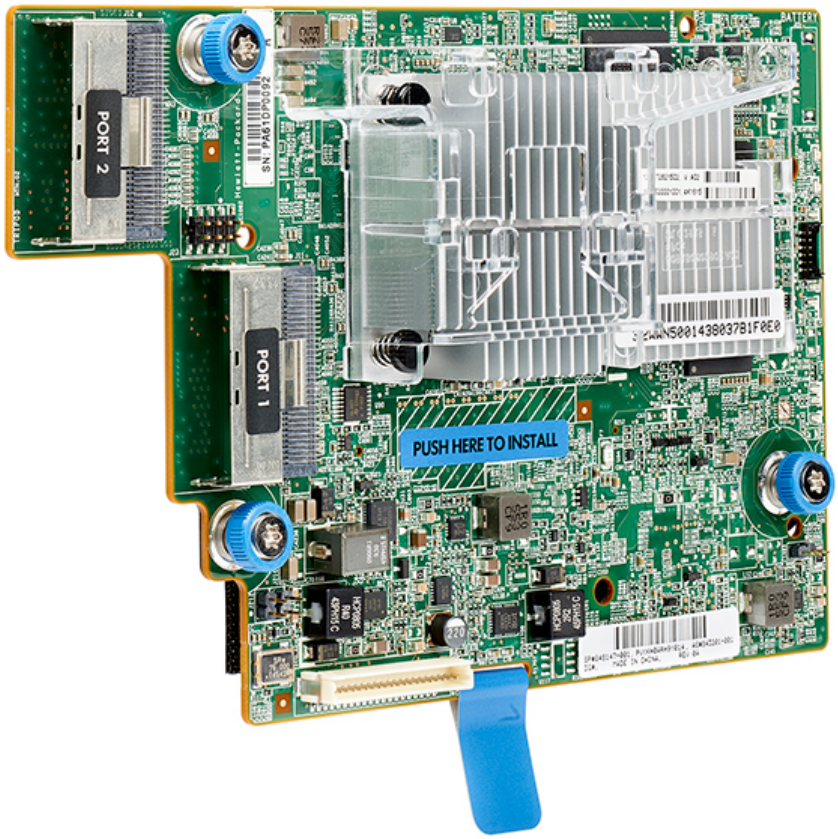
Overview

HPE Smart Array P840ar Controller

The HPE Smart Array P840ar Controller is a flexible Smart Array 12 Gb/s Serial Attached SCSI (SAS), PCI-Express (PCIe) 3.0 x8 RAID controller that provides enterprise-class storage performance, increased internal scalability, and data protection for HPE ProLiant DL360 and DL380 Gen9 rack servers. It features 16 internal physical links and delivers increased server uptime by providing advanced storage functionality, including online RAID level migration between any RAID levels with flash-backed write cache (FBWC), global online spare, and pre-failure alert. This controller supports 16 drives without need for the SAS Expander Card providing point to point connectivity to SSDs for lower latency. The HPE Smart Array P840ar Controller supports HPE Secure Encryption and also supports the HPE Smart Storage Battery, which allows multiple Smart Array controllers to be supported.



Models

HPE Smart Array P840ar Controller	HPE Smart Array P840ar/2GB FBWC 12Gb 2-port Internal SAS Controller	843199-B21
	NOTE: HPE Smart Array P840ar/2GB FBWC 12Gb 2-port Internal SAS Controller includes the HPE Smart Storage 96W Battery.	
	NOTE: Connection of the HPE Smart Array P840ar Controller to the HPE ProLiant DL380 Gen9 Server requires one of the following cables.	
	HP DL380 Gen9 12LFF SAS Cable Kit	785991-B21

Overview

HP DL380 Gen9 8SFF SAS Cable Kit	783009-B21
HP DL380 Gen9 12LFF Rear 2SFF or 3LFF P840/440 SAS Cable Kit	783007-B21
NOTE: Connection of the HPE Smart Array P840ar Controller to the HPE ProLiant DL360 Gen9 Server requires the following cable.	
HPE DL360 Gen9 Smart Array P840ar Cable Kit	843234-B21

Standard Features

The Smart Array Advantage

Hewlett Packard Enterprise'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 HPE Smart Array family brings an unparalleled return on investment through:

Data Compatibility among all models of 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 Hewlett Packard Enterprise server storage.

Pre-Failure Alerts predictive drive failures are reported via S.M.A.R.T. when a drive is going to fail allowing replacement of failing drives prior to actual failure.

