Dell™ PowerVault™ MD Series Support Matrix

This document describes the Dell PowerVault MD32XX/36XX Series RAID Controller Firmware Version 08.20.09.60

Dell Engineering
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A Dell Reference Architecture

Revisions

Date	Description
June 2015	Updated RAID controller NVSRAM and supported physical disk drive models
July 2015	• Updated information about supported physical disk drive models • Updated Supported Management Software section • Updated Supported Operating Systems section • Updated Dell PowerVault MD-Series storage array rules section

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Notes, Cautions, and Warnings

Note: A note indicates important information that helps you make better use of your computer.

Caution: A caution indicates potential damage to hardware or loss of data, if instructions are not followed.

Warning: A warning indicates a potential for property damage, personal injury, or death.

Note: This Support Matrix contains the latest compatibility and interoperability information. If you observe inconsistencies between this information and other MD-series documentation, this document should be considered superseding.

1 Introduction

This document provides information about supported software and hardware for Dell PowerVault MD3200, MD3220, MD3200i, MD3220i, MD3600i, MD3600f, MD3620i, MD3620f, MD3260, MD3260i, MD3660i, and MD3660f storage arrays, and usage considerations, recommendations, and rules.

Note: Unless specified, all information in this document is applicable to the most current RAID controller firmware version available at **Dell.com/support/home**.

2 Changes in Version A12

- Updated information about supported physical disk drive models
- Updated information about Supported Management Software section
- Updated information about Supported Operating Systems section
- Updated information about Dell PowerVault MD-Series storage array rules section

3 Supported data protocols

Table 1 Dell PowerVault MD-Series models and supported data protocols

Dell PowerVault MD Array Model [3]	Data Protocol
Dell PowerVault MD3200[1]	6 Gbps direct-attached SAS storage array with 12 drives (3.5 inch)
Dell PowerVault MD3220[1]	6 Gbps direct-attached SAS storage array with 24 drives (2.5-inch)
Dell PowerVault MD3200i[1]	1 Gbps iSCSI network storage array with 12 drives (3.5-inch)
Dell PowerVault MD3220i[1]	1 Gbps iSCSI network storage array with 24 drives (2.5-inch)
Dell PowerVault MD3600i[1]	10 Gbps iSCSI network storage array with 12 drives (3.5-inch)
Dell PowerVault MD3620i[1]	10 Gbps iSCSI network storage array with 24 drives (2.5-inch)
Dell PowerVault MD3600f[1]	8 Gbps Fibre Channel network storage array with 12 drives (3.5-inch)
Dell PowerVault MD3620f[1]	8 Gbps Fibre Channel network storage array with 24 drives (2.5-inch)
Dell PowerVault MD3260[2]	6 Gbps direct-Attached SAS storage dense array
Dell PowerVault MD3260i[2]	1 Gbps iSCSI network storage dense array
Dell PowerVault MD3660i[2]	10 Gbps iSCSI network storage dense array
Dell PowerVault MD3660f[2]	8 Gbps Fibre Channel network storage dense array

Notes:

[1] Dell PowerVault MD3200, MD3220, MD3200i, MD3220i, MD3600i, MD3620i, MD3600f, and MD3620f models support 120 physical disk drives or slots in base configuration. With premium feature activation, 192 physical disk drives or slots are supported.

[2] Dell PowerVault MD3X60i/f dense array has default 120 drives or slots support (with 20 drives minimum), and 180 drives or slots support with PFK.

[3] Premium Key Feature (PFK) is optional on all models.

4 Dell PowerVault MD-Series storage array rules

This section contains both general and model-specific connectivity and consideration rules for Dell PowerVault MD storage arrays. The rules shown in Table 2 apply only to all storage array models. For rules applying to specific Dell PowerVault MD models, see 0 andTable 4.

Note: Dell PowerVault MD3260, MD3260i, MD3660i, and MD3660f platforms are supported in dual-RAID controller (duplex) configurations only.

Table 2 Dell PowerVault MD-Series storage array rules for all models

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
Maximum number of host servers a single storage array can connect to with one RAID controller module installed	4	32	64	64
Maximum number of host servers a single storage array can connect to with two RAID controller modules installed	8 (4, if using high availability)	32	64	64
Maximum number of Dell 6 Gb SAS HBA cards supported in a single host server attached to single array. (Dell recommends that you use two Dell 6 Gb SAS HBA cards for all redundant cabling configurations.)	2 (each card has two ports)	N/A	N/A	N/A

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
Unused ports on a Dell 6 Gb SAS HBA card already connected to a PowerVault MD3260 cannot connect to another device (such as a tape drive or other model storage array).	✓	N/A	N/A	N/A
Maximum number of PowerVault MD Series Storage Arrays a host server may connect to:	2 (HA)	4	4	4
SAS and iSCSI storage arrays can connect to the same host server.	✓	✓	✓	The I/O co-existence between the Fibre Channel and any other protocol on same host is not supported.
A hot-spare for a disk group must be a physical disk drive of equal or greater disk space than any of the member drives.	✓	✓	✓	✓

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
When using out-of-band management with SMcli by specifying the RAID Controller management port IP addresses on the Dell PowerVault MD Storage Array, SMcli commands that change the attributes of a virtual disk, virtual disk copy, or snapshot virtual disk, must have management access to the owning RAID Controller Module. Dell recommends that you specify both management port IP addresses on the SMcli invocation: SMcli 192.168.128.101 192.168.128.102 -c.	✓	✓	✓	✓
On Linux systems Device Mapper, multipath drivers are required for multipath support	✓	✓	✓	✓
Co-existence of several Linux multi-path drivers is not supported. When using a Dell PowerVault MD3200 or MD3600 series array with Linux host servers, only the Linux Device Mapper failover driver is supported.	✓	✓	✓	✓

