

### Overview

#### HP StoreFabric SN6500C 16Gb FC/FCIP/FCoE Multi-service Switch (MDS9250i)

The HP StoreFabric SN6500C 16Gb Multi-service Switch (MDS 9250i) brings the most flexible storage networking capability available in the fabric switch market today. Sharing a consistent architecture with the MDS 9700 (SN8500C) Directors, HPE's SN6500C 16Gb Multi-service Switch integrates both Fibre Channel and IP Storage Services in a single system to allow maximum flexibility in user configurations. With 20 16-Gbps Fibre Channel ports active by default, two 10 Gigabit Ethernet IP Storage Services ports, and 8 10 Gigabit Ethernet FCoE ports, the SN6500C 16Gb Multi-service switch is a comprehensive package, ideally suited for enterprise storage networks that require high performance SAN extension or cost-effective IP Storage connectivity for applications such as Business Continuity using Fibre Channel over IP or iSCSI host attachment to Fibre Channel storage devices. Also, using the eight 10 Gigabit Ethernet FCoE ports, the SN6500C 16Gb Multi-service Switch attaches to directly connected FCoE and Fibre Channel storage devices and supports multi-tiered unified network fabric connectivity directly over FCoE.



**HPE's SN6500C 16Gb Multi-service Switch**

### Key Features and Benefits

Please note that some features require the optional MDS 9200 Enterprise Package license to be activated

- Integrated Fibre Channel and IP Storage Services in a single optimized form factor:
  - Supports up to forty 16-Gbps Fibre Channel interfaces for high performance storage area network (SAN) connectivity plus two 10 Gigabit Ethernet ports for Fibre Channel over IP (FCIP) and Small Computer System Interface over IP (iSCSI) storage services plus eight 10 Gigabit Ethernet FCoE ports.
  - The SN6500C 16Gb Multi-service Switch comes with 20 ports of 16Gb FC enabled by default and scales up to 40 ports of 16Gb FC with a port upgrade license shown below.
- Industry's highest-performance Inter-Switch Links (ISLs):
  - High-performance ISLs: SN6500C supports up to 16 Fibre Channel ISLs in a single PortChannel. Links can span any port on any module in a chassis for added scalability and resilience. Up to 256 buffer to-buffer credits can be assigned to a single Fibre Channel port to extend storage networks over long distances.
- Hardware Assisted Encryption Security:
  - On-board crypto processing engine supports secure IEEE standard Advanced Encryption Standard (AES) 256-bit algorithms
  - IPsec for Data in Transit over IP networks
- Intelligent network services:
  - Uses virtual SAN (VSAN) technology for hardware-enforced, isolated environments within a single physical fabric.
  - Access control lists (ACLs) for hardware-based intelligent frame processing.
  - Advanced traffic-management features such as Fibre Channel Congestion Control (FCC) and fabric-wide quality of service (QoS) to facilitate migration from SAN islands to enterprise-wide storage networks.
- Comprehensive network security framework:
  - Supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) protocol, Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN Role-Based Access Control (RBAC). Additionally Gigabit Ethernet ports support IPsec authentication, data integrity, and

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- hardware-assisted data encryption and key management.
- Sophisticated diagnostics:
  - Provides intelligent diagnostics, protocol decoding, and network-analysis tools as well as integrated Call Home capability for added reliability, faster problem resolution, and reduced service costs.
- Open platform for network-hosted storage applications:
  - HPE's SN6500C 16Gb Multi-service Switch provides an open platform for hosting intelligent storage services such as network-based virtualization and replication.
- FCIP for remote SAN extension:
  - Simplifies data-protection and business continuance strategies by enabling backup, remote replication and other disaster recovery services over WAN distances using open-standard FCIP tunneling.
  - Optimizes utilization of WAN resources for backup and replication by tunneling up to three virtual ISLs on a single Gigabit Ethernet port, and enabling hardware-based compression, and hardware-based encryption.
  - Enhanced hardware-based FCIP compression performance for both high-bandwidth and low-bandwidth links. HPE's SN6500C 16Gb Multi-service Switch achieves a compression ratio of up to 43:1, with typical ratios of 4:1 to 5:1 over a wide variety of data sources.
  - Cisco SAN Extension over IP application package license is enabled by default for the 2 fixed 10 Gigabit Ethernet IP ports enabling features such as FCIP and compression on the switch without the need for additional licenses.
- iSCSI for extension of SAN to Ethernet attached servers:
  - Extends the benefits of Fibre Channel SAN-based storage to Ethernet attached servers at a lower cost than possible using Fibre Channel interconnect alone.
  - Through transparent operation, preserves the capability of existing storage management applications.

