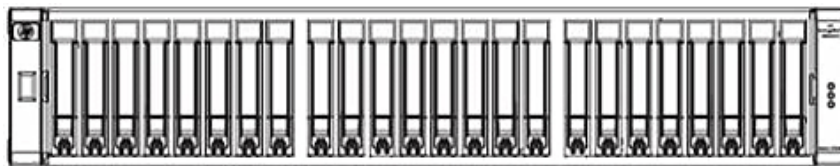## Overview

HPE MSA 1040 Storage

The HPE MSA 1040 Storage is designed for entry-level market needs, features 8Gb Fibre Channel, 12 Gb SAS, and 1GbE and 10GbE iSCSI at previously unattainable entry price points. The array allows users to take advantage of the latest storage technologies in simple and efficient ways by providing a good balance between performance and budget resulting in a highly favorable $/GB return on their investment.

Entry consolidation and virtualization initiatives are now well in your budgetary reach. The MSA 1040 offers many of MSA 2040 features but at more affordable entry price point. ProLiant and BladeSystems administrators as well as IT generalists will find storage management tasks simple and intuitive with MSA.

The MSA 1040 arrays leverage a new 4th-generation MSA architecture with a new processor, 2-host ports and 4GB data cache and 2GB of system memory per controller. Take advantage of the latest hard drive advances by choosing the form factor and technology which best meets your application and budget requirements. Unlike many competing arrays, the MSA 1040 ships standard with intuitive management tools and powerful data services such as Snapshots and Volume Copy for increased data protection. The MSA1040 now offers a simplified licensing strategy with one optional software suite. The Advanced Data Services Suite include the following software licenses:
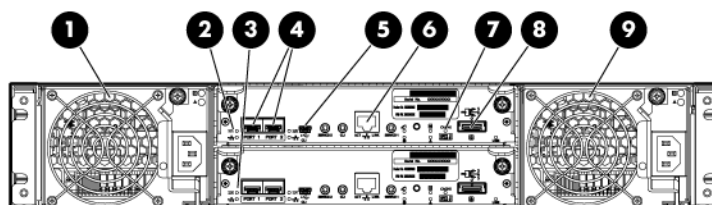- HPE MSA 2042 Performance Automated Tiering LTU
- HPE MSA 512-Snapshot Software LTU
- HPE MSA Remote Snap Software LTU

HPE MSA 1040 Storage (SFF)
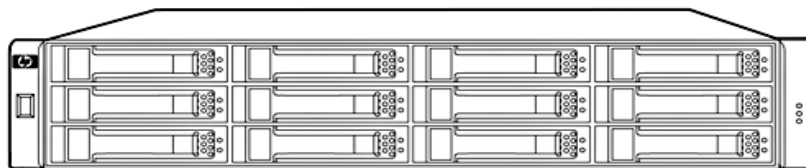
HPE MSA 1040 Storage (LFF)

Overview

MSA 1040, shown with 2 controllers installed

1. Power supply 1
2. Controller Module A
3. Controller Module B
4. CLI Port (mini USB)
5. CLI Port (mini USB)
6. Network Management Port
7. Cache Status LED
8. SAS Expansion Port
9. Power Supply

Models

HPE MSA 1040 Storage Models	**MSA 1040 Pre-Configured Models**

HP MSA 1040 2-port Fibre Channel Dual Controller LFF Storage[1]	E7V99A
HP MSA 1040 2-port Fibre Channel Dual Controller SFF Storage[2]	E7W00A
HP MSA 1040 2-port SAS Dual Controller LFF Storage[3]	K2Q90A
HP MSA 1040 2-port SAS Dual Controller SFF Storage[4]	K2Q89A
HP MSA 1040 2-port 1G iSCSI Dual Controller LFF Storage[5]	E7W01A
HP MSA 1040 2-port 1G iSCSI Dual Controller SFF Storage[6]	E7W02A
HP MSA 1040 2-port 10G iSCSI Dual Controller LFF Storage[7]	E7W03A
HP MSA 1040 2-port 10G iSCSI Dual Controller SFF Storage[8]	E7W04A

NOTE:
[1]Includes LFF Array Chassis + two MSA 1040 FC 2-port controllers, SFPs installed, drives not included.
[2]Includes SFF Array Chassis + two MSA 1040 FC 2-port controllers, SFPs installed, drives not included.
[3]Includes LFF Array Chassis + two MSA 1040 SAS 2-port controllers, drives not included.
[4]Includes SFF Array Chassis + two MSA 1040 SAS 2-port controllers, drives not included.
[5]Includes LFF Array Chassis + two MSA 1040 1GbE 2-port controllers, SFPs installed, drives not included.
[6]Includes SFF Array Chassis + two MSA 1040 1GbE 2-port controllers, SFPs installed, drives not included.
[7]Includes LFF Array Chassis + two MSA 1040 10GbE 2-port controllers, SFPs installed, drives not included, direct attached copper cables are supported in 10GbE Controller systems.
[8]Includes SFF Array Chassis + two MSA 1040 10GbE 2-port controllers, SFPs installed, drives not included, direct attached copper cables are supported in 10GbE Controller systems.