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
Virtual disks on Dell PowerVault MD Series storage arrays cannot be used for booting.	✓	✓	✓	✓
Disk Groups can be migrated between a Dell PowerVault MD3260/3260i/3660i/ 3660f by following the appropriate disk group migration procedure	✓	✓	✓	✓
Disk pools cannot be migrated.	✓	✓	✓	✓
Maximum disk space per array for dynamic disk pooling.	1024 TB	256 TB	256 TB	1024 TB
All iSCSI Host ports on a controller have to be at the same port speed	N/A	Only 1Gbps Supported	✓	N/A
iSCSI Host ports will only auto-negotiate to the port speed set in MDSM	N/A	Only 1Gbps Supported	✓	N/A

If the iSCSI initiators are connected to Dell PowerVault MD3200i and/or MD3600i series through the network switches, ensure that your switches support IEEE 802.3x flow control, and the flow control is enabled for both sending and receiving on all switch ports and server NIC ports. If you do not enable the flow control, your iSCSI storage array may experience the degradation of the I/O performance. Alongside enabling the Ethernet IEEE 802.3x flow control, Dell recommends that you disable unicast broadcast storm control on the switch ports connected to the iSCSI initiators and target arrays and turn on the "PortFast" mode of the spanning tree protocol (STP) on the switch ports connected to the iSCSI initiators and target arrays. Note that turning on the "PortFast" mode is different from turning off the whole operation of STP on the switch. With "PortFast" on, the STP is still enabled on the switch ports. Turning STP off may affect the entire network and can leave the network	N/A	✓	✓	N/A

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
vulnerable to physical topology loops.				
For optimal I/O performance, avoid having more than one iSCSI session originating from one host iSCSI port to the same controller. Ideally, connect the iSCSI host NIC to only one iSCSI target port on the storage subsystem.	N/A	✓	✓	N/A
For Dell-Oracle tested and validated solutions on the Dell PowerVault MD arrays, visit the following site: http://en.community.dell.com/techcenter/enterprise-solutions/w/oracle_solutions/current-release.aspx	✓	✓	✓	✓
The number of VD copies is limited to a maximum of 511 with a maximum of 8 concurrent copies (applicable to RAID controller firmware version 07.84.xx.xx)	✓	✓	✓	✓
Remote Replication is not supported in simplex mode.	N/A	✓	✓	✓
Maximum number of iSCSI sessions.	N/A	192 per port	448 per port	N/A

Table 3 Dell PowerVault MD-Series storage array rules for non-dense, 2U models only (MD3200, MD3220, MD3200i, MD3220i, MD3600i, MD3620i, MD3600f and MD3620f)

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
Support for up to 120 physical disk drive slots (system default configuration). You can attach up to nine Dell MD1200 and/or MD1220 series expansion enclosures to a Dell PowerVault MD storage array. Any mixture of MD1200 and MD1220 enclosures supports up to 120 physical slots.	✓	✓	✓	✓
Support for up to 192 physical slots through a premium feature option. You can attach up to 15 Dell MD1200 and/or MD1220 series expansion enclosures to a Dell PowerVault MD storage array. Any mixture of MD1200 and MD1220 enclosures for a total of 192 physical slots is supported.	✓	✓	✓	✓
Maximum number of physical disk drives in a RAID0, RAID1/10 is 120.	✓	✓	✓	✓
Maximum number of physical disk drives in a RAID5 or RAID6 disk group is 30.	✓	✓	✓	✓
Attached MD1200 series expansion enclosures must be run in unified mode.	✓	✓	✓	✓
The number of snapshots pre 07.80.xx.xx controller firmware is limited to: • Maximum of 256 snapshots per array • Maximum of 16 per VD	✓	✓	✓	✓

Rule	Dell PowerVault MD3200 series	Dell PowerVault MD3200i series	Dell PowerVault MD3600i series	Dell PowerVault MD3600f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
The number of remote replicas (legacy) is limited to maximum of 16 pairs	N/A	N/A	N/A	✓
The number of snapshots starting with 07.87.xx.xx controller firmware code is limited to: • Maximum of 512 snapshots per array • Maximum of 128 snapshots per VD • Maximum of 32 snapshots per snapshot group	✓	✓	✓	✓
The number of remote replicas is limited to the maximum of 32 for each array	N/A	✓	✓	✓

Table 4 Dell PowerVault MD-Series storage array rules for dense, 4U models only

Rule	MD3260 series	MD3260i series	MD3660i series	MD3660f series
	6 Gbps SAS	1 Gbps iSCSI	10 Gbps iSCSI	8 Gbps Fibre Channel
Support for up to 180 physical slots with a premium feature activation.	✓	✓	✓	✓
Maximum number of physical disk drives in a RAID0, RAID1, and RAID10 is 120.	✓	✓	✓	✓
Up to two Dell PowerVault MD3060e series, expansion enclosures can be attached to Dell PowerVault MD3260/MD3260I/MD3660i/MD3660f dense storage arrays for 3 Dell PowerVault MD3x60 enclosures.	✓	✓	✓	✓

Support for up to 120 physical slots (system default configuration).	✓	✓	✓	✓
A minimum of 20 SAS or SSDs are required in each MD3x60 enclosure (4 in front of each drawer)	✓	✓	✓	✓

5 Default IPv4 settings for the management ports on the Dell PowerVault MD-Series storage arrays

Note: No default gateway is set.