## Product Highlights

<b>FCIP for remote SAN Extensions</b>	Data distribution, data protection, and business continuance services are significant components of today's information-centric businesses. The ability to efficiently replicate critical data on a global scale not only ensures a higher level of data protection for valuable corporate information, but also increases utilization of backup resources and lowers total cost of storage ownership. HPE's SN6500C 16Gb Multi-service Switch uses the open-standard FCIP protocol to break the distance barrier of current Fibre Channel solutions and enable interconnection of SAN islands over extended distances.
<b>Advanced FCIP Features to Facilitate Business Continuance and Disaster Recovery</b>	HPE's SN6500C 16Gb Multi-service Switch is designed to support robust business continuance services using FCIP for remote connectivity in conjunction with a suite of advanced features, such as VSANs and hardware-assisted FCIP compression and encryption.
<b>VSANs and IVR Enhance SAN Security and Stability</b>	VSANs allow more efficient storage network utilization by creating hardware-based isolated environments within a single physical SAN fabric or switch. Each VSAN can be zoned as a typical SAN and maintains its own fabric services for added scalability and resilience. With the optional MDS 9200 Enterprise Package license enabled, HPE's SN6500C 16Gb Multi-service Switch supports Inter-VSAN Routing (IVR), the industry's first routing functionality for Fibre Channel. IVR allows selective transfer of data traffic between specific initiators and targets on different VSANs while maintaining isolation of control traffic within each VSAN.
<b>High Performance SAN Extension with Compression</b>	HPE's SN6500C 16Gb Multi-service Switch supports hardware-based FCIP compression to maximize the effective WAN bandwidth of SAN extension solutions. The SN6500C 16Gb Multi-service Switch achieves up to a 43:1 compression ratio, with typical ratios of 4:1 over a wide variety of data sources.
<b>Advanced Traffic Management for High-Performance, Resilient Fabrics</b>	<ul style="list-style-type: none"> <li>• Virtual Output Queuing ensures line rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.</li> <li>• Up to 4095 buffer-to-buffer credits can be assigned to an individual port for optimal bandwidth utilization across long distances.</li> <li>• Port Channels allow users to aggregate up to 16 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links. The bundle can consist of any port from any module in the chassis, ensuring that the bundle remains active even in the event of a module failure.</li> <li>• Fabric Shortest Path First (FSPF)-based multipathing provides the intelligence to load balance across up to 16 equal cost paths and, in the event of a switch failure, dynamically reroute traffic.</li> <li>• Quality of service can be used to manage bandwidth and control latency in order to prioritize critical traffic.</li> <li>• Fibre Channel Congestion Control (FCC), an end-to-end, feedback-based congestion control mechanism, augments the Fibre Channel buffer-to-buffer credit mechanism to provide enhanced traffic management.</li> </ul>
<b>Industry's Most Advanced Diagnostics and Troubleshooting Tools</b>	HPE's Cisco MDS 9000 Family integrates the industry's most advanced analysis and diagnostic tools. Power-on self-test (POST) and online diagnostics provide proactive health monitoring. HPE's SN6500C 16Gb Multi-service Switch implements diagnostic capabilities such as Fibre Channel Traceroute for detailing the exact path and timing of flows and Switched Port Analyzer (SPAN) to intelligently capture network traffic. Once traffic has been captured, it can then be analyzed with the Cisco Fabric Analyzer, an embedded Fibre Channel analyzer. Comprehensive port- and flow-based statistics facilitate sophisticated performance analysis and service-level agreement (SLA) accounting.
<b>Comprehensive Solution</b>	Please note that some features require HPE's MDS 9200 Enterprise Package software license to be

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### for Robust Network Security

activated.

HPE's SN6500C 16Gb Multi-service Switch offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The SN6500C 16Gb Multi-service Switch employs intelligent packet inspection at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced Port Security features.

