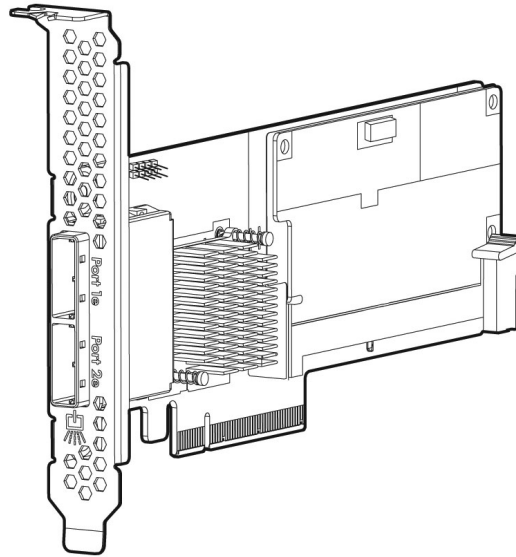


Overview

The HP Smart Array P421 Controller is a low profile, 6 Gb/s, PCIe 3.0, Serial Attached SCSI (SAS) RAID controller that provides enterprise class, storage performance, maximum external scalability, and data protection for select HP ProLiant Gen8 rack servers and tower servers.

It features eight external SAS ports and delivers increased server uptime by providing advanced storage functionality, including online RAID level migration (between any RAID levels) with flash back write cache, global online spare, and pre-failure warning. Data Compatibility among all models of Smart Array controllers allows simple and easy migration at any time when needs for higher performance, capacity, and availability increase. Even new generations of Smart Array controllers can understand the data format of previous generations of Smart Array controllers.



What's New

- HP Smart Array Advanced Pack 2.0 features are now part of the base features for the HP Smart Array P421 Controller at no additional cost

Models

HP Smart Array P421 Controller	HP Smart Array P421/1GB FBWC 6Gb 2-ports Ext SAS Controller	631673-B21
	HP Smart Array P421/2GB FBWC 6Gb 2-ports Ext SAS Controller	631674-B21

Standard Features

The Smart Array Advantage

HP's innovative design and integration work of the Smart Array family of products creates customer value that is unmatched in the industry. Use of Smart Array products across multiple applications results in a much lower Total Cost of Ownership (TCO) than any other server storage RAID product. The HP Smart Array family brings an unparalleled return on investment through:

Data Compatibility among most current shipping Smart Array controllers allows simple and easy upgrades any time needs for higher performance, capacity, and availability increase. Even successive generations of Smart Array controllers understand the data format of other Smart Array Controllers.

Consistent Configuration and Management Tools. Most current shipping Smart Array products utilize a standard set of management and utility software. These tools minimize Total Cost of Ownership (TCO) by reducing training requirements and technical expertise necessary to install and maintain the HP server storage.

Pre-Failure Warranty means HP Insight Manager not only reports when a drive is going to fail but allows replacement of failing drives prior to actual failure. For complete details, consult the HP Support Center or refer to your HP Server documentation.

Key Features

- The SA-P421 Controller supports up to 200 drives.
- The SA-P421 Controller supports the HP D2600 Disk Enclosure and HP D2700 Disk Enclosure (up to 8 daisy chained) Seamless upgrades to current or next generation HP high performance and high capacity Serial Attached SCSI Smart Array controllers
- 6Gb/s SAS technology delivers high performance and data bandwidth and contains full compatibility with 3Gb/s SATA technology.
- x8 PCIe 3.0 host interface technology delivers high performance and data bandwidth up to 8.5 GB/s maximum bandwidth.
- Standard on the P421 are RAID 6, RAID 60, RAID 1 ADM, Capacity Expansion, mirror split, recombine, and rollback in Online Mode, Drive Erase, Performance Optimization-Degraded Reads and Read Coalescing, Move/Delete any individual LUNS
- The HP SSD Smart Path feature included in the Smart Array software stack improves SSD reads for all RAID levels and RAID 0 write operations by optimizing the path to each SSD attached to the controller
- The HP SmartCache licensed feature (available as an additional option) is a controller-based read caching solution in a DAS environment that caches the most frequently accessed data ("hot" data) onto lower latency SSDs to dynamically accelerate application workloads
- Mix-and-match SAS and SATA hard drives, lets you deploy drive technology as needed to fit your computing environment
- Support for SAS tape products
- Software consistency on most current shipping Smart Array products: HP Smart Storage Administrator, HP Systems Insight Manager, and HP Intelligent Provisioning. The HP Smart Storage Administrator configures and manages a host of Smart Array controllers and other storage devices using a single interface. It replaces the HP Array Configuration Utility (ACU) with an updated design and configuration enhancements
- 1GB or 2 GB 72-bit wide DDR3 1333 MHz Flash Back Write Cache module standard
- Low-profile PCI Express form factor - ships with a full size bracket for deployment in either a low-profile or full sized slot

