Agenda

1	**PowerVault ME4 Series Overview**
2	**Solutions Overview**
3	**Management Ecosystem**
4	**PowerVault MD/ME JBOD Overview**
5	**PowerVault NX Series Overview**
6	**Service and Support**

SIMPLE. FAST. AFFORDABLE.

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Dell EMC entry & midrange storage around the globe

- **92% of the Fortune Global 100 Companies** use Dell EMC Entry/Midrange Storage

- Top **10 Largest Energy Companies** in the World use Dell EMC Entry/Midrange Storage

- Top **10 Largest Banks in the World** use Dell EMC Entry/Midrange Storage

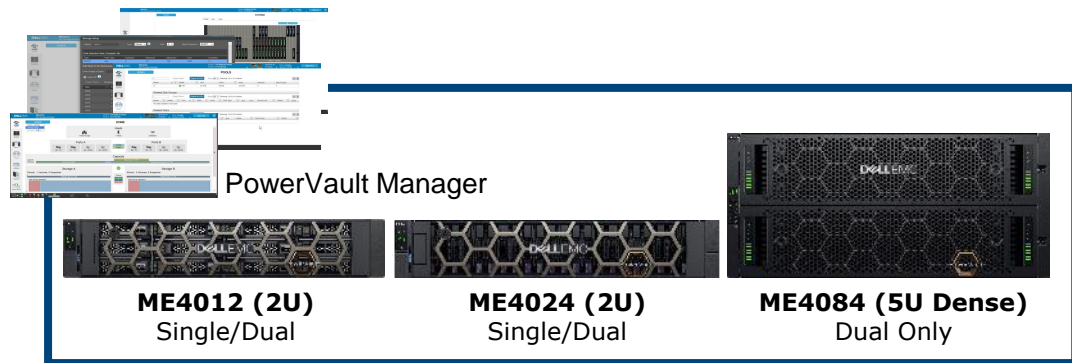PowerVault ME4 Series   PowerStore Series   SC Series   Unity XT Series

Based on Dell Technologies internal analysis, February 2020

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Dell EMC PowerVault ME4 Series

Purpose-built storage for SAN & DAS

PowerVault Manager

ME4012 (2U)
Single/Dual

ME4024 (2U)
Single/Dual

ME4084 (5U Dense)
Dual Only

4PB

5-9's
99.999%

**HIGH AVAILABILITY &
HIGH CAPACITY**

**SERVER-ATTACH
READY**

**SAN STORAGE-
READY**

SIMPLE.
– Web-based (HTML5) management
– Installs and configures in 15 minutes
– Extended management ecosystem

FAST.
– Bandwidth: 5.5GB/s Write & 7GB/s Read
– Performance: up to 320K[1] IOPs
– Scale: 12G SAS backend

AFFORDABLE.
– Low-cost starting configurations
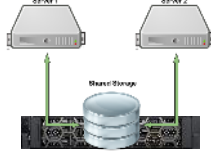– Easy to own with all-inclusive software
– Modular pay as you grow model

1 AD# G18000167 Based on Seagate Technology's LX-3 Performance Characterization report, 2018 (Virtual Test Results)

Why PowerVault ME4 Series?

ME4 delivers significant improvements and benefits over MD3[1]

122%
More raw capacity

75%
More system drives

40%
Better density

4X
Increased performance

2.6x
Faster bandwidth writes

HTML5
Management GUI

SIMPLE.   FAST.   AFFORDABLE.

1 MD3 primary storage arrays have gone End Of Sales Life

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PowerVault ME4 Storage

Entry level performance, scale and simplicity

EBOD Expansion Enclosures[1]

RBOD Models with RAID Controllers:

	ME4012	**ME4024**	**ME4084**	**ME412**	**ME424**	**ME484**
Configurations:	2U12 drives	2U24 drives	5U84 drives	2U12 drives	2u24 drives	5U84 drives
Max Raw Capacity[2]	3.1PB	3.0PB	4PB	9 x 2U enclosures (behind ME4012/ME4024)		
Min/Max Drives	2/264	2/276	28/336	3 x 5U enclosures (behind ME4012/ME4024/ME4084)		
Media	Hybrid (0-100% Flash)					
Protocols	8/16Gb FC, 1/10Gb iSCSI, 12Gb SAS			12Gb SAS Backend		
Data Protection	Virtual Copy, Snapshots, Async Replication, SEDs					
Performance	Tiering, SSD Read Cache					
Integration	VMware Vcenter Plugin, SRM Plugin					
Management	PowerVault Manager					
Architecture	Thin provisioning, ADAPT, Internal Key Manager (encryption)					

[1] ME Expansion Units (DAE) cannot be connected to a server directly (not a server-attached JBOD)
[2] Three ME484 enclosures as expansion; PB maximum per array determined by use of Virtual or Linear mode

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Connecting up PowerVault ME4 Storage

Flexible expansion options for PowerEdge Servers

Direct-Attach
Low Latency

PowerEdge Server

SAS

MD1400 / MD1420 JBOD

PowerVault ME484 JBOD

Shared Storage
Performance

PowerEdge Server

FC/iSCSI SAN

PowerVault ME4 RBOD*

PowerVault ME4 EBOD*

Shared Storage
Density

PowerEdge Server

SAS

PowerVault ME4 RBOD*

PowerVault ME4 EBOD*

2 x Server Brick 1

Single Namespace

2 x Server Brick 2

Single Namespace

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PowerVault ME4 Storage all-inclusive software

