Cisco MDS 9000 Family 4-Gbps Fibre Channel Switching Modules

Cisco® MDS 9000 Family 4-Gbps Fibre Channel switching modules deliver the intelligence and advanced features required to build truly scalable storage area networks (SANs). Delivering twice the link bandwidth of 2-Gbps Fibre Channel products, the Cisco Fibre Channel switching modules include hardware-enabled innovations designed to dramatically improve performance, scalability, availability, security, and manageability of storage networks, resulting in increased utility and lower total cost of ownership (TCO).

Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules are available in three configurations. The Cisco 12-Port 4 Gbps Fibre Channel Switching Module delivers the highest performance for the most demanding storage networking applications. The Cisco 24-Port 4-Gbps Fibre Channel Switching Module delivers the optimal performance and port density for connection of today's high performance servers and storage arrays. The Cisco 48-Port 4-Gbps Fibre Channel Switching Module is the ideal solution for consolidating large numbers of server connections into the smallest number of SAN switches, in many cases eliminating the need for core-edge topologies.

The Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules are compatible all MDS 9500 Series Multilayer Directors as well as MDS 9216A and MDS 9216i multilayer fabric switches providing outstanding value and investment protection.

Product Overview

12-Port 4-Gbps Fibre Channel Switching Module

For the most demanding storage networking environments, the Cisco MDS 9000 Family 12-Port 4-Gbps Fibre Channel Switching Module delivers uncompromising performance. The 4-Gbps ports deliver up to 96 Gbps of full-duplex bandwidth, making the Cisco 12-Port Fibre Channel Switching Module ideal for attachment of the highest performance 4-Gbps-enabled storage subsystems and for ISL connections between switches. With its multiprotocol capability, the Cisco 12-Port 4-Gbps Fibre Channel Switching Module transparently integrates FICON protocol, FICON CUP management, and switch cascading to enable mainframe connectivity. VSANs allow hardware-based separation of Fibre Channel and FICON traffic switched on a single physical SAN, increasing overall TCO without compromising scalability, availability, manageability, and network security.

24-Port 4-Gbps Fibre Channel Switching Module

For high-performance storage networking environments, the Cisco MDS 9000 Family 24-Port 4-Gbps Fibre Channel Switching Module delivers an ideal balance of performance and scalability. Twenty-four auto-sensing 1/2/4-Gbps ports delivers 96 Gbps of total bandwidth required to meet the performance demands of today's enterprise-class storage arrays and servers. Bandwidth is allocated across four 6-port port-groups, providing 24 Gbps of full-duplex bandwidth per port-group. Port Bandwidth Reservation, a unique Cisco feature available on the Cisco 24-Port 4-Gbps

Fibre Channel Switching Module, enables switching bandwidth to be dedicated to a port, enabling optimal bandwidth allocation for any application, including high-performance ISLs.

48-Port 4-Gbps Fibre Channel Switching Module

Storage network consolidation moves to a new level with the transport optimization provided by the Cisco MDS 9000 Family 48-Port 4-Gbps Fibre Channel Switching Module. With Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules, network architects can allocate bandwidth optimally to meet specific application requirements while decreasing the switching footprint and lowering overall storage network deployment cost. The Cisco 48-Port 4-Gbps Fibre Channel Switching Module delivers 96 Gbps of total bandwidth and extremely high port density, enabling 528 ports per chassis and 1584 ports per rack. Bandwidth is allocated across four 12-port port-groups, providing 24 Gbps of full-duplex bandwidth per port-group. Port Bandwidth Reservation, a feature unique to Cisco available on the Cisco 48-Port 4-Gbps Fibre Channel Switching Module, enables switching bandwidth to be dedicated to a port, enabling the flexible bandwidth allocation needed to meet a wide range of application requirements.

All Cisco 4-Gbps Fibre Channel switching modules are 1/2/4-Gbps autosensing compatible, hot-swappable and include hot-swappable, Small Form-Factor Pluggable (SFP) LC interfaces. Individual ports can be configured with Cisco 4-Gbps short-wave, or long-wave SFPs for connectivity up to 10 kilometers at 4 Gbps. Additionally, ports can be configured with Cisco 2-Gbps coarse wave division multiplexing (CWDM) SFPs for connectivity up to 100 kilometers at 2 Gbps. Up to 250 buffer credits per port are supported 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.

By combining Cisco 12-port, 24-port and 48-port 4-Gbps Fibre Channel switching modules in a single, modular chassis, customers 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. Fewer switches simplify management and reduce deployment and operational costs, resulting in significantly lower TCO. Figure 1 shows the Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules.

