## Overview

# HPE MSA 2050 SAN Storage

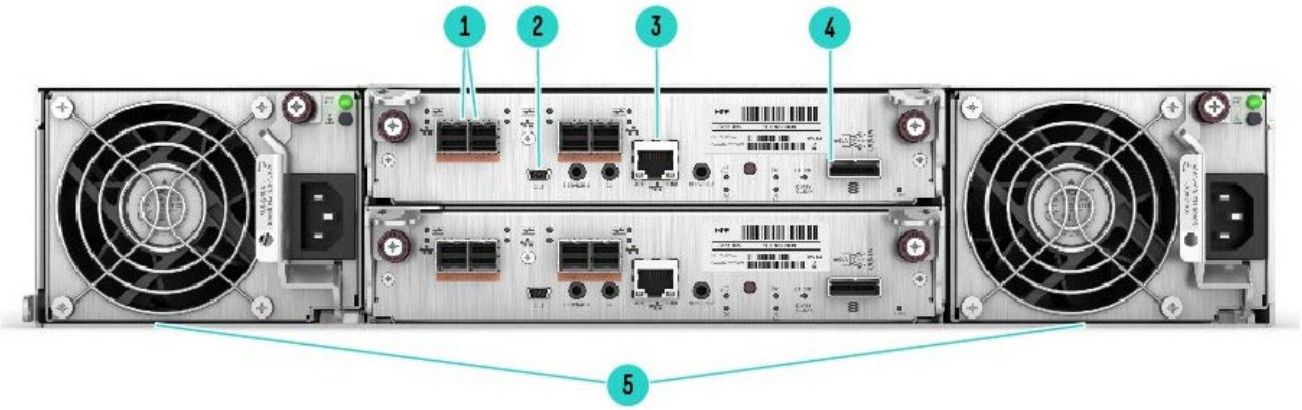
The flash-ready HPE MSA 2050 SAN Storage system is designed for affordable application acceleration that is ideal for small and remote office deployments. But do not let the low cost fool you. The HPE MSA 2050 SAN Storage system gives you the combination of simplicity, flexibility to grow now and into the future, and advanced features you may not expect to find in an entry-priced array. Start small and scale as needed with any combination of solid-state disks (SSD), high-performance enterprise, or lower-cost midline SAS-based drives.

HPE MSA Storage has been the industry-leading entry storage Fibre Channel platform for the past eight years, with nearly 500,000 storage systems sold worldwide. Now the HPE MSA 2050 SAN Storage system delivers 2x higher performance [1] than the previous generation at the same price, delivering in excess of 200,000 IOPS starting at under $10,000 USD for affordable application acceleration. It's seriously simple and affordable flash-ready storage to help you get the most performance for the lowest cost.

- **200,000+ IOPS starting at under $10K for affordable application acceleration**
  - Flexible base model delivers 2x IOPS performance than the previous generation MSA for the same price.
- **Advanced data services with no experience required**
  - Easy to install, easy to use, easy to maintain—no storage expertise necessary
  - Automated tiering dynamically responds to workload changes, so you don't have to
- **Keep your business running with expanded data protection features**
  - Virtualized snapshot technology makes data protection and instant recovery a snap
  - Remote replication with FC and iSCSI supports affordable disaster recovery
- **Grow flexibly now and into the future**
  - Data-in-place upgrades protect drive investments and eliminate data migrations
  - Start small and scale as needed with any combination of SSD, Enterprise or Midline SAS drives

**HPE MSA 2050 SAN Storage**

## Overview




**HPE MSA 2050 SAN Storage**

1. Host connection ports*
2. CLI port (mini-USB)
3. Management Ethernet port
4. Expansion port
5. AC or DC power supplies

**Notes:** *8 and/or 16Gb FC, 1 and/or 10GbE iSCSI or 12Gb SAS

### What's New in the MSA 2050 array family

- New TAA-compliant MSA 2050 Dual Controller Storage Array models including support for SAN SFF and SAN LFF.

### MSA 2050 Storage Models

| Description | SKU |
|---|---|
| HPE MSA 2050 SAN Dual Controller LFF Storage | Q1J00B |
| HPE MSA 2050 SAN LFF TAA-compliant Storage | R4Y07A |
| HPE MSA 2050 SAN Dual Controller SFF Storage | Q1J01B |
| HPE MSA 2050 SAN SFF TAA-compliant Storage | R4Y08A |
| HPE MSA 2050 SAS Dual Controller LFF Storage | Q1J28B |
| HPE MSA 2050 SAS Dual Controller SFF Storage | Q1J29B |

## Standard Features

| HPE MSA 2050 SAN 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 | 8/16Gb |
| iSCSI host connectivity | 1Gb or 10Gb |
| SAS host connectivity | 6Gb or 12Gb |
| **Cache, per array** | |
| Max Read cache per array | 8TB |
| Data (read/write) cache + system memory per array | 16GB |
| Pool Capacity (with Large Pool Support) | 562 TB (512 TiB) |
| RAID Levels supported: Virtual mode | RAID 0*,1, 5, 6, 10<br>**Notes:** *Read Cache Only |
| **Enclosures** | |
| Expansion Drive Enclosures | 0-7 enclosures |
| LFF/SFF array/enclosure mixing | Supported |
| Maximum number of drives per array enclosure | 24 SFF/12 LFF |
| Maximum number of drives per drive enclosure | 24 SFF/12 LFF |
| Drive enclosure interface type | 6Gb SAS |
| **Drives** | |
| Maximum total HDDs per array | 192 SFF / 96 LFF |
| Maximum total SSDs per array | 192 SFF / 96 LFF |
| Max raw capacity per array enclosure | 76.8 TB SFF / 168TB LFF |
| Max raw capacity per drive enclosure | 76.8 TB SFF / 168TB LFF |
| Max raw capacity per array | 614.4TB SFF / 1344TB LFF |
| **Drive Capacities** | |
| SFF SSDs | 800GB, 960GB, 1.6TB, 1.92TB, 3.2TB |
| LFF SSDs | 800GB, 960GB, 1.92TB |
| SFF HDDs | 15K: 600GB, 900GB<br>10K: 600GB, 1.2TB, 1.8TB, 2.4TB |
| LFF HDDs | 7.2K: 4TB, 6TB, 8TB, 10TB, 12TB, 14TB |
| SEDs | SSDs: 800GB, 1.6TB<br>SFF 10K HDD: 1.2TB<br>LFF 7.2K HDD: 4TB |
| **Software Features** | |
| Thin Technologies | Thin Provisioning, Space Reclamation, Thin Rebuild |
| Tiering | Performance Tier, Standard Tier, Archive Tier |
| Replication | Snapshots (512), Volume Copy, Remote Snaps |
| Quality of Service | Virtual Tier Affinity |
| **Additional Features** | |
| Maximum number of volumes | 512 |
| Maximum number of snapshots | 512 |
| Maximum number of hosts | 512 |
| Maximum number of initiators | 1024 |
| Customer self-installable | Yes |
| Customer self-repairable | Yes |
| Customer self-upgradeable | Yes |
| Health Check analytics | Yes |