Extended zoning capabilities are enabled to ensure that LUNs are accessible only by specific hosts (LUN zoning), to limit SCSI read command for a certain zone (read-only zoning), and to restrict broadcasts to only the selected zones (broadcast zones). VSANs are used to achieve higher security and greater stability by providing complete isolation among devices that are connected to the same physical SAN. In addition, Fibre Channel Security Protocol (FC-SP) provides switch-switch and host switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication supporting RADIUS or TACACS+, to ensure that only authorized devices access protected storage networks. Finally, for both FCIP and iSCSI deployment, the comprehensive IPsec protocol suite delivers secure authentication, data integrity, and hardware-based encryption.

### Ease of Management

HPE's SN6500C 16Gb Multi-service Switch comes standard with three principal modes of management: the C-series MDS 9000 Family CLI, the Quick Configuration Wizard, and the Cisco Data Center Network Manager.

#### Command Line Interface (CLI):

The C-series MDS 9000 Family CLI is easy to learn and delivers broad management capabilities. The C-series MDS 9000 Family CLI is an extremely efficient and direct interface designed to provide optimal capabilities to administrators in enterprise environments.

#### Quick Configuration Wizard:

The Quick Configuration Wizard helps eliminate management complexity and creates a readily available SAN environment for small- and midsized-business (SMB) applications. The wizard allows server access to storage to be set up quickly and easily in a single step using an intuitive GUI.

### iSCSI for Cost Effective Extension of SAN Storage to Ethernet Attached Servers

Many IT managers have been hesitant to extend SAN access beyond their mission-critical applications to midrange data center applications because of the complexity and cost involved in upgrading large numbers of midrange servers to Fibre Channel. HPE's SN6500C 16Gb Multi-service Switch addresses these limitations by enabling IT organizations to extend their storage networks using cost-effective Ethernet infrastructure. All the benefits of SANs, including increased storage utilization, centralized backups, easier addition of incremental storage capacity, management simplification, and reduced overall total cost of ownership (TCO), can be extended to a new range of applications. Because the HP SN6500C 16Gb Multi-service Switch is an integral component of the HPE MDS 9000 Family, Ethernet attached servers will enjoy the same SAN scalability, availability, manageability, and intelligent services as those servers connected directly to a Fibre Channel SAN, while maintaining the cost and ease-of-use benefits of Ethernet and IP.

### Product Family Models

- HP StoreFabric SN8500C 8-slot 16Gb FC Director
  - Intelligent, multi-protocol 8-slot Director with up to 384 16/8 Gb Fibre Channel ports in a single chassis. Also, the HP StoreFabric SN8500C 48-port 16Gb FC Module and the included Fabric 1 modules provide up to 384 ports of full 16Gbps line-rate performance across all ports.
- HP StoreFabric SN8500C 4-slot 16Gb FC Director (MDS 9706)
  - Intelligent, multi-protocol 4-slot Director with up to 192 16/8/4 Gb Fibre Channel ports in a single chassis. Also, the HP StoreFabric SN8500C 48-port 16Gb FC Module and the included Fabric 1 modules provide up to 192 ports of full 16Gbps line-rate performance across all ports or 192 10GbE FCoE ports in a single chassis.
- HP SN6500C 16Gb Multi-service Switch
  - Intelligent multi-protocol Fabric Switch with twenty fixed 16/8 Gb Fibre Channel

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ports, two fixed 10 Gigabit Ethernet FCIP ports, and eight fixed 10 Gigabit Ethernet FCoE ports. Provides up to forty active 16/8 Gb Fibre Channel ports through a port upgrade license.

- HP SN6010C 16Gb Fabric Switch (MDS 9148S)
  - With up to 48 Auto-Sensing 16/8/4 Gb Fibre Channel ports
  - "Pay as you grow" scalability starting at 12 ports

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## Software Components, Standard

**NX-OS** HPE's SN6500C 16Gb Multi-service Switch includes the HPE MDS 9000 NX-OS Software operating system version 6.2(7) or higher, Cisco Data Center Network Manager, and a suite of configuration, maintenance and diagnostics tools. It also includes VSAN support, PortChannels, extended fabrics, hardware-enforced zoning, and non-disruptive firmware upgrade capability.

**Cisco Data Center Network Manager**

Cisco Data Center Network Manager is a responsive, easy-to-use Java application that simplifies management across multiple switches and fabrics. Cisco Data Center Network Manager enables administrators to perform vital tasks such as topology discovery, fabric configuration and verification, LUN security, monitoring, and fault resolution. All functions are available through a secure interface, which enables remote management from any location. Cisco Data Center Network Manager may be used independently or in conjunction with third-party management applications. Cisco provides an extensive API for integration with third-party and user developed management tools.

