Overview

The HP StorageWorks Virtual Array is a low-cost, high capacity, high performance, 2 Gb Fibre Channel virtual disk array that delivers industry leading uptime. It is an ideal choice for environments requiring heterogeneous operating systems including HP-UX, other UNIX® servers, and Wintel servers. You can mix and match drives of different size, and add capacity instantly. HP's hot swap technology and redundant components reduce planned downtime. The virtual array architecture simplifies management and administration of the array. File or LUN creation occurs quickly, without worrying about the underlying physical technology.
The HP StorageWorks Virtual Array 7110 (va7110) supports over 6.5 TB with up to 45 disks. The va7110 has one host port per array controller to enable configurations with no single point of failure. These ports support either 1 Gb or 2 Gb Fibre Channel devices to protect your investment in connectivity infrastructure.
The HP StorageWorks Virtual Array 7410 (va7410) supports over 15 TB with up to 105 disks. The va7410 has four host ports to enable simplified and more extensive server and storage area network (SAN) connectivity. These ports support either 1 Gb or 2 Gb Fibre Channel devices. With four back-end disk ports and faster array controllers, the va7410 is capable of up to 34,000 cached I/Os per second and up to 330 MBps sequential throughput.

Unique Customer Benefits/Value

- RAID 1+0 and RAID 5DP: The virtual architecture is designed to dynamically store data in high performance RAID 1+0 mode or cost-effective RAID 5DP mode based on the IO patterns of applications. Most frequently used information is stored in RAID 1+0, least frequently used information is stored in RAID 5DP. As usage patterns dynamically change, the virtual array migrates the way data is stored to adapt - the performance of RAID 1 and the cost of RAID 5.
- RAID 1+0 striping of every LUN across all disks: In a very large redundancy group, striping across all disks reduces the number of LUNs required to achieve a balanced workload and eliminates "hot spots". This self-tuning performance insures consistency in meeting application Service Level Agreements.
- 24x7 performance tuning: The balancing between RAID levels occurs dynamically, without any human intervention. This eliminates downtime for reconfiguration to eliminate performance problems. This self-tuning performance also insures consistency in meeting application Service Level Agreements.
- Mirrored ECC cache: HP's virtual storage architecture implements a tightly coupled mirrored-memory design. This provides greater availability and higher performance in shared environments.
- End-to-end checksum data: Ensures that silent data corruptions can't get passed from the server to the array or from the array to the server.
- Metadata recovery: The actual physical location of data is maintained in logical-to-physical maps in cache memory. These maps are periodically "checkpointed" and copied to disk, similar to database transactions and checkpointing.
- Hot pluggable, redundant components: Disks, power supplies and fans are redundant, and can be replaced on-line. In fact, the virtual technology even allows disks to be replaced in any location with disks of different sizes, eliminating a common data-loss scenario from service.
- Active/active controller operation: Any controller can access any data without performance penalty. This allows I/O load balancing.
- Ordering of complete integrated configurations with a single part number, plus disk drives, is easy and helps ensure that the storage solution completely meets the customer requirements when it arrives.
- Easy to use management tools and integration into upper-level enterprise management tools like OpenView allow web-based management anytime, anywhere.

Product Highlights

Fibre Channel (FC) Technology

The Virtual Array takes advantage of the benefits of FC in distance, performance and connectivity. The use of optical fibre cabling allows arrays to be up to 500 meters from a server or SAN. The Virtual Array supports both 1 Gb and 2 Gb on all host, or front-end paths, and 2 Gb on all disk, or back-end paths. Storage Area Networks (SANs) can be constructed using 8, 16, 32 or 64-port FC switches for fabric connectivity. Fibre channel disk interfaces enable support of up to 45 drives with the 7110, and up to 105 drives with the 7410. Each drive is connected to each controller through a separate loop, enabling dual redundant FC loop connections, and eliminating the connection as a single point of failure.

Storage density

The high density configuration (3U for arrays and JBOD expansion cabinets) provides over 15 TB in a single cabinet using 72 GB disks (disk and controller enclosures included) with a footprint of only 5.9 square feet (0. 55 square meter) of floor space utilized in 42U cabinet, and over 30 TB in a single cabinet using 146 GB disks (14 enclosures (2 arrays, 12 disk expansion cabinets), 210 drives). The internal design of the cabinet allows easy serviceability ensuring Non-Stop high availability.

