QuickSpecs
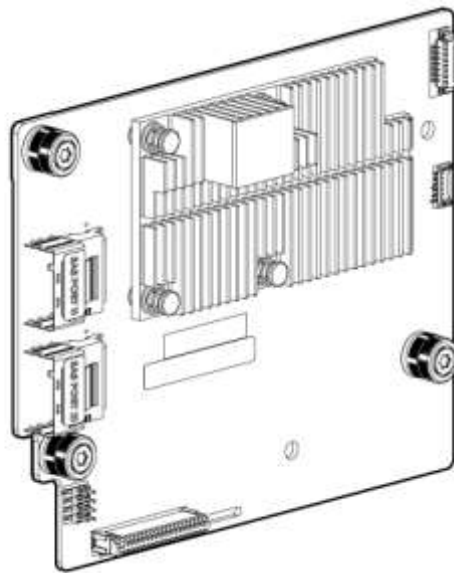
Overview

HP Smart Array P440ar Controller

The HP Smart Array P440ar Controller is a Flexible Smart Array, 12Gb/s SAS RAID controller that provides enterprise-class storage performance, increased internal scalability with SAS Expander Card, and data protection for specific HP ProLiant Gen9 rack and tower servers. It features eight 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 warning.

The Gen9 family of controllers supports the HP Smart Storage Battery. With HP Smart Storage Battery, multiple Smart Array controllers are supported without needing additional backup power sources for each controller, resulting in simple upgrade process.

What's New
- HP Smart Array P440ar with 2GB Flash Backed Write Cache module kit

Models

HP Smart Array P440ar Controller	HP Smart Array P440ar/2GB FBWC 12Gb 2-ports Int SAS Controller	726736-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 as 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-P440ar Controller supports up to 26 physical drives with HP 12G SAS Expander card • 12Gb/s SAS performance Gen9 12Gb/s SAS technology delivers high performance and data bandwidth and contains full compatibility with 6Gb/s SATA technology • PCI Express Gen3 x8 link width delivers high performance and data bandwidth up to 8GT/s theoretical maximum bandwidth • 2 GiBytes Flash Backed Write Cache (FBWC) with Smart Storage battery provides read ahead caching and write back caching with indefinite write cache data retention in the case of unexpected power outage • Capable of supporting both legacy and UEFI boot operation on Gen9 servers • Standard on the P440ar 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 feature (HP Smart Cache license is required on P440ar) 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 • HP Secure Encryption is a Smart Array controller-based data encryption solution for ProLiant Gen9 servers that protects sensitive, mission critical data. • 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. • HBA or RAID mode • Power Efficiency

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

Standard Features

- 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

Ports
- Eight (8) SAS physical links equally distributed across 2 internal x4 Mini-SAS connectors

Performance
- 12Gb/s SAS (1200 MB/s theoretical bandwidth per physical lane) on ProLiant Gen9
- x8 6Gb/s SAS physical links (compatible with 6Gb/s SATA)
- 2 GiBytes 72-bit wide DDR3-1866MHz flash backed write cache provides up to 12.8GB/s maximum cache bandwidth
- PCI Express Gen3 x8 link width
- Read ahead caching
- Write-back caching

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
- 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.

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

Standard Features

> 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.

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 detects and corrects data bit errors
Ease of Use	Consistency and upgradeability on most shipping Smart Array products make them unique in the industry: - 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 Disk Enclosures
HP SSD Smart Path	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/hpssa. 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 - Red Hat Enterprise Linux 6.1, 6.2, 6.3, 6.4, and 6.5 - SUSE Linux Enterprise Server 11 (SP1, SP2, SPA) - VMware ESXi 5.0 U3 - VMware vSphere 5.1 U2 and vSphere 5.5
HP SmartCache	The HP SmartCache 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 Gen9 supported HDD for bulk storage and any HP ProLiant Gen9 supported SSD as an accelerator.

Standard Features

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

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 the FBWC that maps the location of information residing on the accelerator and bulk storage devices.

