Overview

HPE MSA 2040 Storage

ENERGY STAR certified HPE MSA 2040 is a high-performance storage array designed for entry-level Hewlett Packard Enterprise customers desiring 8Gb/16Gb Fibre Channel, 1GbE/10GbE iSCSI, or 12Gb SAS connectivity with 4 host ports per controller. The MSA 2040 Storage array provides an excellent value for customers needing performance balanced with price to support initiatives such as consolidation and virtualization.

The MSA 2040 delivers this performance by offering:

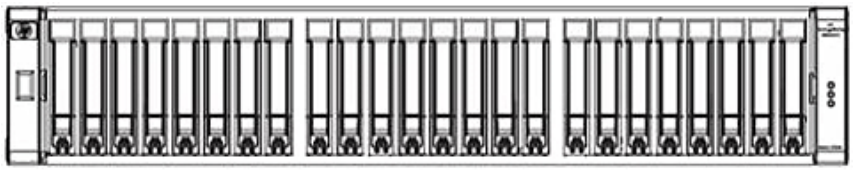
- High performance controller architecture
- 6GB cache per controller **(**Data (Read/Write) cache = 4GB and Metadata and System OS memory = 2GB**)**
- Four host ports per controller
- Support for SSDs, Enterprise SAS HDDs, Midline SAS HDDs, and Self Encrypting Drives
- SAN and SAS interfaces
- Up to four (4) host ports per controller
- Two new MSA 2040 Controllers:
    - MSA 2040 SAN Controller
        - 8Gb/16Gb FC connectivity and/or
        - 1GbE/10GbE iSCSI connectivity
    - MSA 2040 SAS Controller
        - 6Gb/12Gb SAS connectivity (MSA 2040 SAS controllers require mini-SAS HD cables)

The HPE MSA 2040 Storage ships standard with a license for 64 snapshots for increased data protection. There is also an optional license for 512 snapshots. The HPE MSA 2040 can also replicate data between arrays (P2000 G3, MSA 1040 SAN and/or MSA 2040 SAN Model only using FC or iSCSI protocol) with the optional Remote Snap feature.

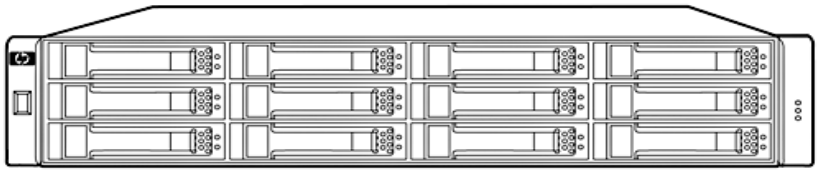
What's New in the MSA 2040 array family

- GL220 firmware, which includes the following new features, is now available for download
    - Virtual Tier affinity for prioritizing workloads
    - Remote Snap Replication Support for Virtual Storage (iSCSI only)
    - Snapshot space management
    - Scheduler for virtual based storage snapshots
    - Large pool capacity support
    - Volume copy for Virtual Storage
- Introducing support for 12G Mixed Use Solid State Drives
    - HPE MSA 400GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive
    - HPE MSA 800GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive
    - HPE MSA 1.6TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive
    - HPE MSA 3.2TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive

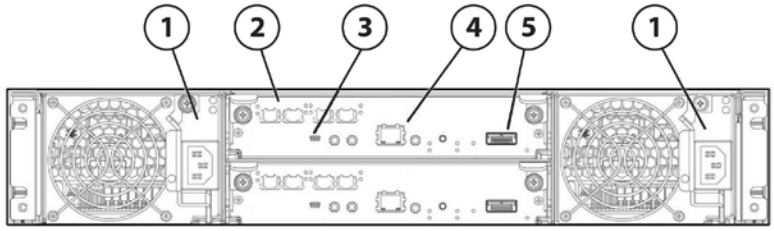
Overview



HPE MSA 2040 Storage (SFF)

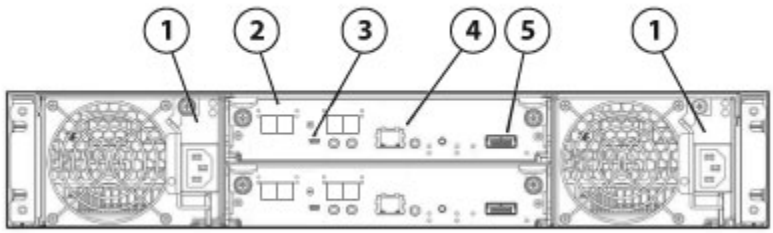


HPE MSA 2040 Storage (LFF)



MSA 2040, 2 SAN controllers installed

1. Power supplies
2. 8 and/or 16Gb Fibre Channel, 1 and/or 10GbE iSCSI
3. CLI port (mini-USB)
4. Management Ethernet port
5. Expansion port



MSA 2040, 2 SAS controllers installed

1. Power supplies
2. 6Gb/12Gb mini-SAS HD ports
3. CLI port (mini-USB)
4. Management Ethernet port
5. Expansion port

Models

HPE MSA 2040 Storage Models	**MSA 2040 Controller:**	
	HP MSA 2040 SAN Controller	C8R09A
	HP MSA 2040 SAS Controller	C8S53A
	MSA 2040 Pre-Configured Models:	
	HP MSA 2040 Energy Star SAN Dual Controller LFF Storage[1]	K2R79A
	HP MSA 2040 Energy Star SAN Dual Controller SFF Storage[2]	K2R80A
	HP MSA 2040 Energy Star SAS Dual Controller LFF Storage[3]	K2R83A
	HP MSA 2040 Energy Star SAS Dual Controller SFF Storage[4]	K2R84A
	MSA 2040 Array Bundles:	
	HP MSA 2040 Energy Star SAN Dual Controller with 24 900GB 12G SAS 10K SFF HDD 21.6TB Bundle[5]	M0S99A
	HP MSA 2040 Energy Star SAN Dual Controller with 24 1.2TB 12G SAS 10K SFF HDD 28.8TB Bundle[6]	M0T00A
	HP MSA 2040 Energy Star SAS Dual Controller with 24 1.2TB 12G SAS 10K SFF HDD 28.8TB Bundle[7]	M0T01A
	HP MSA 2040 Energy Star SAS Dual Controller with 24 900GB 12G SAS 10K SFF HDD 21.6TB Bundle[8]	M0T02A
	HP MSA 2040 SAN DC w/ 4x200GB SFF SSD 6x900GB 10K SFF HDD 1 Performance Auto Tier LTU 6.2TB Bundle9	M0T60A
	HP MSA 2040 SAS DC w/ 4x200GB SFF SSD 6x900GB 10K SFF HDD 1 Performance Auto Tier LTU 6.2TB Bundle[10]	M0T61A

NOTES:

[1]Includes LFF Array Chassis + two MSA 2040 SAN controllers, no drives or SFPs are included

[2]Includes SFF Array Chassis + two MSA 2040 SAN controllers, no drives or SFPs are included

[3]Includes LFF Array Chassis + two MSA 2040 SAS controllers, no drives or host connect cables are included (SFP's not required for SAS controllers)

[4]Includes SFF Array Chassis + two MSA 2040 SAS controllers, no drives or host connect cables are included (SFP's not required for SAS controllers)

[5]Includes SFF Array Chassis + two MSA 2040 SAN controllers + 24 x 900 GB SFF SAS drives, no SFPs are included

[6]Includes SFF Array Chassis + two MSA 2040 SAN controllers + 24 x 1.2TB SFF SAS drives, no SFPs are included

[7]Includes SFF Array Chassis + two MSA 2040 SAS controllers + 24 x 1.2TB SFF SAS drives (SFP's not required for SAS controllers)

[8]Includes SFF Array Chassis + two MSA 2040 SAS controllers + 24 x 900GB SFF SAS drives, no host connect cables are included (SFP's not required for SAS controllers)

[9]Includes SFF Array Chassis + two MSA 2040 SAN controllers + 4x200GB SSD + 6x900GB 10K SFF HDD + 1 Performance Auto Tier LTU, no SFPs are included

[10]Includes SFF Array Chassis + two MSA 2040 SAS controllers + 4x200GB SSD + 6x900GB 10K SFF HDD + 1 Performance Auto Tier LTU (SFP's not required for SAS controllers)

Features

ENERGY STAR Certified

The HPE MSA 2040 SKU's are now ENERGY STAR certified. ENERGY STAR certified products are energy efficient which result in cost savings via reduced energy consumption and regulatory rebates. Please refer to the US EPA website for details on ENERGY STAR certification criteria and process. MSA 2040 ENERGY STAR Certification is listed on the EPA website - **Link**

As a part of gaining ENERGY STAR certification, MSA 2040 SKUs were required to change such that Hewlett Packard Enterprise and our customers can delineate between product shipped before the EPA recognized the MSA 2040 as ENERGY STAR compliant and arrays shipped after the MSA 2040 obtaining the official certification.

No physical changes were made to the MSA 2040 or any of its components to pass the ENERGY STAR compliance testing other than SKU numbering and labels (physical and electronic). There are no physical, form, fit or function differences between the older and the ENERGY STAR compliant HPE MSA 2040 SKU's.

No new qualification or testing is required in order to use/substitute the new ENERGY STAR certified SKU's.

NOTE: The EOL SKU's in the table below were discontinued on July 31, 2015. The replacement ENERGY STAR SKU's are listed below.

Table showing the replacement HPE MSA 2040 ENERGY STAR SKU's

EOL SKU	Energy Star SKU	Energy Star SKU Description
C8R14A	K2R79A	HPE MSA 2040 Energy Star SAN Dual Controller LFF Storage
C8R15A	K2R80A	HPE MSA 2040 Energy Star SAN Dual Controller SFF Storage
C8S54A	K2R83A	HPE MSA 2040 Energy Star SAS Dual Controller LFF Storage
C8S55A	K2R84A	HPE MSA 2040 Energy Star SAS Dual Controller SFF Storage
C8R10A	K2R81A	HPE MSA 2040 Energy Star SFF Chassis
C8R12A	K2R82A	HPE MSA 2040 Energy Star LFF Chassis
C8R18A	M0S96A	HPE MSA 2040 Energy Star LFF Disk Enclosure
C8R17A	M0S99A	HPE MSA 2040 Energy Star SAN Dual Controller with 24 900GB 12G SAS 10K SFF HDD 21.6TB Bundle
C8R16A	M0T00A	HPE MSA 2040 Energy Star SAN Dual Controller with 24 1.2TB 12G SAS 10K SFF HDD 28.8TB Bundle
C8S56A	M0T01A	HPE MSA 2040 Energy Star SAS Dual Controller with 24 1.2TB 12G SAS 10K SFF HDD 28.8TB Bundle
C8S57A	M0T02A	HPE MSA 2040 Energy Star SAS Dual Controller with 24 900GB 12G SAS 10K SFF HDD 21.6TB Bundle

Features

HPE MSA 2040 Carrier-Grade Components (NEBS)

The HPE MSA 2040 Storage arrays (SAN or SAS Controllers) connected 2U storage area network (SAN) or direct connect solution designed for network equipment providers (NEPs) and communication service providers. Suited for those who need a robust telecom infrastructure.

The HPE MSA 2040 Carrier-Grade Chassis (C8R11A) is a controller-less 6Gb chassis capable of supporting one or two MSA 2040 SAN Controller (C8R09A) or MSA 2040 SAS Controller (C8S53A) and has twenty-four Small Form Factor (SFF) drive bays. It comes equipped with two DC-power power supplies.

The HPE P2000 2.5-in Dual I/O JBOD (BV921B) is a special model disk enclosure designed for use with NEBS compliant MSA 2040 configurations. This drive enclosure has 24 drive bays (unlike the D2700 with 25 drive bays) and has dual DC-power supplies. It is only sold with a carrier grade arrays.
The NEBS compliant MSA 2040 supports configurations with up to 7 compliant disk enclosures for a maximum of 192 SFF HDD´s.