Multi-Vendor Platform

Support for industry-leading Operating System platforms including: Microsoft® Windows® NT®, Windows 2000 (Advanced Server), Datacenter, Windows.NET (when available), SUN Solaris, HP-UX, IBM-AIX, Linux and NetWare.

No-Single-Point-of-Failure

Redundant, hot pluggable architecture and value added software eliminates single-points-of-failure from server to storage in clustered or single server configurations with multi-pathing.

Clustered Server and High Availability System Support

Dual and multi-node cluster support is provided for host level fault tolerance and high system availability. MC Service Guard support is provided on HP-UX; VERITAS Cluster support and SUN Cluster support is provided on SUN Solaris; Microsoft Cluster Server (MSCS) is provided for ProLiant and other x86 platforms for Microsoft Windows NT Enterprise Edition and Windows 2000 Advanced Server; and HACMP is supported on IBM AIX.

Multi-Server Shared Support for Storage Consolidation

Heterogeneous and homogeneous host support provides the ability to share storage between multiple servers. The Virtual Array provides LUN access control through Secure Manager assuring that a host cannot access data belonging to a different host. SAN-based data zoning is also supported.

Solution Capacity

Model	Minimum Drives	Number of Drive Bays	Maximum Capacities (GB)			
			18 GB*	36 GB	72 GB	146 GB
Virtual Array 7110	4	15	270	540	1080	2190
Virtual Array 7410	10	15	270	540	1080	2190
Virtual Array (1) 7110 + DS2405 Expansion (1) va7110, (2) ds2405		45	810	1620	3240	6570
Virtual Array (1) 7410 + DS2405 Expansion, (1) va7410, (6) ds2405 Expansion Model		105	1890	3780	7560	15330

*18GB drives are supported from older arrays for investment protection, but will not be orderable after January 1, 2003.

Fibre Channel Switch Support

Support for 8-, 16-, 32- and 64-port FC switches operating at 1 Gb and 8- 16-, 32- and 64-port FC SAN switches operating at 2 Gb allow the full benefits of a storage area network (SAN), providing exceptional connectivity while increasing the effective bandwidth of the network. Supported SAN features include zoning for communication isolation.

Transfer Speeds

The Virtual Array 7410 has two FC ports per controller. The VA7110 has one FC port per controller. Each controller-to-host interface is 2 Gb enabled. The controllers are also compatible with 1 Gb and 2 Gb FC switches, HBAs, servers and other storage solutions.

Product Highlights

Easy Installation	The Virtual Array can be ordered with the array components (controller, cache and disks) integrated into the array enclosure and ready for field racking (A suffix), as a diskless enclosure (AE suffix) for integration in the field or customer site, or pre-installed into racks at the factory (suffix AZ). After unpacking, they can be plugged into power sources, connected to the FC SAN, enabled and configured.
Fault Tolerance	Redundant drive enclosure power supplies, blowers, controllers, mirrored cache, cache battery backup, and hot spare disks ensure fault tolerance against system outages and data loss.
High Availability	All Virtual Array models provide redundant cooling, power redundancy and environmental monitoring. Drives and most solution components are hot swappable. Each solution is configured with dual controllers that operate in dual redundant mode. In the event of a path failure, the alternate path to the controller can be utilized with the use of Auto Path software. The DS2405 FC drive enclosure also supports dual redundant FC loops that provide load balancing and redundant paths should either FC loop become unavailable.
Hot Pluggable Support	The Virtual Array Enclosure and ds2405 FC Drive Enclosure support hot plug (power on) removal or insertion of FC disk drives.
Performance	Fibre Channel host connections provide up to 200 MB/s bandwidth for each path. Each va7410 controller has two Fibre Channel host ports (four ports in a redundant pair of controllers) assuring the availability of bandwidth for the most stringent applications. In addition, up to 2 GB of cache per controller pair ensures high performance. Mirrored write caching capability maintains optimal performance while assuring data integrity in the event of a failure.
Scalability	A controller pair will support up to 128 host connections and up to 1024 LUNs.
Operating Systems Supported – Single and Clustered	• HP HP-UX • Windows NT, Windows 2000, Windows Server 2003 • SUN Solaris • IBM AIX • Linux • NetWare • MPE/iX Contact your HP authorized reseller or HP sales representative for specific details about version numbers, host bus adapters and infrastructure support.
Additional Software for the Virtual Array Family	HP StorageWorks Command View – SDM manage, diagnose and monitor the performance of the array HP StorageWorks Integration Pack – integrates Command View SDM into HP OpenView NNM for HP-UX or Windows, HP TopTools, CA-Unicenter-TNG, Tivoli Netview and BMC Patrol HP StorageWorks Business Copy VA – enables LUN copying with the array HP StorageWorks Secure Manager VA – enables LUNs to be locked into a secure shared environment HP StorageWorks Auto Path – enables I/O path fail-over in a single server for Windows, HP-UX and Linux
Total Cost of Ownership	The new Virtual Array has one of the highest density disk storage solutions in the industry. Additionally, the unique virtual architecture enables up to a 2x reduction in storage management costs.

