Overview

HPE MSA 2042 Storage



HPE MSA 2042 Storage (SFF)



HPE MSA 2042 Storage (LFF)

The MSA 2042 further drives the MSA 2040 family into the world of flash acceleration with a new set of MSA models which includes 800GB of flash capacity in all SFF and LFF configurations. In addition to including 2x400GB Mixed Use SSDs in the base configuration, the MSA 2042 also includes a rich set of software features as standard including 512 Snapshots, Remote Replication and Performance Tiering capabilities, all at a very attractive price compared to other hybrid configurations. The 800GB of SSD capacity can be used as Read Cache or as a start to building a fully tiered configuration. With the inclusion of the Advanced Data Services SW License, customers can choose how to best utilize these SSDs to provide the optimal flash acceleration for their performance hungry applications. Both Read Cache and Performance Tiering utilize a real-time tiering algorithm which works without user intervention to place the most accessed data on the fastest medium at the right time. The MSA 2042 will dynamically move hot pages up to SSD for flash acceleration and move cooler, more stagnant data back down to spinning media as workloads change in real time hour-to-hour, day-to-day, and week-to-week. All done hands free and without any management overhead from the IT manager.

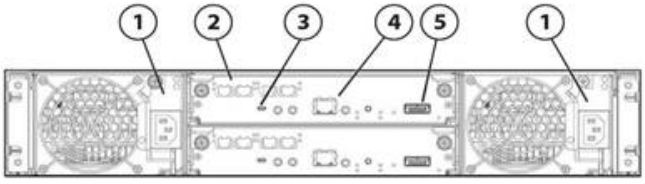
- **Starting at $10K, accelerate applications affordably**
  - The industry's leading entry array, now with 800GB of SSD capacity standard
  - Built-in, tiering dynamically moves hot data to flash and cold data to lower-cost media
- **Set it and forget it**
  - Hands-free data tiering engine eliminates performance bottlenecks with zero admin required
  - All-inclusive software suite and simple management tools for IT generalists & server admins
- **Reduce risk with modern disaster recovery and business continuity**
  - 512 snapshots out-of-the-box for instant recovery
  - Remote replication included for affordable application availability
- **Grow flexibly now and into the future**
  - Data-in-place upgrades eliminate risky data migrations and costly drive investments
  - Start small and scale as needed with any combination of SSD, Enterprise or Midline SAS drives

What's new with the MSA 2042

- Adding new higher capacity 2.4TB 12G SAS 10K SFF HDD and 12TB 12G SAS 7.2K LFF HDD
- Adding new higher capacity 900GB SAS 15K SFF HDD

	HPE MSA 2042 Storage
Array	
Access Type	Block
Form Factor	SFF or LFF
Number of controllers per array	2
Minimum/Maximum host ports	1/8
FC host connectivity	8/16Gb
iSCSI host connectivity	1Gb or 10GbI
SAS host connectivity	6/12Gb
Cache, per array	
Max Read cache per array	8TB
Data (read/write) cache + system memory per array	12GB
Pool Capacity (with Large Pool Support)	562 TB (512 TiB)
RAID Levels supported: Virtual	RAID 1, 5, 6, 10

RAID Levels supported: Linear	RAID 0,1,3,5,6,10,50
Enclosures	
Expansion Drive Enclosures	0-7 enclosures
LFF/SFF array/enclosure mixing	Supported
Maximum number of drives per array enclosure	24 SFF/12 LFF
Maximum number of drives per drive enclosure	25 SFF/12 LFF
Drive enclosure interface type	6Gb SAS
Drives	
Maximum total HDDs per array	199 SFF / 96 LFF
Maximum total SSDs per array	199 SFF / 96 LFF
Number of SSDs embedded in base system	2 x 400GB SSDs
Max raw capacity per array enclosure	76.8 TB SFF / 144TB LFF
Max raw capacity per drive enclosure	80 TB SFF / 144TB LFF
Max raw capacity per array	637TB SFF / 1152TB LFF
Supported Drive Capacities	
SFF SSDs (Mixed Use)	400GB, 800GB, 1.6TB, 3.2TB
LFF SSDs	400GB, 800GB
SFF HDDs	15K SAS: 300GB, 450GB, 600GB 10K SAS: 300GB, 600GB, 1.2TB, 1.8TB, 2.4TB 7.2K SAS: 1.0TB, 2.0TB
LFF HDDs (12G)	7.2K SAS: 2TB, 4TB, 6TB, 8TB, 10TB, 12TB
Software Features	
Thin Technologies	Thin Provisioning, Space Reclamation, Thin Rebuild
Tiering	Performance Tier, Standard Tier, Archive Tier
Replication	Snapshots (512), Volume Copy, Remote Snaps
Quality of Service	Virtual Tier Affinity
Additional Features	
Maximum number of volumes	512
Maximum number of snapshots	512
Maximum number of hosts	512
Maximum number of initiators	1024
Customer self-installable	Yes
Customer self-repairable	Yes
Customer self-upgradeable	Yes



