

Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules

Cisco® MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules deliver high performance and innovative features to enable convergence, scalability, and intelligence in large, virtualized data centers. With up to 528 line-rate 8-Gbps Fibre Channel ports per chassis, industry-first technologies such as Cisco FlexSpeed and Arbitrated Local Switching, intelligent fabric services such as integrated VSANs, Inter-VSAN Routing (IVR), and PortChannels, Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules enable deployment of large, scalable, and virtualized data centers.

Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules are available in two configurations:

- The 32-Port 8-Gbps Advanced Fibre Channel Switching Module delivers line-rate performance across all ports and is ideal for high-end storage subsystems and for Inter-Switch Link (ISL) connectivity.
- The 48-Port 8-Gbps Advanced Fibre Channel Switching Module provides higher port density and is ideal for connection of high-performance virtualized servers. With Arbitrated Local Switching enabled, this module supports 48-ports of line-rate 8-Gbps and is perfect for deploying dense virtual machine clusters with locally mapped storage. For traffic switched across the backplane, this module supports 1.5:1 oversubscription at 8-Gbps Fibre Channel (FC) rate across all ports.

The 8-Gbps Advanced Fibre Channel Switching Modules are compatible with all Cisco MDS 9500 Series Multilayer Directors, providing investment protection and outstanding low total cost of ownership (TCO).

Product Overview

Cisco MDS 9000 32-Port 8-Gbps Advanced Fibre Channel Switching Module

For the most demanding storage networking environments, the 32-port 8-Gbps Advanced Fibre Channel switching module delivers uncompromising performance. The 32-port 8-Gbps Advanced switching module delivers full-duplex aggregate performance of 512 Gbps, making this module well suited for attachment of high-performance 8-Gbps storage subsystems or either 8- or 10-Gbps Inter-Switch Links (ISLs).

Cisco MDS 9000 48-Port 8-Gbps Advanced Fibre Channel Switching Module

For large-scale storage networking environments, the 48-port 8-Gbps Advanced Fibre Channel switching module delivers full-duplex aggregate backplane switching performance of 512 Gbps, making this module ideal for high-performance and virtualized servers. With Arbitrated Local Switching, the 48-port 8-Gbps Advanced module delivers full-duplex aggregate performance of 768 Gbps across locally switched ports on the module. Arbitrated Local Switching on the 48-port 8-Gbps Advanced Fibre Channel module is well suited for deployment of dense virtual machine clusters with locally mapped storage.

Figure 1. Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules



Cisco MDS 9000 Family 48-Port 8-Gbps Advanced Fibre Channel Switching Module



Cisco MDS 9000 Family 32-Port 8-Gbps Advanced Fibre Channel Switching Module

Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules provide up to 528 ports with an aggregate bandwidth of 8.4 terabits per second (Tbps). 8-Gbps Advanced modules enable you to consolidate SAN deployments with fewer hardware components, consolidate workloads from hundreds of virtual machines with unparalleled performance, and scale with incremental updates as your SAN grows while protecting your existing investment. Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules also provide Cisco VMpath technology, which enables advanced virtual machine-aware SAN provisioning and monitoring for virtualized data centers. With Cisco VMpath, you can monitor, manage, and control SAN resource allocation and performance on a per-virtual machine basis and map out paths all the way from the server to storage, enabling tracking of mission-critical workloads end-to-end.

Cisco MDS 9000 Family Advanced Fibre Channel Switching Modules are hot-swappable and compatible with 1/2/4/8- and 10-Gbps interfaces, and they support hot-swappable Enhanced Small Form-Factor Pluggable (SFP+) transceivers. Individual ports can be configured with Cisco 8- and 10-Gbps shortwave or longwave SFP+ transceivers. Each port supports 500 buffer credits for exceptional extensibility without requiring additional licensing. With the Cisco Enterprise Package, up to 4095 buffer credits can be allocated to an individual port, enabling full link bandwidth over long distances with no degradation in link utilization.

The 8-Gbps Advanced Fibre Channel switching modules continue to provide previously available features such as - predictable performance and high availability, advanced traffic management capabilities, integrated VSANs and IVR, resilient high-performance ISLs, intelligent fabric services, advanced IBM Fibre Connection (FICON) services, comprehensive security frameworks, fault detection and isolation of errored packets, and sophisticated diagnostics.

