PowerVault Storage devices with a rich set of diagnosis and notification data. When you deploy OME, you can easily monitor PowerVault ME4 Storage systems alongside non-Dell EMC hardware for a single-view of the infrastructure.
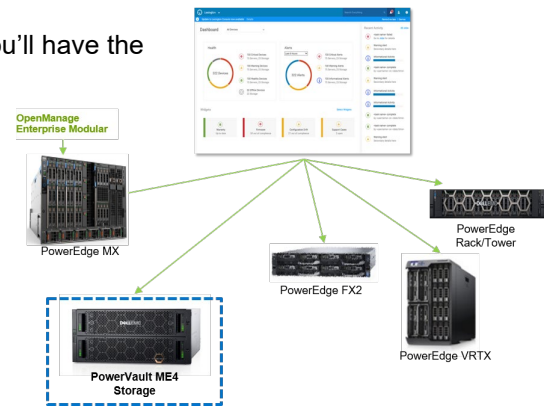
OpenManage Enterprise users can leverage the GUI for discovery, inventory, monitor hardware health and receive alerts on MD and ME devices as well as utilize the RESTful API for scripting. Built as a policy driven management engine, OME delivers firmware and configuration compliance along with monitoring policies and is deployed as a secure virtual appliance supporting PowerVault devices running ESXi or Hyper-V hypervisors.

OME is integrated with SupportAssist supporting automated case creation eliminating the need to download special diagnostic tools – all so you can spend less time on the phone with support. OME is designed for security throughout the PowerVault full lifecycle of discovery, detect, and monitoring.

Upgrading your OME environment to include PowerVault is easy and there's no cost for the basic discovery, monitoring and management. Customers can generally download, deploy and configure the OME appliance in less than 30 minutes. Once configured, businesses benefit immediately with simplified common IT administrative tasks and remote management of PowerVault Storage devices in the data center. OME reduces the time and effort required to manage and monitor IT infrastructure – including – PowerVault Storage seamlessly.

Access the PowerVault/OME Support Matrix: https://topics-cdn.dell.com/pdf/dell-openmanage-enterprise_support-matrix_en-us.pdf

1.2 CloudIQ Storage Analytics for PowerVault ME4

As the amount of data grows exponentially year by year, the internal and external threats to a data center are growing at an even higher rate. The need for a suite of tools that can detect problems and automatically answer questions humans cannot (easily) answer will be increasingly beneficial to mitigating risks that could lead to data unavailability – or even worse – data loss, thus providing an added layer of protection. Getting your storage health under control starts with being able to pinpoint impacts on capacity, competing workloads,

or system anomalies to help users proactively address issues. The cause of these issues and concerns could range from unexpected activities such as poorly formed or rogue database queries, performance anomalies or even ransomware attacks. Predictive analytics tools that help users more easily identify potential issues and proactively address them before they become business impacts will no longer be a business advantage, but a necessity for managing a data center.
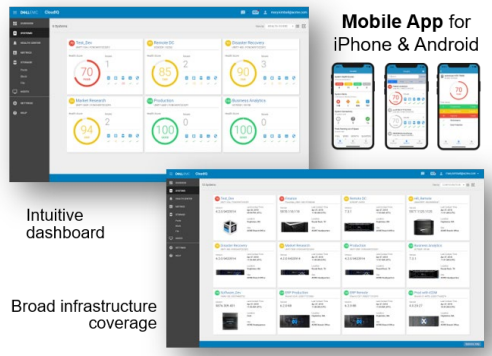
CloudIQ is a no-cost cloud-based application that delivers comprehensive storage health monitoring, insights with remediation, and analytics that let customers easily monitor, analyze, and troubleshoot their PowerVault Storage environment - from anywhere, at any time – reducing risk to their storage environment.