## Standard Features

### All MSA 2050 models offer a common set of valuable features:

- MSA 2050 storage system architecture maximizes performance
  - Includes SFF or LFF array chassis, depending on model
  - Two MSA SAS or SAS controllers, depending on model
  - Four host ports per controller
  - Each SAN controller supports 8 Gb FC, 16 Gb FC, 1GbE iSCSI or 10GbE iSCSI. host connectivity
  - Each SAS controller supports 12Gb SAS host connectivity
  - 8 GB cache per controller.
  - Battery-free cache backup with super capacitors and compact flash

  **Notes:** TAA compliant MSA 2050 models each include 2x pre-installed HDDs. No other MSA 2050 models include pre-installed HDDs. See "Configuration Information" section for more details.
- MSA 2050 SAN controller allows customers to create their own Combo Controller by mixing FC and iSCSI SFPs.
- Storage Management Utility V3 (SMU). The MSA management GUI brings a new modern look and feel to array management.
- Thin Provisioning allows storage allocation of physical storage resources only once they are consumed by an application. Thin Provisioning also allows over-provisioning of physical storage pool resources allowing ease of growth for volumes without predicting storage capacity upfront.
- All models feature a wide variety of drives: High-performance SSD drives, enterprise-class SAS, and SAS Midline drives.
- The MSA 2050 will support a maximum of 7 disk enclosures (either LFF and/or SFF). Add-on enclosures can either be HPE MSA 2050 LFF Disk Enclosure or HPE MSA 2050 SFF Disk Enclosure.
- The MSA 2050 can grow incrementally to a maximum of 96 LFF, 192 SFF drives, or a combination of SFF and LFF enclosures up to the maximum of 8 total enclosures.
- Virtual Storage Disks Groups can be spanned across multiple enclosures.
- Virtual Storage RAID levels supported: 1, 5, 6, 10.
- RAID 0 supported for Read Cache only. SSD read cache is a feature that extends the MSA controller cache. Read cache is most effective for workloads that are high in random reads A maximum of 2 SSDs per pool can be added for read cache.
- Maximum hard drive counts vary by RAID levels: 2 drive max for RAID level 1; max of 16 drives for RAID levels 5, 6, and 10.
- Multiple Disk Groups can be aggregated into a single Storage Pool.
- Storage Pools allow data on a given LUN to span across all drives in a pool. When capacity is added to a system, the user is also getting a performance benefit of the additional spindles.
- The maximum LUN size is 140TB (128TiB)
- Snapshot enhancements for virtual storage, including performance improvements, hierarchical snapshots, and simplified resource management. Administrators can monitor and optionally control snapshot space usage.
- Prioritize data by assigning appropriate affinity level (Performance, No Affinity or Archive)
- Customers can configure 512 TiB capacity per virtual pool by enabling large pool support.
- Non-disruptive on-line controller code upgrade. Requires Multi-pathing software.
- Upgradable by design. Owners of an MSA 2040, MSA 2042 and MSA 1040 array can do data-in-place upgrades to the MSA 2050 array. This unique ability protects the earlier investments in drives, and JBODs.
  - Certain limitations are applicable. Please review the Upgrading to the HPE MSA 1050/2050/2052 Technical Whitepaper before upgrading your MSA 2040, MSA 2042 or MSA 1040 systems

## Product Technology

### SAN controller

MSA 2050 SAN controller supports 8Gb FC, 16Gb FC, 1GbE iSCSI or 10GbE iSCSI host connectivity.

### SAS controller

MSA 2050 SAS controller supports 6Gb and/or 12Gb SAS host connectivity.

## Standard Features

### Modular

#### Chassis

2U rack height. 12 LFF or 24 SFF drive bays. All MSA 2050 Storage Systems come standard with 2 SAN or SAS controllers, depending on model.

**Notes:** The MSA 2050 does not support single controller configurations. Single-controller support is provided only when a controller fails over to its partner controller.

### Available Drives

The MSA 2050 SAN and SAS Storage systems support a wide variety of the MSA 3.5-inch LFF drives, and the 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.

### Optional Disk Enclosures

Just as the user has a choice of chassis for the array enclosure (LFF or SFF drive bays), they also have a choice of expansion disk enclosures accommodating either drive size. Both the MSA 2050 LFF Disk Enclosure and MSA 2050 SFF Disk Enclosure can be hot added to an operating array. SFF and LFF Array enclosures and Disk Enclosures can be mixed without limitations.

**MSA 2050 LFF Disk Enclosure**. This 2U enclosure is designed to support twelve HPE Storage LFF drives and accepts MSA dual-ported 12Gb SSD and SAS Midline hard drives. The pre-configured MSA 2050 LFF Disk Enclosure has two I/O modules and supports the MSA 2050 dual controller arrays.

- The MSA 2050 LFF Disk Enclosure can be attached to the MSA 2050 LFF or SFF storage models.
- Each MSA 2050 LFF Disk Enclosure ships standard with two .5m mini-SAS to mini-SAS cables for connection to the MSA 2050 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 7 total Disk Enclosures

**HPE MSA 2050 SFF Disk Enclosure**.

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

- The MSA 2050 SFF Disk Enclosure can be attached to the MSA 2050 LFF or SFF storage models
- Each MSA 2050 SFF Disk Enclosure ships standard with a two .5m mini-SAS to mini-SAS cables for connection to the MSA 2050 array expansion port or existing disk enclosure cascade port.
- LFF and/or SFF Disk Enclosures can be mixed up to the maximum of 7 total Disk Enclosures.

### Scalability

The MSA 2050 array configurations are designed to allow an installation to begin with smaller capacity and be able to grow gradually as needed. The flexibility of SSD, Enterprise SAS or SAS Midline drives technology, form factors, sizes, speeds, and costs per GB allows a system to easily fit in almost any budget.

- Large Form Factor configurations can scale up to 168TB SAS Midline per array enclosure, expandable to 1344TB SAS Midline with the addition of a maximum of seven MSA 2050 LFF Disk Enclosure.
- Small Form Factor configurations can scale up to 76.8 TB SAS SSDs per array enclosure, expandable to 614.4 TB SAS with the addition of a maximum of seven MSA 2050 SFF Disk Enclosure.
- Users may configure an MSA 2050 SFF array enclosure with MSA 2050 LFF Disk Enclosure. This is an excellent option for a configuration that supports high-speed SFF SSDs or fast SFF enterprise-class SAS drives in the array enclosure, combined with economical LFF drives staged for archival purposes, all in the same array.

## Standard Features

### Disk Group
A Disk Group is a collection of disks in a given redundancy mode (RAID 1, 5, 6, 10). 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 2050 arrays support 512 volumes and up to 512 snapshots in a system. All of these volumes can be mapped to LUNs. Maximum LUN sizes up to 140TB (128 TiB). 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 2050 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.