By default, the management ports on the storage array are set to DHCP. If DHCP fails, the following IPv4 settings are used:

Table 5 Default IPv4 management port addresses

Controller	IPv4 address	Subnet mask
Controller 0	192.168.128.101	255.255.255.0
Controller 1	192.168.128.102	255.255.255.0

5.1 Default IPv4 settings for the iSCSI ports on Dell PowerVault MD36X0i array

Note: No default gateway is set.

By default, the iSCSI ports on the storage array are set to the static IPv4 settings shown in Table 6.

Table 6 Default iSCSI Port IPv4 Addresses on MD36X0i Storage Arrays

Controller/port	IPv4 address	Subnet mask	Port #
Controller 0, Port 0	192.168.130.101	255.255.255.0	3260
Controller 0, Port 1	192.168.131.101	255.255.255.0	3260
Controller 1, Port 0	192.168.130.102	255.255.255.0	3260
Controller 1, Port 1	192.168.131.102	255.255.255.0	3260

5.2 Default IPv4 settings for the iSCSI ports on Dell PowerVault MD32X0i storage array

Table 7 Default iSCSI Port IPv4 addresses on Dell PowerVault MD32X0i storage arrays

Controller/Port	IPv4 address	Subnet mask	Port #
Controller 0, Port 0	192.168.130.101	255.255.255.0	3260

Controller/Port	IPv4 address	Subnet mask	Port #
Controller 0, Port 1	192.168.131.101	255.255.255.0	3260
Controller 0, Port 2	192.168.132.101	255.255.255.0	3260
Controller 0, Port 3	192.168.133.101	255.255.255.0	3260
Controller 1, Port 0	192.168.130.102	255.255.255.0	3260
Controller 1, Port 1	192.168.131.102	255.255.255.0	3260
Controller 1, Port 2	192.168.132.102	255.255.255.0	3260
Controller 1, Port 3	192.168.133.102	255.255.255.0	3260

6 Supported RAID controller firmware and NVSRAM

Note: Dell recommends that you collect support information before performing any firmware upgrade.

Note: Drivers and firmware released only by Dell are supported. For the latest driver and firmware releases, see the Downloads section at **Dell.com/support/home**.

Table 8 Latest RAID controller firmware and NVSRAM versions

Software	Version
RAID controller firmware	08.20.09.60
RAID controller NVSRAM	N26X0-820890-007 for Dell PowerVault MD32xx and MD32xxi(SAS and 1Gbps iSCSI storage arrays) N26X0-820890-907 for Dell PowerVault MD36xxi and MD36xxf (10Gbps iSCSI and Fibre Channel storage arrays)

7 Supported SAS host bus adapters (HBAs)

Go to **Dell.com/support/home** to download the latest supported version of the 6 Gbps SAS HBA firmware and drivers for your specific server hardware platform.

Table 9 Supported SAS HBAs

Vendor	Model	Notes
Dell	6 Gbps SAS HBA	This HBA is not supported in Dell PowerEdge 13th generation servers.
Dell	12 Gbps SAS HBA	This HBA is only supported in Dell PowerEdge 13th generation servers.

Note: Dell 12 Gbps SAS HBA auto-negotiates to 6 Gbps speeds when connected to a Dell PowerVault MD32XX series SAS array.

8 Supported iSCSI software initiators

Table 10 Supported iSCSI initiators

Operating system (OS)	SW initiator vendor	SW initiator version	Notes
Windows Server OS	Microsoft	RTM or later	Included with OS
Red Hat Enterprise Linux	Red Hat	RTM or later	Included with OS
SUSE Linux Enterprise Server	SUSE	RTM or later	Included with OS
VMware ESX	VMware	RTM or later	Included with OS
Citrix XenServer	Citrix	RTM or later	Included with OS

Note: For more information about OS support, refer to the Supported operating systems section in this document.

9 Supported protocol offload (TOE / iSCSI) adapters

Standard Gigabit and 10 Gigabit Ethernet adapters are supported when used with supported software iSCSI initiators. Hosts must have a standards compliant iSCSI initiator to access MD Series storage. Initiator support is provided by the initiator or OS vendor. Dell PowerVault does not support Converged Network Adapters (CNA) in Converged mode. Although PowerVault does not endorse or support initiators directly, this support matrix provides some useful configuration information for common initiators.

Dell's PowerVault MD Series Arrays work with any RFC 3720 iSCSI compliant initiators. The initiator must support all mandatory iSCSI features (IPsec is not required). This information is subject to change without notice. Dell is not responsible for any errors in this information. Hardware initiators are not supported by Dell.

Also, make sure that you read the initiator documentation and Release Notes from the particular vendors, and the Dell PowerVault MD-Series Release Notes for up-to-date configuration recommendations.

10 Fibre Channel SFP+ transceiver support

Table 11 Supported fibre channel SFP+ transceivers

Description	Manufacturer	Mfr. part number
8G FC SFP+	JDSU	PLRXPL-VC-SH4-23-N
8G FC SFP+	Finisar	FTLF8528P2BCV-LS
8G FC SFP+	Avago	AFBR-57D7APZ

11 Supported physical disk drives

Note: Only the physical disk drives with a Dell part number listed in Table 12 are supported.

For the latest available physical disk drive firmware, refer to the Dell PowerVault MD3200/MD3600/MD3660i/MD3660f Drivers and Downloads section available at **Dell.com/support/home**.