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

HP Secure Encryption	HP Secure Encryption is a Smart Array controller-based data encryption solution for ProLiant Gen 8 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 the P2000 or MSA 2040) to the supported HP Smart Array Px3x family of controllers including data on the cache memory of the controller.

The solution is available for both local and remote key management mode 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 HP Integrated Lights Out (iLO) Advanced or Scale Out editions v 1.40 or later and HP Enterprise Secure Key Manager (ESKM) 3.1 or any later release. The HP ESKM manages all the encryption deployments from just a few servers to thousands of servers and 2 million keys per HP ESKM 3.1 cluster.

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

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 P440ar Controller compatibility and support information: www.hp.com/go/smartarray

Operating Systems	Microsoft Windows Server 2012 R2
	Microsoft Windows Server 2012
	Microsoft Windows Server 2008 R2
	Microsoft Windows Hyper-V 2012
	Microsoft Windows Hyper-V 2008
	Red Hat Enterprise Linux 7
	Red Hat Enterprise Linux 6
	SUSE Linux Enterprise Server 11 SP3
	SUSE Linux Enterprise Server 12 (support pending)
	Canonical Ubuntu 14.04*
	Canonical Ubuntu 12.04*
	Solaris 11.1*
	VMware ESXi 5.5
	VMware ESXi 5.
	VMware vSphere 5.5

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

- 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 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.
Related Services	**HP Proactive Care Personalized Support - Environmental Option**
	The Personalized Support option provides an assigned Account Support Manager who can bring best practices from across the industry plus extra technical skills to your IT team. This option is only available as an add-on to HP Proactive Care Support.
	HP Proactive Select Service
	Provides a flexible way to purchase HP best-in-class consultancy and technical services. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months. http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENN.pdf

Service and Support

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://h18013.www1.hp.com/products/servers/management/insight-online/index.html.
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.

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

NOTE: HP's 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 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 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

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 LTO-5 Ultrium 3000 SAS Internal Tape Drive	EH957B
	HP StoreEver LTO-5 Ultrium 3280 SAS Internal Tape Drive	EH899B
	HP StoreEver LTO-6 Ultrium 6650 SAS Internal Tape Drive	EH963A
	HP LTO-6 Ultrium 6250 SAS Internal	EH696A
	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	
HP SmartCache	HP SmartCache No Media 24x7 Technical Support 1 Svr License **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.	D7S26A
	HP SmartCache No Media 24x7 Technical Support Flexible License **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.	D7S27A
	HP SmartCache No Media 24x7 Technical Support Electronic License **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.	D7S27AAE
	NOTE: Please see the QuickSpecs for Technical Specifications and additional information: http://h18000.www1.hp.com/products/quickspecs/14532_div/14532_div.html (Worldwide)	
HP Secure Encryption	**NOTE:** HP Secure Encryption licensing is based on the number of physical drives requiring encryption.	
	HP Secure Encryption No Media E-LTU per Drive	D8S85AAE
	HP Secure Encryption No Media Flexible License per Drive	D8S84A
	NOTE: Please see the QuickSpecs for Technical Specifications and additional information: http://h18000.www1.hp.com/products/quickspecs/14623_div/14623_div.html (Worldwide) For more information visit: www.hp.com/go/hpsecureencryption	

Technical Specifications

Dimensions (excluding bracket)	Flexible Smart Array Form Factor 5.3 x 4.1 x 1.2 in ()
Disk Drive	12Gb/s SAS (Serial Attached SCSI) 6Gb/s SATA (Serial AT Attachment)
SAS Port Link Rate	12Gb/s per physical link supported
PCIe Link Rate	PCIe3 x8
Cache Memory	 DDR3-1866MHz, 72-bit wide bus at 14.9GB/s (2GB cache module)
Physical Drives Supported	Up to 26 drives
Logical Drives Supported	Up to 64 logical drives
Memory Addressing	64-bit, supporting servers with memory space greater than 4 GiB (4.4GB)
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 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. 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.