### RAID 0, 1, 5, 6, 10
The MSA 2050 features several important additional RAID levels. RAID 6 offers the highest level of RAID protection. It allocates two sets of parity data across drives and allows simultaneous write operations. It can withstand two simultaneous drive failures without downtime or data loss. RAID 10 is mirroring and striping without parity and allows large Disk Groups to be created with high performance and mirroring for fault tolerance. RAID 5 combines the block striping and parity. Because data and parity are striped across all 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.

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

### Web Browser support
The MSA 2050 arrays come integrated with web browser and CLI based software for storage and RAID management, setup, configuration, and troubleshooting. The MSA 2050 management supports Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.

### Hot Plug Expansion and Replacement Support
All MSA 2050 models support hot plug expansion and replacement of redundant controllers, enclosures, fans, power supplies, and I/O modules for simple, fast installation and maintenance. Hot add expansion of disk enclosures is also supported.

### HPE Server Compatibility
The MSA 2050 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.

## Standard Features

### 3rd Party Server Support

The MSA 2050 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.

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### 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
- Microsoft Windows Server 2012
- VMware
- HP-UX
- Red Hat Linux
- SuSE SLES Linux
- Solaris
- Oracle Linux
- Citrix XenServer
- OpenVMS

**Notes:** depends on protocol.

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### Advanced Data Services Suite

The HPE MSA Advanced Data Services Suite can be purchased as an option on the MSA 2050 Storage systems. The Advanced Data Service Suite is included as a standard feature on the MSA 2052 at no extra charge. See the MSA 2052 QuickSpecs for more information.
The optional Advanced Data Services Suite includes the following functionality:

- Performance Tiering and Archive Tiering
- 512 Snapshots and Volume Copy
- Remote Snaps

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### Performance Tiering and Archive Tiering

Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 2050 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 2050 supports sub-LUN tiering and automated data movement between tiers. The MSA 2050 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. All-SSD configurations and SSD Read Cache extension do not require a license on the MSA2050 array.

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## Standard Features

### Snapshot and Volume Copy

- All MSA 2050 arrays come standard with 64 snaps.
- A 512 Snapshot license is available as an option on the MSA 2050
- 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 Services operational.

### Remote Snap

HPE MSA Remote Snap Software is array-based software that provides remote replication on the HPE MSA 2050 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.

- HPE Remote Snap functionality is based on existing Snapshot technology offered by HPE MSA array products. Snapshots are used to track the data to be replicated as well as to determine the differences in data updated on the primary volume, minimizing the amount of data to be transferred.
- HPE Remote Snap replication technology provides the ability to accomplish key data management and protection capabilities. First, because Remote Snap uses snapshots as the underlying technology it creates multiple local recovery points which can be used for such tasks as to complement daily backups; second, replication provides the ability to access data in a remote site which could be used for dispersed operations; and third but definitely not least important replication allows for business continuance in the event of a failure on the primary site.
- In order to perform a replication, a snapshot of the volume to be replicated is taken, creating a point-in-time image of the data. This point-in-time image is then replicated to the destination volume by copying the data represented by the snapshot via a transport medium such as TCP/IP (iSCSI) or Fibre Channel. The amount of data transferred is minimized though the use of snapshots whenever possible.
- 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 2050 and MSA 2040 or MSA 1040 arrays using the virtual storage architecture and licensed for Remote Snap. Protects existing investments and enhances business continuity planning objectives.
- Remote replication is supported between the MSA 2052 and the MSA 1060, 2060 and 2062 Storage arrays.
- 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.
- 512 Snapshots and Volume Copy integration provides better efficiencies by combining the management and array technologies to create local copies.
- Fast application recovery with minimal or no transaction loss
- Creation of disaster tolerant copies of your critical business data
- No-single-point-of-failure solution to increase the availability of your data

## Standard Features

**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 3PAR Storage, Nimble Storage, StoreVirtual 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 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 2050 array, HPE OneView for System Center provides the following:

- Monitors the health, events and alerts for the MSA 2050 – 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, memory resources, and storage port/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

## Standard Features

### 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 user interface element called "I/O Workload" has been added to the main screen on MSA's WBI home screen for GL270 or later firmware. 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 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 can reside on SSD media (sized to 80% or 90%). When combined with other performance monitoring tools, the 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.

## Standard Features

### ENERGY STAR Certification

The HPE MSA 2050 SAN Storage systems are ENERGY STAR certified. ENERGY STAR certified products are energy efficient which result in cost savings via reduced energy consumption and regulatory rebates. Please refer to the US EPA website for details on ENERGY STAR certification criteria and process. MSA 2050 ENERGY STAR Certification is listed on the EPA website.

### Carrier-Grade Storage System (NEBS)

The HPE MSA 2050 SAN and SAS NEBS Certified DC-Power Storage systems are designed for network equipment providers (NEPs) and communication service providers. The NEBS compliant MSA 2050 Storage system (Q1J04A and Q1J32A) supports configurations with up to 7 compliant disk enclosures for a maximum of 192 SFF HDDs or SSDs.

The HPE MSA 2050 SAN and SAS DC-power LFF Storage systems (Q179A and Q2P39A) include two (DC) power supplies but are not NEBS certified. The two power supplies are designed to operate over the input range of -40VDC to -75VDC.

The HPE MSA 2050 DC-power Carrier Grade SFF Disk Enclosure (Q1J05A) is a special model disk enclosure designed for use with NEBS compliant MSA 2050 configurations. This drive enclosure has 24 drive bays and has dual -48VDC-power supplies. It is only sold with carrier grade arrays.

When used in conjunction with specific Storage SFF SAS drives, the solution is NEBS certified (GR-63-Core and GR-1089-Core) and Seismic Zone 4 rated. NEBS level-3 certification provides the assurance that the equipment is safe to operate and sturdy enough to withstand certain physical and environmental (for example, fire, earthquakes) conditions. For Seismic Zone 4 rating, the MSA 2050 must be mounted in an HPE Seismic Rack (AH335A).

### TAA Compliance

TAA refers to the Trade Agreements Act (19 U.S.C. § 2501–2581), which is intended to foster fair and open international trade. TAA requires that products must be produced or undergo “substantial transformation” within the United States or a designated country. HPE offers multiple 2050 and 2052 models that are TAA compliant. Please refer to the “Configuration Information” section for more details regarding models that are designated TAA compliant.

### Application

#### Solutions

The HPE MSA 2050 SAN Storage is the ideal solution for customers running Oracle, Microsoft, SAP environments and those customers who are deploying virtual server technologies like VMware and Hyper-V. The MSA 2050 delivers enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HPE MSA 2050 Arrays ensure that crucial business data remains available.

Hewlett Packard Enterprise has developed best-in-class expertise in Oracle, Microsoft, SAP, and Virtualization Hypervisor technology through extensive testing with the HPE MSA 2050, HPE servers, and management software; high availability and disaster recovery solutions; and backup and recovery on the Oracle, Microsoft, and SAP application platforms.