Table 12 Supported physical disk drive models

Form factor	Model	Capacity	Speed	Vendor
2.5″	LB150S	149 GB	SSD	Pliant (SanDisk)
2.5″	LB206M	200 GB	SSD	Pliant (SanDisk)
2.5″	LB406M	400 GB	SSD	Pliant (SanDisk)
2.5"	LB806M	800 GB	SSD	Pliant (SanDisk)
2.5"	LB406R	400 GB	SSD	Pliant (SanDisk)
2.5"	LB806R	800 GB	SSD	Pliant (SanDisk)
2.5"	LB1606R	1.6 TB	SSD	Pliant (SanDisk)
2.5"	LB206S	200 GB	SSD	Pliant (SanDisk)
2.5"	LB406S	400 GB	SSD	Pliant (SanDisk)
2.5"	LT0200MO	200 GB	SSD	SanDisk
2.5"	LT0400MO	400 GB	SSD	SanDisk
2.5"	LT0800MO	800 GB	SSD	SanDisk
2.5"	LT1600MO	1.6 TB	SSD	SanDisk
2.5"	LT0800RO	800 GB	SSD	SanDisk
2.5"	LT1600RO	1.6 TB	SSD	SanDisk
2.5"	LT0200WM	200 GB	SSD	SanDisk

Form factor	Model	Capacity	Speed	Vendor
2.5"	LT0400WM	400 GB	SSD	SanDisk
2.5"	LT0800WM	800 GB	SSD	SanDisk
2.5″	MK2001GRZB	200 GB	SSD	Toshiba
2.5″	MK4001GRZB	400 GB	SSD	Toshiba
2.5″	PX02SMF020	200 GB	SSD	Toshiba
2.5″	PX02SMF040	400 GB	SSD	Toshiba
2.5″	PX02SMF080	800 GB	SSD	Toshiba
2.5″	PX02SMB160	1.6 TB	SSD	Toshiba
2.5″	PX02SSF020	200 GB	SSD	Toshiba
2.5″	PX02SSF040	400 GB	SSD	Toshiba
2.5″	PX02SSB080	800 GB	SSD	Toshiba
2.5″	PX03SNF080	800 GB	SSD	Toshiba
2.5″	PX03SNB160	1.6 TB	SSD	Toshiba
2.5″	MBD2147RC	146 GB	10K	Fujitsu
2.5″	MBD2300RC	300 GB	10K	Fujitsu
2.5″	MBE2073RC	73 GB	15K	Fujitsu
2.5″	MBE2147RC	146 GB	15K	Fujitsu
2.5″	HUC101212CSS600	1.2 TB	10K	HGST
2.5″	HUC101818CS4204	1.8 TB	10K	HGST
2.5″	HUC156030CSS204	300 GB	15K	HGST
2.5″	HUC156060CSS204	600 GB	15K	HGST
2.5″	HUC103014CSS600	146 GB	10K	Hitachi
2.5″	HUC103030CSS600	300 GB	10K	Hitachi
2.5″	HUC106030CSS600	300 GB	10K	Hitachi
2.5″	HUC106060CSS600	600 GB	10K	Hitachi

Form factor	Model	Capacity	Speed	Vendor
2.5″	HUC109030CSS600	300 GB	10K	Hitachi
2.5″	HUC109060CSS600	600 GB	10K	Hitachi
2.5″	HUC109090CSS600	900 GB	10K	Hitachi
2.5″	HUC151473CSS600	73 GB	15K	Hitachi
2.5″	HUC151414CSS600	146 GB	15K	Hitachi
2.5″	ST9300605SS	300 GB	10K	Seagate
2.5″	ST9600205SS	600 GB	10K	Seagate
2.5″	ST9900805SS	900 GB	10K	Seagate
2.5″	ST9900605SS	900 GB	10K	Seagate
2.5″	ST9600204SS	600 GB	10K	Seagate
2.5″	ST9600104SS	600 GB	10K	Seagate
2.5″	ST9146803SS	146 GB	10K	Seagate
2.5″	ST9300603SS	300 GB	10K	Seagate
2.5″	ST9300503SS	300 GB	10K	Seagate
2.5″	ST300MM0006	300 GB	10K	Seagate
2.5″	ST600MM0006	600 GB	10K	Seagate
2.5″	ST900MM0006	900 GB	10K	Seagate
2.5"	ST900MM0036	900 GB	10K	Seagate
2.5"	ST900MM0007	900 GB	10K	Seagate
2.5"	ST1200MM0007	1.2 TB	10K	Seagate
2.5"	ST1200MM0027	1.2 TB	10K	Seagate
2.5″	ST973452SS	73 GB	15K	Seagate
2.5″	ST9146852SS	146 GB	15K	Seagate
2.5″	ST9146752SS	146 GB	15K	Seagate
2.5″	ST600MM0088	600 GB	15K	Seagate

