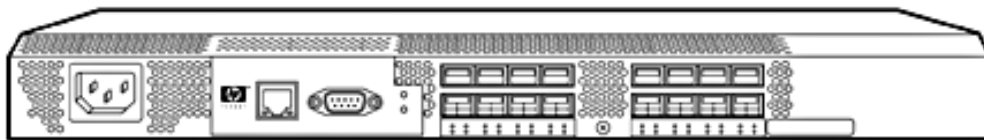*Overview*

The new HP StorageWorks 4/16 SAN Switch and 4/16 SAN Switch Power Pack delivers affordable and flexible 4 Gb/s connectivity for a storage area networks (SANs). The new interconnects can be incorporated into an extensive core fabric or placed at the edge. Both 4/16 SAN Switch variants scale to full SAN configurations as defined by the SAN Design Guide. The 4/16 SAN Switch includes web management tools and hardware and software enforced zoning.

The new switches deliver sixteen high performance auto Sensing 1, 2, and 4 Gb/s Fibre Channel ports. In addition, the 4/16 SAN Switch and the 4/16 SAN Switch Power Pack are fully non-blocking and provide 128 Gb switching (4 Gb full duplex) capacity for un-congested sustained, 4 Gb full duplex throughput. Small-form-factor-pluggable optical transceivers (SFPs) must be ordered separately. All models include one power supply.

The 4/16 Power Pack includes the 4/16 SAN Switch plus a value added software package. The optional Power Pack software bundle can be purchased separately and includes Fabric Watch, ISL Trunking, Extended Fabric and Advanced Performance Monitor. The software bundle provides the SAN administrator with the necessary tools to monitor the health and performance of the network, while also ensuring the highest levels of security, scalability and manageability. Power Pack software provides the foundation for integration into HP OpenView Storage Area Manager (SAM), enabling infrastructure management through a single-pane-of-glass.

HP StorageWorks 4/16 SAN Switch and 4/16 SAN Switch Power Pack Family

Key Features and Benefits

- Flexible storage connectivity
  - The only SAN solutions providing the complete HP SAN Switch functionality from Embedded to Enterprise. The HP B-series line of products allows the capability to apply the complete SAN Switch functionality to an affordable entry level SAN deployment and then to grow that deployment to the largest SAN fabric solutions supported by HP.
- Reduced Total Cost of Ownership for SAN Infrastructure
  - Enables storage consolidation, simplified management of data center SAN environment
- Broadest range of compatibility with SAN products
  - Multi-vendor server and storage environment
  - Widest range of HP SAN solutions
  - Backward compatible with previously installed 1Gb, 2Gb and 4Gb SAN Switches
  - Interoperability with more than 2 Million HP SAN Switch installed base
- HP Power Pack Software Bundle (Optional) - highest supported modular functionality
  - Trunking - highest throughput between switches (32Gb/sec)
  - Proactive threshold monitor (Fabric Watch)
  - Advanced Performance Monitor
  - Extended Fabric
- Broadest Range of HP Packaged SAN Services
  - Mission critical SAN Services SAN-ES
  - Assessment and installation services for security
- Highest integration with Storage Essentials via:
  - SAN Switch API
  - SAN Switch element managers
  - HP StorageWorks Fabric Manager

Models

HP StorageWorks 4/16 SAN Switch and 4/16 SAN Switch Power Pack Models	HP StorageWorks 4/16 SAN Switch	A7985A
	HP StorageWorks 4/16 SAN Switch Power Pack	A7987A
	HP StorageWorks B-Series 8-31 port Power Pack software bundle license	T3573A