Smart Buys	Smart Buys 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 300GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F44SB
HP MSA 600GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F46SB
HP MSA 1.2TB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F48SB
HP MSA 1.8TB 12G SAS 10K SFF (2.5in) 512e Enterprise 3yr Warranty Hard Drive	J9F49SB
HP MSA 200GB 12G ME SAS SFF (2.5in) Enterprise Mainstream 3yr Warranty Solid State Drive	K2Q45SB

Smart Buy MSA 1040 Storage System

HP MSA 1040 2-port Fibre Channel Dual Controller LFF Storage/S-Buy	E7V99SB
HP MSA 1040 2-port Fibre Channel Dual Controller SFF Storage/S-Buy	E7W00SB
HP MSA 1040 2-port 1G iSCSI Dual Controller LFF Storage/S-Buy	E7W01SB
HP MSA 1040 2-port 1G iSCSI Dual Controller SFF Storage/S-Buy	E7W02SB
HP MSA 1040 2-port 10G iSCSI Dual Controller LFF Storage/S-Buy	E7W03SB
HP MSA 1040 2-port 10G iSCSI Dual Controller SFF Storage/S-Buy	E7W04SB
HP MSA 1040 1Gb iSCSI w/12 300GB SAS 10K SFF (2.5in) Hard Drive Bundle/S-Buy	K2Q05SB
HP MSA 1040 1Gb iSCSI w/12 900GB SAS 10K SFF (2.5in) Hard Drive Bundle/S-Buy	K2Q06SB

Models

HP MSA 1040 10Gb iSCSI w/12 300GB SAS 10K SFF (2.5in) Hard Drive Bundle/S-Buy	K2Q07SB
HP MSA 1040 10Gb iSCSI w/12 900GB SAS 10K SFF (2.5in) Hard Drive Bundle/S-Buy	K2Q08SB

Smart Buy Disk Enclosures

HP D2700 Disk Enclosure/S-Buy	AJ941SB

Features

All MSA 1040 models offer a common set of valuable features:

- Ease of management featuring browser-based out-of-band access. This allows a department or small company to effectively handle growing storage requirements, with the aid of an intuitive GUI to administer the unit with a minimum of complexity. Ideal for local or remote installations.
- Storage Management Utility V3 (SMU). This new MSA management GUI brings a new modern look and feel to array management. SMU V3 is 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 when 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 1040 comes standard with 64 controller-based snapshots and clone capability (volume copy is only available on linear storage with pre-GL220 firmware; volume copy for both linear and virtual storage is available with GL220 firmware or newer). There is also an optional license for 512 snapshots.
- Dual controller array models with automated failover for high availability.
- All models support a wide variety of drives: High-performance enterprise-class SAS, and high-capacity SAS Midline drives.
- The MSA 1040 will support a maximum of 3 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 48 LFF or 99 SFF drives.
- Disk Groups support 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 and the purchases virtualization license 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 and the advanced Virtualization license needs to be purchased separately.
- Snapshot enhancements for virtual storage, including performance improvements, hierarchical snapshots, and simplified resource management. These enhancements are offered with GL200 or newer firmware and with the purchase of advanced Virtualization license.
- 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.
- Scheduler to schedule virtual storage snapshots for replication with GL220 firmware or later.
- SSD support is available with GL220 firmware or newer. With SSD support customers can enable advanced virtualization features such as read cache and automated tiering (requires Advanced Virtualization Upgrade License). SSD performance tier requires additional Performance Auto Tiering License.
- Virtual tier affinity allows customers to prioritize data by assigning appropriate affinity level (Performance, No Affinity & Archive) with GL220 firmware or later.

Non-disruptive on-line controller code upgrade (requires dual controllers w/ multi-pathing software) Upgradable by design. Owners of a P2000 G3 array are able to do data-in-place upgrades to the new MSA 1040 array.

This unique ability protects the earlier investments in drives, and JBODs.

NOTE: Certain limitations are applicable- please review MSA 1040-2040 Upgrade Technical Whitepaper before upgrading your P2000 G3 systems **http://www.hpe.com/h20195/v2/GetDocument.aspx?docname=4AA4-6830ENW**

Features

Application Solutions   The HPE MSA 1040 Storage is the ideal solution for customers running Oracle, Microsoft, SAP environments and those customers who are deploying virtual server technologies like VMware, Hyper-V. The MSA 1040 delivers enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HPE MSA 1040 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 1040, Hewlett Packard Enterprise 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.hp.com/go/MSA**
HPE Storage for Oracle hyperlink to: **http://www.hp.com/storage/oracle**
HPE Storage for Microsoft hyperlink to: **http://www.hp.com/storage/microsoft**
HPE Storage for SAP hyperlink to: **http://www.hp.com/storage/sap**
HPE Storage for VMware hyperlink to: **http://www.hp.com/go/vmware/storage**

Family Information

	MSA 1040
Capacity Single Enclosure and Maximum Additional Drive Enclosures	**LFF**: 144 TB (single LFF array-head -using 12 x 12TB LFF SAS MDL drives) 576 TB (by adding 3 LFF Disk Enclosures behind LFF Array & using 12 TB LFF SAS MDL drives) **SFF**: 76.8 TB (single SFF array-head - using 24 x 3.2TB SFF SSD drives) 307.2 TB (by adding 3 SFF Disk Enclosures behind SFF Array & using 3.2TB SFF SSD 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 cache = 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	2 x 8Gb Fibre Channel ports per controller 2 x 1GbE RJ-45 ports per controller 2 x 10GbE ports per controller 2x 12Gb SAS ports per controller
Maximum Drives w/ 3 expansion	48 LFF/99 SFF
Maximum Host Supported	64 in v2 UI 512 in v3 UI
Standard Software	Snapshots (64)
Optional Software	Remote Snap (linear storage only) Max Snapshot (512)

Product Technology

MSA 1040 Models	MSA 1040 Storage offers 4 factory configured models: MSA 1040 8Gb FC with 2-ports per controller MSA 1040 12Gb SAS with 2-ports per controller MSA 1040 1GbE iSCSI with 2-ports per controller MSA 1040 10GbE iSCSI with 2-ports per controller
Modular Chassis	2U rack height. 12 Large Form Factor or 24 Small Form Factor drive bays, accommodating SAS and SAS MDL Drives
Optional Disk Enclosures	Just as the user has a choice of chassis for the array head (LFF and SFF drive bays), so also do they have a choice of expansion disk enclosures accommodating either drive size. The MSA LFF and the SFF disk enclosures can be hot-added to an operating array. SFF and LFF Array heads and Disk

Family Information

Enclosures can be mixed without limitations.

