

Overview

HPE MSA 2052 Storage



HPE MSA 2052 Storage

Looking for seriously simple and affordable flash storage? The hybrid flash HPE MSA 2052 Storage system with the new Gen10 ProLiant Branding 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 2052 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 with 1.6 TB of flash capacity included and scale as needed with any combination of solid state disks (SSD), high-performance enterprise, or lower-cost midline SAS-based drives.

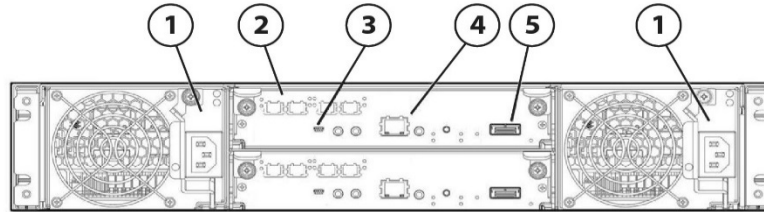
HPE MSA Storage has been the industry-leading entry storage SAN platform for the past eight years, with nearly 500,000 storage systems sold worldwide. Delivering performance in excess of 200,000 IOPS, the hybrid flash MSA 2052 Storage system can save you up to 40% with an all-inclusive software suite and 1.6 TB of flash capacity included. It's seriously simple and affordable flash storage to help you get the most performance for the lowest cost..

- **HPE MSA 2052 performs in excess of 200,000 IOPS for affordable application acceleration**
 - Delivers 2x IOPS performance than the previous generation MSA 2042
 - Save 40% on the hybrid flash MSA 2052 with all-inclusive software and 1.6 TB of SSD capacity included
- **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**
 - New 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

Standard Features

	HPE MSA 2052 Storage
Array	
Access Type	Block
Form Factor	2U, SFF or LFF
Number of controllers per array	2
Minimum/Maximum host ports	1/8
FC host connectivity	8/16Gb
iSCSI host connectivity	1Gb or 10Gbl
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 1, 5, 6, 10
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 / 120TB LFF
Max raw capacity per drive enclosure	76.8 TB SFF / 120TB LFF
Max raw capacity per array	614.4TB SFF / 960TB LFF
Bundled/Integrated SSDs	2x800GB Mixed Use SSDs
Drive Capacities	
SFF SSDs (Mixed Use)	400GB, 800GB, 1.6TB, 3.2TB
LFF SSDs (Mixed Use)	400GB, 800GB
SFF HDDs	15K: 300GB, 600GB, 900GB 10K: 300GB, 600GB, 900GB, 1.2TB, 1.8TB 7.2K: 1.0TB, 2.0TB
LFF HDDs	7.2K: 2TB, 4TB, 6TB, 8TB, 10TB
SEDs	Encryption not supported
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
Bundled/Integrated Licenses	Advanced Data Services LTU standard
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

Standard Features



HPE MSA 2052 Storage

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

**MSA 2052
Storage Models**

Descriptions

HPE MSA 2052 SAN Dual Controller LFF Storage^{1,2}
 HPE MSA 2052 SAN Dual Controller SFF Storage^{1,2}

Part Number

Q1J02A
 Q1J03A

NOTES:

¹Includes an LFF or SFF Array Chassis depending on model, two AC power supplies, two MSA 2052 SAN controllers, two 800GB Mixed Use SSDs, one Advanced Data Services LTU

²SFPs not included

**ENERGY STAR
Certification**

The HPE MSA 2052 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 2052 ENERGY STAR Certification is listed on the EPA website.

**Carrier-Grade
Storage System
(NEBS)**

The HPE MSA 2052 Storage system does not offer a NEBS certified carrier-grade bundled solution. Refer to the MSA 2050 QuickSpecs on how to configure and order carrier-grade components.