Once you have your PowerVault Storage installed and configured, implementing CloudIQ couldn't be simpler. There's nothing else to purchase or install – simply enable CloudIQ directly from the PowerVault Manager GUI and complete the online onboarding process to begin. You can access your CloudIQ dashboard from your favorite web browser or mobile device to centrally view your PowerVault Storage on a single screen. Within this intuitive HTML5 interface, customers will have access to storage health monitoring, proactive PowerVault storage health scores that identify potential risks before they impact the environment, see remediation recommendations based on best practices, download the latest operating environment, and connect directly to PowerVault Manger to manage an identified issue. CloudIQ's smart, predictive analytics and machine learning algorithms proactively alert you when storage resources are at risk or low — so capacity or performance are not impacted. CloudIQ also analyzes historical trends and detects patterns across the connected PowerVault systems and leverage machine learning to pinpoint deviations for faster resolution while maintaining up to two years of historical data so you can visualize long-term storage health trends.

Access the CloudIQ Solution Whitepaper: https://www.dellemc.com/en-us/collaterals/unauth/white-papers/products/storage-2/h15691-emc-cloudiq-overview.pdf

1.3 Dell EMC OpenManage Plug-In for Nagios Core & Nagios XI for PowerVault ME4

Protect existing investment in Nagios Core products are designed to easily integrate and monitor Dell EMC servers, modular infrastructure and now PowerVault ME4 storage within data centers. In doing so, this provides users with opportunities to improve their operational efficiency and flexibility in managing large heterogeneous data center environments. When users have this ability to implement Nagios with PowerVault ME4 storage, then they experience the benefit of increasing productivity by reducing time to maintain, monitor and troubleshoot any issue in their PowerVault ME4 or other supported device. This leads to informed and rapid decisions impacting the availability of all their data center resources.

Dell EMC OpenManage™ Plug-in for Nagios Core and Nagios XI provide a proactive approach to data center management that delivers features for monitoring PowerVault ME4 storage through an agent-free method using Integrated Dell Remote Access Controller (iDRAC) with Lifecycle Controller and Modular infrastructure. With this plug-in, you can dramatically reduce your IT infrastructure monitoring complexity, keep a pulse on your mission-critical infrastructure and achieve increased availability of your PowerVault ME4 storage PowerEdge Servers, modular infrastructure, other Dell EMC storage and networking devices.

With OpenManage Plugin for Nagios Core and XI, you'll be able to monitor the overall health of your PowerVault ME4 storage health. This allows you to have information to troubleshoot issues much faster. Combined with detailed system and component level inventory information, you have comprehensive visibility into your PowerVault ME4 storage as well as your entire Dell EMC infrastructure.

Single pane of glass monitoring of Dell EMC storage, server, network and HCI infrastructure

OpenManage Plugin for Nagios Core and XI also supports SNMP trap monitoring and provides alert knowledge base (KB) articles for common traps that help you to remediate your events in less time, leading to improved system uptime.

- Read more: [OpenManage Plugin for Nagios Core](#)
- Read more: [OpenManage Plugin for Nagios XI](#)

2 Virtual and Linear Storage Modes

Users can choose between two different storage configuration technologies that share a common user interface - virtual or linear storage modes – to operate their PowerVault ME4 storage.

2.1 Virtual Storage Mode Operation

Virtual storage maps logical storage requests to physical storage (disks). It inserts a layer of virtualization such that logical host I/O requests are mapped onto "pages" of storage. Each page is then mapped onto physical storage. A page is a range of contiguous LBAs in a disk group, which is one of up to 16 RAID sets that are grouped into a pool. Thus, a virtual volume as seen by a host represents a portion of storage in a pool. Multiple virtual volumes can be created in a pool, sharing its resources. This allows for a high level of flexibility, and the most efficient use of available physical resources. Some advantages of using virtual storage are:

- Allows performance to scale as the number of disks in the pool increases
- Virtualizes physical storage, allowing volumes to share available resources in a highly efficient way
- Allows a volume to be comprised of more than 16 disks

Note: PowerVault Manager system setup will default to Virtual Mode and ADAPT. Virtual storage provides users with a high level of flexibility with the most efficient use of available resources. Virtual storage is required for Thin Provisioning, Auto-Tiering, SSD Read Cache, Snapshots and Replication functions

2.2 Linear Storage Mode Operation

Stores and maps user data in sequential, fully allocated physical blocks using fixed/static mapping. In some cases, the mapping is 1-to-1, while in most cases the mapping is across groups of physical storage devices, or slices of them. When a linear disk group is created, a linear pool is created at the same time – volumes can be added to the pool, but no further disk groups can be added to a linear pool. Linear method of mapping is highly efficient but has less flexibility to alter the layout once it's established.