No costly licensing makes PowerVault easier to own, deploy and use

ADAPT	Thin Provisioning	SSD Read Cache
Functionality enabling affordable capacity expansion & faster drive rebuild times.	Allocate and consume physical storage capacity as needed in disk pools	Increase execution speed of applications by caching previously read data

IP Remote Replication	FC Remote Replication	Snapshots	Auto-Tiering
Replicate data to any global location that includes mirroring thin provisioned pools	Replicate data to any global location that includes mirroring thin provisioned pools	Recover files after accidental delete/alteration with point-in-time copies	Improve performance and efficiency with less hardware expense

Volume Copy	SED Drive Encryption	vCenter/SRM; SMI-S with SCVMM
Seamlessly clone volumes for re-purposing on different spindles and drives	Render data useless to unauthorized users with drive-level encryption even if the drive has been removed from the enclosure	vCenter & SRM integration to move live VMs at scale between sites; Easily automate storage management running Hyper-V VMs

PowerVault Manager	CloudIQ
Native HTML5 management interface for configuring, provisioning, managing, monitoring and supporting a single PowerVault ME4 array	Cloud-native monitoring application that uses ML/AI and predictive analytics from telemetry gathered across thousands of systems to provide system health scores

Management Ecosystem	SupportAssist
Integrate with Nagios Core/XI for auto-discovery, inventory and monitoring and provide increased scalability for unified datacenter management with OpenManage Enterprise integration	An embedded protocol connected to Dell EMC to help you proactively maintain the health of your PowerVault ME4 storage array or other Dell EMC device.

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FUTURE-PROOF
STORAGE LOYALTY PROGRAM

INVESTMENT PROTECTION	A PATH FORWARD	PEACE OF MIND
Lowering the risk of your investment	*You will be ready for the future*	*No hidden costs or fees*

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Solutions Overview

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PowerVault ME4 Series solution stack flexibility

At-a-glance access to affordable technology options with radical simplicity

SOLUTION	HPC Parallel File Systems	Surveillance	Virtualization, VDI & Backup
BENEFIT	Throughput, Performance, Capacity Expansion	Archive; High Capacity/Density	Simple, Affordable, Fast, Flexible
VIRTUALIZATION	VMware vSphere; VMware Horizon View; Microsoft Hyper-V; Citrix XenServer		
MANAGEMENT	PowerVault Manager; CloudIQ; VMware SRM; OME; Nagios Core & XI		
INTEGRATIONS	SupportAssist; vSphere Plug-in; SRA Adapter; SM-S integration with SCVMM		
PROTECTION	Snapshots; Replication; ADAPT; SED Drives		
INFRASTRUCTURE	PowerVault; PowerEdge; Networks; Monitoring Systems		

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PowerVault ME4 Series for HPC

Modular building blocks for scale-out storage with predictable performance/low latency

Scale Throughput:
to 21.3GB/s Writes
to 22.5GB/s Reads
(sequential)

Scale Capacity:
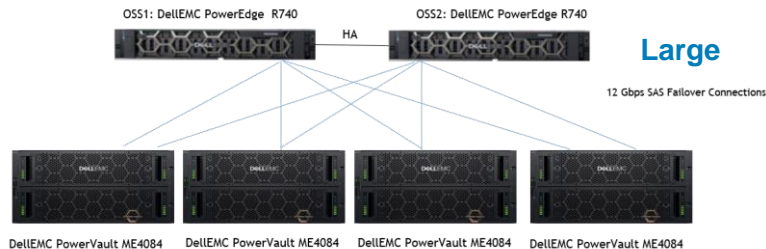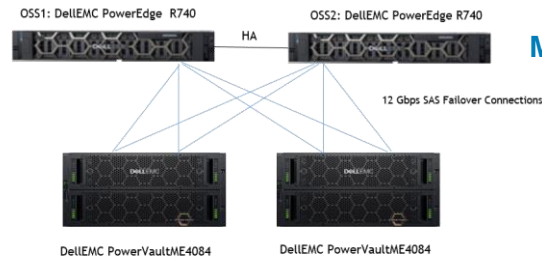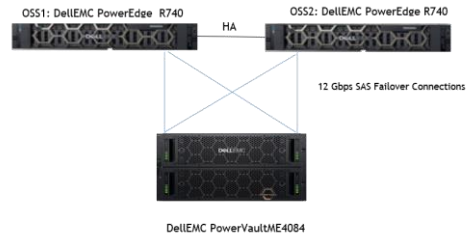from
100's TBs
to 100's PBs

