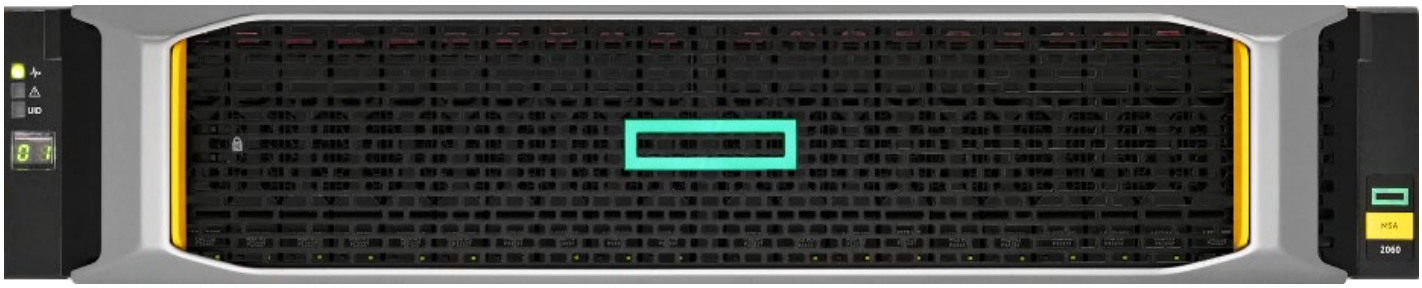
Have feedback on QuickSpecs? We're listening

HPE MSA 1060 Storage Array QuickSpecs

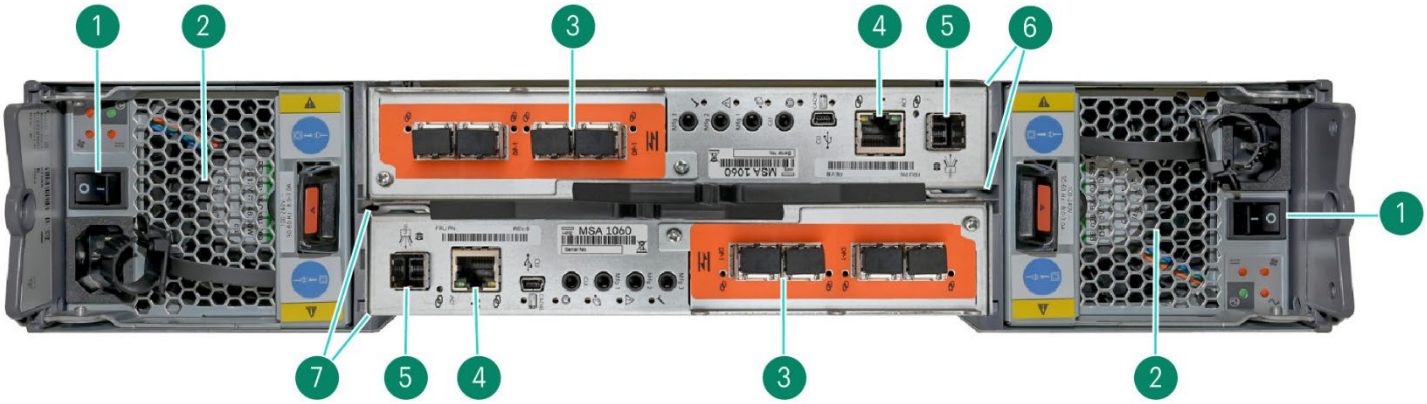
Need a modern shared storage array which is flash-ready and affordable with what's left of a small budget? The HPE MSA 1060 Storage brings affordable flash storage down to the most price sensitive customers.

Designed to meet entry-level storage requirements, the HPE MSA 1060 Storage is a good fit for budget constrained customers. With one of the lowest entry price points in the Hewlett Packard Enterprise Storage portfolio and field-proven HPE ProLiant compatibility, the HPE MSA 1060 Storage is the platform of choice for smaller IT workloads. The HPE MSA 1060 Storage features 10GBASE-T iSCSI, Fibre Channel and SAS host interface connectivity at previously unattainable entry price points. The MSA 1060 allows users to take advantage of the latest storage technologies while also providing a balance between performance and budget.

Overview



HPE MSA 1060 Storage



HPE MSA 1060 Storage-Rear View

Item	Description	Item	Description
1.	Power Switch	5.	12Gb SAS expansion port
2.	Redundant Power and Cooling Module (AC or DC)	6.	Controller A (Inverted)
3.	Host connection ports (8/16Gb FC, 1/10Gb iSCSI or 12Gb SAS depending on model)	7.	Controller B
4.	Ethernet management port		

Overview

What's New

- Configurable HPE Smart Choice MSA 1060 storage array models with select HPE MSA Smart Choice Options to provide flexibility in customizing HPE Smart Choice storage configurations
- HPE Smart Choice MSA 1060 Gen6 storage array bundles with up to 14TB of raw storage capacity included, supporting 16Gb Fibre Channel or 12Gb SAS host connectivity
- All MSA Gen6 and Gen7 storage array models now fully certified for use with HPE Morpheus VM Essential Software.
- Expand MSA 1060 array capacity up to 2.95PB with new HPE MSA self-encrypting (SED) SAS Read Intensive SSD options – 1.92TB (SFF & LFF), 3.84TB (SFF), 15.36TB (SFF), and 30.72TB (SFF)
- HPE MSA 14.4TB SFF 10K HDD and 72TB LFF 7.2K HDD self-encrypting (FIPS) 6-pack media options.

MSA 1060 Storage Models

Description	SKU
HPE MSA 1060 16Gb Fibre Channel SFF Storage	R0Q85B
HPE MSA 1060 10GBASE-T iSCSI SFF Storage	R0Q86B
HPE MSA 1060 12Gb SAS SFF Storage	R0Q87B

Notes:

- Includes a single SFF Array Chassis, two MSA 1060 controllers, two AC power supplies, two 1.5m PDU cords (IEC C13/C14), and one rack-mount kit.
- SFPs are not required for either the iSCSI or SAS array models.
- SFPs are required for the Fibre Channel model and must be purchased separately. SFPs are not included with the 1060 16Gb Fibre Channel model. Please refer to the "Configuration Information" section for further details.
- All SKUs ending in "B" include the new 94% efficient power supply that meets EU Lot9 power efficiency requirements.