When used in conjunction with specific Storage SFF SAS drives, the solution is NEBS certified (GR-63 and GR-1089) and Seismic Zone 4 rated. NEBS level-3 certification provides the assurance that the equipment is safe to operate and sturdy enough to withstand certain physical and environmental (for example, fire, earthquakes) conditions. For Seismic Zone 4 rating, the MSA 2040 must be mounted in an HPE Seismic Rack (AH335A).

P2000 DC-power Carrier-grade SFF Chassis	**SKU**
HP MSA 2040 SFF DC-power Chassis	C8R11A

NOTE: NEBS certified

MSA 2040 Controller:

HP MSA 2040 SAN Controller	C8R09A
HP MSA 2040 SAS Controller	C8S53A

SFF Carrier-grade (only) DC-power JBOD

HP P2000 Dual I/O DC-power Carrier-Grade SFF Drive Enclosure	BV921B

NOTE: 24-drive SFF bays, NEBS certified, only sold with carrier-grade arrays

HPE MSA SFF Hard Disk Drives

MSA 2040 Drives:

SAS Drives (SFF 2.5-inch)

HP MSA 300GB 6G SAS 10K SFF(2.5-inch) Dual Port Ent 3yr Warranty Hard Drive	E2D55A
HP MSA 450GB 6G SAS 10K SFF(2.5-inch) Dual Port Ent 3yr Warranty Hard Drive	E2D56A

Features

HP MSA 600GB 6G SAS 10K SFF(2.5-inch) Dual Port Ent 3yr Warranty Hard Drive	C8S58A
HPE MSA 900GB 6G SAS 10K SFF(2.5-inch) Dual Port Ent 3yr Warranty Hard Drive	C8S59A
HPE MSA 1.2TB 12G SAS 10K 2.5in Dual Port Enterprise 3yr Warranty Hard Drive	J9F48A
HP MSA 1TB 6G SAS 7.2K SFF (2.5-inch) Dual Port Midline 3yr Warranty Hard Drive	C8S62A

For more information on HPE Carrier Grade Platforms go to http://www.hpe.com/products1/servers/carrier_grade/index.html?jumpid=reg_R1002_USEN

Smart Buys

SmartBuys are pre-discounted SKU's available in participating North and South American countries. Please check with your local authorized partner for availability.

Smart Buy Drive Kits

HP MSA 400GB 12G ME SAS 2.5in Enterprise Mainstream 3yr Warranty SSD	J9F37SB
HP MSA 800GB 12G ME SAS 2.5in Enterprise Mainstream 3yr Warranty SSD	J9F38SB
HP MSA 1.6TB 12G ME SAS 2.5in Enterprise Mainstream 3yr Warranty SSD	J9F39SB
HP MSA 3TB 6G 7.2K 3.5in MDL HDD/S-Buy	QK703SB
HP MSA 300GB 6G 10K 2.5in ENT HDD/S-Buy	E2D55SB
HP MSA 600GB 6G 10K 2.5in ENT HDD/S-Buy	C8S58SB
HP MSA 900GB 6G 10K 2.5in ENT HDD/S-Buy	C8S59SB
HP MSA 1TB 6G 7.2K 2.5in MDL HDD/S-Buy	C8S62SB
HP MSA 2TB 6G 7.2K 3.5in MDL HDD/S-Buy	AW555SB
HP MSA 4TB 6G SAS 7.2K 3.5 inch MDL SB HDD	C8R26SB
HP MSA 300GB 12G SAS 10K 2.5in ENT/S-Buy	J9F44A
HP MSA 600GB 12G SAS 10K 2.5in ENT/S-Buy	J9F46A
HP MSA 900GB 12G SAS 10K 2.5in ENT/S-Buy	J9F47A
HP MSA 1.2TB 12G SAS 10K 2.5in ENT/S-Buy	J9F48A
HP MSA 1.8TB 12G SAS 10K 2.5in 512e/S-Buy	J9F49A

Smart Buy MSA 2040 Storage Systems

HP MSA 2040 SAN Controller/S-Buy	C8R09SB
HP MSA 2040 8Gb FC SW XCVR 4-Pack/S-Buy	C8R23SB
HP MSA 2040 16Gb FC SW XCVR 4-Pack/S-Buy	C8R24SB
HP MSA 2040 1Gb SW iSCSI SFP 4 Pk	C8S75SB
HP MSA 2040 10Gb SW iSCSI SFP 4 Pk	C8R25SB
HP MSA 2040 ES SAN DC LFF Storage/S-Buy	K2R79SB
HP MSA 2040 ES SAN DC SFF Storage/S-Buy	K2R80SB
HP MSA 2040 ES SFF Chassis/S-Buy	K2R81SB

Features

HP MSA 2040 ES LFF Chassis/S-Buy	K2R82SB
HP MSA 2040 ES SAS DC LFF Storage/S-Buy	K2R83SB
HP MSA 2040 ES SAS DC SFF Storage/S-Buy	K2R84SB
HP MSA 2040 ES LFF Disk Enclosure/S-Buy	M0S96SB
HP MSA 2040 ES DC SAN 5.2TB Flash/S-Buy*	M0T33SB
*Includes: (1) HP MSA 2040 SAN DC SFF Storage (2) HP MSA 200GB 12G SAS ME 2.5in EM SSD (8) HP MSA 600GB 12G SAS 10K 2.5in DP ENT HDD (1) HP MSA 2040 Perf Auto Tiering E-LTU	
HP MSA 2040 ES DC SAN 8.0TB Flash/S-Buy*	M0T34SB
*Includes: (1) HP MSA 2040 SAN DC SFF Storage (2) HP MSA 400GB 12G ME SAS 2.5in Enterprise Mainstream 3yr Warranty SSD (8) HP MSA 900GB 12G SAS 10K 2.5in DP ENT HDD (1) HP MSA 2040 Perf Auto Tiering E-LTU	
HP MSA 2040 ES DC SAN 5.6TB Flash/S-Buy*	M0T35SB
*Includes: (1) HP MSA 2040 SAN DC SFF Storage (4) HP MSA 200GB 12G SAS ME 2.5in EM SSD (8) HP MSA 600GB 12G SAS 10K 2.5in DP ENT HDD (1) HP MSA 2040 Perf Auto Tiering E-LTU	
HP MSA 2040 ES DC SAN 8.8TB Flash/S-Buy*	M0T36SB
*Includes: (1) HP MSA 2040 SAN DC SFF Storage (4) HP MSA 400GB 12G ME SAS 2.5in Enterprise Mainstream 3yr Warranty SSD (8) HP MSA 900GB 12G SAS 10K 2.5in DP ENT HDD	
Smart Buy Disk Enclosures	
HP D2700 Disk Enclosure/S-Buy	AJ941SB

All MSA 2040 models offer a common set of valuable features:

- MSA 2040 controller architecture which maximizes performance
  - Four host ports per controller
    - MSA 2040 SAN controller supports 8 GB FC, 16 GB FC, 1GbE iSCSI or 10GbE iSCSI SFPs.
    - MSA 2040 SAS controller supports 6 GB and 12 GB SAS host connectivity using mini-SAS HD Cables.
  - 4 GB transportable read/write cache per controller.
  - Battery-free cache backup with super capacitors and compact flash
- MSA 2040 SAN Controller allows customers to create their own Combo Controller by mixing FC and iSCSI SFPs. Below are the valid configurations for mixing SFPs:

Features

Configuration Table for mixing SFPs

Configuration	Controller	Host Port 1 SFP[1]	Host Port 2 SFP[1]	Host Port 3 SFP[2]	Host Port 4 SFP[2]
Table for mixing SFPs	Controller A	16Gb FC	16Gb FC	None	None
				16Gb FC	16Gb FC
				8Gb FC	8Gb FC
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		8Gb FC	8Gb FC	None	None
				16Gb FC	16Gb FC
				8Gb FC	8Gb FC
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		10GbE iSCSI	10GbE iSCSI	None	None
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		1GbE iSCSI	1GbE iSCSI	None	None
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
	Controller B	N/A	N/A	N/A	N/A
Dual Controller	Controller A	16Gb FC	16Gb FC	None	None
				16Gb FC	16Gb FC
				8Gb FC	8Gb FC
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		8Gb FC	8Gb FC	None	None
				16Gb FC	16Gb FC
				8Gb FC	8Gb FC
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		10GbE iSCSI	10GbE iSCSI	None	None
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
		1GbE iSCSI	1GbE iSCSI	None	None
				10GbE iSCSI	10GbE iSCSI
				1GbE iSCSI	1GbE iSCSI
	Controller B	Match Controller A	Match Controller A	Match Controller A	Match Controller A

NOTES: [1] SFP in Host Port 1 must match SFP in Host Port 2
[2]SFP in Host Port 3 must match SFP in Host Port 4

Features

All MSA 2040 models offer a common set of valuable features:

NOTE:
Customers must upgrade their MSA 2040 controller firmware to GL101 or later for iSCSI functionality
Customers must upgrade their MSA 2040 controller firmware to GL105 or later for Self-Encrypting Drive functionality
Customers must upgrade their MSA 2040 controller firmware to GL200 or later for MSA virtualizations features
Customers must upgrade their MSA 2040 controller firmware to GL210 or later for enhanced performance
Customers must upgrade their MSA 2040 controller firmware to GL220 or later for additional MSA virtualization features (such as remote snap replication for iSCSI, virtual tier affinity, large pool support, snapshot space management, scheduler and volume copy on virtual storage)

- MSA 2040 supports SSD drives which allow IT managers to boost IOPS performance.
- Automated Sub-Lun Tiering. The MSA 2040 can manage up to three tiers of storage: Performance tier, Standard tier and Archive tier. This feature is available with GL200 firmware or newer and the Performance tier requires a license.
- Creation of an SSD virtual disk group for both read and write capabilities requires a Performance Auto Tiering License (D4T79A/ D4T79AE)
- SSD Read Cache to improve random read performance. A maximum of 2 SSD's are supported per pool utilizing a maximum of 4TB of read cache per controller.
- MSA 2040 supports Self-Encrypting Drives (SED) to allow customers to secure their critical data and comply with all required regulatory mandates.
- Simple storage management including an intuitive browser-based user interface.
- Storage Management Utility V3 (SMU). This new MSA management GUI brings a new modern look and feel to array management. SMU V3 available with GL200 firmware or newer. Existing MSA customers can choose to use the new SMU V3 or to continue to use the previous generation SMU V2 if new virtualization features are not required.
- Thin Provisioning allows storage allocation of physical storage resources only once they are consumed by an application. Thin Provisioning also allows over-provisioning of physical storage pool resources allowing ease of growth for volumes without predicting storage capacity upfront. Thin Provisioning is available with GL200 firmware or newer.
- MSA 2040 comes standard with 64 controller-based snapshots and clone capability (volume copy is available for both linear and virtual storage with GL220 firmware or later; pre-GL220 firmware, volume copy is only available on linear storage). Arrays also support an optional 512 snaps. Choose either a low-cost single controller array or start with a configured dual controller array model to fit the budget, high availability, and performance needs.
- All models feature a wide variety of drives: High-performance SSD drives, enterprise-class SAS, SED and SAS Midline drives.
- The MSA 2040 will support a maximum of 7 disk enclosures (either LFF and/or SFF). Add-on enclosures can either be D2700 Small Form Factor (SFF) drive enclosures or MSA 2040 Large Form Factor (LFF) disk enclosures. The array can grow incrementally from a few drives to 96 LFF or 199 SFF drives.
- Disks Groups can be spanned across multiple enclosures RAID levels 1, 5, 6, 10. Linear Vdisks support RAID levels 0, 1, 3, 5, 6, 10, 50.
- Maximum hard drive counts vary by RAID levels: 2 drive max for RAID level 1; max of 16 drives for RAID levels 0, 3, 5, 6, and 10; max of 32 drives for RAID level 50. With GL200 or newer firmware multiple Disk Groups can be aggregated into a Storage Pool.
- The maximum LUN size is 140TB (128TiB)
- Storage Pools allow data on a given LUN to span across all drives in a pool. When capacity is added to a system, the user is also getting a performance benefit of the additional spindles –hence the term Wide Striping. Storage Pools are available with GL200 firmware or newer.
- Snapshot enhancements for virtual storage, including performance improvements, hierarchical snapshots, and simplified resource management. Administrators can monitor and optionally control snapshot space usage with GL220 firmware or later.
- Prioritize data by assigning appropriate affinity level (Performance, No Affinity & Archive) with GL220 firmware or later.
- Large Pool Support is available with GL220 firmware or later. Customers can now enjoy 512 TiB capacity per virtual pool by

Features

enabling large pool support.

