Overview

The Smart Array 641 Controller (SA-641) is a 64-bit, 133-MHz PCI-X, single channel, SCSI array controller for entry-level hardware-based fault tolerance. Utilizing the internal SCSI channel of the SA-641 allows you to configure up to 6 internal hard drives to store up to 1.80TB of storage.

The 64MB and 128MB BBWC (Battery Backed Write Cache) Enabler upgrade allows the SA-641 controller an option to add transportable BBWC for improved controller performance and increases the total controller memory, up to 192MB. The SA-641 also features complete data compatibility with previous generation's Smart Array controllers to ease data migration from server to server and for easy controller upgradeability.

Models

Smart Array 641 Controller	Smart Array 641 Controller	291966-B21

Related Options

Upgrade Options	128-MB BBWC (Battery-Backed Write Cache) Enabler	351580-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 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. All 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.

Universal Hard Drive form factor is for use across multiple HP servers, disk enclosures and storage systems. With compatibility across many enterprise platforms, you are free to deploy and re-deploy these drives to quickly deliver increased storage capacity, migrate data between systems, and easily manage spare drives.

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

- Compatibility with all Ultra320, Ultra3 and Ultra2 LVD family products. In addition, a seamless upgrade to next generation HP high performance and high capacity mainstream Ultra320 Smart Array controllers.
- Recovery ROM protects against a ROM corruption.
- Ultra320 SCSI technology delivers high performance and data bandwidth up to 320-MB/s bandwidth per channel.
- Modular, easy-to-upgrade design lets you optimize performance as needed with the 64MB and 128MB BBWC Enabler, from 64-MB of memory for RAID and read cache to up to 128-MB of BBWC.
- Mix-and-match LVD SCSI compatibility protects your investments and lets you deploy drives as needed.
- Software consistency among all Smart Array family products: Array Configuration Utility Insight Manager (CIM), Array Diagnostic Utility (ADU) and SmartStart.
- 64-bit, 133-MHz PCI-X interface boosts bandwidth above 1B/s burst transfer rate over PCI-X bus.
- 64-bit memory addressing supports servers with greater than 4 GB of memory.
- 64-MB memory optimizes performance and data throughput.
  NOTE: 64 MB of DDR memory used for RAID and read cache.

Online Management Features

- Online Capacity Expansion
- Online RAID Level Migration
- Online Stripe Size Migration
- Online Spares (Global)
- User Selectable Expand and Rebuild Priority

Channels

- Single Channel - Provides the ability to support up to 6 drives or 1.80TB

Standard Features

Key Features for 64MB BBWC (Battery-Backed Write Cache) **Enabler**	The 64MB BBWC Enabler is a transportable 64MB battery module increasing the total memory of the controller to 128MB for RAID, read cache, and BBWC. The transportability of the battery memory module protects the write cache data from unexpected power loss, system board failure, or controller board failure. Data retained in the write cache will be protected for up to 72 hours, allowing time to restore power, or transport the module to a functioning system board or array controller. The modular design of the battery memory module is transportable between the Smart Array 641 and Smart Array 642 controllers. 64MB BBWC (Battery Backed Write Cache) Enabler allows the 641controllers an option to add transportable BBWC for improved controller performance and increases the total controller memory to 128MB.
Key Features for 128-MB BBWC (Battery-Backed Write Cache) **Enabler**	The new 128MB BBWC Enabler is a transportable 128MB battery module increasing the total memory of the controller to 192MB for RAID, read cache, and BBWC. The transportability of the battery memory module protects the write cache data from unexpected power loss, system board failure, or controller board failure. Data retained in the write cache will be protected for up to 72 hours, allowing time to restore power, or transport the module to a functioning system board or array controller. The modular design of the battery memory module is transportable between the Smart Array 641 and Smart Array 642 controllers. 128MB BBWC (Battery Backed Write Cache) Enabler allows the 641controllers an option to add transportable BBWC for improved controller performance and increases the total controller memory to 192MB.
Data Compatibility	Data compatibility among all models of Smart Array Controllers means customers can instantly upgrade their Smart Array products to get to higher performance, capacity and availability. Unlike competitive products, successive generations of Smart Array products understand the data format of other Smart Array controllers, providing investment protection for your HP storage solution.
Performance	HP's High Performance Architecture sets new boundaries of industry performance expectations! • Ultra320 SCSI (320 MB/s bandwidth) per channel • High-performance 64-bit architecture • 64-bit, 133-MHz PCI-X bus (1033 MB/s bandwidth)
Capacity	Given the internal server storage need for rapid capacity expansion, the SA-641 offers: • Single SCSI channel support up to 6 internal disk drives • Up to 1.80TB of storage per PCI slot
Availability	Provides increased server uptime by providing advanced storage functionality: • Online RAID Level Migration (between any RAID level) • Online Capacity Expansion • Logical Drive Capacity Extension • Global Online Spare • Pre-Failure Warranty