HPE MSA 2042 Storage

1. Power supplies
2. Host connection ports FC, iSCSI,or SAS
3. CLI port (mini-USB)
4. Management Ethernet port
5. Expansion port

MSA 2042 Storage Models based on Mixed Use SSDs	Descriptions	Part Number
	HPE MSA 2042 SAN Dual Controller LFF Storage [1,2]	Q0F05A
	HPE MSA 2042 SAN Dual Controller SFF Storage [1, 2]	Q0F06A
	HPE MSA 2042 SAS Dual Controller LFF Storage [1,3]	Q0F07A
	HPE MSA 2042 SAS Dual Controller SFF Storage [1 ,3]	Q0F08A

NOTES:

[1] Includes an MSA 2040 LFF or SFF Array Chassis, two MSA 2040 SAN or SAS controllers depending on model, two 400GB Mixed Use SSDs, one

Advanced Data Services LTU.

[2] SFPs not included

[3] SPFs not required

ENERGY STAR Certification ENERGY STAR certification for the HPE MSA 2042 Storage is pending.

Carrier-Grade Components (NEBS) The HPE MSA 2042 Storage arrays are not NEBS compliant. The HPE MSA 2042 does not support DC power supplies.

For customers who require NEBS compliance, or who require DC power supplies, should consider the HPE MSA 2040 Storage arrays. Refer to the HPE MSA 2040 QuickSpecs on how to order the HPE MSA 2040 Carrier-Grade components.

Encryption Data at Rest Encryption is not supported on the HPE MSA 2042. If encryption is desired, refer to the HPE MSA 2040 Storage System.

All MSA 2042 models offer a common set of valuable features:

- MSA 2042 comes standard with two 400GB flash drives which allow IT managers to accelerate application performance
- The two 400GB SSDs can be optionally deployed as read cache, as an SSD virtual disk group for tiered storage, or as a Linear disk group.
  - Deploy the two embedded SSDs as Read Cache to improve random read performance. A maximum of 2 SSD's are supported per pool providing a maximum of 4TB of read cache per controller
  - Deploy the two embedded SSDs as tiered storage. The MSA 2042 can manage up to three tiers of storage: Performance tier, Standard tier and Archive tier..
  - The Performance Auto Tiering License necessary to create a SSD virtual disk group for both read and write capabilities comes standard with all MSA 2042 models. No additional software license purchase is necessary

- All MSA 2042 models come standard with the Advanced Data Services (ADS) Software Suite LTU. Software titles included in the ADS Software Suite include:
  - HPE MSA 2042 Performance Automated Tiering LTU
  - HPE MSA 512-Snapshot Software LTU
  - HPE MSA Remote Snap Software LTU

- MSA 2042 controller architecture which maximizes performance
  - Four host ports per controller
    MSA 2042 SAN controller supports 8 GB FC, 16 GB FC, 1GbE iSCSI or 10GbE iSCSI.
    MSA 2042 SAS controller supports 6 GB and 12 GB SAS host connectivity.
  - 6 GB transportable read/write cache per controller.
  - Battery-free cache backup with super capacitors and compact flash

- MSA 2042 SAN Controller allows customers to create their own Combo Controller by mixing FC and iSCSI SFPs. Below are the valid configurations for mixing SFPs:

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]
Dual SAN 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					