- Non-disruptive on-line controller code upgrade (requires dual controllers w/ multi-pathing software)
- Upgradable by design. Owners of an MSA P2000 G3 and an MSA 1040 array are able to do data-in-place controller upgrades to the new MSA 2040 array. This unique ability protects the earlier investments in drives, and JBODs. (**NOTE: Certain limitations are applicable- please review MSA2040 Upgrade Technical Whitepaper (http://www8.hpe.com/h20195/v2/GetDocument.aspx?docname=4AA4-6830ENW)before upgrading your P2000 G3/MSA 1040 systems**)

Follow us on twitter and be a part of the conversation, and get the latest MSA related news and information at: **http://www.twitter.com/MSAstorage**

Application Solutions

The HPE MSA 2040 Storage is the ideal solution for customers running Oracle, Microsoft, SAP environments and those customers who are deploying virtual server technologies like VMware and Hyper-V. The MSA 2040 delivers enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HPE MSA 2040 Arrays ensure that crucial business data remains available.
Hewlett Packard Enterprise has developed best-in-class expertise in Oracle, Microsoft, SAP, and Virtualization Hypervisor technology through extensive testing with the HPE MSA 2040, HPE servers, and management software; high availability and disaster recovery solutions; and backup and recovery on the Oracle, Microsoft, and SAP application platforms. As a result, our customers can expect a wide range of operational and business benefits where they can:

- Deploy IT assets across multiple locations.
- Incrementally grow storage without interruption.
- Enable high availability and disaster recovery capabilities for critical applications.
- Deploy a remote disaster recovery site.

Learn more

To learn more about specific HPE Storage Solutions that are built with Oracle, Microsoft, SAP and Virtualization environments in mind, visit the solution sites supporting each of these applications.
HPE MSA Storage hyperlink to: **http://www.hpe.com/go/MSA**
HPE Storage for Oracle hyperlink to: **http://www.hpe.com/storage/oracle**
HPE Storage for Microsoft hyperlink to: **http://www.hpe.com/storage/microsoft**
HPE Storage for SAP hyperlink to: **http://www.hpe.com/storage/sap**
HPE Storage for VMware hyperlink to: **http://www.hpe.com/go/vmware/storage**

Family Information

	MSA 2040
Capacity Single Enclosure and Maximum Additional Drive Enclosures	**LFF:** 96 TB (single LFF array-head -using 12 x 8TB LFF SAS MDL drives) 768 TB (by adding 7 LFF Disk Enclosures behind LFF Array & using 8TB LFF SAS MDL drives) **SFF:** 48 TB (single SFF array-head - using 24 x 2TB SFF SAS drives) 398 TB (by adding 7 SFF Disk Enclosures behind SFF Array & using 2TB SFF SAS drives) **NOTE: 1) maximum available storage capacity depends on the RAID level being implemented**
Pool Capacity	GL200: 169 TB (154 TiB) GL210: 219 TB (200 TiB) GL220: 329 TB (300 TiB) GL220 with Large Pool Support: 562 TB (512 TiB) **NOTE: 1) The above pool capacities by firmware release apply to virtual storage only** **2) The above capacities are usable capacity/pool. Each MSA system can support two pools. Therefore each MSA storage system can have double the usable capacity listed above**
Cache	6 GB per controller **NOTE: 6GB cache includes Data (Read/Write) cache = 4GB and Metadata and System OS memory= 2GB**
Total LUNs (LUN size are dependent of the storage architecture: Linear vs. Virtualized)	512 maximum LUN size: 140TB (128TiB) Thin Provisioning allows you to create the LUNs independent of the physical storage
Host Interconnect	MSA 2040 SAN controller will support up to four connections with options of 16Gb, 8Gb FC and 10GbE, 1GbE iSCSI per controller. See table above for valid configuration table. MSA 2040 SAS controller will support up to four 6Gb/12Gb SAS connections per controller using mini-SAS HD cables
Maximum Drives w/ expansion	96 LFF/199 SFF
Maximum host supported	64 in v2 UI 512 in v3 UI
Standard Software:	Snapshot, 64 (snaps)
Optional Software	Remote Snap (linear storage only) Max Snapshot (512) Performance Tiering

Product Technology

MSA 2040 SAN controller MSA 2040 SAN controller supports 8Gb FC, 16Gb FC, 1GbE iSCSI or 10GbE iSCSI SFPs.

Family Information

MSA 2040 SAS controller MSA 2040 SAS controller supports 6Gb and 12Gb SAS host connectivity using mini-SAS HD cables.

Modular Chassis 2U rack height. 12 Large Form Factor or 24 Small Form Factor drive bays, accommodating SSD (available only for Small Form Factor), SAS, SEDs and SAS Midline drives. Comes with space for one or two controllers

Drives available The MSA 2040 controllers support both the MSA 3.5-inch Large Form Factor (LFF) drives, and the MSA 2.5-inch Small Form Factor (SFF) drives.

- Solid State Drives (SSDs) deliver exceptional performance for applications requiring high random read IOPs performance (available only for Small Form Factor).
- Serial Attached SCSI (SAS) enterprise-class drives are designed for high demand, 24x7 usage.
- SAS Midline drives are usually reserved for archival of data as they are relatively inexpensive and are available in very large capacities.
- Self-Encrypting Drives (SEDs) are designed to safeguard critical personal and business information and to comply with Regulatory Mandates

Optional Disk Enclosures Just as the user has a choice of chassis for the array head (LFF and SFF drive bays, AC or DC powered), so also do they have a choice of expansion disk enclosures accommodating either drive size. Both the MSA 2040 and the D2700 disk enclosures can be hot-added to an operating array. SFF and LFF Array heads and Disk Enclosures can be mixed without limitations.

MSA 2040 3.5-inch Disk Enclosure. This 2U unit has twelve LFF (3.5-inch) drive bays and accepts for MSA dual-ported SAS, SEDs and SAS MDL drives. The pre-configured HPE MSA 2040 LFF Drive Enclosure (M0S96A) has two I/O modules and supports both single and dual controller arrays.

- This 3.5-inch MSA disk enclosure can be attached to MSA 2040 LFF or SFF array head.
- Each configured model ships standard with two .5m mini-SAS to mini-SAS cables for connection to the MSA 2040 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 7 total Disk Enclosures
- The MSA 2040 does not support LFF SATA HDDs.

D2700 2.5-inch Disk Enclosure. This 2U storage enclosure (AJ941A) is designed to support twenty five HPE Storage or ProLiant 2.5-inch Universal form factor (SFF) 12Gb, SSD, SAS, SEDs or SAS MDL hard drives. It ships standard with dual I/O modules installed.

- This 2.5-inch D2700 disk enclosure can be attached to MSA 2040 LFF or SFF array head
- The D2700 enclosure ships with a two .5m mini-SAS to mini-SAS cables for connection to the MSA 2040 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 7 total Disk Enclosures.
- The MSA 2040 does not support SFF SATA HDDs.

Scalability The MSA 2040 array configurations are designed to allow an installation to begin with smaller capacity and be able to grow gradually as needed. The flexibility of SSD, SAS or SAS MDL drives technology, form factors, sizes, speeds, and costs per GB allows a system to easily fit in almost any budget.

- Large Form Factor configurations can scale up to 96 TB SAS MDL, expandable to 768 TB SAS MDL with the addition of a maximum of seven MSA 2040 3.5-inch Disk Enclosures.
- Small Form Factor configurations can scale up to 48 TB SAS. With the addition of seven D2700 JBODs, the MSA 2040 storage can support 398.2 TB SAS.
- Users may configure a 24-drive MSA 2040 array head with 12-drive LFF MSA 2040 3.5-inch disk enclosures. This is an excellent option for a configuration that supports high-speed SFF SSDs or fast

Family Information

SFF enterprise-class SAS drives in the array head, combined with economical LFF drives staged for archival purposes, all in the same array.

Vdisks The Vdisk nomenclature is being replaced by Disk Group. In the Linear Storage and in the SMU V2 you will see reference to Vdisk in Linear Storage and the SMU V3 you will see Disk Group. Vdisk and Disk Group are essentially the same. Vdisks have additional RAID types (RAID 0, 3) not available only in the CLI.

Disk Group A Disk Group is a collection of disks in a given redundancy mode (RAID 1, 5, 6, 10, 50). It is equivalent to a Vdisk in Linear Storage and utilizes the same proven fault tolerant technology used by Linear Storage. Disk Group RAID level and size can be created based on performance and/or capacity requirements. With GL200 or newer firmware multiple Disk Groups can be allocated into a Storage Pool for use with the Virtual Storage features.

LUNs The MSA 2040 arrays support 512 volumes and up to 512 snapshots in a system. All of these volumes can be mapped to LUNs. Maximum LUN sizes up to 140TB (128 TiB), the LUNs size are dependent on the storage architecture: Linear vs. Virtualized. Thin Provisioning allows the user to create the LUNs independent of the physical storage.

Storage Pools The GL200 firmware or newer introduces Storage Pools – which are comprised of one or more Disk Groups. LUNs are no longer be restricted to a single Vdisk as with Linear Storage. A volume's data on a given LUN can now span all disk drives in a pool. When capacity is added to a system, users will benefit from the performance of all spindles in that pool.
Leveraging Storage Pools, the MSA 2040 supports large, flexible Volumes with sizes up to 128TiB and facilitates seamless capacity expansion. As volumes are expanded data automatically reflows to balance capacity utilization on all drives.

RAID 0, 1, 3, 5, 6, 10, 50 In addition to the usual RAID levels, the MSA 2040 features several important additional levels. RAID 6 offers the highest level of RAID protection. It allocates two sets of parity data across drives and allows simultaneous write operations. It can withstand two simultaneous drive failures without downtime or data loss. RAID 10 is mirroring and striping without parity and allows large Disk Groups to be created with high performance and mirroring for fault tolerance. RAID 50 combines the block striping and parity of RAID 5 with the straight block striping of RAID 0, yielding higher performance than RAID 5 through the addition of RAID 0, particularly during writes.

Performance The performance figures provided here are for reference as many variables exist between array configurations, workloads, hard drive types, disk group setup parameters and host system setup. All performance information is measured using Linear Storage

Hewlett Packard Enterprise has traditionally published a set of end-to-end MSA performance specifications which feed into HPE Sizer tools which are based on conservative real-world configurations. For consistency, the MSA 2040 performance numbers have been documented in both Benchmark and End-to-End Performance tables. Configuration details are provided for both test scenarios. These numbers are preliminary and subject to change without notice.

Benchmark Performance Results:

MSA 2040 Array Performance	HPE MSA 2040 Converged SAN Controller with HDD	HPE MSA 2040 Converged SAN Controller with SSD
Protocol (host connect)	16 Gb Fibre Channel	16 Gb Fibre Channel

Family Information

MSA 2040 RAID 10 Performance Results[1]		
Random Reads IOPS	66,000	
Random Writes IOPS	32,000	
MSA 2040 RAID 1 SSD Performance Results[2]		
Random Reads IOPS		122,000
Random Writes IOPS		38,000
MSA 2040 RAID 5 Performance Results[3]		
IO Meter Sequential Reads MB/s[4]	6,300	
IO Meter Sequential Writes MB/s[4]	5,200	

Benchmark Setup Configurations

1). Dual Controller configuration, (192) 15k HDDs, RAID: 10, 6 drives per vDisk, block size: 8k, Average Latency under 30ms, Windows Server 2012 host, 16Gb FC direct connect to array. Tested with GL210 firmware.