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## Software Components, Optional

**HPE StoreFabric Data Center Network Manager Package** The "Standard" Cisco Data Center Network Manager software that is included at no charge with the MDS family switches provides basic switch configuration and troubleshooting capabilities. HP's C-series Data Center Network Manager (DCNM) for SN6500C switches (i.e. MDS9250i – SN6500C 16Gb Multi-service Switch) extends Cisco Data Center Network Manager by providing historical performance data collection for network traffic hot-spot analysis, centralized management services and advanced application integration.

**HPE MDS 9200 Enterprise Package** HPE MDS switches have a set of advanced traffic engineering and advanced security features that are recommended for all Enterprise SANs. These features are bundled together in a management application called the HPE MDS 9200 Enterprise Package License to Use (LTU). Please refer to Cisco's MDS Enterprise Package Data Sheet for more information:  
[http://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9000-software-licensing/product\\_data\\_sheet09186a00801ca6ac.html](http://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9000-software-licensing/product_data_sheet09186a00801ca6ac.html).

**Cisco MDS 9000 Family Mainframe Package** The Cisco MDS 9000 Family Mainframe Package is a comprehensive collection of features required for using SN6500C 16Gb Multi-service Fabric Switches in mainframe storage networks, including FICON protocol and CUP management, switch cascading, fabric binding, and intermixing. These features are available through the Cisco MDS 9200 Mainframe FICON Security License To Use (LTU) with NX-OS version 6.2(11c) firmware for the SN6500C.

**HP StoreFabric SN6500C 20-port Fibre Channel Upgrade LTU** This License is required to enable an additional 20 FC ports on the SN6500C 16Gb Multi-service Switch.

## ***HPE Support Services and Warranty Information***

**Warranty** (1-1-1) Hardware Warranty; 1-year parts; 1-year on-site (8x5, next business day response) and 1-year labor.

**NOTE:** The hardware warranty covers firmware and embedded non-saleable software. For extended hardware installation information, click the link below:

<http://www.hp.com/services/deployment>

**NOTE:** Certain restrictions and exclusions apply. Consult the Customer Support Center for details.

Hardware or Software product installation is not included in the warranty, but is available and highly recommended.

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### **Protect your business beyond warranty with HPE Support Services**

HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Our integrated portfolio of Services for storage help customers reduce costs, optimize data, streamline storage management, and improve backup and recovery. HPE Support Services enable you to choose the right service level, length of coverage and response time as you purchase your new storage solution, giving you full entitlement for the support for need for your IT and business.

### **Connect your devices**

Unlock all of the benefits of your technology investment by connecting your products to HP Enterprise. Achieve up to 77%1 reduction in down time, near 100%2 diagnostic accuracy and a single consolidated view of your environment. By connecting, you will receive 24x7 monitoring, pre-failure alerts, automatic call logging, and automatic parts dispatch. HPE Proactive Care Service and HPE Datacenter Care Service customers will also benefit from proactive activities to help prevent issues and increase optimization. All of these benefits are already available to you with your server storage and networking products, securely connected to HPE support.

### **Optimized Care**

#### **HPE Proactive Care\* with 6 hour call-to-repair commitment, three year Support Service**

HPE Proactive Care gives customers an enhanced call experience plus helps prevent problems and maintains IT stability by utilizing tailored, proactive reports with recommendations and advice when your products are connected to HPE. This Service combines three years' proactive reporting and advice with our highest level of hardware support - HPE's 24x7, six hour hardware call-to-repair. HPE is the only leading manufacturer who makes this level of coverage available as a standard service offering for your most valuable storage systems.

<https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf>

### **Standard Care**

#### **HPE Proactive Care\* with 24x7 coverage, three year Support Service**

HPE Proactive Care gives customers an enhanced call experience plus helps preventing problems and maintains IT stability by utilizing personalized proactive reports with recommendations and advice when your products are connected to HPE. This Service combines three years' proactive reporting and advice with our 24x7 coverage, four hour hardware response time when there is a problem.

<https://www.hpe.com/h20195/v2/GetPDF.aspx/4AA3-8855ENW.pdf>

\*HPE Proactive Care and HPE Proactive Care Advanced require that the customer connect their devices to make the most of these services and receive all the deliverables.