Models

	Description	Option Number/ Comments	Product Number
HP StorageWorks Virtual Array 7110 and 7410	va7110 with Dual Controller, 1024 MB Cache	#ABA North America Power Cord – English Localization	A7294A/AZ/AE
	va7110 with Dual Controller, 2048 MB Cache	#ABA North America Power Cord – English Localization	A7296A/AZ/AE
	va7410 with Dual Controller, 1024 MB Cache	#ABA North America Power Cord – English Localization	A6267A/AZ/AE
	va7410 with Dual Controller, 2048 MB Cache	#ABA North America Power Cord – English Localization	A6268A/AZ/AE
Virtual Array Family Modules	Virtual Array Enclosure	#ABA North America Power Cord – English Localization	A6183A/AZ/AE
	Virtual Array Controller 7110	OD1	A7293A
	Virtual Array Controller 7410	OD1	A6218A
	512MB Cache for Virtual Array Processor	OD1	A6186A
	1024MB Cache for Virtual Array Processor	OD1	A6187B
	Enterprise Class 36 GB 15K RPM FC HDD	OD1	A6192A
	Enterprise Class 73 GB 10K RPM FC HDD	OD1	A6193A
	Enterprise Class 73 GB 15K RPM FC HDD	OD1	A7288A
	Enterprise Class 146 GB 10K RPM FC HDD	OD1	A7289A
	DS2405 Disk Enclosure	#ABA North America Power Cord – English Localization	A6250A/AZ/AE
	Fiber Optic Cable 2-meters LC 50/125 M/M		C7524A

Models

Virtual Array Family Optional Software	Command View SDM 1 host License To Use (LTU) and software media kit. Device management for the va7000 Family	Manage, diagnose, and monitor the performance of the array.	T1001A
	Enterprise Integrations 1 host LTU and software media kit	Enables Command View SDM in OpenView NNM, HP TopTools, CA-Unicenter-TNG, Tivoli Netview and BMC Patrol. Supports HP SEMI 1.0 for HP modular storage and tape devices.	T1002A
	Secure Manager, 50 GB host LTU and software media kit. (Required for enablement) (Not combinable – 50 GB max)	Enables LUNs to be locked into a secure shared environment, and allow/disallow server access.	T1003A
	Secure Manager 500 GB LTU		T1004A
	Secure Manager 1 TB LTU		T1005A
	Secure Manager 5 TB LTU		T1006A
	Business Copy VA, 50 GB host LTU and software media kit. (Required for enablement) (Not combinable – 50 GB max)	Enables LUN copying within the array. Requires the same physical space to be available in the array as the LUN(s) being copied.	T1007A
	Business Copy VA 500 GB LTU		T1008A
	Business Copy VA 1 TB LTU		T1009A
	Business Copy VA 5 TB LTU		T1010A
	Auto Path for Windows 2000 1-host LTU and software media kit. (Required for enablement)	Enables I/O path fail-over to protect from SAN or HBA failure in a single server.	T1011A
	Auto Path for Windows 2000 – 1-host LTU		T1012A
	Auto Path for Windows 2000 – 5-host LTU		T1013A
	Auto Path for Windows NTÒ 4.0 – 1-host LTU and software media kit (Required for enablement)		T1039A
	Auto Path for Windows NT 4.0 – 1-host LTU		T1040A
	Auto Path for Windows NT 4.0 – 5-host LTU		T1041A
	Auto Path for HP-UX 11.0, 11i – 1-host LTU and software media kit (Required for enablement)		T1060A
	Auto Path for HP-UX 11.0, 11i – 1 -host LTU		T1061A
	Auto Path for HP-UX 11.0, 11i – 5-host LTU		T1062A