Standard Features

All MSA 2052 models offer a common set of valuable features:

- MSA 2052 SAN storage system architecture maximizes performance
 - Includes SFF or LFF array chassis, depending on model
 - Two MSA SAN controllers
 - Four host ports per controller
 - Each SAN controller supports 8 GB FC, 16 GB FC, 1GbE iSCSI or 10GbE iSCSI. Host connectivity
 - 8 GB read/write cache per controller.
 - Battery-free cache backup with super capacitors and compact flash
 - Two 800GB Mixed Use SSDs
 - One Advanced Data Services Software Suite LTU
- MSA 2052 SAN Controller allows customers to create their own Combo Controller by mixing FC and iSCSI SFPs. Below are the valid configurations for mixing SFPs:

Configuration Table for mixing SFPs

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

NOTES: ¹ SFP in Host Port 1 must match SFP in Host Port 2
² SFP in Host Port 3 must match SFP in Host Port 4

All MSA 2052 models offer a common set of valuable features (cont):

- MSA 2052 comes standard with two 800GB flash drives which allow IT managers to accelerate application performance
- The two 800GB SSDs can be optionally deployed either as read cache, or as an SSD virtual disk group for tiered storage.
 - Deploy the two embedded SSDs as Read Cache to improve random read performance. A maximum of 2 SSD's are supported per pool providing a maximum of 4TB of read cache per controller, max 8TB of read cache per array.
 - Deploy the two embedded SSDs as tiered storage. The MSA 2052 can manage up to three tiers of storage: Performance tier, Standard tier and Archive tier.
 - The Performance Auto Tiering License necessary to create a SSD virtual disk group for both read and write capabilities comes standard with all MSA 2052 models. No additional software license purchase is necessary.
- All MSA 2052 models come standard with the Advanced Data Services (ADS) Software Suite LTU, which includes automatic tiering, 512 snapshots, and remote snaps for remote replication.

Standard Features

- Storage Management Utility V3 (SMU). This new MSA management GUI brings a new modern look and feel to array management.
- Thin Provisioning allows storage allocation of physical storage resources only once they are consumed by an application. Thin Provisioning also allows over-provisioning of physical storage pool resources allowing ease of growth for volumes without predicting storage capacity upfront.
- All models feature a wide variety of drives: High-performance SSD drives, enterprise-class SAS, and SAS Midline drives.
- The MSA 2052 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.
- 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.
- The maximum LUN size is 140TB (128TiB)
- Storage Pools allow data on a given LUN to span across all drives in a pool. When capacity is added to a system, the user is also getting a performance benefit of the additional spindles.
- Snapshot enhancements for virtual storage, including performance improvements, hierarchical snapshots, and simplified resource management. Administrators can monitor and optionally control snapshot space usage.
- Prioritize data by assigning appropriate affinity level (Performance, No Affinity or Archive)
- 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 are able to do data-in-place upgrades to the new MSA 2052 array. This unique ability protects the earlier investments in drives, and JBODs.
 - Certain limitations are applicable. Please review the Upgrading to the HPE MSA 2050/2052 Technical Whitepaper before upgrading your MSA 2040, MSA 2042 or MSA 1040 systems

Application Solutions

The HPE MSA 2052 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 2052 delivers enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HPE MSA 2052 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 2052, 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

Product Technology

SAN controller MSA 2052 SAN controller supports 8Gb FC, 16Gb FC, 1GbE iSCSI or 10GbE iSCSI host connectivity. .

Modular Chassis 2U rack height. 12 LFF or 24 SFF drive bays. All MSA 2052 SAN Storage Systems come standard with 2 SAN controllers

Drives available The MSA 2052 SAN Storage systems support both the MSA 3.5-inch LFF drives, and the MSA 2.5-inch SFF drives.

NOTE: The MSA 2052 does not support single controller configurations.

- Solid State Drives (SSDs) deliver exceptional performance for applications requiring high random read IOPs performance.
- Serial Attached SCSI (SAS) enterprise-class drives are designed for high demand, 24x7 usage.
- SAS Midline drives are usually reserved for archival of data as they are relatively inexpensive and are available in very large capacities.

Optional Disk Enclosures Just as the user has a choice of chassis for the array enclosure (LFF or SFF drive bays), 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, SAS, and SAS MDL hard drives. The pre-configured MSA 2050 LFF Disk Enclosure has two I/O modules and supports the MSA 2052 dual controller arrays.

- The MSA 2050 LFF Disk Enclosure can be attached to the MSA 2052 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 2052 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 drives and accepts MSA dual ported 12Gb SSD, SAS, or SAS MDL hard drives. The pre-configured MSA 2050 SFF Disk Enclosure has two I/O modules and supports the MSA 2052 dual controller arrays.

