Overview

Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy

The Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy Frame 12000 represents an easy to manage high performance and scalable 48-port capable embedded Fibre Channel switch module with 16 Gb FC technology for HPE's Composable Infrastructure. It hot-plugs into the back of the HPE Synergy Frame 12000 and its integrated design frees up rack space, enables shared power and cooling, and reduces cabling resulting in significant infrastructure savings. Enhanced trunking support with external switches provides higher bandwidth up to 128Gb/s FC per trunk group to enable demanding applications and high density server virtualization. The Power Pack+ SAN management software option enables you to manage data flow to maintain optimized application performance. In addition, external facing ports (uplinks) auto-sense lower bandwidth components for flexibility and investment protection (4, 8 or 16 Gb/s for external SFP+ ports) and future investment protection with interoperability to 32Gb and 64Gb SANs when they become available. Furthermore the ports on demand (POD) upgrade license enables you to scale as you grow. The Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy saves space and cost, significantly simplifies the SAN environment, enables easier deployment and management, and delivers the performance required for emerging higher throughput applications.
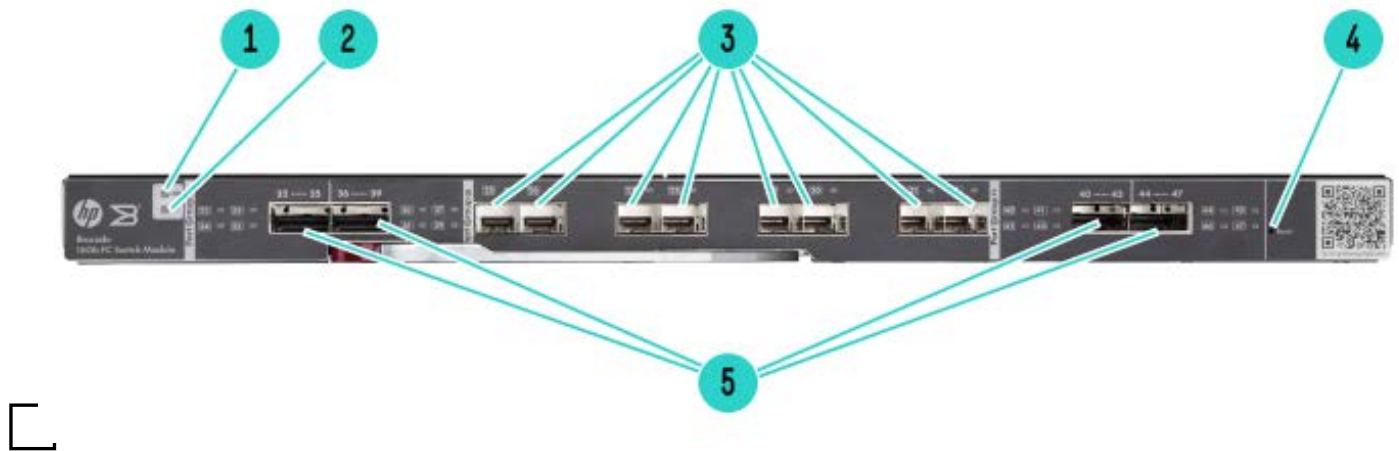

Figure 1 Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy

1. UID LED	2. Health LED
3. Port 25-31 & 0 (16Gb/s FC SFP+ Ports)	4. Reset Button
5. Ports 32-47 (4x16Gb FC Optical Transceivers (QSFP)	

Integrated SAN connectivity	• Enables data center consolidation with HPE Synergy through a state-of-the-art zero-footprint design while lowering cost through shared power and cooling, fewer cables and less space resulting in reduced infrastructure complexity and lower operations costs.
16 Gb FC storage networking	• Enables support of virtualized environments and other emerging technologies through high-speed technology that doubles the performance of the storage network. External facing ports auto-sense lower bandwidth components for flexibility and investment protection with existing

Overview

FC ports (4, 8, or 16Gb/s FC for external ports) as well as to the future FC products (32Gb and 64Gb).

Quad Small Form-factor Pluggable (QSFP)

- Up to four 4x16Gb/s QSFPs are supported, which can be used as additional 16 Gb/s FC ports, 64 Gb/s high speed FC ISL ports between switch modules, or as part of a 128Gb/s trunk port to a B-series Director.

Non-blocking architecture

- Includes connection speed support for all ports to provide a high-performance system with aggregate bandwidth of 576 Gb/s (36 ports x 16 Gb/s). This capability is supported in Native OS mode, which is the default, and not access gateway mode.