All MSA 2042 models offer a common set of valuable features (cont):

- Storage Management Utility V3 (SMU). This new MSA management GUI brings a new modern look and feel to array management.
- 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.
- All models feature a wide variety of drives: High-performance SSD drives, enterprise-class SAS, and SAS Midline drives.
- The MSA 2042 will support a maximum of 7 disk enclosures (either LFF and/or SFF). Add-on enclosures can either be D2700 SFF drive enclosures or MSA 2040 LFF disk enclosures.
- The MSA 2042 can grow incrementally to a maximum of 96 LFF or 199 SFF drives.
- Disks Groups can be spanned across multiple enclosures.
- Virtual Storage RAID levels 1, 5, 6, 10.
- Linear Storage 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.
- Multiple Disk Groups can be aggregated into a single 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.
- Snapshot enhancements for virtual storage, including performance improvements, hierarchical snapshots, and simplified resource management. Administrators can monitor and optionally control snapshot space usage.
- Prioritize data by assigning appropriate affinity level (Performance, No Affinity or Archive)
- Large Pool Support is available with GL220 firmware or later. Customers can configure 512 TiB capacity per virtual pool by enabling large pool support.
- Non-disruptive on-line controller code upgrade. Requires 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 2042 array. This unique ability protects the earlier investments in drives, and JBODs.
  - Certain limitations are applicable. Please review the Upgrading to the HPE MSA 1040 or HPE MSA 2040/2042 Technical Whitepaper before upgrading your P2000 G3/MSA 1040 systems

Application Solutions

The HPE MSA 2042 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 2042 delivers enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HPE MSA 2042 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 2042, 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/storage/MSA**

Standard Features

Product Technology

SAN controller MSA 2042 SAN controller supports 8Gb FC, 16Gb FC, 1GbE iSCSI or 10GbE iSCSI host connectivity. .

SAS controller MSA 2042 SAS controller supports 6Gb and 12Gb SAS host connectivity.

Modular Chassis

2U rack height. 12 LFF or 24 SFF drive bays. All MSA 2042 models come pre-configured with two controllers, two 400GB SSDs, and an Advanced Data Services LTU
NOTE: The MSA 2042 does not support single controller configurations.

Drives available

The MSA 2042 controllers support both the MSA 3.5-inch LFF drives, and the MSA 2.5-inch SFF drives.

- Solid State Drives (SSDs) deliver exceptional performance for applications requiring high random read IOPs performance.
- 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.

Optional Disk Enclosures

Just as the user has a choice of chassis for the array enclosure (LFF or SFF drive bays), so also do they have a choice of expansion disk enclosures accommodating either drive size. All of the SFF and LFF disk enclosures can be hot-added to an operating array. SFF and LFF array heads enclosures and Disk Enclosures can be mixed without limitations.

The MSA 2040 storage systems have supported various SFF and LFF disk enclosures over time. The latest disk enclosures to be supported on the MSA 2040 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 2040 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.

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 3.5-inch Disk Enclosure. This 2U enclosure is designed to support twelve HPE Storage LFF drive bays and accepts MSA dual-ported 12Gb SSD, SAS, and SAS MDL hard drives. The pre-configured MSA 2040 LFF Drive Enclosure has two I/O modules and supports the MSA 2042 dual controller arrays.

- The MSA 2040 LFF MSA Disk Enclosure can be attached to the MSA 2042 LFF or SFF storage models.
- Each MSA2040 LFF Disk Enclosure ships standard with two .5m mini-SAS to mini-SAS cables for connection to the MSA 2042 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

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 2040 dual controller arrays.

- The MSA 2050 LFF Disk Enclosure can be attached to the MSA 2040 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 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 on the MSA 2040 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

HPE D2700 Disk Enclosure This 2U enclosure is designed to support twenty five HPE Storage 2.5-inch SFF drive bays and accepts MSA dual ported 12Gb SSD, SAS, or SAS MDL hard drives. The pre-configuared D2700Disk Enclosure has two I/O modules and supports the MSA 2042 dual controller arrays.