#### Learn more

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

## Standard Features

### 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 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.
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**

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### 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 1050, 2050 and 2052 storage arrays, and is available for purchase directly from HPE. 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 SAN/NAS 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**

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### 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 1050/2050/2052 arrays as well as the prior two generations of arrays (MSA P2000 G3 and MSA 1040/2040/2042). The tool is available immediately at:
**www.hpe.com/storage/MSAHealthCheck**

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## Service and Support

### HPE Services

No matter where you are in your digital transformation journey, you can count on HPE Services to deliver the expertise you need when, where and how you need it. From planning to deployment, ongoing operations and beyond, our experts can help you realize your digital ambitions.

**https://www.hpe.com/services**

### Consulting Services

No matter where you are in your journey to hybrid cloud, experts can help you map out your next steps. From determining what workloads should live where, to handling governance and compliance, to managing costs, our experts can help you optimize your operations.

**https://www.hpe.com/services/consulting**

### HPE Managed Services

HPE runs your IT operations, providing services that monitor, operate, and optimize your infrastructure and applications, delivered consistently and globally to give you unified control and let you focus on innovation.

**HPE Managed Services | HPE**

### Operational services

Optimize your entire IT environment and drive innovation. Manage day-to-day IT operational tasks while freeing up valuable time and resources. Meet service-level targets and business objectives with features designed to drive better business outcomes.

**https://www.hpe.com/services/operational**

### HPE Complete Care Service

HPE Complete Care Service is a modular, edge-to-cloud IT environment service designed to help optimize your entire IT environment and achieve agreed upon IT outcomes and business goals through a personalized experience. All delivered by an assigned team of HPE Services experts. HPE Complete Care Service provides:

- A complete coverage approach -- edge to cloud
- An assigned HPE team
- Modular and fully personalized engagement
- Enhanced Incident Management experience with priority access
- Digitally enabled and AI driven customer experience

**https://www.hpe.com/services/completecare**

### HPE Tech Care Service

HPE Tech Care Service is the operational support service experience for HPE products. The service goes beyond traditional support by providing access to product specific experts, an AI driven digital experience, and general technical guidance to not only reduce risk but constantly search for ways to do things better. HPE Tech Care Service delivers a customer-centric, AI driven, and digitally enabled customer experience to move your business forward. HPE Tech Care Service is available in three response levels. Basic, which provides 9x5 business hour availability and a 2-hour response time. Essential which provides a 15-minute response time 24x7 for most enterprise level customers, and Critical which includes a 6-hour repair commitment where available and outage management response for severity 1 incidents.

**https://www.hpe.com/services/techcare**

## Service and Support

### HPE Lifecycle Services

HPE Lifecycle Services provide a variety of options to help maintain your HPE systems and solutions at all stages of the product lifecycle. A few popular examples include:

- Lifecycle Install and Startup Services: Various levels for physical installation and power on, remote access setup, installation and startup, and enhanced installation services with the operating system.
- HPE Firmware Update Analysis Service: Recommendations for firmware revision levels for selected HPE products, taking into account the relevant revision dependencies within your IT environment.
- HPE Firmware Update Implementation Service: Implementation of firmware updates for selected HPE server, storage, and solution products, taking into account the relevant revision dependencies within your IT environment.
- Implementation assistance services: Highly trained technical service specialists to assist you with a variety of activities, ranging from design, implementation, and platform deployment to consolidation, migration, project management, and onsite technical forums.
- HPE Service Credits: Access to prepaid services for flexibility to choose from a variety of specialized service activities, including assessments, performance maintenance reviews, firmware management, professional services, and operational best practices.

**Notes:** To review the list of Lifecycle Services available for your product go to:
**https://www.hpe.com/services/lifecycle**

For a list of the most frequently purchased services using service credits, see the **HPE Service Credits Menu**

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### Other Related Services from HPE Services:

#### HPE Education Services

Training and certification designed for IT and business professionals across all industries. Broad catalogue of course offerings to expand skills and proficiencies in topics ranging from cloud and cybersecurity to AI and DevOps. Create learning paths to expand proficiency in a specific subject. Schedule training in a way that works best for your business with flexible continuous learning options.
**https://www.hpe.com/services/training**

#### Defective Media Retention

An option available with HPE Complete Care Service and HPE Tech Care Service and applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction.

Consult your HPE Sales Representative or Authorized Channel Partner of choice for any additional questions and services options.

#### Parts and Materials

HPE 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.

#### How to Purchase Services

Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from HPE or an enterprise reseller are quoted using HPE order configuration tools.
- Customers purchasing from a commercial reseller can find services at **https://ssc.hpe.com/portal/site/ssc/**

## Service and Support

### AI Powered and Digitally Enabled Support Experience

Achieve faster time to resolution with access to product-specific resources and expertise through a digital and data driven customer experience

Sign into the HPE Support Center experience, featuring streamlined self-serve case creation and management capabilities with inline knowledge recommendations. You will also find personalized task alerts and powerful troubleshooting support through an intelligent virtual agent with seamless transition when needed to a live support agent.
**https://support.hpe.com/hpesc/public/home/signin**

### Consume IT On Your Terms

**HPE GreenLake** edge-to-cloud platform brings the cloud experience directly to your apps and data wherever they are—the edge, colocations, or your data center. It delivers cloud services for on-premises IT infrastructure specifically tailored to your most demanding workloads. With a pay-per-use, scalable, point-and-click self-service experience that is managed for you, HPE GreenLake edge-to-cloud platform accelerates digital transformation in a distributed, edge-to-cloud world.

- Get faster time to market
- Save on TCO, align costs to business
- Scale quickly, meet unpredictable demand
- Simplify IT operations across your data centers and clouds

To learn more about HPE Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Contact information for a representative in your area can be found at "Contact HPE"
**https://www.hpe.com/us/en/contact-hpe.html**

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

# Configuration Information

## Step 1 - MSA 2050 - Base Configurations

### Pre-Configured Systems

**Notes:** Single controller options are not supported.

| Description | SKU |
|---|---|
| **MSA 2050 Base System (AC Powered)** | |
| HPE MSA 2050 SAN Dual Controller LFF Storage | Q1J00B |
| HPE MSA 2050 SAN LFF TAA-compliant Storage | R4Y07A |

**Notes:**

- Includes an LFF Array Chassis, two MSA 2050 SAN controllers depending on model, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs not included.
- TAA compliant model R4Y07A includes 2x preinstalled 4TB 12G SAS 7.2K LFF MDL HDDs.

| | |
|---|---|
| HPE MSA 2050 SAN Dual Controller SFF Storage | Q1J01B |
| HPE MSA 2050 SAN SFF TAA-compliant Storage | R4Y08A |

**Notes:**

- Includes an SFF Array Chassis, two MSA 2050 SAN controllers depending on model, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs not included.
- TAA compliant model R4Y08A includes 2x preinstalled 1.2TB 12G SAS 10K SFF ENT HDDs.

| | |
|---|---|
| HPE MSA 2050 SAS Dual Controller LFF Storage | Q1J28B |

**Notes:**

- Includes an LFF Array Chassis, two MSA 2050 SAS controllers, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs are not required with SAS Storage.

| | |
|---|---|
| HPE MSA 2050 SAS Dual Controller SFF Storage | Q1J29B |

**Notes:**

- Includes an SFF Array Chassis, two MSA 2050 SAS controllers, two AC power supplies, two .7m PDU cords (IEC C14), one rack-mount kit.
- SFPs are not required with SAS Storage.