The MSA 1040 storage systems have supported various SFF and LFF disk enclosures over time. The latest disk enclosures to be supported on the MSA 1040 platform are the MSA 2050 SFF Disk Enclosure and the MSA 2050 LFF Disk Enclosures.   The MSA 2050 SFF and LFF enclosures can be added to existing MSA 1040 storage systems for expansion disk capacity. The MSA 2050 SFF and LFF disk enclosures can be intermixed with the D2700 SFF disk enclosure and/or the MSA 2040 LFF disk enclosure when connected to the MSA 1050 base system.

The MSA 2050 SFF and LFF disk enclosures are the recommended enclosures to be used for capacity expansion on the MSA 2040 storage system.

LFF Disk Enclosures

MSA 2040 LFF 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 1040 LFF or SFF array head.
- Each configured model ships standard with two .5m mini-SAS to mini-SAS cables for connection to the MSA 1040 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 3 total Disk Enclosures

MSA 2050 LFF Disk Enclosure. This 2U enclosure is designed to support twelve HPE Storage LFF drives and accepts MSA dual-ported 12Gb SSD and SAS Midline hard drives. The pre-configured MSA 2050 LFF Disk Enclosure (Q1J06A) has two I/O modules and supports the MSA 1040 dual controller arrays.
- The MSA 2050 LFF Disk Enclosure can be attached to the MSA 1040 LFF or SFF storage models.
- Each MSA 2050 LFF Disk Enclosure ships standard with two .5m mini-SAS to mini-SAS cables for connection to the MSA 1040 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 3 total Disk Enclosures on the MSA 1040 storage models.
- Requires GL225 array controller firmware or newer
- **The MSA 2050 LFF Disk Enclosures are the recommended LFF enclosures to be used for capacity expansion on the MSA 2040 storage system**.

SFF Disk Enclosures

HP D2700 Disk 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.

HPE MSA 2050 SFF Disk Enclosure (Q1J07A) This 2U enclosure is designed to support twenty four HPE Storage 2.5-inch SFF drive bays and accepts MSA dual ported 12Gb SSD, Enterprise SAS, or SAS Midline hard drives. The pre-configured MSA 2050 SFF Disk Enclosure has two I/O modules and supports the MSA 1040 dual controller arrays.

- The MSA 2050 SFF Disk Enclosure can be attached to the MSA 1040 LFF or SFF storage models
- Each MSA 2050 SFF Disk Enclosure ships standard with a two .5m mini-SAS to mini-SAS cables for connection to the MSA 1040 array expansion port or existing disk enclosure

Family Information

cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 3 total Disk Enclosures.
- Requires GL225 array controller firmware or newer
- The MSA 2050 SFF Disk Enclosures are the recommended SFF enclosures to be used for capacity expansion on the MSA 1040 storage system

Scalability

The MSA 1040 Arrays are designed to allow an installation to begin with smaller capacity and be able to grow gradually as needed. The flexibility of 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 120 TB SAS MDL, expandable to 480 TB SAS MDL with the addition of a maximum of three MSA 3.5 LFF-inch Disk Enclosures.
- Small Form Factor configurations can scale from 43.2 TB SAS. With the addition of three D2700 JBODs, the MSA 1040 storage can support 178.2 TB SAS.

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 the Virtual 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) 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 1040 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 (128TiB), 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 1040 features several important additional levels. RAID 6 is 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. 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 preliminary performance figures provided here are for your reference as many variables exist between array configurations, workloads, hard drive types, vdisk setup parameters and host system setup. All Performance information is measure using Linear Storage.

MSA 1040 Array Performance (with SSDs)[1]	HPE MSA 1040 8Gb FC Controllers	HPE MSA 1040 10GbE Controllers	HPE MSA 1040 1GbE Controllers	HPE MSA 1040 SAS Controllers
Protocol (host connect)	8Gb Fibre Channel	10GbE iSCSI	1GbE iSCSI	6Gb SAS

Family Information

MSA 1040 RAID 1 Performance Results				
Random Reads IOPS	72,900	69,100	53,400	71,200
Random Writes IOPS	29,100	28,000	27,900	29,000
Random Mix 60/40 IOPS	42,700	41,200	40,700	42,300
MSA 1040 RAID 5 Performance Results				
Random Reads IOPS	69,700	66,000	53,300	68,700
Random Writes IOPS	16,200	15,900	15,900	16,000
Random Mix 60/40 IOPS	28,500	27,900	25,100	28,100
MSA 1040 RAID 6 Performance Results				
Random Reads IOPS	69,500	66,700	53,500	68,600
Random Writes IOPS	13,000	12,700	12,600	13,000
Random Mix 60/40 IOPS	24,800	24,300	24,000	24,600

NOTE: 1) SSD's were used in a dual controller configuration of 4 vdisks consisting of two disks per vdisk and 1 volume per host. 4 hosts directly attached to the HPE MSA 1040 array were used in this test configuration (results cannot be expected with a single host).