Form factor	Model	Capacity	Speed	Vendor
2.5″	ST1200MM0088	1.2 TB	15K	Seagate
2.5″	ST300MP0004	300 GB	15K	Seagate
2.5″	ST300MP0005	300 GB	15K	Seagate
2.5″	ST600MP0005	600 GB	15K	Seagate
2.5″	ST600MP0025	600 GB	15K	Seagate
2.5″	ST9146853SS	146 GB	15K	Seagate
2.5″	ST9300653SS	300 GB	15K	Seagate
2.5″	ST9300453SS	300 GB	15K	Seagate
2.5″	ST91000640SS	1 TB	7.2K	Seagate
2.5″	ST9500620SS	500 GB	7.2K	Seagate
2.5″	ST91000642SS	1 TB	7.2K	Seagate
2.5″	ST9500430SS	500 GB	7.2K	Seagate
2.5″	ST9500431SS	500 GB	7.2K	Seagate
2.5″	ST2000NX0273	2 TB	7.2K	Seagate
2.5″	AL14SEB030N	300 GB	7.2K	Toshiba
2.5″	AL14SEB060N	600 GB	7.2K	Toshiba
2.5″	AL14SEB090N	900 GB	7.2K	Toshiba
2.5″	AL14SEB120N	1.2 TB	7.2K	Toshiba
2.5″	MBF2300RC	300 GB	10K	Toshiba
2.5″	MBF2600RC	600 GB	10K	Toshiba
2.5"	AL13SEB300	300 GB	10K	Toshiba
2.5"	AL13SEB600	600 GB	10K	Toshiba
2.5"	AL13SEB900	900 GB	10K	Toshiba
2.5″	MK1401GRRB	146 GB	15K	Toshiba
2.5″	MK3001GRRB	300 GB	15K	Toshiba

Form factor	Model	Capacity	Speed	Vendor
2.5"	AL13SXB300N	300 GB	15K	Toshiba
2.5"	AL13SXB600N	600 GB	15K	Toshiba
2.5″	WD3000BKHG	300 GB	10K	Western Digital
2.5″	WD6000BKHG	600 GB	10K	Western Digital
2.5″	WD3001BKHG	300 GB	10K	Western Digital
2.5″	WD6001BKHG	600 GB	10K	Western Digital
2.5″	WD9001BKHG	900 GB	10K	Western Digital
2.5″	WD3002BKTG	300 GB	10K	Western Digital
2.5″	WD6002BKTG	600 GB	10K	Western Digital
2.5″	WD9002BKTG	900 GB	10K	Western Digital
3.5"	HUS724020ALS640	2 TB	7.2K	HGST
3.5"	HUS724030ALS640	3 TB	7.2K	HGST
3.5"	HUS724040ALS640	4 TB	7.2K	HGST
3.5″	HUS156030VLS600	300 GB	15K*	Hitachi
3.5″	HUS156045VLS600	450 GB	15K*	Hitachi
3.5″	HUS156060VLS600	600 GB	15K*	Hitachi
3.5″	HUS723020ALS640	2 TB	7.2K	Hitachi
3.5″	HUS723030ALS640	3 TB	7.2K	Hitachi
3.5″	ST3600002SS	600 GB	10K*	Seagate
3.5″	ST3300657SS	300 GB	15K*	Seagate
3.5″	ST3450857SS	450 GB	15K*	Seagate
3.5″	ST3600057SS	600 GB	15K*	Seagate

Form factor	Model	Capacity	Speed	Vendor
3.5″	ST3450757SS	450 GB	15K*	Seagate
3.5″	ST3600957SS	600 GB	15K*	Seagate
3.5″	ST3500414SS	500 GB	7.2K	Seagate
3.5″	ST31000424SS	1 TB	7.2K	Seagate
3.5″	ST32000444SS	2 TB	7.2K	Seagate
3.5″	ST31000425SS	1 TB	7.2K	Seagate
3.5″	ST32000445SS	2 TB	7.2K	Seagate
3.5″	ST500NM0001	500 GB	7.2K	Seagate
3.5″	ST1000NM0001	1 TB	7.2K	Seagate
3.5″	ST2000NM0001	2 TB	7.2K	Seagate
3.5″	ST32000645SS	2 TB	7.2K	Seagate
3.5″	ST33000650SS	3 TB	7.2K	Seagate
3.5″	ST33000652SS	3 TB	7.2K	Seagate
3.5"	ST1000NM0023	1 TB	7.2K	Seagate
3.5"	ST2000NM0023	2 TB	7.2K	Seagate
3.5"	ST3000NM0023	3 TB	7.2K	Seagate
3.5"	ST4000NM0023	4 TB	7.2K	Seagate
3.5"	ST4000NM0063	4 TB	7.2K	Seagate
3.5"	ST6000NM0034	6 TB	7.2K	Seagate
3.5″	MG03SCA100	1 TB	7.2K	Toshiba
3.5″	MG03SCA200	2 TB	7.2K	Toshiba
3.5″	MG03SCA300	3 TB	7.2K	Toshiba
3.5"	MG03SCA400	4 TB	7.2K	Toshiba
3.5″	MK1001TRKB	1 TB	7.2K*	Toshiba
3.5″	MK2001TRKB	2 TB	7.2K*	Toshiba

Form factor	Model	Capacity	Speed	Vendor
3.5”	WD1000FYYG	1 TB	7.2K	Western Digital
3.5”	WD2000FYYG	2 TB	7.2K	Western Digital
3.5”	WD1001FYYG	1 TB	7.2K	Western Digital
3.5”	WD2001FYYG	2 TB	7.2K	Western Digital
3.5”	WD3001FYYG	3 TB	7.2K	Western Digital
3.5”	WD4001FYYG	4 TB	7.2K	Western Digital

Note: 3.5” 15 K rpm drives, 3.5” 10 K rpm drives, and 3.5” 7.2K rpm drives marked with (*) are not supported on Dell PowerVault MD dense arrays such as Dell PowerVault MD3260, MD3260i, MD3660i, and MD3660f.

12 Supported Expansion Enclosures

Dell PowerVault MD 3X60 Series Dense Storage Arrays support a maximum of 180 physical disk drive slots (with premium feature activation). For a system without premium feature activation, this physical disk drive slots limit is 120. The additional slot support can only be provided by up to two Dell PowerVault MD3060e expansion enclosures.