QuickSpecs

Product Highlights

16 non-blocking ports	Sixteen auto-sensing 1, 2, and 4 Gb/s universal, self-configuring ports (F, FL, E). Can be programmed to fixed 1 Gb/s, 2 Gb/s or 4Gb/s speed.
Configuration support	SAN Switch 4/16 will interoperate with 1Gb/s, 2Gb/s, and 4 Gb/s B-Series SAN Switches running the firmware version defined in the SAN Design Guide http://www.hp.com/go/SANDesignGuide
High-availability features	• Hot Code Load Activation
Advanced Fabric Services	• ISL Trunking (optional) • Hardware Enforced Zoning • WebTools Enhanced Group Management (EGM) • Fabric Watch (optional) • End-to-End Performance Analysis (optional) • Data Center Fabric Manager (optional)
Manageability	• WebTools • Enhanced Group Management (EGM) • OpenView • API • IP • SNMP • Radius
Scalability	• Both the SAN Switch 4/16 and SAN Switch 4/16 Power Pack Scale the maximum limits defined in the SAN Design Guide. http://www.hp.com/go/SANDesignGuide
Cabinet Support	• 22U, 36U, and 42U; 5000, 9000 and 10,000 series StorageWorks Cabinets are supported • 25U, 33U, and 41U HP system/e cabs

Software Components

Frame Filtering	An ASIC based capability in the B-series family of switches that enables new applications and features. The switch now has the ability to "view" the first 64 bytes of the Fibre Channel frame. At this time, Frame Filtering enables advanced capabilities such as Advanced Zoning and Advanced Performance Monitoring.
Advanced Zoning	In the 4 Gb generation of switches, WWN Zoning and Access Control are enforced by hardware that provides the same simple administration previously enforced only with software. Administrators can organize a physical fabric into logical groups and prevent unauthorized access by devices outside the Zone.

Product Highlights

WebTools	Enables organizations to monitor and manage single Fibre Channel switches and small SAN fabrics. Tasks can be performed through a Java-capable Web browser from a standard laptop, desktop PC or workstation from any location within the enterprise.

EGM — Enhanced Group Management (EGM) is a FOS license that is included with all B-Series switches and enables multi-switch operations. It helps automate operations across multiple switches to save time and streamline repetitive operations, which are typically prone to error. EGM drives consistency across fabrics, while minimizing the risk associated with potential downtime due to configuration mismatches. EGM provides streamlined troubleshooting for more effective fabric monitoring and diagnosis.

Both Data Center Fabric Manager Professional and Enterprise enable EGM functionality. Customers have EGM functionality enabled within the hardware product and need only to make the decision around which management application is right for them - Data Center Fabric Manager Professional or Enterprise.

Software Components, Optional

Power Pack Software Bundle — Includes bundled license for:

- ISL Trunking
- Advanced Performance Monitoring
- Fabric Watch
- Extended Fabric

ISL Trunking — For high performance enhanced Trunking, this optional license logically groups up to four E-ports to provide a high bandwidth trunk between two switches. Each 4Gb switch needs its own license. The switch operating system views the trunk as a single, high bandwidth resource (up to 32 Gb) when routing connections between switches. Connections are load-balanced across the individual links, which comprise the logical trunk group. Each 16-port switch can have a total of four separate 4-port Trunk groups.

Advanced Performance Monitor — This enabling technology helps administrators monitor and watch specific fabric metrics from a SID (Source ID) to a DID (Destination ID), so they can fine-tune and scale the fabric more efficiently. Plus, Advanced Performance Monitoring includes the ability for early warning detection of hot spots within the fabric, a powerful tool for maintaining overall balanced performance.

Fabric Watch — Fabric Watch enables each switch to monitor the SAN for potential faults-and automatically alert network managers to problems before they become failures. Fabric Watch tracks a variety of SAN fabric elements, events, and counters. Monitoring fabric-wide events, ports, SFPs, and environmental parameters permits early fault detection and isolation as well as performance measurement. Each switch in the SAN needs its own Fabric Watch license.

Extended Fabric — Extends all of the scalability, reliability, and performance benefits of Fibre Channel Storage Area Networks (SANs) beyond the native 10 km distance specified by the Fibre Channel standard.