Standard Features

Online Management Features

- Online array expansion
 - Online capacity expansion
 - Online logical drive extension
 - Online RAID level migration
 - Online stripe size migration
 - Online mirror split, recombine and rollback
 - Online and high performance offline Rapid Parity Initialization (RPI)
 - Unlimited global online spare assignment
 - User selectable expand and rebuild priority
 - User selectable RAID level and stripe size
 - User selectable read and write cache size
 - Supports Predictive Spare Activation
-

- Ports**
- Eight (8) SAS physical links distributed across 2 external x4 miniSAS connectors.
-

Performance HP's High Performance Architecture sets new boundaries of industry performance expectations!

- Second Generation 6Gb/s SAS (600MB/s bandwidth per physical link)
 - x8 6Gb/s SAS physical links (compatible with 3Gb/s SATA)
 - 1GB or 2GB 72-bit wide DDR3-1333MHz flash backed write cache provides up to 10.6 GB/s maximum cache bandwidth
 - Read ahead caching
 - Write-back caching (with FBWC)
-

Capacity

- Up to 384TB of external storage per controller with 8 x HP D2600 Disk Enclosure and 96 x 4TB 3.5" SAS or SATA hard drives
- Up to 240TB of external storage per controller with 8 x HP D2700 Disk Enclosures and 200 x 1.2TB SFF SAS hard drives
- Up to 200 TB of external storage per controller with 8 x HP D2700 Disk Enclosures and 200 x 1TB SFF SATA hard drives
- Up to 280TB of external storage per controller with 1 x HP D6000 Disk Enclosure and 70 x 4TB LFF SAS hard drives
- Up to 48TB of external storage per controller with 1 x HP MSA2040 SAN Storage and 12 x 4TB LFF SAS hard drives
- Up to 24TB of external storage per controller with 1 x HP MSA2040 SAN Storage and 24 x 1TB SFF SAS hard drives

NOTE: Support for greater than 2TB in a single logical drive. Please check the website of the supported Disk Storage System to get the most recent information on maximum capacity

Standard Features

Availability

- Online RAID level migration between any RAID levels
- Online stripe size migration
- Online capacity expansion
- Online logical drive extension
- Online active drive replacement
- Online drive firmware upgrade
- Unlimited global online spare
- Pre-Failure Warranty

Fault Prevention

The following features offer detection of possible failures before they occur, allowing preventive action to be taken:

- S.M.A.R.T. (Self Monitoring Analysis and Reporting Technology) was first developed by HP which detects possible hard disk failure before it occurs, allowing replacement of the component before failure occurs.
- Drive Parameter Tracking monitors drive operational parameters, predicting failure and notifying the administrator.
- Dynamic Sector Repairing continually performs background surface scans on the hard disk drives during inactive periods and automatically remaps bad sectors, ensuring data integrity.
- Smart Array Cache Tracking monitors integrity of controller cache, allowing pre-failure preventative maintenance.
- Environment Tracking for External Storage System: Monitors fan speed and cabinet temperature of Modular Smart Array Enclosures and HP Disk Enclosures.

Fault Tolerance

Keeps data available and server running while a failed drive is being replaced; several fault tolerance configurations are supported including:

- **RAID 6** (Advanced Data Guarding): Supported with a minimum of 4 drives. This allocates two sets of parity data across drives. This level of fault tolerance can withstand a double drive failure without downtime or data loss.
- **RAID 60**: Supported with a minimum of 8 drives. This volume is composed of two or more RAID 6 sub-volumes (parity groups) where data is striped across each parity group as if it were a single physical drive. Each RAID 6 parity group can sustain up to two drive failures without incurring data loss.
- **RAID 5** (Distributed Data Guarding): Supported with a minimum of 3 drives. This allocates one set of parity data across drives. This level of fault tolerance can withstand a single drive failure without downtime or data loss.
- **RAID 50**: Supported with a minimum of 6 drives. This volume is composed of two or more RAID 5 sub-volumes (parity groups) where data is striped across each parity group as if it were a single physical drive. Each RAID 5 parity group can sustain a single drive failure without incurring data loss.
- **RAID 1 & 10** (Drive Mirroring): Supported with a minimum of 2 drives. This allocates half of the drive array to the data and the other half to the mirrored data, providing two copies of the data.
- **RAID 1 ADM & 10 ADM** (Advanced Data Mirroring): Supported with a minimum of 3 drives. RAID 1 ADM creates redundant copies of the data using 3 drives. RAID 10 ADM stripes data across two or more sets of RAID 1 ADM volumes. This level of fault tolerance can withstand a double drive failure within a RAID 1 ADM volume without downtime or data loss.

Standard Features

Fault Recovery

Minimizes downtime, reconstructs data, and facilitates a quick recovery from drive failure

- **Recovery ROM:** This feature protects the user from a firmware image corruption by storing a redundant copy of the firmware image. If the active firmware image becomes corrupt, the controller will use the redundant firmware image and continue operating.
- **On-Line Spares:** There is no limit to the number of spare drives that can be installed prior to drive failure. If a failure occurs, recovery begins with an On-Line Spare and data is reconstructed automatically.
- **DRAM ECC** corrects against single bit data and address corruption.
- **Flash Backed Write Cache** provides read ahead caching and write back caching with indefinite write cache data retention in the case of unexpected power outage.

Ease of Use

- GUI based configuration, management and diagnostic software tools with the HP Smart Storage Administrator
- Common data format between generations of products
- Data migration between servers and external HP Modular Smart Array enclosures and HP Disk Enclosures

HP SSD SmartPath

The HP SSD Smart Path feature included in the Smart Array software stack improves Solid State Disk (SSD) read performance. With up to 4x better SSD read performance, HP SSD Smart path chooses the optimum path to the SSD and accelerates reads for all RAID levels and RAID 0 writes. HP SSD Smart Path Requires updated firmware, drivers, and configuration utility available at: www.hp.com/go/ssdsmartpath. HP SSD Smart Path is ideal for read intensive workloads and is included as a base feature on HP Smart Array P-series controllers. The following operating systems are supported by the HP SSD Smart Path feature:

- Microsoft Windows Server 2008
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012

HP SmartCache

The HP SmartCache licensed feature is a controller-based read caching solution in a DAS environment that caches the most frequently accessed data ("hot" data) onto lower latency SSDs to dynamically accelerate application workloads. The HP SmartCache architecture is flexible and supports any HP ProLiant Gen8 supported HDD for bulk storage and any HP ProLiant Gen8 supported SSD as an accelerator.

HP SmartCache is deployed and managed through the HP Smart Storage Administrator (HP SSA) or the HP Array Configuration Utility (ACU).

The basic HP SmartCache architecture is comprised of the following three elements:

- **Bulk storage:** The first element is the bulk storage device, which is any supported HDD attached to the HP Smart Array controller.
- **Accelerator:** The second element, the accelerator, is a faster/lower latency SSD device that caches data.
- **Metadata:** The final element is metadata, information held in a relatively small storage area that maps the location of information residing on the accelerator and bulk storage devices.

For more information please visit www.hp.com/go/smartcache

Standard Features

Warranty

The warranty for this device is 3 years parts only.

Pre-Failure Warranty: Drives attached to the Smart Array Controller and monitored under Insight Manager are supported by a Pre-Failure (replacement) Warranty. For complete details, consult the HP Support Center or refer to your HP Server Documentation.

Warranty Upgrade Options

- Response - Upgrade on-site response from next business day to same day 4 hours
- Coverage - Extend hours of coverage from 9 hours x 5 days to 24 hours x 7 days
- Duration - Select duration of coverage for a period of 1, 3, or 5 years
- Warranty upgrade options can come in the form of Care Packs, which are sold at the HP System level to which this product attaches

Compatibility

Server Support

For up to date compatibility, please see the following URL for complete Smart Array P421 Controller compatibility and support information: www.hp.com/go/smartarray

Operating Systems

Microsoft Windows Server 2008 (x64 & x86)
Microsoft Windows Server 2012
Red Hat Enterprise Linux 5 (x64 & x86)
Red Hat Enterprise Linux 6 (x64 & x86)
SUSE Linux Enterprise Server 10 (x64 & x86)
SUSE Linux Enterprise Server 11 (x64 & x86)
VMware ESX 4.1
VMware ESXi 4.1
VMware ESXi 5.0
VMware ESXi 5.1

