

Overview

The HP MDS 9222i MultiService Fabric Switch brings the most flexible storage networking capability available in the fabric switch market today. Sharing a consistent architecture with the MDS 9500 (SN8000C) and MDS 9700 (SN8500C) Directors, the HP MDS 9222i integrates both Fibre Channel and IP Storage Services in a single system to allow maximum flexibility in user configurations. With eighteen 4-Gbps Fibre Channel ports, four Gigabit Ethernet IP Storage Services ports, a four port FCIP software license and an open modular expansion slot that can be used to connect an additional forty-eight ports of 8-Gbps or 4-Gbps Fibre Channel or even four 10-Gb Fibre Channel ports for Inter-Switch Links, the HP MDS 9222i 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.



HP MDS 9222i MultiService Fabric Switch

Key Features and Benefits

- Integrated Fibre Channel and IP Storage Services in a single optimized form factor:
 - Supports eighteen 4-Gbps Fibre Channel interfaces for high performance storage area network (SAN) connectivity plus four Gigabit Ethernet ports for Fibre Channel over IP (FCIP) and Small Computer System Interface over IP (iSCSI) storage services plus an on-board crypto processing engine to encrypt data transported over IP networks or to be stored on tape.
- Industry's highest-performance Inter-Switch Links (ISLs):
 - Supports up to sixteen 4 or 8-Gbps or 4, 10-Gbps Fibre Channel links in a single PortChannel.
 - Links may span any like speed ports on any module within a chassis for added scalability and resilience.
 - Up to 4095 buffer-to-buffer credits can be assigned to a single Fibre Channel port to extend storage networks over unprecedented 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 hardware-assisted data encryption and key management.
- Sophisticated diagnostics:

Overview

- 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:
 - The HP MDS 9222i provides an open platform for hosting intelligent storage services such as network-based virtualization and replication.
 - Storage services modules can be installed in the HP MDS 9222i chassis to provide scalable, distributed application intelligence in the fabric.
- 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, hardware-based encryption, FCIP Write Acceleration, and FCIP Tape Acceleration.
 - Enhanced hardware-based FCIP compression performance for both high-bandwidth and low-bandwidth links. The MDS 9222i achieves a compression ratio of up to 43:1, with typical ratios of 4:1.
 - FCIP Services Software License is included for the 4 Gigabit Ethernet ports included with the MDS 9222i base unit.
- 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

FCIP for remote SAN Extensions

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. The HP MDS 9222i 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.

Advanced FCIP Features to Facilitate Business Continuance and Disaster Recovery

The HP MDS 9222i 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 Inter-VSAN Routing (IVR), hardware-assisted FCIP compression and encryption, FCIP Write Acceleration, and FCIP Tape Acceleration.

VSANs and IVR Enhance SAN Security and Stability

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. The HP MDS 9222i 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.

High Performance SAN Extension with Compression and FCIP Write Acceleration

The HP MDS 9222i supports hardware-based FCIP compression to maximize the effective WAN bandwidth of SAN extension solutions. The HP MDS 9222i achieves up to a 43:1 compression ratio, with typical ratios of 4:1 over a wide variety of data sources. The HP MDS 9222i also supports FCIP Write Acceleration, a feature that can significantly improve application performance when storage traffic is extended across distance. When FCIP Write Acceleration is enabled, WAN throughput is optimized by reducing the latency of command acknowledgements. Similarly, the HP MDS 9222i supports FCIP Tape Acceleration, which significantly improves throughput over WAN links for remote tape backup operations.

Advanced Traffic Management for High-Performance, Resilient Fabrics

- Virtual Output Queuing ensures line rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- Up to 4095 buffer-to-buffer credits can be assigned to an individual port for optimal bandwidth utilization across long distances.
- 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.
- 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.
- Quality of service can be used to manage bandwidth and control latency in order to prioritize critical traffic.
- 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.

Product Highlights

Industry's Most Advanced Diagnostics and Troubleshooting Tools

The HP 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. The HP MDS 9222i 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.