Table 13 Expansion enclosures supported on dense (4U) storage arrays

Enclosure model	Minimum firmware version
Dell PowerVault MD3060e	03.99

Dell PowerVault MD32XX/36XX series storage arrays support a maximum of 192 physical disk drive slots (with premium feature activation). For a system without premium feature activation, this physical disk drive limit is 120. You can provide the additional slots with up to 15 MD1200 expansion enclosures, seven MD1220 expansion enclosures, or a combination of both. When you use a combination of expansion enclosures, the total number of physical disk drive slots in the system cannot exceed 192.

Table 14 Expansion enclosures supported on non-dense (2U) storage arrays

Enclosure Model	Minimum Firmware Version
Dell PowerVault MD1200	1.05
Dell PowerVault MD1220	1.05

Note: Attaching a 4U (dense) expansion enclosure to a 2U (non-dense) RAID storage array is not supported. Alternately, you cannot attach a 2U expansion enclosure to a 4U RAID storage array. All EMMs in an expansion stack must be at the same firmware level.

13 Supported management software

Dell PowerVault MD-Series resource DVD and other supported management software details are shown in Table 15.

Table 15 Supported management software (Windows)

Software component	Version	Notes
Dell PowerVault MD32/36 Series Storage Arrays Resource DVD	6.1.0.6	
Modular Disk Storage Manager	11.20.0A06.0010	
Modular Disk Configuration Utility	2.1.0.60	Supported on iSCSI only
Dell PowerVault MD32/36 series hardware provider VDS/VSS Providers*	D1.20.0G06.0004/S1.20.0G06.0004	
Dell PowerVault MD Storage Array vCenter Plug-in	See Supported management software (VMware vCenter Plug-in).	
Dell PowerVault MD Storage Array VASA Provider (iSCSI and Fibre -Channel only)	See Supported management software (VASA provider support).	Supported on: • Windows Server® 2008 R2 SP1(64-bit version only) • Windows Server 2012 • Windows Server 2012 R2
Dell PowerVault MD Storage Array Storage Replication Adapter (SRA) (Fibre Channel only)	See Supported management software (Storage Replication Adapter Support).	

* Maximum number of concurrent backups supported while using the hardware provider VSS provider with clustered shared volumes is two.

Table 16 Supported management software (Linux)

Software Component	Version	Notes
Dell PowerVault MD Series Dense Storage Arrays Resource DVD	6.1.0.6	
Modular Disk Storage Manager	11.20.0A06.0010	
Modular Disk Configuration Utility	2.1.0.60	Supported with iSCSI storage arrays only.

Table 17 Supported management software (VMware vCenter Plug-in)

vCenter Plug-in version	VMware version supported	Notes
2.7	All protocols: • ESXi 5.5 • EXSi 5.1 • EXSi 5.0	This is compatible only with firmware 7.84.56.60 only or later.
2.5	All protocols: • ESXi 5.1 • ESXi 5.0	This is compatible only with firmware 7.84.53.60 or later.

Table 18 Supported management software (VASA provider support)

VASA version	VMware supported version	Notes
5.5	vSphere™ Client 5.0/5.1/5.5 vCenter Server 5.0/5.1/5.5 Site Recovery Manager (SRM) 5.1/5.5	Supported on 08.20.05.60 firmware or later.
5.1	vSphere™ Client 5.0/ 5.1/5.5 vCenter Server 5.0/5.1/5.5	Supported on 7.84 firmware only.
1.0	vSphere™ Client 5.0 vCenter Server 5.0	You must install vCenter on a separate server than the VASA Provider. For more information, see the *MD Storage Array VMware VASA 1.0 Provider User's Guide*.

Note: Supported on Fibre Channel and iSCSI arrays only.

Table 19 Supported management software (Storage Replication Adapter Support)

SRA Version	VMware version supported	Notes
5.1	vSphere™ Client 5.0/ 5.1/5.5 vCenter Server 5.0/5.1/5.5 Site Recovery Manager (SRM) 5.0/5.1/5.5	Supported on 7.84 firmware only.
5.0	vSphere Client 5.0 vCenter Server 5.0 Site Recovery Manager (SRM) 5.0	For more information, see the *MD Storage Array VMware Storage Replication Adapter 5.0 Installation and Configuration Guide*.
1.1	vSphere™ Client 4.1 vCenter Server 4.1, 4.0 or 3.5	For more information, see the *MD Storage Array Storage Replication Adapter 1.1 Installation and Configuration Guide*.

Note: Supported on Fibre Channel and iSCSI arrays only.

14 Supported operating systems

Where clustering is supported by the OS, it is also supported on the Dell PowerVault MD3200, MD3200i, MD3600i, MD3600f, MD3260, MD3260i, MD3660i, and MD3660f series storage arrays, subject to the following limitations:

Windows 2008 R2 SP1:

- Maximum iSCSI nodes is 16
- Maximum SAS nodes is 4
- Maximum FC nodes is 16

Table 20 Dell PowerVault MD-Series OS support

OS	SAS host server	iSCSI host server	Mgmt. station	Fibre channel host server	Notes and required hotfixes
Windows Server 2012 R2 (U1)*					
Standard server and core	✓	✓	✓	✓	KB2966870
Datacenter server and core	✓	✓	✓	✓	KB2966870
Foundation server and core	✓	✓	✓	✓	KB2966870
Windows Server 2012 *					
Standard server and core	✓	✓	✓	✓	KB2822241
Datacenter server and core	✓	✓	✓	✓	KB2822241
Essentials server and core	✓	✓	✓	✓	KB2822241
Windows Server 2008 R2 SP1*					
Windows 2008 R2 SP1 Standard and Core	✓	✓	✓	✓	KB2522766 KB2637197
Windows 2008 R2 SP1 Enterprise and Core	✓	✓	✓	✓	KB2522766 KB2637197