## Step 2 – Choose Your SFP+ Module

### SFP+ Modules

| | |
|---|---|
| HPE MSA 8Gb Short Wave Fibre Channel SFP+ 4-pack Transceiver | C8R23B |
| HPE MSA 16Gb Short Wave Fibre Channel SFP+ 4-pack Transceiver | C8R24B |
| HPE MSA 10Gb Short Range iSCSI SFP+ 4-pack Transceiver | C8R25B |
| HPE MSA 1Gb RJ-45 iSCSI SFP+ 4-pack Transceiver | C8S75B |

**Notes:**

- MSA SFPs are for use only with MSA 2050 SAN Controllers.
- MSA SAS controllers do not require SFP modules.
- MSA 2050 SAN Controllers do not ship with any SFPs.
- Customer must select at least one of the above SFP options.
- Each MSA 2050 SAN controller can be configured with 2 or 4 SFPs.
- Controllers must be configured identically. Number and type of transceivers in each controller must be the same.
- For MSA 2050 10Gb iSCSI configuration user can use DAC cables instead of SFPs.

## Configuration Information

**Configuration Table for mixing SFPs**

| Configuration | Controller | Host Port 1 SFP[1] | Host Port 2 SFP[1] | Host Port 3 SFP[2] | Host Port 4 SFP[2] |
|---|---|---|---|---|---|
| **Dual SAN Controller** | Controller A | 16Gb FC | 16Gb FC | None | None |
| | | | | 16Gb FC | 16Gb FC |
| | | | | 8Gb FC | 8Gb FC |
| | | | | 10GbE iSCSI | 10GbE iSCSI |
| | | | | 1GbE iSCSI | 1GbE iSCSI |
| | | 8Gb FC | 8Gb FC | None | None |
| | | | | 16Gb FC | 16Gb FC |
| | | | | 8Gb FC | 8Gb FC |
| | | | | 10GbE iSCSI | 10GbE iSCSI |
| | | | | 1GbE iSCSI | 1GbE iSCSI |
| | | 10GbE iSCSI | 10GbE iSCSI | None | None |
| | | | | 10GbE iSCSI | 10GbE iSCSI |
| | | | | 1GbE iSCSI | 1GbE iSCSI |
| | | 1GbE iSCSI | 1GbE iSCSI | None | None |
| | | | | 10GbE iSCSI | 10GbE iSCSI |
| | | | | 1GbE iSCSI | 1GbE iSCSI |
| | Controller B | Match Controller A | Match Controller A | Match Controller A | Match Controller A |

**Notes:**
- [1] SFP in Host Port 1 must match SFP in Host Port 2
- [2]SFP in Host Port 3 must match SFP in Host Port 4

### Step 3 – Select Your Drives

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

#### SFF SSDs

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

**Notes:** NEBS Certified SKUs for more details visit Carrier-Grade Storage System (NEBS) on page 4

| | |
|---|---|
| HPE MSA 960GB SAS 12G Read Intensive SFF (2.5in) 3yr Wty SSD | R0Q35A |
| HPE MSA 1.92TB SAS 12G Read Intensive SFF (2.5in) 3yr Wty SSD | R0Q37A |

**Notes:**
- 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 MSA2050 array.

#### SFF HDDs

**12G SFF 15K SAS Enterprise HDDs**

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

**Notes:** NEBS Certified SKUs for more details visit Carrier-Grade Storage System (NEBS) on page 4

## Configuration Information

| Description | SKU |
|---|---|
| **12G SFF 10K SAS Enterprise HDDs** | |
| HPE MSA 600GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive | J9F46A |
| HPE MSA 1.2TB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive | J9F48A |
| **Notes:** NEBS Certified SKUs for more details visit Carrier-Grade Storage System (NEBS) on page 4 | |
| HPE MSA 1.8TB 12G SAS 10K SFF (2.5in) 512e Enterprise 3yr Warranty Hard Drive | J9F49A |
| HPE MSA 2.4TB 12G SAS 10K SFF (2.5in) Enterprise 512e 3yr Warranty Hard Drive | Q2R41A |
| **LFF SSDs** | |
| HPE MSA 800GB 12G SAS Mixed Use LFF (3.5in) Converter Carrier 3yr Wty Solid State Drive | P9M80A |
| HPE MSA 960GB SAS 12G Read Intensive LFF (3.5in) 3yr Wty SSD | R0Q36A |
| HPE MSA 1.92TB SAS 12G Read Intensive LFF (3.5in) 3yr Wty SSD | R0Q38A |

**Notes:**

- 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 MSA2050 array.

| | |
|---|---|
| **LFF HDDs** | |
| **12G LFF 7.2K SAS Midline Drives** | |
| HPE MSA 4TB 12G SAS 7.2K LFF (3.5in) Midline 1yr Warranty Hard Drive | K2Q82A |
| HPE MSA 6TB 12G SAS 7.2K LFF(3.5in) Midline 1yr Warranty Hard Drive | J9F43A |
| HPE MSA 8TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive | M0S90A |
| HPE MSA 10TB 12G SAS 7.2K rpm LFF (3.5in) Midline 512e 1yr Wty Hard Drive | P9M82A |
| HPE MSA 12TB 12G SAS 7.2K LFF (3.5in) Midline 512e 1yr Warranty Hard Drive | Q2R42A |
| HPE MSA 14TB SAS 12G Midline 7.2K LFF (3.5in) 1yr Wty 512e HDD | R0Q21A |
| **SFF Self-Encrypted Drives** | |
| HPE MSA 1.6TB SAS 12G Mixed Use SFF (2.5in) ST 3yr Wty Self-encrypting SSD | Q9D46A |
| HPE MSA 800GB SAS 12G Mixed Use SFF (2.5in) ST 3yr Wty Self-encrypting SSD | Q9D47A |
| HPE MSA 1.2TB 12G SAS 10K rpm SFF (2.5in) Enterprise Self Encrypted 3yr Wty Hard Drive | P9M81A |
| **Notes:** NEBS Certified SKU for more details visit Carrier-Grade Storage System (NEBS) on page 4 | |
| **LFF Self-Encrypted Drives** | |
| HPE MSA 4TB 12G SAS 7.2K LFF (3.5in) Midline Self Encrypted 1yr Warranty Hard Drive | Q1H48A |

**Notes:**

- All drives within the MSA 2050 array must be self-encrypted drives (SEDs) to enable the encryption feature.
- There cannot be a mixture of encrypted and non-encrypted drives within the same array.
- SEDs can be used in a non-SED environment, but will not be encrypted unless all drives in the array are SEDs.
- All MSA SEDs are FIPS 140-2 compliant FIPS 140-2 Validated Self-Encrypting Drives (SEDs) have been certified by the U.S. National Institute of Standards and Technology (NIST) and Canadian Communications Security Establishment (CSE) as meeting the Level 2 security requirements for cryptographic modules as defined in the Federal Information Processing Standards (FIPS) 140-2 Publication.
- Configurations which have a mixture of both SED SSDs and SED HDDs within the same system being used as a capacity Tie (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 MSA2050 array.

