## Overview

HPE MSA 2060 Storage Array

The HPE MSA 2060 is a flash-ready hybrid storage system designed to deliver hands-free, affordable application acceleration for small and remote office deployments. Don't let the low cost fool you.   It gives you the combination of simplicity, flexibility, and advanced features you may not expect in an entry-priced array. Start small and scale as needed with any combination of solid state drives (SSDs), high-performance Enterprise SAS HDDs, or lower-cost Midline SAS HDDs. With the ability to deliver 325,000 IOPS, the new MSA 2060 is up to 45% faster than its prior generation with ample horsepower for even the most demanding workloads.

HPE MSA 2060 Storage
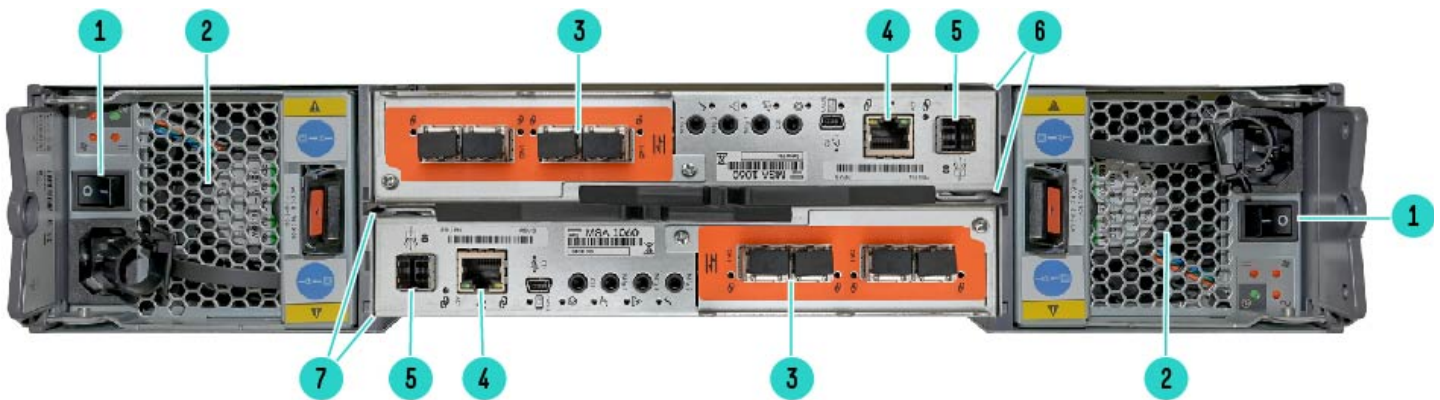
HPE MSA 2060 Storage

Item	Description
1.	Power Switch
2.	Redundant Power and Cooling Module (AC or DC)
3.	Host connection ports (16Gb FC, 10GbE iSCSI or 12Gb SAS depending on model)
4.	Ethernet management port
5.	12Gb SAS expansion port
6.	Controller A (Inverted)
7.	Controller B

Overview

What's New

- New 6th Gen MSA storage architecture (HW + SW) that provides a modernized HW platform with more resources for features such as Tiering 2.0, a new RAID protection scheme (MSA-DP+), a new task-optimized web interface, and highly optimized data management through a new RESTful interface.
- Improved array performance that provides more IOPS, bandwidth and backend connectivity; up to 45% increase on IOPS, and up to 70% improvement on sequential throughput vs MSA Gen 5 (depending on protocol).
- Capable of delivering over 325,000 IOPS for affordable application acceleration for small to medium-sized businesses.
- Simple made simpler with a new disk group type (MSA-DP+) that increases availability, dramatically decreases RAID rebuild times, improves performance, and simplifies setup (eliminates Power of 2 requirements, automatically handles spares), and provides more granular expansion of disk pools.

MSA 2060 Storage Models

Description	SKU
HPE MSA 2060 16Gb Fibre Channel LFF Storage	R0Q73A
HPE MSA 2060 16Gb Fibre Channel SFF Storage	R0Q74A
HPE MSA 2060 10GbE iSCSI LFF Storage	R0Q75A
HPE MSA 2060 10GbE iSCSI SFF Storage	R0Q76A
HPE MSA 2060 12Gb SAS LFF Storage	R0Q77A
HPE MSA 2060 12Gb SAS SFF Storage	R0Q78A

Notes:

- Includes an SFF or LFF Array Chassis depending on model, two MSA 2060 controllers, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs are not included in the base Storage Systems.

Standard Features

HPE MSA 2060 Storage	
Array	
Access Type	Block
Form Factor	2U, SFF or LFF
Number of controllers per array	2
Number of host ports per array	8
FC host connectivity	16Gb
iSCSI host connectivity	10Gb
SAS host connectivity	12Gb
Cache, per array	
Max Read cache per array	8TB
Data (read/write) cache + system memory per array	24GB
Pool Capacity	Two Pools with 1 PB each
RAID Levels supported:	RAID 0*,1, 5, 6, 10, MSA-DP+
	Notes: *Read Cache Only
Enclosures	
Expansion Drive Enclosures	0-9 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	24 SFF/12 LFF
Drive enclosure interface type	12Gb SAS
Drives	
Maximum total HDDs per array	240 SFF / 120 LFF
Maximum total SSDs per array	240 SFF / 120 LFF
Max raw capacity per array enclosure	92.16TB SFF / 192TB LFF
Max raw capacity per drive enclosure	92.16TB SFF / 192TB LFF
Max raw capacity per array	921.6TB SFF / 1.92PB LFF
Drive Capacities	
SFF SSDs	960GB, 1.92TB, 3.84TB
LFF SSD	1.92TB
SFF HDDs	15K: 900GB
	10K: 600GB, 1.2TB, 1.8TB, 2.4TB
LFF HDDs	7.2K: 6TB, 8TB, 10TB, 12TB,14TB,16TB
Self-Encrypting SSDs	SFF: 960GB, 1.92TB
	LFF: 1.92TB
Self-Encrypting HDDs **Notes**: Sold in 6 Pack bundles only	SFF: 900GB, 2.4TB LFF: 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

Standard Features

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
Health Check analytics	Yes
Energy Star Certified	Yes

All MSA 2060 models offer a common set of valuable features

Chassis
- 12 drive bay LFF or 24 drive bay SFF 2U base arrays, depending on model
- 12 drive bay LFF or 24 drive bay SFF 2U expansion enclosures, depending on model
- 12Gb SAS disk expansion protocol
- New next-generation drive carriers
- New optional locking bezel

Storage Controllers
- Dual hot-swappable active/active controllers
- 4 host ports per controller, 8 host ports per array
- 16Gb Fibre Channel, 10Gb iSCSI and 12Gb SAS protocol support
- Auto negotiation
- New next-generation RAID offload ASIC and Processor
- 24GB system cache
- 12Gb SAS expansion ports
- Battery-free cache backup with super capacitors and compact flash