ISL Trunking performance enhancements

- Support for multiple trunks, with the maximum trunk size of up to eight SAN ports for up to 128 Gb/s balanced throughput per each trunk group. Trunking of the SAN-facing ports with external Brocade or HPE B-series switches provides a high-bandwidth solution while lowering costs through fewer SFPs and cables. You can trunk up to 8 external FC SFP+ ports or up to two QSFP ports. For maximum flexibility any number of consequent ports within adjacent QSFP ports can form a trunk.

Fabric Vision

- Enables powerful built-in monitoring SAN management, and diagnostic tools to simplify administration, increase uptime and reduce costs. This results in significant insight and visibility across SANs with extensive analytics to keep your SAN optimized for best results. Available by default in the Power Pack+ model or as an upgrade option.

Access Gateway mode

- Employs N_Port ID Virtualization (NPIV), an ANSI T11 standard, to enable interoperability with other SAN fabrics and eliminate domain considerations while improving SAN scalability.

Broad range of management tools and SMI-s conformance

- Integrates with HPE OneView for monitoring and leverages HPE B-series SAN management and monitoring tools (PowerPack+, Fabric Vision). An SMI-s API enables the use of industry standard interfaces to integrate management with other applications.

Switch Configuration- available in three base models

- Available in 12-port, 24-port and 24-port Power Pack+ Full Fabric models. Choose the features and management options that make sense for your needs.

What's New

- First traditional 16Gb/s FC modular switch to support HPE's Composable Infrastructure
- New 16 Gb/s Fibre Channel embedded high performance SAN switch module for HPE Synergy 12000 Frame
- 12 downlink internal server ports, up to 8 uplink (SFP+) external ports and 4 uplink (QSFP) external ports; 48-port capable switch is scaleable to 36-FC ports only.
- 4X16 QSFP FC ports can be used as additional 16Gb/s FC ports or 64 Gb/s FC uplinks or ISL trunks up to 128 Gb/s FC ports
- Internal Port Support for HPE Synergy 3830C 16G Fibre Channel Host Bus Adapter

Overview

- Support for up to 6 FC switch modules per HPE Synergy Frame 12000

Product Highlights

Advanced Fabric Services	- Hardware Enforced Zoning***** - Dynamic Path Selection***** - WebTools - Power Pack+ fabric services software bundle (optional) - Fabric Vision - ISL Trunking - Extended Fabrics***** *** Not supported in Brocade Access Gateway mode.**
Manageability	- HPE Network Advisor - WebTools - HPE Storage Operations Orchestration (optional) - API - SNMP - SMI
Interoperability	Brocade Access Gateway mode enables the Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy to interoperate with other SAN fabrics running supported firmware. While in Access Gateway mode, the device must be connected to an NPIV-enabled edge switch or director. Supported edge environments are listed in the **SAN Design Guide http://www.HPE.com/go/sandesign** or **http://www.HPE.com/go/sandesignguide**.

Software Components, Standard

Access Gateway*	Brocade Access Gateway Mode enables seamless connectivity for the Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy to other supported SAN fabrics, enhances scalability and simplifies manageability. Utilizing N_Port ID Virtualization (NPIV) standards, Brocade Access Gateway eliminates switch/domain considerations. *** Brocade Access Gateway mode does not support switch-related features, including some features in the Power Pack+ bundle (e.g. Extended Fabric). Please refer to the Access Gateway Administrator's Guide for details.**
Frame Filtering	A special B-Series ASIC-based capability that enables new applications and features. The switch 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 Fabric Vision (optional).
Advanced Zoning	Zoning (Port and Worldwide Name), as well as Access Control, are enforced by hardware within the ASIC. Hardware enforcement enables the highest level of zoning enforcement without any impact to performance. Administrators can organize a physical fabric into logical groups and prevent unauthorized access by devices outside the Zone.
WebTools	Enables organizations to monitor and manage single Fibre Channel switches and monitor 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.
Dynamic Path Selection	Improves performance by dynamically routing data traffic across multiple links and trunk groups.

Product Highlights

Adaptive Networking Services

Adaptive Networking services optimize fabric behavior and ensure ample bandwidth for mission-critical applications. The tools currently include Quality of Service (QoS), Ingress Rate Limiting and Traffic Isolation. By assigning zones a high, medium, or low priority, QoS allocates bandwidth in the event of congestion to expedite high-priority traffic and keep all traffic flowing. Ingress Rate Limiting restricts data flow from less-critical hosts at preset bandwidths. Traffic Isolation assigns high-bandwidth data flows to specific ISLs. **NOTE: Adaptive Networking Services are included by default in the switch firmware and do not require a separate license.**

Software Components, Optional

Power Pack+ Software Bundle

The Power Pack+ Software Bundle includes:

- Fabric Vision
- ISL Trunking
- Extended Fabrics*****

NOTE:* Not supported in Access Gateway mode (see the Access Gateway Administrator´s guide for full details).