## Configuration Information

### 6-Pack Drive Bundles

#### SFF Drive Bundles

| Description | SKU |
|---|---|
| HPE MSA 7.2TB SAS 12G Enterprise 10K SFF (2.5in) 3yr Wty 512n 6-pack HDD Bundle | R0P85A |
| **Notes:** Contains 6 x MSA 1.2TB 12G SAS 10K SFF Enterprise HDDs (J9F48A) | |
| HPE MSA 10.8TB SAS 12G Enterprise 10K SFF (2.5in) 3yr Wty 512e 6-pack HDD Bundle | R0P86A |
| **Notes:** Contains 6 x MSA 1.8TB 12G SAS 10K SFF Enterprise HDDs (J9F49A) | |
| HPE MSA 14.4TB SAS 12G Enterprise 10K SFF (2.5in) 3yr Wty 512e 6-pack HDD Bundle | R0P87A |
| **Notes:** Contains 6 x MSA 2.4TB 12G SAS 10K SFF Enterprise HDDs (Q2R41A) | |
| HPE MSA 3.6TB SAS 12G Enterprise 15K SFF (2.5in) 3yr Wty 512n 6-pack HDD Bundle | R0P88A |
| **Notes:** Contains 6 x MSA 600GB 12G SAS 15K SFF Enterprise HDDs (J9F42A) | |
| HPE MSA 5.4TB SAS 12G Enterprise 15K SFF (2.5in) 3yr Wty 512n 6-pack HDD Bundle | R0P89A |
| **Notes:** Contains 6 x MSA 900GB 12G SAS 15K SFF Enterprise HDDs (Q1H47A) | |

#### LFF Drive Bundles

| | |
|---|---|
| HPE MSA 48TB SAS 12G Midline 7.2K LFF (3.5in) 1yr Wty 512e 6-pack HDD Bundle | R0P90A |
| **Notes:** Contains 6 x MSA 8TB 12G SAS 7.2K LFF Midline HDDs (M0S90A) | |
| HPE MSA 60TB SAS 12G Midline 7.2K LFF (3.5in) 1yr Wty 512e 6-pack HDD Bundle | R0P91A |
| **Notes:** Contains 6 x MSA 10TB 12G SAS 7.2K LFF Midline HDDs (P9M82A) | |
| HPE MSA 72TB SAS 12G Midline 7.2K LFF (3.5in) 1yr Wty 512e 6-pack HDD Bundle | R0P92A |
| **Notes:** Contains 6 x MSA 12TB 12G SAS 7.2K LFF Midline HDDs (Q2R42A) | |
| HPE MSA 84TB SAS 12G Midline 7.2K LFF (3.5in) 1yr Wty 512e 6-pack HDD Bundle | R0Q22A |
| **Notes:** Contains 6 x MSA 14TB 12G SAS 7.2K LFF Midline HDDs (R0Q21A) | |

## Step 4 – Options

### Disk Enclosure

| | |
|---|---|
| HPE MSA 2050 LFF Disk Enclosure | Q1J06B |
| HPE MSA 2050 SFF Disk Enclosure | Q1J07B |
| HPE MSA 2050 DC Power Carrier Grade SFF Disk Enclosure | Q1J05A |

**Notes:**

- Each disk enclosure includes one rack-mount kit and two 0.5m MiniSAS to MiniSAS cables.
- Add up to 7 additional disk enclosures.
- MSA 2050 LFF Disk Enclosure can be connected to either the MSA 2050 SFF or LFF dual controller systems.
- HPE MSA 2050 SFF Disk Enclosure can be connected to either the MSA 2050 SFF or LFF dual controller systems.

### SAS Cables

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

**Notes:** When connecting a MSA 2050 controller to a disk enclosure if a longer cable is needed.

## Configuration Information

### Power Cords

| Description | SKU |
|---|---|
| HPE C13 - C14 WW 250V 10Amp 2.0m Jumper Cord | A0K02A |
| HPE C13 - C14 WW 250V 10Amp Flint Gray 2.0m Jumper Cord | AF573A |
| 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 - C14 WW 250V 10A Gray 0.7m Jumper Cord | A0K03A |
| HPE C13 - CEE-VII EU 250V 10Amp 1.83m Power Cord | AF568A |
| HPE C13 - CNS-690 TW 110V 13Amp 1.83m Power Cord | AF561A |
| HPE C13 - DK-2.5A DK 250V 10Amp 1.83m Power CordHPE C13 - DK-2.5A DK 250V 10Amp 1.83m Power Cord | AF566A |
| 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 - IS-1293 IN 240V 6Amp LV 2.0m Power Cord | AF562A |
| HPE C13 - JIS C8303 JP 100V 12Amp 2.0m Power Cord | AF572A |
| HPE C13 - KSC- 8305 KR 250V 10Amp 1.83m Power Cord | AF560A |
| HPE C13 - NBR-14136 BR 250V 10Amp 1.83m Power Cord | AF591A |
| HPE C13 - Nema 5-15P US/CA 110V 10Amp 1.83m Power Cord | AF556A |
| HPE C13 - SABS-164 ZA 250V 10Amp 2.5m Power Cord | AF567A |
| HPE C13 - SEV 1011 CH 250V 10Amp 1.83m Power CordHPE C13 - SEV 1011 CH 250V 10Amp 1.83m Power Cord | AF565A |
| HPE C13 - SI-32 IL 250V 10Amp 1.83m Power Cord | AF564A |
| HPE C13-NEMA 6-15P 10A/250V 3.6m Black Power Cord | A0N33A |

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

## Step 5

### Step 5a - Choose Supported Options for 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 |
| HPE Premier Flex LC/LC Multi-mode OM4 2 Fiber 50m Cable | QK737A |

#### OM3 FC LC-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 |

## Configuration Information

### Step 5b - Choose Supported Options For 10GbE Infrastructure

#### Direct Attach Copper Cables

| Description | SKU |
|---|---|
| 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 |

### Step 5c - Choose Supported Options For SAS Infrastructure

#### Supported options

#### 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 |

**Notes:** These cables are used to connect 6Gb SAS initiator to MSA 2050 SAS controller. These are not used for connecting to a disk enclosure.

| | |
|---|---|
| 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:** These cables are used to connect 12Gb SAS initiator to MSA 2050 SAS controller. These are not used for connecting to a disk enclosure.

| | |
|---|---|
| HPE 4.0m External Mini SAS High Density to Mini SAS Cable | 716193-B21 |

**Notes:** This cable is used to connect 6Gb SAS initiator to MSA 2050 SAS controller. This is not used for connecting to a disk enclosure.

| | |
|---|---|
| HPE External 4.0m (13ft) Mini-SAS HD 4x to Mini-SAS HD 4x Cable | 716199-B21 |

**Notes:** This cable is used to connect 12Gb SAS initiator to MSA 2050 SAS controller. This is not used for connecting to a disk enclosure.