- The D2700 Disk Enclosure can be attached to the MSA 2042 LFF or SFF storage models
- Each D2700 Disk Enclosure ships standard with a two .5m mini-SAS to mini-SAS cables for connection to the MSA 2042 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.

HPE MSA 2050 SFF Disk Enclosure 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 2040 dual controller arrays.

- The MSA 2050 SFF Disk Enclosure can be attached to the MSA 2040 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 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.
- 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 2040 storage system

Scalability The MSA 2042 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 144TB SAS MDL, expandable to 1152TB 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 76.8 TB SAS, expandable to 637 TB SAS. with the addition of a maximum of seven HPE D2700 2.5-inch Disk Enclosures.
- Users may configure an MSA 2042 SFF array enclosure with LFF MSA 2040 3.5-inch disk enclosures. This is an excellent option for a configuration that supports high-speed SFF SSDs or fast SFF enterprise-class SAS drives in the array enclosure, combined with economical LFF drives staged for archival purposes, all in the same array.

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 2042 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 LUN capacity is 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 Storage Pools 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.

The MSA 2042 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 2042 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.

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 using Linear Storage:

MSA 2042 Array Performance [1]	HPE MSA 2042 Converged SAN Controller with HDDs	HPE MSA 2042 Converged SAN Controller with Mainstrem Endurance SSDs	HPE MSA 2042 Converged SAN Controller with Mixed Use SSDs
Protocol (host connect)	16 Gb Fibre Channel	16 Gb Fibre Channel	16 Gb Fibre Channel
MSA 2042 RAID 10 Performance Results [2]			
Random Reads (IOPs)	66,000		
Random Writes (IOPs)	32,000		
MSA 2042 RAID 1 SSD Performance Results [3]			
Random Reads (IOPs)		122,000	115,000
Random Writes (IOPs)		43,000	40,000
MSA 2042 RAID 5 Performance Results [4]			
Sequential Reads (MB/s)	6,300		
Sequential Writes (MB/s)	5,200		

Benchmark Setup Configurations

[1] Performance numbers generated through the IO Meter performance software.

[2] 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.

[3] Dual Controller configuration, (4) SSDs, RAID: 1, 2 drives per vDisk, block size: 8k (8k Aligned), Average Latency under 3ms, Windows Server 2012 R2 host, 16Gb FC direct connect to array. Tested with GL220 firmware.

[4] Dual Controller configuration, (48) 15k HDD, RAID: 5, 12 drives per vDisk, block size: 256k, Average Latency under 30ms, Windows Server 2012 host, 16Gb FC direct connect to array. Sequential numbers are obtained using a single volume per vdisk and single sequential workload. Tested with GL210 firmware.

End-to-End Performance Figures using Linear Storage:
Guarantee Performance numbers are a guideline as established by tests using RAW I/O in an Operating System Agnostic test lab environment.

HPE MSA Linear End-to-End Performance Figures[5]								
MSA 2042 Array Performance	**HPE MSA 2042 Converged SAN Controller With HDD[7]**	**HPE MSA 2042 Converged SAN Controller With SSD[8]**	**HPE MSA 2042 Converged SAN Controller With HDD[7]**	**HPE MSA 2042 Converged SAN Controller With SSD[8]**	**HPE MSA 2042 Converged SAN Controller With HDD[7]**	**HPE MSA 2042 Converged SAN Controller With SSD[8]**	**HPE MSA 2042 Converged SAS Controller With HDD[7]**	**HPE MSA 2042 Converged SAS Controller With SSD[8]**
Protocol (host connect)[6]	16 Gb Fibre Channel	16 Gb Fibre Channel	10GbE iSCSI	10GbE iSCSI	1GbE iSCSI	1GbE iSCSI	12Gb SAS	12Gb SAS
MSA 2042 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 IOPS	32,000	31,500	30,500	31,500	30,500	31,500	31,000	32,500
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	5,000		4,700		860		4,720	
Sequential Writes MB/s	2,400		2,300		850		2,300	
MSA 2042 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	4,900		4,700		860		4,700	
Sequential Writes MB/s	4,000		3,600		850		4,100	
MSA 2042 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	4,900		4,600		860		4,500	
Sequential Writes MB/s	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/storage/msa2040**								

5) Sequential tests (MB/s) are based on 256K block sizes and random tests (IOPS) are based on 8K block sizes run against linear storage. 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. Results cannot be expected with a single host.