Product Highlights

- **Cisco FlexSpeed:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules are equipped with Cisco FlexSpeed technology, which enables ports on the Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules to be configured as either 1/2/4/8-Gbps or 10-Gbps Fibre Channel interfaces. 10-Gbps interfaces enable reduced cabling for ISLs because they provide a 50 percent higher data rate than 8-Gbps interfaces. With integrated Cisco TrustSec[®] encryption, the 10-Gbps links provide secure, high-performance native Fibre Channel SAN Extension. Both 32- and 48-port modules support up to 24 10-Gbps Fibre Channel interfaces, which enables consolidation of 1/2/4/8-Gbps and 10-Gbps ports into the same Fibre Channel switching module, thereby conserving space on the Cisco MDS 9000 Family chassis.
- **Arbitrated Local Switching:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules provide line-rate switching across all the ports on the same module without performance degradation or increased latency for traffic exchanged with other modules in the chassis. This capability is achieved through Cisco MDS 9500 Series Multilayer Directors crossbar architecture with a central arbiter arbitrating fairly between local traffic and traffic to and from other modules. Local switching can be enabled on any Cisco MDS 9500 Series director-class chassis.
- **Integrated Hardware-Based VSANs and Inter-VSAN Routing (IVR):** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules enable deployment of large-scale consolidated SANs while maintaining security and isolation between applications. Integration into port-level hardware allows any port or any virtual machine in a system or fabric to be partitioned into any VSAN. Integrated hardware-based IVR provides line-rate routing between any ports in a system or fabric without the need for external routing appliances.
- **Resilient High-Performance ISLs:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules support high-performance ISLs consisting of 8- or 10-Gbps secure Fibre Channel. Advanced Fibre Channel switching modules also offer PortChannel technology, with up to 16 links spanning any port on any module within a chassis grouped into a logical link for added scalability and resilience. Up to 4095 buffer-to-buffer credits can be assigned to single Fibre Channel port, providing industry-leading extension of storage networks up to 4000 km at 2 Gbps, 2000 km at 4 Gbps, 1000 km at 8 Gbps, or 680 km at 10 Gbps while maintaining full link bandwidth.
- **Intelligent Fabric Services:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules provide integrated support for VSAN technology, Cisco TrustSec encryption, access control lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic-management features to enable deployment of large scale enterprise storage networks. The 8-Gbps Advanced Fibre Channel switching modules provide Fibre Channel Redirect (FC-Redirect) technology, which is a distributed flow redirection mechanism that can enable redirection of a set of traffic flows to an intelligent fabric service such as Cisco MDS 9000 I/O Acceleration (IOA), Cisco Data Mobility Manager (DMM), and Storage Media Encryption (SME).
- **Advanced FICON Services:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules support 1/2/4/8-Gbps FICON environments, including cascaded FICON fabrics, VSAN-enabled intermix of mainframe and open systems environments, and N-port ID virtualization (NPIV) for mainframe Linux partitions. FICON Control Unit Port (CUP) support enables in-band management of Cisco MDS 9000 Family switches from the mainframe management console.

- **Comprehensive Security Framework:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules support RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure FTP (SFTP), Secure Shell (SSH) Protocol, and 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). Cisco TrustSec Link Encryption implemented by the 8-Gbps Advanced Fibre Channel switching modules secures sensitive data within or across data centers over high-performance 8- and 10-Gbps Fibre Channel links.
- **Sophisticated Diagnostics:** Cisco MDS 9000 8-Gbps Advanced Fibre Channel Switching Modules provide 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.

Key Benefits

Investment Protection

Cisco continues to innovate in the Fibre Channel SAN space, offering advanced features for existing Cisco MDS 9500 Family chassis. Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules provide scalability, flexibility, and performance for existing Cisco MDS 9500 Series chassis. The 8-Gbps Advanced Fibre Channel switching modules deliver up to 528 8-Gbps line-rate ports per chassis to meet the scalability needs of large-scale data centers, Cisco FlexSpeed provides 1/2/4/8-Gbps and 10-Gbps ports coexisting on the same module, and 8-Gbps line-rate Arbitrated Local Switching across all 48 ports in the Cisco MDS 9500 Series switching to take advantage of localized clusters. The 8-Gbps Advanced Fibre Channel switching modules support intelligent fabric services such as Cisco IOA and SME, Integrated hardware-based VSANs and IVR, and a comprehensive security framework fully compatible with previous-generation Cisco MDS 9000 Family Fibre Channel Switching Modules to protect customer investment in switching modules and fabric services.