Expansion Capacity
- Maximum expansion of 9 drive enclosures (either LFF and/or SFF)
- Maximum of 240 SFF or 120 LFF drives
- Maximum of 921.6TB SFF / 1.92PB LFF raw capacity

Storage Services
- Virtual Storage
  - Up to two pools (1PB each)
  - Automated tiering v2.0
  - SSD read cache extension
  - Thin Provisioning
  - Volume Copy
  - Snapshot capability (64 snaps standard, 512 optional snapshot per array)
- Virtual Storage Disk Groups can be spanned across multiple enclosures.
- Virtual Storage RAID levels supported: 1, 5, 6, 10, MSA-DP+
- New disk group type (MSA-DP+):
  - Integrated sparing
  - Fast rebuilds
  - Improved sequential performance
  - Incremental disk group expansion

Standard Features

Management
- New redundant web based interface (SMU v4)
- HPE MSA Health Check
- New RESTful interface
- CLI
- Firmware Update Server – automatically receive notification of new firmware availability
- Non-disruptive on-line controller code upgrade. Requires Multi-pathing software
- Arxscan Arxview remote monitoring via HPE Complete

Data Protection
- Self-encrypting SSDs and HDDs
- Drives FIPS 140-2 Level 2 certified
- Remote Snapshot (Array-based asynchronous replication)
- VMware Site Recovery Manager
- Zerto Virtual Replication via HPE Complete
- Optional locking bezel

Product Technology

Storage Controllers
- The MSA 2060 FC controllers support 16Gb FC host connectivity.
- The MSA 2060 iSCSI controllers support 10GbE iSCSI host connectivity.
- The MSA 2060 SAS controllers support 12Gb SAS host connectivity.
- No converged SAN controllers with MSA 2060 models.
- Dual controller active/active (dual pool) design. System can be configured as active/passive (single pool).
- Controllers contain next generation RAID offload ASIC and CPU.
- 24GB System cache
- 12Gb SAS expansion ports.

Notes: The MSA 2060 does not support single controller configurations. Single-controller support is provided only when a controller fails over to its partner controller.

Modular Chassis
- New chassis design with the MSA array and drive enclosures.
- 2U rack height 12 LFF or 24 SFF drive bays, depending on model.
- 12G SAS Midplane.
- Next generation drive modules.
- New locking bezel kit for added security.

Available Drives
The MSA 2060 Storage Systems support a wide variety of MSA 3.5-inch LFF drives, and MSA 2.5-inch SFF drives.
- Solid-State Drives (SSDs) deliver the highest levels of performance and reliability.
- Enterprise-class SAS hard disk drives (10K/15K RPM) offer a balance of performance, capacity, and cost while delivering enterprise grade reliability.
- Midline SAS hard disk drives (7.2K RPM) are optimized to provide the best ratio of capacity to cost.

Standard Features

Optional Drive Enclosures

MSA 2060 LFF Drive Enclosure

This 2U enclosure is designed to support twelve HPE Storage LFF drives and accepts MSA dual-ported 12Gb SSD, Enterprise SAS, or SAS Midline hard drives. The pre-configured MSA 2060 LFF Drive Enclosure has two I/O modules and supports the MSA 2060 Storage systems.

- The MSA 2060 LFF Drive Enclosure can be attached to the MSA 2060 LFF or SFF Storage systems.
- Each MSA 2060 LFF Drive Enclosure ships standard with two .5m mini-SAS HD to mini-SAS HD cables for connection to the MSA 2060 array expansion port or existing drive enclosure cascade port.
- LFF and/or SFF drive enclosures can be mixed up to the maximum of nine drive enclosures

HPE MSA 2060 SFF Drive Enclosure

This 2U enclosure is designed to support twenty four HPE Storage SFF drive and accepts MSA dual ported 12Gb SSD, Enterprise SAS, or SAS Midline hard drives. The pre-configured MSA 2060 SFF Drive Enclosure has two I/O modules and supports the MSA 2060 Storage systems.

- The MSA 2060 SFF Drive Enclosure can be attached to the MSA 2060 LFF or SFF Storage systems.
- Each MSA 2060 SFF Drive Enclosure ships standard with a two .5m mini-SAS HD to mini-SAS HD cables for connection to the MSA 2060 array expansion port or existing drive enclosure cascade port.
- LFF and/or SFF drive enclosures can be mixed up to the maximum of nine drive enclosures.

Scalability

- LFF configurations can scale up to 192TB SAS Midline per array enclosure, expandable to 1.92PB SAS with the addition of a maximum of nine MSA 2060 LFF Drive Enclosures.
- SFF configurations can scale up to 92.1TB per array enclosure, expandable to 921.6TB with the addition of a maximum of nine MSA 2060 SFF Drive Enclosures.

Disk Group

A Disk Group is a collection of disks in a given redundancy mode (RAID 1, 5, 6, 10, MSA-DP+). Disk Group RAID level and size can be created based on performance and/or capacity requirements. Multiple Disk Groups can be allocated into a Storage Pool for use with the Virtual Storage features.

LUNs

The MSA 2060 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. 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. 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 2060 supports large, flexible Volumes with sizes up to 128TiB and facilitates seamless capacity expansion. As pools are expanded data automatically reflows to balance capacity utilization on all drives.

Standard Features

RAID 0, 1, 5, 6, 10, MSA-DP+

The MSA 2060 features several important additional RAID levels. MSA-DP+ offers improved performance, availability, and very fast rebuild times compared to traditional parity RAID by utilizing erasure coding technology. MSA-DP+ includes distributed spare capacity (default is equal to 2x the largest drive), and does not use traditional spare drives. RAID 6 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 5 combines the block striping and parity. Because data and parity are striped across all of the disks, no single disk is a bottleneck. Striping also allows users to reconstruct data in case of a disk failure. RAID 0 (Striping) is supported for Read Cache only.

MSA-DP+

MSA-DP+ is a new RAID-based data protection level introduced with the 6th Generation MSA Storage Systems that:
- Maximizes flexibility
- Provides built-in spare capacity
- Optimizes performance due to the elimination of idle spares
- Allows for very fast rebuilds, large storage pools, and simplified expansion

If a disk fails in an MSA-DP+ disk group, and the failed disk is replaced with a new disk in the same slot, the replacement disk will be added to the disk group automatically. All disks in an MSA-DP+ disk group must be the same type (enterprise SAS, for example), but can have different capacities, provided the range of difference does not exceed a factor of two. For example, mixing a 600GB disk and a 1.2TB disk is acceptable; but mixing a 6TB disk and a 16TB disk is not recommended. It is conceivable that a sizeable difference between mixed disk capacities (ratio greater than two) could prevent consuming space on disks due to insufficient distributed space required to support striping.