Service and Support, HP Care Pack and Warranty Information

Warranty	• 2-year, 8x5, 4-hour on-site response on hardware • 2-year, 8x5, phone-in-assistance and LTU upgrade on Command View SDM
Hardware and mission critical support/ warranty upgrade offerings	• 1 to 3-year, 24x7, 4-hour on-site response • 1 to 5-year Storage Critical Support (SCS for VA), providing proactive services with assigned account team, core array management services and selectable technical consulting delivery, and reactive services including 6-hour call-to-repair and 24x7x365 for hardware and software. • Business Continuity Support (BCS), with services that include assigned account team, operational assessment, change management assistance, system monitoring, and preventive assistance with the High Availability Observatory (HAO).
Software support offerings (for optional software packages)	• 1-, 2- or 3-year, 8x5, phone-in assistance (PIA) and LTU upgrade

Installation and Startup Services

The Installation and Startup Service package provides installation of StorageWorks Virtual Array products. It is required for the VA. It includes:

- Pre-Installation planning
- Hardware Installation
- Software enablement
- LUN design and implementation
- Customer documentation
- Customer orientation

For detailed support and services product and ordering information, refer to the storage hardware and implementation services at http://www.hp.com/hps/storage/.
NOTE: This Web site is available in English only.

Family Information

	Virtual Array 7110	Virtual Array 7410
Drive Interface	Dual ported 2 Gb FC-AL	Dual ported 2 Gb FC-AL
Cache per controller	1024 MB min, 2048 MB max	1024 MB min, 2048 MB max
RAID Support	RAID0+1, AutoRAID	RAID0+1, AutoRAID
Channels	Two 2 Gb FC-AL	Four 2 Gb FC-AL
Maximum Drives per enclosure	15	15
Maximum drives with optional expansion enclosures	45	105
Maximum Capacity per enclosure	2.2 TB (with 146 GB disks)	2.2 TB (with 146 GB disks)
Maximum Capacity with optional expansion enclosures	6.6 TB (with 146 GB disks)	15.3 TB (with 146 GB disks)
Redundant Controllers	Yes	
Drive Capacities	36 GB 10K rpm 72 GB 10K rpm 146 GB 10K rpm 36 GB 15K rpm 72 GB 15K rpm	

Configuration Information Contact your HP authorized reseller or HP sales representative for assistance in building a specific configuration.

TechSpecs

VA7110 and VA7410 Controller Enclosure	Physical Specifications	Height	5 in (12.7 cm)	
		Width	17.6 in (44.7 cm)	
		Depth	26 in (66.04 cm)	
		Net Weight Max	34 lb (15.4 kg)	
		Shipping Weight Max	130.1 lb (59.0 kg)	
	Electrical Specifications	Voltage (Auto-Ranging)	100-127 VAC, 200-240 VAC	
		Frequency	50/60 Hz	
		Current (Maximum; 2 power inputs)	8.2 A @ 100 VAC, 3.6 A @ 200 VAC	
		Inrush Current (Peak)	36 A	
		Power Consumption	670 W	
		Heat Dissipation	196 BTU/hr	
		VA Rating (Maximum Configuration)	720 VA	
	Environmental Specifications	Temperature	Operating Range	41° to 95° F (5° to 35° C)
			Recommended Range	68° to 78° F (20° to 25.5° C)
			Non-Operating	-40° to 158° F (-40° to 70° C)
		Temperature Gradient	Operating Range	36° F (20° C) per hour
			Recommended Range	36° F (20° C) per hour
			Non-Operating	36° F (20° C) per hour
		Relative Humidity	Operating Range	15% to 80% @ 28° C (dry bulb)
			Recommended Range	30% to 50% @ 28° C (dry bulb)
			Non-Operating	10% to 90% @ 28° C (dry bulb)
		Shock	Operating Range	4 g, 11 ms half sine
			Non-Operating	4 g, 11 ms half sine
		Vibration	Operating Range	0.21 g rms, 5- to 500-Hz random
			Non-Operating	2.09 g rms, 5- to 500-Hz random
				0.5 g peak, 5- to 500-Hz swept sine
		Altitude	Operating Range	0 to 10,000 ft (0 to 3,048 m)
			Recommended Range	0 to 10,000 ft (0 to 3,048 m)
			Non-Operating	0 to 15,000 ft (0 to 4,572 m)
		Acoustic (ISO 9296)	Operating Range	8.0 bels
			Recommended Range	8.0 bels