OS	SAS host server	iSCSI host server	Mgmt. station	Fibre channel host server	Notes and required hotfixes
Windows 2008 R2 SP1 Datacenter and Core	✓	✓	✓	✓	KB2522766 KB2637197
Windows 2008 R2 SP1 Foundation and Core	✓	✓	✓	✓	KB2522766 KB2637197
Windows 2008 R2 SP1 Web and Core			✓		KB2522766 KB2637197
Windows 2008 Storage Server R2 SP1 all editions	✓	✓	✓	✓	KB2522766 KB2637197
Windows 2008 R2 SP1 HPC Server	✓	✓	✓	✓	KB2522766 KB2637197
Red Hat Enterprise Linux (RHEL)					
Red Hat Enterprise Linux 7.1 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum) The Linux sg driver has been disabled by default in RHEL 7.1 and is required for in-band management. To work around this, manually issue `modprobe sg` or add it to an init script. After the driver is loaded, in-band management will be available. For more information about this issue, refer to RHEL 7.1 Release Notes, issue BZ#1186462.
Red Hat Enterprise Linux 7 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum)
Red Hat Enterprise Linux 6.7 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum)
Red Hat Enterprise Linux 6.6 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum)

OS	SAS host server	iSCSI host server	Mgmt. station	Fibre channel host server	Notes and required hotfixes
Red Hat Enterprise Linux 6.5 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum)
Red Hat Enterprise Linux 6.4 (x64 only)	✓	✓	✓	✓	Basic Server install (Minimum)
SUSE Linux Enterprise Server (SLES)					
SUSE® Linux Enterprise Server 12 (x64 only)	✓	✓	✓	✓	
SUSE® Linux Enterprise Server 11.4(x64 only)	✓	✓	✓	✓	
SUSE® Linux Enterprise Server 11.3(x64 only)	✓	✓	✓	✓	
SUSE® Linux Enterprise Server 11.2(x64 only)	✓	✓	✓	✓	
Virtualization Hosts / Hypervisors**					
VMware ESXi 6.0	✓	✓		✓	• For supported array firmware versions, see VMware HCL • Supported path policies: -MRU -RR
VMware ESXi 5.5 (U1, U2,U3)	✓	✓		✓	• For supported array firmware versions, see VMware HCL • Supported path policies: -MRU • -RR

OS	SAS host server	iSCSI host server	Mgmt. station	Fibre channel host server	Notes and required hotfixes
VMware ESXi 5.1 (U1, U2)	✓	✓		✓	• For supported array firmware versions, see VMware HCL • Supported path policies: -MRU -RR
Citrix XenServer	✓	✓		✓	For supported XS releases see http://hcl.xensource.com/
Microsoft Hyper-V Server 2012 R2	✓	✓	✓	✓	
Microsoft Hyper-V Server 2012	✓	✓	✓	✓	
Microsoft Hyper-V Server 2008 R2 SP1	✓	✓	✓	✓	
Windows Server 2008 R2 SP1 with Hyper-V	✓	✓	✓	✓	
Windows Desktop Operating Systems					
Windows 8.1 (x64 only) Pro Enterprise			✓		
Windows 8 (x64 only) Pro Enterprise			✓		
Windows 7 (x86, x64)			✓		

*__NOTE:__ Core editions Windows servers can only manage storage arrays by using the SMcli client.

** __NOTE:__ The VMware Hardware Compatibility List only shows support for RAID controller firmware version *07.84*. However, this indicates support for all firmware versions 07.84.xx.xx or later.

15 Windows ODX support

The MD32XX or MD36XX Series Storage Arrays support Windows ODX for Windows Server 2012 or later.

16 ALUA support on supported host operating systems

The following OSs supported by your MD Series storage arrays support ALUA natively. No configuration steps are required to enable ALUA on these OSs.

- Microsoft Windows 2008 R2 SP1 and newer.
- Red Hat Enterprise Linux 6.3 and newer.
- SUSE Linux Enterprise Server 11.2 with Service Pack 2 and newer.

VMWare ESXi is not natively configured to support ALUA on the Dell PowerVault MD Series storage arrays. You must manually configure ALUA to enable it. Configuration details are found in the MD Series Administrator's Guide documents on **Dell.com/support/home**.

17 Supported device mapper software

Table 21 Supported device mapper software

OS	Component	Supported version
SUSE Linux Enterprise Server 11.4	Native	Native
SUSE Linux Enterprise Server 11.3	Native	Native
SUSE Linux Enterprise Server 11.2	Native	Native
Red Hat Enterprise Linux 7.1	Native	Native
Red Hat Enterprise Linux 7	Native	Native
Red Hat Enterprise Linux 6.7	Native	Native
Red Hat Enterprise Linux 6.5	Native	Native
Red Hat Enterprise Linux 6.4	Native	Native

18 Supported Fibre Channel Host Bus Adapters

Table 22 Supported Fibre Channel HBAs

HBA name	Fabric configuration	Direct-attach configuration
Qlogic*		
QLE2660/62	✓	✓
QLE2560/62	✓	✓
QLE2460/62/64	✓	✓
QLE220**	✓	✓
QME2662	✓	✓
QME2572	✓	✓
QME2472	✓	✓
Emulex*		
LPe16000/2	✓	
LPe12000/2	✓	✓
LPe 11002	✓	✓
LPe 1150	✓	✓
LPe 1105-M4	✓	✓
LPe 1205-M	✓	✓
LPe 16002-M	✓	✓

HBA name	Fabric configuration	Direct-attach configuration
Brocade*		
BR815/BR825	✓	✓

* See Required Timeout Settings for Fibre Channel Host Bus Adapters for required timeout settings by manufacturer.