Adaptive Networking and Server Application Optimization features are included by default in the switch firmware and do not require a separate license

Fabric Vision

Fabric Vision offers innovative diagnostic, monitoring and management capabilities to help accelerate new application deployments, address SAN problems before they impact operations and reduce operational costs, it Includes:

- Monitoring and Alerting Policy Suite: A policy-based monitoring tool with pre-built rules and automation that simplifies fabric-wide threshold configuration and monitoring.
- Flow Vision: A comprehensive tool that enables administrators to identify, monitor, and analyze specific application data flows without using taps to ensure optimized performance.
- Health and performance dashboard: A single customizable screen displayed in HPE SAN Network Advisor that contains all critical SAN information for convenient review and analysis.

Fabric Vision will be included by default in all HPE StoreFabric B-series Fibre Channel switches and Directors bundled with Power Pack+ (with FOS 7.2.0a and later). In all other cases, Fabric Vision can be enabled on HPE StoreFabric B-series Fibre Channel switches and Directors in any one of the following ways

- Application of the Fabric Vision LTU (FOS 7.2.0a and later)
- Application of the Power Pack+ LTU (FOS 7.2.0a and later)

ISL Trunking

For high performance and seamless failover, this optional license logically groups up to eight E_ports (switch mode) or F_ports (Access Gateway mode) to provide a high bandwidth trunk between two HPE B-Series or Brocade switches. Each switch needs its own license. The fabric operating system views the trunk as a single, high bandwidth ISL resource (up to 128 Gb/s when routing connections between 16 Gb/s capable switches). Connections are load-balanced across the individual links, which comprise the logical trunk group.

Product Highlights

Extended Fabrics	Extends the native Fibre-Channel traffic up to 3857 km at 4 Gb or up to 964 km at 16Gb. Extended Fabrics increases 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.

SAN Network Advisor Professional

HPE SAN Network Advisor Professional is a management application available at no-charge and comes with B-series SAN Switches and:

- Allows management of two Fabric OS (FOS) fabrics (up to 1,000 devices, 300 switch ports) at a time
- Performs group switch management beyond the scope of Web Tools
- Does not offer management of the SN8000B 8-Slot or DC SAN Backbone Directors

It is targeted for SMB customers that use FOS based SAN fabrics and require a management solution for smaller SANs with up to 2 fabrics.

SMB customers that initially start off with SAN Network Advisor Professional and have a small SAN environment may over time feel the need for an enterprise-class product (SAN Network Advisor 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 SAN Network Advisor Professional to SAN Network Advisor Enterprise.

SAN Network Advisor Enterprise and Professional+

HPE SAN Network Advisor Enterprise and Professional+ are the enterprise-class products that support FOS products. SAN Network Advisor Enterprise provides complete SN8000B 8-Slot Director and DC SAN Backbone Director management including enterprise-class features/environments such as FICON, Fibre Channel Routing, FCIP, adaptive networking, etc., while HPE SAN Network Advisor Professional+ provides the same feature set except for support for the SN8000B 8-Slot Director, DC SAN Backbone Director, and FICON.

HPE SAN Network Advisor Enterprise delivers unprecedented scalability, up to 100 fabrics and 15,000 switch ports, while HPE SAN Network Advisor Professional+ scales to 36 SAN Fabrics and 2560 switch ports. To accommodate growth, there is an upgrade available to SAN Network Advisor Enterprise from SAN Network Advisor Professional Plus.

HPE Synergy Frame 12000 compatibility

Brocade 16 Gb FC SAN Switch Module for HPE Synergy must be deployed within the HPE's Composable Infrastructure solution, and is compatible only with HPE Synergy Frames.