6) Fibre Channel results were measured using 16Gb FC Host Bus Adapters. SAS results were measured using 6Gb SAS Host Bus Adapters. 10GbE iSCSI results were measured using 10GbE iSCSI Host Bus Adapters. 1GbE iSCSI results were measured using 1GbE network interface controllers (NICs). Hosts were directly attached to the HPE MSA 2040 array.

7) MSA 2040 Hard Disk Drive (HDD) results: Dual Controller configuration, 192 15k SAS HDDs, 12 drives per vdisk, 8 vdisks per controller, 1 volume per vdisk.

8) MSA 2040 Solid State Drives (SSD) results: Dual Controller configuration, 2 SSDs per vdisk in RAID 1, 3 SSDs per vdisk in RAID 5, 4 SSDs per vdisk in RAID6, 2 vdisks per controller, 1 volume per vdisk

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.

End-to-End Performance Figures using Virtual Storage:
Guarantee Performance numbers are a guideline as established by tests using RAW I/O in an Operating System Agnostic test lab environment.

HPE MSA Virtual End-to-End Performance Figures[9]								
MSA 2042 Array Performance	**HPE MSA 2042 Converged SAN Controller With HDD**	**HPE MSA 2042 Converged SAN Controller With SSD**	**HPE MSA 2042 Converged SAN Controller With HDD**	**HPE MSA 2042 Converged SAN Controller With SSD**	**HPE MSA 2042 Converged SAN Controller With HDD**	**HPE MSA 2042 Converged SAN Controller With SSD**	**HPE MSA 2042 Converged SAS Controller With HDD**	**HPE MSA 2040 Converged SAS Controller With SSD**
Protocol (host connect)[10]	16 Gb Fibre Channel	16 Gb Fibre Channel	10GbE iSCSI	10GbE iSCSI	1GbE iSCSI	1GbE iSCSI	12Gb SAS	12Gb SAS
MSA 2042 RAID 10 Performance Results [11,12,13,18]** **NOTE:** RAID 1 was used for SSD testing								
Random Reads IOPS	62,300	96,000	62,000	92,500	61,100	81,500	62,700	92,900
Random Writes IOPS	33,100	40,500	32,200	38,300	31,700	37,500	32,400	39,000
Random Mix 60/40 IOPS	44,800	58,100	44,200	55,700	43,400	53,900	44,100	56,300
Sequential Reads MB/s[7]	5,350		5,340		880		5,350	

Sequential Writes MB/s[7]	3,110		2,910		860		3,110	
MSA 2042 RAID 5 Performance Results [14,15,18]**								
Random Reads IOPS	54,300	92,300	53,300	83,200	52,900	70,470	54,000	88,800
Random Writes IOPS	17,700	22,500	17,500	22,100	17,500	21,800	17,700	22,200
Random Mix 60/40 IOPS	27,200	38,900	27,000	38,000	27,000	37,500	27,300	38,400
Sequential Reads MB/s[7]	5,270		5,250		880		5,270	
Sequential Writes MB/s[7]	3,950		3,430		880		3,900	
MSA 2042 RAID 6 Performance Results [16,17,18]								
Random Reads IOPS	55,100	93,000	54,100	79,000	53,800	70,470	55,000	89,800
Random Writes IOPS	13,000	19,200	13,000	18,800	13,000	18,700	13,000	19,000
Random Mix 60/40 IOPS	21,100	34,800	21,000	33,800	21,100	33,600	21,000	34,200
Sequential Reads MB/s[7]	5,540		5,480		880		5,530	
Sequential Writes MB/s[7]	3,790		3,290		880		3,810	
Refer to the paper titled "Upgrading to the HPE MSA 2040", available in the Resource Library at: **http://www.hpe.com/storage/msa2040**								

9) Sequential tests (MB/s) are based on 256K block sizes and random tests (IOPS) are based on 8K block sizes run against virtual pool storage. 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. Results cannot be expected with a single host.

