Cisco MDS 9000 Family 8-Gbps Fibre Channel Switching Modules

Cisco® MDS 9000 Family 8-Gbps Fibre Channel switching modules deliver the intelligence and the high performance required to support the most demanding storage applications, providing the foundation for large scale Storage Area Network (SAN) consolidation. Delivering up to 528 8-Gbps ports per chassis and twice the bandwidth of previous switching modules, the 8-Gbps Fibre Channel switching modules enable you to build consolidated SANs with fewer chassis for dramatic savings in space, power and cooling, and total cost of ownership (TCO).

Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules are available in three configurations:

- **The 24-Port 8-Gbps Fibre Channel Switching Module** delivers the highest performance for high-end storage subsystems and for Inter Switch Link (ISL) connectivity.
- **The 48-Port 8-Gbps Fibre Channel Switching Module** provides optimized performance and port density for connection of high-performance and virtualized servers.
- **The 4/44-Port 8-Gbps Host-Optimized Fibre Channel Switching Module** offers a very cost-effective solution for consolidating standard servers into the smallest number of SAN switches, in many cases eliminating the need for core-edge topologies.

The 8-Gbps Fibre Channel switching modules are compatible with all MDS 9500 Series Multilayer Directors, enabling you to continue to use your existing 2- and 4-Gbps MDS 9000 Family Fibre Channel switching modules and gradually phase in 8-Gbps technology as your network demands it.

Product Overview

24-Port 8-Gbps Fibre Channel Switching Module

For the most demanding storage networking environments, the Cisco MDS 9000 Family 24-Port 8-Gbps Fibre Channel Switching Module delivers uncompromising performance. The front panel ports deliver up to 192 Gbps of full-duplex bandwidth, making this module best suited for attachment of 4- and 8-Gbps-enabled storage subsystems and for Inter Switch Link (ISL) connectivity. Virtual SANs (VSANs) allow hardware-based separation of Fibre Channel and FICON traffic switched on a single physical SAN, lowering overall TCO without compromising your network's scalability, availability, manageability, and security.

48-Port 8-Gbps Fibre Channel Switching Module

For high-performance storage networking environments, the Cisco MDS 9000 Family 48-Port 8-Gbps Fibre Channel Switching Module delivers an ideal balance of performance and scalability. Its 48 autosensing 1/2/4/8-Gbps ports deliver a total of 192 Gbps of full-duplex bandwidth to meet the performance demands of enterprise-class or highly virtualized servers. Through easy-to-use traffic engineering capabilities, the 48-Port 8-Gbps Fibre Channel Switching Module offers the flexibility to provide predictable high-performance storage and inter-switch connectivity, fully utilizing the available bandwidth.

4/44-Port 8-Gbps Host-Optimized Fibre Channel Switching Module

Optimized for host connectivity, the Cisco MDS 9000 Family 4/44-Port 8-Gbps Host-Optimized Fibre Channel Switching Module enables storage network consolidation with high-density, cost-effective connectivity. Four 8-Gbps ports and 44 4-Gbps ports deliver 96 Gbps of full-duplex bandwidth, sufficient for the majority of today's standard servers.

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

Port Bandwidth Reservation, available on all Cisco MDS 9000 Fibre Channel switching modules, enables switching bandwidth to be dedicated to specific ports. This unique Cisco feature gives you great flexibility in bandwidth allocation to support a mix of applications within a single module, including high-performance ISLs. By combining Cisco 24-Port, 48-Port, and 4/44-Port Host-Optimized 8-Gbps Fibre Channel switching modules in a single modular chassis, you can design storage networks optimized for cost and performance in a wide range of application environments. This application-optimized approach to port deployment can reduce the number of switches and ISLs required in a storage network, in many cases eliminating the need for core-edge network topologies. Using these switching modules, the Cisco MDS 9513 Multilayer Director can scale up to 528 ports per chassis or 1584 ports per rack: fewer switches simplify management and reduce deployment and operational costs, resulting in significantly lower TCO. Figure 1 shows the three configurations of Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules.