Scale Performance:
to 28.5K Write IOPS
to 34.06K Read IOPS

Ideal solution for BeeGFS, PixStor, more

Small

Medium

Large

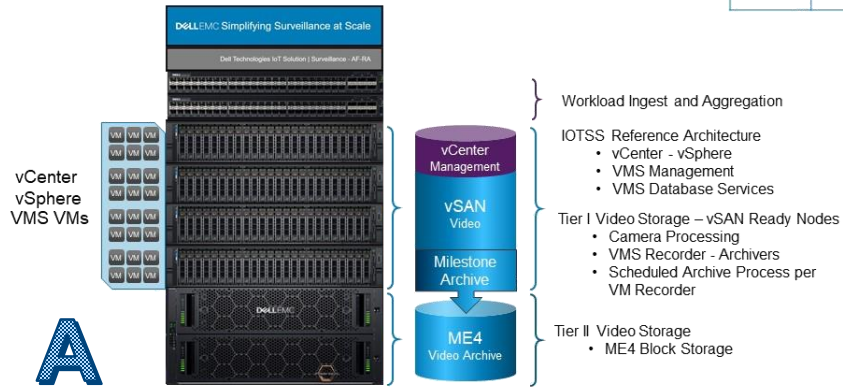PixStor: https://www.dell.com/support/article/en-us/sln318841/dell-emc-ready-solution-for-hpc-pixstor-storage?lang=en

BeeGFS: https://www.dell.com/support/article/us/en/19/sln319381/dell-emc-ready-solutions-for-hpc-beegfs-storage?lang=en

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PowerVault ME4 Series for Surveillance

Flexible video archive and capacity storage implementations
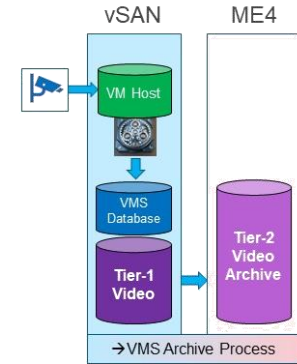

IOTSS Reference Architecture – Safety and Security

T1	T2
VSAN	ME4

vCenter vSphere VMS VMs

DELLEMC Simplifying Surveillance at Scale
Dell Technologies IoT Solution | Surveillance - AF-RA

Workload Ingest and Aggregation

IOTSS Reference Architecture
- vCenter - vSphere
- VMS Management
- VMS Database Services

Tier I Video Storage – vSAN Ready Nodes
- Camera Processing
- VMS Recorder - Archivers
- Scheduled Archive Process per VM Recorder

Tier II Video Storage
- ME4 Block Storage

vCenter Management

vSAN Video

Milestone Archive

ME4 Video Archive

A

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ME4 as T2 Capacity Storage

VMS-DB	T1	T2
vSAN	vSAN	ME4
	VMS Archive	

vSAN   ME4

VM Host

VMS Database

Tier-1 Video

Tier-2 Video Archive

→VMS Archive Process

DELLEMC Simplifying Surveillance at Scale
Dell Technologies IoT Solution | Surveillance - Reference Architecture

B

Support up to 600 cameras @ 4 Mb/s

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PowerVault ME4 Series for Virtual Desktops