MSA 1060 Smart Choice Storage Models

Description	SKU
HPE MSA 1060 SFF 2x16Gb FC 2-port Controller 12x1.2TB HDD 4x16Gb SFP FC XCVR 14TB Storage Array	P79250-B25
HPE MSA 1060 SFF 2x12Gb SAS 2-port Controller 12x1.2TB HDD 14TB Storage Array	P79251-B25

Notes:

- Includes an MSA 1060 SFF Array Chassis, two MSA 1060 controllers, two AC power supplies, two 1.5m PDU cords (IEC C14), one rack-mount kit.
- Each model includes twelve factory-integrated 1.2TB 10K SFF HDDs and one 4-pack of supported SFP transceivers (excluding 12Gb SAS model)
- All models include 94% efficient power supplies that meet EU Lot9 power efficiency requirements.

Overview

Description	SKU
HPE MSA 1060 SFF 2x16Gb FC 2-port Controller Storage Array	P89129-B25
HPE MSA 1060 SFF 2x12Gb SAS 2-port Controller Storage Array	P89130-B25

Notes:

- Includes an MSA 1060 SFF Array Chassis, two MSA 1060 controllers, two AC power supplies, two 1.5m PDU cords (IEC C14), one rack-mount kit.
- Drives and transceivers are not included. Please select required options from “HPE MSA Smart Choice Options” menu in Configuration Information section.
- All models include 94% efficient power supplies that meet EU Lot9 power efficiency requirements.

Standard Features

HPE MSA 1060 Storage	
Array	
Access Type	Block
Form Factor	2U, SFF
Number of controllers per array	2
Number of host ports per array	4
FC host connectivity	8/16 Gb
iSCSI host connectivity (IPv4 and IPv6)	1/10 Gb
SAS host connectivity	12 Gb
Cache, per array	
Max Read cache per array	8 TB
Data (read/write) cache + system memory per array	24 GB
Pool Capacity	Two (2) Pools 4 PiB addressable capacity per pool 712 TiB* Useable capacity per system **Notes:** *Based on using 7.68 TB SSDs and 24 TB HDDs in RAID MSA-DP+ with recommended sparing
RAID Levels supported:	RAID 0*,1, 5, 6, 10, MSA-DP+ **Notes:** *Read Cache Only
Enclosures	
Expansion Drive Enclosures	0-3 enclosures
LFF/SFF array/enclosure mixing	Supported
Maximum number of drives per array enclosure	24 SFF
Maximum number of drives per drive enclosure	24 SFF or 12 LFF
Drive enclosure interface type	12 Gb SAS
Drives	
Maximum total HDDs per array	96 SFF / 24SFF + 36 LFF
Maximum total SSDs per array	96 SFF / 24SFF + 36 LFF
Max raw capacity per array enclosure	737.28 TB SFF
Max raw capacity per drive enclosure	737.28 TB SFF / 288 TB LFF
Max raw capacity per array	2.95PB (All SFF) 1.6PB (SFF array + LFF drive enclosures)
Drive Capacities	
SFF SSDs	960 GB, 1.92 TB, 3.84 TB, 7.68 TB
LFF SSD	1.92 TB
SFF HDDs	10 K: 600 GB, 1.2 TB, 1.8 TB, 2.4 TB
LFF HDDs	7.2 K: 6 TB, 8 TB, 12 TB, 16 TB, 20 TB, 24 TB
Self-Encrypting SSDs	SFF: 1.92 TB, 3.84 TB, 15.36 TB, 30.72 TB LFF: 1.92 TB

Standard Features

Self-Encrypting HDDs **Notes:** Sold in 6 Pack bundles only	SFF: 2.4 TB LFF: 12 TB
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 per pool	512
Maximum number of volumes per array	1024
Maximum number of snapshots (included with array)	64
Maximum number of snapshots (with Advanced Data Services License)	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
USGv6 Certified	Yes

All MSA 1060 models offer a common set of valuable features

Chassis

- 24 drive bay SFF 2U base storage systems
- No LFF base storage systems offered.
- 12 drive bay LFF or 24 drive bay SFF 2U expansion enclosures, depending on model
- 12Gb SAS disk expansion protocol
- Two AC power supplies with 1 black 1.5m C13/C14 PDU style jumper cord each
- New next-generation drive carriers
- Front-side bezel with support for optional bezel lock

Storage Controllers

- Dual hot-swappable active/active controllers
- 2 host ports per controller, 4 host ports per array
- 8/16Gb Fibre Channel, 1/10Gb iSCSI and 12Gb SAS protocol support
- Auto negotiation supported on Fibre Channel (down to 8Gb) and 10GBase-T iSCSI (down to 1Gb)
- New next-generation RAID offload ASIC and Processor
- 24GB system cache

Standard Features

- 12Gb SAS expansion ports
- Battery-free cache backup with super capacitors and MMC

Expansion Capacity

- Maximum expansion of 3 drive enclosures (either LFF and/or SFF)
- Maximum of 96 SFF or 24SFF + 36 LFF drives
- Maximum of 2.95PB SFF (All SFF) / 1.6PB SFF + LFF Drive Enclosure mixed configuration

Storage Services

- Virtual Storage
- Up to two (2) pools (4 PiB addressable capacity per pool)
- Automated tiering v2.0
- SSD read cache extension
- Thin Provisioning
- Volume Copy
- Snapshot capability (64 snaps standard, 512 optional snapshot per array with Advanced Data Services License)
- Virtual Storage Disk Group can be spanned across multiple enclosures.
- Virtual Storage RAID levels supported: 0, 1, 5, 6, 10, MSA-DP+ (RAID 0 supported for Read Cache only)
- New disk group type (MSA-DP+):
  - Integrated sparing
  - Fast rebuilds
  - Improved sequential performance
  - Incremental disk group expansion

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

- Remote Snapshot (Array-based asynchronous replication)
- VMware Site Recovery Manager
- HPE Zerto Virtual Replication
- Optional bezel lock

Standard Features

Product Technology

Storage Controllers

- The MSA 1060 FC controllers support 8/16Gb FC host connectivity.
- The MSA 1060 iSCSI controllers support 1/10GbE iSCSI host connectivity (Copper 10GBASE-T).
- The MSA 1060 SAS controllers support 12Gb SAS host connectivity.
- 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 1060 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 with 24 SFF drive bays, all 1060 array models.
- 2U rack height 12 LFF or 24 SFF drive bays, depending on 2060 drive enclosure model.
- 12G SAS Midplane.
- Next generation drive carriers.
- New bezel lock kit for added security.

Available Drives

The MSA 1060 Storage Systems support a wide variety of MSA 3.5-inch LFF drives (via the MSA 2060 LFF Drive Enclosure) 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 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.

Optional Drive Enclosures

MSA 2060 LFF Drive Enclosure.

This 2U enclosure is designed to support twelve (12) HPE Storage LFF drives and accepts MSA dual-ported 12Gb SSD and/or SAS Midline HDDs. The pre-configured MSA 2060 LFF Drive enclosure has two I/O modules and supports the MSA 1060 dual Storage systems.