Cisco 8-Gbps Fibre Channel switching modules are hot-swappable and 1/2/4/8-Gbps autosensing compatible, and support hot-swappable, Small Form-Factor Pluggable (SFP) and Enhanced Small Form-Factor Pluggable (SFP+) LC interfaces. Individual ports can be configured with Cisco 4- and 8-Gbps short-wave or long wave SFPs and SFP+s for connectivity up to 10 kilometers. Additionally, ports can be configured with Cisco 2- and 4-Gbps coarse wave division multiplexing (CWDM) SFPs for connectivity up to 100 kilometers at 2 Gbps, or 40 kilometers at 4 Gbps. Each port supports 250 buffer credits for maximum 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 thousands of kilometers with no degradation in link utilization.

Key Features and Benefits

Cisco MDS 9000 Family Fibre Channel 8-Gbps switching modules offer the following features:

- **Autosensing 1/2/4/8-Gbps interfaces:** Provide high performance and compatibility with existing devices.
- **High-performance ISLs:** Support up to 16 links in a single PortChannel; links can 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, providing industry-leading extension of storage networks up to 8000 km at 1 Gbps, 4000 km at 2 Gbps, 2000 km at 4 Gbps, or 1000 km at 8 Gbps while maintaining full link bandwidth.
- **Intelligent network services:** Provide integrated support for VSAN technology, access control lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic-management features such as Fibre Channel Congestion Control (FCC) and fabric-wide quality of service (QoS) to enable migration from SAN islands to enterprise storage networks.
- **Integrated hardware-based VSANs and Inter-VSAN Routing (IVR):** Enable deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port or any virtual machine (VM) within a system or fabric to be partitioned into any VSAN. Integrated hardware-based IVR provides line-rate routing between any ports within a system or fabric without the need for external routing appliances.
- **Advanced FICON services:** 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 for mainframe Linux partitions. CUP support enables in-band management of Cisco MDS 9000 Family switches from the mainframe management console.
- **Comprehensive security framework:** Supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (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.
- **Sophisticated diagnostics:** 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.
- **Port density and configuration flexibility:** Provides 24-port, 48-port, and 4/44-port configurations to optimize performance, flexibility, and density; supports industry-leading port densities of up to 528 8-Gbps Fibre Channel ports per chassis and 1584 ports per rack.
- **Fibre Channel Link Encryption:** Delivers transparent, hardware-based, line-rate encryption of Fibre Channel data in motion between any Cisco MDS 9000 Family 8-Gbps modules, preserving integrity and confidentiality of Fibre Channel traffic.

Intelligent Scalability

The Cisco MDS 9000 Family offers high port density, scaling from 4 to 528 ports per chassis. Because building a large-scale storage network requires more than just high port density, Cisco has introduced innovative features that make multilayer storage networks a reality. VSANs, Inter-VSAN Routing on every port, advanced traffic management, hardware-enabled serviceability, and comprehensive security features make the Cisco MDS 9000 Family the platform of choice when you require high scalability and low TCO.

Virtual Machine Transparency

Server virtualization means that a SAN must concurrently support thousands of diverse, tiered applications, each with unique performance requirements. These applications and the virtual machines they run on are not bounded by physical servers and network ports. The Cisco MDS 9000 Family provides deterministic hardware performance and a rich feature set that allows VMs to have the same SAN attributes as a physical server. On a per-VM basis, the MDS 9000 Family NX-OS offers VSAN isolation, QoS policies, access control, performance monitoring, and data protection to enable scalability and mobility of VMs.

Virtual SANs

Ideal for efficient, secure SAN consolidation, ANSI T11 compliant 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, maintaining its own fabric services for added scalability and resilience. VSANs allow the cost of SAN infrastructure to be shared among more users, while ensuring absolute segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis. Through unique industry-first virtualization features, VSANs benefits can be extended to virtualized servers, providing the foundation for an end-to-end virtualized data center.

Integrated SAN Routing

In another step toward deploying the most efficient, cost-effective, consolidated storage networks, the Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules support IVR functionality on every port 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, thereby maintaining fabric stability and availability. Integrated IVR lowers TCO by eliminating the need for external routing appliances, greatly increasing routing scalability while delivering line-rate performance, simplifying management, and nearly eliminating the challenges associated with maintaining separate systems.