Optimized virtual desktop experience for SMBs

| Linked Clone | Linked Clone | Linked Clone | Linked Clone |

vmware Horizon View

VMware vSphere

VDI Infrastructure

SAN/DAS

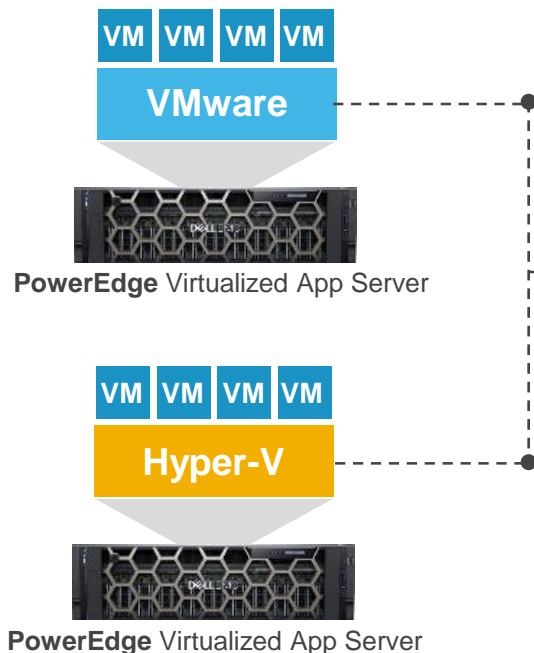FC, iSCSI, SAS

PowerVault ME4 Series
Primary Storage
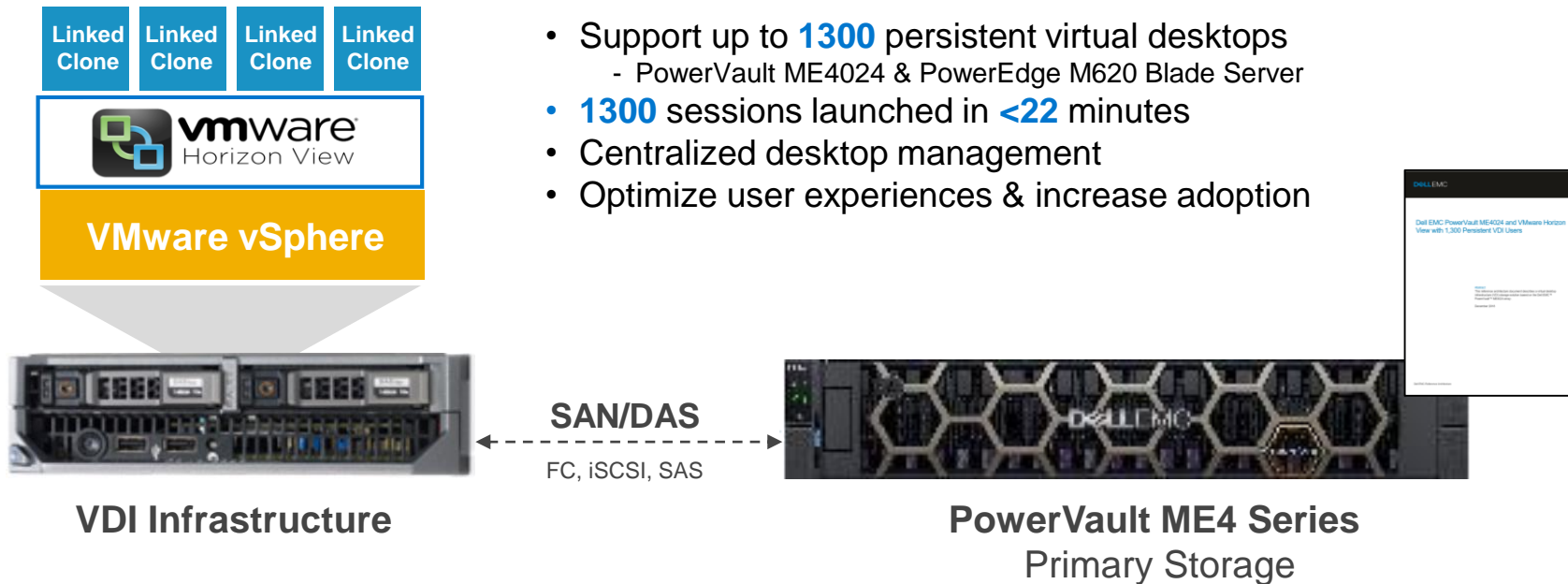
- Support up to **1300** persistent virtual desktops
  - PowerVault ME4024 & PowerEdge M620 Blade Server
- **1300** sessions launched in **<22** minutes
- Centralized desktop management
- Optimize user experiences & increase adoption

White paper: https://downloads.dell.com/manuals/common/powervault-me4024-vmware-horizon-reference-architecture-1300-users-3919-ra-vdi_en-us.pdf

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PowerVault ME4 Series for Virtualization

Affordable virtualization for SMBs

VM	VM	VM	VM

VMware

PowerEdge Virtualized App Server

VM	VM	VM	VM

Hyper-V

PowerEdge Virtualized App Server

- Support for **100's of VMs**[1]
- vSphere and Hyper-V hypervisors
- Integrates with SMI-S / MS SCVMM & SRA
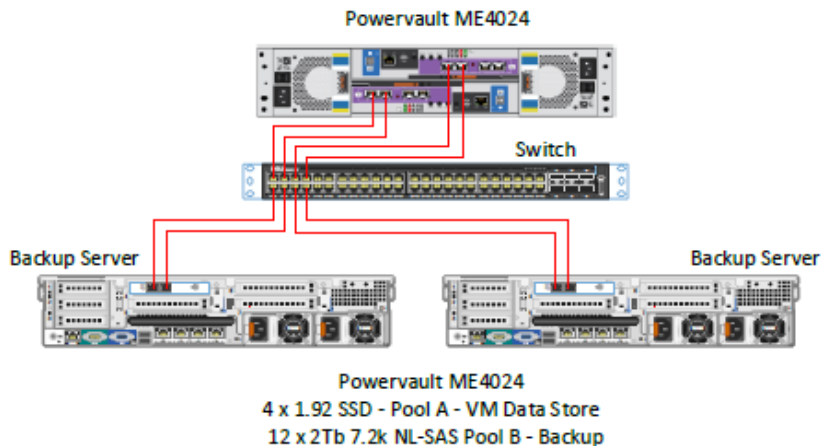- Supports PowerEdge Servers

PowerVault ME4 Production Storage

VMware Compatibility Guide

1 Variables such as volumes, RAID, configuration, cores, server, etc. will ultimately determine the actual value

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PowerVault ME4 Series for Backup/Recovery

Simplified block-based data protection for SMBs

Switched Topology

Powervault ME4024

Switch

Backup Server

Backup Server

Powervault ME4024
4 x 1.92 SSD - Pool A - VM Data Store
12 x 2Tb 7.2k NL-SAS Pool B - Backup

- ME4 is certified with Veeam Ready Program
- Can be used as DAS or NAS
- Backup your data easily and keep it safe
- Visit: https://www.veeam.com/kb3113

DAS Configuration

backup

SMB Backup Server Environment

PowerVault ME4 as Backup Storage

Note: NL SAS drive backup performance exceeded the Veeam requirements

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PowerVault ME4 is OEM ready

Where your brand and our IP come together

Un-badged storage waiting for your logo

Place your logo on PowerEdge ME4 un-badged products in the factory

Minimize administration overhead

Dell EMC provides technical training documents, packaging and labels
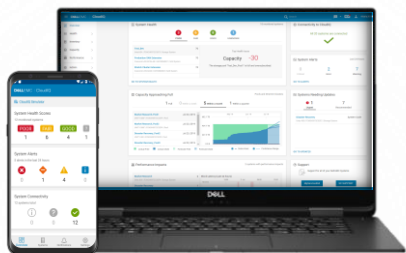
Established in 4 Workloads