HPE FC HBA Mezzanines 16Gb HPE Fibre Channel Mezzanine cards for HPE Synergy are supported

- Please refer to the HPE FC Mezzanine HBA Product QuickSpecs for Compute Module support details. Support for the16Gb/s FC HBA Mezzanine with the Brocade 16Gb SAN Switch for HPE Synergy requires HPE FOS v8.0.0_gft or later

NOTE: 8 Gb Fibre Channel Mezzanine HBAs are not supported

Product Highlights

HPE Synergy Frame Frame   HPE Synergy Frame 12000

Switch interoperability

HPE B-Series Switches, Directors, and Routers	**16Gb/s Fibre Channel Switches and Directors**	• SN8000B Director Switch (Enterprise) • SN6500B Fibre Channel SAN Switch • Brocade 16Gb SAN Switch for HPE BladeSystem c-Class • SN6000B Fibre Channel Switch (Midmarket) • SN3000B Fibre Channel Switch (Entry)
	8 Gb Switches	• 8/24 SAN Switch • 8/8 SAN Switch • Embedded switch for HPE 4400 Enterprise Virtual Array • Encryption SAN Switch • Brocade 8 Gb SAN Switch for HPE c-Class BladeSystem
	Virtual Connect	• HPE Virtual Connect 8Gb 24-port Fibre Channel Module • HPE Virtual Connect 8Gb 20-port Fibre Channel Module • HPE Virtual Connect 16 Gb 24-port Fibre Channel Module • Virtual Connect FlexFabric 24-Port Module for c-Class BladeSystem
	Multi-Protocol Routers and Gateways	• Multi-protocol Extension Blade • 10/24 Blade for DC SAN Directors • Multi-Protocol Router Blade • SN4000B FC SAN Extension Switch • 1606 SAN Extension Switch

Service and Support, and Warranty Information

Warranty	(3-3-3) Hardware Warranty - Three-year on-site warranty, normal business hours, next business day response, and installation not included.

NOTE: The hardware warranty covers firmware and embedded non-saleable software. Saleable software carries its own warranty, please see below.

Software Warranty: Hewlett Packard Enterprise 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 Hewlett Packard Enterprise 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 Hewlett Packard Enterprise in the country in which you obtained the software.

Services Included with Product Purchase

The Power Pack+ Software Bundle includes three years of Hewlett Packard Enterprise standard business hours, standard business days Software Support (includes software technical support and software product and documentation updates).

HPE Service and Support HPE Technology Services offers you a rich portfolio of consulting and support services designed to add value to our core products and solutions. We have the know-how and experience to put technology to work for you. We work closely with you, as your strategic partner, leveraging our full services portfolio to make sure that everything works to help optimize your enterprise.

Choose from services aligned to our product offerings and lifecycle. From proactive onsite services to innovative support when your products are connected to Hewlett Packard Enterprise, you choose the precise level of attention and support your business demands.

HPE Technology Services for HPE Synergy
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. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.

Protect your business beyond warranty with HPE Support Services
HPE support services offer complete care and support expertise with committed response choices that are designed to meet your IT and business needs.

HPE Foundation Care services offer scalable reactive support-packages for HPE Synergy and software. You choose the type and level of service that is most suitable for your IT and business needs.

HPE Proactive Care keeps your system stable and reliable helping to prevent problems and reduce outages through proactive service management and enhanced technical response.

Advise, transform, integrate, support, automate, and flex

HPE Technology Services helps you get the most out of what you have today and transition to HPE's composable infrastructure, at your pace and from wherever you are on the journey.

Start with the HPE Transformation Workshop to ensure that your business and IT organizations

Service and Support, and Warranty Information

collaborate, define the topline strategy for composable, software-defined, cloud-ready infrastructure and kick-start your projects confidently. This workshop clarifies your business requirements and the issues that IT and operations teams must resolve in order to meet these requirements. A detailed executive briefing or high-level report summarizes the strategies, high-level plan and functional requirements.

HPE Modernization and Migration Services helps you choose the right platform for the right workload at the right cost and evolve your IT infrastructure, processes and organization taking advantage of "on-hybrid infrastructure" innovations such as composable, converged, software-defined, technologies. Hewlett Packard Enterprise experts advise, transform, integrate and implement for platform refresh, datacenter consolidation virtualization, migration and automation projects.

HPE Flexible Capacity is a pay per use model for on premise infrastructure.   This offers needed HPE Synergy capacity in the datacenter, plus a buffer of additional capacity.   As HPE Synergy will be a dynamic environment, this provides enough room to grow your environment, but only pay for actual metered use. Technology transitions and refresh can be built in, infrastructure and services are billed monthly, enabling you to align costs to business use.

HPE Datacenter Care-Infrastructure Automation (DC-IA) is an extension to HPE Datacenter Care and delivers enterprise-grade support, advice, guidance and best practices for infrastructure automation. The service also includes Enterprise editions of automation tools including Enterprise Chef and selected others. The DC-IA Center of Excellence (CoE) is staffed with highly trained experts who have specific expertise on integrating Chef with HPE OneView.