Comprehensive Solution for Robust Network Security

The HP MDS 9222i offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The HP MDS 9222i 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

The HP MDS 9222i 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. The HP MDS 9222i 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 MDS 9222i is an integral component of the HP 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.

QuickSpecs

HP MDS 9222i MultiService Fabric Switch

Product Highlights

Product Family Models

- HP StoreFabric SN8500C 8-slot 16Gb FC Director
 - Intelligent, multi-protocol 8-slot Director with up to 384 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 384 ports of full 16Gbps line-rate performance across all ports.
- HP SN8000C 13-Slot Supervisor 2A Fabric3 Director
 - Intelligent, multi-protocol 13-slot Director with up to 528 Auto-Sensing 8/4/2 Gb Fibre Channel ports in a single chassis. Also, the 32-port 8Gb Advanced Fibre Channel modules and the included Fabric 3 modules provide up to 352 ports of full 8Gbps line-rate performance across all ports.
- HP SN8000C 9-Slot Supervisor 2A Director
 - Intelligent, multi-protocol 9-slot Director with up to 336 Auto-Sensing 8/4/2 Gb Fibre Channel ports
- HP SN8000C 6-Slot Supervisor 2A Director
 - Intelligent, multi-protocol 6-slot Director with up to 192 Auto-Sensing 8/4/2 Gb Fibre Channel ports
- HP MDS 9222i Multilayer Fabric Switch
 - Intelligent, multi-protocol modular Fabric Switch with eighteen fixed 4Gb Fibre Channel ports, four fixed 1Gb Ethernet ports, a four port FCIP software license and an open modular expansion slot for up to forty-eight 48 additional Fibre Channel ports or 10Gb Fibre Channel ports for Inter-Switch Links
- HP SN6000C 8Gb Fabric Switch
 - With up to 48 Auto-Sensing 8/4/2 Gb Fibre Channel ports
 - "Pay as you grow" scalability starting at 16 ports
- Cisco MDS 8Gb Fabric Switch for HP BladeSystem c-Class
 - With up to 24 Auto-Sensing 8/4/2 Gb Fibre Channel ports
 - "Pay as you grow" scalability starting at 12 ports

Software Components, Standard

NX-OS

HP MDS9222i includes the HP MDS 9000 NX-OS Software operating system version 5.2(1) or higher with a complete set of security features, Cisco Data Center Network Manager, a full suite of configuration, maintenance and diagnostics tools. It also includes VSAN support, PortChannels, extended fabrics, per VSAN-based access control, hardware-enforced zoning, Port Security and Host/Switch Authentication (DH-CHAP), RADIUS and TACACS+ and Advanced Encryption Standard (AES) 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.

Product Highlights

Software Components, Optional

HP 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. MDS9222i) 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.
HP MDS 9200 Enterprise Package	HP 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 HP MDS 9200 Enterprise Package License to Use (LTU).
Cisco MDS 9000 Family Mainframe Package	The Cisco MDS 9000 Family Mainframe Package is a comprehensive collection of features required for using the HP MDS9222i 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).
HP MDS 9200 MPS 18/4 FCIP Module LTU (only required when optional AG852B module is used for FCIP)	This License is required to use FC over IP with an optional 18/4 module on an MDS 9222i switch. This License is not required to use the embedded IP ports in an MDS9222i switch. Those ports are already enabled and the License is included with the switch.

 Service and Support and Warranty Information
Warranty

(2-2-2) Hardware Warranty - Hardware Warranty - Two-year on-site warranty, 24x7, 4-hour remote 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.

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

Service and Support**Services to accelerate time to results**

HP Storage Services bring you a rich portfolio of consulting and support services designed to add value to our core storage products and solutions. We have the know-how and experience to put storage 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 optimize your enterprise.

Choose from services aligned to our storage product offerings and lifecycle. From mission-critical onsite services to innovative web-based remote support, you choose the precise level of attention and support your business demands.

Discover, plan, and design Choose from a rich portfolio of services to make the most of your HP MDS9222i Multiservice Fabric Switch so you can efficiently and affordably consolidate, manage, and extract value from unstructured data.