Video Surveillance

Healthcare Appliances

Telco

Archive
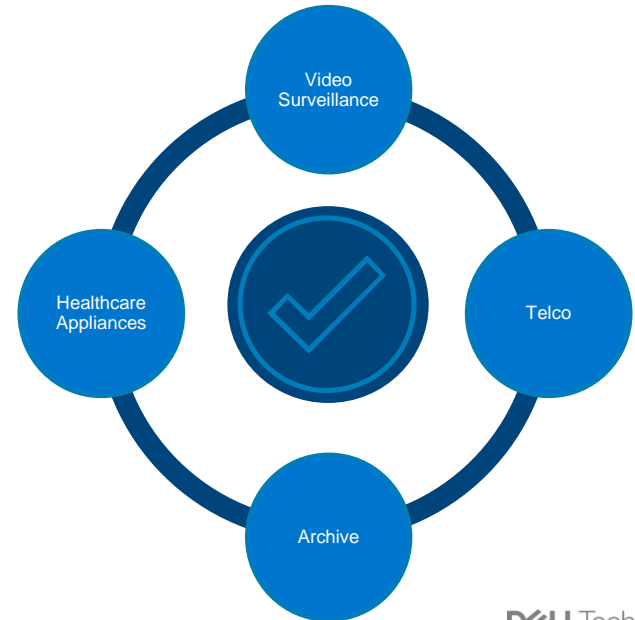
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Management Ecosystem

CloudIQ

Intelligently answering questions about your data center

NEW

CloudIQ

Reduce Risk
Monitor potential vulnerabilities across your data center and virtual infrastructure with proactive health scores

Spot Trouble
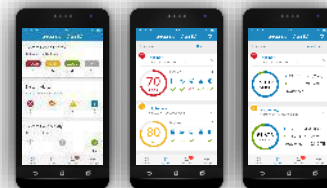Pinpoint deviations in your environment to focus and expedite trouble-shooting

Plan Ahead
Anticipate business needs with capacity forecasting and anomaly detection

Data Center

Available with:

PowerMax
Isilon
XtremIO
Unity XT
SC Series
PowerVault
Connectrix
VxBlock
VMware

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PowerVault Manager web-based management

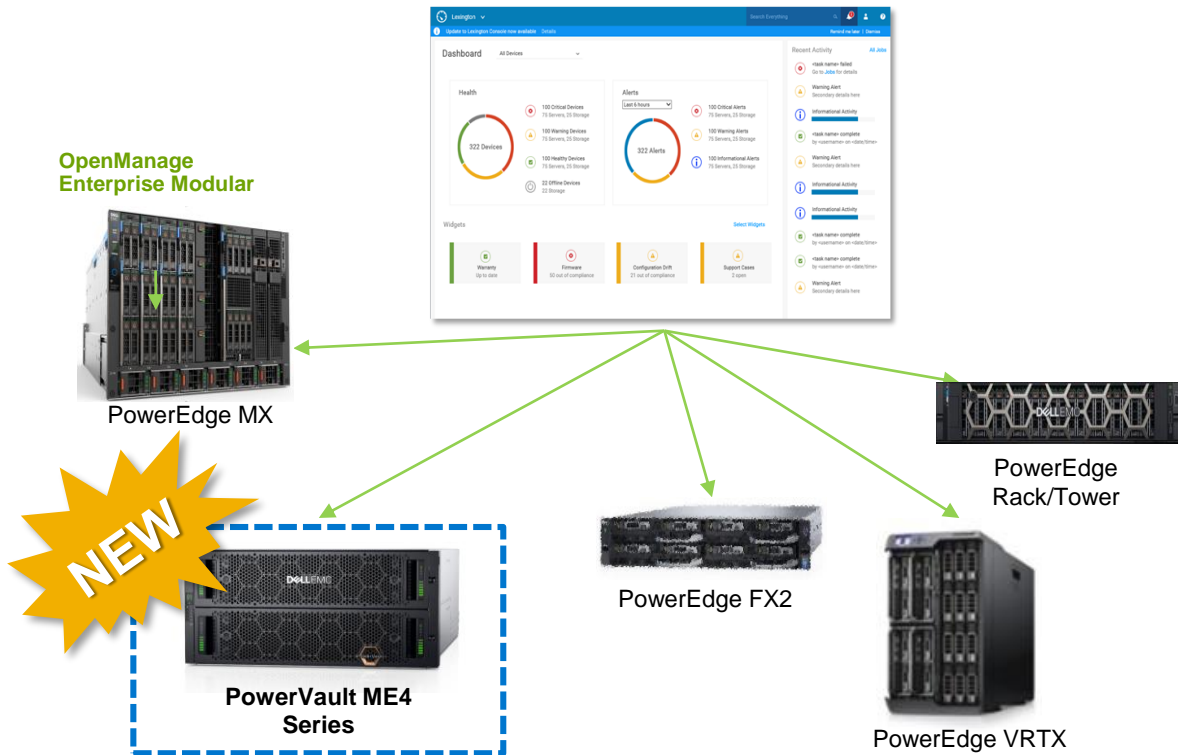Manage ME4 storage simply, intuitively from anywhere