#### SAS Controllers/HBAs

| | |
|---|---|
| HPE Smart Array E208e-p SR Gen10 (8 External Lanes/No Cache) 12G SAS PCIe Plug-in Controller | 804398-B21 |
| HPE Smart Array P408e-p SR Gen10 (8 External Lanes/4GB Cache) 12G SAS PCIe Plug-in Controller | 804405-B21 |
| HPE Smart Array P408e-m SR Gen10 (8 External Lanes/2GB Cache) 12G SAS Mezzanine Controller | 804381-B21 |

## Configuration Information

### Step 6 – Software

**Notes:** The MSA Advanced Virtualization software is available as an option on the MSA 2050.

| Description | SKU |
|---|---|
| HPE MSA Advanced Data Services Suite LTU | Q0H99A |
| HPE MSA Advanced Data Services Suite E-LTU | Q0H99AAE |

**Notes:**

- The Advanced Data Services Suite includes a Performance Tiering LTU, 512 Snapshot Software LTU, and the Remote Snap Software LTU.
- Individual Software titles are not available for sale on the MSA 2050.
- 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 MSA2050 array.

## Technical Specifications

| MSA 2050 | |
|---|---|
| **Power requirements** | |
| Input Power Requirements (typical-running I/O) SFF/LFF arrays | 110VAC 3.32A, 344-390 W; 220VAC 1.61A,374-432W |
| Max Input Power | 100-240 VAC, 50/60 Hz., 4.5-1.9A; 48-60 VDC 10.4A/8.3A |
| Heat Dissipation | 1622 BTU/hr |
| **Temperature and humidity ranges** | |
| Operating Temperature | 41°F to 104°F (5°C to 40°C) |
| Shipping Temperature | -40°F to 158°F (-40°C to 70°C) |
| Operating Humidity | 10% to 90% RH @ 104°F (40°C) non-condensing |
| Non-Operating Humidity | Up to 93% RH @ 104°F (40°C) |
| **Declared acoustic noise levels** | |
| Sound Power | A weighted sound power LWAd=6,75 B |
| Sound Pressure | A weighted sound pressure LpAm - 55dB |
| **Shock and vibration** | |
| Shock, Operational | 3G's for 11 milliseconds |
| Shock, Non-Operational | 15G 11ms half sine |
| Vibration, Operational | 5-500Hz, 0.14 Grms shaped |
| Vibration, Non-Operational | 3-365-3Hz, 1.22 Grms, z-axis,0.85 Grms, X&Y axis shaped spectrum |
| **Physical** | |
| Height | 3.5 in/ 8.9 cm |
| Depth (excluding cables) (back of ear to back of controller handle) | SFF 24-bay array: 19.5 in / 49.5 cm<br>LFF 12-bay array: 22.5in. / 57.2 cm |
| Width (body only) | 17.6 in / 44.7 cm (w/ ears 19 in / 48.26 cm) |
| Weight<br>(Includes chassis and 2 controllers. No drives) | LFF chassis: 40.6 lbs. (18.4 kg)<br>SFF chassis: 38.7 lbs (17.6 kg) |

# Technical Specifications

## Performance

The performance figures provided here are for reference as many variables exist between array configurations, workloads, hard drive types, disk group setup parameters and host system setup. Hewlett Packard Enterprise has traditionally published a set of end-to-end MSA performance specifications 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 2050 in a subsequent publication. These numbers are subject to change without notice.

| **MSA 2050 End-to-End Performance Results** | | |
|---|---|---|
| **MSA 2050 Array Performance** [1] | **HPE MSA 2050 Converged SAN Controller with HDDs** | **HPE MSA 2050 Converged SAN Controller with SSDs** |
| Protocol (host connect) | 16 Gb Fibre Channel | 16 Gb Fibre Channel |
| **MSA 2050 RAID 1 SSD Performance Results** [2] | | |
| Random Reads (IOPs) | | 220,800 |
| Random Writes (IOPs) | | 103,000 |
| **MSA 2050 RAID 5 Performance Results** [3,4] | | |
| Segmented Sequential Reads (MB/s) | 5,290 | |
| Segmented Sequential Writes (MB/s) | 4,650 | |

**Notes:** End-to-End performance

- [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, (8) SSDs, RAID: 1, two drives per Disk Group; two Disk Groups per Pool, 2 volumes per Pool, block size: 8k, average latency under 5ms, Windows Server 2012 host, 16Gb FC direct connect to array
- [3]Dual Controller configuration, (72) 15k HDD, RAID: 5, nine drives per Disk Group, 4 Disk Groups per Pool, 32 volumes per Pool, block size: 256k, average latency under 30ms, Windows Server 2012 host, 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

## Technical Specifications

| End-to-End Performance Figures using Virtual Storage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **HPE MSA 2050 End-to-End Performance Figures** [1] | | | | | | | | |
| **Controller Model** | **HPE MSA 2050 SAN** | | | | | | **HPE MSA 2050 SAS** | |
| **Host Protocol** [2] | 16 Gb FC | | 10 GbE iSCSI | | 1 GbE iSCSI | | 12 Gb SAS | |
| **Drive Technology** | HDD | SSD | HDD | SSD | HDD | SSD | HDD | SSD |
| **MSA 2050 RAID 10 Performance Results**** [3,4,5,11] | | | | | | | | |
| Random Reads IOPS | 63,600 | 220,800 | 63,500 | 208,400 | 63,200 | 103,700 | 50,800 | 219,100 |
| Random Writes IOPS | 37,300 | 103,000 | 37,300 | 94,300 | 37,200 | 93,300 | 37,100 | 97,500 |
| Random Mix 60/40 IOPS | 47,600 | 142,100 | 46,600 | 133,000 | 46,800 | 130,500 | 44,500 | 138,800 |
| Sequential Reads MB/s | 5,350 | | 5,350 | | 880 | | 5,350 | |
| Sequential Writes MB/s | 3,110 | | 3,110 | | 880 | | 3,120 | |
| **MSA 2050 RAID 5 Performance Results** [6,7,12] | | | | | | | | |
| Random Reads IOPS | 56,300 | 219,200 | 55,800 | 201,400 | 56,000 | 103,400 | 47,300 | 209,600 |
| Random Writes IOPS | 18,100 | 43,400 | 18,000 | 41,400 | 18,300 | 40,600 | 18,000 | 43,100 |
| Random Mix 60/40 IOPS | 29,100 | 80,000 | 29,200 | 75,400 | 28,700 | 73,900 | 28,000 | 78,700 |
| Sequential Reads MB/s | 5,290 | | 5,280 | | 880 | | 5,290 | |
| Sequential Writes MB/s | 4,650 | | 3,870 | | 880 | | 4,710 | |
| **Controller Model** | **HPE MSA 2050 SAN** | | | | | | **HPE MSA 2050 SAS** | |
| **MSA 2050 RAID 6 Performance Results** [8,9,10,13] | | | | | | | | |
| Random Reads IOPS | 56,100 | 219,000 | 55,700 | 201,300 | 55,700 | 105,000 | 47,400 | 209,800 |
| Random Writes IOPS | 13,000 | 36,000 | 13,000 | 35,600 | 13,200 | 35,300 | 13,000 | 36,700 |
| Random Mix 60/40 IOPS | 21,400 | 72,200 | 21,200 | 68,500 | 21,300 | 67,300 | 21,300 | 71,500 |
| Sequential Reads MB/s | 5,550 | | 5,530 | | 880 | | 5,560 | |
| Sequential Writes MB/s | 4,440 | | 3,680 | | 880 | | 4,600 | |