- The MSA 2060 LFF Drive Enclosure can be attached to the MSA 1060 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 1060 array expansion port or existing drive enclosure cascade port.
- LFF and/or SFF drive enclosures can be mixed up to the maximum of 3 total drive enclosures

Standard Features

HPE MSA 2060 SFF Drive Enclosures.

This 2U enclosure is designed to support twenty-four (24) HPE Storage 2.5-inch SFF drive bays and accepts MSA dual ported 12Gb SSD and/or Enterprise SAS HDDs. The pre-configured MSA 2060 SFF Drive enclosure has two I/O modules and supports the MSA 1060 Storage systems.

- The MSA 2060 SFF Drive enclosure can be attached to the MSA 1060 SFF Storage systems.
- Each MSA 2060 SFF Drive enclosure ships standard with two .5m mini-SAS HD to mini-SAS HD cables for connection to the MSA 1060 array expansion port or existing drive enclosure cascade port.
- LFF and/or SFF drive enclosures can be mixed up to a maximum of 3 total drive enclosures.

Scalability

- The MSA 1060 can scale up to 737.28TB of raw capacity per array enclosure, expandable to 1.6PB of raw capacity with the addition of up to 3 MSA 2060 LFF Drive Enclosures and up to 2.95PB of raw capacity with the addition of up to 3 MSA 2060 SFF Drive Enclosures.
- Users may configure an MSA 1060 SFF array enclosure with MSA 2060 SFF and/or LFF 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 Virtual Storage features.

LUNs

The MSA 1060 arrays support 512 volumes and up to 512 snapshots in a system. All volumes can be mapped to LUNs. Maximum LUN sizes up to 140TB. Thin Provisioning allows the user to create 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 1060 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 1060 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. RAID 6 can also 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 block striping and parity. Because data and parity are striped across all drives, no single drive is a bottleneck. 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
- Optimize performance
- 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 1.2TB disk and a 2.4TB disk is acceptable; but mixing a 8TB disk and a 24TB 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.

Standard Features

Configuration and Management Tools

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

Web Browser Support

The MSA 1060 arrays come integrated with web-based management (SMU v4) and CLI based software for storage and RAID management, setup, configuration, and troubleshooting. The MSA 1060 management supports Microsoft Edge, Mozilla Firefox, and Google Chrome.

Hot Plug Expansion and Replacement Support

All MSA 1060 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 1060 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 1060 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 2022
- Microsoft Windows Server 2019
- Microsoft Windows Server 2016

- VMware
- Red Hat Enterprise Linux
- SuSE SLES Linux
- Citrix XenServer (Hypervisor)

  Notes: depends on protocol.

Advanced Data Services Suite

The HPE MSA Advanced Data Services Suite can be purchased as an option on the MSA 1060 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 one or more Disk Groups of similar physical disks. The MSA 1060 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 1060 supports sub-LUN tiering and automated data movement between tiers. The MSA 1060 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.

An Advanced Data Services Suite License is required when mixing HDDs and SSDs within the same system, except when using SSDs exclusively as SSD Read Cache. See the following table for examples:

Pool A	Pool B	License required?
HDDs	– HDDs – None	No
SSDs (Flash pool)	– SSDs (Flash pool) – None	
HDDs & SSDs (Read Cache)	– HDDs & SSDs (Read Cache) – HDDs – None	
SSD (Flash pool)	– HDDs	Yes
HDD & SSD (Auto-tiering)	– Any configuration – None	

Snapshot and Volume Copy

- All MSA 1060 arrays come standard with 64 snapshots and can be expanded to 512 snapshots with the Advanced Data Services License.
- 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.
- A 512 Snapshot license, included in the Advanced Data Services LTU, is available as an option on the MSA 1060.
- Hewlett Packard Enterprise does not provide warranty assistance for software products included with our base hardware products. Support is available with either SupportPlus or SupportPlus24 Service options. The hardware warranty component of these services is accounted for in the pricing of the SP and SP24 HPE Service options.

Remote Snap

HPE MSA Remote Snap Software is array-based functionality that provides remote replication on the HPE MSA 1060 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 can 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.
- 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.
- 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 sites.
- MSA Remote Snap on the MSA 1060 allows one peer connection.
- Advanced scheduler provides several options to IT administrators for business continuance
- Flexible architecture allows remote replication between MSA 1060 and MSA 2060 or MSA 2062 arrays using the virtual storage architecture and licensed for Remote Snap with the Advanced Data Services LTU.

Standard Features

- 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.
- 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.
- Provide a cluster-level view of the storage

HPE OneView for VMware vCenter is downloadable from MSC (My Software 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 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

HPE Morpheus VM Essentials Software

HPE Morpheus VM Essentials Software is a virtualization software solution that allows customers to provision and manage KVM and VMware-based VMs from a single intuitive interface. The solution comes with the KVM-based HVM hypervisor that is enhanced to include enterprise-grade cluster management with capabilities such as high availability, live compute and storage migration, distributed workload placement, integrated data protection, secure hardening, and external storage support. To enable flexibility for those continuing to host VMware-based applications, VM Essentials can also be used to connect to and manage existing VMware clusters. This means unified management and simple VM provisioning across both the HVM hypervisor and VMware ESXi™ so you can provision workloads on demand to the right environment, on your terms, with zero lock-in. When you're ready, you can use the included toolset to convert existing VMware images to VM Essentials.
Please review the HPE Morpheus VM Essentials Software QuickSpecs for further details.

HPE MSA Gen6 Storage is now fully qualified for use with HPE Morpheus VM Essential Software.
Please visit the HPE Morpheus VM Essentials Software Compatibility Matrix for further details on supported server, storage, and software platforms.

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

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.

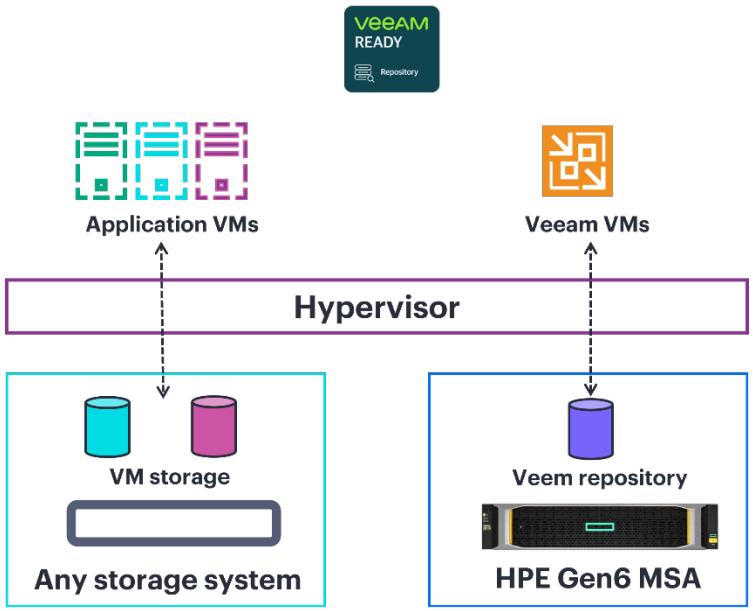
The new I/O Workload graph will show a line labeled Capacity and a line plot for each selected workload percentage (100%, 80%, or Other% value). Below are two examples of user scenarios where the I/O Workload Graph might be useful and how to utilize the data the graph provides.