All disks in an MSA-DP+ disk group are used to hold user data, but not all disks will be used by each page of data. To increase fault tolerance, any available capacity on disks can be allocated as spare for reconstruction purposes. When new data is added, new disks are added, or the system recognizes that data is not distributed across disks in a balanced way, the system moves the data to maintain balance across the disk group. Spare drives are not used by MSA-DP+ disk groups since the RAID design provides built-in spare capacity that is spread across all disks in the disk group. In the case of a disk failure, data will be redistributed to many disks in the disk group, allowing for quick rebuilds and minimal disruption to I/O. The system will automatically default to a target spare capacity that is the sum of the largest two disks in the MSA-DP+ disk group, which is large enough to fully recover fault tolerance after loss of any two disks in the disk group. The actual spare capacity value can change depending on the current available spare capacity in the disk group. Spare capacity is determined by the system as disks are added to a disk group, or when disk groups are created, expanded or rebalanced.

Notes:
- HPE recommends not mixing disks if the ratio of the largest disk to the smallest disk is greater than two.
- For more information on MSA-DP+, refer to the HPE MSA 1060/2060/2062 Storage Management Guide.

Configuration and Management Tools
- Management access, out-of-band, Storage Management Utility (SMU) V4, CLI.
- Interface Types: USB 100/1000 Ethernet.
- Protocols Supported SNMP, SMI-S, SSH, SMTP, FTP, SFTP, HTTP, HTTPS, Telnet

Standard Features

Web Browser Support

The MSA 2060 arrays come integrated with a new web browser (SMU v4) and CLI based software for storage and RAID management, setup, configuration, and troubleshooting. The MSA 2060 management supports Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.

Hot Plug Expansion and Replacement Support

All MSA 2060 models support hot plug expansion and replacement of redundant controllers, drives, fans, power supplies, and I/O modules for simple, fast installation and maintenance. Hot add expansion of drive enclosures is also supported.

HPE Server Compatibility

The MSA 2060 supports most HPE ProLiant, BladeSystems and Integrity servers including

- HPE ProLiant DL, ML Servers
- HPE c-Class Blade Servers
- Integrity servers, IA64
- Compatibility must be confirmed at: **http://www.hpe.com/storage/spock**
  Notes: Depends on protocol.

3rd Party Server Support

The MSA 2060 supports most multi-vendor industry standard 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

Refer to the Hewlett Packard Enterprise support statements for complete current OS version support:

http://www.hpe.com/storage/spock

- Microsoft Windows Server 2019
- Microsoft Windows Server 2016
- VMware
- HP-UX
- Red Hat Linux
- SuSE SLES Linux
- Oracle UEK Linux
- Citrix XenServer
  Notes: depends on protocol.

Standard Features

Advanced Data Services Suite

The HPE MSA Advanced Data Services Suite can be purchased as an option on the MSA 2060 Storage systems.
The optional Advanced Data Services Suite includes the following functionality:

- Performance Tiering
- 512 Snapshots and Volume Copy
- Remote Snap functionality

Performance Tiering and Archive Tiering

Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 2060 supports 3 distinct tiers:

- A Performance tier with SSDs
- A Standard SAS tier with Enterprise SAS HDDs
- An Archive tier utilizing Midline SAS HDDs.

The MSA 2060 supports sub-LUN tiering and automated data movement between tiers. The MSA 2060 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.

Configurations which have a mixture of both SSDs and HDDs within the same system being used as a capacity tier (excluding SSD Read Cache), will require the Advanced Data Service Suite LTU. This rule applies to the system level and therefore the license is required regardless of whether the drives are configured for auto-tiering within the same pool. Configurations of only SSDs or SSD Read Cache extension do not require a license on the MSA2060 array.

Snapshot and Volume Copy

- All MSA 2060 arrays come standard with 64 snaps.
- A 512 Snapshot license is available as an option on the MSA 2060.
- 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.
- 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 like 64 snapshots and volume copy software, 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. Support is available with either the SupportPlus or SupportPlus24 Service options the hardware warranty component of these services is accounted for in the pricing of the SP and SP24 HPE Pointnext operational.

Remote Snap

HPE MSA Remote Snap Software is array based functionality that provides remote replication on the HPE MSA 2060 array products. MSA 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 on a second independent system. This second system may be co-located with the first system or may be located at a remote site.

- MSA Remote Snaps are used to determine the data to be replicated using the differences in snapshots on the primary volume, minimizing the amount of data to be transferred.
- MSA 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 create 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.

Standard Features

- 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 compared to the point-in-time image taken during the previous replication and the changes are 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.
- Storage based asynchronous snapshot replication.
- Support of both Ethernet and Fibre 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.
- Advanced scheduler provides several options to IT administrators for business continuance.
- Flexible architecture allows remote replication between MSA 2060 and MSA 2062 or MSA 1060 arrays using the virtual storage architecture and licensed for Remote Snap with the Advanced Data Services LTU.
- 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.
- 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 data.
- With the improved disaster recovery features of the MSA 1060, MSA 2060 and MSA 2062, you can failover to the secondary / remote volume or volume group, map the secondary volume or volume group for access, then, when the primary array has recovered, failback to the primary volume or volume group, with the option to incorporate changes made to the secondary volume or volume group back to the primary volume or volume group.
- Another improvement in Remote Snap with the MSA 1060, MSA 2060 and MSA 2062 is the ability to reverse the direction of the replication set

Notes: One Advanced Data Services Suite 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.

HPE OneView for VMware vCenter

HPE OneView for VMware vCenter is a component within the HPE OneView plug-in for vCenter. It enables vSphere administrators to quickly obtain context-aware information and manage supported HPE storage devices like the MSA in their VMware vSphere environment directly from within vCenter. This plug-in operates independently of the core HPE OneView product and does not require a license to use. By providing a clear relationship 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 Storage, and other HPE Storage systems including Primara Storage, 3PAR Storage, Nimble Storage, and StoreOnce.

When deployed with MSA Storage, HPE OneView provides the following:
- Active Management functionality for the MSA Storage:
  - Create/Expand/Delete a Datastore
  - Create a Virtual Machine from a template
- Monitors the health and status of the MSA Storage
- Displays LUN / volume connections from VMs and ESX servers to the arrays and provides the location and attributes of the MSA array within the SAN.
- Identifies what storage features are available to allow administrators to match the features available on the MSA array to their requirements.