### **Basic Care**

#### **HPE Foundation Care 24x7, three-year Support Service**

HPE Foundation Care 24x7 gives you access to HPE 24 hours a day, seven days a week for assistance on resolving issues. This service includes need based Hardware onsite response within four hours. Simplify your support experience and make HPE your first call to help resolve hardware or software problems.

## ***Service and Support***

<https://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-8876ENW&cc=us&lc=en>

### **Related Services**

#### **HPE Installation Service**

Provides for the basic hardware installation of HPE branded servers, storage devices and networking options to assist you in bringing your new hardware into operation in a timely and professional manner.

<https://www.hpe.com/h20195/V2/GetPDF.aspx/5981-9356EN.pdf>

#### **HPE SAN Deployment Service**

Hewlett Packard Enterprise delivers complete design and implementation services for Fibre Channel, FCoE, FCIP, SAS, and iSCSI SAN connectivity components.

<http://h20195.www2.hpe.com/V2/GetPDF.aspx/5981-8527EN.pdf>

### **For more information**

<http://www.hp.com/services/storage>

To learn more on HPE Storage Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner.

HPE Support Services are sold by HPE and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from HPE or an enterprise reseller are quoted using HPE order configuration tools.
- Customers purchasing from a commercial reseller can find HPE Support Services at <http://www.hp.com/go/lookuptool>

## Configuration Information

	<b>HP StoreFabric SN8500C 4-slot 16Gb FC Director</b>	<b>HP StoreFabric SN8500C 8-slot 16Gb FC Director</b>	<b>HP StoreFabric SN6010C 16Gb Fabric Switch</b>	<b>HP StoreFabric SN6500C 16Gb Multi-service Switch</b>
<b>Switch Type</b>	Multilayer Director	Multilayer Director	Multilayer Fabric Switch	Multi-service Fabric Switch
<b>Maximum ports</b>	192 16 Gbps Fibre Channel ports, 192 FCoE ports	384 16 Gbps Fibre Channel ports, 384 FCoE ports	Up to 48 16 Gbps Fibre Channel ports	Up to 40 16 Gbps FC ports, 2 fixed 10GbE FCIP ports, 8 fixed 10GbE FCoE ports
<b>Number of slots per chassis</b>	Four	Eight	One fixed	Two fixed

**NOTE:** For additional switch support information, refer to the C-series FC Switch Connectivity Stream on the Single Point of Connectivity Knowledge (SPOCK) website at: <https://h20272.www2.hp.com/spock/>. You must sign up for a Hewlett Packard Enterprise Passport to enable access. Once logged in, click switches under Other Hardware in the last navigation panel of the window to access the Fibre Channel Switch Streams. Click on the C-Series FC Switch Connectivity Stream to open the document.

### Step 1 – Base Configuration

Select one:

<b>Model</b>	<b>Model Description</b>	<b>Part Number</b>
<b>SN6500C 16Gb Multi-service Switch</b>	HP StoreFabric SN6500C 16Gb FC/FCIP/FCoE Multi-service Switch	E7Y64A

#### Fibre Channel Port Expansion Modules

	<b>Part Number</b>
HP StoreFabric C-series 16 Gb Fibre Channel SW SFP+ Transceiver	C8S72A
HP StoreFabric C-series 16 Gb Fibre Channel LW SFP+ Transceiver	C8S73A
HP C-series 10GbE Short Range SFP+ Transceiver	AP783A
HP StoreFabric C-series 10GbE Long Range SFP+ Transceiver	E7Y65A
HP MDS 9000 8Gb FC SFP+ Short Range Transceiver	AJ906A
HP MDS 9000 8Gb FC SFP+ Long Range Transceiver	AJ907A

#### Optional Software

HP StoreFabric SN6500C 20-port Fibre Channel Upgrade LTU	D4U17A
HP StoreFabric SN6500C Data Center Network Manager LTU	TC365A
Cisco MDS 9200 Enterprise Package RTU	A7516A
Cisco MDS 9200 FICON Mainframe Connectivity LTU	T4409A

#### Recommended Cables

##### HPE PremierFlex OM4+ Fiber Optic Cables

	<b>Part Number</b>
HP Premier Flex MPO/MPO Multi-mode OM4 8 fiber 10m Cable	QK729A
HP Premier Flex MPO/MPO Multi-mode OM4 8 fiber 50m Cable	QK731A
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A