Deploy and integrate	**HPE Synergy First Frame Installation and Startup -** Provides for hardware installation (HPE Synergy compute modules, Storage Modules, Virtual Connect modules, Interconnect Link Modules, Fibre Channel Modules, Frame Link Modules, and HPE Synergy D3940 Storage Modules) and software startup for the first frame of your HPE Synergy deployment. Additional frames can be added using the HPE Synergy Additional Frame Installation and Startup Service. **HPE Synergy Additional Frame Installation and Startup Service -** Add additional frames to your HPE Synergy First Frame Startup service or expand your existing HPE Synergy Infrastructure.
Optimized Support	Choose the right support to maximize uptime, free up your resources, and achieve improved value—as you get the most out of the existing IT assets while accelerating time-to-revenue. **HPE Proactive Care Advanced - 24x7 coverage, three year Support Service** Builds and incorporates on Proactive Care and also gives customers personalized technical and operational advice from an assigned, local Account Support Manager for personalized technical collaboration, flexible access to specialist skills to help optimize business critical IT, and Critical Incident Management to help so the business is not affected if there is a system or device outage. This recommendation provides 24x7 coverage with four-hour response for hardware and Basic Software Support and Collaborative Call Management for selected non-HPE software that offers two-hour callback for supported software issues. **http://www8.hpe.com/h20195/v2/GetPDF.aspx/4AA5-3259ENW.pdf**
Standard Support	**HPE Proactive Care with 24x7 coverage, three year Support Service** Hardware and software support services designed specifically for your technology with rapid access to

Service and Support, and Warranty Information

Advanced Solution Center specialists for start to finish case management plus proactive reports and recommendations for firmware and software management and best practice advice. This recommendation provides 24x7 coverage with four-hour response for hardware and Basic Software Support and Collaborative Call Management for selected non-HPE software that offers two-hour callback for supported software issues.

http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf

HPE Education

Training your IT staff is critical to help drive the value of HPE Synergy with increased efficiencies and better business outcomes. Training is key to the transformation and management of HPE Synergy.

Parts and Materials

Hewlett Packard Enterprise will provide HPE-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 quick-specs, 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

Additional Support Services can be found at HPE Support Services Central
http://ssc.hpe.com

Configuration Information

Step 1 – Base Configurations

Select one:

Part Number

Brocade 16Gb/12 Fibre Channel SAN Switch Module for HPE Synergy

- (1) 16Gb/s SAN Switch
- 12 ports enabled for any combination (12 internal and 24 external)
- Dual function mode - Native OS (default) or Access Gateway Mode
- Documentation

Brocade 16Gb/24 Fibre Channel SAN Switch Module for HPE Synergy

- (1) 16Gb/s SAN Switch
- 24 ports enabled for any combination (12 internal and 24 external)
- Dual function mode - Native OS (default) or Access Gateway Mode
- Documentation

Brocade 16Gb/24 PowerPack+ Fibre Channel SAN Switch Module for HPE Synergy

- (1) 16Gb/s SAN Switch
- 24 ports enabled for any combination (12 internal, 24 external)
- Dual function mode - Native OS (default) or Access Gateway Mode
- Documentation and includes Power Pack+ Bundle and management tools (see software components, optional)

Step 2 – Additional Options

Select each type of required options with quantities specified:

Hardware:

Model Name	Model Description	Part Number
16Gb/s QSFP	HPE B-series 4X16 Short Wave QSFP Transceiver	
16Gb/s Optical Transceivers	HPE B-series 16Gb SFP+ Short Wave Transceiver	
(SFP+)	HPE B-series 16Gb SFP+ Long Wave 10Km Transceiver	
	HPE B-series 16Gb LW 25km FC SFP 1-pack Transceiver	
8 Gb Optical Transceivers	HPE 8Gb Shortwave B-series Fibre Channel 1 Pack SFP+ Transceiver	
(SFP+)	HPE 8Gb Long Wave B-series 10km Fibre Channel 1 Pack SFP+ Transceiver	
	HPE B-series 8Gb Extended Long Wave 25km Fibre Channel SFP+	

Configuration Information

Transceiver 1 Pack

Optical cables	**PremierFlex OM4 LC/LC Multi-mode Cables**

HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable
HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable

OM3 LC/LC Multi-mode Cables

HPE LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable
HPE LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber
Optic Cable