- Single-array HTML5 management interface
- Use common management tasks from convenient locations
- Manage storage profiles, network connections, alerts, more
- Easily connect to SupportAssist and onboard CloudIQ
- CLI support
- Configure in 15 minutes

D&LL Technologies
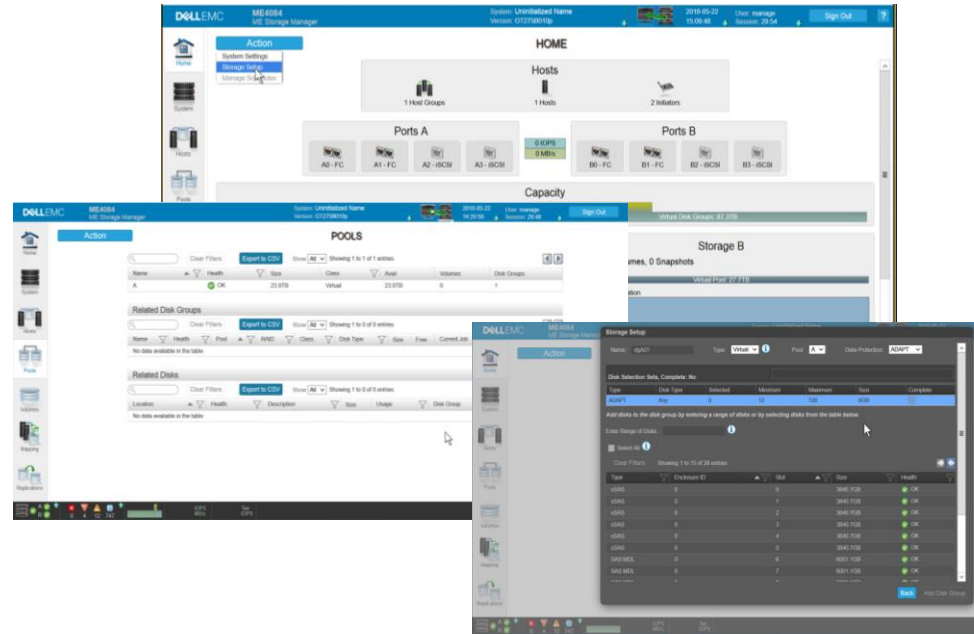
PowerVault ME4 Series and OpenManage Enterprise

Increased scalability for unified data center management

- Monitor ME4 storage and non-Dell EMC hardware for a single-view of the infrastructure

- Scales to manage up to 8,000 server, storage and network devices

- One console can support devices spread across the globe

OpenManage Enterprise Modular

PowerEdge MX

NEW

PowerVault ME4 Series

PowerEdge FX2

PowerEdge Rack/Tower

PowerEdge VRTX

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Monitor Dell EMC storage arrays with Nagios Core/XI

OPEN

NEW

Nagios 3.1 storage features include:

- Auto-discovery, inventory and monitoring

- Overall storage array health and component-level health monitoring

- SNMP Trap monitoring support

- H/W warranty monitoring

- Launch 1:1 element management consoles directly from Nagios-Core and XI

PowerVault ME4 Series

Dell EMC storage arrays already supported

SC-Series

PS-Series

PowerVault MD 34/38-Series

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PowerVault ME4 Series and Nagios Core and XI

Monitor Dell EMC storage, server, network and HCI infrastructure

Auto-creation of Host Groups for all supported storage devices including ME4

1 **Configure** various parameters for device discovery such as Target IPs, communication protocol, etc.

2 **Select Discovered Devices** and the associated services that you would like to monitor
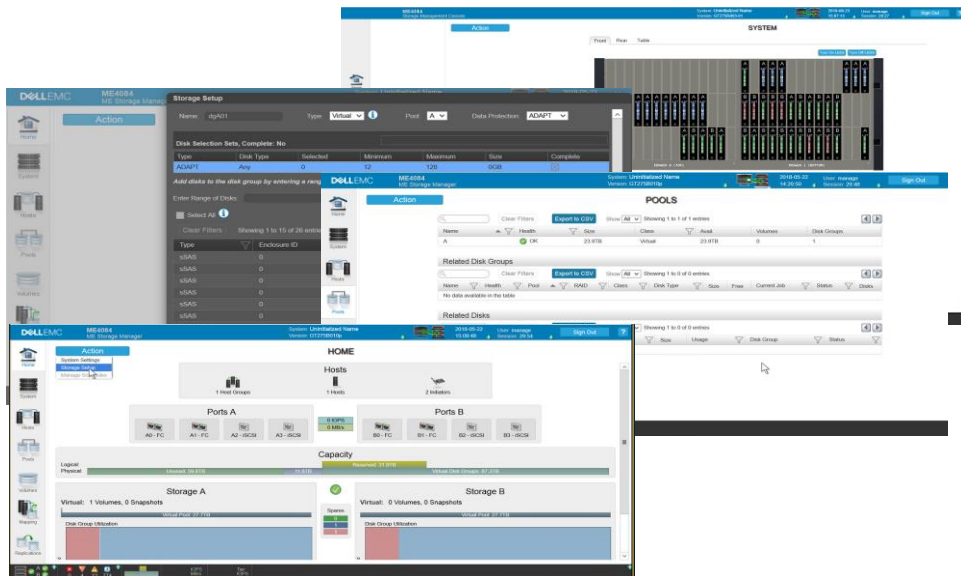
3 **View Configuration Summary**, customize if required and finish configuration

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PowerVault ME4 Demonstration

25 of Y   © Copyright 2019 Dell Inc.