**Notes:**

- **RAID 1 was used for SSD testing.
- 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 2050 are designed to give a conservative reference point for comparisons.
- [1]Sequential tests (MB/s) are based on 256K block sizes and random tests (IOPS) are based on 8K block sizes run against the storage. For sequential workloads with a queue depth greater than 1, each sequential stream is targeted to operate on a separate LBA range. Other types of sequential workloads that target specific LBA ranges may achieve higher results. Results cannot be expected with a single host.
- [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. 1 GbE iSCSI results were measured using 1GbE network interface controllers (NICs). Hosts were directly attached to the HPE MSA 2050 array.
- [3]MSA 2050 RAID 10 Hard Disk Drive random results: Dual Controller configuration, (192) 15K HDD, 12 drives per disk group, 8 disk groups per pool, 8 volumes per pool.
- [4]MSA 2040 RAID 10 Hard Disk Drive sequential read results: Dual Controller configuration, (96) 15K SAS HDDs, 12 drives per disk group, 4 disk groups per pool, 4 volumes per pool.
- [5]MSA 2040 RAID 10 Hard Disk Drive sequential write results: Dual Controller configuration, (48) 15K SAS HDDs, 12 drives per disk group, 2 disk groups per pool, 4 volumes per pool.
- [6]MSA 2050 RAID 5 Hard Disk Drive random results: Dual Controller configuration, (180) 15K HDD, 9 drives per disk group, 10 disk groups per pool, 10 volumes per pool.

## Technical Specifications

- [7]MSA 2050 RAID 5 Hard Disk Drive sequential results: Dual Controller configuration, (72) 15K HDD, 9 drives per disk group, 4 disk groups per pool, 4 volumes per pool.
- [8]MSA 2050 RAID 6 Hard Disk Drive random results: Dual Controller configuration, (180) 15K HDD, 10 drives per disk group, 9 disk groups per pool, 9 volumes per pool.
- [9]MSA 2050 RAID 6 Hard Disk Drive sequential read results: Dual Controller configuration, (80) 15K HDD, 10 drives per disk group, 4 disk groups per pool, 4 volumes per pool.
- [10]MSA 2050 RAID 6 Hard Disk Drive sequential write results: Dual Controller configuration, (40) 15K HDD, 10 drives per disk group, 2 disk groups per pool, 4 volumes per pool.
- [11]MSA 2050 RAID 1 Solid State Drive results: Dual Controller configuration, (8) SSDs, 2 SSDs per disk group, 2 disk groups per pool, 4 volumes per pool.
- [12]MSA 2050 RAID 5 Solid State Drive results: Dual Controller configuration, (6) SSDs, 3 SSDs per disk group, 1 disk group per pool, 4 volumes per pool.
- [13]MSA 2050 RAID 6 Solid State Drive results: Dual Controller configuration, (8) SSDs, 4 SSDs per disk group, 1 disk group per pool, 4 volumes per pool.

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### MSA 2050 Regulatory Info

#### Safety

- UL/CSA 62368-1 (USA/Canada)
- EN 62368-1 (European Union)
- IEC 60950-1 (International)

#### 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 55024 (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 Compliance, China RoHS, WEEE

#### Country Approvals

United States, Australia/New Zealand, Canada, European Union, Japan, South Korea, Taiwan

**Notes:** India and EAC are not covered for TAA compliant MSA Array models.

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## Summary of Changes

| Date | Version History | Action | Description of Change |
|---|---|---|---|
| 13-Nov-2023 | Version 23 | Changed | HPE Services Rebranding |
| 04-Oct-2021 | Version 22 | Changed | Service and Support section was updated<br>Obso SKU was removed |
| 18-Jan-2021 | Version 21 | Changed | Removed all mentions of array and expansion enclosure “A” SKUs that are now obsolete and added other textual updates. |
| 05-Oct-2020 | Version 20 | Changed | Overview, Standard Features and Configuration Information sections were updated |
| 03-Aug-2020 | Version 19 | Changed | Adjusted the regional availability of the “B” SKUs |
| 04-May-2020 | Version 18 | Changed | Added MSA Health Check tool |
| 02-Mar-2020 | Version 17 | Changed | Added “B” variants for EMEA countries only.<br>Removed EOL SKUs. |
| 07-Oct-2019 | Version 16 | Changed | Added Arxscan support |
| 06-May-2019 | Version 15 | Changed | 14TB HDD and Bundle added<br>Max capacity of array increase. |
| 02-Apr-2019 | Version 14 | Changed | RAID 0 added.<br>Edits made throughout the QuickSpecs |
| 04-Mar-2019 | Version 13 | Changed | Added Drive 6 Pack Options<br>Added Read Intensive SSDs<br>Added Windows Server 2019 support<br>Removed HDDs and cables that were EOLed<br>Overview, Standard Features and Configuration Information sections were updated |
| 03-Dec-2018 | Version 12 | Changed | Overview and Configuration Information sections were updated |
| 01-Oct-2018 | Version 11 | Changed | SKU descriptions in Overview and Configuration Information were updated. |
| 04-Sep-2018 | Version 10 | Added | Added HPE Storage File Controller support.<br>Added HPE Complete/Zerto replication support. |
| 06-Aug-2018 | Version 9 | Added | Added I/O Workload Functionality. |
| 02-Jul-2018 | Version 8 | Added | Added SED SSDs and LDAP Support. |
| 05-Mar-2018 | Version 7 | Added | Added End-to-End Performance Metrics. |
| 05-Feb-2018 | Version 6 | Changed | Standard Features, Software, Configuration Information, and Technical Specifications were revised. |
| 06-Nov-2017 | Version 5 | Changed | Changes made throughout the QuickSpecs. |
| 02-Oct-2017 | Version 4 | Changed | Changes made to the Standard Features Section. |
| 25-Sep-2017 | Version 3 | Changed | Changes made throughout the QuickSpecs. |
| 11-Jul-2017 | Version 2 | Changes | Fixed Typos. |
| 05-Jun-2017 | Version 1 | Created | Document Created. |

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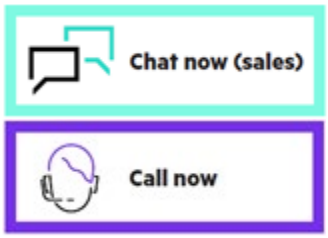


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