Key Features

- The P840ar Controller supports up to 16 drives without need for an expander card.
- Seamless upgrades to and from other HPE Smart Array controllers.
- 16 SAS/SATA physical links distributed across 2 double wide mini-SAS 8i connectors for attachment to internal drive backplanes.
- 12Gb/s SAS performance when used on Gen9 servers with 12Gb/s devices (HDD or SSD).
- 12Gb/s SAS technology delivers up to 1200 MB/s per physical link.
- 6Gb/s SATA technology delivers up to 600 MB/s for directly attached SATA drives.
- Mix-and-match SAS and SATA drives. Deploy drive technology as needed to fit the computing environment.
- PCI-e 3.0 x8 host interface provides up to 8GiB/s in each direction.
- 2GB flash-backed write cache (not all of which is available for user data).
- Capacity Expansion, mirror split, recombine, and rollback in Online Mode, Drive Erase, Performance Optimization-Degraded Reads and Read Coalescing, Move/Delete any individual LUNS and Online Split Mirror.
- RAID 0, 1, 10, 5, 50, 6, 60, 1 ADM, 10 ADM.
- Capable of supporting both legacy and UEFI boot operation on Gen9 servers.
- Recovery ROM protects against ROM corruption.
- HPE SSD Smart Path.
- HPE SmartCache.
- Optional HPE Secure Encryption.
- Consistent management software among most current shipping HPE Smart Array products, including HPE Smart Storage Administrator (HPE SSA), Systems Insight Manager (SIM), Array Diagnostic Utility (ADU), and Intelligent Provisioning.
- HBA or RAID mode.
- Power efficiency.
- Rapid rebuild.

Ports

- 16 SAS/SATA physical links distributed across 2 double wide mini-SAS 8i connectors

Performance

- 12Gb/s SAS (1200 MB/s theoretical bandwidth per physical lane)
- 2GB DDR3-1866 Flash-Backed Write Cache provides up to 14.9GB/s maximum cache bandwidth
- PCI Express Gen3 x8 link width

Standard Features

- Read ahead caching
- Write-back caching

RAID Levels

- **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): RAID 1 is supported with a minimum of 2 drives, and RAID 10 is supported with a minimum of 4 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): RAID 1 ADM is supported with a minimum of 3 drives, and RAID 10 ADM is supported with a minimum of 6 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.

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 sizes
- Supports Predictive Spare Activation

Availability

Provides increased server uptime by providing advanced storage functionality:

- 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

Fault Prevention

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

Standard Features

- S.M.A.R.T.: Self-Monitoring Analysis and Reporting Technology first developed at Hewlett Packard Enterprise 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.

Fault Recovery

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

- Recovery ROM: This feature provides unique redundancy that protects from a ROM image corruption. A new version of firmware can be flashed to the ROM while the controller maintains the last known working version of firmware. If the firmware becomes corrupt, the controller will revert back to the previous version of firmware and continue operating. This reduces the risk of flashing firmware to the controller.
- 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.

Ease of Use

Consistency and Upgradeability on most current shipping Smart Array products make them unique in the industry:

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

HPE SSD SmartPath

The HPE 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, HPE SSD Smart Path chooses the optimum path to the SSD and accelerates reads for all RAID levels and RAID 0 writes. HPE SSD Smart Path requires updated firmware, drivers, and configuration utility available at: **http://www.hp.com/go/hpssa**.

HPE SSD Smart Path is ideal for read intensive workloads and is included as a base feature on HPE Smart Array P-series controllers. Please note, FBWC must be disabled for HPE SSD Smart path to be operational.

HPE SmartCache

The HPE SmartCache feature is a controller-based read and write 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 HPE SmartCache architecture is flexible and supports any HPE ProLiant Gen9 supported HDD for bulk storage and any HPE ProLiant supported SAS or SATA SSD as an accelerator.

HPE SmartCache is deployed and managed using the HPE SmartStorage Administrator (HPE SSA).

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

Standard Features

- **Bulk storage:** The first element is the bulk storage device, which is any supported HDD attached to the HPE 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 the FBWC that maps the location of information residing on the accelerator and bulk storage devices.

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

HPE Secure Encryption

HPE Secure Encryption is a Smart Array controller-based data encryption solution for ProLiant Gen9 servers that protects sensitive, mission critical data. This is an enterprise-class encryption solution for data at rest on any bulk storage attached (with the exception of tape or external arrays such as P2000 or MSA 2040) to the supported HPE Smart Array Px4x family of controllers including data on the cache of the controller.

The solution is available for both local and remote deployments. Local Key Management Mode is focused on single server deployment where there is one Master key per controller that is managed by the user. All volumes still have their own unique key(s) for data encryption. Remote Key Management Mode is for enterprise wide deployments and requires HPE Integrated Lights Out (iLO) Advanced or Scale Out editions v2.0 or later and HPE Enterprise Secure Key Manager (ESKM) 3.1 or later release. The HPE ESKM manages all the encryption deployments from just a few servers to thousands of servers and 2 million keys per HPE ESKM 3.1 cluster.

For more information please visit **http://www.hp.com/go/hpsecureencryption**

Warranty

The warranty for this device is 3 years parts only.

Compatibility

Server Support	HPE ProLiant DL380 Gen9 Servers HPE ProLiant DL360 Gen9 Servers
Operating Systems	**For information on the Hewlett Packard Enterprise Certified and Supported ProLiant Servers for OS and Virtualization Software and latest listing of software drivers available for your servers and Smart Array Controller, please visit our Support Matrix at: http://www.hp.com/go/ossupport.**

Service and Support

Service and Support

Protect your business beyond warranty with HPE Support Services

HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. HPE Support Services enable you to choose the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement to the support for need for your IT and business.