10) Fibre Channel results were measured using 16Gb FC Host Bus Adapters. SAS results were measured using 6Gb SAS Host Bus Adapters. 10GbE iSCSI results were measured using 10GbE iSCSI Host Bus Adapters. 1GbE iSCSI results were measured using 1GbE network interface controllers (NICs). Hosts were directly attached to the HPE MSA 2040 array.

11) MSA 2042 RAID 10 Hard Disk Drive (HDD) random results: Dual Controller configuration, 192 15k SAS HDDs, 12 drives per disk group, 8 disk groups per pool, 8 volumes per pool.

12) MSA 2042 RAID 10 Hard Disk Drive (HDD) sequential read results: Dual Controller configuration, 96 15k SAS HDDs, 12 drives per disk group, 4 disk groups per pool, 4 volumes per pool.

13) MSA 2042 RAID 10 Hard Disk Drive (HDD) sequential write results: Dual Controller configuration, 48 15k SAS HDDs, 12 drives per disk group, 2 disk groups per pool, 4 volumes per pool.

14) MSA 2042 RAID 5 Hard Disk Drive (HDD) random results: Dual Controller configuration, 180 15k SAS HDDs, 9 drives per disk group, 10 disk groups per pool, 10 volumes per pool.

15) MSA 2042 RAID 5 Hard Disk Drive (HDD) sequential results: Dual Controller configuration, 72 15k SAS HDDs, 9 drives per disk group, 4 disk groups per pool, 4 volumes per pool.

16) MSA 2042 RAID 6 Hard Disk Drive (HDD) random results: Dual Controller configuration, 180 15k SAS HDDs, 10 drives per disk group, 9 disk groups per pool, 9 volumes per pool.

17) MSA 2042 RAID 6 Hard Disk Drive (HDD) sequential results: Dual Controller configuration, 80 15k SAS HDDs, 10 drives per disk group, 4 disk groups per pool, 4 volumes per pool.

18) MSA 2042 Solid State Drives (SSD) results: Dual Controller configuration, 2 SSDs per disk group in RAID 1, 3 SSDs per disk group in RAID 5, 4 SSDs per disk group in RAID6, 1 disk group per pool, 1 volume per pool.

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.

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
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 2042 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. See **https://www.hpe.com/h20195/V2/getpdf.aspx/4AA5-5032ENW.pdf?ver=1.0**
Snapshot and Clone	All MSA 2042 arrays come standard with 512 snaps. 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.
HPE Server Compatibility **NOTE:** depends on protocol	The MSA 2042 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**
3rd Party server support	• Supports most multi-vendor industry standard 32-bit and 64 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. • 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 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 2016 • Microsoft Windows Server 2012 • Microsoft Windows Server 2008 R2 • VMware • HP-UX • Red Hat Linux • SuSE SLES Linux • Solaris • OpenVMS • MAC OS
Web Browser support	• The MSA 2042 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 MSA 2042 supports target based management, and include a Web interface and a telnet interface for management • MSA 2042 customers have the option to use SMU v2(Linear Only) or SMU v3. • Users taking advantage of virtualization features will be required to use SMU V3. • The MSA 2042 management supports Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.

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
Performance Tiering and Archive Tiering Software	Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 2042 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.

The MSA 2042 supports sub-LUN tiering and automated data movement between tiers. The MSA 2042 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). The Performance Tiering functionality is provided at no charge on the MSA 2042.

Another feature to the MSA 2042 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 2042 platform

Snapshot and Volume Copy Software

- A 512 Snapshot license and Volume Copy are included with all MSA 2042 models as standard
- Snapshots create up to 512 point-in-time copies of data
- Volume Copies create up to 128 point-in-time copies of data
- Volume copies become standard volumes when they are complete
- 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;).
- Backup 'snapped' data to disk, virtual tape, or physical tape without a backup window
- If telephone support and software updates are desired for bundled software functionalities, 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.

Remote Snap Software

- HPE MSA Remote Snap software is available for both linear and virtual storage with GL220 firmware or later. HPE MSA Remote Snap Software is array based software that provides remote replication on the HPE MSA 2042 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 and SAS 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.

