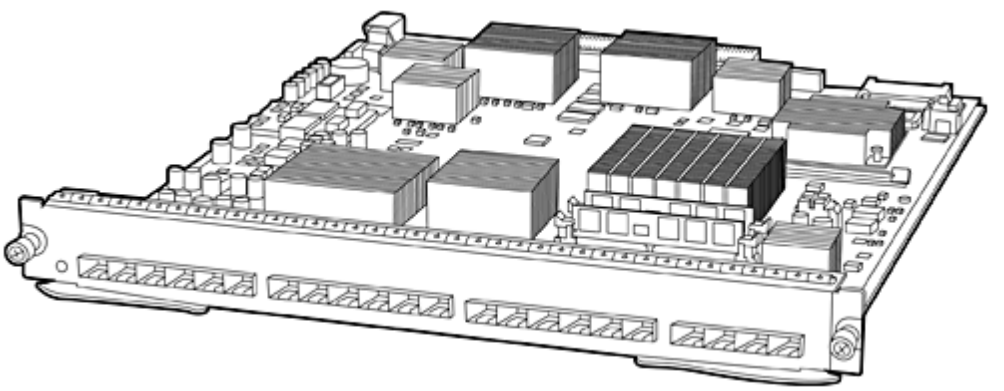
*Overview*

The Cisco MDS 9000 18/4-port Multiservice Module is optimized for deployment in high-performance storage area network extension solutions, distributed intelligent fabric services, as well as cost-effective IP storage and mainframe connectivity in enterprise storage networks. Natively integrating support for intelligent fabric applications, the Cisco MDS 9000 Family 18/4-Port Multiservice Module provides a platform for distributed fabric services. The Cisco MDS 9000 Family 18/4-Port Multiservice Module transparently offers such advanced functions to devices connected to the fabric; facilitating ease of deployment, scalability, and high availability. With eighteen 4-Gbps Fibre Channel ports, four, 1 Gigabit Ethernet IP Storage Services ports, and FCIP software license the MDS 9000 18/4 module easily adds ports and functionality to a MDS 9200 family switch or MDS 9500 Family Director. The Cisco MDS 9000 18/4 is ideally suited for enterprise storage networks that require high performance SAN extension or cost-effective IP Storage connectivity for applications such as Business Continuity and iSCSI host attachment to Fibre Channel storage devices.



## Key Features and Benefits

- Integrated Fibre Channel and IP Storage Services in an optimized form factor:
  - Supports eighteen 4-Gbps Fibre Channel interfaces for high performance storage area network (SAN) connectivity and four Gigabit Ethernet ports for Fibre Channel over IP (FCIP) and Small Computer System Interface over IP (iSCSI) storage services.
- Industry's highest-performance Inter-Switch Links (ISLs):
  - Supports up to sixteen 4-Gbps or 4, 10-Gbps Fibre Channel links in a single PortChannel.
  - Links may span any port 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 vast 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
  - FIPS 140-2, level 2 certification
- 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.
- 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 Cisco MDS 9000 18/4 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, hardware-based encryption, FCIP Write Acceleration, and FCIP Tape Acceleration.
  - Enhanced hardware-based FCIP compression performance for both high-bandwidth and low-bandwidth links.
  - FCIP Services Software License is included for the 4 Gigabit Ethernet ports included with the MDS 9000 18/4 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 Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 supports hardware-based FCIP compression to maximize the effective WAN bandwidth of SAN extension solutions. The Cisco MDS 9000 18/4 achieves up to a 43:1 compression ratio, with typical ratios of 4:1 over a wide variety of data sources. The Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 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 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. The Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The Cisco MDS 9000 18/4 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.

**Encryption**

The MDS 9000 18/4 MultiService Module protects data using secure IEEE-standard AES algorithms. Encryption has become an important feature for an Extended SAN environment where data is transmitted over an IP network. The 18/4 MultiService module enables data to be compressed, encrypted, and authenticated for secure management of data in flight.

**FIPS 140-2 Level 2 Compliant**

The FIPS standard is an information technology security accreditation program for cryptographic modules produced by private-sector vendors who seek to have their products certified for use in government departments and regulated industries (such as financial and health-care institutions) that collect, store, transfer, share, and disseminate sensitive but unclassified (SBU) information.

**Ease of Management**

The Cisco MDS 9000 18/4 presents a consistent, logical CLI. Adhering to the syntax of widely known Cisco IOS® Software CLI, the Cisco MDS 9000 Family CLI is easy to learn and delivers broad management capability. The Cisco MDS 9000 Family CLI is an extremely efficient and direct interface designed to provide optimal functionality to administrators in enterprise environments.

Cisco Fabric Manager is a responsive, easy-to-use Java application that simplifies management across multiple switches and fabrics. Cisco Fabric Manager enables administrators to perform vital tasks such as topology discovery, fabric configuration and verification, provisioning, monitoring, and fault resolution. All functions are available through a secure interface, enabling remote management from any location.