Note: ADAPT functionality is supported in Linear Mode. Other ME4 Series software features are not. Only one storage mode is allowed per ME4 array

3 Configuring Virtual Storage Mode for Optimum Sequential Write Performance

3.1 Configuring RAID for Optimal Segment Sizes

One of the important part of getting all potential performance from your PowerVault ME4 is configuring RAID levels with appropriate disk quantity depending on your RAID level.

If you are using your PowerVault ME4 in Virtual mode; you may notice that there is no "block size" selection box on *"Add Disk Group"* window in PowerVault Manager GUI like in Linear Mode. PowerVault ME4 uses either 512k or 64k block size depending disk quantity in RAID Set. To ensure best performance with sequential workloads and RAID-5 and RAID-6 disk groups, use a power-of-two data disks.

RAID Level	Total Disks	Data disks (equivalent)	Parity disks (equivalent)
RAID 6	4	2	2
	6	4	2
	10	8	2
RAID 5	3	2	1
	5	4	1
	9	8	1

The controller breaks virtual volumes into 4-MB pages, which are referenced paged tables in memory. The 4-MB page is a fixed unit of allocation. Therefore, 4-MB units of data are pushed to a disk group. A write performance penalty is introduced in RAID-5 or RAID-6 disk groups when the stripe size of the disk group isn't a multiple of the 4-MB page.

- Example 1: Consider a RAID-5 disk group with five disks. The equivalent of four disks provide usable capacity, and the equivalent of one disk is used for parity. Parity is distributed among disks. The four disks providing usable capacity are the data disks and the one disk providing parity is the parity disk. In reality, the parity is distributed among all the disks, but conceiving of it in this way helps with the example.

Note: The number of data disks is a power of two (2, 4, and 8). The controller will use a 512-KB stripe unit size when the data disks are a power of two. This results in a 4-MB page being evenly distributed across two stripes. This is ideal for performance.

- Example 2: Consider a RAID-5 disk group with six disks. The equivalent of five disks now provides usable capacity. Assume the controller again uses a stripe unit of 512-KB. When a 4-MB page is pushed to the disk group, one stripe will contain a full page, but the controller must read old data and old parity from two of the disks in combination with the new data in order to calculate new parity. This is known as a read-modify-write, and it's a performance killer with sequential workloads. In essence, every page push to a disk group would result in a read-modify-write.
  - To mitigate this issue, the controllers use a stripe unit of 64-KB when a RAID-5 or RAID-6 disk group isn't created with a power-of-two data disks. This results in many more full-stripe writes, but at the cost of many more I/O transactions per disk to push the same 4-MB page. For better efficiency and performance, use similar disk groups in a pool.

- Disk count balance: For example, with 20 disks, it is better to have two 8+2 RAID-6 disk groups than one 10+2 RAID-6 disk group and one 6+2 RAID-6 disk group.

- RAID balance: It is better to have two RAID-5 disk groups than one RAID-5 disk group and one RAID-6 disk group per tier.
- In terms of the write rate, due to wide striping, tiers and pools are as slow as their slowest disk groups.
- All disks in a tier should be the same type. For example, use all 10K disks or all 15K disks in the Standard tier.
- Create more small disk groups instead of fewer large disk groups.
- Each disk group has a write queue depth limit of 100. This means that in write-intensive applications this architecture will sustain bigger queue depths within latency requirements.
- Using smaller disk groups will cost more raw capacity. For less performance-sensitive applications, such as archiving, bigger disk groups are desirable.

Read more: [Dell EMC PowerVault ME4 Series Storage System Administrator's Guide](#)

3.2   Using ADAPT Instead of Traditional RAID

ADAPT – Autonomic Distributed Allocation Protection Technology - is Dell EMC's new erasure encoding solution which is an alternative to traditional RAID types (RAID 0, 1, 5, 6, etc.) with a protection scheme that distributes the parity across a larger set of HDDs or SSDs - providing better data protection, scalability, and other advantages.