HP Services can help you discover needs and create a plan for simplifying the environment, reducing risk, and maximizing your storage investments

HP Storage Efficiency Analysis - The HP Storage Efficiency Analysis provides customers with a view of their storage infrastructure and operating environment; highlighting recommendations for improvements. The report provides extensive insight about the existing storage environment, opportunities for efficiency gains, asset aging and replacement through interaction with key decision makers.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-6727ENW.pdf>

HP Storage Impact Analysis (SIA): The HP Storage Impact Analysis service provides a 2-4 week discovery engagement with executive summary presentation. The goal of this service is to help provide customers guidance on storage related issues and develop remediation plans.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA4-1174ENW.pdf>

Service and Support and Warranty Information

HP Storage Modernization Service: The HP Storage Modernization service is a 4-6 week service that defines the customer's envisioned target storage environment based on a proven solution design methodology. HP architects will quickly perform tool-assisted automatic discovery and facilitate a two-day strategy workshop with all key stakeholders involved in the storage infrastructure initiative
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-4620ENW.pdf>

Deploy and integrate

We can help you configure, set up, and efficiently use your HP MDS9222i Multiservice Fabric Switch as well as help migrate data, improve capacity utilization, and establish information management standards used across backup, replication, and archiving needs.

HP Enhanced Implementation Service for SANs - Select this service for complete design and implementation support for Fibre Channel, FCoE, FCIP, SAS, and iSCSI SAN connectivity components.
<http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-8527ENW.pdf>

HP Storage Data Migration Services - End-to-end data migration service providing seamless discovery, assessment, planning, and design, completely customizable to your organization's storage area network or network attached storage environment and using innovative software to help you migrate to HP storage quickly and efficiently.
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-0774ENW.pdf>

HP Storage and Data Consultant Residency Service - Strategic augmentation of your current environment with HP resources who become your trusted advisor to provide answers that are right for your storage and backup environment.
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-9481ENW.pdf>

HP Proactive Select - A flexible way to purchase services to fit your environment with an extensive menu of HP Proactive Select event and technical services, such as onsite firmware upgrades, health checks, assessments, and education.
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENW.pdf>

Choose from three levels of operate and support care

Optimized Care - Delivers the highest levels of performance and stability through deployment and proactive management practices

HP Proactive Care 24x7-Plus, 20 credits per year

Additional options -HP Proactive Care Personalized Support (once per Proactive Care support new environment), an additional day of HP Personalized Support, and 10 additional HP Proactive Select credits per year

Service and Support and Warranty Information

Basic Care - Minimum recommended support**HP Foundation Care 24x7**

Additional options - 10 HP Proactive Select credits per year

For more information

www.hp.com/services/storage

To learn more on HP Storage Services, please contact your HP sales representative or HP Authorized Channel Partner

HP Care Pack Services are sold by HP and HP Authorized Service Partners:

- Services for customers purchasing from HP or an enterprise reseller are quoted using HP order configuration tools.

Customers purchasing from a commercial reseller can find HP Care Pack Services at

www.hp.com/go/lookuptool

QuickSpecs

HP MDS 9222i MultiService Fabric Switch

Family Information

	HP StoreFabric SN8500C 8-slot 16Gb FC Director	HP SN8000C 13-Slot Supervisor 2A Fabric3 Director	SN8000C 9-Slot Director w/ Dual Supervisor 2A	SN8000C 6-Slot Director w/Dual Supervisor 2A	SN6000C 8Gb Fabric Switch	Cisco MDS 8Gb Fabric Switch for HP BladeSystem c-Class	HP MDS 9222i
Introduction Date	August 2013	May 2012	May 2011	May 2011	June 2010	November 2010	November 2007
Switch Type	Multilayer Director	Multilayer Director	Multilayer Director	Multilayer Director	Multilayer Fabric Switch	Embedded Fabric Switch	Multilayer Fabric Switch
Maximum ports	384 Fibre Channel	528 Fibre Channel, 44 IP ports	336 Fibre Channel, 28 IP ports	192 Fibre Channel, 16 IP ports	Up to 48 Fibre Channel ports	16 Internal, 8 auto-sensing 8/4/2 Gb Fibre Channel ports	18 fixed auto-sensing 4/2/1 Gbps Fibre Channel ports, 4 1Gb Ethernet ports
Number of slots per chassis	Eight	Thirteen	Nine	Six	N/A, Fixed FRU	N/A, Fixed FRU	Two, One fixed