Connect your devices

Unlock all of the benefits of your technology investment by connecting your products to Hewlett Packard Enterprise. Achieve up to 77% reduction in down time, near 100% diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to Hewlett Packard Enterprise support.

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

Recommended Support

Standard

HPE Proactive Care* with 24x7 coverage, three year Support Service

HPE Proactive Care gives customers an enhanced call experience. When your products are connected to Hewlett Packard Enterprise, 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. This service also includes collaborative software support for Independent Software Vendors (ISVs), (Red Hat, VMWare, Microsoft, etc.) running on your Hewlett Packard Enterprise servers.

Optimized

HPE Proactive Care* with 6 hour call-to-repair commitment, three year Support Service

HPE Proactive Care gives customers an enhanced call experience. When your products are connected to Hewlett Packard Enterprise, 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 - Hewlett Packard Enterprise 24x7, six hour hardware call-to-repair. Hewlett Packard Enterprise is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable servers. This service also includes collaborative software support for Independent Software Vendors (ISVs), (Red Hat, VMWare, Microsoft, etc.) running on your Hewlett Packard Enterprise servers.

Learn more on HPE Proactive Care Service at
http://h20195.www2.hp.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf

Related Services

HPE Server Hardware Installation

Provides for the basic hardware installation of Hewlett Packard Enterprise branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.
http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-9356EN.pdf

HPE Installation and Startup Service provides for the installation and startup of Hewlett Packard Enterprise 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

Service and Support

	Channel), Ethernet network interconnects, and InfiniBand, as well as the installation of one supported operating system type (Windows® or Linux). **HPE Technology Services Support Credits** offer flexible services and technical skills to meet your changing IT demands. With a menu of service that is tailored to suit your needs, you get additional resources and specialist skills to help you maintain peak performance of your IT. Offered as annual credits, you can plan your budgets while proactively responding to your dynamic business.
HPE Education Services	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. **http://www.hpe.com/ww/learn**
HPE Support Center	The HPE Support Center is a personalized online support portal with access to information, tools and experts to support Hewlett Packard Enterprise business products. Submit support cases online, chat with Hewlett Packard Enterprise experts, access support resources or collaborate with peers. Learn more **http://www.hpe.com/support/hpesc** The HPE 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. HPE Insight Remote Support and HPE Support Center are available at no additional cost with a Hewlett Packard Enterprise warranty, HPE Support Service or Hewlett Packard Enterprise contractual support agreement. *HPE Support Center Mobile App is subject to local availability.
Parts and materials	Hewlett Packard Enterprise will provide Hewlett Packard Enterprise-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 QuickSpecs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services. The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.
For more information	To learn more on services for HPE ProLiant Servers, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Or visit: **http://www.hpe.com/services/proliant**.

Related Options

HPE Cable Options	**HPE ProLiant DL380 Gen9 Server Cables**	
	HP DL380 Gen9 12LFF SAS Cable Kit	785991-B21
	HP DL380 Gen9 8SFF SAS Cable Kit	783009-B21
	HP DL380 Gen9 12LFF Rear 2SFF or 3LFF P840/440 SAS Cable Kit	783007-B21
	NOTE: One of the above cables is required for connecting the HPE Smart Array P840ar Controller to the HPE ProLiant DL380 Gen9 Server.	
	HPE ProLiant DL360 Gen9 Server Cable	
	HPE DL360 Gen9 Smart Array P840ar Cable Kit	843234-B21
	NOTE: The HPE 360 Gen9 Smart Array P840ar Cable Kit is required for connecting the HPE Smart Array P840ar Controller to the HPE ProLiant DL360 Gen9 Server.	
HPE Secure Encryption	HP Secure Encryption per Svr Entitlement	C9A82AAE
	NOTE: The HPE Secure Encryption per server license allows customers to be in compliance with the end-user license agreement for encryption on a server regardless of the number of drives or Smart Array controllers installed.	
	NOTE: Please see the QuickSpecs for Technical Specifications and additional information: **http://www8.hp.com/h20195/v2/GetHTML.aspx?docname=c04318075**	
	For more information visit: **http://www.hp.com/go/hpsecureencryption**	

Technical Specifications

Dimensions (excluding bracket)	6.4 in x 4.1 in x 1.0 in (16.3 cm x 10.4 cm x 2.5 cm)
Disk Drive and Enclosure Interface - Transfer rate	12Gb/s SAS (Serial Attached SCSI) 6Gb/s SATA (Serial ATA)
SAS Connectors	2 internal x8 Mini-SAS double-wide connector
SAS Port Link Rate	12Gb/s per physical link
PCI Link Rate	PCIe 3.0 x8
Cache Memory Speed	DDR3-1866MHz, 72-bit wide bus at 14.9GB/s (2 GB)
Physical Drives Supported	Up to 16 physical drives without expander
Logical Drives Supported	Up to 64 logical volumes
Host Memory Addressing	64-bit, supporting greater than 4GiB (or 4.4 GB) server memory space
RAID Support	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	Upgradeable Firmware with recovery ROM feature

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

Technical Specifications

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

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