2). Dual Controller configuration, (24) SSDs, RAID: 10, 6 drives per vDisk, block size: 8k, Average Latency under 30ms, Windows Server 2012 host, 16Gb FC direct connect to array. Tested with GL210 firmware.

3). Dual Controller configuration, (48) 15k HDD, RAID: 5, 12 drives per vDisk, block size: 256k, Average Latency under 30ms, Windows Server 2012 host, 6Gb FC direct connect to array. Tested with GL210 firmware.

4). Sequential numbers are obtained using a single volume per vdisk and single sequential workload generated through the IO Meter performance software. Tested with GL210 firmware.

End-to-End Performance Figures:

Guarantee Performance numbers are a guideline as established by tests using RAW I/O in an Operating System Agnostic test lab environment.

MSA 2040 Array Performance	HPE MSA 2040 Converged SAN Controller With HDD[5]	HPE MSA 2040 Converged SAN Controller With SSD[6]	HPE MSA 2040 Converged SAN Controller With HDD[5]	HPE MSA 2040 Converged SAN Controller With SSD[6]	HPE MSA 2040 Converged SAN Controller With HDD[5]	HPE MSA 2040 Converged SAN Controller With SSD[6]	HPE MSA 2040 Converged SAS Controller With HDD[5]	HPE MSA 2040 Converged SAS Controller With SSD[6]
Protocol (host connect)[8]	16 Gb Fibre Channel	16 Gb Fibre Channel	10GbE iSCSI	10GbE iSCSI	1GbE iSCSI	1GbE iSCSI	12Gb SAS	12Gb SAS
MSA 2040 RAID 10 Performance Results **NOTE: RAID 1 was used for SSD testing								
Random Reads IOPS	57,000	112,500	56,500	102,000	56,500	93,000	56,500	112,500
Random Writes	32,000	31,500	30,500	31,500	30,500	31,500	31,000	32,500

Family Information

IOPS								
Random Mix 60/40 IOPS	45,000	57,500	44,500	54,500	44,500	54,500	44,500	58,000
Sequential Reads MB/s[7]	5,000		4,700		860		4,720	
Sequential Writes MB/s[7]	2,400		2,300		850		2,300	
MSA 2040 RAID 5 Performance Results **NOTE: RAID 1 was used for SSD testing								
Random Reads IOPS	57,000	106,500	55,500	100,000	55,500	87,000	55,500	108,000
Random Writes IOPS	18,000	20,500	17,500	20,500	17,500	20,000	18,000	20,500
Random Mix 60/40 IOPS	30,000	37,500	29,500	37,500	29,500	36,500	29,500	37,000
Sequential Reads MB/s[7]	4,900		4,700		860		4,700	
Sequential Writes MB/s[7]	4,000		3,600		850		4,100	
MSA 2040 RAID 6 Performance Results **NOTE: RAID 1 was used for SSD testing								
Random Reads IOPS	57,000	106,500	54,500	97,500	54,500	87,000	55,500	108,000
Random Writes IOPS	12,500	16,500	12,000	16,000	12,000	16,000	12,500	16,500
Random Mix 60/40 IOPS	23,000	31,500	22,500	31,000	22,500	30,500	23,000	32,000
Sequential Reads MB/s[7]	4,900		4,600		860		4,500	
Sequential Writes MB/s[7]	3,900		3,500		850		3,800	
Refer to the paper titled "Upgrading to the HPE MSA 2040", available in the Resource Library at: http://www.hpe.com/go/msa2040								

5). For MSA 2040 Hard Disk Drive (HDD) results, 300 GB 15K SAS drives were used in a dual controller configuration of 16 vdisks consisting of twelve disks per vdisk, 3.3 TB volumes, and 4 volumes per host. 4 hosts directly attached to the HPE MSA 2040 array were used in this test configuration (results cannot be expected with a single host).

Family Information

NOTE: MSA 2040 tests with 1GbE iSCSI used 8 hosts directly attached to the HPE MSA 2040 array.

6). For MSA 2040 Solid State Drives (SSD) results, 200 GB and 400 GB Enterprise Mainstream SSDs were used in a dual controller configuration of 4 vdisks consisting of two disks per vdisk, 200 GB and 400 GB volumes, and 1 volume per host. 4 hosts directly attached to the HPE MSA 2040 array were used in this test configuration (results cannot be expected with a single host).

NOTE: MSA 2040 tests with 1GbE iSCSI used 8 hosts directly attached to the HPE MSA 2040 array.

7). Sequential tests results were achieved with 256K block sizes and random tests were based on 8K block sizes.

NOTE: For sequential workloads with a queue depth greater than 1, each sequential stream is targeted to operate on a separate LBA range. Other types of sequential workloads that target specific LBA ranges may achieve higher results

8). All SAS results were measured using 6Gb SAS Host Bus Adapters. All configurations were tested with GL210 firmware.

9). All Fibre Channel results were measured using 16Gb FC Host Bus Adapters. All SAS results were measured using 6Gb SAS Host Bus Adapters. All 10GbE iSCSI results were measured using 10GbE iSCSI Host Bus Adapters. All 1GbE iSCSI results were measured using 1GbE network interface controllers (NICs)

NOTE: Number and type of applications, drive type and number of drives, operating system used, and the number of hosts will affect overall performance. This table is provided strictly as a test-lab comparison.

NOTE: These numbers reflect a full array configuration with the maximum number of front-end ports, disks, and controllers. The test results shown for the HPE MSA 2040 are designed to give a conservative reference point for comparisons.

Family Information

DC-power chassis

Hewlett Packard Enterprise is making the two models of controller-less chassis available with direct current (DC) power supplies. They each have the two empty bays where users can insert one or two MSA 2040 controller(s).
The 500 watt power supply is designed to operate over the input range of -40VDC to -75VDC.

MSA 2040 Controller-less Chassis (DC-powered)

HP MSA 2040 SFF DC-power Chassis	C8R11A
(Will accept one or two MSA 2040 SAN or MSA 2040 SAS controllers and can accommodate up to twenty four 2.5-in (SFF) drives)	
HP MSA 2040 LFF DC-power Chassis	C8R13A
(Will accept one or two MSA 2040 SAN or MSA 2040 SAS controllers and can accommodate up to twelve 3.5-in (LFF) drives)	

Configuration and Management Tools

HPE Storage Management Utility (SMU). Management access, out-of-band: WEB GUI, CLI. Interface Types: USB 100/1000 Ethernet. Protocols Supported SNMP, SMI-S, SSL, SSH, SMTP, FTP, HTTP, Telnet

MSA 2040 Software and Documents Support CD

- All product documentation (CD can be used on ALL supported server Operating Systems.)
- Host Software Bundles (Win and Linux for both ProLiant x86, ProLiant x64 and Integrity IA64servers)
- CD updated quarterly on HPE.com with sustaining firmware updates

Hot Plug Expansion and Replacement Support

All MSA 2040 models support hot plug expansion and replacement of redundant controllers, enclosures, fans, power supplies, and I/O modules for simple, fast installation and maintenance. Hot add expansion of disk enclosures is also supported.

Snapshot and Clone

All MSA 2040 arrays come standard with 64 snaps, 512 snaps is available as an option. This controller based functionality offers higher levels of data protection, enables an almost instant recovery from data failure or corruption and offers alternative development testing of 'offline' production data and the ability to backup snapped/cloned data.

Overview	The MSA 2040 arrays come integrated with web browser and CLI based software for storage and RAID management, setup, configuration, and troubleshooting. This reduces the cost of ownership by reducing the training and technical expertise necessary to install and maintain your HPE storage solution. The SPOCK database provides interoperability information for thousands of components and millions of component combinations. It is available to all users at **http://www.hpe.com/storage/spock**.
Server Compatibility **NOTE:** depends on protocol	Supports most HPE ProLiant, BladeSystems and Integrity servers including • HPE ProLiant DL, ML • HPE c-Class Blade Servers • Integrity servers, IA64 • Compatibility must be confirmed at: **http://www.hpe.com/storage/spock**
Industry Standard servers support	• Supports most multi-vendor industry standard 32-bit Intel and AMD based (x86) servers. Hewlett Packard Enterprise requires the Third-Party Server to be logged and listed on the Microsoft Windows Server Catalog. • Refer to the Microsoft website: **http://www.microsoft.com/windows/catalog/server/** • Hewlett Packard Enterprise recommends that the Third-Party Server Vendor is an active member of TSANet. Refer to the TSANet website for details: **http://www.tsanet.com** • Non-HPE servers will generally be supported if the HPE storage stack is used. This includes

Family Information

	supported HPE branded HBAs and drivers, and supported FC switches.
OS Support **NOTE:** depends on protocol	Refer to the Hewlett Packard Enterprise support statements for complete current OS version support: **http://www.hpe.com/storage/spock** • Microsoft Windows Server 2012 • Microsoft Windows Server 2008 R2 • VMware • HPE-UX • Red Hat Linux (32/64) • SuSE SLES (32/64)
Web Browser support	• The MSA 2040 supports target based management, and include a Web interface and a telnet interface, and require a web browser for management. • Beginning with GL200 or newer firmware, MSA 2040 customers have the option to use one of two WBI´s. • Users taking advantage of virtualization features will be required to use SMU V3. • The MSA 2040 management supports Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.

Optional Software

MSA Performance Tiering

Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 2040 supports 3 distinct tiers:

1. A Performance tier with SSDs
2. A Standard SAS tier with Enterprise SAS HDDs
3. An Archive tier utilizing Midline SAS HDDs.

Prior to GL200 firmware the MSA 2040 operated through manual Tiering, LUN-level tiers are manually created and managed by using dedicated vdisks and volumes. LUN level Tiering requires careful planning such that applications requiring the highest performance be placed on Vdisks utilizing high performance SSD´s. Applications with lower performance requirements can be placed on Vdisks comprised of Enterprise SAS or midline SAS HDDs. Beginning with GL200 or newer firmware, the MSA 2040 now supports sub-LUN tiering and automated data movement between tiers.

The MSA 2040 automated tiering engine moves data between available tiers based on the access characteristics of that data. Frequently accessed "pages" will migrate to the highest available tier delivering maximum I/O´s to the application (Performance Tiering). Another feature to the MSA 2040 tiering engine is Archive Tiering where "cold" or not frequently accessed data can be moved to lower performance tiers. Pages are migrated between tiers automatically such that I/O's are optimized in real-time.

The Archive Tiering functionality is provided at no charge on the MSA 2040 platform beginning with GL200 or newer firmware. The Performance Tiering capability utilizing a fault tolerant SSD Disk Group is a paid feature and requires the below SKU to enable it. Creating an SSD virtual disk group for both read and write capabilities requires a Performance Auto Tiering License. Performance Tiering from SAS MDL (Archive Tier) to Enterprise SAS (Standard Tier) drives is provided at no charge.

HPE MSA 2040 Perf Auto Tiering LTU	D4T79A
HPE MSA 2040 Perf Auto Tiering E- LTU	D4T79AAE

VMware Site Recovery Manager(SRM)

VMware vCenter Site Recovery Manager (SRM) is an extension to VMware vCenter that delivers business-continuity and disaster-recovery solution that helps you plan, test, and execute the recovery of vCenter virtual machines. SRM can discover and manage replicated datastores, and automate migration of inventory from one vCenter to another. Site Recovery Manager integrates with the underlying replication product through a Storage Replication Adapter (SRA). The SRM is available only for linear storage.