Cisco Fabric Manager may be used independently or in conjunction with the optional Cisco Fabric Manager Server and other HP management applications such as HP OpenView and HP Storage Essentials. Cisco MDS SAN-OS also provides an extensive API for integration with third-party and user developed management tools.

*Product Highlights*

**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 Cisco MDS 9000 18/4 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 Cisco MDS 9000 18/4 is an integral component of the Cisco 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**

- Cisco MDS 9500 Supervisor 2 Module
  - Enables high-performance, intelligent, resilient, scalable, and secure multilayer SAN switching solutions in the MDS 9500 Director family
- Cisco MDS 9000 12/24/48 port 4 Gb Fibre Channel Module
  - Up to 48, 4 Gb auto-sensing Fibre Channel ports to increase port density for unparalleled performance and value
- Cisco MDS 9000 4 port 10 Gb Fibre Channel Module
  - Uncompromising performance with 10 Gb link bandwidth, 80 Gb continuous aggregate bandwidth per module
- Cisco MDS 9000 32 port Storage Service Module
  - 32 Fibre Channel port module supports Intelligent Fabric Applications from Hewlett-Packard and others

## Software Components, Standard

**SAN-OS**

Cisco MDS 9000 SAN-OS delivers numerous advanced storage networking capabilities for the Cisco MDS 9000 Family of Multiprotocol Services Modules.

**Cisco Fabric Manager**

Cisco Fabric Manager is a responsive, easy-to-use Java application that simplifies management across multiple switches and fabrics. Cisco Fabric 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 Fabric 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.

## Software Components, Optional

**Cisco Fabric Manager Server Package**

The "Standard" Cisco Fabric Manager software that is included at no charge with the MDS family switches provides basic switch configuration and troubleshooting capabilities. The Cisco Fabric Manager Server (FMS) Package extends Cisco Fabric Manager by providing historical performance data collection for network traffic hot-spot analysis, centralized management services and advanced application integration.

**Cisco Enterprise Package**

Cisco 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 Cisco MDS 9000 Enterprise Package.

**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 and maintenance information, click the links below:
http://h18005.www1.hp.com/services/carepaq/us/install/
http://h18005.www1.hp.com/services/carepaq/us/hardware/.
NOTE: Certain restrictions and exclusions apply. Consult the Customer Support Center for details.
NOTE: Hardware or Software product installation is not included in the warranty, but is available and highly recommended.

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**HP Service & Warranty Support**

HP Service & Warranty Support Additional Warranty protection and/or HP Installation packages can be purchased.
NOTE: Certain restrictions and exclusions apply. Consult the Customer Support Center for details. HP provides a one-year, hardware limited warranty, fully supported by a worldwide network of resellers and service providers.

In addition, available service offerings include a full range of HP Care Pack packaged hardware and software services:

- Installation
- Extended coverage hours and enhanced response times
- System management and performance services

For more information on warranty and support options, please visit our Web site at:
http://www.hp.com/hps/tech/storage/supp/.

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**Software Product Services**

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: Certain restrictions and exclusions apply. Consult the Customer Support Center for details.
NOTE: Hardware or Software product installation is not included in the warranty, but is available and highly recommended.

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*Service and Support and Warranty Information*

**HP Care Pack Services**

HP Care Pack Services offer upgraded service levels to extend and expand your standard product warranty with easy-to-buy, easy-to-use support packages that help you make the most of your hardware and software investments. They let you choose the support levels that meet your business requirements, from basic to mission-critical. They help you contain total cost of ownership.

HP Care Pack warranty extensions can be purchased along with HP products to cost-effectively upgrade or extend your warranty. For many products, post-warranty HP Care Pack Services are available when your original warranty has expired. For more information on these services, contact your local HP sales representative or visit: http://www.hp.com/services/storage_carepacks

HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.

- HP Care Pack is not available for less than the product's warranty duration.
- HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required.
- HP Care Pack services are prepaid.

**Additional HP support services**

HP Services provides a broad spectrum of services to commercial and enterprise customers, including performance and availability services such as proactive mission-critical services, as well as support management services for deployment of the entire IT infrastructure, including HP and multivendor environments. For more information on these services, contact your HP sales representative or visit: http://www.hp.com/hps/storage

**Education services**

HP offers a variety of training methods to fit your needs including traditional instructor-led courses at one of our 120 training centers worldwide, onsite training customized to your needs, in your facility, or even Remotely Assisted Instruction Learning that combines the best of traditional classroom training (including its live instructor and labs) with the best of online training (no traveling required). And if you like learning on your own schedule, at your own pace, make use of e-learning opportunities on the award-winning HP IT Resource Center, a "learning community" with extensive on-demand resources that can be accessed 24x7. For more information on these services, contact your HP sales representative or visit: http://www.hp.com/learn and click on "HP StorageWorks".