- 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 suggests 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 allows 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.

Protect your data with HPE MSA Storage and Veeam Backup & Replication

Together, HPE and Veeam help you safeguard your data to ensure it's always on, always protected and that your enterprise can rapidly and easily recover should a situation arise - from human error to a malicious attack. And now, HPE MSA Storage is certified as a Backup Repository to provide seamless protection and Instant VM Recovery. Veeam Backup & Replication provides a single management console to orchestrate the protection of virtual servers, physical machines and cloud-based workloads. Due to the extraordinary ratio of cost to capacity and performance offered by HPE MSA Storage, Veeam Backup & Replication with HPE MSA Storage makes the perfect solution to modernize your backup strategy and protect your data from disaster.



Key features of Veeam Backup and Replication:

- Image-level VM backups: Create application-consistent backups with advanced application-aware processing.
- Higher data availability with efficient movement of backup copies offsite for disaster recovery
- Unify management of protection of physical and cloud environments
- Scale-out Backup Repository: Create a single virtual pool of backup storage to which backups can be assigned, offering the freedom to easily extend backup storage capacity.
- SureBackup: Automatically tests and verifies every backup and every VM for recoverability.
- Image-based VM replication with WAN acceleration: Get backups off site up to 50x faster than non-accelerated traffic and save bandwidth for offsite for disaster recovery (DR).
- Direct Storage Access: Perform vSphere backups faster and with reduced impact by backing up via Direct SAN Access and Direct NFS Access.
- Instant VM Recovery: Restore access to a failed VM in less than two minutes while the full restore is executed in parallel.
- Native tape support: Store entire VM backups or individual files on HPE StoreEver with direct restore from tape.
- SureReplica: Automatically test and verify every VM replica for recoverability.

For more details on Veeam Backup & Replication see the Veeam Backup & Replication web pages.

HPE 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 an enterprise storage array, enterprise storage replicated to an MSA array for backup, or replication of MSA workloads into the cloud for data protection.

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 allows IT to confidently move workloads and data across heterogeneous storage or cloud.

Ordering, configuring and installing Zerto is simple. Zerto is licensed by the 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 HPE Complete/Zerto QuickSpec for a complete list of part numbers. 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.

Review the HPE Zerto quickspec for more information.

HPE Insight Remote Support

HPE Insight Remote Support (Insight RS) is a software solution that enables reactive and proactive remote support to improve the availability of supported servers, storage and networking. Insight RS enables enhanced delivery of your warranty or support services contract. Insight RS supplements your monitoring continuously to ensure maximum system availability by providing intelligent event diagnosis and automatic, secure submission of hardware event notifications to HPE, initiating a fast and accurate resolution, based on your product's service level. Notifications may be sent to your HPE Authorized Channel Partner for on-site service, if configured and available in your country. For more information about Insight Remote Support see: http://www.hpe.com/services/getconnected.

HPE Insight Remote Support is fully supported on all HPE MSA Gen6 and Gen7 array models. Its use requires the purchase of an HPE Tech Care Service agreement: Basic, Essential, or Critical.

HPE 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 checks 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: http://www.hpe.com/storage/MSAHealthCheck.

For more information on how to use HPE MSA Health Check, please review the HPE MSA Health Check User Guide.

ENERGY STAR Certification

The HPE MSA 1060 SAN Storage systems are ENERGY STAR certified. ENERGY STAR certified products are energy efficient which results in cost savings via reduced energy consumption and regulatory rebates. Please refer to the US EPA website for details on ENERGY STAR certification criteria and process. MSA 1060 ENERGY STAR Certification is listed on the EPA website.

Network Equipment-Building System (NEBS) Certification

When used in conjunction with specific Storage SFF SAS drives and the MSA 2060 764W -48VDC Hot Plug Power Supply Kit (R0Q90A), the HPE MSA 1060 16Gb FC SFF Storage (R0Q85A/R0Q85B) and MSA 1060 12Gb SAS SFF Storage (R0Q87A/R0Q87B) arrays are certified compliant with GR-63-Core (Issue 5) and GR-1089-Core (Issue 7) NEBS criteria. NEBS Certified DC-Power Storage systems are designed for network equipment providers (NEPs) and communication service providers. All NEBS compliant MSA 2060 Storage systems support configurations with up to 3 compliant 2060 SFF Drive Enclosures (R0Q40A/R0Q40B) for a maximum of 240 SFF HDDs or SSDs

Service and Support

For the most up-to-date information on HPE Services, please refer to the HPE Services – Supplemental QuickSpecs, which provides a comprehensive and regularly updated overview of available services.

Configuration Information

HPE Smart Choice purchase program

The HPE Smart Choice purchase program features popular HPE solutions that can be quoted in minutes and shipped quickly through HPE Authorized Partners. HPE MSA bundles including storage and transceivers are configured and tested in an HPE factory and stocked at HPE Authorized Distributors and Partners. The products arrive in a single box, making onsite integration easier and more efficient for partners and customers. Additionally, you may purchase HPE Smart Choice Array models that can be configured by either the HPE authorized partner or at the customer site using either standard HPE MSA Options or HPE MSA Smart Choice Options.

For additional information on the HPE Smart Choice purchase program, please visit:
https://www.hpe.com/psnow/doc/a50009219enw

HPE MSA 1060 Smart Choice Arrays

HPE MSA Gen6 1060 Storage models currently available through the HPE Smart Choice program include:

Description	SKU
HPE MSA 1060 SFF 2x16Gb FC 2-port Controller 12x1.2TB HDD 4x16Gb SFP FC XCVR 14TB Storage Array	P79250-B25
HPE MSA 1060 SFF 2x12Gb SAS 2-port Controller 12x1.2TB HDD 14TB Storage Array	P79251-B25

Notes:

Each of the Smart Choice models listed above includes -

- Two 2-port controllers with either 16Gb FC or 12Gb SAS host connectivity (depending on selected model)
- Twelve factory-integrated MSA 1.2TB SFF 10K SAS HDDs
- One 4-pack of SFP Transceivers, host connectivity appropriate (excluding 12Gb SAS models)
- Included drives factory configured into a single pool

HPE MSA 1060 SFF 2x16Gb FC 2-port Controller Storage Array	P89129-B25
HPE MSA 1060 SFF 2x12Gb SAS 2-port Controller Storage Array	P89130-B25

Notes:

Each of the Smart Choice models listed above includes -

- Two 2-port controllers with either 16Gb FC or 12Gb SAS host connectivity (depending on selected model)
- Drives and transceivers are not included. Please select required options from “HPE MSA Smart Choice Options” menu.
- All models include 94% efficient power supplies that meet EU Lot9 power efficiency requirements.