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Attach compute power to data power

Flexible capacity expansion options for your PowerEdge Servers

Include PowerVault MD/ME JBODs with Dell PowerEdge Servers

PowerEdge

PowerVault ME484 JBOD

MD1400 / MD1420
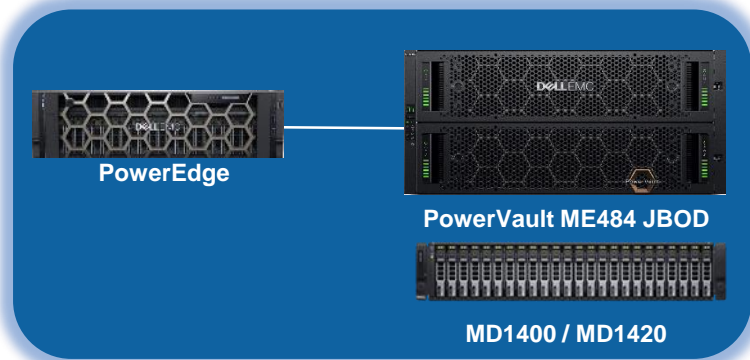
- Simplifies challenges of server capacity expansion

- Business applications get high-speed access to data

- Support for PowerEdge Servers 13G and 14G
  - Up to 4PB raw capacity for servers
  - 12Gb SAS

- Support for NX NAS servers with Microsoft Storage File/Print Server

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PowerVault MD1400/MD1420 direct-attach storage

Versatile density and performance

Cost effective storage solution

- Low-cost storage expansion (cost/TB)
- Simple and cost-effective capacity for PowerEdge servers
- Ideal for backup or disaster recovery solutions

Designed for density and performance

- Mix and match drives: NL SAS, SAS, and SSD, SED
- OS support for various applications
- Enclosures to meet your capacity and performance requirements

Simple design drives efficiencies

- Hot-swappable EMMs, drives, fans and power supplies
- Seamless data management with the PowerEdge server
- End-to-end 12Gb connectivity improves performance

Benefits	Ideal for
• Dramatically expand storage behind PowerEdge servers at an affordable price • Choose the form-factor, drive size and OS support needed to optimize performance and operational objectives • Data is secure and can be managed seamlessly though the PowerEdge host server	• I/O Performance-Intensive Applications (large databases, web serving, email) or sequential applications for video streaming • Ideal for backup or data recovery solutions

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PowerVault ME484 dense server-attach

Dell's best drive density per rack unit – extreme density

Designed for PowerEdge server expansion

Dell EMC enterprise hard drives

- Ensures added capacity is affordable

Mix and match drive capacity

- Tailor performance to meet the needs of a variety of applications
- 40% more capacity than the previous dense enclosure

Data remains close to the compute power of the PowerEdge server

- Keeps performance at its peak

Benefits	Ideal for
• Ultra-dense storage for Dell EMCs award-winning PowerEdge server products — over 4 Petabytes of capacity • Maintain compute power and performance, while adding storage capacity	• Video surveillance • High performance and high capacity requirements • Software-Defined-Storage

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PowerVault server-attach expansion enclosures

PowerVault JBOD Models:

	MD1400	MD1420	ME484

Value: High-density | Performance-optimized | Performance & density-optimized

	MD1400	MD1420	ME484	
Max Raw Capacity	1.15PB	460.8TB	4PB	
Max Drives	2/96	2/192	28/336	
Max Enclosures	8	8	4	
Configuration	2U12	2U24	5U84	
Drives	SSD, SAS, NLSAS, SED			**All three JBOD models support 13G and 14G Dell PowerEdge Servers**
Drive Bays	12x3.5"	24x2.5"	84x3.5" & 2.5"	
Host Interface	12Gb SAS	12Gb SAS	12Gb SAS	
Management	OpenManage		PowerTools Server Hardware Manger	

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Dell EMC and Microsoft: a powerful, affordable solution

Dell EMC NX Windows NAS series

+

Windows Storage Server 2016

=

Easy management

Reliable integration

Storage scalability

- Dell's PowerEdge server and storage experience with the latest Windows Storage Server OS
- One contact for software, hardware and infrastructure services

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PowerVault NX Windows NAS Series

PowerVault NX430

- Turnkey, entry-level NAS
- Windows Storage Server 2016 Standard or Workgroup
- 1U with max capacity up to 40TB

PowerVault NX3240

- SMB or remote office
- Windows Storage Server 2016 Standard
- 2U with max capacity up to 192TB

PowerVault NX3340

- Highly available clustered storage
- Windows Storage Server 2016 Standard
- 1U supports up to 64 cluster nodes

- Affordable storage without sacrificing performance or capacity
- Enterprise features and capabilities with Windows Storage Server 2016
- PowerEdge server hardware with built-in energy efficiency

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Service and Support

PowerVault with SupportAssist Enterprise & leading system management consoles

Support Automation

Automate your support experience with predictive, data-driven technology & **resolve issues up to 72%* faster**