Standard Features

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 first developed at Compaq 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 ProLiant Storage System and newer HP storage enclosures.

Fault Tolerance

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

- Distributed Data Guarding (RAID 5): This allocates parity data across multiple drives and allows simultaneous write operations. It is recommended for up to 14 hard drives.
- Drive Mirroring (RAID 1, 1+0): This allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file. It is a high-performance RAID.

Fault Recovery

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

- Recovery ROM: This new feature provides a unique redundancy feature 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: Up to two spare drives can be installed prior to drive failure. If a failure occurs, recovery begins with an On-Line Spare and data is reconstructed automatically. **NOTE:** On-Line Spares can only be used with RAID level 1, 1+0, and 5.

Ease of Use

Consistency and Upgradeability make the Smart Array family unique in the industry:

- GUI based configuration, management and diagnostic software tools
- Common data format between generations of products
- Data migration between servers and external storage enclosures

Compatibility

Servers Compatibility

For up to date compatibility, please see the following URL for complete Smart Array 641 Controller compatibility and support information:
http://h18006.www1.hp.com/products/servers/proliantstorage/arraycontrollers/index.html

Operating Systems

Microsoft® Windows® 2000 (Server/Adv Server)
Microsoft Windows 2003 (when available)
Microsoft Windows NT® 4.0
NetWare 6
NetWare 5.x
Red Hat Enterprise Linux
SUSE Linux Enterprise Server
IBM OS/2 Warp Server for ebusiness
SCO Open Server 5.05, 5.0.7
SCO UnixWare 7.1.1
SCO Open UNIX® 8
SCO UnixWare 7.1.3

NOTE: For more Linux OS support & certification information, please visit our the ProLiant & BladeSystem Server Linux matrix:
http://h18004.www1.hp.com/products/servers/linux/hpLinuxcert.html

Software Suite

All Smart Array products share a common set of configuration, management and diagnostic tools, including Array Configuration Utility, Array Diagnostic Utility (ADU), and Insight Manager. This software consistency of tools reduces the cost of training for each successive generation of product and takes 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 the HP server storage.

Systems Insight Manager

- Powerful server and server options/storage manager tool
- Monitors over 1200 server parameters
- Configuration/Diagnostic Utilities
- HP Array Configuration Utility (ACU)
- Powerful Web based configuration utility for all Smart Array controllers
- Provides a graphical view of HP drive array configurations
- Allows for management of multiple arrays over a secure internet connection from anywhere in the world
- Easy to use Wizards for configuration
- Runs online on Windows NT v4.0, Windows 2000 and NetWare
- HP Options ROM Configuration for Arrays (ORCA)
- Rapid configuration during initial install of the OS
- HP Array Diagnostic Utility (ADU)
- Powerful diagnostic utility for all Smart Array controllers

Service and Support, HP Care Pack, and Warranty Information

Warranty	Maximum: The remaining warranty of the HP server product in which it is installed (to a maximum three-year limited warranty) Minimum: One-year, on-site limited warranty 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.
Software Product Services	Standalone telephone support Rights to new license version Media and documentation updates
Hardware Product Services	Installation services On-site maintenance (includes warranty support) Response time upgrades during the warranty period Post-warranty coverage RAID setup and performance consulting via statement of work For additional hardware installation and maintenance information, please refer to the URL: http://www.hp.com/hps/hardware/
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
HP Care Pack Information	HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage. HP Care Pack is not available for less than the product's warranty duration. HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required. HP Care Pack services are prepaid. For additional HP Care Pack (hardware & software) information, as well as orderable part numbers, please refer to the URL http://www.hp.com/hps/carepack/