NOTE: A Remote Snap License is provided with the MSA2042. 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 a total of 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 Fibre 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
- Advanced scheduler provides several options to IT administrators for business continuance
- Flexible architecture allows remote replication between MSA 2042 and/or MSA 2040, MSA 1040 or P2000 G3 supported arrays. Protects existing investments and enhances business continuity planning objectives.
- Replication Wizard (Linear only) 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 512 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

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.

Site Recovery Adapter (SRA)

The MSA 2042 SRA, a free-to-use plugin, is the program that integrates the VMware vCenter SRM with HPE MSA 2042 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 2042 systems. Users are required to acquire Remote Snap license for their local and remote HPE MSA 2042 arrays to use the HPE MSA SRA.

Site Recovery Manager Requirements/Dependencies:

- Requires vSphere 5.1, 5.5 or above
- 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 two MSA 2042 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 2042 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 2042, MSA 2040, MSA 1040, P2000, EVA, P4000, and the XP array series including the P9500.

When deployed with the MSA 2042 array, HPE OneView provides the following:

- Active Management functionality for the MSA 2042 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 2042
- Displays LUN / volume connections from VMs and ESX servers to the arrays and provides the location and attributes of the MSA 2042 within the SAN
- Identifies what storage features are available to allow administrators to match the features available on the MSA 2042 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 HPE MSA, HPE StoreVirtual, HPE 3PAR StoreServ, HPE StoreOnce, HPE StoreEasy, HPE XP, HPE EVA and HPE StoreEver Storage.
When deployed with the MSA 2042 array, HPE StoreFront Manager provides the following:

- Monitors the health, events and alerts for the MSA 2042/2040/1040 - 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

Warranty, Service and Support Information

Warranty

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

Enclosures, Hard drives, and Options for the MSA 2042 carry their own warranty. Refer to Hewlett Packard Enterprise Limited Warranty Statement for more information.

The MSA 2042 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://h20565.www2.hpe.com/hpsc/doc/public/display?sp4ts.oid=5211884&docId=emr_na-c04770336&docLocale=en_US

Products included in various kits carry their own individual warranties.

NOTE: The warranty of the hard drive options purchased with the MSA 2042 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. **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	**Protect your business beyond warranty with HPE Support Services** 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 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**

Configuration Information

Configuration Information

Step 1 - MSA 2042 - Base Configurations

Pre-Configured Systems	HPEMSA 2042 SAN Dual Controller LFF Storage[1,2]	Q0F05A
	HPEMSA 2042 SAN Dual Controller SFF Storage[1,2]	Q0F06A
	HPEMSA 2042 SAS Dual Controller LFF Storage[1,3]	Q0F07A
	HPEMSA 2042 SAS Dual Controller SFF Storage[1,3]	Q0F08A

NOTES:

[1] Includes an MSA 2040 LFF or SFF Array Chassis, two MSA 2040 SAN or SAS controllers depending on model, two 400GB Mixed Use SSDs, one Advanced Data Services LTU. The two bundled 400GB SSDs and the Advanced Data Services LTU are shipped with the MSA2042, but are not factory integrated. Integration is required.

[2] SFPs not included

[3] SPFs not required

Step 2 - Choose Your SFP+ Module

SFP+ Modules	HPE MSA 8Gb Short Wave Fibre Channel SFP+ 4-Pack Transceiver (Includes four x 8Gb SW FC SFPs)	C8R23B
	HPE MSA 16Gb Short Wave Fibre Channel SFP+ 4-Pack Transceiver (Includes four x 16Gb SW FC SFPs)	C8R24B
	HPE MSA 10Gb Short Range iSCSI Channel SFP+ 4-Pack Transceiver (Includes four x 10Gb SW iSCSI SFPs)	C8R25B
	HPE MSA 1Gb RJ-45 iSCSI Channel SFP+ 4-Pack Transceiver (Includes four x 1Gb RJ-45iSCSI SFPs)	C8S75B

NOTE:
MSA 2042 SAN Controllers do not ship with any SFPs
MSA 2042 SAS controllers do not require SFP modules.
Customer must select one of the above SFP options for SAN Controllers.
Each MSA 2042 SAN controller can be configured with 2 or 4 SFPs.
MSA SFPs are for use only with MSA 2042 SAN Controllers.
For MSA 2042 10Gb iSCSI configuration user can use DAC cables instead of SFPs.