- The MSA 2050 SFF Disk Enclosure can be attached to the MSA 2052 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 2052 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 2052 array configurations are designed to allow an installation to begin with smaller capacity and be able to grow gradually as needed. The flexibility of SSD, SAS or SAS MDL drives technology, form factors, sizes, speeds, and costs per GB allows a system to easily fit in almost any budget.

- Large Form Factor configurations can scale up to 120TB SAS MDL per array enclosure, expandable to 960TB SAS MDL 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 2052 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 2052 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 2052 supports large, flexible Volumes with sizes up to 128TiB and facilitates seamless capacity expansion. As volumes are expanded data automatically reflows to balance capacity utilization on all drives.
RAID 1, 5, 6, 10	The MSA 2052 features several important additional levels. RAID 6 offers the highest level of RAID protection. It allocates two sets of parity data across drives and allows simultaneous write operations. It can withstand two simultaneous drive failures without downtime or data loss. RAID 10 is mirroring and striping without parity and allows large Disk Groups to be created with high performance and mirroring for fault tolerance. RAID 5 combines the block striping and parity. Because data and parity are striped across all of the disks, no single disk is a bottleneck. Striping also allows users to reconstruct data in case of a disk failure
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 Mixed Use SSDs
Protocol (host connect)	16 Gb Fibre Channel	16 Gb Fibre Channel
MSA 2050 RAID 1 SSD Performance Results ²		
Random Reads (IOPs)		220,600
Random Writes (IOPs)		102,800
MSA 2050 RAID 5 Performance Results ^{3,4}		
Segmented Sequential Reads (MB/s)	5,280	
Segmented Sequential Writes (MB/s)	4,650	

End-to-End performance 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, (8) 400GB Mixed Use 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

Standard Features

3Dual 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.

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 2052 arrays come integrated with web browser and CLI based software for storage and RAID management, setup, configuration, and troubleshooting. The MSA 2052 management supports Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome.
Hot Plug Expansion and Replacement Support	All MSA 2052 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 2052 supports most HPE ProLiant, BladeSystems and Integrity servers including <ul style="list-style-type: none">• HPE ProLiant DL, ML Servers• HPE c-Class Blade Servers• Integrity servers, IA64• Compatibility must be confirmed at: http://www.hpe.com/storage/spock• NOTE: depends on protocol
3rd Party server support	The MSA 2052 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. <ul style="list-style-type: none">• 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 <ul style="list-style-type: none">• Microsoft Windows Server 2016• Microsoft Windows Server 2012• VMware• HP-UX• Red Hat Linux• SuSE SLES Linux• NOTE: depends on protocol

Software

Advanced Data Services Software Suite

The HPE MSA Advanced Data Service Suite is included as a standard feature on the MSA 2052 at no extra charge. The standard MSA Advanced Data Services Software Suite includes the following functionality:

- Performance Tiering and Archive Tiering Software
- 512 Snapshots and Volume Copy Software
- Remote Snap Software

Performance Tiering and Archive Tiering

Disk tiers are comprised of aggregating 1 or more Disk Groups of similar physical disks. The MSA 2052 supports 3 distinct tiers:

1. A Performance tier with SSDs
2. A Standard SAS tier with Enterprise SAS HDDs
3. An Archive tier utilizing Midline SAS HDDs.

The MSA 2052 supports sub-LUN tiering and automated data movement between tiers. The MSA 2052 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.

To enable the tiering (data movement) between the Performance tier with SSDs and either of the other tiers, the Advanced Data Services Suite is required. Systems containing only SSDs will not require additional licenses until additional tiers are added.

Snapshot and Volume Copy

- 512 Snapshots and Volume Copy are standard features on the MSA 2052
- 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

Remote Snaps

- 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 SAN array products. Snapshots are used to track the data to be replicated as well as to determine the differences in data updated on the master volume, minimizing the amount of data to be transferred.
- HPE Remote Snap replication technology provides the ability to accomplish key data 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

Software

TCP/IP (iSCSI) or Fibre Channel. The amount of data transferred is minimized through the use of snapshots whenever possible.

NOTE: 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.

Product Features

- 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 2052 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.
- 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

HPE OneView for VMware vCenter

HPE OneView for VMware vCenter is a component within the HPE OneView plug-in for vCenter. It provides VMware administrators that are using VMware's vSphere management console (vCenter) with the ability to see how virtual machines are mapped to datastores and individual MSA 2052 volumes. By providing these clear relationships between VM's, datastores and storage, the VMware administrator's productivity increases, as does the ability to ensure quality of service. Roles for administrators can be defined on an individual basis, providing the ability to apply specific permissions for both view and control functions.