Standard Features

- 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

HPE OneView for System Center

HPE OneView for Microsoft System Center provides a comprehensive integration of HPE Storage, HPE Servers, HPE Blade System and HPE Virtual Connect with Microsoft System Center. HPE OneView for System Center enables management and monitoring of HPE MSA Storage running in Microsoft environment with a single pane-of-glass view to events/alerts, capacity and health dashboards and detailed virtual infrastructure information. It provides seamless integration with Microsoft System Center Operations Manager (SCOM) enabling predefined discovery and monitoring policies, event processing rules and topology views for HPE Storage including the MSA Storage Systems.

When deployed with the MSA 2060 array, HPE OneView for System Center provides the following:

- Monitors the health, events and alerts for the MSA 2060 – virtual pools, and volumes
- Provides topology information for VMs provisioned on the MSA Storage array

HPE OneView for System Center is downloadable at no charge 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

LDAP Support

LDAP (Lightweight Directory Access Protocol) is an industry standard application protocol for accessing and maintaining distributed directory information services over an IP network. LDAP provides the ability to authenticate MSA users with a central directory.

- Domain or Directory Credentials are not stored on the MSA for authentication – avoids a security issue.
- Once user groups are configured on all MSAs in your organization, users can be authenticated on any MSA through the Active Directory.
- Uses an LDAP implementation to authenticate users with a Windows Active Directory.
- The MSA CLI and SMU will allow the configuration of new LDAP users groups into the MSA security scheme (manage vs monitor users, interface restrictions Web/CLI/FTP).
- Ability to authenticate Local or LDAP users.

Standard Features

I/O Workload Functionality

A beneficial user interface element called "I/O Workload" is included in the MSA web browser (SMU v4). The MSA array controllers keep track of a substantial amount of data pertaining to the I/O dynamics at a logical page level (4MB chunks). From this data, it is possible to provide some visibility to what percent of I/O's are being processed by what percent of the overall array's capacity across a 7 day timeline. While some workloads have "transient" data access patterns, many workloads have steady access patterns on small portions of the array's capacity. This produces "hot" pages in the array which remain hot a large amount of the array's uptime. Users would see substantial benefits if these pages could be served from the fastest media in the array (ideally SSDs). As has been described in the MSA's tiering functionality, the MSA array's tiering engine will work to position the hottest pages on the fastest media at any given time.

The new I/O Workload graph will show a line labeled Capacity and a line plot for each selected workload percentage (100%, 80%, or Other% value). Below are two examples of user scenarios where the I/O Workload Graph might be useful and how to utilize the data the graph provides.
- New User or SSD Installation.
- Once the MSA array is installed and has had workloads running against it for a week's time, the I/O Workload data will give a representation of what Capacity is servicing 100% of I/O and 80% of I/O. Users may select a custom % value if desired. In a new installation or in an installation with no SSD tier installed, the 80% line is a reasonable starting point for an SSD tier. Based on SSD RAID settings, customers can then calculate a good starting point with regard to SSD tier sizing based on that week's workload. While not a hard fast rule, it is a good starting point. These values should also be compared to the Best Practices "rule of thumb" which suggest that 5-15% of the array's capacity should be SSDs for tiered solutions.
- Users with existing SSD tiering or read caching installed and running.
- For arrays running with SSDs installed (tiered or read cache), the I/O Workload graph will have a dotted line which shows the installed SSD capacity. The I/O Workload graphs can be checked periodically to see where the 80% I/O line is with regard to the SSD capacity line. While there are no hard and fast rules which indicate good/bad situations, users can use the graph with other system performance tools to better understand specific dynamics of their installation and the normal dynamics of a system in the day-to-day activities for a specific environment.

Interpreting the I/O Workload graphs allow users to strike a balance between the SSD costs versus performance benefits. For example, some customers may be willing to have a couple of days where peak usage is far above the SSD capacity line as it may be acceptable to have slower performance as the system uses HDDs for a larger percentage of the workload I/O. This may be perfectly acceptable for systems sized to optimize $/TB due to budget constraints. Other users may want to optimize the system such that a sizeable percentage of daily I/O have the opportunity to reside on SSD media (sized to 80% or 90%). When combined with other performance monitoring tools, the new I/O Workload function gives users some representation as to how the workloads and the MSA are working together in a user's real-world environment.

HPE Complete – Zerto

HPE MSA Storage users can leverage Zerto Virtual Replication to replicate applications and data from one MSA array to another MSA array. Popular use cases include departmental MSA storage replicated to enterprise storage, enterprise storage replicated into MSA array, or protect MSA workloads into the cloud.

Zerto operates on the hypervisor level and includes orchestration and automation built-in to enable faster recovery of workloads (RTO in minutes) at much lower Recovery Point Objective (RPO of seconds) available through other data protection tools like backup. Zerto is also a workload mobility tool and allow IT to confidently move workloads and data across heterogeneous storage or cloud.

Ordering, configuring and installing Zerto is simple. Zerto is licensed by number of Virtual Machines that are being protected or moved. For mobility use cases, order the appropriate number of migration licenses needed. For replication use cases, order the appropriate quantity of Zerto Virtual Replication licenses using a combination of the tiered licenses plus the corresponding maintenance part numbers. The license is independent of source and target array size, type or capacity being replicated. See the

Standard Features

HPE Complete/Zerto QuickSpecs for a complete list of partnumbers. A corresponding MSA Advanced Data Services LTU is not required for data replication when using Zerto Virtual Replication. An MSA Advanced Data Services LTU would be required if deploying MSA array-based replication.

Zerto installs as a virtual machine under VMware or Hyper-V or in the Cloud as a VM in AWS and Azure in minutes Zerto does not install any components in the guest operating system and does not depend on any specific configuration of the storage or use MSA array or VMware snapshots to replicate and recover applications.

Zerto virtual replication is available on HPE Catalog via HPE Complete program.

For more information on the HPE Complete – Zerto solution, visit;
https://h20195.www2.hpe.com/v2/getdocument.aspx?docname=a00006013enw

HPE Complete – Arxscan

Arxscan is an HPE Complete Partner delivering innovative software that drives value through unique enterprise data center monitoring and reporting. Arxscan provides infrastructure monitoring for Storage, Network, Servers and Applications. Arxscan is fully supported on the HPE MSA 1060, 2060 and 2062 storage arrays, and is available for purchase directly from Hewlett Packard Enterprise. Arxscan's intuitive dashboard delivers an unprecedented view of how organizations store, distribute and protect their data, providing relevant views around device quality and performance metrics. Benefits include:

- Remote delivery from any location to any location worldwide.
- Supports all HPE arrays, storage OEM product lines, SAN switch and server OS platforms without agents.
- Quickly installed in under two hours in SMB, midrange or enterprise customer environments.
- Presents views that are business operations and infrastructure/system operations centric.
- Creates global collaborative touch points for all users of local and remote data center resources.
- One Stop Shop – ability to purchase complete solutions from HPE that include both HPE products and best-in-class third party branded products, all on a single HPE purchase order.