Step 3 - Select Your Drives.

MSA HDDs and SSDs drives are for use with MSA Storage Systems only.
Customers can mix SSD, SAS, and SAS MDL drives in the same array enclosure and disk enclosure

SFF SSDs	**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
SFF HDDs	**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
	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
	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
	• SAS MDL drives are designed for archival or reference data. • SAS MDL drives should not be used in a heavy or intense I/O environment. • Intense I/O environments require the use of enterprise-class SSD or SAS drives	
LFF SSDs	**12G LFF SAS SSDs (Mixed Use)**	
	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
LFF HDDs	**12G LFF 7.2K SAS Midline Drives**	
	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 1 yr 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) 512e Midline 1yr Warranty Hard Drive	J9F43A
	HP MSA 4TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive	K2Q82A
	• SAS MDL drives are designed for archival or reference data. • SAS MDL drives should not be used in a heavy or intense I/O environment. • Intense I/O environments require the use of enterprise-class SSD or SAS drives	

Step 4 - Options

Drive Enclosures	HPE MSA 2040 Energy Star LFF Disk Enclosure	M0S96A
	HPE D2700 Disk Enclosure	AJ941A
	HPE MSA 2050 LFF Disk Enclosure	Q1J06A
	HPE MSA 2050 SFF Disk Enclosure	Q1J07A
	NOTES: • Each drive enclosure includes two 0.5m MiniSAS to MiniSAS cables • Add up to 7 additional drive enclosures • MSA LFF Disk Enclosure can be connected to either the MSA2042 SFF or LFF dual controller systems.	

- MSA SFF Disk Enclosure can be connected to either the MSA 2042 SFF or LFF dual controller systems.
- The D2600 Disk Enclosure is not supported on the MSA2042 storage system.
- The MSA 2050 LFF and SFF Disk Enclosures are the recommended disk enclosures for capacity expansion on the MSA 2040 storage systems.
- The use of MSA 2050 LFF and SFF Disk Enclosures with MSA 1040/2040/2042 storage requires requires GL225 array controller firmware, or newer.

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

- Connecting MSA 2042 Controller to a JBOD if a longer cable is desired.

AC Power Cords	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

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

Step 5a - Choose Supported Options For Fibre Channel Infrastructure

PremierFlexOM4 type cables	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
M3 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 5b - Choose Supported Options For SAS Infrastructure

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

- These cables are used to connect 6Gb SAS initiator to MSA 2042 SAS controller.
- These cables 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

- These cables are used to connect 12Gb SAS initiator to MSA 2042 SAS controller.
- These cables are not used for connecting to a disk enclosure.

Step 5c - Choose Supported Options For 10GbE Infrastructure

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

Step 6 - Software

Software

The following advanced virtualization functionalities are included as a standard feature on all new MSA 2042 SAN and SAS models.

HPE MSA 2042 Performance Automated Tiering LTU	Standard
HPE MSA 512-Snapshot Software LTU	Standard
HPE MSA Remote Snap Software LTU	Standard

Technical Specifications

MSA 2042

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)	SFF 24-bay array: 19.5 in / 49.5 cm 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)
Weight (Includes chassis and 2 controllers. No drives)	LFF chassis: 40.6 lbs. SFF chassis: 38.7 lbs

MSA 2042 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 7 to 8	Added	Added MSA 2050 SFF and LFF Disk Enclosures as supported options on the MSA 2042 storage systems.
05-Feb-2018	From Version 6 to 7	Changed	Standard Features and Configuration Information were revised.
06-Nov-2017	From Version 5 to 6	Changed	Changes made to the entire document.
02-Oct-2017	From Version 4 to 5	Changed	Changes made to the Standard Features Section
27-Mar-2017	From Version 3 to 4	Changed	Changes made to the entire document
13-Feb-2017	From Version 2 to 3	Changed	Changes made to the entire document
26-Sept-2016	From Version 1 to 2	Changed	Changes made to the entire document.
15-Aug-2016	Version 1	Created	Document Created

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