HPE OneView for VMware vCenter supports mixed array environments including MSA 2050/2052, MSA 2040/2042, MSA 1040, P2000, EVA, P4000, and the XP array series including the P9500.

When deployed with the MSA 2052 array, HPE OneView provides the following:

- Active Management functionality for the MSA 2052 array:
 - Create/Expand/Delete a Datastore
 - Create a Virtual Machine from a template
- Monitors the health and status of the MSA 2052
- Displays LUN / volume connections from VMs and ESX servers to the arrays and provides the location and attributes of the MSA 2052 within the SAN
- Identifies what storage features are available to allow administrators to match the features available on the MSA 2052 to their requirements
- Provide a cluster-level view of the storage

Software

HPE OneView for VMware vCenter is downloadable from Software

Depot: <https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=HPVPR>

For more information on HPE OneView for VMware vCenter

visit: <http://h22168.www2.hpe.com/us/en/partners/vmware/>

HPE StoreFront Manager for Microsoft

HPE StoreFront Manager for Microsoft enables management and monitoring of HPE MSA Storage running in Microsoft Hyper-V environment with a single pane-of-glass view to events/alerts, capacity and health dashboards and detailed virtual infrastructure information. It integrates seamlessly with Microsoft System Center Operations Manager (SCOM) and provides Microsoft administrators the following:

It supports heterogeneous HPE Storage environment including HPE MSA, HPE StoreVirtual, HPE 3PAR StoreServ, HPE StoreOnce, HPE StoreEasy, HPE XP, HPE EVA and HPE StoreEver Storage.

When deployed with the MSA 2052 array, HPE StoreFront Manager provides the following:

- Monitors the health, events and alerts for the MSA 2052 – virtual Pools, and volumes
- Provides detailed information on the VMs provisioned through MSA Storage
- Effortless installation and configuration using Powershell

HPE StoreFront Manager for Microsoft for MSA Storage is downloadable from Software Depot:

https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=System_Center

vStorage API for Array Integration (VAAI)

The vStorage API for Array Integration (VAAI) is one of the storage application programming interface (API) sets in vSphere. VAAI is an API storage partners can leverage to enhance performance of virtual machine (VM) management operations by delegating these operations to the storage array. With hardware offload, ESX/ESXi hosts perform certain operations faster and consume less server CPU and memory resources, and also storage port and storage fabric bandwidth. VAAI includes high performance and scalable VM data path primitives.

Storage Hardware Primitives for VAAI

- Full Copy or Hardware Assisted Move
- Block Zeroing or Hardware Assisted Zeroing
- Hardware Assisted Locking or Atomic Test and Set (ATS)

UNMAP reclaims space that is no longer on a thinly provisioned VMFS volume

Warranty, Service and Support Information

Warranty

Three-year limited warranty, parts exchange Next Business day delivery.
3 Years 9x5 telephone support, with Rights to New Versions bundled with the MSA 2052.

Enclosures, Hard drives, and Options for the MSA 2052 carry their own warranty. Refer to **Hewlett Packard Enterprise Limited Warranty Statement** for more information.

The MSA 2052 has been designed with customer self-repairable parts to minimize repair time and provide greater flexibility in performing defective parts replacement. Please refer to Hewlett Packard Enterprise limited warranty Statement and parts replacement instructions for further details.

NOTE: The warranty of the hard drive options purchased with the MSA 2052 models is different for SAS hard drives versus SAS MDL. SAS hard drive options have a three year warranty and SAS MDL have a one year warranty.

Solid State Drives (SSD) Warranty

3/0/0 warranty; Customer Self Repair (CSR) subject to maximum usage and or maximum supported lifetime limitations, whichever occurs first. Maximum Supported Lifetime is the period in years set to equal the warranty for the device. Maximum usage limit is the maximum amount of data that can be written to the device before reaching the device's write endurance limit.