Product Highlights

Data Center Fabric Manager Professional

HP StorageWorks Data Center Fabric Manager Professional is a server based management application available at no-charge and comes with B-series SAN Switches and includes the following features:

- Allows management of a single Fabric OS (FOS) fabric (up to a 1,000 B-Series switch ports) at a time
- Performs group switch management beyond the scope of Web Tools
- Does not offer management of the DC SAN Backbone Director

It is targeted for SMB customers that use FOS based SAN fabrics and require a management solution for smaller SANs based on a single fabric.

SMB customers that initially start off with Data Center Fabric Manager Professional and have a small SAN environment may over time feel the need for an enterprise-class product (Data Center Fabric Manager Enterprise) as their environments start to grow in size and complexity, and as they start to uptake more enterprise-class functionality (such as Fibre Channel Routing, FCIP, etc.). A non-disruptive upgrade path is available from Data Center Fabric Manager Professional to Data Center Fabric Manager Enterprise

Data Center Fabric Manager Enterprise

HP StorageWorks Data Center Fabric Manager Enterprise is the enterprise-class product that supports FOS products as well as FOS and M-EOS products together. It provides complete DC SAN Backbone Director management including enterprise-class features/environments such as FICON, Fibre Channel Routing, FCIP, adaptive networking, etc.

It delivers unprecedented scalability (up to 24 fabrics and 9,000 switch ports) compared to the existing products.

It offers brand-new features including Adaptive Networking features for quality of service, ingress rate limiting and traffic isolation zones.

Data Center Fabric Manager Enterprise requires at least one FOS based B-series SAN switch in the SAN. While DCFM provides increased functionality, not all features available in FM or HAFM are available in DCFM, and some functions may operate differently. Please refer to the Migration and Transition guide for additional information.

Secure Fabric OS

Secure Fabric OS™ is a comprehensive security solution for SAN fabrics, providing policy-based security protection for more predictable change management, assured configuration integrity and reduced risk of downtime. Secure Fabric OS protects the network by using the strongest, enterprise-class security methods available, including digital certificates and digital signatures, multiple levels of password protection, strong password encryption and Public Key Infrastructure (PKI)-based authentication, and 128-bit encryption of the switch's private key used for digital signatures. With its flexible design, Secure Fabric OS enables organizations to customize SAN security to meet specific policy requirements. In addition, Secure Fabric OS works in conjunction with Advanced Zoning to further secure access to the SAN, simplify storage management, and reduce provisioning time.

Service and Support, HP Care Pack, and Warranty Information

Warranty	(1-1-1) Hardware Warranty - One-year on-site warranty, 8x5, next business day response, installation not included. NOTE: The hardware warranty covers firmware and embedded non-saleable software. Saleable software carries its own warranty, see below. Software Warranty - HP warrants only that the software media will be free of physical defects for a period of ninety (90) days from delivery. EXCLUSIVE REMEDY. The entire liability of HP and its suppliers and your exclusive remedy for software that does not conform to this Limited Warranty shall be the repair or replacement of the defective media. This warranty and remedy are subject to your returning the defective media during the warranty period to HP in the country in which you obtained the software.
HP Service & Warranty Support	HP Service & Warranty Support Additional Warranty protection and/or HP Installation packages can be purchased. NOTE: Certain restrictions and exclusions apply. Consult the Customer Support Center for details. HP provides a one-year, hardware limited warranty, fully supported by a worldwide network of resellers and service providers. The first year of Rights to New License Version and standard business day, standard business hours telephone support is included with the purchase of an HP Power Pack. In order to continue to receive telephone support and Rights to New License Version after the first year, the purchase of a software support contract or Care Pack is required. In addition, available service offerings include a full range of HP Care Pack packaged hardware and software services: ● Installation ● Extended coverage hours and enhanced response times ● System management and performance services For more information on warranty and support options, please visit our Web site at: http://www.hp.com/hps/tech/storage/supp/.
Software Product Services	● Stand-alone 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
HP Care Pack Services Warranty Upgrade Options	Service offerings include a full range of Customer HP Care Pack services for both hardware and software services: ● Response - Upgrade on-site response from next business day to same day 4-hours ● Coverage - Extend hours of coverage from 5 days x 9 hours to 7 days x 24 hours ● Duration - Select duration of coverage for a period of 1, 3, or 5 years Additional Warranty protection and/or HP Installation packages can be purchased. NOTE: Certain restrictions and exclusions apply. Consult the HP Customer Support Center for details.