HPE MSA 2040 Site Recovery Adapter (SRA)

The MSA 2040 SRA, a free-to-use plugin, is the program that integrates the VMware vCenter SRM with HPE MSA 2040 arrays. It enables full-featured use of the VMware SRM. It is a host-software component installed on a Microsoft Windows Server that enables disaster recovery management (DRM) software on the host to communicate and control certain aspects of the replication feature in storage systems connected to the server. It allows the VMware SRM software to automatically coordinate virtual machine failover and failback between a protected data center and a disaster recovery site by employing a disaster recovery solution called Remote Snap. A perfect combination of the Remote Snap replication and VMware SRM provides an unfailing automated

Optional Software

solution for implementing and testing the disaster recovery between sites located across geographies. It enables communication between the HPE MSA Remote Snap replication functionality that is embedded in HPE MSA 2040 systems. Users are required to acquire Remote Snap license for their local and remote HPE MSA 2040 arrays to use the HPE MSA SRA.

Site Recovery Manager Requirements/Dependencies:

- Requires vSphere 5.1, 5.5
- Supports SRM 5.1, 5.5 and 5.8
- Requires HPE MSA 2040 /P2000 SRA 5.8 or later Plug-in (downloadable from hpe.com)
- SRM works with Remote Snap linear mode
- Requires purchase of MSA 2040 Remote Snap licenses (one for each site)

HPE OneView for VMware vCenter

HPE OneView for VMware vCenter is a component within the HPE OneView plug-in for vCenter. It provides VMware administrators that are using VMware's vSphere management console (vCenter) with the ability to see how virtual machines are mapped to datastores and individual MSA 2040 volumes. By providing these clear relationships between VM's, datastores and storage, the VMware administrator's productivity increases, as does the ability to ensure quality of service. Roles for administrators can be defined on an individual basis, providing the ability to apply specific permissions for both view and control functions.

HPE OneView for VMware vCenter supports mixed array environments including MSA 2040, 1040, P2000, EVA, P4000, and the XP array series including the P9500.

When deployed with the MSA 2040 array, HPE OneView provides the following:

- Active Management functionality for the MSA 2040 array:
  - Create/Expand/Delete a Datastore
  - Create a Virtual Machine from a template
  - VMClone for linear storage
- Monitors the health and status of the MSA 2040
- Displays LUN / volume connections from VMs and ESX servers to the arrays and provides the location and attributes of the MSA 2040 within the SAN
- Identifies what storage features are available to allow administrators to match the features available on the MSA 2040 to their requirements
- Provide a cluster-level view of the storage

HPE OneView for VMware vCenter is downloadable from Software Depot:
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=HPVPR

For more information on HPE OneView for VMware vCenter visit:
http://h22168.www2.hpe.com/us/en/partners/vmware/

HPE StoreFront Manager for Microsoft

HPE StoreFront Manager for Microsoft enables management and monitoring of HPE MSA Storage running in Microsoft Hyper-V environment with a single pane-of-glass view to events/alerts, capacity and health dashboards and detailed virtual infrastructure information. It integrates seamlessly with Microsoft System Center Operations Manager (SCOM) and provides Microsoft administrators the following:

It supports heterogeneous HPE Storage environment including MSA 2040, 1040, HPE StoreVirtual, HPE 3PAR StoreServ, HPE StoreOnce, HPE StoreEasy, HPE XP, HPE EVA and HPE StoreEver Storage.

Optional Software

When deployed with the MSA 2040 array, HPE StoreFront Manager provides the following:

- Monitors the health, events and alerts for the MSA 2040/1040 – Linear and virtual Pools, and volumes
- Provides detailed information on the VMs provisioned through MSA Storage
- Effortless installation and configuration using Powershell

HPE StoreFront Manager for Microsoft for MSA Storage is downloadable from Software Depot:
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=System_Center

vStorage API for Array Integration (VAAI)

The vStorage API for Array Integration (VAAI) is one of the storage application programming interface (API) sets in vSphere. VAAI is an API storage partners can leverage to enhance performance of virtual machine (VM) management operations by delegating these operations to the storage array. With hardware offload, ESX/ESXi hosts perform certain operations faster and consume less server CPU and memory resources, and also storage port and storage fabric bandwidth. VAAI includes high performance and scalable VM data path primitives.

Storage Hardware Primitives for VAAI

- Full Copy or Hardware Assisted Move
- Block Zeroing or Hardware Assisted Zeroing
- Hardware Assisted Locking or Atomic Test and Set (ATS)
- UNMAP reclaims space that is no longer on a thinly provisioned VMFS volume

Snapshot and Volume Copy Software for the MSA 2040

Product Features

Data Protection

- Snapshots create up to 512 point-in-time pictures of data
- Volume Copies create up to 128 point-in-time copies of data
- Recovery is instant - revert data from any previous Snapshot or Volume Copy (volume copy is available for both linear and virtual storage with GL220 firmware or later; pre-GL220 firmware volume copy is only available on linear storage).
- Backup 'snapped' data to disk, virtual tape, or physical tape without a backup window
- A 64 snapshot license and Volume Copy are included with all MSA 2040 models.
- Support and updates are desired for bundled software functionalities (such as 64 LTU Snap and/or Volume Copy etc. in the MSA 2040 products) a combination HW + SW support care pack must be purchased.
- Hewlett Packard Enterprise does not provide warranty assistance for software products included with our base hardware products. This would either be SupportPlus or SupportPlus24. The hardware warranty component of these services is accounted for in the pricing of the SP and SP24 care packs.

Data Testing

- Snap or clone data to test the performance of a software application on 'offline' production data
- Snap or clone data to test how a software patch or enhancement will function on 'offline; production data

MSA 2040 Snapshot and Clone:

All MSA 2040 models come STANDARD with 64 snapshots and Volume Copy software (volume copy is available

Optional Software

for both linear and virtual storage with GL220 firmware or later; pre-GL220 firmware volume copy is only available on linear storage).

512 Snapshot option is also available for additional cost.

HPE MSA 512-Snapshot Software LTU	TC462A
HPE MSA 512-Snapshot Software E-LTU	TC462AAE

HPE MSA Remote Snap Software

- HPE MSA Remote Snap software is available for both linear and virtual storage with GL220 firmware or later; pre-GL220 firmware remote snap replication is only available on linear storage. HPE MSA Remote Snap Software is array based software that provides remote replication on the HPE MSA 2040 Array products. HPE Remote Snap is a form of asynchronous replication which consists of replication of block-level data from a volume on a local system to a volume that may be on the same system or on a second independent system. This second system may be co-located with the first system or may be located at a remote site.
- HPE Remote Snap functionality is based on existing Snapshot technology offered by HPE MSA SAN Array products. Snapshots are used to track the data to be replicated as well as to determine the differences in data updated on the master volume, minimizing the amount of data to be transferred.
- HPE Remote Snap replication technology provides the ability to accomplish key data management and protection capabilities. First, because Remote Snap uses snapshots as the underlying technology it creates multiple local recovery points which can be used for such tasks as to complement daily backups; second, replication provides the ability to access data in a remote site which could be used for dispersed operations; and third but definitely not least important replication allows for business continuance in the event of a failure on the primary site.
- In order to perform a replication, a snapshot of the volume to be replicated is taken, creating a point-in-time image of the data. This point-in-time image is then replicated to the destination volume by copying the data represented by the snapshot via a transport medium such as TCP/IP (iSCSI) or Fibre Channel. The amount of data transferred is minimized though the use of snapshots whenever possible.

HPE MSA Remote Snap Software LTU	TC463A
HPE MSA Remote Snap Software E-LTU	TC463AAE

(NOTE: One license per array is required for replication. For example, if you have two MSA arrays performing replication (from Primary system to Remote System), you will need 2 licenses).

Product Features

- Storage based asynchronous snapshot replication
- Initial copy of data can be performed locally, reducing burden on wide area networks
- Support of both Ethernet and Fiber Channel interconnects provides flexible options to the application environments. Remote Snap is not supported on SAS models.
- Snapshot based replication technology means only changed data will be replicated to alternate site
- Many to 1 replication (up to 4 nodes) - primary use case is to replicate from "many" branch offices to the home office for the purpose of backing up data from the branches
- Single controller to single controller replication
- Advanced scheduler provides several options to IT administrators for business continuance
- Flexible architecture allows remote replication between MSA 2040 and/or P2000 G3 supported arrays. Protects existing investments and enhances business continuity planning objectives.
- Replication Wizard simplifies the task of setting up and establishing replication pairs from one unified, easy to use GUI.
- Snapshot based replication enables both local and remote recovery depending on the need. Snapshot replication isolates problems to a specific point in time which can be selected by the administrator.

Optional Software

Additionally snapshot replication supports longer distance replication.

- Multiple relationships provide greater storage flexibility and utilization.
- Bundled 64 Snapshots and Volume Copy integration provides better efficiencies by combining the management and array technologies to create local copies.
- Fast application recovery with minimal or no transaction loss
- Creation of disaster tolerant copies of your critical business data
- No-single-point-of-failure solution to increase the availability of your customers data

Service and Support, HP Care Pack, and Warranty Information

Warranty

Three-year limited warranty, parts exchange Next Business day delivery

Enclosures, Hard drives, and Options for the MSA 2040 carry their own warranty. Refer to Hewlett Packard Enterprise Limited Warranty Statement for more information.

The MSA 2040 has been designed with customer self-repairable parts to minimize repair time and provide greater flexibility in performing defective parts replacement. Please refer to Hewlett Packard Enterprise limited warranty Statement and parts replacement instructions for further details.

http://h18006.www1.hpe.com/products/storageworks/warranty.html

Products included in various kits carry their own individual warranties.

NOTE: The warranty of the hard drive options purchased with the MSA 2040 models is different for SAS hard drives versus SAS MDL. SAS hard drive options have a three year warranty and SAS MDL have a one year warranty.

Solid State Drives (SSD) Warranty

3/0/0 warranty; Customer Self Repair (CSR) subject to maximum usage and or maximum supported lifetime limitations, whichever occurs first. Maximum Supported Lifetime is the period in years set to equal the warranty for the device. Maximum usage limit is the maximum amount of data that can be written to the device before reaching the device's write endurance limit.

Service and Support

Services to accelerate time to results

HPE Storage Services bring you a rich portfolio of consulting and support services designed to add value to our core storage products and solutions. We have the know-how and experience to put storage technology to work for you. We work closely with you as your strategic partner, leveraging our full services portfolio to make sure that everything works to optimize your enterprise.

Choose from services aligned to our storage product offerings and lifecycle. From mission-critical onsite services to innovative web-based remote support, you choose the precise level of attention and support your business demands.

Discover, plan, and design

Choose from a rich portfolio of services to make the most of MSA 2040 SAN Storage so you can efficiently and affordably consolidate, manage, and extract value from unstructured data.

HPE Services can help you discover needs and create a plan for simplifying the environment, reducing risk, and maximizing your storage investments

HPE Storage Efficiency Analysis - The HPE Storage Efficiency Analysis provides customers with a view of their storage infrastructure and operating environment; highlighting recommendations for improvements. The report provides extensive insight about the existing storage environment, opportunities for efficiency gains, asset aging and replacement through interaction with key decision makers
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-6727ENW.pdf

HPE Storage Impact Analysis (SIA): The HPE Storage Impact Analysis service provides a 2-4 week

Service and Support, HP Care Pack, and Warranty Information

discovery engagement with executive summary presentation. The goal of this service is to help provide customers guidance on storage related issues and develop remediation plans.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-1174ENW.pdf

HPE Storage Cloud Design Service - Build a scalable, low-cost enterprise storage environment with inherent cloud benefits to meet big data needs.