Service and Support

Protect your business beyond warranty with HPE Support Services

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

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Achieve up to 77%¹ reduction in down time, near 100%² diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7 monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HPE support

¹ IDC

² HP CSC reports 2014-2015

Learn more about getting connected at <http://www.hpe.com/services/getconnected>

Warranty, Service and Support Information

Optimized Care	<p>HPE Proactive Care with 6 hour call-to-repair commitment, three year Support Service</p> <p>HPE Proactive Care gives customers an enhanced call experience. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice. This Service combines three years' proactive reporting and advice with our highest level of hardware support; HPE's 24x7, six hour hardware call-to-repair. HPE is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers and storage, including the HPE MSA 2050/2052 Storage.</p> <p>https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf</p>
Standard Care	<p>HPE Proactive Care with 24x7 coverage, three year Support Service</p> <p>HPE Proactive Care gives customers an enhanced call experience. When your products are connected to HPE, Proactive Care helps prevent problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice. This Service combines three years' proactive reporting and advice with our 24x7 coverage, four hour hardware response time when there is a problem.</p> <p>https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf</p>
Basic Care	<p>HPE Foundation Care 24x7, three-year Support Service</p> <p>HPE Foundation Care 24x7 gives you access to HPE 24 hours a day, seven days a week for assistance on resolving issues. This service includes need based Hardware onsite response within four hours. Simplify your support experience and make HPE your first call to help resolve hardware or software problems.</p> <p>https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en</p>
Foundation Care	<p>HPE Foundation Care 24x7, three-year Support Service</p> <p>HPE Foundation Care 24x7 gives you access to HPE 24 hours a day, seven days a week for assistance on resolving issues. This service includes need based Hardware onsite response within four hours. In addition, collaborative software support is included in this service that provides troubleshooting assistance on industry leading software running on your HPE server. Simplify your support experience and make HPE your first call to help resolve hardware or software problems. https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en</p>
Parts and Materials	<p>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.</p> <p>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.</p> <p>The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction</p>
Related Services	<p>HPE Hardware Installation</p> <p>Provides for the basic hardware installation of HPE branded servers, HPE storage including the MSA 2050/2052. devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.</p> <p>https://www.hpe.com/h20195/V2/GetPDF.aspx/5981-9356EN.pdf</p> <p>HPE Installation and Startup Service</p> <p>Provides for the installation and startup of HPE technology including BladeSystems, C-Class enclosure, HPE ProLiant c-Class and Integrity server blades, storage blades, SAN switch blades, HPE Virtual Connect modules (Ethernet and Fibre Channel), Ethernet network interconnects, and InfiniBand, as well as the</p>

Warranty, Service and Support Information

installation of one supported operating system type (Windows® or Linux). Included the HPE MSA 2050/2052.

HPE Datacenter Care service

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

For more information, visit

HPE Flexibly Capacity,

With Flexible Capacity, you get the speed, scalability, and economics of the public cloud in the privacy of your data center. Gain the advantages of the public cloud—consumption-based payment, rapid scalability without worrying about capacity constraints. Reduce the “heavy lifting” needed to operate a data center. And retain the advantages that IT provides the business (i.e., control, security). Deliver the right user experience, choose the right technology for the business, manage privacy and compliance, and manage the cost of IT. And, you have the option to use the public cloud when needed.

HPE Factory Express for Servers and Storage

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

Factory Express offers service packages for simple configuration, racking, installation, complex configuration and design services as well as individual factory services, such as image loading, asset tagging, and custom packaging. HPE products supported through Factory Express include a wide array of servers and storage: HPE Integrity, HPE ProLiant, HPE Apollo, HPE ProLiant Server Blades, HPE BladeSystem, HPE 9000 servers as well as the HPE MSA Storage, HPE 3PAR Storage, HPE XP, rackable tape libraries and configurable network switches.

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

HPE Support Center

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

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

For more information: <http://www.hpe.com/services>

Configuration Information

Step 1 - MSA 2052 - Base Configurations

Pre-Configured Systems	MSA 2052 Base System (AC Powered)	
	HPE MSA 2052 SAN Dual Controller LFF Storage ^{1,2,3}	Q1J00A
	HPE MSA 2052 SAN Dual Controller SFF Storage ^{1,2,3}	Q1J01A

NOTE:

- 1) Includes an LFF or SFF Array Chassis depending on model, two AC power supplies, two MSA 2052 SAN controllers, two 800GB Mixed Use SSDs, one Advanced Data Services LTU
- 2) SFPs not included
- 3) Single controller options are not supported

Step 2 – Choose Your SFP+ Module

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

NOTE:

- MSA SFPs are for use only with MSA 2052 SAN Controllers
- MSA 2052 SAN Controllers do not ship with any SFPs
- Customer must select at least one of the above SFP options
- Each MSA 2052 SAN controller can be configured with 2 or 4 SFPs
- For MSA 2052 10Gb iSCSI configuration user can use DAC cables instead of SFPs

Step 3 – Select Your Drives.