ADAPT is an additional option that is provided at the time of generating the disk group. An ADAPT disk group can be created in Linear or Virtual Storage modes. In Linear the space is allocated across all members of the array. In the virtual case, it is allocated as needed on a page by page basis as new space within the Volume is created.

ADAPT using 8+2 stripe size which is same protection technique as RAID 6 with dual parity. A chunk is 512KiB therefore making the stripe width 4MiB. Therefore ADAPT is also shows good performance on sequential writes; irrespective of the chosen number of drives in the Disk Group.

Read more: [PowerVault ME4 Series ADAPT](#)

4   SupportAssist Enterprise

4.1   What is SupportAssist?

SupportAssist is an embedded protocol to help you proactively maintain the health of your PowerVault ME4 storage array or other Dell EMC storage, Dell EMC server and networking devices. It is also required to be enabled in order to access and use CloudIQ – a no-cost cloud-based storage analytics application. When SupportAssist is enabled and an issue is detected, resolution is kick-started as automatic notifications and the necessary diagnostic information are sent to Dell EMC for troubleshooting. Dell EMC technical support will

contact you with a resolution, preventing issues from becoming costly problems. In fact, users who combine SupportAssist with ProSupport Plus resolve issues 72% faster. Personal or business data is not collected in this process. SupportAssist only collects system state information including configuration, event notifications, and system diagnostic information. With SupportAssist, your information is safe during transport and storage. Data is transported securely with 256-bit encryption, secure web ports, and via a firewall with protected one-way communication from your site to Dell while your device usage and login credentials are never collected or leave your site.

4.2   Enabling SupportAssist Remote Support

SupportAssist is a feature that you can enable or disable, and optionally configure a proxy host to use for HTTP communication. When enabled, you agree to allow the feature to remotely monitor the storage system, collect diagnostic information, and transmit the data to a remote support server. Each time SupportAssist runs, a service tag is sent that includes a unique identifier for your system. This identifier can be used to contact you if your system needs repair.

You can toggle between pausing and running SupportAssist by clicking the Pause button. You can send the remote server a debug log collection on demand by clicking Send Logs. You can check the connection to the remote server by clicking Check Connection.

What features of SupportAssist are available with Basic Hardware Support, ProSupport and ProSupport Plus?

	Basic	ProSupport	ProSupport Plus
Automated issue detection and system state information collection	●	●	●
Proactive, automated case creation and notification		●	●
Predictive issue detection for failure prevention			●
Monthly reporting and recommendations			●

By default, the SupportAssist feature is disabled. Enabling it is a simple and straight forward process.

1. In your favorite HTML 5 Browser, navigate to the Web Manage Interface of your ME4.
2. On the home screen, click the "Action" button and select "System Settings"

3. In the new window, navigate to the tab "SupportAssist".
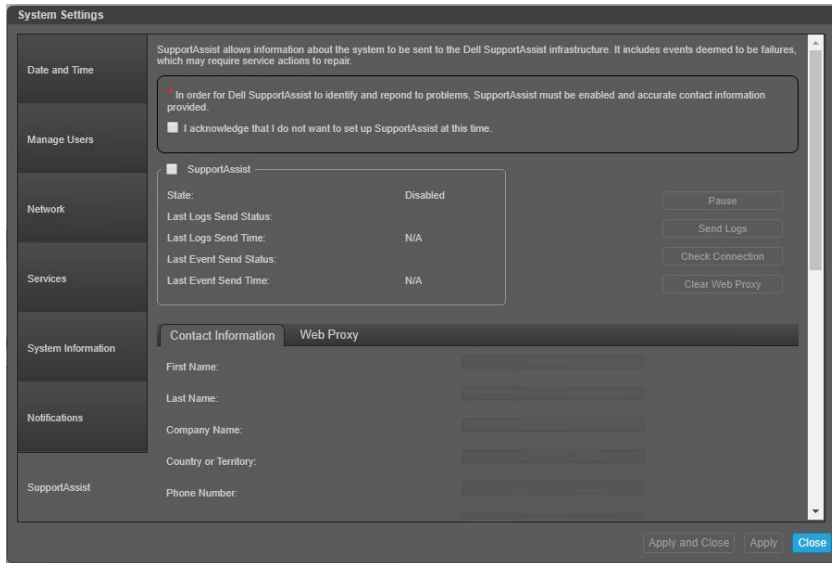
4. Click the Check-box, next to SupportAssist, to enable the feature.
5. Read through the EULA agreement. In order to acknowledge the agreement, click on Accept.
6. Under Contact Information, fill-in your details (Name, Email, phone number, address of the system).
7. Click "Apply".