Figure 1. Cisco MDS 9000 Family 4-Gbps Fibre Channel Switching Modules

Key Features and Benefits

Cisco MDS 9000 Family Fibre Channel 4-Gbps switching modules offer the following features:

- **Autosensing 1/2/4-Gbps interfaces**—Provide high-performance connectivity and compatibility with existing devices.
- **High-performance inter-switch links (ISLs)**—Support up to sixteen links in a single PortChannel; links can span any speed-matched 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, providing industry-leading extension of storage networks up to 8,000 km at 1 Gbps, 4000 km at 2 Gbps, or 2000 km at 4 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-wide storage networks.
- **Integrated hardware-based VSANs and Inter-VSAN Routing (IVR)**—Enables deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port within a system or fabric to be partitioned into any VSAN. Integrated hardware-based inter-VSAN routing provides line-rate routing between any ports within a system or fabric without the need for external routing appliances.
- **Advanced FICON services**—Supports 1/2/4-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 (Control Unit Port) 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**—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.
- **Port density and configuration flexibility**—Provides 12-port, 24-port, and 48-port configurations to optimize performance, flexibility, and density; supports port densities of up to 528 Fibre Channel ports per chassis and 1584 ports per rack, more than twice the port density of competitive solutions.

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 (IVR), advanced traffic management, hardware-enabled serviceability, and comprehensive security features make the Cisco MDS 9000 Family the platform of choice for businesses requiring high scalability and low TCO.

Virtual SANs

Ideal for efficient, secure SAN consolidation, 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. 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.

Integrated SAN Routing

In another step toward deploying the most efficient, cost-effective, consolidated storage networks, the Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules support IVR 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. With IVR, data can transit VSAN boundaries while maintaining control plane isolation, thereby maintaining fabric stability and availability. Integrated IVR eliminates the need for external routing appliances, greatly increasing routing scalability while delivering line-rate performance, simplifying management and eliminating the challenges associated with maintaining separate systems. Integrated IVR means lower total cost of SAN ownership.

Integrated Mainframe Support

Cisco 4-Gbps Fibre Channel switching modules are mainframe ready, with full support for IBM zSeries FICON and Linux environments. Qualified by IBM for attachment to all FICON-enabled devices in an IBM zSeries operating environment, Cisco 4-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 SAN utilization and simplified SAN management. VSAN-based intermix mode eliminates the uncertainty and instability often associated with zoning-based intermix techniques. VSANs also greatly reduce the probability of a misconfiguration or component failure in one VSAN affecting operation in other VSANs. VSAN-based management access control simplifies partitioning of SAN management responsibilities between mainframe and open systems environments, enhancing security. 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 4-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 an individual port for optimal bandwidth utilization across distance.
- **PortChannels**—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 speed-matched ports 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, in the event of a switch failure, dynamically reroute traffic.
- **QoS**—Can be used to manage bandwidth and control latency to prioritize critical traffic.

- **Fibre Channel Congestion Control (FCC)**—An end-to-end feedback-based congestion control mechanism that augments the Fibre Channel buffer to-buffer credit mechanism to provide enhanced traffic management.
- **Port Bandwidth Reservation**—Allows users to define dedicated bandwidth on a per port basis.

Advanced Diagnostics and Troubleshooting Tools

Management of large-scale storage networks requires proactive diagnostics, tools to verify connectivity and route latency, and mechanisms for capturing and analyzing traffic. The Cisco MDS 9000 Family integrates advanced analysis and debug tools. Power-on self-test (POST) and online diagnostics provide proactive health monitoring. The Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules provide the integrated hardware functionality required to implement 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. After traffic has been captured, it can then be analyzed with the Cisco Fabric Analyzer, an embedded Fibre Channel analyzer. Comprehensive port-based and flow-based statistics enable sophisticated performance analysis and service-level agreement (SLA) accounting. With the Cisco MDS 9000 Family, Cisco Systems® delivers a comprehensive toolset for troubleshooting and analysis of storage networks.

Comprehensive Solution for Robust Security

Addressing the need for failproof security in storage networks, the Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules offer an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The Cisco 4-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 are enabled to ensure that logical unit numbers (LUNs) are accessible only by specific hosts (LUN zoning), to limit SCSI read commands 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. 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.

Product Specifications

Table 1 lists the product specifications for the Cisco MDS 9000 Family 4-Gbps Fibre Channel switching modules.

Table 1. Technical Specification

Feature	Description
Product Compatibility	• Cisco MDS 9000 Family
Software Compatibility	• Cisco MDS SAN-OS Release 3.0(1) or later

Feature	Description
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-FS, Revision 1.9 (ANSI/INCITS 373-2003) ◦ FC-FS-2, Revision 0.91 ◦ FC-LS, Revision 1.2 ◦ 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 8.2 ◦ 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-VI, Revision 1.84 (ANSI/INCITS 357-2002) ◦ 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-SP, Revision 1.6 ◦ FC-DA, Revision 3.1 (INCITS TR-36-2004) ◦ FAIS, Revision 0.7 • 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	• 12, 24, or 48 fixed autosensing 1/2/4-Gbps Fibre Channel ports
Features and Functions	
Fabric Services	• Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Public loop • Broadcast • In-order delivery