NOTE: For more information on HP's Certified and Supported ProLiant Servers for OS and Virtualization Software and the latest listing of software drivers available for your server and Smart Array RAID controller, please visit our Support Matrix at: <http://www.hp.com/go/ossupport>

NOTE: For more Linux OS support and certification information, please visit: <http://h18004.www1.hp.com/products/servers/linux/>

Software Suite

Most current shipping Smart Array products share a common set of configuration, management and diagnostic tools, including HP Smart Storage Administrator, and HP Systems Insight Manager. These software tools reduce the cost of training for each successive generation of product and take much of the guesswork out of troubleshooting field problems. These tools lower the total cost of ownership by reducing training and technical expertise necessary to install and maintain HP server storage.

HP Systems Insight Manager

- Powerful server and server options/storage manager tool
- Monitors over 1200 system wide parameters
- Configuration/Diagnostic Utilities

HP Smart Storage Administrator (HP SSA)

- Comprehensive management for HP Smart Storage products
- Simplified and intuitive interface and functionality
- Advanced scripting and diagnostic features

For more information please visit: www.hp.com/go/hpssa

Service and Support

Service and Support

HP Technology Services

Capitalizing on HP ProLiant server and HP BladeSystem capabilities requires a service partner who understands your increasingly complex business technology environment. That's why it makes sense to team up with the people who know HP infrastructure hardware and software best - the experienced professionals at HP Services.

Protect your business beyond warranty with HP Care Pack Services

When you buy HP Options, it's also a good time to think about what level of service you may need. HP Care Pack services provide total care and support expertise with committed response choices designed to meet your IT and business need.

HP Foundation Care services offer scalable reactive support-packages for HP servers and software. You can choose the type and level of service that is most suitable for your IT and business needs. HP Proactive Care delivers high levels of system availability through proactive service management and advanced technical response.

Recommended HP Care Pack Services for optimal satisfaction with your HP product

Optimized Care

3-Year HP 6 hour Call to Repair Response, Proactive Care

Combined reactive and proactive support for hardware and software helping optimize your systems and delivering high levels of availability through proactive service management and advanced technical response. Hardware problem resolution to return the hardware in operating condition within 6 hours of the initial service request. A Technical Account Manager, as your single point of contact, will own your call or issue end to end until resolved.

<http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855EEE.pdf>

HP Installation of ProLiant Add On Options Service

This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware or software is installed smoothly, efficiently, and with minimal disruption of your IT and business operations

Standard Care

3-Year HP 24x7 4 hour response, Proactive Care Service

This service gives you combined reactive and proactive support including rapid access to our Advanced Solution Center to manage and prevent problems and a Technical Support Specialist with a broad level of technical knowledge that will engage with additional technical expertise as needed from HP's vast global resources.

<http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855EEE.pdf>

HP Installation of ProLiant Add On Options Service

This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware or software is installed smoothly, efficiently, and with minimal disruption of your IT and business operations

Insight Online/Insight Remote Support

HP Insight Remote Support provides 24 X 7 remote monitoring, proactive notifications, and problem resolution. This comes at no additional cost with your HP solution. Learn more about Insight Remote Support <http://www.hp.com/go/insightremotesupport> and [Insight Online](http://www.hp.com/go/insightonline) <http://h18013.www1.hp.com/products/servers/management/insight-online/index.html>.

Service and Support

HP Support Center

Personalized online support portal with access to information, tools and experts to support HP business products. Submit support cases online, chat with HP experts, access support resources or collaborate with peers. Learn more <http://www.hp.com/go/hpsc>

HP's Support Center Mobile App allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime.

NOTE: HP Support Center Mobile App is subject to local availability

Parts and materials

HP will provide HP-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 exceeded their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product QuickSpecs, or the technical product data sheet will not be provided, repaired or replaced as part of this service.

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

For more information

To learn more on services for HP ProLiant servers, please contact your HP sales representative or HP Authorized ServiceOne Channel Partner. Or visit: www.hp.com/services/proliant

Related Options

NOTE: This is a list of supported options. Some may be discontinued.