HPE MSA Smart Choice Options

HPE MSA Smart Choice Arrays can be configured with either standard MSA Options or with options from the MSA Smart Choice Options menu below:

Description	SKU
HPE MSA 11.5TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty 6-pack (6x1.92TB) SSD Bundle	P88911-B25
HPE MSA 23TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty 6-pack (6x3.84TB) SSD Bundle	P88912-B25
HPE MSA 46TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty 6-pack (6x7.68TB) SSD Bundle	P88913-B25

Configuration Information

Description	SKU
HPE MSA 7.2TB SAS 12G Enterprise 10K SFF (2.5in) M2 3-year Warranty 6-pack (6x1.2TB) HDD Bundle	P88914-B25
HPE MSA 14.4TB SAS 12G Enterprise 10K SFF (2.5in) M2 3-year Warranty 6-pack (6x2.4TB) HDD Bundle	P88915-B25
HPE MSA 16Gb SFP+ Short Wave Fibre Channel 4-pack Transceiver Bundle	P88918-B25
HPE MSA Advanced Data Services LTU	P88922-B25

Step 1: MSA 1060 Base Configurations

Description	SKU
HPE MSA 1060 16Gb Fibre Channel SFF Storage	R0Q85B
HPE MSA 1060 10GBASE-T iSCSI SFF Storage	R0Q86B
HPE MSA 1060 12Gb SAS SFF Storage	R0Q87B

Notes:

- Includes a SFF Array Chassis, two MSA 1060 controllers, two AC power supplies, two 1.5m PDU cords (IEC C13/C14), and one rack-mount kit.
- SFPs are not included with the Fibre Channel array model and are not required for the iSCSI or SAS array model.
- All SKUs ending in “B” include the new 94% efficient power supply that meets EU Lot9 power efficiency requirements.
- HPE MSA 1060 models R0Q85B and R0Q87B are compliant with Network Equipment-Building System (NEBS) criteria for GR-63-Core (Issue 5) and GR-1089-Core (Issue 7). See “Step 3” and “Step 4” for NEBS supported drive and power supply options or refer to “NEBS Certification” section for further details.

Step 2: Select Your SFP+ Module

Description	SKU
HPE MSA 16Gb Short Wave Fibre Channel SFP+ 4-pack Transceiver	C8R24B

Notes:

- Th MSA SFP (C8R24B) is for use with the MSA 1060 Fibre Channel Storage system (R0Q85B) only.
- MSA 1060 Fibre Channel Storage systems do not ship with SFPs – they must be purchased separately
- One SFP 4 pack transceiver is required for the 1060 Fibre Channel model.
- MSA 1060 SAS and iSCSI Storage systems do not require SFP modules.

Step 3: Select your Drives

- The following HDD and SSD options are for use with MSA Gen 6 and Gen7 Storage Systems only
- The following HDD and SSD options 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
- MSA 1060 array models only accept SFF HDD and SSD options – to use LFF drives with your array configuration, you must add a 2060 LFF Drive Enclosure (R0Q39B)

Configuration Information

- Customers can mix SSD, Enterprise SAS, and SAS Midline (MDL) drives within the same array configuration
- An Advanced Data Services Suite License is required when mixing HDDs and SSDs within the same system, except when using SSDs exclusively as SSD Read Cache. See the **Performance Tiering and Archive Tiering** section for more information
- Configurations with all SSDs or with an SSD Read Cache extension do not require an ADS license on the MSA1060 array.

SFF HDD 6-Pack Bundles

Select MSA SFF HDD options are available to purchase in bundles that include 6 drives. Purchasing MSA drives in bundles typically provides a lower purchase price than purchasing them individually. Check with your HPE sales representative or channel partner for further details.

Description	SKU
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). Certified for use in Network Equipment-Building System (NEBS) certified MSA Gen6 configurations.	
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). Certified for use in NEBS certified MSA Gen6 configurations.	
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). Certified for use in NEBS certified MSA Gen6 configurations.	

LFF HDD 6-Pack Bundles

Select MSA LFF HDD options are available to purchase in bundles that include 6 drives. Purchasing MSA drives in bundles typically provides a lower purchase price than purchasing them individually. Check with your HPE sales representative or channel partner for further details.

Notes: LFF drives can only be added to a MSA1060 array configuration using the 2060 LFF Drive Enclosure (R0Q39B).

Description	SKU
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 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)	
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)	

Configuration Information

Description	SKU
HPE MSA 120TB SAS 12G Midline 7.2K LFF M2 1-year Warranty 6-pack HDD Bundle	S0F33A
Notes: Contains 6 x MSA 20TB 12G SAS 7.2K LFF Midline HDDs (S0F32A)	
HPE MSA 144TB SAS 12G Midline 7.2K LFF M2 1-year Warranty 6-pack HDD Bundle	S3P39A
Notes: Contains 6 x MSA 24TB 12G SAS 7.2K LFF Midline HDDs (S3P38A)	

Self-Encrypting HDD 6-Pack Bundles

Select MSA Self-Encrypting (SED) HDD options are available to purchase in bundles that include 6 drives. Purchasing MSA drives
in bundles typically provides a lower purchase price than purchasing them individually. Check with your HPE sales representative or channel partner for further details.

Notes: LFF drives can only be added to a MSA1060 array configuration using the 2060 LFF Drive Enclosure (R0Q39B).

Description	SKU
HPE MSA 14.4TB SAS 12G Enterprise 10K SFF (2.5in) M2 3-year Warranty FE 6-pack HDD Bundle	S4M84A
Notes: Contains 6 x MSA 2.4TB 12G SAS 10K SFF FIPS-Encrypted HDDs	
HPE MSA 72TB SAS 12G Midline 7.2K LFF (3.5in) M2 1-year Warranty FIPS Encrypted 6-pack HDD Bundle	S4R85A
Notes: Contains 6 x MSA 12TB 12G SAS 7.2K LFF FIPS-Encrypted HDDs	

Notes:

- All drives within the MSA 1060 array must be self-encrypted drives to enable the encryption feature.
- Mixing SEDs and regular non-encrypting drives within the same system is supported but not recommended. Encryption is unavailable while both drive types are installed in the same system, even if allocated to a different pool. Additionally, non-encrypting drives installed to expand a system with encryption enabled will not be usable.
- 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.
- Some SED drives are TAA compliant – check notes for details. However, this does not apply to the TAA compliance for the array or the entire configuration. If array TAA compliance is required, please select the appropriate MSA Gen6 TAA-compliant array model.