QuickSpecs

HP MDS 9222i MultiService Fabric Switch

Configuration Information

Step 1 – Base Configuration

Select one:

Model	Model Description	Part Number
HP MDS 9222i w/o SFP Fabric Switch	HP MDS 9222i	AG851B

Step 2 – Options

Model Description

Fibre Channel Port Expansion Modules

	Quantity	Part Number
MDS 9000 8Gb FC SFP+ Short Range Transceiver		AJ906A
MDS 9000 8Gb FC SFP+ Long Range Transceiver		AJ907A
HP MDS 9000 18/4 Multiservice Module	1 Max	AG852B
HP MDS 9000 4Gb FC SFP, 4 pack, Short Range XCVR		AE379A
HP MDS 9000 4Gb FC SFP, Long Wave XCVR		AE380A
Cisco MDS 9000 32-Port Storage Service Module	1 Max	AE378B
1GB Ethernet & 1-2Gb FC short wave SFP, LC		A7487A

Optional Software

HP StoreFabric SN6500C Data Center Network Manager LTU		TC365A
HP MDS 9200 MPS 18/4 FCIP Module LTU (only required when optional AG852B module is used for FCIP)		T5412A
HP MDS 9200 Enterprise Package LTU		A7516A
Cisco MDS 9200 Mainframe FICON Security License To Use (LTU)		T4408A

NOTE: Required for each Switch used for FICON
Plus prerequisite [HP C&I Service HA546A1](#)

NOTE: For XP Array configurations only, plus [HP Services Installation and Startup Statement of Work](#) is required

Installation Service

Cisco MDS 9222i Installation Service		HA113A1#5D2
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Step 3 - Additional Options

Recommended Cables

HP PremierFlex OM4+ Fiber Optic Cables

	Part Number
HP Premier Flex MPO/MPO OM4 8f 10m Cbl	QK729A
HP Premier Flex MPO/MPO OM4 12f 50m Cbl	QK731A
HP Premier Flex LC/LC OM4 2f 1m Cbl	QK732A
HP Premier Flex LC/LC OM4 2f 2m Cbl	QK733A
HP Premier Flex LC/LC OM4 2f 5m Cbl	QK734A
HP Premier Flex LC/LC OM4 2f 15m Cbl	QK735A
HP Premier Flex LC/LC OM4 2f 30m Cbl	QK736A
HP Premier Flex LC/LC OM4 2f 50m Cbl	QK737A



QuickSpecs

HP MDS 9222i MultiService Fabric Switch

Configuration Information

HP 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 5.2(1) 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)
- 10GFC, Revision 4.0 (ANSI INCITS 364-2003)
- 10GFC, Amendment 1 (ANSI INCITS 364-2003/AM1-2007)
- 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-LS, Revision 1.62 (ANSI INCITS 433-2007)
- FC-AL, Revision 4.5 (ANSI INCITS 272-1996)
- FC-AL-2, Revision 7.0 (ANSI INCITS 332-1999)
- FC-AL-2, Amendment 1 (ANSI INCITS 332-1999/AM1-2003)
- FC-AL-2, Amendment 2 (ANSI INCITS 332-1999/AM2-2006)
- 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-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-BB, Revision 4.7 (ANSI INCITS 342-2001)
- FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003)
- FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006)
- FCP, Revision 12 (ANSI INCITS 269-1996)
- FCP-2, Revision 8 (ANSI INCITS 350-2003)
- FCP-3, Revision 4 (ANSI INCITS 416-2006)
- 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-VI, Revision 1.84 (ANSI INCITS 357-2002)
- FC-SP, Revision 1.8 (ANSI INCITS 426-2007)
- FAIS, Revision 1.03 (ANSI INCITS 432-2007)
- 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)
- FC-DA, Revision 3.1 (INCITS TR-36-2004)
- 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