Service and Support, HP Care Pack, and Warranty Information

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 listed below:
http://h18005.www1.hp.com/services/carepaq/index.html

Additional Services

Implementation service, SAN Architecture service. For more information on service options, please visit our Web site at: http://www.hp.com/go/san.

Family Information

Features	8/8 SAN Switch Base and 8/8 SAN Switch	8/24 SAN Switch Base	8/40 SAN Switch and 8/40 SAN Switch Power Pack+	8/80 SAN Switch and 8/80 SAN Switch Power Pack+	DC04 SAN Director and DC04 SAN Director Power Pack+	DC SAN Backbone Director Power Pack+
Targeted Environment	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments	Data Centers	Data Centers
Port Bandwidth	8Gbit/sec	8Gbit/sec	8Gbit/sec	8Gbit/sec	8Gbit/sec	8Gbit/sec
Aggregate device bandwidth	128 - 384 Gbit/sec end-to-end	256 - 384 Gbit/sec end-to-end	384 - 640 Gbit/sec end-to-end	768 - 1280 Gbit/sec end-to-end	3 Tbit/sec end-to-end	6.5 Tbit/sec end-to-end
OS Support	NOTE: Please Refer to SAN Design Guide http://www.hp.com/go/sandesign or http://www.hp.com/go/sandesignguide					
Storage system support	XP, EVA, MSA					
Ports	8 Enabled 24 Max	16 Enabled 24 Max	24 Enabled 40 Max	48 Enabled 80 Max	Up to 192	Up to 384
SFP	B-series	B-series	B-series	B-series	B-series	B-series
Advanced Trunking	Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Form factor	1U	1U	1U	2U	7U	14U
Zoning Software	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	No	No	Yes	Yes	Yes	Yes
Hot plug fans	No	No	Yes	Yes	Yes	Yes

Family Information

Features	4/8 SAN Switch Base and 4/8 SAN Switch	4/16 SAN Switch and 4/16 SAN Switch Power Pack	4/32B SAN Switch and 4/32B SAN Switch Power Pack	4/64 SAN Switch and 4/64 SAN Switch Power Pack	4/256 SAN Director and 4/256 SAN Director Power Pack
Targeted Environment	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments	Data Centers
Port Bandwidth	4Gbit/sec	4Gbit/sec	4Gbit/sec	4Gbit/sec	4Gbit/sec
Aggregate device bandwidth	64 Gbit/sec end-to-end	128 Gbit/sec end-to-end	128-256 Gbit/sec end-to-end	512 Gbit/sec end-to-end	3.2 Tbit/sec end-to-end
OS Support	NOTE: Please Refer to SAN Design Guide http://www.hp.com/go/sandesign or http://www.hp.com/go/sandesignguide				
Storage system support	XP, EVA, MSA				
Ports	8 Enabled 16 Max	16 Enabled	16 Min 32 Max	32 Min 64 Max	Up to 384
SFP	HP	HP	HP	HP	HP
Advanced Trunking	Optional Upgrade	Included with Power Pack or Optional Upgrade	Included with Power Pack or Optional Upgrade	Included with Power Pack or Optional Upgrade	Included with Power Pack or Optional Upgrade
Form factor	1U	1U	1U	2U	14U
Zoning Software	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	No	No	Yes	Yes	Yes
Hot plug fans	No	No	Yes	Yes	Yes