## Configuration Information

HP Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A

### HPE OM3 LC-LC Optical Cables

HP LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
HP LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
HP LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A
HP LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
HP LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
HP LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
HP LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A

## Technical Specifications

**Minimum software requirements** NX-OS 6.2(5a) or later

**Fibre Channel protocols** Fibre Channel standards

- FC-PH, Revision 4.3 (ANSI INCITS 230-1994)
- FC-PH, Amendment 1 (ANSI INCITS 230-1994/AM1-1996)
- FC-PH, Amendment 2 (ANSI INCITS 230-1994/AM2-1999)
- FC-PH-2, Revision 7.4 (ANSI INCITS 297-1997)
- FC-PH-3, Revision 9.4 (ANSI INCITS 303-1998)
- FC-PI, Revision 13 (ANSI INCITS 352-2002)
- FC-PI-2, Revision 10 (ANSI INCITS 404-2006)
- FC-PI-3, Revision 4 (ANSI INCITS 460-2011)
- FC-PI-4, Revision 8 (ANSI INCITS 450-2008)
- FC-PI-5, Revision 6 (ANSI INCITS 479-2011)
- FC-FS, Revision 1.9 (ANSI INCITS 373-2003)
- FC-FS-2, Revision 1.01 (ANSI INCITS 424-2007)
- FC-FS-2, Amendment 1 (ANSI INCITS 424-2007/AM1-2007)
- FC-FS-3, Revision 1.11 (ANSI INCITS 470-2011)
- FC-LS, Revision 1.62 (ANSI INCITS 433-2007)
- FC-L2-2, Revision 2.21 (ANSI INCITS 477-2011)
- FC-SW-2, Revision 5.3 (ANSI INCITS 355-2001)
- FC-SW-3, Revision 6.6 (ANSI INCITS 384-2004)
- FC-SW-4, Revision 7.5 (ANSI INCITS 418-2006)
- FC-SW-5, Revision 8.5 (ANSI INCITS 461-2010)
- FC-GS-3, Revision 7.01 (ANSI INCITS 348-2001)
- FC-GS-4, Revision 7.91 (ANSI INCITS 387-2004)
- FC-GS-5, Revision 8.51 (ANSI INCITS 427-2007)
- FC-GS-6, Revision 9.4 (ANSI INCITS 463-2010)
- FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003)
- FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006)
- FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008)
- FC-BB-5, Revision 2.0 (ANSI INCITS 462-2010)
- FCP, Revision 12 (ANSI INCITS 269-1996)
- FCP-2, Revision 8 (ANSI INCITS 350-2003)
- FCP-3, Revision 4 (ANSI INCITS 416-2006)
- FCP-4, Revision 2b (ANSI INCITS 481-2011)
- FC-SB-2, Revision 2.1 (ANSI INCITS 349-2001)
- FC-SB-3, Revision 1.6 (ANSI INCITS 374-2003)
- FC-SB-3, Amendment 1 (ANSI INCITS 374-2003/AM1-2007)
- FC-SB-4, Revision 3.0 (ANSI INCITS 466-2011)
- FC-VI, Revision 1.84 (ANSI INCITS 357-2002)
- FC-SP, Revision 1.8 (ANSI INCITS 426-2007)
- FC-SP-2, Revision 2.71 (ANSI INCITS 496-2012)
- FAIS, Revision 1.03 (ANSI INCITS 432-2007)
- FAIS-2, Revision 2.23 (ANSI INCITS 449-2008)
- FC-IFR, Revision 1.06 (ANSI INCITS 475-2011)
- FC-FLA, Revision 2.7 (INCITS TR-20-1998)
- FC-PLDA, Revision 2.1 (INCITS TR-19-1998)
- FC-Tape, Revision 1.17 (INCITS TR-24-1999)
- FC-MI, Revision 1.92 (INCITS TR-30-2002)
- FC-MI-2, Revision 2.6 (INCITS TR-39-2005)

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- FC-MI-3, Revision 1.03 (INCITS TR-48-2012)
- FC-DA, Revision 3.1 (INCITS TR-36-2004)
- FC-DA-2, Revision 1.06 (INCITS TR-49-2012)
- FC-MSQS, Revision 3.2 (INCITS TR-46-2011)
- IP over Fibre Channel (RFC 2625)
- IPv6, IPv4 and ARP over Fibre Channel (RFC 4338)
- Extensive IETF-standards based TCP/IP, SNMPv3, and Remote Monitoring (RMON) MIBs
- Class of Service:
  - Class 2
  - Class 3
  - Class F
- Fibre Channel standard port types:
  - E
  - F
  - FL
  - B
- Fibre Channel enhanced port types:
  - SD
  - ST
  - TE