For more information please refer to **HPE Complete** on **HPE.com**

MSA Health Check Tool

MSA Health Check is a cloud-based tool that provides users insight into the general health of their MSA array. The tool uses a powerful rules-based analytics engine which can predict failures before they happen. The MSA Health Check tool performs a full sweep of analytics and checking thousands of data points from sensors inside the MSA array. The analytics engine will pick up common failure signatures and check against MSA best practices producing a simple, easy to digest PDF report with status and suggested courses of action to correct anything found in the scan. The tool is free of charge to HPE MSA customers. The MSA Health Check tool is supported across all current MSA 1060/2060/2062 arrays as well as the prior three generations of arrays (MSA P2000 G3, MSA 1040/2040/2042 and MSA 1050/2050/2052). The tool is available immediately at:
www.hpe.com/storage/MSAHealthCheck

Service and Support

Warranty

- MSA Storage Systems carry a 3 year limited warranty, parts only exchange, normal business hours, next business day response.
- MSA Enterprise SAS (15K and 10K RPM) SFF HDDs carry a 3 year limited warranty, parts only exchange, normal business hours, next business day response.
- MSA Midline SAS (7.2K RPM) LFF HDDs carry a 1 year limited warranty, parts only exchange, normal business hours, next business day response.
- MSA SSDs carry a 3 year limited warranty, parts only exchange, normal business hours, next business day response. MSA 2060 SSD warranty includes unconditional replacement in case of drive failure, media wear-out, or both.
- The MSA 2060 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.

Service and Support

Protect your business beyond warranty with HPE Support Services

HPE Pointnext provides a comprehensive portfolio including Advisory and Transformational, Professional, and Operational Services to help accelerate your digital transformation. From the onset of your transformation journey, Advisory and Transformational Services focus on designing the transformation and creating a solution roadmap. Professional Services specializes in creative configurations with flawless and on-time implementation, and on-budget execution. Finally, operational services provides innovative new approaches like Flexible Capacity and Datacenter Care, to keep your business at peak performance. Hewlett Packard Enterprise is ready to bring together all the pieces of the puzzle for you, with an eye on the future, and make the complex simple.

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Achieve up to 77% reduction in down time, near 100% 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.

Learn more about getting connected at **http://www.hpe.com/services**

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. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice. This Service combines three years' proactive reporting and advice with our highest level of hardware support; the HPE 24x7, six hour hardware call-to-repair. Hewlett Packard Enterprise is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers and storage, including the HPE MSA Storage systems.
https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf

Service and Support

Standard Care
HPE Proactive Care with 24x7 coverage, three year Support Service
HPE Proactive Care gives customers an enhanced call experience. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice 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.

Foundation 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. In addition, collaborative software support is included in this service that provides troubleshooting assistance on industry leading software running on your HPE server. 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
HPE Hardware Installation
Provides for the basic hardware installation of HPE branded servers, HPE storage including the MSA 2060 devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.

HPE Installation and Startup Service
Provides for the installation and startup of HPE technology including BladeSystems, c-Class enclosure, HPE ProLiant c-Class and Integrity server blades, storage blades, SAN switch blades, HPE Virtual Connect modules (Ethernet and Fibre Channel), Ethernet network interconnects, and InfiniBand, as well as the installation of one supported operating system type (Windows® or Linux).

HPE Datacenter Care service
Helps improve IT stability and security, increase the value of IT, and enable agility and innovation. It is a structured framework of repeatable, tested, and globally available services "building blocks." You can deploy, operate, and evolve your datacenter wherever you are on your IT journey. With HPE Datacenter Care, you benefit from a personalized relationship with HPE via a single point of accountability for HPE and others' products.

HPE Factory Express for Servers and Storage
HPE Factory Express offers configuration, customization, integration and deployment services for HPE servers and storage products. Customers can choose how their factory solutions are built, tested, integrated, shipped and deployed.

Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. HPE products supported through Factory Express include a wide array of servers and storage: HPE Integrity, HPE ProLiant, HPE Apollo, HPE ProLiant Server Blades,

Service and Support

HPE BladeSystem, as well as the HPE MSA Storage, HPE Primera Storage, HPE 3PAR Storage, HPE XP Storage, rackable tape libraries and configurable network switches.

HPE Education Services
Keep your IT staff trained making sure they have the right skills to deliver on your business outcomes. Book a class today and learn how to get the most from your technology investment. **http://www.hpe.com/ww/learn**

HPE Support Center
The HPE Support Center is a personalized online support portal with access to information, tools and experts to support HPE business products. Submit support cases online, chat with Hewlett Packard Enterprise experts, access support resources or collaborate with peers.

Learn more **http://www.hpe.com/support/hpesc**

HPE Insight Remote Support and HPE Support Center are available at no additional cost with a HPE warranty, HPE Support Service or HPE contractual support agreement.

For more information: **http://www.hpe.com/services**

Parts and Materials
Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.

Configuration Information

Step 1: MSA 2060 Base Configurations

Pre-Configured Systems

Description	SKU
MSA 2060 Storage Systems	
HPE MSA 2060 16Gb Fibre Channel LFF Storage	R0Q73A
HPE MSA 2060 16Gb Fibre Channel SFF Storage	R0Q74A
HPE MSA 2060 10GbE iSCSI LFF Storage	R0Q75A
HPE MSA 2060 10GbE iSCSI SFF Storage	R0Q76A
HPE MSA 2060 12Gb SAS LFF Storage	R0Q77A
HPE MSA 2060 12Gb SAS SFF Storage	R0Q78A

Notes:
- Includes an SFF or LFF Array Chassis depending on model, two MSA 2060 controllers, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs are not included in the base MSA 2060 Storage systems.
- There are no converged protocol models with the MSA 2060 Storage systems.

Step 2: Select Your SFP+ Module

HPE MSA 16Gb Short Wave Fibre Channel SFP+ 4-pack Transceiver	C8R24B
HPE MSA 10Gb Short Range iSCSI SFP+ 4-pack Transceiver	C8R25B

Notes:
- MSA 2060 Storage Systems do not ship with SFPs.
- MSA SFPs are for use with MSA 2060 FC or iSCSI Storage Systems.
- MSA 2060 SAS Storage Systems do not require SFP modules.
- Minimum of one SFP 4 pack transceiver required for FC or iSCSI models
- Each MSA 2060 Storage Systems can be configured with four or eight SFPs.
- MSA 2060 10Gb iSCSI configurations can use DAC cables instead of SFPs.
- Controller host ports are recommended to be configured identically.
- Cannot mix FC transceivers with iSCSI transceivers in the same storage system.