If you are using a proxy server to connect to the Internet, make sure to enable the Web Proxy option for SupportAssist as well:

1. Next to the tab "Contact Information", you find the tab "Web Proxy".
2. To enable the "Web Proxy", click the check-box, next to "Web Proxy"
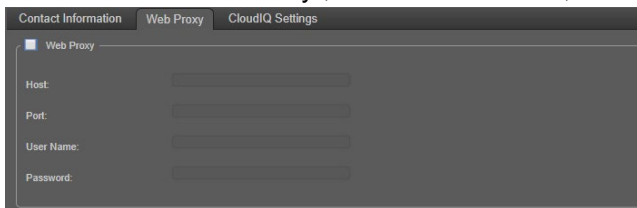
3. Populate the requested details, the fields username and password are optional.

4.3 Diagnostics

Dell SupportAssist, (the "Support Tool") collects and stores machine diagnostic information, including but not limited to configuration information, user supplied contact information, names of data volumes, IP addresses, access control lists, diagnostics & performance information, network configuration information, host/server configuration & performance information and related "collected Data" and transmits this information to Dell.
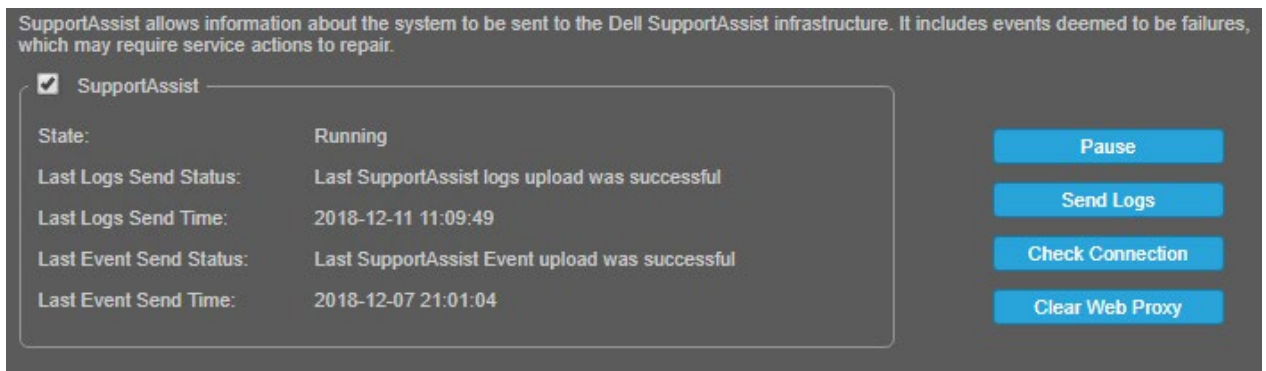
Event information sent to the remote server includes error and critical event messages, event IDs, event codes, timestamps, and component identifiers. Log data information includes the current configuration state of the storage system, the XML API dump of the system, the event log, and the full debug log.

4.4 Automated Case Creation

With ProSupport and ProSupport Plus a case will be automatically created if your PowerVault ME4 runs into trouble. Furthermore, a diagnostic bundle will be automatically generated by the array and uploaded at the time of case creation.

Hence reducing the need for manual intervention with Dell EMC Technical Support resources.
Dell EMC Technical Support may contact you to confirm the address & contact details, as well as if an onsite engineer to replace the part, is required.

GT280R004-01 adds the following features to SupportAssist:

- Customer can opt out of auto case creation with tech support
- Customer can place system in Maintenance Mode

GT280R006-01 adds the following features to SupportAssist:

- Automatic Maintenance Mode for updates

5   PowerVault ME4 Storage Integrations

5.1   SMI-S and Microsoft SCVMM Integration

SMI-S is intended to facilitate the management of storage devices from multiple vendors in a Storage Area Network (SAN).