## Protocols

- IP standards
  - RFC 791 IPv4
  - RFC 793, 1323 TCP
  - RFC 894 IP/Ethernet
  - RFC 1041 IP/802
  - RFC 792, 950, 1256 ICMP
  - RFC 1323 TCP performance enhancements
  - RFC 2338 VRRP
  - RFC 2460, 4291 IPv6
  - RFC 2463, 4443 ICMPv6
  - RFC 2461, 2462 IPv6 neighbor discovery and stateless auto-configuration
  - RFC 2464 IPv6/Ethernet
  - RFC 3270, 3980 iSCSI
  - RFC 3643, 3821 FCIP
- Ethernet standards
  - IEEE Std 802.3-2005 Ethernet
  - IEEE Std 802.1Q-2005 VLAN
  - IPsec
  - RFC 2401, 4301 security architecture for IP
  - RFC 2403, 2404 HMAC
  - RFC 2405, 2406, 2451, 4303 IP ESP
  - RFC 2407, 2408 ISAKMP
  - RFC 2412 OAKLEY Key Determination Protocol
  - RFC 3566, 3602, 3686 AES
- Internet Key Exchange (IKE)
  - RFC 2409 IKEv1
  - RFC 4306 IKEv2

## Features and functions

- Fabric services
  - Name server
  - Internet Storage Name Server (iSNS)
  - Registered State Change Notification (RSCN)
  - Login services
  - Fabric Configuration Server (FCS)

## Technical Specifications

- Public loop
- Broadcast
- In-order delivery
- Advanced Functionality (please note that some features require the optional MDS 9200 Enterprise Package license to be activated)
  - VSANs
  - Inter-VSAN Routing (IVR)
  - PortChannel with Multipath Load Balancing
  - QoS - flow-based, zone-based
  - FICON XRC (z/OS Global Mirror)
- Diagnostics and troubleshooting tools
  - Power-on-self-test (POST) diagnostics
  - Cisco Generic Online Diagnostics (GOLD)
  - Internal port loopbacks
  - SPAN and Remote SPAN
  - Fibre Channel Traceroute
  - Fibre Channel Ping
  - Fibre Channel Debug
  - Cisco Fabric Analyzer
  - Syslog
  - Online system health
  - Port-level statistics
  - Real Time Protocol Debug
- Network security (please note that some features require the optional MDS 9200 Enterprise Package license to be activated)
  - VSANs
  - Access Control Lists
  - Per-VSAN role-based access control
  - Fibre Channel Zoning
    - N\_Port WWN
    - N\_Port FC-ID
    - Fx\_Port WWN
    - Fx\_Port WWN and interface index
    - Fx\_Port domain ID and interface index
    - Fx\_Port domain ID and port number
  - iSCSI zoning
    - iSCSI name
    - IP address
  - Fibre Channel Security Protocol (FC-SP)
    - DH-CHAP switch-switch authentication
    - DH-CHAP host-switch authentication
  - Port Security and Fabric Binding
  - IPsec for FCIP and iSCSI
  - IKEv1 and IKEv2
  - Management access
    - SSH v2 implementing AES
    - SNMPv3 implementing AES
  - SFTP
- Serviceability
  - Configuration file management
  - No disruptive software upgrades for Fibre Channel interfaces
  - Cisco Call Home
  - Power-management LEDs
  - Port beaconing
  - System LED
  - SNMP traps for alerts

## Technical Specifications

- Network boot

### Performance

- Port speed: 16/8-Gbps auto-sensing, optionally configurable
- Buffer credits:
  - 64 per port (shared-mode ports)
  - Up to 256 per port (dedicated-mode ports with optional MDS 9200Enterprise Package license activated)
- Ports per chassis:
  - 20 to 40 16/8-Gbps Fibre Channel ports and 10 ports of 10-Gbps Ethernet
- Ports per rack:
  - Up to 1050
- Port Channel:
  - Up to sixteen physical links
- FCIP tunnels:
  - Up to 6 per port

### Cards, ports, slots

Base:	Fixed configuration with 40 auto-sensing 16/8-Gbps Fibre Channel ports, 10 10-Gb Ethernet ports
Expansion:	n/a