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

SFF SSDs	12G SFF SAS SSDs (Mixed Use)	
	HPE MSA 400GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X95A
	HPE MSA 800GB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X96A
	HPE MSA 1.6TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X91A
	HPE MSA 3.2TB 12G SAS Mixed Use SFF (2.5in) 3yr Warranty Solid State Drive	N9X92A
SFF HDDs	12G SFF 15K SAS HDDs	
	HPE MSA 300GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F40A
	HPE MSA 600GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	J9F42A
	HPE MSA 900GB 12G SAS 15K SFF (2.5in) Enterprise 3yr Warranty Hard Drive	Q1H47A
	12G SFF 10K SAS HDDs	
HPE MSA 300GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F44A	

Configuration Information

HPE MSA 600GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F46A
HPE MSA 900GB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F47A
HPE MSA 1.2TB 12G SAS 10K SFF(2.5in) Dual Port Enterprise 3yr Warranty Hard Drive	J9F48A
HPE MSA 1.8TB 12G SAS 10K SFF (2.5in) 512e Enterprise 3yr Warranty Hard Drive	J9F49A
12G SFF 7.2K SAS MDL HDDs	
HPE MSA 1TB 12G SAS 7.2K SFF (2.5in) 512e Midline 1yr Warranty Hard Drive	J9F50A
HPE MSA 2TB 12G SAS 7.2K SFF (2.5in) 512e Midline 1yr Warranty Hard Drive	J9F51A

NOTE:

- SAS MDL drives are designed for archival or reference data
- SAS MDL drives should not be used in a heavy or intense I/O environment
- Intense I/O environments require the use of enterprise-class SSD or SAS drive

LFF SSDs

12G LFF SAS SSDs (Mixed Use)

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

LFF HDDs

12G LFF 7.2K SAS Midline Drives

HPE MSA 2TB 12G SAS 7.2K LFF (3.5in) 512n Midline 1 yr Warranty Hard Drive	N9X93A
HPE MSA 4TB 12G SAS 7.2K LFF (3.5in) 512e Midline 1yr Warranty Hard Drive	K2Q82A
HPE MSA 6TB 12G SAS 7.2K LFF (3.5in) 512e 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 LFF (3.5in) Midline 512e 1 yr Wty Hard Drive	P9M82A

Step 4 – Options

Drive Enclosures	HPE MSA 2050 LFF Disk Enclosure	Q1J06A
	HPE MSA 2050 SFF Disk Enclosure	Q1J07A

NOTE:

- Each drive enclosure includes two 0.5m MiniSAS to MiniSAS cables
- Add up to 7 expansion drive enclosures
- MSA 2052 LFF Disk Enclosure can be connected to either the MSA 2052 SFF or LFF dual controller systems.
- HPE MSA 2052 SFF Disk Enclosure can be connected to either the MSA 2052 SFF or LFF dual controller systems

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

NOTE:

- Connecting MSA 2052 Controller to a JBOD if a longer cable is desired

AC Power Cords	HP ProLiant 12 ft Power Cord	227099-001
	Power Cord, (Australia/China/New Zealand)	227098-001
	Power Cord, (Central Europe)	157215-001
	Power Cord, (United Kingdom/Hong Kong)	157216-001
	Power Cord, (Switzerland)	157219-001
	Power Cord, (Italy)	157217-001
	Power Cord, (Denmark)	157218-001
	Power Cord, (Japan)	139867-001

Configuration Information

Power Cord, (South East Asia/India)

157220-001

NOTE:

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

Step 5a - Choose Supported Options For Fibre Channel Infrastructure

PremierFlexOM4 type cables	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A	
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A	
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A	
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A	
	HP LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A	
	HP LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A	
	HPE LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A	
	HP LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A	
	M3 FC LC-LC cables	HP LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
		HP LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
HP LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable		AJ839A	