Features	Embedded SAN Switch for EVA4400	Brocade 4Gb SAN Switch for HP c-Class BladeSystem	HP 400 Multi-protocol Router	B-Series Multi-protocol Router Blade
Targeted Environment	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments	Data Centers
Port Bandwidth	8Gbit/sec	4Gbit/sec	4 Gbit/sec Ethernet: 1 Gbit/sec	4 Gbit/sec Ethernet: 1 Gbit/sec
Aggregate device bandwidth	320 Gbit/sec end-to-end	192 Gbit/sec end-to-end	128 Gbit/sec end to end	N/A
OS Support	NOTE: Please Refer to SAN Design Guide http://www.hp.com/go/sandesign or http://www.hp.com/go/sandesignguide			
Storage system support	XP, EVA, MSA			
Ports	20 external per EVA Controller Pair	4 or 8 external / 8 or 16 internal	18 ports: 16 FC and 2 Gigabit Ethernet	18 ports: 16 FC and 2 Gigabit Ethernet
SFP	B-series	HP	HP	HP
Advanced Trunking	Optional Upgrade	Optional Upgrade	Optional Upgrade	Optional Upgrade to chassis
Adaptive Networking	Included with Power Pack+ or Optional Upgrade	No	No	Optional Upgrade to DC SAN Director Backbone Chassis
Form factor	Embedded	Embedded	1U	Blade in SAN Director
Zoning Software	Yes (Included)	Yes (Included)	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	Yes, in EVA 4400 Enclosure	Yes, in BladeSystem Enclosure	Yes	Yes, in SAN Director chassis

Family Information

Hot plug fans	Yes, in EVA 4400 Enclosure	Yes, in BladeSystem Enclosure	Yes	Yes, in SAN Director chassis

Configuration Information

Step 1 – Base Configuration

Select one:

Model Name	Model Description	Part Number
StorageWorks 4/16 SAN Switch	16-port Fibre Channel Fabric Switch, licenses, docs, and rack rails. NOTE: Requires optical transceivers listed below.	A7985A
StorageWorks 4/16 SAN Switch Power Pack	16-port Fibre Channel Fabric Switch with bundled software and rack rails. NOTE: Requires optical transceivers listed below.	A7987A

Add Software		
Power Pack Software Bundle	Fabric Watch, ISL Trunking, Advanced Performance Monitoring	T3573A
Optional Software:	Fabric Watch	324504-B21
	ISL Trunking	324506-B21
	Advanced Performance Monitor	324507-B21
	Extended Fabric	324505-B21
	Secure Fabric OS for 8 & 16 port switches (v3.x firmware or higher)	332924-B21
	Data Center Fabric Manager Enterprise	T5542A

Step 2 – Additional Options

Optical Transceivers	Short Wave 4Gb/s	A7446B
	Long Wave 4Gb/s (10 km)	AE493A
	Short Wave 2Gb/s	A6515A
	Long Wave 2Gb/s (10 km)	A6516A
	Long Wave 2Gb/s (35 km)	300836-B21

2 Gb optical cables	*LC-LC for between two 2 Gb devices*	
	2 m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
	5 m LC-LC Multi-Mode Fibre Channel Cable	221692-B22
	15 m LC-LC Multi-Mode Fibre Channel Cable	221692-B23
	30 m LC-LC Multi-Mode Fibre Channel Cable	221692-B26
	50 m LC-LC Multi-Mode Fibre Channel Cable	221692-B27
	LC-SC for between a 1 Gb and a 2 Gb device	
	2 m LC-SC Multi-Mode Fibre Channel Cable	221691-B21
	5 m LC-SC Multi-Mode Fibre Channel Cable	221691-B22
	15 m LC-SC Multi-Mode Fibre Channel Cable	221691-B23
	30 m LC-SC Multi-Mode Fibre Channel Cable	221691-B26
	50 m LC-SC Multi-Mode Fibre Channel Cable	221691-B27