Scalable Consolidated SAN Deployment

With the exponential growth of data in today's business environment, organizations need large-scale SAN deployments. To fulfill these scalability requirements, Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules offer industry-leading port densities of up to 528 8-Gbps ports or 264 10-Gbps ports per chassis, high per-slot performance, unparalleled functionality with intelligent fabric services, VSANs for consolidating individual physical SAN islands while maintaining logical delineations, and IVR for sharing resources across VSANs. These capabilities enable the consolidation of an organization's data assets into fewer, larger, and more manageable SANs. The 8-Gbps Advanced Fibre Channel switching modules provide the choice of high-performance 1/2/4/8-Gbps and 10-Gbps Fibre Channel connectivity coexisting on the same switching module, thereby eliminating the need for a separate 10-Gbps Fibre Channel switching module and enabling further consolidation of SAN resources. For unified fabric deployments that have converged LAN and SAN using Lossless Ethernet in the server access layer, the 8-Gbps Advanced switching modules provide high-performance connectivity to existing Fibre Channel infrastructure. The 8-Gbps Advanced switching modules are also especially suited to provide resilient connectivity to dense computing POD environments.

Virtual Machine Aware SAN Deployment

Increasing adoption of server virtualization in the data center increases the number of hosts attached to the SAN, places higher workloads on the SAN, requires increased storage, and increases the need for SAN services. Cisco VMpath technology, part of the Cisco Data Center Network Manager for SAN (DCNM-SAN), provides end-to-end visibility all the way from the virtual machine down to storage, with resource allocation, performance measurements, and predictions available on a per-virtual machine basis to enable rapid troubleshooting in mission-critical virtualized environments. Dense clustered virtual machine environments with locally mapped storage can be deployed to take advantage of local switching across all ports of the Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules.

Integrated Mainframe Support

Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules are mainframe ready, with full support for IBM System z FICON and Linux environments. The 8-Gbps Advanced Fibre Channel switching modules support transport of the FICON protocol in both cascaded and noncascaded fabrics, as well as intermix of FICON and open systems Fibre Channel Protocol (FCP) traffic on the same switch. VSANs simplify the intermixing of SAN resources between z/OS, mainframe Linux, and open systems environments, allowing increased utilization and simplified management of SANs. VSAN-based intermix mode avoids the uncertainty and instability often associated with zoning-based intermix techniques. VSANs also greatly reduce the probability that a misconfiguration or component failure in one VSAN affects other VSANs. VSAN-based management access control enhances security by simplifying partitioning of SAN management responsibilities between mainframe and open systems environments.

FICON VSANs can be managed using the integrated Cisco DCNM-SAN; the Cisco command-line interface (CLI); or IBM CUP-enabled management tools, including SA/390, Resource Measurement Facility (RMF), or Dynamic Channel Path Management (DCM).

Advanced Traffic Management

Advanced traffic management capabilities integrated into every Cisco MDS 9000 Family 8-Gbps Fibre Channel Switching Module simplify deployment and optimization of large-scale fabrics.

- **Virtual Output Queuing:** Helps ensure 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 any individual port for optimal bandwidth utilization across distance
- **PortChannels:** Allow you to aggregate up to 16 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links; the bundle can be a mix of any port from any module in the chassis, helping ensure that the bundle can remain 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 dynamically reroute traffic in the event of a switch failure
- **Quality of Service (QoS):** Helps manage bandwidth and control latency to prioritize critical traffic, available on every port
- **Port Bandwidth Reservation:** Allows you to define dedicated bandwidth on a per-port basis

Advanced Diagnostics and Troubleshooting Tools

The Cisco MDS 9000 Family integrates proactive diagnostics, tools to verify connectivity and route latency and mechanisms for capturing and analyzing traffic, helping simplify the management of large-scale storage networks. Power-on self-test (POST) and online diagnostics provide proactive health monitoring. Integrated hardware functions enable diagnostic capabilities such as Fibre Channel Traceroute to identify the exact path and timing of flows, and Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN) to intelligently capture network traffic. Captured Fibre Channel traffic can be analyzed with the embedded Cisco Fabric Analyzer. Comprehensive port-based and flow-based statistics enable sophisticated performance analysis and service-level agreement (SLA) accounting.

Product Specifications

Table 1 lists the product specifications for the Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules.