QSFP to 4xLC Breakout Cables

HPE Premier Flex MPO to 4xLC 5m Cable
HPE Premier Flex MPO to 4xLC 15m Cable

OM4 MPO/MPO Multi-mode Cables

HPE Premier Flex MPO/MPO Multi-mode OM4 8 Fibre 10m
Cable
HPE Premier Flex MPO/MPO Multi-mode OM4 8 Fibre 50m
Cable
HPE Premier Flex MPO/MPO OM4 100m (12ft) Cable

Software:

Power Pack+ Software Bundle

Brocade 16Gb Embedded Switch Power Pack+ E-LTU
(For upgrading Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy to Power Pack+). Includes bundled license for:

- Fabric Vision
- ISL Trunking
- Extended Fabrics

Optional Software

HPE 8/16Gb Embedded Switch Fabric Vision E-LTU

HPE B-series ISL Trunking E-LTU
Extended Fabrics*****

Brocade 16Gb Fibre Channel SAN Switch Module 12-port Upgrade E-LTU for HPE Synergy

NOTE: the Brocade 16Gb FC Switch Module for HPE Synergy is capable of

Configuration Information

supporting 48-FC ports; however with Dual Port 16Gb FC Mezzanine cards, only a maximum of 12-downlinks are supported., which allows each Brocade 16Gb FC Switch Module for HPE Synergy to support a maximum of 36-FC ports. For example, for the 16/12-port base you can add up to (QTY) 2 12-port upgrade LTUs totaling 36-ports, or add (QTY) 1 12-port upgrade LTU to a 24-port base switch module totaling support 36-ports.

HPE SAN Network Advisor Enterprise Software LTU
HPE SAN Network Advisor Professional Plus Software LTU
HPE SAN Network Advisor Professional Plus Upgrade LTU
* In order to obtain Extended Fabrics Software, a purchase of the TC464AAE Power Pack+ Software Bundle is required.

NOTE: Most HPE B-series software licenses are available through the Electronic Delivery (E-Delivery) mechanism. The E-Delivery software licenses with part numbers listed in this document are functionally equivalent to the corresponding physical licenses with different part numbers. Some software licenses in this document are represented by two part numbers, the first of which is the E-Delivery version (ending with AAE) and the second is the physical version.

NOTE: HPE SAN Network Advisor software will no longer be shipped as a DVD to customers. Instead, customers will be able to access and download the software from HPE's Product Download web site.

Family Comparison

Features	8/8 SAN Switch Base and 8/8 SAN Switch	8/24 SAN Switch Base
Targeted Environment	Workgroups, Departments	Workgroups, Departments
Fibre Channel Port Bandwidth	8Gbit/sec	8Gbit/sec
Aggregate device bandwidth	64-192 Gbit/sec	128 - 192Gbit/sec
OS Support	**NOTE:** Please Refer to SAN Design Guide **http://www.HPE.com/go/sandesign** or **http://www.HPE.com/go/sandesignguide**	
Storage system support	**3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA**	
FC Ports	8 Enabled 24 Max	16 Enabled 24 Max
SFP	B-series	B-series
Advanced Trunking	Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Included	Included
Form factor	1U	1U
Zoning Software	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	No	No
Hot plug fans	No	No

Features	SN3000B 16Gb FC Switch and SN3000B 16Gb FC Power Pack+	SN6000B 16Gb FC Switch and SN6000B 16Gb FC Power Pack+	SN6500B 16Gb FC Switch and SN6500B 16Gb FC Power Pack+
Targeted Environment	Workgroups, Departments	Workgroups, Departments	Workgroups, Departments
Fibre Channel Port Bandwidth	16Gbit/sec	16Gbit/sec	16Gbit/sec
Aggregate device bandwidth	192-384Gbit/sec	384-768Gbit/sec	768-1536Gbit/sec
OS Support	**NOTE:** Please Refer to SAN Design Guide **http://www.HPE.com/go/sandesign** or **http://www.HPE.com/go/sandesignguide**		
Storage system support	**3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA**		
FC Ports	12-24 Enabled 24 Max	24 or 48 Enabled 48 Max	48 or 96 Enabled 96 Max
SFP	B-series	B-series	B-series
Advanced Trunking	Included with Power Pack+	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Included	Included	Included
Form factor	1U	1U	2U
Zoning Software	Yes (Included)	Yes (Included)	Yes
Hot plug, redundant power supplies	Optional	Yes	Yes