Fibre Channel Standards And Revisions	FC-AL Rev. 4.5	FC-GS-2 Rev 5.3	FC-PH Rev 4.3	FC-PLDA Rev 2.1	FC-VI Rev 1.5
	FC-AL-2 Rev 7.0	FC-FG Rev 3.5	FC-PH-2 Rev 7.4	FC-SW Rev 3.3	IPFC RFC 2625
	FC-FLA Rev 2.7	FC-FH Rev 1.7	FC-PH-3 Rev 9.4		

Technical Specifications

Fibre Channel ports	16 universal ports
Scalability	Full fabric architecture: http://www.hp.com/go/SANDesignGuide
Certified maximum	Refer to SAN Design Guide: http://www.hp.com/go/SANDesignGuide

Interoperability

- SAN Switch 8
- SAN Switch 16
- SAN Switch 8-EL
- SAN Switch 16-EL
- SAN Switch 2/8v
- SAN Switch 2/16v
- SAN Switch 2/16N
- SAN Switch 2/16
- SAN Switch 2/16-EL,
- Core Switch 2/64
- SAN Switch 2/32
- SAN Director 2/128
- 4/256 SAN Director
- 4/64 SAN Switch
- 4/32 SAN Switch
- 4/32B SAN Switch
- 4/8 SAN Switch
- 4/16 SAN Switch
- 8/8 SAN Switch
- 8/40 SAN Switch
- 8/80 SAN Switch
- DC04 SAN Director
- DC SAN Backbone Director
- Brocade 4Gb SAN Switch for HP p-Class BladeSystem
- Brocade 4Gb SAN Switch for HP c-Class BladeSystem
- MSA SAN Switch 2/8
- HP 400 MP-Router
- HP MP-Router

Performance	4.25 Gbit/sec line speed, full duplex
Switch core	Non-blocking
Fabric latency	$<2\,\mu$ sec. with no contention, cut-through routing
Maximum frame size	2112-byte payload
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	FL_Port, F_Port, and E_Port; self-discovery based on switch type (U_Port)
Data traffic types	Fabric switches support unicast and broadcast
Media types	Small Form-Factor Pluggable (SFP)
Laser	Short-wave up to 1,640 ft (500 m); long-wave up to 6.2 mi (10 km) when available
Fabric services	Simple Name Server, Registered State Change Notification (RSCN), Alias Server (multicast); and Zoning, WebTools, Enhanced group Management. Optional Fabric Watch, ISL Trunking, Extended Fabric and Advanced Performance Monitor.
Options	SFP media

Technical Specifications

Supported software	Telnet,RADIUS, SNMP, WebTools, Enhanced group Management, Advanced Zoning, Fabric Watch, Data Center Fabric Manager		
Management access	10/100 Ethernet (RJ-45), serial port		
Diagnostics	POST and embedded online/offline diagnostics		
Back-to-front airflow, power inlet on port side	1 u, 19-in.–EIA compliant		
Dimensions	Width	16.87 in (42.86 cm)	
	Height	1.69 in (4.29 cm)	
	Depth	12.1 in (30.73 cm)	
	Weight	8.8 lb (4.0 kg)	
Environment	Temperature	Operating	32° to 104° F (0° to 40° C)
		Non-operating	-58° to 212° F (-50° to 100° C)
	Humidity	Operating	20% to 85% non condensing at 104° F (40° C)
		Non-operating	10% to 85% , non condensing at 158° F (70° C)
	Altitude	Up to 9,800 ft (3,000 m)	
	Shock	20 G, 6 ms, half sine	
	Vibration	Operating	.5 G, 5-500-5 Hz
		Non-operating	2 G, 5-5 kHz
Power	Supported power range	Nominal	100 to 240 VAC, 2.0 A
		Operational	90 to 264 VAC
	Frequency	47 to 63 Hz	