MSA 1040 Array Performance (with HDDs)[2]	HPE MSA 1040 8Gb FC Controllers	HPE MSA 1040 10GbE Controllers	HPE MSA 1040 1GbE Controllers	HPE MSA 1040 SAS Controllers
Protocol (host connect)	8Gb Fibre Channel	10GbE iSCSI	1GbE iSCSI	6Gb SAS
MSA 1040 RAID 10 Performance Results				
Random Reads IOPS	29,400	29,200	28,900	29,500
Random Writes IOPS	23,000	22,500	22,500	22,000
Random Mix 60/40 IOPS	25,500	25,000	25,000	25,000
Sequential Reads MB/s	3,100	3,050	440	3,100
Sequential Writes MB/s	1,650	1,650	420	1,650
MSA 1040 RAID 5 Performance Results				
Random Reads IOPS	29,000	28,800	28,600	29,500
Random Writes IOPS	13,000	12,800	12,500	12,500
Random Mix 60/40 IOPS	16,500	16,500	16,500	16,500
Sequential Reads MB/s	3,100	3,050	440	3,100
Sequential Writes MB/s	2,900	2,700	430	2,800
MSA 1040 RAID 6 Performance Results				
Random Reads IOPS	29,000	28,800	28,500	29,500
Random Writes IOPS	9,500	9,500	9,500	8,700
Random Mix 60/40 IOPS	12,500	12,700	12,500	12,500
Sequential Reads MB/s	3,100	3,050	440	3,100
Sequential Writes MB/s	2,700	2,650	420	2,750

NOTE: 2) 300 GB 15K SAS drives were used in a dual controller configuration of 8 vdisks consisting of twelve disks per vdisk, 3.3 TB volumes, and 2 volumes per host. 4 hosts directly attached to the HPE MSA 1040 arrays were used in this test configuration (results cannot be expected with a single host).

Family Information

NOTE: MSA 1040 tests with 1GbE iSCSI used 4 hosts directly attached to the HPE MSA 1040 array.

- 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.

- All Fibre Channel results were measured using 16Gb FC Host Bus Adapters running at 8Gb. All 10GbE iSCSI results were measured using 10Gb iSCSI Host Bus Adapters. All 1GbE iSCSI results were measured using 1Gb network interface controllers (NICs). All 6Gb SAS results were measured using 6Gb SAS Host Bus Adapter.

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 1040 are designed to give a conservative reference point for comparisons.

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
Hot Plug Expansion and Replacement Support	All MSA 1040 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 1040 arrays come standard with 64 snaps, 512 snaps available. 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 1040 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.hp.com/storage/spock**.

Server Compatibility

NOTE: depends on protocol

Supports most HPE ProLiant and BladeSystems including

- HPE ProLiant DL, ML
- HPE c-Class Blade Servers
- Compatibility must be confirmed at: **http://www.hp.com/storage/spock**

Industry Standard servers support

- Supports most multi-vendor industry standard servers. Hewlett Packard Enterprise requires the Third-Party Server to be logo'd and listed on the Microsoft Windows Server Catalog.
- Refer to the Microsoft website: **https://www.windowsservercatalog.com/**
- 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-Hewlett Packard Enterprise servers will generally be supported if the HPE storage stack is used. This includes supported Hewlett Packard Enterprise branded HBAs and drivers, and supported FC

Family Information

switches.

OS Support   Refer to the Hewlett Packard Enterprise support statements for complete current OS version support:
http://www.hp.com/storage/spock

- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2016
- VMware
- HPE-UX
- Red Hat Linux
- SuSE SLES
- Solaris
- OpenVMS
- MAC OSX

Web Browser support

- The MSA 1040 supports target based management, and includes a Web interface and a telnet interface, and require a web browser for management.
- Beginning with GL200 or newer firmware, MSA 1040 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 1040 requires Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.

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.

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.hp.com/portal/swdepot/displayProductInfo.do?productNumber=System_Center

Optional Software

Advanced Data Services Software Suite

All software for the MSA platform is now included as a standard feature on the MSA 2042 at no extra charge. The MSA 2042 includes the Advanced Data Services Software Suite which includes the following software titles

1. HPE MSA 2040 Performance Automated Tiering LTU
2. HPE MSA 2040 512 Snapshot Software LTU
3. HPE MSA Remote Snap Software LTU

HPE MSA Advanced Data Services Suite LTU	Q0H99A
HPE MSA Advanced Data Services Suite E-LTU	Q0H99AAE

See below for a detailed description of each of these software features

HPE MSA 1040 Advanced Virtualized Features

A Virtualized Storage array is an extension to the Linear Storage building blocks (Vdisks)

Data is virtualized not only across a single Vdisk, as in Linear implementation, but also across multiple Disk Groups and additionally now across multiple Tiers of storage with different performance capabilities.

No new MSA 1040 hardware is required to take advantage of Virtualized Storage features available at a very low price point.

HPE MSA 1040 Adv Virtualized Upg LTU	D4T78A
HPE MSA 1040 Adv Virtualized Upg E-LTU	D4T78AAE

MSA Performance Tiering

Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 1040 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.

Beginning with GL220 or newer firmware, the MSA 2040 now supports sub-LUN tiering and automated data movement between tiers.

The MSA 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 1040 platform beginning with GL220 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. AutoTiering from SAS MDL (Archive Tier) to Enterprise SAS (Standard Tier) drives is provided with the Advanced Virtualization license specified above. To utilize a Performance SSD tier requires BOTH the Advanced Virtualization license and the Performance Auto Tiering license.

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 Storage 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

Optional Software

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 Storage, P2000, EVA, StoreVirtual Appliances, and the XP array series including the P9500.

When deployed with the MSA Storage array, HPE OneView for VMware vCenter provides the following:

- Active Management functionality for the MSA 1040 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 1040
- Displays LUN / volume connections from VMs and ESX servers to the arrays and provides the location and attributes of the MSA 1040 within the SAN
- Identifies what storage features are available to allow administrators to match the features available on the MSA 1040 to their requirements
- Provide a cluster-level view of the storage

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

For complete software requirements and compatibility lists, refer to the product documentation below and the HPE SPOCK website: **http://www.hp.com/storage/spock**

For more information on HPE Insight Control Storage Module for vCenter visit:
http://www.hp.com/go/vmware

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 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 Hp.com)
- SRM works with Remote Snap linear mode

Requires purchase of MSA 2040 Remote Snap licenses (one for each site)

Optional Software

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)

Snapshot and Volume Copy Software for the MSA 1040

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 1040 models.
- Support and updates are desired for bundled software functionalities (such as 64 LTU Snap and/or Volume Copy etc. in the MSA 1040 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 1040 Snapshot and Clone:
All MSA 1040 models come STANDARD with 64 snapshots and Volume Copy software.
512 Snapshot option is also available for additional cost.