Step 3: Select Your Drives

- MSA Gen 6 HDDs and SSDs are for use with MSA Gen 6 Storage Systems only.
- MSA Gen 6 HDDs and SSDs are not compatible with prior generation MSA Storage Systems
- Prior Generation of MSA HDDs and SSDs are not compatible with MSA Gen 6 Storage Systems.
- Customers can mix SSD, Enterprise SAS, and SAS Midline (MDL) drives in the same array enclosure or drive enclosure
- Configurations which have a mixture of both SSDs and HDDs within the same system being used as a capacity Tier (excluding SSD Read Cache), will require the Advanced Data Service Suite LTU. This rule applies to the system level and therefore the license is required regardless of whether the drives are configured for auto-tiering within the same Pool.
- All SSD configurations and SSD Read Cache extension do not require a license on the MSA2060 array.

SFF SSDs

HPE MSA 960GB SAS 12G Read Intensive SFF (2.5in) M2 3yr Wty SSD	R0Q46A
HPE MSA 1.92TB SAS 12G Read Intensive SFF (2.5in) M2 3yr Wty SSD	R0Q47A
HPE MSA 3.84TB SAS 12G Read Intensive SFF (2.5in) M2 3yr Wty SSD	R3R30A

Configuration Information

Description	SKU
SFF HDDs	
HPE MSA 900GB SAS 12G Enterprise 15K SFF (2.5in) M2 3yr Wty HDD	R0Q53A
HPE MSA 600GB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty HDD	R0Q54A
HPE MSA 1.2TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty HDD	R0Q55A
HPE MSA 1.8TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty HDD	R0Q56A
HPE MSA 2.4TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty HDD	R0Q57A
SFF 6 Pack Bundles	
HPE MSA 5.4TB SAS 12G Enterprise 15K SFF (2.5in) M2 3yr Wty 6-pack HDD Bundle	R0Q64A
Notes: Contains 6 x MSA 900GB 12G SAS 15K SFF Enterprise HDDs (R0Q53A)	
HPE MSA 7.2TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty 6-pack HDD Bundle	R0Q65A
Notes: Contains 6 x MSA 1.2TB 12G SAS 10K SFF Enterprise HDDs (R0Q55A)	
HPE MSA 10.8TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty 6-pack HDD Bundle	R0Q66A
Notes: Contains 6 x MSA 1.8TB 12G SAS 10K SFF Enterprise HDDs (R0Q56A)	
HPE MSA 14.4TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty 6-pack HDD Bundle	R0Q67A
Notes: Contains 6 x MSA 2.4TB 12G SAS 10K SFF Enterprise HDDs (R0Q57A)	
LFF SSDs	
HPE MSA 1.92TB SAS 12G Read Intensive LFF (3.5in) M2 3yr Wty SSD	R0Q49A
LFF HDDs	
HPE MSA 6TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q58A
HPE MSA 8TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q59A
HPE MSA 10TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q60A
HPE MSA 12TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q61A
HPE MSA 14TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q62A
HPE MSA 16TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R3U72A
LFF 6 Pack Bundles	
HPE MSA 48TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty 6-pack HDD Bundle	R0Q69A
Notes: Contains 6 x MSA 8TB 12G SAS 7.2K LFF Midline HDDs (R0Q59A)	
HPE MSA 60TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty 6-pack HDD Bundle	R0Q70A
Notes: Contains 6 x MSA 10TB 12G SAS 7.2K LFF Midline HDDs (R0Q60A)	
HPE MSA 72TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty 6-pack HDD Bundle	R0Q71A
Notes: Contains 6 x MSA 12TB 12G SAS 7.2K LFF Midline HDDs (R0Q61A)	

Configuration Information

Description	SKU
HPE MSA 84TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty 6-pack HDD Bundle	R0Q72A
Notes: Contains 6 x MSA 14TB 12G SAS 7.2K LFF Midline HDDs (R0Q62A)	
HPE MSA 96TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty 6-pack HDD Bundle	R3U73A
Notes: Contains 6 x MSA 16TB 12G SAS 7.2K LFF Midline HDDs (R3U72A)	

Self-Encrypting Drives (SED)

HPE MSA 960GB SAS 12G Read Intensive SFF (2.5in) M2 3yr Wty FIPS Encrypted SSD	R0R52A
HPE MSA 1.92TB SAS 12G Read Intensive SFF (2.5in) M2 3yr Wty FIPS Encrypted SSD	R0R53A
HPE MSA 1.92TB SAS 12G Read Intensive LFF (3.5in) M2 3yr Wty FIPS Encrypted SSD	R0R55A
HPE MSA 5.4TB SAS 12G Enterprise 15K SFF (2.5in) M2 3yr Wty FIPS Encrypted 6-pack HDD Bundle	R0R44A
Contains 6 x MSA 900GB 12G SAS 15K SFF FE HDDs	
HPE MSA 14.4TB SAS 12G Enterprise 10K SFF (2.5in) M2 3yr Wty FIPS Encrypted 6-pack HDD Bundle	R0R47A
Contains 6 x MSA 2.4TB 12G SAS 10K SFF FE HDDs	
HPE MSA 72TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty FIPS Encrypted 6-pack HDD Bundle	R0R50A
Contains 6 x MSA 12TB 12G SAS 7.2K LFF FE HDDs	

Notes:
- All drives within the MSA 2060 array must be self-encrypted drives to enable the encryption feature.
- SEDs can be used in a non-SED configuration.
- All MSA SEDs are FIPS 140-2 validated self-encrypting drives
- All MSA SEDS have been certified by the U.S. National Institute of Standards and Technology (NIST) and Canadian Communications Security Establishment (CSE) as meeting the Level 2 security requirements for cryptographic modules as defined in the FIPS 140-2 Publication.

Step 4: Options

Drive Enclosures

HPE MSA 2060 SAS 12G 2U 12-disk LFF Drive Enclosure	R0Q39A
HPE MSA 2060 SAS 12G 2U 24-disk SFF Drive Enclosure	R0Q40A

Notes:
- Each drive enclosure includes two 0.5m MiniSAS HD to MiniSAS HD cables.
- Add up to nine additional drive enclosures.
- MSA 2060 LFF Drive Enclosure can be connected to either the MSA 2060 SFF or LFF Storage systems.
- MSA 2060 SFF Drive Enclosure can be connected to either the MSA 2060 SFF or LFF Storage systems

Drive Enclosure Cables

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

Notes: When connecting a MSA 2060 controller to a drive enclosure if a longer cable is needed.

Security Option

HPE Bezel Lock Kit	875519-B21

Configuration Information

Description	SKU
DC Power Option	
HPE MSA 2060 764W -48VDC Ht Plg PS Kit	R0Q90A

Notes:
- All MSA 2060 array enclosures and drive enclosures come standard with 2 AC power supplies.
- If DC power is desired, then two DC power supplies must be selected on the array enclosure and all drive enclosures.
- DC Power Supplies can be ordered with factory integration or with field integration. With factory integrated orders, the AC power supplies will not be shipped.