Technical Specifications

- Class 3
- Class F
- Fibre Channel standard port types:
 - E
 - F
 - FL
 - B
- Fibre Channel enhanced port types:
 - SD
 - ST
 - TE
 - TL

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)
 - Public loop
 - Broadcast
 - In-order delivery
- Advanced Functionality
 - VSANs
 - Inter-VSAN Routing

Technical Specifications

- PortChannel with Multipath Load Balancing
- QoS - flow-based, zone-based
- Fibre Channel Congestion Control
- Extended Buffer-To-Buffer Credits
- Diagnostics and troubleshooting tools
 - Power-on-self-test (POST) diagnostics
 - Online diagnostics
 - 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
 - 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
 - LUN
 - Read-only
 - Broadcast
 - 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
 - Nondisruptive software upgrades for Fibre Channel interfaces
 - Call Home
 - Power-management LEDs
 - Port beaconing
 - System LED

Technical Specifications

Performance

- SNMP traps for alerts
- Network boot
- Port speed: 4/2/1-Gbps auto-sensing, optionally configurable
- Buffer credits:
 - 16 per port (shared-mode ports)
 - Up to 250 per port (dedicated-mode ports)
 - Up to 4095 on an individual port (dedicated-mode ports with optional MDS 9000 Family Enterprise Package license activated)
- Ports per chassis:
 - 18 to 66 4/ 2/1-Gbps Fibre Channel ports, up to Twelve 1-Gbps Ethernet ports
- Ports per rack:
 - Up to 980
- Port Channel:
 - Up to sixteen physical links
- FCIP tunnels:
 - Up to 3 per port

Cards, ports, slots

Base: 18 fixed auto-sensing 4/2/1-Gbps Fibre Channel ports, 4 1-Gb Ethernet ports
 Expansion: 1 empty expansion slot

Network Management

- Access methods
 - Out-of-band 10/100 Ethernet port
 - RS-232 serial console port
 - In-band IP-over-Fibre Channel
 - DB-9 COM port
- Access protocols
 - CLI-via console and Ethernet ports
 - SNMPv3-via Ethernet port and in-band IP-over-Fibre Channel access
- 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 Fabric Manager
 - 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
- Passive backplane

Technical Specifications

	<ul style="list-style-type: none"> ● Virtual Router Redundancy Protocol (VRRP) for management and FCIP or iSCSI connections ● Online diagnostics
Programming Interfaces	<ul style="list-style-type: none"> ● Scriptable CLI ● Fabric Manager GUI ● Device Manager GU
Approvals and Compliance	<ul style="list-style-type: none"> ● Safety compliance: <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 140-2 Level 3 (for Multiservice FIPS Module - DS-X9304-18FK)
Power and Cooling	<ul style="list-style-type: none"> ● Power supply (845W AC) <ul style="list-style-type: none"> ○ AC input characteristics <ul style="list-style-type: none"> ■ 100 to 240 VAC (10% range) ■ 50-60Hz (nominal) ● Airflow: <ul style="list-style-type: none"> ○ 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	<p>Temperature, ambient operating 32° to 104° F (0° to 40° C)</p> <p>Temperature, ambient non-operating and storage 40°F to 158° F (-40°C to 75° C)</p> <p>Relative humidity, ambient (non-condensing) operating 10% to 90%</p> <p>Relative humidity, ambient (non-condensing) non-operating and storage 10% to 95%</p>

QuickSpecs

HP MDS 9222i MultiService Fabric Switch

Technical Specifications

	Altitude, operating	-197 to 6500 feet (-60 to 2000 meter)
Dimensions (HxWxD)		5.25 x 17.32 x 22.66 in (13.34 x 43.99 x 57.56 cm)
		3 Rack Units (RU)
		All units rack mountable in standard 19 inch EIA rack
		Weight of Fully configured chassis with optional Multiprotocol Service Module: 62 lb (28.2 kg)

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