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 1040 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 collocated 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

Optional Software

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.

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 Advanced Data Services 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.
- 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 1040 and/or MSA 2040/ 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. 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

Optional Software

Use Case - Scenario 1B
"Peer" sites with failover
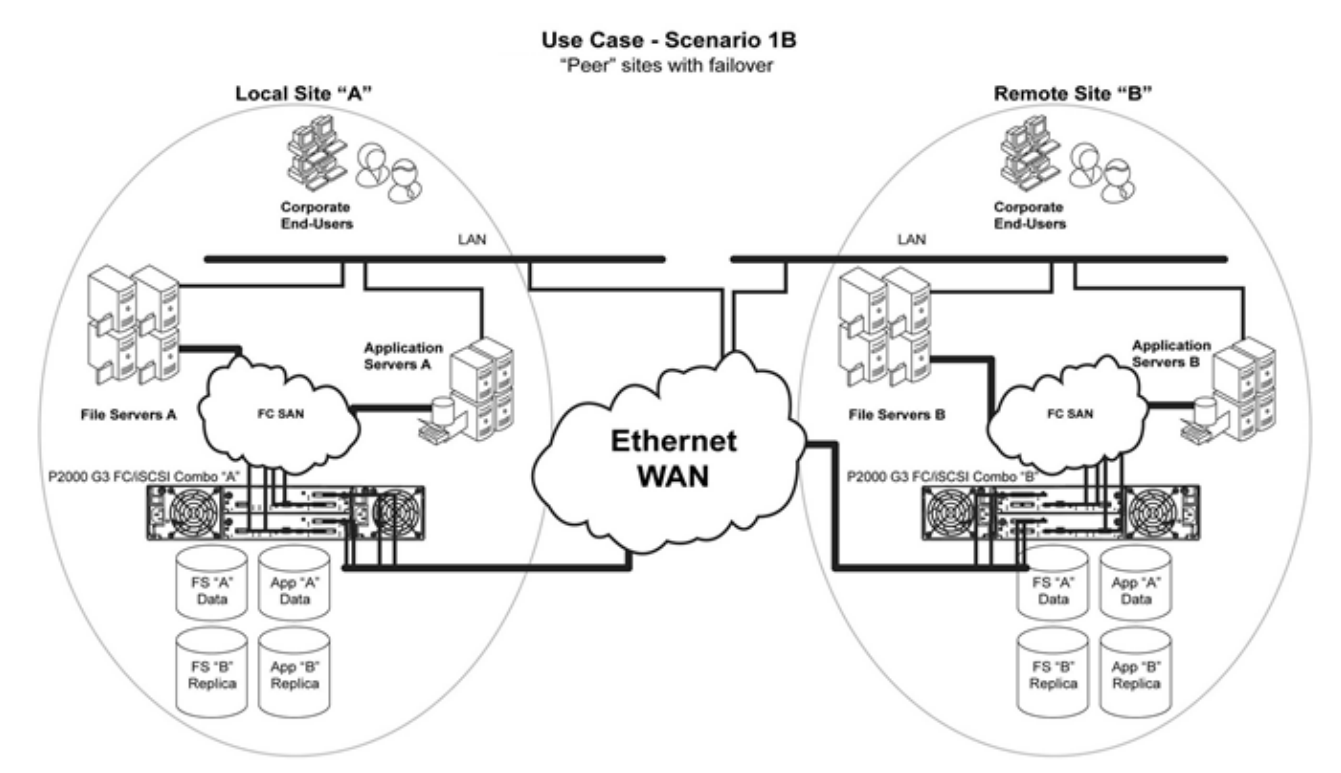
Customer Benefits

Disaster Recovery

Replication technology has typically been used to address disaster recovery issues. Disaster recovery is still the driving business case behind replication. Remote replication can be implemented from the production site to one or more remote sites across a campus, across town, across a state or across the country. When a disaster strikes the primary location, the applications can be brought up at the remote site and continue processing against the replicated copies. When the primary site is back online, the replication can be reversed and when the data is resynchronized, processing can be switched back to the primary site and business can continue. In the past, if an e-mail system experienced a disaster it was an "oh well" moment. The loss of a day or more of e-mail was not considered important. Today, e-mail is a critical component of many companies' business plans and recovering e-mail after a disaster quickly and completely is required.

Maintenance

HPE Remote Snap software can also be used to solve other business needs. For instance, E-mail servers may need periodic maintenance that can take hours to complete. With remote replication in place, the downtime can be minimal (as long as it takes to bring the remote peer of the primary e-mail server online). The primary server can be worked on (patches, hardware upgrades, etc.) and then brought back online and into production. A whole datacenter can be failed over to a remote site on purpose to perform maintenance on generators, air conditioning, etc. Replication can also be used to perform a datacenter move with minimal downtime (fail everything to the DR site, move the production datacenter to its new location then fail the DR site back to the new datacenter).

Storage Based

Data replication is performed at the storage subsystem controller level and is totally transparent to the host, alleviating unnecessary host cycles to perform the data mirroring functions. Unlike a fabric based or host based solution, the storage based solution dedicates its resources to managing the replication process between arrays, with minimal impact to applications, other data or devices on the SAN.

Bi-Directional

The bidirectional HPE MSA 1040 Array solution addresses the growing need among businesses to ensure continuous availability of applications that are critical to daily business operations. HPE MSA 1040 enables two sites in a remote replication connection to use each other as a destination to maintain replicated copies of online data. This maximizes resource utilization while enabling business continuance, even in the event of disaster.