HPE Storage Modernization Service: The HPE Storage Modernization service is a 4-6 week service that defines the customers envisioned target storage environment based on a proven solution design methodology. Hewlett Packard Enterprise architects will quickly perform tool-assisted automatic discovery and facilitate a two-day strategy workshop with all key stakeholders involved in the storage infrastructure initiative
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-4620ENW.pdf

Deploy and integrate

We can help you configure, set up, and efficiently use MSA 2040 SAN Storage as well as help migrate data, improve capacity utilization, and establish information management standards used across backup, replication, and archiving needs.

HPE MSA Family Disk Array Installation and Startup Service - Implement right from the start, as Hewlett Packard Enterprise experts install, test, and configure your hardware and software onsite. We deliver a tailored storage deployment properly integrated into your environment.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA0-3048ENW.pdf

HPE Storage Data Migration Services - End-to-end data migration service providing seamless discovery, assessment, planning, and design, completely customizable to your organization's storage area network or network attached storage environment and using innovative software to help you migrate to HPE storage quickly and efficiently.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-0774ENW.pdf

HPE Storage and Data Residency Service - Strategic augmentation of your current environment with Hewlett Packard Enterprise resources who become your trusted advisor to provide answers that are right for your storage and backup environment.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-9481ENW.pdf

HPE Proactive Select - A flexible way to purchase services to fit your environment with an extensive menu of HPE Proactive Select event and technical services, such as onsite firmware upgrades, health checks, assessments, and education.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA2-3842ENW.pdf

Operate and support

Choose the right support to maximize uptime, free up your resources, and achieve improved value-as you get the most out of the existing IT assets while accelerating time-to-revenue.

HPE Proactive Care 24x7 - Hardware and software support services designed specifically for your technology with rapid access to Advanced Solution Center Specialists plus firmware and software management and best practice advice
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf

HPE Proactive Care Advanced – Building on HPE Proactive Care to give you personalized technical and operational advice from an assigned local Account Support Manager for personalized

Service and Support, HP Care Pack, and Warranty Information

	technical collaboration, flexible access to specialist skills to help fine-tune business critical IT, and Enhanced Critical Incident Management to help make sure your business is not affected if you experience a system or device outage. **http://h20195.www2.hpe.com/V2/GetDocument.aspx?docname=4AA3-8855ENW&cc=us&lc=en** **HPE Proactive Care Personalized Support -** An option-if you have HPE Proactive Care- to bring increased personalization of the Proactive Care support experience through the assignment of an Account Service Manager (ASM) who provides IT best practice advice to help address IT issues and projects. **http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-3446ENW.pdf** **HPE Foundation Care 24x7 Service** - HPE Foundation Care 24x7 connects you to HPE 24 hours a day, seven days a week for assistance on resolving issues - hardware onsite response within four hours and software call back within two hours after opening your case. Three years' coverage recommended with HPE Care Pack Service. **HPE Education Services -** Comprehensive training for new, as well as experienced, storage administrators designed to expand your skills and keep you up to speed with the latest storage and virtualization technology from HPE Storage. **http://education.hpe.com/curr-storsan.htm**
Optimized Care- delivers best performance and stability through deployment and proactive management practices	**Choose from three levels of operate and support care** **HPE 6hr CTR Proactive Care Service** **Additional options** - HPE Proactive Care Personalized Support (once per Proactive Care support new environment), an additional day of HPE Personalized Support, and 10 additional HPE Proactive Select credits per year, per array
Standard Care-maintains high level of uptime, along with expert help to cut the cost and complexity of implementation and support	**HPE Proactive Care 24x7** **Additional options** - HPE Proactive Care Personalized Support (once per Proactive Care support new environment), an additional day of HPE Personalized Support, and 10 additional HPE Proactive Select credits per year, per array
Basic Care-Minimum recommended support	**HPE Foundation Care 24x7** **Additional options** - 10 Proactive Select Credits per Year
Remote Support Automation	HPE Automation provides 24x7 coverage, proactive problem prevention, accurate problem diagnosis and faster problem resolution, as well as interactive support portals and tools. This is an integral, and cost-free, part of your HPE support relationship and we are continually investing in additional cutting-edge capabilities to make it better.
For more information	**http://www8.hpe.com/us/en/business-services/it-services/storage-services.html** To learn more on HPE Storage Services, please contact your Hewlett Packard Enterprise sales representative or HPE Authorized Channel Partner HPE Care Pack Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise

Service and Support, HP Care Pack, and Warranty Information

Authorized Service Partners:

- Services for customers purchasing from Hewlett Packard Enterprise or an enterprise reseller are quoted using Hewlett Packard Enterprise order configuration tools.
- Customers purchasing from a commercial reseller can find HPE Care Pack Services at **http://cpc.ext.hpe.com/portal/site/cpc/**

Configuration Information

Configure to Order Program Information

Hewlett Packard Enterprise has a very successful Configure to Order program for the MSA 2040 family The MSA 2040 models and options may or may not be factory installed in a rack with add-on controllers, switches, MSA 2040 disk enclosures and hard drives. The MSA 2040 arrays may be integrated with ProLiant servers or as standalone storage.
Orders to be shipped through the CTO process must have a minimum of two drives of the same type (SSD, SAS or SAS MDL) ordered per controller.

Step 1 - MSA 2040 - Base Configuration

Select one chassis:

Model Name	SKUs
MSA 2040 Controller-less Chassis (AC-powered)	
HP MSA 2040 Energy Star SFF Chassis	K2R81A
HP MSA 2040 Energy Star LFF Chassis	K2R82A
MSA 2040 Controller-less Chassis (DC-powered)	
HP MSA 2040 SFF DC-power Chassis	C8R11A
HP MSA 2040 LFF DC-power Chassis	C8R13A

Step 2 - Options

Select each option with quantities specified.

Step 2a - MSA 2040 Controllers

Quantity	Description with Parts Shipped:	SKUs
1 or 2	HP MSA 2040 SAN Controller **NOTE: for either the LFF or SFF MSA 2040 chassis or the two DC-powered chassis**	C8R09A
1 or 2	HP MSA 2040 SAS Controller **NOTE: each controller has four mini-SAS HD ports for host connection. Cables must be purchased separately** **NOTE: for either the LFF or SFF MSA 2040 chassis or the two DC-powered chassis**	C8S53A

Step 2b - SFPs

NOTE: MSA 2040 SAN Controller does not ship with any SFPs. MSA SAS controllers do not require SFP modules. Customer must select one of the following SFP options. Each MSA 2040 SAN controller can be configured with 2 or 4 SFPs. MSA SFPs are for use only with MSA 2040 SAN Controllers. For MSA 2040 10Gb iSCSI configuration user can use DAC cables instead of SFPs.

MSA Small Form Factor Pluggable (SFPs) Transceivers:

HPE MSA 2040 8Gb Short Wave Fibre Channel SFP+ 4-Pack Transceiver (Includes four x 8Gb SW FC SFPs)	C8R23A
HPE MSA 2040 16Gb Short Wave Fibre Channel SFP+ 4-Pack Transceiver (Includes four x 16Gb SW FC SFPs)	C8R24A

Configuration Information

HPE MSA 2040 10Gb Short Range iSCSI Channel SFP+ 4-Pack Transceiver (Includes four x 10Gb SW iSCSI SFPs)	C8R25A
HPE MSA 2040 1Gb RJ-45 iSCSI Channel SFP+ 4-Pack Transceiver (Includes four x 1Gb RJ-45iSCSI SFPs)	C8S75A

Step 2c - SSD, SAS, SED or SAS MDL Drive Options

NOTE: SAS MDL drives are designed for archival or reference data. They should not be used in a heavy or intense I/O environment. Those situations require the use of enterprise-class SSD or SAS drives. MSA 3.5-inch or 2.5-inch drives are for use only with MSA arrays.
Customers can mix SSD, SAS, and SAS MDL drives in the same array head and disk enclosure.

MSA 2040 Drives:

Solid State Drives (SSDs) (SFF 2.5-inch)

12G SFF SAS SSDs (Mixed Use)

HP MSA 400GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X95A
HP MSA 800GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X96A
HP MSA 1.6TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X91A
HP MSA 3.2TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X92A

12G SFF SAS SSDs (Mainstream Endurance)

HP MSA 200GB 12G ME SAS SFF (2.5in) Enterprise Mainstream 3yr Warranty Solid State Drive	K2Q45A
HP MSA 400GB 12G ME SAS SFF (2.5in) Enterprise Mainstream 3yr Warranty Solid State Drive	J9F37A
HP MSA 800GB 12G ME SAS SFF (2.5in) Enterprise Mainstream 3yr Warranty Solid State Drive	J9F38A
HP MSA 1.6TB 12G ME SAS SFF (2.5in) Enterprise Mainstream 3yr Warranty Solid State Drive	J9F39A

SAS Drives (SFF 2.5-inch)

12G SFF 15K SAS HDDs

HP MSA 300GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F40A
HP MSA 450GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F41A
HP MSA 600GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F42A

12G SFF 10K SAS HDDs

HP MSA 300GB 12G SAS 10K 2.5in Dual Port Enterprise 3yr Warranty Hard Drive	J9F44A
HP MSA 600GB 12G SAS 10K 2.5in Dual Port Enterprise 3yr Warranty Hard Drive	J9F46A
HP MSA 900GB 12G SAS 10K 2.5in Dual Port Enterprise 3yr Warranty Hard Drive	J9F47A
HP MSA 1.2TB 12G SAS 10K 2.5in Dual Port Enterprise 3yr Warranty Hard Drive	J9F48A
HP MSA 1.8TB 12G SAS 10K SFF (2.5in) 512e Enterprise 3yr Warranty Hard Drive	J9F49A

NOTE: 512e drives require MSA 1040/2040 firmware version GL200P002 or newer

6G SFF 10K SAS HDDs

HP MSA 300GB 6G SAS 10K 2.5-inch Dual Port Enterprise 3yr Warranty Hard Drive	E2D55A
HP MSA 450GB 6G SAS 10K 2.5-inch Dual Port Enterprise 3yr Warranty Hard Drive	E2D56A
HP MSA 600GB 6G SAS 10K 2.5-inch Dual Port Enterprise 3yr Warranty Hard Drive	C8S58A
HP MSA 900GB 6G SAS 10K 2.5-inch Dual Port Enterprise 3yr Warranty Hard Drive	C8S59A

12G SFF 7.2K SAS MDL HDDs

HP MSA 1TB 12G SAS 7.2K SFF (2.5in) 512e Midline 1yr Warranty Hard Drive	J9F50A
HP MSA 2TB 12G SAS 7.2K SFF (2.5in) 512e Midline 1yr Warranty Hard Drive	J9F51A

NOTE: 512e drives require MSA 1040/2040 firmware version GL200P002 or newer

Configuration Information

6G SFF 7.2K SAS MDL HDDs

HP MSA 1TB 6G SAS 7.2K 2.5-inch Dual Port Midline 1yr Warranty Hard Drive	C8S62A

MSA Large Form Factor (LFF) SAS MDL DP drives for MSA 2040 Array and MSA 2040 3.5-inch Disk Enclosure

12G LFF 7.2K SAS Midline Drives

HP MSA 8TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive	M0S90A
HP MSA 6TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive	J9F43A
HP MSA 4TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive	K2Q2A

NOTE: 512e drives require MSA 1040/2040 firmware version GL200P002 or newer

6G LFF 7.2K SAS Midline Drives

HP P2000 1TB 6G SAS 7.2K LFF (3.5-inch) Dual Port MDL Hard Drive	AP861A
HP P2000 2TB 6G SAS 7.2K LFF (3.5-inch) Dual Port MDL Hard Drive	AW555A
HP MSA 2TB 6G SAS 7.2K LFF(3.5in) Midline Self Encrypted 1yr Wty Hard Drive	C8R22A
HP P2000 3TB 6G SAS 7.2K rpm (3.5-inch) Midline 1yr Warranty Hard Drive	QK703A
HP MSA 4TB 6G SAS 7.2K LFF(3.5in) Midline Self Encrypted 1yr Wty Hard Drive	G0M44A