Integrated Mainframe Support

Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules are mainframe ready, with full support for IBM System z FICON and Linux environments. The 8-Gbps 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 intermix of SAN resources between z/OS, mainframe Linux, and open systems environments, allowing for 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 Fabric Manager; 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:** Helps manage bandwidth and control latency to prioritize critical traffic, available on every port.
- **Fibre Channel Congestion Control (FCC):** Augments the Fibre Channel buffer to-buffer credit mechanism for enhanced traffic management, through end-to-end feedback-based mechanism.
- **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 functionality enables diagnostic capabilities such as Fibre Channel Traceroute for detailing the exact path and timing of flows, 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.

Comprehensive Solution for Robust Security

The Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules offer an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The 8-Gbps Fibre Channel switching modules employ 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 ensure that logical unit numbers (LUNs) are accessible only by specific hosts (LUN zoning), limit SCSI read commands for a certain zone (read-only zoning), and restrict broadcasts to selected zones (broadcast zones). VSANs provide mutual isolation among devices connected to the same physical SAN, while IVR enables controlled sharing of resources between VSANs. In addition, FC-SP provides switch-switch and host-switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication, supporting RADIUS or TACACS+ to help ensure that only authorized devices access protected storage networks. Fibre Channel Link Encryption, available on the Cisco MDS 9000 Family 8-Gbps modules, addresses the growing security compliance requirements by allowing you to transparently encrypt ISL traffic, providing an additional layer of protection for data within and between datacenters.

Product Specifications

Table 1 lists the product specifications for the Cisco MDS 9000 Family 8-Gbps Fibre Channel switching modules.

Table 1. Technical Specification

Feature	Description
Product compatibility	• Cisco MDS 9500 Series Multilayer Directors and Cisco MDS 9222i Multiservice Modular Switch (4/44-Port 8-Gbps Fibre Channel Switching Module)
Software compatibility	• Cisco MDS NX-OS Release 4.1 or later
Protocols	• Fibre Channel standards • FC-PH, Revision 4.3 (ANSI INCITS 230-1994) • FC-PH, Amendment 1 (ANSI INCITS 230-1994/AM1-1996) • FC-PH, Amendment 2 (ANSI INCITS 230-1994/AM2-1999) • FC-PH-2, Revision 7.4 (ANSI INCITS 297-1997) • FC-PH-3, Revision 9.4 (ANSI INCITS 303-1998) • FC-PI, Revision 13 (ANSI INCITS 352-2002) • FC-PI-2, Revision 10 (ANSI INCITS 404-2006) • FC-PI-4, Revision 8 (ANSI INCITS 450-2008) • 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 0.5 • 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-SW-5, Revision 8.1 • 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)
Protocols (continued)	• FC-GS-6, Revision 9.21 • 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) • FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008) • FC-IFR, Revision 1.03 • 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) • FAIS-2, Revision 2.23 (ANSI INCITS 449-2008) • 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 FC (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
Cards/ports/slots	• 24, 48, or 48 fixed autosensing 1/2/4/8-Gbps Fibre Channel ports

Feature	Description
Features and functions	
Fabric services	• Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Public loop • Broadcast • In-order delivery
Advanced functionality	• VSAN • IVR • PortChannel with Multipath Load Balancing • QoS-flow-based, zone-based • FCC • N_Port ID Virtualization
Diagnostics and troubleshooting tools	• 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
Network security	• VSANs • ACLs • 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 • FC-SP ◦ DH-CHAP switch-switch authentication ◦ DH-CHAP host-switch authentication • Port Security and Fabric Binding • Management access ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES ◦ SFTP • Link Level Encryption ◦ SSHv2 implementing AES
FICON	• FC-SB-3 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel FCP traffic • CUP management interface