Power Cords

HPE C13 - C14 WW 250V 10Amp 2.0m Jumper Cord	A0K02A
HPE C13 - C14 WW 250V 10A Gray 0.7m Jumper Cord	A0K03A
HPE C13-NEMA 6-15P 10A/250V 3.6m Black Power Cord	A0N33A
HPE C13 - Nema 5-15P US/CA 110V 10Amp 1.83m Power Cord	AF556A
HPE C13 - GB-1002 CN 250V 10Amp 1.83m Power Cord	AF557A
HPE C13 - IRAM -2073 AR 250V 10A 2.5m Power Cord	AF558A
HPE C13 - KSC- 8305 KR 250V 10Amp 1.83m Power Cord	AF560A
HPE C13 - CNS-690 TW 110V 13Amp 1.83m Power Cord	AF561A
HPE C13 - IS-1293 IN 240V 6Amp LV 2.0m Power Cord	AF562A
HPE C13 - SI-32 IL 250V 10Amp 1.83m Power Cord	AF564A
HPE C13 - SEV 1011 CH 250V 10Amp 1.83m Power Cord	AF565A
HPE C13 - DK-2.5A DK 250V 10Amp 1.83m Power Cord	AF566A
HPE C13 - SABS-164 ZA 250V 10Amp 2.5m Power Cord	AF567A
HPE C13 - CEE-VII EU 250V 10Amp 1.83m Power Cord	AF568A
HPE C13 - AS3112-3 AU 250V 10Amp 2.5m Power Cord	AF569A
HPE C13 - BS-1363A UK/HK/SG 250V 10Amp 1.83m Power Cord	AF570A
HPE C13 - JIS C8303 JP 100V 12Amp 2.0m Power Cord	AF572A
HPE C13 - C14 WW 250V 10Amp Flint Gray 2.0m Jumper Cord	AF573A
HPE C13 - NBR-14136 BR 250V 10Amp 1.83m Power Cord	AF591A
HPE C13-C14 IN 250V 10Amp 2m Black Jumper Cord	R1C65A

Notes:
- Two PDU cables ship standard with all AC-powered enclosures.
- The power cords may be used by customers that desire to plug their base array and/or drive enclosures into a wall outlet or PDU.

Configuration Information

Step 5: Choose Cables for Host Connection

Description	SKU
Fibre Channel Infrastructure	
PremierFLexOM4 type cables	
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
PE Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A
OM3 Fibre FC to LC cables	
HPE LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
HPE 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
HPE LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
HPE LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
HPE LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
HPE LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A
10GbE Infrastructure	
Direct Attach Copper Cables	
Aruba 10G SFP+ to SFP+ 1m Direct Attach Copper Cable	J9281D
Aruba 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	J9283D
Aruba 10G SFP+ to SFP+ 7m Direct Attach Copper Cable	J9285D
HPE BladeSystem c-Class 10GbE SFP+ to SFP+ 3m Direct Attach Copper Cable	487655-B21
HPE BladeSystem c-Class 10GbE SFP+ to SFP+ 5m Direct Attach Copper Cable	537963-B21
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
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A

Configuration Information

Description	SKU
SAS Infrastructure	
Mini SAS HD to Mini SAS Cables	
HPE 1.0m External Mini SAS High Density to Mini SAS Cable	716189-B21
HPE 2.0m External Mini SAS High Density to Mini SAS Cable	716191-B21
HPE 4.0m External Mini SAS High Density to Mini SAS Cable	716193-B21

Notes:
- These cables are used to connect the c-Class 6Gb BladeSystem SAS switch to MSA 2060 SAS Storage system.
- These are not used for connecting the MSA 1060 to a drive enclosure.

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

Notes:
- These cables are used to connect the DL and ML ProLiant 12Gb SAS Servers to MSA 2060 SAS Storage system.
- Limited to two redundantly connected hosts.
- The 1.0m and 2.0m Mini-SAS HD to Mini-SAS HD cables can also be used for connecting a MSA 2060 SAS controller to a SFF or LFF drive enclosure.

Step 6: Software

HPE MSA Advanced Data Services LTU	R2C33A
HPE MSA Advanced Data Services E-LTU	R2C33AAE

Notes:
- The Advanced Data Services Suite includes a Performance Tiering LTU, 512 Snapshot Software LTU, and the Remote Snap Software LTU.
- Configurations which have a mixture of both SSDs and HDDs within the same system being used as a capacity Tier (excluding SSD Read Cache), will require the Advanced Data Service Suite LTU. This rule applies to the system level and therefore the license is required regardless of whether the drives are configured for auto-tiering within the same Pool.
- All SSD configurations and SSD Read Cache extension do not require a license on the MSA2060 array.
- The MSA Advanced Data Services LTU comes standard on the MSA 2062 models.
- Visit HPE Complete on HPE.com for information on Zerto Virtual Replication and Arxscan Arxview software that is supported on the MSA 1060/2060/2062 Storage.

Technical Specifications

MSA 2060	
Power requirements	
Input Power Requirements (typical-running I/O) SFF/LFF arrays	120VAC 3.07A, 293-361 W; 220VAC 1.58A,289-352W
Max Input Power	100-230 VAC, 50/60 Hz., 4.38-2.17A; 48-60 VDC 10.4A/8.3A
Heat Dissipation	1766 BTU/hr
Physical	
Height	3.5 in (8.9 cm)
Depth (Back of chassis ear to controller latch)	20.0 in (50.8 cm)
Depth (Front of chassis ear to back of cable bend)	26.4 in (66.9 cm)
Width (Chassis only)	17.5 in (44.5 cm)
Width (Chassis with bezel ear caps)	19.0 in (48.3 cm)
Weight LFF Enclosure	
Chassis empty	11 lb (5 kg)
Controller enclosure(fully populated with FRUs and disks)	71 lb (32 kg)
Expansion enclosure (fully populated with FRUs and disks)	62 lb (28 kg)
Weight SFF Enclosure	
Chassis empty	11 lb (5 kg)
Expansion enclosure (fully populated with FRUs and disks)	66 lb (30 kg)
Controller enclosure(fully populated with FRUs and disks)	55 lb (25 kg)

Technical Specifications

MSA 2060 Benchmark Performance Results

The performance figures provided here are for reference as many variables exist between array configurations, workloads, 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 that are fed into HPE Sizer tools which are based on conservative real-world configurations. For consistency, the MSA performance numbers have been documented in both Benchmark and End-to-End Performance tables. These numbers are subject to change without notice