HP Optional Upgrades HP 2GB P-series Smart Array Flash Backed Write Cache 631681-B21

HP Disk Storage Systems **MSA 2040 Storage**

HP MSA 2040 SAS Dual Controller LFF Storage C8S54A

HP MSA 2040 SAS Dual Controller SFF Storage C8S55A

NOTE: Please see the supported MSA 2040 QuickSpecs for a list of compatible hard drives:

http://h18004.www1.hp.com/products/quickspecs/14603_div/14603_div.html

Disk Enclosures

HP D2000 Disk Enclosures

HP D2600 Disk Enclosure AJ940A

NOTE: Supports 12 LFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.

HP D2700 Disk Enclosure AJ941A

NOTE: Supports 25 SFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.

NOTE: Please see the supported Disk Enclosure QuickSpecs for a list of compatible hard drives: http://h18000.www1.hp.com/products/quickspecs/13404_div/13404_div.html

HP D6000 Disk Enclosure

HP D6000 Dual I/O Module Disk Enclosure QQ695A

NOTE: Please see the supported Disk Enclosure QuickSpecs for a list of compatible hard drives: http://h18000.www1.hp.com/products/quickspecs/14419_div/14419_div.html (HP D6000 Disk Enclosure)

HP Tape Backup

NOTE: For the complete range of StorageWorks tape drives, autoloaders, libraries and media see: <http://www.hp.com/go/tape>.

SAS Tape Drives

HP StoreEver DAT 160 SAS Internal Tape Drive Q1587A

HP StoreEver DAT 160 SAS External Tape Drive Q1588A

HP StoreEver LTO-2 Ultrium 448 SAS External Drive DW086A

HP StoreEver LTO-3 Ultrium 920 SAS External Tape Drive EH848A

HP StoreEver LTO-4 Ultrium 1760 SAS External Tape Drive EH920A

HP LTO-4 Ultrium 1760 SAS (1) in 1U Rack-mount Kit EH946A

HP StoreEver LTO-4 Ultrium 1840 SAS External Tape Drive EH861A

HP StoreEver LTO-5 Ultrium 3000 SAS Internal Tape Drive EH957B

HP StoreEver LTO-5 Ultrium 3000 SAS External Tape Drive EH958B

HP StoreEver LTO-5 Ultrium 3000 SAS Tape Drive in 1U Rack-mount EJ014B

HP StoreEver LTO-5 Ultrium 3280 SAS Internal Tape Drive EH899B

HP StoreEver LTO-5 Ultrium 3280 SAS External Tape Drive EH900B

HP StoreEver LTO-5 Ultrium 3280 SAS Tape Drive in 3U Rack-mount EJ013B

Related Options

HP StoreEver LTO-6 Ultrium 6650 Internal Tape Drive	EH963A
HP StoreEver LTO-6 Ultrium 6650 External Tape Drive	EH964A
HP LTO-6 Ultrium 6250 SAS Internal	EH696A
HP StoreEver LTO-6 Ultrium 6250 External Tape Drive	EH970A
HP LTO-6 Ultrium 6250 SAS Rack-mount - single drive 1U rack-mount kit	COL99A
NOTE: HP internal tape drives are only supported when installed in a Rack-mount Tape Drive Enclosure	
Rack-mount Tape Drive Enclosures	
HP 1U SAS Rack-mount Kit	AE459A
NOTE: The 1U SAS Rack-Mount Kit can support up to (2) half-height internal tape drives and is compatible with the DAT 160 SAS, LTO-2 Ultrium 448 SAS, LTO-3 Ultrium 920 SAS, LTO-4 Ultrium 1760 SAS, LTO-5 Ultrium 3000 and LTO-6 Ultrium 6250 tape drives.	
HP 3U SAS Rack-mount Kit	AG576A
NOTE: The 3U Rack-mount Kit can support up to (2) full-height or (4) half-height internal tape drives and compatible with multiple SAS tape drives including DAT 160 SAS, LTO-2 Ultrium 448 SAS, LTO-3 Ultrium 920 SAS, LTO-4 Ultrium 1760 SAS, LTO-4 Ultrium 1840 SAS, LTO-5 Ultrium 3000 SAS, LTO-5 Ultrium 3280 SAS, LTO-6 Ultrium 6250 and LTO-6 Ultrium 6650 tape drives.	
SAS Tape Autoloaders	
HP StoreEver 1/8G2 LTO-6 Ultrium 6250 SAS Tape Autoloader	COH18A
HP StoreEver 1/8 G2 LTO-4 Ultrium 1760 SAS Tape Autoloader	AK377B
HP StoreEver 1/8 G2 LTO-5 Ultrium 3000 SAS Tape Autoloader	BL536B
SAS Tape Libraries	
HP StoreEver MSL2024 1 LTO-6 Ultrium 6250 SAS Tape Library	COH20A
HP StoreEver MSL2024 2 LTO-6 Ultrium 6250 SAS Tape Library	COH21A
HP MSL2024 1 LTO-5 Ultrium 3000 SAS Tape Library	BL537B
HP MSL2024 1 LTO-4 Ultrium 1760 SAS Tape Library	AK378B
HP StoreEver MSL4048 2 LTO-6 Ultrium 6250 SAS Tape Library	COH23A
HP MSL4048 2 LTO-5 Ultrium 3000 SAS Tape Library	BL538B
HP MSL4048 2 LTO-4 Ultrium 1760 SAS Tape Library	AK380B
HP MSL4048 0-Drive Tape Library	AK381A
HP MSL8048 0-drive Tape Library	AU300A
HP StoreEver MSL8096 2 LTO-6 Ultrium 6250 SAS Tape Library	COH25A
HP MSL8096 2 LTO-5 Ultrium 3000 SAS Tape Library	BL539B
SAS Cables for Tape Drives and Automation	
HP SAS Min-Min 1x-2M Cable Assembly Kit	AE470A
NOTE: Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	
HP SAS MIN-MIN 1X-4M Cable Assembly Kit	AE465A
NOTE: Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	