Configuration Information

MSA Large Form Factor (LFF) SAS DP drives for MSA 2040 Array and MSA 2040 3.5-inch Disk Enclosure

12G LFF 15K SAS HDDs (SFF Drives in LFF Converters)

HP MSA 300GB 12G SAS 15K LFF (3.5in) Converter Enterprise 3yr Warranty Hard Drive	J9V68A
HP MSA 450GB 12G SAS 15K LFF (3.5in) Converter Enterprise 3yr Warranty Hard Drive	J9V69A
HP MSA 600GB 12G SAS 15K LFF (3.5in) Converter Enterprise 3yr Warranty Hard Drive	J9V70A

MSA Small Form Factor (SFF) SAS DP Self-Encrypted Drives for MSA 2040 Array and D2700 2.5-inch Disk Enclosure

HP MSA 900GB 6G SAS 10K SFF(2.5in) Enterprise Self Encrypted 3yr Wty Hard Drive	G0M43A

NOTE:

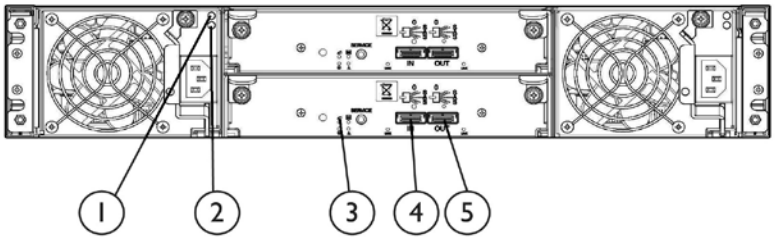
- All drives within the MSA 240 array must be self-encrypted drives to enable the encryption feature. There cannot be a mixture of encrypted and non-encrypted drives within the same array.
- SEDs can be used in a non-SED environment, but will not be encrypted unless all drives in the array are SED
- Self-encrypted drives are only supported on the MSA 2040 Storage array and requires Firmware version GL105. Customers must upgrade their MSA 2040 controller firmware to GL105 or later for Self-Encrypting Drive functionality
- All MSA SEDs are FIPS 140-2 compliant FIPS 140-2 Validated Self-Encrypting Drives (SEDs) have been certified by the U.S. National Institute of Standards and Technology (NIST) and Canadian Communications Security Establishment (CSE) as meeting the Level 2 security requirements for cryptographic modules as defined in the Federal Information Processing Standards (FIPS) 140-2 Publication
- Technical White Paper on MSA SEDs: **http://h20195.www2.hpe.com/V2/GetDocument.aspx?docname=4AA5-8639ENW&cc=us&lc=en**

NOTE:

- For instructions to setup and use SEDs, refer to the MSA 2040 CLI Reference Guide and MSA 2040 SMU Reference Guide located on the HPE MSA 2040 Manuals page: (**http://www.hpe.com/support/msa2040/Manuals** for instructions on setup and use of SEDs
- Also, Refer to the HPE MSA 1040/2040 Best Practices document at **http://www.hpe.com/support/msa2040/BestPractices**

Step 2d - Drive Enclosure Options

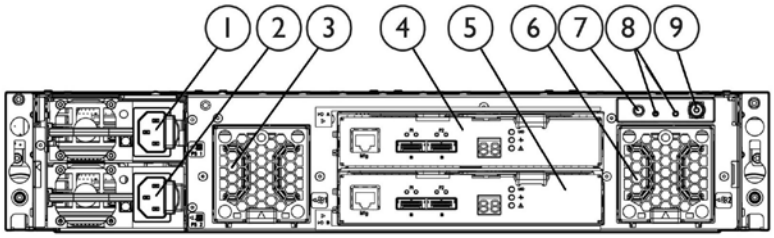
Configuration Information



MSA 2040 Dual I/O 3.5-inch 12 Disk Enclosure

Rear Panel components

1. Power Indicator
2. Fault Indicator
3. Unit Locator
4. SAS In Port
5. SAS Out Port



HPE D2700 Disk Enclosure

Rear Panel components

1. Power Supply 1
2. Power Supply 2
3. Fan 1
4. I/O Module A
5. I/O Module B
6. Fan 2
7. Rear UID push button
8. Enclosure LEDs
9. Power on/standby button

Use either disk enclosure with Large or Small Form Factor, single or dual controller array heads. Each ships with two .5m mini-SAS to mini-SAS cables.

HP MSA 2040 Energy Star LFF Disk Enclosure	M0S96A
HP D2700 Disk Enclosure	AJ941A

Step 2e - SAS Cable Options

mini-SAS to mini-SAS Cables:

Connecting MSA 2040 Controller to a JBOD if a longer cable is desired.

HP External Mini SAS 1m Cable ALL	407337-B21
HP External Mini SAS 2m Cable	407339-B21

Step 3 - Other MSA 2040 Options

Choose optional AC Power Cords (2 required)

NOTE: Two PDU cables: one 142263-008 (Black) and one 1422633-013 (Grey), ship standard with all AC-powered enclosures.

Configuration Information

HP ProLiant 12 ft Power Cord	227099-001
Power Cord, (Australia/China/New Zealand)	227098-001
Power Cord, (Central Europe)	157215-001
Power Cord, (United Kingdom/Hong Kong)	157216-001
Power Cord, (Switzerland)	157219-001
Power Cord, (Italy)	157217-001
Power Cord, (Denmark)	157218-001
Power Cord, (Japan)	139867-001
Power Cord, (South East Asia/India)	157220-001

Step 4 - Choose Supported Options For Fibre Channel Infrastructure

	Model	SKUs
CFibre Channel Host Bus Adapters - X86 servers	**NOTE:** Please visit **http://www.hpe.com/go/fchba** for product details and **http://www.hpe.com/storage/spock** for compatibility details.	
	FC HBAs	
	HP StoreFabric SN1000Q 16GB 1-port PCIe Fibre Channel Host Bus Adapter	QW971A
	HP StoreFabric SN1000Q 16GB 2-port PCIe Fibre Channel Host Bus Adapter	QW972A
	HP StoreFabric SN1100E 16Gb Single Port Fibre Channel Host Bus Adapter	C8R38A
	HP StoreFabric SN1100E 16Gb Dual Port Fibre Channel Host Bus Adapter	C8R39A
	BladeSystem c-Class Fibre Channel Mezzanine HBAs	
	QLogic QMH2562 8Gb Fibre Channel Host Bus Adapter for c-Class BladeSystem	451871-B21
	Emulex LPe1205 8Gb Fibre Channel Host Bus Adapter for c-Class BladeSystem	456972-B21
	C-class HBA	
	HP QMH2572 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class	651281-B21
	HP LPe1205A 8Gb Fibre Channel Host Bus Adapter for BladeSystem c-Class	659818-B21
	HP 82Q 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AJ764A
Fibre Channel Host Bus Adapters - Integrity servers	**Integrity**	
	HP 4Gb 1-port PCI-X 2.0 Fibre Channel Host Bus Adapter	AB378B
	HP 4Gb 2-port PCIe Fibre Channel Host Bus Adapter	AD300A
	HP 4Gb 1-port PCIe Fibre Channel Host Bus Adapter	AD299A
	HP 4Gb 2-port PCIe Fibre Channel Host Bus Adapter	AD355A
	HP PCIe 1-port 4Gb and 1-port 1000BT Adapter	AD221A
	HP PCIe 2-port 4Gb and 2-port 1000BT Adapter	AD222A
	HP PCIe 2-port 4Gb and 2-port 1000BSX Adapter	AD393A
	HP PCI-X 1-port 4Gb FC and 1-port 1000BT Adapter	AD193A
	HP PCI-X 2-port 4Gb FC and 2-port 1000BT Adapter	AD194A
	HP PCI Express 1-port 8Gb Fibre Channel SR (QLogic) Adapter	AH400A
	HP PCI Express 2-port 8Gb Fibre Channel SR (QLogic) Adapter	AH401A
	HP 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AH402A
	HP 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AH403A

Configuration Information

	Brocade Fibre Channel HBAs	
	HP 81B 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AP769B
	HP 82B 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AP770B
	Emulex Fibre Channel HBAs	
	HP 81E 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AJ762B
	HP 82E 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AJ763B
	QLogic Fibre Channel HBAs	
	HP 81Q 8Gb 1-port PCIe Fibre Channel Host Bus Adapter	AK344A
	HP 82Q 8Gb 2-port PCIe Fibre Channel Host Bus Adapter	AJ764A
	Integrity server blades	
	QLogic QMH2562 8Gb Fibre Channel Host Bus Adapter for c-Class BladeSystem	451871-B21
	Emulex LPe1205 8Gb Fibre Channel Host Bus Adapter for c-Class BladeSystem	456972-B21
Fibre Channel Switches	HP 8/20q Fibre Channel 8-ports Active Switch	AQ233B
	HP 8/20q Fibre Channel Switch	AK242B
	HP 8/8 Base (0) e-port SAN Switch	AM866B
	HP 8/8 (8) Full Fabric Ports Enabled SAN Switch	AM867B
	HP 8/24 Base (16) Full Fabric Ports Enabled SAN Switch	AM868B
	HP 1606 FCIP 16-pt Enabled 8Gb FC 6-pt Enabled 1GbE Power Pack+ Switch	AP864B
	HP 1606 FCIP 16-pt Enabled 8Gb FC 6-pt Enabled 1GbE Full Switch	AP863B
	HP 1606 FCIP 4-pt Enabled 8Gb FC 2-pt Enabled 1GbE Base Switch	AP862B
	Brocade 8/12c SAN Switch for BladeSystem c-Class	AJ820B
	Brocade 8/24c SAN Switch for BladeSystem c-Class	AJ821B
	Brocade 8/24c Power Pack+ SAN Switch for BladeSystem c-Class	AJ822B
	HP SN6000 Stackable 8Gb 24-port Single Power Fibre Channel Switch	AW575B
	HP SN6000 Stackable 8Gb 24-port Dual Power Fibre Channel Switch	AW576B
	HP SN6000 Stackable 12-port Single Power FC Switch	BK780B
	Cisco MDS 9124 8-ports Active Fabric Switch	AG646A
	Cisco MDS 9124 16-ports Active Fabric Switch	AG647A
	HP MDS 9124 24-ports Active Fabric Switch	AG648A
	Cisco MDS 8/12c Fabric Switch for HP BladeSystem c-Class	AW563A
	Cisco MDS 8/24c Fabric Switch for HP BladeSystem c-Class	AW564A
	HP SN6000C 8Gb 16-port Fibre Channel Switch	AW585A
	HP SN3000B 16Gb 24-port/12-port Active Fibre Channel Switch	QW937A
	HP SN3000B 16Gb 24-port/24-port Active Fibre Channel Switch	QW938A
	HP SN6000B 16Gb 48-port/24-port Active Fibre Channel Switch	QK753B
	HP SN6000B 16Gb 48-port/24-port Active Power Pack+ Fibre Channel Switch	QK754B
	HP SN6000B 16Gb 48-port/48-port Active Fibre Channel Switch	QR480B
	HP SN6000B 16Gb 48-port/48-port Active Power Pack+ Fibre Channel Switch	QR481B
	HP SN6000 Stackable 8Gb 24-port Single Power Fibre Channel Switch	AW575B
	HP SN6000 Stackable 8Gb 24-port Dual Power Fibre Channel Switch	AW576B

Configuration Information

	HP SN6000 Stackable 12-port Single Power FC Switch	BK780B
PremierFlexOM4 type cables	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A
OM3 FC LC-LC cables	HP LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
	HP LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
	HPE LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A
	HP LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
	HP LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
	HP LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
	HP LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A

Step 4a - Choose Supported Options For SAS Infrastructure

Supported options

Mini-SAS Cables

HP 1.0m External Mini SAS High Density to Mini SAS Cable	716189-B21
HP 2.0m External Mini SAS High Density to Mini SAS Cable	716191-B21
HP 4.0m External Mini SAS High Density to Mini SAS Cable	716193-B21

NOTE: These cables are used to connect 6Gb SAS initiator to MSA 2040 SAS controller. These are not used for connecting to a disk enclosure.