Disaster Tolerance

Optional Software

The MSA 1040 Arrays utilize snapshot data online and in real time to a remote MSA 1040 through a local or extended storage area network (SAN). Additionally, data replication can be bidirectional, meaning that a storage array can be both a source and a destination. A particular LUN can be replicated in only one direction between the two storage arrays. Write I/O data sent to the source is replicated by HPE MSA 1040 Array to the destination. A pair of properly configured HPE MSA 1040 arrays is a replication solution that guarantees data integrity in the event of a storage system or site failure.

First initial copy

When a DR site is initially created an initial copy of the data from the source volume to the target volume must occur. The MSA 1040 array allows this first copy to take place locally. After completion the disks can me manually moved to the remote location. Subsequent changes will only remotely copy the changed blocks.

SAN Extensions

HPE MSA 1040 Array provides the capability to replicate data over direct Fibre Channel. The distances supported over dark fiber are determined by the speed of the dark fiber connection and the technology used to communicate over the dark fiber.

Path failover (MPIO)   Multipath failover (MPIO) is supported on all operating systems

HPE StoreEasy 3000 Gateway Storage

Add more value to your MSA 1040 array

HPE MSA combined with HPE StoreEasy 3850 Gateway Storage enables you to consolidate block and file storage onto a single, high-performance system - giving your business the flexibility to meet changing business needs on-demand.

The HPE StoreEasy 3850 delivers efficient, secure, and highly available file services that help address your changing file-serving needs. It reduces your cost of ownership by simplifying management, increasing resource utilization, centralizing growth, and protecting data. HPE StoreEasy 3850 provides a simple and consistent experience for managing block and file storage for multiple workloads centrally.

NOTE: For more information visit: **http://www.hp.com/go/StoreEasy**

HPE StoreEasy 3850 Gateway Storage	K2R69A
HPE StoreEasy 3850 Gateway Single Node	K2R70A
HPE StoreEasy 3850 Gateway Blade Storage	K2R72A

Service and Support, HPE Care Pack, and Warranty Information

Warranty	Three-year limited warranty, parts exchange Next Business day delivery
	Enclosures, Hard drives, and Options for the MSA 1040 carry their own warranty. Refer to The Hewlett Packard Enterprise Limited Warranty Statement for more information.
	The MSA 1040 has been designed with customer self-repairable parts to minimize repair time and provide greater flexibility in performing defective parts replacement. Please refer to The Hewlett Packard Enterprise limited warranty Statement and parts replacement instructions for further details.
	http://h18006.www1.hp.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 1040 models is different for SAS hard drives versus SAS MDL. SAS hard drive options have a three year warranty and SAS MDL
	NOTE: Firmware updates beyond the 3 year warranty period requires a support contract.
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
	NOTE: SSDs used for replacement will be of equal or greater capacity and are designed to meet or exceed the original SSD warranty. Replacement drive/s could be of the same model drive or of a different model qualified to operate interchangeably inside the MSA array. Warranties of these components are unaffected by any substitution.
Service and Support	**Services to accelerate time to results**
	HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Our integrated portfolio of Services for storage help customers reduce costs, optimize data, streamline storage management, and improve backup and recovery. HPE Support Services enable you to choose the right service level, length of coverage and response time as you purchase your new storage solution, giving you full entitlement for the support for need for your IT and business
Connect your devices	Unlock all of the benefits of your technology investment by connecting your products to HP Enterprise. Achieve up to 77%[1] reduction in down time, near 100%[2] diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HPE support.
	[1] IDC whitepaper - The Business Value of Connected Support from HP, March 2015
	[2] HP CSC reports 2014 – 2015
Optimized Care	**HPE Proactive Care with 6 hour call-to-repair commitment, three year Support Service**
	HPE Proactive Care gives customers an enhanced call experience plus helps preventing problems and maintains IT stability by utilizing tailored, proactive reports with recommendations and advice when your products are connected to HPE. This Service combines three years' proactive reporting and advice with our highest level of hardware support - HPE's 24x7, six hour hardware call-to-repair. HPE is the only leading manufacturer who makes this level of coverage available as a standard service offering for your

Service and Support, HPE Care Pack, and Warranty Information

most valuable storage systems.
https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf

Standard Care

HPE Proactive Care with 24x7 coverage, three year Support Service
HPE Proactive Care gives customers an enhanced call experience plus helps preventing problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice when your products are connected to HPE. This Service combines three years' proactive reporting and advice with our 24x7 coverage, four hour hardware response time when there is a problem.
https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf

Basic Care

HPE Foundation Care 24x7, three-year Support Service
HPE Foundation Care 24x7 gives you access to HPE 24 hours a day, seven days a week for assistance on resolving issues. This service includes need based Hardware onsite response within four hours. Simplify your support experience and make HPE your first call to help resolve hardware or software problems.
https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en

Related Services

Choose from a rich portfolio of services to make the most of MSA 2042 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 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/5982-4107en.pdf

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/4aa3-9475enw.pdf

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 Support Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners.

Configuration Information

Configure to Order Program Information

Hewlett Packard Enterprise has a very successful Configure to Order program for the MSA 1040 family. The MSA 1040 models and options may be factory installed in a rack with switches, disk enclosures and hard drives. The MSA 1040 arrays may be integrated with ProLiant servers or as standalone storage.
Orders to be shipped through the CTO process must have a minimum of four drives of the same type (SAS or SAS MDL).