Family Comparison

Hot plug fans	Yes	Yes (integrated with power supply)	Yes

Features	8/24 Bundled FC Switch	SN6000B 16Gb Bundled FC Switch
Targeted Environment	Workgroups, Departments	Workgroups, Departments
Fibre Channel Port Bandwidth	8Gbit/sec	16Gbit/sec
Aggregate device bandwidth	128 - 192Gbit/sec	384-768Gbit/sec
OS Support	**NOTE:** Please Refer to SAN Design Guide **http://www.HPE.com/go/sandesign** or **http://www.HPE.com/go/sandesignguide**	
Storage system support	**3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA**	
FC Ports	16 Enabled 24 Max	24 or 48 Enabled 48 Max
SFP	B-series, 16 units included in the box	B-series, 24 units included in the box
Advanced Trunking	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Included	Included
Form factor	1U	1U
Zoning Software	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	No	Yes
Hot plug fans	No	Yes (integrated with power supply)

Features	SN8000B 8-Slot SAN Director Power Pack+	SN8000B 4-Slot SAN Director and 4-Slot SAN Director Power Pack+
Targeted Environment	Cloud Optimized Data Centers	Cloud Optimized Data Centers
Port Bandwidth	Up to 16Gbit/sec	Up to 16Gbit/sec
Aggregate device bandwidth	10.2 Tbit/sec	5.1 Tbit/sec
OS Support	**NOTE:** Please Refer to SAN Design Guide **http://www.HPE.com/go/sandesign** or **http://www.HPE.com/go/sandesignguide**	
Storage system Support	**3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA**	
Ports	Up to 512	Up to 256
SFP	B-series	B-series
Advanced Trunking	Included with Power Pack	Included with Power Pack or Optional Upgrade
Adaptive Networking	Included	Included
Form factor	14U	9U
Zoning Software	Yes (included)	Yes (included)
Hot plug, redundant power supplies	Yes	Yes
Hot plug fans	Yes	Yes
Features	**Brocade 16Gb Fibre Channel**	**Brocade 16Gb SAN Switch for**	**Brocade 8Gb SAN Switch for HPE**

Family Comparison

	SAN Switch Module for HPE Synergy	HPE c-Class BladeSystem	c-Class BladeSystem
Targeted Environment	Enterprise, Datacenters, Workgroups, Departments	Enterprise, Datacenters, Workgroups, Departments	Workgroups, Departments
Port Bandwidth	16Gbit/sec	16Gbit/sec	8Gbit/sec
Aggregate device bandwidth	576 Gb/s (36 ports x 16 Gb/s)	448 Gbit/sec (24 ports X 16Gb/s)	192 Gbit/sec
OS Support	NOTE: Please Refer to SAN Design Guide http://www.HPE.com/go/sandesign or http://www.HPE.com/go/sandesignguide		
Storage system support	3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA		
Ports	8 SFP+ external, 4 QSFP external /12 internal	12 external /16 internal	8 external /16 internal
SFP	B-series	B-series	B-series
Advanced Trunking	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Included	Included	Included
Form factor	Embedded	Embedded	Embedded
Zoning Software	Yes (Included)	Yes (Included)	Yes (Included)
Hot plug, redundant power supplies	Yes, in Synergy Frame	Yes, in BladeSystem Enclosure	Yes, in BladeSystem Enclosure
Hot plug fans	Yes, in Synergy Frame	Yes, in BladeSystem Enclosure	Yes, in BladeSystem Enclosure

Features	1606 SAN Extension Switch	SN4000 SAN Extension Switch
Targeted Environment	Data Centers	Data Centers
Fibre Channel Port Bandwidth	8Gbit/sec	16Gb/s
Ethernet	1Gbit/sec Ethernet	10Gbit/sec Ethernet
FCIP/FICON	Yes, optional license required for FICON	Yes, optional license required for FICON
OS Support	NOTE: Please Refer to SAN Design Guide http://www.HPE.com/go/sandesign or http://www.HPE.com/go/sandesignguide	NOTE: Please Refer to SAN Design Guide http://www.HPE.com/go/sandesign or http://www.HPE.com/go/sandesignguide
Storage system support	3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA	3PAR StoreServ, StoreVirtual 4000, P9000/XP, P6000/EVA, P2000/MSA
FC Ports	4 or 16 Enabled 16 Max	24 ports Enabled 24 Max
Ethernet Ports 1/10GbE, 40GbE	2 or 6 ports 1GbE Enabled 6 Max	16 ports 1/10GbE Enabled 16 Max 2 - 40GbE ports
SFP+	B-series	B-series
Advanced Trunking	Included with Power Pack+ or Optional Upgrade	Included with Power Pack+ or Optional Upgrade
Adaptive Networking	Included	Included
Form factor	1U	2U
Zoning Software	Yes (Included)	Yes (Included)