Options

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

Hard Drives	**10,000 RPM Universal Hard Drive**	
	HP 300GB U320 10K Universal HDD	350964-B22
	HP 146GB U320 10K Universal HDD	286716-B22
	HP 72GB U320 10K Universal HDD	286714-B22
	15,000 RPM Universal Hard Drive	
	HP 300GB U320 15K Universal HDD	411089-B22
	HP 146GB U320 15K Universal HDD	286713-B22
	HP 72GB U320 15K Universal HDD	286778-B22
	HP 36GB U320 15K Universal HDD	286776-B22
	10,000 RPM Universal Hard Drive	
	HP 146GB U320 10K NHP HDD	356990-B21
	HP 72GB U320 10K NHP HDD	332751-B21
	15,000 RPM Universal Hard Drive	
	HP 36GB U320 15K NHP HDD	357012-B21
Universal Hot Plug Tape Drives	HP StorageWorks DAT 40 SCSI Hot-plug Tape Drive (Carbon)	Q1546A
	HP StorageWorks DAT 72 SCSI Hot-plug Tape Drive (Carbon)	Q1529A
Related Products	HP Smart Array 5302/128 Controller	283552-B21
	HP Smart Array 5302/128 Controller (Japan)	283552-291
	HP Smart Array 5304/256 Controller	283551-B21
	HP Smart Array 5304/256 Controller (Japan)	283551-291
	HP Smart Array 6i Controller **NOTE:** The Smart Array 6i Controller ships integrated on several HP ProLiant servers. Please see the Smart Array 6i Controller QuickSpecs for details at: http://h18000.www1.hp.com/products/quickspecs/12030_div/12030_div.HTML	N/A
	HP Smart Array 642 Controller	291967-B21
	HP Smart Array 6402/128 Controller	273915-B21
	HP Smart Array 6404/256 Controller	273914-B21

Technical Specifications

Dimensions	12.3 x 4.2 x 0.6 in (31.24 x 10.7 x 1.5 cm)
Protocol	Ultra320 SCSI
Architecture	64-bit
SCSI Electrical Interface	Low Voltage Differential (LVD)
Drives Supported	Up to 6 Ultra320, Ultra3 and Ultra2 SCSI hard drives
SCSI Port Connectors SA-641	One internal SCSI port
Data Transfer Method	64-Bit PCI bus-master
PCI Bus Speed	64-bit, 133-MHz PCI-X (1 GB/s maximum bandwidth)
PCI	3.3 volt CPI slot compatibility only
Simultaneous Drive Transfer Channels	Two
Channel Transfer Rate	320 MB/s total; 320 MB/s per channel
Software upgradeable Firmware	Yes
Cache Memory	64 MB of DDR memory used for RAID and read cache
Logical Drives Supported	32
Maximum Capacity	1.80TB (6 x 300GB)
Memory Addressing	64-bit, supporting servers memory greater than 4 GB
RAID Support	RAID 5 (Distributed Data Guarding) RAID 1+0 (Striping and Mirroring) RAID 1 (Mirroring) RAID 0 (Stripping)
Upgradeable Firmware	2-MB Flashable ROM
Disk Drive and Enclosure Protocol Support	Ultra2, Ultra3, and Ultra320

64-MB BBWC Enabler

Dimensions (HxWxD)	3.5 x 1.8 x 0.54 in (8.89 x 4.6 x 1.37 cm)
Cache Memory	64 MB of DDR memory for RAID, read cache, and BBWC: ECC protection, battery-backed, and removable
Cache Batteries	Up to 3 days of battery life, removable for easy replacement

128-MB BBWC Enabler

Dimensions (HxWxD)	3.5 x 1.8 x 0.54 in (8.89 x 4.6 x 1.37 cm)
Cache Memory	128 MB of DDR memory for RAID, read cache, and BBWC: ECC protection, battery-backed, and removable
Cache Batteries	Up to 3 days of battery life, removable for easy replacement

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.

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