Step 1 - MSA 1040 - Base Configuration

Select one model:

Model Name	SKUs
HP MSA 1040 2-port Fibre Channel Dual Controller LFF Storage[1]	E7V99A
HP MSA 1040 2-port Fibre Channel Dual Controller SFF Storage2	E7W00A
HP MSA 1040 2-port SAS Dual Controller LFF Storage[3]	K2Q90A
HP MSA 1040 2-port SAS Dual Controller SFF Storage[4]	K2Q89A
HP MSA 1040 2-port 1G iSCSI Dual Controller LFF Storage[5]	E7W01A
HP MSA 1040 2-port 1G iSCSI Dual Controller SFF Storage[6]	E7W02A
HP MSA 1040 2-port 10G iSCSI Dual Controller LFF Storage[7]	E7W03A
HP MSA 1040 2-port 10G iSCSI Dual Controller SFF Storage[8]	E7W04A

NOTE:
[1]Includes LFF Array Chassis + two MSA 1040 FC 2-port controllers, SFPs installed, drives not included
[2]Includes SFF Array Chassis + two MSA 1040 FC 2-port controllers, SFPs installed, drives not included
[3]Includes LFF Array Chassis + two MSA 1040 SAS 2-port controllers, drives not included
[4]Includes SFF Array Chassis + two MSA 1040 SAS 2-port controllers, drives not included
[5]Includes LFF Array Chassis + two MSA 1040 1GbE 2-port controllers, SFPs installed, drives not included
[6]Includes SFF Array Chassis + two MSA 1040 1GbE 2-port controllers, SFPs installed, drives not included
[7]Includes LFF Array Chassis + two MSA 1040 10GbE 2-port controllers, SFPs installed, drives not included, direct attached copper cables are supported in 10GbE Controller systems
[8]Includes SFF Array Chassis + two MSA 1040 10GbE 2-port controllers, SFPs installed, drives not included, direct attached copper cables are supported in 10GbE Controller systems

Step 2 - Options

Select each option with quantities specified.

Step 2a - SAS or SAS MDL Drive Options   **SKUs**

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 SAS drives. MSA 3.5-inch or 2.5-inch drives are for use only with MSA arrays and supported Disk Enclosures.

MSA 1040 Drives:

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 600GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F42A
HPE MSA 900GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	Q1H47A

12G SFF 10K SAS HDDs

HP MSA 300GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F44A

Configuration Information

HP MSA 600GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F46A
HP MSA 1.2TB 12G SAS 10K SFF(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
HPE MSA 2.4TB 12G SAS 10K SFF (2.5in) Enterprise 512e 3yr Warranty Hard Drive	Q2R41A

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

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

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

12G SFF SAS SSDs (Mixed Use)

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

MSA Large Form Factor (LFF) SAS MDL DP drives for MSA 1040 Array

12G LFF 7.2K SAS Midline (MDL) HDDs

HPE MSA 12TB 12G SAS 7.2K LFF (3.5in) Midline 512e 1yr Warranty Hard Drive	Q2R42A
HPE MSA 10TB 12G SAS 7.2K LFF (3.5in) Midline 512e 1yr Wty Hard Drive	P9M82A
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) Midline 1yr Warranty Hard Drive	J9F43A
HP MSA 4TB 12G SAS 7.2K LFF (3.5in) Midline 1yr Warranty Hard Drive	K2Q82A

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

MSA Large Form Factor (LFF) SAS DP drives for MSA 1040 Array

12G LFF SAS SSDs (SFF Solid State Drives in LFF Converters)

HPE MSA 400GB 12G SAS Mixed Use LFF (3.5in) Converter Carrier 3yr Wty Solid State Drive	P9M79A
HPE MSA 800GB 12G SAS Mixed Use LFF (3.5in) Converter Carrier 3yr Wty Solid State Drive	P9M80A

Step 2b - Drive Enclosure Options

Use either LFF or SFF disk enclosures with either Large or Small Form Factor array heads. Each enclosure ships with two .5m mini-SAS to mini-SAS cables.

HP MSA 2040 Energy Star LFF Disk Enclosure	M0S96A
HP D2700 Disk Enclosure	AJ941A
HPE MSA 2050 LFF Disk Enclosure	Q1J06A
HPE MSA 2050 SFF Disk Enclosure	Q1J07A

NOTE:
- The MSA 2050 LFF and SFF Disk Enclosures requires GL225 firmware, or newer.
- The use of MSA 2050 LFF and SFF Disk Enclosures with MSA 1040/2040/2042 storage requires requires GL225 array controller firmware, or newer.

Step 2c - SAS Cable Options

miniSAS to miniSAS Cables:
Connecting MSA 1040 Controller to a disk enclosure where a longer cable is desired.

Configuration Information

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

Step 3 - Other MSA 1040 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.

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

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
	HP 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 4 - Choose Supported Options For SAS Infrastructure

Supported options	**Mini-SAS HD to Mini-SAS Fanout Cables**	
	HP Mini SAS High Density to Dual 2-lane Mini SAS External Fanout 1 Meter Cable	K2R02A
	HP Mini SAS High Density to Dual 2-lane Mini SAS External Fanout 2 Meter Cable	K2R03A
	HP Mini SAS High Density to Dual 2-lane Mini SAS External Fanout 4 Meter Cable	K2R04A

NOTE: Recommended to utilize Fanout cables when connecting to SAS HBAs for maximum future flexibility without downtime. The Fanout cables are not supported on the MSA 2040

	Mini-SAS HD to Mini-SAS HD Fanout Cables	
	HP Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 1 Meter Cable	K2Q99A
	HP Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 2 Meter	K2R00A

Configuration Information

Cable

HP Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 4 Meter Cable	K2R01A

NOTE: Recommended to utilize Fanout cables when connecting to SAS HBAs for maximum future flexibility without downtime. The Fanout cables are not supported on the MSA 2040

Mini-SAS HD to Mini-SAS Cables

HP 1.0m External Mini SAS High Density to Mini SAS Cable	716189-B21

NOTE: This cable is used to connect 6Gb SAS initiator to MSA 2040 SAS controller. This is not used for connecting to a disk enclosure.