The PowerVault ME4 comes with an embedded SMI-S array provider allowing network administrators to manage the PowerVault ME4 from their preferred storage management application via SMI-S.

System Center Virtual Machine Manager (SCVMM) is an integral component to Microsoft's System Center line of virtual system management and reporting tools.

For Azure, Storage Spaces or Hyper-V virtualized environments along with SQoS and SOFS, ME4's integration allows for ease of monitoring and configuring ME4 arrays.
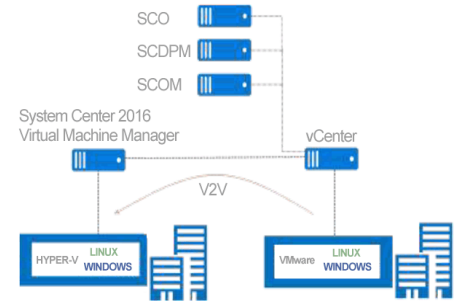
## 5.2   vSphere Client Plug-in Integration
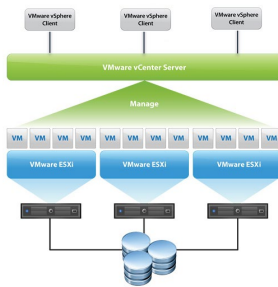
The VMware vSphere virtualization platform allows for the management of resources in a unified operating environment. The vSphere Client Plug-in allows integration into vCenter Server, which manages multiple resources connected in a network. For those installations with multiple ME4 arrays, this provides a single pane of glass capability to monitor and configure the ME4s.

PowerVault ME4 Storage supports the vSphere Client Plug-in as a browser-based tool that integrates with the VMware vSphere 6.5 Web Client. This provides an alternative interface that lets users monitor and manage a Dell EMC PowerVault ME4 Storage array.

For further information, download the Dell EMC PowerVault ME4 Series vSphere Client Plug-in User's Guide

5.3   Storage Replication Adapter (SRA) Integration

Performance, affordability, flexibility and reliability in today's virtualized environments are a requirement. Meeting today's SLAs; doing more with less, is an ongoing challenge. A virtualized environment having cost-effective growth paths, the ability to provide high availability, disaster recovery and planned migration capabilities, is essential.
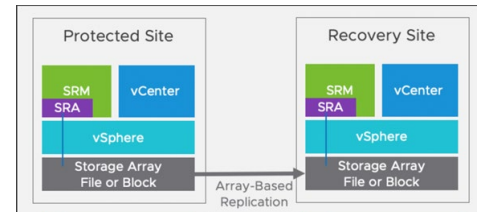
Planned Migration: Orderly decommissioning of virtual systems at the protected site and commissioning of equivalent systems at the recovery site, such as moving from MD3 to ME4

Disaster Recovery: Ensuring availability of data in case of failure of a primary site by promoting the secondary site.

PowerVault ME4 Storage Replication Adapter (SRA) for vSphere enables full-featured use of the VMware vCenter Site Recovery Manager (SRM) version 6.5 or later. Combining the PowerVault ME4 Storage system's replication functionality with the vCenter SRM, the SRA provides users with an automated solution

for implementing and testing disaster recovery between geographically separated sites. This solution also enables users to use SRM for planned migrations between two sites.

For further information, download the [Dell EMC ME4 Series Storage Replication Adapter for vSphere User's Guide](#)

6   Summary

Any decision to select a storage array should consider its flexibility to be able to address as many workloads as possible – and at the best TCO. The reality is, only the IT group has the full knowledge and understanding of the organization's full storage and workload needs. The PowerVault ME4 Series provides IT an opportunity to implement an array that can flexibly address small to large scale workload requirements. PowerVault ME4 Series is a system that can be configured as a hybrid or all-flash array to support virtualization, backup and recovery, HPC parallel file systems, Safety and Security archives, virtual desktops and much more. PowerVault ME4 storage are easy to understand, use, and support enabling IT to make an immediate and informed strategic storage decision for most of their environment. Knowing this, the next step is knowing how to take full advantage of your PowerVault ME4 Series investment. This paper was compiled with this exact intention – to provide you with perspectives as to how you can optimize your insights, use and support your PowerVault ME4 Series to fully address storage/data challenges.

PowerVault ME4 Series

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