	Regulatory Compliance	Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998
		Immunity	EN 55024: 1998/CISPR-24: 1997
		Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14
		Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995
		Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995

VA7xx0 Disk Enclosure	Physical Specifications	Height		5 in (12.7 cm)
		Width		17.6 in (44.7 cm)
		Depth		20 in (50.8 cm)
		Net Weight Max		84.5 lb (38.3 kg)
		Shipping Weight Max		101.5 lb (46.0 kg)
	Electrical Specifications	Voltage (Auto-Ranging)		100-127 VAC, 200-240 VAC
		Frequency		50/60 Hz
		Current (Maximum; 2 power inputs)		8.2 A @ 100 VAC, 3.4 A @ 200 VAC
		Inrush Current (Peak)		3.92 A @ 269 VAC
		Power Consumption		473 W @ 120 VAC, 457 W @ 240 VAC
		Heat Dissipation		1443 BTU/hr
		VA Rating (Maximum Configuration)		473 VA @ 120 VAC, 457 VA @ 240 VAC
	Environmental Specifications	Temperature	Operating Range	41° to 95° F (5° to 35° C)
			Recommended Range	68° to 78° F (20° to 25.5° C)
			Non-Operating	-40° to 158° F (-40° to 70° C)
		Temperature Gradient	Operating Range	36° F (20° C) per hour
			Recommended Range	36° F (20° C) per hour
			Non-Operating	36° F (20° C) per hour
		Relative Humidity	Operating Range	15% to 80% @ 28° C (dry bulb)
			Recommended Range	30% to 50% @ 28° C (dry bulb)
			Non-Operating	5% to 95% @ 149° F (65° C)
		Shock	Operating Range	4 g, 11 ms (20 low-impulse pulses)
			Non-Operating	20 g, 30 ms trapezoidal (non-transport) 1-inch edge drops per side (transport)
		Vibration	Operating Range	0.21 g rms, 5- to 500-Hz random
			Non-Operating	2.09 g rms, 5- to 500-Hz random
				0.5 g peak, 5- to 500-Hz swept sine

	Altitude	Operating Range	0 to 10,000 ft (0 to 3,048 m)
		Recommended Range	0 to 10,000 ft (0 to 3,048 m)
		Non-Operating	0 to 15,000 ft (0 to 4,572 m)
	Acoustic (ISO 9296)	Operating Range	8.0 bels
		Recommended Range	8.0 bels
Regulatory Compliance	Radiated and Conducted Emissions	FCC Class A, EN 55022: 1998, CISPR-22: 1997 Level A, and GB9254: 1998	
	Immunity	EN 55024: 1998/CISPR-24: 1997	
	Harmonic Current	IEC 61000-3-2: 1998/EN 61000-3-2: 1995 + A14	
	Voltage Fluctuations and Flicker	IEC 61000-3-3: 1994/EN 61000-3-3: 1995	
	Product Safety	EN 60950: 1991, Second Edition + A1, A2, A3, and A4 CAN/CSA - C22.2 No. 60950-00, Third Edition UL 1950: Third Edition IEC 60825-1: 1993 + A1/EN 60825-1: 1994 + A11 Class 1 (Laser/LED) GB4943: 1995	

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