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: Recommended to utilize standard cable when connecting to Blade enclosure switches.

Mini-SAS HD to Mini-SAS HD Cables

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

SAS Controllers

HPE Smart Array P408e-m SR Gen10 12G SAS Mezzanine Controller	804381-B21
HP Smart Array P441/4GB FBWC 12Gb 2-ports Ext SAS Controller	726825-B21
HPE Smart Array P408e-p SR Gen10 12G SAS PCIe Plug-in Controller	804405-B21
HP Smart Array P441/4GB FBWC 12Gb 2-ports Ext SAS Controller	726782-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

Configuration Information

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)
NOTE: Direct attached copper cables are supported in 10GbE Controller systems

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	HPE X242 10G SFP+ to SFP+ 1m Direct Attach Copper Cable	J9281B
	HPE X242 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	J9283B
	HPE X242 10G SFP+ to SFP+ 7m Direct Attach Copper Cable	J9285B
	HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable	JG081C
	HPE FlexNetwork X240 10G SFP+ SFP+ 7m Direct Attach Copper Cable	JC784C

iSCSI Adapters   **NOTE:** OS Specific software iSCSI initiators are supported on NICs which conform to the IEEE Ethernet Standards. Review SPOCK for any changes to the hardware iSCSI adapters which are supported: **http://www.hp.com/storage/spock**

Step 5 - Software

Software   The MSA advanced virtualization functionalities are available as salable options for new and existing MSA 1040 owners. A firmware upgrade may be required
NOTE: The Advanced Data Services Suite includes a Performance Tiering LTU, 512 Snapshot Software LTU, and the Remote Snap Software LTU.

HPE MSA Advanced Data Services Suite LTU	Q0H99A
HPE MSA Advanced Data Services Suite E-LTU	Q0H99AAE
HPE MSA 1040 Adv Virtualized Upg LTU	D4T78A
HPE MSA 1040 Adv Virtualized Upg E-LTU	D4T78AAE

Technical Specifications

MSA 1040	**POWER REQUIREMENTS**	
	Input Power Requirements (typical-running I/O) SFF/LFF arrays	110VAC 3.20A, 343W; 220VAC 1.67A,337W
	Max Input Power	100-240 VAC, 50/60 Hz., 4.20-1.77A
	Heat Dissipation	1174 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	Per NEBS GR-63-CORE UNPACKAGED EQUIPMENT SHOCK CRITERIA (4.3.2)
	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 1040 SFF 24-bay array: 19.5 in / 49.5 cm MSA 1040 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 1040 LFF chassis: 31 lbs. (DC-pwr model: 32.6 lbs) MSA 1040 SFF chassis: 29.1 lbs (DC-pwr model: 30.7lbs)
MSA 1040 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 Support	6 Gb SAS - Serial Attached SCSI
	Host Ports	2 x 8Gb Fibre Channel per controller 2 x 1GbE iSCSI per controller 2 x 10GbE iSCSI per controller
	Expansion Port	SAS (SFF8088) 4x lane 6 Gb SAS
	Weight, controller	MSA 1040 Controllers 4.8 lbs.

Technical Specifications

MSA 1040 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:
05-Mar-2018	From Version 22 to 23	Added	Added MSA 2050 SFF and LFF Disk Enclosures as supported options on the MSA 1040 storage systems.
05-Feb-2018	From Version 21 to 22	Added	Added new Drive Capacities.
		Changed	Maximum Capacity with SFF and LFF drives. Family Information and Configuration Information were revised.
06-Nov-2017	From Version 20 to 21	Changed	Changes were made throughout the QuickSpecs
27-Mar-2017	From Version 19 to 20	Changed	Changes were made throughout the QuickSpecs
13-Feb-2017	From Version 18 to 19	Changed	Changes were made throughout the QuickSpecs
26-Sept-2016	From Version 17 to 18	Changed	Changes made to the Configuration Information, Family Information and Features Sections
15-Aug-2016	From Version 16 to 17	Changed	Changes were made throughout the QuickSpecs
13-May-2016	From Version 15 to 16	Changed	Changes made to the Configuration Info and Models Sections.
11-Mar-2016	From Version 14 to 15	Changed	Changed made to the What´s New, Models and Family Info Sections.
16-Feb-2016	From Version 13 to 14	Changed	Changes made to the Optional Software, Configuration information, Features and Service and Support Sections
04-Dec-2015	From Version 12 to 13	Changed	Corrected the description of the StoreEasy gateway SKU
23-Oct-2015	From Version 11 to 12	Changed	Changes were made throughout the QuickSpecs.
18-Sept-2015	From Version 10 to 11	Changed	Changes made to the Configuration Information Section.
21-Aug-2015	From Version 9 to 10	Changed	Changes were made throughout the QuickSpecs.
17-Jul-2015	From Version 8 to 9	Changed	Changed the Models, Family Info and Configuration information Sections
26-Jun-2015	From version 7 to 8	Changed	Changes made to the Optional Software, Family Information, Features and Overview Sections
01-Jun-2015	From Version 6 to 7	Changed	Changes were made throughout the QuickSpecs.
03-Apr-2015	From Version 5 to 6	Changed	Changes made to the What´s New, Family Info and Config Info. Sections.
30-Mar-2015	From version 4 to 5	Changed	SKUs descriptions updated, Obsolete SKUs removed
		Added	Introducing support for 12G SFF and LFF w Hard Disk Drives
01-Dec-2014	From Version 3 to 4	Changed	Changes were made throughout the QuickSpecs.
29-Sep-2014	From Version 2 to 3	Changed	Changes were made throughout the QuickSpecs
14-Apr-2014	From Version 1 to 2	Changed	Corrected the HTML Changes document.

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