**Financial services**

HP Financial Services provides innovative financing and financial asset management programs to help customers cost-effectively acquire, manage, and ultimately retire their HP solutions. For more information on these services, please contact your HP sales representative or visit: http://www.hp.com/go/hpfinancialservices

| | Cisco MDS 9000 12/24/48 port 4 Gb Fibre Channel | Cisco MDS 9000 4 port 10 Gb Fibre Channel | Cisco MDS 9000 Storage Service Module | Cisco MDS 9000 Supervisor 2 | Cisco MDS 9000 8-port IP Services Module | MDS 14/2 Multiprotocol Services Module |
|---|---|---|---|---|---|---|
| Introduction Date | February 2006 | February 2006 | Feburary2006 | March 2007 | November 2004 | November 2005 |
| Module Type | 4Gb FC Service | 10Gb FC Service | FC and Intelligent Storage Services | Supervisor | Multiprotocol IP iSCSI and FCIP Services | 2Gb FC, Multiprotocol iSCSI and FCIP |
| Maximum ports | 12,24, or 48 Fibre Channel | 4 Fibre Channel | 32 2Gb Fibre Channel | N/A | 8 IP | 14 FC, 2 IP |

## Step 1 – Base Configuration

Select one:

| Model | Model Description | Part Number |
|---|---|---|
| HP Cisco MDS 18 FC plus 4 IP Ports Multiservice Module w/0 SFPs | Cisco MDS 9000 18/4 Multiservice Module | AG852A |

## Step 2 - Options

| Model Description | Quantity | Part Number |
|---|---|---|
| *Optical Transceivers* | | |
| Cisco MDS9000 4Gb FC SFP 4pk 500m XCVR | | AE379A |
| Cisco MDS9000 4Gb FC SFP 4KM Transceiver | | AE494A |
| Cisco MDS9000 4Gb FC SFP Long Wave XCVR | | AE380A |
| 1GB Ethernet & 1-2Gb FC short wave SFP, LC | | A7487A |
| 1GB Ethernet & 1-2Gb FC long wave SFP, LC | | A7488A |
| *Optional Software* | | |
| HP MDS 9200 MPS 18/4 FCIP Module LTU | | T5412A |
| HP MDS 9500 MPS 18/4 FCIP Module LTU | | T5413A |
| *Installation Service* | | |
| Cisco MDS 9000 18/4 Installation Service | | HA113A1#5D2 |

## Accessories

| Optical Cables | Part Number |
|---|---|
| (LC-LC for between two 2 Gb devices) | |
| 2 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B21 |
| 5 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B22 |
| 15 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B23 |
| 30 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B26 |
| 50 m LC-LC Multi-Mode Fibre Channel Cable | 221692-B27 |
| (LC-SC for between a 1 Gb and a 2 Gb device) | |
| FC Cable LC/SC 1 Meter | A7485A |
| FC Cable LC/SC 5 Meter | A7486A |
| 2 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B21 |
| 5 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B22 |
| 15 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B23 |
| 30 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B26 |
| 50 m LC-SC Multi-Mode Fibre Channel Cable | 221691-B27 |

**O/S Support** Cisco MDS 9000 SAN-OS Release 3.2(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
  - 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
  - PortChannel with Multipath Load Balancing
  - QoS - flow-based, zone-based
  - Fibre Channel Congestion Control
  - FCIP Write Acceleration
  - FCIP Tape Read and Write Acceleration
- 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
- FICON
  - FC-SB-3 compliant
  - Cascaded FICON fabrics
  - Intermix of FICON and Fibre Channel Protocol traffic
  - CUP management interface
- Serviceability
  - Configuration file management
  - Nondisruptive software upgrades for Fibre Channel interfaces
  - Call Home
  - Power-management LEDs
  - Port beaconing
  - System LED
  - SNMP traps for alerts
  - Network boot

*Technical Specifications*

**Performance**

- 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)
- Port Channel:
  - Up to sixteen physical links
- FCIP tunnels:
  - Up to 3 per port

**Cards, ports, slots**

Module: 18 fixed auto-sensing 4/2/1-Gbps Fibre Channel ports, 4 1-Gb Ethernet ports

**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
  - 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 Fabric Manager
  - Cisco Device Manager
  - CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)
- CiscoWorks Resource Manager Essentials(RME) and Device Fault Manager (DFM)

**Reliability and Availability**

- Hot-swappable module
- Hot-swappable SFP optics
- Stateful process restart
- Any module, any port configuration for PortChannels
- Fabric-based multipathing
- Per-VSAN fabric services
- Port tracking
- Virtual Router Redundancy Protocol (VRRP) for management and FCIP or iSCSI connections
- Online diagnostics

**Programming Interfaces**

- Scriptable CLI
- Fabric Manager GUI
- Device Manager GUI

*Technical Specifications*

**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-X9304-18FK9)

**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-operating and storage | 10% to 95% |
| Altitude, operating | -197 to 6500 feet (-60 to 2000 meters) |

**Dimensions** (HxWxD)

1.75 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)
occupies one slot in a Cisco MDS 9200 Series or MDS 9500 Series chassis
Weight of Fully configured chassis with optional Multiprotocol Service Module: 7.75 lbs (3.5 kg)