HPE MSA 2060 Benchmark Performance Results	
Benchmark Performance Results[1]	**HPE MSA 2060 (with SSDs)**
IOPS	
Random Reads [2]	325,000
Random Writes [3]	175,000
Sequential [4]	
Segmented Sequential Reads [5]	13.1 GB/s
Segmented Sequential Writes [6]	7.3 GB/s

Notes:

- [1]Performance results were generated using internal HPE test tools. 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.
- [2]Dual controller configuration, four SSDs, RAID 1, two SSDs per disk group; one disk groups per pool, four volumes per pool, block size: 8k, 16Gb FC direct connect to array.
- [3]Dual controller configuration, 20 SSDs, RAID 10, ten SSDs per disk group; one disk groups per pool, four volumes per pool, block size: 8k, 16Gb FC direct connect to array.
- [4]Sequential performance numbers were generated using segmented sequential workloads. For segmented 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.
- [5]Dual controller configuration, 20 SSDs, RAID 10, ten SSDs per disk group, 1 disk group per pool, four volumes per pool, 256k block size, 16Gb FC direct connect to array.
- [6]Dual controller configuration, 18 SSDs, RAID 5, nine SSDs per disk group, 1 disk group per pool, four volumes per pool, 256k block size, 16Gb FC direct connect to array.

Technical Specifications

MSA 2060 End-to-End Performance Figures						
Storage Model	**MSA 2060 FC**		**MSA 2060 iSCSI**		**MSA 2060 SAS**	
Host Protocol	16Gb FC[2]		10GbE iSCSI[2]		12Gb SAS[2]	
Drive Technology	HDD	SSD	HDD	SSD	HDD	SSD
MSA 2060 RAID1 / RAID 10 Performance Results[3,4,5,6,7]						
Random Reads IOPs	49,900	300,900	43,400	221,100	49,900	294,200
Random Writes IOPs	31,600	161,800	31,600	132,600	31,700	160,800
Random Mix 60/40 IOPs	40,100	226,300	39,800	175,100	40,100	223,900
Sequential Reads MB/s[1]	8,400	12,100	5,500	7,700	8,400	12,100
Sequential Writes MB/s[1]	4,000	5,300	3,700	4,400	4,000	5,300
MSA 2060 RAID 5 Performance Results[8,9,10,11]						
Random Reads IOPs	48,100	275,400	41,300	211,100	48,000	269,500
Random Writes IOPs	15,500	60,500	15,600	55,000	15,600	60,500
Random Mix 60/40 IOPs	27,300	112,500	27,200	98,000	27,100	112,500
Sequential Reads MB/s[1]	8,000	11,800	5,400	7,700	8,000	11,800
Sequential Writes MB/s[1]	5,800	6,700	4,500	4,500	5,800	6,700
MSA 2060 RAID 6 Performance Results[12,13,14,15]						
Random Reads IOPs	48,900	273,000	42,000	210,200	48,800	266,100
Random Writes IOPs	12,000	52,200	12,000	47,000	12,000	52,000
Random Mix 60/40 IOPs	20300	101,800	20,300	89,100	20,300	101,300
Sequential Reads MB/s[1]	8,000	12,100	5,500	7,800	8,000	12,100
Sequential Writes MB/s[1]	5,700	6,300	4,300	4,400	5,700	6,300
MSA 2060 MSA-DP+ Performance Results[16,17,18]						
Random Reads IOPs	48,600	267,600	41,800	207,700	48,600	262,000
Random Writes IOPs	11,700	52,300	11,800	47,400	11,800	52,400
Random Mix 60/40 IOPs	20,300	101,900	20,300	89,200	20,300	101,200
Sequential Reads MB/s[1]	8,000	12,100	5,400	7,800	8,000	12,100
Sequential Writes MB/s[1]	5,400	6,300	4,300	4,400	5,400	6,300

Notes:
- 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. These numbers reflect a full array configuration with the maximum number of front-end ports and controllers. The test results shown for the HPE MSA 2060 are designed to give a conservative reference point for comparisons.
- All performance numbers were captured using dual controller configurations.
- All performance numbers were captured using four volumes per pool.
  - [1]Sequential tests (MB/s) are based on 256K block sizes and random tests (IOPS) are based on 8K block sizes. 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.
  - [2]Fibre Channel results were measured using 16 Gb FC Host Bus Adapters. SAS results were measured using 12 Gb SAS Host Bus Adapters. 10 GbE iSCSI results were measured using 10GbE iSCSI Host Bus Adapters. Hosts were directly attached to the HPE MSA 2060 array.
  - [3]RAID 1 Solid State Drive random read and mixed results: 4 SSDs, 2 SSDs per disk group, 1 disk group per pool.
  - [4]RAID 10 Solid State Drive random write results: 8 SSDs, 4 SSDs per disk group, 1 disk group per pool.
  - [5]RAID 10 Sold State Drive sequential results: 20 SSDs, 10 SSDs per disk group, 1 disk group per pool.
  - [6]RAID 10 Hard Disk Drive sequential results: 96 10K HDDs, 12 drives per disk group, 4 disk groups per pool.
  - [7]RAID 10 Hard Disk Drive random results: 240 10K HDD, 10 drives per disk group, 12 disk groups per pool.
  - [8]RAID 5 Solid State Drive random results: 6 SSDs, 3 SSDs per disk group, 1 disk group per pool.

Technical Specifications

- o   [9]RAID 5 Solid State Drive sequential results: 18 SSDs, 9 SSDs per disk group, 1 disk group per pool.
- o   [10]RAID 5 Hard Disk Drive sequential results: 90 10K HDD, 9 drives per disk group, 5 disk groups per pool.
- o   [11]RAID 5 Hard Disk Drive random results: 234 10K HDD, 9 drives per disk group, 13 disk groups per pool.
- o   [12]RAID 6 Solid State Drive random results: 8 SSDs, 4 SSDs per disk group, 1 disk group per pool.
- o   [13]RAID 6 Solid State Drive sequential results: 20 SSDs, 10 SSDs per disk group, 1 disk group per pool.
- o   [14]RAID 6 Hard Disk Drive sequential results: 80 10K HDD, 10 drives per disk group, 4 disk groups per pool.
- o   [15]RAID 6 Hard Disk Drive random results: 240 10K HDD, 10 drives per disk group, 12 disk groups per pool.
- o   [16]MSA-DP+ Solid State Drive results: 24 SSDs, 12 SSDs per disk group, 1 disk group per pool.
- o   [17]MSA-DP+ Hard Disk Drive sequential results: 96 10K HDD, 12 drives per disk group, 4 disk groups per pool.
- o   [18]MSA-DP+ Hard Disk Drive random results: 240 10K HDD, 30 drives per disk group, 4 disk groups per pool

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Summary of Changes

Date	Version History	Action	Description of Change
08-Sep-2020	Version 1	New	New QuickSpecs.

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