### Network Management

Please note that some services require the optional MDS 9200 Enterprise Package license

- Access methods
  - Out-of-band 10/100 Gigabit Ethernet port
  - RS-232 serial console port
  - In-band IP-over-Fibre Channel
  - In-band FICON CUP over Fibre Channel
- Access protocols
  - CLI-via console and Ethernet ports
  - SNMPv3-via Ethernet port and in-band IP-over-Fibre Channel access
  - Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S)
  - FICON CUP
- Distributed Device Alias service
- Network security
  - Per-VSAN role-based access control using RADIUS and TACACS+ based authentication, authorization, and accounting (AAA) functions
  - SFTP
  - SSH v2 implementing AES
  - SNMPv3 implementing AES
- Management applications
  - Cisco MDS 9000 Family CLI
  - Cisco Prime DCNM
  - Cisco Device Manager
- CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)

### Reliability and Availability

- Hot-swappable, 1+1 redundant power supplies
- Hot-swappable fan tray with integrated temperature and power management
- Hot-swappable SFP optics
- Hot-swappable switching module
- Stateful process restart
- Any module, any port configuration for PortChannels
- Fabric-based multipathing
- Per-VSAN fabric services
- Port tracking

## Technical Specifications

- Passive backplane
- Virtual Router Redundancy Protocol (VRRP) for management and FCIP or iSCSI connections
- Online diagnostics

### Programming Interfaces

- Scriptable CLI
- Cisco Prime DCNM
- Cisco Device Manager GUI

### Approvals and Compliance

- Safety compliance:
  - CE Marking
  - UL 60950
  - CAN/CSA-C22.2 No. 60950
  - EN 60950
  - IEC 60950
  - TS 001
  - AS/NZS 3260
  - IEC60825
  - EN60825
  - 21 CFR 1040
- EMC compliance
  - FCC Part 15 (FR 47) Class A
  - ICES-003 Class A
  - EN 55022 Class A
  - CISPR 22 Class A
  - AS/NZS 3548 Class A
  - VCCI Class A
  - EN 55024
  - EN 50082-1
  - EN 61000-6-1
  - EN 61000-3-2
  - EN 61000-3-3
- FIPS
  - 140-2 Level 3 (for Multiservice FIPS Module - DS-X9304-18FK)

### Power and Cooling

- Power supply (300W AC)
  - AC input characteristics
    - 100 to 240 VAC (10% range)
    - 50-60Hz (nominal)
- Airflow:
  - 200 linear feet per minute (lfm) through system fan assembly
  - Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4 cm) between walls and the chassis air vents and a minimum separation of 6 inches (15.2 cm) between two chassis to prevent overheating.

### Environmental

Temperature, ambient operating	32° to 104° F (0° to 40° C)
Temperature, ambient non-operating and storage	40°F to 158° F (-40°C to 75° C)
Relative humidity, ambient (non-condensing) operating	10% to 90%
Relative humidity, ambient (non-condensing) non-	10% to 95%

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## Technical Specifications

operating and storage

Altitude, operating -197 to 6500 feet (-60 to 2000 meter)

**Dimensions** (HxWxD)

3.84 x 17.22 x 21.4 in (9.75 x 43.74 x 54.36 cm)

2 Rack Units (RU)

All units rack mountable in standard 19 inch EIA rack

Weight of Fully configured chassis: 22.4 lb (10.2 kg)

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## Summary of Changes

Date	Version History	Action	Description of Change
18-Nov-2016	From Version 6 to 7	Changed	Removed references to SN8000C 8Gb Directors as products are, now, obsolete. Updated some urls and content where software licenses are required.
08-Apr-2016	From Version 5 to 6	Changed	Removed references to MDS 8Gb Fabric Switch for HP BladeSystem as products are, now, obsolete. Also, updated Spock url.
21-Aug-2015	From Version 4 to 5	Changed	Added FICON support for SN6500C (MDS 9250i) switch with NX-OS 6.2(11c) firmware. Removed SN6000C switches due to be obsolete Sep'15.
20-Feb-2015	From Version 3 to 4	Changed	Removed MDS9222i as obsolete, included Spock info, fixed typo.
05-Dec-2014	From Version 2 to 3	Changed	Changes made to the Configuration Info and Products Highlights Sections.
26-Sep-2014	From Version 1 to 2	Changed	Changes made thought all QuickSpecs



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