HP External 1.0m (3ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable	716195-B21
HP External 2.0m (6ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable	716197-B21
HP External 4.0m (13ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable	716199-B21

NOTE: These cables are used to connect 12Gb SAS initiator to MSA 2040 SAS controller. These are not used for connecting to a disk enclosure.

SAS Host Bus Adapters (HBAs)

HP H241 12Gb 2-ports Ext Smart Host Bus Adapter	726911-B21
HP H221 PCIe 3.0 SAS Host Bus Adapter	729552-B21

SAS Controllers

HP Smart Array P741m/4GB FBWC 12Gb 4-ports Ext Mezzanine SAS Controller	726782-B21
HP Smart Array P731m/512 FBWC 6Gb 4-ports Ext Mezzanine SAS Controller	698536-B21
HP Smart Array P721m/2GB FBWC 6Gb 4-ports Ext Mezzanine SAS Controller	650072-B21
HP Smart Array P721m/512 FBWC 6Gb 4-ports Ext Mezzanine SAS Controller	655636-B21
HP Smart Array P712m/256 6Gb 2-ports Int/2-ports Ext Mezzanine SAS Controller	488348-B21
HP Smart Array P711m/1G 6Gb FBWC 4-ports Ext Mezzanine SAS Controller	513778-B21
HP Smart Array P441/4GB FBWC 12Gb 2-ports Ext SAS Controller	726825-B21

Configuration Information

	HP Smart Array P431/2GB FBWC 12Gb 2-ports Ext SAS Controller	698531-B21
	Switches	
	HP 6Gb SAS Switch Single Pack for HP BladeSystem c-Class	BK763A
	HP 6Gb SAS Switch Dual Pack for HP BladeSystem c-Class	BK764A

Step 4b - Choose Supported Options For 10GbE Infrastructure

- verify that the cable/transceiver is supported with the connecting device (i.e. switch or NIC/iSCSI HBA)
For detailed information on NICs and OS initiator please go to: http://www.hpe.com/storage/spock

Copper Cable	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 0.5m Direct Attach Copper Cable	487649-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 1m Direct Attach Copper Cable	487652-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 3m Direct Attach Copper Cable	487655-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 5m Direct Attach Copper Cable	537963-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 7m Direct Attach Copper Cable	487658-B21
DAC Cable	HP X242 10G SFP+ to SFP+ 1m Direct Attach Copper Cable	J9281B
	HP X242 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	J9283B
	HP X242 10G SFP+ to SFP+ 7m Direct Attach Copper Cable	J9285B
	HP X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
	HP X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
	HP X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C
	HP X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable	JG081C
	HP X240 10G SFP+ SFP+ 7m Direct Attach Copper Cable	JC784C

Step 5 - Choose Rack Options

Please refer to the HPE Infrastructure products page for more information on HPE racks and rack options or the HPE 10000 G2 Series Rack QuickSpecs
http://h18004.www1.hpe.com/products/servers/platforms/rackandpower.html
http://h18000.www1.hpe.com/products/quickspecs/12402_div/12402_div.html

Step 6 – Services (Software Support) MSA 2040 Advanced Vistualization Funtionality

The MSA advanced virtualization functionalities are available for new and existing MSA 2040 owners via Firmware upgrade. (Thin Provisioning, SSD Read Cache, Automated Tiering: Archive and Performance**, Redirect on Write Snapshots and Wide Striping).
****NOTE:** The Performance Automated Tiering is a paid option for the MSA 2040.**

HPE MSA 2040 Perf Auto Tiering LTU	D4T79A
HPE MSA 2040 Perf Auto Tiering E-LTU	D4T79AAE
HPE MSA 512-Snapshot Software LTU	TC462A
HPE MSA 512-Snapshot Software E-LTU	TC462AAE
HPE MSA Remote Snap Software LTU	TC463A
HPE MSA Remote Snap Software E-LTU	TC463AAE

Technical Specifications

MSA 2040	**POWER REQUIREMENTS**	
	Input Power Requirements (typical-running I/O) SFF/LFF arrays	• 110VAC 3.32A, 344-390 W; 220VAC 1.61A,374-432W
	Max Input Power	100-240 VAC, 50/60 Hz., 4.5-1.9A; 48-60 VDC 10.4A/8.3A
	Heat Dissipation	1622 BTU/hr
	TEMPERATURE AND HUMIDITY RANGES	
	Operating Temperature	41°F to 104°F (5°C to 40°C)
	Shipping Temperature	-40°F to 158°F (-40°C to 70°C)
	Operating Humidity	10% to 90% RH @ 104°F (40°C) non-condensing
	Non-Operating Humidity	Up to 93% RH @ 104°F (40°C)
	DECLARED ACOUSTIC NOISE LEVELS	
	Sound Power	A weighted sound power LWAd=6,75 B
	Sound Pressure	A weighted sound pressure LpAm - 55dB
	SHOCK AND VIBRATION	
	Shock, Operational	3G's for 11 milliseconds
	Shock, Non-Operational	15G 11ms half sine
	Vibration, Operational	5-500Hz, 0.14 Grms shaped
	Vibration, Non-Operational	3-365-3Hz, 1.22 Grms,z-axis,0.85 Grms, X&Y axis shaped spectrum
	PHYSICAL	
	Height	3.5 in/ 8.9 cm
	Depth (excluding cables) (back of ear to back of controller handle)	MSA 2040 SFF 24-bay array: 19.5 in / 49.5 cm MSA 2040 LFF 12-bay array: 22.5in. / 57.2 cm
	Width (body only)	17.6 in / 44.7 cm (w/ ears 19 in / 48.26 cm)
	Chassis Weight (no controllers)	MSA 2040 LFF chassis: 31 lbs. (DC-pwr model: 32.6 lbs) MSA 2040 SFF chassis: 29.1 lbs (DC-pwr model: 30.7lbs)

MSA 2040 Controllers:	**User Interface**	Status and activity provided via management interfaces. Status Indicators on front of Controller
	RAID Support	0, 1, 3, 5, 6, 10, 50
	Cache Memory	4GB Read/Write. ECC protection with backup to Flash memory (indefinite backup)
	Cache Backup	ECC protection with back up to flash memory (indefinite backup)
	Upgradeable Firmware	yes
	Disk Drive and Enclosure Protocol	6 Gb SAS - Serial Attached SCSI

Technical Specifications

	Support	
	Host Ports	FC: 4 x 8Gb Fibre Channel (per controller) FC: 4 x 16Gb Fibre Channel (per controller) iSCSI: 4 x 10GbE iSCSI (per controller) iSCSI: 4 x 1GbE iSCSI (per controller)
		SAS: 4 x 12 Gb mini-SAS HD using SAS 3.0 SFF-8644 connect interface (per controller)
	Expansion Port	SAS (SFF8088) 4x lane 6 Gb SAS
	Weight, controller	MSA 2040 SAN Controllers 4.8 lbs.

MSA 2040 Regulatory Info	**Safety**	UL 60950-1 (USA)
		CAN/CSA-C22.2 No.60950-1-03 (Canada)
		EN 60950-1 (European Union)
		GS mark (Germany)
		IEC 60950-1 (International)
		CCC Mark (power supply only, China PRC)
	Electromagnetic Compatibility	VCCI:2008-04 Class A (Japan)
		FCC 15:109(g) Class A (USA)
		ICES-003:2004 Class A (Canada)
		EN55022 : (European Union Class A); CISPR 22 (International Class A)
		EN61000-3-2 : (Harmonics) (European Union)
		EN61000-3-3 : (Flicker) (European Union)
		EN 55024 (European Union, Immunity, Class A);CISPR 24 (International Immunity, Class A)
		AS/NZS CISPR 22, Class A (Australia, New Zealand)
		CNS 13438 Taiwan, Class A (Taiwan)
		KN22 Class A (Emissions Class A); KN24 (Immunity) (S Korea)
	RoHS and WEEE	RoHS-6/6 Compliance, China RoHS, WEEE
	Country Approvals	United States ,Australia/New Zealand, Canada, China (PRC), European Union, Germany (GS Mark), Japan, South Korea, Taiwan

Summary of Changes

Date	Version History	Action	Description of Change
16-Feb-2016	From Version 20 to 21	Changed	Changes made throughout the QuickSpecs.
04-Dec-2015	From Version 19 to 20	Added	Made two important updates on: 1. Added a note on Performance Auto Tiering LTU 2. Added a note on Read cache
01-Dec-2015	From Version 18 to 19	Changed	Changes made throughout the QuickSpecs . Rebranded Edition.
18-Sept-2015	From Version 17 to 18	Changed	Changed made to the Configuration Information section.
21-Aug-2015	From Version 16 to 17	Changed	Changes made to the Models, Features, Software and Configuration Information Sections.
17-Aug-2015	From Version 15 to 16	Changed	Changes made throughout the QuickSpecs.
19-Jun-2015	From Version 14 to 15	Changed	1. New Link to the ENERGY STAR listing on the EPA website 2. Correction to one of the ENERGY STAR SKU 3. Formatting changes and alignment 4. Update of the Benchmark Performance results 5. Note on the GL210 storage pool limit
1-Jun-2015	From Version 13 to 14	Changed	Changes made throughout the QuickSpecs.
10-Apr-2015	From Version 12 to 13	Changed	What´s new, Models, Family Information, Configuration Information sections were updated
3-Apr-2015	From Version 11 to 12	Changed	Changes made to the What´s New, Models, Family Info, Optional SW and Config Info. Sections.
30-Mar-2015	From Version 10 to 11	Changed	SKUs descriptions were updated, Obsolete SKU were removed.
0-Jan-1900		Added	Support for 12G SFF and LFF w Hard Disk Drives
12-Dec-2014	From version 9 to 10	Changed	Added the Configuration Table for mixing SFPs. on the Features Section
1-Dec-2014	From Version 8 to 9	Changed	Changes made throughout the QuickSpecs.
29-Sep-2014	From Version 7 to 8	Changed	Changes made throughout the QuickSpecs.
2-May-2014	From Version 6 to 7	Changed	Operate and Support and Basic Care were revised.
25-Apr-2014	From Version 5 to 6	Changed	Models and mini-SAS cables were revised.
31-Mar-2014	From Version 4 to 5	Changed	Hard Drives were revised.
9-Dec-2013	From Version 3 to 4	Changed	Changes made to the What's New section: Introducing a new 1.2 TB SFF 10K Enterprise Hard Drive (E7W47A) Adding two new MSA 2040 bundles using the new 1.2 TB SFF SAS Hard Drive C8R16A - HPE MSA 2040 SAN Dual Controller 24x1.2TB SAS 10K SFF HDD 28.8TB Bundle

Summary of Changes

			C8S56A - HPE MSA 2040 SAS Dual Controller 24x1.2TB SAS 10K SFF HDD 28.8TB Bundle
30-Sep-2013	From Version 2 to 3	Changed	Changes made throughout the entire QuickSpec. Changed What's New in the MSA 2000 array family to: Adding 12Gb SAS Models -support up to Four 6Gb/12Gb SAS connections per controller. Adding support for 1GbE/10GbE iSCSI to MSA 2040 SAN Controller. **NOTE:** Customers must upgrade their MSA 2040 controller firmware to GL101 or later for iSCSI functionality. Adding support for HPE MSA 2040 SAN Controller to offer a combination of host interface protocols by mixing FC and iSCSI SFPs on the same controller. Please refer to the valid Configuration Table for Mixing SFPs in this doc. Adding support for new 1.2 TB SFF SAS and 4TB LFF SAS Midline drive.
21-Aug-2013	From Version 1 to 2	Changed	Changes made in the Family Information and Configuration Information sections.

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