SFF HDDs

Description	SKU
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

Configuration Information

Description	SKU
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

Notes: MSA 1.2TB, 1.8TB, and 2.4TB 10K SFF HDD options are certified for use in Network Equipment-Building System (NEBS) certified MSA Gen6 configurations.

LFF HDDs

Notes: LFF drives can only be added to a MSA1060 array configuration using the 2060 LFF Drive Enclosure (R0Q39B).

Description	SKU
HPE MSA 8TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q59A
HPE MSA 12TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R0Q61A
HPE MSA 16TB SAS 12G Midline 7.2K LFF (3.5in) M2 1yr Wty HDD	R3U72A
HPE MSA 20TB SAS 12G Midline 7.2K LFF M2 1-year Warranty HDD	S0F32A
HPE MSA 24TB SAS 12G Midline 7.2K LFF M2 1-year Warranty HDD	S3P38A

SFF SSDs

Description	SKU
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
HPE MSA 7.68TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty SSD	S0F31A

Notes: MSA 960GB, 1.92TB, and 3.84TB SSD options are certified for use in NEBS certified MSA Gen6 configurations.

LFF SSDs

Notes: LFF drives can only be added to a MSA1060 array configuration using the 2060 LFF Drive Enclosure (R0Q39B).

Description	SKU
HPE MSA 1.92TB SAS 12G Read Intensive LFF (3.5in) M2 3yr Wty SSD	R0Q49A

Configuration Information

Self-Encrypting Drives (SED) SSDs

Notes: LFF drives can only be added to a MSA1060 array configuration using the 2060 LFF Drive Enclosure (R0Q39B).

Description	SKU
HPE MSA 1.92TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty FIPS Encrypted SSD	S4M81A
HPE MSA 1.92TB SAS 12G Read Intensive LFF (3.5in) M2 3-year Warranty FIPS Encrypted SSD	S4M82A
HPE MSA 3.84TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty FIPS Encrypted SSD	S4M83A
HPE MSA 15.36TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty FIPS Encrypted SSD	S4R83A
HPE MSA 30.72TB SAS 12G Read Intensive SFF (2.5in) M2 3-year Warranty FIPS Encrypted SSD	S4R84A

Notes:

- All drives within the MSA 1060 array must be self-encrypted drives to enable the encryption feature.
- Mixing SEDs and regular non-encrypting drives within the same system is supported but not recommended. Encryption is unavailable while both drive types are installed in the same system, even if allocated to a different pool. Additionally, non-encrypting drives installed to expand a system with encryption enabled will not be usable.
- 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.

Step 4: Options

Drive Enclosures

Description	SKU
HPE MSA 2060 SAS 12G 2U 12-disk LFF Drive Enclosure	R0Q39B
HPE MSA 2060 SAS 12G 2U 24-disk SFF Drive Enclosure	R0Q40B

Notes:

- Each drive enclosure includes a single rack-mount kit and two 0.5m MiniSAS HD to MiniSAS HD cables.
- Add up to 3 additional drive enclosures.
- MSA 2060 SFF or LFF Drive Enclosures can be connected to the MSA 1060 SFF Storage systems.
- All SKUs ending in “B” include the new 94% efficient power supply that meets EU Lot9 power efficiency requirements.
- The HPE MSA 2060 SFF Drive Enclosure, R0Q40B, is compliant with Network Equipment-Building System (NEBS) criteria for GR-63-Core (Issue 5) and GR-1089-Core (Issue 7). See “Step 3” and “Step 4” for NEBS supported drive and power supply options or refer to “NEBS Certification” section for further details.

Drive Enclosure Cables

Description	SKU
HPE External 1.0m (3ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable	716195-B21

Configuration Information

Description	SKU
HPE External 2.0m (6ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable	716197-B21

Notes: When connecting an MSA 1060 controller to a drive enclosure if a longer cable is needed.

Security Option

Description	SKU
HPE Bezel Lock Kit	875519-B21

Notes: Each array and drive enclosure chassis includes a bezel. This option includes a lock for securing the bezel.

DC Power Option

Description	SKU
HPE MSA 764W -48VDC Hot Plug Power Supply Kit	R0Q90A

Notes:

- All MSA 1060 array enclosures and drive enclosures come standard with two 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.
- One (1) 48VDC 2.3M power cord is included with each R0Q90A kit.
- Required for use in Network Equipment-Building System (NEBS) compliant MSA Gen6 configuration.

Power Cords

Description	SKU
HPE C13 - C14 WW 250V 10Amp 2.0m Jumper Cord	A0K02A
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

Configuration Information

Description	SKU
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, 1.5m black C13/C14, ship standard with all AC-powered enclosures
- The above power cord options may be used by customers that desire to plug their base array and/or drive enclosures into a wall outlet or require a different length PDU Jumper Cord.

Step 5: Choose cables for host connection

Fibre Channel Infrastructure

PremierFLexOM4 type cables

Description	SKU
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
HPE Premier Flex LC/LC Multi-mode OM4 2 Fiber 50m Cable	QK737A

OM3 Fibre FC to LC cables

Description	SKU
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

Configuration Information

10GBase-T Infrastructure

Ethernet Cables

Notes: CAT 6 cables or above are required.

SAS Infrastructure

Min-SAS HD to Mini-SAS HD Fanout Cables

Description	SKU
HPE Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 1 Meter Cable	K2Q99A
HPE Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 2 Meter Cable	K2R00A
HPE Mini SAS High Density to Dual 2-lane Mini SAS High Density External Fanout 4 Meter Cable	K2R01A

Notes:

- These cables are used to connect HPE ProLiant DL and ML servers to MSA 1060 SAS Storage system.
- These cables are used for direct connect of more than two hosts.
- These cables are not used for connecting the MSA 1060 to a drive enclosure.

Mini SAS HD to Mini SAS Cables

Description	SKU
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 1060 SAS Storage system.
- These are not used for connecting the MSA 1060 to a drive enclosure.

Mini SAS HD to Mini SAS HD Cables

Description	SKU
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:

- Each kit includes a single cable that can support up to 4 lanes.
- These cables are used to connect the DL and ML ProLiant 12Gb SAS Servers to MSA 1060 SAS Storage system.
- Limited to two redundantly connected hosts.
- Fanout cables are highly recommended.
- The 1.0m and 2.0m Mini-SAS HD to Mini-SAS HD cables can also be used for connecting a MSA 1060 SAS controller to a SFF or LFF drive enclosure.