SupportAssist Enterprise

- ✓ Automated issue detection, case creation, & system state information collection
- ✓ Proactive and predictive alerts
- ✓ On-demand reporting

* When combined with ProSupport Plus

Systems Management

Manage up to 15K server, storage or networking devices with management consoles to simplify and automate essential HW management tasks

OpenManage Enterprise

OpenManage Enterprise – Modular *(available 9/13/18)*

OpenManage Essentials

Microsoft System Center Operations Manager

- ✓ Device discovery & Inventory
- ✓ Device monitoring and management
- ✓ Alert processing
- ✓ Bare-metal server deployment
- ✓ Server configuration maintenance
- ✓ Server firmware updates
- ✓ On-premise reporting

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Data migration

Move data faster, more securely, and with minimal disruptions

Host-based migrations

MD3, PS, SCv2 and VNXe **to ME4**

Up to 35TB distributed across up to 15 Hosts and 15 LUNs per host

EXPERTISE

- Program Manager, Data Migration Architect and Data Migration Engineer assigned to each project

DELIVERABLES

- Detailed analysis, reporting, step-by-step procedures, and cutover plans available

- Specialized migration software moves data accurately and securely

AVAILABILITY

- For unstructured and structured data platforms

- Works with 3rd party or Dell EMC storage arrays

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Dell Technologies Services | PowerVault ME4 Series

Ultimate Choice & Flexibility
for the life of your system

Dell EMC ProDeploy Enterprise Suite

Dell EMC Data Migration Services

Dell EMC ProSupport Enterprise Suite

Plan, install & configure with confidence

Move data efficiently with minimal disruption

Get ahead of problems before they happen

With data-driven technologies to connect and manage your service experience

Summary

Dell EMC PowerVault ME4 Storage

Simple, fast and affordable entry storage for SAN/DAS

PowerVault ME4012

PowerVault ME4024

PowerVault ME4084

- Built-in simplicity
    - Intuitive HTML5 GUI
    - All-inclusive SW
    - CloudIQ storage analytics
    - Management ecosystem
    - JBOD options for DAS

- DAS and SAN optimized

- Workload diverse

- Exceptional performance, scale

- Built-in data protection features

- Flexible configurations

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Backup slides

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Ready Solution for BeeGFS with PowerVault ME4 Storage

- The Dell EMC Ready Solution for HPC BeeGFS parallel file storage solution allows efficient scaling both up and down without losing performance or capacity.

  - Based on Dell PowerEdge Servers, PowerVault ME4 Storage Arrays

  - InfiniBand, OmniPath support, Ethernet

  - Whamcloud backed Lustre Support

Up to ~4PB (raw), 21.3GB/s write, 22.5GB/s read for a single OSS pair
Scale with additional pairs to scale out performance and capacity

Benefits

① Run larger and more complex applications faster with over a petabyte in sustained capacity.

② Start small and scale to tens of thousands of clients and beyond an petabytes in capacity.

③ Dell EMC and Whamcloud® have bundled a tested, validated solution that removes guesswork and support challenges, so you can stay focused on your business or research objectives

Dell EMC Ready Solutions for HPC Pixstor Storage

Benefits

The Dell EMC Ready Solutions for HPC Pixstor Storage allows efficient scaling both up and down without losing performance or capacity.

- Based on Dell PowerEdge Servers, PowerVault ME4 Storage Arrays

- InfiniBand, Ethernet

- ArcaStream Backed Support

1. Run larger and more complex applications faster with over a petabyte in sustained capacity.

2. Start small and scale to tens of thousands of clients and beyond a petabyte in capacity.

3. Dell EMC and ArcaStream have bundled a tested, validated solution that removes guesswork and support challenges, so you can stay focused on your business or research objectives

Dell EMC Ready Solution for HPC NFS Storage

- Storage solutions based on the NFS protocol are time-tested, easy to use and install.

- For clusters running applications with **lower I/O** needs, NFS storage offers reduced costs in a reliable, easy to administer, industry-standard storage solution.

- In clusters with **higher I/O requirements**, NFS is a good option for a secondary storage repository for home directories, application storage, and longer-term storage of application data.

Benefits

1. Highly Available NFS Storage System tuned for HPC environments.

2. The Dell EMC Ready Solution for HPC NFS Storage is tuned to get up to 30% throughput performance improvement compared to non-optimized NFS solutions.

3. Meet future needs more easily with the ability to provide up to 1008 PB raw capacity, with 7 GB/s read & ≈5 GB/s write performance in a supported single namespace.

4. Full XFS support for 768 TB of usable space.

PowerVault for Video Surveillance

Bandwidth and scalability for archive and retention needs

Simple, scalable, high-value solutions

- PowerVault ME4 Storage block solution enables direct integration with video management software to match size and scale capacity expansion and retention requirements
- PowerVault ME4 Storage array can provide up to 4PB

Solution Sizing

- Dell EMC surveillance team is available to help size and configure storage solutions based on choice of video management system (VMS) and physical architecture

High-density designs

- Ideally suited for increased storage demands of HD and multi-megapixel camera deployments

Solution with multiple enclosures that can scale as a single SAN up to 4 PB or as a building block contributing to larger-capacity solutions.

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