Step 5b - Choose Supported Options For 10GbE Infrastructure

Copper Cable	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 0.5m Direct Attach Copper Cable	487649-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 1m Direct Attach Copper Cable	487652-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 3m Direct Attach Copper Cable	487655-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 5m Direct Attach Copper Cable	537963-B21
	HP BladeSystem c-Class 10GbE SFP+ to SFP+ 7m Direct Attach Copper Cable	487658-B21
DAC Cable	HPE X242 10G SFP+ to SFP+ 1m Direct Attach Copper Cable	J9281B
	HPE X242 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	J9283B
	HPE X242 10G SFP+ to SFP+ 7m Direct Attach Copper Cable	J9285B
	HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C
	HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable	JG081C
HPE FlexNetwork X240 10G SFP+ SFP+ 7m Direct Attach Copper Cable	JC784C	

Step 6 – Software

The MSA Advanced Data Services Software Suite comes standard on the MSA 2052. No optional software titles are available on the MSA 2052.

Technical Specifications

MSA 2052	POWER REQUIREMENTS	
	Input Power Requirements (typical-running I/O) SFF/LFF arrays	<ul style="list-style-type: none"> 110VAC 3.32A, 344-390 W; 220VAC 1.61A,374-432W
	Max Input Power	100-240 VAC, 50/60 Hz, 4.5-1.9A; 48-60 VDC 10.4A/8.3A
	Heat Dissipation	1622 BTU/hr
	TEMPERATURE AND HUMIDITY RANGES	
	Operating Temperature	41°F to 104°F (5°C to 40°C)
	Shipping Temperature	-40°F to 158°F (-40°C to 70°C)
	Operating Humidity	10% to 90% RH @ 104°F (40°C) non-condensing
	Non-Operating Humidity	Up to 93% RH @ 104°F (40°C)
	DECLARED ACOUSTIC NOISE LEVELS	
	Sound Power	A weighted sound power LWAd=6,75 B
	Sound Pressure	A weighted sound pressure LpAm - 55dB
	SHOCK AND VIBRATION	
	Shock, Operational	3G's for 11 milliseconds
	Shock, Non-Operational	15G 11ms half sine
	Vibration, Operational	5-500Hz, 0.14 Grms shaped
	Vibration, Non-Operational	3-365-3Hz, 1.22 Grms,z-axis,0.85 Grms, X&Y axis shaped spectrum
	PHYSICAL	
	Height	3.5 in/ 8.9 cm
Depth (excluding cables) (back of ear to back of controller handle)	SFF 24-bay array: 19.5 in / 49.5 cm LFF 12-bay array: 22.5in. / 57.2 cm	
Width (body only)	17.6 in / 44.7 cm (w/ ears 19 in / 48.26 cm)	
Weight (Includes chassis and 2 controllers. No drives)	LFF chassis: 40.6 lbs. SFF chassis: 38.7 lbs	
MSA 2052 Regulatory Info	Safety	UL 60950-1 (USA)
		CAN/CSA-C22.2 No.60950-1-03 (Canada)
		EN 60950-1 (European Union)
		GS mark (Germany)
		IEC 60950-1 (International)
	Electromagnetic Compatibility	CCC Mark (power supply only, China PRC)
		VCCI:2008-04 Class A (Japan)
		FCC 15:109(g) Class A (USA)
		ICES-003:2004 Class A (Canada)
		EN55022 : (European Union Class A); CISPR 22 (International Class A)
		EN61000-3-2 : (Harmonics) (European Union)
EN61000-3-3 : (Flicker) (European Union)		

Technical Specifications

		EN 55024 (European Union, Immunity, Class A); CISPR 24 (International Immunity, Class A)
		AS/NZS CISPR 22, Class A (Australia, New Zealand)
		CNS 13438 Taiwan, Class A (Taiwan)
		KN22 Class A (Emissions Class A); KN24 (Immunity) (S Korea)
	RoHS and WEEE	RoHS-6/6 Compliance, China RoHS, WEEE
	Country Approvals	United States, Australia/New Zealand, Canada, China (PRC), European Union, Germany (GS Mark), Japan, South Korea, Taiwan

Summary of Changes

Date	Version History	Action	Description of Change
05-Jun-2017	Version 1	Created	Document Created



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