19 Required timeout settings for Fibre Channel Host Bus Adapters

This table shows required timeout settings for all Dell-supported fibre channel (FC) HBAs, by manufacturer and OS. Make sure that any FC HBA connected to your MD36xxf storage array has these timeout values set as shown.

Use one of these manufacturer utilities to set these values on your HBA:

- Brocade© Command Line Utility (BCU)
- Emulex® HBAnyware® or OneCommand™ Manager
- QLogic SANsurfer FC HBA Manager

Table 23 Fibre channel HBA timeout values (by manufacturer)

HBA manufacturer	Timeout parameter	Required value (in seconds)
Qlogic		
Windows Server 2008 R2 SP1	LinkDownTimeout	10
	PortDownRetryCount	10
Linux only	qlport_down_retry	10
Emulex		
Windows only	LinkTimeout	10
	NodeTimeout	10
Linux only	lpfc_devloss_tmo	10
Brocade		
Windows and Linux	pathtov	10

20 Supported Fibre Channel switches

Supported only on fibre channel storage arrays running the most current RAID firmware versions.

Table 24 Supported Fibre Channel switches

Switches	Firmware	Description
Brocade		
200E	FOS 6.2.2	Brocade 4 Gb 16-port FC switch
4100	FOS 6.4.1a	Brocade 4 Gb 32-port FC switch
4100	FOS 6.4.2	Brocade 4 Gb 64-port FC switch
4900	FOS 6.4.1a	Brocade 4 Gb 64-port FC switch
4900	FOS 6.4.2	Brocade 4 Gb 64-port FC switch
5000	FOS 6.4.1a	Brocade 4 Gb 32-port FC switch
5000	FOS 6.4.2	Brocade 4 Gb 32-port FC switch
300	FOS 6.4.1a	Brocade 8 Gb 24-port FC switch
	FOS 6.4.2	
	FOS 7.0.1	
5100	FOS 6.4.1a	Brocade 8 Gb 40-port FC switch
	FOS 6.4.2	
	FOS 7.0.1	
5300	FOS 6.4.1a	Brocade 8 Gb 80-port FC switch

Switches	Firmware	Description
	FOS 6.4.2	
	FOS 7.0.1	
6505	FOS 7.0.1	Brocade 16 Gb 24-port FC switch
6510	FOS 7.0.0b	Brocade 16 Gb 48-port FC switch
	FOS 7.0.1	
DCX & DCX-4S	FOS 6.4.1a	Director class switch chassis
	FOS 6.4.2	
	FOS 7.0.1	
DCX8510-4	FOS 7.0.0b	Director class switch chassis
	FOS 7.0.1	
DCX8510-8	FOS 7.0.0b	Director class switch chassis
	FOS 7.0.1	
FC8-48		48-port 8 Gb FC blade module for DCX an DCX8510 chassis
FC8-32		32-port 8 Gb FC blade module for DCX an DCX8510 chassis
FC8-16		16-port 8 Gb FC blade module for DCX an DCX8510 chassis
FC16-32		32-port 16 Gb FC blade module for DCX8510 chassis
FC16-48		48-port 16 Gb FC blade module for DCX8510 chassis

Switches	Firmware	Description
Dell		
Dell PowerConnect B-DCX-4S	FOS 6.4.1a	Dell PowerConnect Director class switch chassis
	FOS 6.4.2	
	FOS 7.0.1	
Dell PowerConnect DCX8510-4	FOS 7.0.0b	Director class switch chassis
	FOS 7.0.1	
Dell PowerConnect DCX8510-8	FOS 7.0.0b	Director class switch chassis
	FOS 7.0.1	
Dell Networking S5000		48-port unified switch
FC8-48		48-port 8 Gb FC blade module
FC8-16		16-port 8 Gb FC blade module
FC16-32		32-port 16 Gb FC blade module
FC16-48		48-port 16 Gb FC blade module
Cisco		
Nexus 5548UP		8 Gbps 48-port FC switch
Nexus 5596UP		8 Gbps 96-port FC switch
Nexus 5010		8 Gbps FC switch
Nexus 5020		8 Gbps FC switch

Switches	Firmware	Description
9148		8 Gbps 48-port FC switch
9506		8 Gbps 192-port FC switch
9509		8 Gbps 48-port FC switch
9513		8 Gbps 528-port FC switch
9710		Director class switch chassis

21 Supported Dell M1000e Fibre Channel IOMs

Table 25 Supported fibre channel I/O modules

Fibre Channels IOMs	Firmware	Description
M6505	FOS 7.0.1	Brocade 16 Gb 24-port FC switch module
M5424	FOS 6.4.1a	24-port 8 Gb or 4 Gb FC blade switch module
	FOS 6.4.2	
	FOS 7.0.1	
M5424-N	FOS 6.4.1a	24- port 8 Gb or 4 Gb FC SAN module
	FOS 7.0.1	
FC8PT		16-port 8Gb FC pass-through module

22 Tested Brocade, Cisco, and Qlogic Fibre Channel routers

Table 26 Supported Fibre Channel routers

FCIP routers	Description
Brocade	
7500	Brocade 7500 Extension switch
7800	Brocade 7800 Extension switch
Cisco	
9216i	MDS 9216i Multilayer Fabric Switch
Qlogic	
6142	SANbox 6142