Step 6: Software

Description	SKU
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 that are being configured for performance tiering (excluding SSD Read Cache) will require the Advanced Data Service (ADS) Suite LTU.
- Configurations with all SSDs or with a SSD Read Cache extension do not require an ADS license on the MSA1060 array.

Technical Specifications

MSA 1060	
Power Requirements	
Input Power Requirements (typical-running I/O) SFF/LFF arrays	120 VAC 3.07A, 293-361 W 220 VAC 1.58A, 289-352 W
Max Input Power	100-240 VAC, 50/60 Hz., 4.38-2.17A; 48-60 VDC 10.4A/8.3A
Heat Dissipation	1766 BTU/hr
Temperature and Humidity Ranges	
Operating Temperature	ASHRAE A3 5°C to 40°C, -12°C DP & 8 to 24°C DP (Derate maximum allowable dry-bulb temperature 1°C/175m above 900m)
Shipping Temperature	-40°F to 158°F (-40°C to 70°C)
Operating Humidity	Up to 85% RH
Non-Operating Humidity	Up to 90% RH @ 30°C
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)
Controller enclosure (fully populated with FRUs and disks)	66 lb (30 kg)
Expansion enclosure (fully populated with FRUs and disks)	55 lb (25 kg)
Acoustic Ratings	
Sound Power	A weighted sound power LWAd - 8.3 B
Sound Pressure	A weighted sound pressure LpAm – 74 dBA
Shock and Vibration	
Shock, Operational	5G, 11 ms
Shock, Non-Operational	15G, 10 ms
Vibration, Operational	5-500Hz, 0.18 Grms
Vibration, Non-Operational	x-axis (5-300Hz) 0.8 Grms z-axis (5-300Hz) 1.2 Grms

Technical Specifications

Altitude			
Altitude, operating	3000m (10,000 feet)		
Altitude, non-operating	12,192m (40,000 feet)		

Power Supply Details			
2U Flex 580W PSU 80+ Gold			
Input Voltage Range (V rms)	100-240		
Frequency Range (Hz)	50-60		
Nominal Input Voltage	115	208	230
Maximum Output Wattage Rating (W)	584	584	584
Nominal Input Current (Arms)	5.7	3.2	2.8
Maximum Input Wattage Rating (W)	652	645	644
Maximum Rated VA (VA)	653	661	650
Efficiency (%/100)	0.896	0.905	0.907
Power Factor	0.999	0.976	0.991
Leakage Current (mA)	<0.8		
Maximum Inrush Current (A peak)	45		
Maximum Inrush Current Duration (ms)	40		
Maximum British Thermal Unit Rating (BTU-hr)	2224.233	2201.382	2196.286
2U Flex 580W PSU 80+ Platinum			
Input Voltage Range (V rms)	100-240		
Frequency Range (Hz)	50-60		
Nominal Input Voltage	115	208	230
Maximum Output Wattage Rating (W)	584	584	584
Nominal Input Current (Arms)	5.56	3.06	2.77
Maximum Input Wattage Rating (W)	639.4	635.5	630
Maximum Rated VA (VA)	640.3	636.1	625.2
Efficiency (%/100)	0.913	0.919	0.935
Power Factor	0.999	0.999	0.999
Leakage Current (mA)	<0.8		
Maximum Inrush Current (A peak)	45		
Maximum Inrush Current Duration (ms)	40		
Maximum British Thermal Unit Rating (BTU-hr)	2180.4	2167.0	2148.3

Technical Specifications

MSA 1060 Regulatory Information	
Safety	– UL/CSA 62368-1 (USA/Canada)
	– EN 62368-1 (European Union)
	– IEC 60950-1 (International)
Power	– EU Regulation 2019/424 (Lot 9)
Electromagnetic Compatibility	– VCCI Class A (Japan)
	– FCC Class A (USA)
	– ICES-003 Class A (Canada)
	– EN55032 : (European Union Class A); CISPR 32 (International Class A)
	– EN61000-3-2 : (Harmonics) (European Union)
	– EN61000-3-3 : (Flicker) (European Union)
	– EN 55035 (European Union, Immunity, Class A); CISPR 24 (International Immunity, Class A)
	– AS/NZS CISPR 32, Class A (Australia, New Zealand)
	– CNS 13438 Taiwan, Class A (Taiwan)
	– KN32 Class A (Emissions Class A); KN35 (Immunity) (S Korea)
RoHS and WEEE	– RoHS-6/6
	– China RoHS
	– WEEE
Country Approvals	United States, Australia/New Zealand, Canada, European Union, Japan, South Korea, Taiwan

MSA 1060 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. Complete End-to-End Performance results will be provided for the MSA 1060 in a subsequent publication. These numbers are subject to change without notice

HPE MSA 1060 Benchmark Performance Results	
Benchmark Performance Results[1]	**HPE MSA 1060 (with SSDs)**
IOPS	
Random Reads [2]	154,000
Random Writes [3]	60,000
Sequential [4]	
Segmented Sequential Reads [5]	6.6 GB/s
Segmented Sequential Writes [6]	6.5 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 10, two SSDs per disk group; one disk groups per pool, two volumes per pool, block size: 8k, 16Gb FC direct connect to array.
- [3]Dual controller configuration, four SSDs, RAID 10, two SSDs per disk group; one disk groups per pool, two 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, 96 10k RPM HDDs, RAID: 10, nine drives per disk group, 13 disk groups per pool, two volumes per pool, block size: 256k, 16Gb FC direct connect to array.
- [6]Dual controller configuration, 90 10k RPM HDDs, RAID 5, nine drives per disk group, 13 disk groups per pool, two volumes per pool, block size 256k, 16Gb FC direct connect to array.