Feature	Description
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
FICON	• FC-SB-3 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel FCP 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
Performance	• Port speed: 1/2/4-Gbps autosensing, 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 Enterprise Package license activated) • PortChannel: up to 16 ports

Feature	Description		
Supported Cisco Optics, Media, and Transmission Distances (4-Gbps Optics Modules)	**Speed** • 1 Gbps—SW, LC SFP • 1 Gbps—SW, LC SFP • 1 Gbps—LW, LC SFP • 2 Gbps—SW, LC SFP • 2 Gbps—SW, LC SFP • 2 Gbps—LW, LC SFP • 4 Gbps—SW, LC SFP • 4 Gbps—SW, LC SFP • 4 Gbps—MR, LC SFP • 4 Gbps—LW, LC SFP	**Media** • 50/125-micron multimode • 62.5/125-micron multimode • 9/125-micron single-mode • 50/125-micron multimode • 62.5/125-micron multimode • 9/125-micron single-mode • 50/125-micron multimode • 62.5/125-micron multimode • 9/125-micron single-mode • 9/125-micron single-mode	**Distance** • 500m • 300m • 10 km • 300m • 150m • 10 km • 150m • 70m • 4 km • 10 km
Supported Cisco Optics, Media, and Transmission Distances (2-Gbps CWDM Optics Modules)	**Speed** • 1 Gbps—CWDM, LC SFP • 2 Gbps—CWDM, LC SFP • 4 Gbps—CWDM, LC SFP	**Media** • 9/125-micron single-mode • 9/125-micron single-mode • 9/125-micron single-mode	**Distance** • Up to 100 km • Up to 100 km • Up to 40 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) ◦ 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)		
Programming Interfaces	• Scriptable CLI • Fabric Manager GUI • Device Manager GUI		

Feature	Description
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 ◦ 12-Port 4-Gbps Fibre Channel Switching Module only: 7.75 lb (3.50 kg) ◦ 24-Port 4-Gbps Fibre Channel Switching Module only: 7.75 lb (3.50 kg) ◦ 48-Port 4-Gbps Fibre Channel Switching Module only: 11.00 lb (4.95 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

The latest transceiver support matrix is available at http://www/en/US/prod/collateral/ps4159/ps6409/ps4358/product_data_sheet09186a00801bc698.html

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-X9112	Cisco MDS 9000 Family 1/2/4-Gbps 12-Port Fibre Channel Switching Module
DS-X9124	Cisco MDS 9000 Family 1/2/4-Gbps 24-Port Fibre Channel Switching Module
DS-X9148	Cisco MDS 9000 Family 1/2/4-Gbps 48-Port Fibre Channel Switching Module
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)
Advanced Software Package	
M9200ENT1K9	Cisco MDS 9200 Enterprise Package
M9200FMS1K9	Cisco MDS 9200 Fabric Manager Server Package

Part Number	Product Description
M9200FIC1K9	Cisco MDS 9200 Mainframe Package
M9500ENT1K9	Cisco MDS 9500 Enterprise Package
M9500FMS1K9	Cisco MDS 9500 Fabric Manager Server Package
M9500FIC1K9	Cisco MDS 9500 Mainframe Package
Spare Component	
DS-X9112=	Cisco MDS 9000 Family 1/2/4-Gbps 12-Port Fibre Channel Switching Module, Spare
DS-X9124=	Cisco MDS 9000 Family 1/2/4-Gbps 24-Port Fibre Channel Switching Module, Spare
DS-X9148=	Cisco MDS 9000 Family 1/2/4-Gbps 48-Port Fibre Channel Switching Module, 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-1470=	Cisco 1470 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1490=	Cisco 1490 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1510=	Cisco 1510 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1530=	Cisco 1530 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1550=	Cisco 1550 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1570=	Cisco 1570 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1590=	Cisco 1590 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM-1610=	Cisco 1610 NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1470=	Cisco 1470 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1490=	Cisco 1490 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1510=	Cisco 1510 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1530=	Cisco 1530 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1550=	Cisco 1550 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1570=	Cisco 1570 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1590=	Cisco 1590 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
DS-CWDM4G1610=	Cisco 1610 NM CWDM Gigabit Ethernet and 1/2/4-Gbps Fibre Channel SFP, Spare
M9200ENT1K9=	Cisco MDS 9200 Enterprise Package, Spare
M9200FMS1K9=	Cisco MDS 9200 Fabric Manager Server Package, Spare
M9200FIC1K9=	Cisco MDS 9200 Mainframe Package, Spare
M9500ENT1K9=	Cisco MDS 9500 Enterprise Package, Spare
M9500FMS1K9=	Cisco MDS 9500 Fabric Manager Server Package, Spare
M9500FIC1K9=	Cisco MDS 9500 Mainframe Package, Spare

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