Feature	Description
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
Performance	• Port speed: 1/2/4/8-Gbps autosensing, optionally configurable • Buffer credits: 24-port and 48-port 8-Gbps modules: 32 per port (shared-mode ports), up to 500 per port (dedicated-mode ports), 4/44-port module: 32 per port (shared-mode ports), up to 250 per port (dedicated-mode ports), all modules: up to 4095 on an individual port (dedicated-mode ports with optional Enterprise Package license activated) • PortChannel: up to 16 ports
Supported Cisco optics, media, and transmission distances	**Speed** / **Media** / **Distance** 8 Gbps-SW, LC SFP+ / 50/125-micron multimode / 150 m 8 Gbps-SW, LC SFP+ / 62.5/125-micron multimode / 21 m 8 Gbps-LW, LC SFP+ / 9/125-micron single-mode / 10 km 4 Gbps-SW, LC SFP / 50/125-micron multimode / 380 m 4 Gbps-SW, LC SFP / 62.5/125-micron multimode / 70 m 4 Gbps-MR, LC SFP / 9/125-micron single-mode / 4 km 4 Gbps-LW, LC SFP / 9/125-micron single-mode / 10 km 4 Gbps-CWDM, LC SFP / 9/125-micron single-mode / Up to 40 km 2 Gbps-CWDM, LC SFP / 9/125-micron single-mode / Up to 100 km 2 Gbps-DWDM, LC SFP / 9/125-micron single-mode / Up to 80 km
Reliability and availability	• Hot-swappable module • Hot-swappable SFP optics • 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	• Access methods through Cisco MDS 9500 Series Supervisor module ◦ 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 ◦ In-band FICON CUP over Fibre Channel • Access protocols ◦ CLI by console and Ethernet ports ◦ SNMPv3 by 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-based and TACACS+-based authentication, authorization, and accounting (AAA) functions ◦ SFTP ◦ SSHv2 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)

Feature	Description
Programming interfaces	• Scriptable CLI • Fabric Manager GUI • Device Manager GUI
Environmental	• 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 2000 m)
Physical dimensions	• Dimensions (H x W x D): 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 ◦ 24-Port Performance Module only: 10.25 lb (4.65 kg) ◦ 48-Port Performance Module only: 10.25 lb (4.65 kg) ◦ 4/44-Port Host-Optimized Module only: 9.75 lb (4.42 kg)
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 (CFR 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

Ordering Information

Table 2 provides ordering information for the Cisco MDS 9000 Family Fibre Channel switching modules.

Table 2. Ordering Information

Part Number	Product Description
DS-X9224-96K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 24-Port FC Module
DS-X9248-96K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 48-Port FC Module
DS-X9248-48K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 4/44-Port Host-Optimized FC Module
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-FC4G-SW	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC
DS-SFP-FC4G-MR	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Longwave, SFP, LC (4-km reach)
DS-SFP-FC4G-LW	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Longwave, SFP, LC (10-km reach)
Spare Component	
DS-X9224-96K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 24-Port FC Module, Spare

Part Number	Product Description
DS-X9248-96K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 48-Port FC Module, Spare
DS-X9248-48K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 4/44-Port Host-Optimized FC Module, 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
DS-SFP-FC8G-LW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km reach), Spare
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
DS-SFP-FC4G-MR=	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Longwave, SFP, LC (4-km reach), Spare
DS-SFP-FC4G-LW=	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Longwave, SFP, LC (10-km reach), Spare
DS-CWDM-xxxx=	Cisco XXXX NM CWDM 1/2-Gbps Fibre Channel SFP, spare (where XXXX=1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610)
DS-CWDM4GXXXX=	Cisco XXXX NM CWDM 4-Gbps Fibre Channel SFP, spare (where XXXX=1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610)
DWDM-SFP-XXXX=	Cisco 15XX.XX NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare (where XXXX=6061, 5979, 5898, 5817, 5655, 5575, 5494, 5413, 5252, 5172, 5092, 5012, 4851, 4772, 4692, 4612, 4453, 4373, 4294, 4214, 4056, 3977, 3898, 3819, 3661, 3582, 3504, 3425, 3268, 3190, 3112, 3033)
DS-13SLT-FAB2=	Cisco MDS 9513 Crossbar Switching Fabric2 Module, Spare (required for 24-port or 48-port Modules in the MDS 9513)

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.

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