Table 1. Technical Specifications

Feature	Description
Product compatibility	<ul style="list-style-type: none">• Cisco MDS 9500 Series Multilayer Directors
Software compatibility	<ul style="list-style-type: none">• Cisco MDS NX-OS Software Release 5.2 or later
Protocols	<ul style="list-style-type: none">• 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-LS-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)• 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 2• 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-BB-2, Revision 6.0 (ANSI INCITS 372-2003)

Feature	Description
	<ul style="list-style-type: none"> • 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) • 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) • 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) • FC-DA, Revision 3.1 (INCITS TR-36-2004) <p>MIBs</p> <ul style="list-style-type: none"> • Class of service (CoS): Classes 2, 3, and F • Fibre Channel standard port types: E, F, and FL • Fibre Channel enhanced port types: SD, and TE
Cards, ports, and slots	<ul style="list-style-type: none"> • 32 or 48 autosensing 1/2/4/8-Gbps Fibre Channel ports • 24 10-Gbps Fibre Channel ports
Features and Functions	
Fabric services	<ul style="list-style-type: none"> • Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Public loop • Broadcast • In-order delivery
Advanced functions	<ul style="list-style-type: none"> • VSAN • IVR • PortChannel with Multipath Load Balancing • Flow-based and zone-based QoS • NPIV • Local switching with centralized arbitration
Diagnostics and troubleshooting tools	<ul style="list-style-type: none"> • POST diagnostics • Online diagnostics • Internal port loopbacks • SPAN and RSPAN • Fibre Channel Traceroute • Fibre Channel Ping • Fibre Channel Debug • Cisco Fabric Analyzer • Syslog • Online system health • Port-level statistics • Real-Time Protocol Debug

Feature	Description		
Network security	<ul style="list-style-type: none"> • VSANs • ACLs • Per-VSAN RBAC • Fibre Channel zoning <ul style="list-style-type: none"> ◦ N-port Worldwide Name (WWN) ◦ N-port Fibre Channel ID (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 ◦ Logical unit number (LUN) • Fibre Channel Security Protocol (FC-SP) <ul style="list-style-type: none"> ◦ Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) switch-to-switch authentication ◦ DH-CHAP host-to-switch authentication • Port Security and Fabric Binding • Management access <ul style="list-style-type: none"> ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES ◦ SFTP • Cisco TrustSec Fibre Channel Link Level Encryption <ul style="list-style-type: none"> ◦ SSHv2 implementing AES 		
FICON	<ul style="list-style-type: none"> • FC-SB-3 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel FCP traffic • FICON CUP management interface 		
Serviceability	<ul style="list-style-type: none"> • 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 		
Performance	<ul style="list-style-type: none"> • Port speed: 1/2/4/8-Gbps autosensing, optionally configurable for 10-Gbps Fibre Channel • Buffer credits: Up to 500 per port and up to 4095 on an individual port (with optional Enterprise Package license activated) • PortChannel: Up to 16 ports 		
Supported Cisco optics, media, and transmission distances	Speed	Media	Distance
	10-Gbps SW, LC, SFP+	50/125-micron multimode	300m
	10-Gbps SW, LC, SFP+	62.5/125-micron multimode	33m
	10-Gbps LW, LC, SFP+	9/125-micron single-mode	10 km
	8-Gbps SW, LC, SFP+	50/125-micron multimode	150m
	8-Gbps SW, LC, SFP+	62.5/125-micron multimode	21m
	8-Gbps LW, LC, SFP+	9/125-micron single-mode	10 km
	8-Gbps ER, LC, SFP+	9/125-micron single-mode	40 km
	4-Gbps SW, LC, SFP	50/125-micron multimode	380m
	4-Gbps SW, LC, SFP	62.5/125-micron multimode	70m

Feature	Description
Reliability and availability	<ul style="list-style-type: none"> • Hot-swappable module • Hot-swappable SFP/SFP+ transceivers • Online diagnostics • Stateful Process Restart • Nondisruptive Supervisor Failover • Any module, any port configuration for PortChannels • Fabric-based multipathing • Per-VSAN fabric services • Port Tracking • Virtual Routing Redundancy Protocol (VRRP) for management
Network management	<ul style="list-style-type: none"> • Access methods through Cisco MDS 9500 Series Supervisor module <ul style="list-style-type: none"> ◦ Out-of-band 10/100 Ethernet port (Supervisor-1) ◦ Out-of-band 10/100/1000 Ethernet port (Supervisor-2 and Supervisor-2A) ◦ RS-232 serial console port ◦ In-band IP over Fibre Channel ◦ DB-9 COM port • Access methods through Cisco MDS 9000 Family Fibre Channel Switching Module <ul style="list-style-type: none"> ◦ In-band FICON CUP over Fibre Channel • Access protocols <ul style="list-style-type: none"> ◦ CLI through console and Ethernet ports ◦ SNMPv3 through 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 <ul style="list-style-type: none"> ◦ Per-VSAN RBAC using RADIUS- and TACACS+-based authentication, authorization, and accounting (AAA) functions ◦ SFTP ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES • Management applications <ul style="list-style-type: none"> ◦ Cisco MDS 9000 Family CLI ◦ Cisco Fabric Manager ◦ Cisco Device Manager ◦ CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)
Programming interfaces	<ul style="list-style-type: none"> • Scriptable CLI • Cisco DCNM-SAN Essentials • Cisco DCNM-SAN Advanced
Environmental	<ul style="list-style-type: none"> • Temperature, ambient operating: 32 to 104°F (0 to 40°C) • Temperature, ambient nonoperating and storage: -40 to 167°F (-40 to 75°C) • Relative humidity, ambient (noncondensing) operating: 10 to 90% • Relative humidity, ambient (noncondensing) nonoperating and storage: 10 to 95% • Altitude, operating: -197 to 6500 ft (-60 to 2000m)
Physical dimensions	<ul style="list-style-type: none"> • Dimensions (H x W x D): 1.75 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm) • Weight <ul style="list-style-type: none"> ◦ 32-port Advanced FC module: 10.5 lb (4.76 kg) ◦ 48-port Advanced FC module: 10.5 lb (4.76 kg)