Family Comparison

Hot plug, redundant power supplies	Yes	Yes
Hot plug fans	Yes	Yes
Optional software	PowerPack+, 1606 base to Full Upgrade, SAN Network Advisor, Advanced Extension, Integrated routing, FICON CUP, ISL trunking	SAN Network Advisor, FICON Accelerator, FICON CUP, Integrated Routing, 10Gb or 40Gb WAN Rate Upgrade, ISL Trunking

Technical Specifications

Fibre Channel ports	12 Internal 16Gb/s (downlink) ports; up to 24 External 4/8/16 Gb/s auto-sensing (8x SFP+ and 4x QSFP+) (uplink) - universal (E, F, N, D) ports. For the 16Gb/24 Port SAN Switch model: up to 24 ports in any internal/external port combination enabled. Depending on San switch module model selected, order the total number of Brocade 16Gb Fibre Channel SAN Switch Module 12-port Upgrade E-LTU or LTU for HPE Synergy to increase active FC port counts.
Device support and Scalability guidelines	**http://h18006.www1.HPE.com/products/storageworks/san/documentation.html**
Performance	16Gb/s line speed, full duplex
Certified maximum	Certified maximum information available at: **http://h18006.www1.HPE.com/products/storageworks/san/documentation.html**
Switch core	Non-blocking
Fabric latency	700 nanoseconds through the use of cut-through frame routing at 16Gb/s
Maximum frame size	2112-byte payload
Classes of service	Class 2, Class 3, Class F (inter-switch frames)
Port types	D_Port (Diagnostic port), E_Port, F_Port; optional port type control Brocade Access Gateway mode: F_Port and NPIV-enabled N_Port
Data traffic types	Fabric switches supporting unicast
Media types	Hot-pluggable, B-Series Branded Small Form Factor Pluggable (SFP), LC connector; Short-Wave Laser (SWL), Long-Wave Laser (LWL); Extended Long-Wave Laser (ELWL); distance depends on fiber-optic cable and port speed. Supports 4x16 QSFP+ (16/8/4 Gbit/sec) and/or SFP+ (16/8/4 Gbit/sec) optical transceivers.
Advanced	Short-wave, long-wave, and extended long wave laser transceivers are supported
Fabric services	Simple Name Server, Registered State Change Notification (RSCN). Includes Advanced WebTools and Advanced Zoning. Optional advanced fabric services include: Fabric Vision, ISL Trunking, and Extended Fabrics.
Options	SFP media, port upgradeable licensing, advanced management software licensing
Supported software	Telnet, SSH, SNMP (FE MIB, FC Management MIB), HPE Storage Operations Manager, Advanced WebTools, Advanced Zoning, SAN Network Advisor
Management access	WebTools, SMI-s provider, SNMP, Telnet, and Secure Telnet
Diagnostics	Cable diagnostic (D_Port), including electrical/optical loopback, link traffic/latency/distance

Technical Specifications

Dimensions	Depth	1.082 in.
	Height	11.051 in.
	Width	16.918 in.
	Weight	Approx. 3.18lb - without media

Environment	System Inlet Temperature	Operating	Inlet air temperature up to 43°C (109.4°F) at sea level with an altitude derating of 1.0°C per every 1000 feet of elevation above sea level to a maximum operating altitude. For example, the maximum inlet air temperature requirement at 5000 ft. above Sea level is 38°C.
		Non-operating	-40°C to 70°C (-40° to 158°F). Maximum rate of change is 20°C/Hr (36°F/Hr).
	Relative Humidity	Operating	5 to 95% relative humidity, 38.7°C maximum wet bulb temperature, and Non-condensing.
		Non-operating	5 to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.
	Altitude	Operating	3050 m (10,000 ft.). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min).
		Non-operating	9144 m (30,000 ft.). Maximum allowable altitude change rate is 457 m/min (1500 ft. /min).

Vibration	Operating	1 G, 10-500 Hz, 60 minutes per axis
	Non-operating	2 G, 10-500 Hz, 30 minutes

Shock	Operating	Half-sine-wave shock, 40 G, 2 ms duration, in each direction of three mutually perpendicular axes.
	Non-operating	Half-sine-wave shock, 140 G, 2 ms duration, in each direction of three mutually perpendicular axes; and square-wave shock up to 80 G, 180 inches/s velocity change, in each direction of three mutually perpendicular axes.

Summary of Changes

Hewlett Packard Enterprise