Related Options

HP 2m External Mini-SAS to 4x1 Mini-SAS Cable	AN975A
NOTE: One cable is required for every four drives. Use this cable to connect HP StorageWorks MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.	
HP 4m External Mini-SAS to 4x1 Mini-SAS Cable	AN976A
NOTE: One cable is required for every four drives. Use this cable to connect HP MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.	

HP SmartCache

HP SmartCache No Media 24x7 Technical Support 1 Svr License	D7S26A
NOTE: This part number can be used to purchase a single license or to order multiple licenses with a unique activation key per server. Customer will receive a printed license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online or via fax in order to obtain the license activation key(s). Include one year of 24x7 HP Software Technical Support Services.	
HP SmartCache No Media 24x7 Technical Support Electronic License	D7S27AAE
NOTE: This part number can be used to purchase multiple licenses with a single activation key. Customer will receive a printed license entitlement certificate via physical shipment. The license entitlement certificate must be redeemed online or via fax in order to obtain the license activation key(s). Includes one year of 24x7 HP Software Technical Support Services.	
HP SmartCache No Media 24x7 Technical Support Flexible License	D7S27A
NOTE: This part number can be used to purchase a single license or to order multiple licenses with a single activation key. Customers will receive a license entitlement certificate via e-mail. The license entitlement certificate must be redeemed online or via fax in order to obtain the license activation key(s). Include one year of 24x7 HP Software Technical Support Services.	
NOTE: HP SmartCache requires the following: Min 1 or 2 GB FBWC module along with HP ProLiant Gen8 supported HDD(s) and SSD(s) for more information visit: www.hp.com/go/smartcache	

Technical Specifications

Dimensions (excluding bracket)	Low Profile PCIe Form Factor 19.05 cm x 24.13 cm x 5.72 cm (7.5 in x 9.5 in x 2.25 in)
Disk Drive and Enclosure Protocol Support	6Gb/s SAS (Serial Attached SCSI)
SAS Connectors	6Gb/s SATA (Serial AT Attachment)
SAS Port Link Rate	2 external (Mini SAS) x8 wide port connectors
PCIe Link Rate	6 Gb/s per physical link
Cache Memory	PCIe3 x8
Logical Drives Supported	DDR3-1333 MHz, 72-bit wide bus at 10.6 GB/s
Memory Addressing	Up to 64 logical drives
RAID Support	64-bit, supporting servers with memory space greater than 4 GiB (4.4 GB)
Upgradeable Firmware	RAID 6, 60 (Advanced Data Guarding) RAID 5, 50 (Distributed Data Guarding) RAID 1, 10 (Drive Mirroring) RAID 1 ADM, 10 ADM (Advanced Data Mirroring) RAID 0 (Striping)
	Upgradeable Firmware with recovery ROM feature

Environment-friendly Products and Approach	End-of-life Management and Recycling	Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: http://www.hp.com/go/green . To recycle your product, please go to: http://www.hp.com/go/green or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.
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The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.