Technical Specifications

MSA 1060 End-to-End Performance Figures						
Storage Model	**MSA 1060 FC**		**MSA 1060 iSCSI**		**MSA 1060 SAS**	
Host Protocol	16Gb FC[2]		10GbE iSCSI[2]		12Gb SAS[2]	
Drive Technology	HDD	SSD	HDD	SSD	HDD	SSD
MSA 1060 RAID1 / RAID 10 Performance Results[3,4,5]						
Random Reads IOPs	18,900	142,700	19,000	115,900	19,000	137,400
Random Writes IOPs	18,100	56,000	18,100	48,500	18,100	55,700
Random Mix 60/40 IOPs	17,900	83,900	18,000	70,700	17,900	81,500
Sequential Reads MB/s[1]	6,100	6,100	2,900	4,400	7,000	7,000
Sequential Writes MB/s[1]	4,700	5,400	2,900	3,800	4,600	5,200
MSA 1060 RAID 5 Performance Results[5,6]						
Random Reads IOPs	17,700	132,500	17,700	109,300	17,700	128,400
Random Writes IOPs	9,100	31,300	9,300	28,400	9,300	30,800
Random Mix 60/40 IOPs[1]	11,200	55,000	11,200	48,700	11,200	54,000
Sequential Reads MB/s[1]	6,100	6,100	4,400	4,400	7,000	7,000
Sequential Writes MB/s[1]	5,600	6,000	3,900	3,800	5,400	5,700
MSA 1060 RAID 6 Performance Results[7,8]						
Random Reads IOPs	16,500	131,500	16,400	109,000	8,900	127,200
Random Writes IOPs	6,000	28,000	6,000	25,800	5,600	27,800
Random Mix 60/40 IOPs[1]	7,700	51,000	7,700	45,400	6,600	50,200
Sequential Reads MB/s[1]	6,100	6,100	4,400	3,000	6,900	7,100
Sequential Writes MB/s[1]	5,600	6,000	3,800	2,900	5,400	5,600
MSA 1060 MSA-DP+ Performance Results[9,10]						
Random Reads IOPs	18,800	129,300	18,700	107,700	18,700	124,900
Random Writes IOPs	7,000	27,900	7,000	25,800	7,000	27,600
Random Mix 60/40 IOPs[1]	9,200	50,700	9,300	45,200	9,200	49,900
Sequential Reads MB/s[1]	6,100	6,100	2,900	4,400	7,000	7,100
Sequential Writes MB/s[1]	5,500	6,000	2,900	3,800	5,200	5,600

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 1060 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 2 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
- [3]Bus Adapters. 10 GbE iSCSI results were measured using 10GbE iSCSI Host Bus Adapters. Hosts were directly attached to the HPE MSA 1060 array.
- [4]RAID 10 Solid State Drive random results: (4) SSDs, 2 SSDs per disk group, 1 disk group per pool.
- [5]RAID 10 Hard Disk Drive results: (96) 10K HDD, 10 drives per disk group, 12 disk groups per pool.
- [6]RAID 5 Solid State Drive random results: (6) SSDs, 3 SSDs per disk group, 1 disk group per pool.
- [7]RAID 5 Hard Disk Drive results: (90) 10K HDD, 9 drives per disk group, 13 disk groups per pool.
- [8]RAID 6 Solid State Drive random results: (8) SSDs, 4 SSDs per disk group, 1 disk group per pool.
- [9]RAID 6 Hard Disk Drive results: (80) 10K HDD, 10 drives per disk group, 12 disk groups per pool.
- [10]MSA-DP+ Solid State Drive results: (24) SSDs, 12 SSDs per disk group, 1 disk group per pool.
- [11]MSA-DP+ Hard Disk Drive results: (96) 10K HDD, 30 drives per disk group, 15 disk groups per pool.

Environment-friendly Products and Approach End-of-life Management and Recycling

Hewlett Packard Enterprise offers end-of-life product return, trade-in, and recycling programs in many geographic areas for our products. Products returned to Hewlett Packard Enterprise will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard Enterprise web site. These instructions may be used by recyclers and other WEEE treatment facilities as well as Hewlett Packard Enterprise OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

Summary of Changes

Date	Version History	Action	Description of Change
08-Sep-2026	Version 22	Added	New base SKU added - R0Q86B
		Removed	Obsolete or not supported SKU removed - 716189-B21
20-Jul-2026	Version 21	Changed	QuickSpecs maintenance updates have been applied.
		Removed	Obsolete or not supported SKUs removed - R0Q86B, R0R47A, R0R50A, R0Q58A
02-Mar-2026	Version 20	Changed	Overview, Standard Features, and Configuration Information sections were updated. Main changes: – Reflect the new Smart Choice offerings – Normalize terminology and branding – Align configurations with current power efficiency (EU Lot 9) and NEBS compliance statements
		Added	P89129-B25, P89130-B25, P88911-B25, P88912-B25, P88913-B25, P88914-B25, P88915-B25, P88918-B25, P88922-B25
19-Jan-2026	Version 19	Changed	HPE Rebranding applied
28-Jul-2025	Version 18	Changed	Overview, Standard Features and Configuration Information sections were updated - HPE Smart Choice MSA models and HPE Morpheus VM Essentials Software details added
		Added	P79250-B25, P79251-B25
03-Mar-2025	Version 17	Changed	Standard Features and Configuration Information sections were updated. Removed HPE Complete section and added details on Smart Choice.
02-Dec-2024	Version 16	Changed	Overview, Standard Features and Configuration Information sections were updated. Added new FIPS-Encrypted HDD and SSD options.
05-Aug-2024	Version 15	Changed	Overview, Standard Features, Service and Support, Configuration information and Technical Specifications sections were updated Added 24TB HDD options.
04-Dec-2023	Version 14	Changed	HPE Services Rebranding
07-Aug-2023	Version 13	Changed	Overview, Configuration information and Technical Specifications sections were updated Updated array models, technical specifications, and certifications.
19-Jun-2023	Version 12	Changed	Overview, Standard Features and Configuration Information sections were updated. Added NEBS certification details, support for Veeam, and other general updates.

Summary of Changes

Date	Version History	Action	Description of Change
06-Feb-2023	Version 11	Changed	Overview and Standard Features sections were updated GreenLake for Backup and Recovery content added.
05-Dec-2022	Version 10	Changed	Overview, Standard Features and Configuration Information sections were updated. Added 20TB HDD, 20TB HDD six-pack, and 7.68TB SSD drive options
06-Sep-2022	Version 9	Changed	Overview, Standard Features, Configuration information and Technical Specifications sections were updated Added MSA 1060 Storage Array and MSA 2060 Drive Enclosure SKU additions for Lot9 2023 compliance.
13-Jun-2022	Version 8	Changed	Overview, Standard Features, service and Support and Configuration Information sections were updated.
04-Oct-2021	Version 7	Changed	Service and Support section was updated
02-Aug-2021	Version 6	Changed	Service and Support section was updated
06-Jul-2021	Version 5	Changed	Update to What's New section, 48VDC power cord, and other updates.
06-Apr-2021	Version 4	Changed	Added 18TB HDD option, updated OS support, updated temperature and humidity specifications
18-Jan-2021	Version 3	Changed	Added power supply details, system certifications, and other textual updates.
16-Nov-2020	Version 2	Changed	Added shock, vibe, and acoustic specifications. Updated SFP messaging. Updated HDD and SSD options
08-Sep-2020	Version 1	New	New QuickSpecs.

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