Feature	Description
Approvals and compliance	<ul style="list-style-type: none"> Regulatory compliance <ul style="list-style-type: none"> CE Markings per directives 2004/108/EC and 2006/95/EC Safety compliance <ul style="list-style-type: none"> UL 60950-1 Second Edition CAN/CSA-C22.2 No. 60950-1 Second Edition EN 60950-1 Second Edition IEC 60950-1 Second Edition AS/NZS 60950-1 GB4943 2001 EMC compliance <ul style="list-style-type: none"> 47CFR Part 15 (CFR 47) Class A AS/NZS CISPR22 Class A CISPR22 Class A EN55022 Class A ICES003 Class A VCCI Class A EN61000-3-2 EN61000-3-3 KN22 Class A CNS13438 Class A EN55024 CISPR24 EN300386 KN24

Ordering Information

Table 2 provides ordering information for the Cisco MDS 9000 Family 8-Gbps Advanced Fibre Channel Switching Modules.

Table 2. Ordering Information

Part Number	Product Description
DS-X9232-256K9	Cisco MDS 9000 Family 32-Port 8-Gbps Advanced Fibre Channel Switching Module
DS-X9248-256K9	Cisco MDS 9000 Family 48-Port 8-Gbps Advanced Fibre Channel Switching Module
DS-13SLT-FAB3	MDS 9513 Crossbar Switching Fabric3 Module
DS-SFP-FC10G-SW	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Shortwave, SFP+, LC
DS-SFP-FC10G-LW	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Longwave, SFP+, LC
DS-SFP-FC8G-SW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC
DS-SFP-FC8G-LW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km Reach)
DS-SFP-FC8G-ER	2/4/8-Gbps Fibre Channel Extended Reach SFP+, LC (40 km Reach)
DS-SFP-FC4G-SW	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC
DS-C9513-4AK9	Cisco MDS 9513 Base Config: Chassis, 2 Sup2A, 2 Fabric3, 2 6K AC PS
Spare Component	
DS-X9232-256K9=	Cisco MDS 9000 Family 32-Port 8-Gbps Advanced Fibre Channel Switching Module, Spare
DS-X9248-256K9=	Cisco MDS 9000 Family 48-Port 8-Gbps Advanced Fibre Channel Switching Module, Spare
DS-13SLT-FAB3=	MDS 9513 Crossbar Switching Fabric3 Module, Spare
DS-SFP-FC10G-SW=	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Shortwave, SFP+, LC, Spare
DS-SFP-FC10G-LW=	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Longwave, SFP+, LC, Spare
DS-SFP-FC8G-SW-4=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, 4 pack, Spare
DS-SFP-FC8G-SW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, Spare

Part Number	Product Description
DS-SFP-FC8G-LW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km Reach), Spare
DS-SFP-FC8G-ER=	2/4/8-Gbps Fibre Channel Extended Reach SFP+, LC, Spare (40 km Reach)
DS-SFP-FC4G-SW-4=	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Shortwave, SFP+, LC, 4 pack, Spare
DS-SFP-FC4G-SW=	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC, Spare

For More Information

For more information about the Cisco MDS 9000 Family Fibre Channel Switching Modules, visit <http://www.cisco.com/go/storage> or contact your local account representative.

For detailed information about supported optics, see [Cisco MDS 9000 Family Pluggable Transceivers](#).



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

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